RadCom

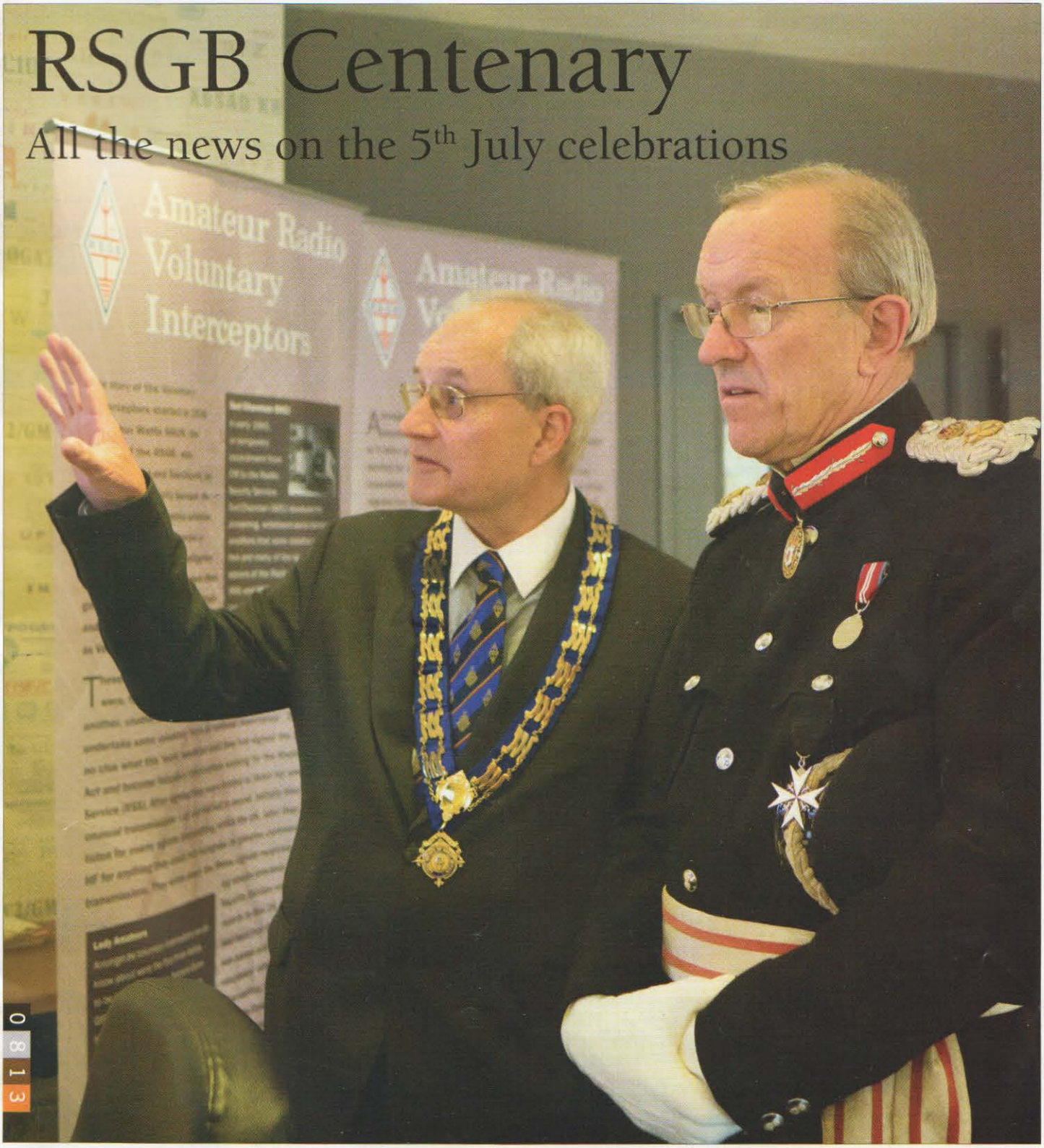
RADIO SOCIETY OF GREAT BRITAIN ◆ 100 YEARS WORKING FOR AMATEUR RADIO

Radio Society of Great Britain
RSGB
100 YEARS 1913 - 2013

AUGUST 2013 ◆ VOLUME 89
NUMBER 08 ◆ £4.95

RSGB Centenary

All the news on the 5th July celebrations



0813

Design Notes

Accurate power measurement using ingenious 1960s technology

Mills on the Air

May's successful event activating wind and water mills countrywide

QRP

A replica Paraset at Four Days In May, new radio kits and other low power news

WATERS & STANTON

Orderline 01702 206835 Online Catalogue www.wsplc.com

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Enquiries: 01702 204965
Fax: 01702 205843
Email: sales@wsplc.com
Mon-Sat 9am-5.30pm

Scottish Store

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Phone: 0845 5050128
Fax: 01592 610451
Email: jayceecoms@aol.com
Sat 9am-4pm Tue-Fri 9.15am-5pm
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Follow @wsplc on twitter!

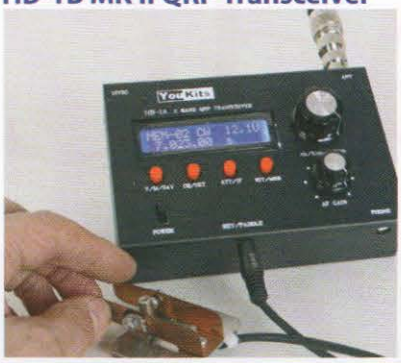
RigRunner

The smart Way to Run Your Rig!

Each unit includes 2m main feed cable and is rated at 40A unless stated otherwise. Each output is individually fused and all connectors are of the Anderson type.

RR/8012/C	RIGrunner 12-way 24 connectors 80A	£155.95 C
RR/8012	RIGrunner 12-way with audio warning	£146.95 C
RR/4010/SC	RIGrunner 10-way and connectors + Master switch	£146.95 C
RR/4010/S	RIGrunner 10-way with audio warning	£129.95 C
RR/4012/C	RIGrunner 12-way AF warning and connectors	£129.95 C
RR/4012	RIGrunner 12-way with audio warning	£112.95 C
RR/4008/C	RIGrunner 8-way AF warning and connectors	£121.95 C
RR/4008	RIGrunner 8-way with audio warning	£99.95 C
RR/4008H/C	RIGrunner 8-way and connectors (Horizontal)	£112.95 C
RR/4008H	RIGrunner 8-way (Horozontal)	£95.95 C
RR/4005/C	RIGrunner 5-way and connectors	£79.95 C
RR/4005	RIGrunner 5-way	£66.95 C
RR/4005H/C	RIGrunner 5-way and connectors (Horizontal)	£79.95 C
RR/4005H	RIGrunner 5-way (Horizontal)	£66.95 C
RR/4004U/C	RIGrunner 4-way, 12 connectors dual USB	£89.95

HB-1B MK II QRP Transceiver



Enjoy the great outdoors with this fine little transceiver.

This little CW 80, 40, 30, and 20m transceiver runs 6 Watts from external 12v or 4W from optional internal lithium cells. Has tunable filter 400Hz-3kHz, electronic keyer, programmable auto CQ, 30 memories, switched tuning speeds. Also receives SSB from 3.4 - 16MHz. It also has a nice clear LCD display. A great QRP transceiver at a great price.

IN STOCK £249.95 C

INTEREST FREE CREDIT IS AVAILABLE ON MOST EQUIPMENT.

We want to make buying that new rig as painless as possible and cut down the waiting time. That's why we offer interest FREE credit terms and great part exchange deals. So if you have some gear to part exchange, want to take advantage of our interest free terms, or both. Just call or email us and we will be happy to put a deal together. You could have the radio you want in a couple of days, with a great part exchange deal and an interest free loan for the balance. Act today.

HOCKLEY MEGA OPEN DAY

SUNDAY JULY 28th

10am - 4pm FREE LOCAL PARKING

OUR BIGGEST OPEN DAY EVER. We celebrate our coming 40th anniversary in September. We promise that it will be a day to remember. DON'T' MISS OUT!

Lecture Stream

Rob Mannion G3XFD "My years as editor of Practical Wireless."
Peter Waters G3OJV "Our close association with Elecraft USA."
Justin Johnson G0KSC "My antenna designs and our manufacture."

Wednesday / Thursday 24th/25th Essex CW Group will be here operating G100RSGB from early till late! Come and watch them and have a tea or coffee - we will post closing times on www.wsplc.com

Icom - Kenwood - Yaesu will be with us
Elecraft Contest Station
InnovAntennas with 80ft Mobile Tower
Huge Discounts + Service Clear Outs
RSGB & Local Groups
Over £1000 Raffle Prizes
FREE Refreshments & Parking
BE THERE!

FT-950 - SAVE £165!
HF & 6m 100W Transceiver

30kHz - 56MHz Rx, Auto ATU, triple conversion Rx with 3 roofing filters, 32 bit floating point DSP, Tx variable bandwidth and Mic EQ adjust, and much more! A really great transceiver for base station use. One of our most popular radios. **£1099.95c**

FT-450 HF & 6m 100W Transceiver

The FT-450D is a great base station that covers all HF bands anf goes right up to 50MHz. It also has a built in auto ATU. **£789.95d**

FTDX-3000HF & 6m Transceiver

NEW

Dual roofing filters, DSP IF filtering, large colour LCD screen, RTTY and PSK31 mode. Spectrun scope, bandscope and data. Super front end combined with down conversion to 9MHz . IF output and USB interface comes as standard. And of course you get a built-in automatic ATU. IN STOCK - **£2399d**

FT-DX5000 160 - 6m Transceiver

NEW DISCOUNT PRICE!

This radio is regarded by many as the current ultimate performer for serious HF base station use with its 3dB power advantage over the standard 100W radios. Available from

The current Yaesu "flagship" radio.

FT-DX5000 Standard	**£4199.95 D**
FT-DX5000D + SM-5000	**£4495.95 D**
FT-DX5000MP abobe + filters	**£4899.95 D**

FTM-350AE NOW £399.95!
2m/70cm Mobile Transceiver

SAVE! £200!

The FTM-350AE 2m/70cm transceiver from Yaesu with Bluetooth GPS APRS * Two Separate Receivers * GPS / APRS® / Bluetooth® * 144/430 MHz 50 W FM Dual Band Transceiver * DTMF Microphone Included .

WATSON Power Mite-NF

£79.95c

- 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

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

WIN A BRAND NEW YAESU FT-897D!

YAESU

To be in with a chance of winning a brand new FT-897D or 19 other prizes - simply return your Yaesu warranty card to us for any Yaesu purchase made through W&S between 18th March and 3pm Saturday 28th September 2013. Draw will be held at RSGB National

FT-60E + FREE ACCESSORIES!
2m/70cm Dualband 5W Handie

Choose either a QS-112Y4 Speaker Mic or WEP-501Y4 Earpiece/Boom Mic.
+ THESE GOODIES
1x WCN-3 Adaptor (worth £4.95)
1x LBMP-BK Log Book (worth £5.95)
1x WSC-3 Soft Case (worth £12.95)
1x Exclusive Yaesu Cap (worth £19.95)

£129.95b Plus £50 Worth of FREE Extras

ICOM Exclusive Deals!

IC-7000

SAVE £100

HF-70cms up to 100W All Modes £1099.95d

PLUS £60 of FREE Accessories

Base or mobile, this is a great all-band and all-mode radio. Full colour screen, DSP selectivity and noise reduction and a great reputation.

ICOM Cap	worth £19.95
ICOM Mug	worth ££7.95
ICOM Document case	worth £19.95
A4 Log Book	worth £4.95
World Prefix Map	worth £4.95

IC-R6

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

PLUS £50 of FREE Accssories

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 - SAVE £60!
2m/70cm 5W Handheld

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

ICOM IC-7100 HF - 70cms inc 4M!

Feaatures

- *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 versatile digital processing performance*
- *Built-in RTTY demodulator and decoder*
- *Voice recording and playback functions*
- *Optional RS-BA1 IP control remote control software*

REX Rig Expert Ukraine

Antenna analyzers

AA-30

1-30MHz Graphical SWR (Standing Wave Ratio) and impedance display are key features of these analysers which significantly reduce the time required to adjust an antenna. **£195.95b**

AA-54

1 - 54MHz. Easy-to use measurement modes, as well as additional features such as connection to a personal computer (to plot Smith charts, etc.), make RigExpert AA-30 and AA-54 attractive for professionals and hobbyists. It is quite important that graphical display of various parameters over a wide frequency range. **£259.95c**

AA-230 Pro

1 - 230MHz. If you are serious about antenna work and design then this is the analyser for you. Totally portable with a large graphic display, it provides a wealth of data. **£419.95c**

KENWOOD TS-990S 160m - 6m Transceiver - In Stock!

RadCom: "Performance Second to None" - "performed impeccably on strong and

New Low Price!

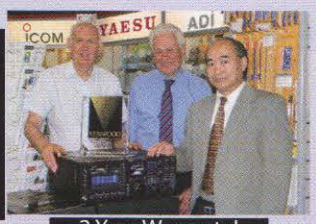
PART EXCHANGE WELCOME

PHONE OR EMAIL US FOR A REALLY GREEAT DEAL.

The TS-990s 160-6m 200W transceiver is the product of many months of work carried our by the Kenwood engineers, and has resulted in a radio that is surely right at top of current radio technology. Its comprehensive colour display forms the centre of the design. The large heavy flywheel drive is a joy to use and underlines the mechanical superiority of the TS-990s.

When you get your new TS-990 transceiver you also get a high quality Heil microphone to give you the best audio in the business. The TS-990s is capable of some wonderful audio quality that can be achieved using a top grade microphone.

PART EXCHANGE MEGA DEALS just give us a call on: 01702 206835



KENWOOD VISIT

The head designer from Kenwood Japan visited us in Hockley at the end of June. Toshio JA6QXW was in charge of the TS-990 design and recalled that he also visited us around 25 years ago!

2 Year Warranty! **£5999.95d**

FlexRadio from USA

Flex-1500 1.8 - 54MHz 5 Watts All Modes

It's the ideal radio to get started on SDR radio. All you need is a Windows based PC with a USB port. and a 12v supply. You all the features shown on the adjacent screen display inc. specturm display and superb

Flex-30001.8 - 54MHz 100 Watts All Modes + Auto ATU

The great SDDR base station with a full 100W output and built-in auto ATU. You just add a Windows based PC and firewire cable. Join in the fun with great performance. **£1399.95c**

- - - and this is the display that you get with your radio. It's large, clear and the most comprehensive you can imagine. Total Flexibility and Total Controllability.

Handheld Transceivers

ID-31E 70cm 5W D-Star Handheld with GPS

A sleek and lightweight radio, but don't let size fool you...inside the ID-31E is an integrated GPS receiver and fully functional D-Star radio.
* IPX7 submersible * Micro SD card slot * 1252 memories * 5W output
* Full Dot Matrix Display & Directional Keypad * Automatic Repeater List * Multiple Scan Functions * CS-31 Cloning Software **£349.95d**

VX-3E 2m / 70cm Handheld Wide-band receive **£129.95d**

VX-6E 2m/70cms Handy, Wide-band Receive **£179.95c**

TH-K20E & TH-K40E Two new handies from Kenwood. "K20E" offers 5.5W output and rx from 136-174MHz. "K40" offers 5W out and rx from 400 - 470MHz. ***£119.95d*** each

VX-7R Waterproof triple band handy (silver/black) ***£299.95c***

VX-8DE Triple Band 6/2m/70cm Upgraded APRS **£369.95d**

IC-E80D 2m/70cm D-Star CTCSS & DTCS GPS Compat. **£329.95d**

IC-E92D Dual band 2m/70cm waterproof fitted D-Star. Rugged radio. **£387.95d**

TH-F7E Dual band 2m/70cm + wideband receive inc. SSB **£236.95c**

TH-D72E Dual band 2m/70cm with GPS & TNC + SiRF **£426.95c**

TG-UV2 Dual band 2m/70cm with CTCSS DCS & LED torch! **£84.95d**

KG-UV6D Dual band 2m/ 70cm 5W/4W SMA **£94.95d**

NEW

ICOM ID-51E 2m/70cm DSTAR 5W

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

TS-590S 160m - 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

1.8 - 23cns* All Modes - Ome Box!

KENWOOD TS-2000 160m - 23cn*

A base station that does every thing. All modes, 160-2m 100W, 70cms 50W and 23cm (option) 10W. **£1549.95c**

ICOM IC-9100 160m - 23cn*

The latest all mode DC to light radio from ICOM. 160-2m 100W, 70cms 75W and 23cm (otion) 10W. **£2899.95c**

ASK ABOUT OUR INTEREST FREE CREDIT!FF

ICOM IC-7600 HF Transceiver

HF - 6m 100W
Dual DSP and three roofing filters. 3 - 6 & 15kHz
Double conversion superhet - super image refection
Display 5.8" with ultra wide viewing angle.
Real time specrum scope - USB for flash card or leyboard
PSK and RTTY Operatioon with external keyboard.
104dB dynamic range for great receier performance
IN STOCK £3299.95 D

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. Wethink that this is the one. **£699.95**

NEW

FG-01 MkII Antenna Analyser

The new FG-101 antenna analyser that covers up to 72MHz with larger screen and will include a matching AC charger and PSU. This highly portable unit features dual impedance and VSWR traces with colour screen.

Mobiles

TM-281E Latest 2m FM 65W mobile. Superbly built **£169.95 D**

FT-8800E Dualband Mobile 50W / 30W Great Value **£284.95 D**

FT-2900E 75 Watt 2m 3W Audio, CTCSS, DTMF mic & "WIRES" internet. **£142.95 D**

FT-7900E 2m/70cms mobile 50/40W CTCSS, DTMF, internet, wide Rx **£219.95 D**

FT-8900R Quad band 10/6/2m/70cm FM 50W (70cm 35W) **£329.95 D**

FTM-10E 2m/70cms Blue Tooth & built-in mic. **£324.95 D**

ID-E880 50 Watt Dual band 2m/70cm with D-Star and airband receive. **£439.95 D**

TM-D710E 50 Watts 2m/70cms with APRS **£445.95 D**

FTM-350AE 2m/70cm Mobile Bluetooth GPS APRS **£399.95 D**

TM-V71E 2m/70cm Mobile with Echo Link ~~£299.95~~ **£259 D**

Add A Quality Dash-Board Speaker!

SP-160 * 8 Ohms * Power rating 1.5W * 3m of lead with 3.5mm jack * Size 97 x 67 x 27mm * Weight **£9.95b**

SP-180A 6W Amplified Speaker 6W * Gain and on/off control * 12V DC cigar plug, bracket, audio lead with3.5mm plug. **£20.95b**

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

HF - UHF Compacts - One Box! GREAT PRICES

YAESU

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

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

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 Has extra IF filter & an Auto ATU built in. 100W 160m - 6m with 3 IF filters 300Hz, 500Hz & 2.4kHz. **£789.95d**

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

ICOM

ICOM

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

KENWOOD

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

TEN-TEC

Jupiter-538CE 160m - 10m 100 Watts SSB CW AM FM with on-screen CW reader and socket for PC keyboard.

IN STOCK **£1649.95d**

WATERS & STANTON

Orderline 01702 206835 | Online Catalogue www.wsplc.com

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Phone: 0845 5050128
Fax: 01592 610451
Email: jayceecoms@aol.com
Sat 9am-4pm Tue-Fri 9.15am-5pm
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It's Official! - W&S The World's Largest MFJ Distributor

Why Buy From Us?

W&S are the world's largest MFJ dealer and the exclusive distributor for the UK. We offer a 12 month warranty and carry out all service work on MFJ we sell. Nobody has been selling MFJ longer than us, and only W&S are endorsed and supported by MFJ. That means you get the best deal now and for the life of your purchase.

MFJ

Just Great Ideas!

MFJ-225 Antenna Analyser with USB VNA!

It's the most comprehensive antenna analyser available for ham radio use and built to a very high standard.

NEW

Introductory Offer **£399.95b**

We are pleased to announce the introduction of the new antenna analyser from MFJ. This is a new step forward in design with built in VNA and can even be powered from the USB port of your PC.

FEATURES

- *VSWR with variable bandwidth sweeps 1-180MHz*
- *3" LCD panel for detailed data display.*
- *Impedance and reactance*
- *Return cable loss and phase angle*
- *Capacitance and Inductance measurements*
- *Coax length and loss - Coax break location*
- *VNA works with your PC - USB connection*
- *Power: Internal AA cells, Ext, 12v or USB*

Antenna Analysers To Make Antenna Adjustments EASY!

MFJ-266 HF/VHF/UHF Digital Ant Analyser

Covers HF, VHF, plus UHF amateur & commercial frequencies with digital precision. Also displays SWR, Complex Impedance, & Impedance magnitude simultaneously - all on the same easy-to-read LCD screen. Use it to measure Capacitance, Inductance. Field Strength, Frequency & generate test signals. Fine tune stubs, analyse coax, test baluns & RF transformers, and perform many other important RF-related tasks around the shack

£329.95 c SPECIAL!

MFJ-269PRO Professional Digital Analyser

Instantly check and tune any antenna from 1.8 to 170MHz and 430-520MHz with this antenna test lab! It measures SWR, return loss, reflection coefficient, match efficiency, RF resistance, reactance, impedance and phase angle of antennas and antenna resonance, and Q. Even determine coax cable loss, velocity factor, length and electrical degrees.

429.95c

MFJ-986 1.5kW 1.8-30MHz ATU

Differential-T Tuner uses a differential capacitor making tuning easier. Broadband coverage ends constant re-tuning. A rugged roller inductor atu that handles 1500 Watts PEP SSB power and covers 1.8 - 30 MHz continuously.

£359.95c

MFJ-269 HF/VHF/UHF Digital Analyser

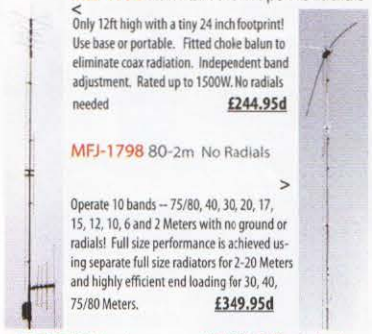
* Freq Coverage 1.8-170, 415-450MHz
* Frequency Counter * LCD readout
* SWR & impedance or SWR Bargraph
* Coaxial loss meter * VSWR Meter
* Signal Generator * N-socket (Ant), Freq Counter) **£389.95c**

MFJ Vertical HF Antennas

MFJ-259B HF/VHF Digital Analyser

* Frequency Coverage 1.8-170MHz
* Frequency Counter * LCD readout
* SWR & impedance or SWR Bargraph
* VSWR Meter * Signal Generator
* Connectors: SO-239 (Ant), BNC (Counter) **£289.95 £249.95c**

MFJ-1796 40m-2m No Traps No radials



Only 12ft high with a tiny 24 inch footprint! Use base or portable. Fitted choke balun to eliminate coax radiation. Independent band adjustment. Rated up to 1500W. No radials needed **£244.95d**

MFJ-1798 80-2m No Radials

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with no ground or radials! Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters. **£349.95d**

MFJ-974B 3.5-30MHz Manual ATU 300W

A fully balanced line antenna tuner. Gives you superb current balance throughout a wide matching and frequency range. Handles 300 Watts SSB PEP and 150 Watts CW. ~~£194.95c~~

SPECIAL! **£175.95 c**

MFJ-974HB Same as MFJ-974B but covers 1.8-54MHz. ~~£199.95~~ £189.95 C

MFJ-9982 1.8-30MHz 2.5kW Manual ATU

Continuous Carrier atu handles 2500 Watts continuous carrier output on all modes and all HF bands into most unbalanced antennas -- even on 160 Meters where even the best atu's fail! 6-position antenna switch, 4-core balun, dummy load, true peak/average lighted SWR/ Wattmeter, 6:1 reduction drives with detailed logging scales, 3-digit turns counter

£684.95c

MFJ-263 300W Load DC-3GHz

NEW

DC-3GHz with N socket. Handles 125W continuous and 300W for10 secs.

MFJ-263 b £99.95 b

MFJ-251 Calibrator Load

NEW

This 300W load lets you switch 6.6, 25, 50, 100 or 150 Ohms to provice 1:1, 2:1 and 3:1 VSWRs (high and low impedance) **£TBA b**

MFJ-912

The fanous W9INN 4:1 1.5kW balun is for feeding ladder line via coax cable. Two large insulators for ladder line and SO-239 for coax. loss. **£76.95c**

MFJ-971 1.8 - 30MHz Portable ATU (QRP)

The MFJ-971 is ideal for portable work and as well as dual ranges of 30W and 300W, it is possible by changing an internal jumper to convert to QRP 6W or 30W FSD. Wire, coax or balanced.

£119.95c

MFJ-941EK ATU KIT!

NEW

Now you can build your own ATU, have fun and save money!

300W 1.8 - 30 MHz Coax , wire or balanced - includes case. **£145.95c**

MFJ-941E 1.8 - 30MHz 300W ATU

Here is amazing value. A cross needle meter, antenna selector switch, and the ability to match wire, coax and balanced feed. This makes a great base station gtuner capable of up to 300W and has internal 4:1 balun. 12v illumination **£119.95c**

MFJ-993B IntelliTuner Auto ATU 300 W 1.8-30MHz VALUE!

Lets you tune long wire, coax or balanced feed. Features analogue cross-needle meter & LCD display! MFJ's exclusive algorithm gives you ultra fast tuning with 20,000 memories! Beat that! Select 300 Watts for 6-1600Ω matching or 150 Watts for ultra wide 6-3200Ω. Versatile antenna selection and pre-used setups are found in milleseconds! **£279.95d**

MFJ-925 Ideal For IC-7000/FT-857D

This ATU sits nicely under the IC-7000 or FT-857D. A complete automated station that will match any antenna!

£174.95d

MFJ-929 World's Fastest Compact Auto ATU

200W handling matches any antenna with near perfect VSWR. Get the best from your antenna!

£214.95c

MFJ-991B 300W Auto ATU

Handles 300W, cross needle meter. Wide range: coax, balanced or wire. 300 Watts matches 6-16000 hms, **£214.95c**

MFJ-998 1.5kW Auto ATU

Highest power model matches coax, balanced feed - fast tuning. Cross needle metering & LCD display.

£659.95d

1.5kW Handling Power!

MFJ-998RT 1.5kW Remote Auto ATU

MFJ's 1500 Watt remote automatic antenna tuner is built into a weather-tight ABS plastic cabinet top with a stainless steel bottom. Includes MFJ-4117 BiasTee Power Injector to send DC/RF down the coaxial line. When you key your transmitter, MFJ's InstantRecall checks to see if that requency has been used before. If so, tuning is instantaneous. Measures 13 3/4W x 6 3/4H x 17 1/2D inches. It's the true fit and forget Auto ATU for those using linear amplifiers. **£779.95d**

MFJ-994BRT 600W Remote Auto ATU

As you're ragchewing, contesting or DXing, your MFJ IntelliTuner is learning! to operate in milliseconds! We've made this tuner to suit the UK market, so that those with linear amplifiers can enjoy the benefit of auto ATU. Includes coax DC feed. **£449.95d**

MFJ-993BRT 300W Remote Auto ATU

The Remote IntelliTuner is mounted in a durable hard plastic case. Covers 1.8 to 30 MHz, has heavy duty 16 Amp / 1000 Volt relays and a highly efficient L-network. It also includes the MFJ-4117 BiasTee Power Injector to send DC/RF down your coax.

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Diam. at top: 19m

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MFJ-1908H 13m	£249.95d
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RadCom

THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

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

News and Reports

RSGB Centenary Day celebrations – P6

Features

New UK 76GHz distance record – P65

Cover image: Sir Henry Aubrey-Fletcher Bt JP is shown around the National Radio Centre by RSGB President Dr Bob Whelan, G3PJT on RSGB Centenary Day.

Photo: Mike Richards, G4WNC

Reviews

Technical Features

Regulars

RSGB Centenary
100 years working for amateur radio

I wonder what the original Members of the London Wireless Club would have thought about the Centenary Day on 5 July 2013? Visionaries though they were, I can't imagine they would have predicted so many would take part in the day – whether visiting Bletchley Park, working G100RSGB or at the Centenary dinner.

It was a glorious day, the weather was warm and sunny, and around 250 Members used their free entry vouchers to join in the celebrations. Overseas RSGB Member Joachim V Geisau, M0JVG/DH4JG, summed up the thoughts of many visitors when he said, "Having been a frequent visitor to the UK and an RSGB Member for more than 15 years I did not hesitate to decide to pay a visit to the RSGB Centenary Celebrations. And it proved to be a good idea. I enjoyed the day very much, especially the re-creation of Dud Charman, G6CJ's Aerial Circus by Terry Giles, G4CDY and the lecture about the role of Radio Amateurs in the Radio Security Service during WWII – completely different from the history of German radio amateurs at that time. The importance of a hundred year's history was very well underlined by Sir Henry Aubrey-Fletcher Bt JP in his speech unveiling the plaque commemorating the Society's centenary. The Centenary Dinner at Horwood House proved to be a very nice evening with some good speeches and, of course, a great dinner. Another remarkable point for me is an invitation to Wales by a fellow radio amateur! All in all it was a brilliant event – so I am looking forward for the next anniversary!"

The Lord Lieutenant, Sir Henry Aubrey-Fletcher Bt JP and RSGB President Bob Whelan, G3PJT after the unveiling of the RSGB's Centenary plaque.

Members of RSGB HQ staff and Bletchley Park personnel were around the site to help visitors with maps, programme details and directions and we have received several comments from visitors saying how helpful everyone was. We were also joined by 21 students and teachers from schools who tried their hand at amateur radio direction finding (ARDF) and home construction. We had hoped to be joined by our Patron, HRH The Prince Philip, Duke of Edinburgh, KG, KT but, following his recent illness, he has cancelled all official engagements until the autumn. Graham Coomber, G0NBI, RSGB General Manager said, "Thanks to the efforts of our team of volunteers and staff, the day was a great success. We were able to overcome the disappointment that the Patron could not be with us, and we wish him a speedy recovery".

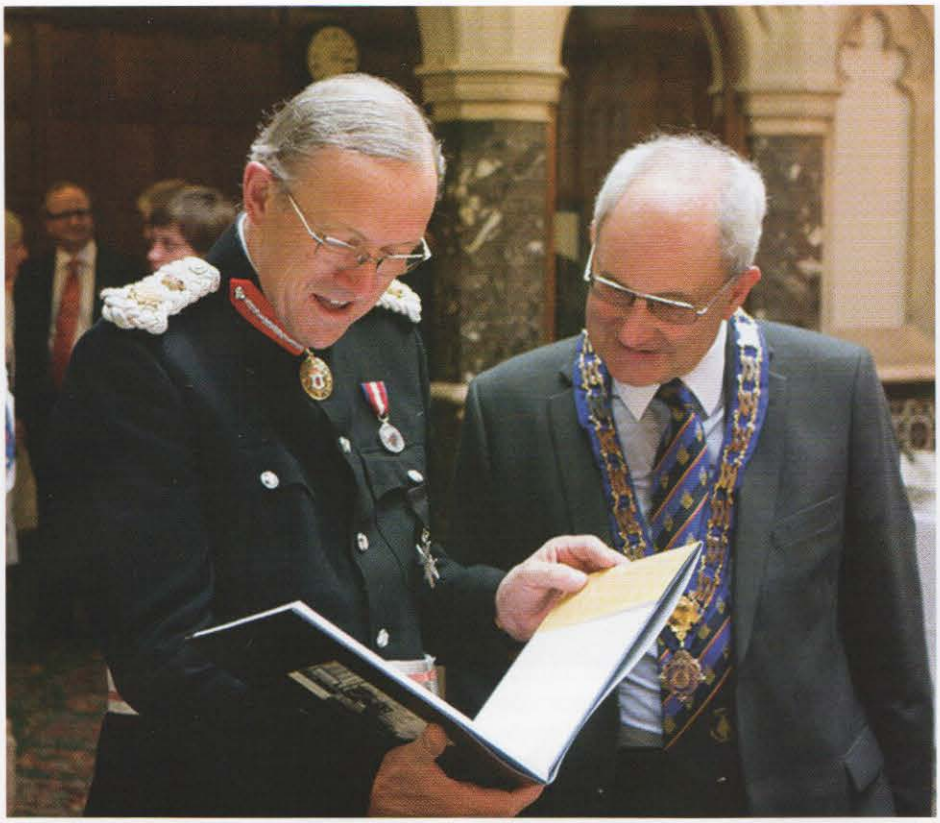
NATIONAL RADIO CENTRE. The NRC was open all day, running the G100RSGB callsign rather than the usual GB3RS call. The pile ups continued all day as stations queued to get G100RSGB in the log on the actual anniversary day. Our thanks go to the three main operators for the day, Richard, G4MKR, Robert, G3ZNH and Peter, M0PJD, for their sterling efforts. Throughout the day VIPs and students were given guided tours of the building and they were encouraged to try the various interactive exhibits. Many Members were visiting the NRC for the first time and there are lots of very positive comments in the visitors' book – several stating the aim of visiting again in the near future.

ARDF. The Amateur Radio Direction Finding team were busy from the moment the gates opened and our thanks go to Bob, G3ORY, John, M1SHE and John Marriott for their tireless efforts. In the morning they were visited by the students and their teachers. Later in the day, amateurs and members of the public visiting Bletchley Park had the opportunity to try their hand at tracking down the transmitters. For many, this was their first attempt at ARDF and they were surprised at how quickly they were able to master the techniques involved.

STUDENTS & THE BUILDATHON. Year 8 and Year 9 students from Wootton, Holywell and Marston Vale schools were joined by students from Warwick and Kings High School for Girls. They had a jam-packed day, beginning with radio orienteering in the morning. This involved students (and teachers) wearing headphones to listen

Students had a jam-packed day, beginning with radio orienteering in the morning.

Students taking part in a Buildathon.



The Lord Lieutenant, Sir Henry Aubrey-Fletcher Bt JP and RSGB President Bob Whelan, G3PJT reading the Centenary book.

to signals directing them towards hidden beacons to collect a stamp once found. All the times were recorded and medals were awarded to the fastest. Students also listened to a talk on how the Enigma machine helped us to win the Second World War.

The major part of their day however involved taking part in a Buildathon where students had to construct a 20m direct conversion receiver then write a programme for a Raspberry Pi computer to log the signals received. This took several hours and required an awful lot of patience and skill on a very hot day! Students persevered and the vast majority managed to see their receivers in action by the end of the day. Thanks go to the organisers of this activity, Steve, G0FUW, Lewis, G4YTN, Dan, M0TGN and Peter, 2E0SQL.

The RSGB would like to thank RS Components who provided a Raspberry Pi and all accessories for each student. Thanks also to Peter Wood and Colin Eddy from RS Components who provided support on the day.

Students were visited by the Lord Lieutenant of Buckinghamshire before being presented with their own Raspberry Pi computers to take home with them. Students were all praised for their excellent standards of behaviour and patience and were a credit to all of their schools.

LECTURES. During the day a lecture programme took place in the Mansion. Terry Giles, GCDY, assisted by Martin Charman, G4FKK, presented his recreation of Dud Charman, G6CJ's Aerial Circus. Both the morning and afternoon lectures were full to overflowing, such was the anticipation for this talk. Originally, Dud designed a system that used microwaves to demonstrate aerials of all shapes and designs. It was first demonstrated in 1945 when, using micro-mini aerial models, he was able to illustrate exactly what happened to the RF when reflectors and directors were added to a dipole. Terry has created a modern equivalent and demonstrated a variety of aerial designs, showing the radiation patterns associated with each aerial.

Paul Cort-Wright, G3SEM spoke about the role played by the RSGB and radio amateurs in the Radio Security Service (RSS) during WWII. Arthur Watts, G6UN was the President in 1939 when he was approached by Lord Sandhurst who was looking for amateurs who could help set up a radio listening watch on behalf of the RSS. Gradually, under an oath of secrecy, he talked to some of the leading operators of the time and they were asked to join. Operating from their own homes, in back bedrooms and sheds, these Voluntary Interceptors carried out their new task. Their reports were sent to the mysterious Box 25, which was actually in Barnet, north London. There they were sorted and passed to the Government School of Codes and Ciphers at Bletchley Park. By 1941 they had reached a peak of 10,000 pages in a single day. They received signals that were shown to have come from the German Secret Service. There were around 1,500 radio amateurs engaged as VIs at the peak of WWII.

The final talk of the day was A Dip Into The RSGB Archives to look at the work and innovation of RSGB Members during both World Wars. Using photos and documents found in the RSGB archives as well as research from other sources the stories were told of amateurs such as Lt Col Baynton Hippisley, licensed as HLX and later as 2CW, and his creation of a listening post in WWI; Ernest Simmonds, 2OD who worked with early valves; Dud Charman, G6CJ and his work at Hanslope Park and the RAF Civilian Wireless Reserve.

PLAQUES. In the afternoon, the RSGB and guests were joined by The Lord Lieutenant, Sir Henry Aubrey-Fletcher Bt JP, High Sheriff of Buckingham Sir Stuart Hampson, and Councillor Brian White, Mayor of Milton Keynes. Sir Henry unveiled two plaques; one commemorating the work of the Voluntary Interceptors during WWII and the other celebrating the RSGB's Centenary. Sir Henry paid tribute to the Society's Patron who had served the Society for 61 years and explained his own interest in radio over the years. That started when, as a schoolboy, he visited a local repair shop to collect old components that were being thrown away for re-use in his own projects. He went on to speak about the work of the Voluntary Interceptors, many of whom were Members of the RSGB in WWII, as they took on their secret and lonely task. He then unveiled the plaque commemorating their work. It says, 'To commemorate the work of 1500 radio amateurs who as Voluntary Interceptors assisted the World War II effort through the interception of German wireless

Winners of the ARDF medals for the fastest times.

The guests at the RSGB Centenary dinner.

communications. "In the years when Civilisation was menaced with destruction they gave generously of their time, powers and technical skills in essential service to this Country" Sir Henry Creedy, War Office, 1945'.

Before unveiling the second plaque, Sir Henry spoke about some of the highlights in the RSGB's history including the work of Hippesley in WWI, the VHF aviation experiments in the 1930s, the radios built for Everest expeditions and the work of radio in emergency situations. He noted that whilst the technology has changed the essence of amateur radio has not; it still enables people to communicate all over the world.

After unveiling the plaques, Sir Henry accompanied RSGB President Bob Whelan, G3PJT on a tour of the National Radio Centre. He also visited the Buildathon and the ARDF team.

At the end of the day, RSGB President, G3PJT said, "Our past, our present and our future came together in one gloriously confident day. Thanks to everyone who played their part, the Members, the VIPs, the organisers and the general public, all came together to make a memorable event."

Victor Brand, G3JNB demonstrates for The Lord Lieutenant, Sir Henry Aubrey-Fletcher Bt JP.

