RadCom

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

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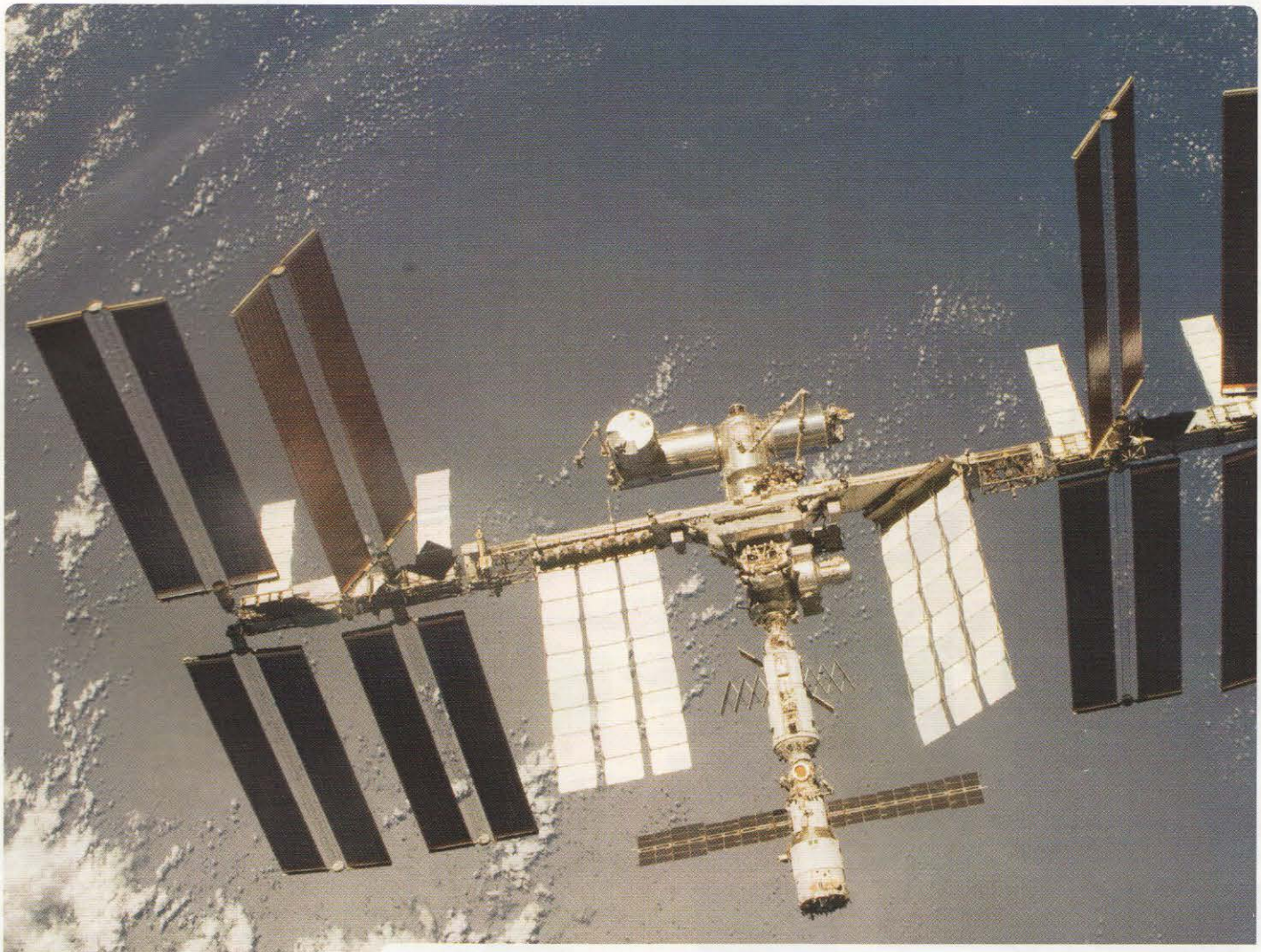
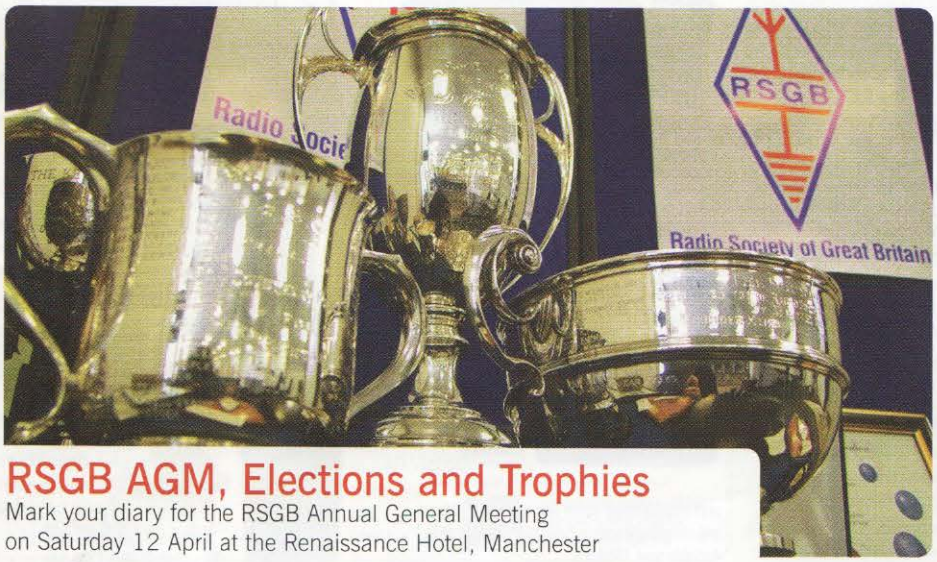


Digital amateur TV test card generator for the International Space Station

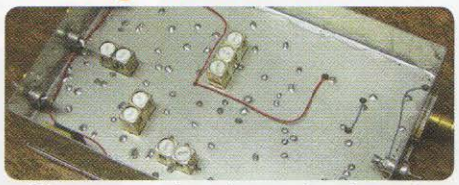
0414



RSGB AGM, Elections and Trophies

Mark your diary for the RSGB Annual General Meeting on Saturday 12 April at the Renaissance Hotel, Manchester

Getting started in...



...Microwaves, where low cost equipment can give great DX on the wide open bands

EMC

Continuing our look at photovoltaics and EMC

WATERS & STANTON

Head Office & Southern Store

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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

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YAESU
Choice of the World's top DX'ers

FT-DX1200

£1,266d
Includes £83 Yaesu Cash Back

Price Down!

In Stock!

Features
* HF - 6m with wideband receive
* 100W Output on All Modes
* Triple conversion receiver
* Three roofing filters 3kHz 6kHz and 15kHz
* Texas Instruments DSP Module
* Full Colour 4.3" TFT Display panel
* Variable bandwidth & IF Shift + IF Notch
* 3-Band EQ Mic. amp. adjustment
* Hi-Speed Auto ATU + 2 Antenna sockets
* Bandscope, Analogue or Bar Metering
* CW & RTTY Display decoding (option)

There's lots more to love about this transceiver, not the least of which is the PRICE

100W HF - 6m Transceiver with Colour LCD Panel
A Great Base Station Transceiver at a Great Price

New Yaesu CashBacks Look for the "Smile." Each CashBack Offer runs until the end of March

We can offer interest FREE, no deposit terms, on this transceiver.

Yaesu FT-DX1200 - Peter Haart RadCom Review says:

"Particularly crisp, bright and colourful display - - - 8 input bandpass filters - - many features are the same as in the FT-DX3000D - - wide band receive from 30kHz to 56MHz - - blocking performance is very good - - good ergonomics - - informative display - - I could find little to fault - - another good all rounder - - both FT-DX1200 and FT-DX3000D are excellent choices.

FT-DX3000 HF & 6m Transceiver

Peter Haart Reveiw 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.

Includes £167 Yaesu Cash Back **£,1890 C**

More Exclusive Yaesu Deals from Top UK Yaesu Dealer!

FT-897D HF & 70cms 100W

£687 d
Includes £42 Yaesu Cash Back

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

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 **£3975 d**

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 Mk II

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

WATSON

All models fitted with "NF" Noise Offset Function

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

Power Max-45 NF

£119.95c
- Output Voltage Variable: 4.0V - 16V
- Output Current: 40A Continuous, 45A Peak
- Output Voltage Regulation: Less than 1%

Power Max-65 NF

£199.95d
- Output Voltage Variable: 4.0V - 16V
- Output Current: 60A Continuous, 65A Peak
- Output Voltage Regulation: Less than 1%

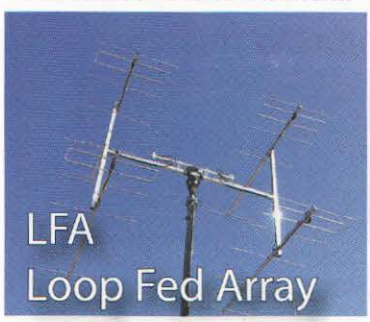
YAESU
Choice of the World's top DX'ers

FT-817ND HF - 70cms 5W All Node 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**

InnovAntennas from Stock



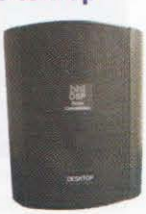
144MHz	Elements	Boom L.	Gain dB	Price inc VAT
144-LFA-3	3el	0.67	8.67	£59.95c
144-LFA-4	4el	1.17	9.49	£74.95c
144-LFA-5	5el	1.79	11.16	£89.96
144-LFA-6	6el	2.41	11.88	£104.95c
144-LFA-8	8el	3.73	13.32	£164.95c
144-LFA-9	9el	4.40	14.06	£194.95c
144-LFA-12	12el	7.13	15.80	£269.95c
432MHz				
432-LFA-SQ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

bhi

Noise reduction products

DeskTop

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

Maybe you are not realising the full potential of your receiver? This DeskTop unit is a great station addition. **£179.95 c**

NES-10-2 mk 3

- Noise Cancelling speaker
- 9 - 35dB reduction
- 8 levels of processing
- Bypass switch
- Easy connects to any receiver
- No need to open up receiver
- 12v DC operation

A great asset to any receiver or transceiver. Hear the signal and not the noise! Makes copy so much easier. **£99.95b**

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**

Free Extras

IC-R6

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

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

Turn Your Old Gear Into Cash or New Gear

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 203353
email: sales@wsple.com

Part Exchange
Use your old gear as part payment.
No Deposit Interest Free
Use your old gear to to reduce monthly payments.
Cash Back
Use your old gear in the Yaesu CashBack Offers

The NEW OM Power 2000+ Amplifier 160 - 6m 2kW

- HF - 6m 2kW SSB CW (1.5kW on 6m) 1.5kW RTTY
- Self Contained Desk Top Operation
- 40 - 60W Drive to FU-728F ceramic tetrode
- Full QSK with silent vacuum relay
- Automatic Protection - LED Dosplay
- 3-way antenna switching
- 390mm x 195mm x 370mm (w x h x d)
- Weight 24kgs 220 - 240v AC input

OM Power are recogniesed as one of the worlds leading manufacturers of high power amplifers. This one reaches a new level of perfprmance and operation. Available now. **£3,895d**

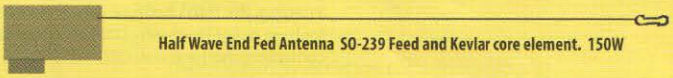
WATSON End Fed Half Waves

NEW

We are pleased to introduce the new Watson range of End Fed Half-Wave Antennas. An easy way, and most convenient antenna system for both home and portable application. These are purpose built single band resonant antennas for optimum performance.

WREF-10	10m (5m long) halfwave SO-239	£62.95c
WRED-12	12m (6m long) halfwave SO-239	£64.95c
WREF-15	15M (7m long) halfwave SO-239	£66.95c
WREF-17	17M (8m long) halfwave SO-239	£66.95c
WREF-20	20M (10m long) halfwave SO-239	£69.95c
WREF-30	30M (15m long) halfwave SO-239	£73.95c
WREF-40	40M (20m long) halfwave SO-239	£86.95c
WREF-60*	60M (30m long) halfwave SO-239	£134.95c
WREF-80*	80M (40m long) halfwave SO-239	£151.95c

*These antennas are suppled with coax choke for optimum matching.



Half Wave End Fed Antenna SO-239 Feed and Kevlar core element. 150W

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! **£695c!**

Handheld Transceivers

YAESU

FT-252 2m Handy **£69.95c**

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	£324.95c
IC-E92D	2m/70cm + D-Star	£379.95c
TH-F7E	2m/70cm + wide receive inc. SSB	£234.95c
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

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

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.

IN STOCK £PHONE FOR DEAL

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**

ICOM IC-9100 160m - 23cm*

The latest all mode DC to light radio from ICOM. 160-2m 100W, 70cms 75W and 23cm (option) 10W. **£2899c**

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 £3299.95c

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. **£699.95c**

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

CHECK OUT OUR NEW WEB SITE

Mobiles

TM-281E

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

FT-8800E

Dualband Mobile 50W / 30W Great Value **£284.95c**

FTM-350AE

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

FT-2900E

75 Watt 2m 3W Audio, CTCSS, DTMF mic & "WIRES" internet. **£142.95c**

FT-7900E

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

TM-V71E

2m/70cm Mobile with Echo Link ~~£299.95~~ **£259c**

FT-8900R

Quad band 10/6/2m/70cm FM 50W (70cm 35W) **£329.95c**

FTM-10E

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

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**

ID-E880

TM-D710E

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

SP-180A

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

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

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. **£687.95c inc. CashBack**

FT-857D The great value mobile or base HF-6m 100W, 2m 50W 70cm 20W. **£679.95c**

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

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Web: www.wsplc.com
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Choosing A Headset

Choosing a Heil headset makes a lot of sense for several reasons.
Firstly it is designed by one of the worlds top ham radio names and a professional audio engineer, Bob Heil. A good enough reason in its own right. They also has a mic. element that is perfect for modern ham radio transceivers. And of course it has the unique phase reversal switch which makes for versatile reception. Of course we can always supply spares and adaptor leads and whilst these headsets can exclude outside noise, they don't clamp your ears, putting you in a chamber totally silent claustrophobic listening. But that's because they are made for ham radio! That's why DXpeditions and contesters choose them! QED!

The Origin of Great Sounding Signals

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

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

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

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**

Base Station Mic

HM-12 Base station Mic.

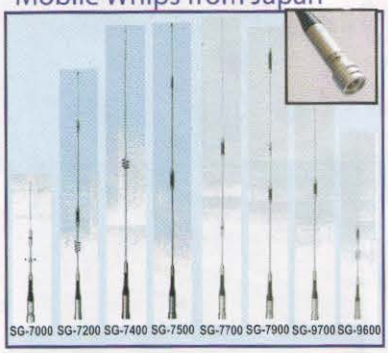
Using the broadcast quality HC-6 insert, this is the ideal base station microphone for the modern transceiver with EQ control. This really is great value and gives you Heil quality at a great price. Call us with details of your radio and we advise on matching lead.
£69.95 c

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**

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 on 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**

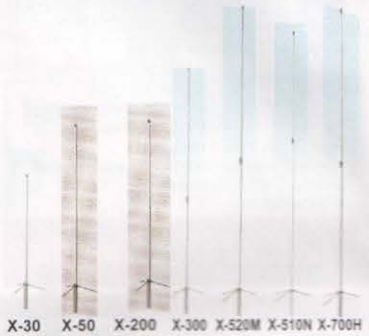
SX-200 1.8 - 200MHz. 5/20/200W FSD. 1W sensitivity for FSD. Single sensor. 0.15dB insertion loss. PEP/RMS **£89.95 C**

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

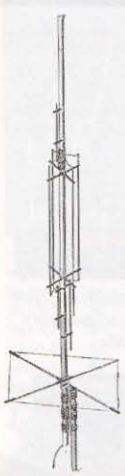
Multi Band Dipole

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**

GAP ANTENNA PRODUCTS

Gap make some great vertical antennas that fit in small spaces and have excellent bandwidths.



TITAN-DX £379 D

10m - 80m
Full band 10 - 40m
100kHz on 80m
Height: 25 ft
Weight: 25 lbs
4 rigid 80' radials
Mount 1ft or more

GAP antennas do not rely on traps or inductive loading. They use a patented feed method that results in most of the antenna being active with minimum loss, excellent efficiency & low angle radiation. A great solution for the small garden.

CHALLENGER-DX £329 D

Bands: 80m 40m 20m 15m 12m 10m 6m 2m
Bandwidth: Under 2:1
Entire band on 40m 20m 15m 12m 10m 6m 2m 80m over 130 KHz; 10m over 1MHz
Thousands of Challengers are now in use throughout the world. Challenger is the first and only antenna capable of operating on eight separate bands from 3.5 MHz to 144 MHz.

EAGLE-DX £359 D

Bands: 40m 20m 17m 15m 12m 10m - with supplied extender, this can be customized to your favorite part of the band
Bandwidth:Under 2:1
The Eagle is the smallest antenna in the GAP product line. The Eagle DX-VI weighs just 11 pounds and can be installed almost anywhere - at ground level, on a pole, on your roof or atop a tower.

VOYAGER-DX £429 D

Bands: 160m 80m 40m 20m
Bandwidth: Under 2:1
Entire band on 80m 40m 20m; 160m over 90 KHz
Offers low band operation from the typical backyard without a huge investment in time, money and space. The GAP Voyager DX-IV incorporates the identical unique technology as in the Challenger DX-VIII to "open up" the low bands.

Contents

RadCom

THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

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All material in *RadCom* is subject to editing for length, clarity, style, punctuation, grammar, legality and taste. No responsibility can be assumed for the return of unsolicited material (if in doubt, call us first!)

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

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

News and Reports

Features

Reviews

Is your coax old and worn? – p70

Cover image: The International Space Station has amateur radio and ATV equipment on board

Image: NASA

Technical Features

Regulars

'What is this amateur radio all about?'

I suppose this is a question we have all been asked at some time or another especially at public events or when chatting with friends. People are often surprised that amateur radio still exists in this age of instant global communication. Radio amateurs have had access to this form of communication for the past 100 years, right from the very start, well almost. A lay person – and even a few radio professionals too – will suggest that the problem of global communications has been solved by the mobile phone and the internet, so what could be the motivation for taking up amateur radio and why is it such an absorbing hobby?

I define the essence of being a radio amateur enthusiast as a self-motivated interest to understand the basis of radio electronics and the practical workings of the electromagnetic spectrum, propagation and the types of systems which one might use to communicate by radio. In all cases I look at it as being a voyage of discovery, during which I hope to meet like-minded people, some with specialist knowledge, with whom I can share experiences, learn new ideas to experiment with and ultimately gain fresh insights.

100 years ago amateur radio was very much a journey into the unknown. Perhaps surprisingly this is still the case, since over the years a whole gamut of new technologies has been developed, especially in the last decade with the merging of radio technology and computer software. This has opened a very wide field of experimentation and new experiences for all of us. It stretches over the whole electromagnetic spectrum from LF to light, from specialised digital signalling to digital TV, from DSP to SDR, antenna modelling to *Skimmer* and *Club Log*. These advances in technology have not displaced any 'traditional' amateur activities such as chatting on 40m or the local repeater, CW, DXing or contesting. This new environment is in fact augmenting our hobby; widening the social contact that is inherent in amateur radio, broadening the concept of radio clubs and enhancing the enjoyment we get from the larger circle of friends and expert advice we can access.

Amateur radio is a robust hobby as it is a lifelong interest with the key integral factor of self-advancement at your own pace and constantly evolving social interaction. It can provide a release from the daily grind and even be a stepping stone to a new career. Developments in radio communication have given radio amateurs a new set of opportunities. The radio amateur now has a chance to connect with other pastimes (eg high altitude ballooning and robotics) where radio is a component, as well as with new types of groups like Maker Spaces with their focus on practical high technology skills.

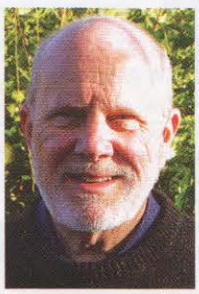
So what is the RSGB's role in all of this?

Put simply it is to enhance the pleasure and satisfaction gained from being interested in radio communications through publications, an examinations system, regional support organisations, specialist committees and its support of radio clubs. The RSGB helps to mitigate obstacles especially as amateur radio is a regulated hobby. If you are really interested in radio communication you are a member of the RSGB.

On behalf of all RSGB Members, I would like to thank all of the volunteers who have helped in running the RSGB and especially the Regional Teams, the staff at HQ, the Society's Officers and my fellow Board members.

Bob Whelan, G3PJT
RSGB President

New RSGB President - Dr John Gould, G3WKL



A single nomination for the role of RSGB President for 2014/5 was received – Dr John Gould, G3WKL – and, therefore, he is elected unopposed. John will take up office at the AGM on 12 April. John will be known to many Members through his work on the Centenary and as chairman of the Spectrum Forum, and his CV and personal statement are shown here.

CURRICULUM VITAE: Board member
2010 - April 2013: Focus spectrum management, Vision & Strategy (Amateur Radio Survey 2010), Project Management, Consultation, IOTA Vision & Strategy and Centenary events.
2010 – to date: Chairman, RSGB Spectrum Forum
2005 - 2011: RSGB HF Manager
- IARU Region 1 General Conferences 2005 and 2008
- IARU 500kHz Working Group
- RSGB 5MHz Working Group

2004: RSGB Founders' Trophy
2002 - 2005: Chairman RSGB HF Convention
1996 - 2004: RSGB HF Committee: LF Matters
1966: Licensed as G3WKL, following G6ACD/T in 1966

PERSONAL STATEMENT: Amateur radio has played a significant role in my life for over 50 years. Learning and sharing knowledge through membership of one's local or specialist clubs is important but, to me, the RSGB has a special place through its broad community of support, nationally and internationally.

I stood for the Board in 2010 to be a part of a team to address issues such as where the Society was heading, what Members valued and to provide leadership for spectrum management. Unexpectedly, the turn of events of 2011 signalled the need for a more drastic change. During this period I was able to offer the Board my experience of strategic and project management, process improvement and e-Learning, gained during my professional life in the electronics, aerospace and higher-education sectors.

The Centenary events and the consultations ahead of Ofcom's Licence Review, has given me many valued connections amongst the UK amateur community. Along with my RSGB work with Ofcom and the IARU, I consider this provides me with a good basis upon which to represent you as your President.

The Society has a new ethos and the change of culture is underway. We need to build on this, so that the RSGB enters its second century in a better position with which to gain the respect it desires from its members, is a membership organisation of which we can all feel proud to be a part, and that continues to be an organisation that works for the future of amateur radio.

Calling Notice for AGM 2014

Formal Minutes of the 86th Annual General Meeting of the Radio Society of Great Britain held on 20 April 2013 at the Institution of Engineering and Technology, London.

RESOLUTION 1: To receive and, if approved, confirm the minutes of the 85th Annual General Meeting. Proposed by Len Paget, GM0ONX. Seconded by Nick Henwood, G3RWF. Motion carried by a show of hands.

RESOLUTION 2: To appoint the auditors Sayer Vincent and to authorise the Board to fix their remuneration. Proposed by John Gould, G3WKL. Seconded by Alan Betts, G0HIQ. Motion carried by a show of hands.

RESOLUTION 3 ELECTION OF PHILLIP BROOKS, G4NZQ: Proposed by Graham Murchie, G4FSG. Seconded by Jeff Stanton, G6XYU. Approved by a show of hands.

RESOLUTION 4 ELECTION OF STEWART BRYANT, G3YSX. Proposed by Dominic Banes, M1KTA. Seconded by Terry Giles, G4CDY. Approved by a show of hands.

RESOLUTION 5 ELECTION OF STAN LEE, G4XXI. Proposed by Chis Duckling, G3SVL. Seconded by Nicholas Seath, G4FI. Approved by a show of hands.

NOTICE FOR AGM 2014. Notice is hereby given that the 87th Annual General Meetings of the Radio Society of Great Britain will be held on Saturday 12 April 2014 at the Renaissance Hotel, Manchester commencing at 12 noon for the transaction of the undermentioned business:

AGENDA. Item 1. To receive and, if approved, confirm the Minutes of the 86th Annual General Meeting held at the Institution of Engineering and Technology in London on 20 April 2013 circulated to Members (Resolution 1).

Item 2. To receive and consider the accounts for the period 1 January to 31 December 2013 and the reports of the Board and the Auditor that appear in the April 2014 edition of *RadCom*.

Item 3. To appoint Auditors Sayer Vincent and to authorise the Board to fix their remuneration (Resolution 2).

Item 4. To consider and, if thought fit, pass the following resolution to amend the articles of association of the Company, which will be proposed as a Special Resolution (Resolution 3):

THAT the articles of association of the Company be amended by deleting the present article 7 and replacing it with the following new article 7:

"ARTICLE 7. No business shall be transacted at any meeting unless a quorum is present. Fifty persons present in person or by proxy entitled to vote upon the business to be transacted, each being a Member or a proxy for a Member or a duly authorised representative of a corporation shall be a quorum."

Item 5. To elect a Board Director (Resolution 4).

Item 6. To elect a Regional Manager for Region 5 (Resolution 5).

By order of the Board, R Thorogood, G3KKT, Honorary Company Secretary

YOTA Team Selected

Following the calling notices sent out in January, the RSGB received thirty applications for members to go to the IARU Region 1 Youngsters on the Air gathering in Finland. The selection panel were really impressed to read about the wide interests and achievements of the young members and selecting just four was not an easy task.

In the end the panel were unanimous that the following should represent the UK in July: Dan McGraw, M0WUT, Ricky Duckhouse, MW6GWR, Adam Hutchison, MM0KFX and Jonathan Rawlinson, M0ZJO. The successful applicant for Team Leader was Gervald Frykman, G0GNF, from Warwick School.

More details on the team members will be published later. Plans are also under consideration for some UK YOTA events; details to follow.

GB2CW Volunteer

The RSGB GB2CW Morse Training Service has its first new volunteer of 2014. It is Chris McCarthy, G3XVL from Ipswich. Chris will be transmitting on 144.265MHz USB on Tuesday evenings at 8pm.

If any other CW operators could spare an hour per week, Roger, G3LDI would love to enrol them in the GB2CW Scheme. His aim is to have at least one GB2CW trainer in every club in the UK.

Some of the participating volunteers may have changed e-mail addresses or other information, so would all the present participants please send an email with their current details to Roger, G3LDI via roger@g3ldi.co.uk.

CONGRATULATIONS

To the following Members/clubs whom our records show as having reached 80, 60 or 50 years' continuous Membership of the RSGB.

80 years	
Coventry ARS	G2ASF
60 years	
Mr A R Smith	G3MPB
Mr B J Jayne	G8BFL
50 years	
Chester & DRS	G3GIZ
Mr J J Jarvis	G3SUG
Mr B C Ward	G3SZV
Echelford ARS	G3UES
Mr J P Billingham	G4AGQ
Mr G D Drinkwater	G8GCU
Mr K J Winnard	GW3TKH
Mr P J W Rowell	RS12236

Club of the Year Winners

The regional winners of The Club of the Year competition, kindly sponsored by Waters & Stanton, have been chosen. As 2013 was the RSGB's Centenary year, the focus of the Club of the Year competition was how clubs have contributed to and used the opportunities that this has presented. Entries were judged by a Regional Manager from outside of the Region to ensure impartiality. The winner and the two runners up of the National Competition will be selected by the Board and announced at the AGM.

Region 1: Cockenzie & Port Seton ARC
Region 2: Caithness ARS
Region 3: Wirral & District ARC
Region 4: Sheffield ARC
Region 5: Wolverhampton ARS
Region 6: Dragon ARC
Region 7: No 1 Welsh Wing ATC AR
Region 8: Mid Ulster ARC
Region 9: Reading & District ARC
Region 10: Horndean & District ARC
Region 11: Poole Radio Society
Region 12: Hilderstone Radio & Electronics Club
Region 13: Sherwood ARC

RAYNET responds to flooding duties...

The foul weather and flooding stretching from before Christmas 2013 and well into the New Year caused massive disruption to normal life but, in general, emergency communications networks were not as severely affected as they were in earlier, similar circumstances. RAYNET members were however called upon individually to provide help, perhaps due to their association with other organisations. We would be pleased to hear of any RAYNET emergency mobilisations, with a view to publishing a selection in an article in due course.

Mid Severn Valley RAYNET was put on standby at 1630 on Wednesday 12 February by the County Council Emergency Planning Team, along with other voluntary agencies.

With the River Severn running some 5m above normal and the then-current flooding within the city of Worcester expected to get worse – already well above the 2007 levels – the EPO team was geared up for any quick response callouts that may have been required for evacuation purposes from residential areas. Daily briefings were held to keep everyone informed of the ongoing situation. (Report from MOVNG).

Hampshire Emergency Planning Dept asked Hampshire RAYNET for potential availability during the worst of the difficulties. (Report from G3TJP).

World Amateur Radio Day

This day is celebrated each year on 18 April in recognition of the anniversary of the founding of the IARU in Paris in 1925. Every year the event has a different theme and this year it is "Amateur Radio: Your Gateway to Wireless Communication". Listen out for the many special event stations from around the world that will be on the air on that day – you may find some unusual callsigns to put in the log.

RSGB Website

Improvements to the website continue, the latest being a tool for improving accessibility and usability by changing elements such as font size, background colour and screen width. Thanks go to Alan Messenger, G0TLK, for providing the programming. Good progress is being made with the development of an online searchable archive for *RadCom* articles, and a revised Member login system will shortly be introduced.

QSL Matters

Last month, around 63,000 cards were shipped to 27 destinations overseas, but it was only to 14 countries as the USA represented 13 of those destinations. The USA requires all cards to be sent by call area number as each has a seperate bureau. That's why we ask all Members to help by bundling USA cards in number groups, 0-9, irrespective of the prefix – all AA1, K1, N1, W1, in one pile etc.

Nominated Director

There remains a vacancy for a nominated director on the RSGB Board. The Nomination Committee is tasked with examining the range of skills of the current Board directors and to recommend a candidate who will fill the most important gaps. This process will take place after the AGM once the composition of the new board is known.

Apologies

Our apologies to John Dunnington for giving him the wrong callsign last month. It should, of course, read John, G3LZQ.

Apologies also to Mr M G Rimmer, G3KDA who should have appeared in the Honour Role. He has been a Member of the Society for 60 years, having joined in September 1953.

WELCOME

The RSGB would like to welcome to the RSGB family the following new Members who have joined their voice to ours and are helping to keep the RSGB strong.

Mr M R Saunders, 2E0CET
Mr P Hickling, 2E0LAQ
Mr D Lapham-Crozier, 2E0OPS
Mr S Vickers, 2E0SRV
Mr P Hallard, 9H5HP
Mr O Siebert, DO6OS
Mr T Rogers, G0MND
Mr B Arnott, G3YYT
Mr M Hodgkinson, G4HCC
Mr S Barrett, G4HTZ
Mr DC Cottle, G4XWQ
Mr B Rosewarn, G4ZRD
Mr R Todd, G7BNV
Mr J Magorrian, G7DCD
Mr T Simmons, G8JFX
Mr P Wilson, G8KEK
Mr P Jones, GW1GKW
Mr D Pierce, GW6VEI
Mr D Collings, M0HCJ
Mr A Wierdis, M0HJJ
Mr K Sekowski, M0LWO
Black Country DX & Contest Group, M0OXE
Mrs C Colless, M0RTW
Mr A Hawrylyshen, M0WTH
Mr D W Mear, M3LFV
Mr M Kidner, M3RTU
Mr S Nixon, M6CZN
Miss A Bertoneri, M6DZN
Mr M Marsh, M6DZP
Mr C Appleton, M6EAU
Mr B Clayton, M6EBO
Mr W Smith, M6EGR
Mr F Riches, M6FNR
Mr G Beacher, M6GPB
Mr A Parker, M6GUI
Mr K Mills, M6HBD
Mr H Phillips, M6HRY
Mr T Taylor, M6JPJ
Mr A Keddie, M6LCN
Mr A Frost, M6MYJ
Mrs A Bishop, M6NHB
Mr P Devlin, M6PDE
Mr R Sayre, M6RSY
Mr T Tate, M6TST
Mr M West, M6WBW
Mr A Brims, M6XAN
Mr P Kaniewski, MM0HNR
Causeway Coast & Glens ARC, MN0CCG
Mr A Holt, MW6TDQ
Mr C Williams, MW6XVT
Mr L Emiel, ON5ALQ
Mr AJ Lutley, RS198642
Mr T P McElwee, RS214895
Mr C Schofield, RS215292
Mr A Castell, RS215343
Mr D Blake, RS215403
Mr G Howard, RS215430
Mr NWJ Montgomery, RS215436
Mr P Collyer, RS215441
Mr W Jones, RS215444
Mr J Walcher, RS215454
Brother Roy W Herbert SFO, RS215459
Mr I Jupp, RS215478
Mr P Kelly, RS215492
M Tanjt, RS215497
Mr C Evans, RS215513
Mr S Wilkes, RS215542
Mr R Pownall, RS215551
Mr J Dyer, RS215552
Mr R Malone, RS215483
Dr A Wollin, VK4ZXI
Mr J Scarlett, WA3YDP
Mr R Biggs, WQ0X

The RSGB would like to welcome back the following Members who have rejoined the Society.

Mr A Barron, 2E0TAZ
Mr J K Chandler, G0NVM
Mr T P Williams, G1IFL
Mr C R Lugard, G4LZE
Mr N D Plant, G4WUJ
Mr R Skingley, G6IWK
Mr B M H Williams, G7FSI
Mr T H Whittingham, G8WT
Mr K Ishikawa, JP3DDZ
Mr S P Sparkes, M0DFD
Mr G Reeds, M1CKJ
D Parnham, M3CFQ
Mr A R Green, M3HZG
Mr P Bull, M6BSQ
Mr L Brannen, ND4XE
Mr N Jones, RS163093
Mr P A Garraway, RS203066
Mr D R Moore, VK2XAR

RSGB shop

FREE P&P
FROM £30 SEE PAGE 72 FOR DETAILS

E&OE All prices shown plus p&p

A History of QST

Amateur Radio Technology

For nearly a century the American Radio Relay League's (ARRL) membership journal, QST has advanced the art and science of amateur radio by delivering timely, engaging and valuable information. This book is a look back through the years and provides the very best features, columns, equipment reviews, technical tips, projects, and news that QST published.

A History of QST - Amateur Radio Technology (Vol.1) captures important technical contributions, adaptations, and syntheses of technology throughout amateur radio's first century. Reproduced on heavy glossy paper the reader will find the original pages of QST reproduced as originally printed preceded by a short introduction explaining the article's significance and relevance. Multiple authors have reviewed the QST pages and other ARRL publications, selecting imperative advances in the state of the art and articles that best illustrate them. Through this collection of, a commentary can uncover amateur inventions and their support of science through individual efforts and cooperation across the entire amateur radio community. Beginning in the era of spark, continuing through to the second century of amateur radio, this book touches upon signals, antennas, propagation, modes, circuitry, satellites, and much more.

Size 208x275mm, 352 pages
ISBN: 9781 6259 5003 1
Non Members' Price: £32.99
RSGB Members' Price: £28.04

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.

174x240mm, 64 pages ISBN: 9781 8578 0346 4
Non Members price: £7.99
RSGB Members: £6.79

Regional Manager Elections

In this year's Regional Elections there are Regional Manager vacancies for seven Regions. In each of the Regions 1, 4, 10 and 12, a single nomination was received and these candidates are, therefore, elected unopposed. Biographies and personal statements of the candidates are shown below. No nominations were received for Regions 2 and 6, the RSGB Board will look to fill these vacancies by co-option. Two nominations have been received for Region 5 and the biographies and personal statements can be found on page 44 as well as details on the election process.

Jason O'Neill, GM7VSB *Elected unopposed as Region 1 Regional Manager*

CURRICULUM VITAE. Founding member and committee member of Dalry Amateur Radio Group 1995-1998. Committee Member of Kilmarnock and Loudoun Amateur Radio Club 2010-2013. RSGB Member. RSGB Deputy Regional Manager Ayrshire Dumfries & Galloway 2010-2013. RSGB Regional Manager (acting) Scotland South & Western Isles 2013-Present. Active HF contester with various wins including, IARU HF Championship SOLP SSB Zone Winner, CQWPX 15m CW SOHP #13 World. Various IOTA activations around Scotland Arran, Muck, Rhum, Canna, Gigha, Islay and counting.

PERSONAL STATEMENT. Acting as Regional Manager for the last 9 months has been a challenging but satisfying experience. Working with the regional team to ensure that member's views are accurately represented and resolved is something that I take personal pride in ensuring happens in as simple and prompt a manner as possible. I endeavour to be as approachable as possible in all matters to do with amateur radio and the RSGB. If elected I will continue to support the members in Region 1, and my colleagues in the regional team, to ensure that the society is accountable to all of its members.

Nigel Ferguson, G0BPK *Elected unopposed as Region 4 Regional Manager*

CURRICULUM VITAE. First licenced in 1984 as G1JCZ, and then the following year as G0BPK, I have been an RSGB member for 30 years. Prior to that I was interested in Broadcast band DXing. My main interests in amateur radio are Awards, eg WAB and DXCC (230 entities confirmed), mobile activity and experimenting with different antennas.

I am the Special Events Manager at my club, Pontefract and District ARS, organising 10-12 special event stations each year.

Asked by Harold, the previous RM to be a DRM in 2013, I have been acting RM for the past six months following his retirement.

PERSONAL STATEMENT. Retiring from NHS in 2009 after 39 years in Pathology Microbiology Laboratories, I have more time for Radio. Amateur Radio is a great scientific hobby. Unfortunately the average age of amateurs is increasing. I would like to introduce more young people to the hobby by encouraging clubs to demonstrate various computer modes such as PSK and SSTV, or satellite working and moon bounce, especially if it can be achieved as part of a school's science activities.

As RM I would like to encourage clubs to exchange visits for talks, quizes, etc, and generate rivalry between regions with an inter-regional contest.

Michael Senior, G4EFO *Elected unopposed as Region 10 Regional Manager*

CURRICULUM VITAE. I have been an active radio amateur since being licenced in 1970. I am a founder member of the Sussex Repeater Group, and helped with the construction of GB3BR, SR, NX, HO, WS and the UK's first 23 cms repeater GB3WX. I am a member of the Horsham Amateur Radio Club. I was a member of the Repeater Management Group and travelled to many parts of the UK on behalf of the RSGB as the Technical Officer. I became the DRM for Sussex, until my co-option to the Regional Council in 2013 as the Regional Manager 10.

PERSONAL STATEMENT. We need to support interest in amateur radio. I will encourage people to join local clubs, and the RSGB, the representative body for their hobby. This should include all, whether VHF local "natter" operators, or the keen HF Dxer, no one person is more important than another. Newcomers to the hobby should be shown the varied aspects of amateur radio. If elected, I intend promoting the hobby by placing "flyers" in schools, youth centres, and getting publicity in local press. I will promote the idea of knowing your adjacent clubs, by such things as quiz nights, foxhunts and socials.

Steven Thomas, M1ACB *Elected unopposed as Region 12 Regional Manager*

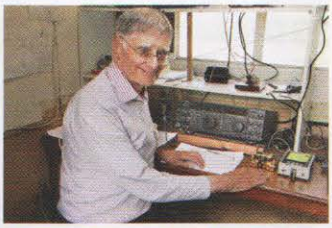
CURRICULUM VITAE. Licensed Radio Amateur since 1994. RSGB Deputy Regional Manager for Suffolk since 2008. Co-opted as RSGB Regional Manager for England East & East Anglia on 1 Jan 2014. ESWR (Ipswich Rally) Committee Member and Treasurer since 1995. Training Team member at Felixstowe & DARS. Member of RSGB, ARRL, RAC, Felixstowe & DARS, Ipswich RC, Martlesham RS, Leiston ARC, Camb-Hams, De Montfort University ARS & CDXC. Regular HF & occasional VHF contester. Occasional IOTA DXpeditioner.

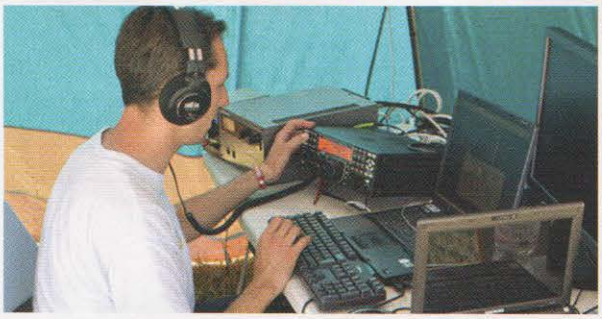
PERSONAL STATEMENT. I've enjoyed representing the Society in Suffolk since 2008, representing, supporting and working with clubs and members around the region and beyond. I see member interaction as key and enjoy taking every opportunity to represent the Society at regional, national and international events to gain a wider appreciation of issues and opportunities.

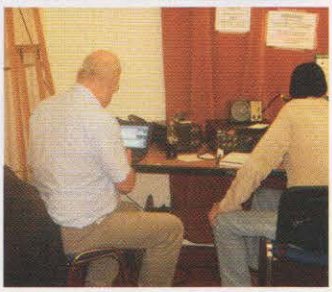
I'd welcome the opportunity to continue my commitment to the Society, expanding my remit to a wider region and helping to influence at a national level.

I'm committed to supporting members, clubs and all aspects of amateur radio.

Centenary station – a reflection on the year







It is now a few months since clubs and individuals in Northern Ireland saw out the Centenary station from its year-long celebration. The movement of the special callsign between clubs, groups and individuals provided a huge variety of operation that gave fun, as well as an invaluable learning experience to both relative newcomers but also 'old hands'. With 132,179 QSOs in the log across 20 bands from 136kHz to 1296MHz there was a great deal of choice across the year.

In planning the event we wanted something that was fun, which could be challenging in different ways, something that would encourage operating, and ideally get people to try something new. With the format of the Centenary station's movement around the UK set, we devised the Centenary Award to promote a wide range of general operating. The Centenary Challenge (the Leaderboard ranking) followed to ensure that the demand for contacts with the Centenary station was maintained throughout the year.

The Centenary Award, indeed proved to be a significant challenge as, in addition to collecting points for Region/band slots with the Centenary station, the majority of the points for the award came from ITU Zones, Commonwealth Country Calls, or UK IOTA band/slots for the HF Award or UK IOTAs, UK Locator squares of UK DXCCs for the VHF Award. Getting these additional points, which made up the bulk of each award required a lot of focused operating. It is not surprising therefore that currently only 20 Gold and 21 Basic HF Awards, and 5 Basic VHF Awards have been awarded. So have a look in your 2013 log to see if you can make one of the awards – there is no deadline for applying for your Centenary Award.

Two of the Centenary stations achieved DXCC through 29,718 matches within Logbook of The World. G100RSGB gained 126 countries Mixed, 105 CW and 105 Phone, and GM100RSGB has 106 countries confirmed. The two certificates will be put on display within the National Radio Centre.

To promote activity beyond that required for these awards, John, G3LZQ sponsored Special Commemorative plaques for the highest Centenary Award scores received at the end of January 2014 in the three UK licence classes, leading SWL and leading Overseas' station. Congratulations go to Peter, G3SJX for being the leading UK station at both HF and VHF. Peter scored an amazing 1,050 at HF and 94 at VHF. Fabrizio, IZ2KXC was the leading HF overseas station with a score of 868, and Sjuk Veenstra, NL-6904 won the SWL position with a score of 260 points. Runners up were Stephen, G3OAG (HF = 898), Derek, G4VWI (VHF = 90) and Michael, VP8NO (HF = 734). No applications from Intermediate or Foundation licence holders were received by the deadline for awarding the plaques. Through e-mails received I know that several people found the introduction to some of the RSGB Awards has inspired them to have a more serious attempt at things like the Commonwealth Century Club, ITUZ, etc.

The Centenary Challenge or Leaderboard proved to be more popular than we had expected, with many hundreds of UK and overseas stations making far more contacts with the Centenary station, in different RSGB Regions and on different bands, than just required for the Centenary Award. In the latter stages of the Centenary year this kept many of us alert to the possibility that a few more contacts with the Centenary station could help improve our Leaderboard position. Thus, for many of us, The Centenary Challenge turned out to be a personal challenge with those around us in the ranking, with a downloadable certificate to remind us of the fun!

Whilst DX style operating, running pile-ups from Japan or North America, making several thousand contacts in a day was the way in which some focused their attention, others chose an equally important style of running more leisurely and focused on intra-UK 40 or 80m contacts. Whatever, your preference, I am sure that many operators of the call sign have some memorable anecdotes. For me it was a chat with Julian, SP3CL on 15m in which he wanted to share his memories of representing the PZK at the IARU Region 1 1959 meeting in Folkestone.

I don't know who was the youngest operator to operate the Centenary station during the year, but as mentioned in the December *RadCom* this could have been William, MW6WOD. He was just 10 years old when he visited the Bromsgrove & DARC event. Another youngster was Danny, MM3YHA, mentioned in last year's April *RadCom*. He operated the callsign in part celebration of his 12th birthday and made over 100 contacts. Many of these gave him exemplary feedback either on the air, the Cluster or by taking the trouble to e-mail him. Too often we hear negative comments across the age divide in amateur radio, so it was a pleasure to listen and join in, as I did, on that February day to such a well controlled and encouraging run of contacts.

Throughout the year 175 clubs, groups or individuals hosted the Centenary station and submitted logs. Whilst it wasn't a competition to see who could have the most contacts, some notable high numbers of contacts were made by some of the clubs, DXers and contest groups with around one or two thousand contacts typically being made in a day. More often groups were making several hundred contacts a day, much depending upon choice of bands, modes, operating style and available time. In terms of Regions, the South West of England and the Channel Islands had the most number of contacts with a total of 16,949 QSOs followed by North Scotland

and the Northern Isles with 13,166 and South Scotland and the Western Isles with 12,314. Full details of the region by region totals, broken down by band and mode is provided on the RSGB website, see links later.

Whilst 40m and 80m were popular bands for contacts with UK stations and the near continent, we did see significant success on 20m, 17m and 15m, which resulted in the Centenary station being treated as DX from other parts of the world. This, of course, was a memorable thrill and experience for those who experienced being at the DX-end of a pile-up for the first time. Our thanks go to the large number of overseas stations that, as the Table shows, made an enormous effort in respect of working the Centenary station on so many Region/band slots.

I've not been able to provide an update on QSLing as Rob, M0VFC is off travelling – this time to VP9 – but I am aware that he has been keeping up-to-date with the OQSL requests. Please see the link below for QSL details and contact information. From Rob, John, G3LZQ and myself we have been very well supported by HQ, the RSGB Regional Team and Michael, G7VJR's *Club Log*. Our lasting memories of organizing the event has been the many comments received from those who appreciated our efforts, both in arranging the event, giving assistance and encouragement to preserver. John, G3LZQ sums it up well with the comment "It has been a very busy but fun year...."

LEADING STATIONS PER CONTINENT

Region	HF slots	Callsign
Europe Winner	79	IZ2KXC*
Europe RU	75	OZ6GH
SA Winner	60	VP8NO
SA RU	20	YV8AD
NA Winner	51	K8ED
NA RU	47	KD4QMY
Asia Winner	40	JA2JNA
Asia RU	34	JA7KY
Oceania Winner	9	ZL3XTJ
Oceania RU	7	VK3HJ
Africa Winner	9	ZS6UT
Africa RU	7	3B8CW

* In addition 2 x 6m slots

WEBSEARCH

Centenary Award application: http://rsgb.org/main/operating/amateur-radio-awards/rsgb-centenary-award-2013/centenary-award-claims-check-sheet/
Centenary station statistics: http://rsgb.org/main/publications-archives/rsgb-centenary-2013/centenary-station/operating-statistics/
QSL information: http://rsgb.org/main/operating/centenary-station/centenary-station-spots-log-and-qsls/
QSL queries: Rob, M0VFC via centenaryqsl@rsgb.org.uk

News

Camb-Hams DXpedition

Thirteen Camb-Hams will be travelling to the northern tip of the Isle of Lewis from 26 April to 3 May. They plan to be active on all bands and many modes from 4m to 80m as well as 2m and 70cm for satellites and 2m and 23cm for EME. The HF bands will be covered by five simultaneous stations, while the 6m & 4m stations will have a great take-off towards the UK and Europe from the island's northern tip in IO68 square. 2m and 23cm EME will be available with a portable low-ERP Yagi system, mainly focussed on JT modes. 2m and 70cm will be available for portable satellite operations. Sked for the more challenging bands and modes can be arranged by e-mail to skeds-2014@camb-hams.com.

Gemini 70 amplifier

The DX Shop (incorporating Linear Amp UK) will be showing a 70cm version of the Gemini solid state amplifier at the Norbreck Rally on 6 April. The Gemini 70 will provide 250-300W output on 432-440MHz for as little as 5W input drive level and has a fully integral 50V linear PSU built in. For more details visit www.linearamp.co.uk.

BiWota

Two events are planned this summer for British Inland Waterways on the air. The main event will be 3 to 5 May, on the air, earlier than usual in the hope that propagation will be better than in the last two years. Celebrating the 50th anniversary of the re-opening of the southern Stratford upon Avon canal and the 40th anniversary of the re-opening of the Upper Avon Navigation, the Stratford River Festival on 5 and 6 July will again see BiWota stations on the air. Award certificates will be available, see the BiWota Facebook page for details, www.facebook.com/BIWOTA.

Yaesu Competition

Customers who buy a new Yaesu radio from Waters & Stanton between 1 February and 27 September will be in a draw to win a Yaesu FTM-400DE. The draw will be made at the National Hamfest as Netwark on 27 September. See their website for details, http://wsplc.com/.

TM02REF

2014 marks the centenary of the outbreak of the First World War and is also the bi-centenary of the French Napoleonic War. TM02REF will be on the air from two historic sites on 13 April from Hurtebise Farm on the Chemin des Dames (JN19UK) and 15 June from the American Monument at Chateau Thierry.

STELAR

Science and Technology through Educational Links with Amateur Radio (STELAR) is offering a new challenge to educators both professional and amateur. The Raspberry Pi computer has opened up new opportunities and stimulated demand for educational projects linking communications systems, via computers. This year STELAR is seeking to support the very best of those ideas by making available grants to educational groups, with projects designed to stimulate experiments with radio linked computing. Educational groups can apply for funding to develop a project of their choice, by submitting ideas for consideration by 31 June 2014. Groups should set out their aims and giving as much detail as possible. Successful entries will be notified during the Autumn term. See www.stelar.info/contact.

ML&S Mobile website

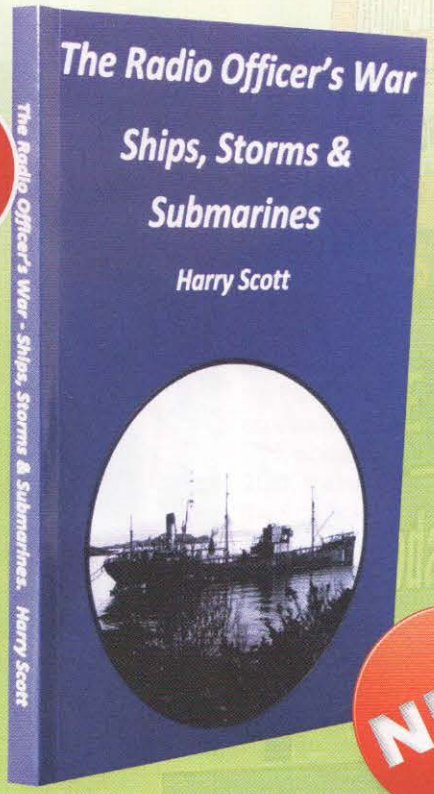
Martin Lynch and Sons Ltd has launched a mobile website. Customers can now access the full ML&S website through a mobile/tablet optimised URL. See www.hamradio.co.uk/mobile.

