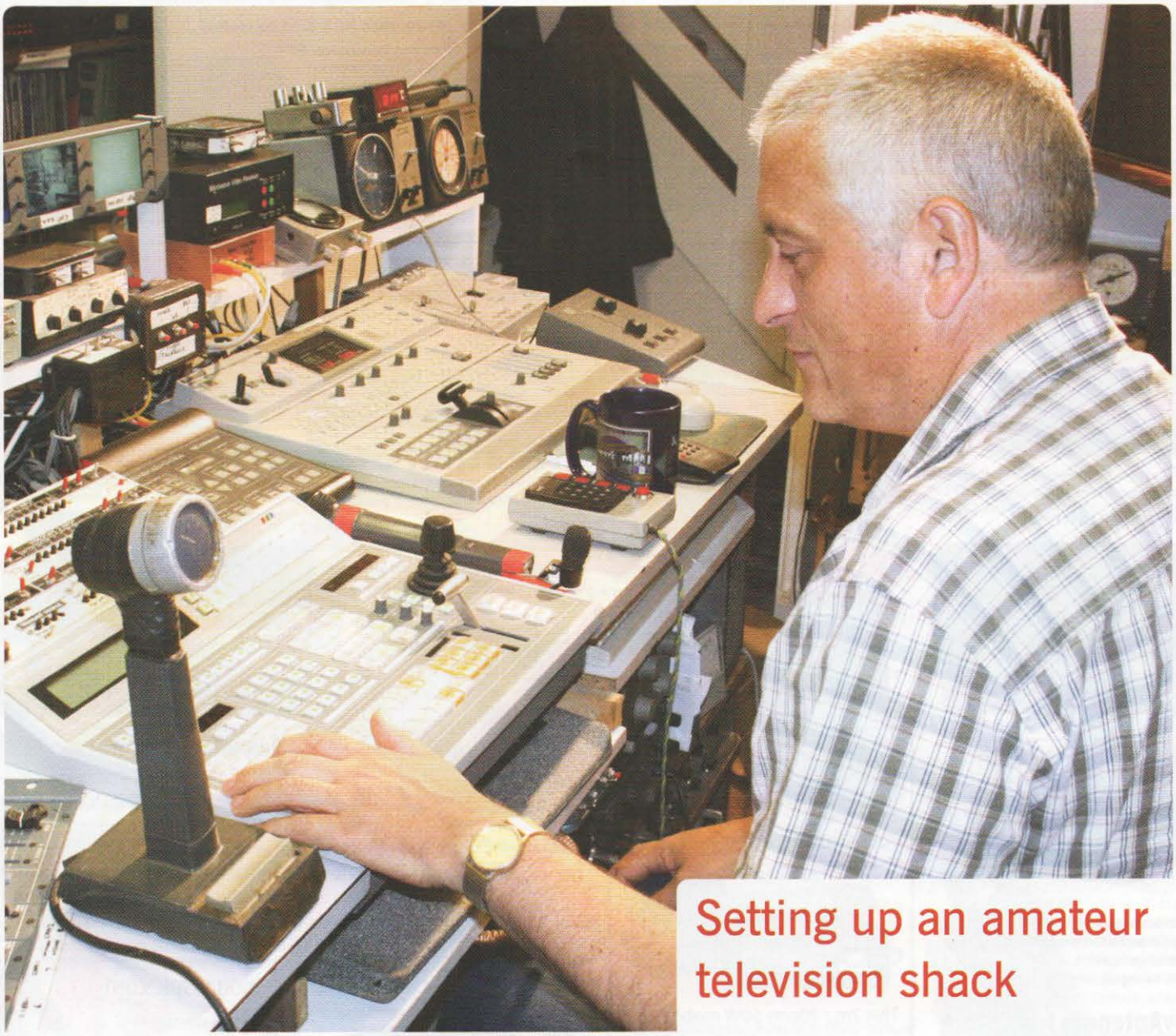
RadCom

RADIO SOCIETY OF GREAT BRITAIN ◆ WORKING FOR THE FUTURE OF AMATEUR RADIO

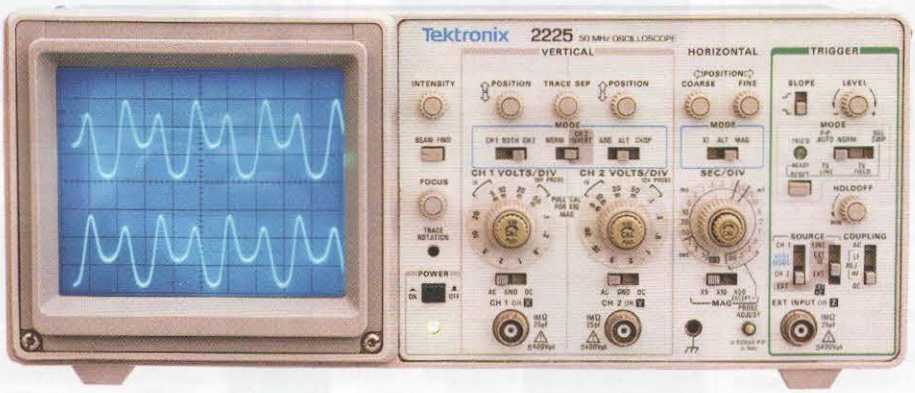
MAY 2014
VOLUME 90
NUMBER 05
£4.95



Setting up an amateur television shack

Equipment mods

'Tooling up' the venerable Kenwood TS-50 with improved CW filtering



Getting Started In...

Test equipment, from simple multimeters and SWR meters to oscilloscopes and complex spectrum analysers

HF

Great long path signals from KH7Y in Hawaii

WATERS & STANTON

Head Office & Southern Store

Spa House, 22 Main Road, Hockley, Essex SS5 4QS
Phone: (+44) 01702 206835 or 01702 204965
FAX: (+44) 01702 205843
Email: sales@wsplc.com
Opening: Monday - Saturday 9am - 5.30pm

Scotland & Northern Store

W&S @ Jaycee, 20 Woodside Way, Glenrothes
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Opening: Tuesday - Saturday 9.15am - 5pm

Web: www.wsplc.com
Blog: blog.wsplc.com

VISA MasterCard PayPal

Sposers of RSGB Club Of The Year

OPEN DAY 2014

Sunday 25th May 10am - 4pm

Hockley - Make it a Date - Get The Bargain Deals - Once Only Discounts!

Part Exchange & FREE Credit

YAESU Choice of the World's top DX'ers

£1,349d

FT-DX1200

FT-DX3000 HF & 6m Transceiver

Peter Hart Review in RadCom:
"There is little I could find fault with."

The new HF generation of base stations from Yaesu/ Built in auto ATU with advanced DSP and superb roofing filters.

£2069

Call us for some really special deals - PLUS FREE CREDIT

More Exclusive Yaesu Deals from Top UK Yaesu Dealer!

FT-897D HF & 70cms 100W

£749 d

The FT-897D is a very compact radio, like and FT-817ND on steroids. All modes and all bands in a very compact package .

FT-DX5000MP Last Few!

We have the last few of these great transceivers at an equally great price. Once they are gone they are gone so hurry if you want to pick one up. Regarded by many as the best HF transceiver in the last few years.

Includes £250 Yaesu Cash Back **£4225 d**

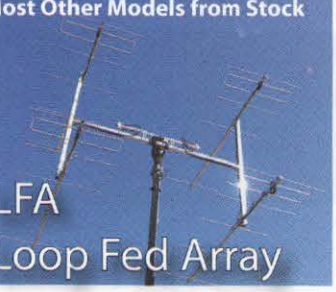
WATSON **Power Mite-NF**

£69.95c

- Output Voltage Variable: 4.0V - 16V
- Output Current: 22A Continuous, 25A Peak
- Output Voltage Regulation: Less than 1%
- Red Trip Warning LED, Green Power LED

InnovAntennas from Stock

Most Other Models from Stock



144MHz	Elements	Boom L.	Gain dB	Price inc VAT
144-LFA-3	3el	0.67	8.67	£59.95c
144-LFA-4	4el	1.17	9.49	£74.95c
144-LFA-5	5el	1.79	11.16	£89.96
144-LFA-6	6el	2.41	11.88	£104.95c
144-LFA-8	8el	3.73	13.32	£164.95c
144-LFA-9	9el	4.40	14.06	£194.95c
144-LFA-12	12el	7.13	15.80	£269.95c
432MHz				
432-LFA-5Q	10el	1.76	14.5	£92.95c
432-LFA-5Q	12el	2.32	15.22	£99.95c
432-LFA-5Q	16el	3.46	15.92	£139.95c
432-LFA-LN	18el	4.27	18.1	£174.95c
432-LFA-5Q	22el	5.51	19.06	£215.95

Buy Now Pay Later - Another Great service from Waters & Stanton

Now you can afford to buy that dream radio. Just come into the store with ID (driving licence, passport credit card or utility bill - we need two of these) and we can sign you up while you wait. Alternatively we can email you the forms and arrange it within 24 hours.

SIX MONTH DEAL - You pay no deposit and at the end of six months you must pay the purchase price to settle the debt.

TWELVE MONTHS - You pay no deposit and at the end of twelve months you must pay the purchase price plus a £15

Our NEW BABY - Weather Station W-8682

NEW

Ideal for hams or normal domestic use. This lovely little station will give you a true picture of what is happening outside including rain, wind, temperature, pressure and trends.

Just £49.95c

Weather Station W-8681-Pro

NEW

The W-8681 Pro Weather Station. It's our most advanced yet. Full colour touch screen with SD card and WiFi that enables you to get the full picture and forward forecast. It is totally wireless. No wires. Features: UV, Wind dir. & speed, humidity, in/out and min/max temp., Day and week, Pressure, Forecast, C/F, Clock, History. AC mains powered display.

£199.95

ICOM

Dual Band Touch Screen D-Star **ID-5100E**

NEW

This 2m / 70cms 50W mobile incorporates the user-friendly technology of Icom's IC-7100. The radio features a large responsive touch screen, integrated GPS, optional Bluetooth® connectivity and support for Android™ devices. DTMF via microphone or ID-5100 display SD Card slot for voice and data storage

Phone for a SPECIAL DEAL GREAT PX & INTEREST FREE.

YAESU Choice of the World's top DX'ers

FT-817ND HF - 70cms 5W All Mode Transceiver

Here's a great combination offer for those who want to go portable with a complete station including matching auto ATU and case for the transceiver. All battery operated and capable of feeding even a long wire. Comprises FT-817ND, Case and Elecraft T1-A auto ATU.

Complete Package **£699 c**

IC-R6

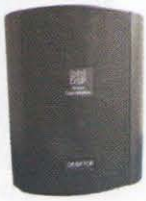
Free Extras

This scanner covers 100kHz-1309MHz. Receives FM WFM & AM and comes with AC charger and NiMH batteries £179.95c

PLUS £50 of FREE Accessories

ICOM Cap	worth £19.95
ICOM Mug	worth £7.95
WAT-999 Earpiece	worth £9.95
WSC-3 Belt case	worth £12.95

bhi DeskTop



Noise reduction products

NEW

- High Quality Desk Speaker
- 4" Bass & 1" Tweeter
- 10W output
- bhi DSP Noise cancelling unit
- Side DSP controls
- Accepts stereo or mono input
- Feed with line or speaker levels
- Requires 12v - lead included
- Hear the difference

£179.95 c

YAESU

FTM-400DE NEW

The New Dual Bander 2m & 70cms 50W Digital / FM

High visibility colour screen with bandscope, altitude and navigational screens. Enjoy both digital and FM. Available now! **£569.95c**

VX-8GE 2m/70cm Handy **Save £60**

The VX-8GE APRS/GPS provides an economical opportunity to obtain a handheld dedicated to APRS on 144 & 430 MHz. This model allows users to acquire a VX-8 series radio without having to pay for many of the VX-8DE features that may not be of value for their active APRS operation

Was ~~£349.95~~ Now £289.95c

Carriage Charges: A=£4, B=£5, C=£8.50, D=£11

YAESU · ICOM · bhi · KENWOOD

FREE local parking
Free Refreshments
Raffle Prizes
Leacture Talks
Service Department Clearance

ELECRAFT · MFJ · HEIL SOUND · SPACE LABS · inno Antennas

Our annual Open Days have become a "fixture" in the ham radio events list. It is a day to meet old friends, get some bargains with one-off discounts. We have now introduced a few short talks on ham radio subjects. It's a great day out.

We are just 3 miles from the Southen Sea Front and world's longest pier

WANTED DEAD OR ALIVE!

We will accept any ham radio equipment in part exchange, even non-working items in many cases.

Just a Phone Call Away! 01702 203959
email: sales@wspic.com

West Mountain Radio — The Blue Tooth Connection!

Here's a Great Way to link your radio up to almost any Bluetooth device.

NEW

£199.95c

Completely Integrated Bluetooth® Interface

- Pairs with a PC, tablet or smartphone to provide a sound device and a rig control serial port.
- Digital mode capability on a tablet or smartphone
- Pairs with a Bluetooth® headset for receive and transmit!
- High gain Bluetooth® antenna provides up to 33' range
- Uses bi-directional audio Bluetooth® protocol (HSP & HFP)
- PC configuration software included for maximum flexibility

* TTL Icom (CI-V)/Yaesu (CAT) interface jack *RS-232C with DB-9 connector provided *XMIT Level allows accurate drive to transmitter *RCV Level adjusts headset volume and waterfall brightness * Audio VOX (with adjustable delay) allows for simple configuration *PTT inhibit for listen only *Red LED provides visual feedback of PTT status

At W&S we can offer you some great part exchange or cash purchase deals. So time to look around the shack and get rid of what you "will never use again" and gets something you will use! We can even arrange collection for you. And even dead radios are acceptable, so there really is no excuse for realising some useful return on those redundant items.

KENWOOD
TS-990S HF Flag Ship - In Stock!
£6399.95c

200W of high quality power output with a quite amazing receiver. If you are looking for a top range transceiver, then this is the way to go. It is our current best seller in this price range with great **Part Exchange** deals. Phone!

FT-450D HF-6m 100W — Price Down!

One of the most popular HF transceivers with built in ATU at a new incredible price. Don't miss out! **£699c!**

Handheld Transceivers

YAESU

FT-252 2m Handy £69.95

Genuine Yaesu Genuine Quality!

- 144-146MHz
- Rx 139-174MHz
- Loud 800mW Audio
- Tx 5W, 2W and 500mW
- CTCSS & DCS Tx & Rx
- 9 DTMF Auto Dial Memories
- 1Ah Li-ion Battery & Charger

VX-3E	2m / 70cm Handy Wideband receive	£129.95c
VX-6E	2m/70cms handy, Wideband Receive	£179.95c
VX-7R	Triple band handy silver/black	£289.95c
VX-8DE	6/2m/70cm Upgraded APRS	£349.95c
IC-E80D	2m/70cm D-Star GPS ready	£329.95c
IC-E92D	2m/70cm + D-Star	£387.95c
TH-F7E	2m/70cm + wide receive inc. SSB	£236.95c
TH-D72E	2m/70cm GPS & TNC + SiRF	£426.95c
TG-UV2	2m/70cm with CTCSS DCS	£84.95c
KG-UV6D	2m/ 70cm 5W/4W SMA	£94.95c

NEW

ICOM ID-51E 2m/70cm

- *Dual Bander*
- *Simultaneous Dual Rx*
- *D-STAR DV*
- *Integrated GPS*
- *AM/FM Broadcast Rx.*
- *Submersible Construction*
- *Voice Memory recorder*
- *MicroSD Card Slot*
- *1304 Memory Channels*
- *Rapid Charge DC Power Jack*

£409.95c

TS-590S 160-6m Transceiver

Get Aa FREE MC-60S Base Mic- - - +
- - £50 off any additional items totalling £100 +

Kenwood has won the admiration of the radio press and hams all over the world. It is probably one of the best transceivers that Kenwood have ever produced. The best dynamic range in its class, digital IF, narrow roofing filters and auto ATU. Also FREE PC control program that can be downloaded. Exceptional value.

IC-9100 HF - UHF Transceiver

The Icom IC-9100 is ideal for the operator who is looking for a complete high performance radio that covers HF - UHF in one box. It offers 100 Watts output on all bands up to 2m, whilst on 70cms you get a healthy 75 Watts. An internal auto ATU is included which covers HF plus 50MHz. IN STOCK **£2899.95 D**

KENWOOD TS-2000 160-23cm *

A base station that does everything. All modes, 160-2m 100W, 70cms 50W and 23cm (option) 10W. This fine radio has stood the test of time. **£1549.95c**

IC-7600 HF Transceiver HF - 6m

Dual DSP and three roofing filters. 3 , 6 & 15kHz
Double conversion superhet - super image rejection

Display 5.8" with ultra wide viewing angle.
Real time spectrum scope - USB for flash card or keyboard. 104dB dynamic range for great receiver performance
IN STOCK £2999.95c

ICOM IC-7100 HF - 70cm £1249.95c

Includes 4m

- HF, 6m, 2m, 70cm Multi-band, All-mode
- DSTAR DV Mode • Intuitive Touch Screen Display
- Easy-to-see, Easy-to-use Slant Top Controller
- Built-In SD Card Slot & USB • Built-In Speaker
- Dual DSP deliver great processing performance
- Built-in RTTY demodulator and decoder
- Voice recording and playback functions
- Optional RS-BA1 IP remote control software

AR-8600MKII Base/Portable

This base or portable station receiver covers 530kHz - 3GHz. All modes AM FM FMW & SSB with standard rotary tuning. The ideal general coverage station receiver. Every Ham radio station needs a means of monitoring the signal that is being transmitted. We think that this is the one. **£599.95c**

NEW

FG-01 MkII Antenna Analyser

The new FG-01 antenna analyser that covers up to 72MHz with larger screen, includes a matching AC charger/PSU. This highly portable unit features dual impedance and VSWR traces with colour screen. **£239b**

Fast Antenna Adjustments

Yaesu FREE GIFTS

Buy any of the rigs below and you get a free remote head kit.
Limited stocks so Hurry!

FT-857D Get FREE YSK-857 Remote kit
FT-8900R Get FREE YSK-8900 Remote kit
FT-8800 Get FREE YSK-8900 Remote kit
FT-7900 Get FrEE YSK-7900 Remote kit

Mobiles

TM-281E

Latest 2m FM 65W mobile. Superbly built **£169.95c**

FT-8800E

FT-2900E

75 Watt 2m 3W Audio, CTCSS, DTMF mic & "WIRES" internet. **£149.95c**

FT-7900E

FT-8900R

Quad band 10/6/2m/70cm FM 50W (70cm 35W) **£299.95c**

FTM-10E

ID-E880

TM-D710E

50 Watt Dual band 2m/70cm with D-Star and airband receive. **£439.95c**

Dualband Mobile 50W / 30W Great Value **£279.95c**

2m/70cms mobile 50/40W CTCSS, DTMF, internet, wide Rx **£219.95c**

2m/70cms Blue Tooth & built-in mic. **£324.95c**

50 Watts 2m/70cms with APRS **£445.95c**

FTM-350AE

2m/70cm Mobile Bluetooth GPS APRS **£399.95c**

TM-V71E

2m/70cm Mobile with Echo Link **£299.95 £299c**

Add A Quality Dash-Board Speaker!

SP-160

* 8 Ohms * Power rating 1.5W * 3m of lead with 3.5mm jack * Size 97 x 67 x 27mm * Weight **£9.95b**

SP-180A

6W Amplified Speaker 6W * Gain and on/off control * 12V DC cigar plug, bracket, audio lead with3.5mm plug. **£20.95b**

HF - UHF Compacts - One Box! GREAT PRICES

YAESU

FT-897D base or portable. This 1.8 - 440MHz transceiver is great value. 1.8 - 50MHz 100W 2m 50W 70cm 20W. **£749.95c inc. CashBack**

FT-857D The great value mobile or base HF-6m 100W, 2m 50W 70cm 20W. **£699.95c**

WATSON HF-VHF Mobile Whips

MultiRanger 9 £49.95c

- 80 - 2m non WARC
- Impedance: 50 Ohms
- Power Capacity: 120 Watts
- Connector: (PL-259)
- Length: 1.9m Max

MultiRanger 2000 £69.95c

This antenna is the same as the MultiRanger 9 but adds the WARC bands of 30m, 17m and 12m, 200Watts

HF on a BUDGET!

YAESU

FT-450D HF - 6m 100W transceiver. Includes Auto ATU Amazing value and a best seller. **£699.95c**

IC-718 SSB CW 100W from 160m-10m. You won't find a more cost effective HF radio! **£594.95c**

ICOM

ICOM

IC-7200 this 100 Watt radio covers 160m-6m and includes digital IF filters. **£839.95c**

KENWOOD

TS-480SAT A very HF popular transceiver giving 100 Watts from 160 - 6m and includes auto ATU. **£779.95c**

Carriage Charges: A-£4, B-£5, C-£8.50, D-£11

WATERS & STANTON

Head Office & Southern Store

Spa House, 22 Main Road, Hockley, Essex SS5 4QS
Phone: (+44) 01702 206835 or 01702 204965
FAX: (+44) 01702 205843
Email: sales@wsplc.com
Opening: Monday - Saturday 9am - 5.30pm

Scotland & Northern Store

W&S @ Jaycee, 20 Woodside Way, Glenrothes
Fife KY7 5DF
Phone: (+44) 0845 5050128
FAX: (+44) 01592 610451
Email: jayceecoms@aol.com
Opening: Tuesday - Saturday 9.15am - 5pm

Web: www.wsplc.com
Blog: blog.wsplc.com

VISA MasterCard PayPal

The Best Handheld Scanner?

AOR AR-8200

All Bands
All Modes
All Occasions

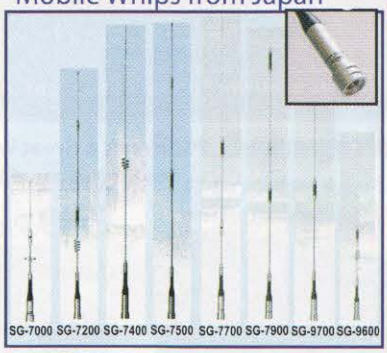
The AR-8200 MK II is the kind of radio that yo u can carry around with you, and get serious wide band coverage reception of HF - UHF including SSB and CW. It's a radio that we sell to UK government organisations for monitoring and it could be a great travelling companion for ham enthusiasts.

£449.95

- 530kHz - 3GHz coverage
- AM FM FMW CW & SSB
- Inc rechargeable batts
- Multi steps Inc. 8.33kHz airband
- 1,000 memories (20 banks)
- Detachable MW bar antenna
- Noise limiter & attenuator
- Dual Freq. & MW bar antenna
- signal meter & PC socket fitted
- 4 x AA cells or Ext 12v

DIAMOND ANTENNA

Mobile Whips from Japan



SG-2000	2m/5.2dB 1.59m	£79.95 C
SG-7000	2m/70cm 2.1/3.8dB 0.47m	£64.95 C
SG-7200	2m/70cm 3.2/5.7db 0.96m	£74.95 C
SG-7400	2m/70cm 2/5.5dB 0.99m	£69.95 C
SG-7500	2m/70cm 3.5/6dB 1.06m	£69.95 C
SG-7700	2m/70cm 4.3/6.8dB 1.27m	£89.95 C
SG-7900	2m/70cm 5/7.6dB 1.58m	£99.95 C
SG-9500M	2/70/23cm 3/6/9.7dB 1m	£89.95 C
SG-9600	6/2/70cmdB 0.82m	£82.95 C
SG-9700	6/2/70cm 0/3/5.8dB 1.07m	£89.95 C

Diamond Mounts

K-11 Gutter mount adjustable tilt £34.95 A
K-600M Trunk lip adjust + cable £64.95 C
K-33 Hatch Mount adjustable £41.95 A

K-400 Heavy Duty Hatch mount £36.95 A
CRM Roof rail / Mirror Mount £14.95 A
K-512 Roof bar mount £42.95 C
ECH 5m cable kit PL-259 £11.95 A

DP-7RH Compact 40/30m Dipole

This is a rigid, telesopic dipole, which has an overall length of approx. 3.5m. It collapses down to pocket size. It can be hung from a tree or clamped to a mast. SO-239 feed.
£124.95 C

HF Verticals

CP-6 80-6m 200W with 1.8m rigid radials. Mast mounted. 4.6m long
£329.95 D

CP-8040 80-40m with 1.8m rigid radials. 6.5m long.
£369.95 D

KV-5 80-40m ground mounted vertical approx 6.5m long.
£319.95 D

SD330

80-6m Remote Tuned Whip
This "screwdriver" design covers all the DX bands (inc WARC0. Continuously tuned with supplied remote control, it will handle 200W and is just 1.85m long. Fitted 3/8" stud mount, it will easily fit onto a 3-way magnetic roof mount. **£389.95 D**

Kevlar Strong Support line

Stronger than steel by weight and won't stretch. **£26.95b**

Formula-1LR

Liquid rubber is a handy substance that can be painted onto any surface where a permanent flexible, but waterproof joint is needed. It has been extensively tested for RF use in professional installations. **£5.95 A**

DIAMOND DEALS

Diamond Power Supplies

GSV-3000

30 Amps continuous 1 - 15vDC variable 250 x 150 x 2400 mm inc. DC cooling fan, weight 9kg
£194.95 C

GZV-6000 60A **GZV-4000 40A**

GZV-6000 60 Amps continuous 1 - 15vDC variable 210 x 110 x 3300 mm inc. DC cooling fan, weight 5.2kg **£389.95 c**
GZV-4000 40 Amps continuous 5 - 15vDC variable 210 x 110 x 3300 mm inc. cooling fan, weight 3.5kg **£199.95 c**

HF Verticals

CP-6 80-6m 200W with 1.8m rigid radials. Mast mounted. 4.6m long. Idealfor mounting cn a mast. **£359.95 D**

CP-8040 80-40m with 1.8m rigid radials. 6.5m long. This is a great low band antenna for small gardens. **£399.95 d**

KV-5 80-10m ground mounted vertical approx 6.5m long. 5 bands in a small space and loveely engineerinf. **£339.95 d**

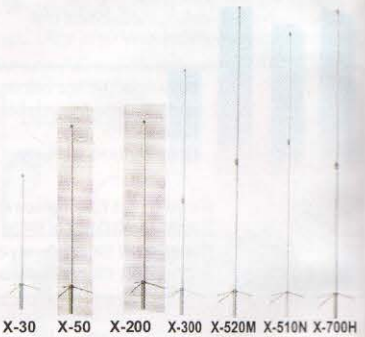
SX-100 HF 3kW
1.6 - 60MHz 30/300/3kW FSD. 3W sensitivity for FSD. Single sensor 0.1dB insertion loss. PEP/RMS
£94.95 C

SX-200 1.8 - 200MHz. 5/20/200W FSD. 1W sensitivity for FSD. Single sensor. 0.15dB insertion loss. PEP/RMS **£89.95 C**

SX-400 140 - 525MHz. 5/20/200W FSD. 4W sensitivity for FSD. Single sensor. 0.2dB insertion loss. PEP/RMS **£94.95 C**

SX-600 HF-UHF
1.8- 160MHz / 140-525MHz 5/20/200W FSD. 1W/3W sensitivity for FSD. Dual sensors 0.2dB insertion loss. PEP/RMS. **£159.95 C**

Base VHF/UHF Antennas



X-30 2/70cm 3/5.5dB 1.3m 150W £54.95 D
X-50 2/70 4.5/7.2dB 1.7m 200W £64.95 D
X-200N 2/70cm 6/8dB 2.5m 200W £89.95 D
X-300 2/70cm 6.5/9dB 3.1m 200W £104.95 D
X-520M 2/70cm 8.3/11.7dB 2.5m £154.94 D
X-510N 2/70cm 8.3/11.7dB 5.2m 200W £149.95 D
X-700H 2/70cm 9.3/13dB 7.2m 200W £249.95 D

Multi Band Dipole

Here's all you need (except the wire!) to make a multi-band dipole. Dipole length = lowest band. Feed with ladder line and terminate with the 4:1 balun.

Ladder Loc 450Ω dipole centre **£18.95b**
4:1 Balun 400W SO-239 **£33.95b**
450Ω Ladder line per metre **£1.20**

HEIL SOUND

The Origin of Great Sounding Signals

It All Starts at The Microphone!
W&S Exclusive Ham & Pro Distributors

ProSet Boom Mic.

The favourite of contesters and DXpeditions

ProSet Elite Boom Mic Headset
Large dual headphone & boom mic. with HC-6 element and Phase Reversal System. **£179.95 c**
ProSet Elite IC Boom Mic Headset
Icom boom set inc Icom lead **£189.95 c**
ProSet- 6 Boom Mic Headset
Everything that you get with the ProSet Elite other thsn the phase reversal.
£149.95 c

We can supply matching cables for any radio

ProSet-3 Heaphones

ProSet-3
If you have never tried a pair of professional headphones, then you are in for a big Surprise. The ProSet 3 has a real "WOW" factor. At last you can hear exactly what is coming out of your receiver. Nothing missing and nothing added. A real investment.
£109.95 c

Fist Mic,

The fist mic is back with an acoustic front vent to reduce noise and echo. Typical Heil quality. Available from stock **£79.95 c**
Matching Rig leads available

Blue Tooth Set

HBA Blue Tooth Set.
Allows you to dispense with your mucrophone lead and wander all round the room if needed! For use with PR-781 mics. or other "PR" series microphones. A great idea. **£109.95 c**

Pro Series Mic

If you are looking for the very best microphone for ham radio, this is the one. Bob Heil designed this for use with top range transceivers using the same element as is used in the best broadcast mics. Available from stock. **£179.95**

Mic. Adaptors
These have **CC** codes
£35.95 for each radio type

Headset Adaptors for boom mics.
These are **AD-1** codes **£18.95 for each radio type**

Base Station Mic

HM-12 Base station Mic.

Using the broadcast quality HC-6 insert, this is the ideal base station microphone for the modern transceiver with EQ control. This really is great value and gives you Heil quality at a great price. Call us with details of your radio and we advise on matching lead.
£69.95 c

MFJ

We Carry Huge Stocks
Great Deals

MFJ-994BRT 600W Remote ATY

As you're ragchewing, contesting or DXing, your MFJ IntelliTuner is learning! to operate in millisecondsl We've made this tuner to suit the UK market, so that those with linear amplifiers can enjoy the benefit of auto ATU. Includes coax DC feed. **£389.00**

MFJ-926B 200W Remote ATY

MFJ-926B Automatic Antenna Tuner covers the entire HF band and will match a random wire or coax-fed antenna 1.8 - 30 MHz at a full 200 Watts SSB/CW. Matches impedances 6-1600 Ohms (SWR up to 32:1).
£279.00

MFJ-269 HF-UHF Antenna Analyser

* Freq Coverage 1.8-170, 415-450MHz
* Frequency Counter * LCD readout
* SWR & impedance or SWR Bargraph
* Coaxial loss meter * VSWR Meter
* Signal Generator * Freq Counter)

£379c

MFJ-993B Auto ATU

£259c

- Automatically tunes unbalanced/balanced antennas
- 1.8-30 MHz with 4:1 current balun for balanced line
- .Now with 20,000 memories
- Antenna Switch and Efficient L-network design
- .Select 300 Watts (6-1600 Ω) or 150 Watts (6-3200 Ω)
- Digital SWR/Wattmeter Audio SWR meter
- Backlit LCD - Remote control port .- Radio interface

MFJ-991B 300W Auto ATU

First dual power level Tuner -- Select 300 Watt SSB/CW and match 6-1600 Ohm antennas Or select 150 Watt SSB/CW and match extra wide-range 6-3200 Ohms. New 10,000 VirtualAntennaTM Memories. Like MFJ-993B, less digital SWR/Wattmeter/ LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.
£229.00

MFJ-998RT 1.5kW 1.8 - 30MHz

Weather-tight ABS plastic cabinet top with a stainless steel bottom. Send DC/RF down the coaxial line. Has MFJ's InstantRecall to see if that requency has been used before. If so, tuning is instantaneous. Measures 13 3/4W x 6 3/4H x 17 1/2D inches. It's the true fit and forget Auto ATU for those using linear amplifiers.
£729.00

Contents

RadCom

THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

MANAGING EDITOR:
Elaine Richards, G4LFM
E-mail elaine.richards@rsgb.org.uk
TECHNICAL EDITOR:
Giles Read, G1MFG
E-mail giles.read@rsgb.org.uk

All contributions and correspondence concerning the content of *RadCom* should be posted to: The Editor, *RadCom*, 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH
Telephone 01234 832 700
Facsimile 01234 831 496
E-mail radcom@rsgb.org.uk

Advertising. All display and classified advertising enquiries (except Members' Ads) should be sent to: Chris Danby, G0DWV, Danby Advertising, Fir Trees, Hall Rd, Hainford, Norwich, Norfolk NR10 3LX
Tel/Fax 01603 898 678
E-mail adsales@rsgb.org.uk

Notices to readers concerning errors and omissions and advertisments can be found at www.rsgb.org/radcom

RadCom is published by the Radio Society of Great Britain as its official journal and is sent free and post paid to all Members of the Society. **The June edition of *RadCom* is expected to arrive with most Members by 23 May, although this can take up to a week longer in some cases; international deliveries can take longer still.**

Layout and design by Kevin Williams. Original concept by Imotea Creative Mediadesign.

The online *RadCom* is at www.rsgb.org/radcom/

News and Reports

Reviews

Features

Chemically cleaning copper conductors – P36

Cover image: G8LES in his extraordinarily well-equipped ATV shack

Photo courtesy of Create Media Partners

Technical Features

Regulars

RSGB annual construction competition

The annual RSGB Construction Competition is to encourage home construction, experimentation, design and innovation. Any Member of the RSGB is eligible to enter. The closing date for entries is 30 September and judging will take place at the RSGB Convention. Winners in each category will be awarded prizes and the Pat Hawker MBE, G3VA Trophy will be awarded to the best overall entry.

PROJECTS. Projects must have an amateur radio context. Examples might include receivers, transmitters, transceivers, aerials, instrumentation, test equipment, etc. Projects must be home-constructed, tested, complete and working. Entrants for each of the four categories listed below must demonstrate the functionality of their entry, by either providing a short video showing it working, or by demonstrating it working to the judges at the Convention.

CATEGORIES. There are four classes of entry: **Designer**. This is aimed at encouraging original designs, which can be software, hardware or a combination thereof. Entries in this class will be judged on the elegance and innovation used to solve a new problem, or to solve a well-known problem in some better way. The entry will also be judged on the degree to which it advances the state of the art in amateur radio.

Craftsman. This category is aimed at those constructing projects designed by someone else; entries are likely to be based on a published design. Kits may feature, either as a part or the whole of the project. For kit builders, credit will be given for personal additions, modifications or finishing touches. Entries in this class will be judged on the overall quality of the construction/ excellence in craftsmanship.

Beginner. This category is aimed at those new to amateur radio. The entrant must have been a member of the RSGB for less than a total of three years and must have held an amateur radio licence of any type for less than three years.

Junior Member. This category is aimed at our young members. The entrant must be a Junior Member of the RSGB on the date of submission of the entry.

In the Beginner and Junior Member categories the judges will balance the elegance, innovation and craftsmanship of the entry in their deliberations.

DOCUMENTATION. Each project must be accompanied by a one-page summary description of not more than 250 words. Electronic projects must also be accompanied by a circuit diagram and sufficient description to explain what it does and how it works. Designers will also need to outline their design approach. If a kit is entered, you may simply attach the documentation that comes with the kit, plus a description of any changes or additions. In the case of an entry with a significant software component, the judges must be provided with access to the source code, and the main software libraries and open source used must be identified to the judges. These details may be provided to the judges in confidence. Original designs must not have been published (in print or on the web) prior to the competition.

Entrants must agree to their projects being featured in *RadCom* if considered appropriate; *RadCom* staff will provide assistance to entrants in preparing a suitable article from the documentation provided with the entry.

ENTRANTS. Entrants must be Members of the RSGB, and each Member may enter more than one project. Entrants must advise the RSGB that they propose to submit an entry by 31 August. All entries must say which category they are entering. Entries must be displayed for judging at the RSGB Convention. Entrants need not attend the Convention in person; their entries can be brought and demonstrated by a proxy. The RSGB will not accept responsible for the security of the entries at the Convention but will take reasonable measures to protect the entries once handed over for display to the judges and until the end of the general viewing period.

PRIZES. Prizes will be awarded to the winners of each category and to other highly commended entries. The Pat Hawker MBE, G3VA Trophy will be awarded to the best overall entry. All prizes will be awarded at the sole discretion of the judges, whose decisions shall be final.

GM7GMC 21 years

Denny, GM1BAN (RM2) recently travelled across the Pentland Firth to Orkney to present George Christie with a hand blown glass microphone to commemorate 21 years of reading GB2RS to Orkney and Caithness via the GB3OC repeater and completing in the region of 1000 news bulletins in the process. When George started out in news reading there were four news readers who used to take it in turns but one by one they went SK or moved out of the district, leaving only George to carry out the duties. He continued doing the reading, unaided, for 16 years or so only missing out if they were not delivered by post in time or over the Christmas period. Whilst being giving the presentation on behalf of the listeners he intimated that he enjoyed

reading the news but he was at the stage that he could do with some help and asked Danny, MM3YHA (14) if he would like to help out. Danny wasn't sure but with a bit of encouragement along with Dad, GM1BAN, and Mum, MM3YMU has now been drafted in as a news reader and gave out his first bulletin under supervision on 30 March, much to George's delight. So George is now getting a short well deserved rest and doing his newsreading on a rota once again.

Sign up a friend

The RSGB Board has developed a new initiative where Members can sign up a friend and you will both receive £10 of RSGB book vouchers. This is your chance to help ensure a strong Society to represent amateur radio both in the UK and around the world.

You can sign up anyone who hasn't been a Member in the last 12 months and you don't have to be a licensed amateur to be an RSGB Member.

RSGB clubs can also recruit new RSGB Members and they will receive £10 cash towards club funds for every Member recruited. Full details are on the website at www.rsgb.org/signupafriend

Wireless Set No 19 at the NRC

As a part of the Vintage Military ARS committees' policy to provide support for the Radio Society of Great Britain where possible, VMARS Chairman Ian Underwood and Public Relations Officer Stuart McKinnon visited the RSGB National Radio Centre on 6 March to deliver a WWII Wireless Set No 19 station on long term loan from VMARS. The RSGB approached the Society last October with a request for assistance in finding a suitably important vintage wireless transmitter to place in their 100 year history of amateur radio exhibition displayed at the NRC, situated at Bletchley Park.

Large numbers of men and women were trained in the use of wireless during the war period and following their de-mobilisation many of them retained an interest in radio and became radio amateurs. During the 1950s and 60s, the War Department set about disposing of the vast quantity of redundant radio equipment that had been accumulated and the programme of wholesale disposal of military wireless sets to high street dealers was put into place. Thousands of Wireless Sets No 19 were made available for sale to the public from Government Surplus radio shops in every corner of Britain and, in 1958, the going rate for a WS No 19 was about £3.10s (£3.50), or £5 to include the 12 volt rotary power supply and ancillary equipment. As an example, Relda Radio in Tottenham Court Road, had 19 sets stacked from floor to ceiling and was still selling them years later. The ready and inexpensive availability of the Government Surplus wireless sets provided a generation of radio amateurs and hobbyists with their very first opportunity to buy well designed radio equipment to modify and use. The sets became hugely popular and magazines like *Practical Wireless* and the *RSGB Bulletin* published numerous articles detailing modifications to improve performance of the sets, add better modulators and incorporate mains power supplies.

A request to VMARS members for a suitable set to offer the RSGB was quickly answered by Graham Mather, who generously offered an original WS No 19 Mk III, complete with variometer, PSU, Remote Control Unit E, Control Box, connectors, headset and microphone that had been cherished by his late father. VMARS Member Paul Craven, M1PVC undertook a thorough external overhaul of the set and its ancillaries and the final presentation that he achieved can only be described as superb.

It is planned to make an additional loan of equipment to the RSGB National Radio Centre later this year.

YOTA UK

Having got the RSGB YOTA Team lined up for their trip to Finland, a UK YOTA event has been given the go-ahead. This is planned to take place on the weekend of 19/20 July. Other than having a date, and knowing we need a central place for young members to meet, the event is pretty much a blank page. We have some ideas but we would rather the young members set the agenda. Please let us know what kind of thing should be part of a YOTA UK event.

Please send your ideas as soon as possible to tec.chair@rsgb.org.uk please. We would also like to have some of the older young members involved in the organising, particularly those that have experience of leadership from Cadets/Scouts/Guides. If you are 'young', willing and able to help, please let us know.

Equally, if you know anyone else who might fit the bill, get them to contact us via tec.chair@rsgb.org.uk

New RSGB IT system

The new RSGB IT system started the commissioning process on 23 March. The next development will be a new log-in system for Members to access the RSGB website and amend their details on the system. Unfortunately, it has not been possible to produce the usual welcome to new Members and re-joiners this month, but they will be included in a later *RadCom* once the system is fully commissioned.

Licence revalidation

As you will know, all radio amateurs are required to revalidate their licence at least every five years. The process to do this requires every licence holder to contact Ofcom to confirm or update the details on the licence database. This process has been underway for some time and to date some 60% of licences have been successfully revalidated.

The quickest way to revalidate is to do so online via the Ofcom website www.ofcom.org.uk or by e-mail to amateur.validations@ofcom.org.uk. This can be done at any time. If individuals need assistance in the process, Ofcom staff are available to help on the telephone but their limited availability means that there may be delays.

Release of spectrum

Ofcom have published a consultation paper that makes proposals for the release of VHF spectrum within the frequency ranges 143 to 169MHz. You can see the consultation at http://stakeholders.ofcom.org.uk/consultations/vhf-143-169mhz/. Details of how the Society will formulate its response will follow in a later *RadCom* and on the RSGB website.

Centenary station – an update

My 'reflection' in last month's *RadCom* unfortunately suffered from an omission on my part as well as trouble from the gremlins. The net result is that the article did not give proper and due recognition of the efforts by many of our microwave enthusiasts during the operation of the Centenary station. The 20 bands mentioned in my article should, of course extended beyond 1296MHz to 24GHz. I also intended to reiterate the key successes of the UKuG's operation at Brian, G4NNS's QTH with their 49 QSOs on 1296MHz, 5.7GHz, 10GHz and 24GHz bands that covered both terrestrial as well as moonbounce contacts. In terms of the diversity of operation during the year it is pleasing to see microwave operation, including moonbounce, as a part of the mix from as far afield as northern Scotland and Cambridgeshire.

John Gould, G3WKL

Club of the Year

Denny, GM1BAN has just performed one of his last duties before retiring as Region 2 RM by presenting the Region 2 Club of the Year to Caithness Amateur Radio Society. Pictured are (L-R) Brian, GM4JYB, treasurer, Hamish, MM0HDW, Chairman and Denny, GM1BAN, Retiring RM2.

Pictured at the Northern Ireland presentation for the Regional Club of the Year to Mid Ulster ARC (from left to right) were Philip, MI0MSO RSGB RM Region 8, Seamus, GI4SZW MUARC Chairman, Brian, MI0TGO, MUARC Secretary and Jimmy, GI0OND, MUARC Vice Chairman.

Conduct of RCF exams booklet

The rules for the UK radio exams are set out in the RCF booklet entitled *Conduct of Amateur Radio Examinations*, which is also referred to as *EX500*. It has come to the attention of the Training & Education Committee that a number of the RCF booklets in circulation do not reflect the current exam procedures. This has, understandably, led to some confusion at exam centres, especially during formal inspections. All exam secretaries are requested to check their copies and destroy any 2006 or 2012 versions.

The current version was published in 2013 and is available to download from the RCF website, www.commsfoundation.org or exam secretaries can request a hard copy booklet from Carol Meredith at RSGB Headquarters, email exams@rsgb.org.uk or telephone 01234 832 700.

ARDF loan kit

Many of the Affiliated Societies who have previously sought to borrow the RSGB ARDF loan kit (ten 80m receivers and four transmitters) to allow them to run an ARDF competition, have found the cost of insured shipping to be unaffordably high. At its last meeting the RSGB Board agreed a scheme for clubs to borrow the equipment without charge for shipping. Since there is an annual cap to the expenditure, clubs might like to bid early to secure their free loan. Please address any queries and booking to ardf.chairman@rsgb.org.uk.

National Radio Centre

The RSGB National Radio Centre, at Bletchley Park is now open 5 days per week from Wednesday to Sunday from 10.30am until 4.30pm throughout the year. The volunteers look forward to meeting interested amateurs as well as members of the public. If you wish to operate the state of the art GB3RS station, please take your licence with you when you visit. For more information, please go to www.nationalradiocentre.com. Amongst those visitors who are planning a visit is regular contact Peter, VK6RZ. The operators at GB3RS look forward to meeting him and the many other foreign visitors to the NRC. Have you planned your visit yet?

Beacon & repeater insurance

The RSGB beacon and repeater insurance renewals are due on 30 April. The premium for 2014/15 has not been finalised yet but if you wish to renew and would like to be contacted when details are available, please e-mail repeater.insurance@rsgb.org.uk – for more information see http://rsgb.org/main/blog/news/rsgb-notices/2014/03/31/rsgb-repeater-insurance/

Correction

Last month's article on the DATV test card generator said that Digilite-ZL started life as an investigation into DVB-S signal generation based on the Digilite project. It should have read "... based on the Digilite-ZL project".

CONGRATULATIONS

To the following Members/clubs whom our records show as having reached 60 or 50 years' continuous Membership of the RSGB.

60 years

Mr D A Platt	G3JNJ

50 years

Mr T H Gonsalves	G0OYJ
Mr J C Boydell	G3TAX
Mr J D Cree	G3TBK
Mr K E Griffiths	G3WIC
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Mr J Yu	G3ZQT
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Mr S W Powell	G3WRA
Mr J Yu	G3ZQT
Mr M J W Hamilton	GM3TAL

An Introduction to Antenna Modelling

By Steve Nichols G0KYA

For many years, the only way for most radio amateurs to work out how well an antenna design would work was to build it and find out. The arrival of computer based antenna modelling programs has changed this. This book looks at the Free MMANA-GAL antenna modelling program that will let you design and optimise a whole host of antennas, and all on your PC.

An Introduction to Antenna Modelling has been written by antenna guru Steve Nichols, G0KYA and shows you step-by-step how to input antennas designs into MMANA-GAL, how to adapt designs you are given and how to optimise your designs for the best performance. By the time you have finished you should be able to model a whole host of antennas including dipoles, the G5RV, the W3DZZ trapped dipole, verticals, off-centre fed dipoles (OCFD), magnetic loop antennas and many more. Computerised antenna modelling for many radio amateurs looks like a black art – needing expensive programs that look like you need a degree in astrophysics to get them to work. This book dispels that and provides a straightforward way to design antennas with predictable results.

Building antennas can be hard work. You have to work out what you want to build, source the appropriate copper wire or tubing, measure everything carefully and spend hours putting it all together. But it needn't be like that *An Introduction to Antenna Modelling* provides an easy way to design and 'test' your antennas without ever lifting a saw or picking up wire cutters

FREE CD
This book is enhanced by the inclusion of CD that not only contains the MMANA-GAL software so you can get started immediately but much more. There are sample antenna files and event other antenna modelling software including EZNEC, MININEC Pro and 4nec2. There are also over 30 other amateur radio programmes included.

Size 174x240mm 80 pages ISBN: 9781 9101 9300 6
Non Members £9.99
RSGB Members £8.49

QSL Matters

Last month we reminded Members forwarding cards to the RSGB QSL Bureau for the USA to bundle them together in number batches, rather than prefix. The call area currently receiving the most cards is area 4. This call are has two bureaus, the number 4 with a single letter prefix and another for those with a 2 letter prefix – something to remember when pre-sorting your cards. For those posting cards direct to the USA, the address for card area 7 has now changed to Willamette Valley DX Club, Box 5993 Boring, OR97007, USA.

ROYAL MAIL. Newly introduced rates from Royal Mail continue to put pressure on Members' pockets and bureau costs alike. Second class large stamps on C5 envelopes still represent the best value for regular users. Our bulk shipping costs UK and overseas will rise between 6-9% this year affecting all members, indirectly. Clubs, GB stations, DXpeditions and individuals can save money whilst helping us be more effective by switching to *Club Log* OQRS systems, responding to QSL requests without the need to QSL 100% outgoing.

G0N. Retiring manager Ted Allen, G3DRN is still recovering from an accident and the bureau is grateful for the help of Mick Senior, Region 10 Manager, for his help in transferring Members' envelopes and cards to Nigel Roberts, G4KZZ, who now has control of all G0 calls.

SPECIAL PREFIX MANAGER. If you want a job done, ask a busy person! Jim Peden, G3ZQQ is already a QSL volunteer having managed G3Y-Z for some years. Jim has kindly stepped up to take on the additional challenge of one of our largest groups: R, Q, O & V special prefix calls. His details can be found on the QSL pages of the RSGB website – follow the links from Operating.

M0M-Z. Stu Adaway, M0TNG is the new sub manager for this very active series. All cards and envelopes have now been transferred. Stu is new to volunteering and tells us that he wants to give something back to the hobby he loves. Please allow him some time to settle in as this is a big group. The bureau is grateful for his kind offer of support and his details are already on the web list.

G3M-P. Gordon, G3MZV has kindly stepped forward to manage this group, left vacant by the death of Frank, G3PZS just before Christmas. This group has been temporarily looked after by Wayne, M0WAY who reported finding many older envelopes with small value stamps (not 1st or 2nd) that could not be used to send waiting cards. Members can find Gordon's details in the list of sub managers under Operating at the RSGB website and he can be contacted using g3mg3pqsl@virginmedia.com.

Regular RSGB & Ofcom Meeting

RSGB officers met with representatives of Ofcom on 15 March as part of our regular series of discussions. The principal items were as follows.

REVIEW OF AMATEUR RADIO LICENCE. Ofcom are planning to publish proposals for consultation at the end of April (and these will be reported in *RadCom* and on the website). Ofcom will be attending the RSGB Convention and the Hamfest to brief amateurs on progress.

REVALIDATION OF LICENCES. Ofcom reported that, of all amateur licences on issue, over 40 percent have not been revalidated. The RSGB agreed to continue to assist Ofcom in publicising the need for all outstanding licences to revalidated during the coming weeks.

AMATEUR RADIO ON THE INTERNATIONAL SPACE STATION (ISS). Ofcom have agreed in principle to issue a Permanent Special Callsign (GB1SS) to the ISS. This will allow Major Tim Peake, the first British astronaut to visit the ISS, and other licenced amateurs who may follow him, to use a British callsign during their stay.

2015 SSES CALLSIGN. Ofcom agreed in principle to the approval of a Special SES (similar to the Gx100RSGB callsign) for use during 2015 on a planned nationwide basis.

YOUR RSGB
Working with the Regulator

YOUNGSTERS ON THE AIR (YOTA). Ofcom agreed in principle to issue the special SES G14YOTA for the month of December 2014 to allow young people in the UK to participate in the IARU YOTA on-air activity.

LOCATING SOURCES OF DELIBERATE INTERFERENCE (DQRM). We discussed ways of working together that would enhance our efforts (both locally and internationally) to reduce deliberate interference.

HIGH POWER USE OF PMR446. Ofcom drew attention to recent cases that were being pursued through the courts.

EMERGENCY COMMUNICATIONS. The RSGB submitted a paper from RAEN for future consideration proposing areas for change in the licence that would enhance the service that they provide.

The date of next meeting is 12 June 2014.

Ofcom

Important 2.3 & 3.4GHz changes

Ofcom has published a statement on the amateur use of spectrum in the 2.3 and 3.4GHz bands. Following a consultation last year, Ofcom has decided to remove from the amateur radio licence all frequencies in these bands that overlap with those planned for award to other civil users (2350 to 2390 and 3410 to 3475MHz), giving amateurs at least twelve months' notice of this intention.

Ofcom has also decided to retain amateur access to the adjacent bands and put in place a procedure to enable these frequencies to be removed from the amateur radio licence if necessary in future.

Ofcom has been required by the Ministry of Defence to implement measures to ensure the MoD's systems are adequately protected from interference from amateur uses in both the release and adjacent bands. The statement therefore contains guidance from Ofcom with which amateur users must comply, with immediate effect, when using these frequencies.

Amateur users of the 2310 to 2350MHz band are requested to register their use and provide contact details to Ofcom. Details are provided in the statement that can be seen at http://stakeholders.ofcom.org.uk/consultations/public-sector-spectrum-release/statement?utm_source=updates&utm_medium=email&utm_campaign=pssr-statement-apr14

RSGB shop

FREE P&P
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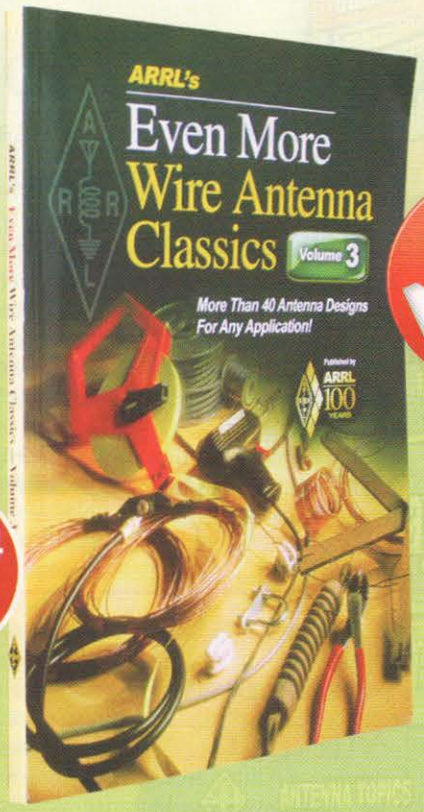
E&OE All prices shown plus p&p



NEW

£19.54 RSGB Members' Price

Even More Wire Antenna Classics (Volume 3)

Even More Antennas to Build – Even More Ideas to Experiment With

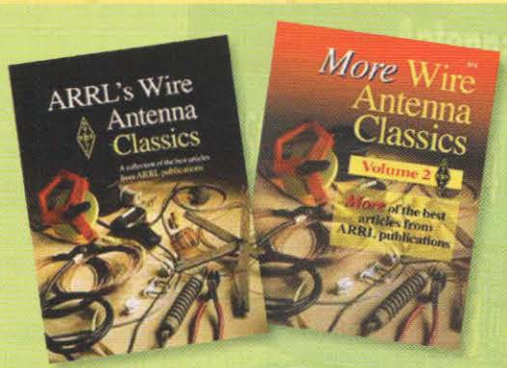
For those familiar with the ARRL books *Wire Antenna Classics* and *More Wire Antenna Classics* this book has been long awaited. This is the third volume of the popular *Wire Antenna Classics* collection and gathers together the best antenna projects and innovative designs from the ARRL magazine QST from 2002 through to 2013. Spanning over 10 years, this book features more than 40 practical designs for a wide range of wire antennas, from simple projects to more complex. As you read, you'll discover new ways to experiment with wire antennas and why they are so rewarding to use.

Even More Wire Antenna Classics has a wide range of content and you will find details of portable antennas that are both inexpensive and easily constructed and antenna systems for operating on the go. There are directional antennas that maximise and focus your signal along with multiband antennas that provide new ways to explore a variety of bands with a single antenna. The efficient and amongst the easiest to build single band antennas are not forgotten and nor are stealth antennas that make the most of space limitations.

Size 205x275mm, 176 pages ISBN: 9781 6259 5014 7

Non Members' £22.99
RSGB Members' £19.54

Other ARRL Antenna Titles Available



Size 205x275mm

Non Members' Price £17.99
RSGB Members' Price £15.29

Size 205x275mm
188 pages.

Non Members' Price £13.99
RSGB Members' Price £11.89

Radio Society of Great Britain **www.rsgbshop.org**
3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

New Starters newsletter

The New Starters Newsletter is sent out every two months to RSGB Members who subscribe. Its aim is to help RSGB Members progress with their hobby by answering all those niggling questions that you might have, such as what is WSPR, what are QSLs, what is PSK31 and is it worth bothering with Morse?

The April/May RSGB Newcomers Newletter takes a special look at 20 metres (14MHz); helps you take your first steps into radio sport with the 80m Club Championship; gives you some hints and tips on tracking down interference sources in your home; and starts to demystify the solar information and forecast in the GB2RS HF propagation report.

Back issues are available, such as the February/March edition that looked at digital SSTV, which is light years ahead of its analogue cousin, looked at the four metre (70MHz) band, which has a loyal following in the UK; and showed how to decode telemetry from a genuine spacecraft with a quick guide to FUNcube-1, or discover what a counterpoise is.

Any Member can sign up at http://rsgb.org/main/get-started-in-amateur-radio/new-amateurs-newsletter/

5MHz Update

Many users of the 5MHz band will have been aware that a large NATO exercise took place around the coast of Scotland during April. Joint Warrior is one of Europe's largest NATO training events and is held twice a year. It involved 35 warships, 25 different types of aircraft and about 13,000 personnel. Radio amateurs have access to the band on a secondary, non-interference basis and, during the exercise, if necessary, amateurs were asked to change frequency to allow the exercise to take place unhindered. Comments were made regarding the courtesy and manner in which this took place.

News

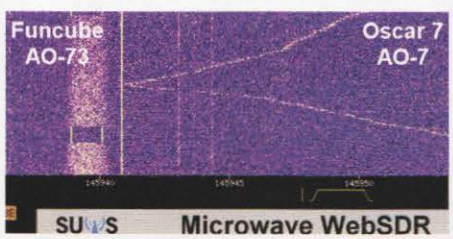
OSCAR 7 and 73

A very good set of co-incident passes of both the AO-7 and FUNcube-1 AO-73 amateur radio satellites occurred over the UK on the morning of 3 April. The two satellites were launched 39 years apart, AO-7 on 15 November 1974 and FUNcube-1 AO-73 on 21 November 2013. Simultaneous downlinks from both satellites could be clearly seen and heard on 2m, via the Southampton University Wireless Society (SUWS) WebSDR that covers the 144, 432, 1290 and 10368MHz bands and is available for use worldwide.

New helical antennas designed by Martin, G8JNJ, the installation of preamplifiers by Noel, G8GTZ and a new PC build by Phil, M0DNY have helped to dramatically improve the overall performance, especially on the 2m and 70cm amateur bands.

The FUNcube-1 AO-73 BPSK telemetry beacon on 145.935MHz is now up to 20dB above the receiver noise floor, and several stations using SSB, including Martin, G8JNJ, could be clearly heard on the 2m downlink via the SDR during transponder tests.

More improvements are in the pipeline, which the team hope will help to further improve the receive sensitivity and reduce the level of interfering signals that can be observed on 2m. Anybody can operate the SUWS WebSDR to receive signals from Satellites, and the team really appreciate users leaving a message in the chatbox to let them know what has been heard.
http://amsat-uk.org/



Military Wireless Museum

The Military Wireless Museum, located in Kidderminster Worcestershire, is now open for the 2014 season. The museum houses a large collection of military radios from around the globe, British, American and rare items like German and Japanese WW2 sets. In addition it has a large collection of Eddystone receivers and also spy and clandestine sets used during WW2 and later years. Look out for the museums club callsign, GB0MWM, to be operational and visitors are always welcome. Contact via www.militarywirelessmuseum.co.uk, or to the curator, Ben Nock, G4BXD.

Donations sought

Cheshire Military Museum are looking for donated equipment for their displays at The Castle, Chester CH1 2DN. As long as the stock is complete it doesn't have to be working as the displays are not powered. If you have something they may be interested to display, e-mail to enquiries@cheshiremilitarymuseum.co.uk describing the equipment available.