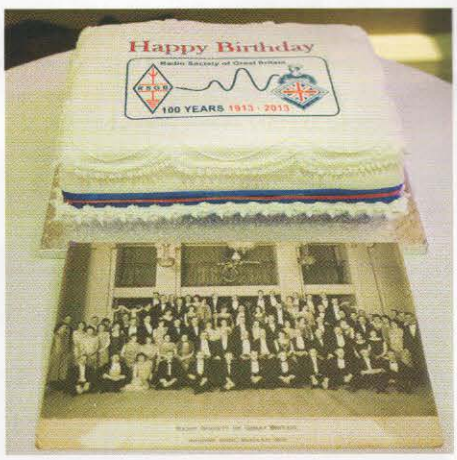
CENTENARY DINNER. Later that evening, 151 guests gathered at Horwood House for the Centenary Dinner. Billed as a voluntary black tie event in recognition of the Founder Members who regularly held formal dinners, all the guests got into the spirit of the evening. A celebratory photograph was taken (see above) and can be viewed and downloaded at www.rsgb.org/picture.

A number of presentations were made during the evening. Kay Craigie, N3KN, President of the ARRL, presented a framed Resolution of Congratulations from the ARRL Executive Committee and Tim Ellam, VE6SH, IARU President, presented the RSGB President with an engraved clock. These gifts, and others received from IARU Region 2, DARC, ARS of India, Danish EDR, Quarter Century Wireless Association Inc, Amateurfunkclub Deutschland and Polish PZK will be displayed in the library of the National Radio Centre.

Professor Peter Cochrane OBE, G3RVC was the after dinner speaker. He has been involved in science, technology and engineering for over 40 years. Nowadays he mainly deals with solving problems through the application of new technology. He spoke of his early radio experiments, some of which caused sparks, small explosions and the odd electric shock! He went on to challenge those radio amateurs in the room to look at the hobby differently by going up in frequency and to think about going well beyond what we know and do. He encouraged us to get into new forms of radio relay and explore things like optical fibre technology.

It was an entertaining evening enjoyed by all who attended and a fitting end to the RSGB's Centenary Day.

Professor Peter Cochrane OBE, G3RVC was the after dinner speaker.



The RSGB's Centenary cake and photograph showing a dinner in 1925.

G5RP Trophy

The G5RP Trophy is an annual award to encourage newcomers to HF DXing. However, the award is not limited to youngsters or the newly-licensed: the HF DX bug can bite at any age or after many years of experience on other bands. If you are an established HF DXer and want to recommend someone to be awarded the G5RP Trophy for 2013, now is the time to send in your nomination. Your nominee should be an up-and-coming HF DXer who has made rapid progress in the last year and has some real achievements to show, for example, a good total of new countries worked or some serious HF DXpedition activity.

This prestigious award will be presented this year at the RSGB Convention on 11-13 October. Please send your nominations to Ian Greenshields, G4FSU, QTHR, or by e-mail to ian.greenshields@gmail.com, to arrive no later than Friday 23 September.

Paul Bowen received the G5RP trophy from RSGB President Dave Wilson, M0OBW at the 2012 RSGB Convention.

QSL Matters

G0 SERIES – MAJOR REVIEW. Following the retirement of a number of long time, loyal sub managers, including G0L; Chris Lennox, G4LXU, G0N; Phil Yates, G7BZD, G0R; Don Roomes, G0T-V; Jon Joll and others and a review of the demand for QSL services, it has been agreed to consolidate all G0 calls into a single group, for the time being. Tony Roberts, G4KZZ and current G0G manager has kindly accepted the challenge of creating the new G0 Series. Over the next 3-4 months, all card and envelope stocks will be transferred, in stages, from other sub managers. As this is a major change, users are asked to help by making sure that they label their C5 collection envelopes correctly, not only with their callsigns, but also their membership numbers, in the top left hand corner, as per the *RSGB Yearbook* and website instructions.

G3A-D. Ted Allen, sub manager for G3A-D and G0N, is retiring after a remarkable stint not only as a sub manager, but also as the former controller of the RSGB's central bureau. Over the years Ted has handled millions of cards for many Members. The Society is deeply grateful for his dedicated service to others and wish him well. His place is being taken by Paul Pasquet, G4RRA, the current G5 series manager.

G4F. As part of changes to the G0 series, another long time and well-known volunteer, Margaret Burchmore, G0ARQ is taking the opportunity to retire. She is also giving up the G4F series. Our thanks go to her for her long and valuable contribution to the amateur community. This series is to become part of a combined G4E-F group, managed by Jeff Pascoe, G4ELZ.

POSTAL GREMLINS. In the June issue we recommended that the most cost-effective advice for small packages was to stay under the 2kg limit, but to be aware that the Post Office now also checks the size of parcels. It should have read the maximum package size is 45cm x 35cm x 80cm, not millimetres! For more info, see *'Our Prices – April 2013'*, from the Post Office, or online.

QSLING 100%. 2013 postal changes have resulted in some bureau users no longer wanting to collect outstanding cards. This highlights again the challenge of finding ways to prevent unwanted cards being sent to the bureau (where they will eventually just be recycled). One solution is for special event stations, clubs and members to upload their logs to *Club Log* and Logbook of the World. Then, if one of your contacts wants a QSL card they can request one using OQRS rather than sending an (unwanted) card. This will reduce waste, cut cost and speed up replies for both sides of a QSO. Don't forget to update your QRZ entry and let people know your QSLing policy on the air too.

The bureau would like to hear from any club QSL managers now using these suggestions and of any benefits or issues that result (qsl@rsgb.or.uk).

Emergency Communications Committee

At the last Board meeting held on 15 June, it was agreed to form an emergency communications committee, responsible for all RSGB RAYNET matters and to further improve links with RAEN. This committee will be chaired by Charlie Morrison, GI4FUE, formerly a board member holding the old Public Services portfolio. The committee will meet twice yearly, once at the National Hamfest at Newark and again at the NARSA Rally in Blackpool. Other committee work will be carried out by phone, e-mail and occasional Skype conference calls.

We are looking for four volunteers to sit on this committee – one representing Regions 1, 2 and 3, one representing Regions 4, 5 and 13, one representing Regions 6, 7 and 11 and one representing Regions 9, 10 and 12.

The candidates must reside in one of the Region groups they wish to represent and preferably be an active RSGB RAYNET member.

Applications by e-mail please to Charlie, GI4FUE at charlie@gi4fue.com.

Deputy AROS co-ordinator

I am delighted to announce the appointment of Mark Jones, G0MGX as Deputy AROS co-ordinator. Mario Brashill's shoes will be hard to fill but, in Mark, we have an excellent replacement. **Graham Coomber, G0NBI, RSGB General Manager.**

CONGRATULATIONS

To the following Members whom our records show as having reached 70, 60 or 50 years' continuous Membership of the RSGB.

70 years	
Mr J G Holland	G3GHS
60 years	
Mr A M Ernest	GW3LQE
50 years	
Mr T S Cooper	ZS1PS
Mr K H Hagemans	PA0JOH
Mr J R Hartley	G3WGQ
Mr P N Henwood	G3RWF
A R Preedy	G3LNP
Mr L P Purcell	EI6D
Mr P J Walters	G3THW

RCF Examination Committee

There are vacancies on the RCF Examination Committee (EC). The EC is responsible for the examination specifications and syllabus, the format of examination papers, vetting of examination items and the maintenance of the examination item banks.

The EC works electronically by e-mail where possible and meets about four times a year for two days midweek. The workload varies between two or three e-mails a week to peaks of four or five a day on particular tasks. Tasks include document writing and maintenance, reviewing draft examination items, considering cases of irregularity and assisting in preparing reports.

PERSON SPECIFICATION. Applicants should possess a full licence and have qualifications in radio and electronics at NVQ level 4 (HNC) or higher. An understanding of syllabus development and examination board practice is also required. It is likely that a successful applicant will be currently employed in, or have recently retired from, a teaching role at GCSE, A level or similar or a position in an examination board involving setting examination requirements or handling irregularity matters. Ideally candidates will have experience of committee work and working as a member of a team. Applicants must be willing and able to attend EC meetings that will involve UK travel and overnight stays. Meetings are held on dates convenient to the majority of members. E-mail facilities and internet access are essential. Incurred expenses are reimbursed.

ADDITIONAL INFORMATION. The RCF is recognised by Ofcom for the provision of amateur radio examinations leading to the issue, by Ofcom, of an amateur radio licence at Foundation, Intermediate or Full level.

To ensure the probity and integrity of the examinations the RCF is separate from the RSGB and is concerned solely with the provision of examinations. Administrative management of the examination scheme, registration of candidates, distribution of examination papers etc is provided by the RSGB under a Memorandum of Understanding between the RCF and the RSGB. All examination matters, disciplinary or academic are handled by the RCF Examinations Committee.

The EC liaises with Ofcom and the RSGB on examination matters to ensure that the examinations are of an appropriate standard, are up to date and remain relevant to amateur radio.

The EC investigates and rules on instances of irregularity and decides appropriate sanctions.

Further details of the vacancies are available on the RCF website, www.commsfoundation.org/rce.

APPLICATIONS. Amateurs interested in joining the committee and contributing to its work should e-mail their application to exams@rsgb.org.uk with the subject 'EC Member Application'. They should include a concise reason why they wish to become an EC member and explain why they believe they are suitable for the role.

EMC Committee Chairman

We are looking for a volunteer to lead our EMC Committee as it moves forward in helping to protect the radio spectrum. The current Chairman, John Rogers, M0JAV, is now a Board member, so a replacement is sought.

The RSGB EMC committee provides the following services to RSGB Members:

- Help and advice with EMC issues
- Lobbying and representation on UK and International Standards Committees and with Ofcom
- Publishing information and technical updates

Previous experience in EMC matters is desirable but experience in leading a team of dedicated individuals with differing areas of technical, standards and legislative expertise is more important. The team has been evolving its strategy with emphasis on providing a better service to Members and representing all UK radio amateurs in protecting the spectrum from fast growing threats to the radio spectrum from other devices.

The committee meets face to face three times a year and holds conference calls in between meetings.

Please express your interest to Graham Coomber, via graham.coomber@rsgb.org.uk by 31 July 2013.

For an informal discussion about the post and further information contact John Rogers, M0JAV, via m0jav@rsgb.org.uk.

The following Members and friends signed the RSGB Guestbook at the Dayton Hamvention:

WA2VYA
KG4TIO
W4WEG
KD8TIZ
GM4AFF
W7JSC
AA9IL
GD6IA
KC2TKD
K9AAL
WB0CNK
AA9LC
K9FZ
W2RDS
K1BG/G4WJQ
WA5ZNU
KV1Y
G8TLQ
N7WY
W4HCF
JK3GAD/M0CFW
KC0G
VE7RW
WA8JIM
WB8LMC
WG8S
KA0HMQ
G4TGP
KK7B
GU4YOX
GU4CHY
KA4VCA
KL0QD
WB9SIS
N8EMO
M0AFJ
KI4YDG
UR5WA
WJ1B
K1KG
W8EHH
W8UJM
N9BX
K9PPY
LU4DXU
G2YL
G5KC
K8GLD
N4FNW8LZ
K2JSG
K2OID
KC8WRM
K4SV
KM4CH
WB2FVE
W9WLW
VE3ZI/G3RBP
KB3IEB
W2XL
WB2KHO
W8IXY
KC8LSD
N9HFW
VA3NC
N4NW
LA60P
KB0PE
KW6S
KB9QUL
VE1RGB
VE1QD
HR1/K2LCT
W3FUO
AK4BL
K2ONP
W9TRC
W5AOD
YV5IAL
N9YZA
OA2DKI
WA9IVU
NI9T
N8VZ
VE3KI
KB1CV
KK8R
W1CC
WB0POH
N9WLW
G4LUE
N8ZNJ
W5WI
KA8UUV
K5LBU/AZ5CF
AD7TN/7K4VQV
WA5A00
VE4TTH
KA8IPO
T6M0
W5LN
W0AO

Members of RSGB staff at Dayton 2013. Photo by Jeff Stanton.

GB3WGI 144MHz transatlantic beacon

The GB3WGI transatlantic 144MHz beacon went live at 1600GMT on 4 June, in time for the peak of the 2013 Sporadic-E season. The beacon runs 100W EIRP in CW and JT65b modes on 144.487MHz and is located in the west of Northern Ireland (IO64bl). The plan is to apply for an increase in EIRP in due course. The beacon's function is to provide an early warning of 144MHz transatlantic propagation on the Europe to USA path as a complement to the existing 144MHz transatlantic beacon network in the USA that provides alerts on the USA to Europe path. It also aims to encourage participation in the IRTS Brendan Trophy and to further study the propagation path using weak signal digital modes (WSJT) developed by Nobel Laureate Professor Joe Taylor, K1JT.

Current 144MHz European transatlantic beacons are much further to the South and/or East in Cornwall, France and the Azores. GB3WGI has a clear sea takeoff to the eastern seaboard of the USA.

The beacon was supported by a number of amateur donations including The City of Belfast Radio Amateur Society, but the major donation of £500 was made by the RSBG Propagation Studies Committee from the legacy left by the late Charlie Newton, G2FKZ. The bulk of this went on the beacon, the remainder to fund beacon driver development for future beacons. Charlie Newton wrote the definitive book on radio auroras and was acknowledged as one of the leading experts on the topic of VHF propagation. He was for many years a leading light in the RSGB Propagation Studies Committee. Acknowledgements also go to Brian, WA1ZMS who inspired the concept of GB3WGI, Andy, G4JNT who designed and built the driver, Powabeam Antennas and The DX Shop who supplied parts for the antenna system, to James, G3RUH who provided a GPSDO reference, to Murray, G6JYB for Ofcom liaison, to John, GI4BWM and Dave, GI4SNA and of course to beacon keeper and site manager Gordon Curry, GI6ATZ who really drove the project through to completion.

WELCOME

Last month we offered a special Centenary Membership offer that encouraged Members to sign up a friend for £1. We are delighted to welcome so many new and returning Members and look forward to their continuing support for the Society.

Mr M Placidi, 2E0BJL
Mr J Tonge, 2E0BLP
Mr P Cunningham, 2E0BMV
Mr A Hipkiss, 2E0BSC
Mr L Godden, 2E0BVC
Mr R Byrne, 2E0BYV
Mr F Clifton, 2E0CIY
Mr P Wright, 2E0CKJ
Mr N Curtis, 2E0CMN
Mr C D Barthel, 2E0CPW
Mr D Bonham, 2E0CQW
Mr J Parris, 2E0CRI
Mr J Cranston, 2E0CRN
Mr T Chapman, 2E0CSE
Mr G Wilman, 2E0CSU
Mr B Scott Wilson, 2E0CSW
Mr J Farr, 2E0CUH
Mr M C Boon, 2E0CUU
Mr S Bache, 2E0CUY
Mr A Parker, 2E0CVS
Mr D Mooney, 2E0DCZ
Mr D Jacobs, 2E0DFJ
Mr J Rudd, 2E0DJR
Mr D Jarvice, 2E0DNJ
Mr E Marsh, 2E0EJM
Mr A Whyman, 2E0EZW
Mr C Coady, 2E0FCL
Mr K Rowland, 2E0FFG
Mr A Claxton, 2E0FMF
Mr G Foster, 2E0GBB
Mr G Bosnyak, 2E0GCD
Mr G Dean, 2E0GDZ
Mr N Hallwood, 2E0GRM
Mr J Hobbs, 2E0HEP
Mr G Carter, 2E0HTC
Mr A Mears, 2E0HYM
Mr S Bentley, 2E0HYR
Mr M Moffat, 2E0IKM
Mr I Huggins, 2E0ILH
Mr C Wlson, 2E0ILY
Mr A Jones, 2E0IPT
Mr D Grayson, 2E0IUK
Mr J G Ritson, 2E0JGR
Mr J Adler, 2E0JJA
Mr J Moylan, 2E0JJM
Ms J Wilson, 2E0JJO
Mr R Hutton, 2E0KCP
Mr T Lee, 2E0KIL
Miss K Stevens, 2E0KSG
Mr P Dimmick, 2E0LFM
Miss L Goldsmith, 2E0LJG
J Roberts, 2E0LZM
Mr M Bradley, 2E0MDR
Mr M Jones, 2E0MIJ
Mr P Hindle, 2E0MNM
Mr P Fisher, 2E0MNO
Mr M Denham, 2E0MVD
Mr N Czernuszka, 2E0NCZ
Mr N Crabb, 2E0NKI
Mr S Jones, 2E0NLW
Mr S Beedham, 2E0NSQ
Mr C J Howard, 2E0OCH
Ms P Jones, 2E0PBP
Mr P Faulkner, 2E0PCF
Mr P Noble, 2E0PFO
Mr P Marsh, 2E0PIP
Mr R Hillman, 2E0RGH
Mr R Mansfield, 2E0RMZ
Mr R Miranda, 2E0RVI
Mr S Finch, 2E0SAF
Mr J Woolley, 2E0SBV
Mr S Waudby, 2E0SCA
Mr S David, 2E0SDD
Mr D Wild, 2E0SDJ
Mr J Mottram, 2E0SEY
Mr C Prentice, 2E0TEG
Mr S Cole, 2E0TEY
Mr D James, 2E0TLG
Mr J Caswell, 2E0TUF
Mr A Kinch, 2E0UKQ
Mr J Hallard, 2E0UKV
Mr A Hudson, 2E0VAZ
Mr J Arblaster, 2E0VYV
Mr W Knapp, 2E0WBK
Mr A Forrest, 2E0WET
Mr W Bradley, 2E0WJB
Mr G Walker, 2E0WKR
Mr P Newth, 2E0WTH
Mr J Martin, 2E0XAV
Mr A Welsh, 2E0XEA
Mr G Garman, 2E0YTF
Mr F Stevenson, 2E1EVH
Mr S Flemming, 2E1GSN
Mr A Gow, 2E1IFM
Mr A Arnold, 2E1MPU
Mr D Bryant, 2E1TAF
Mr K Mikicki, 2I0HBO
Mr P Floyd, 2I0LDC
Mr N Jenkinson, 2I0SFA
Mr M Jamieson, 2M0CTI
Mr M A L Olesen, 2M0MEC
Mr R Burnell, 2M0RPB
Mr A Hutchison, 2M0ZAX
Mr N Wells, 2W0HPM
Mr R Marshall, 2W0HWP
Mr M Dean, 2W0JMK
Mr C Hodgetts, 2W0OGY
Mr D P Dixon, 2W0RLD
Mr A Trotter, DO1APT
Mr M Grundulis, EI2HNB
Mr B Kehoe, EI3GFB
Mr O Pauley, G0BGX
Mr D Shaw, G0BHD
Mr M Jakes, G0CXM
Dr M A Williams, G0EGA
Mr S Dalton, G0EHU
Mr P Wilson, G0FVG
Mr G Frykman, G0GNF
Mr B S Barwick, G0HRF
Mr C Deakin, G0HRX
Mr S A Ratcliffe, G0IUA
Mr N Proctor, G0IZL
Mr S Rosbottom, G0JEH
Mr P R Barden, G0JUY
Mr S Sorockyj, G0LCG
Mr D Davies, G0LLG
Mr D Briggs, G0LQC
Mr M Jones, G0MLJ
Mr R Blanning, G0NZU
Mr N Garrod, G0OQK
Mr J Bunbury, G0SJK
Mr D Scargrill, G0UND
Mr A Morris, G0UOZ
Mr P Giles, G0WQS
Mr M Hunger, G1AJI
Mr N Losardo, G1CTQ
Mr Paul Burnett, G1DAT
Mr A Adams, G1EGZ
Mr B Etherington, G1ISP
Mr B Jackson, G1IUL
Mr A Thompson, G1JXI
Mr M Pauley, G1MKP
Mr P Jacques, G1VLT
Mr S Ireland, G1VRH
Mr G Buck, G1VSX
Mr J MacLeod, G1VZP
Mr K Rayner, G1YIJ
Mr K Hobson, G1YPQ
Mr A Smith, G3LHI
Mr P Lonsdale, G3PVX
Mr G Higgins, G3PXT
Mr P Cochrane, G3RVC
Mr J Sutton, G3TVY
Mr J Tozer, G3XLZ
Mr T Barron, G3YYH
Mr I Abel, G3ZHI
Mr D Schofield, G4OJI
Mr S Marsh, G4BWG
Mr J Brade, G4CDH
Mr B Sheppard, G4CVF
Mr A Turford, G4DPX
Mr D Barwood, G4EGR
Mr J Weedon, G4GAU
Mr J Davis, G4HGK
Mr A Langford, G4IQW
Mr P Thompson, G4JVF
Mr N Watson, G4LCE
Mr A Corker, G4NJI
Mr W G Robinson, G4NOL
Mr R Williams, G4NYK
Mr C Bourne, G4RPG
Mr J Wilson, G4SMX
Mr R Tams, G4TCG
Mr D Pearson, G4UFS
Mr D Hudson, G4WOE
Mr D Haden, G4WXN
Miss G Spencer, G4XCP
Mr W Bridgen, G4XSB
Mr N Hancocks, G4XTF
Mr I Morrison, G4XYT
Mr D Perry, G4YVM
Mr R Reed, G4ZCW
Mr R M Westerman, G5BMH
Mr C Redding, G6CSL
Mr A Fisher, G6CUK
Mr J Martin, G6HIV
Mr J D Ashworth, G6JOV
Mr S Hall, G6KOS
Mr D Bentley, G6LKZ
Mr A Dunham, G6OHM
Mr S Harding, G6OVY
Mr R Anstee, G6RSU
Mr J W Smith, G6SGZ
Mr A R Pilgrim, G6VKG
Mr M Yorke, G6WBX
Mr J Hartnell, G6YWX
Mr H Smithey, G6ZFT
Mr G Cheshire, G7ACV
Mr P Crook, G7AES
Mr C Herring, G7AQY
Mr A Carter, G7BJO
Mr S Hogarth, G7CZH
Mr R Jones, G7DUY
Mr P H Wilson, G7EOK
Mr S Fantini, G7FAN
Mr J Pipkin, G7FEF
Mr J Broughton, G7FRI
Mr L Booker, G7GKO
Mr R Simons, G7GLE
Mr D Haigh, G7HKP
Mr M Colman, G7HXX
Mr A White, G7JVG
Mr S Hutchinson, G7KBZ
Mr D Mulvaney, G7KDA
Mr D Pearce, G7KEH
Miss K Leigh-Thompson, G7KGT
Mr P Jones, G7KMT
Mr N Hull, G7KUL
Mr D Wilkinson, G7MCE
Mr C Gaskin, G7MNZ
Mr N Brown, G7MVU
Mr B Williams, G7OFR
Mr P Kendall, G7RPG
Mr R Basham, G7TAS
Mr J L Pearson, G7UBO
Mr S Freegard, G7UEM
Mr M Jones, G7UWI
Mr C Earey, G7UWT
Mr P Gow, G7VHJ
Mr R Burrows, G8BYI
Mr R Emery, G8FUP
Mr P Richmond, G8GVV
Mr M Admans, G8ITJ
Mr B Sayers, G8IYK
Mr J McKinnon, G8JIT
Mr J Parkins, G8KVP
Mr S Wood, G8LWQ
Mr L Phillips, G8NBO
Mr P Price, G8NOP
Mr D Sheppard, G8OUX
Mr C Pomphrett, G8PIC
Miss S E Firth, G8SFI
Mr Steve Haywood, G8TFB
Mr J Rice, G8UEY
Mr G Roberts, G8VSU
Mr A R Dawe, G8WMF
Mr J Dixon, GI0BFO
Mr S Rafferty, GI0EJT
Mr C O'Connell, GI1RXL
Mr D Cafolla, GI4DOM
Mr N Bradley, GI4MQA
Mr V Mitchell, GI4ONL
Mr H Graham, GI6JPO
Mr D Graydon, GI6DE
Mr H Taylor, GM0CNW
Mr H Urguhart, GM0UTD
Mr J Reynolds, GM0UWV
Mr G Askew, GM1OPO
Mr I J McGowan, GM1RIG
Mr D Gillies, GM4HSR
Mr N Dunnachie, GM6VVX
Mr K Pugh, GM7DHA
Mr N Paull, GW1CUQ
Mr P Jones, GW4UKU
Mr G Rowlands, GW7TED
Mr B Steadman, GW8FSN
Mr W Blatz, K3ONO
Mr R L Robbins, K5DE
Mr P C Bunch, KB1YOH
Mr J Macrae, KK4OYJ
Mr T Maton, KK6CW
Mr A Reilly, M0ATV
Mr I James, M0CJY
Mr B Johnson, M0CTI
Mr E Simms, M0EDY
Mr G Toombs, M0EPV
Mr A Barkley, M0GKT
Mr G Ellis, M0GME
Mr R Bell, M0GMG
Mr M Zlobinksi, M0GNY
Mr J Akinin, M0GWR
Mr S Kapadia, M0GZP
Mr A Stromstedt, M0GZX
Mr C Satorius, M0HBK
Mr S Cordner, M0HET
Mr E F Montanes, M0HJV
Mr R Green, M0HJY
Mr K Brunning, M0HKB
Mr K Cullum, M0HKC
Mr A frontera, M0HKH

Mr K Schmidt, M0HLM
Mr H Ellis, M0HRE
Mr R H Sale, M0HRR
Mr J Stevenson, M0JCS
Mr J S Woodland, M0JSW
Mr K Borszlak, M0KEJ
Mr D Niggemann, M0KRD
Mr A Burfield, M0KVR
Mr L Clark, M0LAE
Mr D Johnson, M0LBT
Mr M Reynold, M0LEH
Mr M Bowen, M0MBN
Ms A Wilson, M0MDY
Mr K Brankin, M0MGT
Mr J Malley, M0MLY
Mr M Till, M0MTH
Mr M Knowles, M0MYK
Mr D Taylor, M0NAV
Mr G Bansil, M0NNH
Newton-Le-Willows ARC, M0NRC
Mr P Woolley, M0PEW
Mr P Graham, M0PGX
Mr A Clayton, M0PHX
Mr P Lettington, M0PLL
Mr N Bos, M0RAX
Mr G Baker, M0RGB
Mr P Willams, M0RGN
Mr B Dalley, M0RJD
Mr A C Perrins, M0SBM
Mr S Light, M0SCA
Mrs E Hallard, M0SFU
Mr K Bowdler, M0TBX
Mr R Colan-Whaley, M0TTN
Mr R West, M0VGC
Mr C Vernon, M0VTZ
Mr A Waddington, M0WAD
Mr H Penny, M0WDX
Mr M Deeley, M0WFM
Ms S Williams, M0WSA
Mr C Langdon, M0ZOM
Mr B Bateman, M0ZVR
Mr S Ford, M1ALY
Mr L Parrott, M1AOH
Mr K Wright, M1EVH
Ms H Glover, M1HLG
Mr M Incles, M1IVA
Mr M Burfield, M1MPB
Mr G Doughty, M1REC
Mr C Cross, M3CJX
Mr R Cooney, M3CPV
Mr R Nelson, M3ENS
Mr K Cambell, M3KPS
Mr M Hunt, M3MSH
Mrs L Mockford, M3MYX
Mr A Nicholson, M3NRQ
Mr D Jones, M3PVX
Mr R Taylor, M3TCD
Ms G Arnold, M3TEA
Ms H Doman, M3TGT
Mr B Monksummers, M3UZE
Ms V Bryant, M3VEB
Mr D Gathergood, M3XTQ
Mr N Gleaden, M3ZXA
Mr K Hornby, M3ZZZ
Mr P Richards, M5DUO
Mr C Beattie, M5GUM
Mr I Parbery, M60AF
Mr K Ball, M6AIF
Mr A Keen, M6AKC
Mr S Skirving, M6ARL
Mr P A Rollason, M6ASG
Mr P Kingston, M6BCN
Mr P Scott, M6BGU
Mr V Casambros, M6BOK
Mr G Smith, M6BTL
Mr A Booth, M6BVX
Mr D Eastwood, M6CGC
Mr A Trowse, M6CHT
Mr M Walls, M6CIQ
I London, M6CIZ
Mr R Baines, M6CKI
Mr E Williams, M6CLB
Mr M Bradley, M6CNA
Mr C Jackson, M6CNJ
Mr T Walsh, M6CPQ
Mr M Spiers, M6CPZ
Mr G Davies, M6CQX
Mr S M R Knott, M6CTN
Dr T Digman, M6CWX
Mr D Pettitt, M6CXG
Mr G Megson, M6CXI
Mr F Strickland, M6CXN
Mr J Nethercott, M6CYI
Mr S Mouradian, M6CYP
Mr D P Daniels, M6DDO
Mr D Sproston, M6DEO
Mr D McDonagh, M6DPM
Mr D Poole, M6DPT
Mr S Clarke, M6DSE
Mr S Danskin, M6DSK
Mr E Westwood, M6EAL
Mr E Mason, M6ECK
Mr D Rasbarry, M6EDO
Mr N Henderson, M6ELH
Mr R Haywood, M6ELT
Miss E Luckett, M6ELZ
Mr S Guest, M6ETR
Ms F Mather, M6FEE
Mr M Goodman, M6FTF
Mrs B Harrop, M6FUO
Mr P Armstrong, M6GBT
Mr A Finn, M6GBV
Ms J Howarth, M6GKY
Mr T Smith, M6GMC
Mr A Holden, M6GND
Mr R P Riches, M6GNZ
Mr G Matthews, M6GPX
Mr M Southgate, M6GYN
Mr A Bos, M6HAX
Mr S Marr, M6HEE
Mr S Parker, M6HEE
Mr R Bowen, M6HXI
Mr S Ronald, M6HXI
Mr S K Shambhu, M6IAF
Mr I C Barber, M6IAK
Mr M Stephenson, M6ICS
Mr G Benford, M6IGM
Mr A C Forbes, M6JOE
Mr P Whitehead, M6JPW
Mr N Wing, M6JRT
Mrs J S Evans, M6JSE
Mr J Cavanagh, M6JUR
Mr J Wade, M6JWP
Mr B Wiggins, M6KBF
Mr K D Crosby, M6KCD
Mr K Bott, M6KRV
Mr D D R Palmer, M6KVM
Mr R Clements, M6LAX
Mr I Hyde, M6LBI
Ms L Boden, M6LBJ
Mr J Eades, M6LID
Mr T Greer, M6LRS
Mr L Sands, M6LSS
Mr K Jones, M6LVK
Mr M A Moore, M6MBM
Mr M Hayler, M6MBW
Mr M Johnson, M6MDK
Mr A Sharif, M6MEU
Mr M Fitzgerald, M6MFZ
Mr M Everett, M6MGE
Mr N Giuliano,M6MNG
Mr M Poole,M6MWP
Mr N Parker,M6NAR
Mr N Alders,M6NAU
Mr C Johnson, M6NCU
Mr N Kimber, M6NPK
Mr A Lyman, M6NPL
Mr O Trehearne, M6OJT
Mr C C Hall, M6ONK
Mr S Kiely, M6OOC
Mr I Maltby, M6PBY
Mr P Davies, M6PDJ
Mr P Evans, M6PKY
Mr P Dart, M6POD
Mr P Castle, M6PWC
Mr G E Fielding, M6PYG
Mr P Ballington, M6RCG
Mr R McKay, M6RMM
Mr C Larner, M6RMO
Mr S Pettit, M6SCP
Mr S Gibson, M6SDY
Mr S Blythe, M6SHR
Ms S Maton, M6SHU
Mr S Worger, M6SWA
Mr N G Carter, M6SXA
Mr M Dengate, M6SXT
Mr A Green, M6TBK
Mr T Burkinshaw, M6TBX
Mr A Todd, M6TCY
Mr S Richardson, M6TGZ
Mr T Kosteletos, M6TKK
Mr R Macdougall-Smith, M6TNH
Mr C Power, M6TSP
Mr T Crespel, M6TWR
Mr T Harrold, M6TZM
Mr A Cudworth, M6UAS
Mr S Smith, M6UEH
Mr J Elstone, M6VPC
Miss V Brown, M6VRD
Mr W Steingold, M6WCE
Miss K Cullen, M6WHT
Mr S Halsey, M6WSH
Mr W Pascoe, M6WTP
Mr T Barker, M6XED
Mr M D O'Brein, M6XMN
Mr C Winfield, M6XOZ
Mr A Lewis, M6XRE
Mr S Brookes, M6XTD
Mr M Mahers, M6YAZ
Mr M Lee, M6YMN
Mr I Harvey, M6YRU
Mr A Carter, M6ZAY
Mr J Kavanagh, MI0ADX
Mr V Best, MI0AEY
D I Hamilton, MI0DWD
Mr M Edwards, MI0OIM
Mr R Gilmore, MI0RGX
Mr J Sinclair, MI0ZSC
Mr G Harkin, MI3TJV
Miss A McCusker, MI6XEM
Mr S M Huelin, MJ0ULE
Mr P Ahier, MJ6AUD
Mr J Cook, MM0AXL
Mr G Milne, MM0GXQ
Mr K Glacken, MM0KJG
Mr M Overthrow, MM0MOB
Mr D Smith, MM1BJT
Mr G P Lawrie, MM3GPL
Mr G M Askew, MM3NTX
Mr B Robb, MM6BLY
Mr L Waller, MM6BNT
Mr K Monaghan, MM6BQH
Mr C Fraser-Hopewell, MM6CFH
Mr S Harvey, MM6CXA
Mr R Inglis, MM6CXJ
Mr A Miller, MM6FBU
Mr A Riley, MM6FSR
Mr F Gorman, MM6FTG
Mr J Mackenzie, MM6JCZ
Mr R A Blackie, MM6LDC
Mr A Anderson, MM6NAI
Ms C Morris, MM6NSM
Mr G Gailey, MM6OBN
Mr I McNair, MM6PYT
Mr R Walmsley, MM6RWA
Mr R Johnstone, MM6RXJ
Mr S Jackson, MM6SKJ
Mr S Boyd, MM6SUB
Mr I Booth, MW0IDT
Mr M Griffiths, MW1AND
Mr N Edwards, MW3NAE
Mr C Summerfield, MW6CQL
Mr N Sugg, MW6CQN
Mr D Hunnisett, MW6DHN
Mr I Macpherson, MW6POS
Mr G Round, MW6PYH
Mr P Smith, MW6ZAN
Mr B Servies, N6NUL
Mr M S McGraw, N7FXE
Mr J van de Merwe, PH1A
Mr C D Silveira,P Y3CJS
Mr A Fallon, RS
Mr D Brough, RS13685
Mr F Pauling, RS190458
Mr C. Rolfe, RS197690
Mr M Hurst, RS198062
Mr I G Bennett, RS201660
Mr K W Winwood, RS202823
Mrs V Forsyth, RS203455
Mr M Patrick, RS208101
Mr N Edwards, RS208805
Mr D Stocker, RS211896
Mr A Gardner, RS212375
Mr G Flew, RS212740
Mr P J Hassell, RS212867
Mr M R Huelin, RS212889
Mr D Duell, RS213019
Mr C Flew, RS213138
Mr K Freer, RS213197
Mr P N Kirby, RS213308
Mr C Stephen, RS213321
Mr J M McCosh, RS213338
Mr S Manning, RS213345
Mr J Erinjeri, RS213351
Mr R W Syms, RS213385
Mr T Ayland, RS213389
Mr G Stephen, RS213395
Mr S Bradley, RS213398
Miss L Hultby, RS213404
Mr J Mason, RS213413
Mr R E Adams, RS213420
Mr C Field, RS213424
Mr A Jessett, RS213437
Mr R Brown, RS213441
Mr S Pickering, RS213453
Mr P J Neale, RS213465
Mr K Bell, RS213469
Mr D Lyon, RS213473
Mr K Sheehan, RS213486
Mr R Bishop, RS213497
Mr M Bradley, RS213499
Mr B Alderson, RS213506
Mr D Wooldridge, RS213516
Mr M Lock, RS213518
Mr G Malcolm, RS213525
Mr M Barker, RS213530
Mr D Guilfoyle, RS213539
Mr D Stewart, RS213541
Mr A R Mawby, RS213544
Mr L Brown, RS213549
Mr W Paternoster, RS213553
Mr M Wilson, RS213558
Mr G Goodhall, RS213559
Mr A Shale, RS213564
Ms S de Carteret, RS213570
Mr C Allen, RS213572
Mr P Weston, RS213577
Mr R Rich, RS213597
Mr A Vass, RS213602
Mr S Scott, RS213607
Mr J Brennand, RS213611
Mr S Reid, RS213617
Mr D Heath, RS213623
Mr S Roberts, RS213626
Mr M Northover, RS213627
Mr R Hall, RS213628
Mr R Mason, RS213630
Mr K Jones, RS213631
Mr P Cooper,R S213632
Miss R F Todd BSC, CIME, RS213634
Mr S Shakespeare, RS213636
Mr L McGarth, RS213637
Mr O Gallagher, RS213638
Mr Z Szot, RS213646
Mr W Smith, RS213651
Mr I Barber, RS213655
Mr A Braeman, RS213657
Mr J Anthony, RS213658
Mr R Edwards, RS213665
Mr T Lincoln, RS213671
Mr P Lloyd, RS213673
Mr M Walker, RS213695
Mr A Butcher, RS213700
Ms B Krawczyzk, RS213701
Mr D Friendship, RS213705
Mr F Foy, RS213708
Mr I Henderson, RS213711
Mr C Ryves, RS213715
Mr P Davies, RS213716
Mr R Beasant, RS213718
Mr R Moloney, RS213722
Mr M Sawyer, RS213724
Mrs D Smout, RS213731
Mr M Smith, RS213734
Mr T Higgingson, RS213737
Mr J Thompson, RS213738
Mr G Roylance, RS213740
Mr L Bee, RS213741
Mr D Bee, RS213742
Mr K Bates, RS213743
Mr P Moreau, RS213752
Mr R Robinson, RS213754
Mr C Cousins, RS213767
Mr N Walters, RS213774
Mr J Bowyer, RS213777
Mrs R Bardon, RS213780
Mr A Bardon, RS213781
Mr G Lewis, RS213782
Mr B Sharp, RS213783
Mrs L Clark, RS213788
Mr M Blackburn, RS213794
Mr G Davies, S213795
Mr P Sladen, RS213796
Mr K Huellin, RS213797
Mr S Huelin, RS213799
Mr K Dodds, RS213801
Mr D Giffney, RS213808
Mr P Matthews, RS213819
Mr P Gates, RS213822
Mr J Woulfe, RS213832
Mr L Starrett, RS213838
Mr D Hollebon, RS213839
Miss S Kitchen, RS213859
Mr M Holmes, RS213860
Mr L Williams, RS213870
Dr S Francis, RS213889
Mr B Brown, RS213893
Mr J Eames, RS213902
Mr C Hopkins, RS213905
Mr A Butkus, RS213909
Mr J Emery, RS213918
Mr A Watt, RS213921
Mr J Allen, RS213923
Mr P Whitall, RS213929
Mr A Golden, RS213937
Mr I Groom, RS213939
Mr J Whitehouse, RS213943
Miss M Everett, RS213956
Fleetwood REG, RS213958
Mr G Muir, RS213977
Mr C Norris, RS213988
Mr J Copeland, RS213990
Mr B Bannister, RS213993
Mr D Gilbert, RS213995
Mr M Lowther, RS214000
Mr K Saville, RS214001
Mr S Ravenscroft, RS214003
Mr S Challis, RS214004
Mr R Wild, RS214008
Mr J Aldred, RS214020
Mr S Stoyanov, RS214021
Mr T Bryant, W2APF
Mr B Adolphson, W2FYJ
Mr R Johnson, W7RKJ

Welcome also to Mr K McIntosh, RS212466, who was omitted from the previous list due to an administrative error.