RSGB shop

FREE P&P
FROM £30 SEE PAGE 72 FOR DETAILS

E&OE All prices shown plus p&p

25% OFF RSGB Members



NEW

The Radio Officer's War

Ships, Storms & Submarines

By Harry Scott

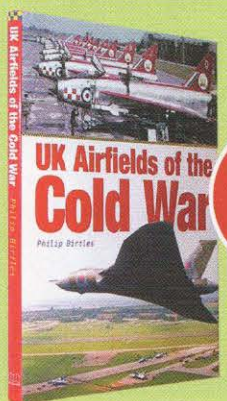
The Radio Officer's War - Ships, Storms & Submarines is an exciting first-hand account of the dangers faced by the sailors of the British Merchant Navy during WWII. This is seen from the perspective Ian Robert Hendry Waddell a bright and gifted 20 year old, who joined the Merchant Navy in 1940 after qualifying as a Seagoing Radio Officer.

Ian made 14 crossings of the North Atlantic Ocean at a time when German U-boats were sinking a huge amount of Allied shipping. He wrote a series of journals, and wonderfully descriptive and amusing letters, about his life and work at sea. He also captured on film the dramatic events as his ship was bombed during the Allied landings in Norway. Ian also describes the harrowing scenes he and his shipmates witnessed, and the danger they faced, as they became involved in the dramatic rescue of the crew of a Royal Navy ship sunk by a U-boat. Harry Scott has woven this fascinating story into an extraordinary book by reproducing Ian's journals, letters and photographs along with explanations of context and historical detail.

The Radio Officer's War - Ships, Storms & Submarines is a fascinating glimpse of WWII from the perspective of a Radio Officer giving a real sense of the story, timing and history of the Atlantic War. Thoroughly recommended reading.

Size 150x225mm, 194 pages ISBN: 9781 4936 9721 2

Non Members £9.99
RSGB Members £7.49 (25% off)



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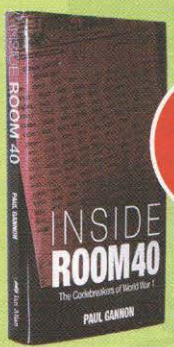

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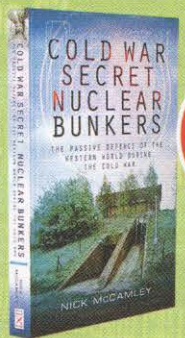


£11.24 RSGB Members' Price

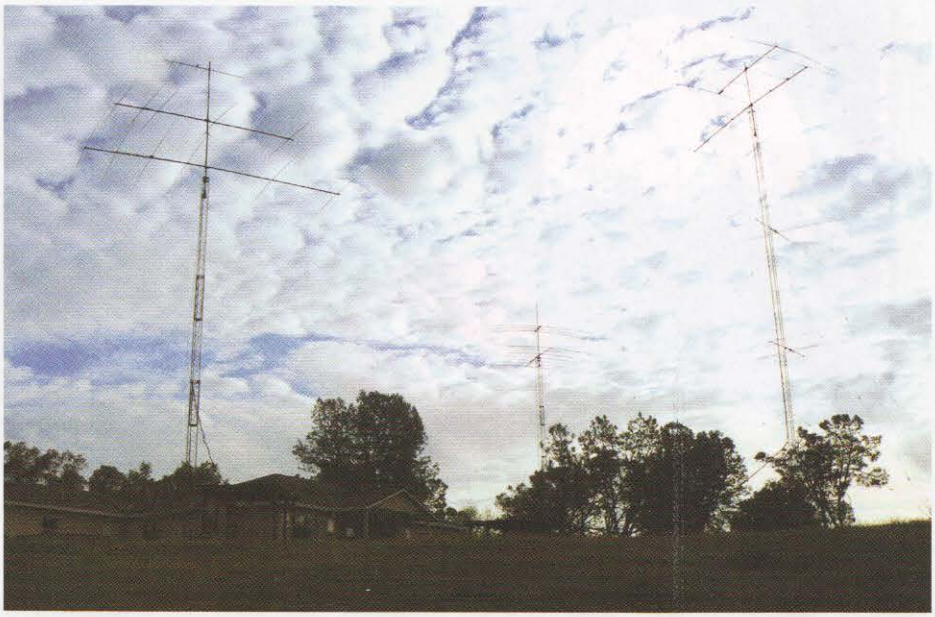
Radio Society of Great Britain www.rsgbshop.org
3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

April 2014 • RadCom

Steve White, G3ZVW • e-mail: steve.g3zvw@gmail.com

WPX SSB from W6

Personal experiences of operating in a major contest from California



WC6H QTH and towers.

CQWW CONTEST. In March 2013 I was fortunate enough to be one of the operators of a 'Californian kilowatt' station in one of the world's biggest SSB contests – the CQ Worldwide Worked All Prefix Contest (commonly known as WPX). It was the culmination of a plan many months in the making.

CREATING THE POSSIBILITY. I wanted to take my elderly father to visit his sister, who lives in Northern California. Whilst he could have made the trip at pretty much any time, it would have been impractical for him to do it alone because his eyesight is bad. I offered to treat him to the trip and chaperone him, but equally I didn't want to intrude on 'the old folks' too much. Leaving them for a few days to talk about their memories made perfect sense to me, but what to do while they put the world to rights? Take part in a contest, of course!

I have visited the US numerous times, indeed I hold the US Advanced Class license (sic) AF6SU, so operating from the country is not a problem for me. I made two overtures to see if there was a possibility that someone might have 'a spare seat' on a station that I could occupy. One of those was to a British contesting friend who lived and worked in California for ten years, before returning to Britain in 2010. He suggested Rich Cutler, WC6H, whose station regularly achieves a high placing in the results of the WPX SSB contest. I e-mailed Rich and, in the best tradition of amateur radio, he said 'yes'.

And so it was that I made the necessary bookings for flights, car hire, accommodation, insurance, etc. The middle weekend of the trip (Easter 2013) would coincide with the contest.

FUNDAMENTAL DIFFERENCES. Timing. Having operated in WPX SSB before, I am accustomed to it starting at 1am on Saturday and ending at midnight Sunday. This apparent shortfall of one hour in a 48-hour contest is because British Summer Time commences on the final weekend of March, half way through the contest. Not in the US! American daylight saving time commences early in March and the time difference between GMT and California means that the contest starts at 5pm on Friday and ends at 5pm on Sunday.

Antennas. Getting permission to erect even modest antennas in the UK is sometimes no simple matter. The planning process is fraught with difficulty. The dice are loaded against us. Not in the US, where before building his house Rich asked if he needed permission for antennas and was told that none was necessary.

Power. In Britain I frequently feel that we are required to engage in contesting with one hand tied behind our backs, because we are limited to 400 watts output. Not in the US! Like many other countries of the world they are allowed 1500 watts, and they like to use every last one of them. However, in the interest of good sportsmanship, the team I operated with were diligent not to exceed the power limit.

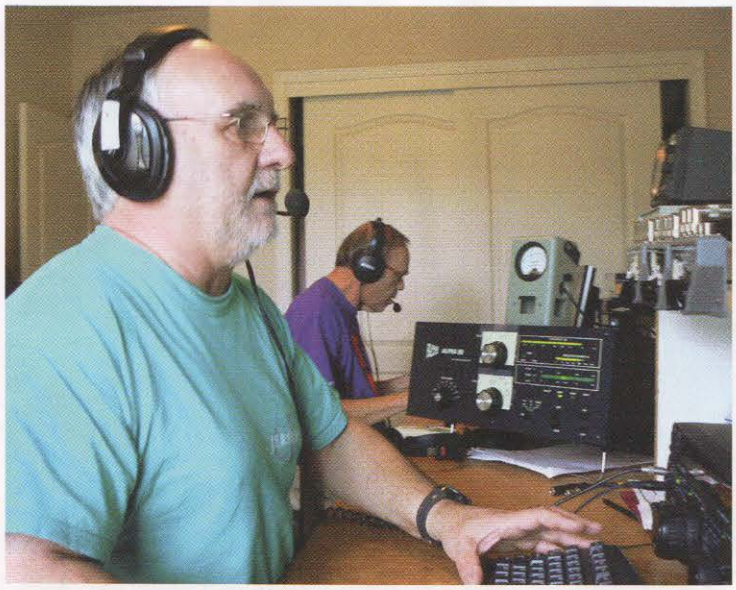
WC6H. It's not just Rich Cutler's station that was built with contesting in mind, he chose the plot of land where he had his house built with contesting in mind! His QTH is located in the foothills of the Sierra Mountains, a few hours drive North East of San Francisco Bay. It's a sparsely populated area, with properties spaced well apart. Rich's plot isn't on a mountaintop, but it is in an elevated position with views all around.

His shack contains two legal-limit stations. Station 1 is a Yaesu FT-1000MP (with all the optional Inrad filters) plus an Alpha 99 amplifier. This was allocated to 10/20/80/160m for the WPX contest. Station 2 is an Elecraft K3 plus an Acom 2000A amplifier (allocated to 15/40m). In addition there are networked PCs running *WinTest*, bandpass filters, rotator controllers etc.

But it's outside where the most impressive parts of the station are located. The biggest tower is 122ft high. The top antennas are a Force 12 240N 2-ele 40m beam at 122ft and a 5-ele M² 20m beam at 115ft. Below these – and fixed East (into the US) – there is a stack of Force 12 C3's at 78 and 52ft. Next comes the middle-size tower that supports a TH7 tri-bander at 72ft. Finally, the 'little' tower, that supports a 5-ele 10m beam at 59ft and a KLM 6-ele 15m beam at 50ft. Inverted-V dipoles for 80m and 160m are slung from Tower 1, with the feed points at 112ft. Not only is Rich's plot large enough for the towers, but also for Beverage receive antennas. He has two of these, at 90 degrees to one another. They are unterminated, which results in them being bi-directional.

THE CONTEST ITSELF. A teleconference was held and an operating rota distributed before the event. With six operators and two stations to keep going for 48 hours (Multi-2 category), it meant 4-hour shifts (5-9pm, 9pm-1am, 1-5am etc, with 8-hour rest periods for everyone. My shifts were 1-5am and 1-5pm each day.

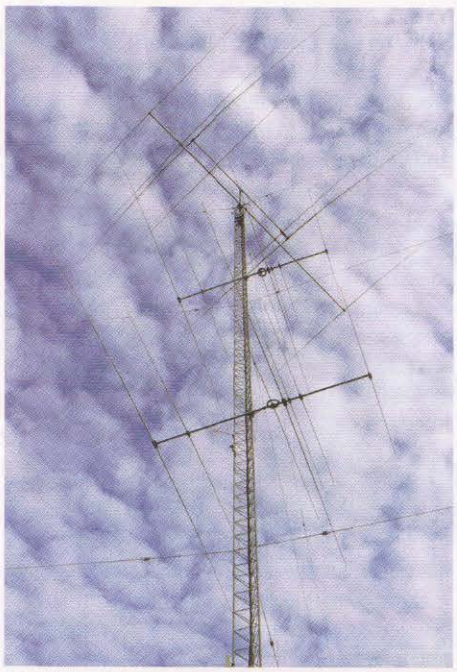
Before the event I was told that the QSO rate that is achievable from California is rather less than from Europe. And so it turned out to be, especially at the start of the event. With the K index at 4-5, conditions on the upper bands were not good. 10m was dead, so the operators of the first shift started on 15m and 20m, but 15m closed by 7pm so they were resolved to run 20m and 40m for the second two hours. Unfortunately 20m gave out shortly before 9pm, so the second shift started on 40m and 80m. Apart from a few brief forays back up to 20m and down to 160m, they stayed on those bands for the duration of their shift.



G3ZVW (alias AF6SU) and N6RC operating WC6H.

MY 1ST SHIFT. (1-5am Saturday). My alarm was set for 00:30 and I entered the shack shortly before 1am. My shift was on Station 1. 160m had already been worked dry and the HF bands – as expected – were closed, so I spent all four hours on 80m. The first hour was agonisingly slow (11 QSOs), but things improved after that. There were no huge pile-ups or long runs, so I was grateful for having my CQ calls recorded and available at the press of F1 on the keyboard. My partner for all four of my shifts was Dick, N6RC. He spent his four hours on 40m. After the shift I slept for another two hours, then spent time chatting with other off-duty ops, taking photos, etc.

The other morning shifts managed to run on 20m after 6am and 15m after 8:30am. 10m was tried after 11am, but except for a few South Americans and a couple of W's the band was hopeless.



A look up the main tower.

MY 2ND SHIFT. (1-5pm local, Saturday). I was allocated to Station 2 and had a good run on 15m. Much of this was to the Far East, especially Japan. Dick worked 20m, mainly to the Americas. The K index was falling, but 10m still wasn't in the mood to co-operate. My shift was followed by an early dinner and then bed.

The evening shifts continued on 15m and 20m, but 15m gave out before 7pm. 20m went the same way at 10pm, so once again the operators were stuck with 40m and 80m. Propagation wise it was almost an exact repeat of the day before.

MY 3RD SHIFT. (1-5am local, Sunday). I woke at about midnight local time to a few rumbles of thunder, but continuous lightning. I have truly never seen anything like it. One of a line of storms that was moving north through California was passing right over the station. Most of the lightning was between clouds, but nonetheless those in the shack at the time had thought it necessary to close down and disconnect the antennas. 35 minutes of operating time was lost.

Operators reported that outside the guy wires on Tower 1 (the only tower that is guyed) were hissing and fizzing. By the time my shift started the storm was over, except for the static! Once again I was allocated to Station 2, which meant 40m. For the first hour there was very heavy QRN. It made life really difficult, but most stations who called were still workable. It just meant a lot of repeats.

As darkness descended in the Far East the band opened in that direction. Not only were there plenty of Japanese to work, but being able to beam away from the storms helped. On 80m/160m Dick had an absolutely torrid time of it. He suffered heavy static all night. Having Beverage antennas for receive helped, but even so he wasn't able to work as many as 20 stations in four hours. At one point he didn't make a QSO for an entire hour! He must be commended for putting up with it.

By Sunday morning the K index was much lower and 20m woke up at 6.30am, so the operators that followed our shift could abandon at least one of the LF bands early. 15m was runnable from 8am and finally 10m became usable for short periods. But now we had another problem – several power outages. None lasted for more than a few minutes, but each time it took the amplifiers a couple of minutes to warm up so I guess we lost about 20 minutes.

MY 4TH SHIFT. (11am-5pm local). Conditions had recovered nicely from the start of the contest and the HF bands were running well. Dick was on Station 2 and ran 15m. I was on Station 1 and spent most of the time on 20m, but 10m was also runnable to Japan in the final hour.

At the end of the contest we had 4,392 QSOs in the log and a claimed score of almost 10.2 million points, which was down on 2012. Propagation was felt to have been terrible at the start, but had recovered by the end. Saturday night's storm had also cost us points because of the time off the air, plus the subsequent loss of QSOs with callers who were buried below the noise level. And then there was the transceiver that failed. It was difficult to know where our efforts would place us, but other claimed scores on 3,830 suggested about 2nd in the US. One way or another we had all had a pretty tough time of it.

POST EVENT. As soon as WPX ended we all sat down to dinner, cooked by Rich himself. Once again the guys in the team wanted to be seen as good sportsmen, so they uploaded the log straight away. Then everyone headed off home. Most of the operators had a drive of some hours ahead of them, me included. For my part I expressed sincere thanks to my host (Rich, WC6H) and for the warm welcome I was given by all the other members of the team (Bob, N6TV; Dick, N6RC; Jim, WX6V and Barry, K6ST).

The results of the contest were declared in early September and we were pleased to achieve 1st place in W6, 2nd place in the US and 22nd in the world.

ROUNDING UP. So what should you do if the idea of something like this appeals to you? First of all I'd say that you need a contesting track record. This doesn't just mean taking part in contests, it means sending your logs to the adjudicators. You might not do well to begin with, but if you continually seek to improve your station and your operating techniques you'll get better and better. Creating a track record isn't something that can be done overnight, but devotion to the cause won't go unnoticed. If you start taking part in major contests such as WPX it is likely that before long you will fall in with others who do the same. Your friends can be an invaluable source of help, as was the case for me.

April 2014 • RadCom
Dr David Lauder, G0SNO • e-mail: emc.radcom@rsgb.org.uk

EMC

More on solar photovoltaic systems on both commercial and domestic scales

PHOTO 1: Part of a typical commercial-scale solar PV plant in Germany. Photo: Rainer Lippert.

EFFICIENCY AND POLLUTION. Recently, the EMC column has mentioned various technologies that are intended to benefit the environment, for example by harnessing renewable energy sources or by improving energy efficiency. The potential environmental benefits of such technologies are well known but what is less well-known is that in some cases, they may also cause pollution to a different type of environment. That is, pollution of the electromagnetic environment in the form of radio interference. This could be avoided by good EMC design of electrical/electronic systems.

DOMESTIC SOLAR PV. The item on solar PV panels in RSGB Matters, March 2014 *RadCom* has resulted in a number of useful responses. At the time of writing this month's EMC column these are being analysed and further responses are being received. In the meantime, a related issue has arisen in the form of solar PV farms.

SOLAR PV FARMS. Photo 1 shows an example of a solar PV farm in Germany. A Member in Hampshire has sent details of a new photovoltaic solar farm at Stubbington near Fareham, Hampshire. The farm was under construction from December 2013 to March 2014 and, at the time of writing, it is not yet operational. The solar PV farm covers 27.04 hectares (66 acres) and consists of 3649 arrays containing 87,576 modules and 25 inverter and transformer cabinets. The solar farm will feed electricity into the National Grid.

Some small domestic installations can radiate RF interference at certain frequencies and, clearly, 87,576 solar PV panels are a lot more than a typical domestic installation of 10 or 12. This raises the question of possible RF emissions from such a large installation and it gives an opportunity to make RF noise floor measurements before the site is operational and then again when it is operating.

This particular type of inverter that converts DC from solar panels to 50Hz AC and feeds power back into an AC power distribution network is known as a Grid Connected Power Conditioner (GPCP). Standards for GPCPs have different limits for domestic installations and for larger industrial GPCPs of 20kVA or more. EMC standards generally specify conducted emission limits below 30MHz but the actual level of radiated emissions produced in a real installation depends on various factors. These include the configuration of the AC and DC power cables, whether these are run as close pairs and to what extent they form loops when connecting the DC outputs of multiple panels. Much of the cabling on this site is buried but there is still a possibility of conducted RF emissions onto high voltage overhead grid lines which could then radiate. This effect has been seen elsewhere, at a wind farm and investigations are ongoing.

The European Commission has issued a Guide for the EMC Directive 2004/108/EC (see websearch). Although this has no weight in law, it deals with a number of practical issues that will be of interest to manufacturers and other stakeholders. One such issue is 'fixed installations'. This Guide includes a definition of fixed installations and it also gives examples including wind turbine stations. It therefore appears likely that solar PV farms are also classed as 'fixed installations'.

Section 4.1 states, "Owing to their characteristics fixed installations are not subject to the need for free movement within the Community. Therefore, they are not subject to the requirements for CE marking, DoC or for formal EMC assessment before putting into service. However, fixed installations have to comply with the protection requirements and other specific requirements (Annex I of the Directive) which are applicable to them."

Complying with the 'protection requirements' is an important point because these include a requirement that "the electromagnetic disturbance generated by relevant apparatus shall – (a) not exceed a level allowing radio and telecommunications equipment to operate as intended; ...."

Section 4.1 also recommends how compliance with the protection requirements should be achieved. There are recommendations for 'good engineering practice' including "Emissions: take appropriate actions to mitigate the source of disturbances by EMC design, eg by the addition of filters or of absorption devices etc." There are also recommendations on documentation and persons responsible for fixed installations.

The RSGB EMC Committee is keeping a close watch on RF emissions from solar PV farms (along with many other things) and we would be interested to hear from any Members who live near solar PV farms, whether planned or operational.

VHF INTERFERENCE MEASUREMENT. If you receive unwanted signals from some electronic equipment nearby, is it possible to relate the levels to relevant EMC standards and work out whether the source is likely to comply with the standard? In principle it is possible to estimate the level of VHF radiated emission from a source based on measurements with amateur radio equipment and antennas although this *will* only be an estimate due to various measurement uncertainties that need to be considered.

Carl, G3XGK asked whether an interference source that first appeared last year is likely to be exceeding the relevant EMC standard or not. Carl reports that the source radiates interference at VHF, including the 50MHz amateur band where there are pulsing carriers at intervals of 19kHz, making over 100 carriers in that band. This interference was present from dawn to dusk and it first appeared after a solar PV system was installed nearby. Based on the reported

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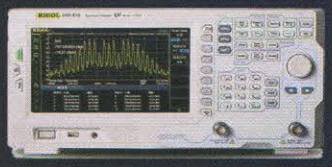

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characteristics of the emissions, it appears likely that the source is optimisers rather than the GPCP.

Carl reported the matter to Ofcom, who visited in May 2013 and measured the signals on a hand-held spectrum analyser. This showed a comb of signals across the 50 – 52MHz amateur band. It was also observed that there was no problem when pointing the antenna at a different solar PV system to the north. Ofcom visited the site of the suspected source, but were unable to gain access or to contact the occupier at that time.

Ofcom subsequently spoke to the installation company but it appears that the sales staff did not fully understand the technical issues nor how to deal with them. In July 2013, Ofcom visited again while they were in the area. This time, there was bright sunlight and the emissions were still on at 19kHz intervals as before but with a slight buzz, not pure tone and not pulsing much. Ofcom had still not heard anything from the installers. In December 2013, Ofcom were still waiting to hear from the supplier, so Carl hopes that something may get changed eventually. In the meantime, we have been doing some estimates of field strength from this source.

Carl's 50MHz antenna is a 2-ele homebrew gamma fed Yagi with a gain of around 4dBd. The feeder is 60ft of UR67 and the transceiver is an Icom IC-7400. Carl has checked the calibration of the S-meter using an HP signal generator, so that S-meter readings can be related to signal levels in microvolts. On 50MHz, the measured level of S9 was 5.6μV, which is close to the IARU specification for VHF of 5μV in 50Ω at the receiver's antenna connector. Nevertheless, like most sets today, the steps below S9 are less than 6dB per S-point (they are nearer 3-4dB per S-point).

Carl reports an increase in background noise to about S3 when beaming towards one particular solar PV installation and also pulsing signals spaced at approximately S6, spaced at intervals of 19kHz. Based on the S-meter calibration, the pulsing signals are approximately 2.5μV and the background noise is approximately 0.8μV. Both measurements are in 2.4kHz SSB bandwidth.

If we convert the signal levels to dB(μV) (that is, dB relative to 1μV), that gives -2dB(μV) for the broad band noise and 8dB(μV) for the pulsing signals. Then we need to consider the type of detector. EMC measurements may use Quasi-Peak (QP), average or RMS detectors. These give the same result for narrow band unmodulated carriers but for pulse modulated signals or noise, the QP detector will generally give a higher reading than the other types. Some detectors in amateur radio transceivers appear to be peak responding however and may therefore give an indication closer to QP detector than other types.

We also need to consider the bandwidth of the amateur receiver compared to the 120kHz CISPR bandwidth that is used for EMC measurements above 30MHz. For the noise-like emission, increasing the bandwidth by a factor of 50 should increase the power by a factor of 50 so we can add 10Log(50) or 17dB to scale this particular emission from -2dB(μV) in 2.4kHz to 15dB(μV) in 120kHz.

The pulsing signals at 19kHz intervals are a bit more complex. First, let's assume that most of the power in each 19kHz harmonic is within the 2.4kHz bandwidth of the amateur receiver. If there was only one such narrowband signal in 120kHz bandwidth then we wouldn't need to do any scaling but in this case, there are about 6 of these harmonics within 120kHz bandwidth. The power in 120kHz may be up to 6 times higher than in 2.4kHz (although it may be less). It that case, we would need to add up to 8dB to scale this particular emission so 8dB(μV) in 2.4kHz would be equivalent to 16dB(μV) in 120kHz.

At this point we have two signal components of 15 – 16dB(μV) in 120kHz so we could add 3dB to the smaller one to find the total level of the signal that would be measured in 120kHz. Let's estimate 18dB(μV) for the two added together although ultimately, the only way to find out is to measure it in 120kHz.

The next step is to allow for the cable loss. According to [1], a matched 100m length of UR67 has a loss of 4.6dB at 50MHz. That can be scaled to 0.84dB for 18.3m. Another loss to consider is possible mismatch loss as the receiver's input may or may not be a good match to 50Ω. One way to reduce measurement uncertainty due to mismatch is to make measurements using a 10dB 50Ω attenuator at the input to the receiver, provided that leaves enough signal to measure. Subtracting the cable loss and assuming zero mismatch error gives 17.16dB(μV).

The next thing to find out is the Antenna Factor, AF. The units of AF are dB per metre, sometimes written as dB/m (not to be confused with dBm). Add the E-field antenna factor in dB/m to the output voltage of an antenna in dB(μV) in 50Ω to find the strength of the electromagnetic field in dB(μV/m). According to [2], the gain G of an antenna in dBi is related to AF as follows:

$G = 20\text{Log}(F) - 29.79 - AF$

For a half wavelength dipole antenna, G = 2.15dBi so AF at 50MHz is 2.04dB/m. Hence for an antenna with a gain of 4dBd, the antenna factor would be -1.96dB/m (an antenna with a higher gain has a lower antenna factor). Adding the antenna factor to 17.16dB(μV) gives a field strength of 15.2dB(μV/m) at the amateur antenna.

Finally, we need to consider the effect of measurement distance. In this case, the actual distance is 36 metres so the calculated increase in field strength at 10 metres would be 20Log(36/10) = 11.13dB. There are other factors to consider however, particularly signal reflections from ground or other objects. When EMC measurements are performed on an open area test site (OATS) there is a metal ground plane. At each frequency, the height of the measuring antenna is adjusted between 1m and 4m above ground plane to find the strongest signal, where the direct and reflected signals add. Measurements that are not performed on an OATS with ground plane could therefore be lower but are less likely to be higher.

If we take a field strength of 15.2dB(μV/m) at 36m and add 11.13dB, this gives a calculated field strength of 26.33dB(μV/m) at 10m. This is under the radiated limit of 30dB(μV/m) (QP) at 10m from 30 to 230MHz that is specified in BS EN 61000-6-3:2007 Electromagnetic Compatibility (EMC) – Part 6-3: Generic Standards - Emission Standard for Residential, Commercial and Light-Industrial Environments +A1:2011.

Although there are substantial measurement uncertainties, measurements at 50 – 52MHz only do not in themselves indicate that non-compliance is likely. If we could make some measurements with less measurement uncertainty, in 120kHz bandwidth and from 30 to 230MHz however, there may be other frequencies where the emission is higher than at 50MHz.

Nevertheless, if the source is solar PV optimisers, there may be several of them. For a number of optimisers N, the combined emission could be 10Log(N) dB higher than for single optimiser. The standard applies to each individual optimiser so an installation with 2 optimisers could go 3dB over the limit, 4 could go 6dB over and 8 could go 9dB over.

Optimisers for solar PV installations have some other unusual properties. First they have two DC power ports but no AC power port, so they only have to meet the less demanding DC power port emission limits (below 30MHz), not the AC power port limit. Secondly, they are normally installed in high but inaccessible locations such as behind solar panels on a roof or in a loft. In many cases, only the installer knows what type is fitted but if we can't find the make and model number then we can't report our findings to the manufacturers of such products.

WEBSEARCH

[1] White, I, *The VHF/UHF DX Book*, chapter 7, DIR Publishing, 1995

[2] Williams, T, *EMC for Product Designers*, Appendix D, Newnes, 2011

European Commission, Enterprise and Industry, Electromagnetic Compatibility (EMC) – Guidance, Guide to assist the common application of the Directive 2004/108/EC – http://ec.europa.eu/enterprise/sectors/electrical/documents/emc/guidance/index_en.htm

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International Museums Weekend 2014

Two weekends in June to celebrate museums around the globe

Patrick Kirkden, M0ZPK operating the station organised by Hilderstone AR & EC.

For well over a decade now, International Museums Weekend (IMW) has been a popular and well supported annual amateur radio event. The majority of those taking part in the event have been in the United Kingdom, but with a few radio amateurs taking part from the rest of the world. For the 2014 IMW, the members of the IMW administration team are hoping to make the event a truly in international one, with great deal more participation from beyond the UK's borders.

The basic idea of the event is to set up and operate an amateur radio special event station from absolutely any type of location that might be broadly classified as a museum. In the UK there have been stations set up in castles, preserved WW2 warships, air museums, railway museums, radio museums, preserved jails, agricultural museums and even doll museums – in fact the event has involved over 270 different museums over the years. The possibilities of finding a suitable venue are almost without limit. The sites have been operated by teams from clubs or just a lone operator. Irrespective of the location, those taking part have always had a great time and the operators were generally invited back for the following years by the museum's curator, pleased with the extra visitors and publicity the event has generated.

Apart from the enjoyment for the operators, the event is intended to help spread the word for amateur radio in locations regularly visited by members of the public – the museums.

The 2014 IMW will take place on two weekends – 14/15 and 21/22 June. More details about the event, its history and how to register to take part can be found at www.ukradioamateur.co.uk/imw/. There is no cost involved for taking part, nor is there any cost for the range of IMW awards available to those who take part.

THE 2013 EVENT. South Tyneside Amateur Radio Society took part over the weekend 22 and 23 June in the viewing tower of Segedunum Roman Fort, Walsend, Newcastle. They even dressed the part, as can be seen by operator David Harbron, G7PHG with his winged helmet and dagger! A lot of people visited the station from all over the north and there were a number of foreign visitors too. This just shows that those taking part have a good time.

Nigel Auckland, M0NAF wrote to say, "Have you ever had that moment when you suddenly think 'What have I done? Why didn't I keep my mouth shut?'" when he got involved in 2103.

His radio club – Horndean and District Amateur Radio Club – always operates from the Royal Marine Museum at Eastney, Portsmouth and decided to set up on the latter weekend. Nigel offered to put the Palace Ruins on the air the first weekend, a new locations and a first for Nigel. He got an NoV from Ofcom for the callsign GB2BWP, a process he found easy to do. English Heritage gave permission to set up a station in the grounds of the Palace Ruins. Nigel described it as a sprawling site of the one time grand home of the Bishops of Winchester, before Cromwell added his special form of air conditioning in the 15th century. It is known as Bishops Waltham Palace, hence the BWP in the callsign.

The operator, David Harbron, G7PHG got well into the theme at Segedunum Roman Fort.

Nigel had helped as an operator two years previously at the Royal Marine Museum and held the NoV for G100RSGB for his club. For this event he had to gather the equipment, work out how to set it up and then run the station – single handed.

"By the time I had loaded my Land Rover Discovery and got to the site, I think I had enough equipment to rebuild the ruins!", he recounts. By the end of the day he had used only about 10% of it. The GRP mast from RossComm went up like a cream single handed, with a Slim Jim style VHF aerial on the top and a 10m to 40m dipole attached just below it, both from Alton Antennas. His Yaesu FT-879 with attached ATU for HF; and a Yaesu FT-8900R for VHF and the station was complete. The generator provided the power to run the HF rig, while the VHF rig ran on gel batteries all day. He made contacts throughout the United Kingdom and into Europe through the day, a total of 13 countries, all giving at least 5/7 and mostly 5/9. Considering the very low conductivity of the four foot thick flint walls that were higher than the antennas, the event could be deemed a success. The only problem was the flying gazebo which, after three chases, Nigel took down and put away. He ran the station from the back of the Discovery from then on. By the time he dismantled at 1715, he was very tired, but had enjoyed a great day of operating.

Hilderstone AR & EC took part in the Museums on the Air event by setting up an HF station at the Manston Spitfire and Hurricane Memorial Museum. It was a very windy day, causing the antenna to come down at one point, but the major problem was with wind noise! The photo shows Patrick Kirkden, M0ZPK making contacts around the country. The event generated much interest with visitors as well as with passing amateur radio enthusiasts – one from Holland and another an engineer from Bristol, working on the Vulcan bomber for the Thanet Air Show.

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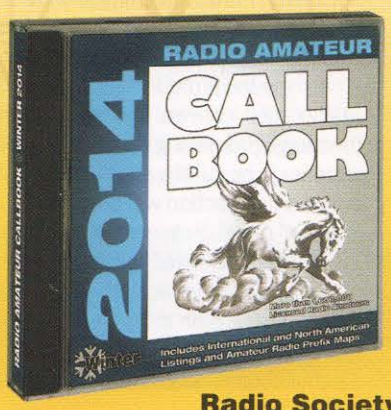

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Animated MPEG video test card for ARISS

The story of a development equally at home in an Earth-bound ATV shack

INTRODUCTION. This article describes the creation process associated with the generation of a simple 60-second animated MPEG video test card using open-source software. While this project was initially conceived as part of a larger project, there is no reason that the techniques described cannot be applied to create some useful general purpose digital amateur television (DATV) test signals.

As created, the MPEG program stream can be re-multiplexed along with system information and null padding to form a transport stream ready for transmission, or could be run as a loop on one of the readily available MPEG players that have baseband composite video, blanking and sync (CVBS) outputs (for composite PAL or NTSC).

Sample codes and scripts are included as a starting point for PAL and NTSC projects.

BACKGROUND. Some while ago, a group in the USA were working on ground station development for the Amateur Radio on the International Space Station (ARISS) project. One of the missing pieces of their puzzle was the availability of a streaming DVB-S signal source for ground station alignment. Mandatory requirements included small size, portability, low cost, with an integrated animated video source.

In due course, Kerry Banke, N6IZW approached the DigiLiteZL [1] team with an inquiry to see how difficult it would be to add this feature to the project. DigiLiteZL started life as an investigation into DVB-S signal generation based on the (now very successful) DigiLiteZL project. The project has since grown a field programmable gate array (FPGA) and a life of its own.

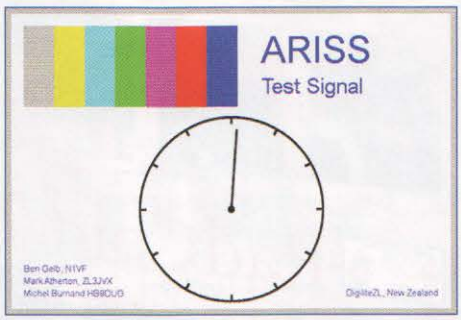

FIGURE 1: Sequence 3 of the animation.

DigiLiteZL already had an SD card socket fitted, so local storage was not an issue, and Ben Gelb's hardware DVB-S modulator occupied about 6% of available FPGA space. A soft 32 bit processor core (NIOS II) could be constructed using the free *Quartus II* development tools, which would add required flexibility to the project. The remaining issues included the generation of a 60 second clip of video at 1300k symbols/sec (just under 9Mbytes) and the (as it turned out) not so easy task of loading this video test clip from the SD card into the 32MB of local SDRAM in a reasonable boot up time frame.

For smaller files (< 2GB), FAT16 is an appropriate file system given its relative simplicity and broad acceptance. There was also a naïve assumption that the open-source file system stacks would be fast enough for the job at hand. Even with the smallest implementation available, only about 100k bits per second (12.5kbytes/sec) load rate were possible. For a 9MB file, this implied an unacceptable load time of about 12 minutes.

An FPGA based, single wire SD card interface was eventually located that has a native sector level transfer rate of about 10Mbits/sec. Further tail-chasing involved creating a completely new and very lean FAT16 (actually FAT16B; there is quite a difference) read-only file system driver. All this effort was rewarded with system that is can stream data (video) off of a Class 10 SD card at 6Mbits/sec (750kbytes/sec), so the test video can load in about 12 seconds.

TABLE 1: Excerpt from the NTSC variant of the tc.bat file.

```
// create a white, NTSC-sized GIF image
convert -size 720x480 xc:white tc_bg.gif
// using 256 level RGB colour space, draw a grey rectangle
convert tc_bg.gif -fill "rgb(192,192,192)" -draw "rectangle 20,20 70,150" tc_bg.gif
// using 256 level RGB colour space, draw a yellow rectangle
convert tc_bg.gif -fill "rgb(255,255,0)" -draw "rectangle 70,20 120,150" tc_bg.gif
// ... and continues through to the blue rectangle
// add callsign, name and remaining annotation
convert tc_bg.gif -font arial.ttf -pointsize 60 -fill blue -draw "text 410,80 'ARISS'" tc_bg.gif
convert tc_bg.gif -font arial.ttf -pointsize 35 -fill blue -draw "text 410,130 'Test Signal'" tc_bg.gif
// ... and continues through to annotation process
// add outer and inner circle of the clock face
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "circle 360,318 360,168" tc_bg.gif
convert tc_bg.gif -fill black -stroke black -strokewidth 3 -draw "circle 360,318 360,322" tc_bg.gif
// add inner clock '5 second' tick marks
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "line 360,178 360,168" tc_bg.gif
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "line 360,178 360,168" tc_bg.gif
... and continues with the remaining 10 marks
```

MEANWHILE, BACK AT THE RANCH. The final piece of the puzzle was the creation of the test video stream. A very simple test card was designed with colour bars, callsign and a 60 second rotating hand akin to a clock.

Quite a bit of exploration was done on possible generation methods. One that provides huge flexibility along with a fine level of process-audit is the creation of individual GIF images followed by video compression.

In the 4:3 standard definition (SD) video world (at least according to the chosen MPEG encoder), NTSC has a resolution of 720x480 pixels, while PAL uses 720x576 pixels. I am sure the pedantic amongst us can dine on this statement for quite a while but, from a pragmatic perspective, the path of least resistance is required to keep this sort of a project moving.

Moving back to the test pattern for a moment, the image was constructed using a common background frame. The 'moving hand' was then added as a second step. 360 such GIF images were created, with the hand moving slightly (one degree) for each step. Since the final video was 60 seconds long, each 'tick' represents 1/6 second. A numeric index was also added as part of each filename so they could be encoded in the correct sequence (eg tc_000.gif ... tc_359.gif). **Figure 1** shows step 3 in the sequence.

IMAGEMAGICK. This ended up being the chosen software package for image creation. One significant difference between it and the more usual drawing packages such as *Corel, Paintshop Pro* etc is that it is command line driven rather than mouse driven. This is clearly the drawing package of choice for Dilbert; see [2] for download details.

Among the armoury of this tool suite is a utility called 'convert' that forms the core of the image processing described here. This appears to be quite a powerful tool, of which only a small fraction will be used. Typing 'convert' prints quite a lengthy argument list, along with associated syntax.

Initially, this application was run under XP, but a Linux version is also available (and for reasons that you will see later may have been a better choice). Converting from a batch file

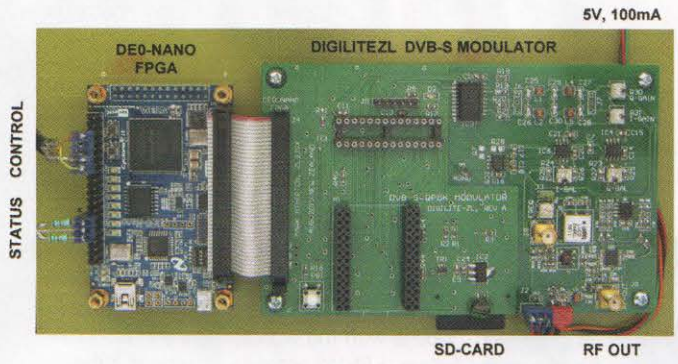

PHOTO 1: The completed hardware.

to a shell script should hopefully be trivial. Table 1 shows a few lines of the NTSC variant of the batch file tc.bat (responsible for creating the image). Comments have been added by prefixing with '//'.

Each command references the file associated with the background of the test card (hence its name, tc_bg.gif). The file is loaded at the start of the line, an action or process is taken and the file is saved again. This is probably the simplest, slowest and, more to the point, most obvious way to do the job.

Moving on, the background image needs to be read, a single stroke needs to be added (the animated second hand), and the result needs to be saved to a new file. Table 2 shows the process.

So with the batch file execution complete, a background image and 360 animation gif image files have been created. If you display them in sequence using a fast image browser the animation becomes readily apparent.

CONVERTING FROM GIF TO MPEG PROGRAM STREAM. For quite some time, *FFMPEG* has been one of the utilities of choice in the open-source world for the creation and management of (amongst other things) MPEG video files. An interesting feature of its capability to encode a sequence of GIF files into MPEG2 video. A curiosity (or the author has been doing something daft) is that the feature only appears to work correctly when running under Linux.

So, having moved the 360 GIF files onto a machine running Ubuntu Studio 12.04 [3] (which has *FFMPEG* pre-installed), only a single line shell script is required to create an MPEG program stream:

```
ffmpeg -f image2 -r 1 -i tc_%03d.gif -y -an
-target ntsc-dvd -b 1000kb ARISS.mpg
```

It is worth noting that the substring -i tc_%03d.gif translates to the English "take a series of input files with names between tc_000.gif and tc_999.gif". We have already created the series tc_000.gif to tc_359.gif, so we have met this naming convention.

Documentation associated with *FFMPEG* insinuates that MPEG transport streams may be created directly, but the author was unable to get this mode operating correctly.

MEDIAINFO. This is a wonderful free application [4] that allows inspection of media files and is very useful as a first line of defence when trying to figure out what has gone wrong. Taking our MPEG file and running it through Media Info in text mode, the information in Table 3 is revealed, which was just about what is expected.

CREATION OF TC.BAT. This batch file is the output of a piece of quick and dirty C [5]. The main reason for this approach is the calculation of start and end points for the animated seconds hand as well as the marking of the inside of the clock with required tick marks. The bulk of the rest of the code simply has printf statements with hard coded *ImageMagick* commands.

CONCLUSION. Migrating the whole process to Linux would have saved quite a bit of data movement between different operating systems. But since the initial project was only expected to be used once (as usual) this wasn't too high on initial project priorities.

On the subject of optimisation: 'there isn't any'. Lots of things could have been done to make the generation process run (much) faster. Simplicity and obviousness wins hands down in terms of ease of maintenance with these kinds of projects (at least in my opinion of the author).

This is far from an exhaustive discussion on the subject of MPEG video creation, but hopefully will spark some interest in the art as applicable to DATV. As usual, quite a lot was learned and discovered during this project, and hopefully the few more clumps of hair that sit on my office floor will save you from having to rediscover some things...

Some of the techniques described here might be very useful as part of a rendering engine associated with a GUI based test card generator, with sizable entities such as colour bars and annotation. It could be also be possible to insert and place static images and maybe even add simple wipes, fades etc.

CREDITS. Thanks go to Ben Gelb, N1VF who wrote the FPGA based DVB-S modulator and provided significant support when I needed to add the CPU-to-modulator video conduit. Michel Burnand, HB9DUG has always been on hand to provide an invaluable second pair of eyes associated with documentation and testing, and has worked on a PS -> TS multiplexer.

Alan Page, ZL3UYJ deserves praise for beating sense into me when I was about to make foolish decisions. Thanks to Brian Jordan, G4EWJ and Malcolm Johnson, GOUHY from the original DigiLiteZL project for their (considerable) help and support getting the original DigiLiteZL hardware commissioned.

Last, but by no means least, to Kerry Banke, N6IZW who provided the impetus to get all-this-stuff-that-I-have-been-meaning-to-do-for-a-while and all of his mates at NASA. He also managed to isolate a stability issue that had gone unnoticed.

If you are interested to learn more about the DigiLiteZL project, which is an FPGA based DVB-S modulator, please see [1].

WEBSEARCH

[1] DigiLiteZL experimental DVB-S modulator – www.idesignz.org/DigiLiteZL/DigiLiteZL.htm
[2] *ImageMagick* – www.imagemagick.org
[3] *Ubuntu Studio* – http://ubuntustudio.org/download/
[4] *MediaInfo* – http://mediaarea.net/en/MediaInfo
[5] Support and sample files – www.idesignz.org/misc/tc_files.zip or http://rsgb.org/main/publications-archives/radcom/radcom-downloads/

TABLE 2: Adding the second hand to the background.

```
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "line 360,318 360,188" tc_359.gif
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "line 360,318 358,188" tc_358.gif
convert tc_bg.gif -fill white -stroke black -strokewidth 3 -draw "line 360,318 355,188" tc_357.gif
// ... and continues to generate all required files tc_356.gif through to tc_000.gif
```

Table 3: Media Info for the MPEG file (see text).

General	
Complete name	ARISS.mpg
Format	MPEG-PS
File size	3.86 MiB
Duration	59s 826ms
Overall bit rate	541 Kbps
Video	
ID	224 (0xE0)
Format	MPEG Video
Format version	Version 2
Format profile	Main@Main
Format settings, BVOP	No
Format settings, Matrix	Default
Format settings, GOP	M=1, N=18
Duration	59s 826ms
Bit rate mode	Variable
Bit rate	530 Kbps
Maximum bit rate	500 Kbps
Width	720 pixels
Height	480 pixels
Display aspect ratio	3:2
Frame rate	29.970 fps
Standard	NTSC
Color space	YUV
Chroma subsampling	4:2:0
Bit depth	8 bits
Scan type	Progressive
Compression mode	Lossy
Bits/(Pixel*Frame)	0.051
Stream size	3.78 MiB (98%)

QRP

Victor wins operating award

Victor Brand, G3JNB and his wife Audrey were guests of honour at the RSGB Centenary Day celebrations in July 2013.

QRP WINTER SPORTS. I have known Victor Brand, G3JNB for a good many years and he sums up all that is best in a QRPer. He is an avid QRP operator and a keen radio constructor so I was pleased to find out that he had won the G4DQP award. This is a plaque presented to the operator who is considered to have added most to the G QRP Club Winter Sports. This annual event is a QSO Party, not a contest, held every year that attracts large numbers of QRP operators. The 2013 event was as popular as ever and the Club's G4DQP Trophy, for a truly an amazing effort, was awarded to regular 'WS' participant Victor Brand, G3JNB, whose QRP Club membership number 3432 reveals his length of service.

Victor wrote, "The G-QRP Club's Winter Sports activity period is held annually from Boxing Day to New Year's Day and is intended to encourage HF operators to work with 5 watts, or less, and to submit their logs. I used my veteran FT-817 (2002 model) and a decidedly wonky 97' doublet 'sloper' up at just 25' and worked CW on all bands from 80m to 10m, including 60m, with some nice DX including A71AE Qatar on 12m and the special W1AW calls on 12 and 10m. I have been an avid QRP op for well over 60 years now and still find low power DXing great fun and far more satisfying than my QRO contacts. QRP keeps you young!"

This was a typically modest response from Victor. What he didn't say is that he turned 80 during 2013. Victor won the Shefford Amateur Radio Society G2DPQ Construction Trophy for 2013. He and his wife, Audrey, were special guests at the RSGB Centenary celebrations at Bletchley Park (see photo)... and he took part in the G100RSGB event on the WARC CW bands. All I can say is: well done Victor!

TABLE 1: Summary of the 302 responses received in the SOTAbeams portable antenna survey.

Antenna type	Proportion
End-Fed Half Wave	17.55%
Linked dipole	14.57%
Single band dipole	11.59%
Random length end fed	11.59%
Ground-plane	10.93%
Other	10.60%
Doublet	9.27%
Multi-band loaded dipole	6.29%
Magnetic loop	5.96%
W3EDP	1.66%

PORTABLE ANTENNA SURVEY. Many *RadCom* readers will know Richard Newstead, G3CWI, as a prime mover in the 'adventure radio' movement and an instigator in the Summits on the Air awards programme. In more recent years he has become known as the proprietor of SOTAbeams; a company offering an innovative range of amateur radio products. My attention was drawn to Richard and his products when I read, on the G QRP Club internet mailing list, that he was to conduct a survey on portable antennas. I followed the results to the SOTAbeams webpage at www.sotabeams.co.uk/efhw. This page opens with the words, "The end-fed half-wave (EFHW) antenna ... why is it the world's most popular portable antenna?" and then lists the relative popularity of a range of 10 well-known portable antennas. Such antennas hold a new interest for me. When I retired, I moved from a large, old, vicarage with reasonable garden space to a 1970s semi with a postage stamp sized garden. These portable antenna choices were the sort of antenna I now had space to erect.

In his webpage report Richard writes, "In early 2014 I conducted an online survey for portable antennas. The survey asked just one question, "What is your favourite portable antenna?" The rationale behind this was not to find what people thought was necessarily the best-performing portable antenna but rather to find out what they were most likely to actually use. The survey was copied to various groups such as the QRP-L mailing list, G QRP and the SOTAbeams mailing list to name but a few. There was a bias towards QRP sources but the question was not directly QRP related. Respondents were given a number of options to choose from. **Table 1** summarises the responses."

Rather usefully, the webpage goes on to deal with the practical implementation of an end-fed half wave antenna. I learned a lot about the EFHW antenna and must look further into that option; at present I use a W3EDP antenna. But as Richard points out, the W3EDP is really just a particular case of the EFHW.

NOVEL RECEIVERS. Each year the G QRP Club offers the W1FB Memorial Award in memory of Doug DeMaw, W1FB, former technical editor of the American *QST* magazine who did so much to popularise QRP construction particularly in the 1980s. Sadly Doug died in 1997 and the trophy was first presented in 1999. Each year it sets a practical theme, designed to produce an article for the G QRP journal *SPRAT*. In 2012/2013 the theme was to design and build an amateur bands receiver for one band, capable of being built by a beginner. The entrants were to supply circuit diagram(s), full component values and brief notes. I wrote about this in the October 2013 *RadCom*. Readers may be interested to know that there is a YouTube video that covers one of the winners, see www.youtube.com/watch?v=EP54yizjG1A.

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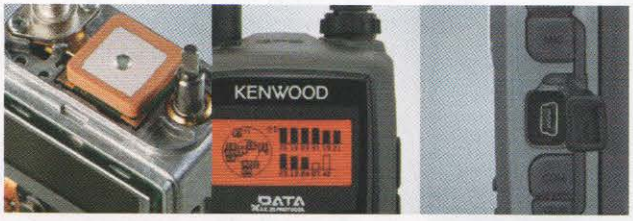

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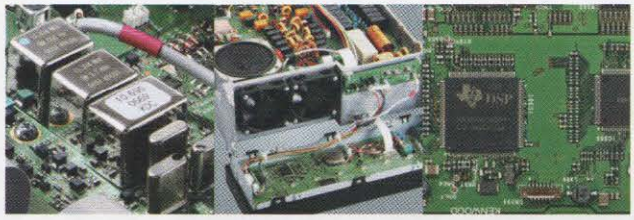

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Sam Jewell, G4DDK and John Worsnop, G4BAO • e-mail: jewell@btinternet.com, john@g4bao.com

Getting started in microwaves

Amateur allocations in the GHz bands

INTRODUCTION. At some time, most radio amateurs must have wondered what it is like to operate on the higher amateur bands. That is, above the 50MHz amateur band. Many years ago, the Class B licence only allowed operation on 430MHz and above. Then access was extended down to include the 144MHz band. This gave many amateurs a taste for VHF to add to their UHF activities. When the Morse test qualification was removed and access to HF was permitted for the holders of VHF licenses, many of the 'VHF' amateurs decided to give the HF bands a try. If you were one of these amateurs and you continue to enjoy the cut and thrust of HF you probably decided to stay on HF and abandon the higher bands. However, many others will have already returned to VHF and may now be thinking about moving up onto the microwave bands.