GB3CF, GB3LE, GB3UM & GB3GV

The Leicestershire Repeater Group have taken the decision at their most recent committee meeting due to falling membership to limit the hours of operation of the repeaters GB3CF (2m), GB3GV (23cm TV), GB3LE (70cm) and GB3UM (6m) to conserve funds. As a result the repeaters are now switched off overnight between the hours of 10pm and 5am. The beacons GB3LEX and GB3LES continue to operate 24 hours a day. For further information or to join or donate to the group see www.leicestershirerepeatergroup.org.uk

The new Icom ID-5100

The Martin Lynch and Sons sales team were recently treated with a visit from Icom's John Turner, who came bearing Icom's soon to be released ID-5100. Offering dual band 50W VHF/UHF operation on independent band units via a large touch sensitive screen and D-Star as standard to enable world-wide communications for when the local analogue repeater is quiet. A simple user interface for safe mobile operation alongside Bluetooth integration with Icom's very own android app. They say it's the ultimate modern VHF/UHF mobile transceiver!

Having spent a few hours with this latest offering from Icom, ML&S staff are looking forward to receiving their stock soon.

A new design of broadband HF vertical antenna

Part 1: background and development concepts

INTRODUCTION. For several years I have been exploring and testing the design of various HF broadband antennas, many of which are documented on my website [1]. This article outlines the background and the development of a new type of efficient, omnidirectional broadband vertical antenna that requires no tuner. The design is protected by patent [2], but I have no objection to individuals building one for personal use. The second part of this article will contain detailed construction details.

BACKGROUND. With the evolution of high frequency (HF) radio systems and the increasing use of digital communication techniques, there is a requirement for antennas to be capable of instantaneous operation over a wide range of operating frequencies. Examples include commercial, military and amateur stations undertaking frequency hopping, propagation monitoring, beaconing, WSPR or similar activities.

DESIGN GOALS. Modern transmitters are designed to have a nominal output impedance of 50Ω: to achieve this specification, many antennas incorporate matching networks. Such networks are often only efficient across a relatively narrow range of operating frequencies, typically ±10%. In transmission systems where rapid changes in operating frequencies are required, some form of active tuning system is necessary in order to maintain the correct matching impedance and efficient transfer of radio frequency (RF) energy. Active tuning networks are undesirable as they require a finite settling time before any transmission can commence. Rapid switching of such networks is usually implemented by electromechanical devices, which only have a limited number of operating cycles before they need to be replaced.

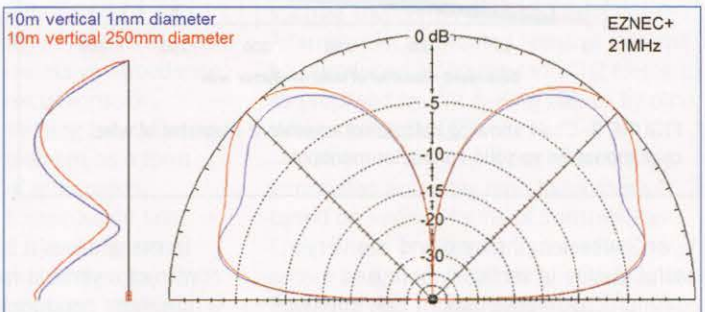


FIGURE 1: EZNEC plot comparing 'thin' with 'fat' radiating elements.

A few types of antennas have a relatively constant 50Ω feed impedance over a wide frequency range. This group of antennas includes bicone, discone and log periodic arrays, which are the most common broadband designs used for transmission purposes at VHF and higher frequencies. It is possible to use them on lower frequency bands, but the physical dimensions that are required for such antennas make them unpopular for anything other than fixed, or point to point communications.

Compact broadband antennas use various techniques to achieve a 50Ω feed impedance across a very wide frequency range. This often relies upon introducing some form of resistive loss that is large enough to dominate excessive impedance excursions. However, any loss results in reduced efficiency, as less power is available to be radiated from the antenna.

In this article I wish to demonstrate that by using a combination of the best of these techniques it is possible to design a new type of antenna that is capable of efficient, predictable operation over a very wide frequency range.

In order to simplify explanations from this point onwards. I will only consider a monopole antenna fed against a suitable ground plane. Although it should be noted that the information and descriptions are equally applicable to dipole antennas, by considering them as two monopoles connected back to back, with no requirement for a ground plane, the impedance values are doubled.

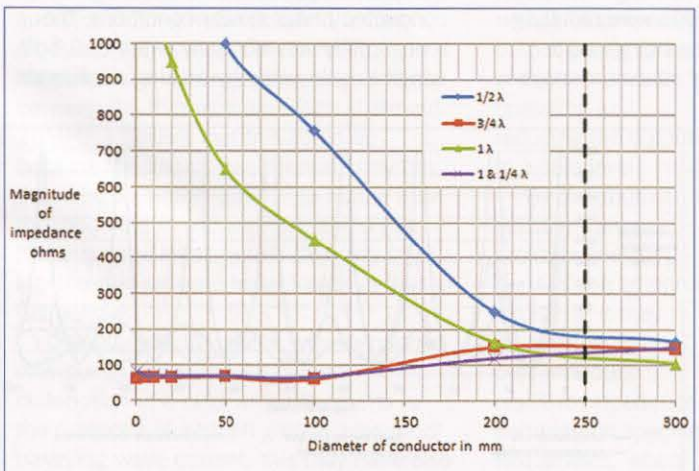


FIGURE 2: Monopole formed from solid conductor calculated magnitude of feed impedance vs diameter of conductor.

EXISTING BROADBAND ANTENNAS. The easiest way to increase the operating bandwidth of a simple monopole or dipole antenna is to use a 'fat' radiating element, or to emulate one by bundling multiple conductors in order to make the overall diameter a substantial proportion of its total length. The length to diameter ratio plays a significant factor in maximising the operating bandwidth of such antennas at the fundamental ¼ wave resonance of each radiating element.

With 'thin' antennas there is an additional problem that occurs when the electrical length of an antenna begins to exceed ⅝ of a wavelength. The radiation pattern starts to split and deep nulls form in between the main radiation lobes. However, as we progressively increase the diameter of the radiating element so that it becomes fatter, a number of interesting changes occur.

With a fat conductor the current and phase distribution along the radiating element becomes modified and starts to depart from a standing wave pattern to be more like that of a travelling wave. This has a significant effect on the radiation pattern as nulls start to become 'filled' and minor lobes disappear.

Lobe filling is particularly noticeable at frequencies where the antenna is

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Martin Ehrenfried, G8JNJ • e-mail: tc2m.info@yahoo.com

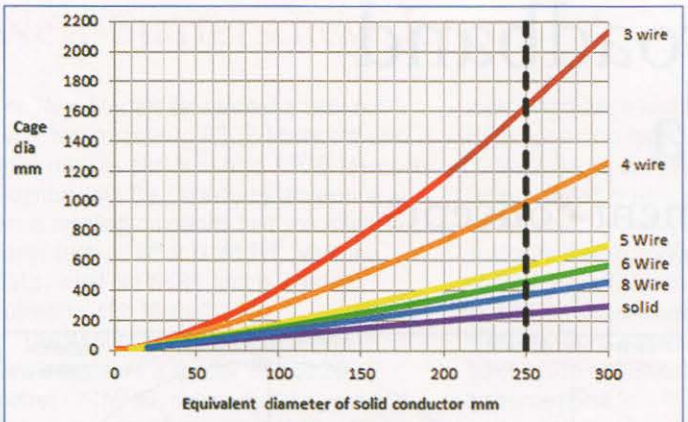

FIGURE 3: Chart showing calculated equivalent diameter of wire cage monopole vs solid conductor monopole.

$^3/_2$ or 2 wavelengths long and is a very useful quality in vertically polarised communication antennas. It can improve the performance at intermediate 'skip' zone distances and, in some cases, increases the useful gain. **Figure 1**, which was produced from an *EZNEC* **[3]** model, shows this in more detail. The left hand side of the diagram shows a graphical representation of the current distribution along a 10m tall vertical radiator, whilst the right hand side shows the resulting radiation pattern.

Small diameter radiating elements, such as those constructed from thin wire, have a large range of impedance excursions at the feed point. This can vary from a few tens of ohms, at odd multiples of the fundamental ¼ wave resonance, up to several thousand ohms at even multiples. As the diameter is increased the high feed impedance at $^1/_2$, $^2/_2$, $^3/_2$, $^4/_2$ wavelength etc starts to fall; whilst the low feed impedance at $^3/_4$, $^5/_4$, $^7/_4$ wavelength etc begins to rise slightly. Note that both the resistive and reactive the range of impedance excursions are diminished, which reduces the SWR when used without a tuner and decreases the reactance range that needs to be matched when a tuner is used.

Figure 2 shows the *EZNEC*-modelled feed impedance of a typical 10m long HF vertical antenna, using a solid conductor of gradually increasing diameter.

Note that once a conductor diameter of approximately 250mm (or 10") has been reached, the feed impedance at $^1/_2$, $^3/_4$, 1 and $^5/_4$ wavelengths begins to converge at a value of around 150 to 170Ω. This corresponds to a length to diameter ratio of 40.

Further increases in conductor diameter will continue to modify the feed impedance, but in terms of the size of a practical antenna, this tends to produce diminishing returns, especially when the diameter of the antenna becomes a sizable proportion of its overall height. If the diameter is increased to a sufficiently large value, the feed impedance will become close to 50Ω. This technique is used in the conical monopole antenna and variants. However the desire to obtain a 50Ω feed impedance comes at a price. As an example, a 10m high antenna would require a maximum diameter of about 8m. This is quite a bit larger than the 250mm diameter solid conductor previously mentioned.

In many cases it is impracticable to construct a vertical radiating structure with a minimum conductor diameter of 250mm. However it is possible to simulate a solid conductor by making a 'skeleton' circular wire cage of a suitable number of much smaller diameter conductors connected in parallel.

It is possible to calculate **[4]** the size of cage and number of wires that would be required to simulate a conductor of a given size and plot them graphically. In this case we are interested in cages constructed from 1mm diameter wire that represent a solid conductor with a minimum diameter of 250mm as shown in **Figure 3**.

It is possible to confirm that the practical results closely match these calculated values by measuring the actual feed impedance of a selection of different diameter 10m tall vertical monopoles, as shown in **Figure 4**.

The vertical scale shows the amplitude of the measured feed impedance, and the horizontal scale shows the frequency. Note that I have limited the maximum value of impedance shown on the graph, in order to make some of the lower impedance traces more legible.

When using a very thin wire radiating element, the impedance swings quite dramatically between a maximum value of around 5kΩ to a minimum of around 40Ω. Progressively increasing the conductor diameter dramatically reduces the range of impedance excursions and even a modest increase in conductor diameter helps to reduce the impedance swings quite noticeably. This is one of the reasons that 33ft or 43ft self-supporting vertical antennas, constructed from moderately large diameter tube, are so popular for multiband operation.

However, when using a skeleton cage, if the spacing between the wires of the cage starts to become a substantial proportion of a wavelength, the equivalence to a single large diameter conductor becomes flawed. This can be seen around the 100MHz end of the frequency range, where the 0.4m diameter 5 wire cage has a lower feed point impedance in comparison to the much wider 1m diameter 5 wire cage.

This leads to the conclusion that a 10m high, 5 wire cage monopole fed against an adequate ground plane would be suitable for operation on the HF bands. Providing that a cage diameter of greater than 0.6m is used, the average feed impedance across a very wide range of frequencies lies somewhere in the region of 150 to 170Ω. This is a very easy impedance to match to a value near 50Ω, by means of a 4:1 ratio broadband impedance transformer or unun, producing a worst case SWR of no greater than 3:1 on any frequency from approximately 7MHz to well over 70MHz. This ensures that the unun is always operating close to its designed matching range, reduces coax mismatch losses and is suitable for use with most built-in antenna tuners.

I was able to verify this form of antenna, by making RF field strength measurements from transmissions using different vertical antennas, all having the same length of radiating element, but with varying diameters or numbers of wires forming a cage.

In order to make these measurements I used a remote controlled spectrum analyser and broadband active antenna. This was mounted on the roof of a building at approximately 20m AGL that was approximately 8km away from the transmitter site, well outside the near field zone of the transmitting antenna. I found that providing that the measurements were conducted under similar conditions; the repeatability was normally within ±0.5dB, which I could verify by making a reference

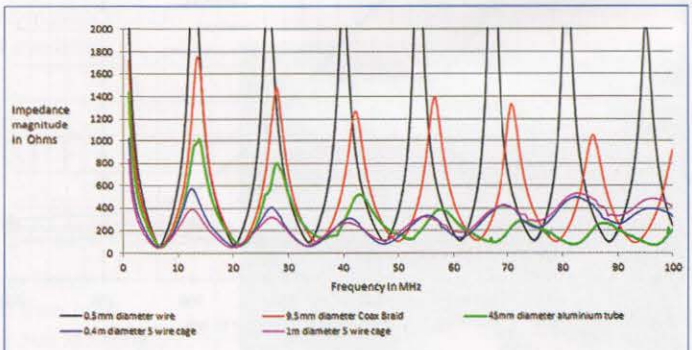

FIGURE 4: Measured feed impedance of 10m high vertical monopole antenna with different diameter radiating elements.

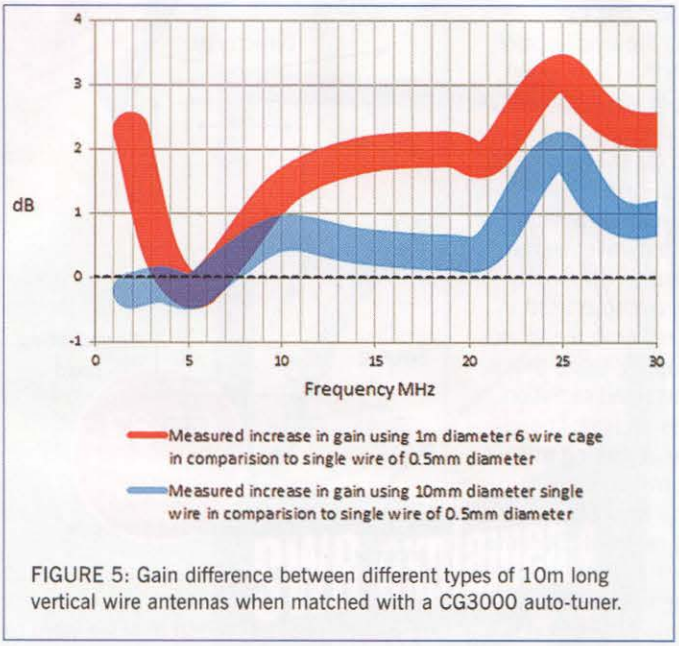

FIGURE 5: Gain difference between different types of 10m long vertical wire antennas when matched with a CG3000 auto-tuner.

measurement at the start and finish of each session. **Figure 5** shows the results averaged over many test runs.

Note that reference field strength was produced by using a thin (0.5mm diameter) vertical wire. This was matched to 50Ω at the base of the antenna by means of a CG3000 auto-tuner. This particular model of auto-tuner incorporates air spaced coils and has matching losses that are typical of many common makes of tuner.

The results clearly show that a measured improvement in field strength of up to 3dB (twice the power) could be achieved simply by using a larger diameter of radiating element.

Increasing the wire diameter from 0.5mm to 10mm slightly improves the efficiency, but using a six wire cage makes a dramatic improvement. This was much greater than predicted by *EZNEC* [3]. In fact, I was so was amazed by these results that I took great care to verify them by using several different types of tuners and of matching networks. All the tuners produced very similar curves resulting in a big difference in comparative performance between the thin wire and cage at around 25MHz. I believe that this could be because the impedance presented by the thin wire was more difficult to match than the moderate impedance presented by the wire cage antenna and this may have significantly reduced tuner losses at these frequencies.

One other factor, which was mentioned previously, is that the RF current distribution in a cage antenna results in the presence of a much greater amount of travelling wave current; this may have also helped to improve the antenna gain at low angles of radiation in comparison to the single thin wire radiating element.

RESISTIVELY TERMINATED ANTENNAS. Another group of broadband antennas use a different technique to achieve a 50Ω impedance match across a very wide frequency range. This relies upon either using a resistive load to mask excessive impedance excursions, or treating the radiating element as a form of terminated transmission line. It should be noted that in the majority of cases, adding a restive termination also reduces antenna efficiency, so a compromise has to be struck between overall size, bandwidth and gain.

Resistive loss may be introduced in the form of a resistor, in conjunction with some sort of radiating element. Probably the simplest example of this type of antenna is a 50Ω resistive load connected directly across the transmitter output, and a length of wire acting as the radiator. I have tried this and it does work. But the efficiency is very low, somewhere in the region of about 20dB worse than a similar length of wire fed via a suitable matching unit.

Other commercial antennas, such as the Diamond BB7V vertical and BB6W wire antenna, use combinations of impedance matching transformers and load resistors to achieve broadband operation. The efficiency of these designs may be several dB worse than a similar length of wire fed from a suitable matching unit, but have the advantage of providing a load impedance that is manageable by most transceivers incorporating a built in antenna tuning unit. This permits the full transmitter output power to be used, without an SWR protection circuit operating and reducing the output to a safe level.

By distributing resistive losses around various parts of the antenna structure, it may be possible to only introduce resistive impedance damping on specific frequencies, where the feed impedance would otherwise be outside the desired matching range. Adding inductive, capacitive, or resistive networks at various points along the radiating element(s) is another method used in some military antenna systems. It is also possible to use some other component such as an impedance matching transformer that is specifically designed to incorporate resistive loss. There are many examples of this technique being used in commercial antennas being sold on the amateur market such as the Comet CHA250 (and copies). Alternatively, distributed resistive loss can be introduced along the radiating elements as proposed by Wu & King [5], or by other similar methods [6].

The more efficient types of resistively terminated antennas tend to be those based on various forms of transmission lines. These are known as travelling wave antennas and include designs such as the Beverage and rhombic antenna.

Un-terminated antennas have a standing wave current (and voltage) distribution along their length. When a wave propagates along the antenna from the source to the end of the radiating element, it encounters an open circuit and is reflected back toward the source. This interacts with other waves travelling from the source and adds and subtracts with the incident wave. This forms peaks and troughs in the current (and voltage) distribution along the radiating element. If the feed point is at a current maximum, the feed impedance will be low, and conversely if the feed point is at a current minimum, the feed impedance will be high.

If the peaks and troughs occur at ¼ wavelength intervals of the applied frequency, they form standing waves. If we move our feed point along the radiating structure the impedance will vary, depending upon its position relative to that of the standing wave pattern. This principle is used in the off-centre fed dipole, where the point feed is chosen to be in approximately the same position (or impedance value) relative to the standing wave pattern on multiple harmonically related amateur bands.

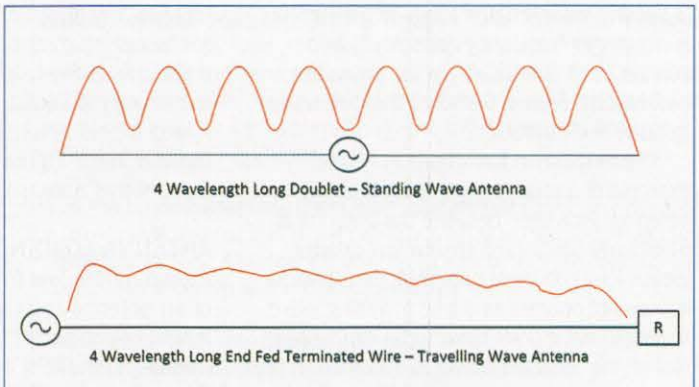

FIGURE 6: Red lines show the magnitude of current distribution along the two different antenna types.

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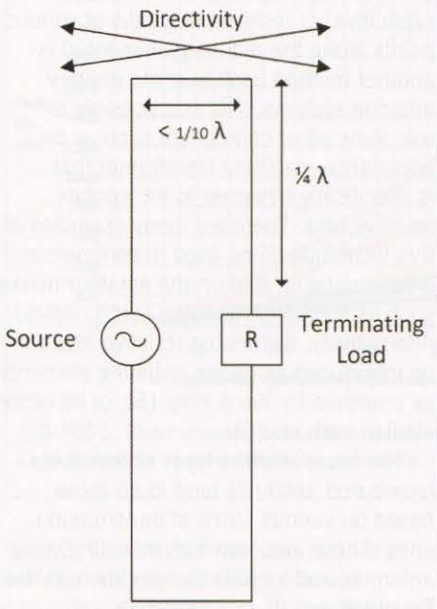

FIGURE 7: The terminated folded dipole antenna.

It is possible to modify the standing wave pattern of an electrically long antenna by terminating the far end with a suitable value of resistive load. The remaining (non-radiated) part of the forward wave is then absorbed and not reflected back towards the source, so the current distribution along the radiating element is relatively constant. This is referred to as a travelling wave antenna.

However, a practical radiating element does not form a perfect balanced transmission line, so the fields associated with the antenna are not confined to the immediate vicinity of the radiating element. This means that it is not possible to provide a perfect non-reflecting termination. Consequently there will still be some slight peaks and troughs in the current distribution along the radiating element. These excursions are fairly small, so the feed impedance remains relatively constant no matter where the source is placed along the radiating element, providing the length of radiating element is several wavelengths long. The antenna is no longer frequency conscious, and can be used over a very wide operating bandwidth. **Figure 6** shows the difference in current distribution.

The terminated folded dipole is one example of a relatively compact broadband antenna. However, because the antenna is electrically small (less than a few quarter waves long) on most operating frequencies, it does not operate as a true travelling wave antenna, but it does have some similarities. Not all the reflected power is absorbed in the terminating load but a reasonable proportion is, particularly at lower frequencies, which reduces the overall antenna efficiency. However, this absorption also has the desirable effect of reducing the amplitude of any standing waves which may form along the radiating element, improving the match at the feed point. This basic principle is used in commercial antennas such as the terminated folded dipole [7] shown in **Figure 7**.

Note that this design requires a relatively large spacing between the parallel elements in order to radiate efficiently. Very closely spaced conductors, such as those used in commercially manufactured twin feeder or coaxial cable, have a coupling factor that is designed to minimise unwanted radiation when used as a transmission line. The equal and opposite currents flowing in each conductor (differential current flow) will suppress RF energy in the form of common mode current from being radiated. Because the resistive load is placed at the opposite side of the antenna to the feed point the resulting phase relationship of the total current distribution from the antenna in one direction is additive, and in the other direction subtractive. So the radiation pattern is slightly asymmetric, with about 2dB less gain in some directions on certain frequencies.

In order to improve upon some of these shortcomings, a variant of the original terminated folded dipole uses two outer wires either side of a central wire. The central wire is being used to connect to the terminating load. This forms a more symmetrical antenna (only in two planes), with improved radiation efficiency, less asymmetry and much more constant feed impedance.

TERMINATED FOLDED MONOPOLE. It is possible to modify the terminated folded dipole, by just using half of the antenna and feeding it against the ground. This results in a Terminated Folded Monopole. A practical version of such an antenna was first published in *AntenneX* magazine [8]. In this design, half a terminated folded dipole is orientated vertically and fed against a ground screen that is used to provide the 'missing' other half of the antenna. However, the design does not include any specific details with respect to the optimum conductor spacing. It also suffers from the lower gain and pattern asymmetry associated with the terminated folded dipole antenna it is originally derived from. **Figure 8** shows the general form of this antenna.

ANTENNA LOADING. Another method of extending the low frequency performance of an antenna is to add an additional length of conductor to the radiating element in order to make it appear to be electrically longer than it actually is. The additional conductor can be arranged to run alongside or parallel to the radiating element, or in some cases, coiled around it. If we were to remove the resistive terminating load from the terminated folded monopole antenna shown in the previous drawing and leave the connection open circuit, we would then have a linearly loaded ¼ wave antenna as the loading wire is ¼ wavelength long. The total electrical length of the antenna would now be a ½ wave at the original frequency.

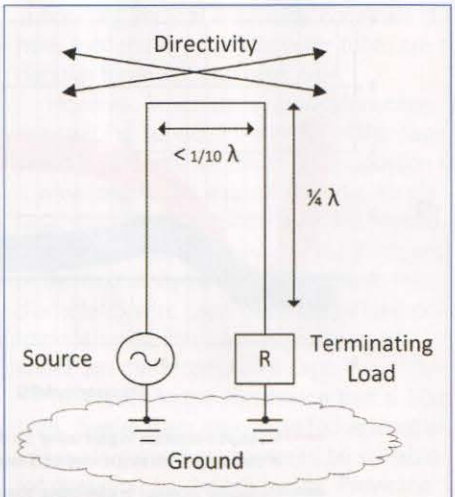

FIGURE 8: Terminated folded monopole antenna.

For example a 7MHz vertical ¼ wave antenna, when linearly loaded in this way, would appear to be electrically similar to a ¼ wave antenna operating on 3.5MHz. Although the impedance measured at the feed point would be very similar, the actual performance and radiation efficiency would not be the same. This is due to a combination of factors, including losses in the folded radiating structure, which could be considered as length of mismatched but closely coupled twin transmission line. In this case the partial cancellation of currents travelling along the parallel conductors would reduce the overall antenna radiation efficiency.

In the next part I will describe how many of the features of these existing designs can be incorporated into a new type of antenna that is compact, efficient, cost effective and easy to construct.

WEBSEARCH

[1] G8JNJ website: www.g8jnj.webs.com
[2] GB2485812
[3] *EZNEC*: www.eznec.com/
[4] Reg Edwards, G4FGQ, Cage dipole calculator, http://home.centurytel.net/badgerlake/Hamradio/calcs/dipcage1.exe
[5] *The Cylindrical Antenna with Non-Reflecting Resistive Loading*, T T Wu & R W P King
[6] US patents US5644321, 691985 & 3950757
[7] Terminated folded dipole patented by Barker & Williams on 27 December 1983, US patent 4423423
[8] A wide-band folded vertical, Dave Cuthbert, WX7G, June 2002 *AntenneX* magazine No 62

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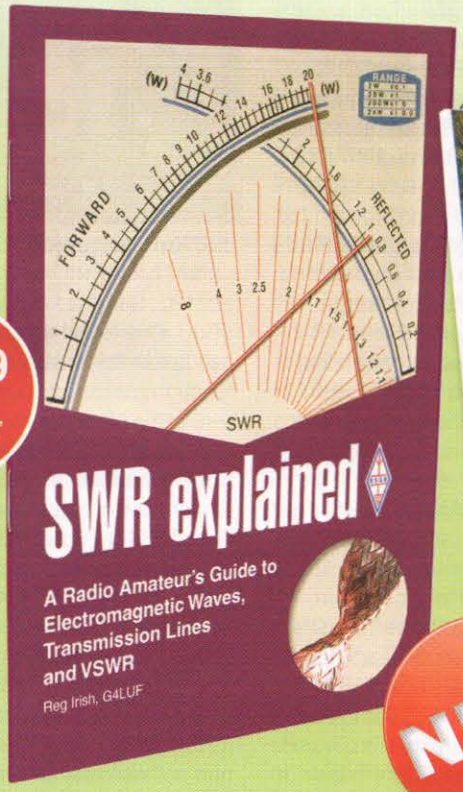

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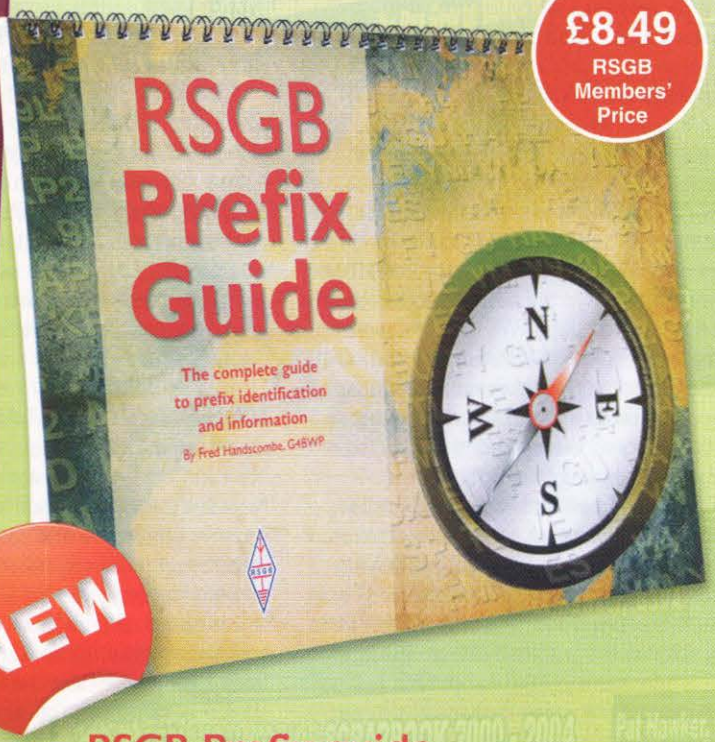

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NEW

SWR Explained

A Radio Amateurs' Guide to Electromagnetic Waves, Transmission Lines and VSWR

By Reg Irish G4LUF

Many radio amateurs are familiar with the concept of the Standing Wave Ratio (SWR) and the effect it has on the transmission and reception of signals. Few however understand much about it beyond the adjustment of an antenna tuning unit to the reduce SWR. *SWR Explained* sets out to fill that gap and provide the context that makes electromagnetic Waves, transmission Lines and VSWR comprehensible.

Written by leading electrical engineer Reg Irish G4LUF *SWR Explained* sets out by explaining what waves are, how they move in free space and how guided waves react. Steering clear of great chunks of heavy mathematical theory the author brings your personal experience to bear so that the reader gets a practical feel for the topic. How transmission lines react is explained along with matching and even using transmission lines as resonant circuit elements. There are designs for measurement of transmission lines and a practical guide to the working of a VSWR meter.

SWR Explained provides a guide to the mysteries of electromagnetic waves, transmission Lines and VSWR yet is light on heavy mathematics. If you want more information about understanding this fascinating topic this book is recommended reading.

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RSGB Prefix guide

11th Edition

by Fred Handscombe, G4BWP

The RSGB Prefix Guide is simply the very latest amateur radio prefix information available and a lot more besides.

Fully updated with all the very latest changes in the amateur radio world the *RSGB Prefix Guide* is the best guide available to amateur radio prefixes. This edition has the latest changes to allocations, fromE6 to the Pacific island nation of Niue through to Z8 for the newly formed nation of South Sudan. Readers will find more "special" prefixes mapped and even one new DXCC entity. The latest deletions are here including MalyjVysotskijIsland whichhas now been handed back to Russia.

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Homebrew

Transmit amplifiers for the LF/MF transceiver

FUN AND GAMES. Building the transmit RF amplifiers turned out to be quite an interesting task. I have built many broadband power amplifiers in the past, but this is the first time I have built a PA that also covers the extreme LF end of the spectrum. I have built several broadband amplifiers for previous projects. Most of these covered the usual HF bands from 160m to 10m. A few also included coverage of the 6m band.

RF power amplifier bandwidth is usually specified in MHz or occasionally in octaves, where each octave is a doubling or halving of frequency. A typical HF broadband PA will cover 4-5 octaves from 1.8MHz to 29.7MHz or in some designs up to 52MHz. The latter case is a frequency ratio of about 29:1. I have found that it is relatively easy to cover several octaves at low power levels. As power is increased to hundreds of watts, it becomes progressively more difficult to achieve very wide bandwidth. There are a number of reasons for this. High power circuits tend to have very low impedances. As a result, relatively small values of inductive reactance may have a significant influence on amplifier performance. High power devices are often physically large, which also tends to result in increased reactance. High power transistors will have I/O and junction capacitance of hundreds, or in some cases, thousands of picofarads.

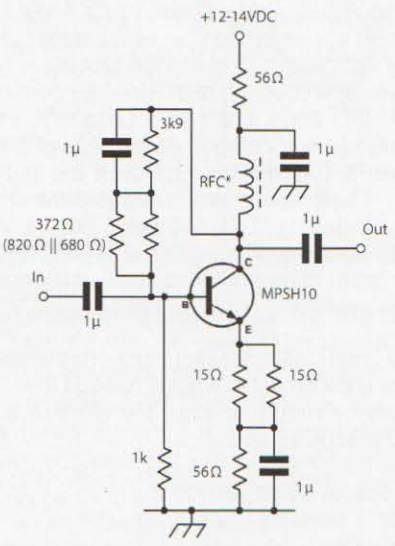

FIGURE 1: Common-emitter transistor low level transmit amplifier.

The design and construction methods used for previous amplifier projects has resulted in successful designs with a bandwidth of 4-5 octaves. Will this be sufficient for our LF/MF transmitter? If we wish to use 137kHz as the lower frequency limit, a frequency ratio of 29:1 as mentioned earlier will allow coverage from 0.137 x 29 = 3.973MHz. This should be sufficient to cover from 137kHz (2200 metres) to the top of the 80m band. Coverage of higher bands is not possible anyway because of the 4.2MHz cutoff frequency of the RF/LPF, which is common to both transmitter and receiver. It would seem that we may be able to build a complete transmit amplifier strip based on tried-and-tested methods as used in previous projects.

LOW LEVEL TRANSMIT AMPLIFIERS. The circuit in **Figure 1** shows a simple common-emitter transistor amplifier. Negative feedback is used to control gain, improve bandwidth and ensure the amplifier is stable under all conditions. Shunt feedback and emitter-degeneration are both employed in this circuit. Gain is around 15dB. Previous versions of this amplifier have easily covered from 1.8MHz well into the low VHF region. It should be possible to cover lower frequencies by simply scaling component values accordingly.

COMPONENT VALUES. Most semiconductor devices are inherently broad-banded. The MPSH10 transistor is a VHF device, but it will work very well at LF and DC. Negative feedback will take care of the excess gain at LF. The passive components will have much larger values than we are accustomed to. We will calculate values for XC and XL of 50Ω at 137kHz and use that as a guide for choosing capacitor and inductor values for the amplifier. $1000 \div (2 \times \pi \times 0.137 \times 50) = 23.23$nF and $50 \div (2 \times \pi \times 0.137) = 58\mu$H. The general rule of thumb for inductors in transformers and other broadband (non-resonant) circuits is that XL should be several times greater than the circuit impedance. This requires inductance of several hundred μH for the RF chokes (marked RFC in the schematics). Similarly, XC of coupling and de-coupling capacitors should be small compared to the working impedance of 50Ω. Several hundred nF will be required. These values are not unreasonably large, but they do present some difficulties for me because they are outside the normal range of components I keep in stock.

For the first tests of the amplifier, RFC was a 100μH choke (Maplin WH41U or similar) and all capacitors were 470nH dipped ceramic types. These were the largest value in the box and I only had a few available. Testing the amplifier using the tracking generator in my spectrum analyser showed a perfectly flat response from below 400kHz to well above

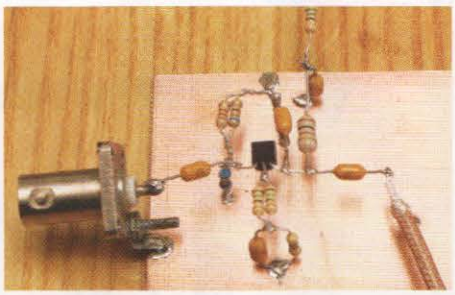

PHOTO 1: Completed low level transmit amplifier.

25MHz. Gain was exactly as expected at 15dB. Due to test equipment limitations, I had to use the sinewave output of a bench function generator as the signal source for testing the LF end of the frequency range. The amplifier output was terminated by a 50Ω resistor and an oscilloscope was used to monitor the output level and waveform. The -3dB (half power) point was just below 100kHz.

The moulded 100μH choke was replaced by a home made inductor of 24 turns of 0.375mm enamelled copper wire on an FT37-43 ferrite toroid. The inductance of this coil is approximately 200μH. The 470nF capacitors were replaced by 1μF non-polarised capacitors that were recovered from a scrap PCB. These are probably miniature polyester types. The amplifier now shows -1dB bandwidth down to the required 137kHz and a flat response that extends to more than 25MHz. This experiment proves that this circuit is suitable for our purpose and we will use it as the first stage of the low level and driver amplifier block. The completed amplifier is shown in **Photo 1**.

LOW-LEVEL AMPLIFIER AND DRIVER AMPLIFIER. The mixer unit (described in the February 2014 Homebrew) has a post-mixer amplifier that is currently configured for a gain of 20dB. Receiver tests show that this is probably a bit excessive. This amplifier is also used in the transmit signal path. As a result, we will probably have excessive gain in the transmit stages as well. This will be resolved in the final assembly stages when we will make any necessary adjustments to the gain distribution.

Figure 2 shows the schematic of the low-level and driver amplifier unit. The first stage is an MPSH10 as already described. RFC in the collector circuit is 24 turns of 0.375mm (not that critical) enamelled wire on an FT37-43 or similar ferrite toroid. The 372Ω shunt feedback resistor is made up from 820Ω and 680Ω resistors connected in parallel. The 7Ω5 emitter resistor is also made up from a parallel pair of 15Ω resistors. 7Ω5 is a standard value, but they are not easy to find.

Ideally, the constructor will always have the perfect device available for any situation. A VHF RF driver transistor with a dissipation rating of several watts would make an excellent choice for the driver stage.

PHOTO 2: Completed driver amplifier. Note that the heatsinks must not touch the ground plane.

In the real world, the amateur designer and constructor will often have to make compromises. We may decide to select, order and wait for a suitable transistor to arrive in the post. Or we might instead use devices that are readily available. At this stage, I'm not entirely certain how much power will be required to drive the final PA unit. Based on a rough sketch of gain distribution of the transmitter, it is likely that somewhere between 400mW and 1W will be needed. The upper end of this range is more than we can reasonably expect to achieve using the 2N5109 (my standard choice of VHF/UHF driver transistor). I have therefore decided to use a pair of transistors in a parallel configuration.

The RFC in the base circuit is a 100µH choke (Maplin WH41U or similar). A home made choke as described previously would make a good substitute. The collector and base terminals of the two 2N5109 transistors are connected by short lengths of wire. Separate emitter-degeneration resistors are used for each transistor. This configuration encourages equal current sharing between both transistors. A clip-on heatsink is required for each transistor. As the transistor case is internally bonded to the collector, the heatsinks must be isolated from ground. All capacitors are 1µF non-polarised types. Dipped ceramic are ideal, most plastic (polyester etc) types should also be perfectly adequate at LF/MF. The RFC in the collector circuit is 24 turns on an FT37-43 or similar. The 750Ω resistor from the collector to base circuits is made from a parallel pair of 1k5Ω resistors. All resistors are 0.25W metal-film types. The completed amplifier is shown in Photo 2.

TESTING. As with the earlier test amplifier, the new two-stage amplifier showed a very flat frequency response from 137kHz to 25MHz and beyond. Gain was measured at just slightly above the intended value of 30dB. The transistors run warm, but not excessively hot. I ran the amplifier continuously for one hour. The temperature in my outdoor shack was 14°C so I'm sure the cooling will be adequate even at higher temperatures. This will be tested again if/when summer arrives.

A MOSFET PA. The most successful broadband PA from our previous projects was a 16W MOSFET PA based on a push-pull pair of RD16HHF1 devices [1]. This amplifier showed an almost perfectly flat response from below 1.8MHz to above 50MHz; the -3dB point was well above 100MHz. The design was described in the April 2011 Homebrew. Our new LF/MF PA will be based on this design. Unlike most other MOSFETs, the Mitsubishi devices are designed to operate with a nominal 12V supply. This is very convenient for mobile operation or for most amateur shacks where a 12-14V DC supply is usually available.

INDUCTORLESS AMPLIFIER. One option is a direct coupled amplifier without inductors. It would be possible to build a direct-coupled broadband amplifier for LF/MF. Such an amplifier would be similar to a hi-fi audio amplifier. The frequencies are a bit higher, but 4MHz should be easily achievable at medium power levels.

The problem with this approach is that it calls for a much higher supply voltage. Typical hi-fi amplifiers use a split positive/negative supply with somewhere between 50 and 100 volts across the supply rails. As RF transmitters are usually designed for a 50Ω load rather that the 4-8Ω load of a loudspeaker, even higher supply voltages would be required to generate a given power level. However, some amateurs have used audio amplifiers for LF service. I have also seen reports of audio amplifier ICs used as the PA in transmitters.

BROADBAND TRANSFORMERS. In most cases, transmitters will use some form of RF transformers. This approach allows the generation of high power output from relatively low supply voltages. Hundreds of watts can be generated by a single PA running from a 12-14V supply. Even greater power is possible by combining the outputs from several amplifier modules.

There are many different types and configurations of broadband RF transformer. The two basic types are 'conventional' (magnetic flux-coupled) transformers and transmission-line (TL) transformers. Both types have been used in many of our previous projects. As the transmission-line type tends to operate over a greater bandwidth, TL transformers will be used for this project.

A simple TL 1:1 balun transformer is shown at the top of **Figure 3**. This device is symmetrical in that the input and output are interchangeable. Either side can be used as the unbalanced end by grounding one of the two terminals. The transmission line characteristic impedance should be equal to the I/O impedance. This may be important at HF/VHF, but tends to be much less important at lower frequencies where the total line length through the transformer is a very small fraction of a wavelength. A typical HF/VHF broadband balun will consist of a length of coaxial cable wound on a core made from ferrite or other magnetic material. At higher frequencies, an air core is often adequate. This is often seen as a coil in the coax feedline at a point close to an aerial feedpoint. LF/MF/HF TL baluns are often formed from lengths of twisted pair (bifilar) wound on a ferrite toroid core. The bottom of Figure 3 shows a 1:4 (or 4:1 in the other direction) TL balun. In this example, the two lines are wound on separate ferrite cores. In practice, the two lines are sometimes wound on a 'binocular' type of core, which is a single block of ferrite with two holes. Note that the terminals are connected in parallel at one (low impedance) side of the balun and in series at the other. This results is a 1:2 voltage transformation or a 1:4 impedance transformation. **Photo 3** shows a 1:4 balun of this type, which is

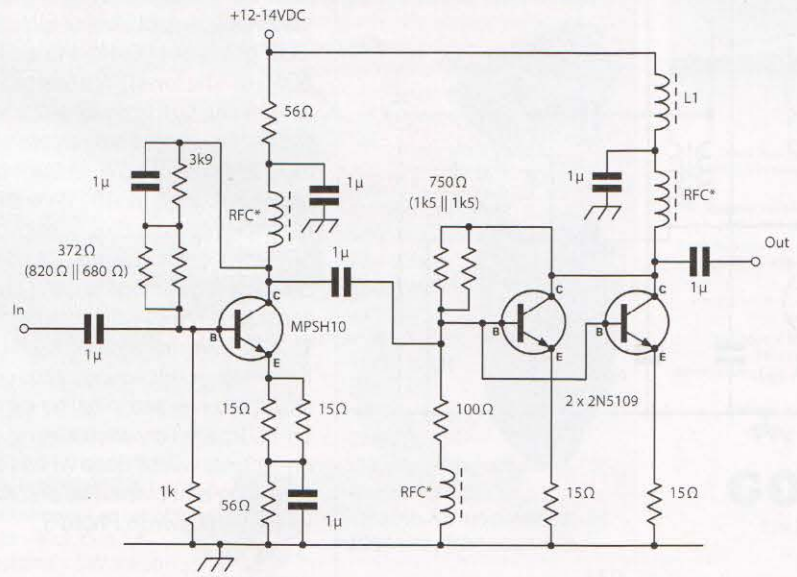

FIGURE 2: Low level and driver amplifier stages. * See text. L1 is 4t on a Maplin N89AB core.

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Eamon Skelton, EI9GQ • e-mail: hbradio@eircom.net

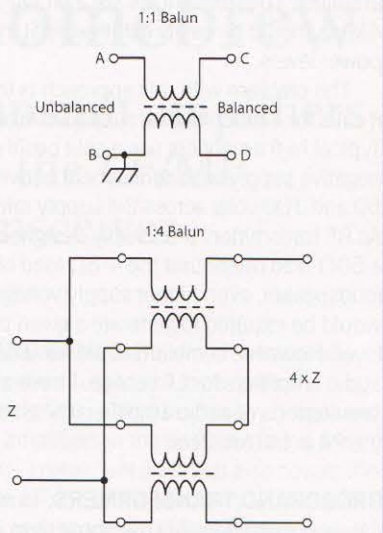


FIGURE 3: Top: 1:1 transmission line balun transformer. Bottom: 1:4 transmission line balun transformer wound on two separate cores.

used as a PA output matching transformer. The output impedance is unbalanced 50Ω, the input impedance is unbalanced 12.5Ω. Balanced input is on the left, unbalanced output is on the right.

The PA circuit is shown in **Figure 4**. The transistors are a pair of RD16HHF1 MOSFETs mounted on a medium sized heatsink. Around 1.5-2.0°C/W should be adequate for Class A/B linear operation. I have found that I don't need to use a cooling fan when running this amplifier at 10W output. Unlike most other plastic-packaged FETs, the drain terminal is not internally connected to the heatsink tab. This means that it is not necessary to use an insulating

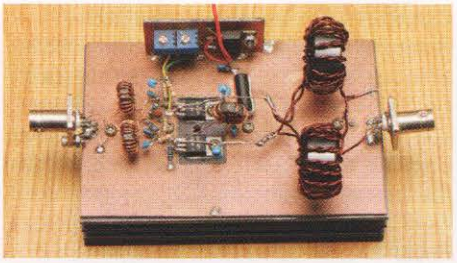


PHOTO 3: Completed 10W power amplifier.

kit when mounting the transistors. As well as the reduced expense and component count, direct mounting gives a significant reduction in thermal resistance between FET and heatsink. I used a thin film of heatsink compound between the FETs and heatsink.

The bias circuit is very simple. Bias voltage comes from an 8V regulated supply. This may be switched separately from the drain supply to simplify Rx/Tx switching. Bias is adjusted using a pair of standard pots in a fail-safe configuration that will reduce bias to zero if the pot is intermittent or noisy. It is particularly easy to set the standing current for these devices. I used standard 22k pots. Multi-turn types would make adjustment even easier.

The input transformer is a 4:1 unbalanced to balanced configuration. T1 is a pair of FT50-43 toroids with 20 turns of bifilar wound twisted-pair (0.375mm again) on each core. When this type of transformer is wound with coax cable, it is easy to check the polarity of the connections. This is not so easy with enamelled copper wire unless you have used pairs with different enamel colour for each wire. Check the polarity carefully. I find the 'beeper' function of my multimeter very handy for this task.

T2 is 12 turns, twisted pair (bifilar) on another FT50-43. This provides the DC drain supply for each FET. Two separate 220nF capacitors are used for drain supply decoupling. This arrangement makes it easy to insert separate current meters in the DC supply for each FET, which provides an easy way of setting the standing current separately for each device or for checking for equal current draw under load. In practice, I found this wasn't necessary with my well matched pair of FETs. I just set both pots for zero current, adjusted one for 500mA drain current and then adjusted the second for a further 500mA increase giving a total standing current of 1A.

RFC 1 is 4 turns through a ferrite sleeve (Maplin N98AB). The output transformer is similar to the input transformer, except for its greater size. It is probably larger than necessary, but this was dictated by the size of the available ferrite cores. T3 is 15 turns of bifilar-wound 1mm enamelled wire on a pair of HEM3011 toroids (Maplin N88B). Wire size isn't very critical here. The wire I used measures 1.1mm including enamel. As with the input transformer, take great care with the polarity of the windings on the high-Z (50Ω) side. I/O connections are via BNC sockets. This is convenient at the testing stages, although I will probably use smaller and cheaper alternatives in the final assembly.

TESTING. The gain of the amplifier is just a shade under 15dB. This gives a total gain for the amp/driver/PA cascade that is exactly on target at 45dB. Testing the PA stage only at moderate output shows the LF -1dB point at below 100kHz. Remarkably, the HF -1dB point is at more than 50MHz, with -3dB well above 100MHz. This is the third time I have used RD* series MOSFETs in an amplifier project. On every occasion, the amplifier performance – and particularly the bandwidth – has far exceeded my expectations. Testing the full chain (amp/driver/PA) at a more reasonable output level of 5W shows -3dB points at 100kHz and well above 50MHz. The lower limit seems to be determined by the driver unit and not the PA. Full output is in excess of the expected level of 16W. In the interests of linearity, I will run the PA with a relatively high standing current of 500+500mA = 1A total. Maximum output will be limited to 10W or considerably less when driving my QRO MOSFET PA. Transmitted signal from the existing units sounds good on my shack receiver and initial on-air reports on 160m are very encouraging. Further on-air tests will be done when Rx/Tx switching is in place. The assembled PA unit is shown in **Photo 3**.

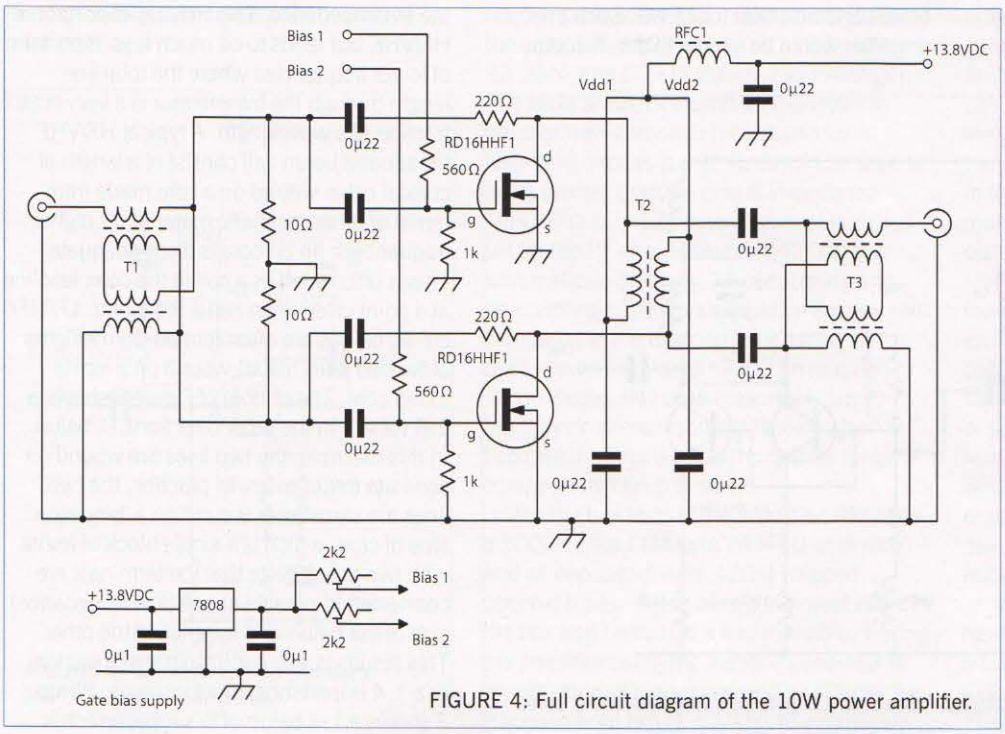


FIGURE 4: Full circuit diagram of the 10W power amplifier.

REFERENCES

[1] RD16HHF1 data sheet, Mitsubishi, 2011

IOTA

An interview with IOTA activator Christian Cabre, EA3NT

Following on from feedback received regarding Interview the Activator in the March IOTA column, I'm grateful to my second interviewee, Christian, EA3NT from Tarragona, Spain.

Christian is relatively young in the world of amateur radio, not least in IOTA circles, but his island hopping and activations are more like those of an old hand. As founding member of the Invoker Team, Christian along with his team, pride themselves in activating rare and difficult to access islands around the world.

How was your passion for IOTA born?

To be honest, I can't remember very well, but my first ever IOTA activation was on Buda island, EU-154 (now deleted), which I presume is where I got bitten by the virus.

As a founding member of the Invoker Team, who specialise in activating rare or difficult to access islands, can you tell me which particular IOTA you've found most challenging to date?

Every uninhabited island has got its own challenge. I well remember the extremely steep climb to the top of Eilean Mor in the Flannan islands group, EU-118 (as MS0INT) or the 3km trek across quicksand to reach Tombelaine island, EU-156 (as TM0INT) at low tide, needless to say always fully loaded with radio equipment. Also, how can I forget being on St Paul island (as CY9M) hauling gear up a cliff face for 8 hours solid?

Which one IOTA do you dream to activate, even though it may never be possible?

I would love to go to a never-activated IOTA, as any dedicated activator would. Besides that, I dream of activating any of the Aleutian islands or similar US islands scattered around the North Pacific.

Where do you see RSGB IOTA in the next 50 years?

Everything has its high or low moments. 50 years is a long time, but hopefully the passion to activate rare islands will remain for years among the DX community and, most importantly, the restrictions to access them will slowly disappear. Nowadays it is getting more difficult, sometimes impossible, to gain access to rare islands all in the name of protecting the environment. Common sense is required by those who are tied by red tape.

The HP0INT DXpedition, a six island activation in Panama.

Christian Cebre, EA3NT, a founding member of the Invoker Team.

You've visited some pretty interesting places over the years. Is there an island that, in your view, stands out for natural beauty?

I was really impressed with the beauty of the Samoan islands, Upolu and Savaii, or the pristine Tokelauan atolls. The St Kilda archipelago, in the north Atlantic, is another amazing place worth visiting; easy to see why it's a UNESCO World Heritage Site for natural and cultural qualities.

Do you have any future IOTA plans you could reveal to *RadCom* readers?

Some of the Invoker Team will be active, weather permitting, from Longstone Island, EU-109, as MX0INT, during early May. We are also planning to activate two rare Spanish IOTAs soon. Further projects will likely occur as the year progresses.

You, along with other Invoker Team members, recently won the DXpedition of the IOTA Marathon with a six-island activation throughout Panama as HP0INT. That must have been quite an adventure?

I had wished to visit Panama for a long time, and when I proposed to the guys we should go there, never did we think it would be such an eventful trip. The 15-day tour was so perfectly planned by Vincent, F4BKV that we managed to pull off activating all the HP-IOTA groups, making island chasers feel like they were travelling with us. Such interaction between activators and chasers really satisfied me and we were delighted to win this award that will be presented at the 50th IOTA Convention at Beaumont House, Windsor over the weekend of 4 to 6 July.

UPCOMING IOTA ACTIVITY. Look for Gil, **MM/F4FET** who hopes to be active for a few hours a day sometime between 14 and 18 May from Lunga Island, EU-108, in the Treshnish group.

TM4U is a 5-man Belgian team who will be active from Saint Nicolas island, EU-094, from 25 to 30 May. See www.eu094.be/

SU8N will again be active from Nelson Island, AF-109, between 13 and 20 June. Last year this was the first activation of a brand new IOTA group so demand will still be high for those needing this one.

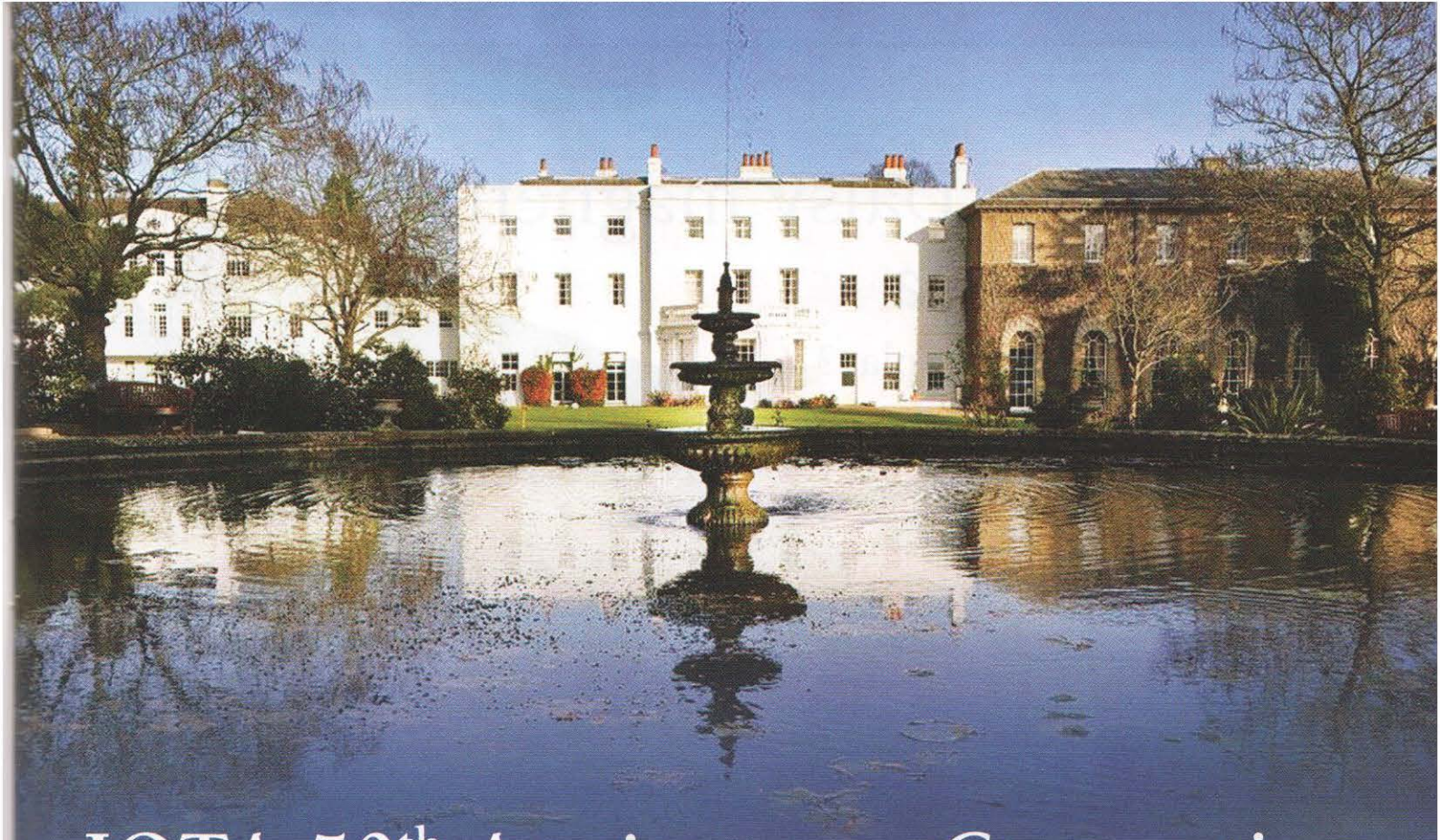
A team consisting G0MTD, M1PAF, M0XUH, G7MRL and M0WCR will be active from Tanera Mor (Summer Isles), EU-092, as **MS0WRC** between 14 and 21 June.

A team consisting of G0DRX, G0ECM, G0MEM, G0UQT, M0HTB and SWL Julja plan to be active as **GB2BLE** from Lundy Island, EU-120, between 15 and 20 June.

Next time round will be a consolidated listing of activations for this year's RSGB IOTA contest (26 and 27 July). Drop me an e-mail if you'd like to be included.

IOTA 50th Anniversary Convention

2014 is the 50th Anniversary of the RSGB IOTA Programme and the Society will celebrate the event at Beaumont House over the weekend 4 to 6 July. If you are a keen IOTA follower or interested in things DX, you will find this event both fascinating and memorable. It will be a truly international celebration of IOTA and will be an event to remember. Details are online at www.rsgbevents.org



IOTA 50th Anniversary Convention

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If you are a keen IOTA follower or interested in things DX you will find this event not only fascinating but memorable in many ways. During the day there will be fascinating IOTA and DX lectures, reports of the IOTA marathon and much more. On Saturday night there will be an extra special Gala dinner to celebrate the anniversary.

The venue for the event is Beaumont House in Old Windsor, which is in a beautiful setting within 40 acres of countryside just by the River Thames. Beaumont was also the venue for the IOTA 30th anniversary party in 1994 and some may remember it fondly as the home for many years of the RSGB HF Convention.

IOTA 50th Anniversary Convention will be a truly international celebration of IOTA and will be an event to remember. Come and mingle with well-known island enthusiasts both from the UK and overseas and celebrate 50 years of the IOTA programme with the RSGB.