Apologies to Mr D Timbrell, whose name was misspelt last month.

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

Mr C R Cook, 2E0AXZ
Mr A Rudge, 2E0BBD
Mr G Marshall, 2E0BNI
Mr M K A Bate, 2E0CDH
Mr P Dickson, 2E0CUP
Mr A Beirne, 2E0GBC
Mr G W Jones, 2E0GGO
Mr A Taylor, 2E0HTM
Mr I M Turner, 2E0IMT
Mrs G Whitehead, 2E0JIL
Mr S Walrond, 2E0JQF
Mr W H Denison, 2E0LDB
Mr M Frame, 2E0MAL
Mr S Ridley, 2E0MEG
Mr P McGrath, 2E0MPG
Mr P Borer, 2E0PFW
Mr P Brown, 2E0PLA
Mr P R Pupins, 2E0PRP
Mr A A Fulton, 2E0PUB
Mr A Woodrup, 2E0RAF
Mr J D Salmon, 2E0RMI
Mr G Botterill, 2E0ZAG
Mr J Preece, 2E1AVX
Mr T W Middleton, 2E1HNS
Ms J Miller, 2E1PJJ
Mr J I Hatton, 2E1RDX
Mr R J Preece, 2E1VAR
Mr G Dempster, 2M0IVG
Mr J Connelly, 2M0SIL
Mr M T Davies,2 W0MTD
Mr G G Garcia, EA1FBF
Mr R A Reanney, G0AKU
Mr M D Adams, G0AMO
Mr D W Dixon, G0AYD
Mr V Tharp, G0CQY
Mr D F Allsopp, G0DFA
Mr M D Beakhust, G0DGF
Mr G A Fingerhut, G0ENW
Mr R F R Isaac, G0HAE
Mr B Cooper, G0HCT
Mr D Long, G0HWW
Mr N C Allison, G0JOH
Mr R Cook, G0JVK
Mr J Littler, G0LVY
Mr R F Dunne, G0MGM
Mr M J Jones, G0MIX
Mr A P Keeble, G0MJC
Mr P Timmins, G0NDV
Mr B Wood, G0OQQ
Mr K Brooks, G0SPH
Mr R W L Stanley, G0SSZ
Mr B O Palliser, G0SZR
Mr R Walker, G0TAK
Mr C I Alexander, G0TID
Mr T Clayton, G0TKJ
Mr M McNamara, G0UEX
Mr D Brice, G0UIL
Mr R B Gibson, G0UOO
Mr C Turnbull, G0URG
Mr P J Earnshaw, G0UUU
Mr I Goodier, G0UWK
Mr E E Webster, G0VDJ
Mr D T S Trout, G0VIW
Mr B Burdis, G0WZB
Mr J T Stockwell, G0XBJ
Mr M Cooper, G1ANI
Mr P D Endean, G1BZM
Mr C R Ward, G1EUC
Mr P R Beevers, G1GGC
Mr N D Evans, G1HSG
Mr Hoey, G1HSO
Mrs V A Green, G1IXE
Mr M J Coker, G1LIG
Mr I Marchant, G1RSW
Mr D J McCauley, G1SPQ
Mr J M Grant, G1SSO
P Spence, G1UDS
Mr C J Colclough, G1VDP
Mr J M Voorsanger, G1VGF
Mr R S Taylor, G1WEX
Mr D Bayliss, G1XKM
Mr N J Marsh, G1ZBL
Mr D J Quigley, G3PRI
Mr R J Matthews, G3SAH
Mr R N Dixon, G3SNT
Mr M J Fisher, G3UBI
Mr H Martin, G3VES
Mr C R Traveller, G3WXW
Mr M Edwards, G3WYT
Mr M Gee, G3ZHI
Mr G D Hotchkiss, G4BEQ
Mr J M Houlihan, G4BLJ
Mr A Horsfall, G4CBW
Mr P Rossiter, G4CMX
Mr M J Coburn, G4DUL
Mr M J Hill, G4FPH
Mr D I Sparvell, G4FTC
Mr P Torrance, G4HAK
Mr S R L Braund, G4HXD
Mr P J Richardson, G4IBZ
Mr P D Martin, G4ISJ
Mr G Hampson, G4IXW
Mr P Bicknell, G4JFT
Mr F J Lobban, G4JQW
Mr M S Foster, G4KLE
Mr P E Biddle, G4LUX
Mr K J Brazington, G4LZV
Mr K R Rawlings, G4MIU
Mr S C Rice, G4NEA
Mr N Sharples, G4NFS
Mr R J Lane, G4NQX
Mr V Cawthron, G4ODG
Laurence Sharps, G4OHP
Mr H D Baxendale, G4OJK
Mr H C Palmer, G4PFW
Mr J Child, G4PIR
Mr M D Beasant, G4RKY
Mr Vickers, G4SEQ
Mr H Park, G4UME
Mr G Newton, G4UOS
Mr T H Kirby, G4VXE
Mr M Deeley, G4VZO
Mr D K Roden, G4WBM
Mr I M Hopkins, G4WUH
Mr P Harding, G4WUQ
Mr P J Harman, G4XGD
Mr Miles, G4XXH
Mr S A Coleman, G4YFB
Mr F H Normington, G4YLJ
Mr D J McKie, G4ZPW
Mr S L Wellon, G6DMG
Mr T Place, G6DRG
Mr D J Aldridge, G6FOV
Mr R Venison, G6HMF
Mr P D Guy, G6IVD
Mr D C Warburton, G6LKB
Mr R White, G6LTT
Mr J B Coates, G6PJT
Mr D C Brown, G6PRL
Mr M J Searl, G6SBN
Mr I T Webb, G6TNW
Mr G B Miller, G6WWY
Mr P Shaw, G6XIP
Mr J T Cromack, G6YLV
Mr D B Fisher, G6YQJ
Mr G M Searle, G6ZLA
Mr M Charlton, G6ZQS
Mr D A Crook, G6ZQU
Mr M Gynane, G7AWW
Mr S W Harris, G7BCE
Mr A Phoenix, G7CBR
Mr C Woodward, G7CZZ
Mr N Kaberry, G7EVW
Mr C Holloway, G7FKJ
Mr M Burgess, G7HID
Mr R Davies, G7JGL
Mr A Brookes, G7KXM
Mr P Gibson, G7LJA
Mr A W Nielsen, G7LRR
Mr K E Bartlett, G7LSR
Mr T R Ingle, G7MZE
Mr P Salmon, G7NFF
Mr R Parkes, G7NFO
Mr P F Carter, G7ODJ
Mr I Leather, G7PAN
Mr B Lennard, G7PRY
Mr A Melham, G7VNM
Mr D Oakley, G8AXW
Mr D W Coxhill, G8CXT
Mr E B March, G8EOJ
Mr R J C Harwood, G8GJM
Mr M Lees, G8IAN
Mr L E Johnson, G8MES
Mr C Smart, G8OCV
Mrs J Bailey, G8PLJ
Mr R J H Shears, G8SHE
Mr D J Pickford, G8TNE
Mr J List, G8WLY
Mr G G Brock, G8WRY
Mr M R Maxwell, G8YOY
Mr C G A Moore, G8YPE
Mr I Moth, G8ZHC
Mr S Potter, G8ZQO
Mr T J Mills, GI0GQG
Mr M A Shaw, GI1XBH
Mr A H Lennon, GI4MUN
Mr G E Frazer, GI4SJQ
Mr P J Seaton, GM0AKJ
Mr R D Pugh, GM0OTB
Mr J B Tuke, GM3BST
Mr P A W Cooper, GM3VMB
Mr C J Claydon, GM4ZJI
Mr R A G Gibbons, GW0AIY
Mr R F Merrick-Jenkins, GW8JJZ
Mr G Ogle, GW8RAK
Mr D Vickers, M0AKB
Mr J A Layton, M0ARA
Mr R Hull, M0AUW
Mr D D Hill, M0AZK
Mr G Hoyle, M0BAU
Mr B Pearce, M0CMN
Mr J A Dodd, M0CSN
Mr K J T Phillips, M0DCK
Mr S Cassidy, M0DOM
Mr M J Whitehead, M0DXV
Mr P J Marsh, M0EYT
Mr A P Moffatt, M0FAT
Mr A Hawkins, M0FDA
Mr S J Packman, M0FGH
M Kittika, M0FVD
Mr J Harris, M0GUR
Mr L Zywicki, M0ICJ
Mr S Lucas, M0JKB
Mr K J Cornmell, M0KCO
Mr W Dwyer, M0MBX
Mr D P Rimell, M0MST
Mr N D Evans, M0NDE
Mr L Jepson, M0NEX
Mr C Davy, M0PZT
Mr S C Trevayne, M0RGJ
Mr R Styles, M0TFO
Mr E R Newby, M0TMC
Mr D D'Mellow, M0TTF
Mr C Luckett, M0UGR
Mr P Hamilton, M0UTC
Mr A Grant, M0VAG
Mr A R Romanov, M0XBI
Mr M Cox, M0XOC
Mr C Watkins, M0ZQI
Mr M D Skinner, M1AGR
Mr A Bloor, M1AJB
Mr A Amos, M1BEP
Mr M R Curtis, M1CMN
Mr B P Jarvis, M1CMR
Miss C Block, M1CVF
Mr I L Taylor, M1DSR
Mr M E Collins, M1IKE
Ms J E Hawkins, M1JUL
Mr A Coathup, M1KMC
Mr S Pybus, M1SPY
Mr P A Braidwood, M1TCP
Mr K Morrison, M1VHT
Mr G J Woodcock, M3CHD
Mr D Fearn, M3FON
Mr A Bidwell, M3HPZ
Mr L Wilson, M3KOM
Mr G M Gammer, M3LHG
Mr N J Hall, M3NCK
Mr R Fern, M3PQQ
Mr R A Jenkinson, M3SWF
Mr J Soloman, M3YFL
Mr J Renmans, M3ZOV
Mr J M Swearman, M5ADZ
Mr I Bassett, M5AXA
Mark Chanter, M6CQG
Mr N Read, M5DND
Mr D C Pennison, M6DFD
Mr D Slade, M6DFS
Mr D H Vincent, M6DHV
Mr S W Day, M6KMC
Mr K Ford, M6KVF
Mr C Braddock, M6NCL
Mr N D Brown, M6NDB
Mr P Deluce, M6TCB
Mr A Bowditch, M6WSB
Mr T Whelan, M6XAT
Mr S J Gillespie, MI0GTA
Mr J V McKaig, MI0JST
Mr W G Doherty, MI0MIX
Mr P Holmes, MI0VAX
Mr D McCullough, MI1VOX
Mr M Patton, MI3DNK
Mr A Thompson, MM0EQE
Mr J Blair, MM3DKA
Mr A McLean, MM3XBX
Mr M T Buxton, MW0TTK
Mr V Groom, RS178634
Mr A M Dingwall, RS185836
Mr S Lauritson, RS186065
Mr A V Rigler, RS187881
Mr B Hicks, RS190234
Mr A Thomson, RS209405
Mr D Heath, RS213623
Mr M Northover, RS213627
Mr R Hall, RS213628
Mr K W Schemmel, W9LVM

Ofcom Updates

The July *RadCom* (page 7) had news on a number of Ofcom consultations. The release of spectrum at 2.3 and 3.4GHz is the topic of a substantial and thorough Ofcom consultation. It also has wider implications for other Secondary allocations and licensing and will conclude on 22 July. The GHz Column and RSGB website has data and links regarding this and an online discussion forum.

MICROWAVES. Also available online on the Ofcom and RSGB websites are our recent responses to 24GHz car radar, additional spectrum for wireless broadband at WRC-15, and exempt use of 2400MHz (which is related to the 2.3GHz spectrum release) At 24GHz Ofcom has now implemented new automotive radar regulations, which the Society was keen to see. These will gradually phase out use of wide band car radar from our Primary allocation. The topic also has a linkage to WRC-15 Agenda Item 1.18 for 78GHz vehicle radars. Of particular note are the responses submitted to the Ofcom 2.4GHz Exempt Usage consultation. The frequency band supports a mix of exempt applications (such as Wi-Fi, Bluetooth & ZigBee), as well as amateur and amateur-satellite use. Both the Society and some leading commercial organisations highlighted significant concerns regarding the impact that 2.3GHz LTE might have on 2.4GHz usage and capacity.

VHF DELAY. Microwave and WRC matters have occupied a major proportion of Ofcom time. We understand that the VHF Consultation which includes the prospect of 146-147MHz and other low band opportunities may now not be released until the end of the summer.

WEBSEARCH

RSGB: http://rsgb.org/consultations

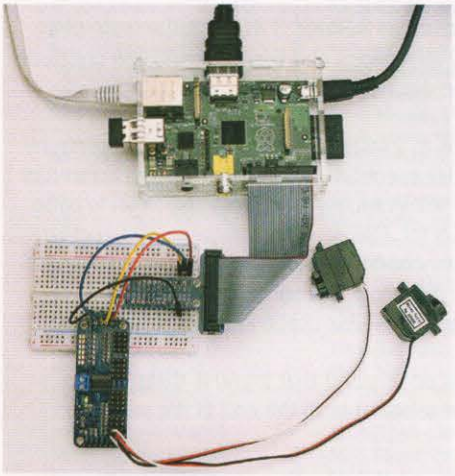
Ofcom: http://stakeholders.ofcom.org.uk/consultations/

Centenary Construction Competition

There's still time to put in an entry, there's even cash prizes!

BUILD YOUR OWN. The early radio experimenters had no recourse but to build their own equipment, with our predecessors often having to construct many of the main component parts themselves! Whilst things have moved on, for many of us a central part of amateur radio is the creative interest and learning that is achieved through home construction. There is also the sense of achievement when something that we have made helps us to improve our station, make a successful contact, etc.

Dud Charman, G6CJ, one of our Members celebrated for his work with the Voluntary Interceptors in WWII and afterwards for his famous Aerial Circus lectures, gave a futuristic look for his 1952 Presidential address, by stating that the radio amateur in 2000 will *"...still do the things we do today – but with an apparatus beyond our ken, using words, languages and a depth of interest which make our present efforts seem primitive"*. How right he was, and it is interesting to ponder whether his views will also be true in another 50 years? It is not difficult to see that there will still be enormous scope for experimentation, especially in system design. This is partly because one of the unique features of amateur radio is our *freedom to innovate*. The ITU amateur service is almost completely unconstrained by business, or government, especially within our Primary allocations. So the challenge is to mark our Centenary by showing off the best of our current capability in system design and home construction by entering our Centenary Construction Competition.



The Raspberry Pi category could give those with computing knowledge a challenge.

Something as simple as building a project from kit can be entered.

CENTENARY CONSTRUCTION COMPETITION. Two key dates are important. By the end of August you need to have registered your intent to enter the competition and then 12 and 13 October is when the entries will be on show and judged at the RSGB Convention.

There should be something in the competition for everyone. We have the 'Builders' category for those getting started in home construction, where the projects are essentially low-cost and may involve, or be completely based upon, assembling a kit.

For the more experienced designers and constructors there is the 'Designers' category. This is an unrestricted category, where the judges will be looking for a novel design, reproducibility and quality of construction.

Finally, to reflect current technology we have the 'Pi Users' category, where the emphasis is on designing and building an amateur radio application by combining the compute capability of the Raspberry Pi with a significant hardware element. Just to raise the bar somewhat we have invited Eben Upton, a founder and trustee of the Raspberry Pi Foundation, to join our panel of judges.

ML&S are offering prizes for overall winners and there are also plaques along with cash prizes in each category. In addition, RS Components are offering one of their 1,000 limited edition blue Raspberry Pi Model B Boards as one of the prizes.

We are having some real fun with the Centenary station, which of course will continue throughout the rest of the year. Let us add to those many memorable hours of operating something that will do amateur radio proud in terms of construction. If you have made a start on an entry for one of these categories that is great, however, there is still time to make a start if this short article gives you some ideas as to what you might offer. Just remember to lodge your intent to enter before the end of August. See Websearch below for full details of the rules and registration.

WEBSEARCH

Details and rules: http://rsgb.org/main/about-us/rsgb-centenary-2013/centenary-construction-competition/
Construction Competition registration: www.rsgb.org/constructorregister

There should be something in the competition for everyone.

RSGB Centenary

RSGB Members Only Products

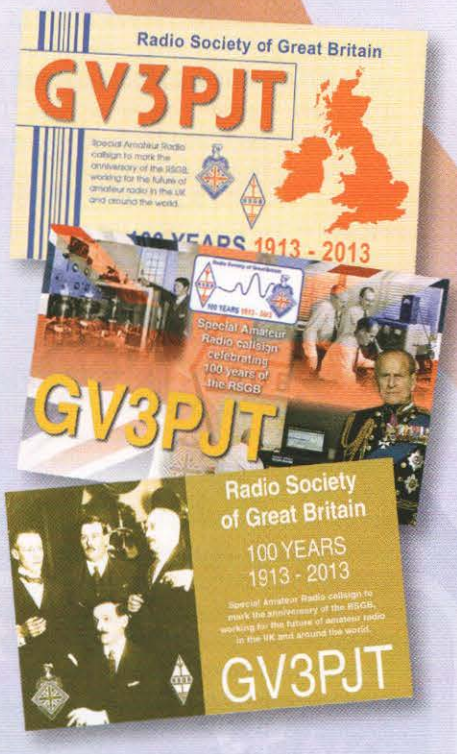
RSGB Centenary QSL Cards

The RSGB are pleased to offer special QSL cards celebrating the RSGB Centenary. The special V suffix will be in use from the Centenary day on the 5th July to the end of the month. There is a choice of three specially designed cards that are only available to RSGB members. If you are planning to use the 'V' callsign, this is an economic way to produce special cards to mark your support of the RSGB and our Centenary.

These standard size QSL cards are personalised with your special callsign and glossily printed in full colour on a high quality 250gsm card. The back of the card is also personalised with your special callsign, station address and IOTA reference (if required). This is black only print onto a matt white finish which is easy to write on or adhere labels to. These cards are only available via the RSGB and are produced by FDS Cards on our behalf.

This offer is also strictly limited to RSGB members, who may buy personalised cards for their own use, at only £10.99 for 100 cards plus £1.00 post & packing (larger also quantities available).

See our website
www.rsgbshop.org for larger images and full details.

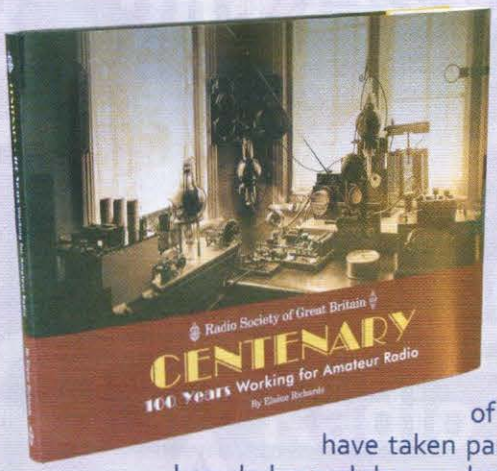


From £10.99 (plus P&P)

Centenary

100 Years *Working for Amateur Radio*

By Elaine Richards, G4LFM



As part of the Centenary celebrations the RSGB has commissioned and produced this special hardback book looking at 100 years of RSGB History. In its first century, the RSGB has represented the interests of members at national and international level and provided the framework within which the early pioneers and experimenters thrived. Centenary outlines the first century of activity of the RSGB and its members.

Centenary is a peek at the history of the RSGB. The stories gathered together here provide a glimpse of the people behind the organisation and the way they have shaped the history of the Society. It would have been impossible for all the stories, famous names and events from the first 100 years have made it into print. Nevertheless, this collection of events gives a flavour of the RSGB history and the hobby it supports. From the first days and its initial membership of four, through two World Wars to a new Millennium, the RSGB's membership have taken part in propagation experiments, pushed the boundaries of radio and electronic knowledge and shown what international amateur radio relations is all about. Whether it's proving that VHF communications is more than line-of-sight, showing the world how far radio signals can travel or putting satellites into space, radio amateurs have been involved in it all.

Packed with over 200 colour and mono photographs this book provides a fascinating insight into the life and times of the RSGB. Produced as a quality hardback book, with a glossy slip cover and glossy paper throughout, this book is exceptional.

ISBN: 9781 9050 8689 4, Hardback
Size: 300x225mm (landscape), 144 pages

Non Members: £19.99
RSGB Members: £16.99

RSGB shop

Radio Society of Great Britain www.rsgbshop.org
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The latest news of the Centenary celebrations

FRIEDRICHSHAFEN. Following a successful lecture at the Dayton Hamfest in May, we had another opportunity to talk about our history at the Friedrichshafen international rally. Chris, G3SVL, a regular at Friedrichshafen and until recently a Board member, agreed to present a talk on the theme of international cooperation and development of amateur radio over the past 100 years – based upon our archives. The usual RSGB stand and bookstall was well visited, and the mood of the celebrations was captured with Bob, G3PJT, RSGB President, giving a toast to the Centenary and international cooperation.

CENTENARY STATION. With the first six months completed we have exceeded 70,000 QSOs. When we were planning the schedule and in particular the Centenary Award and Leaderboard, we were keen to make sure that the station had some staying power throughout the year, so that the groups hosting the station later in the year still had plenty of chasers. It is interesting to reflect that we estimated something like 120,000 QSOs might be a realistic target; time will tell whether or not this was right.

As usual, I have received several comments on the levels of activity, the Alert system, choice of bands and delays in getting logs uploaded to *Club Log* and Log Book of The World. My replies have been generally along the line that the Centenary station is intended to be fun as well as give a large number of people the chance to run a sought after callsign; for some this will be their first such experience. The way in which the station calendar has been organised there should be a good mix of interests, capability and conditions, to meet the demand both from RSGB members in the UK as well as overseas, and of course amateurs worldwide.

The bulk of the activity since my report in the July edition of *RadCom* has been from South Wales (RSGB Region 7). In that edition I was able to mention that Barry ARS had made over 2,000 QSOs. Since then I have received a more detailed report from Glyn, GW0ANA, who commented that at one time the pile-up on 20m was such that he was working 115 QSOs an hour. The club also managed a creditable 12 QSOs via satellite.

Not all groups in Region 7 had it easy. Jimmy, MW0EQL, summed up one of his club's days, which was on the Brecon Beacons, "The bands were abysmal and only 40m was any good, with one solitary SSB [QSO] on 2m... unfortunately, we had the solar flares, which basically wiped out the bands. We are all tired, wet and hungry... signed, Jimmy, no suntan, just rust". Gareth, GW4JPC, from the St Tybie ARS commented, "We are very few in number and mostly gentlemen of a certain age! Only two on hand to man the station until a relief operator arrived in the evening, and what a relief. It was a long day but thoroughly enjoyed by us. We were especially touched by the thanks received from so many thanking us for putting on the station".

At the time of writing this, I haven't received reports from many of the Region 9 clubs who have so far hosted the station. However, from my own observation there have been some very good operations from a number of the clubs in the London & Thames Valley area, including some pioneering efforts on the new 472kHz band by the Whitton ARG.

What is very clear is that everyone involved in putting on the stations are having fun. But, there is also some real learning going on, eg use of computer logging, aerials, choice of locations, band-change planning and understanding propagation. That on-the-job learning can only be beneficial to amateur radio in the UK, and make us ready for our second Century!

NORTH WALES. Mid July sees the action moving to East England (Region 12) and on 13 August to North Wales (RSGB Region 6). As usual I have included the outline calendar, see **Table 1**. There are a number of vacant days during the Region 6 allocation. Mark Harper, MW1MHH, our Region 6 Manager has been very busy encouraging people and groups in North Wales to commit to hosting the station, but the reality is that there are probably fewer clubs etc in this part of the UK than many of the other Regions. Anyone who is interested in taking up any of the free days, by putting on a station with some capability and good location on several bands within the Region's boundary, should contact Mark via rm6@rsgb.org.uk at least 10 days prior to the requested date.

STATION CALENDAR FOR AUGUST
REGION 12: EAST ENGLAND, G100RSGB

1 – 4 Aug	Muckleburgh Collection
5 – 6 Aug	North Norfolk ARS
7 – 8 Aug	South Essex ARS
19 – 10 Aug	Thames ARG
11 – 12 Aug	West Kent ARS
Region 6: North Wales, GW100RSGB	
13 – 14 Aug	Dragon ARS
15 – 17 Aug	
18 Aug	Meirion ARS
19 – 23 Aug	
24 Aug	Powys ARC
25 – 26 Aug	Region 6 Manager
27 – 30 Aug	
31 Aug – 1 Sept	Dragon ARS
2 SepS	

Bob, G3PJT, RSGB President, giving a toast to the Centenary and international cooperation. Photo courtesy Murray, G6JYB.

FUTURE EVENTS. If you are an avid HF contester, I will not need to remind you of the IOTA Contest that takes place between 1200UTC on Saturday 27 to 1200UTC on Sunday 28 July. Five HF bands are used – 3.5MHz, 7MHz, 14MHz, 21MHz and 28MHz. Both CW and SSB contacts may be made and each mode counts separately, so a station may be worked twice on each band, once on CW and once on SSB. There are sections for SSB-only and CW-only, either with high power or a 100 watt limit. This year a special Centenary Commemorative Certificate is available. Everyone who enters and submits a log of contest QSOs will be eligible. To qualify, simply make 100 QSOs along with 20 multipliers (make sure you have more than 100 QSOs and 20 multipliers to allow for errors).

Our Centenary celebrations are by no means over at this mid-way point during the year. Members from the HQ and Regional Teams, supported by many of the committees and Hon Officers will again be present at the National Hamfest (27th & 28th September). A couple of weeks after that is the weekend of the annual RSGB Convention. Preparations are well advanced for another great programme, which this year will be enhanced by some unique talks to commemorate our Centenary. As mentioned elsewhere, there will also be the display and judging of the Centenary Construction Competition.

I hope to be able to give your more details next month of a Centenary lecture being planned in conjunction with the Institution of Engineering and Technology (IET). The IET, formally the IEE, was closely associated with the RSGB in its early days so it will be fitting to mark our Centenary with a jointly arranged event. The IET is currently investigating a suitable venue for an event to take place in London later in October or November.

WEBSEARCH

Centenary Award: http://rsgb.org/main/operating/amateur-radio-awards/rsgb-centenary-award-2013/

Leaderboard: http://rsgb.org/main/operating/centenary-station/centenary-station-spots-log-and-qsls/

Centenary IOTA Contest: www.rsgbcc.org/hf/rules/2013/riota.shtml

National Hamfest: www.nationalhamfest.org.uk/

SDR (and other radio) futures

Software defined radio's progress to date plus a look at what may be around the corner

INTRODUCTION. Predicting the future is always a risky venture and particularly so when relatively new technologies are involved. However, in the world of software defined radios (SDRs) a number of different architectures are now emerging, each with its own 'pros' and 'cons', giving us a clearer picture of where radios will head in the next decade. In this two-part article we will investigate these architectures and consider individually what they offer the radio amateur who is interested in SDR. In the process, we will also look at how radios using conventional superheterodyne architectures are evolving alongside SDR, assisted by SDR-related digital signal processing techniques. Please note that whilst being a technically based article, the views in this article are those of VK6APH and VK6VZ and may not coincide with other radio 'fortune tellers'.

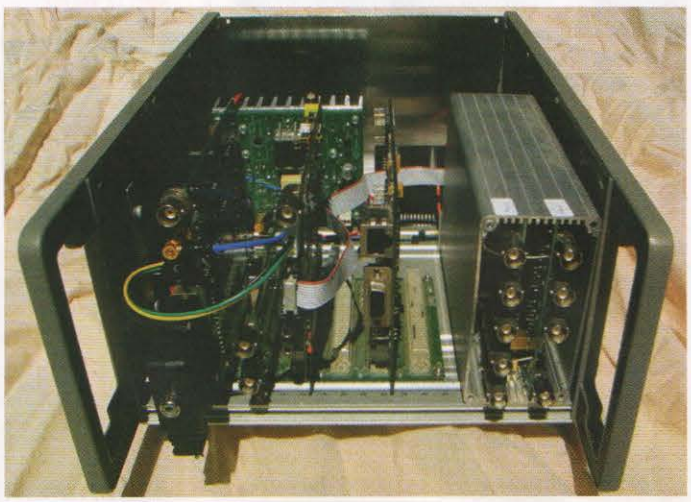

PHOTO 1: VK6VZ's HPSDR transceiver under construction.

ARCHITECTURES. At the highest level, the differences between the new SDR architectures and their predecessors – the first generation quadrature sampling detector (QSD)/mixer type and the second generation digital down conversion/digital up conversion (DDC/DUC) – relate to needing a personal computer (or similar device, eg a tablet or mobile phone) so the user can operate the radio as opposed to conventional analogue controls (ie knobs and dials).

Well-known examples of the QSD/mixer architecture are the Flex SDR-1000 [1] and the SoftRock series of kit receivers and transceivers [2], while the DDC/DUC architecture is used by the popular High Performance Software Defined Radio (HPSDR) [3] project (**Photo 1**).

The exciting SDR technologies that are emerging use DDC/DUC, where received signals are digitised 'down' virtually directly at the antenna socket using an analogue-to-digital converter (ADC). The transmitted signal is created digitally and converted 'up' to an analogue signal, at the required output frequency, using a digital-to-analogue converter (DAC) and subsequently amplified in conventional power amplifiers.

Owing to the inherent limitations of the first generation QSD/mixer architecture when it comes to image rejection, the authors consider that DDC/DUC will be the dominant SDR architecture of the future. That being said, the image cancellation techniques being used by the latest QSD/mixer SDRs, in particular the Elecraft KX3, is much more effective than previous techniques. One significant advantage of the QSD/mixer architecture compared with DDC/DUC techniques is the former uses much less power. This can be a consideration where portable operation, for example, is desired, such in the KX3.

ALTERNATIVE ARCHITECTURES. ***Conventional knob-based radios.*** Whilst most of the existing manufacturers of HF amateur radio equipment use DSP techniques, the majority still use an analogue 'superhet' architecture with DSP applied in the final intermediate frequency (IF) stages. However, on the 21st century HF amateur bands, where there are lots of *very* strong signals during contests and major DXpeditions, in order to improve dynamic range there has at least been a move away from using a first IF in the VHF spectrum. Manufacturing crystal filters having steep sides and with a bandwidth of a kHz or two is much easier at HF than VHF.

As a result, Elecraft and Kenwood have gone 'back to the future' by using a HF first IF, in a similar manner to the classic analogue radios of the 1980s such as the Kenwood TS-830S and Drake T4XC/R4C, giving improved close-in dynamic range. However, the DSP that is used in contemporary radios like the Elecraft K3 and Kenwood TS-590S is vastly superior to that implemented in radios of the previous decade.

A radio with a conventional analogue front panel radio but high-grade digital processes appeals to the technically savvy radio amateur who has not embraced the idea of using a personal computer as the sole means of operating his radio. This is a category into which VK6VZ, who reluctantly uses a PC for work every day, still falls.

The Elecraft KX3 [4] is one of the first SDR-based radios to have a traditional analogue 'dial and knob' interface (**Photo 2**) and has sold very well because of its pure SDR sound and good dynamic range. If it had a DDC/DUC architecture instead of a direct conversion one, VK6VZ would probably be using it as his main radio.

As far as the authors are aware the Swiss-designed ADAT ADT-200A [5] is the only commercially available DDC/DUC HF transceiver currently available that uses conventional controls in order to operate it (**Photo 3**). The receiver section uses a 14-bit ADC that offers a claimed signal to noise (S/N) ratio of 74dB (over the half Nyquist bandwith of 36.86MHz). After the subsequent decimation, ADAT claim a blocking dynamic range of 120dB.

The ADT-200A has four parallel receivers and eight independent VFOs to provide cross-band and split-band operations. It produces 50W

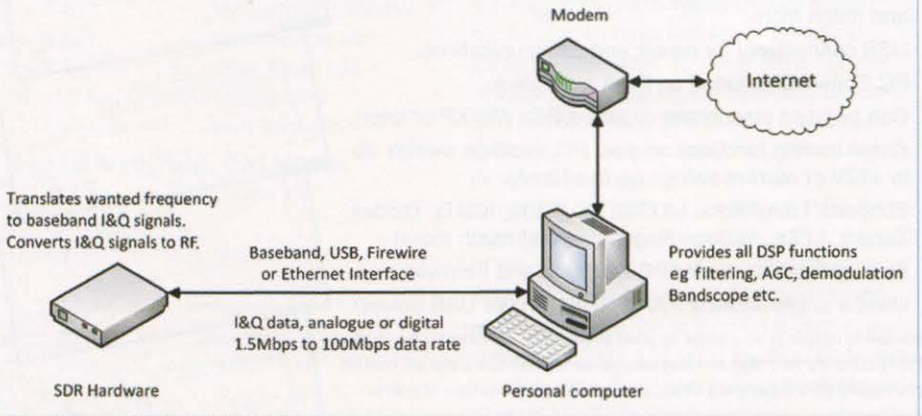

FIGURE 1: SDR connected to a PC.

and also contains an antenna scope that allows measurement complex antenna impedances – like a vector network analyser. The VFOs can all be set to the same or to different bands, independent from its receiver frequencies.

There are two ways to remote control the ADT-200A transceiver: via USB interface, controlled by a PC, or via local area network (LAN) using an optional Web Server Module. This makes it possible to operate the ADT-200A remotely via an internet connection. ADAT says on its website that remote control via LAN is currently only possible between two ADT-200A devices.

It will be interesting to see if traditional radio manufacturers such as Yaesu, Icom, Kenwood, Elecraft and Ten-Tec offer a radio like the ADT-200A in the near future. We anticipate this will be the case since the trend to lower cost and higher performance ADCs means the manufacturing cost of DDC/DUC-based radios will be lower than conventional radios with superheterodyne architectures.

The 'pros' for such a DDC/DUC radio with a conventional 'knobs and dial' front panel are:

- A conventional analogue user interface of this kind is attractive to those who use traditional radios
- Users are drawn to a radio that is contained in a single box for reasons of convenience The radio can be operated without the use of a PC.

In contrast, the 'cons' include:

- Less flexibility in adding highly useful extra features (such as a high definition, wide spectrum bandscope or a wide spectrum Morse decoder/skimmer) than an SDR radio that uses a personal computer to do its DSP
- The radio is likely to cost more than an SDR radio that uses a personal computer to do its DSP.

PC-BASED DSP RADIOS. Presently this architecture (**Figure 1**) represents the largest pool of SDR radios. For some time there have been available a number of commercial radios of this kind in both complete (such as the FlexRadio Systems 3000 and 5000 radios) and kit form (such as the Softrock series). The prime purpose of the SDR hardware in such radios is to reduce the data rate of the analogue-to-digital conversion to a slower rate such that the associated PC can process it.

PHOTO 2: The Elecraft KX3 is a software defined transceiver with traditional front panel controls. Photo courtesy of Elecraft.

For a DDC receiver, if we consider the data rate required for say digitising the entire HF spectrum from 0 to 30MHz with 16 bits per sample, the minimum data rate is: 60,000 x 16 = 960 megabits per second (960Mbps). Whilst this data rate is within the specification of a Gigabit Ethernet interface, the PC needs to process this data at a *sustained* rate. For even a fast personal computer this is akin to 'drinking from a fire hose' and certainly in the near future, if technological development continues at the current rate, is not going to be cost-effective in regards to an amateur radio budget.

In practice, most PC-based DSP SDR hardware reduces the data rate to a more manageable 192,000 samples per second (192ksps), which at 2 x 24 bits per second is approximately 9Mbps. Note the factor of two is because in-phase *and* quadrature samples are generally sent to the personal computer.

Slower sampling rates (eg 96ksps and 48ksps) as well as rates in the low MHz are also common. The higher sampling rates have the advantage that any associated bandscope will be able to display a wider slice of HF spectrum.

At the lower data rates a mid-range PC is capable of providing the necessary DSP for filtering, noise reduction, a bandscope display, etc.

Communications between the SDR hardware and the PC was initially at baseband audio frequencies since the analogue to digital conversion was carried out using a sound card in the PC. For higher performance, the digital conversion was implemented in the SDR hardware, and USB and FireWire used to interface to the PC. However, more recently high speed Ethernet has proved a very popular and reliable interface, such as provided by the Metis and Hermes boards (**Photo 4**) for the HPSDR project [3].

On this basis, the 'pros' for such architecture include:

- The SDR hardware is often relatively simple and hence low cost (ie Softrock series of receivers and transceivers).
- The user may be able to use an existing PC that is already used in the shack/household.
- There is a wide range of suitable SDR application software to run on a personal computer (such as *PowerSDR* and *KISS Konsole*) and support (including suitable drivers) for different operating systems (such as Windows XP, Windows 7 and Linux).
- The PC software is frequently 'open source', meaning that the user with some programming skills can add new features themselves or via a group of similarly interested radio amateurs (such as openhpsdr.org).
- A suitably skilled individual, or group of enthusiasts of this kind, can also provide code updates, bug fixes, user support and new features.

In contrast, the 'cons' include:

- Since all the DSP is being performed in a PC, then the user experience is dominated by how well the PC performs. Simultaneously loading the PC with several other tasks (ie downloading from the internet whilst listening to your favourite music CD and keeping your eye on HF using an SDR application) on a low performance PC is a sure recipe for a poor user experience.
- Give the myriad of possible hardware, operating systems and installed software combinations this architecture can present a very difficult, time consuming and expensive, user support load for a commercial SDR manufacturer. Often user support issues are not related to the SDR

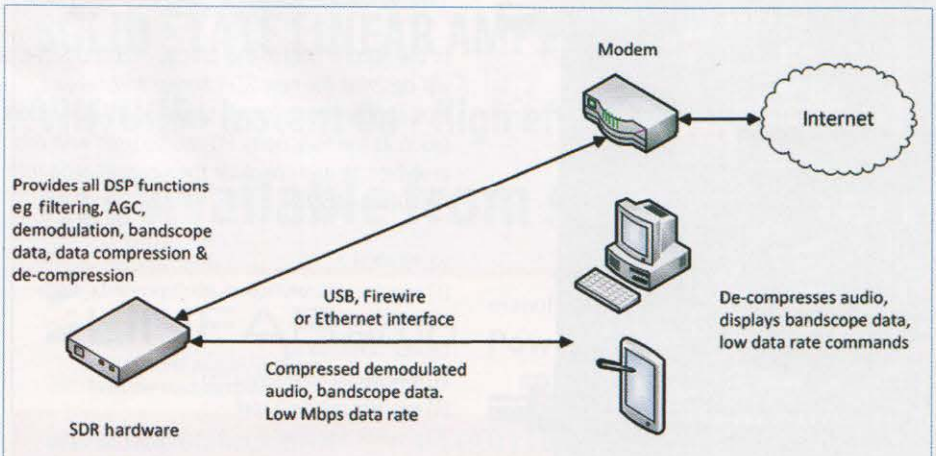

FIGURE 2: All in one box architecture.