The unique and interesting propagation of the 'weather propagation bands' are the equal of any HF propagation mode and, in some cases, far more fascinating.

In case you are thinking, as many mistakenly do, that the higher bands are only for short range, line of sight, contacts think again. Typical ranges for the most common propagation modes will cover much of Europe from the UK and using the most advanced modes, such as moonbounce, the whole world can be worked with far more reliability than by HF propagation modes. But before we can run we must learn to walk. This is what this 'Getting Started' article is all about.

PHOTO 1: TS2000X transceiver that provides 1240MHz to 1300MHz all-mode coverage with 10W RF output. Courtesy G4DDK.

In a few short pages it is impossible to give advice and encouragement on how to operate on all the UHF and microwave bands available to the interested amateur. So, we have decided to cover the two most popular microwave bands of 1.2GHz and 10GHz, with some advice on equipment, techniques and what sort of propagation you might expect to encounter.

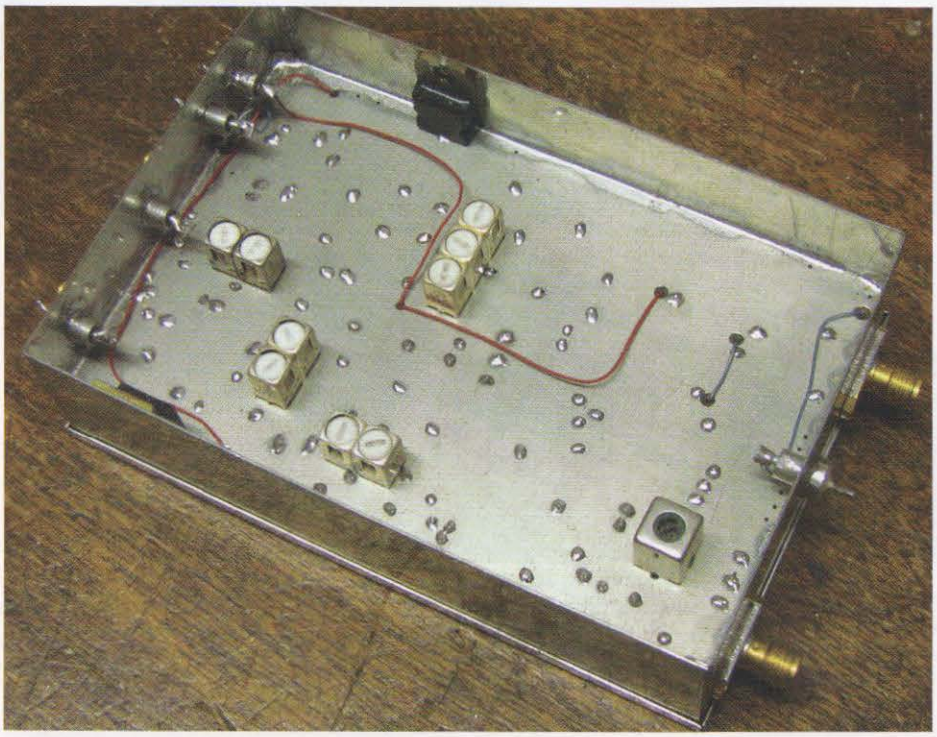

PHOTO 2: 1296MHz transverter module designed by G4DDK. Courtesy G4DDK.

1.2GHz. The UK 1.2GHz (23cm) band covers from 1240MHz to 1325MHz, with 1296MHz to 1298MHz allocated to weak signal DX modes; 1260MHz to 1270MHz is allocated to the amateur satellite service (earth to space direction) and other parts of the band have been allocated, variously, to data links, amateur TV and repeaters.

This article will deal only with weak signal, narrowband, techniques and equipment. Details of amateur TV (ATV) can be found on the British Amateur TV (BATC) website [1], whilst amateur satellite information can be found on the AMSAT UK website [2].

COMMERCIAL TRANSCEIVERS. Very few 23cm band amateur radio transceivers have been made available. Most of those that have usually include 23cm band as an option. A few dedicated 23cm band transceivers have appeared, including the venerable Icom IC-1271 and IC-1275. VHF/UHF multiband rigs with 23cm included the Icom IC-910X, IC-9100X, Kenwood TS-2000X (Photo 1) and the Yaesu FT-736. Of these, only the

IC-9100X and Kenwood TS-2000X are still currently in production as of the end of 2013. All of these radios are multimode and include SSB, FM and CW modulation modes.

A number of FM-only 23cm band transceivers have also appeared. These include the Yaesu FT-912R, FT-2311, FT-2312, Icom IC-1200, IC-2500 and IC-3700. Kenwood produced the TM-521, TS-531 and TM-541, whilst Alinco have also produced a 23cm band FM handheld. More recently, Icom have introduced a range of D-Star [3] transceivers with 23cm band capability.

If the cost of a commercial transceiver is felt to be excessive in order just to try a new band then using a transverter may be a viable alternative. A transverter is a combined transmit frequency up-converter and receive frequency down-converter with common switching between the two (**Photo 2**). A lower frequency transceiver is then used as an intermediate frequency (IF) radio. 144MHz and 432MHz radios, such as the Yaesu FT-817, are very popular as IF transceivers.

Many 23cm transverter designs have appeared in amateur radio publications over the years [4, 5, 6] and several of these have gone on to become available as kits. The kit approach solves the perennial problem of 'where do I obtain parts?'. Popular 23cm transverter kits include the Kuhne Electronic (DB6NT) [7] and Down East Microwave Incorporated (DEMI) [8] as well as kits from Australia [9] and Spain [10].

Ready built 23cm transverters are also available from several of these manufacturers. Technical details and prices are shown on their respective web pages.

Intending constructors should carefully check the status of some earlier published designs. These may no longer be viable as critical parts become obsolete.

In almost all cases, an out-board (external) power amplifier is required in order to produce output power in excess of 25W. 23cm is a band where 'a bit more power' can help enormously in making the longer distance contacts, as will be discussed later in the section on propagation.

Modern RF metal oxide silicon (MOS) FET power amplifiers (**Photo 3**) can be obtained from PE1RKI [11], Kuhne Electronic and others.

10GHz. The 10GHz (3cm) band consists of three sub-bands from 10000 to 10125MHz, 10225 to 10450 and 10450 to 10500MHz in the UK. 10368 to 10370 is allocated to weak signal DX modes, 10450MHz to 10500MHz is allocated to the amateur satellite service (earth to space direction), with the top 25MHz of this sub-band allocated to satellites only. Other parts of the band are allocated, variously, to data links and repeaters.

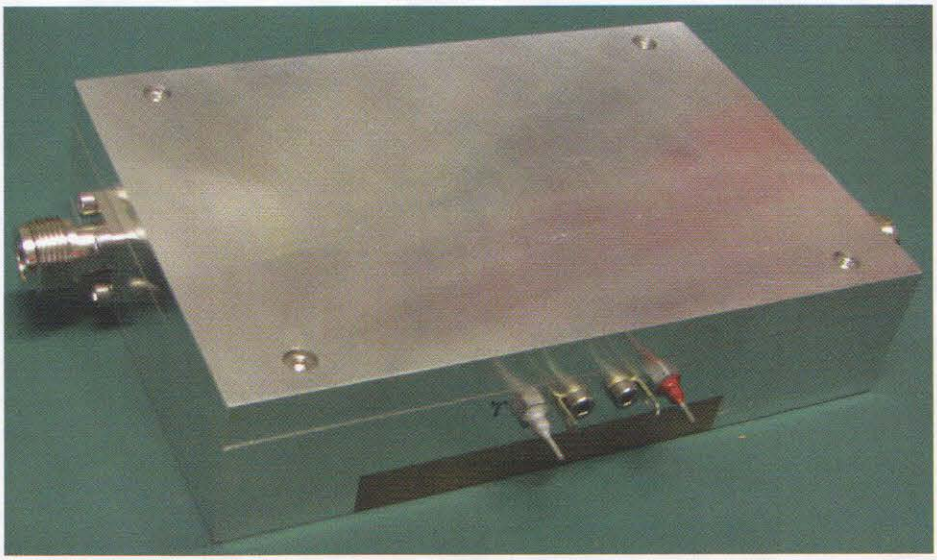

PHOTO 3: PE1RKI 250W output RF MOS FET power amplifier module for 1296MHz. Courtesy G4DDK.

10GHz operation may be a challenge for the microwave newcomer, but don't be put off by this. It would be sensible to gain some experience on 144 or 432MHz first before venturing higher. You can then seek out active microwavers by joining a group such as the UK Microwave Group [12] and learn from them.

By far the best, easiest and cheapest way to get a feel for 10GHz is with a receive-only system consisting of a frequency down-converter using a surplus satellite LNB with a cheap USB stick (dongle) designed for TV reception and a software defined radio (SDR) program such as *SDR Sharp* [13] or *SDR-radio* [14].

There are many articles, most recently in *RadCom* [15], describing how to set up these dongles. The LNB uses a local oscillator at 9.75GHz so the 10368MHz band produces an IF at 618MHz, which is well within the range of the dongle receiver. Many modern LNBs, especially the newer phase locked loop (PLL) ones, are stable enough to be used without further modification and there is a wealth of information about this approach on a number of websites [16, 17].

Start by listening for beacons and partner with someone who can transmit and work them cross band to one of the lower bands, before moving on to transmission. Stable transmitters are not yet quite so easy to make, so transverters are then the next step, but best left until you are sure you want to make the investment. 10GHz is not like VHF or even UHF, in that you may not get as many QSOs on the microwave bands as you would on the lower bands, but you don't take up microwaves to have large numbers of QSOs: you do it because you are interested in radio propagation, microwave technology and pushing the boundaries of amateur radio. The reward is pursuing different propagation mechanisms – rain and snow scatter, extreme ducting, aircraft scatter, efficient obstacle reflections – and there are still lots of paths unexplored. If portable is your interest, who can beat being out on the hills in the right weather?

COMMERCIAL EQUIPMENT. For transmission on 10GHz, there are no stand-alone transceivers available so the most popular way to become operational is by using a transverter, as described in the section on 1.2GHz. Most transverters use a 144MHz or 432MHz IF so a 144MHz or 432MHz multimode transceiver is required to drive them, but as you will probably be 'serving your apprenticeship' on one of those bands, you may already have one available.

There are a number of commercial transverters available and transverter designs have appeared in amateur radio publications over the years [18, 19] and several of these have gone on to become kits. Popular 10GHz transverter kits are available from the same sources as for 1.2GHz, namely Kuhne Electronic (DB6NT) (**Photo 4**) and Down East Microwave Incorporated (DEMI) as well as kits from GW4DGU [20] and outlets in Australia [21] and Spain [22]. Ready built 10GHz transverters are also available from several of these manufacturers. Technical details and prices are shown on their respective web pages.

10GHz POWER AMPLIFIERS. Good results can be obtained on 10GHz with transverters running just a few hundred mW, but an out-board (external) power amplifier is required in order to produce output in excess of 1W to take advantage of some of the anomalous propagation on the band (**Photo 5**). Modern gallium arsenide (GaAs) FET RF power amplifiers can be obtained from, Kuhne, DEMI, GW4DGU and others.

10GHz FROM HOME. While many people see microwaves as a portable activity, good

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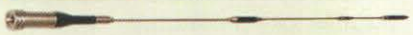

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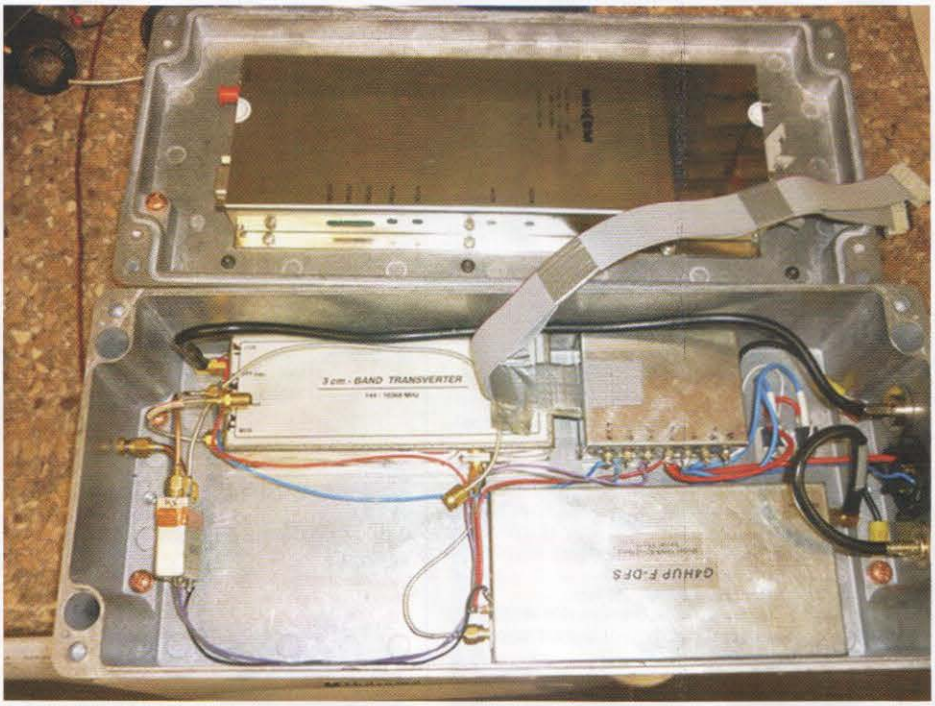

PHOTO 4: A DB6NT transverter plus ancillaries, boxed up and ready to go. Courtesy G4BAO.

results can be had from the shack, given a reasonable take off in one or two directions. Some people with really good, high, sites get QSOs just by pointing the dish through a closed upstairs window but most of us need a proper outdoor installation. Unlike 1.2GHz, coaxial cable loss is very high, and even with professional 3/8 inch 'hardline' coax like Andrew FSJ2-50, just 3 metres of this can lose you a whole dB of power and add 1dB to your system noise figure. Ideally, the whole transverter system, or at least a preamp and possibly the power amplifier, should be mounted on the mast close to the dish. DC is then fed up to the transverter and the 144MHz IF can come back to the shack on RG58 or similar size coax. Great care needs to be taken to waterproof the entire outside system if you are not going to find yourself with a box full of water after the first heavy shower. An alternative, with a typical 'gable end' mounted short pole system, is to put the transverter system in the loft. A run of around 6-7 metres of good coax will get you up to the feed and give a maximum of 3dB loss on Rx and Tx, making for a workable system – albeit at the loss of half your Tx power and a poorer receiver performance.

ANTENNAS. Above all else (excuse the pun), a good antenna is required in order to get the best out of the microwave bands. This needs to be mounted as high as you can manage and in the clear. 1.2GHz and above is not the place for loft-mounted antennas. The attenuation of roof tiles, brick gable ends and wooden roof trusses can be excessive at these frequencies. If you cannot get your antennas outside and in the clear it may be time to think about operating portable.

1.2GHz ANTENNAS. Antennas for 1.2GHz tend to be of the Yagi Uda type, although dishes, corner reflectors and flat plate designs are also used. Most activity on this band uses horizontal rather than vertical polarisation. This is largely historic and resulted from extensive testing that showed horizontal polarisation achieved lower loss over hills and other obstructions as well as better penetration of valleys and other difficult locations. For VHF, UHF and microwave DXing, this is ideal. Circular polarisation, although in theory even better, has never really caught on, except for EME.

PHOTO 5: A DB6NT 8W RF output power amplifier for 10GHz. Courtesy G4DDK.

Typical Yagi (the contraction of Yagi Uda) antennas may have over 30 elements in order to achieve high gain. Stacking and baying is also very popular in order to achieve even higher gain. Of course, gain comes at the expense of narrower beamwidth, so a good quality rotator with resolution to better than 5° is desirable, but not absolutely necessary. It goes without saying that the rotator needs to be set up carefully in order to fully utilise that sort of resolution, in order to achieve beam heading accuracy. Cheap rotators will work, especially with shorter, lightweight Yagis, but if you can afford a good rotator, it will give years of good service with larger antenna arrays. Sometimes cheap is false economy.

10GHz ANTENNAS. Antennas for 3cm usually consist of a 'surplus' satellite TV dish and a horn feed of some kind. Horn antennas alone, folded up from sheet metal or from PCB material [23] can be useful for portable operation. Good results can be obtained both portable and from home with a 45cm Sky dish that can often be picked up for a few pounds at a local radio rally (**Photo 6**). For those who prefer to buy there are a number of commercial feed horns available, notably from GW4DGU (**Photo 7**) [20] and W1GHZ [23], but if you prefer to make your own then or with care you can use plumbing parts. An example of a plumbing feed is shown in **[24]**.

PROPAGATION. In free space microwave signals do not suffer any greater loss than signals at lower frequencies. However, it is rare for signal paths to be entirely in free space. The majority of radio signal paths have to contend with obstructions such as hills, the curvature of the earth and even buildings and trees. The signal loss caused by these obstructions is higher (often much higher) at microwaves than at HF and VHF. It is this loss that limits the range of 1.2GHz and above.

Most microwave propagation takes place in the lower few km of the earth's atmosphere, unlike HF where propagation is mainly in the ionosphere. The lower atmosphere is where the weather is located and therefore the various weather phenomena have a large influence of how well signals are propagated.

Across a plane earth surface, with no obstructions, microwave signals will propagate to a distance about 1/3 farther than line of sight. This is due to refraction in the atmosphere where signals are bent back towards the surface of the earth as the air thins at increasing altitude. Refraction is constantly changing so that the distance signals are refracted can vary from less than line of sight to distances of thousands

of kilometres. The weather conditions that cause signals to propagate over these enormous distances are not too common and the reader is referred to the *RSGB Handbook* or *RSGB VHF/UHF DX Book* (now out of print, but occasionally available on eBay) for a more complete description.

Day to day propagation, at distances beyond line of sight, is mainly due to tropospheric scatter (troposcatter). Weak, but useable, signals can propagate to distances approaching 1000km by scatter from small variations in the refractive index of the troposphere. UK amateur radio power level restrictions limit what distances can be achieved by pure troposcatter. In general, troposcatter is more effective on the higher bands than the lower VHF bands.

Whilst there is no ionospheric-mode propagation at 10GHz, limited meteor scatter contacts have been made at 1.2GHz and amateur radio aurora propagation is theoretically possible on this band.

The use of aircraft reflection (AR) is common at 1.2GHz and to a lesser extent on 10GHz. Aircraft flying at 10km altitude can give short but useable reflections between two stations located up to about 800km apart and even further with some forms of range extension, such as intense ducting (a form of refraction).

At 1.2GHz aircraft can give reflections up to about 3 minutes duration. At 10GHz the reflection duration may be no more than about 20 seconds. Obviously the 10GHz mode is for experienced operators!

The increasing use of digital modulation modes, coupled with aircraft prediction software such as *Airscout* [25] have recently made AR even more popular.

PHOTO 7: GW4DGU dish feed. Courtesy G4BAO.


PHOTO 6: A neat microwave portable system using a Sky dish. Courtesy G4BAO.

10GHz WIDEBAND. This short article has dealt only with weak signal, narrowband techniques and equipment. Some amateurs are still experimenting with and getting respectable results from 'wideband' techniques, mainly wideband FM using Gunn diode transmitters. Looking back at the 1970s and 1980s copies of the *VHF-UHF Manual* and other textbooks will produce numerous wideband projects. While there is plenty of room in the 10GHz band for this, and it is a useful introduction to microwaves, it gives the misleading impression that it's only possible to work line of sight paths of a few tens of km, whereas a modern, low power, narrowband system can work 150km or more on a regular basis. Things have moved along a lot since those days, and much of this 1980s 'surplus' technology is getting very hard to find now. To move on from 10km contacts to 150km+ requires a completely new system; only the antenna and feeds from these older wideband systems can be pressed into service. We know of many amateurs who have gone down the wideband path, got disillusioned and never progressed on to more exciting QSOs!

MICROWAVE ADVENTURE. It is to be hoped that this short article has whetted your appetite for the microwave bands. It is a long time since these bands were for 'plumbers'. The technology that enables every radio amateur to access and use the bands above 1GHz is now available. And new and exciting developments are coming along every day that will further open up the potential of all this spectrum.

WEBSEARCH

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[4] *DUBUS* Technik 4
[5] *RSGB International Microwave Handbook*, 2nd Edition. ISBN 9781-9050-8644-3
[6] *The ARRL UHF/Microwave Projects Manual*. ISBN 0-87529-449-1
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[9] Mini Kits Australia: www.minikits.com.au/
[10] Transverter Spanish
[11] PE1RKI: http://members.chello.nl/b.modderman/
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April 2014 • RadCom
Steve Ireland, VK6VZ • e-mail: vk6vz@arach.net.au

SDR for the DXer and contester

A personal view of using SDRs to get a competitive edge – plus a review of the WoodBox Tmate2 console

INTRODUCTION. For those experienced radio amateurs who have a several decades-long interest in HF DXing and contesting, 'if', 'how' and 'where' to use a software defined radio (SDR) can be challenging decisions. Over the last few years, the use of simple sampling detector-type SDRs as a means of providing a bandscope function, via PC-based software such as *PowerSDR* [1] and *CW Skimmer* [2], to radios such as the Elecraft K3, via an external intermediate frequency (IF) output, has increased dramatically.

PHOTO 1: VK6VZ Elecraft K3-based station with Softrock SDR running from its 8.215MHz IF into M-Audio D44 pc-based soundcard, old Pentium IV PC and *CW Skimmer* software running under Windows XP. Note 'blind mode' is selected on *CW Skimmer*.

Whether you are a contester or a DXer, a bandcope of this kind gives you an excellent picture of what is happening up and down a HF band (or even two if you have the right kind of software and hardware), giving you an edge in a DX pile-up or in a crowded (or apparently deserted) band in a contest. Not to have this kind of functionality today in any kind of competitive situation is effectively tying one hand behind your back.

The SDR/bandscope hardware can be in the form of the N8LP LP-Pan [3], the Elecraft P3 [4] or a Softrock receiver [5] covering the same frequency as the IF output (in the case of the K3, 8.215MHz). Only the P3 is a self-contained bandscope – in the case of the LP-Pan or the Softrock, a Windows PC that will support *PowerSDR* or *CW Skimmer* is required.

After some HF DX contest administrative committees decided to place those who used *CW Skimmer* to decode CW signals in the Assisted category (ie the same one as those who used web-based DX clusters to tell them on what frequencies rare 'multiplier' stations were operating), the inventor of *CW Skimmer,* Alex Shovkoplyas, VE3NEA cleverly developed a 'blind' function for his software. This switched off the CW signal decoding facility but still allowed contesters to 'see' CW signals up and down the bands on a bandscope display and allowed them to enter the Unassisted category. The 'blind' function is a great innovation and I've been using it since Alex introduced it – see **Photo 1**.

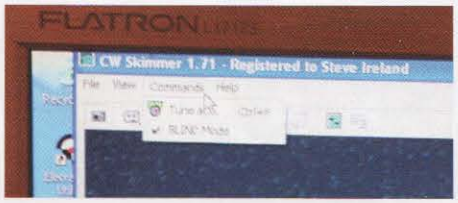

PHOTO 2: Selecting 'blind mode' in *CW Skimmer*.

Those who have used or seen conventional waterfall displays on software such as *PowerSDR* and been disappointed can suffer something akin to a religious experience (some even uttering 'hallelujah') when using *CW Skimmer* for the first time and experiencing its ability to show/decode individual signals in a pileup containing 20 or 30 stations in only a few kHz with its horizontally-scrolling waterfall-type display.

Not only that, but *CW Skimmer* will actually show which caller is giving the ubiquitous '599' report to the DX station at any given moment, potentially giving you the chance to 'click' on the caller's signal with your mouse and call the DX station on the same frequency once the QSO is over.

To use *CW Skimmer* in this manner in conjunction with an Elecraft K3 (with a SoftRock receiver tuned the K3's 8.215MHz IF) is a simple matter of an RS-232 connection between the K3 and the *CW Skimmer* PC. This is something I have been doing for several years, with the sensitive *CW Skimmer* bandscope's ability to see weak signals resulting in a steady upward progress in my 160m DXCC score.

However, all this is using an SDR as an add-on to a conventional superhet architecture (that is getting close to a century in age) and misses out on the best advantage of an SDR – the ability to make weak signals in noise more intelligible. Forget the flashy computer bandscope – though it *is* really cool and helpful, being able to hear signals better on an SDR in comparison to a superhet is arguably *the* most fundamental improvement you get from an SDR.

PURE SDR. The (truly wonderful) Elecraft K3 and all the other conventional HF transceivers at the top of Rob Sherwood, NC0B's widely regarded 'top-ten' performance table [6] use crystal filtering as the first point in their architecture after the antenna to give selectivity of a few kHz.

All the radio frequencies that amateurs use are covered in noise – some of which is atmospheric, some ionospheric and the rest man/machine made. When noise pulses/spikes pass through a crystal filter, the non-linear phase response of the filter distorts and lengthens these pulses into an extended pulse, which sounds very harsh. However, when noise pulses/spikes pass through an analogue to digital converter (ADC) with a linear response in an SDR based on digital down conversion (DDC) techniques, the phase response stays the same because the ADC treats the noise pulses/spikes in a linear manner and they sound much softer on the ear, provided the pulses/spikes don't overload the ADC. Whilst crystal filters by their nature generally have a non-linear phase response, the good news is noise spikes generally don't drive ADCs into limiting.

What happens in practice is that on a DDC SDR such as the HPSDR [7], Hermes [8] or Apache Labs ANAN series [9] (and probably Flex-Radio's FLEX 6000 series [10]), any noise actually sounds mellow and easy on the ear, in a manner that has to be experience to be believed, rather than harsh and grating as it does on a radio with crystal filtering.

When it comes to my ageing ears, even one stage of crystal filtering (such as is used on the Elecraft K3 and the equally regarded Kenwood TS-590s and Yaesu FTDX-5000) is enough to cause a phase response to noise that eventually irritates/tires me after several hours of operation and makes me want to switch the radio off. As a long-time contester who needs to operate up to 24 hours at a sitting, this is an issue for me.

HPSDR VERSUS K3. For the last year, my Elecraft K3-based station (with a SoftRock SDR attached to its 'IF Out' connector and, in turn, its output feeding into an M-Audio Delta 44 sound card as an ADC and running *CW Skimmer* under Windows XP) has sat next to my HPSDR station.

In this case, the HPSDR DDC/DUC transceiver is hooked up to another old PC running *PowerSDR* and *CW Skimmer* under XP and feeding an Expert 1K-FA linear [11] amplifier. Although the HPSDR only produces 10W or so from its Pennylane power amplifier [12], this is easily enough to drive the Expert 1K-FA to 400W PEP on all bands from 160 – 10m.

What I have here can be regarded as the best of both worlds but, based on my previous comments about the HPSDR's receive capabilities, you would think I'd probably be mainly using this station rather than the K3 for my contesting and DXing. The reverse has actually been true.

While the HPSDR is noticeably better at pulling out weak signals with its linear response to noise and steep-sided razor-like digital filtering, in my opinion its *PowerSDR* bandscope/*CW Skimmer* view and frequency hopping facilities are simply not as good as those available on the K3 station, on which I can effectively use *CW Skimmer* via RS-232 to control its operation.

If semi-break-in (or break in) CW operation is engaged on the Elecraft K3, I simply find a signal on the *CW Skimmer* bandscope – which is giving me a direct reading of my transceiver's frequency thanks to the RS-232 connectivity – using my mouse or the tuning knob and then touch the paddle of my iambic paddle key to switch to transmit/send.

To make this even sweeter, if I pick off the RS-232 signals using a break-out box and connect this to the Expert 1K-FA's RS-232 port, when I change bands on the K3 the Expert 1K-FA automatically tracks these changes. How cool is that?

In contrast, using the HPSDR station, I can only connect up *CW Skimmer* to the radio via *PowerSDR* by creating what is known as a 'virtual audio cable' using some specialist software. What this means in practice is I cannot 'point and click' on CW signals I can see in the *CW Skimmer* bandscope and change the HPSDR to their frequency.

However, while it is annoying having more SDR-type functionality on my Elecraft K3 station than on my HPSDR station, I can live with this for some of the time because of the better ability of the HPSDR-based station to recover a weak signal in noise. That said, the 'deal-breaker' that has regularly taken me back to the K3 has been being stuck with using a mouse on the HPSDR station for all tuning and engaging receive and transmit

PHOTO 3: VK6VZ HPSDR-based station connected via USB to an old Pentium IV PC with *PowerSDR OpenHPSDR* software running under Windows XP. Just 8 – 10W from the HPSDR can drive an Expert 1K-FA linear to 400W PEP.

functions. When it comes down to it, in the heat of a contest or a big DX pile-up it is often much easier and intuitive to use a conventional knob and button front panel than just a mouse.

On the K3-based station, I can tune the radio with the mouse or use the tuning dial – whichever seems easiest at the time. On the HPSDR-based station, there has been no option other than pointing and clicking or scrolling with a mouse to change AF or RF gain, adjusting filtering or the use the receiver independent tuning (RIT). The latter takes a heap of super extra concentration, while tweaking a couple of knobs and pressing a couple of buttons on the K3 front panel is much easier

Even worse, I use a mouse for my writing and editing work from Monday to Friday. When I get home I often hate even the thought of using the mouse for anything – let alone carrying out my de-stressing hobby of amateur radio. The end result of all this was my HPSDR station was sitting mainly unused.

THE SOLUTION. What I have wished for ages – along with other radio amateurs who can see the sheer RF performance advantages of an DDC/DUC-type SDR transceiver – is an old-fashioned front panel/console for my HPSDR. Some time ago I discovered that 'Beppe' Campana, IK3VIG, who is well known among the SDR community for his software development, was working on developing exactly that in his WoodBox Radio company, with a product called the Tmate2 [13].

After what seemed a very long wait, in April 2013 the WoodBox Radio website announced the Tmate2 was ready for sale. However, it appeared the Tmate2 and its accompanying console software, which connects the console/front panel to *PowerSDR* software, was only available for the Flex-Radio FLEX-1500, FLEX-3000 and FLEX-5000 transceivers. The $64,000 question was I going to be able to use this device with my HPSDR hardware and *PowerSDR OpenHPSDR*? After discussions with my long-time friend and SDR mentor, Phil Harman, VK6PH, I decided to purchase a Tmate2 from Beppe.

SOFTWARE. The HPSDR (and the Hermes and Apache Labs ANAN transceivers) can use a variant of *PowerSDR* called *OpenHPSDR* [14]. For those who don't know the history, *PowerSDR* is the Windows-based client software created by FlexRadio Systems to operate their software defined radios. It has been adapted, primarily by Bill Tracey, KD5TFD and Doug Wigley, W5WC to work with the HPSDR boards.

The version of *OpenHPSDR* that I currently use with my HPSDR station is v2.2.12 W5WC [15], which I was hoping was close enough in compatibility with the current FlexRadio *PowerSDR* version 2.6.4 to be able to operate the WoodBox Radio Tmate2 console [13] and its associated software [16].

How the console and its associated computer aided transceiver (CAT) software works is by using the CAT protocol and a valid 'virtual serial port' (more of this later) to connect them to *PowerSDR*. This enables a number of *PowerSDR* tuning and control functions to be carried out by the 'tuning dial', two rotary encoders and six function buttons on the T-mate2 console/front panel, which is connected to the PC running *PowerSDR* by a USB connection.

Using freeware software from Eterlogic called *VSPE Manager* [17], a pair of virtual serial ports is created in a VSPE file – one for *PowerSDR* (say, COM2) and one for the Tmate2 software (say, COM4). One of these virtual serial ports is then set/selected in the *PowerSDR* CAT window (in the Settings menu/card) and the other is selected in the configuration window of the Tmate2 console software – see **Photo 2**. The settings in the rest of the Tmate2 software configuration window then need to be completed and saved.

When the emulation in the *VSPE Manager* file is then started, along with the *PowerSDR* software and the Tmate2 console software, the console becomes active. What this means is the LCD display in the physical Tmate2 console shows main Rx/Tx frequencies, an S-meter with an accompanying dBm meter becomes active and the display shows modes such as the active VFO; the status of the *PowerSDR* noise blanker, noise reduction, auto notch filter, RIT XIT, and sub receiver facilities, along with low/high filter cut, filter shift, AGC threshold, noise blanker and squelch levels.

On the transmit side, the console shows transmit drive level and how many watts are coming out.

CONTROLS. By default, the Tmate 2's main knob/encoder carries out the active VFO tuning – and the VFOs can be swapped by pushing the main dial down, which operates

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Steve Ireland, VK6VZ • e-mail: vk6vz@arach.net.au

PHOTO 4: Woodbox Tmate console with custom-made paper labels.

a switch. A long downward push of the main knob switch 'locks' the frequency of the active VFO, so accidentally turning the dial doesn't change the frequency of the HPSDR if you wish to monitor one frequency only.

The two smaller encoders are labelled E1 and E2 and, like the main encoder, are both rotatable controls and push switches. Each of them has a cycle of functions, which are moved through by a series of downward pushes. The E1 knob cycles through audio level, squelch level, AGC threshold level, transmit drive level and noise blanker level – all of which can be set by its rotatable control function. Similarly, the E2 knob cycles through low/high digital filtering cut, filter shift, receiver independent tune (RIT) and transmitter independent tune (XIT) functions and the degree of these are set by its rotatable control function. The functions to which each of the knobs is currently set is indicated at the bottom of the LCD display, with the designation of the knob (eg E1) shown to the left of its function (eg VOL).

Four of the six buttons have on/off functions in *PowerSDR OpenHPSDR*, with F1 switching on the sub receiver, F2 switching on the noise reduction, F3 switching on the noise blanker and F4 switching on the auto notch. The functions of F5 and F6 are selectable in the Tmate2 console software configuration menu, with the options being frequency step (up/down), band (up/down) and RIT & XIT (on/off).

TMATE2 IN OPERATION. Initially some problems were experienced in getting the Tmate2 to talk to the *PowerSDR OpenHPSDR* software/HPSDR using *VSPE Manager*. However, after going to Woodbox Radio's excellent website (which can be viewed in both Italian and English) and reading some of Beppe's advice to users, I realised the problem was in how I was configuring *VSPE Manager*.

One of the virtual comports I was trying to create was COM1 – and as this is already a 'real' (hardware) comport I could not initialise it. When I created a 'true' pair of virtual comports, using COM2 and COM4 designations, these ports initialised without any problems and I found I could use the Tmate2 with *PowerSDR OpenHPSDR* v2.2.12.

After carefully testing out the functions of the Tmate2, the only one that does not seem to work with the *OpenHPSDR* version I use is the RGB display wattmeter – which is a small price to pay. Beppe is still refining the Tmate2 software console (at the time of writing I am using the beta version) so this minor issue may disappear in future.

Photo 3 shows the Tmate2 console in operation with *OpenHPSDR* v2.2.212 and the *PowerSDR OpenHPSDR* screen, taken during the All Asia CW Contest. I tested the Tmate2 thoroughly during casual operation in this contest and was absolutely delighted with the increased ease and flexibility of operation of my HPSDR-based station.

The 65mm by 23mm LCD display is clear and easy to read. Its background colour changes, depending on the operating status of the radio. Separate colours are used for receive (orange), transmit (red) and sub receiver (green) states.

The 32mm diameter metal Tmate2 'tuning knob' encoder works smoothly and makes me very happy in comparison to tuning using a mouse wheel or clicking/dragging with a mouse on the *OpenHPSDR* bandscope/screen. You can set the size of the tuning step on *PowerSDR OpenHPSDR* screen interface, or using the Tmate2 console as described earlier ('Frequency Step'). If you want an analogue feel to the tuning, then you need to set the frequency step down very small, say to a few Hz. However, this is inconvenient for general tuning around on a band.

What works for me is to use the mouse in 'click and drag mode' for making large frequency changes and then using the Tmate2 tuning knob (set to, say, 10Hz frequency steps) for the smaller adjustment. Whilst not perfect, being able to use a combination of the mouse and the tuning knob is much better than just being stuck with a mouse.

Note that when the *OpenHPSDR* sub receiver is switched on (say, by pressing the F1 button) the E1 encoder sets its audio level and the background colour of the Tmate2 LCD display will change to green.

After the All Asia CW Contest was over, I decided it would be good to make some paper labels for the three rotary encoders and the six function buttons, in order that I didn't have to think too hard about what they actually did the next time I wanted to use the Tmate2 in the heat of a contest. After 12 hours or so of operation the average contester's brain is beginning to turn to mush and labels on absolutely all station equipment become highly desirable/necessary. My 'annotated' Tmate2 is shown in **Photo 4**.

What has happened since the purchase of the Tmate2 is that the Elecraft K3-based station is now the one that is sitting unused for most of the time – totally opposite to what

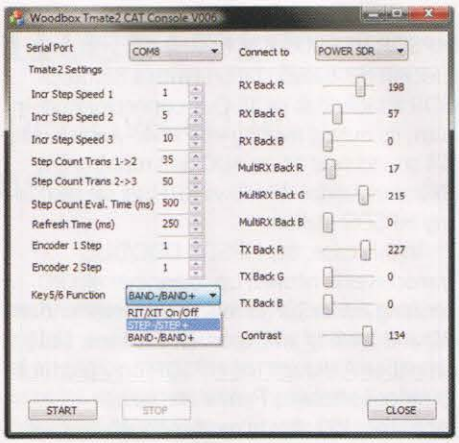

PHOTO 5: Tmate2 console software configuration window.

was happening before. My Tmate2 (and associated downloadable console software, **Photo 5**) cost €260 from WoodBox Radio and has transformed my HPSDR/*PowerSDR*/*OpenHPSDR* station into what I consider a cutting edge DX and contesting SDR for someone who still needs knobs and buttons. Thank you, Beppe! My impression is there are many other older radio amateurs like myself who will be very grateful to you for integrating the digital world of SDR into the old analogue radio world controlled by knobs and buttons.

WEBSEARCH

[1] *PowerSDR*: www.flex-radio.com/Products.aspx?topic=powersdr1x
[2] CW *Skimmer*: www.dxatlas.com/cwskimmer/
[3] N8LP LP-Pan: www.telepostinc.com/LP-PAN.html
[4] Elecraft P3: www.elecraft.com/P3/p3.htm
[5] Softrock receiver: http://fivedash.com/
- see also http://wb5rvz.com/sdr/
[6] Sherwood receiver performance table: www.sherweng.com/table.html
[7] HPSDR: http://openhpsdr.org/
[8] Hermes: https://apache-labs.com/al-products/1022/OpenHPSDR-Hermes-Transceiver-Card-Assembled--Tested.html
[9] Apache Labs ANAN series: https://apache-labs.com/1001/Ham-Radio-Products/1001/Radio--Accessories.html
[10] Flex Radio FLEX 6000 series: www.flex-radio.com/FLEX-6000_v2.pdf
[11] Expert 1K-FA linear amplifier: www.radio-ham.eu/eng/1kfa/scheda.html
[12] Pennylane power amplifier: www.tapr.org/kits_PL.html
[13] WoodBox Radio Tmate 2: www.woodboxradio.com/tmate2.html
[14] *PowerSDR OpenHPSDR* software: http://openhpsdr.org/wiki/index.php?title=PowerSDR
[15] This software version has now been superseded by PowerSDR OpenHPSDR v2.2.14 W5WC: see http://openhpsdr.org/download.php
[16] WoodBox Radio Tmate 2 console software (Tmate2CatConsole_v0006.zip) can be downloaded from www.woodboxradio.com/tmate2.html
[17] Eterlogic virtual serial port emulation software *VSPE Manager*: www.eterlogic.com/Products.VSPE.html

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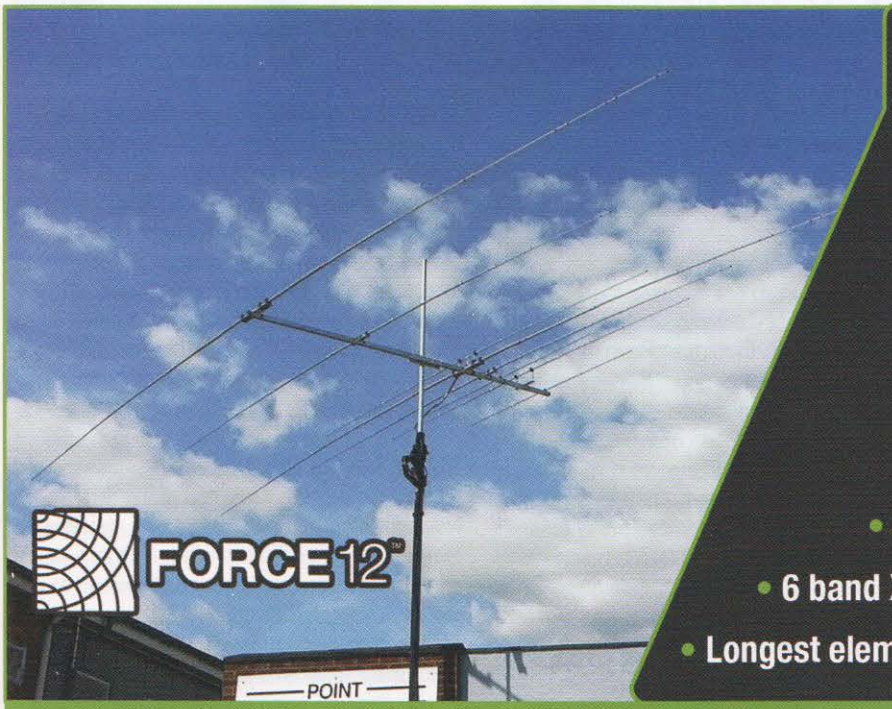

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Radio Society of Great Britain Annual Report 2014

Legal and administrative details for the year ended 31 December 2013

Status:	The organisation is a company limited by guarantee, incorporated on 21 July 1926
Company number:	216431
Registered office and operational address:	3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH
Honorary officers:	
President	Dr R C Whelan, G3PJT
Chairman	P G Murchie, G4FSG
Treasurer	R Horton FCA, G4AOJ
Company Secretary	R Thorogood, G3KKT
Audit Committee:	Phillip Brooks, G4NZQ Stan Lee, G4XXI Richard Horton FCA, G4AOJ
Bankers:	Natwest Plc, 181 Darkes Lane, Potters Bar, Herts EN6 1XT
Solicitors:	Hatchers Solicitors LLP, Welsh Bridge, 1 Frankwell, Shrewsbury, SY3 8LG
Auditors:	Sayer Vincent, Chartered accountants and statutory auditors, 8 Angel Gate, City Road, London EC1V 2SJ

The directors present their report and the audited financial statements for the year ended 31 December 2013.

PRINCIPAL ACTIVITIES. The principal activities of the Society are to provide services to Members who are radio amateurs, short wave listeners or others with interests in radio communications. The Society represents the interests of UK licensed radio amateurs to the regulatory authority in the UK, Ofcom, and via the International Amateur Radio Union (IARU) to other international bodies.

FINANCIAL RESULTS. The surplus on ordinary activities before taxation amounted to £122,000 (2012 - £88,000).

The reported surplus of £122,000 for 2013 reflects the recovery of £42,000 from the Society's previous general manager, bringing that matter to a satisfactory conclusion. Adjusting for this item, the operating surplus amounted to £80,000.

Subscription income remained stable, and commercial income from advertising and book sales showed a modest increase from £472,000 to £514,000. Operating costs were in line with the previous year.

The Society's net assets at 31 December 2013 amounted to £1,141,000 (2012 - £1,019,000). These figures include legacy reserves of £171,000 (2012 - £168,000). Free reserves increased to £439,000 from £351,000 reflecting the surplus for the year.
Richard Horton, G4AOJ FCA, Hon. Treasurer

Report of the Board

INTRODUCTION AND OVERVIEW. The RSGB strives to continually improve its services to ensure radio amateurs enjoy their interest in Radio Communications to the full.

The AGM in April 2013 saw a new Board and President installed which provided several new faces as well as continuity from the previous Interim Board. This year we have been implementing the plans laid by the previous directors and adding to these solid foundations for the following years.

2013 was our Centenary Year, the highlight of which was our Centenary Day celebrations at Bletchley Park. We were pleased to welcome the Lord Lieutenant of Buckinghamshire as the Queen's personal representative in the County who covered the unavoidable absence of our Patron, HRH The Prince Philip, Duke of Edinburgh. Attendees experienced a wonderful day in the company of our international partners including the ARRL and IARU, suppliers and advertisers. Other Centenary events captured the imagination of Members across the UK, and the success of the special G100RSGB callsign provided by Ofcom exceeded our expectations. We are already building on the legacy of our Centenary Year with Club Lectures etc.

We have been very active in preparing for Ofcom's Licence Review and Spectrum Release which they will consult on later this year. Many Members helped shape our pre-consultation input which has been warmly welcomed by Ofcom.

GOVERNANCE. This has been the first year of the new arrangements agreed at the EGM in November 2012. Apart from a new constitution for the Board itself, a major improvement has been the greater involvement of Committee Chairs, Honorary Officers and Regional Managers in determining policy through the Leadership Team, which now meets regularly.

Financial

As shown in the audited accounts, the Society has returned a healthy surplus this year, helped by the repayment, with interest, of the debt owed to us by the previous General Manager. The Board is planning that part of the surplus should be shared with the Membership and, during the year all Members will be offered RSGB book tokens to the value of £12.50.

HQ management

Improving our membership services is a goal and part of our financial success relies on keeping our administration costs under tight control. In order to do this it was regrettably necessary to reduce the headcount at HQ during the year. There are now just 13 staff members, underlining the reliance that the Society places on its volunteers.

Publications

RadCom continues to be seen as one of the best amateur radio publications in the world. We have enhanced our publications with a newcomers' newsletter in electronic format and plans are in hand to offer a similar supplement with material designed for more advanced readers.

Plans to offer *RadCom* in digital format have raised a number of important issues on copyright which at the moment have not been resolved but we are still committed to do this in the future. Significant progress has been made towards providing a Ten Year Index for *RadCom*.

Books

There still remains a demand for amateur radio specialist publications despite the ready

availability of online information resources. The Society continues to commission and publish a wide range of paper-based publications for Members and the market generally. It continues to keep under review the options for electronic publishing and will embark on this when the time and technologies are right.

Licence Examinations

Examination pass rates remain high even though there was a slight reduction in the number of candidates in all three classes of licence. The long term trend in progression to Advanced level is a positive one. Congratulations to all those concerned at all levels. New examination software was introduced and optical marking was successfully implemented. The RSGB is very appreciative of the efforts of the volunteer trainers, assessors, exam secretaries and invigilators, which have led to these results.

Membership Recruitment and Retention

Increasing membership of the society remains our top priority and to do this means we must ensure the quality of our services to existing Members as well as recruiting anew. You, the Members, are our best recruiters and, to say thank you to all who bring others in to the Society, every Member will receive £10 in book tokens for every new paying Member they sign up. The new joiner will also receive a £10 token to start their book collection.

National Radio Centre (NRC)

The NRC continues to showcase radio communication at Bletchley Park and visitor numbers are on the increase. Bletchley Park is undergoing major renovation work which will be completed in June. After that time, RSGB Members will be able to enter the Park for free – watch the website for details.

Clubs

Clubs are the social life blood of amateur radio, providing local contact with newcomers, training, running examinations and much more. The Board will be exploring ways of supporting and working more closely with clubs in the coming year. Clubs are also a vital source of recruitment to the Society and we will now pay £10 into club funds for every new paying Member they sign up as Members of the RSGB.

Volunteers and Staff

The Society relies heavily on the work of many volunteers in Committees, as Honorary Officers and in many other voluntary capacities. The Board has agreed a new approach to recognising and encouraging volunteers, the unsung heroes of the RSGB, who we must never take for granted. If any Member is interested in volunteering then we would be delighted to hear from you – the personal satisfaction of volunteering one's time and skills can be a two way process of giving and receiving; a true partnership.

Statement of the directors' responsibilities

The directors are responsible for preparing the directors' report and the financial statements in accordance with applicable law and regulations.

Company law requires the directors to prepare financial statements for each financial year. Under that law the directors have elected to prepare the financial statements in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards and applicable law). Under company law the directors must not approve the financial statements unless they are satisfied that they give a true and fair view of the state of affairs of the company and the profit or loss of the company for that period.

In preparing these financial statements, the directors are required to:

- select suitable accounting policies and then apply them consistently
- make judgements and accounting estimates that are reasonable and prudent
- state whether applicable UK Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the company will continue in business

The directors are responsible for keeping adequate accounting records that are sufficient to show and explain the company's transactions and disclose with reasonable accuracy at any time the financial position of the company and enable them to ensure that the financial statements comply with the Companies Act 2006. They are also responsible for safeguarding the assets of the company and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The directors are responsible for the maintenance and integrity of the corporate and financial information included on the company's website. Legislation in the United Kingdom governing the preparation and dissemination of the financial statements may differ from legislation in other jurisdictions.

Each of the directors confirms that to the best of his / her knowledge there is no information relevant to the audit of which the auditors are unaware. Each of the directors also confirm that they have taken all necessary steps to ensure that they themselves are aware of all relevant audit information and that this information has been communicated to the auditors.

The directors who served on the board during the year and up to the date of this report were as follows:
Don Beattie, G3BJ resigned 20.4.2013
Phillip Brooks, G4NZQ
Stewart Bryant, G3YSX appointed 20.4.2013
Chris Duckling, G3SVL resigned 20.4.2013
John Gould, G3WKL resigned 20.4.2013
Steve Hartley, G0FUW co-opted 16.11.2013
Stan Lee, G4XXI appointed 20.4.2013
Alan Messenger, G0TLK resigned 20.4.2013
Graham Murchie, G4FSG appointed 20.4.2013
Len Paget, GM0ONX appointed 20.4.2013
John Rogers, M0JAV appointed 20.4.2013
Bob Whelan, G3PJT
Dave Wilson, M0OBW resigned 20.4.2013

Every Member of the Society undertakes to contribute to the assets if it should be wound up while he/she is a Member or within one year after he/she ceases to be a Member for payment of the liabilities of the Society contracted before he/she ceases to be a Member. Every Member also undertakes to contribute to the costs; charges and expenses of winding up the same, and for the adjustment of the rights of the contributories amongst themselves, such amount as may be required not exceeding one pound. The number of guarantees held at the balance sheet date was 20,325 (2012: 19,245).

Auditors

Sayer Vincent were re-appointed as the company's auditors during the period and have expressed their willingness to continue in that capacity. The directors' report has been prepared in accordance with the provisions applicable to companies subject to the small companies' regime.