The booking website is open to accept your reservations at **www.rsgbevents.org**

www.rsgbevents.org

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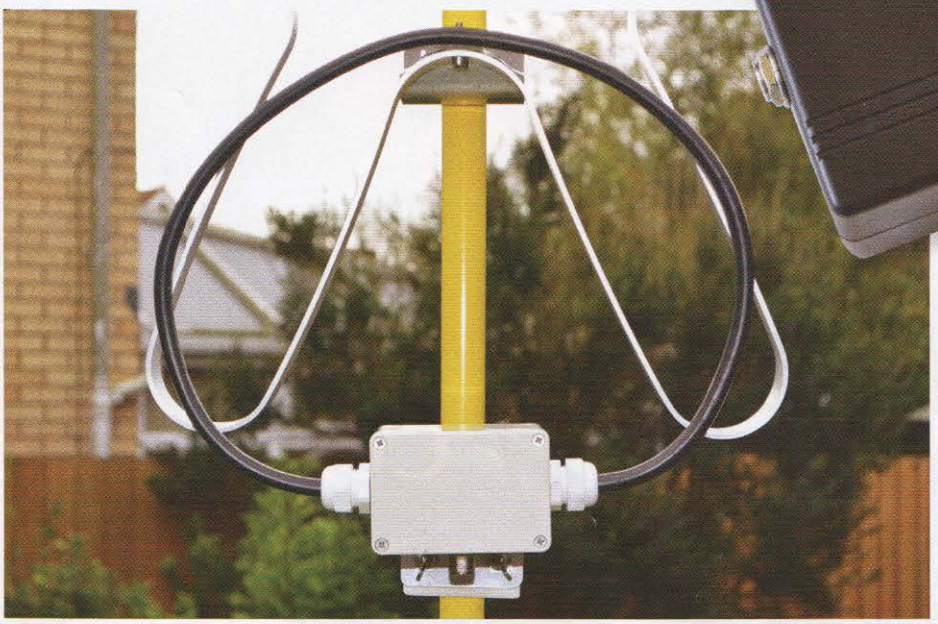
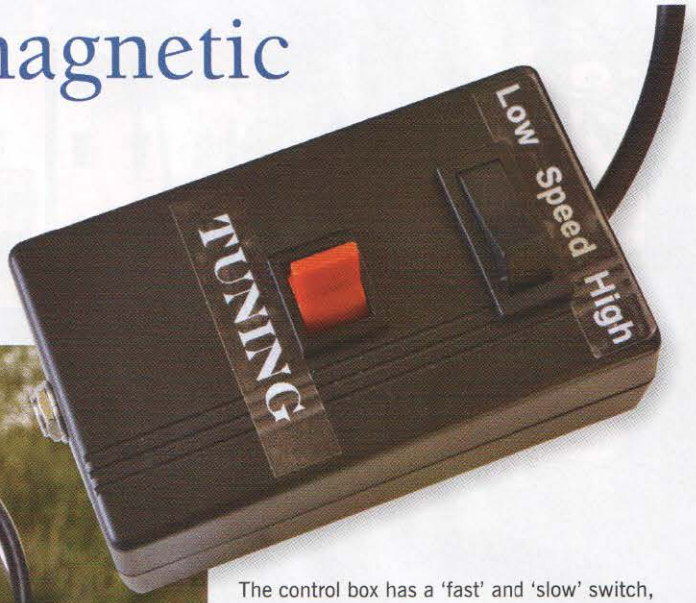
Steve Nichols, GOKYA • e-mail: steve@infotechcomms.co.uk

The Crazy Daisy magnetic loop antenna

But is using it child's play?



The antenna is fed with a single-turn Faraday loop.



The control box has a 'fast' and 'slow' switch, and a rocker for moving up and down the band.

SEEN AT THE NATIONAL HAMFEST. Victor Borisov, GM0SDV is very keen on developing new antenna designs. In 2011, Peter Dodd, G3LDO reviewed his figure of eight magnetic loop antenna constructed from 22mm tube. This turned out to be quite a performer, coming within a fraction of a decibel of the performance of a half wave dipole during WSPR tests. The original review and antenna is available from www.mixw.co.uk.

Victor has now switched his attention to smaller antennas and visitors to the Newark Hamfest in September 2013 may have seen his Crazy Daisy magnetic loop antenna for HF on the RigExpert stand.

I asked Victor if I could take it away to test for *RadCom* and he was more than happy for me to do so.

UNIQUE PETAL-PATTERN. The Crazy Daisy has a unique petal-pattern main loop formed from aluminium flat bar 3mm thick, 36mm wide. The overall diameter is about 870mm and it has eight zig-zag spokes or petals. It looks a little like a child's Crazy Daisy toy that you connect a garden hose to, hence the name.

The loop is brought to resonance with a 'butterfly' split stator variable capacitor at the top which is in a weather-sealed enclosure. The capacitor is connected to the loop via bolts secured by wing nuts.

The capacitor is turned by a small DC motor and reduction gear and controlled by a small lightweight controller that is fed via a plug-in 12V power supply, similar to a mobile phone charger. The box has a 'fast' and 'slow' switch, which reduces the voltage to the motor and a rocker switch for moving up and down the band.

There is no 'up' or 'down' button as such as the capacitor can rotate more than 360°. This means that going 'up' in frequency would depend upon where the capacitor position was to start with.

Tuning is done by listening for increased band noise as the capacitor is turned and then fine tuning to give the lowest SWR. The antenna is fed with a single-turn Faraday loop to which your coax is connected.

Victor says that the antenna can take up to 400W, although in testing I limited this to 100W.

The whole antenna is about three feet wide, relatively light and fits on a single pole, which I supported in the ground using a screw-in support obtained from Clas Ohlson.

IN THEORY. The theory of how a magnetic loop works is quite well documented and I have used two different commercial varieties (MFJ and Capco/AAA) on and off for years so I know pretty much what to expect.

When mounted vertically they offer a fan-shaped radiation pattern in a line with the loop with nulls off the side. At the horizon the radiation is vertically polarised, although overhead it is largely horizontal – just think about what you see when you look down on a magnetic loop and you can see why.

If built properly a magnetic, or more correctly small tuned loop (STL), can be very efficient, approaching dipole-like performance on 28MHz (10m) and a few dB down on the lower HF bands. I say 'built properly' as you have to ensure that losses are kept to a minimum by using good quality components with very low loss connections, such as welded or brazed. A few milliohms of loss can drastically affect the performance of a loop and many proponents of the loop art advocate using vacuum variable or split stator capacitors to reduce losses.

And if you think that everything is known about the STL and its performance, think again. Rich Fusinski, K8NDS is currently experimenting with helically-loaded magnetic loops that use copper flashing rather than tubing. When fitted with a vacuum variable capacitor and fed with a gamma match he is getting good reports and can even run 1kW into them without problems.

There is a debate about whether K8NDS's antenna is more efficient than a conventional loop made out of copper tubing, but it is good to see experimentation going on.

ON TEST. Anyway, back to the Crazy Daisy. On test it was found to tune from 12.4MHz to 29.5MHz. The positioning of the Faraday loop was found to be critical, but I was able to get the SWR down to around 1:1.2 or less on some frequencies and less than 1.8:1 across the whole frequency range.

As you would expect the bandwidth once tuned was narrow – about 50kHz between 3:1 SWR points on 20m (14MHz), 84kHz

The Crazy Daisy has a unique petal-pattern main loop.

The loop is brought to resonance with a 'butterfly' split stator variable capacitor.

on 15m (21MHz) and 125kHz on 10m (28MHz).

On receive, the first thing that struck me was just how quiet the antenna is. Band noise was minimal, which meant that weak signals were received loud and clear. Tuning around it was clear that the loop was receiving just about everything my main antennas could hear. Usually signals were down a little when compared with my dipoles, but the lower noise floor meant that the overall signal to noise ratio was about the same.

This suggests that the antenna would be an excellent choice for a short wave listener who doesn't have the space for a full-size antenna. One antenna could be used to cover everything from 12.4 to 29.5MHz, including amateur, shortwave broadcast, aeronautical and anything else in the spectrum. If you live in a flat with no access to a garden the Crazy Daisy could be located on a balcony and enable you to play radio.

So how well does the Crazy Daisy work? I decided to test the antenna using WSPR (Weak Signal Propagation Reporter). I used 5W and transmitted for two, two-minute periods with the loop (tuned to the appropriate WSPR frequency). I then switched and antennas and transmitted again.

By going to www.wsprnet.org I was then able to see where my signals had been received and at what signal strength. I then took only the reports where the signals had been received from both antennas and calculated a mean (average) signal strength.

The results showed that on 20m (14MHz) the Crazy Daisy mounted with the base just four feet off the ground was down about 9.4 - 9.7dB on a half wave dipole mounted at 25 feet.

To give the full picture, signals from the dipole were received by more reporting stations than the Crazy Daisy, which is to be expected given the performance outlined above.

Similar results were obtained on 18MHz (17m) and 21MHz (15m), where conditions were not too good at the time of the tests.

On 10m, the antenna performed slightly better (as you would expect, where its physical size is less small compared with the wavelength in use). Here it was around 6dB down on a 28MHz dipole at 25 feet.

The different radiation patterns and vagaries of the ionosphere meant that some signals were similar in strength and some were worse.

This led me to believe that for optimum efficiency it would make sense to mount the Crazy Daisy on a rotator so that you can align it with the area of the world you wish to work.

ANALYSIS. Once the tests were over it was time to think about the results and why the antenna performs the way it does. Current wisdom is that one of the critical factors of a magnetic loop antenna is the area enclosed by the loop. For example, for a circular loop of radius 400mm the enclosed area is Pi x radius squared = $0.5m^2$.

Now, although the overall width of the Crazy Daisy is about 0.87m, its design means that it covers roughly the same area as a circle of approximate radius 0.3m, giving a total enclosed area of about $0.28m^2$.

Feeding these figures into the loop calculating program (RJELoop1.exe) by the late Reg Edwards, G4FGQ suggests that its performance might be about 3dB down on a circular loop of about 800mm diameter.

Either way, I think Victor, GM0SDV should be congratulated on experimenting with different loop designs and the antenna enables an amateur with little space to get on the air. The fact that the loop received and transmitted signals to the USA, Canada, Israel and Reunion Island and took about 30 minutes to erect says it all.

Victor says that he builds the antennas for fun and ploughs the money that he makes from selling them back into research and design – he is currently interested in fractal antennas, which he feels could offer a lot of performance for their size.

AVAILABILITY. The Crazy Daisy is available from KMK UK Ltd (e-mail mixw@mixw.co.uk or web www.mixw.co.uk) for £200 + P&P. Our thanks to Victor for lending the antenna to us for review.

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Tooling up the TS-50 for CW

A new filter to improve reception

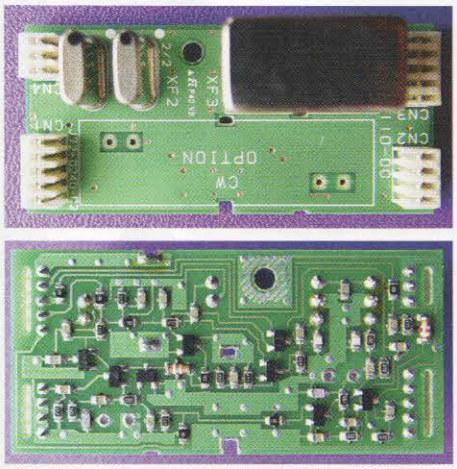

PHOTO 1: Top and bottom view of filter daughter board.

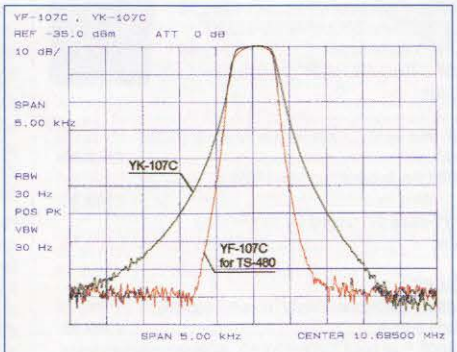

FIGURE 1: Comparison between YK-107C and YF-107C filters.

INTRODUCTION. The ubiquitous TS-50 is still very popular, as is witnessed by the large user group [1]. Its overall performance, in particular for portable/mobile operation, is still very acceptable.

THE CW PROBLEM. The question of CW operation has been an issue of recent times as it appears that a large number of these equipments were not factory fitted with narrow filters. Kenwood has even stated that the optional YK-107C filter did not have very good performance – and is very hard to get now due to the limited number that were produced. In the development report for the follow-on TS-480 [2], Kenwood stated it had been redesigned as a YF-107C to provide a more desirable characteristic. Figure 1 compares the two; you can see how poor the skirt selectivity of the original filter was.

Retrofitting the TS-50 with this newer filter is however made difficult because of the *handedness* of the new package – the input/output pin arrangement has been reversed from the original. A suggested fix for this was provided by Joerg Wunsch, DL8DTL, who posted a description [3]. He solved the problem by fitting long wire legs onto the filter, providing the necessary cross-over, which is both stiff enough to allow for a self supporting structure yet flexible enough so that the filter can subsequently be pushed down so as to prevent mechanical interference when the equipment lid is refitted.

Although successful, this arrangement is subject to both vibration (dealt with by using compressible foam pads both above and below the filter body) and the more problematic electrical bypass coupling from the filter's input and output terminals. A new method has been sought to overcome both of these problems.

A BETTER SOLUTION. There is little room on either side of the daughter board to fit rerouting wires whilst maintaining the filter package grounding via the tag solder holes. New holes cannot be drilled for the new filter input/output pins due to the high under side circuit density, seen in **Photo 1**. However, by cutting away some of the ground plane, it is possible to provide the necessary cross-over linking and still be able to use the tag solder holes. This is shown in **Photo 2** where two isolated areas of track are produced by carefully cutting away the ground plane with a scalpel. The solder resist is subsequently scraped away and finally cleared using a fibre cleaning pen. Two small areas, which will be coincident with the new filter's ground terminal pin, are also shown scraped away and cleaned.

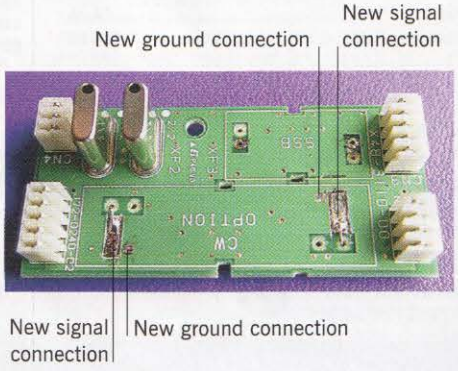

PHOTO 2: Cross-over tracks cut into ground plane.

Two short wires can now be soldered in position to connect the cross-over tracks to the original signal pin plated through holes, as shown. To provide later accessibility and ease of working, it is recommended that the SSB filter (circuit reference XF3) be carefully removed.

The new filter pins need to be shortened so that they protrude by no more than 1.5mm beyond the package bottom edge. Be very careful when cutting these pins. Note that the third pin, which merely provides a specific resistance value (allowing the TS-480 processor to automatically identify which filter type has been fitted), can be fully cropped in our application, as the TS-50 processor has no such sensing facility – there is a menu entry to inform the processor that a CW filter is fitted – see **Photo 3**.

The pin ends, after being cut and trimmed, are tinned with solder and further dressed with a Swiss file to be of equal length.

The two small ground areas (adjacent to the new cross-over tracks) are subsequently 'bump' tinned (ie make a bump of solder) in preparation for the new filter assembly.

The filter is now located in position using the package ground tabs and held tightly onto the board with an elastic band. The ground pins must be seen to be seated onto the two ground solder bumps previously prepared. At this stage a gap should be seen below each of the two signal pins and the package solder tabs should protrude through the existing board grounding holes by about 1mm.

If all is well, a temperature controlled soldering iron with a narrow conical bit is used to re-flow the ground pin solder bumps in rapid succession, allowing the pins to drop into the solder *pools* there created. This will be evidenced by the closing of the signal pin gaps so that they sit squarely onto the cross-over link track ends. The filter package solder tabs are now properly soldered on the board underside to provide a solid mechanical fixing.

Finally, the signal pins are now easily soldered and properly filleted as the thermal capacity of the cross-over link tracks is relatively small. **Photo 4** shows the filleted solder joints under each end of the newly installed filter. Following the satisfactory inspection of all the new joints, the original SSB filter is re-fitted in position as shown in **Photo 5**.

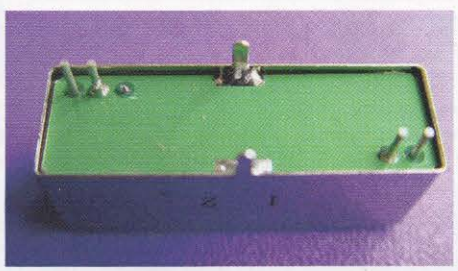

PHOTO 3: Cropped/trimmed pins.

Continued on page 46

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MFJ-945E 1.8-54MHz 300W tuner with meter..... £139.95
MFJ-941E 1.8-30MHz 300W Versa tuner 2..... £164.95
MFJ-948 1.8-30MHz 300W deluxe Versa tuner..... £174.95
MFJ-949E 1.8-30MHz 300W deluxe Versa tuner with DL..... £199.95
MFJ-934 1.8-30MHz 300W tuner complete with artificial GND £204.95
MFJ-974B 3.6-54MHz 300W tuner with X-needle SWR/WATT . £194.95
MFJ-969 1.8-54MHz 300W all band tuner..... £219.95
MFJ-962D 1.8-30MHz 1500W high power tuner..... £299.95
MFJ-986 1.8-30MHz 300W high power differential tuner..... £359.95
MFJ-989D 1.8-30MHz 1500W high power roller tuner..... £399.95
MFJ-976 1.8-30MHz 1500W balanced line tuner with **X-Needle** SWR/WATT..... £479.95

MFJ Analysers

MFJ-229 UHF Digital Analyser 270-480MHz ..£219.95
MFJ-249B Digital Analyser 1.8-170MHz..... £269.95
MFJ-259B Digital Analyser 1.8-170MHz..... £294.95
MFJ-269 Digital Analyser 1.8-450MHz £399.95
MFJ-269PRO Digital Analyser 1.8-170/415-450MHz ..£429.95
MFJ-266 Digital Analyser 1.5-490MHz in stock now....£399.95

MFJ-225 HF/VHF 1.8-170MHz Graphic Analyser

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LDG Z-11 Pro 1.8-54MHz great portable tuner £167.95
LDG KT-100 1.8-54MHz ideal for most Kenwood radios..... £182.95
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LDG AT-100 Pro II 1.8-54MHz £209.95
LDG AT-200 Pro II 1.8-54MHz £219.95
LDG AT-1000 Pro II 1.8-54MHz continuous y..... £499.95
LDG AT-600Pro II 1.8-54MHz with upto 600W SSB..... £299.95
LDG YT-450 designed for FT-450 & FT-950 in stock now..... £224.95

JUST IN. New SARK-110 Vector Impedance Analyser

The SARK-110 Antenna Analyser is a pocket size instrument providing fast and accurate measurement of the vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits).

Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths.

The SARK-110 has full vector measurement capability and accurately resolves the resistive, capacitive and inductive components of a load. The measurement reference plane is automatically adjusted via the Open/Short/Load calibration standard to enable the accurate impedance measurements at the end of an intermediate coaxial cable.

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ATV

The ATV shack

GETTING SET UP. Figure 1 shows how things are arranged in a typical amateur television shack. For 70, 23 and 13cm the antenna is usually a Yagi, whereas a dish is normally used for higher bands. It is important that a low noise preamplifier [1] (or frequency downconverter) is mounted close to the antenna to keep losses to a minimum. A bandpass filter either before, or built into, the preamp is also important to prevent strong out of band signals overloading the input and reducing sensitivity. If there are strong in-band signals nearby, such as a voice repeater, a much narrower filter may be required. Narrow, low loss bandpass filters are quite tricky to make and usually consist of three or five sections of tuned circuits made from brass rods or resonant cavities. The loss should be less than 1dB, with sufficient bandwidth to pass the TV signal, usually 2.5 to 5MHz wide for digital signals or 9MHz+ for analogue. Construction details can be found in magazines such as *CQ-TV*. Search for 'interdigital filter' for more information.

The feeder down into the shack should have as lower loss as possible within the constraints of your budget and would normally have a diameter of at least 10mm and use a foam dielectric (to keep moisture out). Air spaced feeders are not recommended.

The Tx/Rx changeover relay can be an expensive item. Usually type N connectors are used. It must have a good match at the frequency in use (<1.1:1 SWR), good isolation (>40dB) to prevent the transmit signal from damaging the receiver and be capable of handling the power from the transmitter. The relay is controlled by the transmit/receive switch, with a suitable delay after switching the transmitter off before switching over to receive.

The receiver is likely to be the cheapest item in the shack. Various receivers are available such as the Comtech series [2] for analogue reception or a 'free to air' digital satellite receiver such as the Big Sat Golden 1 [3]. The receiver normally provides power through the feeder for the preamplifier or converter/LNB.

The receiver feeds a video monitor or the video input of a TV. A wide screen version is best so that the picture may be adjusted to 4:3 or 16:9 aspect ratio depending on the transmission. It is becoming more common to use wide screen as this is often available from the normal 625 line video output of domestic camcorders.

A variety of transmitters are available, for analogue the low cost Comtech type or more professionally made German units [4] [5]. For digital transmission the DTX1 [6] (for BATC members only) or from SR-Systems [7] can be used. The wide tuning range of some of the transmitters means that their harmonic content can be quite high and is best filtered out by a bandpass filter before the PA. A simple Toko or similar PCB mounted filter is sufficient. For the higher frequency bands, 9cm and up, it may be necessary to have an up converter after the transmitter.

The power amplifier may be a homebrew, surplus or professionally made product. Digital transmissions require good linearity. An amplifier using FET (LDMOS etc) technology is to be preferred [8] [4]. Transmitters often give only a few mW output so a high gain PA will be required. Television transmission requires a much wider bandwidth than audio transmissions so it is usual to use as much power as possible for the TV transmitter. For digital transmission lower power may be used. I personally use 300W for analogue transmissions and 30W for digital.

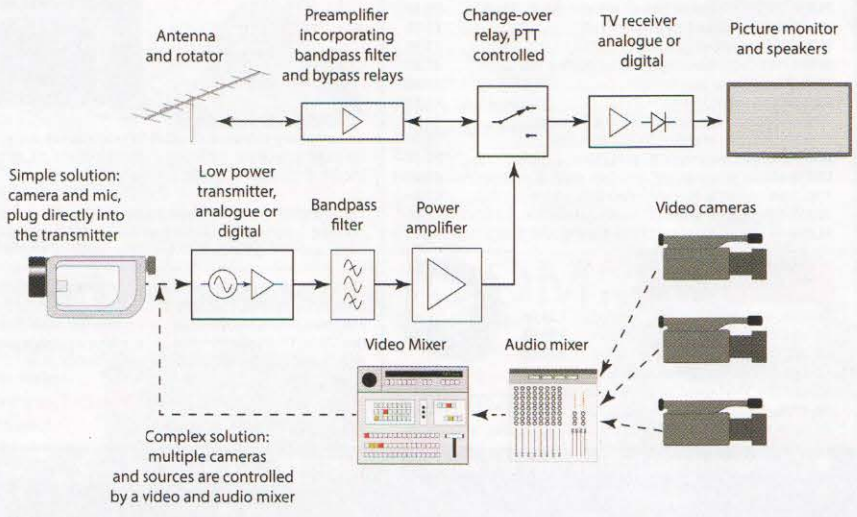

FIGURE 1: General arrangement of an amateur television shack.

VIDEO SOURCES. So, having built the transmission system we now have to think what we are going to transmit. A simple solution is just to plug your camcorder into the transmitter and use the camera directly or to play recordings. Another option is to use a media player to show videos or captions from memory cards. Such players can be purchased for as little as £30. Almost anything respectable and non-commercial may be transmitted, providing you do not infringe someone else's copyright.

A more comprehensive solution (see photo on front cover) is to feed the transmitter from a sound and vision mixer. New sound mixers are surprisingly inexpensive and vision mixers are readily available second hand. With such equipment you can mix between a number of cameras and other video sources to generate a slick production. Several examples of this can be seen on the BATC streaming channels both from repeaters and members' streams [9]. Most people use 625 PAL, or 525 NTSC overseas, either in 4:3 aspect ratio or wide screen. As time goes by I am sure we will see a change towards all-digital studio interfaces with full HDTV.

I hope this insight on how to setup a television station has been of interest; please e-mail me with any questions. Also, any ATV news for the next edition would be welcome.

BATC SUMMER FUN CONTEST. The BATC Summer Fun Contest date has been changed by one week to 14/15 June so that it coincides with the Dutch ATV contest. Given the high level of activity in The Netherlands, this was too good an opportunity to miss. Additionally, in order to encourage digital activity, the BATC has decided to create a new Digital Section and offer a prize of a Nexus 7 tablet for the highest placed station [10].

ISS ATV. The International Space Station continues to transmit a DVBS ATV signal on the 13cm band – sometimes with the camera on but mostly with the camera off. This is still useful for setting up a tracking antenna. The situation is changing daily so for the current status please see the BATC forum for more details [11].

WEBSEARCH

Most of the items mentioned in the text are available from many sources; these are just examples

[1] www.ssb.de
[2] https://batc.org.uk/shop/3rdparty
[3] www.microxpress.co.uk/
[4] www.kuhne-electronic.de/en/
[5] www.id-elektronik.de/en/
[6] https://batc.org.uk/shop/hardware-and-kits
[7] http://g8ytz.com/
[8] http://www.dg0ve.de/en/
[9] www.batc.tv/
[10] www.batc.org.uk/contests/contest_news.html
[11] www.batc.org.uk/forum/

RSGB insurance clinic

Your insurance questions answered by Julian Dent of SW Broking

INTRODUCTION. Julian Dent is the Managing Director of South West Broking

Insurance is paramount in many people's minds right now. The unprecedented flooding we have experienced, especially in the South West, has brought the need for adequate insurance cover into stark relief. With amateur radio enthusiasts up and down the country finding that they may be underinsured or, worse, not insured at all, what lessons can be learned to ensure you keep your hobby protected?

South West Broking is recognised by the RSGB as a specialist insurance broker and provider of insurance to its Members. Here are just a few of the questions from Members to have passed my desk this month alone. If you have any other questions do feel free to get in touch with Sotuh West Broking and my team here will do our best to answer them.

Question: A fellow radio enthusiast in the next village to us has been a victim of the floods this year and whilst the house, thankfully, has escaped, their barn and garage at the bottom of the garden have been completely flooded and it has taken out their radio equipment. Apparently their insurance company say they are not covered under their policy. I have just bought a new transceiver and currently have it stored in my radio shack that is a purpose built timber building situated in our back garden. We're not currently at risk of flooding but I don't want the same issue – will my equipment be covered?

Julian: I'm so sorry to hear about your friend. Sadly your question is an all too common one, and not just because of flooding. I understand that the policy in question was a household contents policy taken out direct with a high street insurer having been bought online. Household contents policies are very rarely adequate to protect specialist amateur radio equipment in sheds or out-buildings.

Quite apart from the fact that online websites generally encourage people to buy the cheapest policy rather than the one that really reflects the individual's specific requirements, amateur radio enthusiasts have specific policy needs that can't be always covered under standard household contents insurance. Household policies, for example, will have an upper limit for contents kept in out-buildings, which may not be sufficient for the value of radio equipment kept in external radio shacks. My advice would be

The amateur's worst nightmare - a blown-over tower.

1 Take out standalone cover for a specialist technical hobby providing 'All Risks' cover (including theft and public liability) alongside your household contents insurance. A good specialist broker will help you assess your insurance needs and requirements so they fully understand the risks involved and tailor the policy to suit. It is also important that you read the policy and understand the cover you are buying so that your expectations are met if you ever need to claim.
2 Beware of the dangers of under insurance. If your sum insured is inadequate to fully reflect the current replacement value for all your radio equipment you will be under insured that will enable insurers to reduce the amount of any claim settlement to reflect the amount of under insurance. This principle applies to all property insurance policies and is known as 'Average'.

Question: I bought a lot of radio equipment back in 2000 that was high spec in its day. If it were to be damaged or stolen would I get replacement equipment of the same (now old and outdated) spec or higher? Also, could I save money on the policy by only insuring certain items for the cost of replacement second hand rather than new?

Julian: Under our amateur radio scheme we can tailor the policy to meet your needs. This includes things such as insuring your equipment either at your home, or anywhere in the United Kingdom or even worldwide. However, if you only wish to insure specific items of radio equipment that are of particular importance to you and choose to not set a sum insured which reflects all your radio equipment there are some inherent problems in store for you. For example, water or fire damage will not discriminate between different items of equipment and you can find that saving a few pounds on your insurance premium can cost you significantly more in the value of damaged equipment if it has not been insured.

In answer to the query on cost; it is tempting to want to be selective on the equipment you cover or the values that you insure them for in order to bring down the cost of the premium, but this is often a false economy. For example, say you bought a mast for £15k in 1990, but the mast is now only worth £3k. You might be tempted to only insure the mast for £3k. The difference in premium cost maybe much less than you think than to insure it 'new for old' and have it replaced with a brand new mast of the same spec.

At the end of that day it comes down to making an informed purchase. The job of the specialist broker is to understand your cover needs and inform you of the options available to you and make you aware of what you will and won't be covered for. Amateur radio is a highly technical and specialised hobby with very specific cover needs that needs the advice and guidance of a specialist broker.

Please Note

In compliance with UK law, the RSGB does not sell insurance and is unable to provide any form of insurance advice.
Members are recommended to contact an authorised broker to discuss any insurance requirements.

May 2014 • RadCom
Dave Pick, G3YXM • e-mail: daveyxm@gmail.com

Getting started in test equipment

What's useful in the shack

No shack is complete without a few key items of test equipment. In this article I'm going to suggest a basic range of test gear that you should have to hand and how to get the best out of it.

MULTI-METER. For basic measurement of voltage and current you can choose between traditional analogue moving-coil meters and modern digital ones. Both types have their advantages.

Most common nowadays is the DMM or hand-held digital readout multi-meter (**Photo 1**). These start at just a few pounds and go to well over £100. Even the cheapest ones are good enough for simple voltage readings. However, do be aware that just because the readout goes to 0.1V it doesn't mean that the meter is as accurate as that. A good meter will claim an accuracy of about 1%, so when it's reading 100.0V the value could actually be anywhere between 99 and 101V.

Some have extra features like capacitance or frequency measurement but look carefully at the range covered, many of them aren't much use for RF work. Look for one that measures AC current, the cheapest ones don't, and many that do won't go much over 1A. Another useful feature is 'continuity test' that will emit a beep when the probes are connected by a low resistance. This makes tracing wiring a bit easier as you don't have to look at the meter.

Also available on most DMMs is a 'diode test' facility. In this mode the scale reads the voltage drop across the diode junction, or the emitter-base or collector-base junction of a transistor. You will see a figure close to 0.6 indicated for a good silicon diode or transistor in one direction and an 'over-range' indication the other. A Schottky diode will measure 0.2V or less. If you see zero in both directions then you have a short-circuit device.

I would recommend an 'auto-ranging' meter as it's difficult enough holding the probes in place whilst adjusting something, without having to fiddle with the meter because it's out of range! Auto-range is also very useful when trying to identify that mystery resistor with lots of stripes, just pop the meter across it and there's the value displayed without any adjustment.

Expect to pay between £30 and £50 for a decent hand-held DMM.

Do analogue multi-meters, like the ones in **Photo 2**, still have a place? I like to use one when I want to be sure that I'm not measuring some spurious leakage voltage. A moving-coil multi-meter is rated in 'ohms per volt', a common spec being 10kΩ/V. This means that on the 1V range it will present a load of 10kΩ to the circuit being measured, and on the 10V range it will be 100kΩ. So a little bit of static won't make the meter read, whereas a DMM has an input resistance of 1MΩ or more and may give some reading on a disconnected wire running down the garden! Of course a moving coil meter is not so good when you are measuring circuitry involving high value resistors as the meter will load the circuit and you will get a lower reading than a DMM would give. It's 'horses for courses' really.

You can get a cheap analogue test meter for about £5.

VSWR BRIDGE. We've all seen these, twin meter, single meter, cross needle, large and small, but which is best?

PHOTO 1: A selection of digital meters all measuring the same voltage!

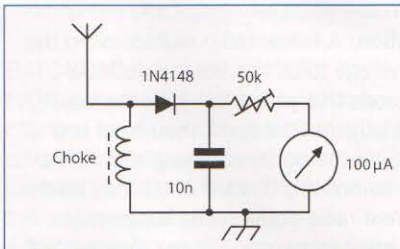

FIGURE 1: Circuit of a simple field strength indicator

I would always go for one calibrated in watts so that you can actually make measurements and I do like the convenience of a cross-needle movement, which gives an instant reading of SWR regardless of the power, just follow the line where the needles cross (**Photo 3**).

The simple type of SWR meter needs to be adjusted each time it is used: set the forward meter to read full scale by adjusting the sensitivity control then look at the reverse meter and read off the SWR.

The purpose of an SWR bridge is to measure both the forward power travelling from the Tx to the aerial – and the reflected, or reverse power, which is coming back. Ideally, the reverse power should be zero, indicating that all the power is being absorbed, and hopefully radiated, by the aerial. A typical bridge will have two meter movements (be they separate or cross-needle) and the reverse power meter is sometimes more sensitive than the forward meter, making it easy to see when just a few watts are being reflected. If you see more

PHOTO 2: Analogue meters including a giant Avo 8, which used to be the 'industry standard' meter.

PHOTO 3: A simple forward or reverse meter (left) and a cross-needle power meter (right).

reflected than forward power then you have the cables the wrong way round!

Whilst it's important that your transmitter is driving into a 50Ω load, and an SWR bridge will allow you to check that, it's not a guarantee that you have an efficient system. Under certain conditions many aerial tuners will give a good match to the transmitter whilst delivering very little power to the aerial. Other measurements, such as aerial current or field strength, may need to be made.

It's worth buying a good quality meter. I have a cheap Chinese cross-needle bridge that reads 1.2:1 into a good 50Ω load and no amount of adjustment will get it right. Expect to pay about £100 for a good one.

FIELD STRENGTH INDICATOR. This is a sensitive meter and detector connected to a small whip aerial (**Photo 4**), and it is no use at all for measuring anything! Where it *does* come in handy is to compare different aerial feeding or tuning methods. Place the field strength indicator somewhere where it can pick up a good signal from the aerial but is not near the transmitter or feeder. That way you know that its reading will correspond to the amount of RF being radiated by the aerial itself. You can then try different types of feeder, tuner or whatever and see if the reading varies.

You may come across a tuned version on the surplus market or you can make a simple un-tuned one very easily, see **Figure 1**.

DUMMY LOAD. You *need* a dummy load (**Photo 5**). Transmitter tests should not be carried out on the air unless it's for something like TVI or RF feedback that involve radiation from the aerial.

A dummy load is just a 50Ω resistor, usually on a heatsink. Choose one to match your requirements. If you have a 100W Tx, get a 100W dummy load (or bigger); they don't take kindly to being overloaded and can burn out or change value. A good homebrew one for HF can be made with two 100Ω 50W thick-film resistors in parallel on a heatsink. An old CPU cooler is good for this purpose. If you keep the wires short it should be a good match on all the HF bands.

COMPONENT TESTER. A multi-meter will measure resistors and possibly large capacitors, but if you are doing RF work you need to be able to measure a few picofarads of capacitance and a few microhenries of inductance. An LCR tester will do that job but a new one capable of measuring small values will cost at least £80. There are plenty of cheaper ones whose lowest range is about 2nF or 2mH; these are OK for a quick check.

One alternative is a surplus LCR bridge that you may pick up at a junk sale for a few pounds. These work by applying an RF signal across a bridge circuit into which you plug the component you wish to test, you then adjust the bridge for balance and read the value off the scale.

Specialist component testers are available that can check transistors, SCRs, FETs etc but these are only necessary if you have a large quantity of parts to test. Most multi-meters will test semiconductors well enough to tell if they need replacing. Different types of component testers are shown in **Photo 6**.

PHOTO 4: A simple field strength meter combined with an SWR bridge.

OSCILLOSCOPE. It's very difficult to set up an SSB or AM transmitter properly without an oscilloscope (**Photo 7**). A contentious statement perhaps, but it's certainly true that a oscilloscope will be very useful if you are having problems.

There are lots of surplus 'scopes available, and the price of new ones has fallen dramatically over the last few years. But what to look for?

If you are going for a traditional analogue oscilloscope for RF work, you need one rated to at least the frequency you want to see. I would suggest that a 50 or 100MHz model is desirable. Oscilloscopes are usually quite a few dB down at their maximum quoted frequency.

If you go for a digital one it'll be rated in GSa/s (Giga-samples per second). A Giga-sample sounds awfully impressive but if you want to make meaningful measurements then you'll need a sample rate at least 10 times your desired frequency. A 1GSa/s digital oscilloscope should be able to display a 100MHz signal clearly, so long as its input stage is up to the job. Check the bandwidth spec as well as the sampling spec!

Another important parameter to check is the maximum timebase speed. To see individual cycles of a high frequency RF waveform you need a timebase with a period of 50ns per division or less. At that speed each cycle of a 20MHz waveform would occupy one horizontal division on the screen. Sometimes it's possible to 'magnify' the trace by 10 times but that gives a rather dim display so a fast timebase is desirable.

Once you have an oscilloscope you can really see what's going on in a radio frequency circuit. Is it 'flat-topping' or are there unwanted spurious signals? All is revealed on screen. Once you get used to the look of a pure sinewave you'll be able to recognise different types of distortion too (**Photo 8**).

To measure an RF voltage with a oscilloscope you may have to do a few quick calculations; you can read the 'peak to peak' voltage from the scale but you'll probably want to know the RMS value so that you can work out power etc.

On a steady carrier, take the peak to peak reading and divide it by 2.8 ($2\sqrt{2}$) to get the RMS value. If you want to calculate power into 50Ω you must square this value and divide by 50 to get the answer in watts. It's a good way to check that your power meter is correct, but remember to factor in the accuracy of the oscilloscope, usually a few percent.

Most oscilloscopes come with a 'x10' probe (times ten). These have a very high input resistance, usually 10MΩ, and have a built-in adjustable equaliser. It's important to adjust this equaliser before making any measurements (**Photo 9**). This is done by connecting the probe to a square-wave generator, often built-in to the 'scope, and adjusting the trimmer to make the edges perfectly square. When using the x10 probe the trace on the screen will be one

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PHOTO 5: Two commercial dummy loads and one homebrewed on a CPU cooler.

PHOTO 6: An old component bridge and two modern digital meters.

tenth of the size of the signal you are measuring, so a 100V peak to peak sine wave will show as 10V on the screen. Some oscilloscopes detect that a x10 probe is connected and alter the scale reading to compensate. Check whether yours does this by plugging in the probe whilst watching the oscilloscope's volts per division readout (if it has one!).

You can measure frequency with a 'scope, in fact many have a built-in frequency counter, but if you do it manually then the accuracy isn't too good. For good accuracy you need a frequency counter.

FREQUENCY COUNTER. It is possible to use your general coverage receiver to measure frequency and it'll probably be as accurate as a basic counter; just 'zero-beat' the signal on SSB and read off the display. A cheap hand-held counter is useful for making quick checks, they can be bought for less than £20, but don't expect great accuracy.

If you really want accuracy, a desktop counter with an 8 digit display (or better) is the thing to have. Both types can be seen in **Photo 10**. These instruments allow you to make a quick low-resolution reading using a fast 'gate' time or a high-resolution reading using a longer gate time. The counter works by passing the input carrier through the gate to a circuit that counts the cycles of RF it receives whilst the gate is open. The time for which the gate is open is very accurately controlled. If the gate were to be open for one second whilst a 1000Hz signal was fed into the counter it would count 1000 cycles in that second. The count of 1000 would then be displayed on the readout. If the gate were set to open for 10 seconds the counter would count 10,000 cycles, but when addressing the display the circuitry will compensate by moving the decimal point to the left and it will show 1000.0 cycles. So as you can see, the longer gate time allows us to get a more accurate reading. With 8 digits you can read a UHF signal down to 10Hz, e.g. 433.32516MHz, which should be enough for most purposes.

As with the multi-meter, the fact that a counter indicates frequency to within a few Hz doesn't mean that it is as accurate as that. It will need checking against a known frequency.

SIGNAL GENERATOR. If you just require a source of RF on a particular frequency, then your transceiver will probably be able to provide it from its low power transverter socket. Many people forget what a useful piece of test equipment a transceiver is; it will make rough and ready measurements of signal strength, it will enable you to check for the presence of harmonics or other spurious signals and it will generate RF on any band it covers.

The advantage of a signal generator is that it can produce a signal to a precise specification of frequency, amplitude and modulation (**Photo 11**). For example: to make meaningful tests on a receiver front end you need to know the level of signal that you are feeding into it. A typical VHF FM receiver should quieten with an input of less than 1μV. A good signal generator will allow you to produce a 1μV signal with good accuracy.

Most signal generators are able to produce 10mW or more at maximum level so can be used to inject signals into other equipment, such as amplifiers, for tests.

New desktop RF signal generators are very expensive so you'll need to trawl the surplus market. I would avoid the old fashioned types with analogue oscillators because they probably won't be accurate or stable enough.

A new breed of small USB controlled signal generators is becoming available for a couple of hundred pounds but remember the accessories, such as attenuators, which might be needed to give a full range of facilities (**Photo 12**).

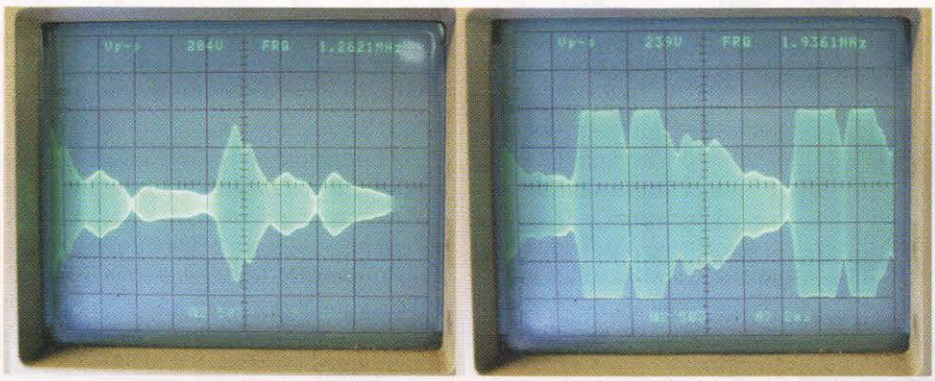

PHOTO 7: An over-driven SSB signal showing 'flat-topping', which would cause splatter compared with a clean transmission.

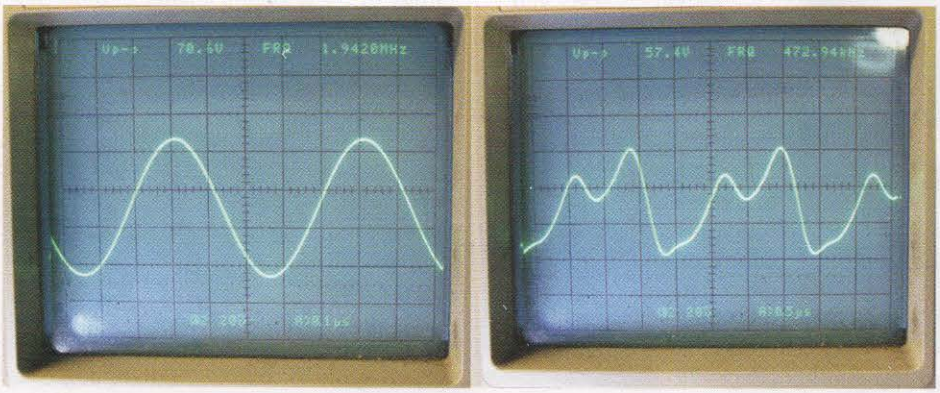

PHOTO 8: A pure sinewave RF waveform compared to the distorted output of my IC-735 on 472kHz that indicates the presence of harmonics.

RF ATTENUATOR. A simple piece of gear that often comes in handy is a switched

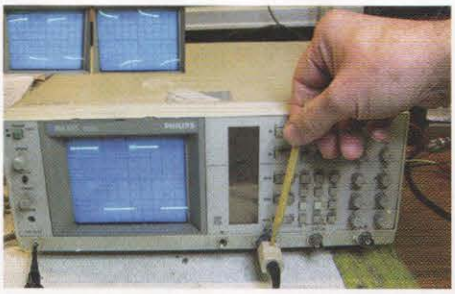

PHOTO 9: Adjusting probe equalisation using the internal CAL generator. Insets show under and over-equalised conditions.

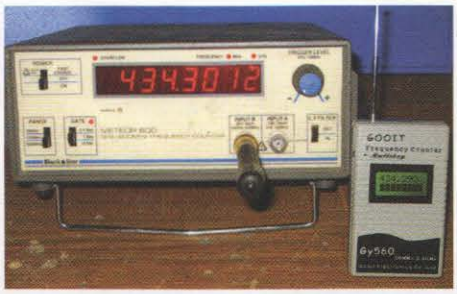

PHOTO 10: A desktop counter and a cheap hand-held counter both measuring the same signal!

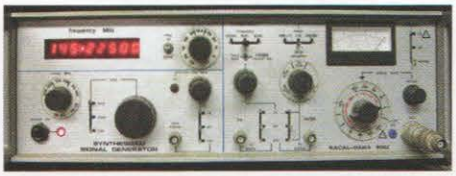

PHOTO 11: An old synthesised signal generator that works from 1.5 to 520MHz.

PHOTO 12: Using the Sark-110 analyser as a signal generator.

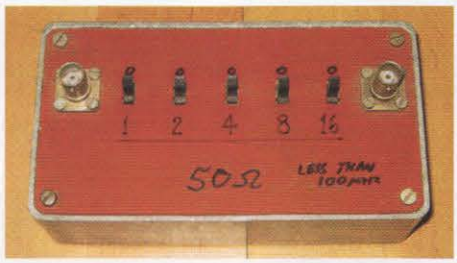

PHOTO 13: A home-made switched attenuator.

PHOTO 14: The new miniature Sark-110 aerial analyser in action.

PHOTO 15: A simple noise bridge will help with aerial experiments.

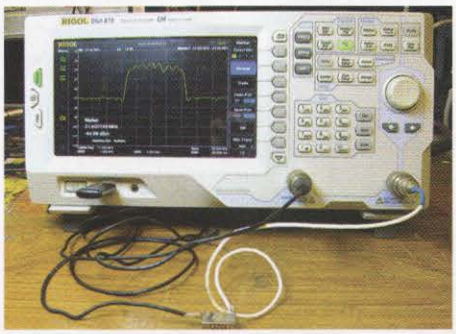

PHOTO 16: A spectrum analyser being used to measure a filter.

attenuator (**Photo 13**). It can be used to reduce the level of a signal by an accurate amount – more accurate than a receiver S-meter. For instance, if you need to measure the difference between two received signals, place the attenuator between the aerial and the receiver and set the weaker signal to read exactly S9 (or another suitable mark), receive the other signal and adjust the attenuator to get the meter back to the same mark. The difference in attenuator settings is the difference between the signals.

You can make a switched attenuator yourself for a few pounds but do keep all the component wires really short if you want it to work accurately at more than a few MHz.

That's the basics covered, we now move on to a couple of 'nice to have' items.

AERIAL ANALYSER. If you like experimenting with aerials then an analyser is a very useful tool (**Photo 14**). It will show you where an aerial is resonant and whether it is a good match to 50Ω on that frequency. Most are portable battery-powered units that can be used outside whilst you make adjustments to the aerial.

There are two styles of analyser, one is a self-contained unit with a display built in, the other is just a plain box that connects to a laptop computer, usually via a USB port. Many of these units are very sophisticated and will present you with a large amount of information about the aerial under test. They can also check the characteristics of coaxial or other feed lines and some even act as simple spectrum analysers.

Useful though these are, unfortunately they are expensive and the simplest type costs over £250. If you are in a radio club maybe you can persuade them to purchase one for use by the members?

For those who can't afford or don't need a full-blown analyser, some of its functions can be achieved with a simple noise bridge (**Photo 15**). This device makes use of a wide-band noise source instead of the analyser's tuneable oscillator, and you provide your own receiver that you tune to the frequency of interest. With the receiver on the detector port and the aerial connected to the test port, the controls on the bridge are adjusted for a null in the noise. You read off the values of resistance and reactance from the scales. A noise bridge is a very simple circuit and makes an ideal homebrew project.

SPECTRUM ANALYSER. For the really serious constructor, a spectrum analyser is the ultimate luxury. It consists of a receiver part that sweeps very quickly across a specified range of frequencies. The amplitude of all the signals in the range is then displayed on the screen.

Many modern transceivers incorporate a spectrum display that analyses a small range either side of the frequency in use, with a spectrum analyser you can look at the entire spectrum from a few kHz to maybe 1GHz and make accurate measurements.

Some spectrum analysers also have a tracking generator that exactly follows the receiver so that you can plot the response of a filter by placing it between the generator and the receiver part (**Photo 16**).

Spectrum analysers are expensive items, £1000 will get you a new basic model. Maybe it's another item that your local radio club could buy for general use amongst the membership?

May 2014 • RadCom
Peter Dodd, G3LDO • e-mail: g3ldo@o2.co.uk

Antennas

Antenna wire and how to make good soldered joints

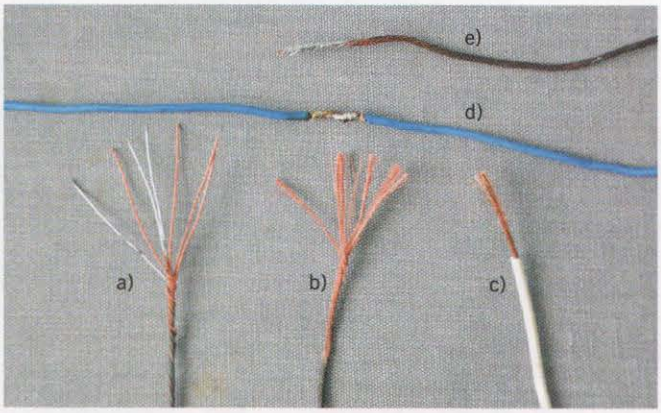

PHOTO 1: Samples of antenna wire. a) 2.5mm 14SWG stranded copper. b) 14SWG Flexweave. c) 3.2mm PVC covered stranded copper wire. d) 2.5mm PVC covered stranded copper wire. e) Length of Flexweave with the end tinned.

ANTENNA WIRE. Most homebrew antennas (and many commercial ones) are made of wire. You can use almost any wire for an antenna; even insulated hook-up wire will work well for a temporary installation. I have used this sort of wire on more than one holiday mini DXpedition to good effect. For general use the ideal antenna wire is made of copper – strong enough to avoid breakage due to climate and weather conditions and able to resist stretching due to wire tension.

My favourite antenna wire is the cheap and cheerful uninsulated 14SWG stranded copper wire, see **Photo 1 (a)**. The use of this type of wire is deprecated by some on the grounds that it oxidises rapidly in the open air and furthermore it is difficult to solder, but more about this later.

A more flexible antenna wire product is Flexweave; see **Photo 1 (b)**. This material comprises several sub-strands, each comprising 25 tiny 0.2mm wires. The result is a sort of very flexible copper rope. It also is available with durable polyethylene (PE) insulation for use in harsh environments. The key to the flexibility of this material is the high number of strands used. This flexibility means that it will not kink like traditional copper antenna wire and coils up much more neatly than ordinary copper wire. It can also be tied in knots to insulators and untied for repeated use in the air faster than if you used copper-clad antenna wire.

Quad antennas I have built over the years were all constructed from multi-strand copper wire. I used to use PVC covered wire (**Photo 1 (c)** and **(d)**) in the quads that I built in the late 1950s. More recently I have tended to use uninsulated 14SWG stranded copper wire, taking the view that for a given wire diameter it is lighter. Also it is easier to alter the wire length during the experimental and tuning phase.

It has been a rough year for antennas, particularly here on the south coast. I had to make a couple of repairs to my multiband quad after storms earlier this year. Fortunately the quad is on top of an easily folded-over mast, which made repair work relatively easy.

The multiband quad is relatively complex with lots of joins and connections with feeders and stubs, see **Photo 2**. I used to use terminal block connectors for these joints but in spite of giving them a liberal coating of grease they corroded after a while (probably caused by copper/steel dissimilar metals contact). I doesn't help that I am located only about 400m from the sea and everything gets covered with a film of salt after a storm. Terminal blocks are fine for making temporary connections when making frequent adjustments during tuning for optimum performance.

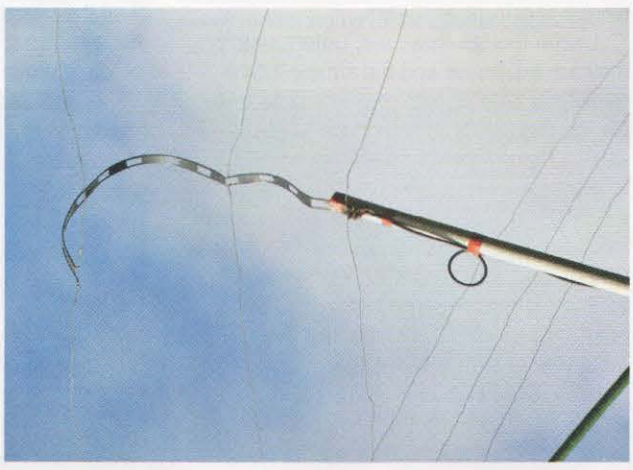

Photo 2: There are quite a number of wire-to-wire connections on the feed system of a multi-band quad antenna.

CLEANING WIRE FOR SOLDERING. The best method of making a good weatherproof connection in copper wire is to make a soldered joint. To do this, the wire ends to be joined must be very clean and free from any corrosion. Any metal that has been exposed to the weather will become corroded and this corrosion must be removed. This is often done by scraping away the corrosion until a shiny metal surface is exposed. While this procedure is suitable for single wire conductors, it can be tedious if you are trying to clean multistrand copper wire.

A better way is to use chemistry – a process that can be achieved using chemicals and items found in the kitchen food cupboard. You need to make up two solutions, one that will dissolve away the corrosion and the other that will neutralise the corrosive properties of the acid solution (and to further clean the wires).

For this you will need two small glass containers, see **Photo 3**. Partially fill the first container with vinegar. Any kind of vinegar will work, from balsamic, to rice, to white vinegars. Then add raw salt, putting in as much salt as the vinegar will dissolve. Partially fill the second container with water then add sodium bicarbonate (baking soda) until the solution is cloudy.

Immerse the end of the wire in the vinegar solution and stir the solution using the wire that is being cleaned. Movement of the wire in the liquid speeds up the process.

After a few minutes the wire will look very shiny and new in the vinegar solution. The acid and salt in the solution will have etched away the oxides, exposing bare metal. Leave the wire in the solution until it is well cleaned by making sure the metal is uniformly shiny. The ends of two fairly weather-tarnished wires and the effects of cleaning are shown in **Photo 4**.

Remove the wire from the solution, rinse under a running tap then plunge it into the baking soda solution to neutralise the acid's corrosive properties. Swish the wire around in the baking soda water for about 10 seconds and then dry it off using a cloth or kitchen roll.

MAKING AND SOLDERING A JOINT. One of the problems of soldering wires in the outdoors is finding a soldering iron that will give enough heat to cause the solder to flow.

In my early days of building quads I used a small 25W mains powered soldering iron but this wasn't really powerful enough for the job. The fix was to place a very small glass jar over the tip and body of the iron to create a hot microclimate, see **Photo 5**. When the iron was judged to be at maximum temperature the glass jar was

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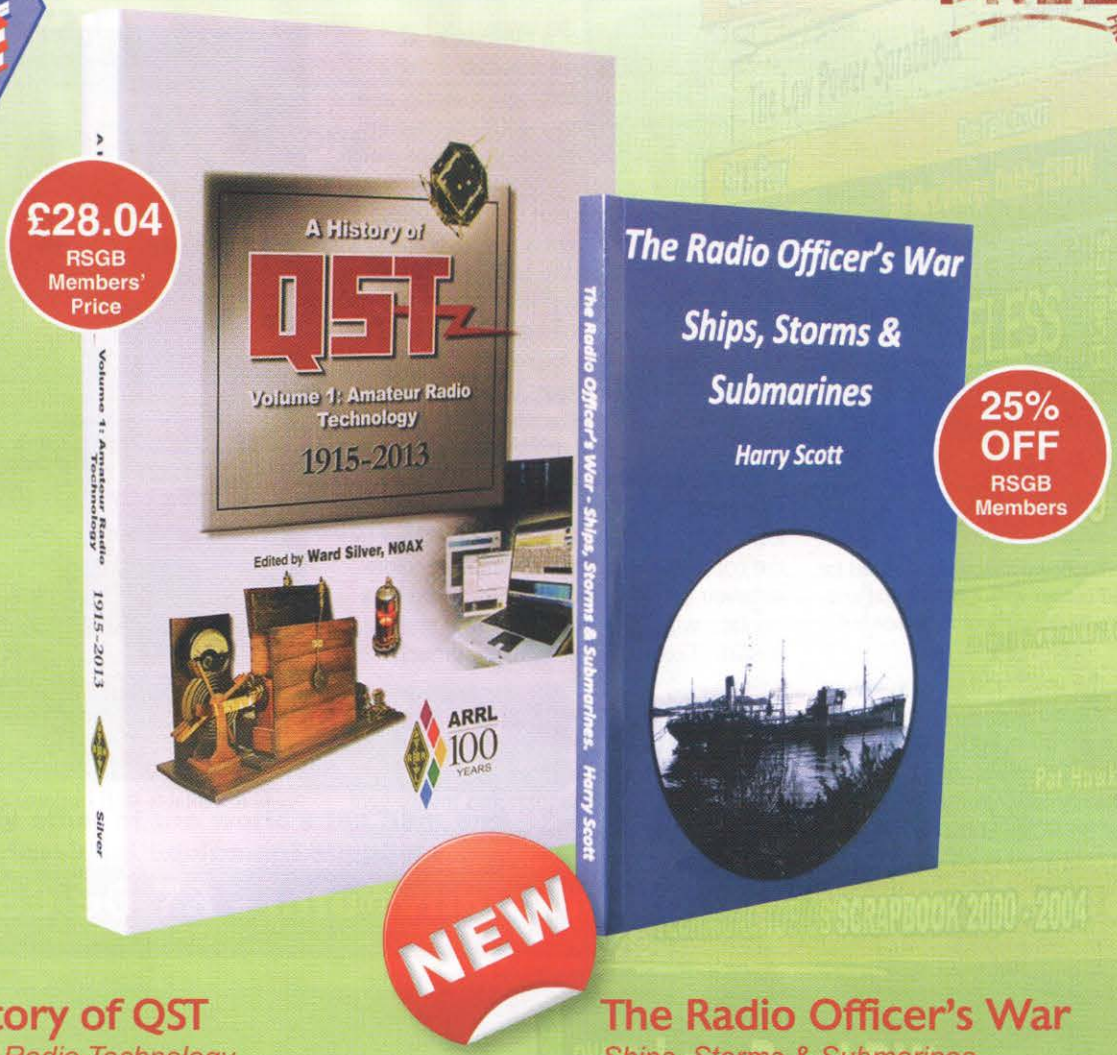

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Photo 3: Kitchen cupboard chemistry set used for cleaning tarnished copper wire. Left: vinegar and salt solution, right: bicarbonate of soda (see text).

flicked off on to the grass and the soldering could begin. (If you do this, *don't touch the glass jar* – it can get quite hot).

I have an old 150W soldering iron, which comes in very handy for antenna work. It is recommend that an RCD [1] be used when using any mains powered electric tool for outdoor work, see **Photo 6**.