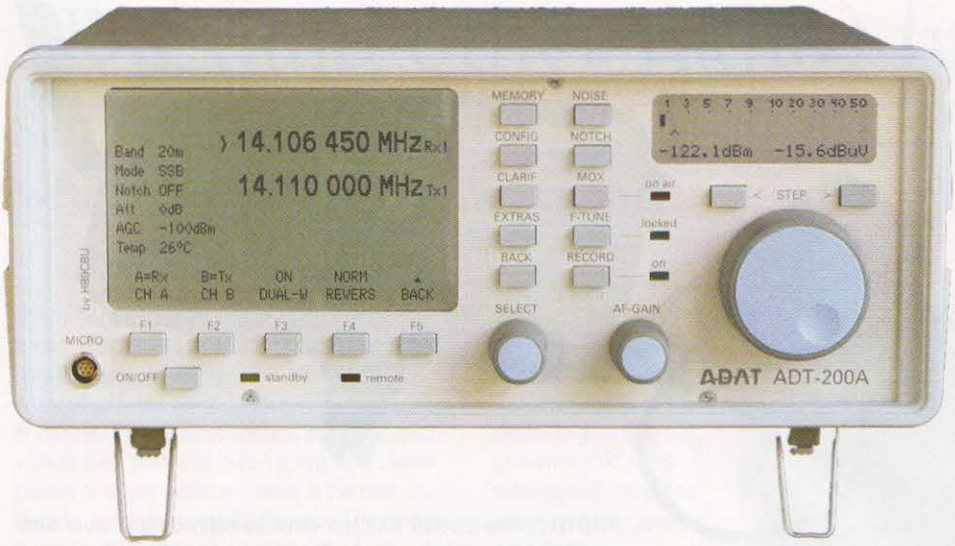

PHOTO 3: ADAT ATC-200A DDC/DUC HF transceiver. Photo courtesy of www.adat.ch.

hardware or software but other applications or device drivers un-associated with the components provided by the SDR manufacturer.

- For the user who wishes to use his SDR in a remote station configuration, a local PC will be required in order to provide the necessary interface between the SDR hardware and the network used to connect it to the PC (eg the internet).

SDR-BASED DSP RADIOS. In this new architecture the bulk of the DSP is undertaken in the SDR hardware (**Figure 2**). In addition to reducing the data rate, the SDR hardware undertakes *all* the DSP required in terms of filtering, noise reduction, automatic gain control (AGC), demodulation, etc.

This kind of architecture appears to have been adopted by FlexRadio Systems in its FLEX-6000 'Signature' range **[6]** of SDRs, which were announced last year. Since virtually no DSP is undertaken in the associated PC, the processing demands on the latter are reduced enormously.

The data rate between the SDR hardware and the PC (which may be geographically distant) only needs to be sufficient to pass the receiver audio, microphone audio, bandscope data and control signals (eg PTT and CW key closures).

Applying readily available data compression techniques **[7]** to the receiver audio can result in a data rate between the SDR hardware and PC as low as 400kbps. This is because the associated PC only needs to decompress the data and pass it to its local sound card plus format the bandscope data for display.

As this latter data is at only a few tens of updates per second (thanks to the persistence of our vision) then this similarly requires little in the way of bandwidth. Assuming the bandscope display will make full use of any graphics acceleration (eg DirectX or OpenGL) available on the PC, then again there is little loading of the PC processor.

On this basis, the 'pros' for such architecture include:

- The performance of the associated PC has much less impact on the overall user experience with this flavour of SDR architecture. As a result, the user has much more freedom in regard to the power of the personal computer being used and what other software it runs at the same time.
- Changes to the personal computer hardware and software have little effect on the overall performance of the SDR system. As you can imagine, this is a very attractive scenario to commercial radio manufacturers, as it potentially requires only a relatively small amount of user support.
- The low PC processing requirements means lower-end computing devices (eg tablets, netbooks and smartphones) could potentially be used to control the SDR hardware.
- Given the processing power available in the SDR hardware, it should be possible to connect it (via a suitable modem) directly to the internet. This would enable remote operation of the station from any location worldwide.
- The protocol used between the SDR hardware and PC may be publically available, perhaps even an application programming interface (API), in which case a user with some programming skills could add new features of a cosmetic (ie graphical user interface) nature.

In contrast, the 'cons' include:

- Substantially more complex SDR hardware is required, resulting in higher design, development and product costs.
- Generally the tools used to develop the complicated firmware necessary for the SDR are likely to be specialist in nature. This means that for commercial providers, the code is either likely to be proprietary or if 'open' very hard for a user to amend. As a result, the user ends up being totally dependant on the manufacture to provide all future code updates, bug fixes, digital modes and new features – a situation that radio amateurs interested in experimentation are unlikely to be comfortable with.
- If wideband in-phase and quadrature (I & Q) data is required to be sent to the user's PC (eg for digital modes, real-time recording of a wide bandwidth of signals or the CW Skimmer application **[8]**) then the low data rate advantages of the architecture are mostly lost.

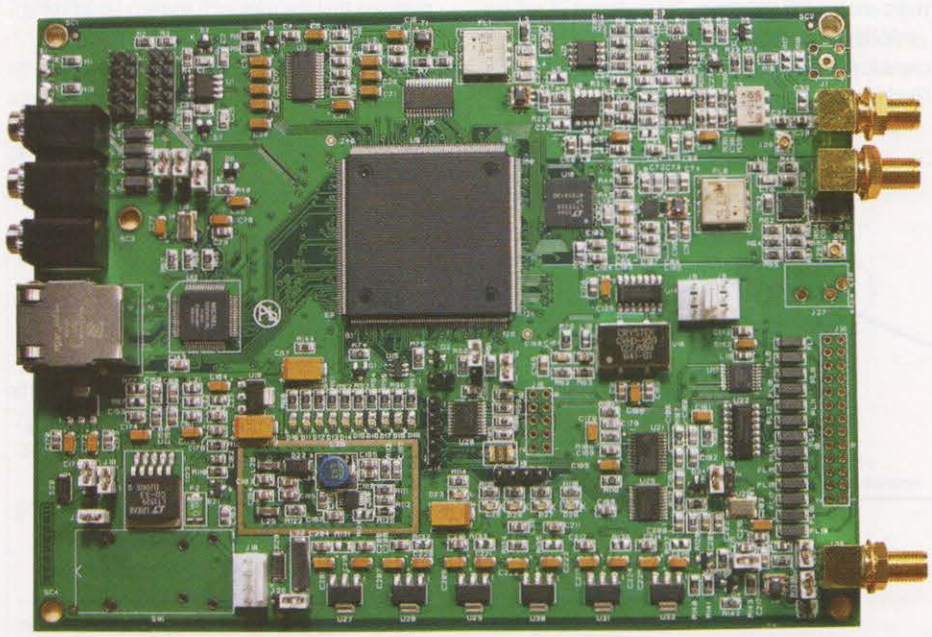

PHOTO 4: Prototype of Hermes openHPSDR DUC/DDC transceiver board.

In the second part of this article, Phil and Steve will describe the new SDR Server architecture, look at how cheap, small, single board computers (such as the Raspberry Pi) can be used with this architecture and conclude their investigation into the future of SDR.

WEBSEARCH

[1] www.flex-radio.com/Products.aspx?topic=sdr1k_details
[2] http://fivedash.com
[3] http://openhpsdr.org
[4] www.elecraft.com/KX3/kx3.htm
[5] www.adat.ch/index_e.html
[6] www.flex-radio.com/
[7] See 'What is Opus?' at www.coolutils.com/Formats/Opus
[8] www.dxatlas.com/cwskimmer/

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Antennas

Tuning the CFR antenna and measuring a ¼ wavelength of coax

HISTORY. In a previous edition of Antennas [1] I described an antenna constructed by John Pegler, G3ENI and Dan Sharpe, G3ZUN for portable operation on 5MHz NVIS experiments. Their design was based on the CFR (Controlled Feeder Radiation), advocated by G2HCG **[2]**; an explanation of how the CFR dipole works is described in [1].

My research into this antenna arrangement indicated that it has been around for some time although each reincarnation is given a new name, which makes tracking its history interesting. For example, the earliest account of this antenna I can find was christened the COBRA **[3]**, described by W6SAI in his Wire Antennas book of 1972 **[4]** and illustrated in **Figure 1**.

As already mentioned in earlier editions of Antennas (including February and May 2005), I have also found the same antenna described as an End-Fed Resonant Feed-Line Dipole by W2OZH **[5]**, a T2LT **[6]** (Tuned Transmission Line Trap) by AA6AX **[7]** and, most recently, the HAK antenna by G8HAK **[8]**. I have settled on calling this antenna the Controlled Feeder Radiation (CFR) dipole because it partially describes how it functions and it also has a neat acronym.

HOW TO TUNE THE CFR. Some readers have built the CFR dipole antenna and I received a couple of enquiries asking how to tell when the antenna is tuned for optimum performance. This subject also came up during an exchange of e-mails with G3TXQ.

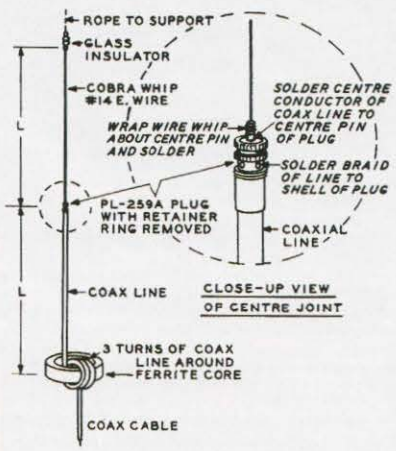


FIGURE 1: The Cobra antenna. Dimension L in feet is approximately 234/f, or 72.42/f for L in metres. The original specified ferrite core was a #CF-123 of Q-1 material, 2.4in in diameter and 0.5in thick.

He advocated using a current meter to measure the common mode current in the coax where resonance could be indicated by minimum current, a logical assumption.

My existing CFR antenna for 14MHz is made simply by taping 16.6ft (5.1m) of 16SWG multi strand insulated copper wire to a fibreglass support. The bottom end of this wire is then connected to the centre conductor of a similar length of RG57. The antenna was configured as an inverted L as shown in **Photo 1** rather than a completely vertical arrangement as illustrated in Figure 1. This inverted L arrangement resulted in a lower SWR, probably because the feed impedance was nearer 50Ω compared with 72Ω for straight vertical dipole. The inverted L arrangement also lent itself to the experimental layout shown in **Photo 2**.

PHOTO 1: An inverted L CFR dipole setup. The feedpoint is located in the top right hand corner where the coax is fixed to the vertical section.

My original attempt to determine optimum performance by measuring coax common mode (CM) current, as described by G3TXQ, was inconclusive. After reading an article on a low capacitance, voltage immune RF current meter by W8JI **[9]** I decided to build one and try the CFR current measurements again. I measured the SWR over a range of frequencies using the AIM4170 (checked with a Daiwa CN-601 SWR meter); the results are shown in **Figure 2**.

I then measured the current on the coax feeder to the radio. Using a transmitted power of 10W the measurements were plotted relative to SWR, see Figure 2. Although current did vary over the frequency range I didn't get the expected minimum within this range. I also measured the RF level at the antenna, which remained fairly constant over the frequency range.

As a result of these measurements I will continue to use SWR as an indication of the correct tuning when using this antenna. I use the choke tuned with a 22pF wide spaced parallel capacitor. Varying the capacitor does not change the SWR shape shown in Figure 2 – it just moves it left or right along the frequency axis.

ELECTRICAL LENGTH OF COAX. Ron Bennett, G4DIY, e-mailed me to say, "I am constructing an antenna project and there is the requirement for me to use an electrical quarter wave of RG213. I know that I have to multiply the physical half wave length of coax by its velocity factor to get the electrical length, 0.66 in the case of RG213". In a further discussion he asked if there was a way to actually measure this velocity factor.

There are several ways. My favourite for many years was to use a grid dip oscillator (GDO) but these instruments have fallen out of favour and fashion in recent times. However, if you are into any sort of antenna experimental work you may have an antenna analyser such as the MFJ-259 or MFJ-269. An instrument that has a method of measuring impedance, such as shown in **Photo 3**, is suitable for measuring coax electrical length.

I decided to measure the electrical quarter wavelength of a length of coax, the characteristics of which were unknown to me. This coax has a grey plastic outer jacket and is labelled SD-2V DAIYU DENSON; it is 2.82m (111in) long and terminated at each end with a PL-259 plug.

The diagram in **Figure 3** illustrates the impedance (Z) transform effect of a quarter wavelength of 50Ω coax terminated with a 25Ω resistor, resulting in a measured impedance of 100Ω at the opposite end. If the cable is not terminated – just left open circuit, then it is terminated with a

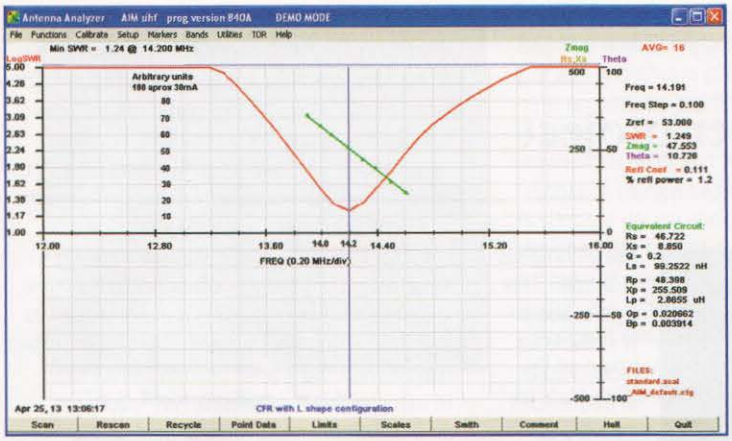


FIGURE 2: SWR plot of the inverted L configuration CFR antenna. The green trace shows the hand plotted current variations.

PHOTO 2: Test set up to compare the current variations relative to SWR on a CFR antenna.

theoretically infinite impedance. This should reflect a zero impedance to the measuring instrument.

I attempted the measurement of the 2.82m length of SD-2V using the old MFJ-259 by starting at the lowest frequency and increasing this frequency until the Z meter made a sharp dip towards zero at 16.49MHz, see Photo 3. A second zero reading occurred at 49.76MHz. The first reading represents the frequency at which the coax length is an electrical quarter of a wavelength long, the second three quarters of a wavelength. The frequency of the electrical half wavelength can be determined by subtracting the lowest from the highest frequency, ie 9.76 – 16.49 = 33.27MHz. On the other hand you could just multiply the lowest frequency by 2, which gives 32.98MHz for a half wavelength.

ACCURACY. You will notice that the two methods of measuring a half wavelength value described above result in slightly different values. This probably is a result of instrument measurement inaccuracies. The problem arises when trying to determine the lowest value of Z. On the MFJ-259 the frequency can be swept over 400kHz (at 16MHz) with no perceptual variation around zero. Accuracy can be improved by sweeping the frequency either side of zero until the Z reading is, say, 10Ω. The average of these two measurements is then 17.99 + 14.99 = 16.49MHz.

The reason for making two frequency measurements is that the rate of impedance value change with frequency is greater away from zero. In this case the frequency sweep was reduced to 8kHz before a perceptual variation of the reading at 10Ω occurred.

These measurements give the electrical length of the coax, which is determined by the velocity factor of the coax. According to the literature on the web the velocity factor can be obtained as follows:

Velocity factor Vf = Physical length (ft) x frequency/246

My 9.25ft length of SD-2V = 9.25 x 16.49/246 = 0.62.

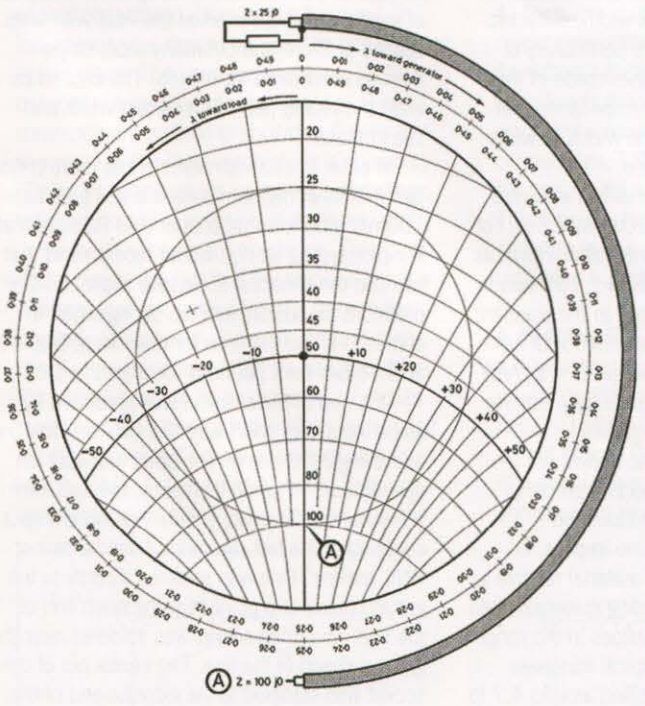


FIGURE 3: A restricted range Smith Chart showing the impedance transformation of a quarter wavelength of coax terminated with 25Ω resulting in 100Ω impedance at (A).

PHOTO 3: MFJ-259 being used to measuring the electrical quarter wavelength of a length of coax.

I realise the velocity factor figures in coax tables are nominal, nevertheless I was expecting 0.66.

REFERENCES

[1] Antennas, *RadCom* September 2012

[2] Controlled Feeder Radiation, G2HCG, *RadCom*, May 1990

[3] A linear loaded dipole described by Ray Cook, W4JOH, in *73 Amateur Radio Today*, June 1997 is also assigned the name COBRA (not an acronym that I am aware of)

[4] *Simple, Low Cost Wire Antennas for Radio Amateurs*, Radio Publications, Inc, 1972, William I Orr, W6SAI & Stuart D, Cowan, W2LX

[5] Resonant Feed-Line Dipoles, *QST*, August 1991, pp24-27

[6] The T2LT acronym is easily confused with the T2FD, a resistance loaded folded multiband dipole antenna

[7] TT *RadCom*, June 1997 (also Technical Topics 1995-1999)

[8] The HAK choked coaxial dipole, G8HAK, *RadCom* April 2013

[9] www.w8ji.com/building_a_current_meter.htm

Homebrew

Continuing the 70cm transverter project

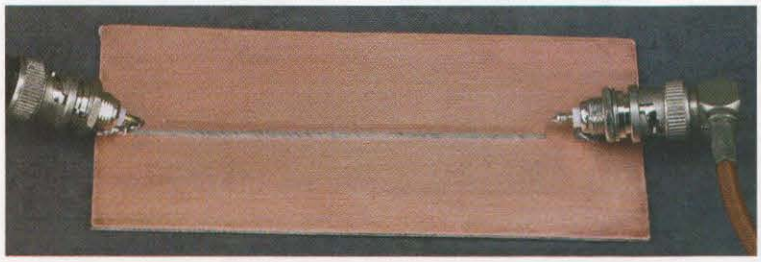


PHOTO 1: Testing the transmission line (see text).

RESONATORS. In the last Homebrew, in June, we looked at UHF band pass filters based on LC resonators. Over the next few months, we will be building some UHF and microwave circuits based on transmission line (TL) resonators.

A TL formed from a long strip of flat conductor mounted over a ground plane is known as a stripline. Large resonators of this type are widely used in the output matching network of valve amplifiers for VHF and UHF. Unlike more complicated structures such as coaxial line, striplines are very easy to fabricate from sheet metal. Smaller TL resonators that are etched on printed circuit board are known as microstrip lines. **Figure 1** shows a typical microstrip line as seen in the transmission line design tool from *QUCS* [1].

The simplest type of PCB TL is just a straight length of copper track on one side of the board with a copper ground plane on the other side. The PCB substrate acts as the TL dielectric. One of the difficulties facing the PCB designer is that all tracks behave as transmission lines, even in cases where the designer might prefer they didn't. Keep this in mind when building UHF and microwave circuits. All tracks have distributed inductance and capacitance and will exhibit TL behaviour at frequencies where the line length is a significant fraction of a wavelength.

Readily available types of double sided PCB use a fibreglass substrate. This type of board is suitable for most circuits at frequencies from DC to UHF. Standard fibreglass PCB may not be suitable for some microwave circuits. As this type of board is not specified for UHF and microwave use, it may have unacceptably high dielectric losses. Many microwave circuits are built on PTFE-based PCB that is designed to have low losses and tight control over other parameters such as relative permittivity and physical size, particularly the material thicknesses.

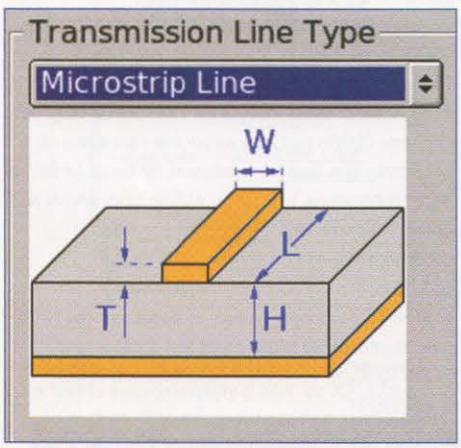


FIGURE 1: A typical microstrip line as seen in the transmission line design tool QUCS.

In most cases, the TL sections are etched from the copper foil using conventional PCB manufacturing methods. Regular readers will know that I prefer to use pre-cut lengths of stripline that I superglue on top of standard PCB copper foil. This is a very fast and easy way of building prototype circuits at UHF and above.

For our purposes, we will consider the PCB ground plane to be infinitely large. The spacing between the PCB and the enclosure lid will also be assumed to be infinite. Line impedance is mostly determined by track width, dielectric height (thickness) and relative permittivity of the dielectric. Transmission lines made in this manner have a characteristic impedance that is inversely proportional to line width, ie wider tracks have a lower impedance.

The permittivity of a material is a measure of its ability to concentrate electrostatic flux. For example, free-space permittivity (also known as vacuum permittivity) $\varepsilon_0 = 8.854 * 10^{-12}$ farads per metre. This constant is used in the standard formula for calculating the capacitance of an air spaced parallel-plate capacitor: $C = \varepsilon_0(A/d)$ where A is area and d is distance between the plates.

Relative permittivity ε_r (also known as dielectric constant) is an important property of dielectric materials in capacitors and transmission lines. As the name implies, it specifies the permittivity of a material relative to free-space permittivity. Insulating materials used in electronics have typical ε_r values in the range 2 to 8. PTFE has ε_r of 2.1, typical fibreglass PCB substrate is usually specified around 4.7 to 5.5 and mica has ε_r around 6. The capacitance value of a capacitor for a given plate size and spacing is proportional to ε_r. Similarly, distributed capacitance of a TL is proportional to the ε_r of the line dielectric.

VELOCITY FACTOR. Signals will propagate along a transmission line at a limited speed. The two limiting factors are the speed of light and the 'velocity factor' (VF) of the line. The basic formula is $VF = 1/\text{sqrt}(\varepsilon_r)$. A TL using air as the dielectric will have a velocity factor (VF) close to 1. A typical example is a wide spaced open-wire feedline made from bare wire and with a small number of spacers/insulators. Such a line will have a VF around 0.97. It is not so easy to calculate VF for other types of line. Coaxial cables don't always use a solid uniform dielectric. In many cases, the dielectric has spaces for air either as channels running through the dielectric or as gas bubbles in cables with a foam dielectric. I have found that in many cases, even the people who make and sell the cable don't always have accurate figures for VF. If in doubt, the best way to determine VF is to measure it, particularly when working with cheap cables where specifications and tolerances may change without warning.

In some of our previous projects, I have used glued stripline made from strips of single-sided PCB laminate. The strips were cut by hand using a hacksaw. For this month's projects, I will use 1.6mm single-sided fibreglass PCB laminate (Maplin WF41 or similar). I don't have detailed specifications for this board, but it seems to be a generic fibreglass board with similar properties to the industry standard FR4 (flame retardant) glass-epoxy board. This should have ε_r of around 4.8.

Standard tables from the RSGB *VHF/UHF Manual* [2] suggest a track width of just under 2.8mm for a conventional 50Ω microstrip line. As neither the hacksaw or its operator is capable of such precision, I marked the PCB with lines spaced at 3mm and cut many more strips than were required for the job. The best strips were then hand picked for correct width and straightness.

In order to establish some of the more critical parameters of my home made line, I glued a 100mm strip to some copper clad PCB laminate. For prototyping work, I would recommend that you use the cheapest superglue available. The premium brands are just too strong when it comes to lifting the lines for reworking. Brand-X at ten tubes for a pound is ideal for this job.

One end of the stripline was grounded by soldering a very short wire link between the line and the ground plane. The other end was left open circuit. At some frequency, this will form a resonant quarter wave stub. For input/output coupling to the test resonator, I used a pair of BNC sockets. One was soldered directly to the ground plane at a point near the open end of the line. The other socket was soldered near the grounded end of the line. The centre pin of this socket was soldered to the extreme end of the line. At first glance, this might seem like a short circuit. However, due to the inductance of the wire link to ground, a small amount of RF energy will be coupled in/out of the line. **Photo 1** shows the test arrangement.

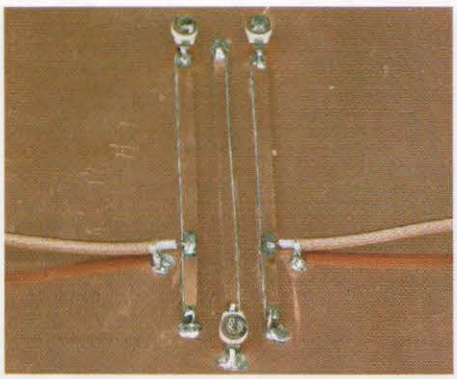


PHOTO 2: Prototype interdigital filter.

I used a spectrum analyser with tracking generator to act as a signal source and sensitive power meter for testing the resonant frequency and Q of the line.

Loss through the filter at resonance was quite high, at more than 30dB. This should ensure that the measured bandwidth is a function of line unloaded Q (Qu) and not due to loading by the test circuit. The line showed a clear resonance at 490MHz. Measured -3dB bandwidth was around 7MHz, indicating Qu of 70. A free space quarter wavelength at the resonant frequency is 75/490 = 0.153 metres = 15.3cm. This shows the velocity factor of the line is 10/15.3 = 0.654. Coincidentally, this is very close to the 0.66 value often quoted for some of the most popular types of coax.

It is not easy to measure the ridiculously small values encountered in UHF circuits. However, I did attempt L and C measurements of the 10cm test line using the simple LC meter (May 2008). I also did a few measurements in the low VHF region using a few standard capacitors and inductors as a reference. Inductance was measured with the line shorting link in place. The short was removed for the capacitance measurements. The VHF C and L measurement method is shown in **Figure 2**. A summary of the measured values is shown in **Figure 3**. All values are in the expected range, with the possible exception of the calculated value for characteristic impedance. This is no doubt due to the fact that my stripline is not a conventional microstrip. Placing the conductor on a raised strip well above the ground plane means that it is surrounded by air rather than fibreglass as would be the case for an etched microstrip (and there are doubtless some edge effects). $Z0=\sqrt{(L/C)}$ gives a value of almost exactly 75Ω. At this point, I should announce that it had always been my intention to make a 75Ω line. All references to 50Ω should be forgotten now. If anybody asks, 'tis a 75Ω line, just as I had always planned.

It is common practice to cut resonant lines to a length well short of an electrical quarter wavelength (90°) and then tune the line to resonance using a capacitor. Sometimes this is simply a design choice. In other cases, the designer may be forced to take this option because of reactances elsewhere in the circuit. In the case of the VHF valve power amplifier mentioned earlier, the valve anode capacitance will be quite large and it will often be necessary to shorten the line considerably so that resonance is achieved. One of the advantages of this is that the physical length of the line is reduced and the amplifier may be significantly smaller.

CIRCUIT TOPOLOGIES. There are many different ways of configuring TL resonators to make a band pass filter (BPF). As with the LC filters used in our previous projects, it is possible to use series or shunt elements for inter-resonator and I/O coupling. The TL resonators can be mutually coupled by placing them in close proximity or individually screened so that coupling must be arranged by other means. This is naturally the case with coax resonators. Simply placing microstrip resonators alongside their neighbours so that there is mutual inductance and capacitance between them is a very simple solution. This technique lends itself to PCB mass production. Calculating or measuring coupling between adjacent lines is not easy at the prototyping stages, but once the design is complete, it can be mass-produced at very low cost.

One very popular topology for TL filters is the 'interdigital' filter scheme shown in **Figure 4**. Each line is inverted relative to its immediate neighbours, rather like interlocking fingers. As with out earlier TL test circuit, one end of each line is grounded to form a quarter wave resonator. The red dots indicate the ground connections. These are the only connections to the ground foil apart from the I/O connectors. This topology results in a very compact filter. I/O coupling in this case is by a direct tap into the input and output lines.

A 404MHz BPF. As our new transverter will use a 404MHz local oscillator based on a simple crystal oscillator and frequency multiplier, we will need to use a 404MHz band pass filter at the output of the LO unit. The filter will ensure that unwanted harmonics of the 44.888MHz crystal oscillator are removed from the LO signal.

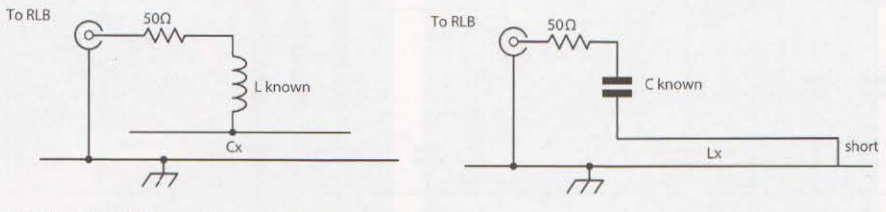


FIGURE 2: VHF C and L measurement setup.

A free-space quarter wavelength at 404MHz is 75/404 = 0.185m. Accounting for VF, the line length would be 18.5*0.654 = 12.1cm. For our prototype filter, we will use 45° lines with a physical length of 6cm. Three coupled lines will be used. Each line is tuned to resonance by a small 10pF ceramic capacitor across the open ends of the lines. Line 2 will be inverted relative to line 1 and 3 in the interdigital configuration mentioned earlier. The prototype filter is shown in **Photo 2**. As this filter is so easy to modify and adjust, the I/O tapping points and spacing between lines will be determined empirically. Transmission loss and filter bandwidth were constantly monitored during the adjustment process.

Based on previous designs for both LC and TL filters, I would expect the optimum I/O tapping points to be towards the grounded end of the lines.

In the final design, the tapping points were at 12mm from the grounded end of both line 1 and line 3. A line-to-line spacing of 6.5mm resulted in a -3dB bandwidth of 15MHz. Loss through the filter was less than expected, at just over 2dB. This suggests that my initial Qu measurements may have been a little pessimistic. **Photo 3** shows a plot of the filter response from LF to 500MHz.

404MHz LOCAL OSCILLATOR. The local oscillator (LO) from my original 432-28MHz receive converter (June 2008) turned out to be one of those magic circuits that exceeded my expectations. Although it had only two transistors, this simple LO unit provided up to 2Vpp at gate 2 of the dual-gate MOSFET receive mixer. Unfortunately, the original design is probably not an ideal choice for use in a transverter. Inadequate buffering between the crystal oscillator and the Tx and Rx mixers in the transverter would likely lead to unwanted frequency variation of the transmitted signal. A new modified LO unit is shown in **Figure 5**. This circuit has a couple of extra transistors. There is a FET source-follower used as a buffer between the crystal oscillator/tripler (Q1) and the second tripler stage (Q3). There is also a new amplifier stage at the output. This can provide sufficient LO power to drive both Rx and Tx mixers via a power splitter.

Q1 is an MPSH10 transistor used as a combined oscillator/tripler. The oscillator is a 3rd overtone type that runs at 44.889MHz. This is tripled to 134.667MHz in the collector circuit of Q1. This signal is buffered by Q2 (BF245C) before it is fed to the second tripler stage (Q3). I tried using several different transistors for Q3. A BFR91 gave the best results. As this was the very last BFR91 available, I also tried several MPSH10s in the circuit. The best of these gave very acceptable results. This was an interesting experiment, but, it is never a good idea to push transistors to the very edge of their capabilities. I will use my last BFR91 in the finished circuit and order a few new ones for future experiments.

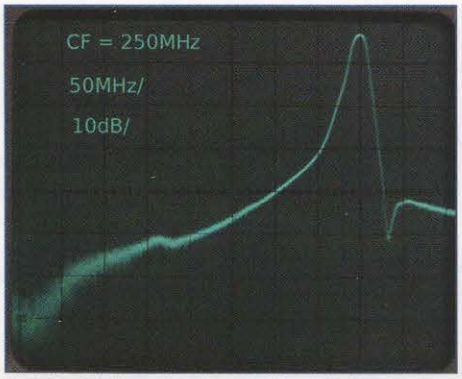


PHOTO 3: Frequency response of the prototype filter from LF to 500MHz.

```
100mm PCB glued line.
Width nominal 2.77mm  measured 2.8-3.0mm
Loose coupled resonance 490MHz.
C LF test 8.3pF VHF test 8.93pF
L LF test 50nH  VHF test 51nH.
VF @490MHz  0.654
Z0 = √((51*10^-9)/(8.93*10^-12) = 75ohms
```

FIGURE 3: Summary of the measured values for my stripline.

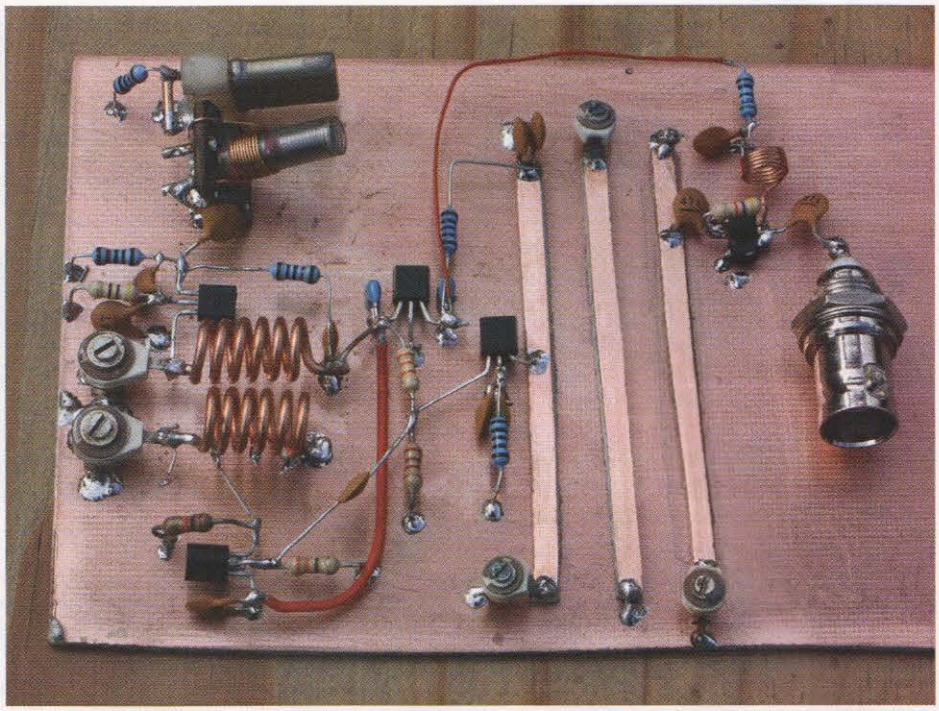


PHOTO 4: Prototype 404MHz oscillator and interdigital filter.

The 404MHz BPF in the LO unit is based on the filter described earlier and shown in Photo 2. Each line is 6cm long, ~2.8mm wide and tuned to resonance at 404MHz using a miniature 10pF trimmer. Q4 is a BFG135. These are surface mount devices, but they are quite easy to apply in dead-bug and similar styles of construction. Another BFR91 would probably make an excellent substitute.

LO UNIT CONSTRUCTION. The LO unit is built on the copper side of 10cm x 8cm of PCB laminate.

L1 is 10 turns on a small slug-tuned former. 6 turns would be adequate on a larger former. L2 and L3 are each 6 turns of 1mm bare copper wound on a 5mm former. Turn spacing is approximately the same as the wire diameter. L3 is tapped at 5 turns from the grounded end. The three lines in the BPF have already been described in detail. The collector of Q3 is tapped into the mid-point (3cm from either end) of the first line. The output tap from the third line is at 12mm from the grounded end. Line-to-line spacing is 6.5mm. **Photo 4** shows the assembled LO unit. Power for Q1, Q2 and the base bias for Q3 come from a 78L09 9V regulator.

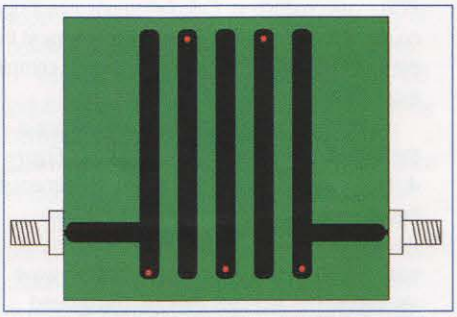


FIGURE 4: Basic layout of an interdigital filter.

The 404MHz output looks very clean on the spectrum analyser. Frequency stability seems quite good after a few minutes warm-up time, although I haven't made any long term drift measurements yet.

WEBSEARCH
[1] *QUCS* (Quite Universal Circuit Simulator) http://qucs.sourceforge.net/
[2] RSGB *VHF/UHF Manual*, fourth edition, G R Jessop, G6JP

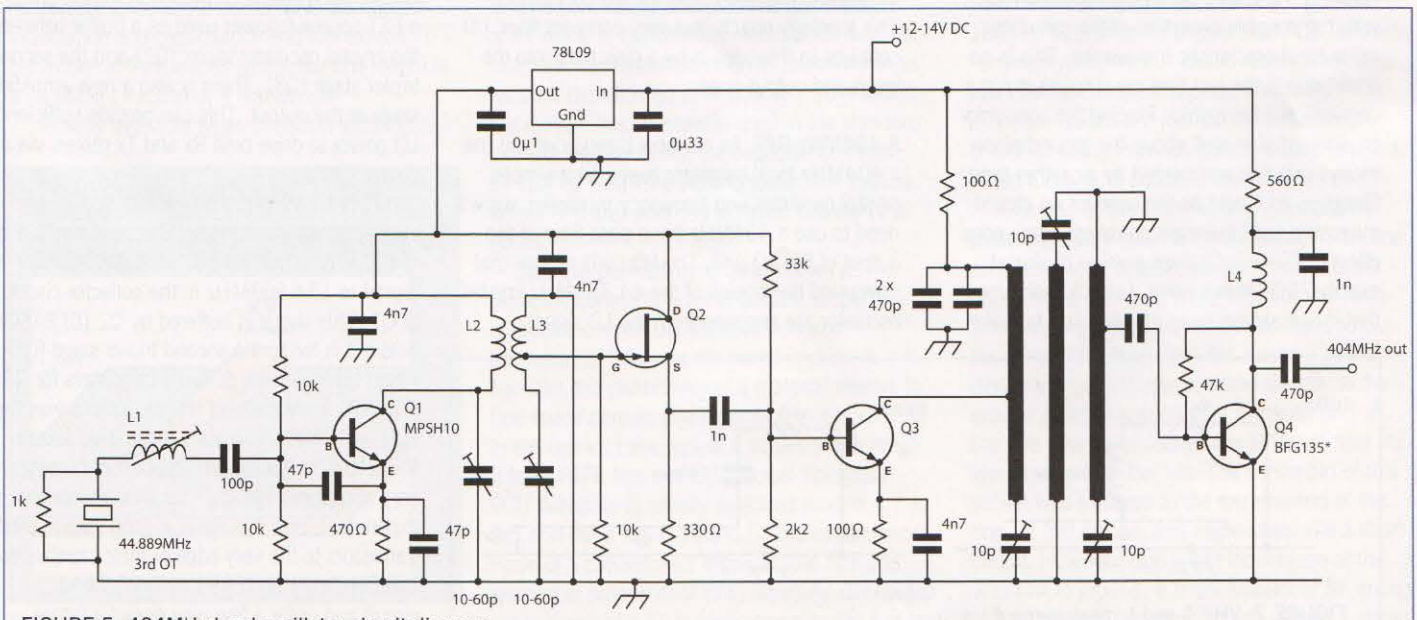


FIGURE 5: 404MHz local oscillator circuit diagram.