Approved by the governing body on 15 February 2014 and signed on its behalf by
P G Murchie, G4FSG Chairman
R R Thorogood, G3KKT Secretary

INDEPENDENT AUDITOR'S REPORT

To the Members of Radio Society of Great Britain

We have audited the financial statements of Radio Society of Great Britain for the year ended 31 December 2013 which comprise the income and expenditure account, balance sheet and the related notes. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

This report is made solely to the company's Members as a body, in accordance with chapter 3 of part 16 of the Companies Act 2006. Our audit work has been undertaken so that we might state to the company's Members those matters we are required to state to them in an auditors' report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the company and the company's Members as a body, for our audit work, for this report, or for the opinions we have formed.

Respective responsibilities of directors and auditor

As explained more fully in the Statement of the directors' responsibilities set out in the report of the directors, the directors are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view. Our responsibility is to audit and express an opinion on the financial statements in accordance with applicable law and International

Standards on Auditing (UK and Ireland). Those standards require us to comply with the Auditing Practices Board's Ethical Standards for Auditors.

Scope of the audit of the financial statements
An audit involves obtaining evidence about the amounts and disclosures in the financial statements sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of: whether the accounting policies are appropriate to the company's circumstances and have been consistently applied and adequately disclosed; the reasonableness of significant accounting estimates made by the directors; and the overall presentation of the financial statements. In addition, we read all the financial and non-financial information in the report of the directors to identify material inconsistencies with the audited financial statements. If we become aware of any apparent material misstatements or inconsistencies we consider the implications for our report.

Opinion on the financial statements
In our opinion the financial statements:

- give a true and fair view of the company's state of affairs as at 31 December 2013 and of its results for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Companies Act 2006.

Opinion on other matter prescribed by the Companies Act 2006
In our opinion the information given in the Directors' report for the financial year for which the financial statements are prepared is consistent with the financial statements.

Matters on which we are required to report by exception
We have nothing to report in respect of the following matters where the Companies Act 2006 requires us to report to you if, in our opinion:

- adequate accounting records have not been kept, or returns adequate for our audit have not been received from branches not visited by us; or
- the financial statements are not in agreement with the accounting records and returns; or
- certain disclosures of directors' remuneration specified by law are not made; or
- we have not received all the information and explanations we require for our audit.
- the directors were not entitled to prepare the financial statements in accordance with the small companies regime and take advantage of the small companies exemption in preparing the report of the directors.

Judith Miller, Senior Statutory Auditor for and on behalf of Sayer Vincent, Statutory Auditor, 25 February 2014. Sayer Vincent, 8 Angel Gate, City Road, London EC1V 2SJ

Income and expenditure account for the year ended 31 December 2013

	Note	2013 Total £'000	2012 Total £'000
Turnover	2	1,541	1,472
Cost of sales		(165)	(151)
Gross surplus		1,376	1,321
Sales and distribution expenses		(137)	(130)
Other operating expenses		(1,132)	(1,135)
Operating surplus		107	56
Profit on disposal of fixed assets		5	18
Interest receivable		10	14
Surplus on ordinary activities before taxation	4	122	88
Taxation	6	-	-
Retained surplus for the financial year		122	88
Accumulated surplus at the start of the year		1,019	931
Accumulated surplus at the end of the year		1,141	1,019

All of the above results are derived from continuing activities. The movement in the income and expenditure account is shown in note 13. There are no other gains or losses other than those shown above.

Balance sheet as at 31 December 2013 **Company number: 216431**

	Note	£'000	2013 £'000	2012 £'000
Tangible fixed assets	7		523	492
Current assets				
Stock	8	73		69
Debtors	9	64		74
Cash at bank and in hand		652		491
Short term deposits		359		435
		1,148		1,069
Creditors: amounts due within one year	10	527		529
Net current assets			621	540
Total assets less current liabilities			1,144	1,032
Creditors: amounts falling due after more than one year	11		3	13
Net assets			1,141	1,019
Capital and reserves				
Income and expenditure account			962	843
Combined Legacy reserves	16		171	168
Spectrum Defence Fund reserve	16		8	8
Total funds	13		1,141	1,019

The financial statements have been prepared in accordance with the provisions applicable to companies subject to the small companies' regime.
Approved by the Directors on 15 February 2014 and signed on their behalf by
P G Murchie, G4FSG, Chairman R R Thorogood, G3KKT, Secretary

Notes to the financial statements for the year ended 31 December 2013

1. Accounting policies

a) The financial statements have been prepared under the historical cost convention and in accordance with applicable accounting standards and the Companies Act 2006.

b) Turnover represents the invoiced amounts of goods sold and services provided, net of Value Added Tax and trade discounts. Turnover comprises subscription income, book income, advertising income and exam income. Subscriptions income is recognised on a monthly basis over the duration of the subscription; book income is recognised on despatch of books; advertising income is recognised on publication date; and exam income is recognised on the date of the exam. Legacies, donations and voluntary income are recognised when received or receivable - whichever is earlier. All income arises in the UK.

c) Depreciation is provided on all tangible assets at rates calculated to write each asset down to its estimated residual value evenly over its expected useful life (except freehold land which is not depreciated), as follows:

Leasehold buildings	2%
Bletchley Park Building	4%
Bletchley Park Fixtures & Fittings	20%
Computer equipment	33%
Fixtures and fittings	10%
Furniture and equipment	20%
Motor Vehicles (not leased)	33%
Leased assets (motor vehicles)	over the period of the lease

Assets are reviewed for impairment if circumstances indicate their carrying value may exceed their net realisable value or value in use. Assets are capitalised where the purchase price exceeds £1,000.

d) Where the carrying value of an asset will be recovered principally through a sale transaction rather than through continuing use, the asset is classified as held for sale and stated at the fair value less costs to sell, following the adoption of a policy of revaluation for this class of asset. No depreciation is charged in respect of current assets classified as held for sale.

e) Stocks are stated at the lower of cost and net realisable value. In general, cost is determined on a first in first out basis and includes transport and handling costs. Net realisable value is the price at which stocks can be sold in the normal course of business after allowing for the costs of realisation. Provision is made where necessary for obsolete, slow moving and defective stocks.

f) Any charge for taxation is based on the surplus for the year and takes into account taxation deferred because of timing differences between the treatment of certain items for taxation and accounting purposes. When this arises it appears in the income and expenditure account. Deferred tax is recognised, without discounting, in respect of all timing differences between the treatment of certain items for taxation and accounting purposes which have arisen but not reversed by the balance sheet date, except as otherwise required by FRS19.

g) Leases acquired under finance leases are capitalised and the outstanding future lease obligations are shown in creditors.

h) The Society contributes to group personal pension policies to provide benefits for employees on a defined contribution basis. The assets of the policies are held separately from those of the Society in independently administered funds. The amount charged to the income and expenditure account represents the contributions payable to the policies in respect of the accounting period.

i) Under FRS 1 the company is exempt from the requirement to prepare a cashflow statement on the grounds of its size.

j) Under FRS 30 the company is exempt from recognising heritage assets on the grounds of its size.

2. Turnover

	2013 £'000	2012 £'000
Subscription income	853	849
RadCom advertising income	170	156
Book sales	344	316
Other income (note 3)	174	151
	1,541	1,472

3. Other income

	2013 £'000	2012 £'000
Foundation licence exams	49	53
Intermediate licence exams	23	23
Full licence exams	18	18
International exam	-	1
3rd Party Book Production	7	2
Commercial Sponsorship	8	5
Sundry income	31	16
Rallies and exhibition fees	34	30
Legacies	4	3
	174	151

4. Surplus on ordinary activities before taxation

This note lists significant items in the income and expenditure account.

The surplus is stated after charging / (crediting):

	2013 £'000	2012 £'000
Depreciation on owned assets	32	48
Depreciation on leased assets	11	25
Interest receivable	(10)	(14)
Profit on disposal of other fixed assets	5	18
Directors' remuneration	-	-
Board reimbursed expenses	15	25
Regional & Committee reimbursed expenses	25	23
Auditors' remuneration:		
■ Audit	11	12
■ Non-audit services	1	1
Legal expenses for debt recovery and employment contractual matters	2	4

Expenses totalling £15,000 (2012: £25,000) were reimbursed to 11 Board members (2012: 7) for travel and subsistence costs of attending meetings, and other sundry costs.

5. Staff costs and numbers

	2013 £'000	2012 £'000
Salaries and wages	417	397
Social security costs	43	40
Pension contributions	8	7
	468	444

One employee earned more than £60,000 during the year. (2012:0)
The average weekly number of employees (full-time equivalent) during the year was as follows:

	2013 No.	2012 No.
Headquarters staff	14	14

6. Taxation

	2013 £	2012 £
UK corporation tax	-	-

RSGB has an agreement with HMRC over the calculation of schedule D Case I profits for corporation tax purposes. In recent years this has generated a loss, contributing to a deferred tax asset (see note 12). RSGB has generated a tax loss in the year, and consequently no corporation tax liability has arisen in the year.

7. Tangible fixed assets

	Leasehold land and buildings £'000	Computer equipment £'000	Fixtures and fittings £'000	Furniture and equipment £'000	Motor vehicles £'000	Bletchley Park £'000	Bletchley Park F&F £'000	GB4FUN £'000	Totals £'000
Cost									
At the start of the year	339	54	6	36	33	210	131	45	**854**
Additions in year	-	71	-	3	-	-	-	-	**74**
Disposals in the year	-	-	-	-	-	-	-	(45)	**(45)**
At the end of the year	339	125	6	39	33	210	131	-	**883**
Depreciation									
At the start of the year	32	47	5	35	7	114	78	44	**362**
Charge for the year	7	5	-	1	11	4	14	1	**43**
Disposals in year	-	-	-	-	-	-	-	(45)	**(45)**
At the end of the year	39	52	5	36	18	118	92	-	**360**
Net book value									
At the end of the year	**300**	**73**	**1**	**3**	**15**	**92**	**39**	-	**523**
At the start of the year	307	7	1	1	26	96	53	1	492

Included in the total net book value of motor vehicles is £15,000 (2012: £26,000) in respect of assets held under finance leases.
Depreciation for the year was £11,000 (2012: £25,000). Computer equipment includes £61,000 of costs relating to the new Membership system and website that are not currently depreciated. Depreciation will be provided on these assets when they are fully completed and brought into use. During the year the Society donated the GB4FUN trailer to the Sheffield Amateur Radio Club. The Society purchased 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH on 17 March 2008 for £339,000. The building has been acquired on a leasehold of 125 years. The land is on a peppercorn lease from Bedford Council for 125 years, and is not depreciated. The National Amateur Radio Centre at Bletchley Park was opened in July 2012. The land is on a peppercorn lease from the Bletchley Park Trust for 25 years and is not depreciated.

8. Stock

	2013 £'000	2012 £'000
Consumable stock	3	-
Goods held for resale	70	69
	73	69

9. Debtors

	2013 £'000	2012 £'000
Trade debtors	40	37
Prepayments and accrued income	25	42
Other debtors	7	40
Provision for doubtful debts	(8)	(45)
	64	74

10. Creditors: amounts due within one year

	2013 £'000	2012 £'000
Trade creditors	69	55
Obligations under finance leases (note 11)	11	11
Taxation and social security	12	13
Other creditors	10	13
Subscriptions in advance	316	334
Accruals	109	103
	527	529

11. Obligations under finance leases

	2013 £'000	2012 £'000
Gross obligations under finance leases	15	26
Less: finance charges allocated to future periods	(1)	(2)
	14	24
Due within one year	11	11
Due within two to five years	3	13
	14	24

12. Unprovided deferred tax asset

	2013 £'000	2012 £'000
Difference between accumulated depreciation and capital allowances	53	(4)
Tax losses	(2,504)	(2,487)
Undiscounted, unprovided deferred tax asset	(2,451)	(2,491)

Deferred tax asset is not recognised because of the unlikelihood of utilising trading losses brought forward in the light of current trading conditions.

13. Reconciliation of movements in Members' funds

	2013 £'000	2012 £'000
Members' funds at the start of the year	1,019	931
Surplus/(Deficit) for the period on income and expenditure funds	119	85
Movement on Combined Legacy reserves	3	3
Members' funds at the end of the year	1,141	1,019

14. Pension scheme

The company operates a defined contribution pension scheme. The pension cost charged for the period represents contributions payable by the company to the scheme and amounted to £8,398 (2012: £6,960). Outstanding contributions at the year end amounted to £709 (2012: £594). These are included in other creditors at the year end.

15. Related party disclosure

The Radio Communications Foundation is a registered charity, number 1100694. Marilyn Slade, an officer of the Society, is a trustee of the charity.

During the year no donations were received by the Society from the Radio Communications Foundation (2012: £Nil).

Since its inception, the Society has provided the Foundation with management services at no cost.

16. Designated funds

	At 31 December 2012 £'000	Incoming resources £'000	Outgoing resources £'000	At 31 December 2013 £'000
Legacy Funds	168	4	(1)	171
Spectrum Defence Fund	8	-	-	8
	176	4	(1)	179

The Legacy Fund received small bequests of £4,285 in 2013 and £750 was donated to the Noise Floor Project.

The Spectrum Defence Fund was established in December 2009 to contribute towards legal costs that would be incurred in the defence of the amateur radio spectrum. In the first instance it was agreed that the money raised would be used to meet the costs of the legal challenge of Ofcom in relation to the Power Line Adaptor issues. The Board decided in February 2010 not to proceed with any further legal challenge. It is committed to a policy of protecting radio amateurs privileges and the amateur radio spectrum and these funds will be used for this purpose.

17. Funds held on behalf of trusts

RSGB acts as custodian for the funds below and holds the amounts below within bank accounts for each fund. These funds are repayable to the individual trusts upon demand and, as such, are not recognised as assets held by RSGB. The movements on these funds are shown below.

	At 31 December 2012 £	Incoming resources £	Outgoing resources £	At 31 December 2013 £
The J Fraser Shepherd	1,232	22	(98)	1,156
DXpedition Fund	8,383	1,676	(1,515)	8,544
The Pilot Officer Norman Keith Adams Prize	1,340	30	-	1,370
Dewit L Jones W4BAA IOTA Legacy Fund	7,260	16	(1,012)	6,264
Total trust funds	18,215	1,744	(2,625)	17,334

These amounts are not included in the balance sheet of RSGB at the year end.

RSGB 2014 AGM

The five Resolutions for this year's AGM and how to vote

Notice is hereby given that the 87th Annual General Meeting of the Radio Society of Great Britain will be held on Saturday 12th April 2014 at the Renaissance Hotel Manchester commencing at 12 noon for the transaction of the undermentioned business:

Resolution 1
To receive and, if approved, confirm the Minutes of the 86th Annual General Meeting held at the Institution of Engineering and Technology in London on 20th April 2013 circulated to all Members with the April 2014 issue of *RadCom*.

Resolution 2
To appoint Auditors Sayer Vincent, and to authorise the Board to fix their remuneration.

Resolution 3
To consider and, if thought fit, pass the following resolution to amend the articles of association of the Company, which will be proposed as a Special Resolution, that the articles of association of the Company be amended by deleting the present article 7 and replacing it with the following new article 7:

"ARTICLE 7. No business shall be transacted at any meeting unless a quorum is present. Fifty persons present in person or by proxy entitled to vote upon the business to be transacted, each being a Member or a proxy for a Member or a duly authorised representative of a corporation shall be a quorum."

The current article 7 requires that the quorum for a General Meeting is 50 members in person. We have, to date, been successful in meeting this requirement although sometimes not by a significant amount. Article 8 goes on to provide that if a quorum is not present within half an hour of the commencement of the meeting, or ceases to be present, then the meeting is adjourned. This means subsequent expense and reorganisation to achieve this with perhaps no guarantee that the following meeting will be quorate.

It is noticeable that the proxy votes, on the other hand, usually exceed the number of those present and, if we assume that the majority if those submitting proxies would have attended if the location had been more convenient, then it is proposed that their number should be included in the quorum.

In common with other organisations this amendment proposes that the proxies are included with the persons present to constitute a quorum. This will then avoid the problem set out above.

Resolution 4
To elect either Steven Hartley, GOFUW or James Stevenson, GOEJQ as a Director of the RSGB to serve on the Board (see page 43).

Resolution 5
Region 5 residents only. To elect either Vaughan Ravenscroft, MOVRR or Martyn Vincent, G3UKV as Regional Manager for Region 5 the West Midlands (see page 44).

VOTING GUIDANCE. You have one of three options for registering your vote on each Resolution as shown here.

IN PERSON. You can attend the AGM in person on 12 April at the Renaissance Hotel, Blackfriars Street, Manchester M3 2EQ, starting at 12 noon. You will not need a ballot paper but you should bring with you copies of the Resolutions and the CVs of the prospective Directors or Regional Managers as appropriate.

VIA THE INTERNET. You can vote by the internet; the voting is being conducted by the Electoral Reform Society (ERS) on behalf of the Society. To vote, go to www.votebyinternet.com/RSGB14. You will be asked for your Membership number without the leading zeros as part 1 of your security code and the first four digits of your callsign as part 2 of your security code (eg GM1MFG enters GM1M). Your Membership number can be found on your *RadCom* mailing wrapper or by enquiry from RSGB HQ.

ERS internet services are available 24 hours a day commencing at midnight on 11 March 2014. The internet voting service will close at 12 noon on 10 April 2014. If you are not attending the AGM in person, this is the RSGB Board's preferred method of voting to contain costs.

BY POST. You can vote by post by requesting a ballot form and envelope from RSGB HQ. You can do this by writing to the General Manager, by e-mail from gm.dept@rsgb.org.uk or by telephone 01234 832 715. The proxy form and return envelope will be sent to you. The details required on the proxy form are your name, address, callsign or RS number and your Membership number. This can be found on your *RadCom* mailing wrapper or by enquiry from RSGB HQ. This is a security measure required by the ERS. Once you have voted, place the completed ballot paper in the pre-paid envelope and post it to the ERS to arrive on or before 12 noon on 10 April 2014. Postal voting is expensive so please use the internet option if possible.

RSGB AGM

Doors will be open from 11am until 11.45am for registration. Refreshments will be available. A Society bookstall will be open from 11am until 12 noon and again during lunch. The proceedings will be recorded and made available on the RSGB website. The use of private audio or video recording equipment will not be permitted.

The AGM will start promptly at 12 noon and, following the formal business, various awards and trophies will be presented.

Lunch will be available from 1pm and is free to those Members who pre-register their attendance online (go to www.rsgb.org/attendagm).

After lunch, starting at 2pm, the President will lead an informal question and answer session. This will be followed by two presentations. Elaine Richards, G4LFM will take a look at the first Transatlantic tests and John Gould, G3WKL will look back at the highlights of Gx100RSGB.

RESOLUTION 4
To elect a Director of the RSGB to serve on the Board.

Steven Hartley, G0FUW *Candidate for RSGB Director*

CURRICULUM VITAE. Passed RAE in 1983, originally G1KVY, G0FUW since 1986. RSGB Instructor/Assessor since 1990 delivering all three levels of UK training. RadCom Author (Newcomers News) 2000-2007. Member of RSGB Amateur Radio Development Committee 2002-2012. Chair of RSGB Training & Education Committee since 2012. Co-author of RSGB Intermediate and Advanced textbooks. Leader of Bath-Based Advanced Distance Learning scheme; nearly 200 passes since June 2011. Co-opted onto RSGB Board in 2013. Member of RSGB, G-QRP Club, ARRL, ARCI, City of Bristol RSGB Group. Secretary of Wessex Contest Group.

RSGB Awards: Bennett Award 2003, Kenwood Trophy 2010 and 2012 & G4STT Trophy 2011

PERSONAL STATEMENT. I have been an active radio amateur for over thirty years. For much of that time I have working with other volunteers, either in clubs, or informal groups to train others and to promote radio construction. The successful Bath Radio Classes, our Buildathons and the Advanced Distance Learning scheme are examples where I have led teams to deliver significant outputs.

My own radio activities include radio construction, QRP operating, VHF backpacking, QRO operation for Special Event Stations, mini-DXpeditions and contests. At one end of the scale, I have worked VK and ZL with 3W and a dipole, at the other I helped activate G100RSGB for 24 hours with amplifiers and beams. I have no professional links with radio technology; I am proud to say that amateur radio is my hobby.

I retired from full-time employment in 2013. My professional work gave me experience of working with directors, involvement with assurance/governance processes and project management. During my career I was also in regular contact with government regulators and I believe that would stand me in good stead for working with the radio regulators. I now work as a part-time lecturer at Portsmouth University, and separately with a national examination body, giving me useful insights into the wider world of training and education.

If elected, I would look to use my knowledge, skills and experience to further develop the Society's focus on promoting the hobby, supporting newcomers and encouraging continuing learning and progression.

Nominee	Location	Known for (yrs)
Mr M Coombs, G3VTO	Bath	15
Mr R Thompson, G3TKF	Bath	15
Rev G Dobbs, G3RJV	Littleborough	7+
Mr A Betts, G0HIQ	Orpington	10+
Mr G Firth, G3MFJ	Leeds	10
Mr C Smith, GM4FZH	Newton Stewart	3
Mr E Taylor, G3SQX	London	12
Mr T R N Walford, G3PCJ	Langport	20
Mr I Carter, G0GRI	Bradford on Avon	20
Mr D Helliwell, G6FSP	Torquay	5

James Stevenson, G0EJQ *Candidate for RSGB Director*

CURRICULUM VITAE. First licensed as G1PCI (later G0EJQ). Former committee member Lincoln Shortwave Club *(put in year)*. Awarded LSWC Shield for committee and fundraising work (2005). Deputy Regional Manager for Region 13 East Midlands (2003-2005). Regional Manager for Region 13 East Midland (2005 -2012). Board Member with Regional Portfolio (representing all Regional managers and members) *from 2007 till 2011*. Member of Chiltern DX CLUB. Awarded DXCC (2006). IOTA Islands Award (2006). Former GB2RS newsreader. Member of the DX Code of Conduct. Personal radio interests include HF mobile/portable/fixed station. My mobile station carries publicity packs for promoting Amateur Radio.

PERSONAL STATEMENT. I firmly believe that to move forward and, indeed, thrive well into the 21st century, UK amateur radio needs a strong society to represent our interests both nationally and internationally.

The Society also has a duty to provide the best possible services to its members within a realistic budget.

The Society should be as inclusive as possible. This includes embracing new interest groups, together with catering for those who enjoy more traditional aspects of the hobby.

If I am elected to the board I intend to actively seek to address issues that are of most concern to members such as:

- The underuse of the spectrum at VHF and above
- Attracting and retaining new members
- The promotion of amateur radio to the wider public
- Closer liaison with Ofcom (in particular the RSGB must actively seek to provide more input to the decision- making process affecting amateur radio)
- Encouraging newly licensed amateur to progress and to stay with the hobby.

Based on my previous experience, which has included a period as RM for region 13, I believe that I have a lot to give to the Society and our members.

I have recently retired and now have the necessary time to devote to the Society.

I have been pro-active in publicising amateur radio through public events where I enjoy doing demonstrations and giving out publicity packs.

I hope to build on this personal approach if I am accepted to the post of director on the RSGB board.

Nominee	Location	Known for (yrs)
Mr C Wilkie, G0CBM	Sutton on Sea	5
Mr D Baldock, G6NKL	Woodhall Spa	10
Mr G Pesch, DJ2XB	Simmerath, Germany	10
Mr J R Hunt, G3PVU	Lincoln	15
Mr F E Windridge, M0WDE	Skegness	6
Mrs P Rose, G4STO	Sturton by Stow	12
Mr R Basham, G7TAS	Boston	5
Mr N Pipkin, M0NJJ	Nottingham	2
Mr K H Schmidt, M0HLM	Boston	10
Mr W Duffner, G6KGG	Doncaster	10

RESOLUTION 5

To elect a Regional Manager for Region 5 - The West Midlands. Please note that only those Members who reside in Region 5 can participate in this vote. Region 5 covers Shropshire, Staffordshire, Gloucestershire, Birmingham, Warwickshire, Herefordshire and Worcestershire.

Vaughan Ravenscroft, M0VRR *Candidate for Region 5 Regional Manager*

CURRICULUM VITAE. I was licensed in February 2000 and a SWL since the age of 7. I am an active participant in the clubs and societies that I belong to and I have held positions of Chairman, Secretary and Child Protection Officer. I became a DRM for the West Midlands (Region 5) in 2010 and was elected Regional Manager in 2011. As an active participant in the hobby I maintain excellent working relationships with individuals and groups involved with different aspects of Amateur Radio.

I enjoy JOTA, Field Days, Radio astronomy and Echolink. I am also the repeater keeper for GB3IC.

PERSONAL STATEMENT. I became Regional Manager in 2011 and have seen the Society undergo a lot of change, some planned and some not. I believe I have been part of the positive changes that the society has undergone and seek re-election to continue to deliver the changes necessary to keep the society current and a true representation of its members. I am a person who speaks out and I do my upmost to ensure the voice of the membership is heard. I strive for excellence in promoting and publicising both the RSGB and amateur radio as a whole.

Nominee	Location	Known for (yrs)
Mr C Meadows, G6KMQ	Solihull 15	
Mr R Wallbank, G0XAT	Cannock	18
Mr M Childs, G7WBX	Bridgnorth	15
Mr T Foster, G3PQP	Birmingham	10
Mr H Walker, M0WHW	Bilston	2
Mr M Lovatt, G0JCN	Cheslyn Hay	1
Mr R Wellsted, M0RNW	Wolverhampton	15
Mr R Mather, M6STD	Codsall	2
Mr A J Mullin, M0HKE	Codsall	1
Mr P Garrett, M0HJQ	Wolverhampton	8 mths

Martyn Vincent, G3UKV *Candidate for Region 5 Regional Manager*

CURRICULUM VITAE. Licensed 1965 and currently active ALL bands 472KHz to 24GHz. Vice-Chairman Telford &DARS. Editor Telford &DARS Newsletter since 1970s. Organiser Telford Hamfest since 2005 and Telford Radio Rally 1978 to 2004. GB2CW Morse Practice Station - weekly transmissions on 80m. G3Z Special Contest Call holder o/b/o Telford &DARS. Submitted Regional and National winning 'Club of the Year Award' entry in 2011 o/b/o Telford &DARS. Member BATC, G-QRP, UK Microwavers, UK 6metre Gp. Shropshire Raynet

A.R. interests:- operating, construction and following current developments

Outside interests:- canal restoration and rural affairs, reading, walking

Professional background prior to retirement:- Primary teacher and headteacher.

PERSONAL STATEMENT. The Regional Manager must have a strong local agenda, forwarding members' views to the Society's Board. I would focus on the following strategies:-

- Supporting directly the 30+ local club, societies and DRMs in Region 5
- Being accessible to individuals at all reasonable times by phone, e-mail or in person
- Supporting local amateur radio activities
- Raising issues where appropriate to the Board
- Being active on the amateur radio bands
- Continued support and recruitment for the RSGB and its reforming agenda.

Please use your Regional Manager vote if you live in Region 5 (West Midlands). If you don't vote, you shouldn't complain!

Nominee	Location	Known for (yrs)
Mr G P Boull, G4NVH	Stafford	20
Mr D Sunderland, M0FHM	Shrewsbury	30+
Mr A Core, G0AGC	Market Drayton	29
Mr G Jones, G3VKV	Cheltenham	47
Mr D J Southey, G0EYX	Stafford	4
Mr D Thom, G3NKS	Cheltenham	20+
Mr P Bowen, M0PNN	Newport	7
Mr T A Woodhouse, M0TAW	Newport	6
Mr E N Mason, G0ASP	Telford	20
Mr D Whalley, G4EIX	Telford	38

If you can't attend the AGM in person, the best way to vote is online at www.votebyinternet.com/RSGB14.

The voting is being conducted by the Electoral Reform Society (ERS) on behalf of the Society.

- ERS internet services are available 24 hours a day commencing at midnight on 11 March 2014.
- The internet voting service will close at 12 noon on 10 April 2014.
- You can vote by post by requesting a ballot form and envelope from RSGB HQ, see details on page 42.

April 2014 • RadCom
Eamon Skelton, EI9GQ • e-mail: hbradio@eircom.net

Homebrew

Carrier oscillator and SSB exciter units for the LF/MF transceiver

IF OSCILLATORS. Several of our previous SSB exciter projects have used a pair of separate IF carrier oscillators. Upper or lower sideband mode is selected by switching the DC supply to the appropriate oscillator. This approach is widely used in both home-made and commercial equipment. Where there is a need for three or more carrier oscillators, the increased component count, size, weight, circuit complexity and cost may be unacceptable. The simplest and often the most cost-effective solution is use a single oscillator for all modes. In some cases, it may also be possible to use a single crystal resonator combined with switched inductors and/or capacitors to pull the oscillator to the required frequency.

As typical IF amplifiers have extremely high gain, it is very important to keep the relatively strong IF carrier signal well away from the receiver front end and the input of the IF stages. Keep this in mind if you use a simple mechanical switch for mode selection. Best practice is to place the oscillator and its buffer amplifier in a screened enclosure and place it directly behind the front panel of the equipment so that there won't be any unscreened wires between the oscillator and the mode switch. If the oscillators are mounted away from the front panel, it is possible to use a rotary switch with a long shaft or shaft extension rod as the mode switch. One very effective way to keep the BFO/CIO signal out of the receiver IF amplifiers is to mount the oscillator on the opposite side of the chassis from the other receiver stages.

It is usually more convenient to use some form of electronically-controlled switch for mode selection. Miniature relays offer good isolation between the oscillator and external circuits, although the size, cost and weight of the relays will negate any advantages over using separate oscillators. Solid state

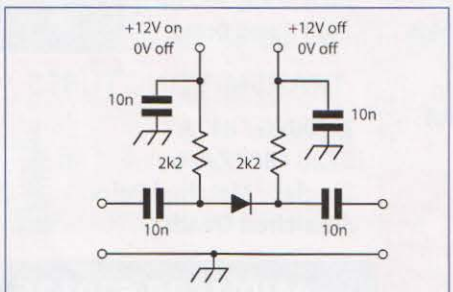

FIGURE 1: Diode switch test circuit.

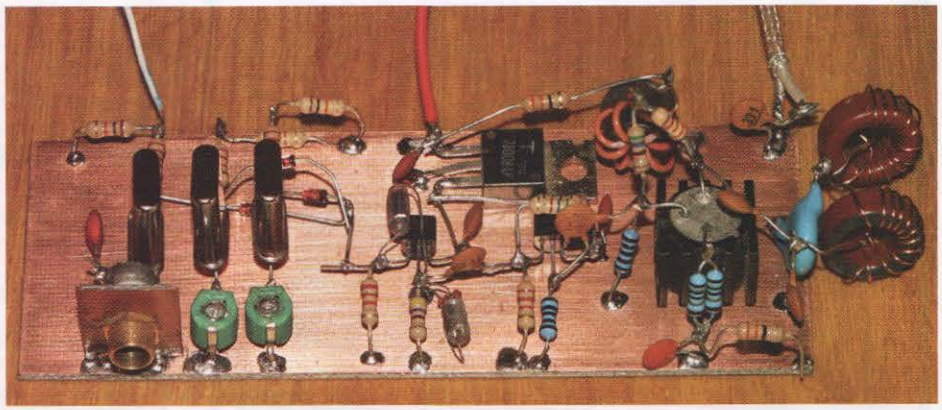

PHOTO 1: Oscillator unit. Note the different trimmer capacitor types on the left (see text).

electronic switches based on PIN diodes, ICs or MOSFETS offer an elegant solution to the problem.

It would seem that I can easily switch the USB/LSB/CW crystals in my new rig using PIN diodes. These are special diodes with a very slow reverse recovery time (slow switching) so that the device behaves more like a resistor than a rectifier when forward-biased. Unfortunately, I don't have any suitable small-signal PIN diodes available, so I will have to use ordinary 1N4148 silicon switching diodes instead. High speed switching diodes are not ideal replacements for PIN diodes. They can provide adequate performance as a signal switching diode provided that the DC bias current is significantly higher than the RF current being switched. Linearity will not be as good as a PIN device, but in this application, there is only one signal involved so intermodulation distortion (IMD) will not be an issue. **Figure 1** shows a simple test circuit for a diode switch. This circuit was tested using a 10MHz signal generator, a 50Ω load and an oscilloscope to monitor the output. Provided that the input voltage is limited to a maximum of about 500mV, the output waveform is a nice undistorted sinewave. For 500mV in, the output was just over 300mV across the 50Ω load. 20Log(300/500) = -4dB. This indicates an RF resistance of around 30Ω for the diode. This is not as good as a typical PIN diode, but it does compare favourably with older CMOS analogue switch technology such as the 74HC4016 etc. The 1N4148 data sheet [1] suggests an absolute maximum zero-bias junction capacitance of 4pF with typical values of around 1pF. Junction capacitance will be less than 1pF with a few volts of reverse bias applied. Testing the switch with a spectrum analyser and tracking generator shows the expected switch-on loss of 4dB. When the switch is biased off, attenuation is a respectable 45dB at 10MHz. With no bias applied (both control terminals floating), attenuation is 35dB. This shows that the extra effort to reverse bias the diode is worthwhile. It is possible to achieve much greater attenuation by using more elaborate circuits having two or more diodes. However, the simple single-diode switch is adequate for our purposes.

Figure 2 shows a simple Colpitts type of crystal oscillator with diode switching to select one of two available crystals. If a positive voltage is applied to terminal A, D1 is forward biased and Xtal_1 is connected to the base circuit of the transistor. Note that the diode current also provides the base bias for the transistor. It is also worth noting that D2 will not be reverse-biased unless terminal B is connected to ground (0V).

CARRIER OSC AND BUFFER AMPS. We will need a beat frequency oscillator / carrier

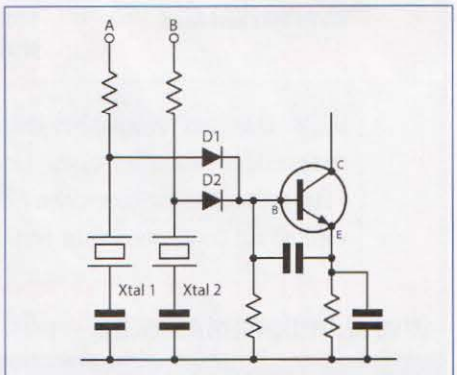

FIGURE 2: Switched oscillator circuit.

PHOTO 2: Balanced mixer module.

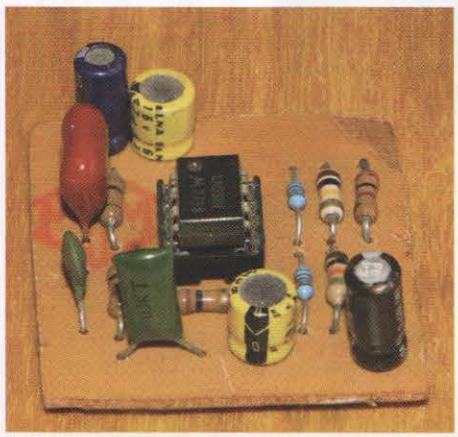

PHOTO 3: Mic amplifier.

insertion oscillator (BFO/CIO) for the new transceiver. My current requirement is for three different frequencies. Two outputs are required, one for the product detector in the receiver and the other for the balanced modulator in the transmitter. As diode mixers need relatively high levels of oscillator drive, each output should produce at least 10mW (+10dBm) and preferably a bit more. The schematic of the carrier oscillator and its buffer amplifiers is shown in **Figure 3**. The associated low pass filter (LPF) and power splitter will be shown separately.

The number of switched crystals can be adjusted to meet your particular requirements. My prototype has three crystals to provide BFO/CIO signals for USB, LSB and CW. This also covers several digital and other modes that are compatible with the bandwidth of my IF filters (see January 2014). I don't have any plans to include a detector/demodulator for AM or FM at the moment. As most types of AM or FM demodulator don't require IF carrier injection, no carrier oscillator would be required for reception of these modes.

The oscillator is a common-collector Colpitts type based on an MPSH10 transistor. As with the earlier example, the crystals are switched by 1N4148 diodes. Note the three 10kΩ pull-down resistors connected to the mode switch output contacts. These ensure that the diodes for the two inactive crystals are properly reverse biased. As I have a good stock of 10MHz crystals, I decided to use a separate crystal for each frequency rather than attempting to pull the oscillator frequency using switched reactances. For my home made ladder filter, the required frequencies are 9.997MHz for USB and 10.000MHz for LSB, with CW somewhere in between. Just to add some extra confusion, running the transceiver local oscillator on the high side of the IF inverts the signal so that the USB oscillator is used for LSB and vice-versa.

The oscillator is followed by a common collector (emitter follower) buffer amplifier based on another MPSH10. The 8V DC supply for the oscillator and first buffer comes from a 7808 regulator. The final stage is a conventional common emitter amplifier based on a 2N4427 VHF/UHF power transistor. As the IF is a relatively low 10MHz, the choice of transistor is not that critical. I found the 2N4427, 2N5109 and a 2N2219A switching transistor all gave identical performance in this circuit. A clip-on heatsink will be required for the final stage. The choke in the collector circuit of the final stage is 8 turns of insulated wire on an FT37-43 ferrite toroid. The single core insulated wire was stripped from standard four core telephone cable.

For best frequency stability, good quality components should be used in the oscillator stage. Critical components are the two 220pF feedback capacitors and the crystal series tuning capacitors. Polystyrene, silvered mica or NPO ceramic capacitors are all suitable for use in this type of oscillator. High quality air-spaced trimmers are preferable to cheap plastic or ceramic types. As my rig will mostly be used on LSB, I used cheap trimmer capacitors for two of the crystals and a brass/ceramic air-spaced piston trimmer for the LSB crystal.

Figure 4 shows the LPF and power splitter at the output(s) of the CIO/BFO. The LPF has a cutoff frequency of 11MHz, so this design can be used with ladder filters based on 10MHz crystals or commercially made

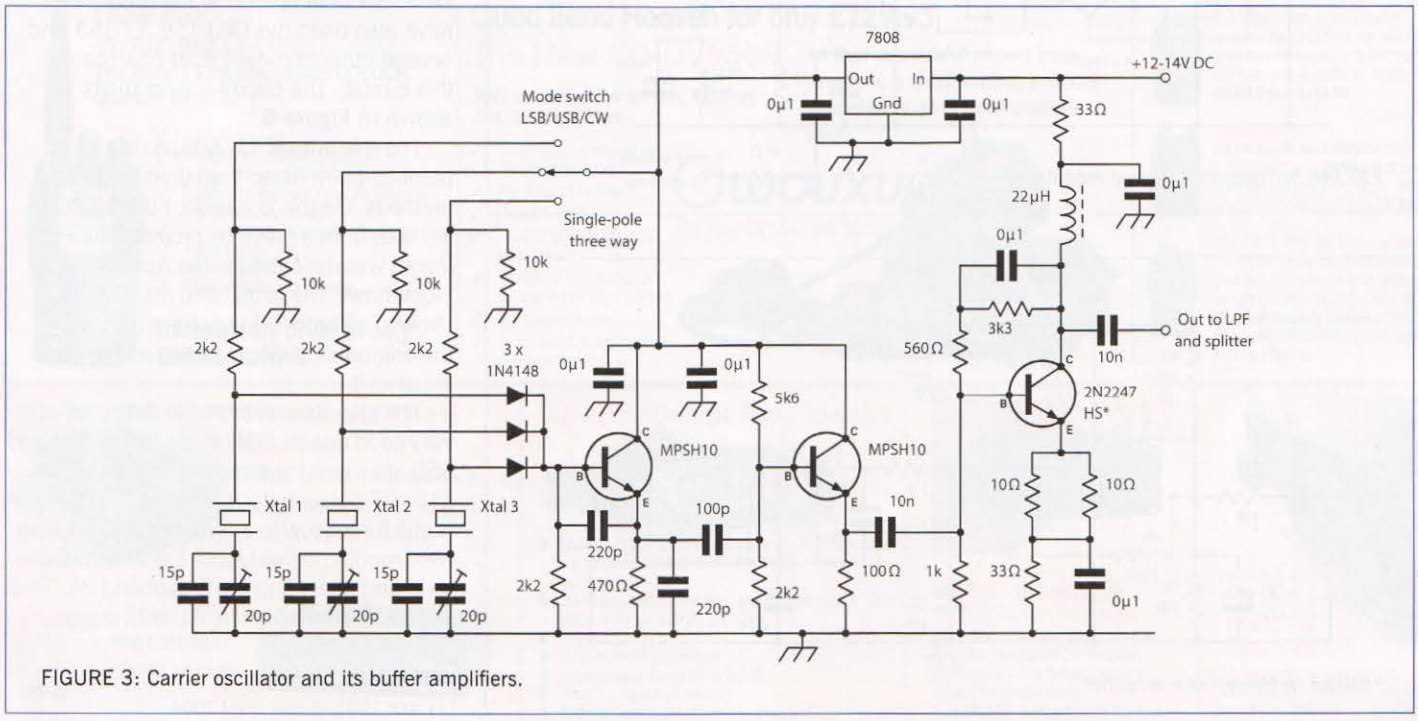

FIGURE 3: Carrier oscillator and its buffer amplifiers.

IF filters with a centre frequency around 10.7MHz. The two inductors in the LPF are each 13 turns of 0.375mm enamelled copper (Maplin YN86T or similar). The turns are bunched so that the coil occupies just 60-70% of the core diameter.

Measured output from the LPF is just over 5Vpp, or +18dBm. A simple passive splitter is used to supply equal power to both outputs. This type of resistive splitter requires resistor values of Z/3 = 16.666Ω for all three resistors. A parallel pair of 33Ω resistors is 16.5Ω, which is near enough for our purposes. Half of the input power is dissipated in the resistors, the remaining half is divided equally between the two 50Ω loads at the output ports. As the total loss from the input port to either output port is 6dB, this device is often referred to as a -6dB splitter. Available BFO/CIO power at each output port is just over +12dBm. The assembled carrier oscillator unit is shown in **Photo 1**.

BALANCED MODULATOR. The transmit balanced modulator (BM) is shown in **Figure 5**. A diode double-balanced mixer is used as the modulator. The CIO signal is fed to the LO port of the mixer, transmit IF is taken from the mixer RF port and transmit audio from the microphone amplifier is fed to what would usually be the IF port of the mixer. At this point in the circuit, the IF output is a double-sideband, suppressed carrier signal. The SSB IF filter will remove the unwanted sideband, leaving a single-sideband signal.

T1 and T2 in the BM are each 8 turns of trifilar wound 0.375mm enamelled copper on an FT37-43 ferrite toroid. The four diodes are 1N5711 Schottky types. As with the other diode mixers in the transceiver, the diodes were matched for forward voltage drop using the diode test function of my digital multimeter. It is possible to use a commercially made mixer module instead of the home-made mixer. The home-made unit shows excellent LO to RF and LO to IF port isolation of 50-60dB, which compares very well with the best available packaged mixer modules.

The BM is followed by a single stage of amplification. The amplifier has a gain of 10-11dB. This more than compensates for the 5-6dB conversion loss of the BM. T3 in the collector circuit of the MPSH10 is 10 turns, bifilar wound on an FT37-43 toroid. The BM unit is shown in **Photo 2**.

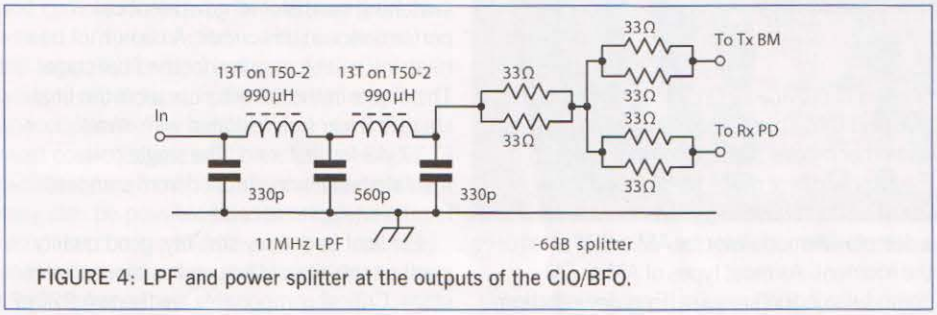

FIGURE 4: LPF and power splitter at the outputs of the CIO/BFO.

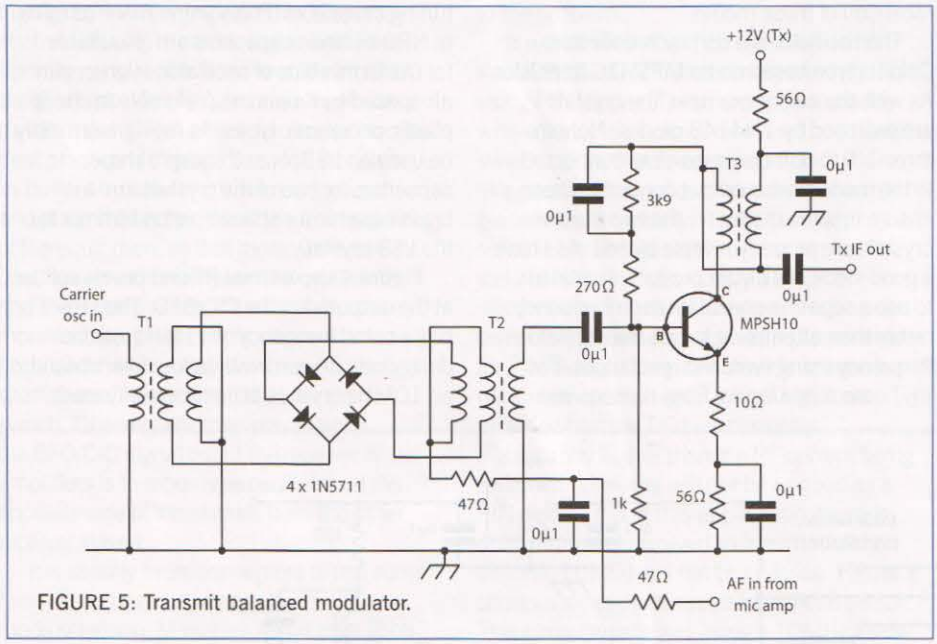

FIGURE 5: Transmit balanced modulator.

MICROPHONE AMPLIFIER. The microphone amplifier is based on a dual opamp. The first stage is an inverting amplifier. As my desk microphone has adjustable gain, I have not included a mic gain control. Voltage gain for this stage is fixed at R5/R8 = 10 or 20dB. If you require gain adjustment from the front panel, replace R5 with a 470k potentiometer. The second op amp stage is an active LPF with a cutoff frequency of just over 3kHz. The choice of opamp is not too critical because of the relatively low frequencies involved. I used an LM358N dual opamp in my amplifier. I have also used the LM1458, LF353 and several other standard dual opamps in this circuit. The circuit schematic is shown in **Figure 6**.

The mic amp is easily built using point-to-point (dead bug) construction methods. On this occasion, I used a PCB left over from a previous project. The PCB layout was described in the August 2006 Homebrew. The completed mic amp is shown in **Photo 3**. I may have a copy of the original artwork somewhere if anyone requires it.

The circuits assembled to date produce very good quality DSB at the BM output and SSB after passing through the 8 pole SSB filter. RF power output from the Rx/Tx mixer is still far too low to attempt any on-air tests. Next month, we will build the transmit low-level amplifiers and the broadband PA. This will allow on-air testing of the Tx stages.

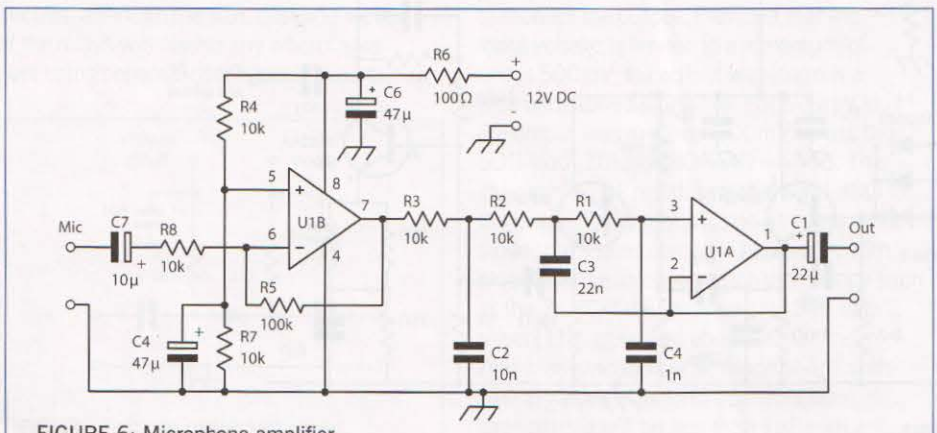

FIGURE 6: Microphone amplifier.

REFERENCE

[1] NXP 1N4148 data sheet 2004

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Delta-DX-EE	40m, 20m, 15m, 10m dipole, it can be used on 30m, 17m, 12m with an ATU. This antenna is not trapped, and has an overall length of 40ft £129.95
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
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
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
DX-Ultra	Medium wave to 30MHz 80ft AM Broadcast Dipole. Efficient, low-noise dipole for military, government, etc., use. £149.95
AD-Delta C	Hardware Kit contains the following: 1 x Dipole Centre. 2 x Dog Bones. 1 x Surge Protection Block £29.95
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

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ML&S Putting back funding into our amazing hobby - Ham Radio

I'm pretty sure most of you saw the news reports on TV about the terrible flooding in our home town, Chertsey. I'm very pleased to report that the building (and its contents more importantly) were far enough away from the Thames not to have been affected and trade continued as usual. I would Just like to thank, on behalf of myself and my staff, the many customers that called to express concern to our well being over that period. Not just limited to the UK but over-seas as well.

TX Factor!

Let's make this absolutely clear, this has NOTHING to do with Simon Cowell! The TX Factor is a show dedicated to Ham Radio and brought to you by a bunch of TV & Radio media professionals who happen to be enthusiastic Radio Hams. The first episode went out on the evening of the 21st of February and as I write this just 3 days later, over 10,000 people have watched the show. It is very impressive and it was something I wanted to get behind from the start and was delighted to be asked to be the principal sponsor of the TX Factor along side Yaesu Musen Co. If you haven't yet seen the first in a regular series of the show, just go to YOUTUBE and search 'TX Factor'. Sit back with a cuppa and enjoy! The next episode appears late March.

GB1BM Brooklands Wireless Communications Collection

Two of my old chums Andy Lambert G8HER & Peter Burton G3ZPB popped in to the store a few weeks ago to tell me about an exciting new project they are both involved in at the local and famous Brooklands Museum. Brooklands is the site of the world's first purpose-built motor racing circuit and was the birthplace of British motorsport and aviation. It's with this background they're setting up a display of early radio communications equipment. All have an aviation theme and include such iconic items as the T1154 and R1155. (I started with an R1155!) As Brooklands are open 7 days a week Andy and Peter are looking for volunteers to help run the station. More details as they build up the display can be found at **www.brooklandswireless.com.**

ML&S to be Principal Sponsor of the RSGB Convention 2014 & IOTA 50th Anniversary

For more years than I can remember, ML&S have been chosen again to be principal sponsor of the celebrated RSGB Convention at Kent's Hill Conference Centre in Milton Keynes. Dates for your diary are 10th-12th October. We are also delighted to be asked to sponsor the IOTA 50th Anniversary at Beaumont House, Windsor on the 4th-6th July 2014. When Roger Balister G3KMA approached me to enquire if I would like to be involved, I just knew the meeting would result in my bank balance being lowered, bringing a sweat to my brow. He succeeded of course. There are still places available, see **www.rsgbevents.org**

Kempton Park Radio Rally

Don't forget to come and see ML&S at the Kempton Park rally on Sunday the 13th of April. The usual ML&S team will be there (even me!) giving top prices on trade-in's and lowest prices across our range of goodies. If you want to pre-order for the show please see the banner promotion on our website.