One of the subjects I was required to study while serving an apprenticeship in the RAF was 'workshop practice'; this included learning how to solder. One of the oddest soldering irons demonstrated, although not used, was the MOX. It was designed for working in the great outdoors without the use of electricity or a blowtorch. All the necessary heat was provided using a circular cartridge containing a quantity of a magnesium oxide (hence MOX) compound, see **Photo 7**. A special type of barium match was ignited and thrust into the centre of the cartridge and the iron shutter quickly clamped shut to prevent a pyrotechnic display. I understand the MOX was, in the past, used by aerial riggers.

Other sources of soldering irons useful for antenna work can be found at secondhand tool stalls at local markets or country fairs. One such item can be seen in **Photo 8**. This type of iron is heated using a gas blowtorch (or even the kitchen gas cooker). A large copper bit can retain soldering temperature for some time. Channels cut in the tip of the copper bit can provide a molten solder reservoir and a method of holding the wire in place while it is being soldered, making the job of soldering the wire joint much easier.

There is yet another way to solder copper joints. After the cleaned wire ends have been wrapped together, multi cored solder is wrapped around the joint and a very light smear of flux added. The wires either side of the joint are then heated using a small gas blowtorch but at the early stage don't play the flame on to the joint itself otherwise the solder just melts and runs away. Once the solder has softened the flame can be very lightly played on to the joint until the solder runs into the wire strands. This procedure works very well and the joint shown in Photo 4 was achieved this way. However, the technique requires some practice.

Photo 4: The effect of cleaning weather tarnished copper antenna wire using the chemistry described in the text. Also shown is a soldered joint I made earlier – 10 years earlier – showing how it has stood up to the weather.

NOTE

[1] Portable RCD (residual current device)
An RCD is a sensitive device that switches off electricity automatically if there is a fault. It constantly monitors the electric current flowing through one or more circuits it is used to protect. If it detects electricity flowing down an unintended path, such as a person who has touched a live part, the RCD will switch the current off very quickly, significantly reducing the risk of death or serious injury.
From notes issued by the Electrical Safety Council.

Photo 6: Portable RCD (residual current device).

Photo 7: A magnesium oxide heated MOX soldering iron originally used for outdoor antenna work.

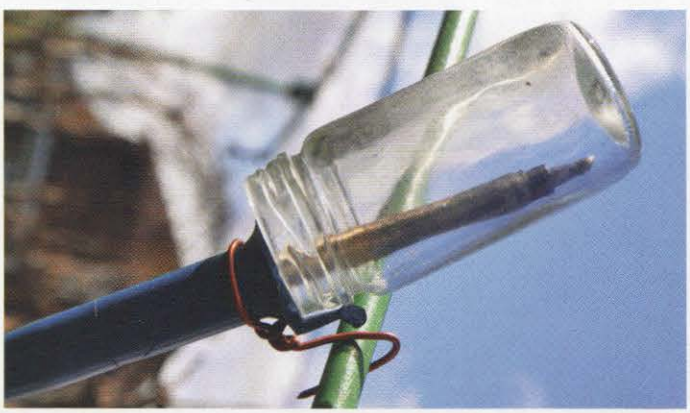

Photo 5: A 25W soldering iron provided with a microclimate to give greater heat.

Photo 8: Large copper bit soldering iron. The two channels cut in the tip provide a reservoir for molten solder, making the job of soldering a wire joint easier.

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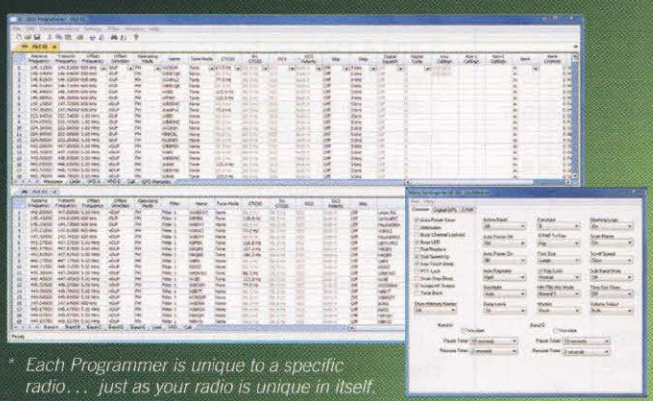

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Push pull amplifiers

A detailed look at series and parallel output configurations and the influence of harmonics

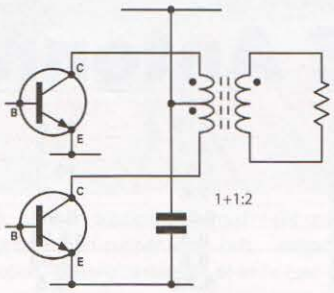

FIGURE 1: The traditional push pull Class B amplifier circuit.

INTRODUCTION. This article is about the operation of linear Class B push pull amplifiers and the way harmonics influence operation. An understanding of the significance of the even harmonics in this type of amplifier and the circuit paths through which they flow is something very important for the experimenter. It is something that is not well explained in existing information I can find and I believe is not well understood. I learnt a few things looking into it, so I hope others will also find this helpful. There is not room to cover everything from the basics, so some understanding of transformers, amplifiers etc is assumed; this has already been covered in *RadCom* and there is also plenty of information on the net. The topic may seem more complicated than you had realised, but do not let this put you off experimenting because nobody knows everything and you certainly do not need to know everything to make good working circuits, but the more you know, the more you can tailor the circuits to do what you want.

A Class of operation might be described as Class B or Class AB; simplistically, each device conducts for just 180 degrees (one half of the input waveform), the two devices taking opposite sides of the waveform. To be more precise, the quiescent current (which determines the proportion of a cycle for which devices conduct at low power) is adjusted for good linearity. If the quiescent current is too low the gain will be lower for small signals than medium size signals and if the quiescent current is too high the situation will be reversed. For very small signals, both devices conduct for the full cycle and, as the drive is increased, the proportion of the cycle for conduction gradually reduces. What is considered here is relevant to any semiconductor amplifier device. The bipolar transistor, which is shown in the diagrams, is intended as a generic.

SERIES AND PARALLEL OUTPUT CONNECTION. A traditional Class B push pull circuit is shown in **Figure 1**. This sort of circuit has been used from the first days of electronics at low frequency. We are all familiar with it, but let's just revise its characteristics.

1) One device only conducts for the positive half of the input signal; the other device only conducts for the negative half of the signal.
2) The supply current consists of a full wave rectified version of the output signal (hence is at twice the signal frequency).
3) There is no average DC component in the core at any signal level because the two halves cancel.
4) The magnetising current in the transformer is small and depends only on how much current the transformer draws with the applied voltage across it.
5) The voltage swing on the active devices depends on the voltage at the load (assuming no leakage inductance and resistance). If the load is shorted out there is no voltage swing on the devices.

Figure 2 shows a possible way of making the transformer for the circuit configuration of Figure 1. It would appear to have the ideal characteristics for a push pull Class B amplifier. However, there is a problem in applying this exact circuit to a wideband amplifier using devices operating at low impedance. It is necessary to have a relatively high impedance presented by the cores at the minimum frequency and also have low series impedance (leakage inductance) of the transformer at the maximum frequency, which requires a transformer with tight coupling. The usual method that has evolved is a metal tube single pass through the core for the primary with the secondary turns inside it. This is convenient and gives tight enough coupling for a 2 to 30MHz range. To obtain the circuit of Figure 1 would require two primary conductors, which is not possible with the simple metal tube and secondary inside. The usual amplifier circuit is shown in **Figure 3** and its physical construction in **Figure 4**. Here we have the same turns ratio as Figure 1 for differential signals. This looks a bit similar to Figure 1 and one might mistake the place where the supply is fed in as a centre tap, but it is not a tap. In Figure 3 and 4 there are two completely separate magnetic circuits. Contrast this with Figure 1 and Figure 2 where, although there are two magnetic circuits, there is in effect only one because they are connected in series. We could replace the two cores with a single one and (neglecting stray L and C) its operation would not be changed. In Figure 3, only the first two conditions of the list of characteristics of Figure 1 apply.

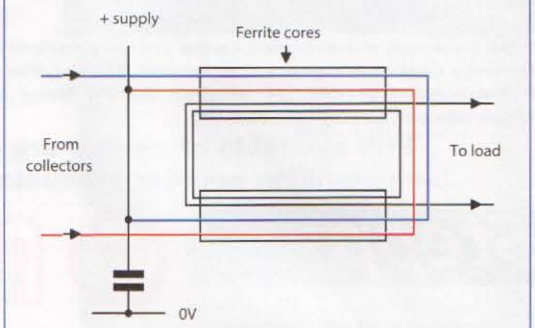

FIGURE 2: Traditional transformer construction for the circuit of Figure 1, using a minimum number of primary turns.

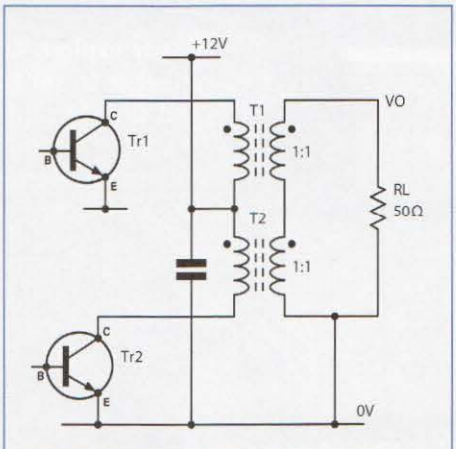

FIGURE 3: Usual (more practical) amplifier circuit.

We can now start to look at the characteristics of Figure 3. First, we will look at a square wave drive because this is easier to understand and will later help in our understanding of what happens with a sine wave drive. We will assume idealised

components. Some circuit constants are given in Figure 3 and waveforms generated by a simulation are given in **Figure 5A**.

There is the full current flowing in either TR1 or TR2 at any time. As soon as one device turns off the other turns on, consequently the supply current is constant throughout the cycle.

There is a DC current flowing in each core; they do not cancel. In fact, when a device turns off the only thing that causes the collector to rise is the energy stored in the magnetic field. The current that flows due to the other transistor switching on (via the secondary), unlike Figure 1, is in the wrong polarity to swing the collector up. Hence during each half cycle only half the output power is supplied by the on device and the other half is supplied by the magnetic field stored in the opposite core, built up by the opposite transistor in the previous half cycle.

The average voltage across each primary must be zero, so when a transistor turns off its collector must have the same voltage-time area above the supply rail as the voltage-time area below the supply rail while the transistor was on.

For a perfect transformer the sum of the currents into the start of the windings, when scaled for the number of turns, will be constant (ie just like a large inductor a transformer maintains a constant current), so the magnetising current in each transformer is largely a constant DC of half the supply current (see **Figure 5B**).

To summarise, the operation of the transformers is not ideal; half the power throughput is transferred by conventional transformer action (as in the operation of Figure 1) and half is transferred via being stored temporarily in the magnetic field (as in the operation of a single ended Class A amplifier). However, if the components are ideal the amplifier works fine with square waves and has 100% efficiency, as a square wave amplifier should have. It can also be seen that with ideal components any load resistance can be connected to the output and, if the transistors are saturated, a full amplitude square wave will be developed across the load.

Now let's look at the situation with sine wave drive. The circuit of Figure 3 presents a transformed load impedance between the two collectors, but it presents an infinite impedance (with ideal transformer) to common mode signals. Conversely, the traditional transformer in Figure 1 presents a zero impedance to common mode signals. The impedance to the common mode current (which is the rectified signal) did not matter in the case of square drive because for a square wave there is no AC common mode current, however for a sine wave there are even harmonics. The same simulation that was used for square

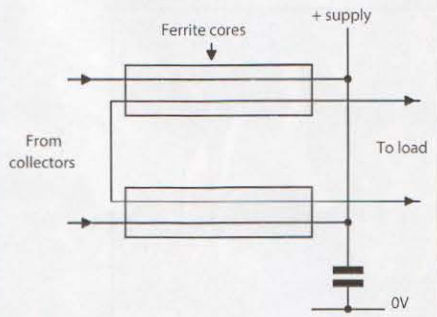

FIGURE 4: Construction of transformer for Figure 3.

wave is now shown with sine drive in **Figure 6**. With sine wave drive and ideal components, a small AC collector current will have an even harmonic common mode component that will be sufficient to swing the collectors down to saturation because of the infinite impedance at common mode. In other words, no voltage can be developed across the load without the devices saturating due to the presence of the even harmonics in the common mode signal. A practical transformer will present a shunt impedance due to its primary inductance and loss (which normally are unwanted), however, here, although the difference mode primary impedance serves no useful purpose, the common mode primary impedance can be beneficial in enabling the circuit to work at a higher output power without the transistors saturating. The simulation uses transformers with some (very high) shunt impedance, consequently the collector waveforms are not quite as bad as they would be in a completely ideal circuit and there is a small output. The simulation shows that the voltage swing on the collectors is larger than we would expect with the circuit of Figure 1. The simulation is now modified by connecting the secondary windings in parallel instead of in series (but the transformer ratios are changed to keep the same collector to collector load). The drive level is unchanged. The result of this simulation is shown in **Figure 7**. The simulation in Figure 7 is equivalent to the circuit of Figure 1 except that the DC magnetic flux does not cancel because the transformers are separate.

We can now see that there are two distinct transformer configurations with different characteristics, one that connects the device outputs in parallel (Figure 1) and one that connects the device outputs in series (Figure 3). We can look at this in a different way and see that whether the circuit behaves as one or the other depends on the common mode impedance at the even harmonics, for example if a choke was inserted in the centre tap connection in Figure 1 the circuit would be converted to operate in a series mode.

Sometimes the arrangement shown in Figure 3 is accompanied by a DC feed 'choke' that is bifilar wound and centre tapped. Its out of phase ends supply the two transistors, hence it also works as a balance transformer (see **Figure 8**). If this choke is included it provides a short circuit for the common mode harmonics; also, there is no DC flux in the output transformer or the choke. Including the choke makes the circuit operate in such a way that the device outputs are connected in parallel.

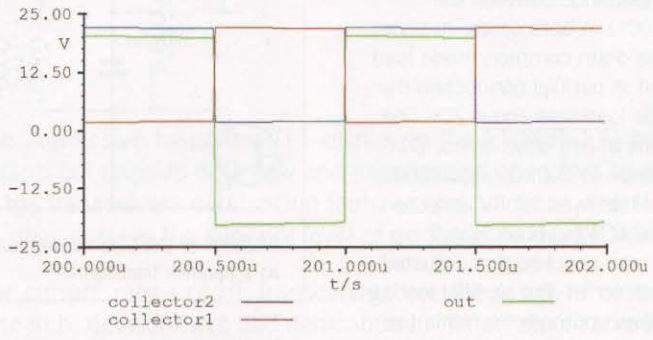

FIGURE 5A: Voltage waveforms of square drive in Figure 3.

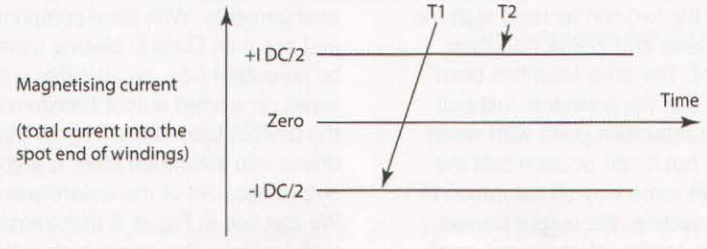

FIGURE 5B: Magnetising current of square drive, refer to Figure 3.

Paul Brooking, G4SHH • e-mail: paul.brooking@talktalk.net

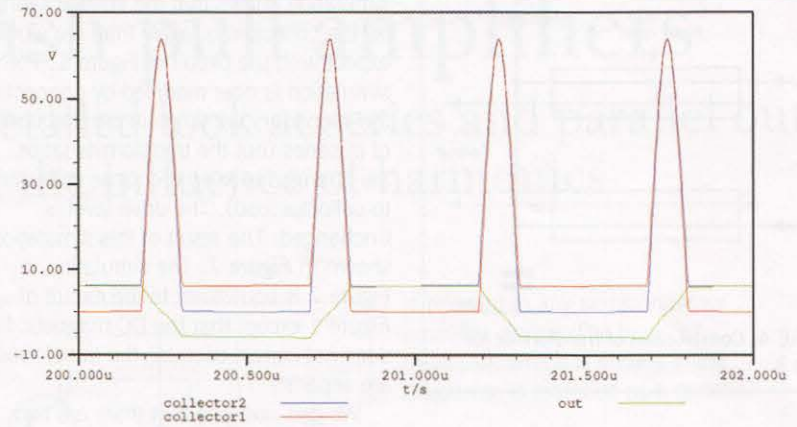

FIGURE 6: Voltage waveforms for sine drive in Figure 3.

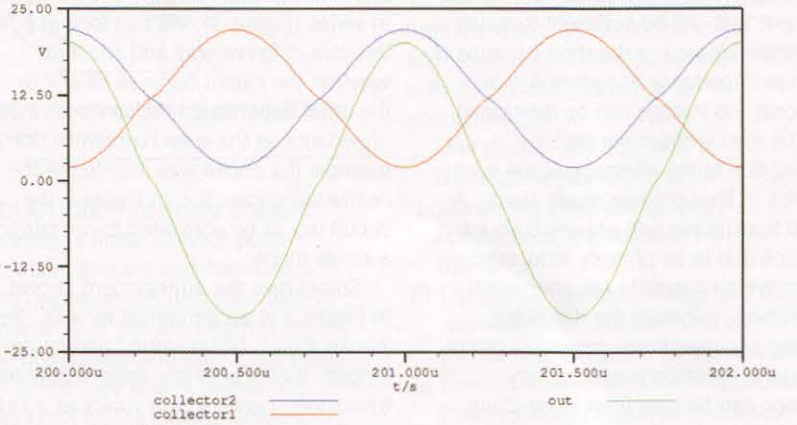

FIGURE 7: Voltage waveforms for Figure 3, but with the secondaries parallel.

PRACTICAL TESTS. An experimental amplifier using a pair of ZVN3306 FETs was tested with both parallel and series connected outputs at 4MHz. The differential impedance between the drains was 200Ω in both cases. In series connection the drain common mode load was 99Ω, and in parallel connection the common mode load was about 2Ω. The tests were done at two drive levels, D1 and D2, common to both configurations. The supply voltage was 14.5V and the quiescent current was about 26mA, although this was checked and adjusted slightly for both series and parallel testing to confirm it was optimum for minimum intermodulation distortion. The results of the tests are shown in **Table 1**.

Figure 10 and **Figure 11** show the collector waveforms of the ZVN3306 FET amplifier in the two connections with the same drive level and 26mA no-signal drain current. The drive level has been adjusted so that the collectors just pull down to the saturation point with series connection, but it can be seen that the collectors are some way off saturation in parallel connection, the output powers from the two configurations is not much different at this drive level.

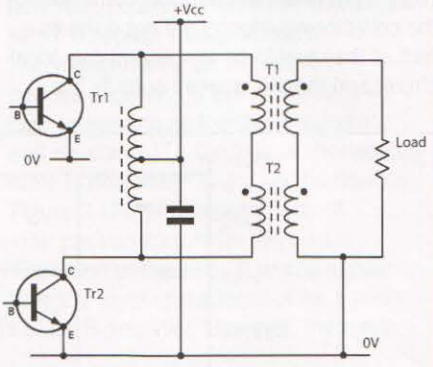

FIGURE 8: DC feed 'choke', which works as a balance transformer.

COMMENT ON SIMULATION AND MEASUREMENT RESULTS. **Figures 12** to **14B** show the collector voltages in various drive and connection arrangements. With ideal components and accurate Class B biasing there would be no output from an amplifier with a series connected output transformer until the devices saturate. We know that when driven into saturation there is a good output because of the square wave test. We can see in Figure 6 that transformers with low loss also cause high collector voltages (the supply there is 12V). If the common mode impedance is lowered from infinity, then the circuit starts to produce an output before saturation.

Figure 9 shows how the common mode impedance affects linearity. The point where the compression curve first breaks away from the ideal straight line as power is increased is the point where the transistors just start to saturate. It can be seen that with very low common mode Z the power does still increase after the point of break away; this is partly because the compression of the transistor is not perfectly sharp, but also because even if the transistor can't increase the instantaneous power at the peak of the sine wave, the fundamental component still increases due to the squaring of the waveform (the fundamental of a square wave has an amplitude of 4/pi times the square peak).

You can see for higher values of common mode Z where the transistors start to saturate, by the break away point from the straight line, but the power continues to increase (clearly seen for 20Ω CM Z) due to the wave shape change. (The reason the 250Ω and 1000Ω curves do not continue is that this it is a difficult problem for the computer to solve and it would not converge to a solution.)

For the amplifier to work without the transistors saturating, the transformer must be sufficiently poor (ie have a low primary magnetising impedance) and/or there must be a standing current in the transistors. In practice there is a limit to how high the magnetising impedance can be made anyhow, because the transformer needs to be small and have few turns to obtain low leakage inductance, and use the imperfect magnetic materials available. So we see that the loss in the ferrite helps the series connected transformer to work in a push pull circuit, however we are feeding the power of the even harmonics and fundamental into the transformer, where they will be lost. If we short out the even harmonics by making the outputs parallel connected, instead of the harmonic voltages heating the transformer cores and reducing the voltage headroom on the transistors, they are removed from the circuit.

If one looks at device manufacturers application notes, mainly parallel connection is used (although often as a result of the balance transformer), but there are cases where series connection is used for Class B amplifiers. Texts that use parallel connection often mention the need to short the common mode even harmonics, but I have never found a text that uses series connection and explains why the even harmonics are not shorted. It is often not clear to me why series connection has been used for Class B, clearly it works, but it might be possible to improve on the performance.

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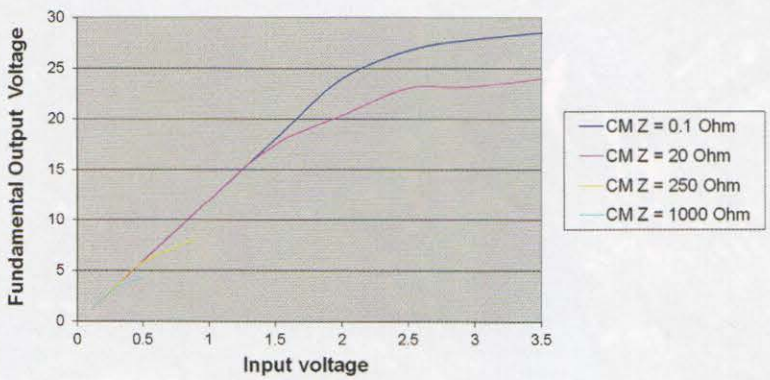

FIGURE 9: Effect of common mode impedance on linearity (fundamental voltage). The collector to collector load is 50Ω, biased for sharp Class B.

EFFECT OF DC ON THE CORE. A separate issue from the series or parallel connection is whether DC is passed through the transformer. This has a negative effect; it reduces the magnetising impedance and hence efficiency (though this could have a positive effect on a series connection circuit), the advantage of passing DC through a transformer is that it may be simple.

To get good wideband performance the transformer winding conductors need to be short compared with a quarter wave at the highest frequency. This requires a small high permeability core, which is the type of core most badly effected by DC current. The best way of supplying a push pull amplifier with DC is in a way that the DC flux is balanced.

The effect of DC current in a ferrite transformer is shown in **Figures 15, 16** and **17**. The core is a 6.5mm MnZn binocular core made from epcos N30 material and the measurement was made with two cores balanced so the RF is isolated from the DC. The stated current is for a single turn, and the measured impedance is twice that for a single turn. Markers are at 1.8MHz and 30MHz.

There is a practical problem in using a DC feed 'choke' as a balance transformer, that while great care has been taken with the leakage inductance in the output transformer using metal tube primary, the component typically used for the DC feed choke has thin wire and many turns on a smaller core than the output transformer. This may be OK to supply the DC, but is not really adequate for the low impedance RF circuit. In Figure 14 the effect of adding a typical balance transformer can be seen which, while significantly removing the second harmonic component compared to Figure 10, is not the ideal solution. The thin conductor in addition to adding its leakage inductance has loss resistance. The 'choke' is actually transferring almost half the output power; half the AC collector current flows in one side of the output transformer and the other half of the collector current flows into the choke where it is inverted and passed to the other side of the output transformer. Dissipating the power loss in the output transformers is a major concern in wideband amplifier design. Motorola datasheet EB104 refers to the balance transformer reaching 200-250°C.

It is not ideal having both the 'choke' and output transformer cascaded in the matching chain in order to provide parallel connection. In order to transform impedances we have to magnetise ferrite and run current through windings, but ideally we would keep both to a minimum.

HOW CAN PARALLEL CONNECTION BE IMPLEMENTED? To try to improve the output transformer configurations often used I have built an amplifier using parallel connected outputs with a separate transformer for each transistor, the circuit is shown in **Figure 18**. The DC is fed through the matching transformers in a way that the DC magnetic flux is balanced, so no feed choke or balance transformer is needed.

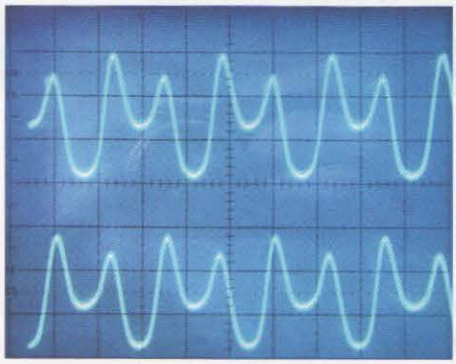

FIGURE 10: Series connection, collector waveforms. 10V/div. 0V is at bottom and centre graticule lines.

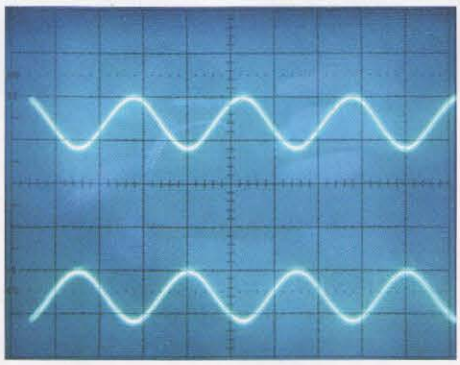

FIGURE 11: Parallel connection, collector waveforms. 10V/div. 0V is at bottom and centre graticule lines. Bias and drive conditions are same as Figure 10.

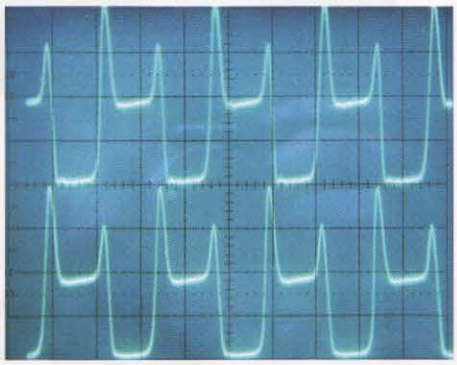

FIGURE 12: Collector voltage series connection, driven to full compression.

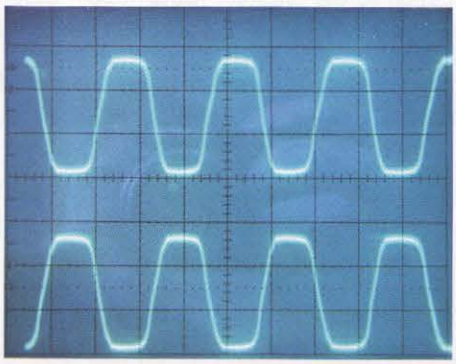

FIGURE 13: Collector voltage parallel connection, driven to full compression.

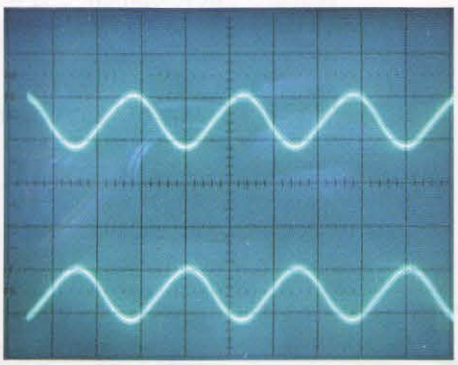

FIGURE 14A: Collector voltage of Figure 8 in linear range.

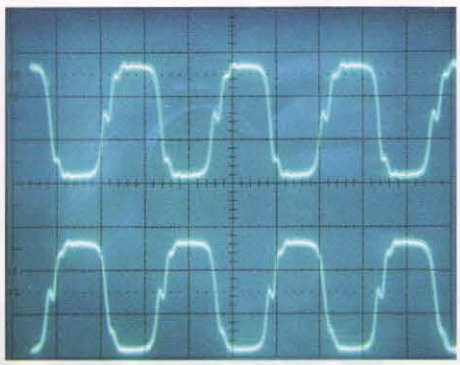

FIGURE 14B: Collector voltage of Figure 8 driven to full compression.

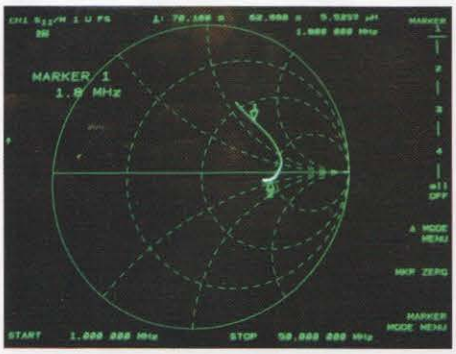

FIGURE 15: No DC. Marker 1 is at 70+j62Ω at 1.8MHz. Marker 2 is at 30MHz.

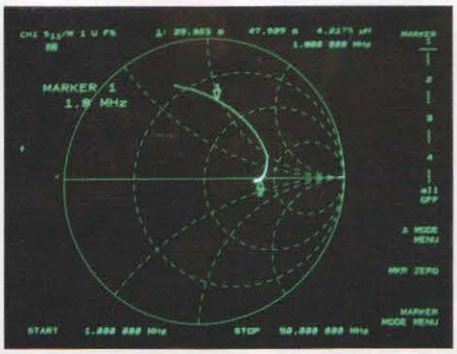

FIGURE 16: 200mA DC. Marker 1 is at 30+j48Ω at 1.8MHz. Marker 2 is at 30MHz.

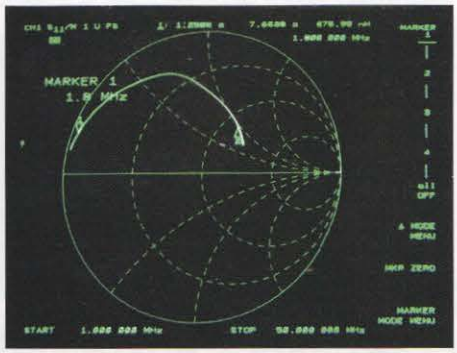

FIGURE 17: 400mA DC. Marker 1 is at 1.2+j7.6Ω at 1.8MHz. Marker 2 is at 30MHz.

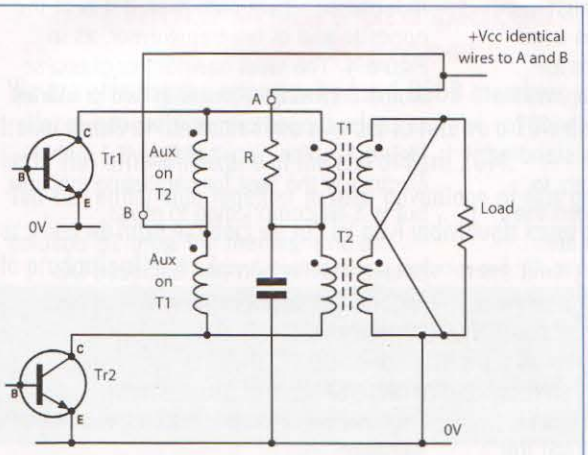

FIGURE 18: Amplifier built using parallel connected outputs with a separate transformer for each transistor.

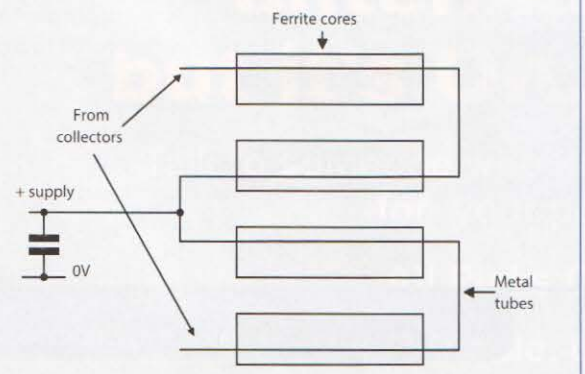

FIGURE 19: Layout for RF paths in Figure 18, auxiliary windings and secondary not shown.

Each transformer has a main primary single turn metal tube carrying RF and DC, and also an auxiliary single turn primary that is connected to the other transistor and balances the DC. The auxiliary turn is not primarily to carry RF and is a normal wire inside the metal tube, carrying ¼ of the supply current to the amplifier.

The copper wire resistor R is needed to give equal DC resistance through the two paths for the DC current, so the two currents are equal and cancel. R is a copper wire (equal to the two auxiliary primary windings in parallel). The balance can be checked by the zero of a millivoltmeter connected between A and B; in practice it is not critical.

Electrically speaking, the best transformer for parallel connection is the type shown in Figure 1. **Figure 20** shows how a transformer with a true centre tapped primary can be made. This is the best type of transformer, but is more complicated. It also prevents magnetic flux encircling the entire bunch of secondary wires inside the usual primary tube, which is a cause of leakage inductance. The coax would be better made from PTFE connecting wire that just fits in a thin copper tube because this will be a lower impedance than 50Ω semi rigid and will give lower leakage inductance. A tip with any type of transformer that uses metal tubes in a low resistivity ferrite core (manganese zinc) of the binocular type is to avoid the metal tubes concentrating the voltage for a single turn across a small part of the ferrite core, which increases loss. This happens if the metal tubes can touch uncoated ferrite and make a complete turn, shorting through ferrite. If separate toroidal cores are used on each side of the transformer, provided the cores on one side can't touch the cores on the other side, it is not possible for this to happen. It is easy to dip a core in high temperature paint if necessary.

The diagram shown is 1+1:2 but any integer ratio can be made by increasing the number of turns.

SITUATIONS WHERE SERIES CONNECTION IS PERFECTLY OK. We have seen from theory and tests that series connection of outputs can cause problems, but there are some situations where it is OK. First, it makes no difference which way the outputs are connected in a Class A amplifier because there are no common mode signals. In narrowband tuned amplifiers the requirement for a harmonic common mode return path still exists but it is usually provided by the capacitance to ground. In an amplifier that is not required to be linear (eg for CW) the only considerations would be getting the most power at high efficiency and not having voltage spikes. We know from the square wave case that this would be possible.

There is a mechanism by which using series connection can have a straightening effect on the linearity. We know that when the amplifier is fully compressed (like square wave drive) there is not much difference in series and parallel connection, but for smaller signals series connection does not work so well. This makes it possible to straighten a compression curve. I had wondered whether it is sometimes used for this reason. Using 2N5038 bipolar switching transistors at 3.7MHz, for which they were not well suited and are not very linear, I have managed to get better 3rd order products with series connection, however this did make the higher order products worse or unchanged. I think that this is unlikely to be a useful technique. Looking at Figure 9, there will have to be a point where the compression breaks away from the straight line, which will cause distortion, even if it is possible to have a good effect on linearity at higher levels.

CONCLUSIONS. The main point of this article is to draw attention to something about the operation of amplifiers that people might not consider. All electronic design is a compromise and there is not a right or wrong way, but one should understand the options and trade offs available. It is possible that in some situations series connection may produce a better result, though it seems to me that normally parallel connection is better. When one understands how a circuit works using series connection, the difficulty it will have in producing

Paul Brooking, G4SHH • e-mail: paul.brooking@talktalk.net

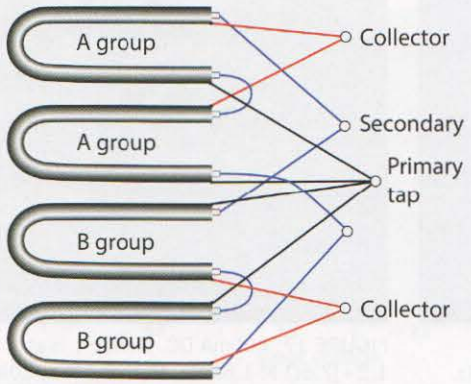

FIGURE 20: Four loops of coax. Each loop goes through the one common magnetic circuit. The loops are spread out for clarity. Note that tubes in each group do not need to be insulated from other tubes in the same group. Blue secondary is inner.

an output with perfect devices, and infinite common mode impedance, it may seem inconsistent that circuits do actually work perfectly OK using series connection. There is not actually anything inconsistent between theory and practice; the effect of increasing the idle current from the ideal zero to a finite value and having a less than infinite common mode impedance has a very significant effect on improving the operation of the circuit. I tested a number of different bipolar and FET devices in both configurations and the results followed what would be expected from the analysis. If a device has a gain largely independent of current (ie it is linear), then a low standing current will be optimum in Class B push pull for linearity. If a device is less linear then a higher standing current will be needed. The difference between parallel and series connection is most significant with linear devices. With less linear devices where a high standing current is used there is less difference between the configurations. Bipolar transistors tend to operate at a lower standing current than FETs and so are likely to show more of a difference between the two configurations. If transistors are operating close to their frequency limit then harmonics are lower; this also improves series operation. A disadvantage of parallel connection is that twice the number of turns are needed and this may result in a lower cut off frequency, but this is counteracted by a number of things: the magnetic material cross section can be halved, making a smaller transformer. For sharp Class B, the leakage inductance that is of significance is between each half of the primary and the output, not the total primary and the output, and this will be improved by parallel connection. (Unfortunately it is not possible to measure the half primary to output leakage of a transformer for series connection, see Figure 3, because this is only meaningful during the non-sinusoidal operation of the transistors). Using either two transformers (as in Figure 18) or a single magnetic circuit with two primaries (Figure 20), the side of the primary which is decoupled to the emitters of the transistors will be close to the transistors resulting in a lower inductance return path than if it is at the opposite end of the transformer, as in Figure 4. The ideal transformer of course would be a single core with two primaries (a centre tapped primary), as shown in Figure 20. The circuit of Figure 1, I think, is electrically the best for parallel connection, but is a bit complicated to make.

The arrangement in Figure 18 enables parallel connection and balanced DC with conventional construction of the transformer.

TABLE 1: Results of tests on ZVN3306 amplifier

	I DC mA	P DC(W)	RF PEP (W)	2 tone efficiency	3rd order products below PEP	5th order products below PEP
Series D1	70.9	1.03	0.55	26.7%	-36dB	-52dB
Series D2	91.5	1.32	0.89	33.8%	-33dB	-46dB
Parallel D1	84.0	1.22	0.71	29.1%	-48dB	-54dB
Parallel D2	103.0	1.49	1.20	40.3%	-36dB	-50dB

WEBSEARCH

The reader may care to refer to the following for further information:

www.circuitstoday.com/push-pull-amplifier

Philips components app note NC08703A *Wideband Linear Power Amplifier (1.6 - 28MHz) 300W PEP*, page 5

Philips Semiconductors: *RF transmitting transistor and power amplifier fundamentals*

Ferroxcube: Ferrite Materials Survey, September 2008

Ferrite Materials Producers Association: *Soft Ferrites – A User's Guide*

Motorola AN758 *1kW solid state amplifier*

Motorola AN762 *Mobile power amplifier*

Motorola AN779 *Low distortion HF driver*

Motorola AN749 *Broadband transformers*

Motorola EB104 *Get 600W from four power FETs*

Gary Cobb, G3TMG • e-mail: g3tmg@talktalk.net

Continued from page 27

PHOTO 4: Filleted solder joints for both input and output terminal pairs.

USAGE. To use the newly-installed filter, change the Menu setup as follows.

1) Hold down the **F.LOCK** button for more than 2 seconds to enter the Menu setup mode.
2) Press the A/B button to select Menu A.
3) Select Menu No 03 with the Tuning control.
4) Select the CW mode.
5) Select 0.5kHz with the Up or Down button.

PHOTO 5: Completed filter installation.

6) Press the CLR or F.LOCK button to exit the Menu setup mode.

On completion, toggling the CW/SB mode button will activate the ***–N*** indicator in the modulation mode area of the main display (bottom right) and the audio output will sound typically narrow band with a CW pitch offset of 800Hz – the default value.

The receiver sensitivity to CW signals is considerably improved with the new filter installed, making CW operation a real pleasure as, I am sure, Kenwood originally intended.

ACKNOWLEDGEMENTS. Thanks to John, G4WQZ who initialised the discussion on the TS-50 filter problem and Andy, G0AYZ who donated the TS-50 for surgery.

WEBSEARCH

[1] http://groups.yahoo.com/group/Kenwood_TS50
[2] *TS-480 In-depth Manual*, Kenwood April 2004
[3] Using a kenwood YF-107C(N) in a TS-50, Joerg Wunsch, DL8DTL, http://groups.yahoo.com/group/Kenwood_TS50/files/MODS%20AND%20REPAIRS/, September 03, 2010

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Moving On

The lead–acid battery

INTRODUCTION. A rechargeable 12V car battery (or accumulator), sometimes with a gel electrolyte, is often used when mains power is not available or not allowed (eg on Field Days). But how does the chemistry of the lead-acid cell produce those copious quantities of current at a nearly constant voltage?

A CHEMISTRY LESSON. Strictly speaking, a battery is a collection of cells, eg six 2V cells making a 12V battery. It is called a lead-acid battery because its main constituents are lead (chemical symbol Pb) and sulphuric acid, H_2SO_4, diluted with water, H_2O. (Water is called the solvent and what is dissolved in it, sulphuric acid, is called the solute). A small proportion of both these last ingredients self-ionise into separate and oppositely charged ions. Water self-ionises into two hydrogen ions, H^+ and an oxygen ion, O^{--}. (The oxygen ion has two negative charges to balance the two singly charged hydrogen ions). The high dielectric constant of water, about 80 at DC, enables its molecules to 'slip between' the components of other (solute) molecules, allowing them to also partially separate and ionise. This can be envisaged as 'any electric field within the solute molecule is hardly affected by the intervening water molecule'. The high dielectric constant of water and its ability to ionise and re-form accounts for why it is such a good solvent for so many materials. The sulphuric acid molecule in solution ionises into two H^+ ions and an SO_4^{--} ion, keeping the molecule electrically neutral.

BATTERY CONSTRUCTION. Each cell in its fully charged state consists of a plate of fairly pure lead, Pb, and a plate of compressed lead peroxide, PbO_2, immersed in dilute (though fairly strong) sulphuric acid, H_2SO_4. To decrease the internal resistance of each cell so that a large current may be drawn, a number of plates of each type are connected in parallel, separated by insulating plastic spacers to prevent the lead and lead peroxide plates coming into contact.

ELECTRO-CHEMICAL ACTION. A fully charged lead-acid cell is shown symbolically in **Figure 1**. Pure lead and lead peroxide are not normally attacked by sulphuric acid, although ordinary lead oxide (PbO) is. The ionised sulphuric acid and water molecules are depicted in **Figure 2**.

The powerful and corrosive SO_4^{--} ions are itching to attack the pure lead plate and convert it into lead sulphate, $PbSO_4$, but as soon as the SO_4^{--} ions have attacked a few lead atoms the negative charge that the ions are carrying are transferred to the lead plate, which becomes negatively charged. This repels any further approach by SO_4^{--} ions. It would be so much easier for this attack to succeed if the negative charges (electrons) could be removed from the lead plate as soon as they arrived. Then the lead plate would be converted to lead sulphate quite easily.

Likewise, the hydrogen ions (H^+) would love to remove an oxygen atom from the lead peroxide to form the very stable compound water, H_2O, but their positive charge, being transferred in like manner to the lead peroxide plate, deters any further approach by positive H^+ ions. If only there were a way of feeding electrons with their negative charge onto the lead peroxide plate to neutralise this positive charge then the 'water-forming' reaction could go ahead. There is! This is exactly what happens when a wire is connected between the lead plate and the lead peroxide plate, as indicated in **Figure 3**.

Electrons flow out of the lead plate (which is now uninhibited from accepting more sulphate ions) and into the lead peroxide plate, where they neutralise the positive charge. The lead peroxide plate is now uninhibited from accepting more H^+ ions and releasing one of its oxygen atoms to make water, H_2O, leaving behind ordinary lead oxide, PbO. This then succumbs to a sulphuric acid attack in a purely chemical (ie non electrical) reaction to produce more water:

$$H_2SO_4 + PbO \rightarrow PbSO_4 + H_2O$$

This is shown diagrammatically in **Figure 4**.

Complete discharge of the cell has occurred when both plates have been converted to lead sulphate and the sulphuric acid has been further diluted by water. Re-charging, converting electrical energy into chemical energy, is exactly the opposite.

PRACTICAL CONSIDERATIONS. Pure lead is too soft to withstand a rough physical environment so it is alloyed with a small proportion of antimony, which is relatively inert and plays no part in the chemical process. The alloy is cast into a grid form and a spongy lead paste is pressed onto the grid spaces. Similarly, the lead peroxide plate is also made of a lead antimony alloy grid that is coated in an impervious layer of lead peroxide before a spongy lead peroxide paste is pressed into its grid spaces. Hundreds of discharge-recharge cycles can be completed before a lead acid battery loses its capacity. This usually occurs because eventually the spongy lead sulphate gets replaced by a hard white form of lead sulphate that cannot easily be converted back to its original state. When in good condition and fully charged, each cell has an EMF of about 2.05V and the specific gravity of the acid is about 1.25. When discharged, the EMF falls to 1.8V per cell and the specific gravity falls to 1.1. The cell should then be recharged. The cell should never be left for any length of time in a discharged condition. A thixotropic agent is sometimes added to the acid as an aid in this respect giving rise to the so-called 'gel cell'. The lead acid cell is one of the most reliable and abuse-tolerant of electrical storage cells.

ACKNOWLEDGEMENT. A version of this article previously appeared in *Verulam News*.

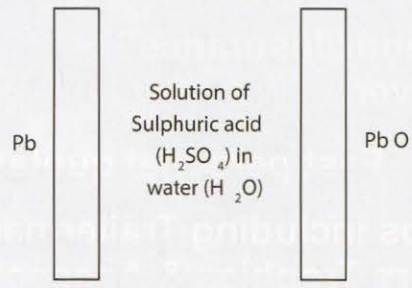

FIGURE 1: Lead-acid accumulator cell.

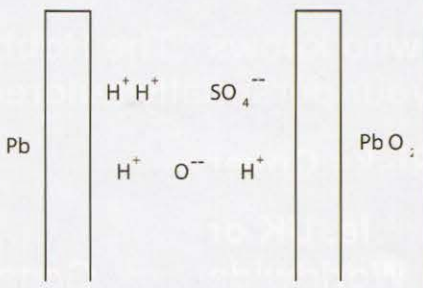

FIGURE 2: Ions in solution.

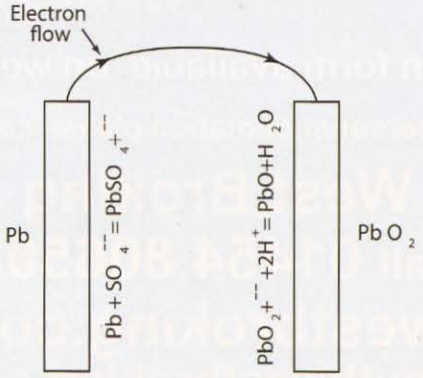

FIGURE 3: Electrons flowing in external circuit enabling ions to react with plates.

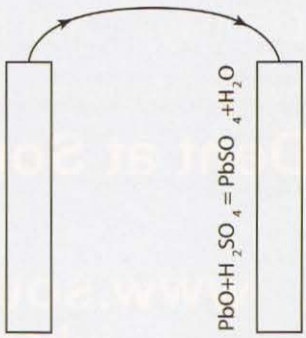

FIGURE 4: Non electrical reaction to produce more water.

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See ML&S video review hamradio.co.uk/ftdx1200video

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50Amp DC power supply. **£125.00**

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25-30Amp 13.8V fixed DC PSU, Twin meters, near silent running. **£179.94**

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Your house will probably fall down before you break this new remote Foot Switch from CG. All metal construction with 1m heavy duty screened cable and terminated with 1/4" jack plug.
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Made from solid die-cast alloy, 2kW DC-30MHz, 250W .5-1GHz and SO-239 sockets.
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Have you seen the TX Factor yet? Episode 2 out now!

Get that cuppa on the table, settle down and watch the latest episode from TX Factor. Episode Two features the FUNcube satellite and FUNcube dongle, including an interview with it's inventor Howard Long G6LVB. RSGB National Radio Centre at Bletchley Park, Yaesu FT-DX1200 rig review and finally the Bath Buildathon.
See www.hamradio.co.uk/txfactor

RADIOSPORT HEADSETS

Manufactured by Arlan Communications in the USA, they were first shown to Hams at the recent RSGB Convention in October. The response was so good we doubled our order to the factory.

Designed around their professional series of race headsets, the new Radio Sport range is aptly named. Ever tripped over a lead of your existing headset only to find you can't simply unplug it and pop in another? A mandatory requirement in contest conditions and just one example of how Arlan have taken a different approach to existing products design. Using a miniXLR 5P interface plug & socket you can be up and operating again in a matter of seconds.

Want to remove external noise without resorting to RF prone DSP reduction circuitry in your headset? Arlan Radio Sport headsets use a real Carbon Fibre outer shell to reduce external clatter by as much as 24dB. Even the ear cushions are interchangeable between Gel or Foam filled muffs in a matter of seconds. The microphone just unscrews for interchange to a different insert. Not a soldering iron in sight.

Whether for DXing, contesting, field day, or casual everyday use we think you'll agree Radiosport headsets have the features you want. Little wonder Arlan have supplied over 2 million headsets since their introduction in 1992. ML&S are proud to have been appointed their distributor and have stock today.

All headsets are supplied with GEL Cushions giving extra comfort and FREE cloth covers.

RS60CF Deluxe Dream Edition Stereo Headset with boom (as featured)	£179.95
RS20S Deluxe Dream Edition Stereo Headset only no boom	£119.95
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PTT-FS-RCA Foot switch with 7ft cable with phono plug	£44.95
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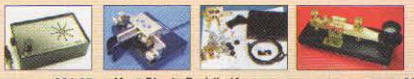
How about an additional 3.5mm socket on the opposite ear cup to allow "tethering" of another headset for a logger or maybe just an additional pair of ears?

Kent Morse Keys



Kent Morse Practice Oscillator.	£31.95	Kent Single Paddle Key.	£95.95
Kent Twin Paddle Key.	£114.95	Kent Single Paddle Key Kit.	£94.95
Kent Twin Paddle Key Kit.	£98.95	Kent KT-1 Professional	£109.95
Kent Hand Key.	£99.95	Kent Vail Lever Correspondent Replica.	£219.95
Kent Hand Key Kit.	£86.95		

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Delta-4B	4-way position SO-239 switch (2kW) for use up to 500MHz. £79.95	**Delta-DX-LB**	160m - 80m, and 40m Low Band dipole. This antenna performance and 2:1 VSWR bandwidth depends on the height and surrounding objects; overall length is 100ft. £119.96
Delta-4BN	4-way position N-type switch (1.5kW) for use up to 1.2GHz. £89.95	**DX-LB-PLUS**	160m, 80m, 40m and 20m - 10m Low Band dipole. This antenna performance and 2:1 VSWR bandwidth depends on the height and surrounding objects; overall length is 100ft. £169.95
AD-ATT3G50	0MHz to 3GHz (200W) surge protector. N-Female Connector. 54.95	**DX-Series**	Full-size utilized monoband dipole. These dipoles are using the Delta-C Centre Insulator with built-in Arc-Purge Surge Suppressor. **DX-20:** 20m Monoband Dipole at 33ft long **DX-40:** 40m Monoband Dipole at 66ft long **DX-80:** 80m Monoband Dipole at 133ft long. £49.95
AD-ATT3G50/HP	0MHz to 3GHz (2kW) surge protector. N-Female Connector. £56.95	**DX-Ultra**	Medium wave to 30MHz 80ft AM Broadcast Dipole. Efficient, low-noise dipole for military, government, etc., use. £149.95
AD-ATT3G50U	0MHz to 500MHz (200W) surge protector. SO-239 Connector. £49.95	**AD-Delta C**	Hardware Kit contains the following: 1 x Dipole Centre. 2 x Dog Bones. 1 x Surge Protection Block. £29.95
AD-ATT3G50U/HP	0MHz to 500MHz (2kW) surge protector. SO-239 Connector. £49.95	**Delta-SEP**	Replacement/spare Arc-Plug™ Static Electricity Protector. This unit is usually attached to the back of the Alpha Delta Centre T Balun. £14.95
End Insulators	Dog Bones. They are extremely rugged, UV and RF resistant. £1.95		
Delta-DX-A	160m, 80m and 40m 1/4 twin slope trap antenna. This antenna combines the tremendous DX firepower of the 1/4-wave slope with the wide bandwidth of the 1/2-wave dipole. One leg is 67ft long and the other is 55ft long. £89.95		
Delta-DX-B	160m, 80m, 40m and 30m single slope trapped antenna. This antenna is designed for limited space installations, where room does not allow for large wire antennas; it only requires 60ft of space providing amazing DX performance at installation heights of 35ft. £89.95		
Delta-DX-CC	80m, 40m, 20m, 15m and 10m dipole. This antenna is parallel length dipole with no traps; overall length is 82ft. £139.95		
Delta-DX-DD	80m and 40m dipole. This antenna is parallel length dipole with no traps; overall length is 82ft. £119.95		

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The UK's favourite rig-mounted antenna system!

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If you are an avid FT-817 or KX-3 operator and enjoy nothing more than heading for the hills on a weekend to active those rare WAB squares. Take a look at the all new WonderWand WonderLoop Antenna.

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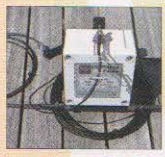
So how does it perform? As we had sunshine this afternoon, we popped out into the car park here at ML&S and attached the loop to our demo FT-817. Within minutes we had tuned to the 20m band worked into EA, I and 9A. Not bad for 5w and the 'shack' in our hand.

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HEF/5Band	80/40/20/15/10m 200W, 23m Long	**£149.95**
HEF/40m-QRO	40m Mono Bander, 2kW Only 20m Long	**£219.95**
HEF/20m-QRO	20m Mono Bander, 2kW, Only 10m Long	**£199.95**

For the full range see www.hamradio.co.uk/hyendfed

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The SARK-110 Antenna Analyser is a pocket size instrument providing fast and accurate measurement of the vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits). Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths. The SARK-110 has full vector measurement capability and accurately resolves the resistive, capacitive and inductive components of a load. The measurement reference plane is automatic adjusted via the Open/Short/Load calibration standard to enable the accurate impedance measurements at the end of an intermediate coaxial cable.

mRS MiniVNA Series of Antenna Analysers

Perfect for checking antennas and RF circuits for hams and commercial users.

MiniVNA Pro with Bluetooth
100kHz-200MHz
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For Pro only, extends range to 1500MHz
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Super Antenna MP1 SuperStick

Covering a massive 80m right through to 450MHz*, this simple to erect compact vertical antenna weighs only 1kG, is only 2.1m tall when fully extended and collapses down to just 30.5cm (12")!

*With optional 80 & 60m coils

Only £159.95 including the 80m Coil FREE!

Product features:

- Ham bands: 40m-30m-20m-17m-15m-12m-10m-6m-4m-2m-70cm
- Frequency Range: HF 7MHz~30MHz continuous
- Frequency Range: VHF 48 to 144MHz continuous
- SWR: 1.5 : 1 or better
- Rated Power: 500W SSB; 300W CW / DIGITAL
- Antenna Weight: < 2 pounds (1kg)
- Also configurable for up to 450MHz
- Standard 3/8"-24 male thread for mounting
- Low profile TM1 tripod included
- MC80 80m coil included for 80m band
- Optional MR series radial sets available
- Optional MC60 60m coil for 60m band

For the complete range of Super Antenna products see www.HamRadio.co.uk/Superantenna

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Base Antennas

NEW! CP-VU8 80m-70cm 200W Compact HF Base, only 2.7m Long! **£469.95**
X-30 2/70, 3/5.5dB, 1.3m Long .. RRP £79.95 **SPECIAL £59.95**
X-50N 2/70, 4.5/7.2dB, 1.7m Long RRP £72.95 **SPECIAL £64.95**
X-300N 2/70, 6.5/9dB, 3.1m Long RRP £146.95 **SPECIAL £109.95**
VX-1000 6/2/70 2.15/6.2/8.4DB 1.42M Long ..... RRP £149.95 **SPECIAL £99.95**
X-510N 2/70 Fibre glass 8.3/11.7dB gain. 5.2m long "N" ..... RRP £154.95 **SPECIAL £129.95**
V-2000 6/2/70, 2.15/6.2/8.4dB, 2.5m Long ..... RRP £149.95 **SPECIAL £109.95**

Mobile Antennas

NR-770R 100W, 2/70, 3/5.5dB, .98m Long ..... RRP £34.95
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NR-7900 2/70, 3.2/6.4dB, 1.46m Long ..... RRP £54.95

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MX-610 HF/6+2+70 (for FT-8900)..... RRP £59.95
MX-2000 6/2/70 Triplexer ..... RRP £91.95
MX-3000N 2/70/23 Triplexer..... RRP £86.95

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CX-310A 3-way, SO-239, Die Cast..... RRP £89.95
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HUSTLER

Hustler are one of America's oldest manufacturers of Ham Radio antennas. The famous "White Whips" have been seen on many cars operating HF mobile. Their HF base range of 4, 5 or 6-BTV antennas are probably the easiest to assemble and get going and of course are ground mounted, operating with just an earth spike mounted close to the base.

See web for full listing!

Base Station Range
Free standing, max 7.3m tall, 1kW

4-BTV	40/20/15/10m	£189.95
5-BTV	80/40/20/15/10m	£229.95
6-BTV	80/40/30/20/15/10m	£269.95

The full mobile and base range and accessories available from stock, including the high power 1kW mobile range.

BlueCAT Repeater Controller

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Design Notes

Controlling a DDS and adding FM

SERIAL CONTROL FOR THE LOW COST DDS MODULE. The February 2013 edition of this column introduced the AD9850 Direct Digital Synthesiser modules available on eBay and showed a standalone controller using a rotary encoder and liquid crystal display to set the frequency. The new *WSQ* datamode (described in both the Data and LF columns last month) requires that frequencies be generated under computer control. Whilst offering soundcard output for upconversion via an SSB transmitter, it can also control a synthesiser by sending tuning words on the serial or COM port interface from the PC. This gives an opportunity to driving switching LF transmitters such as Class D or Class E designs. The authors of *WSQ* included enough flexibility so that any RS232-controlled synthesiser could be adopted, with users editing a configuration file to suit.

I already had a very old serial interface for the AD9850 that required the register contents to be sent to it as hexadecimal characters on an RS232 link **[1]**. While this could be interfaced to the *WSQ* package, the trouble with controlling a DDS based synthesiser this way is that in order to calculate the values to be sent to the chip, we need to know the DDS clock frequency. If driver or datamode software were configured to control one particular module with, say, a 125MHz clock for use at HF, it wouldn't then work for a DDS chip clocked at 10MHz, more suited to the LF bands.

What we want is a more generalised way of issuing frequency commands to the DDS controller. New software is required for the PIC controller that calculates the register values for setting the AD9850 from knowledge of the clock frequency of the attached DDS module and the demanded output frequency.

The first thing to decide upon is the frequency resolution that will be used for setting the synthesiser. The eBay DDS modules with their 125MHz clock and 32 bit DDS register offer a fundamental resolution of 125MHz / 2^{32} = 0.029Hz. If the clock is replaced by one at 10MHz the fundamental step becomes 0.0023Hz. The controller in [1] adopted 0.01Hz as its minimum setting resolution, even though this is smaller than the 125MHz supplied clock allows. This was to allow flexibility and also meant that any frequency up to a little under 43MHz could be represented by a 32 bit value inside the DDS controller. 2^{32} * 0.01Hz = 42.9MHz.