Mills on the Air

Demonstrating amateur radio to the public whilst bringing attention to Mills around the UK

BACKGROUND. On a weekend in May each year, radio amateurs set up stations in windmills and watermills all over the country. Apart from being an exciting time for those involved, the event promotes both the site itself and also amateur radio, since members of the public encounter enthusiasts at work. The event is organised in conjunction with the Society for the Protection of Ancient Buildings (SPAB).

Some nine years ago, Jasmine Marshall, G4KFP, a member of Denby Dale Amateur Radio Society (DDARS) spotted a request in the RSGB news asking for any radio amateur willing to put on a station at one of their windmills or watermills. She contacted SPAB and initially agreed a plan for six groups of amateurs to establish stations at six buildings. As word spread, this number rocketed to 30. DDARS then designed QSL cards and log books for the event and also created an award certificate to be issued to any individual or group having worked ten stations or more. After Jasmine, Brian, G0BFJ and Tony, G4LLZ continued to organise the event. The centrally produced QSL cards were dropped as local organisers preferred to produce their own. Indeed the competition is such that some beautiful cards have been sent out by the special event stations. The event organiser today is Gerald Edinburgh, G3SDY.

Antennas at Ruiton Windmill.

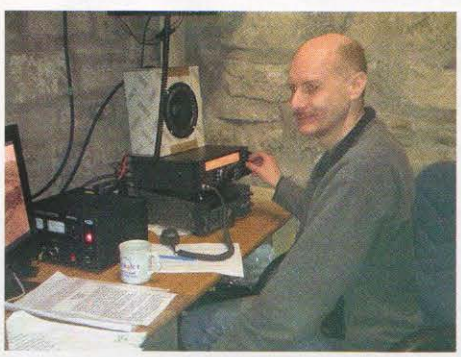
GB5HW. Members of Nunsfield House ARG, Derby and District ARS and South Normanton ARC combined to operate GB5HW from Heage Windmill during the Mills on the Air weekend. Over 200 QSOs were made including those to mills in The Netherlands (PA) and Belgium (ON).

GB2RWM. South Essex Amateur Radio Society had a very successful weekend this year. They operated GB2RWM for Mills on the Air from Rayleigh Windmill using a full size G5RV as an inverted V plus a 5/8 over 5/8 collinear at 30ft for 2m. The organisers report that they always have a problem at this site as there is not a lot of room to erect antennas, but this setup worked very well. They were kept busy working stations until they pulled the plug. At the end of the day they were looking forward to their next event at the Bay Museum, running GB2BM in June for Museums on the Air.

GB2RM. Mills on the Air is a regular occurrence for Dudley & District Amateur Radio Society as they operate from the club QTH of Ruiton Windmill, Upper Gornal, West Midlands. This year they set up various stations and operated for the whole weekend as GB2RM – Ruiton Mill. The radios used were a Yaesu FT-817ND that was mainly running digital modes, a Kenwood TS-590 for HF operation and a Kenwood TM-707 for VHF FM. The antennas and stations were set up on Friday evening in readiness for the weekend ahead, including a three element beam for 10 and 12m and an X300 VHF vertical at the top of the mill. There was an OCF dipole and V dipole taking care of 40 to 10m.

The club enjoyed a good turnout and also made use of the windmill's own kitchen, enjoying a curry on the Friday evening and a full cooked breakfast was served on the Sunday morning. Some operators decided to stay over on the Friday and Saturday nights, making it a true all-weekend event. Attendees included Chris, 2E0FRY, Drew, G7DMO, Neil, 2E0KAX, Kevin, 2E0COJ, Carl, M0ZCR, Gary, M3CHD and Dave, G0MJY amongst many others throughout the weekend.

Operators included Dave, M0DCM, Simon, M0VKY, Keith, M0WYZ, Dave, G0IBD, Stuart, G7HVF and Trevor, G6TPZ. They ended up with a good log of contacts including Australia and Finland on 20m, France, Ireland and Netherlands on 40m, with Brazil and Argentina on 10m digimodes.



Trevor, G6TPZ on HF at Ruiton Windmill.

Operating from Rayleigh Windmill.

G1VAB operating 40m SSB at Heage Windmill.

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Data

SDR dongles and sound cards

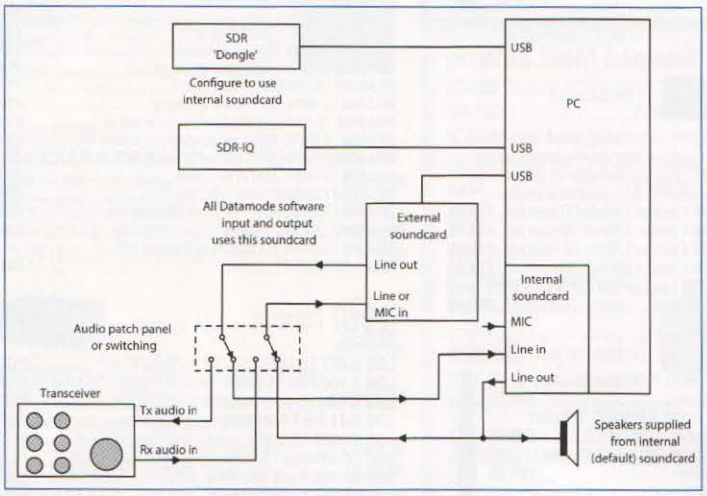


FIGURE 1: A typical interconnection diagram for just one possible configuration of sound cards and radio, including SDR types. If you have multiple sound cards and radios, a diagram similar to this makes it a lot easier visualising what has to be connected to what for any setup and changes.

DONGLES AND SDRS WITH DATAMODES.

The August 2012 Design Notes described the Realtek DVB-T 'dongles' that were starting to be used as general purpose wideband software defined receivers. Now, a year later, their use is widespread, with thousands of amateurs having purchased one or more as a low cost solution for V/UHF multimode receivers. With a simple modification, they also work satisfactorily for LF / MF band coverage.

These dongles, in common with all SDRs that work in conjunction with a personal computer, generate their audio via the PC's sound card. Fine – if all we want to do is listen to voice or other audio signals; but we Data column readers want more. We need to feed the audio into software for signal analysis and decoding. How do we do this if the sound card is already in use?

For receive only, it is often possible to run playback and record independently, so audio out from the SDR can be looped back to the record input for data demodulation software. Not all sound cards allow independent operation,

FIGURE 2: Sound card selection in the Digipan software.

but most do. What about if you need to use a sound card in conjunction with a transceiver (SDR or standard) as well? The solution is to use a second sound card.

CONNECTING MORE SOUND CARDS.

Multiple sound cards have been mentioned several times in this column but never in detail. An extended Skype conversation / help session with John, G0API, who was setting up a new computer, revealed some pitfalls and how long-winded setting up multiple sound cards for data modes and several SDRs and transceivers can be, if you're not completely aware of what you are doing. John has an SDR-IQ, a Realtek dongle, a conventional HF transceiver and many datamode packages. He has two sound cards: the internal one on the PC and a second high-specification USB one with line inputs and outputs. He also has a USB microphone used for Skype.

The idea is that one sound card is used for the SDR and also feeds the loudspeakers. Its record input is not used in receive-only applications, but would be if the SDR were a transceiver. The second sound card then performs all data demodulation, using its record input on receive, and line output for transmit audio. Audio cables loop round from one sound card to the other, and these can simply be swapped around for the radio in use. Or you could make a selector switch box, or a patch panel.

Sounds simple, but there are pitfalls for the unwary! Firstly, which sound card do you use for which purpose? Internal for the SDR, separate external one for the data demodulation / tone generation, or the other way round? How do you set up the software and the SDRs? And then there is the problem of which sound card is the 'default' (preferred) one, used by the operating system and other purposes. With upmarket sound cards, there can be an awful lot of 3.5mm jack sockets looking for a home! The vital thing to do is to make a clear and precise diagram of exactly what you have and what you want to do. Show everything there is on all the sound cards and radios. **Figure 1** shows a diagram of a typical setup.

Probably the easiest way all round is to drive the system speakers from the PC's internal sound card, this being the default one so the operating system noises, online music and TV are treated normally. Make up several audio patch leads with 3.5mm stereo connectors for moving audio feeds around. Better still, make up a switch box for easy selection of the radio in use, with leads going into and out of this box. If your speakers are active types fed from the line output of the main sound card, a tee connection will be needed to tap off received audio to feed into the second sound card for decoding. If you dedicate the second sound card to data decoding and analysis software, this solution has several incidental advantages and just a few potential problems

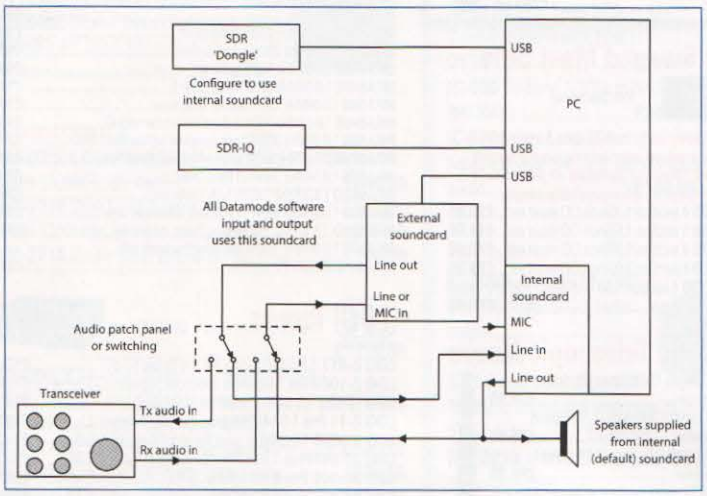
A big advantage of having a dedicated second sound card for generating transmit audio is that system bings, bleeps and warning noises will not get sent over the air. How many times have we heard the Windows startup chimes appearing on the HF bands? Or, worse, a Skype conversation going out over the air? It has happened! SDR demodulation via the main sound card usually means that good quality high power system speakers deliver the SDR audio.

Fortunately, most modern software packages offer the choice of which sound card to use for input and output. A typical selection menu (from *Digipan*) is shown in **Figure 2**. *WSJT* is less elegant to set up, but just as versatile. Some older packages used to work only with the default card, although most of these have been superseded or updated by now. If you do have a piece of software that will only work this way, search around for an update or an alternative – most later packages will probably work better anyway. As a last resort, you may have to do some tedious reallocation of sound cards just for the sake of that one piece of software; perhaps now is the time to stop and think whether it is really worth compromising an optimum hardware setup to cope with obsolete software.

As a final note, a cheap headphone dongle is adequate for datamode tone generation. Having just the microphone input is not a serious hardship when this is used for audio input to demodulation software, provided audio level is attenuated sufficiently. Most cheap headphone dongles use a standard 48kHz sampling clock suitable for all the latest software packages. And the biggest advantage of all? They are simple to control, with only playback volume and record level. No tone controls, no special effects or clever stuff that always seems to detract from and complicate datamode operations.

Data

SDR dongles and sound cards



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*The photographic and printing processes may cause the coloration of the transceiver to appear different from that of the actual transceiver.

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RSGB Centenary Convention

11 – 13 October at Horwood House

The RSGB's Centenary Convention, generously sponsored by Martin Lynch & Sons, takes place over the weekend 11 – 13 October 2013 at Horwood House just a few miles outside Milton Keynes.

LECTURES. The two day lecture programme is well on its way to completion with most of the lecture slots filled by a wide range of topics ranging from DXing and VHF/UHF techniques to HF operating and technical matters. Since the Society is celebrating its Centenary year there will be an additional historic element to the programme. As usual there will be something to suit everyone.

Some of the highlights are...

JOE TAYLOR, K1JT. Joe is a Nobel Prize winner and is very well known in the field of amateur radio weak signal communication. He will be speaking on DXing with weak signals, which is a sufficiently broad title to allow an overview of both HF and EME related applications. His amateur radio feats have included mounting an 'expedition' in April 2010 to use the Arecibo radio telescope to conduct moonbounce with amateurs around the world using voice, Morse code and digital communications. He's written several computer programs and communications protocols, including WSJT (Weak Signal/Joe Taylor) and WSPR (Weak Signal Propagation Reporter), a software package and protocol suite useful for passing short messages via non-traditional radio communications methods, such as moonbounce and meteor scatter and other low signal-to-noise ratio paths. It is also useful for extremely long distance contacts using very low power transmissions.

TUVALU, T2GM. Tom Wylies, GM4FDM is one of the four Scottish amateurs who recently headed to Tuvalu to operate as T2GM. He has kindly agreed to give us an insight to, amongst other things, the troubles they encountered getting to Tuvalu. You may recall that they made over 18,000 contacts, working the UK on 15m through to 40m, which was a great feat transiting the auroral oval right over the North Pole.

EASTER ISLAND XR0YG. Michael Wells, G7VJR will be giving a presentation on his venture to Easter Island where he and his colleagues operated as XR0YG in March, on all bands from 160m through to 10m – CW only. Electricity on Easter Island was subject to frequent blackouts, which caused a few problems, but after six days on the air they'd made some 24,000 QSOs.

WWI COMMUNICATIONS. Dr Elisabeth Bruton is a postdoctoral researcher on a collaborative project looking at telecommunications in WWI and how quickly development in radio was made at that time. Others involved in this project are the University of Leeds and the Museum of the History of Science, Oxford, BT archives, IET archives, Porthcurno Telegraph Museum and the Science Museum. Elisabeth has kindly agreed to come and speak at the Convention. You may have heard Elisabeth recently taking part in the Radio 4 series In our Time hosted by Melvyn Bragg. Elisabeth was one of the three contributors to the edition broadcast on 4 July entitled The Invention of Radio.

DUD CHARMAN'S AERIAL CIRCUS. Continuing the historic theme, Terry Giles, G4CDY will be giving a demonstration of his recreation of G6CJ, Dud Charman's Aerial Circus. Some Members will have seen this demonstrated at the recent Centenary Day celebrations at Bletchley Park, where Terry gave his lecture twice to packed rooms.

RASPBERRY PI. One of the most successful lectures at last year's event was Peter Goodall, 2E0SQL's sessions on Raspberry Pi. I'm pleased to confirm that Peter has agreed to give another presentation at this year's event, which will be complimented by a presentation by Eben Upton, the founder of the Raspberry Pi Foundation. Eben will also be part of the judging panel for the Centenary Construction Competition that's being judged at this year's Centenary Convention.

SAM JEWELL, G4DDK. Sam will be presenting a modern 70MHz transverter. At times of high Sporadic-E activity, signal levels encountered on the 70MHz (4m) band can be extremely high, especially Eastern European OIRT FM broadcast stations. To reduce intermodulation and blocking, equipment for this band must have a high dynamic range receiver. Transmit signals should also be clean to avoid interference to other services. This talk describes a modern transverter design for the radio amateur to build that meets these requirements.

CHRIS MOULDING, G4HYG. Chris will be talking about the recent developments of the Sentinel HF SDR noise measurement receiver and an HF active antenna, looking at how to get accurate RF noise measurements in an amateur radio station without spending large sums on professional test equipment. The talk will also cover SDR receiver design and a novel HF antenna designed to minimise the effects of local RF noise in a typical amateur station.

DINNERS. Friday and Saturday evenings are dominated by the two dinners. The principal sponsor, Martin Lynch and Sons, kindly sponsors the Friday evening while the Saturday dinner this year will have a much wider appeal than in previous years when it's been known as the DX dinner.

UK LICENCE EXAMINATIONS. As in previous years, the RSGB will be offering anyone wishing to obtain a UK amateur radio licence the opportunity to complete one or more of RCF Examinations over the weekend. All candidates must book their exams prior to the event and, as normal, have to provide evidence that they've completed the required practical assessments. Candidates for the Foundation and Intermediate exams *must* contact the exams co-ordinator beforehand so that their progress as regards the practical assessments can be verified. Contact the RCF Department at RSGB HQ on 01234 832 700 for further information and booking the examinations. If required, advice can be given or help finding a local tutor to complete the practical assessments in advance of the Convention weekend.

US EXAMINATIONS. The US exams will be available on Sunday 13th. Candidates will need some form of ID, preferably photo ID, a pen, a US postal address for the FCC to send your licence to and the exam fee (currently the Sterling equivalent of $15). The whole of the US exam question pool is available in the public domain and can be downloaded; there are many websites that have practical papers with answers and (for self study candidates) there are many books available.

IMPORTANT BOOKING INFORMATION. Because last year's event was very popular, so booking early is essential to assure your place. Hotel packages, evening dinner tickets etc can be booked via www.rsgbevents.org. Why not take advantage of the Early Bird discount offer that is open now and runs through till 18 August?

RSGB shop

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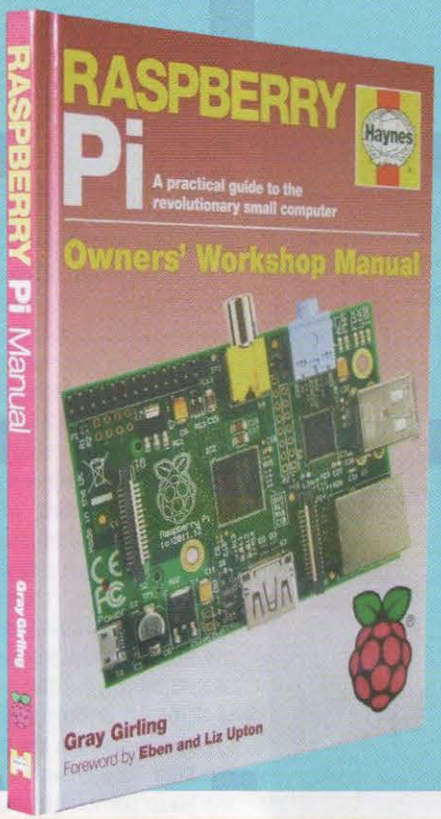
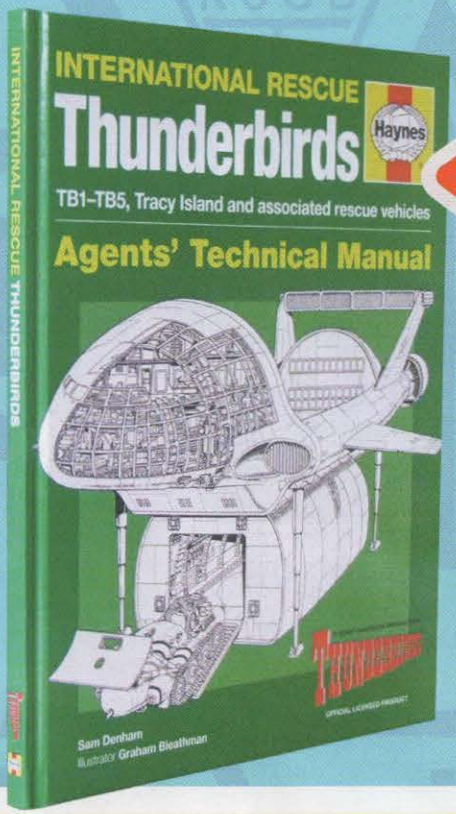
see page 76 for full details





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By: Gray Girling

If you are not familiar with the Raspberry Pi computer, the *Haynes Raspberry Pi Manual* is the perfect introduction. The Raspberry Pi is a revolutionary, fully functioning small computer that can be purchased for a few pounds. Packed with possibilities this book provides a simple and straightforward guide to getting started with Raspberry Pi.

The *Haynes Raspberry Pi Manual* is written as a recipe book with sections titled variously, How to cook, Software recipes, Meal plans, etc. Within each section you find projects and how to guides on a vast array of possibilities that the Raspberry Pi offers. With expert authorship and the trademark Haynes 'how to' approach, this is the manual everyone needs to get started with the Raspberry Pi.

Trying something new is never that easy but the *Haynes Raspberry Pi Manual* certainly provides a great start.

Hardback Size 270 x 210mm, 176 pages
ISBN: 9780857332950

Non Members' Price £17.99
RSGB Members' Price £13.49

25% OFF

International Rescue Thunderbirds Haynes Manual

by Sam Denham

Those familiar with the traditional "Haynes Manual" will recognise that this Hardback book is an inventive, informative and entertaining guide to the world's foremost rescue organisation. For those who aren't familiar with the Haynes approach this book features cutaway drawings, detailed diagrams, colour illustrations and photographs of the Thunderbirds TV series. It provides the ultimate insight into the secrets of the fabulous International Rescue team, including in-depth examinations of the Thunderbirds craft and other vehicles.

Intended for International Rescue field agents, the *Haynes Thunderbirds Manual* includes an introduction by Jeff Tracy and operational procedures for agents' missions.

Whether you are familiar with Thunderbirds or not, this book is an excellent read and a treasure trove of detail and trivia. With 150 colour illustrations and much else to recommend it the *Haynes Thunderbirds Manual* is a thoroughly recommended read.

Hardback Size 270 x 210mm, 136 pages
ISBN: 9780857331175

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Rigol DS2000 series

A series of digital storage oscilloscopes

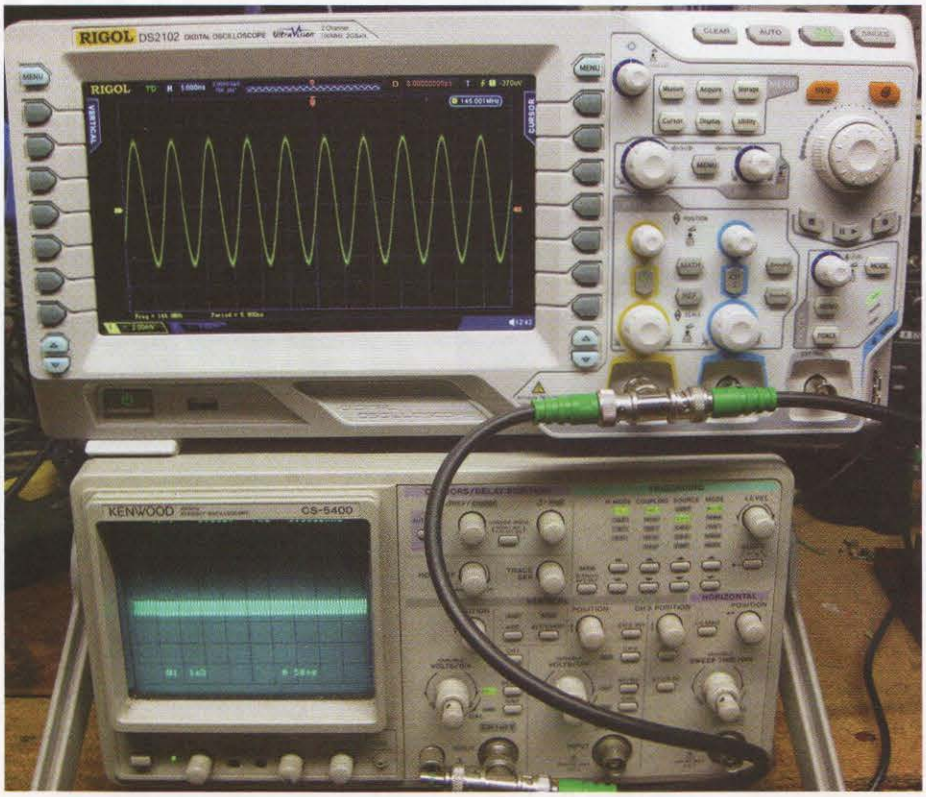


PHOTO 1: A 145MHz signal as seen on the Rigol and an analogue 100MHz 'scope.

TEST GEAR. The Rigol DS2000 series of digital storage oscilloscopes are the latest from this Chinese manufacturer of professional-standard test gear. The range consists of three models with bandwidths of 70MHz, 100MHz and 200MHz. They all share an impressive 2 gigasamples (Gs) per second ADC and have a maximum memory depth of 14Mpts (upgradeable to 56Mpts) with a capture rate of up to 50,000 waveforms per second. All models look the same and have the same facilities; the difference comes in the signal bandwidth, which cannot be upgraded later.

I have been testing the mid-range 100MHz model, the DS2102. It appears to be solidly built and measures 360mm wide by 180mm tall and about 125mm from front to back including the knobs. Underneath there are a pair of flip-out feet so that you can tilt it up a little. On the front panel are all the controls, the two channel input BNC sockets, the external trigger input BNC and a USB socket for saving screen grabs to a pen drive. On top is a sturdy folding carrying handle.

At the left hand side of the back panel there is a recess that houses the trigger output BNC, a USB socket for printer or computer and the LAN connector. The mains IEC input socket is mounted on the back, which means you can't lay the scope flat on its back when in use. Despite the portable size there is no battery option.

This model was supplied with a quick guide plus full manuals on CD and two 350MHz switchable 10x / 1x probes. The oscilloscope is unable to tell what mode the probe is in, so you have to bear this in mind when making measurements. If you wish, you can apply a correction factor to the display so that the voltage readout will be correct with the times 10 probe.

The DS2102 boots up in about 18 seconds and the first thing that catches the eye is the large widescreen display, 800 x 420 pixels and 200mm from corner to corner. The screen looks bright and sharp and has a good viewing angle. The trace occupies the central 175mm diagonal area, with information displayed around the edges. There is a row of buttons on each side of the screen that relate to the selected menu that is displayed on the screen beside the buttons. The 'intensity' control is used to select items from the sub menus; you turn it to scroll up or down, then select the wanted item with a single press. A steady hand is required here because the act of pressing the knob sometimes causes it to hop on to the next item, which can be annoying. There is a fan inside the 'scope that runs all the time, but it is fairly quiet, producing just a gentle rushing sound.

When the first digital storage 'scopes became available, I remember seeing bad aliasing effects on the screen when looking at video signals. Those early models didn't sample as fast as this Rigol though, a 2Gs/s rate gives a maximum resolvable frequency approaching 1GHz. Operating an analogue to digital converter at the Nyquist limit wouldn't give the accuracy required for proper measurements, which is why the top of the range 200MHz model needs a 2Gs ADC. The great thing here is that the lesser models, such as this one, have exactly the

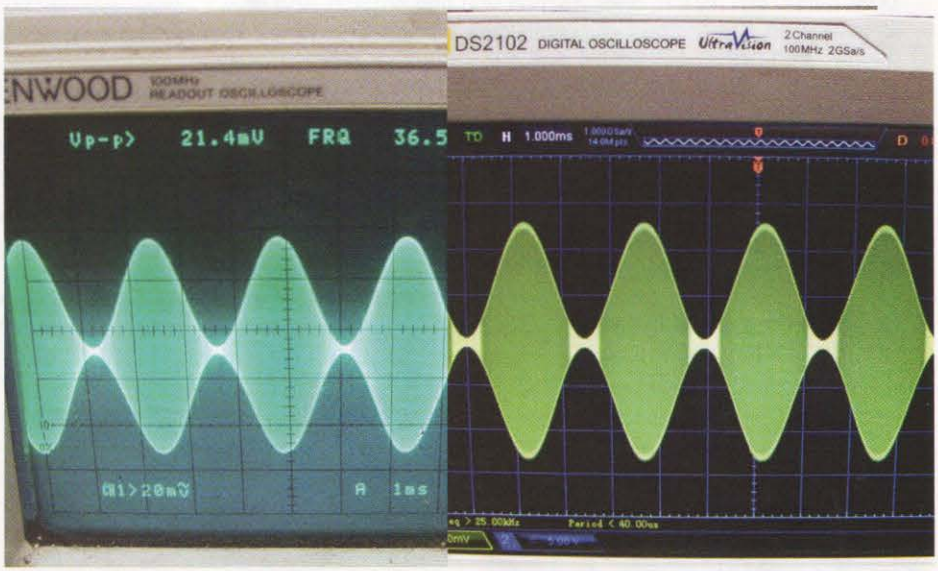


FIGURE 1: AM envelope on an analogue 'scope and the Rigol DS2102.

FIGURE 2: RS232 decoded on screen.

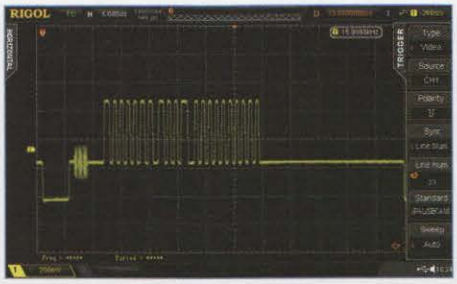


FIGURE 3: Line 23 data from a video signal.

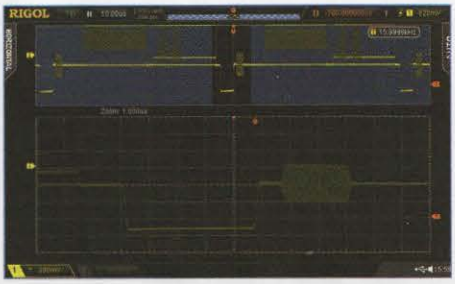


FIGURE 4: The zoom function in action on a video sync pulse.

same ultimate sample limit and facilities, but less amplifier bandwidth. They also have an impressive 500μV per division sensitivity, unusual on a mid-range 'scope.

So how useful is it when working on RF equipment?

My 100MHz analogue scope (which cost £1200 a few years ago!) can just about see a 145MHz signal but measurement accuracy is very poor and you have to use the horizontal 10X magnification to see the waveform clearly. This results in quite a dim trace. On the nominally 100MHz DS2102, the 145MHz trace is clear and stable, and the displayed amplitude is about 77% of the true value, less than 3dB down, see **Figure 1**. I measured the 3dB point as being over 160MHz, so the specification is quite generous. Even more surprising is the Rigol's ability to display a stable 433MHz signal. My analogue scope can see nothing of it, but with careful adjustment the Rigol will show a 1mV RMS 433MHz signal, although of course the sensitivity is well down at this frequency.

There is an in-built frequency counter that I managed to persuade to work at 433MHz, and it is certainly well within its capabilities at 145MHz. It appears to be very accurate; a 10MHz signal from my recently calibrated signal generator read 10.0000MHz.

A nice feature of this range of oscilloscopes is 'intensity grading' that mimics the look of an analogue CRT display, brightening the screen where more samples are present thus giving a clearer view of complex waveforms like an AM modulated carrier, **Photo 1**. Some digital 'scopes without this feature display the whole of the trace at the same brightness, making it less easy to read.

I found the AUTO button very useful in setting the parameters to suit the signal. One press and you have a triggered trace that fills the screen, then all that is required is to select the appropriate menu and do a bit of fine tuning to get the result you want.

Each group of controls has a button (or buttons) that brings up the appropriate menu at the edge of the screen, eg pressing the MENU button in the TRIGGER group brings up the trigger menu where you can choose from a multiplicity of modes. The demo model was fitted with the optional SD-DS2 decoder modes which can display RS232, I²C, SPI or parallel data streams. I tried it on RS232 (**Figure 2**) and was soon reading the ASCI characters sent from my PC, quite useful for diagnosing CAT control problems. It is a £165+VAT option that can be retro-fitted if you find you need it after purchase.

One of the standard trigger modes provided is video, from which you can choose odd or even fields, an 'all lines' display, or you can select a single line to examine. On an analogue 'scope, selecting a single line of video presents you with a rather dim display because the screen is only updated once every 20ms, but with the Rigol it's bright and clear, **Figure 3**.

I had less luck with the 'all lines' mode that, even on a static picture, gave a rather flickery display. I think this is just a consequence of the way a digital 'scope samples: it can't give such a stable trace as an analogue one, which overlays every line in the frame. Increasing the trace persistence to 50ms helped, giving the best display whilst retaining the intensity grading. It wasn't perfect but it was fine for adjusting video level etc.

There are many other trigger modes available in the 'Advanced trigger' package at extra cost. The review model came with time-limited trial versions of modes such as HDTV, NthEdge, Duration and USB installed.

A nice feature of the trigger section is the cursor that gives you a visual indication of your trigger level. Also useful is the overscan feature whereby you can scroll left and right along the triggered display without upsetting the trigger point. You can inspect a triggered waveform in detail by pressing the timebase knob to initiate the zoom function, **Figure 4**. This works a bit like the traditional delayed timebase and allows you to select a part of the waveform from a smaller window at the top of the screen and see it in detail below.

Incidentally, most of the control knobs have a 'press to operate' function. The vertical controls have fine or coarse modes, the trigger control has a zero function, as does the vorizontal position control.

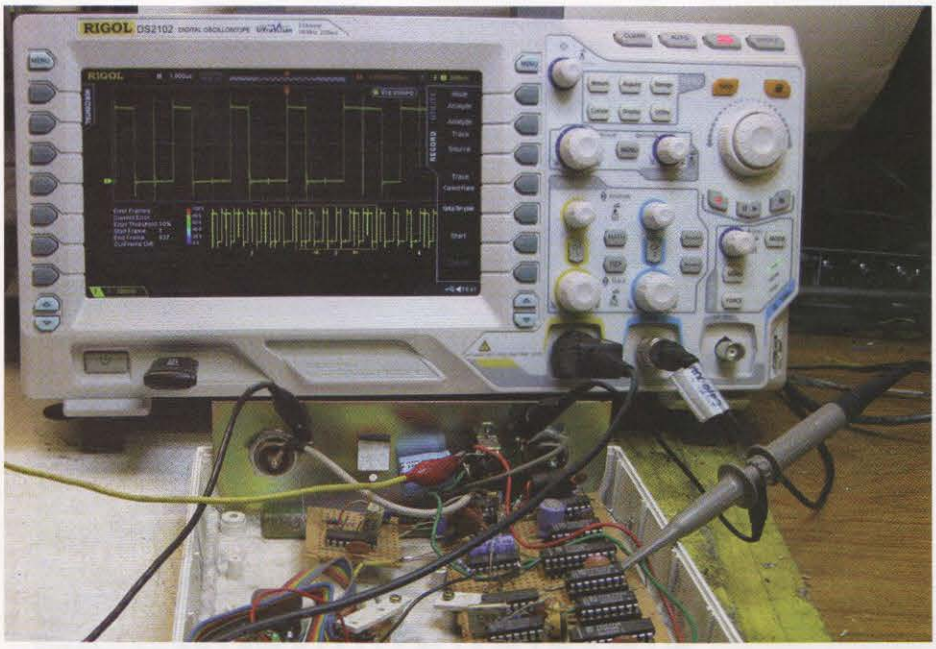


PHOTO 2: Analysing a recording.

MEASURING. The menu buttons on the left hand side of the screen allow you to select from horizontal parameters such as period, frequency, pulse width and rise and fall times, or vertical parameters including max and min, peak to peak and average voltages. These are 'live' readings and up to six can be displayed at any one time across

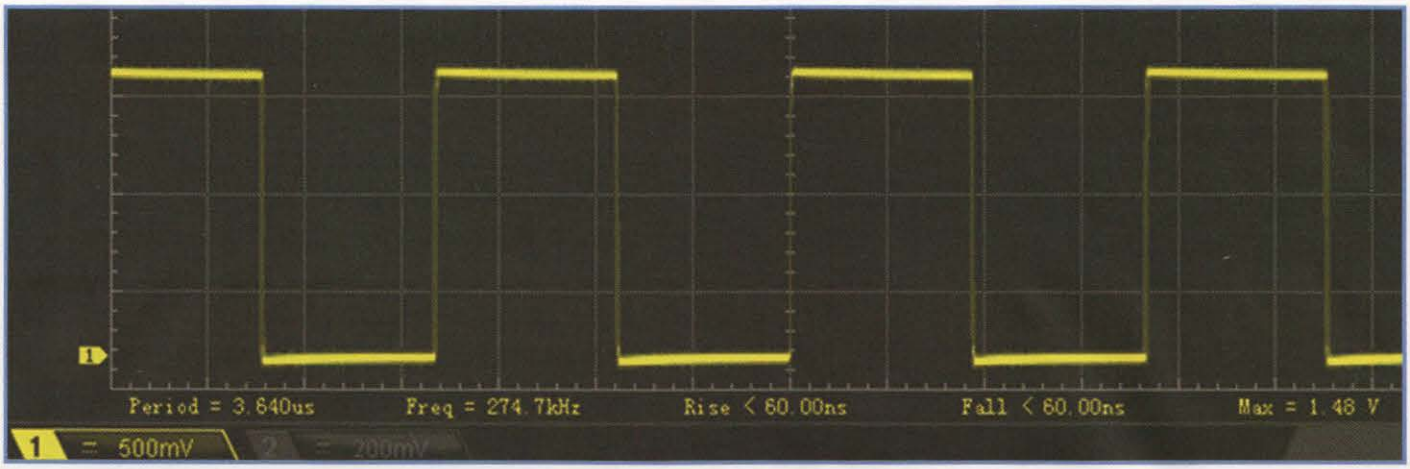


FIGURE 5: Automatic readings across the bottom of the screen.

the bottom of the screen.

In addition to those very handy automatic readings there are the usual cursors to help you make time and voltage measurements manually. You can also use the cursors to set the area within which you want the automatic measurements to be taken, **Figure 5**.

Measurements can be stored and displayed in tabular or graphical form, which could be useful when aligning complicated pieces of equipment where one adjustment may affect another parameter.

STORAGE MODE. To record a waveform you just press the record button: recording will continue until the required number of frames is captured. The RUN/STOP button and the stop button light up when the recording has finished. From the UTILITY menu you can choose 'Open' recording mode that will record constantly until the RUN/STOP button is pressed. Once recorded you can either replay the whole or part of the recording at normal speed or scroll through frame by frame looking for glitches etc. You can also invoke the 'Analyze' mode that allows you to see the waveform and zoom in on points of interest, make comparisons against an ideal frame of waveform and display statistics, **Photo 2**.

Whilst on the subject of storage, you can save a trace, waveform setup or a screen grab to internal memory or to a USB stick, or you can print out a screen dump directly to a PicBridge compatible printer. Some of the pictures shown here are direct screen grabs.

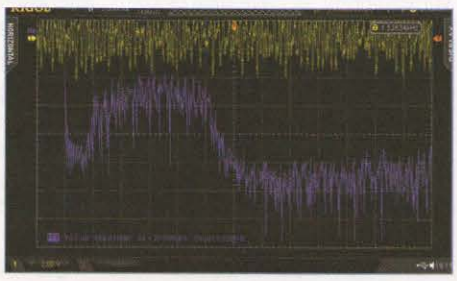


FIGURE 6: Checking the bandwidth of an audio filter with white noise.