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PL259/UHF PLUG RG213 CLAMP
UHF Plug RG213 or Equivalent Cable, Clamp, Top Hat Compression Nickel Body, Solder Pin Nickel Plated. Clamp Body in Nickel gives a good fitting connector and excellent quality and finish. **Price : £2.49**

PL259/UHF PLUG WESTFLEX, ECOFLEX-10, LMR400 CLAMP
HF Plug Ecoflex-10, ANT400, CNT400, LMR400 or Equivalent Cable, Clamp, Top Hat Compression White Bronze Body with Crimp and or Solder Gold Finished Pin. **Price : £5.50**

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Data

The latest on *Opera* and new mode *WSQ*

THE LATEST ON *OPERA*. The latest version of *Opera* is a complete calibrated engineering beacon/data transmission and reception system, capable of assessing propagation and determining the suitability of a path to support traffic by providing an average S/N assessment and the percentage fade below a 3dB margin. It shows the mean S/N calibrated to *PathSim* [1].

Uniquely deploying on-off keying (OOK) of a single carrier it is completely free running with no time locking required and is designed to deliver full performance using normal HF amateur radio equipment and sound cards. The system utilises web linking to distribute spot data to other users and is linked to the PSK-Reporter. A local copy of decodes and a web linked copy of other users' spots is displayed in real time on the Windows software.

The system is in essence a burst data mode, where the message is encoded into a unique 239 bit binary data word. Strong forward error correction (FEC) is included within the data stream to allow successful decode of the message with only 50% of the signal being intercepted. The 50% loss may be within a block, or as bits lost in QSB / QRM randomly distributed along the time line.

Two versions of the encoded message are available: 15 characters plain text or 'QSO mode' giving 20dB S/N in a 120 second Tx period (not active at moment, but the software exists), and a callsign only 'beacon mode'.

The system is compatible with both CW and SSB transmitters, in that both COM-port on/off key and audio tone Tx drive is offered by the software. Trials have also proven compatibility with FSK systems, using recovered tones either inside or straddling the decoder pass band.

TABLE 1: Tests using an SDR.

Mode	Margin (S/N)
OP05	-20dB
OP1	-23dB
OP2	-26dB
OP4	-30dB
OP8	-34dB
OP16	-37dB
OP32	-41dB
Op64	-44dB
OP4H 8.9kHz sound card SDR	-49dB (lowest yet)
16kHz SDR optical test version	
QSO mode (all bands)	-20dB

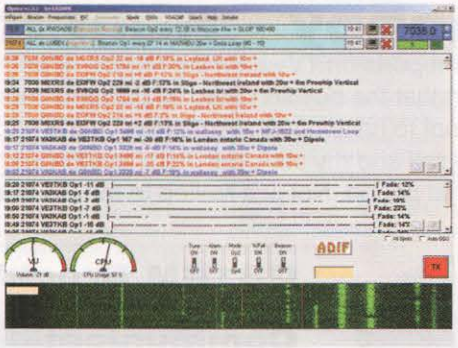

FIGURE 1: Latest version of the *OPERA* user screen (image coutesy of Graham, G0NBD).

Using SSB transceive enables the full capabilities of the system to be exploited; there is no gain to be made from the deployment of high stability equipment or narrow filtering. To the contrary, narrow filtering reduces the achievable S/N level and the audio drive via the sound card provides agile Tx tone frequency placement.

RUNNING *OPERA*. In the period between Tx demand and commencement of transmission, the received audio spectrum is scanned. The Tx carrier is placed in the lowest S/N position, allowing a guard band of a few Hz to prevent collisions with other users, QRM lines and areas of increased noise. This maximises link efficiency.

Reception / decoding is provided by a Windows based software package that contains both Tx and Rx components of the system. An option is also provided to show the 239 bit binary code, for PIC and other types of systems to offer Tx only, fixed beacon use.

Opera comes with considerable choice of symbol length, effectively the noise bandwidth used in the decoder. The minimum decode S/N level is set by Tx cycle time, ranging from -20dB S/N (all S/N values are normalised to a 2.5kHz bandwidth), for the fastest OP0.5 (0.5 minute or 30 second transmission), to -50dB S/N for the 8kHz audio sound-card SDR Op4H with its 4 hour transmission period and roughly 1 minute long symbols. The expected minimum S/N values achievable are listed for each mode. However, tests with an SDR have produced lower levels, possibly by better recovery of the Tx 'pulse', as shown in **Table 1**.

Normal VHF/HF use varies from OP0.5 to OP4. OP4/OP8 are generally in use on 477kHz and OP8/OP32 has become the standard for the 136kHz band. More recently OP16/OP64 was added to support the USA 75kHz experimental stations

OP4H provides the user with an SDR by using the sound card as a direct 8kHz Tx and Rx, as does the 'Experimental Light' (optical test) version, which provides a 16kHz carrier via the sound card and allows direct reception of a keyed 16kHz modulated carrier

The most recent addition to the receive software is the measurement of percentage fade, displayed via the provision of a visual representation of the signal level along the time line and presented as a % fade value. This measurement is a real time indication of the path's ability to support a data transmission. The fade criterion is set at 3dB, the recovered S/N level is the average along the time line, displayed in the lower panel of the software. The fade level is also distributed to other users via the web linked 'spot upload' system, the dedicated server adding range and other information, providing a 'written picture' of the active stations.

Figure 1 shows the *Opera* user screen with the fade indication on the lower panel and the web-delivered other user/band activity recorded on the upper panel.

The text bars display the Tx web beacons and decodes from other users; checking the 'All Spots' tick-box at the lower RH side allows local recording of the band in use or 'all bands'.

NEW 'QSO MODE' FOR LF. Just as this column was being prepared, details appeared of a new development by Con, ZL2AFP and Murray, ZL1BPU. This is Weak Signal QSO or *WSQ* mode. Designed specifically for hand typed two way QSOs, as opposed to mainly beaconing offered by *WSPR* and *Opera*, *WSQ* uses differential multi frequency shift keying, where information is encoded in the change of frequency from one tone to the next in a similar way to the older Jason [2] mode. Data is encoded by transmitting one of 32 tones on a 1.95Hz grid. There is no error correction as this would greatly slow down real time operations. The use of differential, or incremental frequency encoding coupled with a symbol rate of 2.048 seconds reduces the S/N needed for reliable copy. We'll cover *WSQ* in more detail next time. For now, the software with full documentation can be downloaded from [3].

MACHINE GENERATED MODES (MGM). This title appears in the published band plans. The definition applies to transmission types generated by computer and designed for decoding by computer – such as most of the traditional so called, 'Datamodes'. It does not apply to digital voice, slow scan or other 'fuzzy modes' like Hell or QRSS.

WEBSEARCH

[1] *Pathsim* path simulator – www.moetronix.com/ae4jy/pathsim.htm

[2] Jason – www.sdradio.eu/weaksignals/jason/

[3] WSQ software and documentation – www.qsl.net/zl1bpu/SOFT/WSQ.htm

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

Antennas

Measuring coax quarter and half wavelengths, plus small antennas

ANOTHER METHOD. Last year I was asked about methods of measuring quarter wave or half wavelengths of coax for making phasing lines or matching stubs and in [1] and [2] I described methods of doing this using various items of test equipment. At a recent talk at the Worthing and District Amateur Radio Club, G4UDU described a method of performing this measurement using only the shack receiver (or transceiver but ensuring the transmit function is disabled by removing the microphone and key).

This entails connecting the length of feeder to be tested in parallel with the antenna feeder at the point where it connects to the receiver coax socket. This is achieved simply by using a coax T-piece as shown in **Photo 1**. The receiver is tuned to the frequency of interest and the length of feeder under test adjusted for minimum noise or signals.

There are some practical difficulties with this approach. First of all how can you be sure that you have reached the optimum length and not overshot it as you trim the coax length? The solution is to tune the receiver for minimum signal or noise, which can be used to monitor the coax resonant length as you prune it. The receiver tuning should have a fast and slow tuning rate to be of any use in this application. The main difficulty is that there may be signals in the desired frequency range that will upset your measurements.

The solution is to use a noise source instead of an antenna. There are plenty of those around in the form of transformerless mini power supplies or battery chargers. The noisiest of these in my collection is a battery charger that that came with a digital camera. One of the battery connections

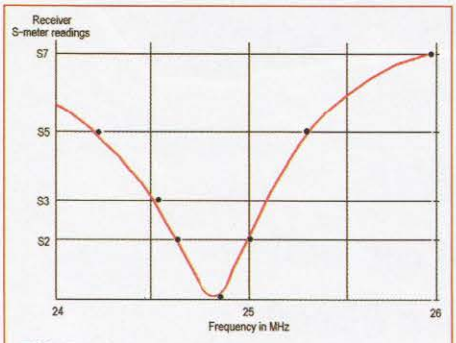


FIGURE 1: Signal strength plot of a noise source, in parallel with an open circuit quarter wavelength of coax at the receiver input.

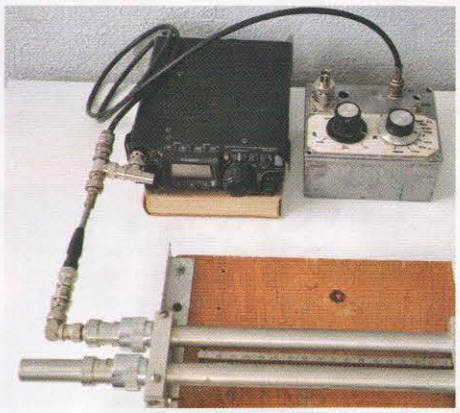


PHOTO 1: A method of measuring the electrical length of a piece of coax using a noise source and an adjustable constant-impedance line.

was connected to the centre conductor of the FT-990 transceiver antenna coax feed, which produced an S9 signal on the signal strength meter. When a short length of coax was connected using a T-piece as described earlier the signal strength varied with frequency as shown in **Figure 1**. The lowest signal level can be obtained from the graph by estimating (interpolating) from known values either side of the point.

You may have noticed the test setup shown in **Photo 1** is not the same as described in the text. The reason was the practical difficulty of photographing the set up using the station FT-990. **Photo 2** shows a test set up using an FT-817 for the receiver, which is more compact, enabling all the items in the test rig to be shown. A homebrew noise bridge is used as a noise source.

TROMBONE LINE. The coax under test in Photo 2 is an item of test equipment known as a trombone; a device used to vary the length of a 50Ω transmission line between two fixed terminals without moving the terminals or using flexible cables. The other important characteristic is that the impedance should be constant. These devices have a variety of names depending on the use to which they are put, eg adjustable constant-impedance line; trombone setter; variable phasor. They can be used as impedance matching transformers, phase adjustment devices or as a calibration tool for impedance/admittance measuring instrument.

I was surprised that no references existed in any of my library of amateur and professional radio books to this device.

SIMPLE METHOD. You can find the electrical quarter or half wavelength of coax for any given frequency without the need of test equipment or computer programs. To find a free space wavelength L in metres, divide c (speed of light in m/s, 300 x 10^6) by frequency in Hz x 10^6. This can be simplified to L = 300/f (MHz). A full wavelength of 14.2MHz is 300/14.2 = 21.126m. For a quarter wavelength, 21.126/4 = 5.28m.

If we assume the coax to be RG-213 with a velocity factor of 0.66 then 5.28 x 0.66 = 3.483m. It is important that you know the pedigree of coax when using this method.

SMALL ANTENNAS AND THE MEANDER LINE. The question 'Does academia have the answers to designing electrically small antennas?' was posed in the February 2014 Antennas. I described a publication on the internet called *Small Antenna Handbook* published by jointly by Wiley and the IEEE. I consulted it to see if there were techniques not covered in amateur radio literature. The classification of various small antennas turned out to be rather curious. For example chapter 4 is headed 'Clever Physics, but Bad Numbers', with several antennas in this category including:

- Contrawound Toroidal Helix antenna
- Transmission Line antennas
- Halo, Hula Hoop, and DDRR antennas
- Dielectric-Loaded antennas
- Meanderline antennas.

I have experimented with Contra-wound Toroidal Helix [3] and DDRR antennas [4] as for mobile use and found they both worked about as well as a conventional centre loaded 14MHz antenna. I therefore read with interest the results of experiments on the Meanderline Antenna by Thomas J Warnagiris and Thomas J Minardo of the Southwest Research Institute, San Antonio, Texas [5] as reported by Pat Hawker, G3VA in Technical Topics (TT) [6]. This paper described a 14MHz resonant dipole antenna with an overall span of just 3ft (1m) with a 2:1 SWR bandwidth of over 5% of the centre frequency and a measured radiation efficiency of some 80%. Such performance would seem to fly in the face of the classical theory of electrically short antenna elements. The trick, it seems, is to make the elements physically long but folded repeatedly into a short span with, for example, a construction resembling the old caged dipole but with the short sections in series rather than parallel.

Figure 2 shows the electrical configuration of a prototype 20.1MHz meander monopole antenna much shorter than a quarter-wave high investigated at the Southwest Research Institute. Mechanical implementation of this antenna is outlined in **Figure 3**. The input impedance of this 17.8in (45cm) high antenna with 21 elements of 26 AWG (~0.5mm dia) wire

was tested over a 3ft by 4ft ground plane. Measured impedance at first resonance was 21.9Ω, much higher than would be expected from a 0.03λ, monopole. The bottom fold feed points were usually at points 10-20% of the total antenna length and produced a 2:1 VSWR bandwidth of about 2-4% of centre frequency (about twice as wide as bandwidths reported for reactively loaded monopoles 0.06λ long).

Another prototype antenna investigated was a 14.2MHz dipole with an overall span of only 3ft. A 2:1 VSWR bandwidth was measured over 6.5% of the centre frequency. When tested for radiation efficiency using the Wheeler method, this antenna exhibited a radiation efficiency of 80%, much higher than would be expected for a loaded 0.05λ dipole.

The 14MHz one-metre design led to some furious efforts on both sides of the Atlantic to reproduce the claimed results but it soon became clear that, despite careful attempts to copy the design exactly as presented in the IEEE paper, the radiation resistance was extremely low and consequently so was the radiation efficiency. The meander antenna built in accordance with the IEEE description worked, but at nothing like 80% efficiency! This was duly reported in TT (October 1999 and January 2000).

1.8MHz MEANDER LINE. Earlier, G3VA suggested a 1.8MHz antenna with a 30ft (10m) metal support pole and a circular RF insulated disc at the top with a series of zigzag wires down to insulated stakes, rather in the form of an umbrella antenna but with the guy-like wires forming a single resonant mast plus wire, rather than forming a capacitive top-cap. The total wire-plus-metal-mast length would be best determined by trial and error and would need to be rather longer than an electrical quarter wave due to its folded form.

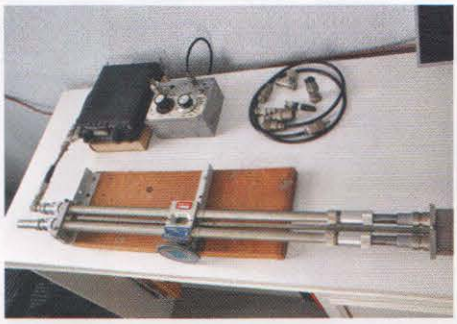


PHOTO 2: Test setup for checking the veracity of the measuring method. The receiver is an FT-817 and a homebrew noise bridge is used as a noise source. An adjustable constant-impedance line trombone is used as the coax under test.

The suggested design inspired former professional engineer Arch Doty, W7ACD to build this 30ft (9.1m) 1.8MHz meander line monopole. The antenna comprised a 4in (100mm) diameter aluminium centre tube, 30ft (9.1m) high. The length of meander lines was 27ft (8.23m) with 27 meander lines. The spacing between adjacent meander lines was 2.75in (68mm), while the spacing of lines to centre tube was 10.5in (267mm). The meander lines were made from 18 AWG (~1mm dia) Copperweld (copper plated steel) and the meander line supports from acrylic plastic 2.5ft (762mm) diameter. The spacing/wire diameter ratio was 68.2. The antenna reduction was factor approximately 4.70.

An SPDT knife switch at the base of each meander line gave the design great flexibility in selecting which of the lines were connected. A remotely-controlled vacuum variable capacitor on the end of the last meander line was used to allow the antenna to be resonated at the required frequency within the band.

W7ACD added, "Of course, I had to try this antenna on the air. Over a month or so, I managed 1.8MHz contacts from Puerto Rico to Hawaii. But this only demonstrated that the antenna's performance was really quite poor, the contacts resulting more from a few decades of working DX (I have 1.8MHz SSB DXCC) than from good antenna performance. To sum up: the Meandered Line Antenna is, basically, pretty useless for 1.8MHz amateur radio. Its gain is negative and its performance unpredictable, but it is a fascinating antenna and one that may have promise at other frequencies, or for other applications".

Electrically small antennas need to be constructed with considerable care. I have scaled small antenna designs before but find that things don't always go to plan in such an operation.

REFERENCES

[1] Antennas, *RadCom*, November 2013
[2] Antennas, *RadCom*, December 2013
[3] Evaluation of the G2AJV Toroidal Antenna, *RadCom*, August 1994
[4] The Mobile Roof-Rack Antenna, G3LDO, *QST*, November 1888
[5] Performance of a Meandered Line as an Electrically Small Transmitting Antenna (*IEEE Antennas and Propagation*, December 1998, pp 1797-1801)
[6] Technical Topics, *RadCom* August 1999

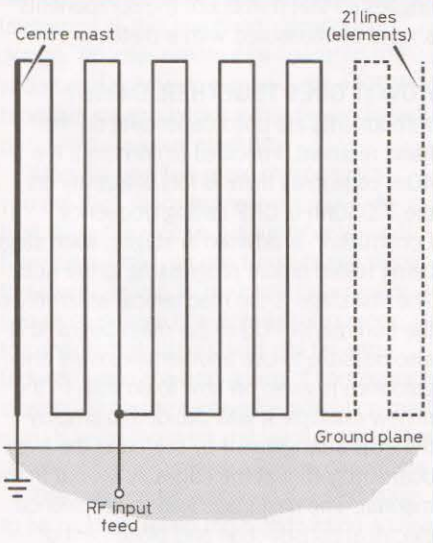


FIGURE 2: Electrical configuration of a very short multi-element meander monopole antenna with a height of only 17.25in with the 21 elements connected as a continuous single wire.

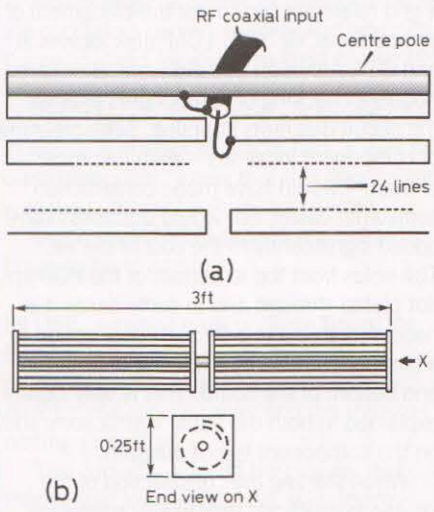


FIGURE 3: A 14.2MHz meander dipole with a span of only 3ft.

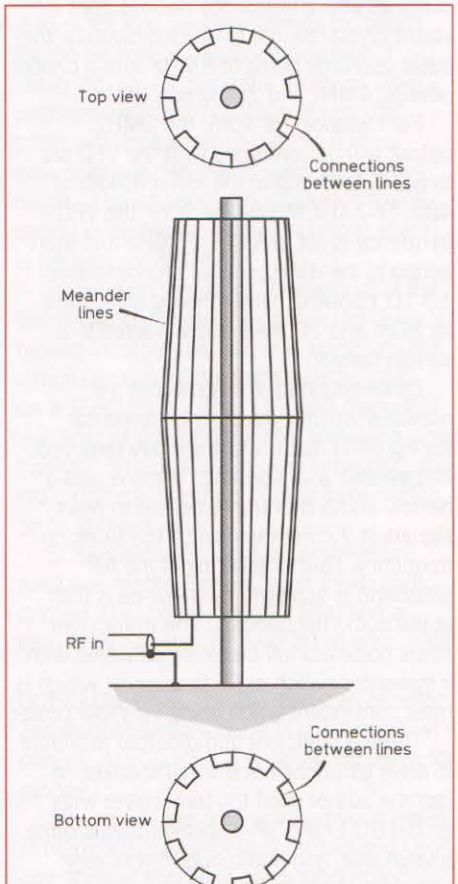


FIGURE 4: Typical mechanical structure of a meander monopole. The discs and central spacer ring or disc should be made from material offering good RF insulation.

April 2014 • RadCom
Ron Stone, GW3YDX • e-mail: info@vinecom.co.uk

Walford Electronics Berrow QRP transceiver kit

Something for the experienced constructor to try

ADVANCED PROJECT. Walford Electronics offers a number of interesting kits, the Berrow being described as an advanced project. I would agree and suggest that intending constructors cut their teeth on something less complex from the Walford range before attempting this project.

DESIGN CONCEPT AND OPERATING FEATURES. The Walford Berrow is a single-band QRP transceiver with a direct conversion (DC) receiver for 80, 40, 30 or 20m, CW only, with a nominal 1.5W RF output. It differs from the usual single-band designs insofar as any of those bands can be selected from the standard Berrow kit. The way this is implemented is unusual for a DC transceiver where frequency generation is usually at the signal frequency. Here, a VFO is not used at the signal frequency, but the VFO output of around 5 to 6MHz is mixed with a frequency derived from a stable crystal source or divided digitally, the basic oscillator being at 8MHz with a divider offering 4MHz and 2MHz outputs.

For instance, for 40m, the 2MHz output will be combined with the VFO set to 5.0-5.040 to give the lower 40kHz of 40m (7-7.040MHz). For 30m, the VFO frequency is set to 6.0-6.15MHz and then added to the 4MHz crystal source to give 10-10.150MHz. Other mixing selections for 80m and 20m are implemented in a similar fashion.

Other operating conveniences are provided, such as receiver incremental tuning (RIT) that is electronically removed in 'transmit' and sidetone. There is also a narrow audio filter implemented to peak signals at 725Hz that is also the sidetone frequency. Further tailoring of the AF passband is achieved by a low-pass filter at the audio frequencies. 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, in fact the author used the transceiver with an old 8Ω Drake SP-4 speaker that is quite a large unit, and audio output was very adequate. Note the normal stereo ear-buds with a 3.5mm stereo plug will not work with this radio as it has a mono earphone socket. An explanation in the manual might be useful for those trying it and getting no audio output! A keying line is provided for a straight key (no internal keyer is implemented) but a CMOS Super-Keyer, which is rather fussy about switching keying voltages, was used without the sometimes-necessary current limiting series resistors in the keying line. This is further evidence of a well thought-out design.

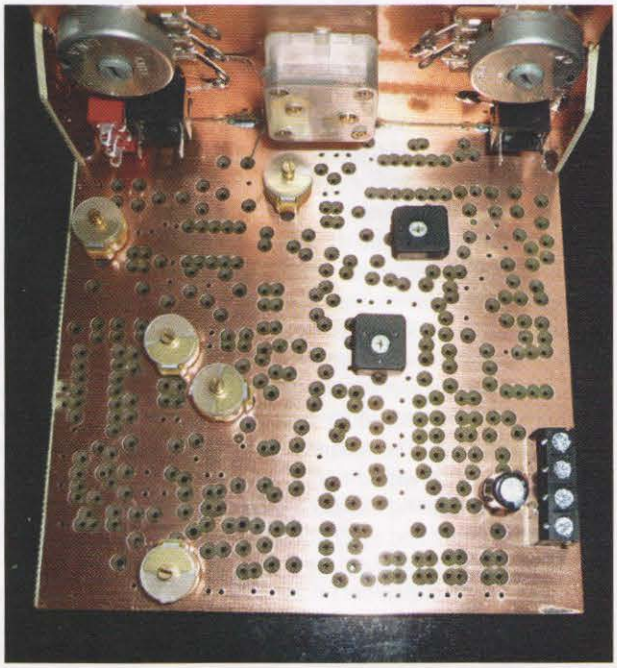


Photo 1: Partly populated board.

WHAT'S IN THE KIT? As supplied, the Berrow kit consists of PCBs and circuit components – all 'regular' components with no SMD parts – plus a very comprehensive 19-page manual detailing the operation of the transceiver stages, instructions for fitting the components, alignment and on-air operating. Photos of the PCB are provided, but only in black and white.

There are two PCBs. One is a single sided front panel PCB panel, drilled to accept the VFO polyvaricon tuning capacitor, the audio gain and RIT controls and sockets for headphones and a Morse key. The main PCB is double sided, the upper side comprising an earth plane. There is no silk-screening of component locations, instead a component layout diagram is provided to actual size with a grid reference system for the placement of components, eg "C15 10nF disk locates at grid G1". Although this did work, it required frequent checking of components against the circuit diagrams supplied. Silk-screening of component locations – even just most of them – would have made construction somewhat easier, but would doubtless have added significantly to the cost of the kit. The holes from top to bottom of the PCB are not plated-through and in some cases it is necessary to make a through-connection to a component lead by soldering to both top and bottom of the board. This is very clearly explained in both the fitting instructions and on the component layout diagram.

When starting the construction of the kit, the instructions very wisely suggest a careful count of the components against a clear list of components. This was carried out and all the components were present. Helpfully, a guide was given to the values of the components for those not familiar with current marking systems. For instance, "10nF disc, "03", and later in the instructions "R24 3K3 OR OR RD" signifying the colour bands on the resistor. It is further suggested that if in doubt the components should be measured with a meter.

HOW IT GOES TOGETHER. Different components are used depending on the band required. I decided to construct the 40m version as there is lots of activity on the 7.030MHz QRP calling frequency. Construction is advised in stages, each stage being tested before progressing to the next. The first stage is the mechanical assembly of the front panel PCB to the main board. It is also possible to use another enclosure and guidance is given on how to do this. In the review example it was decided to employ the PCB arrangement by soldering the two boards together at the edges as set out in the manual. The next stage was to commence electrical construction and placement of the main board components. Wisely, the instructions suggest that components that may only be fitted one way, such as the trimmer capacitors, trimpots and the power and antenna connector are fitted first, in

order to help locate other components later. **Photo 1** shows the board with just those components fitted. The supply parts follow, with a DC test suggested to verify that all is well.

Other stages are installed and tested in the same way. Six inductors on ferrite rings need to be wound and installed. Wire and toroids are provided for a wind-your-own operation. Some constructors are apprehensive about doing this, but it is very simple with the clear instructions given with reference to a band-specific inductor table for wire lengths and suggested number of turns.

The VFO testing is a stage mid-way through construction. It is suggested that a general coverage receiver be used to do this, or a digital frequency counter, as none of the VFO frequencies lie within an amateur band. I had access to a frequency counter and it was very easy to set up the VFO for the 40m band values, accordingly.

After testing the VFO, the parts for the 8MHz crystal oscillator have to be fitted and tested, followed by the parts for the digital divider implementing the 2 and 4MHz mixer frequencies as described earlier. The instructions acknowledge that those parts are "a bit tight" but provided that care is taken and the parts fitted in the sequence suggested in the excellent manual, it can be done without difficulty.

The next stage, tuning up the digital dividers and VFO mixing to give a stable and clean local oscillator (LO) frequency, is the most difficult part of construction. It is suggested that a general coverage receiver again be employed to give what the designer describes as "the most consistent LO signal". An oscilloscope and frequency counter make this process a great deal easier, but in this case an amateur bands only receiver can be used as the LO will be on the signal frequency as this is a direct conversion design. Another constructor has used the wide-band spectrum display from an SDR to tune this stage, checking the display for any undesired spurious products.

After fitting a few more components you are then ready to receive signals. At that stage the receive preamplifier will not have been fitted, so don't expect any signal to be very strong. In my case, only one or two signals were heard, but that served to confirm that 'lift-off' was not far away. Indeed, when the next group of components were fitted for the receive RF amplifier, many signals were received and were then peaked up using the RF receive trimmer capacitors.

The transmitter was then the next stage to be tackled. Again the construction advised proceeding in stages with functional tests after each. With all components fitted apart from the low pass filter, a test gave around 1.7W output into a dummy load. With the low pass filter components fitted, the output was slightly reduced to a touch over 1.5W and the transceiver was ready for use. A photo of the fully-populated board is shown in **Photo 2**.

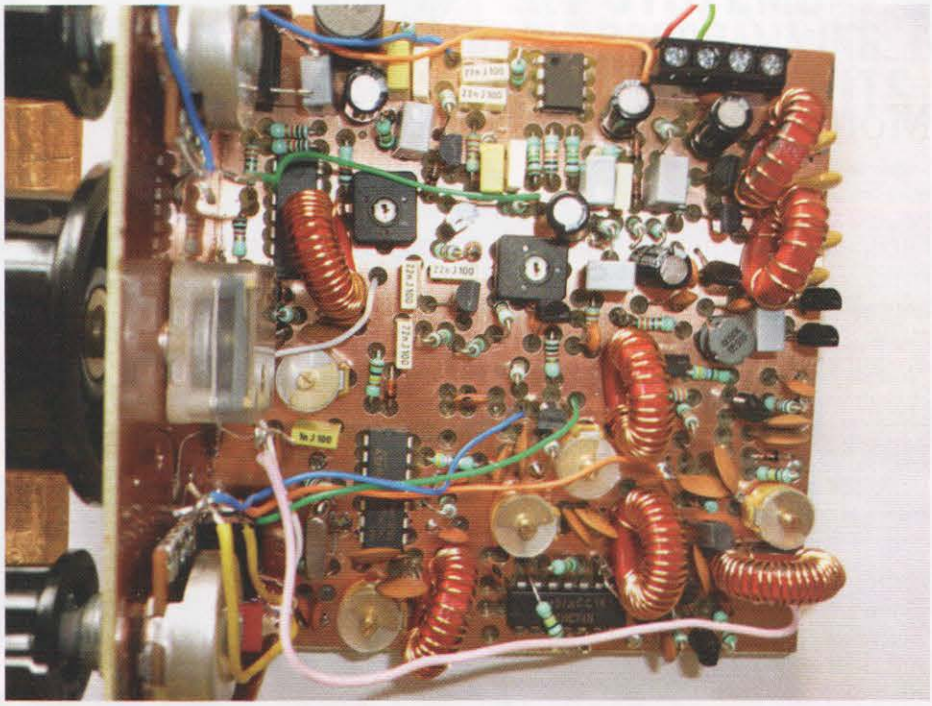


Photo 2: Completed board.

At this stage there appeared to be a problem as although the receiver was working, the transmit signal did not hold consistently to the design frequency. I e-mailed Tim Walford to ask for advice, which was immediate and extremely useful. Nevertheless, stable output was still not obtained, so after further abortive attempts to set it up correctly, the built kit as returned to Tim with a request to identify the problem. Despite every care taken in construction, a capacitor had been misplaced and as a result the LO mixer chain was not stable. Despite being an experienced amateur of some 40+ years, I was more than a little embarrassed by that, but – hey – you are never too 'experienced' to make a mistake!

Tim changed a couple of components, set the oscillators up very quickly and returned the radio, fixed for a very modest charge for time spent. I feel that this kind of support is essential for any firm offering a kit radio and, in the case of Walford Electronics, it was first class (they didn't know that this transceiver was the subject of a *RadCom* review).

In all, the transceiver took around ten hours to build and test.

IN USE. A useful page of hints 'Using the Berrow' is provided in the manual, outlining how to tune in a signal with a direct conversion receiver and the transmit netting procedure.

The correctly-aligned transceiver was then tested for several days, with 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, but at night there were signs of broadcast interference, even with the double-tuned RX BPF's implemented before the product detector. Use of my 2 element Yagi was sometimes too much for the Berrow at night pointing east. Even some 'advanced' superhet receivers have problems with the night signals on that band with that antenna, so the Berrow was quite good in that respect. The only negative point about the receiver is that a strong internally-generated spurious signal is present on 7012kHz.

Reports on the transmitted signal of the Berrow were consistently good, the designer having incorporated some shaping into the circuit. 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 very good, the radio drifting less than 100Hz from switch on to an hour after.

Some useful optional accessories are available for the Berrow, such as an audio-derived AGC board, a notch filter and a frequency counter. None of these were fitted.

CONCLUSIONS. The Berrow is an excellent and flexible design, but it is not a beginner's project. At only £59 it is very good value for money.

The results are well worthwhile in terms of being a fun project to construct and QRP operating at that level gives satisfaction that QRP operators worldwide are well aware of. This kit, and many others, may be found on the Walford Electronics website, www.walfords.net.

LF

More new countries and modes

FRENCH 472kHz ACTIVITY. Three more French stations have special permission to use the 472-479kHz band. Nicolas, F4DTL, Michel, F5WK and Andy, F6CNI have each received a 6 month licence to transmit 1W ERP on the band. That makes a total of four French stations on MF, including F6CIU who already has permission to use it.

Despite problems with bad weather, F4DTL soon made the first contacts in JT9 mode between France and Belgium and between France and Germany. G3WCB reported reception of good signals from both F6CNI and F4DTL.

As for a universal French allocation of the band, John, F5VLF has checked with REF (the French equivalent of the RSGB) and it appears that the licensing authority, ARCEP, approved the necessary amendments to the French licence on 17 December. The matter now has to go before the relevant Minister, after which a notice will be published in the *Journal Officiel* stating when the amendments will take effect and whether people have to ask for a variation to their licence.

MORE COUNTRIES ON 472kHz. From 18 February, Polish amateurs can use the 472kHz band with 1W EIRP. Soon after midnight on the morning of the 18th, SQ5BPF and SQ2BXI were on the band working into the Czech Republic and Germany. There is a Polish aeronautical beacon 'BIA' on 474kHz that is modulated with 1kHz MCW so the carrier and sideband frequencies need to be avoided, especially if you wish to work into Poland.

Bulgaria has also allocated 472-479kHz to its amateurs as part of an update that includes access to the 60m and 4m bands for the first time, plus the extension of Top Band to 2MHz.

FCC CONSIDERS US 472kHz ALLOCATION. Meanwhile, in the USA, their access to the band inches slightly closer. The ARRL recently reported on the success of their MF experiments under the call WD2XSH. They point out that a total of 514 contacts have been made between the dozen or so stations involved, plus many hours of test transmissions, and that no interference issues have arisen. It is hoped that the FCC will soon report on its deliberations regarding the Petition for Rulemaking that the ARRL submitted in November 2012.

In the US, the 472-479kHz band is in part of the spectrum allocated to the Maritime Mobile Service as primary user, and to federal government aeronautical radio-navigation on a secondary basis. The ARRL stated in its Petition to the FCC that it is unaware of any domestic assignments that might conflict with the allocation of 472 to 479kHz to the Amateur Radio Service, and that there is almost no power line carrier (PLC) operation in this area. In 2003, the FCC cited the potential for interference to PLC systems when it turned down an ARRL Petition for an LF band at 135.7 to 137.8kHz.

The *WSQ* program screen.

LF DX. DK7FC is always breaking records on 136kHz and this time it's for the longest distance WSPR report on the band. His signals into the USA on the morning of 5 February were exceptional, with reports from WE2XGR, W1VD and WA3TTS (all around 6,000km), K3SIW/1 and KA9CFD at 7,000km and, best of all, AB0CW near Denver Colorado at 8,162km.

Other notable distances in February were UA4WPF to JA5FP on 136kHz at 6,576km, plus some good reception on 73kHz of WG2XRS/4 and WG2XRS/5 by DF6NM. WG2XRS/5 is over 7,200km away.

EVEN LOWER VERY LOW FREQUENCY. Following on from decisions made at the 2012 ITU World Radio Conference, since 1 January transmitting on frequencies from 8.3 to 9kHz has been forbidden by most authorities. This is to protect meteorological equipment that operates in this part of the spectrum. In response the 'dreamers' have all added even more turns to their loading coils and moved down to new frequencies around 8.27kHz.

DF6NM's calculations indicate that this small shift LF will make signals weaker by 1.4dB at the same aerial voltage and he is finding that interference from railway lines is greater than at 8.97kHz. As if things weren't difficult enough already!

Despite these new challenges the dreamers have responded. Uwe, DJ8WX was first to radiate an effective signal on the new frequency, closely followed by DF6NM. Paul Nicholson's excellent receiving facilities at Todmorden were soon able to pick up *Opera* 4H (four hours per symbol) transmissions from DJ8WX at 700km and DF6NM at over 1000km. Normal service appears to be resumed. *[This month's Data column includes a detailed look at* Opera *– Ed.]*

WSQ? A new LF QSO mode that claims to have performance similar to *WSPR*, but with a data rate equivalent to 5wpm Morse code, has been released. It has been developed by Con, ZL2AFP and Murray, ZL1BPU and the name stands for 'Weak Signal QSO' mode.

WSPR has given many stations reports from far afield but it is really a beacon mode and doesn't allow for a QSO to take place. Con and Murray wanted to develop a mode that would perform as well as *WSPR*, be quicker and was suitable for 2-way contacts.

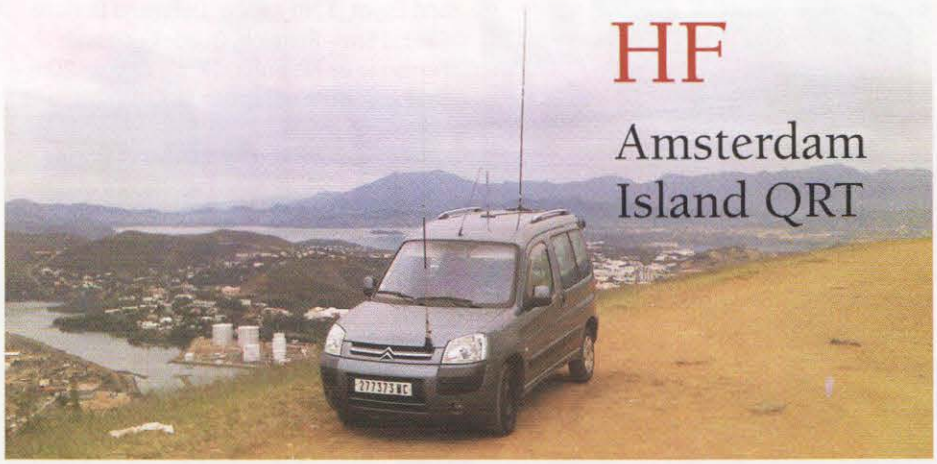
Similar to *Jason*, *WSQ* uses 33 tones, spaced 1.953125Hz apart, resulting in a signal bandwidth of 64.4Hz, including the keying sidebands. The modulation is constant amplitude, phase coherent MFSK with 2.048 second symbols, using IFK coding with 32 frequency differences. This means that each symbol carries enough information for all lower case letters to be expressed in just one symbol, which greatly enhances the speed.

Initial tests on 472kHz haven't quite lived up to expectations, with problems from QSB, static, or carriers in the receive passband being experienced. I suppose part of the success of *WSPR* is that only one instance of the repeated transmission needs to be decoded for a report to be received, whereas in a QSO you need to receive almost everything, a much tougher requirement!

Development is ongoing and experiments continue with many stations involved. I intend to give this interesting mode a try soon and will report back on results. Just search for ZL1BPU on the internet and you'll find Murray's page where you can download the latest version of *WSQ*.

HF

Amsterdam Island QRT



FK8DD's mobile QTH (Tnx FK8DD).

FT5ZM. The FT5ZM DXpedition has now drawn to a close after making a total of 170,000 QSOs with over 36,000 different calls. Looking at *Club Log*, about 800 QSOs were made with UK stations on 10m and around 70 QSOs on 160m, with hundreds on the other HF bands, so it was certainly very popular here. I have summarised the UK leaderboard top positions in **Table 1**. The size of the pile-up did cause complaints about band occupancy but it seemed to me that the operators were doing a reasonable job controlling it for most of the time. With thousands of stations pursuing a contact, even a 15kHz split range on SSB just wasn't going to be enough at the start.

Near the end of the expedition there were over 1000 unique calls going into the log each day – raising the question of just how many new operators were calling for their first QSOs as the pile-ups diminished. The 1000 level could have been exceeded every day for a few more weeks if the expedition had been able to stay longer. The more fundamental question perhaps is how many DX chasers are out there? Michael Wells, G7VJR attempted to answer this last year using the data in *Club Log* but it is not an easy problem given the number of busted calls and multiple calls used by one operator. You can search for his online blog entitled "How many DXers are there in the world?" – but for those impatient to know the answer it seems to be around 150,000, plus or minus a significant margin of error. Interestingly, it looks like there are about 50% more DXers in Europe than in North America.

A big feature of the FT5ZM activity was the unprecedented amount of deliberate and malicious interference (DQRM) on their transmit frequencies. There were the usual policemen and misguided people responding to them but there were also a small number of stations repeatedly transmitting deliberate interference for minutes at a time. I heard recordings of the pile-up, or of other stations, being played back plus strings of dots and dashes and a lot of bad language. The RSGB plans once again to raise this problem at the next IARU meeting but, in my view, there is little that the national societies can do. It really needs the licensing authorities to take action as only they have the necessary very high resolution direction finding stations plus the authority to act. If the European authorities collectively were to announce an intention to proactively monitor the amateur bands during major expeditions and prosecute the worst DQRM offenders then I suspect we would see a dramatic improvement. In the interim we will need to see more awareness from DXpeditions that they need to show some agility by changing their transmit frequency when deliberate interference occurs.

OTHER NEWS. Over in the Pacific, Sam, FK8DD/M continues to be extremely active from New Caledonia from his mobile station – a car to which he has added removable shelving to convert it into a shack. Most of the time he uses whip antennas mounted on the car but he occasionally erects a portable mast for an HF beam. His QRZ.com page has a number of pictures of the mobile station. One reason for his strong signal into the UK must be the hilltop QTH he operates from.

Vladimir, UA4WHX, and his XYL Irina, WA4WHX, were on Robinson Crusoe Island in the Juan Fernandez Islands in mid-February signing CE0Z/UA4WHX. Vlad has activated some very rare Chilean IOTA groups this year and even made a side trip to Antarctica. Let's hope he can find some more rare spots in the near future.

FORTHCOMING ACTIVITY. Flights and hotels are booked and all is set for a Tonga DXpedition by Chris, GM3WOJ and Keith, GM3YXI from 4 to 18 April as A35V and A35X. They plan to be QRV on the 10m through to 160m bands using SSB and CW with some RTTY activity. 30m and 60m activity will depend on getting special NoVs nearer the time. See http://a35va35x.com/ for more information.

Six French operators have announced plans to activate Tromelin Island near Madagascar (AF-031) from 30 October to 10 November this year. They plan to have 4 stations QRV on 10-160 metres. Tromelin is a tiny sandy island of about one square kilometre that is home to seabirds, turtles and a small science team. It is the 9th most wanted DXCC entity worldwide but 19th in Europe. Access to the island will be via a light aircraft that will have to make multiple trips to ferry the team and equipment. More details can be found at the team's website, www.tromelin2014.com/en/.

Rafael Gianni, YV5RED and Rodrigo Lazo, a research scientist, have met the Directorate of Hydrography and Navigation of the Venezuelan Navy about the upcoming 10 day YW0A trip to Aves Island (NA-020) in April. Exact dates have not been announced and will depend on weather and on the operational requirements of the Venezuelan Navy. See www.avesisland.info for more details and photographs of this tiny island where the only safe accommodation is on a special platform on pillars embedded in the beach.

Planning has been continuing for the 12-operator VK9MT DXpedition to Mellish Reef (OC-072) from 28 March to 9 April 2014. The team has a total budget of around $127,000 and welcomes donations to help offset expenses. Check their website at www.vk9mt.com for the latest information. There is also a propagation prediction tool at https://www.k6tu.net/?q=node/add/dx-prediction-vk9mt. Mellish is #22 in the European wanted list according to *Club Log*. For a description of life on one of these reefs readers might like

TABLE 1: UK Leaderboard for FT5ZM band/mode slots (order within each level as per *Club Log* rankings).

Band/Mode Slots	Calls
20	MW0ZZK, G0TSM, G3BJ
17	G3XHZ, GM3POI, G4CCZ, G4EZT, G0BLB, G0DQS, G3LDI, GW3YDX, M0BCT
16	G3SED, GI4SNA, GM4XMD
15	G4PWA, GI3OQR, G3KMA, G3TBK, G4VVP, G3TTJ, GM3YTS, G3XPO
14	G3TXF, GM0UDL, G4ZWY, G3UJE, G0VXE
13	G8DX, M0IKW, MD0CCE, G3VKW, G3VMW, GM0EGI, G4STH, MM0SAJ, G4YLO, G3XRJ, G0BNR
12	GW3NWS, G3RAU, G3ZQH, G4DJJ, G3ZSS, G4FAL, GM4AFF, G4DJX, G3GAF

to consult *Solitude & Solecisms – a Willis Island Notebook* by Frank Exon, who was a wireless operator at the weather station on neighbouring Willis Island in the 1920s. The book has recently been published by Australian Scholarly Publishing and is available by mail order.

The Heard Island DXpedition being organised by Bob Schmieder, KK6EK has been put back to January 2016. Full details of the latest stage of planning including the major scientific research programmes can be found at www.heardisland.org. The island is #6 in the Most Wanted list according to *Club Log*. The last activations were in 1997 (also led by Bob Schmieder) and in 1983. The 1983 activations made quite a story as there were two separate DXpeditions on the air at the same time! Jim Smith, VK9NS led the VK0JS group while VK3DHF and K8CW were active as VK0HI and VK0CW. Jim Smith's team (VK9NS, VK9NL, WA8MOA, OE1LO & VK0SJ) had an arduous trip back when their boat ran out of fuel and had to be sailed back towards Australia using tarpaulins attached to the superstructure.

Aaron, VA1AXC is now active as CY0/VA1AXC from Sable Island (NA-063). He works a rotating schedule for Parks Canada (with approximately two months on the island and two months back in Nova Scotia), and is QRV in his limited spare time using equipment donated by the recent CY0P team. Aaron is new to HF radio operating so people will need to be patient with him.

Gerard, F2JD will be back in Honduras until 4 June and QRV as HR5/F2JD on the HF bands CW, SSB and RTTY.

Guenter, DL2AWG, Hans, DL6JGN and Ron, PA3EWP will be active as KH8/homecall from Ofu Island (OC-077) in American Samoa on 9 to 20 April. They will operate CW, SSB and RTTY on 10 to 40 metres. QSL via home calls.

Babs, DL7AFS and Lot, DJ7ZG will be active holiday style as V21ZG from Antigua (NA-100) until late March. They will concentrate on the higher bands using PSK, RTTY and SSB with some SSTV.

John, W5JON will be active as V47JA from St Kitts (NA-104) until 25 March. He will operate SSB on 6 to 160 metres and will participate in the ARRL DX Contest. His wife, Cathy, W5HAM, will also operate occasionally as V47HAM.

Robert, M0RCX will be QRV /3B8 from Mauritius (AF-049) from 2 to 28 May on 40m to 6m, SSB and digital. He plans to move permanently to Mauritius in about four years.

UA4WHX at Juan Fernandez Airport (Tnx DX World and UA4WHX).

Krish, W4VKU plans to be active from Port Blair in the Andaman Islands (AS-001) as VU4K from 23 to 30 March. This could be difficult as there is likely to be far more demand than he can satisfy. Putting my IOTA-chaser hat on I do wish someone would go the Nicobar Islands again – same DXCC but a much rarer island group that I still need.

Dom, 3Z9DX (ex-SQ9KWW) plans to be QRV 10m to 40m SSB from the Western Sahara as S0/3Z9DX sometime in mid-March for one week – so may be active when you get this copy of *RadCom*.

Tim, NL8F will be QRV from Norfolk Island (OC-005) between 15 and 22 March. He hopes to have the call VK9NF but, if not, it will be VK9N/NL8F. Tim will move to Christmas Island (OC-024) as T32TM from 25 March to 2 April including the CQ WPX SSB Contest.

Wes, ZL3TE, is heading back to Viti Levu Island (OC-016) in the Fiji Islands where he will be QRV as 3D2SE from 11 to 14 April. He'll be on CW and the digital modes.

CORRESPONDENCE. Peter, G4XEX, focussed on 10/12m SSB last month and reports: 10m – India, Mauritius, Rodrigues, Reunion, Namibia, Thailand, Belize and Cameroun, 12m – Mauritius, Sri Lanka, Namibia and the Falklands.

Dave, M0BVE, missed a couple of weeks in January but with a new TS-480 and 200W of CW to a vertical antenna snagged, on 10m – Uruguay, Venezuela, Chile, Grenada, South Africa, Maldives, Amsterdam Island, Malaysia and Egypt, 12m – Saba, Cuba and Burkina Faso, 15m – Reunion, Guadeloupe and Fernando de Noronha, 17m – Gabon, 20m – Svalbard, 40m – Cayman Is, Colombia, and Hawaii.

Fred, G3SVK used a number of sloping dipoles to work an amazing amount of DX including FT5ZM on four bands. His report includes: 10m – Amsterdam I, Egypt, Maldives, Svalbard and Oman, 12m – Amsterdam I and Saudi Arabia, 15m – Amsterdam I and UAE, 17m – Amsterdam I, New Zealand, Philippines, Mongolia, Australia, Laos, Svalbard and Saudi Arabia, 20m – Sth Cooks, Australia, Reunion, Rodrigues, China, Philippines, Afghanistan, Tanzania, and Gabon, 30m – Antarctica, Gabon, New Zealand, Australia, and Svalbard, 40m – Hawaii, China, New Caledonia, India, Gabon, Mexico and large numbers of Caribbean entities.

Peter, G3HQT reports: Guantanamo Bay on 12m RTTY, Tanzania 20m RTTY, Reunion 15m PSK, Rodriques, Amsterdam I and Tanzania on 10m CW, Fernando de Noronha on 15 CW, and Kuwait and New Caledonia on 40m CW.

Les, GM3ITN has been busy chasing Antarctic DX and reports QSOs with RI1ANT at Mirny, RI1ANR at Blue Runway, all of UA4WJX's Chilean stops, the Concordia Italian base, and the *James Clark Ross* (GM0HCQ/MM).

John, G3PQA commented that 80m conditions were mediocre in January but he still managed to work Amsterdam Island, Reunion, Jordan, Sri Lanka, Chile, Costa Rica and Hong Kong. The Marshall Islands (V73) were also audible once on 80. In the 160m contest he heard as far as Chile and Nevada to the west and China and Japan to the east. FT5ZM was apparently a reasonable signal on 160 often peaking 579 (with deep QSB) between 2000 and 2230 but audible between 1800 and 0000UTC. TO7CC on Reunion was much weaker than the FT5 on 160 but still peaked around 579 for those waiting patiently for the right moment to call.