A format for commands sent on the serial interface to set any particular frequency was 'borrowed' from a commercial synthesiser. FRQ475230.45 or FRQ10130000 programmed in 475.23045kHz or 10.13MHz respectively. The frequency is specified in Hz with up to two places of decimals allowed in the command string.

The PIC controller only works with integer arithmetic so the serial command is decoded to give a value representing the number of 0.01Hz steps. We'll call this demanded value D, so for 10.13MHz D = 1013000000.

The output from any DDS is given by the formula N_{DDS} = Fout / Fclock * 2^{32}. If we replace Fout by the value D, the formula can be rearranged as N_{DDS} = D * 2^{32} * 0.01 / Fclock. The three terms on the right of the equation are fixed for any specific clock frequency and are stored as a constant in the PIC, then multiplied by the received value D to generate the value of N to send to the DDS chip.

Taking the 125MHz clock as an example, the constant becomes 2^{32} * 0.01 / 125MHz = 0.343597 (approximately). Since we can only work with integer arithmetic, this constant needs to be scaled by some value to allow an integer to be used. The scaling needs to be sufficiently high so that accuracy is maintained for high values of D, and has to be capable of being 'wound back' when generating the final N value. A scaling factor of 2^{64} was chosen so the stored constant now becomes 2^{96} * 0.01 / Fclock and is stored as a 48 bit number in 6 bytes of PIC memory. The PIC contains a straightforward 32 * 48 bit multiplication routine. The highest 32 bits of the result are the value N sent to the DDS chip and the lowest bits are discarded, effectively removing the 64 bit scaling applied at the start.

PRACTICAL HARDWARE. Figure 1 shows the circuit diagram of the serial PIC controller. A software UART allows direct connection of the RS232 input to the 16F628 PIC with a resistor to limit the current into the pin. Although the same PIC type is used as that for the rotary encoder / LCD, that design and PCB can't be adapted. It used the internal RC oscillator of the PIC, which is not accurate enough for serial interfacing, so a crystal or ceramic resonator is needed with this chip. Other PIC types like the 12F629 offer calibrated internal RC oscillators that are accurate enough for RS232 type operation and this design could quite easily be adapted to one of those. The LED is just there as a debugging aid. PIC firmware and a complete description can be found at **[2]**. No PCB design was produced; the circuit is simple enough for any construction method, or an old disused PIC board can be pressed into service. If the default 125MHz clock is used for the DDS, then the *9850_ser.hex* code supplied can be blown directly into the PIC and it will work straightaway. For any other clock frequency, the new value of constant will have to be calculated as shown above. The resulting value will then have to be stored in *9850_ser.asm* and assembled. Details of doing this are included in the documentation, but note that you will need to be able to calculate hexadecimal number to 48 bit (12 characters) resolution. This may involve some playing around with Microsoft Excel and its DEC2HEX function. [2] contains a simple spreadsheet, *PicDDSCalcs.xls*, that generates the stored constant for any arbitrary clock frequency and step size for such designs.

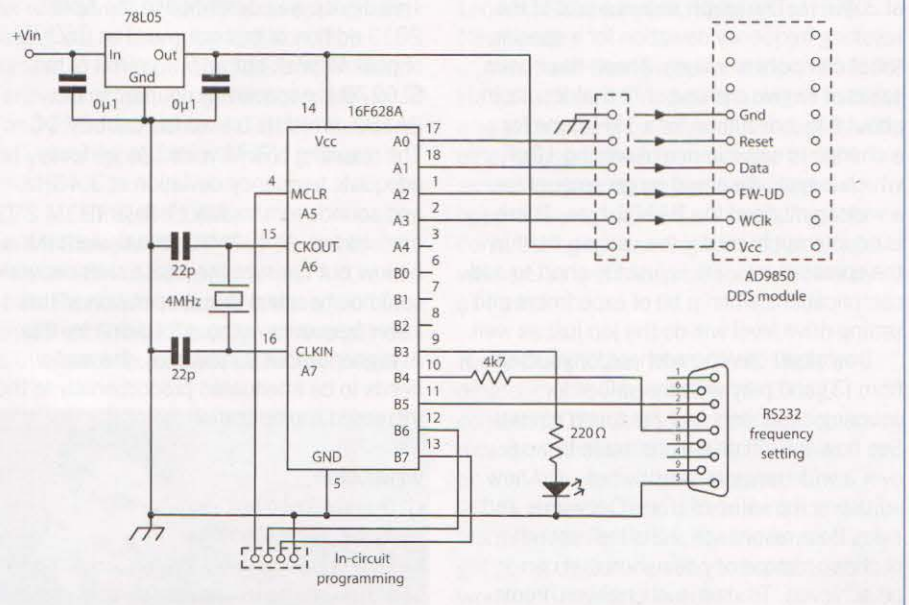


FIGURE 1: RS232 serial interface for AD9850 DDS modules.

May 2014 • RadCom
Andy Talbot, G4JNT • e-mail: ac.talbot@btinternet.com

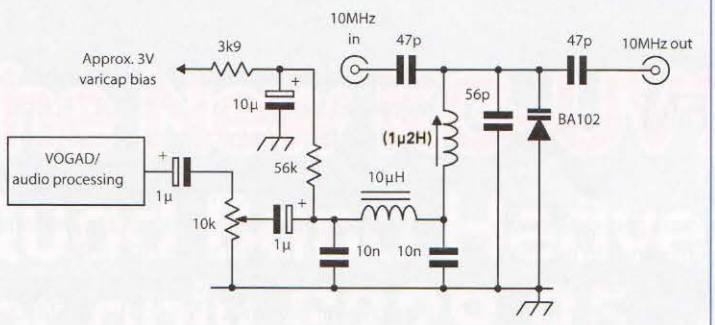


FIGURE 2: 10MHz phase shift network suitable for directly generating NBFM on the microwave bands via a synthesiser / frequency multiplier.

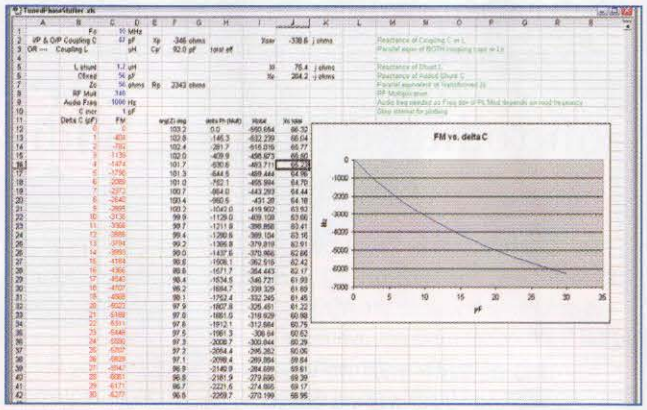


FIGURE 3: Spreadsheet for optimising component values in a tuned circuit phase shift network.

PHASE MODULATOR AND FM. Chris, G8BKE is developing equipment for the 47GHz and 76GHz bands. Up at those rarefied heights, normal transverter / mixer operation is difficult to achieve, with only microwatts of generated RF being possible. Most transmitted signals are of continuous carrier constant amplitude types of modulation, generated by direct multiplication from a stable source. Chris is investigating the use of synthesisers, particularly Fractional-N types such as those described here in November 2012. For voice, frequency modulation is often used as this can be applied to a crystal source very easily by adding a varicap diode across the crystal. However, when the source is a high stability reference, typically at 10MHz, driving a modern fast phase locked loop synthesiser, FM cannot be generated this way. The solution Chris adopted is to use phase modulation (PM) of the 10MHz reference, which is then multiplied up 4700 times to 47GHz.

FM and PM give identical results, except that the modulation for PM exhibits a 6dB per octave rising audio frequency response. This can be compensated using a simple CR low pass filter, so to all intents and purposes the end results of FM and PM are the same. In fact, narrowband FM has actually been defined in this way. In the transmitter, audio pre-emphasis is defined as a CR network with 750µs time constant. This is equivalent to a high pass filter starting at 212Hz and so is, near enough, a 6dB/octave increase over the whole voice band. Exactly what phase modulation gives! A similar time constant de-emphasis network in the receiver flattens the overall frequency response, at the same time attenuating high frequency hiss and background noise on the FM signal.

When G8BKE described this technique, I was intrigued and began wondering how well it could be made to work at lower frequencies. The first requirement was to quantify a phase shifter operating at 10MHz. **Figure 2** shows probably the simplest network. A parallel tuned circuit at 10MHz has a varicap forming part of the tuning capacitance. The combination exhibits a variable reactance as the audio voltage applied to the varicap changes. Coupling capacitors transform the 50Ω input and output impedances to a parallel equivalent resistance across the tuned circuit. The ratio of this transformed impedance to the reactance defines the Q of the network, and how much the overall reactance changes as a result of the varicap. The residual capacitance of the transformed coupling capacitors is absorbed into the parallel tuning capacitance. By choosing suitable value of Q (defined by the coupling capacitors) and fixed L/C components and the varicap voltage / capacitance law, a phase shift network is generated where the phase from input to output can be varied by the voltage applied to the diode.

There are too many components to work with analytically, so the obvious solution was to generate a spreadsheet that modelled this simple circuit, which really amounts to a single resonator bandpass filter. **Figure 3** shows a screen shot from the spreadsheet with values chosen to end up with a reasonable phase / frequency shift for use at 3.4GHz. The graph shows a plot of the resulting frequency deviation for a specific set of component values. These have been selected to give a phase shift that results in about 5kHz deviation for a 1kHz tone for a change in capacitance of around 10pF, which is typically a mid range amount for a varicap diode of the BA102 type. There is no attempt to model the varicap itself in the spreadsheet – life is just too short to add complications when a bit of experiment and setting drive level will do the job just as well.

Download the spreadsheet for yourself from **[3]** and play with the values for coupling capacitors and the tuned circuit. See how the circuit can be made to work over a wide range of sensitivities, and how adjusting the value of L and C towards and away from resonance shifts the amount of phase / frequency deviation that can be achieved. To start, just change L from the 1.2µH shown to 1µH and watch what happens. The values shown operate with the tuned circuit some way above resonance, and net capacitive reactance (shown in the column 'Xtotal'). This is the sum of all parallel reactance terms. Working against the transformed parallel reactance, this dictates the resulting phase shift shown in the column 'arg(Z)'.

A PRACTICAL EXAMPLE. I built up a version using the values shown in Figure 2. The BA102 varicap diode delivers around 12pF capacitance change when the voltage across it varies from 2 to 4 volts. Using an audio signal generator, I managed to verify the output from an LMX2541 Fractional-N synthesiser at 3.4GHz when driven from a 10GHz reference did indeed give a resulting frequency modulation compatible with NBFM receivers. Quite acceptable results were also possible at 432MHz output; distortion was barely detectable by ear even though the network should have been introducing some significant non linearity to get the needed phase shift at the lower RF multiplication.

To complete a working unit, I then added an SL6270 VOGAD chip for use with microphone and line level inputs. This device was described in the April 2013 edition of this column. The 350mV of peak to peak output from pin 8 of the SL6270 is capacitively coupled to the BA102, which is biased to about 3V DC. The resulting NBFM voice has perfectly adequate frequency deviation at 3.4GHz and sounds remarkably clean and undistorted. At 432MHz, the deviation is a bit low but I'm sure the phase shift network could be tweaked to suit operation at this lower frequency, although I didn't try this. At higher output frequencies, the audio needs to be attenuated proportionally to the increased multiplication factor.

WEBSEARCH

[1] Original AD0950 DDS module – www.g4jnt.com/9850DDS.htm
[2] AD9850 serial control – www.g4jnt.com/AD9850_Serial.zip www.g4jnt.com/AD9850_Serial.pdf
[3] Phase shifter design spreadsheet – www.g4jnt.com/DownLoad/TunedPhaseShifter.xls

Youngsters on the air

The RSGB Members chosen for a summer camp

BACKGROUND. In December 2013, the Society was invited to send a team to the annual gathering of Youngsters On The Air (YOTA); a kind of summer camp for young amateurs aged 15 to 25 from IARU Region 1. The RSGB Board gave the green light in January and we secured the final team slot for the event that will take place in Virrat, Finland during July. Fifteen countries are represented with the bulk of the funding coming from the European Commission's Erasmus programme.

Every RSGB Member in the age range (all 234 of them) was sent an invitation to apply for a place on the RSGB Team. We also placed notices on two GB2RS broadcasts and in the March *RadCom* for a team leader, who had to be over 18 and not necessarily a 'youngster'.

We received 27 applications for team members and 4 for team leader. A panel comprising three Board members carried out an evaluation exercise based on predetermined criteria. For the Team members they were; breadth of interests, significance of achievements, clarity of aspirations and what they thought they would get out of the trip to Finland. For the team leaders the criteria were mainly; to be a licensed amateur, to be a teacher or other youth leader, to have experience of leading 'field trips'. We were bowled over by the response and by a number of supportive messages from young people who were unable to apply.

Selecting the lucky five was not an easy task with some extremely good applications missing out to strong competition. This article is to introduce the RSGB YOTA Team, to show what our young Members are up to and to provide some idea of the standard next year's applicants will need to meet.

LET'S MEET THE TEAM.

Dan McGraw, M0WUT. Dan started in amateur radio at Silcoates School ARC and got his Foundation licence at the age of 11. He was encouraged to progress and gained his Intermediate and Advanced licences at Wakefield and District ARS. Being part of a club allowed him to work large pileups and get experience of serious contesting.

He has shared his knowledge and enthusiasm of amateur radio by teaching others. So far, he has helped over 30 people achieve their Foundation licence and has instructed 15 Air Cadets who all recently achieved their Communicators Award.

Turning to his interests he said, "My main amateur radio interest has always been construction and homebrew radio, particularly creating high performance transmitters/receivers on a low budget. This tests good construction skills and encourages thinking outside the box". He has been constructing the transceiver described by Eamon Skelton in *RadCom* and to make the project more suited to his needs he is developing a touchscreen GUI system centred round a Raspberry Pi. It provides spectrum analyser/waterfall displays near the frequency of interest, which are features normally reserved for high end radios, without costing several thousand pounds. The main screen also displays frequency, mode, band and options for direct frequency entry as well as being able to bring up the band plan for the current band of operation on screen.

Dan is in his final year at Welbeck Sixth Form College, studying maths, physics, further maths and electronics. Next year, he hopes to study electronic engineering at university and has received offers from the University of Cambridge, Imperial College London, Southampton, Birmingham and Newcastle.

What will Dan get out of a trip to Finland? He said, "This trip would enable me to meet and exchange knowledge and thoughts with other young people from outside the UK as well as provide an invaluable learning opportunity to improve my operating and constructing by learning from other amateurs who are as enthusiastic about their hobby as I am."

Ricky Duckhouse, MW6GWR. Ricky's amateur radio interests are HF DXing, contests, IOTA (Islands on the Air), obtaining award certificates and SOTA (Summits on the Air). He has been licensed since 2010, when he took his examination with North Wales Radio Society. He immediately got going by participating in contests and working GB special events.

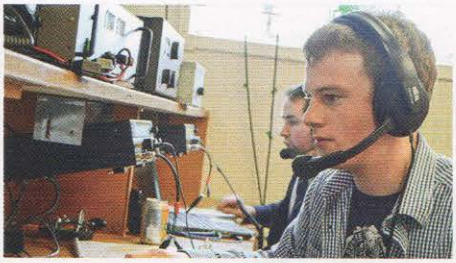
He soon came across the CASHOTA (Castles & Historic Monuments on the Air) scheme and, with his Icom IC-703 transceiver, began cycling to local historic locations in order to activate them on the air for CASHOTA-chasers. As a result he was asked to feature in *PW*'s CASHOTA Special. Being 'portable' and having assembled a lightweight antenna kit, this later led him into SOTA and since April 2012 has made 95 activations of 57 unique summits across southern Britain. Ricky says, "What I like about SOTA is being out in the countryside, working DX and running my own pile up. I have also developed personal skills such as map reading and now also enjoy combining another hobby too: photography – so I can oblige people when they want to 'see' what I've seen!"

Ricky has the achieved several SOTA awards and certificates for his activities and he has contacted 152 DXCC entities across all continents. His aims are to achieve DXCC on all HF bands, obtain the SOTA Mountain Goat Award, activate all UK summits and slightly longer term, to activate the most wanted IOTA and win 1st in the RSGB IOTA Contest.

When asked what he would get out of the trip to Finland he said, "Hopefully it will be two-way in that I can share and exchange experiences with fellow young radio amateurs. It will be a fabulous opportunity to travel, to see something of another country and I will really enjoy making new friends and meeting others interested in radio of my own age. I want to know what the bands are like in communications from Finland and between Finland back to home. Perhaps there will be an opportunity to transmit on the radio using an OH callsign and even work a big pileup – I know there would be people back home listening out for me. I am sure that from participating the whole experience will stand me in good stead for the future in my amateur radio hobby as well as in life."

Adam Hutchison, MM0KFX. Adam is 21 years old and in his final year at the University of Aberdeen, where he is studying

Steve Hartley, G0FUW, RSGB Training & Education Committee Chair • e-mail: tec.chair@rsgb.org.uk



for a degree in Economics. He has been a licensed amateur since September 2011 and gained his Full licence in August 2013.

His interest in amateur radio first began when he stumbled upon an internet feed that streamed audio from the KQ2H repeater located in the Catskill Mountains, in NY State. Intrigued, he did some research on amateur radio by browsing through websites and watching various YouTube videos. He then signed up for the Foundation course at a local club and was licensed only 2 months after first becoming interested in the hobby.

He said, "I am always keen on trying new things, experimenting and understanding the technical side of the hobby. In terms of operating, my main interests lie in contesting and chasing DXCC on HF and VHF using CW, SSB and digital modes. However, I do like chatting away as well!"

Adam is a proud member of the Stirling & District ARS, visiting when home from university. He has competed in a number of contests with the club, including the CQWW SSB contest, where they operated from Rua Reidh lighthouse in the North-West of Scotland in 2012. He has also participated in contests under his own call and has so far operated in the UK DX BPSK63 contest, the EPC WW DX contest and the CQWPX RTTY contest this year.

Outside of operating, he is particularly interested in the science behind HF communications, such as solar weather and the behaviour of the ionosphere. He also enjoys homebrewing his own antennas for both HF and VHF.

Looking forward, Adam is in the early stages of organising a special event station for the 2014 Glasgow Commonwealth Games. Within the next 12 months, Adam hopes to become an instructor to assist in the training of potential amateurs and to further help people who may be interested in the hobby at university.

Longer term, he said "I would relish the opportunity to encourage more young people into the hobby. This could be achieved by setting up a youth team who could represent young amateurs in the UK. A 'youth column' in *RadCom* would also help to encourage young Members and engage them with the hobby."

Adam said that in going to Finland he would ensure that he represented the RSGB and amateur radio in the UK in a positive light. He said he would strive to work well in all team environments, encouraging and supporting others. Summarising, he said "I would hope to have as much fun as possible and relish the opportunity to represent the UK and the RSGB in promoting youth in amateur radio."

Jonathan Rawlinson, M0ZJO. Jonathan lives in South East England and is 18 years old. He was first introduced to amateur radio in 2008 at the Herstmonceux Science Centre. This started off as a starter course in radio astronomy but grew into learning about amateur radio and eventually to him taking the Foundation exam. After this he moved up the licence levels, gaining his Full licence in 2011. Since then he has regularly volunteered at the Science Centre open evenings where the QRZ Amateur Radio Group of Sussex show off the many aspects of radio, including amateur radio and radio astronomy.

In talking about what amateur radio has done for him, Jonathan said, "Doing the radio licence has helped me in many ways in school and out. For example the Full licence gave me a good grounding in maths, which gave me a solid grounding for A-level maths and physics. The has also enabled me to speak confidently to people with whom I am unacquainted, given me valuable practical knowledge in the RF and communications area and it has shown me how theory is applied in the real world".

Last summer Jonathan was successful in obtaining a place with the Year In Industry scheme. This has enabled him to have a year's employment with the MoD. He is sure that a contributing factor to being able to take up this position was due to his experience in RF & communications that was gained solely from the amateur licence.

His amateur radio interests include satellites. He has built two demonstration satellites, one that transmits temperature telemetry and the other that transmits a digital image. He also enjoys antenna design and construction, contesting and radio construction. He confessed that whilst he has built his own transmitters and transceivers, has yet to make a contact using them!

His interests in RF areas outside of amateur radio include amateur radio astronomy. He has written a paper on imaging the sun using amateur equipment that was presented at the ARMMS RF and Microwave Society Conference in 2013. Looking forward, Jonathan said he would like to explore many other areas in amateur radio such as sending images over the air using SSTV or DSSTV, learning Morse by heart, speaking to an astronaut using the amateur radio transceiver on the ISS and joining RAYNET to offer his services to the local community.

When asked why he wanted to go to Finland he said, "I would really like to meet other amateur radio operators from around the world. Sadly, I have only ever met two other radio amateurs in person that are below the age of 20! Therefore I would personally like to meet other members of the amateur radio community that are my age as I would like to share my experiences with them."

TEAM LEADER. Gervald Frykman, G0GNF. The successful applicant for team leader has led many trips and expeditions with young people (some of them amateur radio-related) and is the Educational Visits Co-ordinator at Warwick School, as well as being a full-time teacher of chemistry. He has spent many years teaching amateur radio skills and in 2013 he took a team of youngsters to Bletchley Park for the RSGB Centenary celebrations.

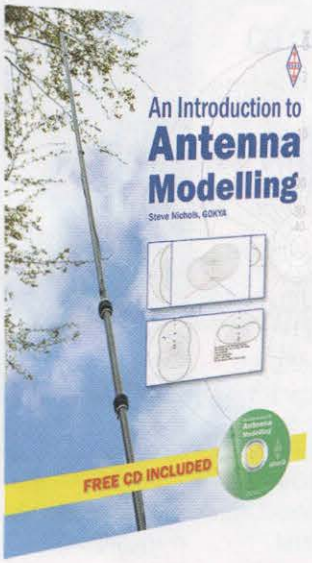
In answer to the question 'what experience do you have of taking young folk away?', Gervald said, "I have been very involved in organising school trips, and have led parties to China, the USA, India and Sweden, where we had a very successful school exchange running for several years. My success in getting 18 pupils and three staff back from the east side of Sweden when the Icelandic volcano led to my being appointed as the Educational Visits Co-ordinator for Warwick School, where I deal with risk assessments and the competence of staff among other things. We run about 170 educational visits per year".

AND FINALLY... I hope you all agree that these guys will make great ambassadors for the RSGB and the UK at YOTA and we look forward to hearing about their experiences after the event.

We are now working to put on a YOTA event in the UK to link up with the Finland camp. That will be open to all young Members under the age of 25. We are also looking to do something special in December, which is designated as YOTA month. Ideas for these activites are most welcome to the e-mail above.

Book Review

Modelling and making amateur radio antennas



An introduction to antenna modelling

by Steve Nichols, G0KYA

Computers have revolutionised antenna design in the last few decades. No longer does one actually have to build a physical antenna and test it (with all the fun, games and inaccuracies that entails); it's now possible to describe your design to a computer and let it simulate its way to a set of easy to interpret figures that tell you how good – or bad – your design may be. Well, that's what the adverts would have you believe but as with most things the reality can be a bit more complicated than that. Fortunately, talented communicator Steve Nichols, G0KYA is on hand to help guide you from first principles through to optimising antennas and seeing how they perform – without cutting a single piece of aluminium.

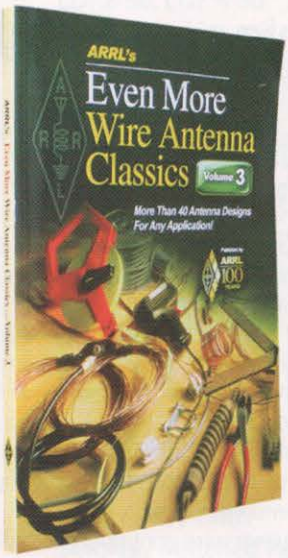
Antenna modelling programs are all based on the principles enshrined in Maxwell's equations which, Steve notes, "have frightened the hell out of every physics student who has ever had to get to grips with them". Although they do appear in the book, you are well shielded from them. The granddaddy of all antenna modelling programs is the notoriously user-hostile *NEC*, for which many friendlier front ends have been written over the years. This book concentrates on the (free!) *MMANA-GAL*, which can be used to design Yagis, quads, loops, verticals and much more. (A summary chapter at the end also discusses *EZNEC v5, 4nec2* and *MININEC Pro).*

Starting with the basics like understanding the user interface and what antenna radiation pattern plots can you, Steve soon moves on to designing a full size 40m loop antenna from scratch – it's easier than you might think. It's also very instructive to see how things like the height above ground have a marked influence on the resonant frequency and impedance. More advanced information follows, including things like coils and traps, matching lines and stubs. Towards the end of the book there are worked examples of many antenna models including classics such as the G5RV, cff-centre fed dipoles and verticals.

The CD included with the book contains several sets of antenna modelling software (including *MMANA-GAL*) and a number of example model files. In total, here are over 30 software packages on the disk.

By the time you reach the end you should feel confident about what antenna modelling can do and what it can't. You should also be able to create your own designs and manipulate them to get the results you want. Anyone with an ounce of interest in antennas is sure to find this a fascinating and very useful book. Highly recommended.

ISBN 978-1-91019-300-6
80 pages, 174 x 240mm
Non Members' price £9.99
Members' price £8.49



ARRL Even More Wire Antenna Classics

Antenna books are always popular and the fact that this is an 'even more' book shows that it is the latest instalment in the ARRL *Antenna Classics* series. It is based on projects published in *QST* between 2002 and 2013 and contains some 40 practical designs.

As is often the case for US antenna books there is a quite different attitude to scale, eg "this [v beam] antenna may also be built with wire lengths as short as 60 feet [ie needing at a run of least 37 metres] *to more easily fit on a city lot*" (my emphasis). Still, given that the antenna it's based on originally had 584 feet (178m) elements, presumably needing a run of almost a quarter of a mile, I guess it *is* progress!

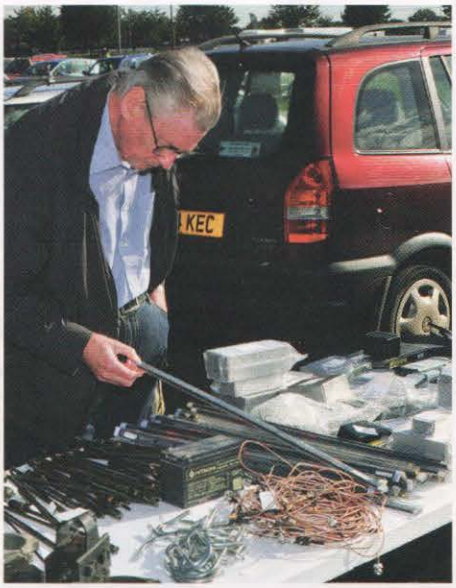
A wide of antenna techniques are explored, some of which are rarely explored. An example is the pneumatically switched dual band dipole, which uses PVC-piped low pressure air to activate switches to isolate sections of the wire and hence operate on two bands. This approach has advantages over things like traps and is much easier to implement than relay switching because you don't have to isolate the relay drive from the antenna element. On the other hand, there is an ingenious design for a relay-switched multiband dipole that uses a novel method of 'addressable relays' built into elements formed from twin feeder.

Of course, I've only scratched the surface here. Differences in opinion about what constitutes "small" aside, this book is an excellent repository of antenna articles selected from a decade of QST. It contains a varied assortment of ideas that are useful in themselves and bound to spark further ideas in experimentally-minded readers.

ISBN 978-1-62595-014-7
176 pages, 276x210mm
Non Members' price £22.99
Members' price £19.54

National Hamfest & RSGB Convention

Two big amateur radio events this autumn



The Hamfest organisers are continuing to build on the success of the car boot area.

NATIONAL HAMFEST. Friday & Saturday 26 and 27 September. Plans are well underway for the UK's largest amateur radio event on 26 and 27 September. The National Hamfest is organised by the Lincoln Short Wave Club in conjunction with the RSGB. Last year's event was the biggest and best, attended by more visitors than ever before and, as a result, many radio manufacturers and traders have already rebooked for 2014. International suppliers, as well as the usual smaller traders, clubs and special interest groups are also attending.

The organisers are continuing to build on the success of the car boot area and hope to expand and improve this after receiving feedback from traders and visitors. 2014 looks to be a bumper year for visitors wishing to grab a bargain.

There is so much more besides the trade element of the show and visitors can look forward to some interesting demonstrations of the latest equipment and gadgets. Visitors will be able to relax in the café with a coffee, have a spot of lunch or enjoy the licensed bar. There will the usual Bring & Buy stall, so start sorting through your shack and see what you can sell to finance some of the latest equipment on sale, or a bargain from the car boot because there will be lots of goodies to choose from. Morse assessments will also be available on demand throughout the show.

The Hamfest special event station will be operating throughout the event. Amateurs are welcome to operate the station, so bring your licence along and play a little radio.

Due to the popularity of visitors wishing to attend both days of the event, the organisers have now introduced packages for those who wish to camp on the Newark Showground during the event. Prices include admission to the show on both days – refer to the website for more information. Bookings for tickets are already open so you can now buy tickets online at a discount. Not only are pre-booked tickets convenient and cheaper than day tickets, you also get that opportunity to avoid the queue and get in using the priority admission entrance.

To book and for more details visit www.nationalhamfest.org.uk.

RSGB CONVENTION. Friday to Sunday 10 to 12 October. Plans are now well advanced for the RSGB Convention at the new venue of Kent's Hill Conference Centre, Milton Keynes. The event runs from Friday until Sunday with two days of lectures, two dinners and plenty of opportunity for coffee and a chat with old friends. The RSGB would like to thank the principal sponsor, Martin Lynch & Sons, for another year of support.

This year there is more space than ever so we can accommodate even more special interest groups than before. If you would like to book space for your group please contact Mark Allgar by e-mail to mark.allgar@rsgb.org.uk. There will also be the ever-popular display of amateur radio equipment from ML&S.

2014 is shaping up to be the best programme in years and more information will be on the website as plans are finalised. Many previous visitors to the Convention will be pleased to know that Contest University is back by popular demand and will run a full programme on Saturday 11 October. Dave Powis, G4HUP will be running the Surface Mount Devices (SMD) workshop at the start of Saturday's proceedings, a class that was extremely popular in 2013. Other highlights confirmed so far include Simon Brown, G4ELI who will be presenting on Advanced SDRs, Jan Verduyn, G0BBL talking about the DG8SAQ VNA and Peter Chadwick, G3RZP on ATUs. There will also be a special session looking at the impact that radio amateurs had on WW1 communications as part of the national commemoration of WW1. Visitors will also be pleased to hear that popular presenter Jim Bacon, G3YLA will be back to talk about Sporadic-E and John Regnault, G4SWX on EME.

There will be 5 main streams of talks – that's around 60 sessions over the two days – focussing on the following areas, HF Operation and DX, VHF and Above, Contest University, Technology and The Wider World of Amateur Radio. We are still looking for experts in a range of fields to present on topics at the convention. If you are interested in giving a lecture, or know someone we should approach, please send an outline of the topic along with a brief introduction to yourself to convention@rsgb.org.uk

Bookings for the RSGB Convention are now open at www.rsgbevents.org.

Kent's Hill is a purpose built conference centre with plenty of room for all RSGB Convention delegates.

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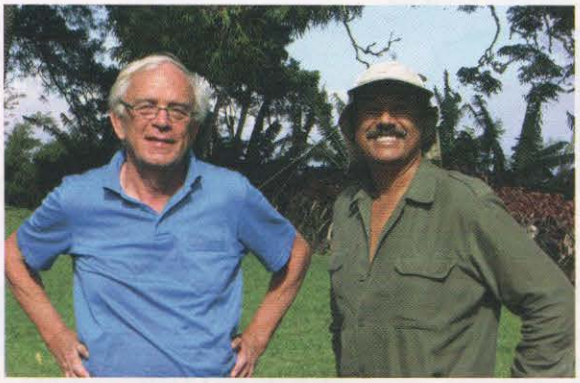
HF

All the news on the improving bands



DJ9KH and ZD8SS at Garden Cottage on ZD8.

BANDS IMPROVING. The HF bands from mid-March onwards were excellent. Plentiful sunspots and the usual seasonal improvement in ionospheric conditions led to lengthy Pacific openings on 14-28MHz for much of the day. The British TX6G team on the Austral Islands were coming through for hours at a time – though that part of the Pacific is something of a 'sweet spot' for propagation to the UK as the path misses most of the auroral zone. I have worked into the area on 21MHz during the afternoon even at sunspot minimum. The problem is that there are very few active stations at that end so these openings usually pass unnoticed.

One opening that hasn't passed unnoticed is the long path one to Hawaii on 10 and 12 metres each morning. This has continued to be good and KH7Y has been a great signal into Europe.

The Chatham Islands are just about at the antipodal point from the UK and propagation to ZL7AAA was excellent – though beam users had to be alert to the optimum direction. On 21MHz this was usually a southerly heading first thing in the morning but switched to the north later. In principle all beam directions lead to the antipodal point – so if the ionosphere is equally good in all directions then beams are unnecessary. But in practice not all paths are equal so beams do help if you can work out exactly where the signal is peaking from.

I received an e-mail from a reader who felt I should have said more about some of the FT5ZM operators who were spreading their pile-ups over large parts of the bands at the start of the activity. I'm reluctant to criticise on these occasions because it is difficult for those of us at this end of the pile-up to imagine the sheer mental and physical fatigue that accumulates after a lengthy sea voyage, an arduous unloading and setup activity and days of insufficient sleep. Listening to a pile-up of hundreds of callers compressed into a few kilohertz can be an impossible task under such circumstances so I'm inclined to give the ops the benefit of the doubt and assume they are doing their best. I imagine though that the DXpedition organisers will have received plenty of feedback.

An interesting question that comes up on a regular basis is whether it is reasonable for a DXpedition to take up significant amounts of bandwidth for its pile-ups. I tend to think about the number of people pursuing a contact and conclude that it is something we all should live with – much as we live with road closures around our towns when there is a marathon or cycle race in the area. DXpedition operators sometimes look for a clear area for their pile-up rather than just saying "up 5-15" but this isn't always feasible.

WHERE IS THIS CALLSIGN FROM? People are often confused about the exact DXCC of a particular callsign. This is a particular problem for a range of prefixes in the past. *Club Log* now provides the answer thanks to a great deal of research by Alan Jubb, G3PMR/5B4AHJ in old DX magazines and newsletters. Go to https://secure.clublog.org/test.php then enter the callsign and date of QSO and *Club Log* will give you the location details based on normal callsign parsing rules and a large list of exceptions prepared by Alan.

VP9. I was pleased to be able to operate from Bermuda in February with G7VJR, M0BLF and M0VFC. We were QRV from the rental shack owned by Ed, VP9GE and were most impressed both by the facilities and Ed's superb hospitality. Pile-ups were very large as a result of the small number of active local amateurs – at least compared with the situation some 40 years ago when there were many VP9 operators on the air and an annual Bermuda Contest.

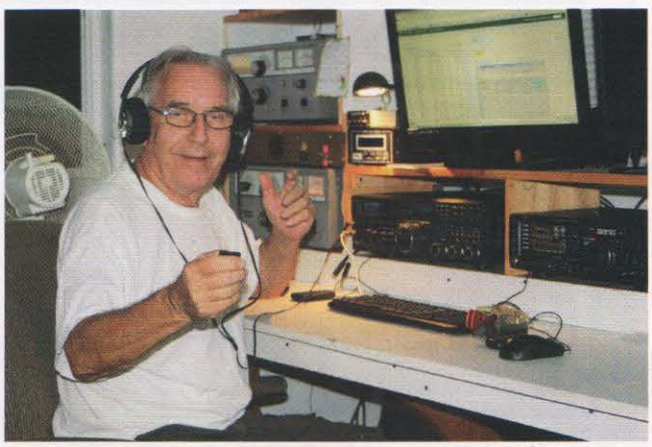
THE CASS AWARD. Presented annually, the Cass Award honours the memory of West Coast DX Bulletin author Hugh Cassidy, WA6AUD (SK) and encourages DXpeditions to maximize the number of individual DXers worked by offering a $1000 prize for the single-operator DXpedition that works the most unique callsigns. Last year's award went to Rob Chipperfield, M0VFC for his ZD9UW operation and the 2013 award has been won by Peri Monioudis, HB9IQB. The citation says, "While QRV from the Palestine as E44PM in August 2013, Peri worked 6,696 unique stations over his 11-day DXpedition, demonstrating an outstanding effort to log as many individuals as possible and setting a new Single-Operator Cass Award record". See www.cassaward.com for more information.

Although it is early days for the 2014 award, Col, MM0NDX is in the lead at the moment with 5,901 unique stations logged from Senegal earlier this year.

SOUTHERN OCEANS. Pierre, ZS1HF, was on an emergency voyage from Cape Town to Gough Island (AF-030) during February to replace a member of the over-wintering team who died unexpectedly. Pierre will be QRV as ZD9M on SSB and digital modes until early October.

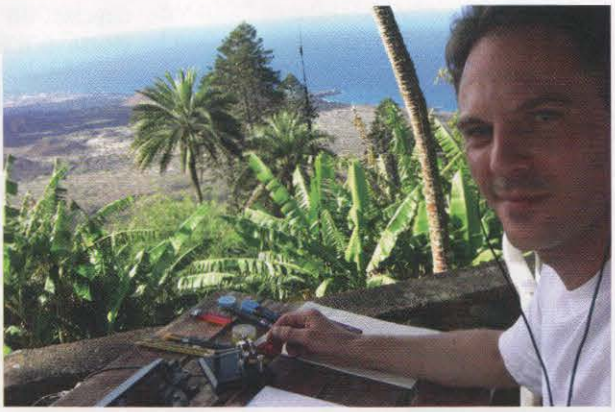
It is all change on Marion Island as Carson, ZS8C is due to leave on 2 May but will be effectively QRT from early April when the ship *Agulhas 2* arrives for the base relief. David, ZS8Z was QRV a few times on JT64 on 28MHz but will presumably be leaving on the same ship. The good news is that Gerard, ZS1KX will be arriving on the island with an IC-738 and 500W amplifier so the island should still be available on the air. His XYL will handle direct QSLs from South Africa while he is on the island.

Garden Cottage on Ascension Island remained busy with amateur radio visitors during February as Werner, DJ9KH took up residence and was joined briefly by Axel, DK9BDN. This is a truly excellent DX location perched on a terrace about 2500



Fred, KH7Y at his operating position.

feet up Green Mountain with unobstructed takeoff from the west through north to the east. The house is the manager's cottage from the time when Cable & Wireless maintained a farm on the upper slopes of the mountain. It suffers from damp and the occasional visiting rat so is not generally rented out to tourists – but amateur radio operators can normally book it if they let the hotel owner know they are willing to accept its condition. I've been there three times now and wouldn't hesitate to go again. As far as I know there is only one local amateur who is active from ZD8 and that is Stedson Stroud MBE aka ZD8SS. Stedson heads up the local conservation department and moves between Ascension and St Helena. Stedson is pictured at the start of the article alongside DJ9KH.



DK9BDN QRV from Garden Cottage on ZD8.

UPCOMING DX. Harry, JG7PSJ will be active again as JD1BMH from Chichijima (AS-031) in the Ogasawara Islands from 27 April to 11 May. He will operate CW, SSB and RTTY on the 10 to 40m bands. Logsearch and other information can be found at http://sapphire.es.tohoku.ac.jp/jd1bmh/ and also check https://twitter.com/jd1bmh/

After some 14 years, Naama, SO1A is active again from Bir Lehlu, in the Western Sahara. At present he only runs 40 watts into a dipole for 10 and 15 metres, but future plans might include activity on 60m. A newly licensed operator Azman, SO1AH, is expected to be QRV from the same location. QSL both callsigns via EA2JG, direct only. Further information may be available at http://saharadx.jimdo.com. Hopefully there will be another DXpedition there before too long.

San, K5YY will be operating as 7P8YY from Lesotho from 22 April until about 1 May. He plans to concentrate on the upper HF bands, especially on 21-28MHz with a goal of working people who need 7P8 for a new country or at least a new band. He's heading to Lesotho with 4-5 other operators for a vacation style operation, and all will be operating with their own 7P8 calls. San is also hoping to operate on RTTY and 60m, if authorised, on CW on 5405 or 5373kHz especially during the last two hours of darkness. The team will have three stations. Check QRZ.com for QSL information.

Chris, VP5/KI4CBF will be in the Turks & Caicos Islands from 2-11 May. He likes 10 to 20m after local sunrise, 40m shortly after the evening greyline and 40, 80 and 160m at night. He also favours PSK31, with some RTTY and limited JT65 and SSB.

Peter, N8PR and Bill, NZ5N will be going on a DXpedition to St Croix in the Virgin Islands from 21-27 May. They will be using a special 1x1 callsign N4M so you may need to adjust your logging software. The primary purpose of the trip is EME, but there is a fully equipped HF station and tri-band Yagi at their Mountain Breeze (NP2N) location – www.mymountainbreeze.com/page7/page7.html

JA1XGI will be celebrating 50 years in amateur radio from Micronesia as V650XG on Pohnpei (OC-010) from 9 to 15 May. Activity will be on the 7 to 28MHz bands on CW, SSB and RTTY.

Tim, LW9EOC will be active from San Andres Island as 5J0T from 18-25 April.

Schalk, ZS1LL will be active as A22LL from Botswana from 5-30 April.

Tov, T32TV has moved from Christmas Island to the much rarer IOTA of Washington (Teraina) Island (OC-084) in the same DXCC entity. He has been QRV on 10 metres SSB and there should be long path propagation around UK breakfast time if he is on then. Reportedly he is running on solar power but hopefully he has some good batteries that will let him operate during the hours of darkness.

T6DD is the Afghan callsign issued to Dragan, 4O4A to use until 15 September. He will be QRV from the town of Mazar in Balkh Province on the 6 to 80m bands mainly CW. The operation has been approved for DXCC credit.

CORRESPONDENCE. Tom, G4IDL, is downsizing from an Optibeam to a Hexbeam for better wind resilience. Despite being away for a couple of weeks he found a lot of CW DX including: Saba on 10m; Zambia and Guadeloupe on 12m; St Vincent, Tanzania, Pakistan and Sri Lanka on 15m; Laos and Saudi Arabia on 17m; Nepal on 20m; and Peru, New Zealand, Venezuela and the Austral Islands on 40m.

Peter, G4XEX, treated himself to a new FT-3000 (and says he is still waiting to find out what the *quid pro quo* purchase for the XYL will be) and focussed on 10 and 12m. He worked: Laos, India, Iran, Sri Lanka, India, Senegal and Annobon on 10m SSB; Gabon, Curacao, Indonesia and Thailand on 10m data; and Amsterdam Island, Rodrigues, Madagascar, Maldives and Laos on 12m SSB.

Fred, G3SVK, sent in an enormous list of DX from which I've picked the highlights. He found: Rwanda, Hong Kong, New Zealand, Australia, Singapore and Hawaii on 10m; New Zealand, New Caledonia, Papua New Guinea, and Alaska on 12m; Australia, New Zealand and Singapore on 15m; New Caledonia, Vanuatu, St Helena, Australia and Burma on 17m; numerous VK/ZLs plus Papua and New Caledonia on 20m; Ogasawara, Alaska and Guam on 30m; Hawaii, New Zealand and Chatham Island on 40m. The Commonwealth Contest clearly provided Fred with a wide range of CW DX on the contest bands.

Dave, M0BVE, was particularly active on 10m but cast an ear over the other bands as well. He worked: Australia, New Zealand, Antarctica, Rodrigues, Alaska, Montserrat, Singapore, China, Mongolia and many others on 10; Annobon, Japan and Guam on 12; Saudi Arabia on 17; Rwanda on 20; Mexico on 30; as well as various Caribbean stations on the 40m band.

I was delighted to receive a letter from John, G3BDQ, who has been DXing since 1946. He has written several books on wire antennas so it is perhaps no surprise that he uses an inverted L with an ATU that tunes it from 160 to 160m. On the equipment front John uses an FT-2000 with a linear, and a barefoot FT-3000. A Top Band specialist, he notes that 160 conditions were very poor last winter with little trans-Atlantic DX – no west coast US stations and very few Japanese. He did however work FT5ZM on 160 as well as JA7NI, JS2FXK, C31CT, 4U1ITU and D4C. On 80m he found Jordan while looking unsuccessfully for the FT5; on 40m there was Australia, Japan, Amsterdam Island and Guatemala; on 30m Bangladesh, India, Reunion Island, Congo and Antarctica; and finally he also found Amsterdam Island on 17, 15 and 12 metres. John asks if there is a list of Antarctic stations giving locations and home calls. There is, at www.waponline.it but it is way too long to attempt to summarise here unless the Editor gives me the rest of the magazine to fill.

THANKS. As always, thanks to DX-World, 425 DX News and Daily DX.

TABLE 1: 2014 Worked DXCC Entities

Call	CW	SSB	Data	All
G4ZOY	143	152	118	196
G3SVK	185			185
G3HQT	155	0	68	157
G4IDL	90	0	0	90
M0BVE	133	0	0	133
G4XEX	0	94	66	100
G4FVK	25	48	0	58

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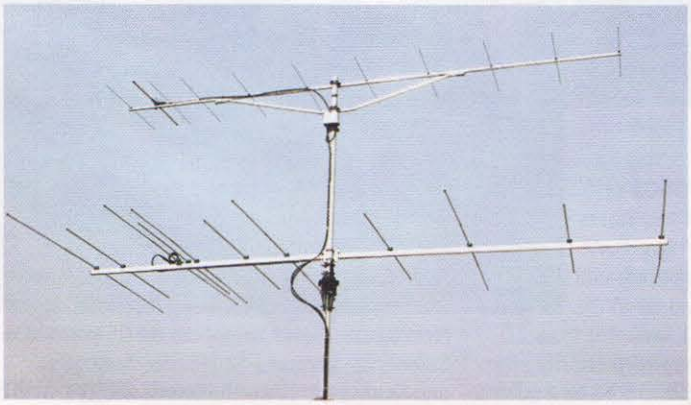

The GOCHE 2-4-6m Yagi group antenna.

INTRODUCTION. What a difference a month makes. From extremely poor weather and radio conditions to a mixed bag of good propagation with excellent DX being worked well into March. Although meteor scatter conditions remained at a pretty low ebb apart from some extraordinary occasional big reflections, EME, aurora, trans equatorial (TEP) and tropospheric propagation were all evident during the period. Of particular satisfaction is the rise in 70cm activity both during the UK Activity Contests and the Wednesday/Sunday activity periods that are showing more than just 'green shoots'. It's nice to get reports of stations actually putting their previously unused 70cm antennas back on their towers rather than left to disintegrate in the grass or behind the shed! The first major 2m/70cm UK and European contest took place during the first weekend in March and although conditions were quite poor the presence of well sited high power continental contest stations gave some DX, however activity from the UK was quite poor on both bands. A welcome tropo opening occurred on the evening of the March 70cm UK Activity Contest and gave some nice 800-1000km QSOs into OZ and SM for many.

TRANS EQUATORIAL PROPAGATION. A rare and exceptional propagation mode useable in the lower VHF regions of 50 and 70MHz but in extreme circumstances contacts have also been made on 2m. TEP relies on a 'chordal hop', having two F-layer reflections without an intervening ground reflection either side of the geomagnetic equator. During March, openings from Southern Europe to South Africa were frequent but it wasn't long before stations on the South coast of England and Southern Ireland in locators IO90, IO80, IO70 and IO51 started working into ZS (South Africa). On 19 March, IZ5ILX and DI2MN reported hearing the ZS6WAB beacon on 70.025MHz with considerable peaks and troughs of QSB at 1822UTC. It was also reported that G3SHK in the appropriate locator of IO90DX also copied the ZS6WAB beacon at 1824UTC.That must be the highest level of MUF to ZS for 2014 so far and also time correlated. Visitors to the RSGB Convention in October 2013 may have seen the excellent lecture on Solar Cycle 24 given by Carl Luetzelschwab, K9LA. Carl has also written an excellent paper on TEP from its discovery by amateur radio operators in the 40s and 50s to developing an understanding of this propagation relevant to today [1].

AURORA. Two reasonable auroral openings occurred on 23 and 27 of February. The former being what used to be termed a 'Scottish type aurora' and the latter a bigger event that had potential for great things but didn't really deliver in DX terms. On 25 February, sunspot AR1990 emerged to the Earth facing side of the solar disc and promptly erupted, producing an X4.9-class solar flare. This flare is considered to be the strongest of this year so far and one of the strongest of the current solar cycle. Sunspot AR1990 was starting its third transit of the sun, having also been known as AR1944 and AR1967. It is customary to renumber any 'returning' spots as they emerge from the far side of the sun. The flare from sunspot AR1990 wasn't totally Earth-directed, however the glancing blow sparked geomagnetic activity around both poles. On Thursday 27 February, an interplanetary shock wave hit Earth's magnetic field at approximately 1645UTC. Such a 'monster' as some observers put it could have caused severe problems to the Earth if the flare had been fully Earth-directed. On 10 March, AR1990 was still visible as it was about to disappear around the back of the sun for the third time, however decaying substantially.

ACTIVITY REPORTS. Richard, G4CZP (IO90) comments that on 5 March he was doing some construction work in the shack, listening around occasionally on 2m and 6m for beacon activity when a couple of ZS beacons unexpectedly appeared on 6m. Between 1330 and 1400UTC he worked ZS6NK, ZS6BTE and ZS6WN just prior to fade out. ZS6AYE was worked again on 18 March and, with a much longer opening on the 19, Richard worked ZS6EZ, ZS6NK and ZS6JM. Unfortunately, he just missed ZX4TX/6. The ZS6TWB/B and ZS6JON/B beacons were good strengths with him on and off for about two hours. Richard also observed that he could hear some of the European stations that the ZS guys were working (I and 9A in particular), but only when he beamed south, so some kind of reflection taking place there. On 21 March, Richard also copied the Ascension Island beacon ZD8VHF (II22) on 50032.5MHz.

Peter, G8BCG (IO80) reports that his 4 x 7-ele 50MHz array thankfully survived the storms. Two Kevlar stays and one Yagi boom snapped but they were easily repaired. Conditions were a pleasant surprise this month with some real Spread F / TEP stretching this far North and down to ZS1 unassisted by Sporadic-E. Between 1 to 21 March, Peter was active on most days, looking for daytime F2 (East-West Path) propagation. On EME, new initals were ON4GG and PY1KK on his moonrise. At moonset in IO80 another new initial worked, K7RWT plus an 'almost' with FW5JJ disrupted by a frustrating noise problem at Peter's location. On 4 March there was an excellent F2 midday opening to South Africa – over 90 minutes of S9+ signals from ZS6. Stations worked were ZS6NK, ZS6WN, ZS6A and ZS6BTE, all at good signal strengths. Having consulted his very co-operative neighbour, the noise problem seems to have been a UV lamp power supply in an outbuilding. Construction of a temporary Faraday screen killed a few decibels, enough to finally work FW5JJ on EME at 0° elevation and achieving DXCC #227. The following day more EME QSOs were made with W7GJ, K2ZD, N3XX and KD3UY for a new initial. On the 18th, JT65 and (after a deal of confusion at his end) JT65A / JT65HF were used to work ZR1ADI in locator JF95KU, Peter's first ZS1 and a new major field #109. TR8CA was also worked on JT65. A big opening occurred on 19 March to ZS again with Peter working ZS6NK, ZS6EZ, ZS4TX/6, ZS6TQ and V51B in Namibia. There was also an early evening surprise with excellent good strength CW QSOs with

LU5FF, PY2XB and PY1RO. An opening again to ZS on 20 March plus strong EU backscatter at 160° working LZ1QI, EA4ZK, F4AZF, DF9TF, EA6BB and I5IAR. Bonanza time came on 24 March where Peter reports a whole afternoon of ZS6 stations copied in IO80 plus XT2AEF (Burkina Faso) IK80 worked on SSB who was audible for over 80 minutes and from 1530UTC peaked a real 59 for about 40 minutes. The 6V7SIX beacon from Senegal was 599++ again plus D2EB (Angola) and FR4NT (Reunion Island) copied at the same time.

Jim, GM3UAG (IO87) reports in from his QTH 20km north of Aberdeen. After a long wait, aurora at last! On Thursday 27 February, about 10pm, he spotted a good display of the Northern Lights of Old Aberdeen – many green streamers dancing away, a touch of red here and there and an arc going right overhead. Switching on 6m there were no beacons to be heard but there were a few CW and SSB signals rasping away. Then, at 2238UTC, he heard GB3MCB on 50.043, at 55A. It didn't last long and he didn't hear it again until about 2255UTC at S2A, again briefly. Reception lengths reminded Jim of meteor scatter. Reception of GB3MCB by MS is very good at his QTH when there is a meteor shower on. There was nothing heard of the usual aurora indicators – GB3LER or OY6BEC.

The log of Kev, G0CHE (IO90PS) shows a mixture of bands and propagation including two TEP QSOs with ZS6AYE (KG54) and ZS6NK in KG46ZS while he was using a Comet GP 15 tri-band vertical! 6m TEP can certainly show some surprises. After earlier storm damage he finally got back on 2m on 21 February with an 11-ele Tonna. 2m meteor scatter resulted in QSOs with IK0SMG, IK0BZY (JN61), IK2OFO (JN45), EB5AL (IN90), IS0AWZ (JM49), S58M (JN76), DO3MXK (JO62), SP3IYM (JO82), CS7/PD0HNL (IM67), DL1VPL (JO61) and DF1SO in JN48. Kev's SSB tropo log shows some excellent DX – F4KJB/P (IN96), ON4KHG (JO10) F6KFH (JN39), PD0HCV, DL6YBF, DF1JC (JO31), F4CWN, F5ICN, F1RYW (JN03) and to cap it all off a JT65B EME QSO with DK3WG (JO72). A 2m preamplifier (LNA) has been installed and his 4/6m duo-band Yagi (G0KSC) is also operational again so he is now QRV on 3 bands ready for some spring Sporadic-E DX. The dual band Yagi is a neat solution to mast restrictions and gives the chance to operate on both bands with reasonable performance.

Other stations reporting 50MHz TEP contacts were G4FJK (with ZS6AYE), EI3KD (with ZS6MAW, ZS6AYE, ZS6A, ZS6NK and ZS6WN) plus G4RRA with ZS6JM.

Chris, GM3WOJ (IO77) was an outstanding auroral signal during the opening on 23 February. He was heard working well into SM including SM7GVF, SM4GGC plus G4FUF, MM0CEZ, G4HGI, LA6OJ, OZ6OL, DL6YBF and again on 27 February QSOs with G4RRA, MM0CYR, LA3BO, LA6OJ, EI3KD, PA4VHF, PA4EME, DL6YBF, LA3EQ, GM4ZNC, OZ6TY, G4HGI and PA3BIY. An interesting observation here in IO83 was how Paul, G4RRA and Mark, EI3KD were working Chris and other GMs at high signal strength, however inaudible at my QTH... so the aurora had clearly gone south of here, which resulted in media reports of a good visual display over the UK.

John, G4SWX (JO02) reports that Tuesday 4 March was his first day back on since mid-January. Some good EME and the usual crop of OZ/SM contacts were made during the Nordic Activity Contest, with the best DX being SQ6A in JO58 at 918km. On 8 March, John managed to work the Belarus expedition EW/UT5UAS, EW/UT6UA before their activities were brought to a halt (despite being duly licensed) by the local police. Sadly, this expedition, which took an immense amount of time negotiating permits and bureaucracy, fell foul of the political tensions in the area. SP1JNY (JO73) was worked using CW on 10 and 11 March at 899km but nothing further was heard. Some fair tropo conditions existed on the morning of Sunday 16th with French stations in JN03 and IN93 worked, the best being F5ICN JN03 at 1006km. There are a number of 'special event' calls in his EME log. W1AW/7 (ARRL Centennial Station), RK22AA, UP0KEDR, RK22WG and RW80KEDR (this was a new square PO41) plus John has also run a couple of MS + tropo tests with EA8TJ (IL18) at 3042km, but only received one short burst with a partial callsign.

Bob, G8HGN (JO01) sent in a multi band log for 4m, 2m and 70cm. It was mainly contest QSOs with some good DX worked. During the March 144/432 contest there were numerous QSOs over 600km with best DX being DR1H (JN59) at 788km. On 70cm, during the UK Activity Contest, with such good conditions to Scandinavia, Bob's best DX was OZ7KJ and OZ9PZ in JO46. QSOs during the 70cm Activity Periods included GD8EXI and DL8DAU.

2m ACROSS THE ATLANTIC. The Brendan Quest Group will operate from Pouch Cove, Newfoundland, from 4 to 12 July in a bid to complete a 2m Transatlantic QSO and claim the Brendan Trophy. The Brendan Trophy is a series of awards offered by the Irish Radio Transmitters Society to the first amateur radio operators to complete a 2m Transatlantic QSO. The actual location will be locator GN37OS, Pouch Cove, Newfoundland, Canada, 47.76942° North, 52.76384° West. The site is 3040km from the Irish coast, 3400km from Poldhu and 23km from Marconi's 1901 reception site. The station will run 750 watts into a 30m long rope Yagi with a gain of more than 23dBd. The theoretical ERP in the centre of the major lobe should be about 150kW. There will be more news in the next issue but this looks like a serious challenge to work across the Atlantic Ocean [2].

MORE EXPEDITION NEWS. PA2CHR Balkan Expedition. News from Chris is that he will be travelling around the Balkan area during May – hopefully nicely timed for some Sporadic-E propagation. 40/PA2CHR (JN92, Montenegro) will be operational from 16 to 19 May primarily on 4m and 2m. ZA/PA2CHR (JN91, Albania) will be on from 31 May to 5 June and will concentrate on 2m and 6m EME, tropo, Sporadic-E and meteor scatter operation. Both locator squares and DXCCs are on many people's 'wanted' list. Keep up to date on these expeditions via Make More Miles On VHF website [3].

6W/PE1L (IK14, Senegal) will be active from 9 to 25 May. PA3CEE and PE1L will also be joined by Hermann, DL2NUD who will activate 13cm. The QTH has been arranged and also upgrades to the electrical system are in progress to take the current for the amplifiers and gear! Medication for malaria, passports and visas are organised so everything is on schedule. Check out their website for developments [4].

70cm ACTIVITY PERIODS. Three months in and this project, I'm pleased to say, continues to grow in popularity with quite possibly Wednesday being the most popular period. There are a number of regular participants including G4JLG, GW8ASD, 2E0BMO (IO83), G4RQI, G8EOP, G4EHD, 2E0KSH (IO93), GD8EXI (IO74), G3SMT, G3UBX (IO82), G4GFI (IO91), G3YDY, G8HGN (JO01) etc. Most of these 'regulars' are finding new stations to work and let's hope it continues. Interestingly, Peter, G3UBX and a couple of other stations have commented that random CQs outside these periods are now yielding QSOs, which is really good news. Just to recap, timings are currently Wednesday 7 to 9pm and Sunday 9 to 11am local time. I hope as the spring and summer months come upon us that activity will continue to increase.

SIGN OFF. Thanks to all contributors this month. As we come closer to Sporadic-E propagation and the chance of good weather and tropo conditions please send reports in to the above e-mail address. Happy DXing on VHF/UHF.