OTHER FEATURES. This is a very sophisticated piece of test equipment with a lot more features than I can cover here but one nice little trick that caught my eye is the ability to apply logic functions to the two signals connected to CH1 and CH2 inputs. You have a choice of AND, OR, NOT or XOR and the result is displayed as a third trace. Whilst you are in this MATH menu you will see that the DS2102 has the ability to add, subtract multiply or divide the two waveforms, apply FFT and even use complex expressions containing logs, exponentials, squares, sines, cosines, tangents etc.

You can then, of course, record the waveforms and the results and play the whole thing back for analysis.

FFT mode can be used as a simple spectrum analyser, **Figure 6**, but, as there is a necessary trade-off between frequency span and bandwidth, you can only make high resolution measurements at audio frequencies.

Once up into the MHz region you are limited to resolution bandwidths of 100kHz per division or greater, but it can be used to make a check for harmonics up to the input bandwidth of over 150MHz, **Figure 7**.

In addition to the normal voltage against time mode, you can select X-Y mode whereby CH1 and CH2 become the vertical and horizontal axes. This is useful for setting up accurate phase relationships using Lissajous figures.

The Rigol can be connected to other equipment via USB or via its LAN port,

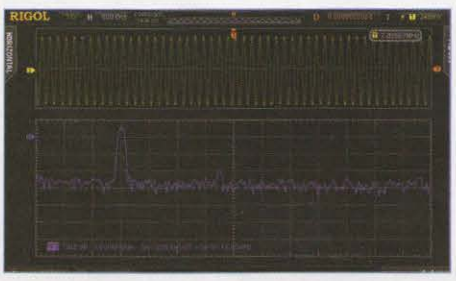


FIGURE 7: Second harmonic of 7MHz visible using the FFT function

which has DHCP. A command window utility called *UltraSigma* allows it to be controlled from a PC, measurements taken and traces stored, analysed etc. *UltraSigma* is available as a free download from www.rigolna.com, but it is a 360MB zip file so it will take some time to download on a slow connection. The National Instruments drivers and *Labview* software are also available free, from sine.ni.com but that is an even bigger download. It is good that all this powerful software is available at no cost but it would be more convenient if some of these files were provided on the CD.

CONCLUSION. The more I used the DS2102, the more I discovered what a powerful piece of test gear it is. It takes a little time to get to know, and many people will be satisfied with a less sophisticated oscilloscope for general shack duties, but they will be hard pushed to find a cheaper one that has such facilities for debugging digital circuits, or the ability to see 433MHz!

This new range of instruments is attracting a lot of interest around the world and there are already a few third-party applications available to control and log the data from the 'scope over USB or LAN. Like many rigs these days the Rigol 'scopes can be kept up to date by loading new firmware. The back-room boys seem to be quite good at issuing updates and patches to solve problems or add facilities. There are also many software options available should you wish to upgrade later.

Remember that the one thing you can't change later is the bandwidth, so make sure you choose the right one!

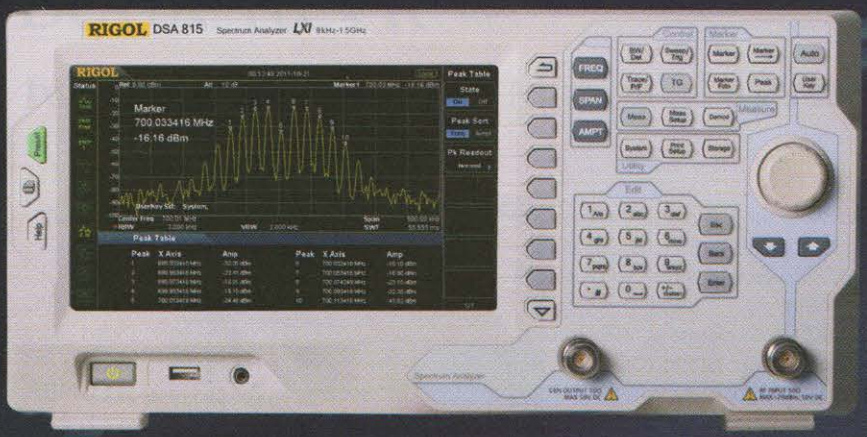
The 100MHz DS2102 is available at the special *RadCom* price of £795 + VAT. The 200MHz DS2202 is available for £1145 + VAT and 70MHZ DS2072 is £585 + VAT.

Thank you to Telonic Instruments Ltd of Berkshire for the loan of the oscilloscope. They are the local authorised RIGOL specialists. See www.RIGOL-uk.co.uk for latest offers and some informative videos.

1.5GHz SPECTRUM ANALYSER

Rigol DSA815

As reviewed by both ARRL & RADCOM



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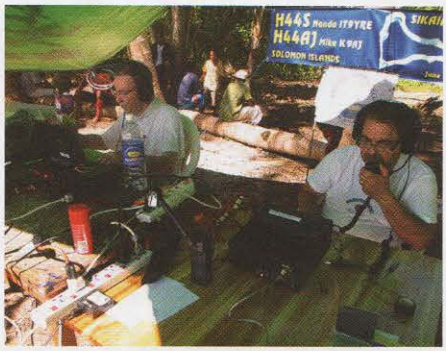
IOTA

IOTA Contest 2013



K9AJ and IT9YRE QRV from Sikaiana Atoll.

CONTEST WORKING. The last full weekend of July sees the 2013 IOTA Contest hit the bands. As always, this is a great opportunity to get easy credits for the IOTA Award. If the people you work submit their logs for the contest then you won't need a QSL card to claim the credit. Additionally, many rare and semi-rare IOTAs will pop up for the event. Some of the announced activity is shown in **Table 1**.

Many of these stations will be on the air before and after the contest and may revert to their home callsigns – but only their contest logs will allow online credit for the IOTA Awards. This is just a partial list so please check the rsgbiota.org website before the contest as N9BX has been doing a great job of maintaining the database of forthcoming activity.

The CS5DX team are offering a special award for making at least 3 QSOs with them during the contest.

OCEANIA ACTIVITY. An October IOTA DXpedition by the Orda Papua DXpedition Team is being planned for Bras Island in the unactivated Mapia Islands (OC-276) using the call YB9Y. There would appear to be about 24 team members so hopefully the group will be on many bands simultaneously. Activity is expected to take place starting about 0900 local time on 15 October and last through 0900 on 21 October. They will be on the air on the 6 through to 160m bands on CW, SSB and digital modes. See the YB9Y website at http://yb9y.com/ for more information. QSL via YB1GJS.

Mike, K9AJ and Nando, IT9YRE successfully activated a new one during June in the form of Stewart (Sikaiana) Island (OC-285). They made about 5,800 QSOs in 4 days of operating but were then delayed on the island for a further 5 days when bad weather prevented the boat returning to collect them. This island has no safe anchorage so visiting ships have to wait elsewhere.

Craig, VK5CE, is planning to be on the air from Flinders Island (OC-261) from 15 to 22 August. He will have a linear and a waterfront vertical so should be a reasonable signal into the UK. See http://oc261.blogspot.com.au for more information.

JA1NLX will activate Lissenung Island (OC-008) from 7 to 14 September as P29VNX. See www.asahi-net.or.jp/~yy7a-ysd/P29VNX-2013.htm.

NORTH AMERICA. OX3LX will be QRV from NA-151, Tasillaq (also known as Ammassalik) Island from 20 July to 1 August. QSL via OZ1PIF. There is a curious explanation for this alternative island name in NA-151. Ammassalik was the original one but was also the name of an Inuk elder who died about 15 years ago. Tradition had it that it was either bad luck or disrespectful to retain the name Ammassalik so a new name had to be chosen. Tasillaq means 'lake" and is appropriate given that the town is on the edge of a sheltered inlet resembling a lake. OX3LX also plans to be in the vicinity of the very rare NA-243 during the second two weeks of August and will try to operate from the island.

Bodo, KT3Q (aka DF8DX), plans to be QRV from a couple of island groups before the IOTA contest. On 19 and 20 July he expects to be on Anacapa Island (NA-144) off the coast of California before moving to Texas and activating NA-092 on 26 and 27 July. His operations will probably be low power CW. QSL to his German call.

A team of 10 to 12 operators plan to activate K4S from Sapelo Island (NA-058) from 12 to 14 September on 1.8 - 28MHz CW, SSB, RTTY and PSK. See QRZ.com for details.

Mike, VE2XB is on Dorset Island (NA-156) off Baffin Island, and has plans to travel to other places in Nunavut and to activate some very rare IOTAs including NA-007, NA-196, NA-174, NA-006 and NA-130. He has been given the very appropriate Arctic callsign of VY0BRR. See http://vy0brr.jimdo.com/ for further information.

Dan, HR2DMR, expects to be on the air as HQ8D on Vivorillos Island from 16 to 20 July. Check the Honduran Island IOTA DXpedition site at http://hriotas.com/. QSL his island operations via KD4POJ.

EUROPE (AND ENVIRONS). Mec, SP7VC and Kasia, SQ7OYL have announced plans for a multi-island trip between 26 July and 27 August including stops at EU-097, EU-173, EU-101, EU-184, EU-141, EU-044, EU-046, EU-076, EU-036, EU-056, EU-079, EU-055, EU-043, EU-029 and EU-172. Activity will be on HF, 6, 4 and 2 metres as well the microwave bands. More details can be found on his QRZ.com page at www.qrz.com/db/SP7VC.

Svein, LA9JKA will be active as JW9JKA from Bear Island (EU-027), Svalbard for six months (from mid-June to mid-December). QSL via his home call (direct).

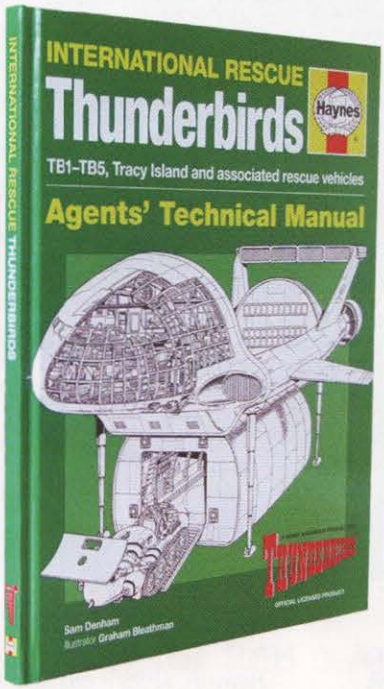
Stavros, 5B4AFM and Philip, 5B4ZN were briefly active from Agios Georgios island (AS-120) on 23 June after some weather delays.

TABLE 1: Some of the announced activity for this year's IOTA Contest.

AF-057	5R8NE	Nosy Be
AS-006	VR2KF	Ma Wan
AS-103	BP0A	Peng Hu
AS-139	BY7RA/7	Weizhou
AS-146	B4/BA4MY	Jiming Dao
AS-147	JA8COE	Yagishiri
EU-006	EJ0PL	Inishmore
EU-008	GM0ADX	Skye
EU-008	GM7A	Gigha
EU-010	MM3KBU/P	South Uist
EU-015	SV9/MM0GOR	Crete
EU-039	TM7T	Chausey
EU-040	CS5DX	Bugio
EU-047	DM50IOTA	Borkum
EU-047	DG5LAC/P	Juist
EU-073	IJ7T	San Pietro
EU-114	MU0THJ	Guernsey
EU-121	EJ5KF/P	Bere
EU-123	MM3T	Bute
EU-125	OZ0TX	Mando
EU-129	DM3X/P	Gormitz
EU-141	LA2MOA	Vardo
EU-145	CT7ACG	Culatra
EU-163	4O/UA3RF/P	Sveti Nikola
EU-170	9A/HA0KA	Pag
EU-174	SV8/OM6NM	Thassos
EU-177	SM5CKV/P	Harstena
NA-014	KI1U	Grand Manan
NA-067	W4O	Ocracoke
NA-140	W4OTN	Smith
NA-143	KT3Q/5	Galveston
NA-151	OX3LX	Tasiilaq
NA-160	HQ3W	Cochinos
OC-021	YB3EDD	Java
OC-164	VK6MAB/P	Rottnest
SA-027	PQ5M	Sao Francisco
SA-047	PR5D	Mel
SA-060	PX8Z	Cotijuba

Book Review

Two excellent Haynes Manuals



Thunderbirds Agents' Technical Manual by Sam Denham

The green colour of this book's cover nicely matched the envious faces of my colleagues who couldn't wait to get their hands on it. I must confess that I rather enjoyed taking my time over the review...

For those of a certain age, or who have seen re-runs, the world of International Rescue will be familiar territory. And this book has it all: personnel biographies, Thunderbird 1 to 5, Tracey Island and associated rescue vehicles. For instance, no fewer than eight pages are devoted to Lady Penelope's iconic six-wheeled pink Rolls-Royce, FAB-1. As with all the other Thunderbirds hardware we're treated to annotated cutaway views of the car detailing all of its technical features from machine-guns to its computer and communication systems.

The book begins with a foreword by Jeff Tracey, in which it is explained that the book contains detailed mechanical diagrams and technical instructions to fully understand the inner workings of International Rescue's fabulous machines. We then move on to a fascinatingly detailed section that describes the world of 2065, where the Thunderbirds action takes place. We learn about the foundation of International Rescue and its key members plus strategic assets such as Tracey Island and – later – the nearby Mateo Island, which provides further facilities. The level of detail is stunning, with a combination of original photographs, annotated line drawings and the occasional very high quality computer-generated image (such as the flight deck of Thunderbird 1). The overall effect is wonderful. The finale of the book is a set of over 30 'mission files' that describe some of the adventures that have involved International Rescue over the years.

I highly recommend this book – I think you'll enjoy it whether or not you remember Supermarionation from the first time round.

ISBN 978-1-85733-117-5
136 pages, 278 x 215mm
Non Members' price £14.99
Members' price £12.74

Raspberry Pi Owners' Workshop Manual by Gray Girling

Over 1½ million Raspberry Pi computers have been sold since its launch at the very end of February 2012. Its pocket-money price – around £28 – and open architecture have led to its widespread adoption way beyond its initial target educational marketplace.

Now, the wizards at Haynes have taken the R-Pi on board and produced a fantastic 'recipe' book that's not quite like anything else I've ever seen. Whilst it starts with the well-trodden path of downloading an SD card image and plugging your Pi system together, it's soon off but it's soon off into the wild blue yonder with an introduction to programming languages. Before you know it you're being encouraged to experiment with programming in Python, rummaging around the operating system and even remote-controlling the Pi from another computer.

For me, one of the things that makes this book stand out is that it recognises that it's trying to document a moving target and makes allowances for the fact. For instance, in the section about *XBMC* (a free application that turns your Pi into a media centre) it says, "[after booting it will show] ... the main start-up screen, which will probably not look exactly like this:" – and then shows a screendump that you've been warned may or may not be what you get. This shows a commendably pragmatic approach to a fast-changing environment.

I must admit I've struggled with my Raspberry Pi, which I've had since shortly after its launch. I've found it quite user-hostile and the documentation rather difficult, seeming to consist of interminable poor-quality YouTube videos or a forum full of über-gurus telling each other to visit a website for gits. But the *Raspberry Pi Owners' Workshop Manual* is like a breath of fresh air: it actually tells a useful story in a sensible order. I Am Impressed.

ISBN 978-1-85733-295-0
136 pages, 278 x 215mm
Non Members' price £17.99
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Getting started in APRS

Automatic Packet Reporting System and the n-N Universal Path Recommendation

BACKGROUND. APRS stands for Automatic Packet Reporting System. It is a real-time data communications method for exchanging information between stations covering a large area (local or worldwide) and is based around the use of a standard packet data transmission protocol known as AX.25. A packet is a string of data in a predefined format, usually with control information and data sent between an identifying start and end header and trailer.

Standard packet radio is useful for passing bulk messages from one point to another, but the fact that data packets are passed in a serial fashion from one station to another means it is not particularly suited to real time events where information has a very short life time and needs to get to *everyone* quickly.

APRS provides universal connectivity to all stations in a net by avoiding the complexity and limitations of a connected network. It permits any number of stations to exchange data signals just like voice users would on a voice net. Any station that has information to contribute simply sends it, and all stations receive it and automatically log it and act on it appropriately.

APRS is also designed to help meet the need to track key assets during real-time special event or emergency operations. APRS not only handles messages and other data but can also produce real-time position reports and map displays of the location of fixed stations and moving vehicles, as well as data on speed, direction, weather, etc.

HOW IT WORKS. The internet monitors APRS worldwide but this is not the primary objective. APRS is primarily a local RF network. Although APRS is used most of the time over great distances and benign conditions, the system has been optimised for short distance real-time events and emergency operations on RF.

GPS-generated position reports from mobile units, and GPS or manually generated position reports from static stations, are transmitted every few minutes by packet radio. These reports are received and relayed by fixed stations that act as 'digipeaters' (data repeaters).

Ultimately, fixed stations with full-time internet connections (Igates – internet gateways) then take this data off the air and send it to a system of over 40 specialised interconnected internet servers known as the APRS Internet System (APRS-IS).

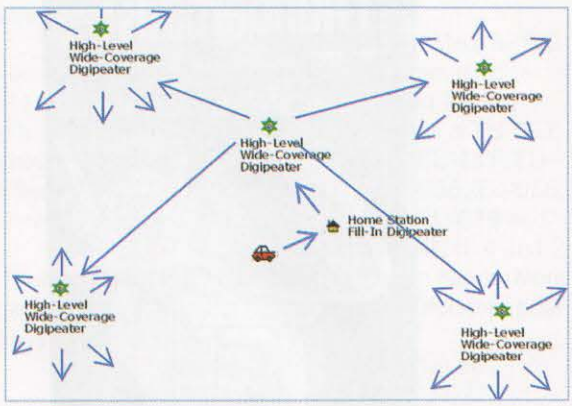

FIGURE 1: Digipeating.

Anyone can then view the position of, and other information sent by, individual stations and display it on maps, by either: (i) monitoring on RF with a receiver having APRS built in, or on a normal receiver connected to a packet modem (TNC) and a computer with suitable APRS software installed; or (ii) monitoring over the internet by accessing one of the APRS-IS servers via an APRS mapping program, or via a dedicated web service.

Most amateur radio APRS programs allow you to transmit data and display both transmitted and received data from RF and from the internet; either independently, or both at the same time. You can see positions of stations from anywhere in the world. There are also APRS apps available for mobile phones that allow a registered amateur to both transmit and receive messages and data and to display positions and other information on a map.

Anyone, not only licensed amateurs, can view the APRS-IS database and the information displayed on a map using an internet service such as http://APRS.fi. No special software is required; just a normal internet connection and a web browser.

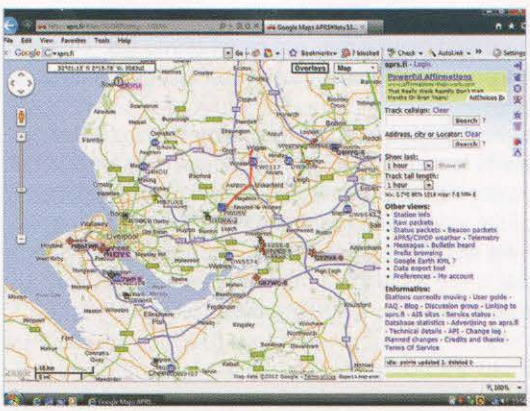

FIGURE 2: Screenshot of APRS.fi showing fixed stations and the red dotted tracks of mobile stations.

In packet radio AX.25 protocol you have to specify the address (callsign) of the destination station as well as the addresses (callsigns) of the chain of digipeaters you want your packet to go through, listing them in the order in which they will be used. A digipeater will only digipeat a packet if its own callsign is in the list and is the next unused one in the list. Callsigns in the list are marked as *'used up'* as the packet progresses along the path. In 'standard' packet radio you therefore have to know in advance the callsigns of every digipeater in the intended path.

However, APRS is primarily a 'one to many' system. APRS messages *can* be sent to *one individual* destination callsign just like other packet radio, but this is not the primary purpose of APRS, which is to disseminate *live data* to *everyone* on a network almost instantaneously. To do this the original package is immediately digipeated (passed on) in all directions through several hops, by other stations that hear it, over an ever increasing area as shown in **Figure 1**.

APRS stations therefore need *all* other stations in range to accept their packet and act on it appropriately. To achieve this, APRS uses a *generic destination address* rather than the address (callsign) of a specific station. This is not a real station address and the packet never actually reaches a specific real destination. The aim is rather to get it far enough to reach an IGate and be posted on the internet on the APRS-IS database where it can then be accessed by everyone including web services like APRS.fi etc. In an RF only network the aim is usually to reach the Control Station and/or to reach all members of the net.

A static station might know the actual callsigns of the digipeaters it has to go through to reach an IGate but this is not the case for mobile stations, and does not take account of digipeaters being unavailable from time to time. APRS therefore again does not use real digipeater addresses (callsigns) either but makes use of what are known as generic aliases instead.

Addresses, and aliases, are in the format of up to 6 alphanumeric characters followed by an optional Secondary Station Identifier (SSID) separated from them by a dash (–). By default the SSID is 0 signifying the main

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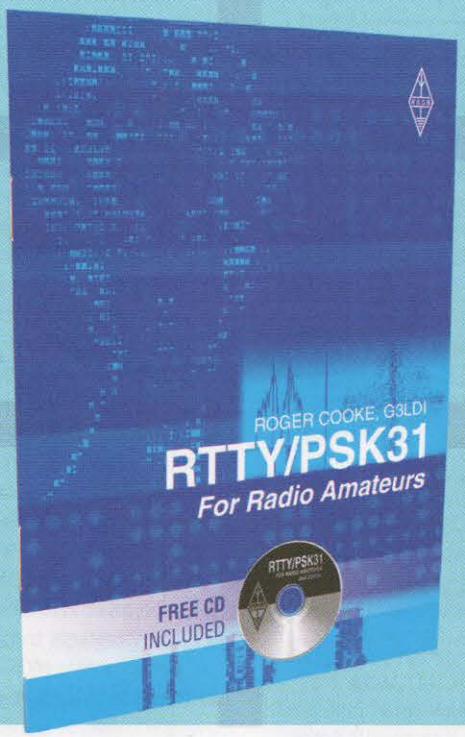

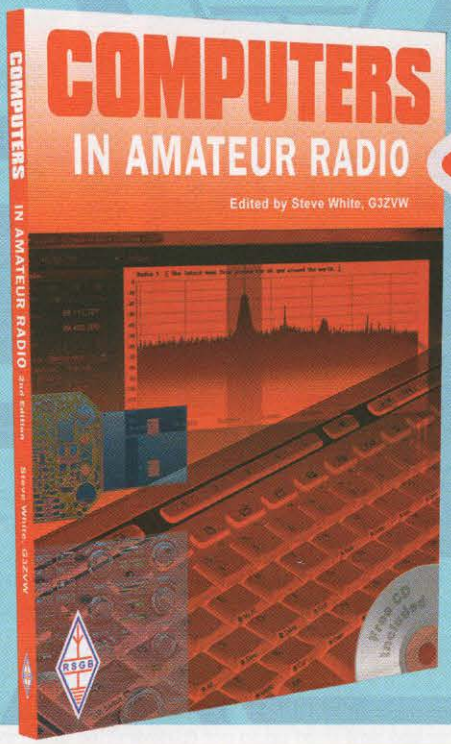

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Edited by Steve White, G3ZVW

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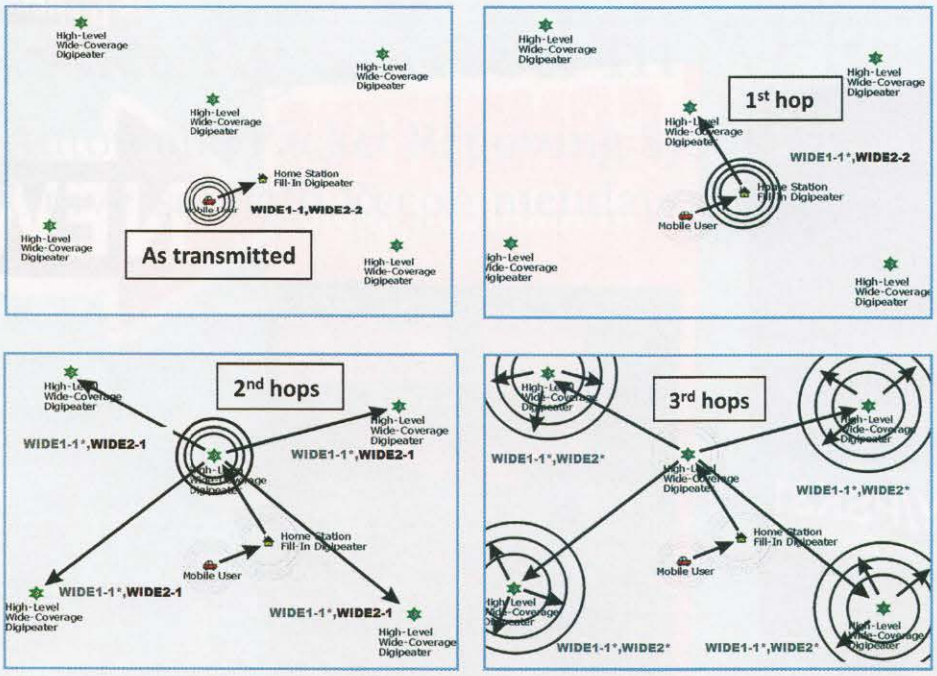

FIGURE 3: The life of a WIDE1-1,WIDE2-2 packet. A: WIDE1-1,WIDE2-2 (transmitted by originating station); B: WIDE1-1*,WIDE2-2 (if a home fill-in digi does the first hop); C: WIDE1-1*,WIDE2-1 (transmitted by next high-level digi); D: WIDE1-1*,WIDE2* (transmitted by the final smart high-level. In this case a smart digipeater and now used up so not retransmitted again even if received by other digipeaters.

station; but the numbers 1 to 15 can be used by standalone trackers to indicate a display symbol appropriate to their current operation eg if mobile: 9 indicates a car symbol, 4 a bike symbol, 10 motorbike, etc. The symbols corresponding to each SSID can be found at www.aprs.net/vm/DOS/SYMBOLS.HTM.

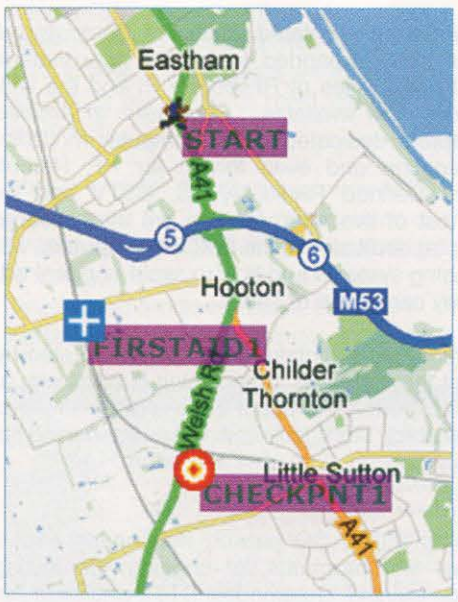

Figure 4: APRS items.

Examples of APRS addresses are: *G8WHR-0* a specific station address used for transmitting and inserting station identification and for destination addresses for specific station to station messages; *APRS-0,* a generic address; and *WIDE1-1,* a generic alias. These are explained in more detail later.

DIGIPEATERS. There are two types of digipeaters: wide area digipeaters and local fill-in digipeaters. The local digipeaters fill in any coverage holes and need only be located so they send to the nearest wide area digipeater. The wide area digipeaters are far apart and send to other wide area digipeaters further away. The aim is that a packet travels outwards in all directions covering an ever expanding area. *Both types* of digipeater are configured to respond to an alias callsign WIDE1-1 as well as their own callsign. Smart high level digipeaters also respond to other aliases WIDE2, WIDE3 etc, as explained later.

In APRS, instead of the packet PATH containing actual digipeater callsigns it contains generic digipeater aliases. These are also used to specify the number of hops known, or thought, to be necessary for the packet to reach an IGate, or in an RF only network the Control Station. Too many hops specified and the network is cluttered with unnecessary repeats. Too few and the packet dies prematurely. To make this system work not only must *all* digipeaters including 'dumb' local fill-in digipeaters respond to the alias WIDE1-1; but WIDE1-1 must be the first alias in all transmitted packet's lists; otherwise the packet could be scuppered at the first hop.

Each hop is also referred to as a path leg. The first hop might be either via a fill-in station acting as a 'dumb' digipeater *or* via a smart high-level digipeater. As well as requiring the first leg to be WIDE1-1 this protocol also requires the originating station to use the APRS generic digipeater *double path* WIDEn-N,WIDEn-N, with the first path leg being WIDE1-1. An example would be WIDE1-1,WIDE2-2. The reason for this double path will become clearer later. Also everyone else in the network must also use the same ALIAS alternative identity WIDE1-1. Using the alias WIDE1-1 enables them to act on any packets that they receive and also, in digipeater MODE, to pass on packets addressed to WIDE1-1 on the first hop, leaving the rest of the path for subsequent hops via smart high-level digipeaters.

The first number (n) in an n-N type path leg is the total number of digipeater hops desired in that leg. The second number (N) is the number of potential hops remaining as the packet is transmitted from a given digipeater. Thus WIDE1-1,WIDE2-2 specifies a path of two legs with 1 hop in the first leg and two hops in the second leg, 1+2=3 hops in total. A single leg path WIDE3-3 (on its own without the WIDE1-1) would also specify 3 hops but is not used by mobiles which might only be within range of a 'dumb' digipeater that would ignore it because the first unused address is not the 'dumb' digipeater's own callsign or its alias WIDE1-1. For the same reason WIDE3-3 on its own should not be used by a fixed station not in direct contact with a smart digipeater.

Whenever a packet is digipeated by a smart digipeater the current level of path hops remaining (N) is reduced by 1 before the packet is digipeated. When the current level of hops remaining becomes 1 then that leg is marked with * by all types of digipeater before it is transmitted. This signifies it is used up on this hop and should not be used again. Packets are digipeated until all the hops have been used up.

TRANSMITTING PACKETS. When using GPS then, as well as POSITION information, track, magnetic variation, TIME, DATE and

TABLE 1: The nine fields of an AX.25 Unnumbered Information (UI) frame.

Packet Start Flag	Destination Address	Source Address	Digipeater Addresses	Control Field	Protocol ID	Information Field	Frame Check Sequence	Packet End Flag
1 byte	7 bytes GPSC67-0, WIDE1-1, WIDE2-2	7 bytes G8WHR-0	0-56 bytes Up to 8 addresses	1 byte	1 byte	1-256 bytes >TESTING CCW DigiTracker	2 bytes	1 byte

SPEED are also transmitted.

Valid generic destination addresses available include APnnnn, GPSCnn, GPSEnn, GPSxyz, SPCxyz, GPSxyz, SYMxyz. Generic addresses can be read by everyone and *all* APRS software must accept packets with a valid generic destination address.

APRS uses the generic addresses GPSCnn, GPSEnn, GPSxyz, SPCxyz and SYMxyz in a special way to specify not only an address but also a display symbol. This is intended for use where it is not possible to include the symbol information elsewhere. GPSxyz allows a set of SYMBOLS with alphanumeric overlays.

APRS transmissions use AX.25 Unnumbered Information (UI) frames, with 9 fields of data as shown in **Table 1**.

In order to accommodate the requirements of different hardware such as standalone GPS trackers, dedicated transceivers, terminal TNCs, etc. APRS allows the display symbol to be specified in any of: the Destination Address, the Source Address, and/or the Information Field. If a symbol is specified in more than one field then precedence is given first to the Information Field, then the Destination Address, and finally the Source Address SSID. There are two sets of Symbol Tables from which to choose – Primary and Secondary.

The nine fields are:

■ **Start and End Flags** – these separate each packet.

■ **Destination Address** – This field can contain APRS data, or a real or generic APRS destination address as in the example above: 6 alphanumeric characters GPSC67 plus Secondary Station Identifier SSID -0. In this case GPSC67 is also used to specify a Primary Symbol Set: Primary Symbol 67 . (GPSE67 would specify a symbol from a Secondary Symbol Set: Secondary Symbol 67 .This frame can also contain a generic APRS digipeater path such as WIDE1-1,WIDE2-2 as shown.

■ **Source Address** – In this example this field contains the callsign, and the optional SSID, of the transmitting station in this case G8WHR-0.

■ **Digipeater Addresses** – In APRS any digipeater addresses in this field are overridden by a generic APRS digipeater path specified in the Destination Address SSID.

■ **Control Field and Protocol**— These fields are set to indicate UnNumbered Information (UI) frames and the 'one to many', broadcast like, parameter called 'Unprotocol', or 'UnProto'. This means that APRS runs in *connectionless* mode and is a packet communications protocol for disseminating live data to everyone on a network at the same time rather than being addressed to one person.

■ **Information Field** – This field contains more APRS data. The first character of this field is the APRS Data Type Identifier that specifies the nature of the data that follows. In this case '>' signifies that the STATUS INFORMATION 'TESTING CCW DigiTracker' follows.

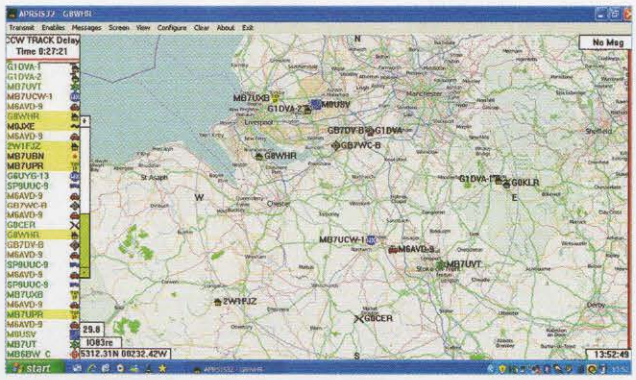

Figure 5: Screenshot of APRSIS32.

'=' would specify that POSITION data followed. Position coordinates are entered as latitude and longitude (degrees and decimal minutes) separated by a display table Identifier (/ for the Primary Table and \ for the Secondary Table), and followed by the Symbol Code. eg =5318.90N\00258.79Wc indicates the Symbol from the Secondary Symbol Table [1]. There can also be a 7 digit data extension immediately following the position data. The most common extensions are COURSE and SPEED: CSE/SPD (eg 088/036 degrees/knots); Station Power, Effective Antenna Height, Gain, and Directivity: PHGphgd (phgd are 0-9 obtained from a standard table); and Pre-calculated Range: RNGrrrr (rrrr is the range in miles with leading zeros).

Symbols from the Secondary Symbol Table can be overlaid with a single letter or digit. The required letter or digit replaces the back slash in the position data.

e.g. =5318.90ND00258.79Wa overlays a red diamond symbol with a "D" ':' would specify that message data followed.

■ **Frame Check Sequence FCS** – is used for checking the integrity of a received frame.

As well as plotting the position of actual stations it is possible to place items and objects such as check points, hazards, first aid points, etc. An OBJECT is the same as an ITEM except it can move during the event and contains information on SPEED and DIRECTION. A FIRST AID TENT would be an ITEM and an AMBULANCE, parked up or moving, an OBJECT. These are placed via the Information Field. Placing a ')' at the start of the field indicates that an item's NAME, POSITION, and SYMBOL information follow. For instance)FIRSTAID1!5317.81N/00258.61WA places an item named FIRSTAID1 at 5317.81N 00258.61W with the SYMBOL . The Name must have '!' at the end and if necessary the Name should be padded with spaces to make it 9 characters long.

If you want to find out more about APRS there is plenty of information on the internet and some links are listed at the end of this article.

If you want a quick dabble then the website www.APRS.fi and a smartphone app such as the free APRSdroid are excellent starting points.

APRS SUPPORT. Some amateur radio mobile transceivers including the Kenwood TM-D700 and TM-D710 and the Yaesu FTM-350R have built in support for APRS. The Kenwood radios also have a built in TNC that can be accessed directly from a computer, or you could brush the dust off that old 2 metre rig, invest in a cheap TNC or a Cross Country Wireless Digi Tracker, download the free APRSIS32 software and get your hands dirty.

APRS can be found on 144.80MHz in the UK and Europe, and on 144.39MHz throughout the North American Continent, as well as on UHF and HF frequencies.

REFERENCES

[1] A full table of symbols can be found at http://wa8lmf.net/miscinfo/APRS_Symbol_Chart_Rev-H.pdf. The column labelled Symbol is the one to use in the Information Field position data. When using the Destination Address then the last two digits after the GPSC or GPSE should be the number in the Index column + 1 i.e. GPSC13 for HOME, GPSC33 for a First Aid Post etc. Do not confuse these numbers with the 15 SSID codes available to enable standalone trackers to display a symbol.

FURTHER READING

APRS PROTOCOL REFERENCE Protocol Version 1.0: ftp://ftp.tapr.org/aprssig/aprsspec/spec/aprs101/APRS101.pdf

APRS.fi User Guide: http://wiki.ham.fi/Aprs.fi_user_guide?setlang=en

Bob Bruninga WB4APR's website: www.aprs.org/

CCW Digi Tracker User Manual: www.crosscountrywireless.net/CCW_APRS_TNC_Digi_Tracker_USB_version_Operating_Manual_v1.9.pdf

APRSIS32: http://aprsisce.wikidot.com/. Request a free passcode at: http://aprsisce.wikidot.com/doc:passcode

APRSdroid: http://aprsdroid.org/

DIGI TRACKER & APRS GETTING STARTED: Join the CCW Yahoo Group and this guide to setting up and using the CCW Digi Tracker is in the Members only FILES section. http://uk.groups.yahoo.com/group/

EMC

Software Defined Radio for EMC plus RFI from gas boilers

SDR AND EMC. If you have any software defined radio (SDR) equipment or if you can borrow some, it can help to identify a source of radio interference. You could either use a dedicated SDR unit or a USB SDR 'dongle'. Many different types of SDR hardware and software could be used but for this article, **Figures 1**, **2** and **3** were produced using a FUNcube Dongle Pro+ with the free *SDR# (SDR Sharp)* software. This USB SDR device has a maximum frequency span of 192kHz, which is fairly typical of this type of SDR.

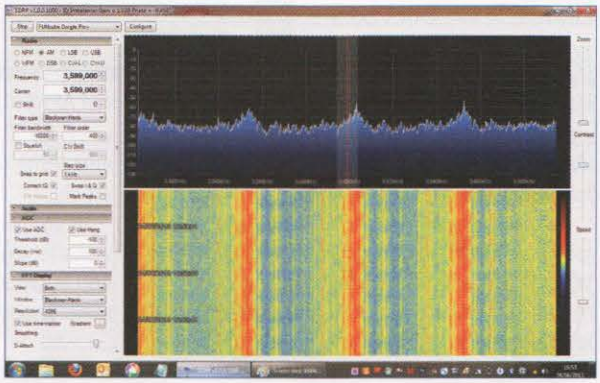

FIGURE 1: SDR plot of RF emissions from a driver for LED lighting.