A POSSIBLE DELETION? Discussion has emerged on DX-World around the DXCC status of Kingman Reef. This entity – never more than a small sandbar – is now reported to be frequently awash at high tide. And to complicate matters further, its ownership status within the US government has changed in a way that jeopardises its grounds for separate DXCC status from Palmyra Island. The last activation was in 2000 and it is #8 on the *Club Log* most wanted list but the US authorities are reportedly opposed to granting permission to visit (though sadly that also applies to a vast swathe of US islands these days). We'll have to see what happens but things are not looking good for Kingman Reef.

Finally, thanks once again to 425 DX News, Daily DX and DX-World.

TABLE 2: 2014 worked DXCC entities.

Call	CW	SSB	Data	All
G4ZOY	95	105	86	156
G3SVK	111			111
G3HQT	97	0	54	110
M0BVE	79	0	0	79
G4XEX	0	70	34	79
G4FVK	25	48	0	58

TABLE 3: Future DXpeditions.

Date	Callsign/Country
Until abt end March	CY0/VA1AXC
Until late March	V21ZG and V47JA
Until 4 June	HR5/F2JD
Mid-March	S0/3Z9DX
23-30 March	VU4K Andamans
28 March – 9 April	VK9MT Mellish Reef
4-18 April	A35 Tonga by GM ops
9-20 April	KH8 by DL and PA ops
April	YW0A Aves I
November	Tromelin Island

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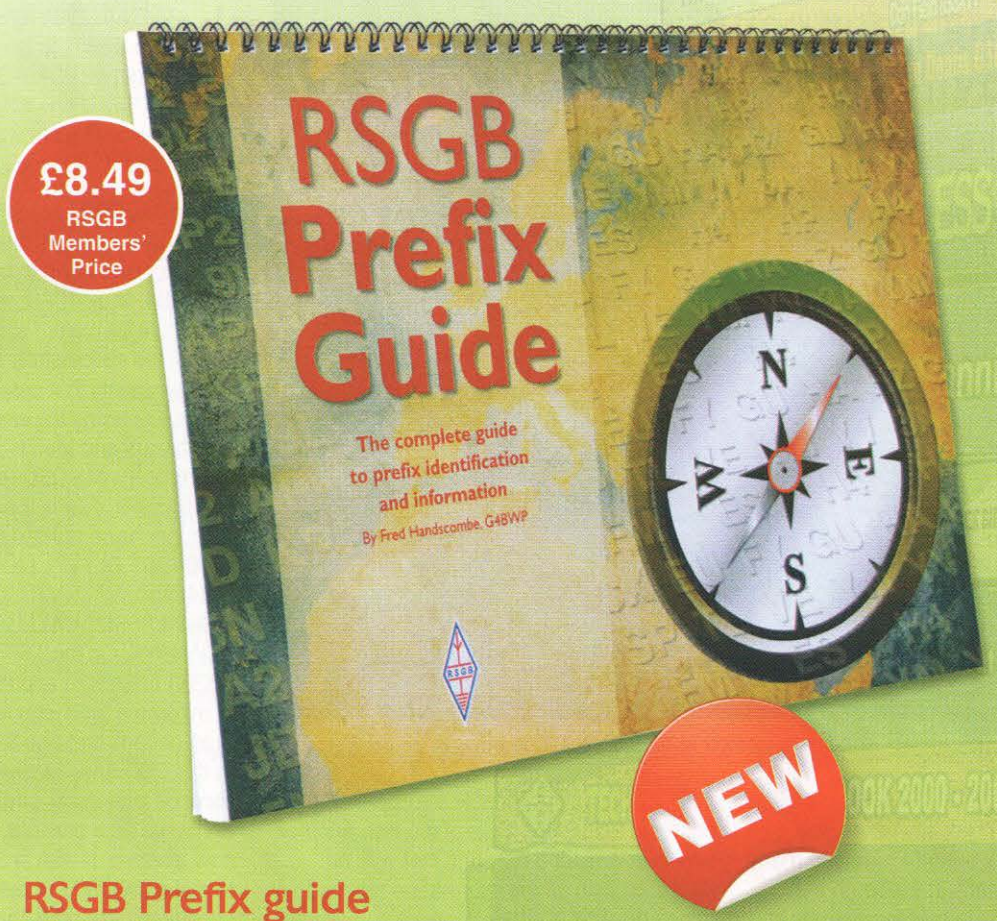

RSGB Prefix guide

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.

This latest edition of the *RSGB Prefix Guide* has a "new look" making listings clearer and easier to use than ever before but still retaining its popular lay flat design. The listings provide a huge range of additional information covering references for continent, CQ Zone, DXCC, IOTA, ITU Zone, Latitude & Longitude and a whole lot more. Readers will find comprehensive lists of DXCC deleted entities, Russian & CIS entities and even the popular DXCC checklist is here. There is the very latest information on various award programs including IOTA, CQ WAZ, DXCC, WAS and others. There is also an index of countries and their callsign allocations divided by continent as are more detailed listings for the wide range of RSGB awards.

From the basic "what was that Call?" question through to research for an elusive award, this book provides what is needed.If you are interested in DX, awards or simply operate the HF bands the *RSGB Prefix Guide* is the book for you.

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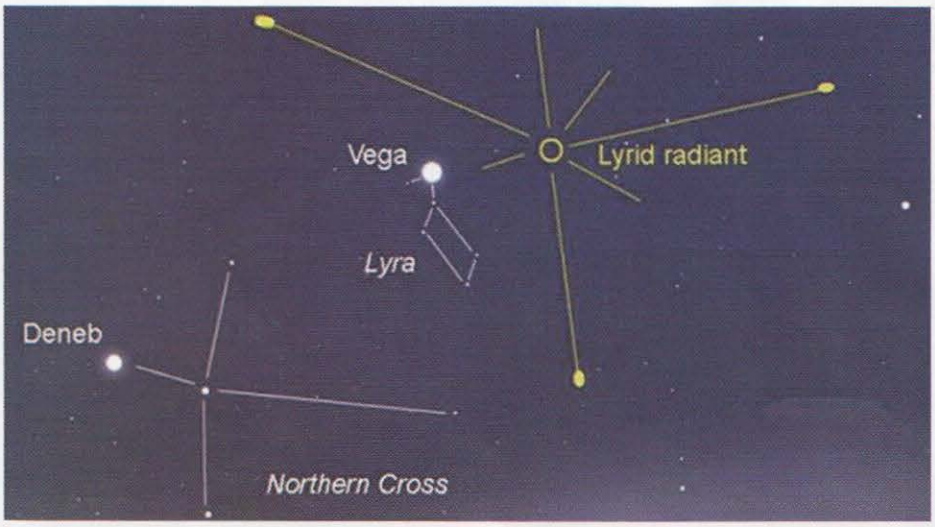
Richard Staples, G4HGI • e-mail: g4hgi@live.com

VHF UHF

Continuing poor conditions & terrible weather keeps activity low



The radiant of the Lyrids meteor shower is located in the constellation of Lyra.

MORE APPALLING CONDITIONS. Just when you thought it couldn't get any worse, the beginning of February brought misery to many in the UK but particularly in the south and west. Continual strong to gale force winds and heavy rain pounded the coastal areas with flooding and damage to antenna systems. The knock on from this was very low levels of activity generally on all VHF bands with little in the way of tropo, aurora or indeed meteor scatter conditions.

With EME conditions being good in the first week of February it was impossible for many big Yagi stations to be QRV as their antennas were still tied down, many from just after the New Year. Meteor scatter conditions are generally poor in February with no distinct showers evident, however patience and good operating techniques can prove fruitful. Just as this column was being finished there was some excellent F2 propagation from the Mediterranean to Southern Africa in progress. Although solar activity was generally good, there was little in the way of useable resulting propagation. Predicted major CME impacts produced very little in terms of auroral openings.

METEOR SCATTER OPERATING. With meteor reflections being generally poor, high levels of patience are required to complete QSOs. Even watching the ON4KST channel [1] where many skeds are made, giving up after 5 or 10 minutes really doesn't give the sked a chance to complete. Reflections will in the main be short and weak so it could be a case of piecing together received information from 2 or 3 pings to enable the operator to continue to the next stage of the test. Another way is to wait for a big burst that will, no doubt, contain all the information required in one hit. This is where patience comes into it as these types of reflections are rare. As an example, from this QTH I made a sked with Bernd, DK3XT (JN49), which should have been a 'quick test' as Bernd described it; however it ended up taking 55 minutes! Persistent one way reflections during the sked ended with a characteristic big burst to complete but we could have easily given up. With shorter distance QSOs there is also the chance for scatter from aircraft.

APRIL LYRIDS. After the Quadrantids in January there's a long wait for any decent meteor shower, with the main one being the April Lyrids that lasts from16 to 26 April each year. The radiant of the meteor shower is located in the constellation of Lyra. The source of the meteor shower is particles of dust shed by Comet C/1861 G1 Thatcher [2]. The shower usually peaks around the evening of 22 April and the morning of 23 April. The zenithal hourly rate (ZHR) typically ranges from 5 to 20 meteors per hour, averaging around 10. Best reflections available to UK stations will be when the radiant is above the radio horizon.

BAND REPORTS. Lyn, GW8JLY (IO81) says that he has little to report this month with random meteors entering their yearly low point with no aurora or tropo conditions either. Although we are in the meteor scatter quiet time, QSOs can still be made and he tries to make at least one every day. Lyn found a new station to try with on 7 January, DM8MM, in JO40AQ, which at 790km was very close for meteor scatter working but they completed successfully after a fairly long QSO. Lyn comments that despite the few random meteors entering the earth's atmosphere in February and March, if there are people willing to try, MS QSOs can be completed. For example, during the morning of 15 February he completed QSOs with IW4ARD (JN64FD), DL1VPL (JO61UA), DL8SCQ (JN48RV), SP2HMR (JO94GH), SM6CEN (JO67AJ), SM5KWU (JO89IP) and DK3XT in JN49FE. On the 16th he completed with DK3XT (JN49FE) and IK4PMB (JN54MM), in minimum time with reflections each end in all periods and also SP3IYM (JO82LJ). In this QSO Andy received a burst of 13 seconds peaking at 14dB – enough for a SSB exchange. In a previous report Lyn mentioned how effective JT65A or JT65B could be to make DX QSOS under marginal tropo conditions. With this knowledge he decided to try to push his effective range further when there was absolutely no tropo enhancement at all. Lyn's QTH is not on a high spot and he doesn't use large multi element antenna arrays so working outside the UK with no assistance from enhanced propagation is difficult. By utilising either JT65B or C he has found that he can make QSOs to the near continent every day. Recent QSOs on a very flat band with JT65A/B were made with F8GGD (IN95UQ) over an obstructed path to the south, PD0HCV (JO31FW), PA2DW (JO22GD) and PA5MS (JO21RQ). Lyn intends to try and continue to test in this way to see just how far his absolute range is when the band is flat. With his current system he should be able to work a distance of 750km under a flat band, helped, no doubt, by periods of aircraft scatter. Tests will be on going to see how he can push his tropo boundary from IO81.

Kev, G0CHE (IO81) admits to not sending anything into *RadCom* for quite some time (shame!) but with the advent of using *WSJT* he has QSYed from his usual 6m activities and begun operating on 2m using meteor scatter and EME. Kev's log shows some excellent DX worked up until 30 January when disaster struck and the storms snapped his 9-ele Yagi, however he should be back on again by the end of February. Most activity was on MS but he also managed a few EME

QSOs as a 'newbie'. Not easy for a single Yagi and just 220-250W out, relying on hearing QRO stations and, if lucky, them hearing him! Rig is IC-7100 with NAG144XL PA. EME stations worked using JT65B mode were I2FAK (JN45), EA6VQ (JM19), UR3EE (KN88), RU1AA (KP40) and UA3PTW in KO93. FSK441 mode was used to work the following via meteor scatter CS7/PD0HNL (IM67), S51AT (JN75), IK0SMG (JN61), DK3XT (JN49), IW4ARD (JN64), IV3GTH (JN65), SQ9QU (JO90), DK5OX (JN59), YU1EV (KN04). Kev's last QSO before going QRT for antenna repairs was with GW8JLY with the 5 elements that were left on his broken Yagi!

John, GW4MBN (IO71) reported very few 'humans' around on 6m and 4m during all the bad weather, however he did manage to work S57RR and DL5WP on 6m ISCAT-B mode and also F8ZW (JN38) on JT6M. Thanks to John for sending in the results of the UKSMG 6m Winter Marathon. John thought the three leaders did remarkably well to work over 100 unique squares in the two month period over Christmas, using mainly MS in what some would consider a 'dead' band at this time of year. In 1st place was G1CWP (IO90) who worked 120 locators with a best DX of 2154km, G4FJK (IO81) in 2nd place with 111 locators and 1954km DX and in 3rd place PA5JS (JO21) with 104 locators and 2322km DX.

EXPEDITIONS. HB0/PA2CHR (Liechtenstein) will be making a short trip during part of the ARI EME contest from locator JN47SG. Moonrise dictates the start of activity on 11 April at 1500UTC with the end of activity on 13 April at 0200UTC. The setup will be 2 x 20-ele x-pol (cross polarised) Yagis with an FT-847 prime mover and 800W from an Italab SSPA. Chris will try and work on 144.147 (if QRM free) and will always transmit in the first period using JT65B. This will be a quality expedition without any doubt and will give the DXCC entity of HB0 to many as firsts from around the world. Chris also comments that the location is surrounded by hills so his visual moonrise will be at 5° and moonset at 12°. There is a very short window to work ZL and some parts of VK, showing how time critical the operation will be.

GS3PYE/P Isle of Lewis (IO68, EU-010). This is definitely one for your diary! The Camb-Hams Group expedition will be operating from 26 April to 3 May, from the Isle of Lewis in the Scottish Outer Hebrides. Thirteen operators will be active on all bands and many modes from 4m to 80m, 2m & 70cm for satellites and 2m & 23cm for EME. The HF bands will be covered by five simultaneous stations, while the 6m & 4m stations will have a great take-off towards the UK and Europe from the islands' northern tip in locator square IO68. 2m and 23cm EME will be available with a portable low ERP

The Camb Hams Isle of Lewis DXpedition.

Yagi system, mainly focussed on JT modes. Contest operations will take place in the RSGB 70MHz UKAC on 29 April. They will also be QRV on Twitter, Facebook and YouTube before, during and after the expedition. You can check on progress or interact with the operators via their blog **[3]**. VHF and EME skeds will also be made via ON4KST and N0UK's EME Chat. The Camb-Hams were formed in early 2006, born out of a number of Cambridgeshire Radio Groups including Cambridge University Wireless Society, Cambridge and District Amateur Radio Club and Cambridgeshire RAYNET and Repeater Group. It provides a common forum for all to work together and has been very successful in increasing the activity in Cambridgeshire. Camb-Hams frequently travel and have DXpeditioned to the Scottish Isles of Mull, Harris, Monachs, Arran, Lunga, Staffa and Iona, as well as organising social trips to many of the major European rallies. Since 2010, the Camb-Hams have been active and increasingly successful in the RSGB UKAC, Field Day and AFS contests.

Z3/PA3FPQ Macedonia. Looking forward to 21 May 21, the Dutch 'A Team' will be on expedition again on a Balkan trip with Johan, PA3FPQ and Jurgen, PE1LWT, joined also by Chris, PA2CHR in a multi band expedition to Macedonia in locator KN11BS. This expedition should cover 6m, 4m (if they get permission) and, of course, 2m. Meteor scatter, Sporadic-E and tropo operations are planned on all bands with EME on 144MHz for another exciting possibly for new DXCCs and 'firsts'. The 2m and 6m stations will both run 1kW output to the 2 x 20-ele 2m x-pol array and 7-ele LFA for 6m. 50W and a 5-ele LFA on 70MHz should be available if they get permission. Working frequencies will be announced nearer the time. This activity is part of a trip by the group to several DXCCs and wanted squares in this region so expect a 'rover' type activity that you should be able to keep up to date through the ON4KST chat channel and various other online forums. More information to follow next month for other squares to be activated.

144MHz REVERSE BEACON. Andy, G4JNT (IO90) had a reverse JT65B beacon set up that was a temporary experiment to prove the idea of *WSJT* decode, auto monitoring and website upload. The receiver was running off an indoor loft omnidirectional antenna. Transmission into the reverse beacon could be made in either period on 144.7805MHz USB centre frequency. Decodes were posted at **[4]** and thanks to Paul, G4DCV for passing the information through the VHF/UHF Yahoo Group. Mark, EI3KD (IO51) was the best DX into it with Gordon, GI6ATZ (IO74), G3WKW (IO91) and others also copied. For more information please log on to Andy's website: this could be an excellent propagation tool.

BEACON INFORMATION. Another excellent source of beacon information is the beaconspot project run by the UK Microwave Group **[5]**. Detailed information and real time spots taken from DX Cluster nodes and ON4KST make this an excellent resource covering microwave and VHF/UHF beacons from 6m to 76GHz . A simple login/username/password is required however you may log in as a guest, but to show distance and bearings or to spot beacons, you need to register.

50MHz BAND PLAN. As we get closer to spring and the possibility of Sporadic-E propagation and a crowed band, I have been approached by a number of 50MHz operators to remind everyone of the band plan that was changed two years ago. There seems to be MGM QSOs still being made on the traditional 50.230MHz frequency. The RSGB website states "Activity between 50.300 and 50.400MHz is mainly using machine generated modes (MGM): 50.305MHz is the PSK centre of activity, 50.310-50.320MHz is used for moonbounce (EME) operation using JT65A and meteor scatter operation using JT6M can be found between 50.320 – 50.380MHz". The band plan was changed to try and give more space to a very crowded band when conditions are good. Also the 50.100-50130 DX window segment is still being used for inter UK and European contacts even during the UK Activity Contests. Please be aware this is an 'intercontinental' segment ie Europe to Africa, North America and so on. If there is any doubt on this band plan please consult the RSGB website **[6]**.

SIGN OFF. Many thanks to all contributors and correspondents' this month and let's hope for some good conditions and better weather for all. Please send reports in by the 3rd week in the month and please send in some SSB and CW reports!

WEBSEARCH

[1] www.on4kst.com/chat/start.php
[2] http://dx.camb-hams.com/
[3] http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=Thatcher
[4] www.g4jnt.com/JTModesBcns.htm
[5] www.beaconspot.eu/
[6] http://rsgb.org/main/operating/band-plans/vhf-uhf/50mhz-band/

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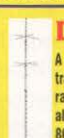
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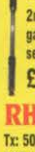
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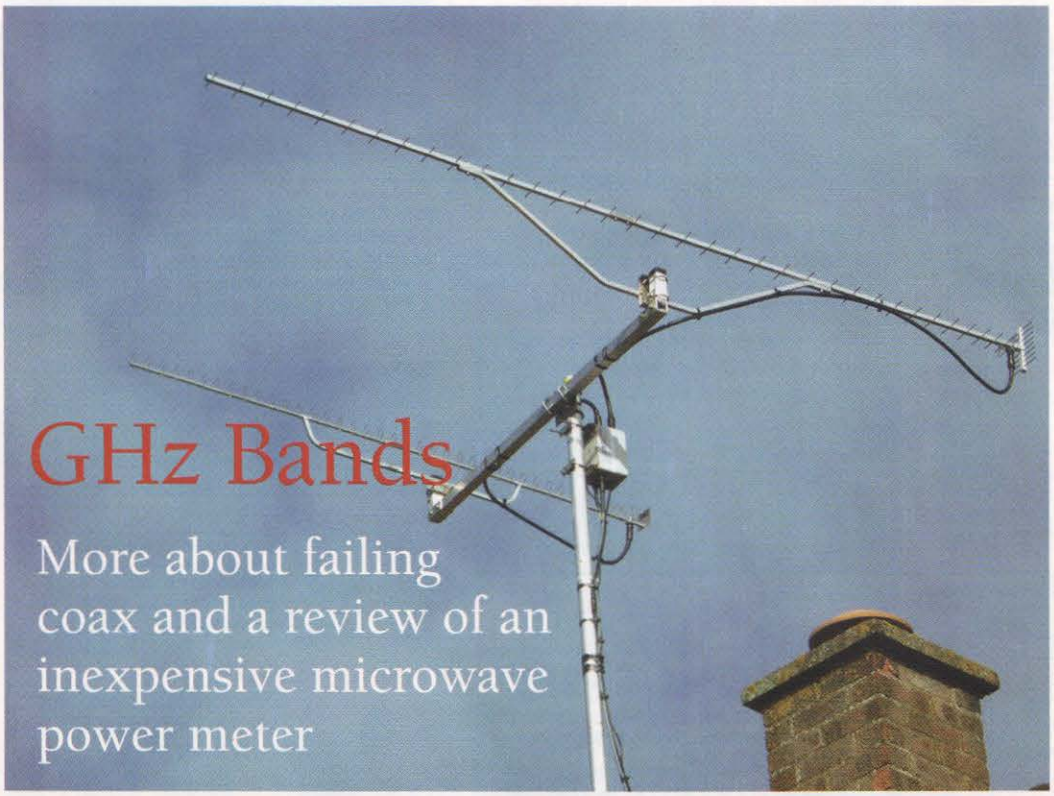


GHz Bands

More about failing coax and a review of an inexpensive microwave power meter

PHOTO 1: G4BAO's new antenna system for 1296 and 2320MHz.

CHECK ANTENNAS BEFORE ERECTING. I'm pleased to report that I'm now back on the 'low bands' from the Fen Edge. My new 1296 and 2320MHz antennas (**Photo 1**) went up just before the February storms hit and I'm pleased to say that they survived. I'm using the common Tx feeder system described last month with a pair of G4DDK VLNAs at the masthead, but with separate RG223 receive feeders for each band. My 10/24GHz dish took a battering though and I had to get up a ladder and straighten the pole, which had started to lean over due to a bend in the bottom bracket. I'm pleased to say that the 10 gauge 2 inch (50mm) alloy pole remained unbent. My 44-ele Yagi for 1296MHz came from Wimo **[1]** and it's worth mentioning some of the issues I had with it out of the box. Once assembled, I measured its return loss at 1296.2MHz and it was a disappointing 15dB (1.4:1 SWR) with no obvious dip in the band. The spec should be better than 1.2:1 over 1240-1300MHz. After speaking to Sam, G4DDK, I found that he had similar issues with both of his 44-ele antennas and, on his advice, I tried bending the dipole a little. I found that I could get a good 26dB return loss at 1296.2MHz by bending the outer ends of the folded dipole backwards slightly, while keeping the centre where it was, resulting in a slight V shape pointing forwards. It now turns out that Sam and I are not the only ones who've had issues with this range of antennas. Gordon, GI6ATZ emailed me to say that he's now had four separate dipole assemblies from Wimo. The original one that came with his first 67-ele in 2009/10, when inspected in 2012, was showing signs of water ingress and the SWR was very poor, >2:1. After "much arguing", a replacement was received free of charge but, like my 44, it had a poor SWR from the outset. It's more than disappointing to see a commercial antenna like the Wimo have such a poor match at 1296.200 out of the box and I wonder how many people using it are unaware of how bad the SWR might be? Many will just assemble them and put them on the air without doing any measurements. After bending the dipole, I sprayed it with conformal coating **[2]**, so we'll see if I hit any long-term problems.

A USEFUL LOW COST MICROWAVE POWER METER. Last year I mentioned a USB RF power meter designed by Jason, G7OCD and sold by xeropage **[3]**. I put it through its paces in my test lab and, for the price, it does seem like very good value. **Photo 2** shows the contents of the box: the PCB comes fully assembled and tested; it just needs to be fitted in the small tinplate box. It is specified from DC to 9GHz with a power range of -50 to 0dBm, with the option to add external attenuators to extend the upper range. It also measures quite well with lower accuracy in the 10GHz band. I followed the simple setup instructions for the PC software and calibrated it as described against my HP power meter. Calibration is optional as the meter does work (to lower accuracy) with the default calibration values. Return loss of the meter was better than 20dB up to 1296MHz, but it fell away above this and due, I think, to the tinplate box 'waveguide' effect it went through a resonance at around 7GHz. Power accuracy was worst at this frequency, obviously due to this effect, but in general it was within 2dB of my reference. I raised this with Jason and he assured me that when the unit was tested outside the box as a bare PCB, not only was return loss more consistent but also the reading errors were better, about ±1dB across the band to 9GHz. I would recommend this as a fine, inexpensive alternative to a professional power meter, but for use above 1296MHz I would advise the use of a good 10dB attenuator in front of it to give the meter at least a 20dB return loss or better. I also suggest you get it spot calibrated at the amateur band frequencies at one of the UK Microwave Group Round Tables **[4]**. It might also be worth experimenting with some microwave absorber in the box lid to dampen the resonance. Many professional power meters have an internal attenuator to improve the return loss but, by not fitting one, Jason has given us the ability to trade between good return loss and minimum power level. If anyone wants a copy of the detailed measurements I took, please e-mail me.

COAX FOLLOW UP. My February 'check out your coax' topic brought a huge response, both direct to me and on the various email reflectors. One amateur, who is also a professional user of cables in the marine survey marine oil and gas exploration industry, told me that the problems with foiled cables are not limited to amateur radio. They've been using low cost ECOflex foiled cable for temporary feeder installations instead of the more rigid professional ones like FSJ4-50B and LDF4-50A. After about 6 months of usage he identified the first failure mechanism; the foil layer had a tendency to creep back from the connectors when the cable was overstressed. At the same time he also found that a better impedance match from the connector to the cable could be had if the foil layer was not cut at the 'top-hat' ferrule 90° bend. Instead they left the foil long enough to reach over the edge after being split in eight segments and laid radially out over the flange of the ferrule. (I have seen this technique used when I've opened up professionally fitted Andrew connectors.) With the foil now anchored in the connectors, during the course of the next year or two a more puzzling failure mechanism came to light, which was traced to radial splits of the foil screen. These most

often occurred just beyond the connectors or about 20-50cm back from them. Here the cables were subjected to pulling or very tight bends below the antennas, along with associated wind vibrations.

Comparing the consumer grade cables to other cables with foil outer conductors like the Belden 9913 types and Times Microwave LMR-400, there are types with both solid and stranded centres, but they use an aluminium foil instead of copper. Due probably to the stiffer centre conductors there haven't been noticeably more failures with these cables. Paul, G3YDY sent me **Photo 3** showing a failed cable from around his rotator that caused intermittently high VSWR such that it would shut down his linear. What was surprising was that it had failed even with a very large rotator loop. For the replacement, Paul fitted N connectors on a length of ECOflex 15 Plus. He noticed that the new cable had even less copper braid than his old ECOflex 15. He did a few basic tests with a Tx and a Bird 43 directional power meter, then he enlisted the assistance of a friend's professional RF measurement laboratory. Using a network analyser, the loss of his length at 432MHz was found to be 1.43dB and return loss was 40dB, showing that that the new cable was pretty much as per spec. Paul stressed to me the importance of the accurate fitting of good quality coaxial connectors, and I agree with his observation on connectors that "there is some terrible rubbish out there". Measurement systems and techniques are crucial; a crude test with a power meter and a load is not really good enough to start criticising manufacturers of cables. The UK Microwave Group has a number of members in their technical support team [5] who have good 'top-end amateur standard' test equipment (and by this I mean professional equipment, but not necessarily with a current calibration certificate) who will be happy to help make more meaningful measurements.

PHOTO 2: The xeropage USB power meter.

ACTIVITY NEWS. February was another dire month for Tropo on the microwave bands, due to the severely disturbed atmosphere caused by the seemingly endless storms rolling over the UK. There were no UK rain scatter QSOs reported despite my copying GB3MHX and PI7RTD on 10GHz here and QSOs reported from France and Germany. I guess most people would have their antennas lowered and be looking worryingly skyward! In Germany DF9IC (JN48) continues to show what can be done with aircraft scatter on 1296MHz, working Swedish and Danish stations at over 800km. I had aircraft scatter QSOs on both 1296MHz and 2320MHz with Andreas, DJ5AR (JN49CV) and Barry, G4KCT (IO93LW) and it was interesting to note just how much better 1296 is than 2320. With Andreas I competed the 23cm QSO in a couple of overs, but the 13cm QSO took some 15 minutes, mainly waiting for the right plane and with very short reflections.

There was plenty of activity in the February 1296MHz UKAC, with the leading Open station G8OHM (IO92) posting 66 QSOs and 15 square multipliers and Restricted leader, G4NBS (JO02) posting 46 QSOs and 14 multipliers. With my first 1296MHz UKAC entry I managed 34 QSOs including a new square for me with an aircraft-assisted QSO with G8PNN (IO95EF) but just 10 multipliers. I need to polish up my technique to increase the multiplier amount as I could have worked many more. I find juggling the time between calling CQ, watching KST, turning the beam and tuning for activity very difficult at the moment, but practice makes perfect and I plan to do better next time!

In warmer climes, after many weeks working on his 10GHz system Ray, 9H1RA in Malta made his first 10GHz QSOs with his new DB6NT based equipment. On the receiving end, scattered all over the island were Noel, 9H1FX (home made equipment), Joe, 9H1VW and Fortunato, 9H1ES (using DB6NT based transverters). Mans, 9H1GB was also testing a 10GHz PLL LNB coupled to an Icom IC-PCR1000. Signals were strong – as to be expected given the size of the island – and Mans commented on how stable and sensitive the PLL LNBs are. Great to see such good 10GHz activity in Malta, sadly just out of reach from the UK (apart from via EME!) but quite possible from holiday activities in the Mediterranean area.

FOOTNOTES. The UK Microwave Group is holding its annual Martlesham Round Table and AGM on the weekend of 26 and 27 April. Details can be found at [6]. Highlights will include talks by Jan, PA3FXB about the rebuilding of the Dwingeloo Radio Telescope and by John, G4EAT about the successful mmWave operations that have been reported in this column. Unfortunately I'm going to miss it again as I'm joining the 2014 Camb-Hams' traditional Scottish Island activation GS3PYE/P. This time we're going to Lewis [7]. The location is The Decca, IO68UL [8] and we'll be there from 26 April to 3 May. As well as all the HF bands plus 50 and 70MHz I'm planning to take a small 23cm EME station with around 200W and 4x23-ele Yagis, which should be enough for JT mode contacts off the Moon and maybe even some CW with larger stations. Look out for us from this rare microwave square.

CORRECTION. Last month I incorrectly gave the locator of 10GHz beacon GB3PKT as JO02MT. It should have been JO01MT – apologies.

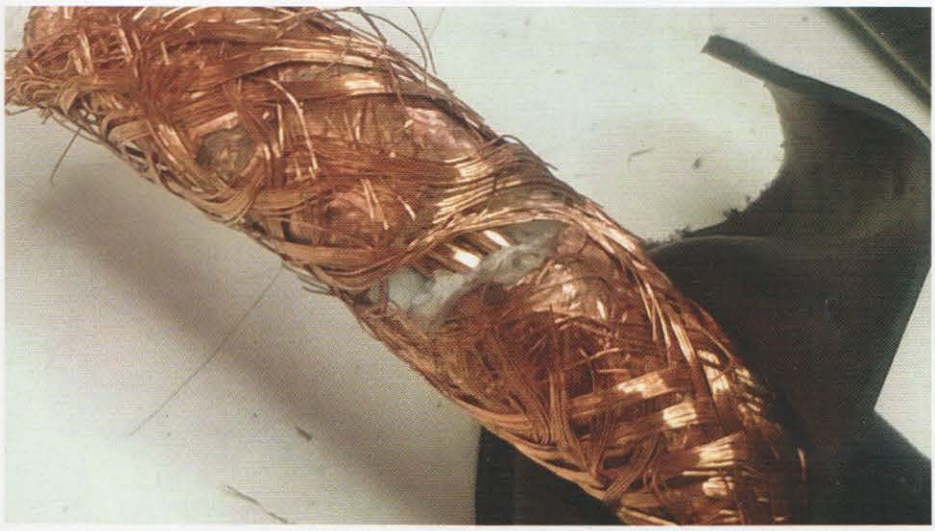
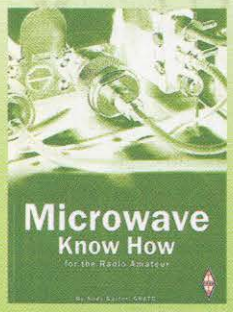


PHOTO 3: G3YDY's failed coax.

WEBSEARCH

[1] 44 element Wimo: www.wimo.de/yagi-antennas-shf-wimo_e.html#shf2344
[2] Conformal coating – Farnell order code 1765265
[3] xeropage USB power meter: www.xeropage.co.uk/powermeter.html
[4] UKuG Round tables – www.microwavers.org/events.htm
[5] UKuG members' tech support – www.microwavers.org/tech-support.htm
[6] UKuG Martlesham Round table and AGM – http://mmrt.homedns.org
[7] Camb-hams Lewis 2014 – http://dx.camb-hams.com/
[8] The Decca – www.thedecca.co.uk/

Satellites, Microwaves, VHF/UHF



Microwave Know How

Edited by: Andy Barter, G8ATD

Articles aimed at those who are interested in building equipment for microwave bands. Designs are from authors all around the world, keen microwave constructors themselves. This ensures that the all of the projects use modern techniques and up to date components. Included chapters:

- Antennas with designs for 23cm, 13cm, 6cm.
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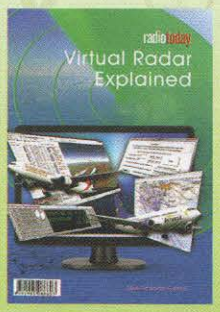

Virtual Radar Explained

By Mike Richards, G4WNC

This book covers the world of aeronautical Virtual Radar. The use of ADS-B by commercial air traffic has revolutionised the amount of information available to aviation enthusiasts.

From the early days of the wartime pioneers through to the very latest multilateration systems - it's all in the book. ADS-B and Mode-S signals get special attention with a detailed look at their message and transmission systems.

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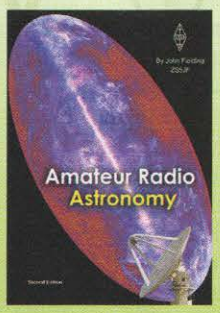

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2nd Edition

By John Fielding, ZS5JF

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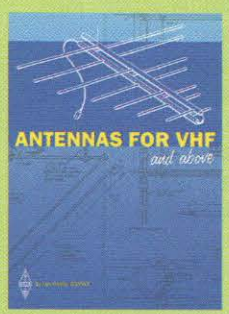

Antennas for VHF and Above

By Ian Poole, G3YWX

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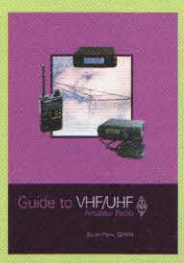

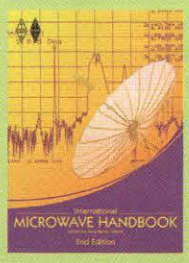

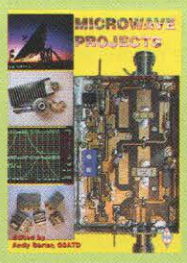

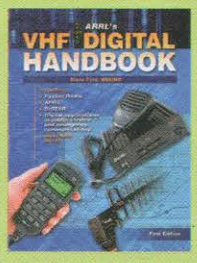

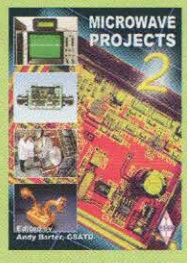

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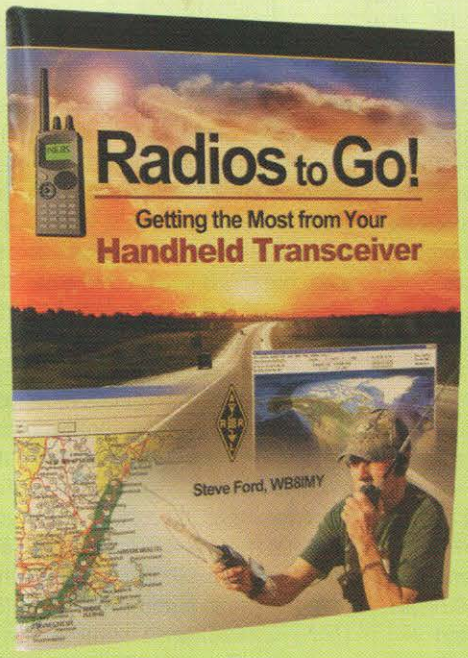

ARRL Radios to Go!

Getting the Most from Your Handheld Transceiver

by Steve Ford, WB8IMY

If you want to get the most out of your handheld transceiver *'Radios to Go!'* is the book for you. 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.

With even the user manuals telling the whole story of your radio transceiver, *'Radios to Go!'* lets you unlock the 'hidden' capabilities that are often not even described. 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 but it is covered in *'Radios to Go!'*. Readers will find topics covered include: Why Are They Called HTs? (And Which One Should I Buy?), the Care and Feeding of Batteries, Memories, Scanning, Antennas, Software Management and Microphones & Headsets. There is even coverage of the Alphabet Soup: CTCSS, DTMF and DCS and even IRLP and EchoLink. For those looking for more, the book also covers 'Expanding Your Horizons: APRS and Satellites'

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.

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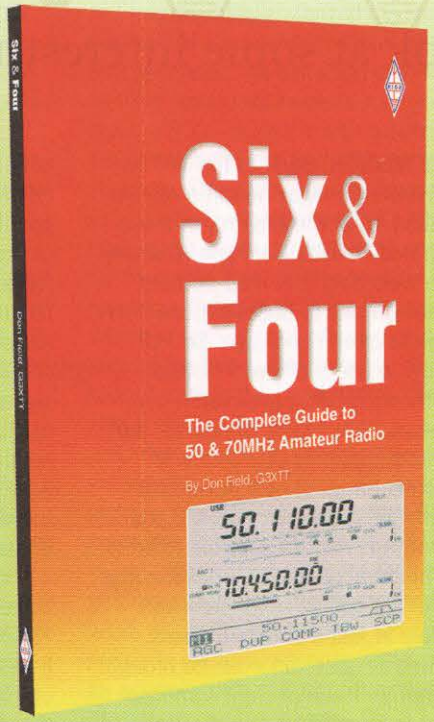

Six & Four

The Complete Guide to 50 & 70MHz Amateur Radio

By Don Field, G3XTT

Six Metres (50MHz) – the 'Magic Band' – has always been 'different'. It sometimes behaves as an HF band, with world-wide propagation, but at other times acts more like a VHF band, enjoying the benefits of Sporadic - E, meteor scatter and other occasional propagation modes. Because it has so many facets, 6m is both a challenge and an enigma and it draws amateurs from both the VHF and HF worlds. Six & Four is the complete guide to this fascinating band and the similar Four Metre (70MHz) band.

Six & Four is based on the hugely popular 6 Metre Handbook, which is credited by some with doing much to popularise the 50MHz band. This book has moved on and is intended as a handbook for both the 6m and 4m bands. It includes a host of new material on the 4m band and the 6m material has been extensively rewritten to bring it fully up to date. There are details of the new equipment that has become available, especially by way of software-defined radios. There have also been some significant advances made in antenna design and EME ('moonbounce') activity has increased. There are new challenges, made possible by technological developments such as the WSJT and capabilities for remote operation have come on apace. And there are many ways to stay abreast of band openings and activity, through smart phones and other technologies. Six & Four covers all this and a lot besides.

Six & Four is essential reading for all radio amateurs, especially those who want to try something new and different. There's something for everyone, from the beginner who has never been on 6m or 4m, to those who might already have 200+ countries confirmed on 6m! Both bands are a lot of fun, as this book shows!

Size 210x297mm, 288pages,
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Design Notes

A look at some interesting ICs

IC OF THE MONTH. Back in the 1970s *Practical Wireless* magazine ran a regular series entitled 'IC of the Month'. In those days integrated circuits were still relatively new, there were only a limited number around of much use to home constructors and they were often expensive. So *PW* showed how to use a different device each month, sometimes in several different ways. Nowadays, of course, the position has completely changed with manufacturers bringing new devices to the market almost daily, at prices that are insignificant. It is near-impossible to keep track of what may be useful, or even what looks useful but will be redundant and unobtainable in just a couple of years.

Old retired devices can even be brought back for another lease of life if someone is prepared to have just a few thousand manufactured at a time. The SL6270 VOGAD chip featured in this column last April is one such example. And then there are all the programmable devices: microcontrollers, gate arrays programmable logic, even programmable analogue and RF functions, where a few device types can fulfil an almost infinity of different tasks – something not even envisaged back then.

So, this month, I'm going to describe a few chips that few will have heard of, but I have used recently in an assortment of unrelated mini-projects.

LM7171 HIGH SPEED OPAMP IN A 10MHz DISTRIBUTION AMPLIFIER. The LM7171 is described as a "very high speed, high output current, voltage feedback amplifier". Each 8 pin chip contains a single opamp capable of working to several megahertz with an output designed for driving 50Ω loads. Being an opamp, it allows an amplifier to be built that has a precisely known voltage gain defined only by feedback resistors. When used in a non-inverting amplifier configuration the resulting amplifier has high input and low output impedances.

Figure 1 shows how the LM7171 device was used in a 10MHz distribution block, taking in a single 10MHz reference from a master oscillator and distributing it to several isolated 50Ω outputs. On a master reference distribution amplifier, good isolation between the different outputs is essential. Many items of test equipment can feed all sorts of noise and spurii back into to 10MHz reference feed. Several makes of frequency counter are particularly bad and I have an old commercial microwave synthesiser that feeds pulsing type interference back along its reference input. If such fed-back interference leaks across to other ports feeding more sensitive users with their 10MHz reference signals – like synthesisers forming local oscillators in receiving equipment – the spurii will appear on the received signals. After it has been multiplied up in frequency these spurii become seriously intrusive and unacceptable.

Isolation can be achieved by using a separate amplifier for each output port. In Figure 1, four identical amplifier stages with a high input impedance are all supplied from one low power input signal coming from the master frequency standard. Although each opamp is designed to drive 50Ω is it not a good idea to connect the outputs from opamps directly to output connectors for several reasons. The actual output source impedance of the chip (looking back into the pin) is very low, typically less than one ohm; it is effectively a voltage source. If this were shorted, overheating and possible damage to the chip could result. Also, if used to drive a long coax lead that is not properly terminated at the far end then all sorts of signal level anomalies can arise. (The issue with reference signals and odd lengths of coax described in February's design notes actually prompted this design). So the design is refined further. By connecting a 50Ω resistor in series with the output, a source impedance of this value is now defined and any resultant reflections from an improperly terminated load will be absorbed. Of course, there is a 6dB loss due to voltage division in the source terminating resistor and the 50Ω load, but this is easily compensated for by winding up the gain of the opamp buffers.

Now, with these extra resistors the total load on each opamp output is 100Ω, with the source termination in series with the load. As the chip is capable of driving 50Ω, why not connect two such outputs to each buffer stage? The isolation between these two resulting ports is not as good as between those driven from separate buffer amplifier stages. If we assume for the sake of argument an output impedance for the LM7171 of 2Ω, then isolation between the two ports driven from a single chip is of the order of 20.LOG(50Ω/2Ω) = 28dB. Not a massive amount of isolation, but adequate for those non-critical loads like frequency counters and timing. Critical loads can keep their own buffer stage.

Figure 1 also shows a few circuit details where care is needed. The opamps need to be DC biassed to mid supply if a single DC input rail is to be used. The mid-rail supply must be extremely well decoupled as any spurii present on the DC input could be transferred directly to the signal path – and that is the last thing we want! So multiple decoupling is used to make sure nothing gets through. Not shown on the circuit diagram, the 8V supply is itself derived from a well

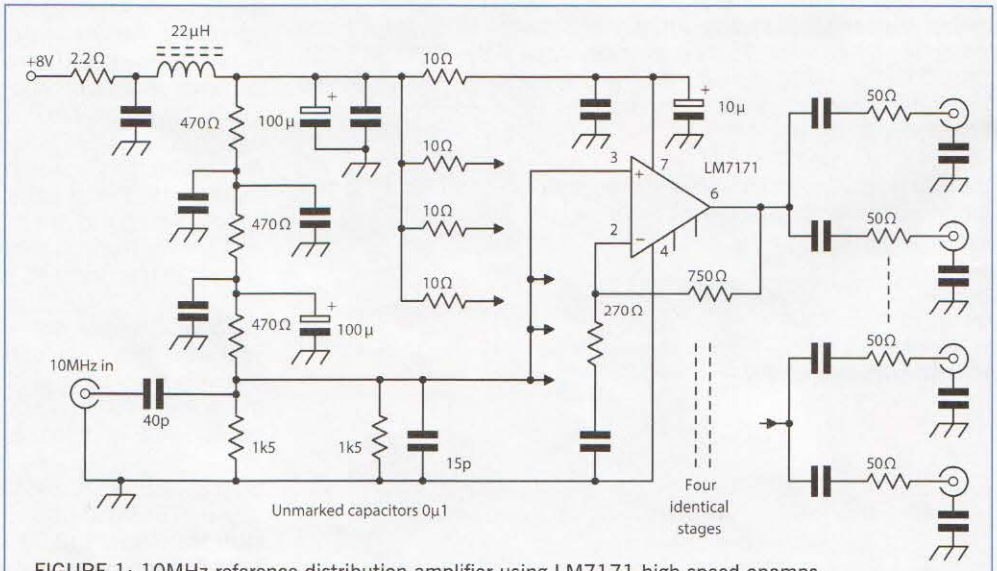


FIGURE 1: 10MHz reference distribution amplifier using LM7171 high speed opamps. A high level of isolation is achieved between output ports driven from different chips.

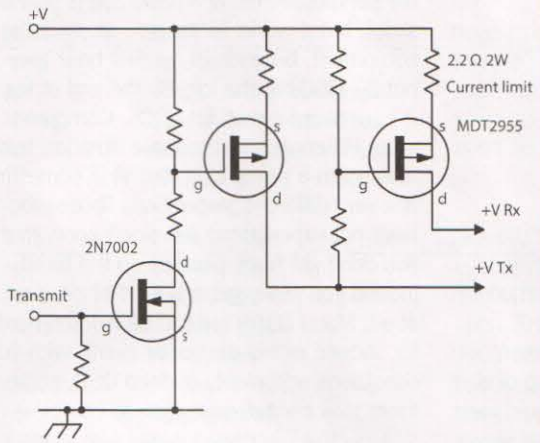


FIGURE 2: The traditional method of switching power rails between transmit and receive in many transceiver and transverter designs. Current limiting for protection from short circuits has been included.

decoupled voltage regulator running from its own plug top PSU. The outer of each of the eight output connectors is isolated from ground at DC, although remaining grounded at RF through coupling capacitors. This is to prevent hum or ground loops forming when several equipments are all supplied with power from a common 13.8V power supply. If even better ground loop isolation is necessary, a 1:1 transformer can be inserted.

This latest distribution amplifier has considerably improved the quality of signals received on my microwave transverters. Previously, when the test equipment rack was turned on, I could often hear hum and regular ticking noises on received signals. These were due to interference being fed back into the old simple passive splitter based 10MHz signal source and appearing on the locked LOs.

The LM7171 is available from RS Components [1] for around £2 each.

BSP452 HIGH SIDE DRIVER. Transmit / receive switching and control in home built equipment often involves switching positive supply rails between blocks of RF hardware. Normally this is performed with P-channel FETs or PNP bipolars in a circuit similar to that of **Figure 2**. Several additional components are needed for level shifting the control signals. Current limiting has to be included so that in the event of either Tx or Rx outputs being shorted to ground, or if electrolytic capacitors are used for supply decoupling further down the chain, the over current surges are limited to protect the series devices.

The BSP452 is described as a "smart high-side power switch" and is designed specifically for such applications. It is controlled from a logic level input, switching at an input threshold of around 2.5V and can switch up to 40V supply at up to 1A. It has built in current limiting, thermal protection and clamping of negative spikes (such as those from inductive loads like relays) and is short circuit proof. The device comes in a package with four connections and looks a bit like a surface mounted power transistor, except that the heatsink tab is the power supply input and is not connected to any one of the three other pins. **Figure 3** shows the vastly simplified version doing the same job. Farnell supply the BSP452 for around £1.70 each [2].

DS1267 DIGITAL POTENTIOMETER. Now, this is a chip I haven't actually used yet, but I'm still looking for a good application. The UK Microwave Group Chip Bank [3] has been donated a supply of these devices and they are available free to members of the Group. The DS1267 has a pair of 256-tap resistor chains, having a resistance of 10kΩ end to end. Any tap position can be selected via a set of internal CMOS switches, using serial data clocked into the chip via a three-wire SPI interface. There is access to both ends of the resistor chains as well as both wipers, making two independent digitally controlled potentiometers. There is also an additional pin that can be switched to either of the two wipers under control via the serial control word. This allows for a 512 tap potentiometer, or can be used for other applications.

One idea I did consider for this chip was for an audio / baseband mixer with an LO supplied from a digitally stored sinewave. If the potentiometer was used as the feedback resistor around an opamp the overall gain is then proportional to the resistance, and hence proportional to the value of the digital data clocked in. If a series of values were to be taken at regular intervals from a sine lookup table we have the digital part of a numerically controlled oscillator (NCO) – the heart of any direct digital synthesiser. By feeding these to the DS1267 the effect is then a multiplication of the input signal by the digitally generated sinewave.

I had originally envisaged this might form the basis of a simple digital third-method SSB generator. The first stage of this 'Weaver method' source [4] involves mixing voice band input at 300 – 3300Hz with a quadrature 1800Hz tone to give two I/Q baseband channels. The audio is folded back onto itself so it can be low-pass filtered at 1700Hz. Having two quadrature channels means the complete 3kHz audio spectrum can be reconstructed later on in the RF upconversion. With two separate potentiometers inside the chip for the two audio channels, all could be controlled from the same digital word for a low chip count solution.

Unfortunately, an annoying quirk of the simplicity of the DS1267 makes this technique difficult using a simple PIC controller. The DS1267 needs 17 bits in the digital control word; eight for each of the two potentiometers with the remaining one for the wiper select. The high speed SPI interface built into many microcontrollers is designed for control words of 8 bits, or a multiple thereof, so cannot be used. The 17 bit word would therefore require the clocking to be done in software. While straightforward to implement, this would not allow particularly fast operation. Even when using the PIC at its highest clock rate and by simplifying code as much as possible, it was impossible to do the clocking at a sampling rate for the NCO at much more than 10kHz. To keep alias products and spurii to acceptable levels, a clock frequency of 50 to 100kHz is needed. So that simplistic idea was a non-starter.

So, if you have any ideas for using these digitally controlled potentiometer chips in a practical and novel application, just let me know. If you are a member of the UK μWave Group, they are available completely free, including postage.

In future editions of this column, I will try to identify other ICs that may have uses in unusual or novel ways. If you have a favourite chip, or way of doing something that simplifies things, or is better than the 'usual' methods, please let us know.