WEBSEARCH

[1] http://k9la.us/Trans-Equatorial_Propagation.pdf
[2] www.brendanquest.org/
[3] www.mmmonvhf.de/latest.php
[4] www.emelogger.com/6w

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Dr John Worsnop, G4BAO • e-mail: john@g4bao.com

GHz Bands

EME activity plus observations on Yagis at 23cm

SPRING FEVER. Lots of GHz bands activity here on the Fen Edge as the spring weather slowly pushes this horrible, wet winter into memory. I've been getting good results with my new 1296/2320MHz system and experimenting with antennas, but by the time you read this column I'll be setting off for the Isle of Lewis with the Camb Hams, GS3PYE/P [1] hopefully with a 'minimalist' 1296MHz JT65c EME system in tow.

PHOTO 1: Sun noise tests on a 4x23-ele Tonna array at G4BAO.

MICROWAVE EME LIGHT. Having committed to the Camb Hams to do 1296MHz this year, I thought I'd see what would be the best small antenna system to take. Because of the long drive from JO02 to IO68 any form of dish was out of the question and I didn't want to risk starting to build a portable dish only to fail, so I decided to look at the possibilities with Yagis.

There are two things not quite right about this decision. Yagis use plane polarisation, whereas most EME stations on 1296 use circular (so that's 3dB gone for a start) and most Yagis have much noisier patterns than dishes of similar gain. What the decision does do though, is give me an excuse to see for myself a number of 'facts' I've been told about Yagi arrays in an EME situation where the background to the wanted signal is the cold sky as opposed to the horizon.

There are a number of low noise antennas around [2] [3] but very few designers have grasped the nettle of a big 1296MHz Yagi optimised for low noise rather than gain, so we are left with Tonnas, Wimos and their like, with all their limitations. So why not just build an array of Yagis, you say? Well, fact number 1 is that stacking and baying Yagis doesn't always give you what you might expect at 23cm. This is for two reasons. The combining losses are significant and multiply up with the number you stack and bay and, remember, any feeder loss in front of the preamp adds directly to the system noise figure. A single preamp would have the losses of the coaxes to the antennas and the combiner in front of it. Fact number 2 is that unless you really model and optimise things very carefully for noise rather than gain you will cause unwanted side and back lobes on the array that just raise the noise temperature of the antenna system again.

To put some numbers on this I decided to do some now-familiar-to-GHz bands-readers sun/cold sky measurements on the three antennas I had available, namely a single 23-ele Tonna, a single 55-ele Tonna (each with a low noise G4DDK VLNA23 preamp at the feed tail) and an array of 4 x 23-eles with the standard Tonna stack frame and combiner and the preamp at the combiner (**Photo 1**). Using the VK3UM calculator [4] I could investigate the antenna performance theoretically as well. For the single 23 element I measured 3.5dB sun to cold sky. To get the same figure from VK3UM with my system parameters I had to add 45K of side lobe noise temperature (which seems a little optimistic to me). The 4 x 23-ele measured just 4.5dB sun to cold sky, so even allowing for 0.3dB of combiner loss, not the 6.9dB predicted by the VK3UM calculator. This lower increase must be down to more side lobe noise. Getting the VK3UM calculator to give the same 4.5dB figure required increasing the side lobe noise temperature to 160K. With the single 55-ele I measured 3.8dB sun to cold sky, requiring a side lobe figure of 123K. I claim no big accuracy for these figures, but it clearly shows, with a real-world measurement, that stacking 4 antennas doesn't give you 6dB improvement in signal to noise performance! The figure seems to be at best a couple of dB.

Successful, small scale 1296MHz EME DXpeditions that use Yagis tend to use a single 67-ele Wimo (see the excellent paper on small station EME by Al Katz, K2UYH for more information [5]). Budget and space constraints mean that I'll probably use the single 55-ele Tonna on Lewis. Tests with it so far have allowed me to just detect the ONOEME Moon beacon [6], get good JT65c decodes from a 4.5m/1.5kW dish station in the US and 'see' G3LTF's 6m dish/400W CW signal.

MORE MICROWAVE WEB SDRS. Since the success of the Mop Cop 10GHz Web SDR [7], more are popping up. Noel, G8GTZ reports adding a 10GHz receiver to the Southampton University SDR located in IO91KH near Basingstoke [8]. The system is a 3 slot wave guide antenna at 8m in to an Octagon PLL LNB feeding an RTL dongle tuning 618 – 620MHz covering the narrowband and beacon sections of the band. The LNB is unmodified, wrapped in bubble wrap and mounted with the antenna inside a section of Wickes white square drain pipe but seems very stable. GB3SEE is audible at all times and gives a useful frequency reference. Many other beacons should be heard during lift conditions. The 1296MHz system uses an omnidirectional slot feeding a G4DDK VLNA23, and I can easily see my 1296MHz signals on it any time over the very obstructed 139km path to my QTH. There is also an SDR on the GB3KM TV repeater (IO94EQ) looking at 432, 1296, 2320 and 10368MHz but

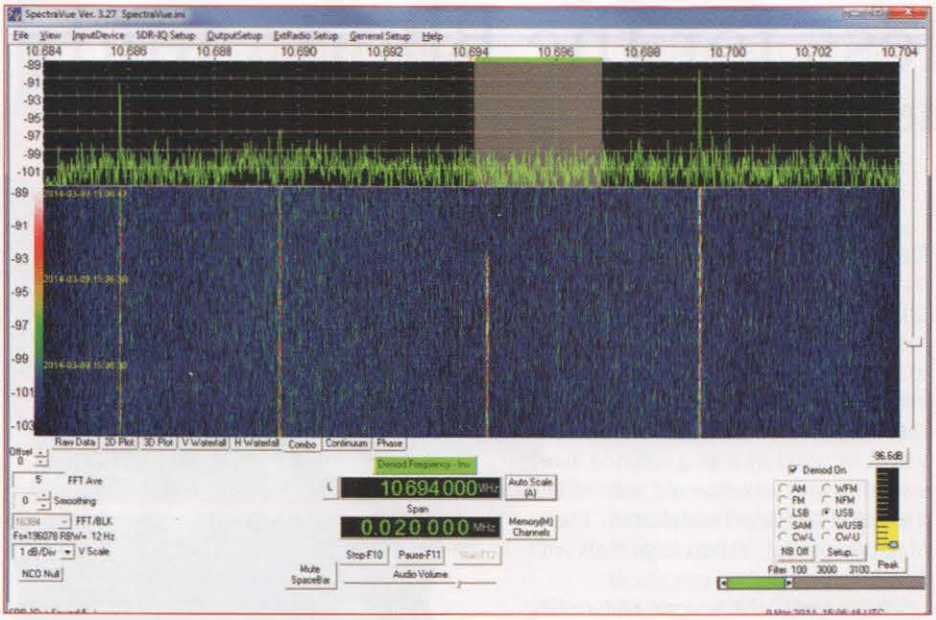

FIGURE 1: 20kHz of the 13cm band during the Dubus CW EME contest.

it doesn't have a web presence. You can watch it via the BATC streamer [9] as it's displayed as part of the test card sequence. You have to be quick, as it cycles thorough the bands and back to the test cards quite quickly! Rob, MODTS tells me that the SDR is only on the repeater output video and is running on a Raspberry Pi that he says is "is only just up to the job anyway so not capable of web too". There are no immediate plans to do a web version just yet, but Rob has promised to change the delay times a bit so it stays on each SDR screen longer!

PLANNED GHz BAND SATELLITE TRANSPONDER. Great news from AMSAT is that a satellite due for launch at the end of 2016 will carry two geostationary 'Phase 4' amateur radio transponders. The Qatar Amateur Radio Society in association with the Qatar Satellite Company [10] have announced that their Es'HailSat-2 communications spacecraft will provide transponders for use by radio amateurs and provide a 250kHz linear transponder intended for conventional analogue operations in addition to another transponder that will have an 8MHz bandwidth. The latter transponder is intended for experimental digital modulation schemes and DVB amateur television. Precise uplink and downlink frequencies remain to be finalised but the uplinks will be in the 2.40-2.45GHz and the downlinks in the 10.450-10.500GHz amateur satellite service allocations. Both transponders will have broad beam antennas to provide full coverage over about 1/3rd of the earth's surface. A team of amateurs led by Peter, DB2OS (President of AMSAT-DL) is providing technical support to this ground-breaking project that is expected to provide an exciting new phase of activity for radio amateurs for the 21st century. I, for one, will be preparing equipment over the next year or so to 'have a go' with what would be the first geostationary amateur satellite transponder.

ACTIVITY NEWS. On 24 March, Roger G8CUB/P and Chris G0FDZ/P worked each other on 134GHz CW. Roger was located at West Tilbury (JO01EL65RR) and Chris was at Higham in Kent (JO01FK22FT). Signals were 559/549 and the distance was 6.721km. Roger will produce a full report for UKuG *Scatterpoint* in due course on this and other recent activity on this band.

I took apart in the *Dubus* 13cm CW EME contest during the weekend of 8-9 March. Activity was high and even with my small 1.9m dish system I managed a work eight stations, including Dima, UA3PTW (KO93BS) for a new CW DXCC and square on 2.3GHz. Despite them being the strongest signal on the band I failed to work SP6OPN. They run QRO to a relatively small dish, so, rather like my own EME station that tends to make you "a bit of an alligator" (large mouth, small ears!)

Down the road from me in Northants was the opposite extreme; running QRP, just 33W to his 3m dish, Charlie, G3WDG worked OK1KIR, G3LTF, HB9Q, ES5PC and W5LUA in a short period over the weekend but, like me, failed with SP6OPN. Charlie could copy his own echoes at just audible level and easy on waterfall. This just confirms that the best way to be reciprocal on EME is to favour dish size over QRO! Like I discussed with Yagis, a larger dish will be 'quieter' due to lower side lobes.

G3LTF had a very enjoyable weekend working with his rebuilt dish on 13cm and was one of the strongest signals on the band with me. Peter says that his dish is definitely working better than before it was damaged in the gales and the backlash has been almost eliminated, improving tracking. Peter worked an impressive 46 stations, including your columnist and two new initials, UA4HTS and UA3PTW. As I don't have a Rx for their band segment yet, I missed out on a number of JA stations, including JA4BLC, who worked 11 stations and heard a number of other Europeans on 2320. JA8IAD worked eight stations, JA8ERE worked 5 stations and JA6CZD (with a 2.4m offset dish) worked 4 stations. Jac, PA3DZL was active using his 3.7m mesh dish and managed to work six initials: UA3PTW #79, SP7DCS #80, DL7YC #81, HB9BCD #82, G4RGK #83, YO8HRI #84. From Italy, Aldo, IK3COJ (with a 4.15m dish and 120W at the feed) worked 13 initials in a total of 29 QSOs. I was very pleased at the level of activity on 13cm during the contest and it just shows what can be done with relatively small systems on this valuable and threatened band. In **Figure 1**, from Sunday afternoon, showing 20kHz of the band on my small system, you can clearly see four strong signals and a couple of very weak ones off the moon.

Back on terra firma, I've been active in the 1296 and SHF UKACs this year with some good DX being worked on Tuesday evenings. On 1296 and 2320 there is enough activity to more than fill the two and a half hours and adding a second band to SHF UKAC guarantees that you are ready for a rest at 2230! In the March 1296 event, I and many stations worked DF9IC (JN48IW) and OZ1FF (JO45BO) at nearly 750km. Both Henning and Kjeld are regulars on the Tuesday night events and in the February event, OZ1FF worked G8OHM on 2320MHz as well. Nick, G4KUX (IO94BP) was QRV on 10GHz during the 25 March SHF event and gave many of us down south some welcome DX and another multiplier on that band. Nick is always a consistently good signal on CW here, as he looks down the Vale of York towards my QTH. As I have said many times, it's great to have all this GHz bands activity twice a month, but let's try and get on the bands outside Tuesday nights as well!

WEBSEARCH

[1] http://dx.camb-hams.com/
[2] www.innovantennas.com/Ifa-benefits.html
[3] www.yu7ef.com/
[4] VK3UM: www.vk3um.com/eme%2Ccalculator.html
[5] K2UYH small station EME: http://bit.ly/1dMNPv9
[6] ON0EME Moon beacon: http://users.skynet.be/on0eme
[7] Mow Cop Web SDR: http://mowcopsdr.boldlygoingnowhere.org:8901/
[8] Southampton University Web SDR: http://websdr.suws.org.uk/
[9] BATC streaming site: www.batc.tv/ch_live.php
[10] Es'HailSat-2 satellite: www.eshailsat.qa/

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Frances Fielding, Fund Raising Manager, frances@blind.org.uk

British Wireless for the Blind Fund

From crystal sets to the internet

British Wireless for the Blind Fund was the brainchild of Sir Ernest Beachcroft Beckwith Towse VC, KCVO, CBE, a blinded Boer War veteran who experienced first-hand the huge difference that a radio could make to a blind person's life. After serving in the First World War as a staff officer working with the wounded in hospitals in France, Captain Towse turned his energies to the service of the blind community. He became Chairman of the British and Foreign Blind Association and travelled the length and breadth of the country fostering interest in the welfare of the blind. By the 1920s the concept of radio as an entertainment medium had blossomed out of David Sarnoff of the Marconi Wireless Communications company's suggestion that radio could be used 'as a music box to be a household utility'. Growing public pressure and the popularity and success of the radio broadcasting in the United States led to the setting up of the British Broadcasting Company in 1922. Daily transmissions started on 14 November 1922, by which time more than one million ten-shilling (50p) licences had been issued.

The idea for the British Wireless for the Blind Fund (BWBF) was born in 1928 when Captain Towse was listening to a makeshift wireless rigged up by two close friends and earthed to a radiator to relieve the monotony of a long stay in hospital. After an appeal for funds broadcast on Christmas Day 1929 by Winston Churchill from his home of Chartwell in Kent, the first 100 crystal sets made by Burne-Jones & Co Ltd were issued to blind people at a cost of 31/6d per set. Headphones cost 7/3d a pair. Since crystal sets depended on their power from radio waves received by a long antenna wire, only a weak sound was received, necessitating the use of sensitive headphones. The Magnum crystal set had large dials with Braille markings.

In the early 1990s, a very interesting discovery was made relating back to the early days of the Fund. A Magnum 1 valve receiver made by Burne-Jones of London was discovered complete in its original postal packaging. The box contained not only the set but also batteries, earphones, a coil of copper aerial wire and some china egg insulators. The 100 foot aerial wire was needed to give a strong signal. Even in 1932, when the D9150 was issued and when receiver controls had already been simplified, setting up the set would have required some skill and would not have easy for someone with a visual handicap. Like the crystal set, all the early Magnum radios specifically manufactured for BWBF utilised the newly formalised Braille code invented by Louis Braille to label the dials on the set. Braille is a system of raised dots representing each letter of the alphabet and by tracing the finger along indentations created by the punches, spelt out words.

The very first crystal radio issued by BWBF

Magnum sets from the E301 to the 3AS1691 with their wooden cases, thermionic valves/tubes and Braille dial markings were issued between 1939 and 1943. Valve radios were a big advance in technology as they allowed incoming signals to be amplified. However, they needed heavy batteries to power them that did not last long. BWBF volunteers used to take and replace the batteries to users of the Magnum sets.

Bush Radio started trading in 1931. They worked with BWBF on producing specially adapted sets that included the Bakelite cased DAC10 that was issued in 1950. This set had five top mounted push button controls, MW and LW preset stations and was smaller and easier to move than the Magnum sets.

In the late 1940s the transistor was discovered and by the early 1960s portable transistor broadcast radios were readily available. BWBF collaborated with Roberts Radio in the early 1950s to produce new models suitable for those whose loss of vision meant they had difficulty using a standard set. The use of transistors to amplify sound instead of vacuum valves meant that the radio could be much smaller, required far less power to operate and was more shock resistant. This advance in technology coupled with modifications to mainstream sets that improved usability for visually impaired users resulted in a series of sets being produced by Roberts from the early 1950s onwards. The R55, issued in 1954, had a turntable mounted into the base of the set for ease of turning and also had top mounted controls. The R303, R600 and R505 incorporated both these features

Delivering some of the earliest British Wireless for the Blind Fund receivers

Roberts RP28 with top mounted controls, first issued in 1993

and were manufactured in the trademark red leather specifically customised for BWBF. The R505, issued in 1974, also had a specially adapted waveband switch.

Bush also continued to make radios for BWBF and their VTR set issued in 1970 had a non-tilting aerial with a smooth plastic moulding on the tip to prevent accidental eye damage.

BWBF is committed to staying at the forefront of technology and continually improving set usability. During the 1980s sets such as the Roberts RM33 incorporated up to five buttons on which radio stations could be preset. This feature has continued through to sets issued present day. With the development of magnetic tape data storage, sets were produced with either a single or dual tape deck. This gave visually impaired people the additional option of listening to pre-recorded music and books and the opportunity of recording messages to send to friends and family. The Roberts RSR50 incorporated a cassette tape facility as well as having large buttons and tone and balance controls.

BWBF briefly collaborated with Clarke and Smith who specialised in educational equipment including the Tapete based talking book system. Their simple, easy to use radios and sound receivers with large controls were a further step towards improved usability. The CS1 1318 model saw the new usage of yellow controls knobs against a charcoal grey body set colour to provide a colour contrast to help those people who still had some residual sight. The yellow and charcoal grey have become standard BWBF set colours.

With the move to compact discs for storage of data, a CD player was added to the range of features of the Roberts specially adapted sets. The 'Symphony' set issued in 2004 was one of the earliest sets with this feature and also included a 'bookmark' facility so that the user could return to the place in the music or story where they had left off.

As new data storage devices have developed, so have the facilities to play them. The currently-issued Concerto 2 set is both a DAB and FM radio, can play tapes, CDs, files from an SD card or a USB memory stick. Ten radio stations can be preset, 5 on DAB and 5 on FM. It has a built in microphone and headphone socket, controls with tactile symbols, a large backlit LCD and can be mains or battery powered.

Internet radio, which involves streaming media, was first pioneered in 1993. The Sonata and Sonata Plus+ sets that use this technology were developed by Solutions Radio of the Netherlands. They originally produced radio units for blind people to enable them to dial-in to their local church to listen to the service. After contacting British Wireless for the Blind Fund in 2007, it was agreed that BWBF would become the UK distributer of the Orion WEB box from June 2008. The set was rebranded in the BWBF charcoal and yellow colours and renamed the Sonata in keeping with the naming convention used by BWBF. Various improvements to the set followed resulting in the current Sonata Plus+ model.

Sonata Plus+ is an internet radio and audio library designed to be simple to use, and fully accessible to blind and partially sighted people, having only five buttons and one dial and a fully spoken menu. It is equipped with wireless connectivity that, once set up, allows the user to move to any part of the house and continue listening. It accesses radio stations from all round the world from which a personalised play list can be set up. The Sonata Plus+ also gives access to an audio library of podcasts, books and talking newspapers.

BWBF

The British Wireless for the Blind Fund is a small, national charity that provide specially adapted, easy to use radios or radio/audio players to registered blind and partially sighted people. These are issued on a free loan basis where the prospective recipient meets the required criteria. BWBF also provide supporting services, answering queries and repairs or replacing sets as necessary. The specially adapted sets are also sold through BWBF Direct. The radio/audio player sets issued are high quality, robust and have high colour contrast tactile yellow controls set against a charcoal grey background. BWBF aims to keep at the forefront of audio technology, responding to changing requirements and technologies and investing in research and development to ensure that sets meet annual and future needs. Current models have DAB and FM radio and facilities to play digital media from tapes, CDs, SD cards and USB memory sticks. Losing one's sight can be socially isolating, particularly for those who live alone. Radio opens up the world to the listener from local, national and international news to drama, music, sport and entertainment. Audio facilities give access to talking books and talking newspapers, helping people to keep in touch. BWBF has over 40,000 sets out on loan, with an annual requirement for 3,500 sets. It is predicted that in 2050, the current 2 million people in the UK experiencing sight loss will double due to an aging population and the increase in incidence of diabetes and AIDS-related macular degeneration. The importance of having an easy to operate radio in the house cannot be underestimated.

Clark & Smith radio cassette player with high contrast yellow controls, first issued in 1994

May 2014 • RadCom
Steve Hartley, G0FUW • e-mail: tec.chair@rsgb.org.uk

Keeping up to date

How did you do in our quiz?

In the March *RadCom* we set a quiz on current UK amateur radio training, assessments, exams and licences. Here are the answers and some explanation.

1: In what year was the first UK amateur radio licence issued? D (1904).

2: How many had been issued by 1906? B (60).

3: How many had been issued by 1914? C (1,600).

4: Approximately how many are now in circulation? D (80,000). If you have not revalidated your licence in the last 5 years, you could be operating illegally! It is easy to revalidate online so check yours now.

5: What is that maximum power allowed by the three licence levels? C (10W, 50W, 400W). These levels do not apply on every band but are the absolute maximums allowed by a standard licences. See Schedule 1 of the licence for more details.

6: In most cases, the maximum power permitted by the UK amateur radio licence is measured. C (At the feedpoint of the antenna). This is a poorly understood part of the UK licence. It's defined in Note (b) to Schedule 1; as the power supplied 'to the antenna', ie at the end of any feeder.

7: What is the minimum age to hold an amateur licence in the UK? D (No age limit).

8: Which of the three levels of licence are permitted to use a club station without supervision? A (Full only). Only those holding their own Full callsign are allowed to operate without supervision (Licence clauses 3(3) to 3(5) refer). It is important to note that 'direct supervision' means being there, not somewhere else on site.

9: What is the licence definition of the suffix '/P'? B (At a location other than the main station address). Note (d) to the licence recommends the use of the suffix '/P' when operating at a temporary location, defined in Clause 17 of the licence as "a fixed location in the United Kingdom which is not the main station address or an alternative address".

10: Which of the three licence levels is allowed to use maximum licence power to control their equipment by remote control? A (Full only). See Clause 10 of the licence. Foundation and Intermediate licensees are limited to 500mW PEP ERP but the Full licence holder can use any band or power that is permitted by the licence.

11: Which of the following bands are Foundation licence holders permitted to use? C (136kHz, 28MHz & 10GHz). Schedule 1 of the licence sets out three tables to show what each licence is allocated. The Foundation licence does not give access to all bands, an increasing number are limited to Full licence holders under Notice of Variation.

12: Which of the following is a Foundation licence holder NOT allowed to do? B (Operate homemade transmitters). The Foundation licence limits holders to using commercially available equipment, unless they are "commercially available kits which satisfy IR 2028". Licence Clause 7(2) rules out 100% homebrew transmitters until Intermediate level.

13: What is the maximum power permitted for an unattended 1.960MHz transmitter using an Intermediate Licence callsign? B (20W). Schedule 2 of the licence describes additional restrictions that apply to unattended operation of beacons. Foundation licence holders have no allocation in Schedule 2.

14: What is the maximum power permitted for an unattended 1.960MHz transmitter using a Full licence callsign? B (20W). The same restrictions referred to in the question apply to both Intermediate and Full licenceees.

15: Which of the licences allows the holder to supervise another UK radio amateur using their radio equipment? D (Foundation, Intermediate and Full). Clause 3(2) of the licence allows all UK licence holders to allow other UK licence holders to operate their radio equipment (that includes the callsign) in their presence and under their direct supervision.

16: Tuning a dipole is part of the assessment for which licence? B (Foundation). This not only means they can adjust the length of a dipole but they can use an SWR meter.

17: How many HF SSB contacts is a Foundation candidate allowed to make under supervision before they pass the exam? D (no limit). Licence clause 3(3)(a) permits any Full licence holder to allow a Foundation licence student to use their radio equipment in their presence and under their direct supervision. There are no restrictions on how many contacts can be made, or the frequency bands that can be used.

18: The practical assessments for which licence requires the candidate to build a radio-related project? C (Intermediate). The Intermediate licence allows holders to build their own transmitters so the practical assessments include the construction of a radio-related project.

19: How many questions were in the very first Radio Amateurs Examination? A (8). However, these required written answers, making use of diagrams where applicable.

20: If you sat one exam at each of the current three levels, how many questions would you be asked in total? C (133). The Foundation exam has 26 questions, the Intermediate 45 and the Full 62, making a grand total of 133. It is important to note that the questions for the lower levels are not included in the higher levels; as you move up there are more questions and they are more difficult.

21: The exams for which licence are marked locally? C (Foundation & Intermediate). Successful candidates can apply for their licence on receipt of the official pass certificate, which takes about a week.

22: How long did it take to use up the G3 plus 3 letter callsign series? C (25 years). January 1946 to 1971.

23: How long did it take to use up the M3 plus 3 letters callsign series? A (6 years). The M3+3 series started in January 2002.

24: What was the highest number of radio amateur exams sat in a single calendar year? C (8,500). We are currently seeing about 2,000 candidates a year sitting UK amateur radio examinations.

25: In which year did the largest number of candidates sit the City & Guilds Radio Amateurs Examination? C (1982). The 1980s were a real boom time and the numbers joining the hobby increased at a massive rate.

So, how did you do? Were there any surprises in the quiz answers? I hope it has helped to explain some of the current state of play, dispel a few myths and, most importantly, highlight the need to keep up to date with the licence.

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Sport Radio

A clever choice of entry category and the closest result yet in the Super League

PHOTO 1: Colin Fallaize, MUOFAL in his shack.

THE NARROWEST MARGIN. The Super League series comprises the six Affiliated Society contests that take place between October and February. Generally speaking the results of the individual events are made public in the same order that they take place, but not so this past season. The chronological release of results held true for the first three events, 6m, 160m and 2m, at the end of which Bristol CG were 64 points ahead of the Camb Hams. But the fourth result to be declared was from the sixth event, 70cm, after which it was clear that Bristol had been well beaten. The Camb Hams won convincingly, making 116 more Super League Points (SLPs) than Bristol (who came 6th), taking a lead of 52 points. Those who follow the series closely knew we would be in for a nail-biting finish, because the Bristol team was claiming more points than the Camb Hams in both of the 80m events. The first of these to be declared was CW AFS, just a few days later. In it Bristol came three places higher than the Camb Hams. This gave them 35 more SLPs than the Camb Hams, cutting their deficit to 17. It meant that if Bristol beat the Camb Hams by one place in SSB AFS they would fail to overcome the remainder of the deficit, but if they were two places ahead in the results the teams would switch places in the Super League.

The SSB AFS results were released about a week later and showed that the Camb Hams had held on by just six SLPs to take the win by a margin of 0.1% from Bristol CG. Spalding & District ARS moved up one place to take third position, with a generally consistent performance in all six AFS events, while Grimsby leapt from 13th place to 4th, entering all six contests (rather than three last time).

Table 1 shows the tiny difference in the final scores of the top two teams – and how close they came to scoring the maximum possible number of Super League points (6,000) – demonstrating just what a tightly fought series this is. The Super League has been running for four seasons now, and with the end of the 2013–14 season the names of Bristol CG and the Camb Hams will each appear on the trophy twice. For the 80m events the Three A's split themselves into regional teams, 'W' indicating West and 'EA' indicating East Anglia in the Table.

WPX CW. I've said it before and I make no apologies for saying it again; if you want to win an award in a major international contest you can give your chances a real boost by picking your entry category cleverly. Colin Fallaize, MUOFAL is a fine example of this (**Photo 1**), because in WPX CW last year he chose to make a 10m Low Power entry. Colin explains why he chose the category he did.

"The reasons for choosing 10m for WPX CW is all about quality. By choosing 10m as a single band there are theoretically more prefixes for less QSOs. There is a reasonable chance of a good Sporadic-E opening, so if the band is in poor condition being in the opening can be an advantage – and of course weak scatter signals can be a help, although people tend to send CW too fast when the signals are echoing, which is a disadvantage to all in serial number contests. The other advantage of 10m is that whilst it is not opening overnight you can get a fairly predictable early morning start and early evening end – although of course if you miss some evening Sporadic-E that is to somebody else's advantage.

"During early 2013, conditions on 10m finally started to make single band 10m contesting more appealing with some periods of decent conditions. The usual north-south path was reliable and the long distance east (morning) and west (afternoon) paths were usually quite predictable, meaning that there was a fair chance of a nice log full of DX. Prior to a contest I like to test the bands, so for a few days before WPX I did a lot of activity on 12m (not 10m, as I didn't want to work the rare ones early), with nice runs; but by Friday there was a definite deterioration in conditions. The Sun was popping again, just at the wrong time, but I decided to go ahead, single band, low power, 10m. Although I find it just as rewarding to work a very weak G station and know that I logged everything as I do to work a 599 signal from the Caribbean, unfortunately the hoped-for conditions were not going to materialise.

"After final propagation checks I decided that it was not worth rising before sunrise for long distance DX. This turned out to be correct, but it is always a risk. Take Saturday; it was quite disappointing, with a few Europeans, but mostly scatter signals with echo, making the copy of serial numbers difficult. By mid afternoon I was considering moving to 15m, because there was no sign of conditions improving, but I allowed for the possibility of Sporadic-E, because when you are in a Sporadic-E window it can be a huge bonus. By early evening I decided it was time to stop for the day. On Sunday I hoped things would improve, but it was not to be. Until about 4pm it consisted of weak scatter signals, then came a short opening to South America. I ended up with just 49 QSOs, but that is just the nature of 10m. A few days earlier it would have most likely taken 20 minutes to make the same number of QSOs. My station is a FT-1000MkV (100W) and a 5/8-wave vertical, about at sea level."

So where did Colin's 49 QSOs get him? You won't be surprised to learn that he came first in Guernsey, so let's widen out the search to other G/M entities. In fact there were no 10m low power entries from *any* other parts of Britain, so I could have won a certificate in the same entry category with just one QSO!

THIS MONTH'S EVENTS. There's not a great deal to tell you about this month in the RSGB HF department, except for the continuing 80m Club Championships; SSB on the 5th, datamodes on the 14th and CW on the 22nd.

It's a very different story above 30MHz though, because there are a whole load of RSGB VHF events this month. This is particularly so on the first weekend, when three events run – at least in part –

RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
May 5	80m Club Championships	1900-2030	SSB	3.5	RS + SN
May 14	80m Club Championships	1900-2030	Data	3.5	RST + SN
May 22	80m Club Championships	1900-2030	CW	3.5	RST + SN

RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
May 3	432MHz Trophy +	1400-2200	All	432	RS(T) + SN + Locator
May 3	10GHz Trophy	1400-2200	All	10G	RS(T) + SN + Locator
May 3-4	432MHz-248GHz Trophy	1400-1400	All	432-248G	RS(T) + SN + Locator
May 6	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
May 11	70MHz CW Δ	0900-1200	CW	70	RST + SN + Locator + Postcode
May 13	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
May 17-18	144MHz May Contest +	1400-1400	All	144	RS(T) + SN + Locator + Postcode
May 18	144MHz Backpackers #1	1100-1500	All	144	RS(T) + SN + Locator
May 20	1.3GHz UKAC	1900-2130	All	1.3	RS(T) + SN + Locator
May 25	70MHz Cumulative #3	1400-1600	All	70	RS(T) + SN + Locator
May 27	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
May 27	SHF UKAC	1900-2130	All	2.3-10G	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
May 3-4	ARI International DX	1200-1200	CW, Phone, RTTY	1.8-28	RS(T) + SN (I's give Province code)
May 4	UKuG Low band	0800-1400	All	1.3-3.4G	RS(T) + SN + Locator
May 18	WAB 7MHz Phone	1000-1400	SSB	7	RS + SN + WAB area
May 18	IRTS 40m Counties	1200-1500	SSB/CW	7	RS(T) + SN (EIs & GIs also send County) May
24-25	CQWW WPX CW	0000-2359	CW	1.8-28	RST + SN
May 25	UKuG	0600-1800	All	5.7-24G	RS(T) + SN + Locator

Δ VHF CW Championship event; + VHF Championship event. For the latest RSGB contest info and results, visit www.rsgbcc.org.

concurrently. The first is the 432MHz Trophy Contest, which takes place for 8 hours on Saturday 3rd. The second is the 10GHz Trophy Contest, which takes place at exactly the same time. The third is the 432MHz-248GHz Trophy, which starts at the same time as the others but runs for 24 hours. The first UKAC of the month is 2m, on the 6th. The 70MHz CW Contest on Sunday 11th seems to be gaining in popularity, because entries were up 50% last year. This will be the fifth year of the event, which now forms part of the VHF CW Championship. Last year there was plenty of Sporadic-E propagation just before and just after the event, but frustratingly little during it! After the 70cm UKAC on the 13th we have the 144MHz May Contest that runs for 24 hours over the weekend of 17-18th. This one is part of the VHF Championship series. With 6-hour and 24-hour sections for Single-Op Fixed and Single-op Open stations, plus an Open section for multi-op stations there are convenient categories for everyone. On Sunday 18th the first 144MHz Backpacker events runs for four hours, the first three of them overlapping the final three hours of the 24-hour contest. Its back to the UKACs on Tuesday 20th, with 23cm, followed by the third session of the 70MHz Cumulatives on Sunday 25th. The final RSGB VHF events of the month are the 6m and SHF UKACs on Tuesday 27th.

The International DX Contest run by the Italian National Society ARI takes place for 24 hours over the weekend of 3rd-4th. This event is unusual in that there are sections for Single-op CW, SSB, RTTY, mixed and Multi-single. For non-Italians the exchange is signal report plus serial number, but Italians give signal report and 2-letter Province code (there are 110 of them). There are no points for working your own country and a differing number of points for working your own Continent (1), other Continents (3), and Italy (10). No single band entries. Multipliers are DXCC entities (except I and ISO), plus Italian Provinces. The third in this year's series of five UKuG Low Band Contests is on the 4th. It coincides with RSGB VHF event running on the same weekend. The Worked All Britain 7MHz Contest on Sunday 18th is a newly introduced, short-duration event. It, along with the Group's 3.5MHz Contest (in March), have replaced the WAB LF Contest. Overlapping the WAB event is another new one for 40m – the IRTS 40m Counties Contest. The rules are basically the same as the IRTS 80m Counties Contest, which was held in January. The CW leg of the CQWW WPX Contest will keep the HF bands busy for the whole 48 hours of the weekend of 24-25th. This is a follow-on event from the SSB leg held at the end of March, so please see the March column for further info. Expect the CW segments of the bands to be packed and some pretty big serial numbers to be handed out by the end, especially if (fingers crossed) propagation on the upper HF bands is favourable – and to that end I would just like to highlight that only one person in the whole of Britain made a single band 10m entry last year (at any power level). Finally, the first in a series of five 5.7/10/24GHz Contests organised by the UK Microwave Group takes place on Sunday 25th.

TABLE 1: Results of the top 5 teams in the 2013-14 Super League events.

	1st	2nd	3rd	4th	5th
6m AFS	Bristol	Camb Hams	Spalding	Trowbridge	Tiverton
160m Club Calls	Camb Hams	Bristol	Wythall	Spalding	Horsham
2m AFS	Bristol	Trowbridge	Spalding	Camb Hams	Bolton
80m CW AFS	Three A's	Three A's (EA)	Three A's (W)	Bristol	De Montfort
80m SSB AFS	Three A's (W)	Three A's	De Montfort	Cray Valley	Bristol
70cm AFS	Camb Hams	Spalding	Trowbridge	Bolton	Blacksheep
Overall Points (% of max)	Camb Hams 5786 (96.4%)	Bristol 5780 (96.3%)	Spalding 5158 (86%)	Grimsby 4804 (80%)	Horsham 4443 (74%)

Bob Titterington, G3ORY • e-mail: ardf.chairman@rsgb.org.uk

ARDF

A review of an PJ80 receiver kit

YOUR RSGB
ARDF: DEDICATED TO DF HUNTING

INTRODUCTION. The Chinese-made PJ80 direction finding receiver was reviewed in *RadCom* in April 2007. The receiver is now being imported into the UK as a kit; part of the CRKits range of products.

The kit arrives packed inside the case of the receiver with the components in two bags, one for the potentiometers, switches and knobs and the other for the through-hole PCB mounted parts. Packed loose are the pre-wound ferrite rod antenna, the earpieces, a cable tie to fasten the ferrite rod to the PCB, the telescopic whip antenna for 'sensing' and the battery terminations that fit into slots on the case.

It is a good idea to download the latest list of parts from the CRKits website (see http://crkits.com/pj80partlist.pdf) and to check off the components against this list. The component identification is reasonably straightforward. For the two 'adjust on test' resistors the kit had 820Ω for 300Ω~1k5 and 18k for 5k~20k.

The two 1000pF capacitors were different types. The hardest part was identifying the three glass encapsulated diodes, which were of three different types. Out came the magnifying glass and it was found that the 1N60 was marked 1N60, the FV1043 was 1043 and the Zener was ST C3V6.

INTERNAL SCREENING. The errata that comes with the downloaded parts list states that the kit does not contain the foil shielding that is incorporated in the factory built versions. The PJ80 is a direct conversion receiver and so has a local oscillator (LO) operating at the frequency being received. In a direction finding competition, this has the potential to cause interference to nearby competitors. The factory built receivers are very good in this regard and the PJ80 LO is inaudible more than two or three metres away. The two pieces of foil required are 84x124mm and each one lines one half of the case, extending upwards from the top of the battery compartment and extending up the top and side walls of the case to finish a millimetre or so short of where the two case halves come together. Cut outs have to be made for the various controls and at the two top corners of the case. It is recommended that shielding is installed if the builder intends to use the receiver in direction finding competitions. **Photo 2** shows the screening installed on a factory built version of the receiver.

The American firm that sources these kits from China has provided a Heathkit

PHOTO 1: The kit as unpacked. Top – case halves, ready wound ferrite rod and telescopic 'sense' antenna. Bottom – bag of through hole components, hardware items, earphones and PCB.

style check list (remember those?) taking the builder part by part though populating the PCB. Construction is subdivided into the audio amplifiers, the LO and finally the RF amplifier. The CRkits notes are well illustrated, albeit in black and white. Testing can be done stage by stage if desired or left to be done in a single process after the PCB has been fully populated. It is wise not to install the 'adjust on test' components R14, R15 and C3 but to 'tack' them into place in case they need changing when testing is carried out. The kit does not provide alternative values and your junk box will have to be raided if any are required.

'ADJUST ON TEST' PARTS. There are three 'adjust on test' parts listed. Typical values are provided for each one and the original

PHOTO 2: Internal screening on a factory built receiver.

Chinese instructions give some information about the role of each. There is arguably a better way of setting up the receiver than that described in the instructions.

The first of these parts, R14, alters the tuning range. The latter is greatest when R14 is zero and the suggested range of R14 is 300-1500Ω.

The tuning scale is a tiny set of marks on the side of the receiver case and there is no real indication of where one is tuned. However, the tuning pot has a mechanical notch, or detent, at mid range and this is detectable as the control is rotated. It is sensible to set up the receiver so that the overwhelmingly most popular frequency for 80m ARDF, 3579.5kHz, is located at this detent. Since the PJ80 is a direct conversion receiver, it is easy to use a general coverage receiver to listen for the LO and thus check the tuning range. With a short circuit for R14, the tuning range turned out to be 3430-3682kHz on the review receiver. This is more than enough to cover the specified 3.5-3.6MHz.

Fitting the supplied 820Ω resistor and adjusting the core of T2 to retune to 3579.5kHz at the position of the detent, gave a tuning range of 3510-3660kHz. The lowest frequency currently used for RSGB ARDF hunts on 80m is 3522kHz for one of the beacons in a sprint race. Hence this result is fine. By sensing the position of the tuning detent, the operator will know that the tuning is close to the popular 3579.5kHz.

Continued on page 77

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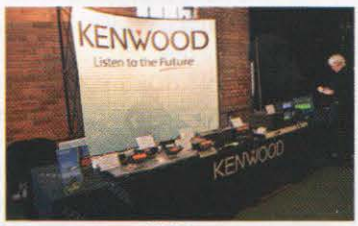

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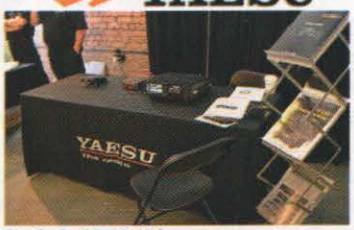

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May 2014 • RadCom
Ron Stone, GW3YDX • e-mail: info@vinecom.co.uk

Rock-Mite QRP transceiver

A crystal controlled radio designed by Small Wonder Labs

Small Wonder Labs was run by Dave Benson, K1SWL and offered the Rock-Mite, of which around 8,000 have been sold world-wide. Now, supply of the kit has moved to Rex Harper, W1REX who runs the qrpme website.

DESIGN CONCEPT. The Rock-Mite is a single-band QRP transceiver for the 80, 40, 30 or 20m amateur bands, CW only, with a nominal 0.5W RF output and direct conversion (DC) receiver. It is crystal-controlled, both receive and transmit, and also equipped with a single-crystal filter at the operating frequency. It has an on-board 8-pin PIC microcontroller that controls a T-R offset on key-down. A brief tap of a push-button control switch reverses the offset to yield a second operating frequency. Pushing and holding on the pushbutton activates the speed adjustment routine for the built-in iambic keyer. If you'd rather use an external keyer or straight key, there's a 'drop-through' mode that allows use of an external keying source. A built-in sidetone oscillator is included.

The iambic keyer has been implemented in a unique way. There is no speed control on the front panel, but a prolonged press on the front panel press-button switch gives an 'S' in Morse, and after that speed can be increased or decreased by pressing upon either lever of a dual-lever iambic paddle. Releasing the levers results in about a two second delay before a further tone is sent and the paddle is ready to send at the newly-selected speed. Holding either side of the paddle closed whilst turning on the power provides a 'straight key' keying line useful also for tuning up.

As the transceiver is crystal-controlled, there is the very minimum of front-panel controls. In the version built by the author only the AF gain control, press-button and headphone socket are on the front panel. The headphone socket is usefully compatible with the 3.5mm stereo plug normally fitted to ear-bud headphones.

Other required connections are for the DC input (8-15V), keyer stereo socket, and antenna socket, generally a BNC socket for QRP transceivers so as to save panel space.

MY KIT. The 40m model was purchased direct from the USA, and arrived in about ten days. As the kit is only about £25 there was no duty or VAT to pay and no 'customs clearance fee' to pay either. For the 40m band, available frequencies being 7015

PHOTO 1: The fully assembled board, courtesy Colin, M1BUU.

7030, and 7040kHz, but there is nothing to prevent users buying crystal pairs at a different frequency. The 7015kHz version was purchased in the belief that more DX could be worked lower in the band. The frequency turned out to be 7013.7kHz, which was a little surprising given that a crystal should have been a little more accurate than that.

The transceiver offers noiseless full break-in achieved with a transistor switch at RF frequency, which is most convenient when using very low power.

There is sufficient audio output available to drive earphones or a small speaker. Most usefully, the earphone socket is compatible with the usual small earbuds used with such equipment that invariably have a stereo 3.5mm plug. Not all kits are so compatible!

Surprisingly, for such a small kit, there is even a reverse-voltage protection diode in the supply leg.

WHAT'S IN THE KIT? As supplied, the basic kit consists of the double-sided PCB (2 x 2.5") and board-mounted components. They are all 'regular' wire-ended components apart from a single 8-pin PIC chip for the keyer and control functions. Pre-wound inductors are used throughout, so there is no need for winding of toroids or other coils. A 4-page basic manual is provided detailing the sequence of fitting components and also operating instructions, but it refers to a more detailed instructional that could be downloaded [1]. No controls or sockets external to the board are supplied in the basic kit, but there is an optional additional kit of parts for the off-board components. This kit comprises a BNC bulkhead antenna connector, a pair of 3.5mm stereo jacks, gain pot, knob, power jack & plug (2.1/5.5mm), power and interconnect wire, subminiature switch, and reverse polarity diode. All that one then needs to supply is an enclosure. I bought the basic board kit and the extra off-board parts kit.

HOW IT GOES TOGETHER. The board is quite tightly packed, but assembly is very much eased by the locations of many of the key components being silk-screened on the top of the board. Construction is advised in stages. The first stage is to fit the 8-pin SMD PIC chip. A significant number of amateurs are put off by any SMD components, but the instructions make it easy. Once done, the remaining components are fitted, with the components marked with silk-screen legends being used to assist location of the others. Helpfully, the two DIL chips used are socket-mounted, which makes mounting them a little easier. **Photo 1** shows the board with all components fitted.

Once the board is completed, it is necessary to provide front and rear panels for the operating controls and sockets for external connections. As no enclosure is provided, a suitable enclosure can be found from the normal sources, or PC board cut to size and soldered to the main board. I decided to mount the little transceiver in a Colman's mustard tin, thus ensuring a 'hot receiver'! The front of the board was tack soldered to the lid of the tin and a rear panel made from PC board, drilled for antenna, DC and key connections and soldered to the rear of the board. Holes were drilled in the mustard tin bottom to allow those to pass through when the rear board was butted up against the bottom of the tin. The main board, being fixed to the lid, was simply slid inside it. The result was reasonably rigid and worked well. The 'Mustard' is shown at **Photo 2**. The whole assembly process was quite simple; the transceiver worked first time and gave immediate results. As a kit, it could be described as an intermediate project. Assembly time was about six hours, no special tools or alignment equipment being needed.

IN USE. Part of the manual contains useful notes on how to tune in a signal for correct zero-beat, using the front-panel switch, and also the use of the switch for keyer

operations. It has to be remembered that this radio is entirely 'rock-bound' by virtue of crystal control. There is no moving it on transmit or receive, apart from listening to the opposite audio image with the front panel press-button. Therefore, if the frequency is occupied, then you have to sit and wait! Once one gets used to the netting procedure it is very easy to use. The inbuilt keyer is a big plus. For some time I had the transceiver on a bedside cabinet and used it if awake early in the morning.

Calling CQ – not generally a habit with flea-power, produced some surprising results, with Africa, North America, Europe and Asia in the log. Contacts were amazed at the results with such low power and operating the tiny transceiver was both exciting and satisfying after using the normal, very much more expensive, equipment at GW3YDX.

The transceiver was then tested for several days, many contacts being made around Europe and even with the east coast of the USA. During the day, with a 40m dipole antenna, there were no signs of overload from broadcast station breakthrough off the signal frequency and, at night, there were no signs of BCI either with the dipole, which is a very good result given the strong broadcast stations around the 40m amateur allocation. However, there were slight signs of broadcast breakthrough when a 2 element Yagi was connected, but it must be said that it is not normal to connect a gain antenna on 40m to a simple DC receiver. Even so, the only station that could be heard was Radio Romania and it was in the background and did not impede contacts. Considering the fairly simple design of the Rock-Mite that is a surprisingly good result.

PHOTO 2: The author's 'Mustard' transceiver.

Reports on the transmitted signal of the Rock-Mite were consistently good. Images of the transmitted signal on a SDR (K3 + N8LP LP-PAN) display of ±40kHz of the fundamental showed a clean transmit signal. Stability was adequate, the radio drifting around very little from switch-on.

Some useful optional accessories are available from other sources. The references below give the details. There is also a supplementary extra-detail assembly guide written by Small Wonder. It closely resembles the style of the old Heathkit manuals that older amateurs will remember.

CONCLUSIONS. This tiny radio gave the author more fun than he has had for a very long time and that is what the hobby should be about. It is an easy project to cut one's teeth on and the SMD part really is easy to fit. Dave Benson answered a couple of post installation queries fast and comprehensively, although please note that production of the kit has moved to *www.qrpme.com* these days.

REFERENCES

Extra-detail assembly /trouble shooting manual - *http://smallwonderlabs.com/docs/RMhelps.pdf*
http://www.qsl.net/n0rc/rm/ contains useful supplementary information including some add-on kits and suggested modifications.

ARDF

Continued from page 74

C3 is an 'adjust on test' component that alters the tuning range of the output tuned circuit of the RF amplifier. It is suggested that this stage is tuned to 3579.5kHz to give best sensitivity at this important ARDF frequency. Providing T1 will peak up at 3579.5 with the 50pF provided then all is well. The review receiver duly complied.

SETTING UP THE 'SENSE'. The final 'adjust on test' component is R15, which is placed in series with the sense antenna and controls the difference in the signal strength when the receiver is placed in the two possible positions (facing towards or facing away from the transmitter). For more information about the need for 'sense' please refer to the April 2007 *RadCom* article or to the RSGB book *Radio Orienteering – the ARDF handbook.*

This is a crucial parameter and it will pay to set up the sense with care. To do this an 80m signal is required and a transmitter is needed with a wholly vertical antenna to radiate the surface wave signal necessary for good adjustment. Wire a 20k carbon variable resistor across the pads for R15 on the PCB (thin wires can be brought out of the case through the same hole as the sense push button) and go about 200m from the source. With the whip antenna fully extended and the button pressed, adjust the 20k pot for the greatest difference between the signals received with the two orientations (facing towards or facing away from the transmitter) of the receiver. The result is dependent on the height above ground that you hold the receiver and on the ground conductivity.

The result for the review receiver was 13k8 compared to the 18k provided in the kit. The difference in signal strength between the two possible positions of the receiver was superb and was very large indeed. A fixed resistor of 15k was then inserted and excellent results were still obtained; more than good enough for any level of ARDF competition. The perfectionist will wish to use a parallel combination of resistors to make up the optimum value and thus obtain the best possible performance.

AN IDEAL CLUB PROJECT. This kit makes a first-rate club or group project. Newcomers to the hobby have the achievement of building a receiver and getting it to work. Since the circuit design is so simple and all the components are 'through hole', neither of these tasks is overwhelming.

By paying attention to optimising the 'adjust on test' components, the resulting receiver can be expected to out perform the factory built versions in DF competitions using 3579.5kHz.

Once built, the receiver can either be used for a club ARDF competition or used to track down noise and interference from computers and switch mode power supplies. 3.5MHz is a good part of the spectrum to use to locate the source of these problems.

The sensitivity of the completed receiver is not the greatest (see *RadCom* April 2007) but it is perfectly adequate for classic 80m DF hunts in the UK where our wooded areas are not overly large and the hidden transmitters are no more than 2-3km away at most.

SDR-kits are thanked for providing the review kit. Kits cost £25.80 inclusive of VAT but carriage is extra. See www.sdr-kits.net/Webshop/products.php?94&cPath=6.

ARDF Events in May and June

ARDF Festival
Friday 9 May (evening) 80m Sprint race, Highgate Common, nr Dudley, GR SO842900
Saturday 10 May (afternoon) 2m Classic race, Wyre Forest (The New Inn), GR SO756792
Sunday 11 May (morning) 80m Classic race, Sutton Park (Blackroot Car Park), GR SP110971
Sunday 15 June 80m, Rowney Warren, Shefford, GR TL123404

Details at www.rsgb.org (main site, under the radio sport tab, select ARDF).

RadCom

HF F-Layer Propagation Predictions for May 2014

Compiled by Gwyn Williams, G4FKH

	3.5MHz	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	24.9MHz	28.0MHz
Time	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220
(UTC)	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020
*** Europe								
Moscow	2.....177	85.....5888	87.223458888	.4767777886.	..67887888..	.....7...	.....	.....
*** Asia								
Yakutsk	.....	.....	4.....3555	666655667777	...66663....	.....	.....	.....
Tokyo	.....	.....	.....	.....	.....4..	.....	.....	.....
Singapore	.....12.	.....688.	.....575.	.....66..	.....466..	.....5...	.....	.....
Hyderabad	.....	355	3665	5654	.....355..	.....	.....	.....
Tel Aviv	9.....899	99.....8999	473.....7887	...4..45773.	...4..4576..	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	.....	.6.....7..	252.....54.	.43.....63	.....5.	.....	.....7.	.....
Perth	.....	.....232.	6634	.....	.....	.....	.....	.....
Sydney	.....	.....37..	.....67..	.....34..	.....	.....	.....	.....
Melbourne (LP)	.....	2995.....	8999.....7	89995.....69	7.77.....78	78	.....7.	.....
Honolulu	.....	.....	.....	...3.....	...35.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....4...	.....	.....	.....	.....
W. Samoa	.....	.....	.....	.....	...4555.....	.....	.....	.....
*** Africa								
Mauritius	2.....22	7.....5888	5.....8887	58874	.....5...	.....	.....	.....
Johanesburg	.....	.2.....454	7876	.....86..	.....56...	.....54...	.....	.....
Ibadan	1.....11	76.....556	773.....2777	.77.....6877	..76..35784.	..47....88..	.....88..	.....65..
Nairobi	3.....22	82.....788	63.....666	65.....5676	..3....4676.	.....4566..	.....75..	.....
Canary Isles	77.....276	887.....788	8875....6888	87873.568888	..8998899998	...88899998.	...5..5577..	.....55..
*** S. America								
Buenos Aires	.....	553.....3	888.....78	657.....88	565	.....55.	.....	.....
Rio de Janeiro	.....	66.....26	887.....589	664.....788	876	.....76.	.....6..	.....
Lima	.....	553.....3	8773.....68	6355.....78	.....	.....	.....	.....
Caracas	.....	44.....4	8884.....78	75874....588	...565445786	....6566676.	.....5..	.....
*** N. America								
Guatemala	.....	331.....	7774.....7	4.35.....36	.....4.	.....	.....	.....
New Orleans	.....	662.....	7663.....5	4.....36	.....	.....	.....	.....
Washington	31.....	774.....4	8775.....7	54..5....367	.....45.	.....	.....	.....
Quebec	6.....	873.....7	756.....57	....3..4456.	.....	.....	.....	.....
Anchorage	.....	.....	43.....3	4.65..555467	..55...6666.	.....	.....	.....
Vancouver	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco	.....	.....	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....	.....	.....	.....	.....

Key: Each number in the table represents the expected circuit reliability, eg '1' represents reliability between 1 and 19% of days, '2' between 20 and 30% of days, etc. No signal is expected when a '.' is shown. **Black** is shown when the signal strength is expected to be low to very low, **blue** when it is expected to be fair and **red** when it is expected to be strong. The RSGB Propagation Studies Committee provides propagation predictions on the internet at **www.rsgb.org.uk/propagation/index.php**. An input power of 100W and a dipole aerial has been used in the preparation of these predictions; therefore a better equipped station should expect better results. The predicted smoothed sunspot numbers for May, June & July 2014 are respectively (SIDC classical method – Waldmeier's standard) 77, 76 & 75 and (combined method) 76, 77 & 78. The provisional mean sunspot number for March was 82.0. The daily maximum / minimum numbers were 115 on 3 March and 78 on 14 March.

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IOTA
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General Manager
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Telephone: 01234 832 700, Option 9

HEADQUARTERS AND REGISTERED OFFICE

3 Abbey Court, Fraser Road,
Priory Business Park, Bedford MK44 3WH
Telephone: 01234 832 700
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QSL BUREAU ADDRESS

PO Box 5, Halifax HX1 9JR, England
Telephone: 01422 359 362
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The RSGB has compiled the questions most frequently asked by Members at www.rsgb.org/faq/

Band Plan
The latest version of the band plan is always available on the website at www.rsgb.org/committees/spectrumforum/band-plans.php

Good Operating Practice
The RSGB fully supports the code of conduct and encourages all amateurs to read the advice at www.rsgb.org/tutors/pdf/good_operating_practices.pdf & www.rsgb.org/operating/ethics/docs/ethics_and_operating.pdf

RSGB Tech
The purpose of this service is to be the first port of call for technical queries on amateur radio matters. It is open to all radio amateurs. See http://groups.yahoo.com/group/rsgbtech/

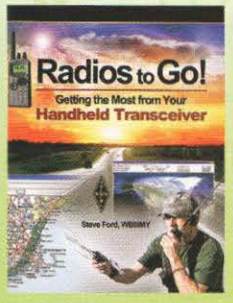
RSGB Shop
All RSGB goods - books, filters, clothing etc - can be purchased online at www.rsgbshop.org/

Club Finder
Use the website to find your nearest radio club and check out the facilities they have to offer. www.rsgb.org/clubsandtraining/

WEBSITE

Main website: www.rsgb.org
Members Pages: Log in using your callsign ***in lower case*** as the user name and your Membership number, without the leading zeros (see your *RadCom* address label) as the password.
If you need to update your Membership details, please visit www.rsgb.org/myaccount/

Operating, DX, QRP



ARRL Radios to Go!

Getting the Most from Your Handheld Transceiver

by Steve Ford, WB8IMY

Modern technology has allowed manufacturers to pack a wealth of features into handheld transceivers. With so many features, however, it isn't always easy to get the full benefit from your investment. This book sets out to show you how to get at the features and use them day to day. *Radios to Go!* lets you unlock 'hidden' capabilities Most dual-band 2m/70cm handheld transceivers can be used to communicate through amateur radio satellites, but you usually won't see this discussion in your average user manual, just one area covered in *Radios to Go!*.

If you own a handheld transceiver and want to get more out of it, or if you're trying to decide which transceiver to buy, *Radios to Go!* is the essential guide.

Size 155x228mm 112 pages
ISBN: 9780 8725 9307 7
Non Members £14.99
RSGB Members £12.74

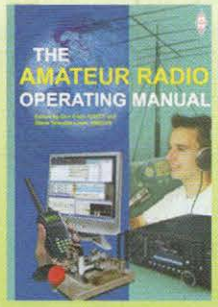
Radio Orienteering - The ARDF Handbook

By Bob Titterington G3ORY, David Williams, M3WDD and David Deane, G3ZOI

Amateur Radio Direction Finding (ARDF) is an outdoor pursuit which combines orienteering with the amateur radio skill of direction finding. Competitors use their skills to locate a number of hidden transmitters within a given time limit.

Radio Orienteering - the ARDF Handbook is packed with information, you'll find everything from 'top 10 tips to improve performance' to 'organising an ARDF event'. The book provides a general overview of the sport, and is an excellent and rounded reference work, highly readable, well-illustrated and is ideal for investigating this sport for the first time or for those looking to extend their knowledge.

Size 175x240mm 112 pages
ISBN 9781-9050- 8627-6
Non Member's Price £9.99
RSGB Member's Price £8.49



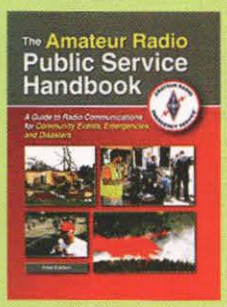
RSGB Radio Amateur Operating Manual

7th Edition By Don Field, G3XTT & Steve Telenius-Lowe, 9M6DXX

Since the first edition of the *RSGB Amateur Radio Operating Manual*, it has provided practical information on many different forms of amateur radio operating. This latest edition covers subjects from the basics of setting up a station for maximum efficiency, DX Operating, through to D-Star, Satellites and much more. Readers will find information detailing the numerous changes to the amateur bands as more countries have gained frequencies.

This Seventh Edition of the *RSGB Amateur Radio Operating Manual* has lots of brand new material. New to the hobby, or an established amateur, everyone will find this book a mine of useful and practical information.

210x297mm, 240 pages,
ISBN 9781-9050-8663-4
Non Members' Price £16.99
RSGB Members' Price £14.44



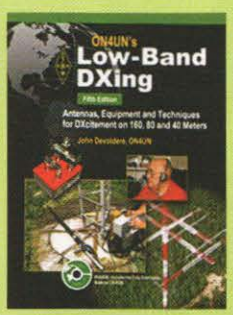
ARRL Amateur Radio Public Service Handbook

Prepare for the Unexpected!

The UK has many fun runs and public events.
For all these events when getting the message through is critical - amateur radio works! And has consistently been the most reliable means of communications when other systems have failed. This book provides a guide to how American radio amateurs work closely with disaster relief agency officials, and other response organisations to offer wireless communications aid.

The Amateur Radio Public Service Handbook is for all amateurs who volunteer their time and skill to serve their communities.

Size: 208x275mm, 304 pages
ISBN: 9780 8725 9484 5
Non Member's Price £28.99
RSGB Member's Price £24.64



ON4UN's Low Band DXing

25 Years of Low Band Success!r

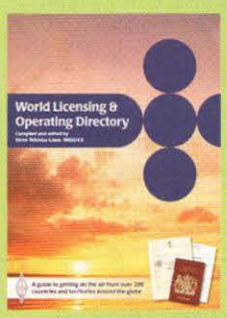
New Fifth edition By John Devoldere, ON4UN

Now been thoroughly updated with lots of new material. You will find many new highlights including a thoroughly revised discussion of receiving antennas and how to greatly enhance their operational bandwidth. There is a new examination of phased arrays, with new concepts such as the hybrid-fed 4-square array and opposite-voltage feed system. This is a must-read for every serious antenna builder

FREE CD
CD-ROM included with the book in a fully searchable PDF format as well as ON4UN's software (Windows XP only).