Commonly used SDR programs have two characteristics that can be useful in identifying a source of radio interference. First, they provide a spectrum display with the possibility of very narrow resolution bandwidth, for example 11.72Hz. This means that it is possible to resolve spectral lines that are close together. Secondly a 'waterfall' display can be used that shows how the power of each spectral line varies with time. On the waterfall display, power is represented by colour and, by adjusting the contrast, it is possible to show certain characteristics more clearly.

Switch mode power supplies (SMPS) are a common source of RF interference in amateur radio bands and the switching frequency may be from about 50kHz up to hundreds of kilohertz or more. Harmonics of the switching frequency may extend up to several megahertz and possibly 10MHz or more. In some cases, the spectrum display may show individual harmonics as in Figure 1, which is centred on 3.6MHz. This is a driver for LED lighting that is believed to be non-compliant with the applicable EMC standard. Almost any type of SMPS can produce a similar type of spectrum.

In Figure 1, the text on the coloured waterfall display is time markers at intervals of six seconds. The power of each spectral line is fairly constant with time although there appears to be a slight variation every few seconds. This variation may be caused by a 'beat' frequency between two LED drivers.

Figure 2 is an example of an emission from an SMPS charger for small rechargeable batteries. The measurement was made very close to the charger to show its characteristics. The plot is centred on 3.6MHz and the horizontal stripes every few seconds are typical of so-called 'smart' battery chargers such as those used with mobile phones. These pulse the charging current on and off every few seconds.

Some types of SMPS may not produce any obvious peaks in the SDR spectrum plot. This may be because the spacing between harmonics of switching frequency is higher than the frequency span of the SDR (in this case 192kHz span) or because the peaks merge together, especially in the higher parts of the HF spectrum. Such peaks may be more clearly visible in the 1.8MHz or 3.5MHz amateur bands.

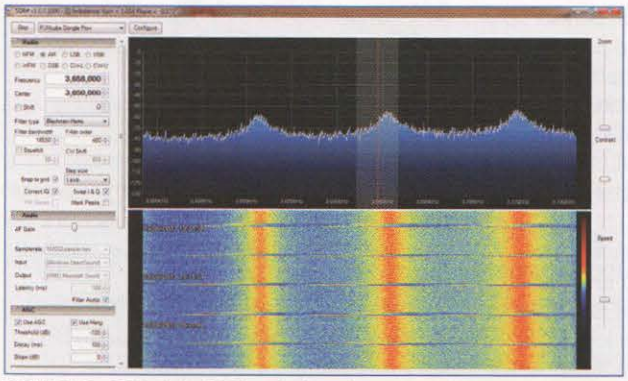

FIGURE 2: SDR plot of RF emissions from a small battery charger.

In any case, the conducted emissions from an SMPS into the mains supply are nearly always amplitude modulated at 100Hz by the diodes in the mains bridge rectifier. These switch off just as the AC mains cycle passes through zero, causing an audible 100Hz buzz when the SDR or any other type of receiver is set to AM detection. It is usually better to use AM detection rather than SSB when searching for a source of interference such as an SMPS.

Another type of electronic product that can give a characteristic RF emission spectrum is a plasma TV. Like almost all electronic products, TVs have switch mode power supplies but plasma TVs can also have an additional source of RF interference that may be radiated directly from the screen or indirectly via the shields of interconnecting cables such as SCART, HDMI or aerial cables. Figure 3 shows an example of radiated emissions measured close to a plasma TV to show its characteristics. This was an HD Ready plasma TV displaying a standard definition digital terrestrial TV channel.

RF emissions from plasma TVs typically consist of broadband noise plus 'clumps' of spectral lines that may come up and go down at different frequencies as the picture content changes. In Figure 3, the centre frequency is 3.6MHz and the text on the waterfall display is time markers at intervals of six seconds.

EMC MEASUREMENTS WITH SDR. Most SDR software has a facility to measure the power of a spectral peak using a cursor or a 'software S-meter'. **Figure 4** was provided by Lee, G3SEW who uses a SoftRock SDR receiver. The software is *HDSDR*, which is free. Figure 4 shows radiated emissions from a neighbour's solar photovoltaic (PV) system on a sunny morning. The frequency range is 3605 – 3797kHz, which is a 192kHz span. Solar PV is likely to be mentioned again in a future EMC column but for this month's article, it is being used as an example of SDR EMC measurements in general.

The wavy orange lines around 3650, 3700 and 3750kHz correspond to emissions of interference from optimisers in a solar PV system. The signals around 3678, 3754, 3762 and 3767kHz appear to be amateur SSB transmissions. The range 3610 – 3625kHz is free of any visible spectral lines so this is a 'quiet spot' where the background level is either natural noise or man-made noise that has the characteristics of white noise. There are also quiet spots around 3730kHz and 3740kHz. The slight rise in the apparent noise floor towards the sides of the plot is due to the characteristics of the SDR receiving hardware.

In order to interpret such measurements for EMC purposes, we need to understand what the SDR is actually measuring and whether it can be compared to a measurement using a conventional spectrum analyser or an EMC measuring receiver.

In Figure 4, the relative power at 3669.160kHz is -119.7dB and at 3702.343kHz, it is -82.7dB. These powers in dB are relative to a 0dB reference level. It would be possible to calibrate the SDR using an RF signal generator so that it reads absolute power in dBm (dB relative to 1mW). Some SDR software gives readings in dBm when used with certain specific types of SDR hardware but clearly the accuracy of such measurements

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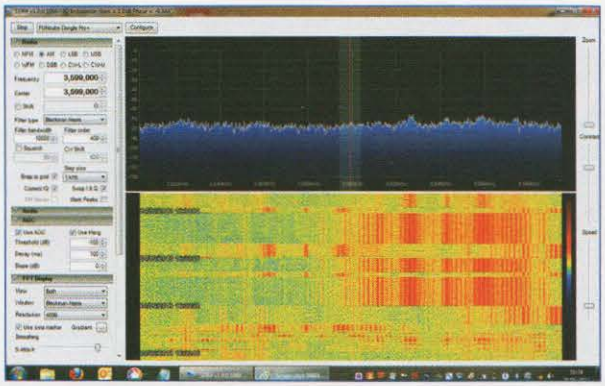

FIGURE 3: SDR plot of RF emissions from a plasma TV.

depends on knowing the gain of the SDR hardware.

If the power of various spectral components can be measured in dBm and the gain of the receiving antenna is known then in principle it would be possible to estimate the field strength of the interfering signal and compare it to relevant EMC standards, although there would be significant measurement uncertainties. It is also necessary to consider the resolution bandwidth, however.

In Figure 4, the spectrum plot in the centre has a resolution bandwidth (RBW) of 23.4Hz. These SDR resolution bandwidths are normally equal to the sampling frequency divided by a power of 2, for example 192kHz/8192. Both of the power readings on the spectrum plot are the power in a bandwidth of 23.4Hz. This allows the power of the peak to be compared to the background noise level on the band and, in this case, the peak is 36dB higher.

This raises the question of whether an SDR measurement of an RF interference source can be compared to a measurement made using a conventional spectrum analyser or an EMC measuring receiver. EMC measurements below 30MHz normally use a RBW of 9kHz so a conventional spectrum analyser or an EMC measuring receiver would detect all the power in a bandwidth of 9kHz.

The *HDSDR* and *SDR Radio* programs both have an S-meter and, in the case of *SDR Radio*, it also reads in dBm. The bandwidth of the SDR receiver can be varied and it could be set to 9kHz for example for EMC measurements. Nevertheless, this S-meter does not appear to sum all the signal power in a bandwidth of 9kHz so such measurements are not generally comparable to those made using a conventional spectrum analyser or a measuring receiver. The only exception would be for truly narrowband signals such as harmonics of a crystal oscillator, where all the significant energy is contained within one RBW of the SDR (eg 11.7 Hz, 237Hz or 23.4Hz). For other interfering signals such as broadband noise or interference, the two types of measurement are not comparable.

I would be interested to receive details of any SDR software that is easily available to radio amateurs and can be used for EMC measurements of broadband signals.

GAS BOILERS. The EMC Committee has received several reports of RF interference from gas fired central heating boilers. This may take the form of a 'comb' of narrow band harmonics spaced at approximately 15kHz intervals extending up to 14MHz or sometimes 28MHz.

One model of boiler is reported to produce drifting carriers about 16.5kHz apart. These move up and down the bands when the gas valve is open and disappear when the gas valve switches off. It appears that the gas valve is driven with 20V pulse width modulated DC, presumably switching at 16.5kHz.

Another Member reports that he had a new central heating boiler fitted last August and had severe interference ever since on the 14, 21 and 28MHz bands. It is not continuous broadband noise but it has peaks every few kHz across the band. The manufacturer's engineer has visited and tried a new fan and a new PCB but that made no difference so he referred it back to the manufacturer's technical support department.

A third Member had some success with reducing RFI from a gas boiler. A qualified service engineer fitted an RS Components ferrite sleeve (part no 309-7962) with three turns of the wires leading to the gas valve. This is a snap-on ferrite sleeve from Wurth Elektronik (see Websearch).

It should be noted however that one needs to be Gas Safe qualified to work on anything inside the case of a gas boiler, inclucing the electrical control circuitry.

The EMC standard for gas boilers is BS EN55014-1 for emissions and BS EN55014-2 for immunity to RF and other disturbances. At frequencies below 30MHz, the BS EN55014-1 emission limits are for conducted emissions via the mains supply. Limits also apply to any other ports such as wiring to a central heating pump.

DVD PLAYERS. Bob, G3VVT reports that he was suffering from interference from a switch mode PSU that made the 3.5MHz band just about unusable. The interference had peaks every 50kHz with sidebands that spread either side and ran from LF right through HF, though to a lesser degree with increased frequency. The effect even raised the noise floor on 70MHz to about S5. To make matters worse the peaks drifted with what appeared to be temperature.

Bob traced the source to a near neighbour with the aid of an FT-817 and portable LW to SW broadcast radio. Unfortunately the neighbour declined to co-operate in resolving the problem, saying he had no difficulties. Using a home constructed 'null steerer' with an auxiliary antenna would not reduce the interference as it appeared to enter the mains power supply.

Bob then called Ofcom to investigate. This involved agreeing to pay Ofcom their commercial rate of £91.42 + VAT per hour if the problem turned out to be his equipment. Bob made very sure it wasn't by monitoring the interference with an FT-817 on battery power whilst switching off the electric power to his house. This showed that it indeed was coming from outside his premises.

When the Ofcom field engineer arrived the source was traced to the same house Bob had previously identified and the location was further refined to a specific bedroom with the aid of a special loop antenna that Ofcom use. It took several weeks for the engineer to gain access, but when this was done, the source was traced to a DVD player that had failed previously, but was still plugged in and was radiating interference.

Bob can now use 3.5MHz as normal and he can hear weak signals on 70MHz.

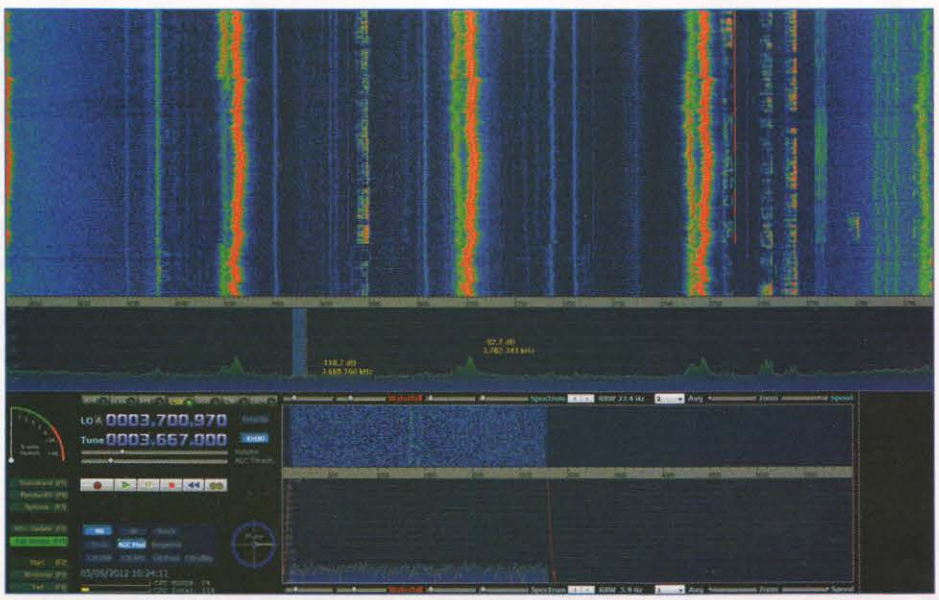

FIGURE 4: SDR plot of RF emissions from a solar PV installation.

WEBSEARCH

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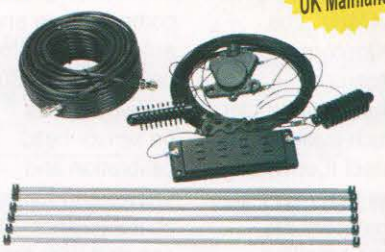

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Less than 1 second (return to memory frequency)
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Design Notes

Accurate power measurement using ingenious 1960s technology

POWER MEASUREMENT. Last week I blew up the sensor head on my HP432A power meter by connecting it to an amplifier delivering half a watt of 144MHz. The head is specified for only 30mW maximum. Normally I keep a 20dB attenuator permanently mounted on that power meter as protection against just such eventualities, as I'm far less likely to connect it unwittingly to a 3W transmitter. But this time, I'd removed the attenuator to measure the nominal –10dBm drive to the amplifier, then simply forgot to put it back when transferring to the output port.

The HP432A power meter is very old, having been designed sometime in the late 1960s, but is relatively simple in concept and has a major difference in the way it measures RF power over any of the more modern types of power meter. This difference is so fundamental that it means the HP432A is still used to this day as a calibrated and verifiable power meter. The method is the DC current balance technique.

RF power measurement usually makes use of thermistors. These are sensors whose resistance changes with temperature. They can be made very small, with a low thermal mass for rapid response and are made of truly resistive material, so are more or less insensitive to the frequency of the RF used to heat them. Provided their operating temperature remains constant, they accurately obey Ohm's law – over a frequency range from DC to whatever frequency the practicalities of stray inductance and capacitance in layout and construction permit.

An RF power meter needs to present an accurate load, typically 50Ω, to the device being measured. One simple way to make a power meter is to use the RF to heat up a 50Ω resistor then use a precision thermistor to measure the resulting temperature rise. Knowing the thermal characteristics of the sensor head, input power can be determined. This technique on its own can only work if the external temperature remains constant so doesn't influence the temperature change due to the RF input. By using a second identical thermistor mounted close to that measuring the load but responding only to external temperature, its effects can be compensated. This is the technique used in the majority of the lower cost simpler power meters and many modern ones where advanced processing allows highly complex compensation and auto balancing to be performed. But, it always relies on sensor head calibration and known and measured characteristics – they can drift with time and ageing.

The DC balance technique works in a different manner. Instead of using a 50Ω load resistor and measuring its temperature rise with applied RF, the thermistor itself is used as the RF load. The thermistor's resistance changes with temperature, so the sensor / load element must be maintained at exactly the temperature needed to ensure it stays at 50Ω. This is done by passing additional DC through the thermistor, so now the power dissipated is due to both the DC and RF. The actual power dissipated is, using Ohm's law, $(I_{DC}^2 + I_{RF}^2) * 50\Omega$. I_{RF} is the RMS current generated by the RF input. Expressing the equation in terms of voltages, the dissipation is $(V_{DC}^2 + V_{RF}^2) / 50\Omega$. If we can ensure the thermistor is maintained at exactly 50Ω by some method of monitoring, we know that if I_{RF} increases then the corresponding DC current I_{DC} will have to decrease by precisely the same amount to maintain constant temperature and hence sensor resistance. But how do we maintain the sensor at exactly 50Ω under all conditions? The solution is to put it into a bridge circuit with feedback, as shown in **Figure 1**.

One arm of the bridge is made up of the thermistor in the lower part and a precision 50Ω resistor at the top. The other arm of the bridge is made from two identical value individually matched resistors. The differential output voltage between points A and B will be exactly zero when the bridge is balanced. This differential output goes to the two inputs of an operational amplifier, whose output V_{OUT} supplies the bridge DC input. The opamp adjusts its output to keep the voltage between the positive and negative inputs at exactly zero. As the thermistor is heated by the addition of the RF power so its resistance changes; the bridge then compensates by reducing the DC drive and thus the total power dissipated in the thermistor element remains constant.

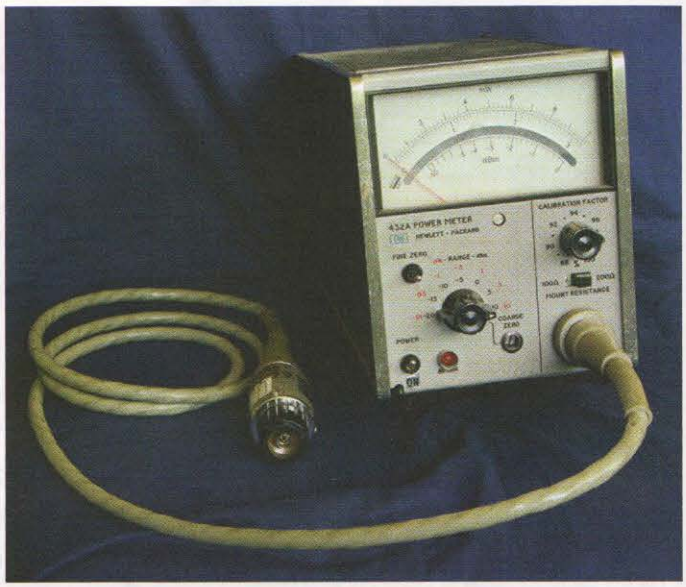

PHOTO 1: The HP432A power meter. An old device, still in regular use and capable of accurate, verifiable measurement of RF power.

So now we know that the RF input power must be exactly equal to the *lowering* of DC power supplied to the thermistor. We can measure DC levels accurately (to small fractions of a percent) and we know the resistances involved. Of the voltage V_{OUT} supplied to the bridge, exactly half must appear across the thermistor and half across the upper resistor in that arm. So the DC power supplied is accurately given by $(V_{OUT} / 2)^2 / 50\Omega$, which is conveniently equal to $V_{OUT}^2 / 200\Omega$.

If we measure the value of V_{OUT} before and after applying RF, we can determine with good accuracy what the RF input power must be. It is given by $(V_{DC}^2 - V_{RF}^2) / 200\Omega$, where V_{DC} is the voltage with no RF applied. The before and after measurement process can get tedious, having to continuously connect and remove the RF to measure the two values of V_{OUT}. If conditions stay unchanged, external temperature remains constant, and things aren't moved, then, perhaps, a single measurement of V_{DC} at the start of the session may suffice. But remember that we are interested in the difference in two voltages, and this may

well be only microvolts for low RF input levels. The tiny difference can easily be swamped by incidental thermal changes, causing V_{DC} to move by many times this over a few minutes. So unless we can continuously get an accurate value for V_{DC}, the current balance technique will fail.

In the HP432A power meter the problem is overcome by using two identical thermistors mounted close together on the same metal substrate, so they closely track each other at all times over external temperature changes. RF is applied to one of these thermistors. Both are used in identical bridges, with two 50Ω resistors forming the upper part of the test arms, two pairs of matched resistors in the other arms and two opamps maintaining balance in each bridge, as shown in **Figure 2**. With identical circuitry and thermistor elements, it is now quite reasonable to assume that V_{OUT} for each of the two bridges will be the same at any instant. If RF is applied to the measurement bridge only, then the additional RF power supplied can be determined from the instantaneous resulting V_{RF} as that bridge rebalances, and the unchanged compensation voltage, V_{COMP} that remains on the reference bridge. There may be small incidental drift between the two bridges due to differential heating, or component drift, but these should be very small and need only be checked for every few hours or when a new measurement sequence starts.

The coaxial head used with the HP432 actually uses a pair of 100Ω thermistors configured so they are in parallel at RF for the correct 50Ω load, but in series at DC so the bridge sees 200Ω in the lower section of the test arm with a precision 200Ω at the top. Knowing this, we can put some values on the levels of DC voltage that need to be accurately measured and compensated for. With a DC resistance of 200Ω, total power supplied to the thermistor is now given by V_{OUT}^2 / 800Ω. The full scale of the power meter is 10mW, so the bridge must be supplied with appreciably more than this at DC. Something like 20 – 40mW of DC is dissipated in the thermistor at all times to maintain a constant operating temperature, although the actual dissipation will depend on external temperature. From the equation above, something in the region of 4 to 6V is needed to supply the bridge.

The RF input level is now given by $(V_{COMP}^2 - V_{RF}^2)$ / 800Ω. We need to measure both these voltages to a high degree of accuracy if low powers in the microwatt region are to be detected properly. The lowest practical input the HP432 can measure reliably is –25dBm, or 3.2 microwatts. This corresponds to a difference between V_{OUT} and V_{REF} of just 0.25mV.

Direct measurement of the two voltages to the accuracy needed is difficult these days, even with precision references and high linearity 24-bit A/D converters. Back in the 1960's it was impossible! Fortunately there is an alternative solution, by rewriting the equation in the form $P = (V_{COMP} + V_{RF}) * (V_{COMP} - V_{RF}) / 800\Omega$.

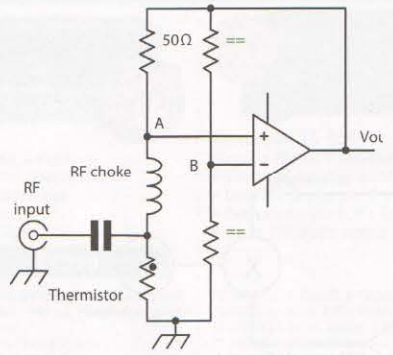

FIGURE 1: The DC balance power meter technique, where a thermistor is maintained at a constant resistance using a bridge and feedback via an opamp.

A good-quality differential amplifier fed with V_{COMP} and V_{RF} delivers the subtraction term directly (the second term in brackets) multiplied by some gain. The additive term is generated by summing the two voltages in another opamp. The multiplication is performed in a clever chopper circuit in the HP432A. The sum term (which only changes by a small amount with RF power and external temperature) is converted to a variable duty cycle square wave that chops the amplified difference signal. The resulting average displayed on a meter is the product, and directly indicates RF power applied on a linear scale. This was advanced analogue signal processing in its day, all done with discrete transistors before stable opamps were available, and a decade or two before digital processors and A/D converters simplified the task.

It is a credit to the designers that they made a power meter for use up to 12GHz to measure down to such a low power level using a verifiable and calibrated technique with acceptable drift. This explains why the HP432A is still in use today and is still maintained by the manufacturer. And why I was so annoyed at destroying my sensor unit, as new heads cost many hundreds of pounds. Second hand ones are still available at slightly lower prices. One thing I can safely say for certain: that 20dB attenuator will be firmly glued on next time using concrete, superglue, Araldite, self-amalgamating tape and anything else I can think of to make sure it can never be removed. I may then only be able to measure down to –5dBm with it, but there are other ways of measuring low power levels. *Relative* power is easy to measure and, for many applications, it is all we want. More about that, perhaps, next time. Absolute RF power is not nearly such an easy quantity to measure accurately.

A homebrew DC balance power meter was published in *RadCom* many years ago. This used a small light bulb as the thermistor, so was only useful at frequencies up to a few MHz. But, being designed for direct input of RF in the region of hundreds of milliwatts to a few watts, the effects of external temperature drift were correspondingly smaller and a single bridge design was possible. With modern 0402 surface mount thermistors, good A/D converters, modern opamp chips and a microcontroller to do the calculation, an accurate homebrew current balance power meter ought to be possible. Who will rise to the challenge?

THE SL6270 STORY. After reading April's article on this reborn VOGAD chip, Peter Chadwick, G3RZP wrote in to say: "The original Clansman VOGAD – Voice Operated Gain Adjusting Device – consisted of two of the SL600 series: the SL620 AGC generator and the SL630 audio amplifier. The next development was to combine the functions of the two circuits into one – the SL622. When the CB boom started in the USA, in those days mainly using AM, a 14 lead dual in line plastic device with a speech clipper was wanted; by leaving out the speech clipper, it could be fitted into an 8 lead mini-DIP, which was much cheaper. The speech clipper version never sold in any quantity, so finally, a further re-design led to the SL6270, the decision having been made in 1978 to use the SL6000 series numbers for future products. The SL6270 removed the speech clipper, thus reducing the chip size and hence cost, and was also moved to a cheaper and newer process.

"The SL6720 also makes a very good amplitude stabilised Wien bridge audio oscillator: I never got around to writing that up into the Application Note for the device. I was the Applications Engineer at the original Plessey Semiconductors for the SL600/6000 series – as well as for the ECL high speed dividers and the radar circuits".

REMOTE CONTROL. Back after seeing the section on remote ATU tuning in the November 2012 Design Notes, Andy Wright, G4OJY wrote: "A solution I'm currently developing uses stepper motors and a free piece of software called *wecontroller*, by IK0VVE [1]. The software exists in a usable format but is not being developed at the moment due to time limitations of the author. It also links into *Ham Radio Deluxe*, though I have not tried this function yet. I currently have a driver which connects to a USB port and drives two stepper motors. I intend to use this for a remote control ATU, with the stepper motors

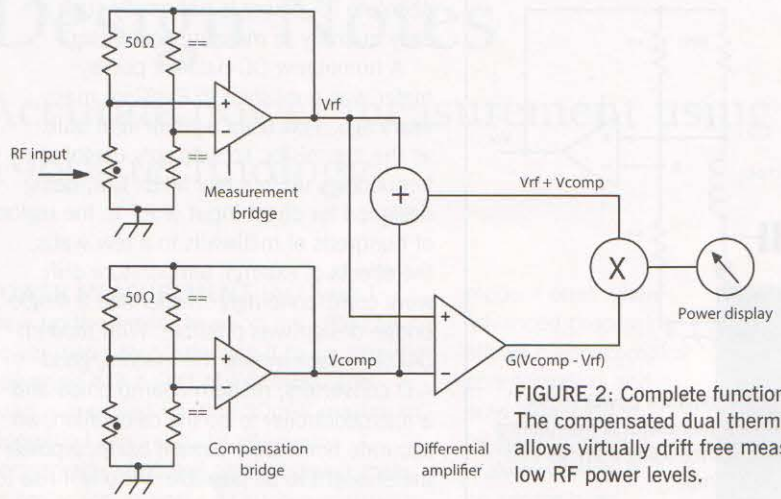

FIGURE 2: Complete functional diagram. The compensated dual thermistor bridge allows virtually drift free measurement of low RF power levels.

being driven remotely from the shack. The software has a system of memories, which can pre-store stepper motor positions. The software author also outlines methods to use the software with stepper motors for computerised linear amplifier tuning, or satellite rotator control."

THE OLDER ICS. After reading June's issue, John Crabtree, KC0G says: "Referring to IC numbering clashes and the MC4044. I dug out my copy of *Phase-Locked Loop Systems Data Book, Motorola Semiconductor Products Inc, 2nd edition, August 1973*. This has some excellent material from what were then the early days of digital phase / frequency detectors. The section on the MC4344 / MC4044 runs to 19 pages. The MC4344 was a version in a ceramic package, with a wider temperature range. I think that the MC4044 was almost the standard phase / frequency detector until either a phase / frequency detector was integrated into larger PLL IC's or the CMOS 4046 became available. Having a quick look at some old material, the Kenwood R-1000 (circa 1979) and R-600 (circa 1982) both used the MC4044, as did the Yaesu FT-ONE transceiver (mid 1980s). The Yaesu FRG-7700 receiver (circa 1981) used the MC14046B, as did the Drake TR-7 transceiver (circa 1977).

"I think that both the MC4044 and MC14046 (and other CMOS versions) had the issue of what happened when the loop is nearly locked. The outputs do not turn on instantly, leading to a reduction in loop gain when the loop is very close to lock. One way to fix this is to turn both outputs (Up and Down) on for a very short period, before turning them both off. This is the way in which one of the phase detectors works in the 74HCT9046, made by NXP, operates.

"Going back to the numbering clashes, the *Phase-Locked Loop Systems Data Book* also shows a MC4024 dual voltage-controlled multivibrator. I have never seen one. The regular 4024 CMOS part is a 7-stage counter."

WEBSEARCH

[1] *wecontroller* – http://www.ik0vve.net/wecon.aspx

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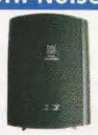

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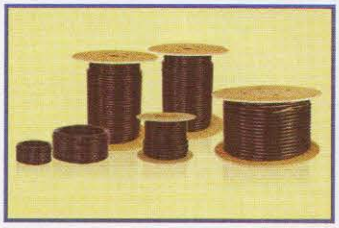

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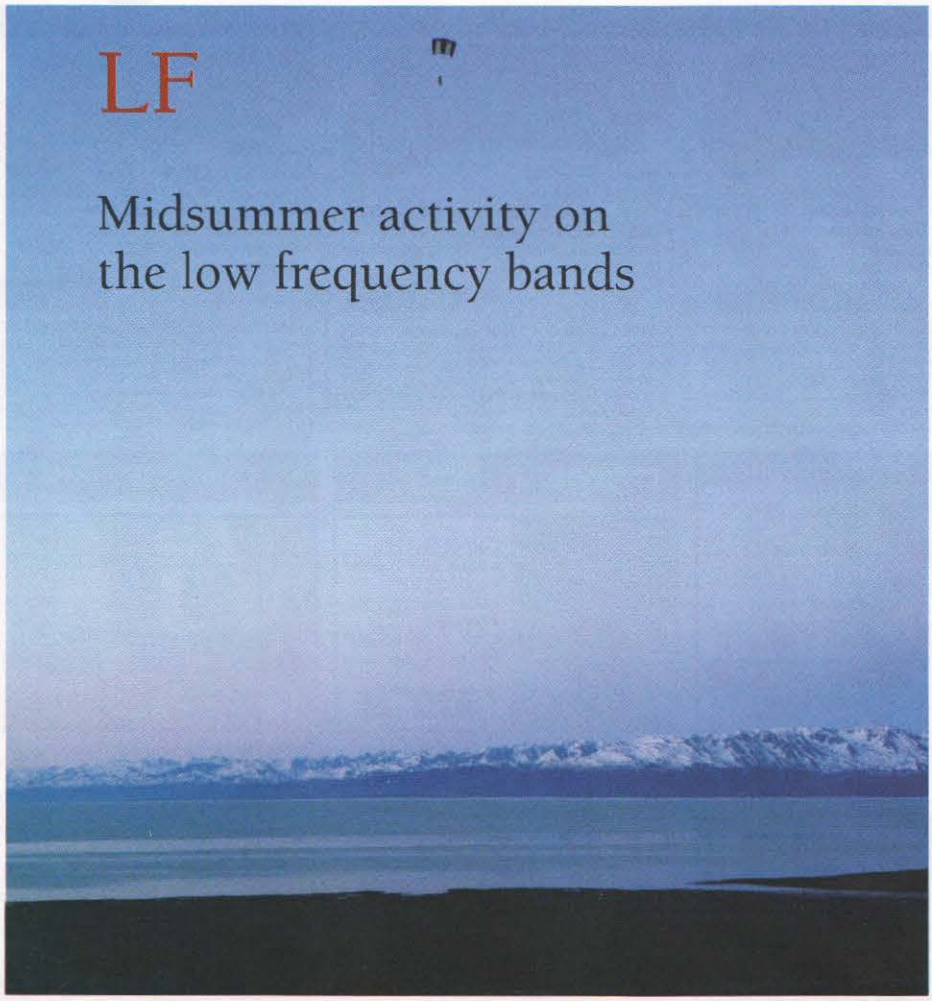
LF

Midsummer activity on the low frequency bands



The kite flying over Kachemak Bay.

LESS DARKNESS. The longest day of the year certainly isn't ideal for LF work; the hours of darkness are few and inconveniently late and, with thunderstorms all over Europe, the static levels tend to be high. In spite of this a determined effort was made to mark the summer solstice with some tests.

On 136kHz, VO1NA used Opera 32, which seemed to get through the QRN quite effectively and was received by G4WGT, G3XDV, GW0EZY, PA0OCD, W1TAG, DF6NM and DF2JP. The longest distance reception was by DF6NM at 4585km. Other midsummer Opera transmitters spotted were G3XDV, SV8CS, G4WGT, PA0OCD, RN3AUS, WD2XES and I1DDS.

Meanwhile on 472kHz high static levels were causing difficulties to WSPR reception. Despite high levels of activity there were no DX reports logged. WSPR Net reported lots of very peculiar callsigns: obviously the static was upsetting the decoding.

SPAIN ON 472kHz. The latest arrival on 472kHz is Spain. Spanish amateurs were given access to the band on 10 May and the first station on-air was Frederico, EA2HB, at San Sebastion near the French border. He spent a couple of weeks calling unsuccessfully on CW in the early evening until Stefan, DK7FC suggested a later hour and maybe some WSPR activity. Frederico was able to copy Stefan's test transmissions and, later, those of G8HUH and G3XIZ, but at the time of writing no signals have made it in the other direction. EA5B and EA1FBU are also active on WSPR, on receive.

MEXICO ON 136kHz. Since last summer XE2HWB and XE2EJ have been experimenting on 136kHz and the first Mexican LF contact was made between them last August. Stefan, DK7FC has recently contacted them and is hoping to make a QSO one day. After his success in mentoring YV7MAE to get the Venezuela grabber up and running so effectively I wouldn't bet against it. Signals from Europe to Venezuela have been very good on several occasions.

VLF. Thunderstorms affect VLF reception badly – that's why lightning detectors operate at 9kHz! Undeterred by this, Henny, PA3CPM has been steadily refining his system. Since May he has managed to increase his aerial current from about 0.3A to a maximum of 0.7A. Shortly after that the transmitter blew up, but he was soon back on at 0.6A. That's quite a feat as his aerial is a modest 14m sloping wire with top loading. Despite the noisy summer conditions his signal has been received at DK7FC and in Todmorden recently.

G100RSGB ON MF. The Whitton club took over G100RSGB on 21 June and were the first to operate on the 472kHz band. David, G0MRF worked a few stations on CW including G3KEV and G3XIZ. The disappointingly low level of CW activity was partly due to noisy midsummer conditions and rather short notice of the activity.

G3XDV BACK ON THE BAND. Mike is back on the air on 136kHz after a frightening experience with a loading coil catching fire near his house last year. He has now re-engineered the system and has sited the loading coil at the far end of the garden well away from the house. I had a similar problem a few years ago when corona discharge from sharp points at wire joints set fire to expanded polystyrene blocks that I had used to separate components. The fire soon spread and the plastic coil formers were destroyed, along with my little aerial tuning shed and part of the hedge!

The lesson we have both learned is that if you are going to run high power on LF or MF you must pay attention to the engineering of the aerial and its loading coil. The aerial and some parts of the tuning system can have tens of thousands of volts of RF on them. Don't leave sharp edges, which can lead to corona, and use ceramic insulators where possible rather than plastic. They may be heavier and more expensive but they don't catch fire.

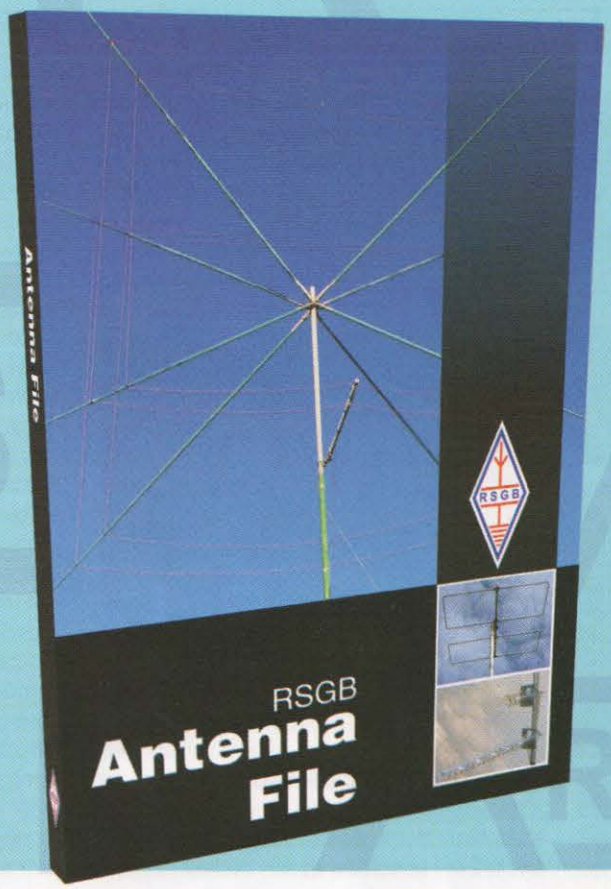
This is a good time of year to get outside and build a new tuner for your aerial system ready for the autumn / winter season. Remember that the more wire you can get in the air the less loading coil you will need and the more efficient the system will be. A top section with two or three wires will have a greater capacitance than a single wire. On the rainy days you can stay in the shack and make a new high power transmitter!

SUMMER HOLIDAY IDEA. Lawrence, KL1X took a fishing trip to Homer Spit in south central Alaska in May and tried out his Powersled 24 kite aerial on the beach. It flew beautifully at about 200ft over the water. No DX was copied in the 24-hour sunshine, just some static from West and central USA. Isn't it a pity that the good weather doesn't coincide with the best LF conditions?

472kHz SKIP. Whilst operating from Scotland in May I noticed a very pronounced skip effect on 472kHz. I had arranged a sked with Finbar, EI0CF, about 110 miles away. From experience on 136kHz we expected 59 signals both ways. The sked took place at night and signal levels were disappointing, with my report being about S6 to 7; this was despite having just worked into Germany with a similar report a few minutes earlier. I also worked G3KEV who is a little further away in the opposite direction and again suffered from weak signals.

The next morning, signals were 59 as we would have hoped, considering the aerial in use. I can only think that the previous evening we had been suffering from a very stable cancellation effect caused by ground-wave and sky-wave arriving out of phase at the 100 mile distance. What surprised me was the stability of the effect: skip is noticeable on Top Band but it is usually accompanied by a great deal of QSB.

RSGB shop



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The Radio Society of Great Britain (RSGB) has been promoting antenna experimentation for 100 years and publishing much of the work in its monthly journal. The RSGB Journal *RadCom* has therefore developed a reputation for producing some of the best material on antennas published anywhere. This book is a compilation of some of the best articles about antennas that have been published by the RSGB.

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In short, there are nearly 120 antenna articles here crammed into 288 pages with information on antennas of all types that will be of interest to all antenna experimenters everywhere.