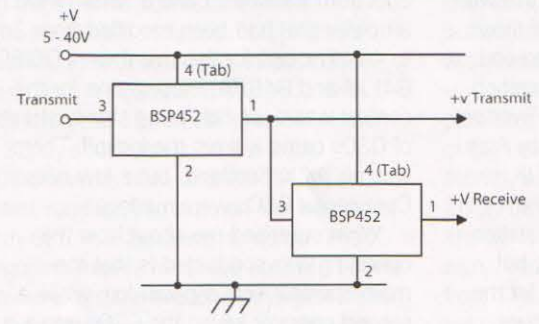


FIGURE 3: Simplified power rail switching using dedicated smart high side switches. These have built in current limiting and thermal protection, with logic level control inputs.

WEBSEARCH

[1] RS Components – http://uk.rs-online.com/web/

[2] Farnell – http://uk.farnell.com/

In both cases, type the device number into the search box to access information and download the datasheets

[3] UK Microwave Group – www.microwavers.org/

[4] Third Method, or Weaver, SSB generator: www.h4.dion.ne.jp/~ja5fp/weaver.pdf and http://en.wikipedia.org/wiki/Single-sideband_modulation

April 2014 • RadCom
Steve White, G3ZVW • e-mail: steve.g3zvw@gmail.com

Sport Radio

4m and 6m contesting, and out-of-band operation

Tiverton SWARC only put up a single 7-ele Yagi for the February session of the 4m Cumulatives due to the weather.

70MHz & 50MHz ACTIVITY. With the First 70MHz Contest taking place this month, I thought it would be interesting to take a look at how activity levels on the band have come along and how one of the leading lights in this event goes about winning. For many years there were ever increasing entries, but last year the trend was reversed. Adjudicator G4BVY reported this was "...probably due to the weather, which rendered a number of portable sites inaccessible." Nevertheless, in this short, Sunday morning contest, he added, "...there were 108 stations active from G, GM, GU, GW, ON and PA." That's an interesting observation in itself, because with 40 entries it means that only 37% of those who took part in some way submitted one.

The winning station in the Open section last year was the club station of the Tiverton South West ARC, G4TSW, operated by Alan Burnett, G0IFC and Tim Hugill, G4FJK. I asked Tim if he would appreciate the opportunity of telling me about their station and how they approached the event, but ended up being invited to visit them for the February session of the 4m Cumulatives and see them in action instead. Tiverton is about an hour's drive from where I live, so I accepted.

The first thing I ought to say about the location of the Tiverton club's QTH is that a lot of VHF enthusiasts would like one even half as good. It is right on top of a 240m-high (787ft) hilltop, just west of the Devon town. With clear views all around the location is the site of an old Royal Observer Corps lookout post. In the days of the Cold War an underground Nuclear Bunker was built there, but this is no longer accessible. In the mid 1980s the club members constructed their own shack/clubhouse on site, which to this day is used for weekly meetings as well as contesting. In a separate building they have a substantial diesel generator that was once used to run refrigeration facilities on a ship. On-air activities cause no EMC problems because there are no neighbouring properties, but QRM on receive has been experienced at times from arcing insulators on local pylons. Although the site is not large they have managed to squeeze three towers onto it. None of them are high, but given the exposed location and lack of space to guy a tower I think it's about as much as can be done safely.

Because of the exposed location the group make an assessment of the likely weather before a contest and then decide what antennas they are going to put up. In this instance the forecast was wet and very windy, so the day before the contest they met to put up a single 7-ele long Yagi. If the weather forecast had been less wild they would have put up a pair of 7-ele Yagis.

Inside the shack the equipment lineup was a Yaesu FT-2000 transceiver, a Spectrum transverter and a NAG-144XL amplifier that had been modified from 2m to 4m. The ops for this event were G0IFC, G4FJK and G4RRA. Propagation for the contest was dead flat, but a steady stream of QSOs came in from the kickoff. There was no DX to Scotland, but a few near Continental QSOs were made.

What surprised me about how the operating was conducted is that the main operator kept a paper log, while a second operator keyed the QSOs into a computer. This was running *Minos*, the logging software written by G4GJV. For anyone wishing to use *Minos*, it can be downloaded free at minos.berlios.de/. From my perspective using a paper log is very old skool, but it works for them... as does the equipment, because in the first hour they put 37 QSOs in the log. By the end of the 2-hour event it was 53 QSOs. Compared to an HF contest of the same duration this may seem a paltry total, but VHF contesting is a very different proposition. Those who have not experienced 4m won't know that you don't get huge pile-ups on the band, indeed you rarely get any kind of pile-up at all! Many QSOs have to be worked hard for, indeed in this particular event, with flat conditions and plenty of deep QSB, some of them took considerable time to complete.

How the Tiverton club will fare in the 4m Contest on Sunday 6 April remains to be seen of course, but one thing we can be sure of is that they will be active and competitive. They will probably also be active in the First 50MHz Contest that takes place a week later, and which they also won the Open section of last year.

Considering the number of people who have 50MHz equipment is so much greater than the number that have 70MHz equipment I was quite surprised when I looked at the results of last year's First 50MHz Contest and discovered that only 53 stations had entered. With sections for Single Operator Fixed stations as well as the Open section for portables and multi-op stations, I can't help but think there is room for a much larger number of entries. It's a bit early in the season for Sporadic-E propagation, but a brief spell – for some, at least – it isn't beyond the realms of possibility.

YOU'RE OUT! It's not often I find myself having to fulfil the role of legal advisor, but in the CQ WW 160m DX Contest at the end of January a few UK (and other European) stations were heard to call American stations below 1810kHz. In IARU Region 2 (Europe, Africa and Russia) the bottom edge of the 160m band is 1810kHz, but stations in Region 1 (North and South America) can transmit down to 1800kHz. Replying out of band to people who are calling CQ is bad enough, but in a previous American-administered 160m contest a G station was also heard calling CQ below 1810kHz. Both of these constitute illegal operation and, to quote G3WRR in a recent *Contesting Newsletter*, "failure to comply with licence conditions may result in the need for uncomfortable explanations to the UK licensing authority".

THIS MONTH'S EVENTS. HF-wise this month is devoted to 80m. RoPoCo 1 is first, on Sunday the 6th. At 90 minutes in duration this may be a short contest, but make no mistake, its quite challenging. The maximum permitted power is 100W (no

RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Apr 6	RoPoCo 1 *	1900-2030	SSB	3.5	RS + full postcode received
Apr 7	80m Club Championships	1900-2030	CW	3.5	RST + SN
Apr 16	80m Club Championships	1900-2030	SSB	3.5	RS + SN
Apr 24	80m Club Championships	1900-2030	Data	3.5	RST + SN

RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Apr 1	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
Apr 6	First 70MHz	0900-1200	All	70	RS(T) + SN + Locator
Apr 8	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
Apr 13	First 50MHz	0900-1200	All	50	RS(T) + SN + Locator + Postcode
Apr 15	1.3GHz UKAC	1900-2130	All	1.3	RS(T) + SN + Locator
Apr 22	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
Apr 22	SHF UKAC	1900-2130	All	2.3 & up	RS(T) + SN + Locator
Apr 29	70MHz UKAC	1900-2130	All	70	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
Apr 5-6	SP DX	1500-1500	CW, SSB	1.8-28	RST + SN (SPs send Province code)
Apr 12	EU Spring Sprint	1600-2000	CW	3.5-14	Both callsigns + SN + Name (no RST)
Apr 13	UKuG Low Band #2	1000-1600	All	1.3-3.4G	RS(T) + SN + Locator
Apr 19	EU Spring Sprint	1600-2000	SSB	3.5-14	Both callsigns + SN + Name (no RS)
Apr 21	IRTS 2m Counties	1300-1500	All	144	RS(T) + SN (EIs & GIs also send county)
Apr 26-27	SP DX RTTY	1200-1200	RTTY	3.5-28	RST + SN (SPs send Province code)
Apr 27	BARTG Sprint 75	1700-2100	RTTY	3.5-28	SN

* HF Championship event; + VHF Championship event. For the latest RSGB contest info and results, visit www.rsgbcc.org.

Members of Tiverton SWARC in the shack that's used for weekly meetings and contesting.

QRP or high power categories) and the basic format is that in your first QSO you send your full postcode and for all subsequent QSOs you send the postcode you received in your previous QSO. If you receive a postcode that you know is erroneous (eg a corrupted version of your own), record it as received and give it to your next QSO partner 'as is'. Provided you are not the person to introduce an error, you'll get the points for the QSOs, because it is the accuracy of the exchange that is important. This is the SSB leg (and the second of this year's HF Championship series events). The CW leg will be in August. This month we approach the half way point in the 80m Club Championship series. I was going to say that any difficult propagation that those participating had to endure in the first month or two should by now be consigned to history because the evenings are light, but this year the sessions in the first month of the series (February) were characterised by excellent conditions, not just within the UK but to continental Europe as well. This month the first mode is CW, on Monday 7th. The SSB leg follows on Wednesday 16th and datamodes on Thursday 24th.

Moving on to VHF, the 2m UKAC is on Tuesday 1st. It is followed by the First 70MHz Contest that takes place on Sunday 6th. This event is a race to accumulate as many kilometres worked as possible, with no multipliers. We return to the UKAC series with 70cm on Tuesday 8th. The First 50MHz Contest on Sunday 13th differs from the 70MHz Contest the week before because it includes multipliers for countries, locator squares *and* postcode areas. Then it's back to the UKACs, with 1.3GHz on the 15th, SHF plus 50MHz on the 22nd, and 70MHz on the 29th.

Other events now; and the SP DX Contest runs for 24 hours on the weekend of 5th-6th. In it there are numerous entry categories, mainly for single ops. Multipliers in this one are the sixteen Polish provinces. For the contest each is given a single letter of the alphabet. The first of the year's four EU Sprint contests is the Spring CW leg on Saturday 12th. It's a 4-hour event with a rigid exchange structure of both callsigns, a serial number and your name (or nickname). One of the UK Microwave Group's Low Band contests takes place on Sunday 13th on 23cm, 13cm and 9cm. With the same rules of engagement as the CW leg, the Spring EU Sprint SSB contest takes place the following Saturday, the 19th. In each Sprint you'll have to engage in some band hopping, to make the most of changing conditions. The results on the contest's official web site haven't been updated for years, but the results of all the more recent Sprints are available on RK3AWL's site at http://rk3awl.ru/eusprint/. The IRTS 2m Counties Contest takes place on the afternoon of Easter Sunday, the 21st. There are awards for non-EI stations, but because this is seen mainly as a domestic event not many EIs beam towards the UK. This means those in Great Britain should not expect to work many stations, but equally it won't require many QSOs with Ireland to win! Having said that, GI stations are best placed geographically to pick up the awards offered for those outside of EI. The penultimate contest of the month, which takes place for 24 hours on 26-27th, is the SPDX RTTY. Send a report and serial number, but expect to receive a signal report and single-letter province code from SPs. The multipliers for this contest are continents, countries and provinces. Finally, the BARTG 75 Baud Sprint runs for four hours on Sunday 27th. The contest exchange is a serial number only.

Book Review

International prefixes and tales of a wartime Radio Officer

RSGB Prefix Guide 11th Edition

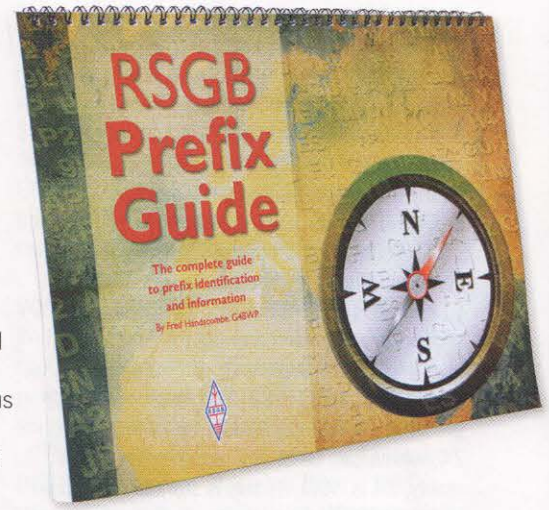
Compiled by Fred Handscome, G4BWP

Billed as "the complete guide to prefix identification and information", this book is an absolute must-have if your radio ambitions extend much beyond inter-G working. Now in its eleventh edition, this version contains the latest updates and revisions from around the world. Although G4BWP compiled the Prefix Guide, he does also gratefully acknowledge assistance from Alan, 5B4AHJ and the *Club Log* team, Steve, PJ4DX, Joe, WA6AXE and information sourced from the Daily DX published by W3UR.

Major changes include the allocation of E6 to the Pacific island nation of Niue and of Z8 to the newly-formed nation of South Sudan. The text also notes the deletion of one DXCC entity, Malyj Vysotskij Island, after its lease from Russia ended.

One piece of advice I was pleased to read was "WFWL" – work first, worry later – meaning that if you hear an unfamiliar prefix you're better off getting it in the log and only *then* using the Prefix Guide to work out precisely how rare an entity you've worked! I think the RSGB Prefix Guide is an essential operating aid, particularly for newcomers to amateur radio who don't automatically know that, for instance, a T2-series callsign hails from Tuvalu or KG4 signals the Guantanamo Bay area – one that, perhaps not surprisingly, is not amongst the most commonly-heard callsigns on the planet.

This certainly is a very comprehensive book. Not only does it cover the basic information you'd expect – a world-wide list of prefixes – it also has a lot of information on things like DXCC Entities (including deleted ones), ITU Zones (in prefix order) and a comprehensive IOTA island group short title list. In addition, there are details of awards programmes by RSGB (for HF and 6m), *CQ* magazine WAZ and Field awards, plus indispensable information on DXCC including the essential prefix/band checklist.



As with the previous edition, this book is spiral-bound so that it will lay nicely flat on your shack table.

Wherever you are in the world, whatever your experience of amateur radio, this is one of the books that you really should have at your fingertips when trawling the bands. Recommendations just don't come much higher than that.

ISBN 978 1 9050 8695 5
80 pages, 210 x 297mm
Non Members' price £9.99
Members' price £8.49

The Radio Officers' Association

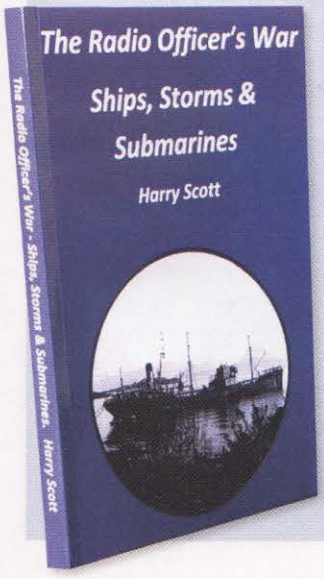
GUEST REVIEWER: Tony Selman, Chairman, The Radio Officers' Association

The Radio Officer's War: Ships, Storms and Submarines

by Harry Scott

The RSGB asked me to review this book because of my historic Radio Officer background, I agreed with pleasure and what a pleasure it turned out to be.

The story concerns Radio Officer Ian Waddell from Galashiels in the Scottish Borders and the book is based on Ian's own journals, plus correspondence between family members, which the author Mr Scott has extensively researched and stitched together into a compelling read. The book is excellent in my opinion because not only is it about a Radio Officer (R/O) but also about WW2, both subjects in which I have a great interest. It is possible that not all RSGB Members will have the same level of interest but in my opinion this should not stop you buying the book.



Ian set off to take his Postmaster General (PMG) Certificates at Leith Nautical College but with the advent of war and the cancellation of 1st and 2nd Class PMG's he ended up with a Special Certificate, as did so many wartime R/O's. The book is most informative and a fascinating insight into being a R/O, who was employed by Marconi Marine, and at sea in WW2. There are numerous graphic tales of appalling Atlantic weather, the constant threat of submarines and the day to day operational duties of a seagoing wartime R/O. The book includes a superbly described, but harrowing, rescue of crew members from a torpedoed warship. I also found the book gave excellent descriptions of the love of, and for, his family members, plus the trials and tribulations of life in general, shortages, travel problems etc.

Ian Waddell was undoubtedly very intelligent (he was a Radio Officer after all!) and his diary is also a fine reflection of the time. Surprisingly to me there are a lot of photographs that he took of his time on various ships because I was under the impression that photography of this nature was forbidden. His writing style was indicative of the time but his literacy shines through.

It is made clear on the cover of the book Ian does not survive the War. At the end I felt I knew him and was saddened by his loss. He was a Radio Officer I would have been proud to have known.

Unhesitatingly recommended.

ISBN 978 1 4936 9721 2
192 pages, 152 x 229mm
Non Members' price £9.99
Members' price £7.49 (25% off)

April 2014 • RadCom

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Highs and Lows of the the ZS6BKW

Revisiting a versatile multiband wire antenna for HF

BACKGROUND. The ZS6BKW multiband dipole evolved from the G5RV designed by Louis Varney in 1958 whose callsign, as a result, will be forever famous. Following that well-established naming tradition, my adaptation of the G5RV has become known as the ZS6BKW; that was my callsign when I designed it in the early 1980s.

The configuration of the ZS6BKW is shown in **Figure 1**. The dipole radiator is L1, of feed point impedance Z1; the series section impedance matching transformer (to give it its formal title), with its characteristic impedance of Z2, is L2. The lower end of L2 presents impedance Z3 to coax of impedance Z4, which can be of any required length. In reality, Z4 is 50Ω, as this is standard practice in all modern radio systems. A computer-based prediction technique indicated that optimum performance will occur if the antenna system has the following dimensions: L1 = 28.5m, L2 = 13.3m x the velocity factor of the line with Z2 = 400Ω. None of these is especially critical. Changes to the lengths of L1 and L2 by a percent or so either way will not seriously affect performance, while Z2 between 300 and 400Ω will work, though the higher values are preferable. Even 450Ω could be used but it must be appreciated that Z2 is a key element in the matching process and the optimum match occurs with a value rather lower than that. A 1:1 balun should be used between L2 and Z4.

The mechanism of operation of the antenna was described in [1] and [2]. With the dimensions shown, the ZS6BKW will produce a better than 2:1 VSWR on the 50Ω cable over significant portions of the 40, 20, 17, 12 and 10m bands without any additional impedance matching or antenna tuning. It does not match on 80, 30 or 15m. The reasons are to be found in the complex relationships between the lengths of L1 and L2 and its characteristic impedance Z2, and the impedances existing at the centre of L1 on the harmonically related amateur bands across the HF spectrum. The original G5RV antenna, which yielded <2:1 VSWR on just 14 and 24 MHz when used without an ATU, provided the starting point in an analysis that led, ultimately, to the values in the ZS6BKW.

GAINS AND LOSSES. The part of the ZS6BKW antenna that does the radiating is L1. It is not a resonant length on any amateur band. But then, resonance was never a requirement for efficient or, indeed, effective radiation from any antenna. What is important is that all the power that reaches the antenna should be radiated. This requires that its radiation resistance must be dominant. Hence L1 must not contain any other resistance save for that that due to its inherent conductivity. Treated entirely on its own, a 28.5m length of copper wire with a diameter sufficient to cope with its own weight and flexing due to the wind (around 1mm is sufficient if it's hard-drawn copper) will exhibit a radiation efficiency of between 98 and 99% across the HF bands. Though the antenna is very efficient, the overall antenna system efficiency depends on the power lost within the L2 matching section and even within the 50Ω coax to the transceiver.

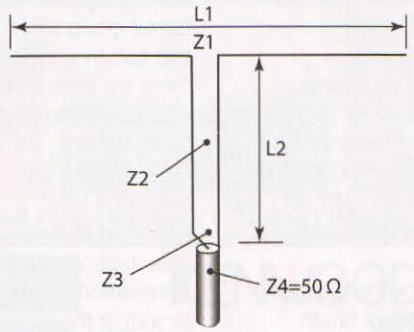

FIGURE 1: General arrangement of the ZS6BKW antenna.

All transmission lines consume some power. If they're severely mismatched then that power loss can increase significantly. It's all to do with the construction of the line, especially the type of dielectric surrounding it, and the fact that standing waves cause significant peaks in the voltage and current along its length. At those peaks the losses increase markedly due to increased loss in the dielectric and the conductors. Coax cable with a solid dielectric is more lossy than the semi air-spaced variety, while open-wire line with its air dielectric has the least loss of all. Open wire line is by far the most efficient transporter of energy between source (Tx) and load (antenna).

Though it is the VSWR on the line that directly affects its losses, what is sometimes overlooked is the fact that the VSWR is not necessarily constant along its length. Only if the line has no loss at all can we assume it to be constant from end to end, and approximately so for very low losses. This is by no means the case when the line is both lossy and the mismatch is severe. The VSWR will then be much higher at the load end than at the input end so measurements made at just one point on such a line can be most misleading.

The loss on a mismatched transmission line can be calculated if we know the VSWR at the load end and the intrinsic loss (at the frequency in question) of the perfectly matched line. Calling these two quantities *S* and *L* respectively, we can find the total loss L_t on the mismatched line with the following expression:

$$L_t = \frac{(S+1)^2 L^2 - (S-1)^2}{4SL}$$

where $L = 10^{L_m/10}$ and L_m is the line loss *in dB* when it is matched. That frequency-dependent figure is always quoted in the cable manufacturer's specifications. Note that the value obtained for L_t from this equation is not in decibels but can easily be written as such since L_t (dB) = 10 log L_t.

Applying this formula to the ZS6BKW with its two transmission lines, L2 and Z4, produced the results given in **Table 1**. The load impedance seen by L2 is the value at the centre of L1, which is readily calculated using NEC. I used *EZNEC* with the antenna at 10m above typical rural ground with a conductivity of 5mS/m and a dielectric constant of 13. The line used for L2 was semi-air spaced with a loss of 0.125dB/30m at 7MHz. A most useful program for carrying out all these simple but tedious calculations was written by W9CF [3].

It is worth noting that despite the severe mismatch in some cases the loss on what is essentially an open-wire line is quite insignificant, only exceeding 1dB when the VSWR was 53:1 at 3.5MHz.

To determine the VSWR and from it the losses on the 50Ω coax requires a knowledge of the impedance at the input of the L2 matching section. This is provided by the *EZNEC* program and appears in **Table 2** as Z3 along with the calculated VSWR and losses

TABLE 1: Antenna impedance, VSWRs and loss on the L2 matching section of length 12.5m, velocity factor 0.94; Z2 = 400Ω.

Frequency (MHz)	Z1 (Ω)	$VSWR_{o/p}$	$VSWR_{i/p}$	Loss (dB)
3.5	20 -j565	53	44:1	1.4
7.1	300 +j785	7.1	6.9	0.14
10.1	4387 -j580	11.2	10.4	0.37
14.2	102 -j445	8.8	8.2	0.35
18.1	409 +j 854	6.3	6.0	0.24
21.2	2464 -j2128	10.8	9.7	0.49
24.9	120 -j345	5.9	5.6	0.30
29.0	628 +j972	5.8	5.4	0.29

TABLE 2: Z3 at matching section input (L2), VSWR and loss on 15m of RG213 and RG58 coax.

Frequency (MHz)	Z3 (Ω)	VSWR	RG213 loss (dB)	RG58 loss (dB)
3.5	6.7 +j12.5	7.9	0.45	0.93
7.1	56.7 +j2	1.1	0.27	0.57
10.1	430 +j1256	82.3	6.1	8.8
14.2	46 +j4.3	1.1	0.39	0.85
18.1	64 +j7.5	1.3	0.47	1.0
21.2	661 +j1503	82.2	7.4	10.3
24.9	69 +j0.7	1.4	0.57	1.2
29.0	70 +j12.8	1.5	0.62	1.3

TABLE 3: Total antenna system loss and efficiency for ZS6BKW fed with RG213 or RG58 coax.

Frequency (MHz)	RG213 L(dB)	RG213 η(%)	RG58 L(dB)	RG58 η(%)
3.5	-2.1	62	-2.5	56
7.1	-0.45	90	-0.75	85
10.1	-6.4	23	-9.2	12
14.2	-0.84	82	-1.34	73
18.1	-0.83	83	-1.33	74
21.2	-7.9	16	-10.5	9
24.9	-1.02	79	-1.6	69
29.0	-0.97	80	-1.7	68

TABLE 4: Loss with nearly-resonant half wave dipoles at 10m above rural ground when fed by 15m of 50Ω coax.

Frequency (MHz)	Z_{ant} (ohms)	$VSWR_{opt.}$	RG213 L(dB)	RG58 L(dB)
3.53	52 +j0.9	1.04	-0.26	-0.46
7.15	80 -j5.6	1.6	-0.37	-0.70
10.14	85 -j5.7	1.7	-0.46	-0.88
14.10	74 -j2.3	1.5	-0.50	-0.97
18.13	64 -j1.4	1.3	-0.58	-1.14
21.20	70 -j3.0	1.4	-0.61	-1.20
24.80	78 -j3.0	1.6	-0.68	-1.34
28.50	75 -j2.4	1.5	-0.71	-1.41

that would exist on RG213 and RG58 cable. The length of coax between the foot of L2 and the transceiver was arbitrarily assumed to be 15m. Other lengths can be handled commensurately.

In this case it is clear that the loss on the coaxial cable is considerably more sensitive to the VSWR, with both the 10MHz and 21MHz cases being intolerably high. On its intended frequencies, however, the ZS6BKW suffers just over 1dB of loss on its two highest frequencies if RG58 coax is used and never more than 1dB on any frequency if the heavier RG213 is used.

The losses on the two transmission lines (L2 and the coax) now combine with those of the antenna to produce the total antenna system loss *L* in dB and, since loss and efficiency η are related by

$$\eta = 10^{-L(dB)/10} \times 100\%$$

we can also represent that as the total antenna system efficiency. Hence the system losses are given by the sum of its parts, thus $L(dB) = L_{ant} + L_{L2} + L_{coax}$, while its overall efficiency is $\eta = \eta_{ant} \times \eta_{L2} \times \eta_{coax}$. Table 3 shows these when either RG213 or RG58 coax are used.

It is instructive to compare the total antenna system loss of individual half wavelength dipole antennas when each is fed with similar 15m lengths of coaxial cable. Again it was assumed that they were 10m above rural ground while their lengths were adjusted to produce an optimum match to the 50Ω coax. Once again *EZNEC* was used to establish those details while W9CF's routines produced the loss figures. *Table 4* shows these results.

To put these loss figures into context, a loss of 1dB represents an efficiency of about 79%.

It is clear that the total system losses incurred by the ZS6BKW on its optimum frequencies exceed those of the equivalent matched dipole by only a fraction of a dB, which is clearly of no consequence at all. Such differences would be imperceptible under operating conditions and may well be considerably offset by the greater gain of the ZS6BKW, at least in certain directions. Since gain G and directivity D are related by the system efficiency simply as $G = \eta D$ or $G(dB) = \eta(dB) + D(dB)$, it is obvious that the ZS6BKW comes very close to realising its maximum gain in those favoured directions.

TABLE 5: Maximum voltage on L2 at 1kW input and minimum conductor spacing to prevent flashover.

Frequency (MHz)	V_{max} (rms)	D_{min} (mm)
3.5	4195	5.9
7.1	1685	2.4
10.1	2117	3.0
14.2	1887	2.7
18.1	1588	2.3
21.2	2079	2.9
24.9	1536	2.2
29.0	1523	2.2

VOLTAGE BREAKDOWN AND FLASHOVER.

Will the ZS6BKW, constructed with none-too-special components, withstand a kilowatt of power? A few more calculations provides the results summarised in **Table 5**.

Dry air at normal temperature and pressure (NTP) breaks down when the electric field strength exceeds about 3MV/m. Water droplets (eg due to rain) will lower the breakdown field strength and for a droplet diameter greater than 1.4mm the threshold drops to 1MV/m. Hence we calculate the minimum spacing D_{min} necessary between the conductors to avoid breakdown, as $D_{min} > (V_{max}(rms)/710)mm$, where V_{max} is the maximum voltage on the transmission line in wet weather. The voltage (and current) peaks along a mismatched transmission line can easily be calculated – both in magnitude and position. It turns out that the maximum voltage on a line of characteristic impedance Zo is given by

$$V_{max} = \sqrt{VSWR \times Zo \times P_L}$$

if the power dissipated in its load is P_L. That voltage is clearly affected by the degree of mismatch on the line as indicated by its VSWR.

For the ZS6BKW at 10m above ground, matching section L2 carries the largest voltages since both its characteristic impedance and VSWR are considerably higher than those of the coax. Table 5 shows the maximum rms voltages on every HF amateur band. It also shows the minimum spacing required between the L2 conductors in air to prevent flashover.

Conventional semi-air spaced or slotted parallel wire line has a typical conductor to conductor spacing of ~20mm at a similar characteristic impedance to that of L2 here. So it is clear that there is no possibility of a voltage flashover at the power of 1kW into the antenna.

WEBSEARCH

[1] Computer-aided design of a multiband dipole – based on the G5RV principle", B A Austin, *RadCom*, August 1985
[2] An HF multiband wire antenna for sirgle-hop point-to-point applications, B A Austin, *Journal of the Institution of Electronic and Radio Engineers*, 57, 4, 1987, pp167-173.
[3] Kevin Schmidt, W9CF: http://fermi.la.asu.edu/wrcf/tran/

April 2014 • RadCom
John Welsh, G0NVZ • e-mail: johnwelsh_1@yahoo.co.uk

Moving On

Wooden construction – and a versatile crystal set

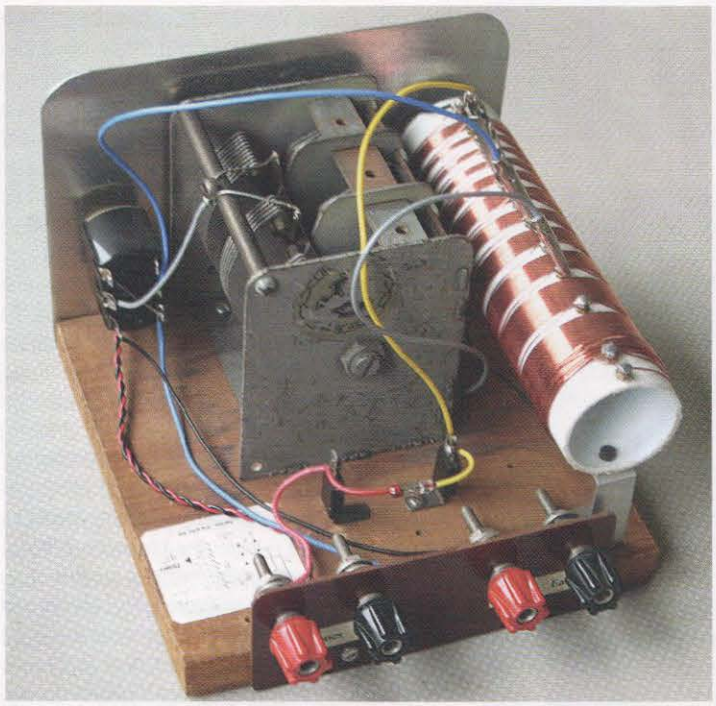

PHOTO 1: The Adaptable Crystal Set.

INTRODUCTION. A construction method I have used on several occasions for audio and low RF frequencies is one that many people might be reluctant to try because of the suspicion that undue losses might be incurred. This involves the use of wood, either as the base or 'bread-board', or in small strips as in 'tag' or terminal boards. This method takes us right back to the 1920s and 30s when home construction of wireless sets could be undertaken on the kitchen table with virtually no tools or test equipment. It was always known that wood was not as good an insulator as Bakelite or Ebonite (in the 20s and 30s), or the resin bonded laminates available today (early versions of which were known in the 1950s to 1980s as Tufnol and Paxolin). The question I set out to answer was: how good or poor was wood as an insulator when used in the way I had sometimes used it?

I had employed wood as the base board in several experimental circuits for the amateur LF band (around 136kHz) where, except for parts of the circuit where I needed a high Q, I considered the frequency was near enough to DC for most practical purposes. The method of construction I used was to tap small pins like nails into the wood and to solder the components between their heads. (One of the advantages of a flat wooden bread-board is that you can lay out the circuit almost exactly as in the circuit diagram and every component is easily accessible to a meter or 'scope probe).

MEASUREMENT. I decided to measure the DC resistance between small nails, similar to those I used in the circuits, spaced at various distances in different samples of wood. Partly because I suspected that there might be polarisation effects that would distort the measurements of resistance at low voltages and partly because I suspected that the resistances would be high, I chose to use a fairly high voltage (1400V) and directly measure the current that flowed. All measurements were made between pairs of 5/8inch (~16mm) nails spaced between 3mm and 27mm apart inserted into augered holes in the wood samples, all of which had been stored for more than five years in either my house or garage. I will not bore you with all the details of the measurements, but in summary, my findings were as per **Table 1**.

As only a small number of experiments were done it is difficult to generalise, but it seems that softwood has a higher resistance than hardwood, that drying for a long period indoors further raised the resistance, the resistance increases in a non linear manner with pin spacing, and that for DC and almost certainly for lowish frequency AC, the insulation resistance between the pins in this breadboard form of construction is high enough not to worry ordinary circuits of low or medium impedance.

CRYSTAL SET. As a matter of interest, I built a very adaptable crystal set and measured some voltages and currents that can be obtained in the St Albans area. By adaptable, I mean that I can tap the aerial, tuning capacitor and crystal almost anywhere on the tuning coil as well as being able to either series or parallel tune it. The best results were achieved when receiving Radio 5 Live on 909kHz using series tuning with maximum inductance and maximum capacitance in series, when the voltage on modulation peaks across the unloaded inductance reached 80V peak to peak. This high open circuit voltage collapsed of course when any current was drawn. The detected voltage, using a small signal germanium diode (the sort where you can see the cat's whisker through the glass), was 3.3V when 0.7mA was drawn, which would be sufficient to power the HF and reaction stages of a simple straight receiver. **Photo 1** shows the crystal set and **Figure 1** is its circuit diagram.

Circuit diagrams of crystal sets often show an RF bypass capacitor across the audio output, but I found that this made no difference to the loudness of the received signal, or to the selectivity, whether headphones or a small cabinet loudspeaker were used (via a suitable matching transformer). The signal strength from Radio 5 Live was quite adequate for comfortable listening by loudspeaker at a distance of about 3 feet (1m).

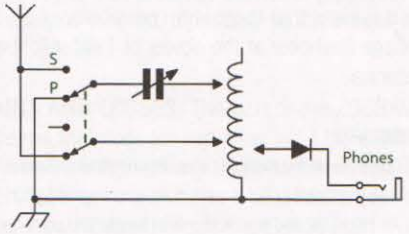

FIGURE 1: Circuit of series or parallel tuned Adaptable Crystal Set.

TABLE 1: Wood measurement results.

Softwood or hardwood	Spacing	Resistance	Storage
Soft	3mm	38MΩ	Garage
Soft	27mm	60MΩ	Garage
Soft	25mm	>150MΩ	House
Hard	3mm	12MΩ	Garage
Hard	24mm	38MΩ	Garage

ACKNOWLEDGEMENT. The material for this article was previously published in *Verulam News* and is used here with their kind permission.

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 of 4-6 July 2014 with the IOTA 50th Anniversary Convention.

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

Booking Agents: NICE Ltd, 7a Lupton Road, Thame, Oxon, OX9 3SE
Tel: 01844 263950 Fax: 01844 217938
niceevents.co.uk

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 May *RadCom* is 24 March and for the June edition it's 22 April. 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

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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
2 Tales from Tuvalu, Tom, GM4FDM
16 A retrospective on GM100RSGB, Bill, GM4ZNC
30 Amateur radio masts in residential neighbourhoods, Ralph, GM4SQO

Border ARS
Alex, GM8BDX, 01890 830 607
11 Club meeting

Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723,
4 Normal club night
16 On-air activity night

Kilmarnock & Loudoun ARC
Graham, MM3GDC, mm3gdc@btinternet.com
1, 15, 29 Construction/education night
3, 10, 17, 24 Construction
6, 13, 20, 27 Sunday club, 9am-1pm
8, 22 Club night, 7pm
21-25 DXpedition to Canna, EU-008

Lothians RS
Alan, GM3PSP, 0131 623 4580,
9 Surplus equipment sale at St Fillans
23 Low cost microwaves, Brian, GM8BJF and *WSPR*, Brian, GM4DIJ

Stirling & District ARS
John McGowan, gm0fsv@gm6nx.com
3, 10, 17, 24 Weekly club meeting
6, 13, 27 Construction, training, projects & operating, 10.30am till late afternoon

DEADLINES

The deadline for the May *RadCom* is 24 March and for the June edition it's 22 April

Gary, 2M0URN, a member of the Isle of Gigha Heritage Trust, visited **Kilmarnock and Loudoun ARC**. He is also a member of KLARC. Gary was presented with a plaque to thank the Trust for their continuing help with the GM7A IOTA contest DXpedition to the island. The photo shows Arthur, MM0DHQ, Graham, MM0GHM, Jason, GM7VSB, Peter, GM7AAJ and Gary, 2M0URN.

Members of the club will be visiting Canna, EU-008, from 21 to 25 April using the callsign MM0KLR. Activity will be on the 2 to 160m bands using SSB, CW and digital modes. QSL cards should go via the bureau or direct to MM0GHM and E-QSL will be used.
In December three members of the club attained their Foundation licences. Tony, MM6ZDR, Alex, MM6EDB and Willie, MM6WBP. The club wish them all the best with their callsigns. The photo shows MM6ZDR and MM6EBD.

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

REGIONAL MANAGER: DENNY MORRISON, GM1BAN, RM2@RSGB.ORG.UK

Aberdeen ARS
Fred, MM0ODL, 01975 651 365
3 Junk sale
10 Construction evening
17 Quiz night
24 Morse and on the air

REGION 3: NORTH WEST

REGIONAL MANAGER: KATH WILSON, M1CNY, RM3@RSGB.ORG.UK

Bolton Wireless Club
boltonwireless@gmail.com
14 WAB, Bill, G4CFP

Chester & DRS
Bruce, M0CVP, 01244 343 825
1 Operating evening
8 Committee meeting
15 AGM
22 Closed
23 Quiz with Wirral and District at Irby
29 The quadcopter

Chorley & DARS
Mark, G1PIE, procter_family@sky.com
13 GB1LCT, CASHOTA Monuments month

Stockport RS
Nigel, 07973 312 699, info@g8srs.co.uk
1 Antenna modelling part 2, Carsten, G0SYP/DL1EFD
6 Attending the Blackpool (NARSA) Rally
15 Computer logging explained, Peter, M1PTR
22 On the air plus open evening

Thornton Cleveleys ARS
John, G4FRK, 01253 862 810
7 On the air
14 Construction evening
21 Closed
28 Mill Sunday discussion

Warrington ARC
Ken, G3VBA, 01928 733 234
1 Final preparation for the Blackpool Rally
3, 10, 17, 24 Informal meeting, use the club equipment, chat, tea & biscuits, 10am
6 Blackpool Rally, 10.15am
6, 13, 20, 27 Solder Sunday from noon
8 History of the Sankey Navigation, Peter Keen
15 Future developments in amateur radio, Paul, G1DVA
22 Enigma restoration, Ken, G3VBA
25 8pm spring dinner
29 An amateur's guide to digital TV part 2, Vincent, MOLCR

Wirral & DARC
Simon, G6XHF, 0151 601 3269
1 UKAC 2m Contest
2 Social at Fox and Hounds, Barnston
6 NARSA Blackpool Rally
8 UKAC 70cm Contest
9 Technical radio topics, Prof Brian Austin
15 UKAC 23cm Contest
16 Social evening at The Harp, Neston
22 UKAC 6m Contest
23 G3PYU memorial quiz against Chester District Radio Club
29 UKAC 4m Contest
30 Social evening at Saughall Massie Hotel

Workington & DARC
Alex, G7KSE, mx0wrc@gmail.com
14 Dip into the RSGB Archives 2

Midway through 2013 **Stockport Radio Society** received permission to erect antennas for HF & VHF/UHF at its Walthew House HQ. When the job was complete, regular on the air evenings began offering members the chance to use the new facility, which has proved to be very popular especially with newer licensees. Society callsigns G8SRS and M5MDX have regularly been aired in

a variety of modes and these evenings have also presented an opportunity for some skills training in such disciplines as CW and construction. The opportunity is now also being taken to enter some contests such as the RSGB AFS Contests in January and the CQ WPX Contest at the end of March, with others in the pipeline too.
To end a successful 2013, the society held an open morning on the Sunday between Christmas and New Year with stations active on both 2 and 40m. The photo shows Nigel, 2E0CKA operating MX5MDX on 40m SSB. Photograph courtesy of Heather Stanley.

REGION 4: NORTH EAST

REGIONAL MANAGER: NIGEL FERGUSON, G0BPK, RM4@RSGB.ORG.UK

Angel of the North ARC
Nancy, G7UUR, 01914 770 036
7, 14, 28 On the air
21 Talk, all welcome
Denby Dale RC
Richard, M0RBG, 07976 220 126
2 Club night
7 80m CC CW
9, 23 Club net, ±145.575MHz, 7.30pm
13 WAB 14/7/3.5MHz data, operating G6LD from Cartworth Moor, noon-10pm
16 80m CC SSB plus a history of Mills on the Air, Jasmine, G4KFP
24 80m CC DATA
30 Real Ale Night, 8pm, Star Inn, HD1 3PJ
Sheffield & District Wireless Society
Krystyna, 2E0KSH, 07884 065 375
2 Getting going on datamodes, including live demo, Peter, G3PHO
16 RSGB 80m Club Contest SSB

Denby Dale ARS will be co-ordinating the annual Mills On The Air event on 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. 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.

MAY *RADCOM* DEADLINE

The deadline for May is 24 March

The photo shows 23 members of South Shields 432 ATC squadron undertaking training for their Foundation licence at **South Tyneside ARS** under the watchful eye of instructor John, G0ROK.

Mark, G1PIE and Jack, G0FQN with Pam, 2E1HQY logging will be running GB4WVR from 7 March into 2015. They will be transmitting from Oakworth Station for the very first time on the Worth Valley Railway. The station and the surrounding area was used during the EMI 1970 film *The Railway Children,* with next year the 45th anniversary, actors from the film will be in attendance at various times. The trio will be mainly on 40m with more information on QRZ.com.

Silcoates School Radio Club welcomed eight new Foundation licensees as a result of a recent course. The school is active with the club call MX0SSW on most days during school term time as well as some weekends and there are currently 30 pupils at the school who hold licences. Nigel, M0NJW said, "The most remarkable thing about the recent course is that some of the teaching was undertaken by James, M3ZTX, Charlie, M6CWW and Daniel, M0WUT – all of whom are older members of the club".
The photograph shows (L to R) Henry, M6ZTA, Todd, M6MHE, Mathew, M6ZMR, Josh, M6HJD, Adam, M6JFR, Joe, M6JOU, Tom, M6ZXC and Umer, M6UZH.

REGION 5: WEST MIDLANDS

REGIONAL MANAGER: VAUGHAN RAVENSCROFT, M0VRR, RM5@RSGB.ORG.UK

Aldridge & Barr Beacon ARC
Albert, G0KFS, 01922 614 169
7 Morse class, general discussion
21 Closed
Central Radio Amateur Circle
Martin, G1TYV, 07906 905 071
1, 24 Night on the air
10 Group meeting
19 Barr Beacon Plug and Play day
Cheltenham ARA
Derek, G3NKS, 01242 241 099
15 Lunch
17 Talking over a light beam, M0OLO
Coventry ARS
John, G8SEQ, 07958 777 363
4 Mini lectures
7, 14, 21 Club net, 145.375MHz, 8pm
11 Committee forum & surplus sale
18 2nd Round 2m DF Trophy
25 Project calibration night
Dudley and District ARS
Carl, M0ZCR, m0zcr@live.co.uk
1 UKAC 2m night on the air
8 On the air & natter night
15 Club social, open discussion
22 Preparation for Mills on the Air
29 Committee meeting
Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595, daytime
7, 14 Closed
21 Crickley Hill operating / picnic Bank Holiday
28 Informal meeting
Midland ARS
Norman, G8BHE, 07808 078 003
2 Open meeting, on the air and training
6 NARSA, Blackpool
9 Committee meeting and training classes
13 Kempton Rally, TW16 5AQ
16 Hot cross buns, tea coffee and fun. Training classes
23 Easter eggs, on the air and training
30 Planning social events, shack on the air and training classes
Rugby ATS
Steve, G8LYB, 01788 578 940,
1 UKAC 2m, radio operation and projects
5 Wonder Wand antennas, Carl, G0NZI
8 UKAC 70cm, radio operation and projects
12 Committee meeting and general radio and technical activities
15 UKAC 1296MHz, on the air and projects
19 Vintage electronics video, Mike, G8CTJ
22 UKAC 50MHz, on the air and projects
26 AGM
29 UKAC 70MHz, on the air and projects
South Birmingham ARS
Gemma, M6GKG,
gemmagordon.m6gkg@gmail.com
1, 8, 15, 22, 29 Coffee morning in the shack, 11am-1pm, all welcome
3, 10, 17, 24 Training classes with Dave, G8OWL
11, 25 Work in the shack
14 Committee meeting 8pm
18, 21 No meeting
Stratford Upon Avon DRS
G0CHO, 01608 664 488
14 Introduction to the Raspberry Pi by Clive, G0CHO
28 In the shack – members bring own projects to discuss or work on
Sutton Coldfield ARS
Robert, spirit.guide@hotmail.co.uk
7, 21 Open net on ±145.250MHz
14, 28 Club meeting at Sutton Coldfield Rugby Club from 7.15pm
15 Open net on ±70.475MHz

Telford & DARS
Mike, G3JKX, 01952 299 677
2 Committee, 7.30, + GX3ZME on the air
9 Preparations for GB8MD, Marconi Day
16 Testing winter projects
23 Members' 10 minute talks
30 Aerial Circus with G4CDY
Wythall Radio Club
Chris, G0EYO, 07710 412 819
1, 8, 15, 22, 29 Morse class, 7.45pm
1 Free 'n' Easy/144MHz UKAC
4, 11, 18, 25 Friday shack social, 7.30pm
6, 13, 20, 27 Club net 145.225MHz, 8pm
6 RoPoCo 80m SSB Contest, 8pm
7 80m CW Club Championship Contest
8 Committee meeting, 8.30pm
13 Club trip to Kempton Park Rally, 8am
15 Easter Contest preparation, 8.30pm
16 80m SSB Club Championship Contest
17 Easter Contest 10am, till Mon 21st at 8pm
24 80m data Club Championship Contest
28 Curry night at the Monsoon, 6.30pm
29 Internet night, Chris, G7DDN, 8.30pm

Saint George's Day, 23 April, will be celebrated by special event station GB0STG from the church of St George and St Mary at Church, Gresley, Derbyshire. Celebrations include Morris dancers, a village quiz, a photographic exhibition and a display by the South Derbyshire Mining Preservation Group, plus many other activities. GB0STG will be operating on the 40m band from 10am until 4.30pm, plus 2m and other HF bands if conditions permit. For more information please visit the **Phoenix Radio Group** website www.M0PHX.org.uk or GB0STG on QRZ.com. The special limited edition QSL card is based on a 1914 recruiting poster.

REGION 6: NORTH WALES

REGIONAL MANAGER: MARK HARPER, MW1MDH, RM6@RSGB.ORG.UK

Marches ARS
Club secretary, marchesars@hotmail.co.uk
10 AGM
Powys ARC
Dave, GW4NQJ, 07870 827 887
3 AGM

GB6RAF from Rednal Air Field near Oswestry will be operated by RAF Air Cadets from 2364 sqn (Welshpool), 2416 sqn (Newtown) and 1165 sqn (Oswestry) along with cadets from a number of other squadrons from the region. They aim to be on air from at least 9am to 6pm on 5 and 6 April, longer if the weather is good. The main operating band will be 7MHz with another station working on 14 and 21MHz as time allows. They will also be on 5MHz (QRP) with their military callsigns. Many cadets on air will be new to amateur radio and this is being used to spark interest before the next Foundation licence training.

REGION 7: SOUTH WALES

REGIONAL MANAGER: JIMMY SNEDDON, MW0EQL, RM7@RSGB.ORG.UK

Aberystwyth & DARS
Ray, GW7AGG, 01970 611 853,
10 North Dyfed RAYNET AGM, 8pm,
24 Club net, 145.500 then 145.550MHz, 8pm

REGION 8: NORTHERN IRELAND

REGIONAL MANAGER: PHILIP HOSEY, MI0MSO, RM8@RSGB.ORG.UK

Mid Ulster ARC
Brian, MI0TGO, muarc.secretary@yahoo.co.uk
1 VHF contest night from the shack
8 Shack-attack night
13 Monthly meeting
15 Antenna maintenance at the shack
22 Marconi Field Day preparations
25 Start of weekend activation for International Marconi Day and Club barbecue at Navan Fort, Armagh
29 Equipment stocktake at the shack

West Tyrone ARC is taking part in the St Patrick's Day celebrations on Monday 17 March in Omagh. The club will be running a special event station GB1SPD. They will be on the top floor of the Strule Arts Centre, in the town centre, and operating on HF, VHF/UHF, *Echolink* and digital modes between 11am and 5pm. If you are interested or would like to see and hear amateur radio in operation then this is your opportunity. A special QSL card is being designed for the event; all contacts will receive the special QSL card.

Bushvalley ARC has moved; the new club premises are at The United Services Club in Limavady, 8 Roe Mill Rd, Limavady, BT49 9DF. Meetings will still be on the last Thursday of every month at 8pm. For more information see www.freewebs.com/bushvalleyarc/.

The Annual Bring and Buy sale by **Ballymena ARC** was held on 14 February. A good crowd attended and quite a few bargains were had. Among those attending were P&D Amateur Radio Supplies, Coleraine (see photo). There was a Bring and Buy and Regional Manager Philip Hosey, MI0MSO manned the RSGB stand.

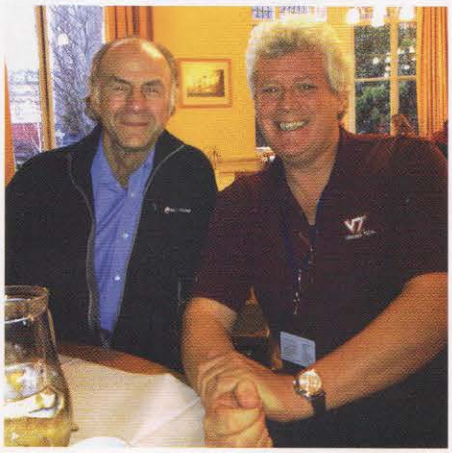
REGION 9: LONDON & THAMES VALLEY

REGIONAL MANAGER: LARRY SMITH, G4OXY, RM9@RSGB.ORG.UK

Burnham Beeches RC
Dave, G4XDU, 01628 625 720
5-6 Club picnic, details from G0SKA
7 Empire by HF data comms 1950s to 1980s, Greg, G4EBY
21 Club contest, details from G8XCK
Edgware & DRS
Mike, G4RNW, 02089 500 658,
10 To QRP or not to QRP, that is the question, Steve, G0PQB
24 Guiding lights in amateur radio, Steve, G0PQB and others
Harwell ARS
Malcolm, G8NRP, 01235 524 844,
8 Antenna modelling, Ron, G7DOE
22 Shack activity night
Newbury & DARS
Rob, G4LMW, 01635 862 737,
23 SOTA and backpacking, Kevin, G7KXZ
Reading & DARC
Pete, G8FRC, 01189 695 697
10 IOTA Awards Programme, Roger, G3KMA
24 *WSPR* on Top Band, Dave, G4BOO
Shefford & DARS
John, 2E0OAK, 07860 804 793
3 The inside story of Concorde, Colin McCartney
10 Club memories of the good old days – Brian, G8GHR interviews John, G6RHL & Ian, G3ORG
13 Club lunch
17 Closed
24 Spring junk sale
Silverthorn Radio Club
Tom, 07866 636 492
4 Junk sale, 56 Friday Hill East, Chingford E4 6JT
Southgate ARC
Mr K Mendum, G8RPA, g8rpa@arrl.net
9 40 years of technology in the BBC, Tony, G0OVA, 8pm; visitors welcome
Verulam ARC
Ralph, G1BSZ, 01923 265 572
10 Social with GB3VH Repeater Group, 7.30pm, Rose and Crown
15 Safe & effective radio installation into vehicles, Norman, G8ATO

At **Verulam ARC's** AGM, David, G4HHJ took over as Chairman of the club from Peter, G4HSO, who was confirmed as the club's secretary. Also in February, four candidates passed their Foundation exam and look forward to getting on the air.