Size: 210x274mm, 672 pages,
ISBN: 978-0-87259-856-0

Non Member's Price £34.99
RSGB Member's Price £29.74



World Licensing and Operating Directory

By Steve Telenius-Lowe, 9M6DXX

Taking your radio on holiday or organising a DXpedition, the *World Licensing and Operating Directory* is the guide for you. Meticulously researched and has input from nearly 100 contributors. There is all the information you need to get on the air from over 200 countries and territories around the globe.
Lavishly illustrated throughout with over 230 photographs and maps.

This unique book will appeal equally to hardened contesters or DXers looking for a competitive station to rent and to those who simply want to complement their family holiday with some amateur radio operation.

Size 240x170mm 160pages
ISBN: 9781-9050-8646-7

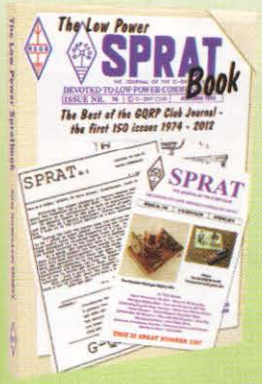
Non Member's Price £12.99
RSGB Member's Price £6.49

SALE 50% OFF RSGB Members

FREE P&P

Order on the internet at **www.rsgbshop.org** or you can order by post making cheques and postal orders crossed and made payable to Radio Society of Great Britain or telephone your credit card order to **01234 832 700**. Open 8.30-4.30 (Mon-Fri). Send no cash. **Post & Packing**: Standard Delivery - 2nd Class Post (4-9 Days), For one item £1.95, For two or more items: £3.50, **For orders over £30.00 standard delivery is FREE.** Priority Delivery - 1st Class Post (2-4 Days), For one item £2.95, For two items: £4.95 , For three or more items: £5.95. **Overseas:** Worldwide Surface Delivery, For one item: £3.00, For two items: £5.00, Extra items: £1.00 per item. Worldwide Air Delivery: For one item: £9.00, For two items: £15.00, Extra items: £3.00 per item.

& Morse books



Low Power - Spratbook

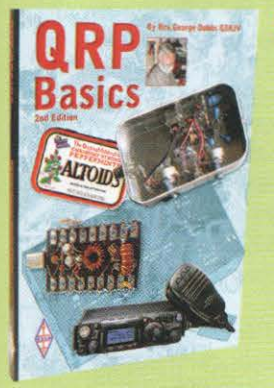
The best of the GQRP Journal - the first 150 issues 1974 - 2012

QRP - the art and science of low-power operation - is one of the most popular aspects of amateur radio. In the UK, the G QRP Club has been a leading light in this area of operation since its formation in 1974. Its journal, SPRAT is recognised as one of the world's leading QRP publications and it has now reached its 150th edition. This milestone is marked by this publication of this book.

The Low Power Spratbook is divided into seven parts, covering transmitters, receivers, transceivers, antennas, ATUs, Morse keys and keyers, and a section for those circuits that do not fall happily into any particular part. Circuits vary in complexity from an "ultra-simple" 80m CW transceiver using just 14 parts to the more sophisticated 'Sparkford', designed by Walford Electronics and also for use on 80m CW. You will find early 'classics' within these pages, including the 'OXO' transmitter from 1981 and the 'ONER' dating from 1985 / 1986, both GM3OXX designs.

The Low Power Spratbook will appeal to the dedicated QRP enthusiast through to all those who have never tried QRP construction work before.

320 pages, 174x240mm,
ISBN: 9781 9050 8686 3
Non Members' Price £14.99
RSGB Members' Price £12.74



QRP Basics

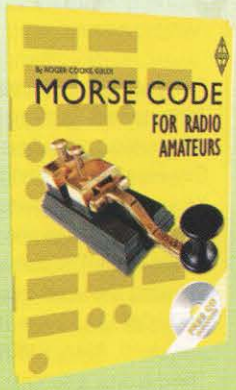
By Rev George Dobbs, G3RJV

This new second edition of *QRP Basics* has been thoroughly updated and continues to provide the ideal guide to low power amateur radio. If you want a new challenge, or have just wanted to try QRP, or even simply want to improve your QRP station, then *QRP Basics* will help you do all of these things.

QRP Basics starts with the 'Why' - what makes so many so enthusiastic about QRP - and then concentrates on the 'How'. Good, solid advice includes choosing commercial QRP equipment - both ready-made and kits, simple antennas and operating tips. Much of the book deals with the art of home-construction, providing practical advice on workshop techniques, and choosing and using components. Chapters are dedicated to simple construction projects based on tried and tested designs. These cover test equipment, transmitters, station accessories, and transmitting and receiving equipment for beginners. Appendices explain where to buy components and how to find more information.

If you are already a QRP operator, *QRP Basics* is certain to improve your experience. If you are new to this part of amateur radio, *QRP Basics* is everything you need to get started.

174x240mm, 208 pages,
ISBN: 9781 9050 8684 9
Non Members' Price £14.99
RSGB Members' Price £12.74



Morse Code for Radio Amateurs

11th Edition

By Roger Cooke, G3LDI

Morse Code for Radio Amateurs is the latest, updated and expanded 11th edition of the RSGB's book designed to show how to learn Morse code and get the maximum enjoyment from using it.

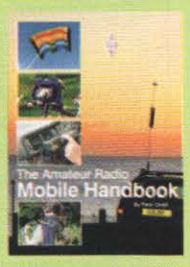
Morse Code for Radio Amateurs has always set the standard for books covering Morse code and this edition is no exception. Morse enthusiast Roger Cooke, G3LDI has expanded this edition to be 50% bigger than its predecessor. As you would expect this book covers the history of Morse but there is much more besides. There are sections that guide you through abbreviations and prosigns, getting started, using computers and how to increase your speed. There is even a chapter on keys that discusses the way to use a straight 'pump' as well as modern keys and paddles. The book also describes the latest learning techniques involving computers and provides a guide to operating in contests.

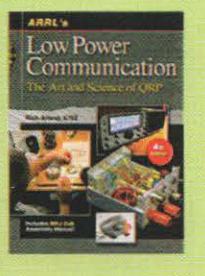
FREE CD:
Included with this book is a free dual mode audio/ computer CD. There is nearly an hour of Morse code audio recordings, providing the opportunity to learn Morse code in the car or at leisure by playing it in any regular CD player. The computer readable section also contains these audio files as MP3 files and a whole host of Morse software from learning to contesting, along with lots of bonus material.

Morse Code for Radio Amateurs is the essential guide to Morse Code and there is no better start for anyone wanting to add "code" to their skills.

Size 210x297mm, 208pages,
ISBN: 9781 9050 8692 4
Non Members' Price: £8.99
RSGB Members' Price: £7.64

For more great Amateur radio reads
www.rsgbshop.org





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3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

Please send news reports to radcom@rsgb.org.uk. To get future events listed here and put on GB2RS, e-mail details of your meetings as early as possible to GB2RS@RSGB.org.uk and we'll do the rest. We need to know your club name, RSGB Region number, contact name & phone number, date of meeting and detail of meeting. Example: South Bristol ARS, Region 11, Len, G4RZY, 01275 834 282,29 October, On the Air. It's that simple. Please note that we don't normally print 'closed', 'TBA' or 'every Tuesday' type submissions. **The deadline for the June *RadCom* is 22 April and for the July edition it's 22 May.** For GB2RS, the deadline is 10am on the Thursday for the week of broadcast. If you need to amend your club details, please visit www.rsgb.org/clubupdates.

INTERNATIONAL

Pafos Radio Club, Cyprus,
Richard, 5B4AJG, 00357 9 785 7891,
5B4AJG@cyprusliving.org

NATIONAL

AMSAT-UK
http://amsat-uk.org/
Weekly net every Sunday 10am, 3.780MHz
Civil Service Amateur Radio Society
Weekly net every Tuesday, 8pm, 3.763MHz

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

REGIONAL MANAGER: JASON, O'NEILL, GM7VSB, RM1@RSGB.ORG.UK

Ayr ARG
Ralph, GM4SQO, 01292 285 281
14 Amateur radio in Bulgaria, MM0YET
28 AGM
Border ARS
Alex, GM8BDX, 01890 830 607
9 Club meeting
Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723
2 Normal club night
9 144MHz DF hunt, meet in Old Ship Inn car park (east) 6.30pm
14 On-air activity night
Kilmarnock & Loudoun ARC
Graham, MM3GDC,
mm3gdc@btinternet.com
4, 11, 18, 25 Sunday club 9am-1pm
6, 20 construction/education night
8, 15, 22, 29 Construction
13, 27 Club night, 7pm
Livingston & DARS
Norman, GM1CNH, 07740 946 192
6 Guest speaker
13 Morse code practice
20, 27 Morse, training and operating
Lothians RS
Alan J Masson, GM3PSP, 0131 623 4580
14 DF hunt, Peter, GM4DTH
28 DXpedition to Swaziland 3DA0, GM3TAL
Stirling District ARS
John McGowan, gm0fsv@gm6nx.com
1, 8, 15, 22, 29 Weekly club meeting
4, 11, 18, 25 Construction, training, projects and operating, 10.30am till late afternoon

NEXT DEADLINE

The deadline for the June *RadCom* is 22 April

Four members of **Kilmarnock and Loudoun ARC** assisted East Ayrshire Brownies with their communication badges at the World Thinking Day event held at Shortlees Community Centre, Kilmarnock. The youngsters had to spell their name and town in phonetics and pass a greeting on the radio. The callsign was GB2WTD (World Thinking Day) and club members present were Peter, GM7AAJ (organiser), Davie, 2M0YFR (club president), Allan, 2M0VNW and Allan, GM3OZB. The day was a success with 21 Brownies getting their communicators badge (100% success) and the girls seemed to enjoy the experience, as it was reported that the radio station was the topic of conversation during their lunch break. The photo shows Peter, GM7AAJ with a group passing greetings on the bands.

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

REGIONAL MANAGER: POST CURRENTLY VACANT

Aberdeen ARS
Fred Gordon, MM0ODL, 01975 651 365
1 Junk sale
8 Mills on the Air preparation evening
10, 11 Mills on the Air weekend
15 Construction evening
22 Discussion night
29 Morse and on the air

The GB7DD D-Star Repeater in Dundee was shut down due to lack of use and has been replaced by a Motorola MotoTRBO DMR TDMA digital voice repeater supplied by Martin, MM0DUN. GB7DD is the first DMR repeater on-air in Scotland and is a colour code 1 UHF repeater on 439.6625MHz with a -9MHz split. Anyone interested in learning more about DMR should visit the GB7DD website at www.gb7dd.co.uk and also the DMRUK website at www.dmruk.net.

REGION 3: NORTH WEST

REGIONAL MANAGER: KATH WILSON, M1CNY, RM3@RSGB.ORG.UK

Bolton Wireless Club
boltonwireless@gmail.com
12 Show & Tell
26 Closed for bank holiday
Chester & DRS
Bruce Sutherland, M0CVP, 01244 343 825
6 Operating night
13 Committee meeting
20 The other man's shack
27 Surplus sale
Chorley & DARS
Mark, G1PIE, procter_family@sky.com
4 MX0ISN, Waterways/canals event weekend
South Manchester R&CC
Ron, G3SVW, 01619 693 999
1 Project update: The Sudden Receiver, Peter, G0BHP
8 Cloud computing, Dave, G4UGM
15 AGM
22 Morse quiz, Ron, G3SVW
26 Technical forum
29 PC clinic, Dave, G4UGM
Stockport RS
Nigel Roscoe, 07973 312 699
6 IOTA explained, plus G5O goes to the Orkneys
20 Society meeting, Walthew House
27 On the air from Walthew House
Thornton Cleveleys ARS
John E Rodway, G4FRK, 01253 862 810
5, 26 Closed for bank holiday
12 Talk by Richard, G3CWI from SOTAbeams
19 Construction project-practical
Wirral & DARC
Simon, G6XHF, 0151 601 3269,
6 2m UKAC contest
7 Social Black Horse Lower Heswall
13 70cm UKAC contest
14 Lost Rivers of Wirral by Gavin Hunter
20 23cm UKAC contest
21 Social Hooton Hotel, Hooton
27 6m UKAC contest
28 Test and build night
Workington & DARC
Alex Hill, G7KSE, mx0wrc@gmail.com
12 Dip into the RSGB Archives 3

As part of the RNLI SOS radio week **GM0KMJ** and **GM0BKC** operated from the Silloth Lifeboat Station on the first weekend of the event. During the event some photos and a short video was produced for Ham Nation. The video was shown in episode 133 and votes as the viewers choice award in episode 140. This is the 2nd award for GM0KMJ. See http://twit.tv/hr.

REGION 4: NORTH EAST

REGIONAL MANAGER: NIGEL FERGUSON, G0BPK, RM4@RSGB.ORG.UK

Angel of the North ARC
Nancy Bone, G7UUR, 01914 770 036
2 Advanced exam
5, 26 Closed
12 On the air
19 Talk, all welcome

Denby Dale RC
Richard, M0RBG, 07976 220 126
5 80m CC SSB
7 Introduction to LOTW and *Club Log*, Richard, M0RBG
10, 11 Mills on the Air weekend - GB2TMI and GB4WMM
14 80m CC Data + OTA at 1930 ±145.575MHz
18 G6LD in WAB 7MHz Phone from Cartworth Moor 1000-1400
21 Torch & community responding, Kevin, G0LUU
22 80m CC CW
28 Evening on the air from 1930 on ±145.575MHz

Hornsea ARC
Gordon MacNaught, G3WOV, 01377 240 573
7 Fox hunt prep night
14 Club night
21 Mobile HF, M0GVZ
28 Quadracopters, G7MFO

Mexborough & DARS
Darrell, G0FUO, 0788 742 3221
2 Advanced exam
9 Final preparations for charity bike ride
16 International Museums preparations
23 Film night
30 Vintage radio talk

Sheffield & District Wireless Society
Krystyna, 2E0KSH, 07884 065 375
7 How to use *Wintest*, plus demo of other logging software
21 Morse workshop

Sheffield ARC
Peter Day, G3PHO, sarc@g3pho.org.uk
12 GB3RCM Comms module 2014
26 Echolink & IRLP, Steve, M1ERS

Congratulations to **Mexborough & District ARS** members Marie, M6RFH and Brian, M6OEB on passing the Foundation exam. Other members are looking forward to hearing them on the air.

Denby Dale ARS will once again be co-ordinating the annual Mills On The Air event over the weekend of 10 and 11 May. Full details of how to register, see the stations taking part and claim a certificate are shown on DDARS website, www.g4cdd.net. Taking part in Mills on the Air is a great way to promote the hobby but also to help and publicise the work done by SPAB (Society for the Protection of Ancient Buildings) in keeping alive industrial heritage. If you would like to take part by running a station, approach a wind or watermill or even an ancient steam driven mill, ask if they are taking part and would they like to have an amateur radio station as part of their event to promote awareness of the mill.

REGION 5: WEST MIDLANDS

REGIONAL MANAGER: POST CURRENTLY VACANT

Aldridge & Barr Beacon ARC
Albert, G0KFS, 01922 614 169
5 Closed
19 HF on air

Bromsgrove & DARC
Chris, M0BQE, 01905 776 869
2 AGM
9 HF night
16 Committee
23 VHF / data night
30 Museums on air planning

Central Radio Amateur Circle
Martin Hallard, G1TYV, 07906 905 071
2 Advanced exam
6 144 UKAC contest meeting
8 Group meeting
17 Barr Beacon
22 On the air

Cheltenham ARA
Derek Thom, G3NKS, 01242 241 099
15 The Atlantic Rowing Challenge
20 Lunch

Coventry ARS
John, G8SEQ, 07958 777 363
2 Charity quiz night
5, 9, 12, 19, 26 Club net from 8pm on 145.375MHz
9 No meeting
16 1st Round G4ZMC Trophy, Sowe Common
23 Radio workshop on PSK31
30 Wine & cheese evening

Dudley and District ARS
Carl Roberts, M0ZCR, m0zcr@live.co.uk
6 2m UKAC
10, 11 Mills On The Air, open weekend, all welcome. G3CWI SOTA talk (Saturday)
13 M0RSD on air, club casual
20 On the air & natter night
27 Open discussion

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595, daytime, www.g4aym.org.uk
5, 26 Crickley Hill operating/picnic
12 Outdoor VHF operating (weather permitting)
19 Shack operating & DF tune up

Midland ARS
Norman, G8BHE, 07808 078 003
7 Open meeting and training classes
14, 28 Committee meeting, OTA & training
18 Dunstable Downs Radio car boots sale at Stockwood Park Luton
21 Planning outside and social events, training classes

Rugby ATS
Steve, G8LYB, 01788 578 940
3 General radio and technical activities
6 UKAC 144MHz, radio operation and projects
10 Using SDR RXs; Softrock on TS-2000X IF and SDR Hunter all band Rx by Neil, G3RIR
13 UKAC 432MHz, radio operation and projects
17 Committee meeting
20 UKAC 1296MHz, radio operation and projects
24 A video about vintage electronics by Mike, G8CTJ
27 UKAC 50MHz, radio operation and projects
31 Practical project session, bring you current project along

South Birmingham RS
Gemma Gordon, M6GKG, gemmagordon.m6gkg@gmail.com
1, 8, 15, 22, 29 Training classes with Dave Murphy, G8OWL
2, 9 Dismantling surplus equipment
5, 26 Bank Holiday – no meeting
6, 13, 20, 27 Coffee morning in the club room 11am to 1pm all welcome
12 Field Day meeting
16, 23 Work in the shack and ragchew

Sutton Coldfield ARS
Robert Bird, spirit.guide@hotmail.co.uk
3 GB4FMC for BIWOTA from Fazeley Mill Marina
5, 20 Open net, 145.250MHz, 7.30pm
11 GB4NHM at New Hall Mill event
12, 26 Club meeting
13 Open net on 70.475MHz

Telford & DARS
Mike, G3JKX, 01952 299 677
7 GX3ZME OTA plus committee meeting
10, 11 GX3ZME OTA in the field
14 Surplus sale
21 Test equipment evening
28 2m DF hunt

Worcester RAA
Rich, M0UVA, secretary@m0zoo.co.uk
4 Breakfast Meeting at the Goring Café, 9am
5 80m CC SSB contest
7 Discussion with the RSGB Regional Manger, Mick, G4EFO
11 Mills on the Air at High Salvington Mill
14 Discussion evening
21 10 trips to the Haute Savoie, Jonathan, G1EXG,
22 80m CC CW contest
28 GX3WOR OTA

Wythall Radio Club
Chris, G0EYO, 07710 412 819
1-31 Morse code activity month
2, 9, 16, 23, 30 7.30pm Nibbles Night in the Shack
4, 11, 18, 25 Club net, 145.225MHz, 8pm
5 80m CC SSB, 8pm
6, 13, 20, 27 Morse Class, 7.45pm
6 Free 'n' Easy/144 MHz UKAC
10 Mills On The Air Day from 9am at Avoncroft Museum
13 Committee meeting 8.30pm
14 80m CC Data, 8pm
20 From Top Band to Radio 4, Jim, G4AEH, 8.30pm
22 80m CC CW 8pm
24, 25 CQ WPX CW Contest
26 Curry night at the Monsoon, 6.30pm
27 Centenary Talk 2: the RSGB in wartime, Chris, G7DDN, 8.30pm

NEXT DEADLINE

The deadline for the June *RadCom* is 22 April

In amongst preparations for their successful Rally in March, **Wythall Radio Club** were also celebrating more exam successes. Two Foundation courses have been running almost concurrently – one 'traditional' and a second new 'online' course. While results are still awaited for the online course, 5 new amateurs were born as a result of the traditional course. Lead tutor Chris, G0EYO said, "The new online course has been a great experience and has enabled folk who really wanted to take the course to do so without travelling long distances to our club on a regular basis – it's been a real success!" On top of that, two other Wythall members couldn't wait for the next Intermediate and Advanced courses run at the club, so did some guided self-study. As a result, George, M6LTE is now 2E0KID and Paul, 2E0PVN is now M0PVN. Since George is Romanian, it is particularly impressive that he passed the exam using his second language! Wythall Club members congratulate all the new amateurs and wish them all the best for a great future in the hobby.
The photos show 14 year old Jamie Williams shows off his pass certificate along with Gavin Weston, Kevin O'Reilly, Darren Meehan & Craig Wright as well as George formerly M6LTE, now proudly 2E0KID.

In March, **Cheltenham ARA** held its annual Constructors' Exhibition that, as usual, attracted a good number of entries ranging from a portable Pic-A-Star HF transceiver through magnetic loops and QRSS gear to a wooden mast. There were over 20 entries in all, a marked increase over the previous year, which shows that home construction is alive and well – at least in the Cheltenham area! The winner of the Bill Brown, G5BK Memorial Cup for 'Best in Show' went to Colin, G3TA for his superb Morse key paddle made out of scrap material but nevertheless finished to a very high standard. The Pat Moore, G3IKR Memorial Cup for 'Innovative Construction' went to Andy, M0JLY for his novel and intriguing magnetic loop antenna constructed from plastic under floor heating pipe incorporating a foil lining. The judges were Jo, M0JMM and Bo, M0NQN. The photograph shows Chairman Doug, G4IGN (centre) with cup winners Colin, G3TA on the left and Andy, M0JLY on the right.

Dudley & District ARS congratulates three new Foundation licensees, Alex, Keith and Nigel, who passed the Foundation exam that was held on Tuesday 11 March.

Midland ARS had success in the March Advanced exam when Paul, M0PVN passed. He can be seen here with trainer and examiner Ron, M0WSN (left). Congratulations to Paul.

Once again, Ruiton Mill, the home of **Dudley & District ARS** will be active in the Special Event Mills On The Air on the weekend of 10 & 11 May with the callsign GB2RM on the HF & VHF Bands. This event is a firm favourite in the club calendar and is an all-weekend event open to visitors. On the evening of the 10th there will be a SOTA talk by Richard, G3CWI.

REGION 6: NORTH WALES

REGIONAL MANAGER: POST CURRENTLY VACANT

Dragon ARC
Stewart Rolfe, GW0ETF, 07833 620 733
5 Bank Holiday discussion night
19 Surplus sale
North Wales Radio Society
Liz Cabban,
lizcabban@vodafoneemail.co.uk
1 General meeting
8 Technical topics
15 Antennas for small locations talk, Peter, G4OST
22 Natter night
29 On the air on the Prom

REGION 7: SOUTH WALES

REGIONAL MANAGER: JIMMY SNEDDON, MW0EQL, RM7@RSGB.ORG.UK

Aberystwyth & DARS
Ray, GW7AGG, 01970 611 853,
ray@clocktower.go-plus.net
8 Fox Hunt, Ray, GW7AGG, Waunfawr Hall, 8pm
29 Club net on 145.500 then 145.550MHz
Llanelli ARS
Craig, MW0MXT, 01269 845 773,
craig@mw0mxt.co.uk
5, 26 Closed for bank holiday
12 On air night
19 Junk sale & club raffle

REGION 8: NORTHERN IRELAND

REGIONAL MANAGER: PHILIP HOSEY, MI0MSO, RM8@RSGB.ORG.UK

Grey Point Fort ARS
Stephen McFarland, GI4RNP,
02891 852 731
17, 18 CASHOTA primary weekend
24, 25 CASHOTA secondary weekend

Mid Ulster ARC won the Region 8 Club of the Year title and the presentation was made by Philip, MI0MSO, Region 8 Regional Manager. Shown in the photo is Philip, MI0MSO, Seamus, GI4SZW MUARC chairman, Brian, MI0TGO MUARC secretary and Jimmy, GI0OND, MUARC vice chairman.

Around Your Region

Bushvalley ARC have relocated their club meetings to The United Services Club in Limavady. The photo shows old and new members who attended the first meeting at the new venue. They meet on the last Thursday of every month at 8pm in The United Services Club, 8 Roe Mill Rd, Limavady, County Londonderry BT49 9DF.

Grey Point Fort ARS will be taking part in the annual Castles And Stately Homes On The Air Weekend on 17 and 18 May and 24 and 25 May. Situated on the shores of Belfast Lough, whose waters it once guarded, Grey Point Fort is one of the most attractive areas within Crawfordsburn Country Park. If arriving by car use Grey Point car park off Fort Road, or park at Helen's Bay Beach car park, just five minutes walk away. Rail passengers can use the Helen's Bay station, which is 10 minutes walking distance away.

The annual **Lagan Valley ARS** radio rally was held on 1 March. There was great turn out of radio amateurs and visitors searching for bargains and the club would like to thank all traders and people for their support. The photo shows some of the Bring & Buy bargains.

REGION 9: LONDON & THAMES VALLEY

REGIONAL MANAGER: LARRY SMITH, G4OXY, RM9@RSGB.ORG.UK

Bracknell ARC
Andy, M0HAK, andy@m0hak.co.uk
7 Club net 8pm 145.375MHz
14 History of Radio by John G3NCN
21 Club net 8pm 145.375MHz
28 Club net 8pm 145.375MHz

Chesham & DARS
Terry, G0VFW, 01442 831 491
7 Preparations for Brill Windmill event
10, 11 GB0BWM for Brill Windmill event

Edgware & DRS
Mike, G4RNW, 02089 500 658
8 Particulars Withheld: why?
Steve, G0PQB and others
22 Constructors Cup contest

Harwell ARS
Malcolm, G8NRP, 01235 524 844,
13 Sporadic-E 2014, has it started yet?
Jim Bacon, G3YLA

Newbury & DARS
Rob, G4LMW, 01635 862 737
10 Windmills on the air
28 AGM

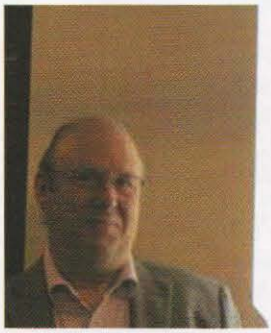
Radio Society of Harrow
Linda, G7RJL, 02083 868 586
1, 15 Talk
5 Harrow Museum GX3EFX/A
6, 13, 29, 27 Social
25 GX3EFX/P

Reading & DARC
Pete, G8FRC, 01189 695 697
1 Visit to Martin Lynch, Chertsey
8 Berkshire Museum of Aviation, Ken Fostekew
17, 24 Foundation course
22 Soviet Special Forces radios, Tony Helm, G4BCX

Southgate ARC
Mr K Mendum, G8RPA, g8rpa@arrl.net
14 Computer Clinic with Keith G8RPA

Verulam ARC
Peter, G4HSO, 01438 833 066, g3v@btinternet.com
8 Social with GB3VH repeater group from 7.30 at the Rose and Crown Pub, Sandridge
20 Intermediate construction projects presentation by students to club members

At **Verulam ARC's** club night in March, Mick, M0MMI gave an introductory talk on contesting to the newly qualified members of the club as part of its policy of mentoring those new to the hobby. Afterwards, Roger, M0RKB gave an historical account to all members on satellite technology. It ranged from the original concepts of Arthur C Clarke, through to the first amateur satellite OSCAR and then FUNcube-1.



Eric (M0LUV) exam secretary, tutor and coordinator.

Reading and District ARC is delighted to announce that all 6 candidates who sat the February, March course over three Saturdays passed their Intermediate exam with very high marks. Some will be taking the Advanced exam in July and the club wishes them every success. Congratulations to everyone. The photo shows, from left to right, Simon, 2E0SRW, Cesar, 2E0DLV, Ben 2E0DPE, Ian 2E0IWF, Graham, G3XZJ tutor, Eric, M0LUV tutor, David, 2E0DGX and Ian P, 2E0HIT.

Silverthorn Radio Club will be holding the Advanced exam on 1 July at Friday Hall, 56 Friday Hill, Chingford. This event is open not only to club members but also to anyone else who wishes to take the Advanced exam on that date. The club also runs courses for those who wish to expand their interest in amateur radio. Anyone wanting to take a course or sit an exam shou d contact the exam secretary Tom Dawson on 020 8967 7621. The club meets every Friday evening at 8pm and Friday Hall is fully accessible with car parking plus a bus service in the road. Visitors and new members are always welcome.

RADCOM DEADLINES

To see your club stories in print, send them to radcom@rsgb.org.uk

The deadlines for the next four issues are:

June - 22 April

July - 20 May

August - 24 June

September - 22 July

Photos should be separate .jpg files as large as possible

REGION 10: SOUTH & SOUTH EAST

REGIONAL MANAGER: MICHAEL SENIOR, G4EFO, RM10@RSGB.ORG.UK

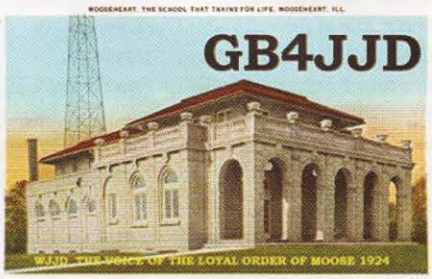
Brede Steam ARS
Steve, 01424 720 815
3, 6, 13, 20, 27 At the shack
Bromley & DARS
Andy, G4WGZ, 01689 878 089
11 Intermediate course
20 How to put a mast up - from simple to large
Coulsdon ATS
Steve Beal G3WZK, 01883 620 730
12 Propagation, Mike of Alton Antennas
Dorking & DRS
Garth, G3NPC, 01737 359 472
27 Practical evening with 3 activities
Farnborough & DRS
Neville, G4SPD, 01252 404 816
2, 9, 16, 23, 30 Club net from 8pm on 144.675MHz
7, 14, 21, 28 Slow Morse net on 3.570MHz, 1pm; Top Band net, 1.995MHz, 8pm
9, 23 Slow Morse net on 1.995MHz, 8pm
10, 11 Mills on the Air at Elstead Mill, Surrey
14 Talk by John, G3KND
28 Visit to Martin Lynch, Chertsey
Guildford & District Radio Society
Timothy Dabbs, G7JYQ, 020 8241 9396
9 The Role of Radio Amateurs in WW1 by Dr Elizabeth Bruton
Hastings E&RC
Gordon, 01424 431 909
28 Construction evening
Horndean & DARC
Stuart, G0FYX, 02392 472 846
1 Natter night and social activities evening
15 Introduction to HF contesting by Stuart, G0FYX
Itchen Valley ARC
Quintin Gee, M1ENU, 023 8078 7799
9 High altitude balloon experiments, Phil Crump, M0DNY
23 Surprise evening
Southdown ARS
John, G3DQY, 01424 424 319
7 Operating at Hailsham
10, 11 Mills on the Air, GB2PW
12 Talk at Chaseley on GB2PW and other things
Surrey Radio Contact Club
John, G3MCX, 020 8688 3322
12 Club talk
26 Construction evening
Sutton & Cheam RS
John, G0BWV, 020 8644 9945
15 Annual General Meeting and constructional contest
Swindon & DARC
Kevin, G6FOP, www.sdarc.net
1, 8, 15, 22, 29 Activity Night
Trowbridge & DARC
Ian, G0GRI, 01225 864 698, E/W
7 Solar Flares and Satnav, Professor Cathryn Mitchell
Wimbledon & DARS
Kim Brown, G6JXA, 07812 735 507
9 On the air
30 Talk by G3DWW

REGION 11: SOUTH WEST & CHANNEL ISLANDS

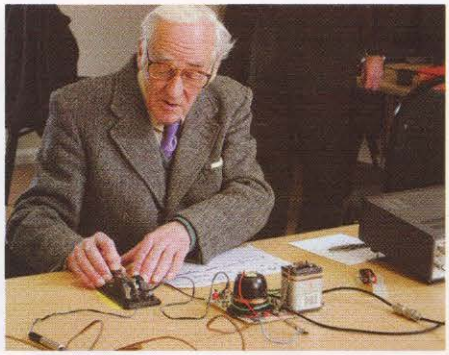
REGIONAL MANAGER: PAM HELLIWELL, G7SME, RM11@RSGB.ORG.UK

Bristol RSGB Group
Robin Thompson, G3TKF, robin@g3tkf.co.uk
26 The History and modern practice of code breaking, Professor Chris Budd, G4NBG
Cornish Radio Amateur Club
Steve, G7VOH, 01209 844 939
1 Main club meeting
7 Committee meeting
15 Activities evening
Exeter ARS
Nick, M0NRJ, 01363 775 756
5, 19 HF net on 3.675MHz at 7.45pm
6, 13, 20, 27 Tuesday 2m net on 145.575MHz from 7.45pm
12 Arduino by Nick, M0NRJ
26 The Genesis G59 SDR transceiver, Steve, M0ZZT
Exmouth Amateur Radio Club
Mike G1GZG, 01395 274 172
7 Ham radio satellite communications, Dean, G0UIL
21 Auction night
Flight Refuelling ARS
John, G4POF, g4pof@hotmail.com
4 Committee meeting
7, 14, 21, 28 Activity and open shack night
11, 25 Natter and social night
18 Contesting experiences by Joe, G3SAZ
Plymouth Radio Club
David Beck, 2E0DTC
d.beck123@btinternet.com
13 Natter night
Poldhu ARC
Keith Matthew, G0WYS, g0wys@yahoo.co.uk
13 SOS – *Empress of Ireland*, David Barlow, G3PLE:
Saltash & DARC
Mark Chanter 2E0MGC, 01752 215 546
1 Log keeping, Eric Rogers, G1OMZ
15 Military radio, Tony Helm
South Bristol ARC
Andrew Jenner, G7KNA, 07838 695 471
1 Morse night
8 Mills on the Air briefing
10, 11 Mills on the Air
15 Homebrew equipment night
22 Near Vertical Incidence Skywave Propagation
29 Open house and on the air night
Torbay ARS
Dave, G6FSP, g6fsp@tars.org.uk
2, 9, 16, 23, 30 Natter night
Yeovil ARC
Rodney Edwards, M0RGE, 01935 825 791
1 Mini talks
8 A famous transmitter by G3MYM
15 Intermediate quiz by G3ICO
22 Morse practice
29 On the air

The radio amateurs of **Burnham-on-Sea Moose Lodge 123** are celebrating a special Moose anniversary this year. A special event station will be on the air for the 90th anniversary of the opening by James John Davis of the Mooseheart Radio Station WJJD, affectionately known as 'The Voice of the Loyal Order of Moose'. The event will take place over the weekend of 21 and 22 June and they will be using all the UK amateur bands. The station call sign will be GB4JJD in honour of JJ Davis and all contacts will receive a commemorative QSL card. They will be particularly listening for any calls from Moose amateurs in the States both on phone or CW.



On 22 Feburary, **Yeovil Amateur Radio Club** held their 60th Anniversary event to mark the long distance radio transmission using a transistor Tx made on 21 February 1954. The distance was 85 miles, from Yeovil in Somerset to Haslemere in Surrey. The transmitter input power was 30 milliwatts, the frequency and mode were 3504kHz CW. Sixty years later, using the frequency 3.560MHz, CW and an equivalent input power, Rob Micklewright, G3MYM made the contacts with some help from other members. The photo shows G7LNJ transmitting. Using four different replica transmitters and two separate aerials arranged at right angles, the club made transmissions from 10am to 1pm from the current club meeting room at Abbey Community Centre at Yeovil. Fifteen miles away at Castle Cary, Richard, G7PBT advertised the event using



the 40m band and kept in touch with the Club meeting room using 2m. Local radio amateurs were able to hear and respond to the replica transmitter transmissions or report in on 2m. Other clubs in the region had been requested to listen for our transmissions. Finally, at 1pm, a long distance contact was made with G0UHM at Waterlooville, 71 miles away. The replica transmitters, using an FET transistor circuit in place of the original point contact transistor circuit, were built during the preceding few weeks and were also the subject of a Construction Contest.

After the success of their trip to the Isle of Skye in 2012 and their G100RSGB activation in 2013, **Wessex Contest Group ARS** will be operating from the Isle of Man (EU-116) from 10 to 17 May 2014. The team intends to be operating as MT0WCB on 40m, 20m, 17m, 15m and 10m with SSB, CW and some digi modes. They are taking sked requests now: just send an e-mail to sked@mx0wcb.com and they will try their best to hook up on air. You can follow the team on Twitter @mx0wcb or follow them on Facebook at www.facebook.com/WessexContestGroup.

REGION 12: EAST & EAST ANGLIA

REGIONAL MANAGER: STEVE THOMAS, M1ACB, RM12@RSGB.ORG.UK

Braintree & DARS
John, M5AJB, 01787 460 947
5 Mills week end planning plus Pac testing part 2
19 AGM

Cambridge & DARC
David, M0ZEB, 01353 778 093
9 Constructors' evening
10, 11 Mills on the Air weekend from Cattell's Mill, Willingham
23 Up the coax, Colin, G8TMV

Chelmsford ARS
Martyn, G1EFL, 01245 469 008
19 Amateur radio skills workshop (see www.hamskills.co.uk)

Felixstowe & DARS
Paul, G4YQC, pjw@btinternet.com
11 GB2WTM, National Mills Day, Woodbridge Tide Mill
26 Closed

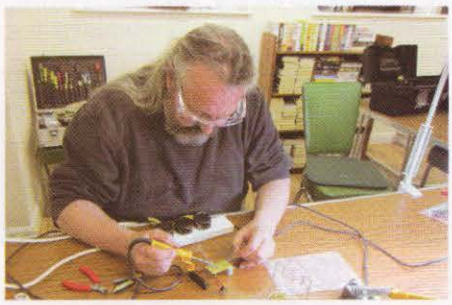
Harwich ARIG
Michael Topple, 2E0GUI, michael.2e0gui@gmail.com
14 On the Air

Hilderstone R&EC
Chrissie Turner, hilderstoneclub@gmail.com
1 Intermediate practical assessments
8 Natter night
11 Mills on the Air at Draper's Mill
29 Construction evening

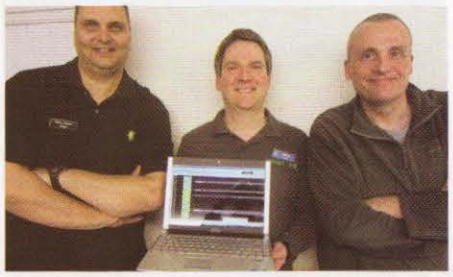
Norfolk ARC
Chris Danby, G0DWV, 01603 898 678
7 Paul Bigwood from Yaesu
14 Informal
21 Images of the Universe with astronomer Paul Money
28 Informal and Bright Sparks

South Essex ARS
Dave, G4UVJ, 01268 697 978
11 GB2RWM for Mills on the Air at Rayleigh Windmill
13 High altitude balloon tracking, Dave, G4UVJ (NB: first meeting at new venue)

The third in a series of Amateur Radio Skills Workshops took place on 17 March. This training initiative by the **Chelmsford ARS** saw close to 40 local amateurs meet up to try something new, get help with technical questions and have a chat. As with previous Skills Nights, there was quite a mix of activities: soldering and construction, demonstration stations and an introduction to surface mount construction. The Essex CW Club were in attendance and the Echolink demonstration station proved as popular as in previous months. Many attendees took the opportunity to bring along various items of show-and-tell, including an Elecraft KX3, several VHF and HF antennas, microphones and books. One member, Bruce, M0XBS, took the concept of a Skills Workshop literally, by bringing along tools to repair a damaged radial on the club's 2m training vertical. The next event takes place at 7pm on 21 April at the Village Hall, Danbury.



The newest club in Essex, **Thurrock Acorns ARC**, held its third get-together on 18 March. The theme for the night was datamodes, with two of the club's active data users, Neil, GORNU and Ricky, M6DII working alongside Pete, M0PSX from Essex Ham. Attendees learned about the benefits of working the world using modes such as WSPR, JT65 and PSK31, discussed experiences of getting setting up, looked at the structure of a data contact, and saw a demo data station being set up using a Yaesu FT-857 with the Digimaster ProPlus data interface. The photo shows Ricky, M6DII, Pete, M0PSX and Neil, GORNU.



South Essex ARS is on the move to a new meeting venue. From 13 May they will be using the Swans Green Hall in Hart Road, corner with The Rundels, Thundersley SS7 3PE for meetings. The hall is equipped with wheelchair access and toilet, has ample car parking available and a good kitchen where tea and coffee will be available during meetings. All members from other clubs are very welcome at the meetings.

Hilderstone Radio Club received the excellent news that it has been awarded the Region 12 Centenary Club of the Year. Everyone in the club worked hard to achieve that, by volunteering at events, giving talks, helping with training and by generally supporting the club. Alan, G3LHI gave a talk about his work on the oil and gas rigs where he designed the PA and alarm systems. He worked on the first amplifier for the Beatles, providing 1kW of power, needed to overcome the screams of their fans. The club also took part in National Science and Engineering week at St Lawrence College in Ramsgate. The pupils constructed crystal radios and learnt about the principles of radio communications and amplitude modulation. Steve, G1WWR, Fred, 2E1HOJ and Terry Alexander of the Ramsgate Vikings Model Boat club demonstrated some of their models. They showed how a radio signal and a crystal can control the motor and rudder on the boats.

Braintree ARS recently enjoyed a Morse/natter night. As Morse seems to be making a comeback, they decided to encourage members to have a go. Tables were set up with keys of different types and oscillators, with more experienced members sending passages of text for others to read. Many members had a go on the key but others preferred to listen to sharpen their receiving skills. A few of the Braintree members have a club CW net once a week on 144.180MHz and the plan is to increase the number taking part. It was an interesting and enjoyable evening. The meeting held on 17 March started with a presentation by Tony, G0IAG and Dave, G0DEC, about Essex RAYNET. Tony, Essex North Group controller, talked about what RAYNET were doing in the county and since the east coast storm surge in December and ensuing flooding, local authorities were once again looking to RAYNET for emergency comms. Essex RAYNET provides event comms for local charities and organisations and Dave, G0DEC, deputy North Group controller and county engineering officer, gave an overview of the types of equipment used and how the events were used to test the equipment for emergency use. Roland, M0BDB was introduced to the club as the new RSGB Region 12 DRM and Essex rep. The final part of the evening was give over to Edwin, G0LPO, with part 3 of the History of the RSGB. Once again, using pictures and text downloaded from the Society's archive. Part 3 covered the antennas used by the experimenters to make the first transatlantic contacts. Another busy meeting at Braintree.

Sandford Mill, Chelmsford's former waterworks, is primarily a museum collections store and science education resource, however it is open to the public for special events during the year. The building houses an extensive radio collection, with some equipment dating back to the 1890s and has a series of five ships' radio room displays representing different decades including some very rare Marconi equipment from ships contemporary with the *Titanic*. The first public open day of 2014 will be held on 26 April from 10am to 5pm to celebrate the birthday of Guglielmo Marconi who was born 25 April, 1874. **Chelmsford Amateur Radio Society** will be operating demonstration stations using the callsign GX0MWT. The HF SSB demonstration station will be located in the historic Marconi 2MT Writtle hut that is now housed inside the museum, while the CW team will operate another station from the first floor office. Colin, G0TRM and his team will be demonstrating the impressive mechanical Morse and Morse key display with the opportunity for the youngsters to try their hand at sending Morse. The Museum is located in Sandford Mill Road, Chelmsford, Essex, CM2 6NY. Admittance and parking are free.

NEWS ITEMS

Whether it's a special event station, exam success, a DF hunt or good works in the community, *RadCom* would like to hear what your club is doing. Send your stories to radcom@rsgb.org.uk - and don't forget to include photos!

Chelmsford Amateur Radio Society participated in SOS Radio Week by operating from the Marconi Sailing Club at Standsgate near Steeple on the River Blackwater. In total five stations using the callsign GX0MWT were operated during the weekend from the Marconi Sailing Club. The club used an Icom IC-756 Pro 3 with linear and 40m dipole supported by the Marconi Sailing Club's flagpole, an Icom IC-7000 with Comet CHA-250B vertical for 20m, 17m, 15m, 12m and 10m, the Icom IC-706 mk 2G with Buddipole, a Kenwood TS-50 mobile station with 4CX250B linear amp in the boot connected to a 150 foot long wire attached to an 8ft delta kite for 160m and 80m as well as an Echolink station. Propagation was assisted by being close to the sea and many countries around the world where contacted and informed of the work of the RNLI. You can watch CARS RNLI SOS Week 2014 at www.youtube.com/watch? v=7U5Z1gBUqHc

REGION 13: EAST MIDLANDS

REGIONAL MANAGER: STEVE BODEN, G4XCK, RM13@RSGB.ORG.UK

Derby & DARS
Richard Buckby, radio@dadars.org.uk
6 Junk sale
13 Committee meeting
Hucknall Rolls Royce ARC
Neil, MONJJ, neilm0njj@gmail.com
1 Fox hunt
Leicestershire Repeater Group
www.leicestershirerepeatergroup.org.uk
8 AGM, 8pm, The Plough Inn, LE6 0XZ
Lincoln Short-Wave Club
Pam Rose, G4STO, 01427 788 356
1 Repeater net, GB3LM, 8pm
3, 10, 17, 24, 31 New licensee mentoring & Saturday surgery
6 144MHz UK AC 7.30pm in the shack
7, 14 Shack activities & natter night
8, 15, 22, 29 Simplex net 145.375 8pm
13 432MHz UK AC
19 Committee meeting
20 1.3GHz UK AC
21 Formal meeting
27 50MHz UK AC
28 Web page design, Ian, G4XFC
Loughborough & DARC
Chris, G1ETZ, 01509 504 319
6 Natter night and on the air

10, 11 GB2WMS at Shepshed Watermill
13 Power supplies, Andrew, G7SEG
20 Open forum on aerial systems with Dave, M3AUC
27 Practical evening

RAF Waddington ARC
Bob, G3VCA, 07971 166 250
5, 12, 19, 26 Club net, 145.325MHz, 8pm
8 The Camera Never Lies, Dave, M0KDD

South Kesteven Amateur Radio Society
Nigel, M0CVO, 01476 402 550
7, 21 Net on 145.525MHz, 8pm
14, 28 Informal

Spalding & DARS
Graham Boor G8NWC, 0775 760 832, secretary@sdars.org.uk, www.sdars.org.uk
4 Dambusters Hamfest
16 High altitude balloon launches, Andrew, M6GTG

The 40th AGM of the **Leicestershire Repeater Group** will be held on 8 May 2014 at 8pm at The Plough Inn, Burroughs Road, Ratby LE6 0XZ. For further info see www.leicestershirerepeatergroup.org.uk

Lincoln Short Wave Club will be holding a Foundation course commencing 10am on 10 May. Anyone interested should contact club secretary Pam, G4STO, on 01427 788 356 in the first instance.

Sheffield & District Wireless Society is excited to announce that the GB3NA repeater has been relocated to its new QTH in Fox Hill, Sheffield, providing local radio amateurs with a much needed analogue facility on 2m. Andy, M0GAV, member of the Sheffield Wireless Society, is the amateur taking up the reins as the host and will continue maintaining GB3NA at his home QTH. The repeater group will still fund this repeater from the yearly subscriptions and monthly donations of members whilst Andy is upkeeping the repeater with costs of the electricity used and eventual IRLP access. GB3NA was the 7th amateur repeater to come on air in the UK over 40 years ago. Five years ago the repeater kit was upgraded with thanks to funding from the South Yorkshire Community Fund in Rotherham. To find out more about the SYRG and the range of repeaters available in Yorkshire, or even become a member for £20 a year, you can visit www.southyorkshirerepeatergroup.co.uk/
The photo shows, from left to right, South Yorkshire Repeater Group members, Annie, M6PLJ, Repeater Keeper Ernie, G4LUE and Mark, G1ANI along with the new repeater host Andy, M0GAV from the Sheffield & District Wireless Society.

Grimsby Amateur Radio Society raised £150 for the RNLI during SOS Radio Week in January. They presented the cash to Frances Hall, secretary of The New Sunnyside Club, Cleethorpes where the group have a permanent radio shack. Shown in the photo are Tom, G4ZRV, Tony, GL0AC, Pete, G6NDH, Frances and Steve Burton, coxswain of the Cleethorpes Inshore Life Boat, Andy, G0MNI, Bri, M6LZX and Chris, G7BRZ.

The **BAA Radio Astronomy Group** will be holding its 2014 General Meeting on 17 May at the National Space Centre, Leicester LE4 5NS. This year there are two keynote speakers. Professor Paul Cannon (University of Birmingham, and formerly also QinetiQ) will speak on the issue of solar storms, their origin and consequences and Dr Klaas Wiersema (University of Leicester) will describe how new radio telescope technologies enable the exploration of the 'transient' radio universe, from the mysterious millisecond duration 'fast radio bursts' to the energetic afterglows of gamma-ray bursts (GRBs) that are sometimes visible for years. Other presentations include: an ultra-low cost Hydrogen Line radio telescope (Peter East); the modelling of our local galactic topology (Gordon Dennis); the design of an Arduino-based magnetometer (Jonathan Rawlinson); making and analysing observations with Starbase (Laurence Newell); experiments with a small SDR radio telescope (David Morgan); and reports on developments at EAARO (Jason Williams) and the Harold Clayton Observatory (Dave James). Tickets are £12 for BAA members, £15 for non-members, including free parking. Tea and coffee will be provided during breaks but lunch is not included. www.britastro.org/radio/.

RadCom HF Propagation Predictions Explained

Gwyn Williams, G4FKH

HF Propagation Predictions have appeared in their present form, with minor changes, since September 1999 and should continue for many years to come. What do they mean and how do you understand them and make the most of the information?

Let's start with some, albeit recent, history. In early 1999 I started looking at replacing the then mainframe-produced predictions with something a little more flexible and easier to produce. Dr Sylvan Katz, VE5ZX programmed the original suite, while I supplied the various parameters and described what the suite should do. The propagation engine I chose was REC533, freely available from [1]. This program was chosen because it is fairly accurate and can be programmatically manipulated. There are manuals explaining the workings of this and the other programs on this website.

The suite produces one of two outputs, (i) a Word Document table that appears in *RadCom* and (ii) a replica but in HTML format, found on my website. The *RadCom* table is produced 3 months in advance, because of the need for the magazine to be printed, whilst the web version is updated on the first day of the current month. But the explanation is valid for whichever version you are looking at.

It should be remembered that the predictions are prepared with Mr Average Amateur in mind, ie a dipole type aerial is used to produce the predictions. If your setup is superior to this then it is only necessary to add a number of two to the table. The table is groped by area and destination down the left hand side and by amateur band across the table. Only the frequencies 3.5MHz to 28MHz have been covered because the lower bands whilst not in the HF portion of the spectrum are not well covered by the prediction program, or any other prediction programs for that matter. Taking just one of the bands, each of the 12 columns represents a 2 hour slot in the day, from 02 to 2400 (2400 does not exist in the 24 hour clock, so it's represented by 00). Alongside each of the destinations and under each of the hours can be found figures or a ".". The figures represent the percentage probability that the path will be available, ie for a figure of 1, the path should be available for between 1% and 19% of the days, a 2 says the path should be available between 20% and 29% of days, etc. Also the numbers are coloured, Black says the received signal is expected to be low to very low, Blue when the received signal is expected to be fair and Red when it is expected to be strong. When a "." is shown the path is not expected to be open. There is a distinct lack of Red in the predictions at the moment. When things pick up (ie lots more sunspot groups on the Sun) then Red will be more prevalent.

With the current presentation of the predictions it can easily been seen when and on what frequency and how audible a particular destination should be. The only real difference with the web page is that when the user clicks on a destination, a graph pops up showing the Lowest Usable Frequency, the Optimum Working Frequency and the best and second best bands for that particular destination.

Use and enjoy.

[1] http://elbert.its.bldrdoc.gov/pc_hf/hfwin32.html

Classified Ads

For Sale

WANT A DATA INTERFACE ? You need an ISOTERM, Various models for your needs. PSK, WSJT, WSPR, CW & RTTY. New Model for Elecraft KX3 available See www.g3liv.co.uk

THINK ITS TIME TO TIDY up your Morse key connections? NEW GOLD PLATED UNIVERSAL CABLETIDYS for most BUG's and PADDLES, VIBROPLEX, JA7GHD,etc 40mm to 60mm spaced connections. See www.g3liv.co.uk email:johnny@melvin.com tel: 0191 2843028

FIBREGLASS TUBE High strength tube, square box, rod, and other sections all from stock in 6m lengths. Engineerec Compositions, Chester. Tel: 01244 676000
e. barbara@engineered-composites.co.uk
www.engineered-composites.co.uk

BAOFENG, TYT & VERO HANDHELDS at best prices from authorised UK importer. Full range of accessories available. www.sinotel.co.uk, 01926-460203, sales@sinotel.co.uk

CTCSS ENCODER AND DECODER KITS, DTMF Kits and Modules, PIC Microcontroller Development Kits. www.cstech.co.uk

Equipment

REPAIRS to all amateur and vintage RX/TX cost effective service phone or call in for details. Kent Rigs, 52, Salisbury Road, CHATHAM, Kent, ME4 5NN, 07903 023437

RELIABLE REPAIRS for all amateur and vintage equipment. Professional service, reasonable rates. Call: 01807 580376 E: radiorepairs@btconnect.com

AMTECH RADIO.
Professional qualified services and repairs to all amateur radio equipment. We also buy and sell amateur radio equipment. Contact David on 01323 472216 – 07517 445452

QUALITY USED EQUIPMENT - Icom IC-4KL 1kW solid state amplifier, Icom 781 Classic HF transceiver, Icom IC-8500 Communications receiver, plus lots more at www.nevadaradio.co.uk
Nevada tel: 02392 313090

Aerials

M0CVO ANTENNAS for all your amateur radio antenna needs. Full details at: http://www.m0cvoantennas.com

G4TPH PORTABLE MAGLOOPS Remote and manual tune models for 40m through 10 metres Details at www.g4tph.com

SIGMA EURO-COMM LTD HF Vertical, Wire, G5RV & Mobile Antennas, VHF Base Station Antennas Mounting Poles, Magnetic Mounts Tel 0121 766 8146
stores.ebay.co.uk/sigmaeurocommltd

"WESTERN HF 10" 67ft wire dipole 160-6m, full details lookup m0bzi at: www.qrz.com buy direct: m0bzi@hotmail.co.uk or 07748331458 reviews at: http://g0kya.blogspot.com/2010_08_01_archive.html or http://www.eham.net/reviews/detail/9424

G WHIP ANTENNAS over 45 years of amateur & commercial business. Military specification at amateur prices. Famous resonant end fdes, baluns, windoms, many different antennas, mostly made using kevlar mill spec wire. See Eham reports or www.gwhip.co.uk Tel: 07592 135431

MILITARY STYLE GREEN KEVLAR (Aramid) Antenna wire, light weight but extremely strong, available by the metre or 100m Drum www.nevadaradio.co.uk Nevada tel: 02392313090

Computer Software

PROGRAMMING SOFTWARE FOR YAESU RADIOS Http://www.g4hfq.co.uk bob.freeth@g4hfq.co.uk (01425) 618092

Wanted

UNWANTED VALVE AMPLIFIERS, working or not. Known makes only (Kenwood, Yaesu, Drake, Linear Amp, etc), not homebrew. Also 3-500Z/ZG valves. Cash paid. Contact Peter G3ZRS on 01482 862323 or g3zrs@hotmail.co.uk

VINTAGE RADIO & VALVES WANTED - national cash settlement for silent key, shack clearouts 07552678725, vintageradio@btinternet.com

Miscellaneous

CALL IN ON THE UK 'GOOD NEWS' CHRISTIAN NETS! Every Sunday morning at 8am local on 3747kHz, 2pm on 3747 or 7147KHz (propagation) and 144.205 SSB at 3pm sharing Christian fellowship. Go to www.wacral.org for more information or contact G3XNX at 51 Alma Road, Brixham, South Devon, TQ5 8QR, Tel: 01803 854504 or derekg3xnx@talktalk.net

PAFOS, CYPRUS. Pafos, 2 bed villa. Simple HF station 300m ASL. www.domsvilla.co.uk

ACCOMMODATION NORTH COAST SCOTLAND. Self catering, B&B, camping. Discounts for licensed amateurs. GM4JYB Tel: 01847 851774. Web: www.letsgonorth.co.uk/dunnet_head Email: briansparks@dunnethead.co.uk

HOLIDAY WITH YOUR AERIALS. Self-catering, smoke-free twin-bed studio cottage, near middle of long 2½-acre garden. Sleeps 2. Peaceful, electrically-quiet rural area. Non-amateur owner OK with (big!) aerials. Diana, 01308 485301, dianapread@icloud.com (W-Dorset).

Cards & Design

QSLERS SPECIAL OFFER 1000 full colour both sides qsl cards £40 plus postage. 07720 580968 www.QSLers.co.uk

LOW COST AND HIGH QUALITY QSL cards by LZ1JZ QSL PRINT http://www.LZ1JZ.com

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Web www.ux5uoqsl.com/

Classified advertisements 58p per word (VAT inc.) with a minimum of 14 words £8.12.
All classified advertisements must be prepaid. Please write clearly. No responsibility accepted for errors. Latest date for acceptance is 1st of the month prior to publication
Payment to: RSGB, 3 Abbey Court, Priory Business Park, Bedford, MK44 3WH

Business Cards

For cost effective Business Card advertising call Chris Danby on 01603 898678 to find out more

Adertisers Index

FREE MEMBERS' ADS

Charges are waived for Members' Ads submitted by e-mail to memads@rsgb.org.uk. One ad per Member per month; other important terms & conditions apply (see grey box on page 95).

FOR SALE

OLD QSL CARDS from 1930 to 1979. All foreign, no UK. 1,900 cards with 225 from 1930s. Offers in writing, no internet or phone please. Buyer must arrange collection. The cards have QSL 'stamps' affixed which paid bureau costs. John Heys, G3BDQ, 01424 812 262 (White Friars, Friars Hill, Guestling, Hastings TN35 4EP).

1.8m ANDREWS MICROWAVE DISH, spun aluminium dish with mounting bracket, was used for 1.6GHz weather sat reception. Collect from my QTH, £40. Brian Butler, G4LUL 01457 763 171 (near Glossop).

YAESU FT-2000D 200W HF/6m xcvr, SP-2000 speaker, Heil HM-12 mic with PTT stand, boxes, manuals, leads: as new; non-smoker. Buyer inspects/collects, £1,950 or will split. G0EOL, 01606 594 205, billg0eol@o2.co.uk (Cheshire).

472kHz 400W ATU! The RF section of a Marconi Marine Crusader Tx. Serious kit – the HT on the finals was 4kV. You will drool over the variometer 12"long by 6"dia. It will tune a LW Ae from 410kHz to 25MHz. Bruce Morris, GW4XXF, bruce@gw4xxf.free-online.co.uk (Tywyn, Gwynedd).

ALINCO DJ-D5 includes mains charger, car kit, new battery, £45. Bofang never used, new, dual band FM transceiver, includes hand mic, 240V charger with adapter, 12V car kit, £45. Jim Durey, M6JEK, 01621 892 042 (Maldon).

bhi NOISE ELIMINATING MODULE NEIM1031. In excellent condition, from a non-smoking home. All ready to plug in and kill all that dreadful noise/hash, £85. Would be happy to demonstrate or can post at cost. Ian, M0IAA, 07929 505 683 (Wakefield).

BRAND NEW 150kHz – 1.05GHz spectrum analyser with tracking generator in full working order and with all accessories, £570. Can be collected or £23 p&p (Royal Mail). G4FAX, rob.macfie@gmail.com (Bedfordshire).

CALLING ALL KOI carp keepers. Number plate ko10koy reads koi o koy. Ready to go on a 10 plate or newer car. Number on retention. No more fees to put on your car. £400 ONO. Call Martin, M0CMH, 07855 292 759 (Essex).

CLANDESTINE / SPECIAL FORCES / SPY RADIOS. GRC 109, GRC 109A, RS6, Mk 123, Mk 128, A16 (=PRC 316), Mk 328 & PRC 320, GRC 109 PSU, crystals, manuals. Good to immaculate condition, view by arrangement. OIEO £3k, together only. G4TMO, 07894 144 939, hugh.kemp@btinternet.com, (Salisbury).

CLARK PUMP UP 6 section mast, was bought new in 2009 but little use since, complete with pump and base, head load 10k, sale due to loss of H/Q, £500 ono, prefer buyer collects. Mike, GW4WWN, 01639 639 745, gw4wwn@yahoo.com (Neath).

EDDYSTONE models 888 and 710 genuine NOS instruction manuals (not repro) £4 ea plus postage. Heathkit VFU 1 VFO in FB order £45 plus postage. G3YPS, 07803 601 176, atko99@tiscali.co.uk (Gainsborough).

ELECRAFT K2, 100W PA, DSP, SSB, (2.65kHz), NB, 160m and 60m, transverter o/p for V/UHF, separate Rx aerial, CAT control; this K2 is ready built and fully working. Offers around £1000. www.elecraft.com/k2_page.htm for more information. Collection preferred, or post £25. Andrew Lenton, G8UUG, 01252 416 363, a@lenton.org (Fleet, Hants).

FT-857D, unused YSK kit, MH-59 mic, MX-626 duplexer, boxes, books, £450. ATAS-120, never used mobile, £150. MFJ-969 HF & 6m tuner, £60. Watson W-25AM PSU, £50. Icom E90 4 band H/H, all antennas, books, boxes, mobile and wall PSUs, £150. John, G6PGT 07840176 797, G6PGT@yahoo.co.uk (Sittingbourne).

GOULD OS250B 15MHz Dual trace scope, Drae power supply 13.8V 4A, Leson DT251 desk mic, Marconi signal generator. Offers please. Sold on behalf of Southport & District Amateur Radio Club. Collect or arrange own courier. Rob, G0HRT 01704 220 775, rob@g0hrt.co.uk (Southport area).

H4 MTV (HAM TV) cherished registration, currently on retention document. Serious offers invited. Giles, G1MFG, 01234 832 714 (office hrs), giles.read@rsgb.org.uk (Bedford).

IC-251E 2m MULTIMODE. VGC, original box, £125. SP-930 ext speaker, £65. DF2FQ 4m transverter, 3-4W output, 29MHz in/out, 100mW-5W, £120. MC-90 desk mic, new, boxed, £125. Capco Transmatch ATU, handles 1kW+, £125. TS-850SAT HF transceiver, VGC, £450. Other items available. Keith, G4GZS, 07859 917 317, keith4gzs@hotmail.co.uk (Rugby).

ICOM IC-7000, as new, boxed, with handbook, filter etc. £750 ONO. John Rollason, G3WCO, 01279 876 607, g3wco@idnet.com (Dunmow, Essex).

ICOM IC-735, 250Hz CW filter, 5MHz enabled, in excellent condition with many spares, £175. Watson W-25AM 25A PSU, £35. bhi noise cancelling speaker, £40. LDG Z-100 plus auto ATU, as new, £50. Tom, G8AMP, 01202 577 030 (Dorset).

ICOM IC-756 in excellent condition, £375 plus post. Icom PS-15 power supply in excellent condition, £75 plus post. Icom SP3 loudspeaker, in excellent condition, £40 plus post. Brian Atkinson, G3GSI, 01435 883 248 g3gsi@tiscali.co.uk (Heathfield).

LDG YT-450 auto tuner for FT-450 and FT-950. Brand new, boxed, with all leads and instructions and unused. £150. Buyer to collect or pay postage. B Hawes, G0KML, 01752 345 054, benhawes@blueyonder.co.uk (Plymouth).

REGAVOLT 715-40 open frame variable transformer. 250V 15A 50Hz. Mounted in steel case with mains filter and meter. Little used. Buyer collects, £90. Nick, G3VNC, g3vnc@uk6.net (Cheddar).

SOLARTRON SERVICE MANUALS LM902.2, OS103.3, LM904, LM1440.2/LM1480.2, LM1420.2, CD1400, AS1164.2 £1 each plus postage at cost. Gordon Shorley, RS93679, 01858 565 854 (Market Harborough).

SOMMERKAMP (RM ITALY) SLB300 HF linear amp. 400W PEP o/p, solid state. Built in PSU, 160-10m, Rx preamp, handook, £275. Daiwa CN-801 pwr/VSWR meter, handbook, boxed, £55. Both in excellent condition. Non smoker. Prefer buyer collects or carriage at cost. Bob, G8BCA, 01638 714 051, g8bca@talktalk.net (Mildenhall, Suffolk).

TECHNICAL INSTRUCTIONS BOOK (issue 6) for vintage Pye PMR radio type PTC116/PTC117. Postage cost only. David Wear, G4DPJ, 0117 959 0413 (Bristol).

TELEQUIPMENT S54A oscilloscope, AF function generator, Trio SG-402 RF signal generator, all in VG condition. New linear HF 10W PA Kit, Reyco antenna traps. Full details at www.oldmarconiman.co.uk/g3lul.html. Dave, G3LUL, 01622 681 294, g3lul@btinternet.com (Maidstone Kent).

VINE ANTENNAS 10m Moxon, £75. Vine 4N6 dual band 6 and 4m 5-ele Yagi, £120. Sandpiper 5/8 4m vertical, £30. All only 2 years old. Collect or will ship at cost. Howarth, GW3TMP, 01352 771 520, jhj43@btinternet.com (Mold, N Wales).

YAESU FT101E complete with instruction book, fist mic and unused DC lead. Still has plastic covering on front panel. In original delivery box. Also 12BY7A driver valve and pair of 6JS6A PA valves. £200. G4GTD 01179 856 253 g4gtd@blueyonder.co.uk (Bristol area).

YAESU FT-690R Mk 2, 50-54MHz all mode transceiver. Excellent condition, includes FL-6020 clip-on 10W linear amp, FTS-7A tone squelch encoder/decoder, battery box, nicads, MH-10 mic, carrying case, mounting bracket, all accessories, original boxes, shoulder strap, £295. E-mail for photographs. Dave, G8ZRE, 01244 316 673, g8zre@hotmail.com (Chester).

YAESU FT-902DM HF transceiver and Yaesu FRG-7 receiver. Both items in excellent condition and with Instruction manuals and Operator handbooks. Moseley TA32 2-element tribander and AR40 rotator with control unit. No reasonable offers refused. David, G0DTC, 01473 788570 (Ipswich).

YAESU FT-920 HF/50MHz 100W transceiver, complete with power lead, mic and handbook. Excellent condition, original box, £500. Buyer to inspect and collect. Niels, G8RWG, 01737 554 493 (Coulsdon, Surrey).

YAESU FTV1000 50MHz 200W transverter to partner FT-1000, VGC with box, manual and leads, £375. Kenwood TS-60S 50MHz 90W multimode transceiver, VGC with box, manual, microphone, power lead and mobile mount bracket, £295. Graham, G8BZL, 07799 312 939 (Hove).

YASEU FT-221R multimode 2 metre transceiver. In as new condition with handbook, microphone and mains lead, £180. Prefer buyer collects as this is a heavy item. Mike, G4OQG, 01249 443 037, g4oqg@hotmail.co.uk (Wiltshire).

WANTED

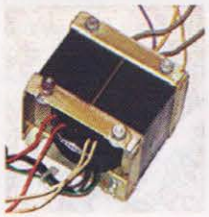
CTCSS PLUG-IN board for Icom IC-U101 70cm mobile. Believe it to be a model UT-31 as used in V200 range of sets. David Noakes, G6IYD, g6iyd@yahoo.com (Rochester, Kent).

TELEPRINTERS. Creed 7(B) or similar. Teletype 33 (ASR/KSR/RO). Dead or alive. Also accessories (such as reperforator), supplies, specific tools, spares, manuals. Godfrey, G4GLM, 020 8958 5113, cgmm2@btinternet.com (Edgware).

DISABLED FAN OF OLD DAYS seeks pre-1975 DX QSL cards, *Short Wave* magazine 1955 to 1958 inclusive and Codar RQ10 pre-selector. Mike, 8 Windsor Road, Reydon, Southwold, IP18 6PQ.

FULLY FUNCTIONAL and complete, with serial lead, auto antenna tuner Yaesu FC-757AT. Contact me with price. Will collect. Andy Graves, G1JQJ, 01752 778 415, andy.graves@btinternet.com (Plymouth).

KW PARTS to complete the following restorations: 1. Blue front panel with paint in reasonable condition for Mk I Vanguard. 2. An 80mm x 80mm, 50 – 500μA meter for KW 109 ATU. 3. Mains transformer for KW 108 Monitorscope. Alan, G3WXI, 01142 881 692, g3wxi@qsl.net (Sheffield).



METRIX U61/LX109 valve tester & RACAL RA1218 & SIEMENS E311 wanted to complete my test gear & receiver collection. Steve, M6WAA, 07552 678 725, chunky9@btinternet.com (Warrington).

TWO GANG variable air spaced capacitor 150pF with 15pF, a variant of type 'OO' made by Jackson Bros Ltd and a 6:1 ball drive (Jackson Bros Ltd type 'F'). Similar combination considered of same values. Colin Burgess, G8EWL, 01233 650 898 (Ashford, Kent).

HELPLINES

Can anyone help with a circuit diagram for Airmec type CT212 signal generator (85kHz-32MHz)? All costs met. John, G4FZG, john.marino@btinternet.com, 01242 582 169 (Cheltenham).

Marconi 2031 signal generator manual or calibration routines. I'm looking for a technical manual for this generator so I can sort out a problem with the calibration. I have the operating manual. Peter Ebsworth, G8CKB / LB0K, lb0k@online.no (Norway).

SILENT KEYS

We regret to record the passing of the following Members:

Name	Date
Mr J I Sinclair, G8VL	11/1/2014
Mr N A Watson, G1XBV	
Mr D F J Henson, G1XBY	17/2/2014
Mr J H English, G2DZF	7/2/2014
Mr A D Hunt, G3CHU	9/3/2014
Mr M Flinn, G3EOQ	2/2014
Mr M G James, G3GVY	8/1/2014
Mr M J Powell, G3IJE	21/3/2014
Mr L V Bright, G4BHQ	
Mr C Venables, G4NWY	
Mr M Davidson, G4WRU	7/3/2014
Mr J B Clarke, G4XMT	1/12/2013
Mr J R Lowther, G4ZJT	11/3/2014
Mr J A Senior, G7RXS	
Mr R Hutton, G8FPU	2/3/2014
Mr N Burrows, G8XCD	16/11/2013
Mr D S Adie, G8ZMI	25/2/2014
Mr A S Holmwood, RS202829	

OBITUARIES

We welcome obituaries from clubs or individuals when someone sadly passes away. They are published at www.rsgb.org/sk. Please send submissions by e-mail (only) to sk@rsgb.org.uk. All submissions are moderated and may be edited for reasons of style, grammar, length etc..

SILENT KEY ENTRIES

The Silent Keys column is **separate** from the online obituaries section. To notify the RSGB that a Member has passed away (and their subscription should end and they should be listed in Silent Keys), please e-mail sales@rsgb.org.uk or telephone 01234 832 700 and then select option 1. We will need to know the deceased's name, callsign or RS number and, if possible, date of death.

The Bergen Broadcaster Association is a museum looking after an old 1936 Telefunken LW/MW broadcasting station. We are looking for any possible help for restoring a 1KW Marconi transmitter 3-rack set to operational status again. The set has a plaque – Model 112 sender; Installation 41075; 1kW. Contact info is on the websites – www.bergenkringkaster.no or www.LA1ASK.no.

RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond

4 MAY – **DAMBUSTERS HAMFEST** – Thorpe Camp Visitor Centre, Coningsby, Lincs LN4 4PE. TI S22, GB3FR, £3, B&B, free parking, pitches free but size is limited if not pre-booked. RAF heritage centre on site. Overnight camping by appointment. C, OT 10am. tcrm@hotmail.co.uk. [www.thorpecamp.org].

5 MAY (Bank Holiday Monday) – **DARTMOOR RADIO RALLY** - Tavistock College, Crowndale Road, Tavistock, Devon. PL19 8DD. No TI. OT 10.15/10.30, £2, Free CP, TS, B&B, SIG, C, DF. Roger Hann, 2E0RPH, 01822 860 619, 2E0RPH@gmail.com.

11 MAY – **LOUGH ERNE AMATEUR RADIO CLUB ANNUAL RALLY** – Share Discovery Village, Lisnaskea, Co. Fermanagh BT92 0EQ, N Ireland. Access from Erne/Shannon Waterway. OT 11.30, CP, B&B, TS, LB, C, DF. Iain, 028 6632 6693, iain@learc.eu.

This list shows all rallies and events we are aware of as of press deadline. If your rally or event is not listed, TELL US ABOUT IT! **Send an e-mail to gb2rs@rsgb.org.uk and your event will appear here and on GB2RS.** It's free! Guidelines for submissions: please let us know your event details as early as possible. If you submit by e-mail (to gb2rs@rsgb.org.uk) then we suggest you set your e-mail program to request a 'read' receipt so you can be sure we've seen the details. We also recommend you check the details are correct in *RadCom* and **tell us if they're not.**

Abbreviations: TI Talk-In; CP Car Park; £ Admission; OT Opening time - time for disabled visitors appears first, (eg 10.30/11am); TS Trade Stands; FM Flea Market; CBS Car Boot Sale; B&B Bring and Buy; A Auction; SIG Special Interest Groups; MT Morse tests; MA Foundation Morse Assessments; LB Licensed Bar; C Catering; DF Disabled Facilities; WIN prize draw, raffle; LEC Lectures/Seminars; FAM Family attractions; CS Camp Site.

SPECIAL EVENTS STATIONS

These callsigns are valid for use from the date given, but the period of operation may vary from 1 - 28 days before or after the event date. Operating details are provided in an abbreviated form as follows: T = 160m; L = 80 or 40m; H = HF bands (30 - 10m); V = 6 and/or 4m; 2 = 2m; 7 = 70cm; S = satellite and P = packet. Details published here are kindly provided by Ofcom.

Date	Callsign	Phonetics	Location	Bands	Keeper
01/05/2014	GB4HSC	Hinckley Sea Cadets	Leicestershire	TLHV27	G8BFF
03/05/2014	GB4ART	Avon River Tewkesbury	Tewkesbury	LHV27	G4MGW
08/05/2014	GB4WMM	Worsbrough Mill Museum	South Yorkshire	L2	M0PIE
09/05/2014	GB2ERW	East Runton Windmill	Norfolk	TLH27	G3PND
	GB0SXW	Stones Cross Windmill	East Sussex	LH	G1FBH
	GB2AWM	Alderford Water Mill	Essex	LH27	G0EMK
10/05/2014	GB2WBM	West Blatchington Mill	East Sussex	LHV27	G4JZC
	GB2WWW	Wicklewood Windmill	Norfolk	LHV27	G0TZZ
	GB2BHM	Benhom Mill	Angus	LHV27	GM3ALZ
	GB2WPM	Wrawby Post Mill	North Lincs	TLHV27	M0AEP
	GB1WW	Wilton Windmill	Wiltshire	LH2	G1OQV
	GB5FRR	First Roughton Rural	Roughton	TLH27	G7VRK
	GB2WMS	Water Mill Shepshed	Shepshed	L27	G1ETZ
	GB2RMK	Rolvenden Mill Kent	Kent	LH7	G4XXM
	GB2RM	Ruiton Mill	West Midlands	LHV27	G7DMO
	GB6MW	Meopham Windmill	Kent	TLHV27	M0KSJ
	GB0BM	Burcott Mill	Somerset	LHV2	M0ALZ
	GB2TMI	Thwaite Mill Island	Leeds	LH	G0BFJ
	GB0SM	Skidby Mill	East Yorkshire	LH2	G4VHM
	GB2BCW	Bally Copeland Windmill	Millisle	LH27	G4AAM
	GB0HSM	High Salvington Mill	Worthing	TLH27	G8MSQ
	GB0TWM	Talgarth Water Mill	Talgarth	LH	MW0GMH
11/05/2014	GB1WML	White Mill	Dorset	LH2	M0KZC
	GB2PW	Polegate Windmill	Willingdon	TLHV27	G3DQY
14/05/2014	GB0LYC	Lydford Castle	Devon	LHV27	M0YDW
15/05/2014	GB0WNS	Wolverhampton North Scouts	Staffordshire	LH7	M0YDH
17/05/2014	GB0CRC	Castle Rising Castle	Norfolk	TLHV27	G4JNQ
	GB1PC	Piel Castle	Cumbria	LHV27	M0MVK
	GB1ST	Saltram Telegraph	Plympton	LH2	M0XIG
	GB4POW	Prince of Wales	Holyhead	LH27	MW0AQZ
21/05/2014	GB1LSF	Lydford Saxon Fort	Devon	LHV27	M0YDW
24/05/2014	GB1HA	Headcorn Aerodrome	Kent	TLHV27	G0UXG
	GB0DZG	Dudley Zoological Gardens	Dudley	LH2	G7DMO
	GB2FOT	Festival of Transport	Milton Keynes	LH2	G0GQP
30/05/2014	GB0RNB	Rugeley Nuclear Bunker	Staffordshire	LHV27	G7TCW
	GB1SNB	Shenstone Nuclear Bunker	Staffordshire	LHV27	G7TCW
	GB4SNB	Standon Nuclear Bunker	Staffordshire	LHV27	G7TCW
	GB6GNB	Gnosall Nuclear Bunker	Staffordshire	LHV27	G7TCW

16 – 18 MAY – **DAYTON HAMVENTION®** – Hara Arena, Dayton, Ohio, USA. CP, OT 8am, $20-$25, TS, huge FM, SIG, DF, LEC, C, CBS, WIN, US exams, FAM. international@hamvention.org. [www.hamvention.org].

18 MAY – **31st DUNSTABLE DOWNS RC NATIONAL AMATEUR RADIO CAR BOOT SALE** – Stockwood Park, Luton. All usual facilities. [www.ddrcbootsale.org].

1 JUNE – **SPALDING & DARS ANNUAL RALLY** – The Sir John Gleed Technology School, Halmer Gardens, Spalding, Lincs PE11 2EF. TI S22, free CP, OT 10am. TS, C, CBS. John, G4NBR, 07946 302 815, rally-secretary@sdars.org.uk. [www.sdars.org.uk].

7 JUNE – **CENTRAL SCOTLAND MINI HAM RADIO CONVENTION** – Crofthead Farm Community Education Centre, Templar Rise, Livingston EH54 6DG. OT 9.50/10am, TS, FM, B&B, LEC, RSGB, WIN, C. [uk.groups.yahoo.com/group/cshrc].

8 JUNE – **13th JUNCTION 28 QRP RALLY** – South Normanton Alfreton and District Amateur Radio Club in association with the G QRP Club. Alfreton Leisure Centre, Church Street, Alfreton, Derbyshire DE55 7BD. 10 mins from M1 J28 and the A38. TI S21, OT 10am. TS, SIG, C, LB. Anya Lawrence, 2E0BQS, 0115 930 7322, adylawri@btinternet.com. [www.snadarc.com].

14 JUNE – **ROCHDALE & DARS SUMMER FLEA MARKET** – St Vincent de Paul's, Caldershaw Rd, off Edenfield Rd (A680), Norden, Rochdale OL12 6BU. OT 10.15am (8.30am traders), £2.50, TI S22, C. Pitches £5 bring your own table. G0PUD, 0161 285 1600, dave.shaw1@sky.com.

15 JUNE – **27th NEWBURY RADIO RALLY** – Newbury Showground, next to M4 J13. TI S22 (V44), free CP, OT 9am (visitors), 8am (sellers). Huge radio, electronics & computing boot sale including demonstration marquee with display of amateur radio on air (SSB, CW, & DATA), air traffic radar, plus clubs and national society stands. Visitors £2.50, CBS pitch £12.50. TS, C, CBS, WIN, DF, FM, SIG. Contact rally@nadars.org.uk. [www.nadars.org.uk].

21 JUNE – **SOUTH LANCS SUMMER RALLY** – Bickershaw Labour Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. OT 9.00 (traders 7.30). £2, B&B, C, DIS, CP, SIG, DF, TS, LB. Jason, G0IZR 01942 735 828. [www.slarc.co.uk/rally].

22 JUNE – **EAST SUFFOLK WIRELESS REVIVAL (Ipswich Radio Rally)** – The Orwell Crossing Lorry Park, A14 Eastbound, Nacton, Ipswich, IP10 0DD. TI S22, CP, OT 9.30, £2, CBS, B&B, SIG, LRC, RSGB book stall, GB4SWR HF station, Kevin, G8MXV, 07710 046 846. [www.eswr.org.uk].

27 – 29 JUNE – **HAMTRONIC SHOW, FRIEDRICHSHAFEN** – Messe, Friedrichshafen, Germany. TS, FM, CP, SIG, LB, C, DF, LEC, CS. Large RSGB book stall. Come and meet the team! [www.hamradio-friedrichshafen.de].

29 JUNE – **WEST OF ENGLAND RADIO RALLY** – Cheese & Grain, Bridge Street, Frome, Somerset BA11 1BE. CP, OT 10am-2pm, £2.50. TS, RSGB book stall, C, DIS. Shaun, G8VPG, 01225 873 098, rallymanager@westrally.org.uk. [www.westrally.org.uk].

5 JULY – **BANGOR AND DISTRICT ARS RALLY** – Donaghadee Community Centre, County Down BT21 0HB. OT 11.30, £3. Trade stands, Bring & Buy, SIG. Peter, MI6NID, 028 9188 9 018, petermi6nid@outlook.com. [www.bdars.com].

6 JULY – **CORNISH RAC 51st MOBILE RALLY** – Penair School, St Clements, Truro, Cornwall TR1 1TN. TS, B&B, C, TI, CP. OT 10.30, £2. Steve, 01209 844 939, g7voh@btinternet.com. [www.gx4crc.com].

6 JULY – **18TH RED ROSE QRP FESTIVAL** – Formby Hall, Alder Street, Atherton, Manchester M46 9EY. Free CP, OT 11.00, £2 (U14 free). TS, SIG, B&B, DF, LB, C. Les Jackson, G4HZJ, 01942 870 634, g4hzj@ntlworld.com.

6 JULY – **BARFORD NORFOLK RADIO RALLY** – Barford Village Hall & Green, Barford, Norwich NR9 4AB, talk-in S22 (V44), CP, OT 9.00 £1.50 (under 16s free). Catering, DF, WIN, TS, Bring & Buy. Contact radio@dcpmicro.com. [www.norfolkamateurradio.org].

12 JULY (SATURDAY) – **STOCKPORT RALLY** – Walthew House, 112 Shaw Heath, Stockport SK2 6QS. OT 10am, £2. TS, DIS, CP, C, TI S22. Tables £10. Nigel, G0RXA, 0161 428 8413 (eves).

13 JULY – **McMICHAEL RADIO RALLY & CAR BOOT SALE** – Reading Rugby Football Club, Holme Park Farm Lane, Sonning Lane (B4446), Sonning on Thames, Reading RG4 6ST. TI, free CP, £2, LB, C, SIG, WIN, TS, CBS, OT 9:30. Pete, G8FRC, 01189 695 697. [www.mcmichaelrally.org.uk].

Rallies & Events

20 JULY – **FINNINGLEY ARS SUMMER RALLY** – The Hurst Radio Communications Centre, Belton Road, Sand toft, Doncaster DN8 5SX. Easily accessible from the M180 Jct 1 / Jct2. OT 10am, TS, CP, B&B, TI, RSGB bookstall. Kevin, G3AAF, 07831614640. [www.finningleyradiorally.co.uk]

27 JULY – **HORNCASTLE SUMMER RALLY** – Horncastle Youth Centre, Lincolnshire LN9 6DZ. OT 10.00/10.30, £1.50, DF, C, free CP. Tables £5, free power. Tony, G3ZPU, 01507 527 835, tony.nightingale@yahoo.co.uk.

3 AUGUST – **25th KING'S LYNN ARC RALLY & CAR BOOT** – Gaywood Community Centre, PE30 4DZ. OT 10am, £2, CP free, TS, CBS pitches, C, CS (by prior arrangement), TI 145.550MHz. Ted, G4OZG, 01553 768701, g4ozg@raynet-uk.net. [www.klarc.org.uk].

8 AUGUST (Friday) – **COCKENZIE & PORT SETON ARC 21st MINI-RALLY** – Community Centre, Main Hall, Port Seton. Bring along your own 'junk' and sell it. Tables free, first come first served. OT 6pm, £2. C, DF. bob.gm4uyz@talktalk.net [www.cpsarc.com].

17 AUGUST – **RUGBY AMATEUR TRANSMITTING SOCIETY ANNUAL RADIO RALLY** – Princethorpe College, Princethorpe, Rugby CV23 9PX. Stephen, G8LYB, 01788 578 940, stephen@tompsett.net. [www.rugbyats.co.uk].

10 AUGUST – **FLIGHT REFUELLING ARS HAMFEST** – Cobham Sports and Social Club Ground, Merley, nr Wimborne, Dorset BH21 3DA. TI S22, CP, OT 10.00, TS, CBS, LB, C. Details hamfest@frars.org.uk. [www.frars.org.uk].

24 AUGUST – **MILTON KEYNES ARS RALLY** – Longueville Hall, Hammond Park, Whaddon Road, Newton Longville MK17 0AT. Free CP, OT 10am, £3, TS, FM, CBS, LB, C, RSGB bookstall. Why not visit Bletchley Park and the National Radio Centre (NRC) as well? Steve, G6KJU, 07866 673 192. [www.mkars.org.uk/mkars/rally].

25 AUGUST (Bank Holiday Monday) – **HUNTINGDONSHIRE ARS RALLY** – St Neots Community College, Barford Rd, St Neots PE19 2SH. OT 10am, £2, TI S22 (V44), CP, CBS, B&B, C, TS, DF. Clive Burchell, G3NKQ, 01480 810 473, clive.burchell@btinternet.com.

31 AUGUST – **TELFORD HAMFEST** – Enginuity Technology Centre, Coalbrookdale, Telford TF8 7DU. Martyn, G3UKV, 01952 255 416. [www.telfordhamfest.co.uk].

14 SEPTEMBER – **HALTON & DISTRICT RADIO AMATEURS RALLY** – Manley Mere. OT 10am, £1.50. TS, B&B, C £2, LB, SIG, FAM. All proceeds after costs to charity. George Low, G0RLF, 07919 935 725 (daytime), g0rlf@talktalk.net. [www.haltonradiorally.webs.com].

14 SEPTEMBER – **TARS 50th ANNUAL COMMUNICATIONS FAIR.** Newton Abbot Race Course, Devon TQ12 3AF. All indoors, TS, B&B, C, DF, WIN, RSGB bookstall. OT 9.30/10am £2. Mike Dixon, 01803 557 941, rally@tars.org.uk.

14 SEPTEMBER – **WEST KENT ARS RADIO AND ELECTRONICS FAIR** – Tunbridge Wells Grammar School for Boys, St John's Road, Tunbridge Wells, Kent TN4 9XB. TI, CP, £2.50, 10am, TS, B&B, C, DF, WIN, RSGB bookstall. Dave, G4OTV, rally@wkars.org.uk

26 & 27 SEPTEMBER – **NATIONAL HAMFEST** – brought to you by the RSGB in association with the Lincoln Short Wave Club. George Stephenson Pavilion, Newark and Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark NG24 2NY (close to junction of A1/A46/A17). Free CP, TS, B&B, CB, C, SIG, Morse proficiency tests on demand, RSGB bookstall, RSGB Services & Committees, DF, FM. [www.nationalhamfest.org.uk].

5 OCTOBER – **BLACKWOOD AND DISTRICT ARS RALLY** – Rougemont School, Llantarnum Hall, Malpas Rd, Newport, NP20 6QB. TI V44 (S22), CP, OT 10am, £2, TS, SIG, CBS, RSGB Bookstall, B&B, C. Andy, MW0MWZ, 01495 220 687. [www.gw6gw.co.uk].

10-12 OCTOBER – **RSGB CONVENTION** – New venue: Kent's Hill Conference Centre, Milton Keynes. Principal sponsor Martin Lynch & Sons. [www.rsgbevents.org/].

12 OCTOBER – **HACK GREEN BUNKER RALLY** – Hack Green Secret Nuclear Bunker, Nantwich, Cheshire, CW5 8AL Sale of electronic equipment, amateur gear, components, military radio sets and vehicle spares. OT 10am, TS, C. Lucy, 01270 623 353, Lucy@hackgreen.co.uk. [www.hackgreen.co.uk]

12 OCTOBER – **HORNSEA AMATEUR RADIO CLUB RALLY** – Floral Hall, 7 The Esplanade, Hornsea, East Yorks HU18 1NQ. OT 10am, CP, TS, B&B, SIG, RSGB, RAFARS, LB, C, DF, WIN. Details from Rick, M0CZR, 01964 533 712, R106221@aol.com. [www.hornseaarc.co.uk].

18 OCTOBER – **CARRICKFERGUS AMATEUR RADIO GROUP RADIO RALLY** – Downshire Community School, Carrickfergus, BT38 7DA. OT 11:30am, £3. TS, B&B, CP, C, DF, SIG, RSGB, MT. Details from Tim, MI0TBL, carg@hotmail.co.uk. [www.radioclubs.net/carg].

19 OCTOBER – **GALASHIELS AND DISTRICT ARS RADIO RALLY** – The Volunteer Hall, St Johns Street, Galashiels, Scottish Borders TD1 3JX. OT 11.30 /11.15, £2.50. B&B, TS, WIN, C. Jim, GM7LUN, 01896 850 245, gm7lun@qsl.net.

26 OCTOBER – **24th GREAT NORTHERN HAMFEST** – Barnsley Premier Leisure Complex, Queens Road, Barnsley S71 1AN or follow the brown Metrodome signs. GNHF in association with SYRG. OT 10.30, TS, SIG, C, FAM. Ernie, G4LUE, 07984 191 873. [www.gnhf.co.uk].

9 NOVEMBER – **WEST LONDON RADIO & ELECTRONICS SHOW** (Kempton Rally) – Kempton Park Racecourse, Staines Road East, Sunbury on Thames TW16 5AQ. TI, free CP, OT 9.50/10am. TS, FM, B&B, SIG, C, DF, WIN, LEC. Paul, M0CJX, 08451 650 351, info@radiofairs.co.uk. [www.radiofairs.co.uk].

22 NOVEMBER – **ROCHDALE & DISTRICT ARS TRADITIONAL RADIO RALLY** – St Vincent de Paul's, Caldershaw Rd., Rochdale OL12 6BU. OT 10.15/10.30, £2.50, TI S22, C. Pitches £5. Dave, G0PUD, 0161 285 1600, dave.shaw1@sky.com. [www.radars.me.uk].

23 NOVEMBER – **CATS RADIO & ELECTRONICS BAZAAR** – 1st Coulsdon Scout HQ, r/o Council Car Park, Lion Green Road, Coulsdon, Surrey. OT 10am-1pm, £1, B&B, C, DIS, free CP. Glenn, G4FVL, bazaar@catsradio.org.

RSGB MEMBERS' ADVERTISEMENTS

RSGB Members wishing to place an advertisement may do so free of charge by e-mail.

The following terms and conditions apply to all Members' Advertisements.

1) In order to qualify for free insertion, Members Ads must be submitted by e-mail to memads@rsgb.org.uk. You should receive an automatic acknowledgement almost immediately. Ads may still be submitted by post but must be accompanied by a payment of £5 to cover administration costs.

2) **Your advert must clearly show whether it is For Sale or Wanted and must include your name, callsign or Membership number, telephone number and postal town.**

3) The Ad may not contain more than 40 words, excluding the information in (2), and may be edited for readability at our sole discretion. Longer ads may be accepted if there is a good reason, eg a shack clearance on behalf of a SK Member; e-mail us and ask.

4) Not more than one ad per month will be accepted from any member. 'Recurring' ads will not be accepted, but Members may re-submit the same advert each month if they wish.

5) E-mailed adverts may optionally include one photograph of the item(s) being offered. Images must be attached as a jpg file, at least 800 pixels wide and of good quality. By submitting any image you warrant that you own the copyright and that you permit the RSGB to use it in anyway. We will endeavour to publish photographs with ads as space permits but cannot guarantee to publish any particular photograph.

6) Adverts will be published at the first available opportunity but no guarantee can be given as to when a particular ad will appear.

7) The RSGB believes that it is inappropriate for Members trading in radio equipment in any way to place Members' Ads. We therefore regret we are unable to accept such ads, although we do welcome these in the 'Classified' advertising section of *RadCom*.

8) The RSGB accepts no responsibility for errors or omissions, or for the quality of goods for sale or exchange.

9) Members' Ads are accepted and published in good faith.

10) Members' Ads are accepted at the sole discretion of the Editor, whose decision is final.

WARNING

Members are advised to ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement.

The 'purchase' of goods legally owned by a finance company could result in the 'purchaser' losing both the goods and the money paid.

Members' Ads also appear on the Members Only website at www.rsgb.org/membersonly/membersads.

23 NOVEMBER – **PLYMOUTH RADIO CLUB RALLY** – Harewood House, The Ridgeway, Plympton, Plymouth PL7 2AS. CP, TI, OT 10am, £2, TS, C. Sheila Hart, 2E0YSH, 07815 542 477, sheo@fsmail.net.

6 DECEMBER – **SOUTH LANCS WINTER RALLY** – Bickershaw Labour Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. OT 9am, traders 7.30am. £2, B&B, C, DIS, CP, SIG, DF, TS, LB. Jason, 01942 735 828.

7 DECEMBER – **BISHOP AUCKLAND RADIO AMATEURS CLUB RALLY** – Spennymoor Leisure Centre, Co Durham DL16 6DB. CP, TI S22 (V44), OT 10.15 /10.30, £2 (U14 free). TS, B&B, C, LB, DF, FAM. John, G4LRG, 01388 606 396.

THE QUAD ANTENNA

Phil Harman, VK6PH/VK6APH and Steve Ireland, VK6VZ

As long-term followers of the work of Les Moxon, G6XN and active constructors of many of his ideas, we were somewhat concerned that Peter Dodd, G3LDO, in the October 2013 Antennas seemed to have missed the majority of the reasons why Les considered the quad to be inferior to some other kinds of antenna. The article also makes it sound as though G6XN disliked loop arrays, where in fact his main antenna was actually a 2-element delta-shaped loop array known as the Claw. Les simply preferred triangular-shaped loop arrays to square ones – and ones in which instead of nesting multiple full wave loops inside each other to get multiband coverage, a single loop was used for each of the two elements and then tuned/switched remotely from the shack to get multiple band coverage.

To set the record straight, Les' argument is as follows:

1. Since the top and bottom halves of the quad loop receive the same amount of current, the major radiation from the antenna lies along the axis of the boom. By mounting two delta loops effectively on top of the boom (as Les does with the Claw), all the radiation comes from above the boom, providing an effective height increase of an eighth of a wavelength on the lowest frequency of the antenna.
2. By removing the bottom halves of the loops, as Les does with the Claw, four spreaders can be eliminated from a 2-element array, which both lightens the antenna and (assuming the *wire* wind loading is negligible) almost halves the wind loading.
3. By nesting loops for multiband operation, rather than using the full aperture of the lowest frequency loop on all bands, additional gain on the higher bands is lost. By using single loops for both elements construction is simplified and, whilst matching becomes slightly more difficult, is achievable.
4. In a standard quad in comparison to the Claw, by making the reflector loop longer than the driven loop, instantaneous beam direction reversal cannot be achieved. Instead, Les proposes that both loops be made physically and electrically the same size and a feeder connected to each loop and brought back to the shack. By simply adding inductance across the coax connected to the loop chosen to be the reflector, in the comfort of the shack, the direction of fire of the Claw can be instantaneously changed using a simple two-pole switch or relay.

It's these shortcomings of the quad antenna (which Les had previously used) that prompted him to develop his Claw antenna (see *HF Antennas for all Locations*, second edition, pages 215–220, and VK6APH's two-part article 'The Claw Revisited', published in *RadCom* October and November 2012).

Even for those traditionalists who still like to nest multiple full-wave loop elements inside each other, triangle-shaped delta elements are increasingly replacing the traditional square-shaped quad elements, owing the need for two fewer spreaders in a two element array, which both cuts cost and wind loading. An excellent and modestly priced source of delta loop hubs can be obtained from RG Antenna Parts at www.deltaloopantenna.com/

COMMUNICATION

Ernie Walls, VK3FM

We amateurs like to think that we are good communicators – and we are often not backward in communicating this aspect of our hobby. However, it is quite obvious that amateur communication capabilities, in all its many forms, is less than the perfect art form that we have claimed for ourselves. In what respect am I addressing with this latest comment?

Well, I use QRZ.com to source a lot of information about my fellow amateur and am sick and tired of the (peculiarly and particularly) English habit of recording only initials instead of their Christian (given) name. Surely, as self-confessed 'communicators par excellence' we can, at the very least, insert our name in this wonderful database so that anyone wishing to find out a little about us can, again at the very least, address them, even in our own minds, with their 'moniker'.

Please – no more SJ, or EH or PW – try Sam, or Evan or Peter – it's much more friendly and, above all, much more communicative.

OLD RADIO GEAR

Andy Choraffa, G3PKW, D Phys

I have been doing some material science recently with aluminium as an RF conductor. I also unearthed some research in connection with materials used in common electronic equipment and devices. I refer you to a paper on the effects of ageing on certain devices and surfaces that contain metal conductors. By their nature, conductors such as zinc, tin, lead and others that includes solder can be subject to an effect called 'electro-migration'. This is a phenomenon where the conductive ions of the material form dendrites (whiskers) across insulating paths. This affects circuit boards, transistors and even potentiometers, causing them to become short circuit. To get a better understanding of this problem due to ageing, see http://en.wikipedia.org/wiki/Whisker_(metallurgy). An extremely useful PDF particularly with reference to germanium transistors can be found at www.vintage-radio.info/download.php?id=371.

So beware, as that old transceiver is probably growing a beard!

[Tin (and other metal) whiskers are a fascinating and poorly-understood phenomenon: a NASA document from 2012 (http://tiny.cc/miraclewhisker p18) says "... THEN A MIRACLE OCCURS to initiate whisker growth" (their emphasis) – G1MFG]

IN SUPPORT OF NEW LICENSEES

Joe, G3LLV

Do you not think that the argument about old and new licensee requirements has been done to death and should be laid aside? I am one of the 'old school' but was recently subject to an epiphany and so realised that the influx of new amateurs was a very good thing for the hobby. Many of these, especially the young, will go on to make their mark and we will be the better for it. In that respect, we were slowly sinking at the stern but now seem to be afloat and just about on course. Also, just take the adverts for gear and parts as an example of how much more there is on offer now that our numbers have increased.

As for CW, a mode that most certainly has its place, let those who want to, do so and lead by example. For those who don't, there are lots of other things to get on with. How much better to gather in anyone who wants to communicate within our very liberal and largely unwritten rules. Transgressions of these are usually a temporary thing and will go away with learning and time. The only fault I find is the closed mind of someone unwilling to learn and let live.

Andy Riley, 2E0WBL

I have read with bemused interest the letters from fellow amateurs who gained their full licence through the old RAE qualification system. I had met with no such opinions at a personal level until I recently visited a local business to find the proprietor using his radio in the shop. After he finished his call to serve me I introduced myself using my recently acquired intermediate call. I was met with the opinion that the shopkeeper didn't agree with what the RSGB had done to 'water down' the licensing system. However, as the discussion progressed, it became apparent that he didn't actually know what was required of a candidate under the current system. So, my message to all the qualified amateurs out there who gained their licence 'the hard way' is this... take a long hard look at the current system before you talk down to those who are working their way through it. You may find it's harder than you think. My personal thanks goes to everyone at the Wirral & District ARC for their help and support, especially our President and training guru, Geoff Brown, G4WUA.

The Last Word – Letters

Letters published in 'The Last Word' do not necessarily reflect RSGB policy. 'Last Word' letters may be e-mailed to radcom@rsgb.org.uk Please note that letters submitted for 'The Last Word' may not be acknowledged. The RSGB reserves the right not to publish any letter, with no reason being given. It is a condition of publication that all letters may be edited for grammar, length and / or clarity. Due to the limited space available, please keep letters as short as possible.

L Kent Taylor, M0LKT

After nearly 7 years as 2E0LKT, I finally made the plunge for my Full licence. I must thank those of South Tyneside ARS for their help and invigilating at the exam. I aim to use my new callsign, M0LKT, to further develop my own skills and to start passing those skills on with the RAF Air Cadets and encourage others to take up the hobby of amateur radio. I must also thank members of my local club, Stockton and District ARG, for pointing me in the right direction so that I could sit the exam. One of my main methods of operation is HF mobile in the Cleveland area (Carlton Bank, Ormesby Bank, Birk Brow and Clay Bank to name a few!) mainly on 20m and 40m.

HOW I GOT STARTED

Mike Stewart, G4RNW

My first contact with constructing any sort of radio came in the late 1940s when I was given a crystal set to build. After I had played with it for some time I 'modified' it by substituting the crystal with a valve, an HL2 battery triode, that I found would work with a 1.5V torch battery for low tension and without any high tension. To this I later added an LP2 valve, but I found that this 'advanced' arrangement needed some high tension, but not much. I never did cure the problem of hearing two stations at once completely and for many years my interest stagnated.

Sometime around 1978 or 79 I met Allan, AE2J from New York. Happily still with us but sadly not as well as he was. He nagged me on and off over the next couple of years to get a licence. "We can then chat to each other on the air", he would say. We rarely have; it's usually on Skype!

Around February 1982, I finally succumbed and paid a visit to the RSGB in Doughty Street. Behind the counter in the shop was a helpful gentleman who informed that I would need to take some written exams to get a G8 (limited licence) or then take a Morse test in order to acquire a full G4 licence, entitling me to use all the available wavebands. I purchased two books from him. These books, I was assured, if learnt thoroughly would give me enough info to pass. He also gave me a batch of sample question papers.

In those days I was blessed with a remarkably good memory (long gone) and I made a point over the next few months of literally learning the contents off by heart. Of course, I understood very little. Electronics have always been a problem for me and 'digital', even worse. Give me mechanical things and I'm your man. Car engines, aero engines, steam engines – no problem. But electronics – hopeless!

I passed the exams in July of that year, but still knowing nothing. Later that year, I joined the RSGB and purchased a Datong Morse synthesiser and some sample tapes. I also acquired a rather scruffy key to practice with. By November I had worked my way up to about 15 words per minute. I had little trouble with CW, which I believe is due to my being a bit musical. I duly took my test later that month and was, in due course, awarded – G4RNW.

Sadly, I have never mastered electronics. I know enough not to cross + with – as this can cause the lights to go out or cause a bang, or probably both, but there it really still stands.

There are many and varied articles in *RadCom*, written by geniuses that invariably go over my head, especially when they bring out the maths formulae. I am sure you get the gist of the above. I am sure I can't be the only one. Perhaps others are too proud to admit it.

However, I know enough to connect one wire to the wing nut on the tuner and bury the other end in the ground. Plus the other wire, which should be as long as possible and thrown out of the window, can then be connected to the insulated bit. One can then adjust the SWR (Shout When Ready) with the ATU (All Tuning Undertaken) and then call up someone in Ulan Bator who is working QRP (Quaint Radio Person) and get and give a 5/9 plus 30 report (Liar!).

Nevertheless it is all good clean fun and for me anyway, beats being out in the rain either playing or watching football.

GB2CW

Rick Hewett, M0LEP

As someone trying to learn Morse, I'm encouraged to read of a new volunteer stepping forward to help run the GB2CW Morse practice broadcasts. Roger, G3LDI's aim to have at least one GB2CW trainer in every club is laudable. However, the number of willing volunteers is small and the reach of VHF broadcasts is limited. I've listened out for GB2CW VHF broadcasts I thought might be within my reach, but I've never managed to hear any of them and I doubt I'll be able to hear the new VHF broadcasts from Ipswich. I've only ever been able to hear GB2CW broadcasts on HF. I hear Martyn, G3UKV's HF broadcasts from Telford clearly almost every week and find his mixed-mode style very helpful. I can also sometimes hear the HF broadcasts sent by Andrew, G0IBN from Tollesbury, depending on propagation (and other engagements). I would welcome more GB2CW broadcasts on HF.

ANTENNAS

Alan Boswell, G3NOQ

I read the with interest the April Antennas column by Peter Dodd, G3LDO but had some difficulty following the argument. The question was: "Does academia understand electrically small antennas?" and he appears to conclude that it does not, by selecting a 25-year-old paper on meanderline antennas that predicted a high performance that was not reproduced by later experiments reported in *RadCom* at the time.

Electrically small antennas are well understood and Peter need look no further than the numerous LF and VLF antennas around the world. Some of these are 300 or more metres high but even so they are electrically small, with heights of 1/50 wavelengths or less on the VLF band below 30kHz. The market makes sure that customers would not pay the price for these structures if anything cheaper could do the job.

The Rugby VLF antenna was first put into service in 1926 on twelve 250m masts, and with some redesigns aimed at improving the bandwidth it remained in service for over seventy years. The masts were 1/70 of a wavelength high at the carrier frequency used in its later decades. Since then new antennas of similar size have replaced it. Anyone wanting ideas for electrically small transmitting antennas could start by looking at how these are designed and I know there are several RSGB Members active on the LF bands who understand the principles.

Another suggestion is that programs like *NEC* have gone into general use for testing antenna ideas while staying indoors. Whilst the right precautions are always needed to avoid the garbage-in-garbage-out syndrome, in the right hands such software offers a good first stab at testing new ideas so that we are not always working in the dark.

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APACHE LABS

SDR AT ITS BEST
Fantastic Receiver

ANAN-100E & ANAN-100DE 100W All Mode Transceivers

Greener and Cleaner!
Apache Labs become the first Amateur Transceiver manufacturer to include Pre-distortion technology within their PA's for ultra-clean TX! 'Pure Signal' technology is available on all new and existing Anan products with a firmware/software update. Existing customers visit *www.apache-labbs.co.uk* and register for full details. This makes your signal "greener" and cleaner! This is even more important if you are running a linear.

Tmate-2
Provides A Natural Progression to SDR

The Tmate 2 brings familiar hardware control to SDR. USB powered, and with a colour LCD panel, you have a compact controller that lets you take advantage of the high performance of SDR while preserving the analogue feel. Even if you are working on a different PC screen display, you still have control over your radio. User programmable controls let you set up your preferences. It's the natural progression.

The Tmate 2 will work with FlexRadio PowerSDR, Apache-Radio HPSDR and will also work with the famous Persius receiver. Software is in progress to enable the Tmate 2 to work with FlexRadio 6000 series SmartSDR.

ANALOGUE FEEL SDR PERFORMANCE!

£269.95c

STOP PRESS
ANAN-100DE
Can be switched to 1536KHz
Panoramic Display

ANAN-100E / 100DE Brief Specification

- *160 - 6m Transmit and Receive. All Modes*
- *Receive 10KHz - 55MHz All Modes*
- *ANAN100 - Single Physical receiver (7 within software)*
- *ANAN100D- Dual Physical receivers (14 within software)*
- *Software - PowerSDR mRX - up to 768kHz display (Current)*
- *cuSDR - up to 55MHz display (In development)*
- *Platforms - Windows (Linux and Max to follow)*
- *12 Front end band pass filters for great receiver performance*
- *Triple Antenna sockets - Software switchable*
- *Ethernet connection to PC - network friendly!*
- *Image rejection >100dB*
- *Rx dynamic range typically 125dB*
- *Switchable pre amp - 135dB noise floor (500Hz bw)*
- *IF filter bandwidths down to 25Hz - configurable.*
- *Short cut keyboard tuning and operational settings*
- *Keyboard CW sending - Wave file record/playback*
- *Dual transverter sockets - PTT out - Accessory multi socket*
- *Stereo audio out - 1W speaker level*
- *13.8v DC - Size 265 x 220 x 80 (mm) Weight 4.5kg*

Full spec: www.apache-labs.co.uk

160m - 6m 100W Ethernet Connection

ANAN-100E £2299.95c ANAN-100DE £2999.95c

The Choice
All feature 10kHz - 55MHz receive.

ANAN-10E
This is the 15W model that uses the Hermes board with internal linear amplifier. Ideal for QRP or VHF-UHF driver. **£1,549.95c**

ANAN-100E
The standard 100W transceiver with 3 antenna sockets and using the Hermes board. **£2,299.95c**

ANAN-100DE
Our top range transceiver that uses the Angelia board with dual independent receivers. **£2,999.95c**

ANAN10 Brief Specification

Price £1559.95c

- *160m - 6m 10W (Typically 15w)*
- *3 ant. Sockets - 1 Transverter I/O - PTT out*
- *10kHz - 55MHz Rx. Displays up to 384KHz*
- *Software: PowerSDR mRX*
- *Ethernet connection*
- *13,8v DC - 165 x 63 x 140 (mm)*

ANAN-10E Transceiver
QRP or VHF - UHF Driver

The ANAN10E fulfills a dual role. It can be used as an HF-6m QRP transceiver or as a driver for VHF - UHF transverting. It is ready equipped with transverter interface. A high quality design that gives superb performance under all band conditions.

FlexRadio Systems®
Software Defined Radios

FlexRadio - 6700 LF - 77MHz 100W Transceiver

NEW
SmartSDR v1.1
Software Available

The new FlexRadio "6000" series heralds a new level of performance and a new product range from the FlexRadio factory in the USA. Direct digital conversion results in quite remarkable performance on both receive and transmit. Each FLEX-6000 Signature Series radio is equipped with a 1Gb Ethernet port for communication to existing PCs or other future display platforms. Since 100% of the receiver and transmitter mixing and filtering are done in the digital domain, unwanted sideband suppression, filter shaping, carrier suppression, and image rejection are no longer limited by non-linear analog circuits. Further, infinitely variable brick wall digital filters allow precise interference elimination without added distortion. The FLEX-6700 and FLEX-6700R incorporate two independent, synchronous Analog Devices. Each of the two Spectral Capture Units allows simultaneous reception from their own respective antenna or the two can be optimally combined to deliver increased dynamic range. There is a lot more to the "6000" series and full details can be had by logging onto the FlexRadio web site - www.flexradio.com.

Flex-6500	SDR transceiver HF & 6m 100W DSP ATU for PC with SmartSDR (up to 4 RX) 0.3-77MHz RX	**£3,449.95c**
Flex-6700	SDR transceiver HF & 6m 100W DSP ATU for PC with SmartSDR (up to 8 RX) 0.3-77 & 135-165MHz RX	**£5,799.95c**

Our New HamPad Touch Screen Controller - No Need to Tie up your PC Screen

£195.95c

HamPad

The most advanced accessory for SDR transceivers. This touch screen mini monitor works alongside your PC giving you the tactile experience of analogue panels and letting your PC screen show other programs such as logging. It is USB connected and comes with lead and software for Windows. Features include: Dedicate DX cluster window, Complete remote control, Dedicated CWskimmer display, Has display for PSK31 and RTTY. Features a colour 7"

Try Out SDR with this Great Flex-1500 Transceiver
Order Yours TODAY!

If you are new to SDR, then this maybe an ideal introduction to one of the most exciting aspects of ham radio technology. Simply connect up to your 12v PSU and plug into the USB socket of your Windows based PC. You can be on the air in minutes with panoramic display and quite the best receiver selectivity and noise reduction for the money. No analogue transceiver offers this level of performance at this price level. And if you are a VHF enthusiast, this could be the ideal driver for your station.

£599c Gets You an SDR Station

Carriage Charges: A-£4, B-£5, C-£8.50, D-£11

K3/0-Mini Remote Control

Remote control your K3

NEW

No PC Needed!

The K3/0-mini allows distant operation in 'terminal mode' in conjunction with a base station K3. It provides unique real time remote control experiannce. You can operate a K3 located in th next room, or across the world. The latest K3 firmware supports compact remote control serial protocol that provides a 100% mi ror image of the remote K3 base, on the controlling K3/0-mini. Au local front panel controls: VFO knobs, other controls and button actions, are immediately communicated back to the base K3, and all display functions from the remote base K3's LCD and LEDs, are immediately displayed on the controlling K3/0-mini.

The K3/0-Mini consists of a K3 front panel only, so it's highly portable. The K3/0-Mini is perfect for home and travel use, due to its small size. It fully duplicates all K3 controls, displays and menus for a realistic remote K3 experience. With the recommended interface at each end, it is possible to connect direct to the local router at each end of the system with no PC needed.

ELECRAFT K3 HF Transceiver HF - 6m

The transceiver that more and more serious hams are turning to. The name of "Elecraft" spells out quality, reliability and performance. What more could you demand? And on the inside are a host of design features that make this radio one of the most satisfying and enjoyable to operate. All the essential controls are accessible from the front panel. No need to go into menus to change those things you need to do quickly, Instead, the comprehensive menu system is the preserve of what you need to change in order to create your own personal performance needs. And if you are worried about it getting out of date - don't.. The K3 is probably the most regularly updated radio on the market. And that is why you rarely see them second hand!

Build or Kit?

KIT: You can build a K3 in around 15 hours of careful assembly with a limited amount of construction experience. No soldering is needed.

Built: we can build your K3 including adding optional extras, correctly align it, computer test and soak test, and deliver it to you with loving care.

Either way: You get an exclusive 24 month UK warranty.

K3-10W
Kit £1495 Built £1595
K3-100W
Kit £1995 Built £2095

The Amazing KX3 Transceiver

Nothing Comes close in Size and Performance

- 160m - 6m SSB CW AM FM PSK31 RTTY
- 100mW to 12W continuous on 13.8v
- 100mW - 5W on internal AA cells
- Internal 8 x AA battery tray
- Variable Selecetivity down to 100Hz
- DSP filtering and Noise Reduction
- Same size display as the K3
- CW Keyer with full and silent QSK
- 6 CW Memories
- Stereo CW and Ambient Modes
- VOX operation and Voice Recorder
- Split operation and true dual receive up to 15kHz shift
- I/Q output for direct use with iPad and other tablets
- Audio filter for really sharp passband
- CW spot and auto zero
- Pre-Amp and Attenuator
- Strong adjacent signal protection circuit
- Free software for update and control
- CW PSK31 & RTTY Displaty decoding
- Send RTTY and PSK 31 via CW key

The KX3 represents a milestone in ham radio history. In the past twelve months it has outsold every other transceiver that we handle, by a very large margin. To many, it is the perfect transceiver. And independent tests show that it outperforms almost every other HF transceiver no matter the cost or make. That is a pretty impressive statistic in itself. But as the radio has so much to offer, it is hardly surprising. Features include: 10W output, SSB CW FM AM PSK31 RTTY, AA Battery Tray, Variable Selectivity, DSP, Large Display, CW Keyer, Voice and CW Memory, Full QSK and VOX, Dual Receive, Stereo CW, Amazing Dynamic Range etc. It all adds up to a very special radio. And with the coming 100W PA, KXPA100 and the 2014 release of the 2m transverter, it has become the classic radio for portable or QRP work.

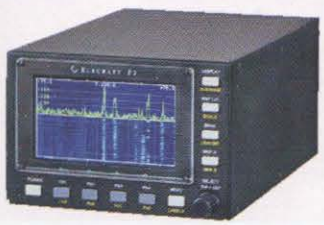
KX3 Built or Kits from Stock.

KX3 Kit	**£899 D**
KX3 Built & Calbrated	**£959 D**

KX3 Accessories from stock.

MH3	Hand Microphone	£64.95 B
KXFL3	Dual Passband g Filter	£129.95 C
KXAT3	Automatic Antenna Tuner	£169.95 C
KXPD3	Iambic Keyer Paddle for KX3	£129.95 C
KXBC3	Internal Charger for board	£64.95 B

P3 Panoramic Display



The P3 really adds performance to your K3 transceiver. It will display live spectrum up to 200kHz wide with Average feature that lets you suppress noise spikes. A press of the cursor button QSYs the K3 to the display signal. The P3 is self powered from the K3. All leads supplied. You will need the KXV3A board fitted inside the K3. We can arrange this modification to your K3 if needed or supply the board.

Built £759 D Kit £709 D

All these accessories and options are normally from stock

K3 Build Examples - All can be supplied from stock

	KIT	BUILT
K3/10 QRP Transceiver		
K3 10W Transceiver + 400Hz Roofing filter	£1638	£1738
K3 10W Transceiver + 400Hz & Auto ATU	£1957	£2057
K3/10 QRP Transceiver / 2m or UHF Driver		
K3 10W Transceiver + 2m Transverterw + KXV3A transvert Interface	£1927	£2027
K3/100 100W Transceiver		
K3/100 Transceiver 8 po;e 2.8kHz filter swap + 400Hz Roofing filter	£2188	£2288
K3/100 Transceiver 8 pole 2.8kHz filter swap + 400Hz Roofing filter	£2507	£1099
K3/100 Transceiver 2.8kHz, 2.1kHz & 400Hz roofing filter + Auto ATU	£2646	£2746
K3/100 Transceiver 2.8kHz, 2.1kHz & 400Hz roofing filter + Auto ATU + Audio Recorder	£2799	£2899
K3/100 Transceiver 2.8kHz, 2.1kHz & 400Hz filter s+ Auto ATU + 2m Transverter & KXV3A	£3074	£3174
K3/100 Transceiver 2.8kHz, 2.1kHz & 400Hz roofing filter + Auto ATU + 2nd Receiver	£3245	£3345

K3 Roofing Filters from Stock

KFL3A-200	200Hz 5-pole	£89.95 C	**KFL3A-1.8K**	1.8kHz 8-pole	£139.95 C
KFL3A-250	250Hz 8-pole	£139.95 C	**KFL3A-2.1K**	2.1kHz 8-pole	£139.95 C
KFL3A-400	400Hz 8-pole	£139.95 C	**KFL3A-2.8K**	2.8kHz 9-pole	£139.95 C
KFL3A-500	500Hz 5-pole	£89.95 C	**KFL3A-6K**		£139.95 C
KFL3A-1K	1KHz 8-pole	£139.95 C	**KFL3B-FM**		£139.95 C

K3 Accessories from Stock

KAT3-K	Internal 100W ATU has a much wider matching range than normal	£319.95 C
K144XV-K	Internal 2m 8W transverter. Excellent low noise receive performance	£299.95 C
KPA3-K	Internal 100W used to upgrade from the low power 10W model	£449.95 D
K144RFLK	K144XV Reference Lock	£99.95 C
KXV3A	RX Ant. IF Out and transverter interface. Also needed for use with P3	£129.95 C
KTCX03-1	High Stability Ref Xtal	£109.95 C
KDVR3	Digital Voice Recorder - recommened we fit as needs front panel removal	£144.95 C
KBPF3	General Cov. Rx Bandpass filter. Improves GC performance	£169.95 C
MH2	Hand Microphone with Up/Down buttons. Eletret type.	£64.95

Now Two Amplifiers!

NEW

The NEW KXPA100 100W Linear Amplifier (FT-817 Ready!)

Did You Know The Little KX3 can drive this Amp to around 180W!

KXPA-100 100W Amplifier

This 100W amplifier covers 160m to 6m and delivers 100W output. It is designed for use with the Ekecraft KX3 or the Yaesu FT-817. The drive input is switchable between 5 or 10 Watts to suit either transceiver. There is also an optional internal auto ATU available.

KXPA-100F Built £749d **KXPA-100K Kit£599d**
KXPA-100AF-F Built £1099d **KX(A-100AT-K £999d**

KPA-500 600W Amplifier

The KPA-500 covers the bands 160m to 6m and delivers 600W with a drive level of aroound 30W. It can be used with any transceiver and features auto band switching through RF sensing. It has a built in AC supply and is the same sixe as the K3 transceiver. This is a great solid state design with full protection. No warm up and capable of full QSK switching.

KPA-500F Built £2199d **KPA-500K Kit £1999d**

Carriage Charges: A-£4, B-£5, C-£8.50, D-£11