At a meeting at the Royal Geographical Society, London, Sir Ranulph Fiennes met with friend Laurence 'Flo' Howell, KL7L, G4DMA and his wife Sheri. Sir Ranulph and Laurence worked together on numerous Polar expeditions since the late 70s – Laurence was a base member of the 79/82 Transglobe Expedition for the Arctic section part of the first circumnavigation of the Earth via both Poles, a 33,000 mile 4 year odyssey. Laurence supported Ran and his team members on HF in the days when using sextants and HF SSB/CW radios were the norm. Laurence continues to support expeditions and in his spare time occasionally teaches communications techniques to a number of relief and youth development agencies. Licensed in the US now as KL7L and experimental LF/MF licence WE2XPQ, Laurence is originally from Coulsdon, Surrey and was in the UK visiting family.

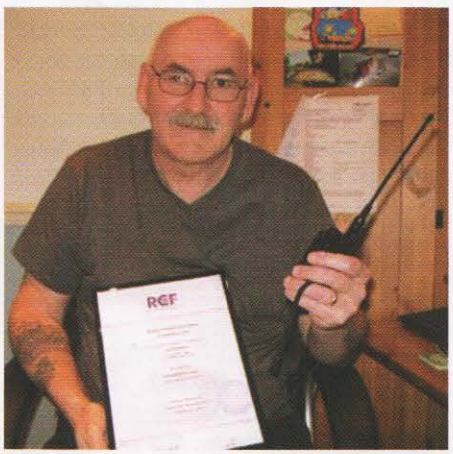


A new radio club has been formed in central London based at the Royal Hospital Chelsea. Its members are some of the famous Chelsea Pensioners. The club already has one licensed amateur, Ray, G0SLL, and several other Pensioners are keen to get their M6 callsigns. To this end, the **Radio Society of Harrow** has arranged training classes and will be holding a Foundation exam in the Spring. The photo shows some of the Pensioners at their first training session (photo by G3YKB).

DEADLINES

The deadline for the May *RadCom* is 24 March and for the June edition it's 22 April

Ivor, M6ITV, recently obtained his Foundation licence. He has been a very keen short wave listener for many years and had an early involvement in CB radio. Realising the way forward was through an amateur licence, he contacted the RSGB who referred him to **Verulam ARC**. Ivor is disabled and would find regular attendance at a course very difficult. To his great credit he studied hard at home and attained the required standard by repeatedly doing the online tests. The practical assessments and the licence examination were done at his home with Roger, M0RBK, Rod, G0IAL and Norman, G8ATO. The club is indebted to the RSGB's Exams Officer, Carol Meredith, who encouraged Ivor and gave him and VARC the necessary help and advice to comply with the requirements of the Exam Board. Ivor is now making friends on the air and has had offers of help and equipment that will help him to grow into the hobby. He has been overwhelmed by the good will of the fraternity of licensed amateurs.
His second ever QSO was with Andy, M0TTB who still uses his first callsign of M6BBC for QRP contacts. What a coincidence: M6ITV meets M6BBC!



REGION 10: SOUTH & SOUTH EAST

REGIONAL MANAGER: MICHAEL SENIOR, G4EFO, RM10@RSGB.ORG.UK

Brede Steam ARS
Steve, 01424 720 815, M0NUC@aol.com
5, 8, 15, 22, 29 At the shack
Bromley & DARS
Andy, G4WGZ, 01689 878 089
15 Deciding a portable event for the summer
Crawley ARC
John, G3VLH, 01342 714 402
23 Used equipment sale
Dorking & DRS
Garth, G3NPC, 01737 359 472
22 Evening at Martin Lynch & Sons, 7-9pm
Farnborough & DRS
Neville, G4SPD, 01252 404 816
2, 16, 30 Slow speed Morse, 8pm, 1995kHz
4, 11, 18, 25 Net at 8pm on 144.675MHz
7, 14, 21, 28 Slow speed Morse net on 3.570MHz at 1pm, Top Band net at 8pm on 1995kHz
9 Natter night
23 Skittles evening
Horndean & DARC
Stuart, G0FYX, 02392 472 846,
3 Natter night/social and activities evening
17 The G5RV antenna, Mike from Alton Antenna Arrays
Itchen Valley ARC
Quintin, M1ENU, 023 8078 7799
11 SDR demonstration, Brian, G0UKB
25 Club forum and helping members revalidate their licence online
Sutton & Cheam RS
John, G0BWV, 020 8644 9945,
17 Easter Island DXpedition, John, G4IRN
Southdown ARS
John, G3DQY, 01424 424 319
2 Operating at Hailsham shack
Trowbridge & DARC
Ian, G0GRI, 01225 864 698, E/W
2 The UKAC by G4JLG, from Bolton WC
16 Natter night & committee meeting
11 Shack layout discusson, Mary, 2E0FMY
25 Surplus sale, Jim, G4WYJ

Andover RAC continues to have a thoroughly enjoyable year, having kicked off with a fabulous Christmas Dinner at the end of January (see photo) that was attended by over ¾ of the membership and was thoroughly enjoyed by all. The club also instigated a new fun event in the form of a 'This is Your Life' where a club member is interviewed so that all the other members get to hear their interesting story. There are over fifty members and, as with other clubs, the majority are 'mature' – this means that there are some *very* interesting lives that have been lived! Richard Powell, M1CFW was the first to be interviewed and his career has spanned the globe over the past six or seven decades, but he is not far in terms of location and interest, from where he first started!

The club also spent one evening enjoying 'A Dip Into the Archives' session 1. It was amazing what such a good evening of fun and banter could be had from a hundred or so 'dusty old photos'. It was interesting for us younger members to hear cries of "I knew him!" as many of the old black and white images went up on screen. The evening was fun and informative and we look forward to the next one, so thanks to Elaine, G4LFM of the RSGB.

On Wednesday 23 April, the **Crawley ARC** Used Equipment Sale will take place in the club house. The organisers says there will be bargains galore – transceivers, test equipment, components. Doors open at 7pm. All CARC members and visitors are welcome. Light refreshments will be available.

REGION 11: SOUTH WEST & CHANNEL ISLANDS

REGIONAL MANAGER: PAM HELLIWELL, G7SME, RM11@RSGB.ORG.UK

Appledore & DARC
Alan, M6CCW, 01237 422 833
Club nets on Monday, Tuesday and Thursday, 4pm, 145.450MHz, Wednesday via GB3DN, 4pm, Friday 7.150MHz ±QRM, 4pm
21 'Plan B', Steve, G6SQX

Bristol RSGB Group
Robin, G3TKF, robin@g3tkf.co.uk
28 Video: Radar during the Battle of Britain plus Bring and Buy Sale

Cornish RAC
Steven, G7VOH 01209 844 939
2 Committee meeting
3 AGM
17 Activities evening

Exeter ARS
Nick, M0NRJ, 01363 775 756,
1, 8, 15, 22, 28 net, 145.575MHz, 7.45pm
7, 21 Club net on 3.675MHz, 7.45pm
14 Planning for 2m and 80m Field Day events, Keith, G7NBU
28 Test your rig night, John, G8XQQ

Exmouth Amateur Radio Club
Mike, G1GZG, 01395 274 172
2 Spring operating night
16 Design and use of linear amplifiers, Dean, G0UIL

Flight Refuelling ARS
John, G4POF, g4pof@hotmail.com
2, 9, 16, 23, 30 On the air
6 Committee meeting
13, 27 Natter night and members' projects
20 Setting up & operating a remote station using *HRD*, Romeo, Y04RDW

Plymouth Radio Club
David, 2E0DTC, d.beck123@btinternet.com
8 Natter night

Saltash & DARC
Mark, 2E0MGC, 01752 215 546
3, 17 Main meeting – newcomers welcome

Torbay ARS
Dave, G6FSP, g6fsp@tars.org.uk
4, 11 Natter night
18 Closed
25 90/10 auction

Yeovil ARC
Rodney Ewards, M0RGE, 01935 825 791
3 The superhet receiver, G3MYM
10 AGM
17 Morse practice with G3MYM
24 QRP briefing
27 30th QRP Convention at Digby Hall

Riviera ARC is now 2½ years old and based in Torbay. The club meet at a new venue on the 1st and 3rd Thursdays – the Acorn Community Centre in Torquay. They are currently involved in Foundation training and regularly like to take part in special event activities as well as portable & mobile radio operations around Dartmoor. More details from John, M6GSW on 07825 288 418. The club is planning to run a club station in support of RAFARS Airfields on the Air event on 5 and 6 April. They are awaiting confirmation of the callsign that will, hopefully, be GB3AOA. The intention is run from the site of Little Haldon, outside Teignmouth, which was a WW2 airfield using 2m and the 10 to 40m bands.

DID YOU HELP IN THE FLOODS?

RadCom would like to hear from anyone, particularly RAYNET members, who got called upon to help during the flooding of late 2013 / early 2014. We hope to be able to run an article on this later in the year.

Please send details and, in particular, any photographs, by e-mail to radcom@rsgb.org.uk.

Thank you.

REGION 12: EAST & EAST ANGLIA

REGIONAL MANAGER: MARK SANDERSON, M0IEO, RM12@RSGB.ORG.UK

Braintree & DARS
John, M5AJB, 01787 460 947
7 Rig clinic with G0DEC
21 Bank holiday natter night

Cambridge & DARC
David, M0ZEB, 01353 778 093
11 Beginners and Veterans – several short presentations

Chelmsford ARS
Martyn, G1EFL, 01245 469 008
1 Marine radio, Carl, G3PEM at Oaklands Museum
21 Amateur radio skills workshop
26 International Marconi Day from Sandford Mill Museum

Colchester Radio Amateurs
Jeff, G7TAT, 07899 894 435
17 Satellites by Jonathan, G0DVJ

Felixstowe & DARS
Paul, G4YQC, pjw@btinternet.com
14 Wartime radio, Peter, G8BLS
28 Rig clinic

Harwich ARIG
Michael, 2E0GUI,
michael.2e0gui@gmail.com
12 Ship spotting and Automatic Identification System, Kevan, 2E0WMG

Hilderstone R&EC
Chrissie, hilderstoneclub@gmail.com
10 Natter night
24 Don's Intermediate project construction

Lowestoft & District PYE ARC
Tim, 2E0TJW, 07810 481 182
2, 10, 17 Club night at the shack
2, 9, 16, 23, 30 Net, 145.450MHz FM, 9pm
6, 13, 20, 27 CW net, 28.050MHz, 8.30pm; club net, 29.140MHz FM, 9pm
9 Bowls Club night, 8pm

Norfolk ARC
Chris, G0DWV, 01603 898 678
2 AGM
9 Visit from Don Field, G3XTT, Editor of *PW*
16 Informal evening
23 The RSGB propagation report, Steve, G0KYA
26 Marconi Day at Caister Lifeboat Station
30 Repeater group meeting, informal and Bright Sparks

South Essex ARS
Dave, G4UVJ, 01268 697 978
8 Back to basics on AC theory, Dave, G4AJY

West Kent ARS
Keith G4JED, info@wkars.org.uk
14 AGM

The 29th Foundation course held by the team at **Chelmsford ARS** started in January. It was a great group, full of candidates very keen about the hobby, asking lots of great questions and keeping the tutors on their toes. CARS has been very fortunate in having so many members willing to assist in the training in a variety of roles. The newest addition to the team is Kristian, 2E0SSX. During the course, Essex Ham produced a short promotional video that can be viewed on YouTube (see www.youtube.com/user/EssexHams).

GB2RAF will be on the air from RAF Neatishead in Norfolk on 1 April for Airfields on the Air.

Hilderstone R & EC took part in the SOS Radio Week at the Ramsgate Lifeboat Station with the callsign GB1RLS, raising funds for the RNLI. They had many contacts during the day and thoroughly enjoyed the successful event. Recently, fifteen exam candidates filled the Crampton Museum hall for their Foundation and Intermediate exams. Everyone passed!

The club held their first Thinking Day on the Air event with the 3rd Margate St John's Brownies using the callsign GB1TBU for Thanet Brownies Unit. Eight eager Brownies had a fun morning learning how to send Morse code. They enjoyed hunting for the cunning fox, which was transmitting intermittently, using their handheld radio and aerial loop. They spoke confidently with other radio amateurs on the special event radio station that was set up in the Observatory. Brown Owl Gill Goodwin was able to speak to Liz Jones, MOACL, organiser of TDOTA.

There's little doubt that gaining the Full UK amateur radio licence is a proud moment – and Cathy Colless has every reason to be very proud... she took, and passed, all three licence levels in just 57 days with no prior amateur radio experience. Cathy, MORTW is currently a Senior Systems Architect at Anglia Ruskin University and attended training courses run by the **Chelmsford Amateur Radio Society**. She passed her Foundation exam in October 2013, took her Intermediate exam with **Bromley and DARS** and sat the Full exam session with CARS on 6 December 2013.

Each February the **South Essex ARS** runs the Canvey Radio and Electronics Rally, now in its 29th year. It still attracts a good crowd on the day and is normally fully booked with traders – this year was no exception. The club started operating the Canvey Rally in 1986 with the emphasis that there should be free tables for user groups and charity groups, cheap door entry and good homemade food including the famous bacon rolls. Some visitors had travelled as far as 150 miles and tables were sold out early on.

Sunday 23 February and members of the **Bredhurst RATS** were up at the crack of dawn and down to the hall for the annual Rainham Rally. The members assisted the traders as they arrived by bringing the stock in to fill the tables to overflowing. The halls were soon full of radio amateurs having a chance to meet old friends, buy lots of goodies and have a good time. Members from two other local clubs Maidstone and Medway called in to support, which was brilliant. Thank you to *Practical Wireless* for donating the door prize and to Charles, G4VSZ who was the driving force behind the rally.

Braintree & DARS had a talk by Dave, G0DEC, entitled *Radio Mobile*, Coverage Prediction Software. Dave demonstrated the *Radio Mobile* software, which is a free download, in conjunction with Ordnance Survey electronic maps and Shuttle Radar Terrain Mapping. Dave showed how to overlay the Shuttle contour map on top of the OS map, and pinpointing a station location on the map. Once this is done put in the individual height above ground, and let the program work. The result shows a radar style sweep predicting the radio signal coverage on different bands and the likely strength of signal. Dave pointed out that this system is most useful when siting aerials for club or RAYNET events. The meeting on the 17th started with part 2 of the history of the RSGB presented by Edwin, G0LPO, based on archive pictures and text downloaded from the Society's website. This talk highlighted the involvement of amateurs during wartime and how many worked as official 'listeners' or in R & D in wartime. The rest of the evening was given over to the Braintree club's annual construction challenge. This year the club is giving those members who wish to take part, a project box and members can build whatever they want in the box. A lot of ideas were discussed.

REGION 13: EAST MIDLANDS

REGIONAL MANAGER: STEVE BODEN, G4XCK, RM13@RSGB.ORG.UK

Derby & DARS
Richard, radio@dadars.org.uk
1 Junk sale
8 Committee meeting
15 Video show
22 Portable operating, Richard, G3CWI of SOTAbeams
29 On the air

Lincoln Short-Wave Club
Pam, G4STO, 01427 788 356
2, 9, 16 Shack activities & natter night 7.30pm the shack, 8.15pm BSA club
3 Repeater net on GB3LM, 8pm
5, 12, 29, 26 new licensee mentoring & Saturday surgery
8 432MHz UK AC in the shack, 7.30pm
10, 17, 24 Club net, 145.375MHz, 8pm
15 1.3GHz UK AC in the shack, 7.30pm
21 Committee meeting
22 50MHz UK AC in the shack, 7.30pm
23 Formal meeting
29 70MHz UK AC in the shack, 7.30pm
30 Used equipment sale, Aisthorpe Village Hall, check in from 7pm, auction starts 8pm

Loughborough & DARC
Chris, G1ETZ, 01509 504 319
1 Yaesu equipment evening – bring something along
8 'Now it can be told' part 2
15 Computer workshop
22 EME equipment setup
29 Practical evening

RAF Waddington ARC
Bob, G3VCA, 07971 166 250
10 Committee meeting

South Kesteven Amateur Radio Society
Nigel, M0CVO, 01476 402 550
2, 16, 30 Informal evening
9, 23 Club net on 145.525MHz, 8pm

Spalding & DARS
Graham Boor G8NWC, 0775 760 832, secretary@sdars.org.uk, www.sdars.org.uk
27 Radiophile Cowbit Exposition

The group meeting for the **Lincoln Short Wave Club** coffee morning at the Range can be seen in the photo. The Range is close to the centre of Lincoln and the coffee morning that started with about 3 members is now up around a dozen or more every week. Meeting every Tuesday at 10am, it's a very sociable morning and more than one wife has attended whilst out shopping. In the photo is James, G0EUN, Jim, G0EJQ, Don, M0CES, Peter, M0EJL, Roger, G3PVU, Alan, 2E0KVR and XYL, Jeff, G6GLW and Peter, G1FLL. The photographer was Chris, 2E0NDT.

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. Engineered 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

Aerials

M0CVO ANTENNAS for all your amateur radio antenna needs. Full details at: http://www.m0cvoantennas.com

VORTEX ANTENNA SYSTEMS UK Manufacturer and hardware supplier. Delta Loops, Yagis, Monoband and Multiband, OWA Arrays, Bespoke Designs. Antenna parts and mounting solutions. 6082-T6 Metric Tubing, Stainless U-Bolts and much more. www.vortexantennas.co.uk or 07943 871893

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

Wanted

UNWANTED VALVE AMPLIFIERS, working or not. Known makes only (Kenwood, Yaesu, Drake, Linear Amp, etc), not home-brew. 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

Computer Software

PROGRAMMING SOFTWARE FOR YAESU RADIOS Http://www.g4hfq.co.uk bob.freeth@g4hfq.co.uk (01425) 618092

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

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 94).

FOR SALE

20 STORAGE DRAWER UNITS full of various components – ICs, resistors, caps, transistors and VCR mechanical parts. Ex TV repair shop. Donation to Bournemouth Amateur Radio Society. E-mail interest AFTER 8 April to view and collect. Mike Nicholas, G3TOI, 01202 419 394, mikenicholas888@btinternet.com (Bournemouth).

AOR AR5000+3 absolute mint condition no marks or scratches. Perfect working order, with original PSU handbook, spare power lead, extra feet. Condition 10 cut of 10, £1,500. Brian, M3SLE, 01903 859 712 (West Sussex).

CUSHCRAFT A3WS 12 and 17m 3-ele Yagi. Only 2 years old, boxed and ready to ship. £250 plus carriage or buyer can collect. Howarth, GW3TMP, 01352 771 520, jhj43@btinternet.com (Mold, Flintshire).

ELECRAFT K2 serial no 6649, mint, KPA 100 100W, all option fitted, ring for details, £650, postage at cost. Alan Wells, G4ERZ, 07722 554 616 (Hull).

ICOM IC-735 HF transceiver, 1.8-30MHz (including 5MHz Tx), 100W, very good condition, complete with mic, power lead and manual, £255, buyer collects. Peter, G3PVX, 01404 813 059, g3pvx73@gmail.com (Ottery St Mary, Devon).

ICOM IC-7400. Very well kept by non-smoker in clean shack. Rx/Tx 1.8-30MHz HF + 6m and 2m all mode, original mic, paper manual and box included, £800. Raul, M0ZZM, 0871 245 6767, m0zzm@rdob.org (SE London).

KENWOOD TS-480SAT HF+6m with high stab oscillator and extended Tx frequency coverage for 60m band. Instruction manual, mobile mounting bracket and all connecting leads, £530. Prefer buyer collects but delivery within UK at cost. Martin, G4GFI, 01737 215 739, martin.broadway@ntlworld.com (Epsom, Surrey).

Kenwood TS480SAT

LATTICE ALUMINIUM MAST. 30ft in three sections. Collection preferred. Photos available, £150. Merrill Elliott, 01788 890 247, merrill4emem@aol.com (Rugby, Warwicks).

MFJ-962D VERSA TUNER 3, £100. MFJ artificial ground, £40. bhi NEIM 1031 noise eliminating module, £95. All in VGC, prefer collect or will post at cost. M Beddard, M1EGX, 0121 351 2827, mbeddard@hotmail.com (Birmingham).

MORSUM MAGNIFICAT magazines for sale. editions 32 and 34 to 89 inclusive. All in excellent condition and mostly in binders. No reasonable offer refused. Buyer to collect or will share postage. Jim Chadwick, M0ANQ, 01204 524 077 (Bolton).

QUAD FM4 hi-fi stereo tuner, working perfectly, in original box, £120. Collection or carriage at cost. Paul, G4OHB, 01562 710 801, paularden@virgin.net (Worcs/W Mids).

RARE ICOM IC-T81A 23cm/70cm/2m/6m quad band handheld. Working order, fair condition. 2 battery packs (condition not guaranteed), 2 belt clips, SMA-701 2/70/23cm antenna, original manual, box. £195 inc UK carriage or £185 if you collect. Contact after 17 March please. Giles, G1MFG, 01234 832 714 (office hrs), giles.read@rsgb.org.uk (Bedford).

REALISTIC DX-394 RECEIVER by Radio Shack. LW/MW/SW, all modes. Nearly new, used for 2 hours only. Complete with telescopic aerial & instructions. Photos available via e-mail. £70 including p&p. Dave, G8ZRE, 01244 316 673, g8zre@hotmail.com (Chester).

SILENT KEY SALE. Yaesu FT-450AT (auto ATU), £475 or ONO. HC 7040 digital multimeter, £5. *Radio Communication Handbook* 5th edition, 1978, offers. Prefer buyer collects and inspects or postage at cost. Dave, G0IIQ, 01472 590 460, david.pykett@ntlworld.com (Grimsby).

STEPPIR 4-EL BEAM (20m-6m), purchased Nov 2011, SDA100 controller, improved motor housings, excellent condition, with handbooks, manuals, £1300. Would consider straight swap for 3-El SteppIR if of similar age & condition or swap with cash adjustment for Optibeam tribander? Ray, G3XLG, 01379 674 632, ray2.s@btinternet.com (Norwich).

THE MFJ-962D handles 1500W PEP SSB between 1.8 and 30MHz. The meter displays SWR, forward and reflected power. A 6-position switch selects the antennas. £200 plus p&p. Phil, G3SWH, 01934 832 736 (near Bristol).

WANTED

ARE THERE ANY Members whom are serving or ex-members of The Rifles, Royal Green Jackets, Ox & Bucks Light Infantry or its antecedent Regiments? I'm planning events for 2014/5, Geoff Day, G4DED, Ex Ox & Bucks, RGJ, g4ded@gmx.com, 07775 981 088 (Kidlington).

***ARRL HANDBOOK* 1945 EDITION.** Any condition considered. Nick, M0NPD 01622 753 097, greenrat.ndp@gmail.com (Maidstone, Kent).

DRAKE RV4C OR RV4 remote VFO, also DRAKE AC4R or AC4 PSU. Damien, G3XER, 01332 865 007, damienmannix@hotmail.com (south Derbys).

INFORMATION ON A KW103 ATU. Also require schematic. A Martins, M0PAM, 01227 366 349 (Herne Bay, Kent).

ISOTECH ISR440. Please can anyone repair my Isotech ISR440 scope or help me with a service manual? Happy to reward. Seems to have an EHT fault? Screen just went blank. Iain, G4DPF, 07836 703 604, iain@g4dpf.co.uk (Cambridgeshire).

KW-107 SUPERMATCH. Good price paid for working model in reasonable condition. Can collect or I will pay postage. Ron Disney, G0HNZ, 01754 766 587 (Skegness).

KW2000E TRANSCEIVER wanted by genuine collector, must be in clean, original, cosmetic condition and working. Also looking for Drake MS-4 AC PSU/speaker unit, similar condition. Can arrange own collection. Richard, G3UGF, 01422 359 362, g3ugf@norcomm.co.uk (Yorkshire).

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).

MICROTAN65 COMPUTER BOARDS. Looking for hires graphics, TANRAM, TANDOS and backplane in particular, trying to build system but any forlorn Microtan bits considered. Michael, G0TNF, 01931 714 061, michaeldani@btinternet.com (Cumbria).

MILLEN TRANSMATCH 92200 ATU manufactured by James Millen. John, G0LJS, 01380 859 088, g0ljs@arrl.net (Chippenham, Wiltshire).

MULTI CONTACT ROTARY UNISELECTOR. All costs will be covered. Graham, G7KYX, 01205 871 624 (Lincolnshire).

SILENT KEY CLEAROUT OR NOT JUST WANTED. I collect QSL cards for historic interest; any date but preferably before 1970. Can collect or arrange collection. Tony, G4UZN, 0113 2693892 or e-mail AQuest1263@ btinternet.com

YAESU XF-8.9GF FM FILTER, as fitted to FM board in FT-902DM. Alan, GW8KSF, alansal@msn.com (Wrexham, N Wales).

ZN414 SINGLE-CHIP RADIO, metal can (presumably TO-18) only. Dead or alive, but not plastic. Godfrey, G4GLM, 020 8958 5113, cgmm2@btinternet.com (Edgware).

HELPLINES

I'm after the handbook or calibration instructions for a Sinclair DM450 DVM, as I don't really want to have tweak pots to see what they do! Expenses met. Fortunately, I have some voltage standards available so that I can calibrate the instrumentation here... Peter Chadwick, G3RZP, peter.chadwick@ties.itu.int (Swindon).

RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond

6 APRIL – 51st NORTHERN AMATEUR RADIO SOCIETIES ASSOCIATION EXHIBITION (Blackpool rally) – Norbreck Castle Exhibition Centre, Blackpool FY2 9AA. TI, CP, OT 10.15/10.30. TS, B&B, SIG, MT, LB, C, DF, RSGB bookstall. Dave, M0OBW, 01270 761 608, dwilson@btinternet.com. [www.narsa.org.uk].

6 APRIL – DEVON & CORNWALL REPEATER GROUP AND CALLINGTON ARS RALLY – Callington Town Hall, New Road, Callington PL17 7BD. OT 10am. CS. Bookings & info Roger, 2E0RPH, 2e0rph@gmail.com.

6 APRIL – CAMBRIDGE REPEATER GROUP RALLY – Foxton Village Hall, Hardman Road, Foxton, Cambridgeshire CB22 6RN. OT 10.00 (traders 07.00), £2. TI, TS, B&B, C, DF. Lawrence, M0LCM, 07941 972 724, rally2014@cambridgerepeaters.net. [www.cambridgerepeaters.net]

13 APRIL – 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 10.00, TS, C. Lucy, 01270 623 353, Lucy@hackgreen.co.uk. [www.hackgreen.co.uk]

13 APRIL – SOUTH GLOUCESTERSHIRE AMATEUR RADIO RALLY – Scout Activity Centre, Woodhouse Park, Almondsbury, BS32 4LX. OT 10am, B&B, CP, C, CBS, TI S22 (V44). Mike, M1DPB, southglosradiorallycoordinator@gmail.com, 07806 310 095. [southglosradiorally.org.uk].

13 APRIL – 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].

20 APRIL – RADARS RALLY AND SURPLUS EQUIPMENT SALE – The Hugh Ripley Hall, Ripon, North Yorkshire HG4 2TP. TI, OT 10.00, stallholders 7.30, £2. C, tables £10, Raspberry Pi demonstrations and sales. Details from rally@ripon.org.uk [www.ripon.org.uk].

27 APRIL – ANDOVER RADIO AMATEURS CLUB SPRING BOOT SALE - Wildhern Village Hall, Andover. CP, TS, FM, C, DF, WIN, CBS, OT 10am. Contact aracsec@hotmail.co.uk. [www.arac.org.uk/events.html]

27 APRIL – 30th YEOVIL QRP CONVENTION – Digby Hall, Hound Street, Sherborne, Dorset DT9 3AA (adjoining the central shopping car park). TI S22, CP, OT 9.30-3.00. TS, LEC, B&B, C, DF. Steve, G7AHP, 01803 666 407, steve@g7ahp.co.uk.

4 MAY – DAMBUSTERS HAMFEST – Thorpe Camp Visitor Centre, Coningsby, Lincs LN4 4PE. TI S22, GB3FR, £3, B&B new for 2013 free parking, Pitches free but size is limited if not pre-booked. RAF heritage centre on site. Overnight camping by appointment. C, OT 10.00. 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. OT 11.30, CP, B&B, TS, LB, C, DF. Iain, 028 6632 6693, iain@learc.eu.

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].

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].

15 JUNE – 27th NEWBURY RADIO RALLY – Newbury Showground, next to M4 J13. TI S22 (V44), free CP, OT 9am (visitors), 8am (sellers). Visitors £2.50, CBS pitch £12.50. TS, C, CBS, WIN, DF, FM, SIG. Huge boot sale, demo marquee with display of amateur radio on air, air traffic radar, plus clubs and national society stands. 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 bookstall, 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 bookstall. [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 bookstall, 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. TS, B&B, SIG. Peter, MI6NID, 028 9188 9018, petermi6nid@outlook.com. [www.bdars.com].

6 JULY – CORNISH RAC 51st MOBILE RALLY – Penair School, St Clements, Truro, TR1 1TN. TS, B&B, C, TI, CP. OT 10.30, £2. Steve, 01209 844 939, g7voh@btinternet.com. [www.gx4crc.com].

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.

SILENT KEYS

We regret to record the passing of the following Members:

Name	Date
Mr J A Williamson, GM0FET	25/1/2014
Mr F W W Gardiner, G0MXQ	20/12/2013
Mr J U Burke, G3HEA	31/12/2013
Mr P N Pitt, G3ICH	11/2/2014
Capt J D F Francis MBE, G3LWI	28/1/2014
Mr E W Holt, G3MHQ	9/2/2014
Mr D Pike, G3WDY	24/1/2014
Mr A G Jones, GW4OGC	1/2/2014
Mr B S Wilkins, G7GUS	22/11/2013
Mr R Moore, GI8FLQ	12/2/2014
Mr G J Doyle, RS48615	1/2014
Mr A J Cooper, 2E0TXC	3/2/2014

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.

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
01/04/2014	GB1BN	Boscombe Down	Amesbury	LHV27	M0GKG
05/04/2014	GB4STB	Stanbridge	Bedfordshire	LH2	M0HBQ
	GB4AOA	Airfields on Air	Devon	LH2	G4XKH
	GB0EG	European Generations	Antrim	LH27	MI0CRQ
	GB0CBN	Chelmer Blackwater Navigation	Essex	H27	G1AJQ
14/04/2014	GB2GKR		East Kilbride	TLH	GM3ZDH
26/04/2014	GB2SOH	Scalpay Outer Hebrides	Isle of Harris	TLHV27	G3WFK
	GB4MDI	Marconi Day International	Penarth	LHV2	MW0VRQ
	GB8IMD	International Marconi Day	Wiltshire	LH2	M0MWS
	GB0CMS	Caister Marconi Station	Norfolk	LH	G0KYA
	GB1AVR	Ackworth Vintage Rally	Ackworth	LHV2	G0BPK

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.

12 JULY (Saturday) – **STOCKPORT RALLY** – Walthew House, 112 Shaw Heath, Stockport SK2 6QS. OT 10am, £2. TS, DIS, CP, C, TI 145.550MHz. Tables available £10 each. Bernard, G3SHF, 01625 850 088 (day).

13 JULY – **McMICHAEL RADIO RALLY & CAR BOOT SALE** – Reading Rugby Football Club, Holme Park Farm Lane, Sonning Lane, Sonning on Thames, RG4 6ST. TI, free CP, £2, LB, C, SIG, WIN, TS, CBS, OT 9:30. Pete, G8FRC, 01189 695 697. [www.mcmichaelrally.org.uk]

20 JULY – **FINNINGLEY ARS SUMMER RALLY** – The Hurst Radio Communications Centre, Belton Road, Sand toft, Doncaster DN8 5SX. 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 768 701, 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, 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].

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 – **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 (Friday-Saturday) – **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, Newport NP20 6QB. 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** – The full convention programme of lectures for all interests will be available on the website later in the year. Principal sponsor Martin Lynch & Sons. [www.rsgbevents.org/].

12 OCTOBER – **HACK GREEN BUNKER RALLY** – Secret Nuclear Bunker, Nantwich CW5 8AL.

12 OCTOBER – **HORNSEA AMATEUR RADIO CLUB RALLY** – Hornsea, East Yorks HU18 1NQ.

18 OCTOBER – **CARRICKFERGUS AMATEUR RADIO GROUP RADIO RALLY** – BT38 7DA.

19 OCTOBER – **GALASHIELS AND DISTRICT ARS RADIO RALLY** – Scottish Borders TD1 3JX.

26 OCTOBER – **24th GREAT NORTHERN HAMFEST** – Barnsley Premier Leisure Complex.

9 NOVEMBER – **WEST LONDON RADIO & ELECTRONICS SHOW** (Kempton Rally).

23 NOVEMBER – **CATS RADIO & ELECTRONICS BAZAAR** – 1st Coulsdon Scout HQ, Surrey.

6 DECEMBER – **SOUTH LANCS WINTER RALLY** – Bickershaw Labour Club, Wigan WN2 5TE.

7 DECEMBER – **BISHOP AUCKLAND RADIO AMATEURS CLUB RALLY** – Co Durham.

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.

HF F-Layer Propagation Predictions for April 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	7.....778	87.....26888	38.333568885	..77777887..	...789998...	....77777...	.....	.....
*** Asia								
Yakutsk	.....	.....	.....2.	53.....46776	..665667645.	...6664.....	.....	.....
.....								
Tokyo	.....3..	.....68..	.....25..	.....	.....	.....	.....5.....	.....
Singapore	.....22.	17872	.....2652.	.....45...	.....366...	.....4....	.....	.....
Hyderabad	.....	444	5654	.....465..	.....55...	.....44...	.....	.....
Tel Aviv	96.....3899	993.....8999	..3....3787.	...4..4675..	...455677...	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	.....	.27.....2..	.27.....4..	..5.....3..	.....	.....	.....	.....
Perth	.....	.....243.	.....3776.	.....43..	.....	.....	.....	.....
Sydney	.....	.....477..	.....787..	.....3765..	.....	.....	.....	.....
Melbourne (LP)	.....	.399.....	68994.....	778973....37	...97.....76	...8.....7.	.....	.....
Honolulu	.....	.....	..43.....	....4.....	....4.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....6...	.....4...	.....4...	.....4...	.....
W. Samoa	.....	.....	...3.....	...3443.....	....555.....	.....	.....	.....
*** Africa								
Mauritius	2.....122	7.....7888	7.....8887	68864	.....36...	.....4...	.....	.....
Johanesburg	.....	34.....566	56.....8998	9985	.....5874.	.....686..	.....57...	.....5...
Ibadan	11.....11	77.....566	775.....3777	.67.....677.	..76..3677..	...754578...	...4...78...	.....67...
Nairobi	3.....12	84.....2788	65.....3566	3.....6664	..3....566..	.....4666..	....55677...	.....
Canary Isles	672.....666	877.....888	8885...26888	758754567888	..799999898.	...8999999..	...5677786..	....45567...
*** S. America								
Buenos Aires	.....	545.....3	878.....77	4.5.....475	.....5..	.....5..	.....	.....
Rio de Janeiro	.....	656.....46	888.....788	536.....886	.....85.	.....7..	.....5..	.....
Lima	.....	544.....2	7675.....67	...5.....65	.....	.....	.....	.....
Caracas	.....	.....	432.....4	8875.....78	4.475....587	....7544576.	....466667..	.....55..
.....								
*** N. America								
Guatemala	.....	322.....	6565.....7	...5.....33	.....	.....	.....	.....
New Orleans	12.....	665.....3	7665.....6	53	.....	.....	.....	.....
Washington	44.....	776.....6	7776.....47	....6....476	.....4..	.....4.55..	.....	.....
Quebec	67.....4	776.....57	...3.....77	....4..4563.	.....	.....	.....	.....
Anchorage	.....	.....	53543.....45	.....6667.	.....66..	.....	.....	.....
Vancouver	.....	.2.....	.....	.....	.....5..	.....	.....	.....
San Francisco	.....	.2.....	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....	.....4....	.....5....	.....64...	.....5....

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) 68, 67 & 67 and (combined method) 77, 78 & 79. The provisional mean sunspot number for February was 102.8. The daily maximum / minimum numbers were 154 on 27 February and 66 on 1 February.

RadCom

PITCAIRN

John, ZL1AH, ex-G3AH

I was interested to read the letter from Alastair, GM3WED, (Last Word, February 2014). In December 1950 I and my family sailed in one of his company's vessels (RMV *Rangitata*) from G to ZL.

A week out from Panama we stopped at Pitcairn on Christmas morning and the islanders rowed out to greet us and trade. The latter depended on our sympathy because all they had was folk art, fruit and stamped picture postcards. They were particularly interested in cotton goods and would barter fruit for cotton shirts, frocks and underwear. This was where I first encountered avocados (part of my daily salad nowadays!).

The reason for this introductory ramble is to mention that the said picture postcards they were flogging were actually VR6TC QSL cards, several thousand of which had been donated by a ham radio club in the USA.

Passenger travel in ships became a casualty with the advent of the big airliners but I believe the British and NZ Governments have a contract for some of the freight lines to carry mail and essential supplies (including patients requiring surgery). The only long term visitors seem to be pastors, so if you have any religious affiliations, you should hunt out any who are good CW men and persuade them to do a stint on the island!

I count myself lucky, in that I have not only worked VR6, I have seen it!

AERIAL THEORY

Andy, G3PKW D Phys

I notice a number of articles and discussions concerning aerial theory.

Any aerial in its simple form is a series tuned circuit plus a real resistive component that is the bit that couples RF power to the æther. This resistance is its radiation resistance part. The confusion usually comes from differentiating the feed impedance from the radiation resistance. A small aerial relative to its wavelength of use has a very small radiation resistance that results in a large current trying to flow. Any reactance or loss resistance that is present just gets in the way and limits the current that is trying to flow into this small radiating part. The series tuning of any aerial system is vital to enable the current to flow and thus enable its magnetic and electrical components to couple themselves to the æther.

It is a fact of physics that a physical half wavelength radiator not too close to the ground, when fed at its centre, happens to have a radiation resistance that is around 50Ω or so. The reactance is cancelled to zero (resonant). Thus when fed it will match adequately to our typical transmitter source impedance. Other systems such as a mobile whip or a doublet with tuned feeders will present feed values much removed from 50Ω. So we need some form of network to transform the real part to a usable 50Ω. This network must also be capable of cancelling any reactive part that still exists in the system. I have written a non-mathematical paper that covers all these points and it is obtainable from my e-mail (andy3PKW@gmail.com).

AERIAL VOLTAGES

Peter Martinez, G3PLX

Robert, G3JRD should not have experienced an electric shock from the spark gap on the end of his dipole. A high voltage at 14MHz would have resulted only in an RF burn, not a shock. If it was indeed a shock then I suggest that the spark gap may have been behaving in a nonlinear manner, rectifying the RF voltage to produce a DC voltage. Only a DC or low-frequency voltage would have given rise to an electric shock.

John Tuke, GM3BST

G3JRD's interesting letter about voltages at the end of the aerial reminds me of an encounter with a lady signals officer while I was in the RAF as a WOM (wireless op mechanic) in 1942-47.

Aerodrome control was with a TR9 on something like 4MHz and we used a vertical aerial of about 40 feet supported by a cross piece on a wooden pole.

We had been getting poor results, and the officer requested me to measure the aerial current at the base where it was connected to the coaxial lead in. This I did, and I think it was about 0.1A.

She then said that perhaps power was lost in the aerial itself and I should measure the current at the top of the aerial. When I very respectfully suggested that might be zero, I was asked in no uncertain terms if I queried her technical knowledge, to which of course I replied, "Of course not ma'am". She then ordered a tower ladder, up which I was to climb and measure the current at the top. Feeling I was being trapped into a bit of hole now, I duly took the hot wire ammeter to the top of the aerial, fiddled about for a bit and shouted down that it was indeed 0.1A. On climbing down I was asked to apologise and advised that any future insubordination might result in being put on a charge.

So how did I measure it? Your guess is as good as mine but a number of little scars on my fingers suggest that while the current may well be zero, the volts can be plenty!!

DUMMY LOADS

David G Blake ISO, G3MWV

I would like to add some comments to the excellent letter in the February issue on Dummy loads. A lot of the lack of use of dummy loads boils down in inadequate technical knowledge especially by newly licensed amateurs. This points to the radio examination levels being set far too low.

A few days ago I was working a station with a recently issued callsign who was on SSB splattering across the band. I ask him to tell me what his mic gain and ALC was set to. His reply was, 'I take no notice of that technical rubbish'! I corrected his error. Another operator again using SSB with a very distorted transmission was heard to say the control on my rig are marked (note not calibrated) 0 – 10 so I set them to 10 to get the maximum output from my transmitter. I gave him a call at the end of his contact and asked him what was his PEP output. He came back and said he did not know what PEP meant. These stations need some help to reduce QRM levels and should be given as much advice as possible from us old timers on how to set up and run a stations. I have found that most will listen and take action.

RAE SUITABILITY AND STANDARDS

Gordon Parker, G4EMK

About a third of a century has elapsed since the old 2 part written RAE was replaced with the multi-choice paper yet it is still being referred to as a 'dumbing down'.

As an RAE tutor for the local College of Further Education, I taught candidates for both styles of exam. The change was not a matter of making the qualification simpler but replacing an out of date exam that was no longer fit for purpose with something more appropriate to the changing times and particularly the changes in the hobby and radio generally.

The old RAE was appropriate to a time when most amateurs used homebrew HF transmitters and domestic televisions were operating on a close harmonic frequency to the amateur bands and, indeed, had an IF in the 14MHz band. By the time the exam changed, so much of the RAE was by then totally irrelevant, particularly in the interference section. The only purpose of retaining the old RAE was for those who wanted to hang onto some sort of 'elitism' surrounding the hobby, interestingly enough many of those who we still hear on the bands complaining about the change are 'black box appliance operators'.

The multi-choice RAE, whilst still hanging onto some of the out of date stuff, was a big step forward for the hobby. The exam was cleverly devised to cover so much more of the syllabus and also was able to demonstrate an understanding of the syllabus rather than a rote learning – let's face it, the old style paper could be passed with a bit of luck if a couple of the topics that had been revised came up. It does not take a genius to re-write a model answer and have no idea what it was all about. I do know someone who passed, credit in both parts, that exam just for the sake of something to do, with no prior radio knowledge and was self taught from the *RAE Manual* and the *Radio Communication Handbook*. There is no way that luck in

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guessing the right answer or even parrot learning could 'win' a pass in the multi-choice RAE.

In the early eighties, a large proportion of my students had come from the CB fraternity. Many were 27MHz SSB operators and already had a surprisingly good basic knowledge of radio. It was a privilege to teach these guys because they were so motivated and keen. Many had never taken an exam in their life, or maybe nothing since they took their CSEs many years before. These students worked so hard and most gained a pass, going on to be excellent radio amateurs. I do believe that most of them would have struggled to pass the old style RAE, but failing to do so would not make them unworthy of a licence. On the contrary, they in fact passed a far more appropriate exam that demanded a far better understanding of the whole syllabus.

I have little knowledge of the latest qualifications but remain confident that they are appropriate to the hobby in the present day. I do however look forward to the day when I can listen to the bands and not hear amateurs 'belittling' others who gained their licence in a different way.

John Taylor, 2E0CWJ

Having read the letters on this subject, in this age of black boxes how much technical expertise is really needed, I have to say I found the Foundation easy and the Intermediate not too difficult but am finding the study for the Advanced much more difficult.

Much is said about dumbing down, not only in amateur radio but in schools and universities and that may be true but I am over 70 and the brain doesn't absorb information as readily as when I was younger.

Most of my time is spent on CW on the HF bands and I will never be clever enough to build, let alone design, a complicated piece of equipment.

Colin Topping, GM6HGW

I write in response to Ross Bradshaw, G4DTD's letter concerning the old City and Guilds exam and the new multi choice (objective testing) papers used for each of the three levels of licence.

The written RAE I sat was divided into two sections. The first part had two questions, one on licensing the other on transmitter interference; a maximum of fifteen marks for each. Part two had eight questions of which six required to be answered. To fulfil the requirements of the syllabus there was a set pattern in part two with questions on Ohm's law, receivers, transmitters, propagation and so on. Hence I swatted up on six areas of interest to me, ignoring the other subjects. I passed both papers with a credit in each using this method of home study as I was not within reach of a club using public transport and too young to drive.

Multi choice question papers require all questions to be answered, not just the areas of particular interest. Therefore they cover the full syllabus and the candidate has to attempt all the questions, not just the subjects they know well.

Multi choice papers can be a little tricky with one answer clearly wrong and two very close to the correct answer. Sometimes the difference might only be an extra zero or the placement of a decimal point. As an examiner for the GMDSS SRC (marine VHF operator qualification) I can testify how often candidates get the wrong answer in the objective testing component of the exam paper, yet perform admirably in the written part.

The present situation with some of the dinosaurs in our hobby reminds me of the old division between the former A and B class licence holders. I won't mention names or callsigns, but a certain few Class A licences holders in my area were well known for their derogative on air comments of Class B licensees. However, being reasonably adept at fault finding, repairs and modifications, it never failed to amaze me that the same dinosaurs would come knocking at my door when their off-the-shelf radio developed a fault; some even asking me to make up power cables and coaxial patch leads as they lacked basic soldering skills.

If the new type of paper examination is as easy as some would have us believe, I'd be interested to see the results if some that hold such views sat the advanced level multi choice paper used presently.

ONE FUTURE FOR AMATEUR RADIO?

Godfrey Manning, G4GLM

The January *RadCom* (page 25, penultimate paragraph) suggests electromagnetic utopia with all signals under the thermal noise level and "...invisible to all other users." This sounds like getting something for nothing, so I feel that it raises some questions.

If a large number of spread-spectrum signals are superimposed, as would happen if all professional communications also went on to the proposed new system, then the noise floor would be raised. Digital techniques would be attempting to pull the same weak signal out of a higher noise and there's no magic about it. Perhaps the signal can be resolved while so many dB below noise, but when the noise floor comes up the gap widens and that dB margin is eroded. That this can actually happen was even mentioned on page 24 of the article (existence theorem) where a spread-spectrum signal was raising the INTELSAT noise floor in an identifiable and definitely not 'Invisible' way.

We now need to model some power budget calculations. The proposal is to throw the existing bits (literally!) of transmitted information up in the air and have them come down in a different shape, that is to say spread more thinly across a wider spectrum.

Now multiply that up for all possible signals superimposed at once and see what this does to the noise floor and how a single wanted signal would fare. This must be characterised before rushing in and assuming that the proposed new system is viable, let alone an improvement.

Ray Soifer BSc(Eng), MBA, W2RS

Thank you for publishing Professor Cochrane's highly thought-provoking article. However, it leaves me with a problem. "Our mission" he writes, "is the maximal exploitation of the electromagnetic spectrum to the advantage of man and machine for the purposes of communication, sensing, manipulation, and processing."

Er, what does that have to do with amateur radio? BT could say much the same thing. So could the Royal Signals, or, for that matter, Cisco Systems and IBM.

As an alternative, how about this, taken from the ITU Radio Regulations: Amateur radio is "a service of self training, intercommunication and technical investigations carried on by amateurs, that is, duly authorized persons *interested in radio technique solely with a personal aim* and without pecuniary interest." (italics added).

Amateur and commercial/government technologies may be diverging to some extent, reflecting our different missions, but we amateurs have not been standing still. This may be seen from another excellent article in the February issue, "An Introduction to Moonbounce" by G4ZTR and G4SWX. It's been 22 years since *RadCom* last published such an introduction. I wrote that one, and am delighted by the technical progress in the intervening years, which has brought EME within the capabilities of countless more amateurs.

Is amateur radio "on a trajectory to total stagnation" as Prof Cochrane fears? Hardly!

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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-lapbs.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,

160m - 6m 100W Ethernet Connection

ANAN-100E £2299.95c ANAN-100DE £2999.95c

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

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.

ANAN-100E / 100DE Brief Specification

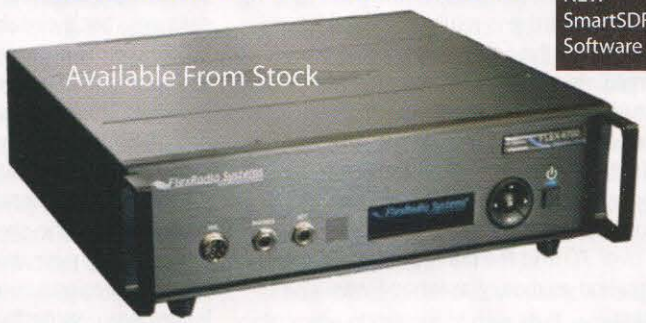
- *160 - 6m Transmit and Receive. All Modes*
- *Receive 10KHz - 55MHz All Modes*
- *ANAN100 - Single Physical receiver (7 within software)*
- *ANAN100D- Dual Physical receivers (14 within software)*
- *Software - PowerSDR mRX - up to 768kHz display (Current)*
- *cuSDR - up to 55MHz display 'In development)*
- *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

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 QRP Radio
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

ELECRAFT®

K3 HF Transceiver HF - 6m

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 terst 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 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 fate - don't.. The K3 is probably the most regularly updated radio on the market. And that is why you rarely see them second hand!

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 pole 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
KTCXO3-1	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!

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 around 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

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- ML&S are a main sponsor & supporter of the CDXC Foundation
- ML&S are the sole principle sponsor of the prestigious RSGB Convention
- All our front line sales, support and engineers are fully licensed active Radio Hams
- HF is our passion.

Kenwood TS-990S

200w HF/50MHz Base Station Transceiver with Dual TFT Display and Dual Receiver

KENWOOD

see www.hamradio.co.uk/ts990s

The TX Factor is a TV Show dedicated to Ham Radio. See YouTube "TX Factor"

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The Kenwood TS-990S carries on where the famous TS-930, TS-940 & TS-950SDX left off.

Let ML&S discuss how you can have one of the most exciting Base Station HF/6m Transceivers in your shack - today.

USUAL RRP: £6,819

ML&S PRICE: £5,999.95

Includes SP-990 Matching Deluxe Base Speaker (RRP: £219.95)

Add the new LDG DM-990 Large Format metering system for only £159.95