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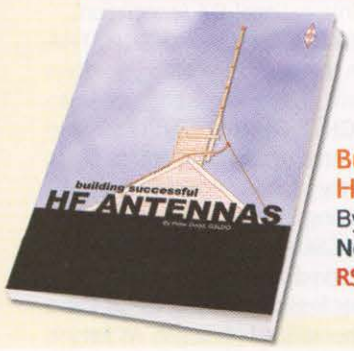

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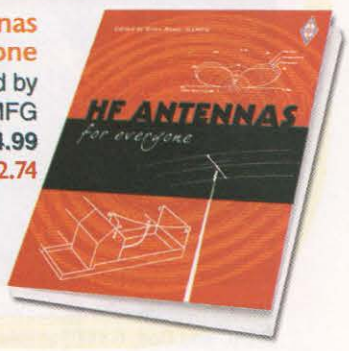

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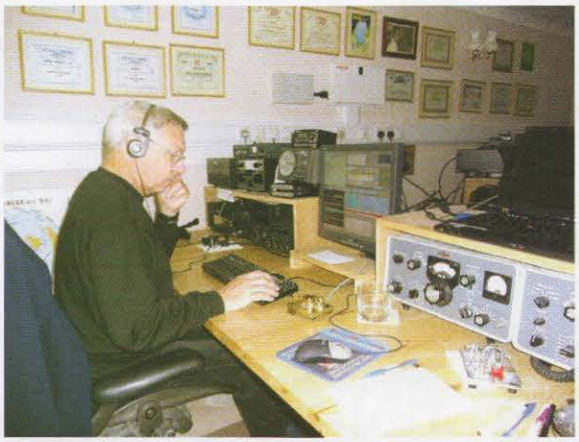
HF

Catching up on two months of HF news

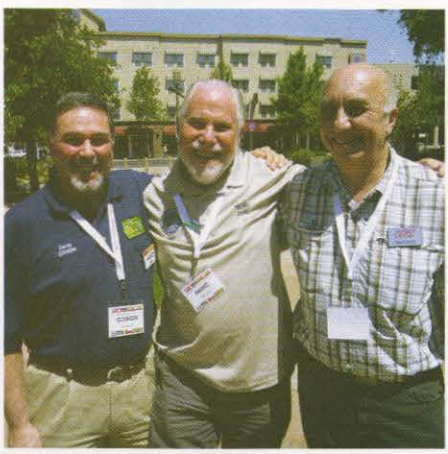
SUMMER PROPAGATION. I feel sure you will have enjoyed last month's Centenary *RadCom*, but it does mean there's two months of news to catch up on this time. That said, the HF bands tend to be quiet over the northern hemisphere summer except for the usual Sporadic-E, which has certainly been around again this year. As far as F2 propagation is concerned, it has been patchy with a number of solar disturbances. A classic example of the effects is that, in late June, I was looking for the IOTA operation by K6VVA/KL7 and, seeing him spotted on 20m one morning by North American stations, I listened but couldn't hear a trace. The following morning, at the same time, I could not only hear him well but worked him first call with just 70 watts.



John, G3WGV operating as GT4FOC (see text).

In May I had the opportunity to join John, G3WGV and Bob, MD0CCE for a few days on the Isle of Man to operate GT4FOC as part of the FOC 75th anniversary celebrations. Whether we were just lucky or whether it's down to Bob's excellent station (or a combination of both) we racked up over 6,000 contacts in three days, with Japan being workable on 15, 17 and 20 metres almost round the clock. I was amazed at the way the short-path to Japan hung in on 15m until early evening and then switched to long-path, where it kept going until close to midnight.

While on the topic of propagation, I see that well-known contester Frank, W3LPL gave a presentation in the Contest University stream at Dayton on the subject of Solar Cycle 24. He noted that this cycle is unusual in many ways and that the sunspot activity in the sun's southern hemisphere is yet to peak. So we may well some an upturn in conditions later this year. We can but hope. That presentation is available on the internet if you put a few of the key words into one of the search engines.



FSDXA members David, G3WGN, Arnie, N6HC and Don, G3XTT at this year's Visalia Convention.

DX NEWS. YL (Young Lady) operators JR3MVF, HL1KDW, LA6RHA, WA0WOF and SM6KAT plan to sign OX5YL from Greenland from 16 to 20 August. Activity will be on all bands. QSL via PA5YL.

I note that Paul, N6PSE and David, AH6HY are recently returned from a trip to the DPRK (North Korea) where they were checking out the possibilities for a DXpedition. While I wouldn't expect any immediate results, it does seem that some gradual progress is being made, especially as they have now included Fan Bin, BA1RB, as a member of the project team. China does seem to have more clout than most in the DPRK.

Dimitri, F5SWB was due to be in the Ivory Coast until the end of October. He has been issued the call TU5DF and plans to be on 40 through 10, mostly on CW with some SSB and PSK31. He also plans to try 80m, but notes there will be lots of static. Dim will be running a barefoot FT-857 into a 10m fishing rod or centre feed antenna. QSL via F5SWB.

A45WY is the new Omani callsign for Andy, G0JLX. He has been operating from ROARS, the Royal Omani Radio Society headquarters, "just up the road from where I am living," he says. He adds, "Initially at least, I will be restricted to operating from the HQ station, so will be signing A47RS, but identifying myself with my own call from time to time".

G0MGX has his new Qatari callsign, A71/G0MGX. He is in Qatar for two weeks at a time, with one-week breaks between. His two week/one week rotation will continue for nine months. His station is a Yaesu FT-450D to a Buddipole portable antenna. He plans to do a little SSB and CW (with a decoder) but mostly it will be RTTY, PSK and JT65. QSL via LoTW, direct to his home call, or via the RSGB bureau.

VP8DOH is a new callsign from the Falkland Islands. Andy, M0HLT is on assignment as an electrician there for two years. He plans to be on 20 through 10m, SSB only. QSL on LoTW or eQSL.

Finally a note that the Heard Island expedition, which was expected next year, has been put back to January 2015, mainly for cost reasons related to chartering a ship. Their preferred vessel, the *Marion Dufresne* (which has carried earlier expeditions) was going to cost $1m to charter before any other expedition expenses were factored in, so they are looking for an alternative while restructuring the scale and scope of the project. More details on their website.

DXCC CHALLENGE. I note that 71 amateurs from 19 countries have reached the 3,000 or above level of the ARRL DXCC Challenge. This total is the number of countries accredited to your DXCC count on 160 through 6m. The latest UK amateur to have achieved that is Neil, G0JHC (with 3003), all done with wire antennas. Congratulations Neil. Other UK stations who are above the 3,000 level are G3KMA (3121), G4BWP (3057) and G3XTT (3002).

HALL OF FAME. As usual, Dayton was the venue for announcing the latest members of the *CQ* Hall of Fame. Those inducted into the DX Hall were Vlad, UA4WHX and Gary, K4MQG. Vlad has visited and operated from over 100 DX entities in the past ten years and operated from all six continents in 2012 alone. He has provided over 700,000 DX contacts for amateurs around the world (and handled his own QSLing, too). Gary is a founding member of the Carolina DX Association and is Founding President of INDEXA, the International DX Association, which has helped support over 200 DXpeditions in the past 30 years.

SOME THOUGHTS ON HF ACTIVITY. Looking back through some old copies of *RadCom* recently I found a letter to the editor complaining that this column doesn't cover ordinary QSOs and also seems to mainly preoccupied with island operations. The letter never found its way to me at the time, so it rather missed its target. As for the comment about island operations, I

would suggest that the correspondent may have been confusing this column with the IOTA one although it's certainly true that many expeditions are to islands. Island nations tend, in many cases, to have small populations and few, if any, amateurs. But HF activity is also rare in many larger countries, hence the regular expeditions to parts of Africa and Asia (the recent expeditions to Burundi and Chad would be good examples). But what about 'ordinary' contacts? I assume the writer was talking about the sort of ragchew contacts that take place every day on our HF bands, from the various UK nets on 80m to the international friendships that are maintained on, say, 20m. I know of UK amateurs with friends in Australia and New Zealand, for example, who have maintained regular schedules on an almost daily basis for many years, during all stages of the sunspot cycle. But that's the thing. In a sense, this isn't news, although it's always nice to hear about some milestone having been achieved in longevity, if nothing else.

Rather, I prefer to focus on those areas where boundaries are being explored – new modes, distant contacts on the edge bands (160m most of the time, 10m when propagation is marginal, and so on), contacts achieved with minimal power, expeditions to places that rarely get visited, whether for logistical or political reasons. Because the good news is that, for day to day contacts, HF propagation is pretty well understood nowadays and, as a consequence, reliable contacts can be maintained between pretty much any two locations, provided the right frequency is selected and the right time of day. To this end the excellent propagation prediction programs can be a real help and such tools are available free of charge either to download or to use in real time on the internet. It's not just propagation, but good station design comes into the equation, too. I recall, from some 40 years or so back, an amateur local to me who had a daily sked with an old friend of his who had emigrated to Australia. My local amateur was unable to erect a tower and beam, but had put up a 20m loop antenna suspended from some trees and oriented to VK. It worked just fine for its intended purpose.

ANTENNA CHOICE FOR DX. This takes me nicely onto a related topic, which also came to mind while sorting through those old magazines. This one is about arrival angles of HF signals. Typically, as a band opens or closes, arrival angles will be very low (ionisation levels are insufficient to reflect higher angle signals) whereas ionisation during the peak period of the band opening will support higher radiation angles. In an ideal world we would have antennas that supported both, which is why the biggest contest stations usually have multiple beams at different heights, switchable individually or as a stack. But most of us cannot even aspire to such facilities. Instead, we probably have to compromise on a single antenna covering a number of bands, fixed at a height that is far from optimum. The article I was reading gave some graphs of the arrival angles to be expected for 20m signals between Western Europe and the East Coast of the USA (a well-used DX path). There is, as might be expected, quite a wide range, but that range is centred around 12 degrees. Now I can't tell you at what height your antenna needs to be to achieve that take-off angle, as it depends not only on height above ground but also on surrounding terrain. Again, though, we have some excellent tools available nowadays for modelling these variables, including EZNEC and others for antenna modelling and terrain analysis software such as that by N6BV. The results can be surprising – for example, you may be better off with a dipole as against a beam if the former can be erected at a greater height than the latter.

Vlad UA4WHX on another of his expeditions, see text.

CORRESPONDENCE. Peter, G4XEX was away in EA8 for some of the time but has been busy otherwise, with NH0J and A3EAQ as all-time new ones. His best DX (for some reason that Peter can't explain, mainly to the Far East) were JW7XM and 8P6NW on 20 SSB, VU2OEC, VK4JD, BG9DZO and HK3DC on 20 data, 6V7T, JA7BXS, JA1OJJ, JO3PDT, PJ4/SP9FIM and V47GIW on 17 SSB, JY5IB on 17 data, YC8GZP, YB1GJS, A3EAQ, NH0J, VR2XMT, BD7IS, BU2AW, DU1/JA3FJE, TZ6BB, ZD7LP, 6V7T, 6V7S and a number of JAs on 15 SSB, HL2WP, VR2XMT and YB2BBY on 12 SSB and JA3EQC plus YB3JOS on 10 SSB.

Peter, G3HQT reports working (all on PSK) VK5CE on 30m, TG9AHM, VK7NEL, VP2ETE and HK1F on 20m, A61DD, YW5PAZ, PZ5RA, A61E, HS0ZBS and EY7AD on 15 and CW90A plus CE4SFG on 10m. Then, on RTTY, FM5CD on 17m. David, M0BVE reports working (all CW, as usual) H70ORO (Nicaragua) on 40, FJ/N5WR on 30, VP2EAQ, BY8AC, VP5/W5CW, D44TWO and 4A2I (Mexico) on 20, DU9/JA1PBV, SV2ASP/A and YV8AD on 17, 9V1YC, KP2M, HK1R and PJ6A on 15 plus CP4BT on 10.

Damian, M0BKV says he has not been so active recently and then goes on to list some very nice DX worked! But he does say, "There has been heavy ionisation every day with aurora and X-ray flares most days resulting in a lot of band noise. Some days the skip seemed very short but the biggest problem was the fast fading, which could mean not completing a contact that had started fine". His list of DX includes KH6MB, VK9NT, YN/K2PFL, TR8CA and 9M2SE on 20 CW, 6V7T, VI103WIA and JW7QIA on 20 SSB, 4X75FOC, 9M6XRO, YN/K2PFL and BH1FXN on 15 CW, V85XD on 15 SSB, 4S7BRG on 15 PSK, ZS2DL on 12 SSB plus Z81X on 10 CW and SSB.

Simon, M0VKY reports working E51JD and VK9NT on 20 SSB, ZK3N on 20 CW, A25CF NH0J AP2MB and JD1BMH on 15 SSB, FO8WBB on 15 CW, and 9W2VVH on 10 SSB.

Owen, G0PHY writes, "I currently have worked about 233 entities and with a modest antenna setup (a doublet) working a new one is now relatively rare. Imagine my surprise and delight recently in working two new ones within half an hour. On 5 May I was awake at about 0430 BST; when the XYL went downstairs to make a cup of tea I took the opportunity to check out 20m. The first station worked was Z81X (Martti, OH2BH, in South Sudan). The second new one was TG9ANF, Guatemala. Unlike Martti he was not working split so it took a little longer to get this one in the log. What was interesting about both signals is that they were both a genuine strength 9 on the S meter. I have usually only heard TG stations during contests in the late afternoon and never at such strength". Well done Owen, two nice ones. And, yes, signals can indeed be loud at that time in the morning. It's just that not many of us in the UK are awake to make the most of it!

COUNTRIES WORKED, 2013 (starting 1/1/13, listed by Mixed Mode total)

Call	CW	SSB	Data	All
M0BKV	110	95	20	151
M0BVE	137	0	0	137
G4XEX	0	120	73	128
G3HQT	-	0	-	86
G4FVK	47	57	0	85

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VHF/UHF

May & June brings excellent meteor scatter, tropo and Sporadic-E conditions

GM0KZG/MM. Andy's shack location.

INTRODUCTION, Many thanks to Sam, G4DDK for stepping in at the last minute and writing the June column. An unfortunate incident with my trusty step ladder and a split-second lack of concentration culminated in a serious compound fracture, two operations and 12 weeks in plaster. We all want to try out our new antenna configuration and get on the air as soon as possible but *please* check your own Health and Safety arrangements and, above all, take care!

OVERALL CONDITIONS. May and June are usually good months for VHF DX with meteor scatter, tropospheric and Sporadic-E propagation possible with some real surprises mixed in. Sunday 5 May was the second day of a major European 2m to Microwave contest. With many high power stations located in excellent high level locations it is possible for UK stations to make DX contacts. With no UK contest, QRM levels are low so winkling out the weak ones is easier.

The period coincided with the Eta Aquarids meteor shower [1]. This shower, over recent years, hasn't really produced many good useable reflections but this year was quite an exception. Interestingly, these conditions coincided with a high MUF hovering just above 50MHz. Characterised by long 20-30 second high intensity bursts, it was possible to make complete contest QSOs for those who had realised what was going on. Unfortunately, many didn't and some QSOs were incomplete. The American Meteor Society website [2] has a wealth of information on all matters meteoric.

June brought Sporadic-E (Es) openings across the VHF bands. 6m gave excellent openings to Japan and China in the middle of the month. 4m gave many stations the chance to work some very rare DXCC entities via Es and meteor scatter. 2m had a quiet start on the Es front but during the middle of June there were some very intense but short openings. DXpeditions were also active, which allowed many stations to work new locator squares.

Solar activity has been relatively low even though we are approaching solar maximum. High latitude auroral contacts were made on 50–144MHz however useable conditions in lower UK and European latitudes were poor.

50 & 70MHz. Peter, G8BCG (IO70) reports that May brought DX to FR4NT and 3B8CF on the 2nd. VK6OX, VK6KXW and YO2BCT were worked for new EME initials on 4 May plus VK0JJJ was worked on the 5th for initial 45 on 6m EME and DXCC entity 219. This was also a first QSO from the UK to Mawson Base. The 5th brought 'regulars' FR4NT and 3B8CF in again, which preceded a bigger opening to LU5FF, PP5XX, PY2XB and CE2AWW. Then the surprise of the night came when Peter was chatting to local station 2E0JJR on 50.130MHz and ZP5SNA called in on SSB for DXCC #220.

David, G8OQW (JO01) was grateful to 50MHz in May obliging with a good opening into Eastern Europe from Chelmsford, Marconi's home town. David worked a total of 23 contacts in 11 countries: OE, 9A, OK, DL, HA, YL, LY, SP, YO, OM and S5 prefixes.

Gary, G4LOE (IO92) reports an opening on 70MHz on 1 May, working OH1UM and IS0AWZ both on USB. During May he also worked EA4SV, EA7KB, IZ4MAO, CT1BXT, EA1FBU, CT1FFU, CT1DIZ, 9A2ZH, IW4BET, IK5ZWU, IK5ZUL, SP8WJW and 9A7PJT. These excellent contacts show how DX can be worked using a compact setup as Gary runs 30 watts from a TS-430S, Spectrum transverter and a vertical dipole at 20ft. Gary used his vertical collinear on 144MHz and worked EA7ERP (IM87), EA7IQM (IM77), CT2HKN (IN51), EA1YN (IN52), CT1ANO (IN51) and EA1YV (IN52).

John Tonks sent in some details of activity using an 'additional' mode to the *WSJT-X* suite of software by Joe Taylor, K1JT. There was a brief double hop Sporadic-E opening between UK and Canada on 17 May. Jim, VE1JF and Ian, GM3SEK had managed to decode each other on JT9-1, but didn't complete. Shortly afterwards, John decoded Jim's JT9 signal. They then tried ISCAT-B mode and they were soon able to exchange reports but, although they tried for 8 hours, John was unable to copy Jim's final RRR. Without a valid QSO, it was however nice to know they could make it across the Atlantic. More information of WSJT-X 9-1 and ISCAT can be found at [3].

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HV0A Vatican City station with Sergio, IK0FTA.

During the April Lyrids, John worked EA1SI, EA1QT, EA3LL, IZ5ILX, F8DGY, F8ZW, DC8TS, LA3EQ, EI6GF, DK9WI, GM4VVX, DL5WP, OZ2PBS, OZ2KEC and SM5EPO on 6m. 4m was also busy with FSK441 QSOs with DI2AX (69.990), PF7M, SP7BUZ, GM4VVX, PF7M, DI2AX, OZ1JXY, PA2M, EA5/G3XGS, EA7HG, EA7KB, EC7AMY and EA4S. The OZ7IGY beacon was 59 with good decodes using PI-RX mode **[4]**.

A good opening on 50MHz during 13 May brought UT4UO, SP2HMR, IZ6RWD, DL5BBF, OK2MBP, DL7PV, S57AC, DL4AV and SP1FPG. However, with severe QRM, John moved up the band a bit to call CQ and over the next 45 minutes was called by around 30 stations including DH3HAS, DG0GE, SP6OPY, DL2CK, DL7FF, DL5OBY, DL9YDW, DL4ABB, IW4AOT, SM0EUI, IK7JTF, DF8XR, SQ3JPV, PE2JMR, DK6BT, DL8YAU, DL1JML, SO1RON, LA8EJ, OZ0HP and PA3DNA before he could get away for a cup of tea!

Justin, G0KSC (JO01) reports that 9 June was a great day for VHF. On 50MHz he managed to add a new one to his tally with 9J2BO being worked late in the afternoon. The conditions dropped a little after that, however a switch to 4m brought several EA and CT stations. He returned to 50MHz to find PYs and LUs lifting the meter past S9 at times. ZD7VHF was booming too, but sadly Justin had worked most of the stations coming in from South America. Then trying 144MHz EA5, EA9 and CT prefixes were worked, so all in all quite a good day.

Martin, GM8IEM (IO78) made some super QSOs on 50MHz multi-hop Es on 21 May with 9Y4D (FK90), 9Y4VU (CW FK90) and FM5AA (CW FK94). Then on 31 May he worked 5B4AIF (KM64).

Geoff, GW3LEW (IO71) reports excellent June Sporadic-E openings on 70MHz to OM, OK, HA, SP I, OZ, EA, CT and OH. Geoff also worked the Swedish Special Event Station SK3JR using SSB where the FSK441 meteor scatter test didn't make it. On 7 June, SV1DH was a 'got away' but a later QSO with EA8BPX completed no problem. Geoff comments on the incredible pile up attempting to work IG9/I2ADN. He called him for ages and never thought that there were so many G stations actually active on 4 metres! With all the Es activity, his usual FSK441 meteor scatter operations took a back seat. In the major Sporadic-E opening on 12 June, Geoff worked 50+ QSOs on 70MHz. CT3 was another 'got away' DXCC, however Geoff was pleased with over 150 locator squares on the band.

Bob, G8HGN (JO01) reports nothing much out of the ordinary on 50MHz, however some reasonable tropo contacts were completed. He did hear VP2V/W9DR in the early evening of 20 June up to 55 but no contact resulted. More QSOs were made during the 50MHz Trophy Contest, but conditions were quite poor with just a couple of minor DX openings. 70MHz was more productive with 11 new squares worked bringing Bob's overall total to 89. During early June Bob worked PE1ITR (JO21), SP3OCC (JO92), OH8MGK (KP23), CT7/F9IE (IM67), EA7KB (IM67), IG9/I2ADN (JM65), EA3GP (JN01), EA6SX (JM19), IK5YJY (JN53), SP9UOP (JO90), OZ1DJJ (JO65), SP2HMR (JO94), OH1LEU (KP01), OH2MA (KP31), ES6QC (KO37), IZ7JXJ (JN80) and HA8MV/P in KN06HT. Bob uses an FT-847 10W + HB9CV 4m AGL proving that awareness of propagation possibilities and good operating can bring excellent results.

Paul, G4RRA (IO80) had a good June on 50MHz with some excellent North American and Caribbean DX. Paul also heard BA4SI and BV2DQ (China) but couldn't work either of them. He did manage JF6TAC and JL8GFB (Japan) at 9000km+. One key aspect of Paul's 50MHz log is the number of CW QSOs, which accounted for over 50% of the 60+ QSO tally. Paul's other top ten contacts were HI3TEJ (FK49), NW0W (EM47), AC4TO (EM70), KC4HW (EM71), PJ4NX (FK52), FM5WD (FK94), 9Y4D (FK90), FG5GP (FK96), KP4EIT (FK58) and W4CSW in EM82. Although Paul thought 144MHz was not so hot, 19 June produced a new DXCC on 2m with HV0A (Vatican City) in the log. SV2, IW9, I8, IK0 and IW0 prefixes were also worked.

USA AND CANADA 6 & 4m CROSS BAND. It was great to receive information via Sam, G4DDK from Emil, W3EP regarding stations who are QRV on 50/70MHz with cross band facilities in North America. Emil has polled an array of East Coast operators and has compiled a list of stations with 70MHz receive capability. Potential cross band stations are VE2DFO (FN25), W1IPL (FN54), K1SIX* (FN43), W1JR (FN42), W1JJ* (FN41), W1XX (FN41), W3EP* (FN31), WB4SLM (EM82) and KE4WBO (EL96). (* indicates stations that have already made cross band QSOs). Emil commented that it would be nice if there was more activity on his side, but so far active interest has yet to spread. Emil advises that Europeans should monitor the ON4KST Region 2 chat page for possible skeds. He will also be trying to make SSB calls near 50.185 when conditions are favourable. Receive frequency will be around 70.185 with CW the preferred mode.

JUNE 144MHz SPORADIC-E. Martin, GM8IEM (IO78) was one of the first UK stations to take advantage of Es conditions that started on 2 June. A short CQ on 144.300 brought a response from F6DRO (JN03), followed by EB3DYS (JN11) and F1USF (JN23). The Es cloud intensified again and in the next 10 minutes Martin worked I2FAK, IW2DAL, I2SVA, IW2NNZ, IZ2CPO (JN45), I2VRN (JN55), OE9MON (JN47), DF1CF, DL3MBJ, DL8MAI (JN57), DL8SCQ (JN48) and 9A9KW in JN65. This second opening was characterised by much more patchy and variable propagation, with stations appearing and disappearing quite rapidly, necessitating very rapid exchanges. Contesting experience can put more QSOs in the log during openings like this.

Dave, G7RAU (IO90) reports that the 144MHz opening on 12 June was patchy and he heard more than worked. He had awful QRN from local houses as his mast was right down due to high winds, but his impressive log does show great DX. These included YL3CL (KO26), YL3GV (KO37), ES6FX (KO37), ES6DO (KO27), UA1ASA/1 (KO48), RK1AS (KP40), OH5LK (KP30), YL2OK (KO37), YL2GD (KO37) plus best DX to R1AX (KO59) at 2225km. Dave also wishes that he could get a job with the whole of the Es season bookable as a holiday! Dave's excellent *Live MUF* software shows clearly the extent of the opening on 12 June **[5]**.

John, G4SWX (JO02) reports Es worked on 30 May, 3, 9, 12, 18, 19 and 20 June. On the 12th, his best DX was RV3VM (KO54) at 1985km with the following

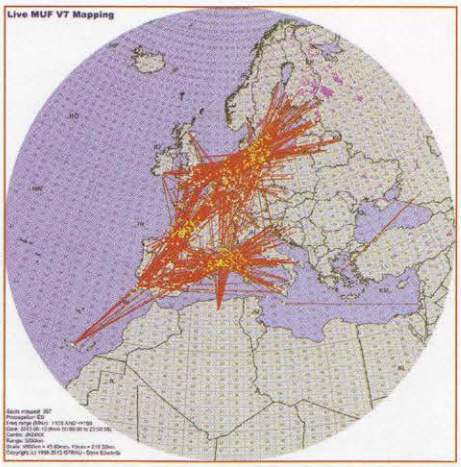
stations also in the log: CT1HZE (IM57), CT1CAD (IM67), LY44WFF (KO05), LY2BH (KO25), UA1ASA/1 (KO48), ES6FX (KO37), YL2OK (KO37), YL2QW (KO17), YL3GV (KO37) and ES6DO in KO27. John also comments that openings were very patchy, as many of the reflecting spots were fairly close to JO02. He spent time looking for 7X (Libya) but no luck. Moonbounce in May brought GM6VXB/P, GS3PYE/P and excellent signals from EA8TJ. These contacts were included in John's prodigious EME log. Andy, GM0KZG/MM was worked in JO06, 07 & 16, mostly on CW. John got through the huge pile-ups for DH8BQA/MM in JO95 but he did not complete on two occasions despite getting bursts almost every period. Unfortunately, the final RRRs were lost in the massive QRM. John did hear an HB0/DL during the AGCW contest on 15 June but lost him in very strong rain static that lasted for nearly 2 hours. LA2Z (JO59) at 971km and SK6QA (JO58) at 918km were nice to work in the Nordic Activity Contest on 4 June. What has been missing so far this year is any significant ionoscatter or field aligned irregularities (FAI) from JO02 but it is probably due to the E layer ionisation being more to the south.

Lyndon, GW8JLY (IO81) took a break from his prolific meteor scatter operations and managed to catch the earlier opening on 12 June. He worked the LY44WFF expedition to KO05 plus SP2OFW (JO82), SQ7DQX (JO91), SP4MPB (KO03), SP2HPD (JO94), and SM7GVF (JO77). Unfortunately, he missed phase two due to a shopping trip later in the day. We've all done that one! On 19 June, Lyn cracked HV0A for a new DXCC.

Ian, G0UWK (IO83) also worked the LY44WFF expedition who was endstop for a time. He also made the following QSOs: LY3UE (KO24), EW1AA (KO33), LY44WFF (KO05), YL3CL (KO26), LY2BH (KO25), YL3AG (KO06), YL2GD (KO3)7, YL3AG (KO06) and best DX RW3VM/3 (KO54) at 2185km.

Bob, G8HGN's log for early June shows a mixture of contest and normal QSOs with F6KPC/P (JN15), TM77A (IN77), PD2TW (JO33), MM0GPZ/P (IO85), GU6EFB (IN89), OZ1BEF (JO46), G8PNN/P (IO95), MI0AYR/P (IO74), EA7IU (IM87), EA5SR (IM98), EA5FWW, IM97KX, CS7/PD0HNL (IM67), CT1IUA (IM67), EB5AL (IN90), EB4FJV (IN80), EA7IQM (IM77), CT1HZE (IM57), LY44WFF (KO05), ES6FX (KO37), RK1AS (KP40), IW9HII (JM67), IW9FRA (JM68) and SV4LRJ/2 in KN10. TM77A was a new square and the first since 2011. Then the Es started and Bob picked up five more new ones plus ES6FX, which was a new DXCC.

G4KWQ, G4EAT, G0HVQ, G0LGS, G3WZT, G4DHF, G4LOH, G8GXP, GM3PMB, G4AEP, GW7SMV, GM4GUF,



G7RAU MUF mapping 12 June 2013.

EI3KD and EI4DQ were all heard making Sporadic-E QSOs up to 20 June.

From a European perspective, the best DX of the Day was from Joe, CT1HZE (IM57) to Jussi, OH5LK (KP30) and Lasse, OH6KTL (KP02) with a QRB of 3500km. These QSOs are only just outside the top distance record table.

DXPEDITIONS AND RARE DXCCS. Many thanks to Sergio, IK0FTA for sending information of the Vatican City Station, HV0A/HV4NAC station that is still on many operators wanted list. It is certainly in demand when QRV whether during Es or meteor scatter conditions. HV0A has a fixed station located near to San Peter in the Vatican City State. For now they have an IC-7400 for 2m (100W) and an 8-ele I0JXX Yagi. They also sometimes have access to a 500W PA for 2m, which is the local legal power limit. On 6m they use the IC-7400 or IC-756 Pro 3 and Expert 1k PA feeding a 4-ele SteppIR or a 5-ele I0JXX. HV0A was QRV on 2m and 4m during June and worked many UK stations.

SK3JR ON 70MHz. During the 35th Nordic VUSHF meeting at Ostersund, Sweden in June, the Jemtlands Radio Amateur Group operated with the first Swedish permit for 4m. Justin, G0KSC was one of the guest speakers and also one of the operators of the station. Although his travel to this regional airport was good he was surprised to be greeted by 25°C temperatures!

Petter, SM3PXO and his son Magnus, SA3PXO met Justin at the airport and provided transfer to the conference site. Justin knew he had arrived when he saw a distinctive driven element of one of his Inovantennas 7 element LFAs mounted on an 8m fibreglass mast above a mobile communications vehicle.

In addition to the conference, another interesting event took place later that afternoon with the activation of a Swedish callsign and locator on 70MHz for the first time. Many new countries have been awarded 70MHz over the last few years and most permanent awards of this kind are a result of a short 'test' or two prior to final allocation. However, there are still some primary commercial services in band so it could be that any final allocation will be segmented like so many are in the early stages of any licence award.

Sweden has a frequency allocated for testing PMR equipment on 70.1375MHz so with a fixed transmit frequency SK3JR had to use split operation. Fortunately the group were loaned a fully modified, UK spec Yaesu FT-847 that ensured they could hear (and accordingly work!) anyone anywhere that could hear them.

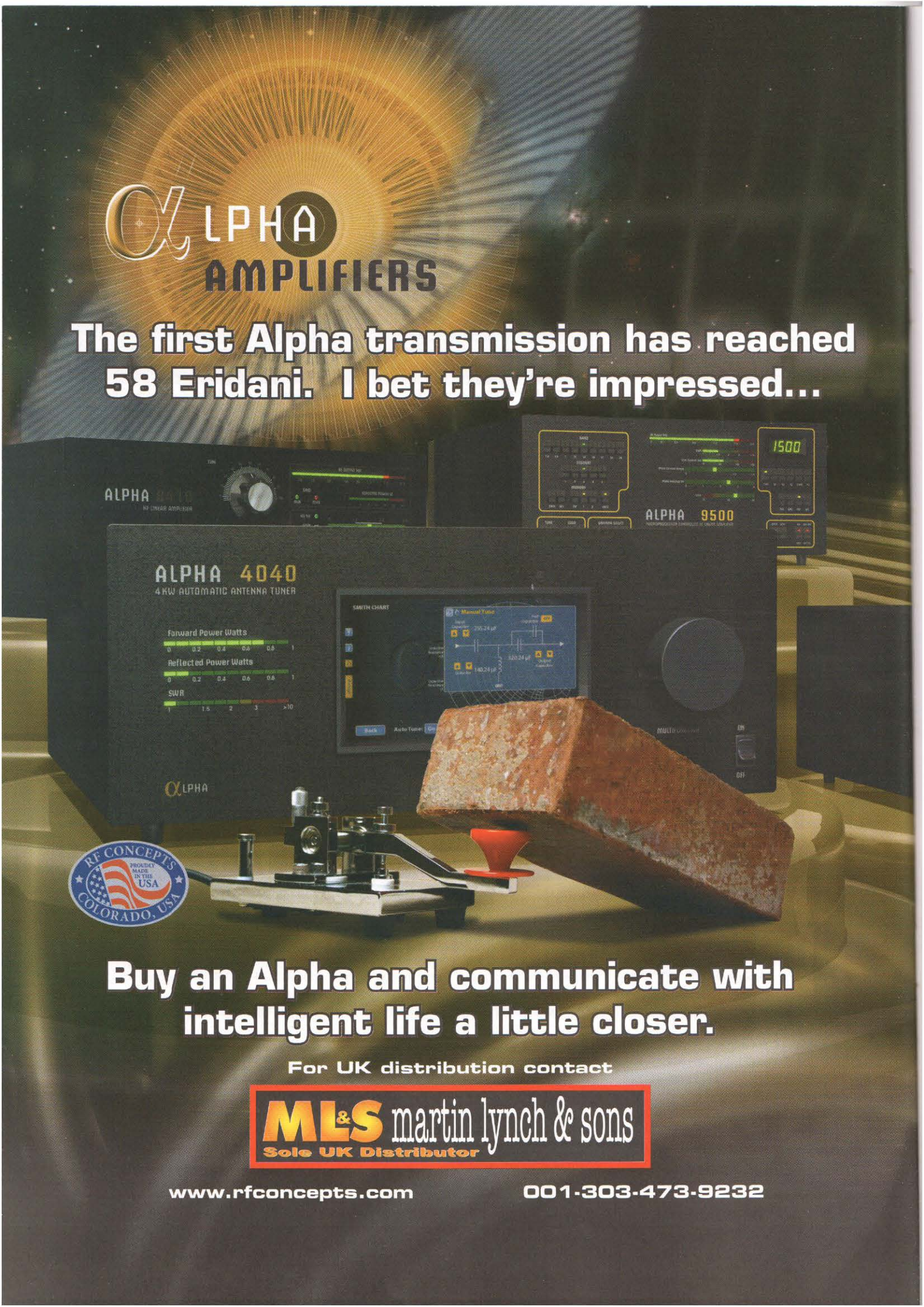
The first G callsign in the log was G8HVY whose excellent station uses 2 x 7-ele LFA Yagis. GM6VXB and GW8ASD completed the UK line up of firsts. ODX was EI8IQ with 14 countries and 29 grid squares worked in total. Most QSOs were the result of meteor scatter operations however there was a small Es opening on Sunday morning. Potentially more activation will continue, so watch this space for more information.

GM0KZG/MM NORTH SEA. Andy was QRV from a platform supply vessel working in the North Sea during the first two weeks of June. He was active on 144 and 50MHz however he wasn't sure if there would be any reciprocal interference from the ship. After trying a small scale operation as a test he was able to establish a station comprising a 9 element Yagi for 144MHz and a 3 element for 50MHz running 50 and 100 watts respectively. 144MHz operation was fairly quiet, with a few UK and near continent tropo contacts from JO16 and JO06. 50MHz brought 160 stations in the log from JO16. It was only possible to work on one band at a time due to the logistics on the ship. Andy's next trip will be down to Brazil where he will join a different ship and probably only run 50MHz with a 5 element Tonna and 100 watts from the FT-847. Good luck Andy and thanks from all for your efforts and new locator squares.

LOOKING FORWARD. Continuing Sporadic-E and tropospheric conditions are possible plus the Persieds meteor shower peaks around 12/13 August. Please check out the excellent Make More Miles on VHF website **[6]** for possibilities for terrestrial and EME conditions. Next month there will also be a feature on the recent TM77A expedition to IN77.

WEBSEARCH

[1] http://meteorshowersonline.com/eta_aquarids.html
[2] www.amsmeteors.org/
[3] http://physics.princeton.edu/pulsar/K1JT/wsjtx.html
[4] http://rudius.net/oz2m/software/pi-rx/
[5] http://vushf.dk/dxrecords/IARU/144_MHz.htm
[6] www.mmmonvhf.de/es.php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GHz Bands

New records at 76GHz and other news

END OF WINTER. It's good to be back after the July Centenary Edition of *RadCom* and I hope that you all enjoyed the celebrations and got plenty of microwave contacts with your special V prefix. As I write this, the Friedrichshafen Hamfest is just two weeks away and there are plenty of contests and round tables coming up including Microwave Field Day in August, so there is no excuse to just sit in the shack.

2.3 AND 3.4GHz SPECTRUM RELEASE. The last few months have been dominated by active discussions about the recent Ofcom consultation on Spectrum Release as we continue to fight to retain access to the bands above 1GHz in the teeth of massive commercial pressure for these valuable resources. I hope you have already put in your response to the consultation but it's worthwhile reviewing what it's all about. The Ministry of Defence (MoD) plans to release 40MHz of spectrum between 2350 and 2390MHz and a further 150MHz from 3410 to 3600MHz for new civil uses. These are known as the 'release bands'. Amateurs currently have access to these bands on a secondary, non-interference basis. In the Ofcom Consultation document [1] it is proposed to remove the release bands completely from the amateur licence and change our licence conditions in the adjacent bands (2310 to 2350MHz, 2390 to 2400MHz and 3400 to 3410MHz) to allow removal in cases of interference. The conditions proposed for removal state "If dealing with interference cases in the adjacent bands on an individual basis and following the process above became too onerous then we would consider varying all amateur licences to remove access to the adjacent band/s in question." That said, another quote bodes well for continued amateur usage, albeit on a reduced spectrum basis: "We have considered the relatively low level of amateur use in this band and believe that there isn't currently a sufficiently serious spectrum management reason to remove amateurs from the adjacent bands given the existing level of uncertainty about future use."

I'm actually pleasantly surprised at how reasonable the consultation is. It's clear to me that there has been some good engagement between amateurs and Ofcom, particularly from the ATV community. It's fair to say that Ofcom's document looks like a pretty thorough job that helps show that amateurs use the bands and how we actually do so. Unlike regulators in some countries, Ofcom is prepared to offer us the benefit of the doubt as Secondary Users in the retained sections, whereas the Primary User might have preferred to clear us out entirely for a simpler life. Of course it does leave us with a host of issues to consider, including dealing with interference, negotiating over withdrawal conditions and band plans. If you read the detail in the annexe, it's clear that ATV has a particular challenge to achieve full compatibility, given the ideal requirement of 10MHz spacing from the Primary User. Moving to narrower bandwidth DATV and improved filtering will inevitably be needed. I quote from the response to the BATC/Ofcom tests: "The results above indicate that it could be sensible for an amateur to apply additional mitigation techniques such as a reduction of transmit power, additional filtering and/or a frequency separation to avoid causing interference to LTE systems". Fitting filters to our systems is not a bad thing to recommend as it also benefits us in reducing potential for interference the other way, but we do need to up our game, technically, if we're not to find ourselves removed from the adjacent bands as well. Losing the release bands, while clearly a benefit to the UK economy, is far from trivial for amateur radio and will inevitably incur some changes and expense. It is, at best, an opportunity to show we can coexist; if this also accelerates DATV developments, that can also bode well for its use in other bands. In my opinion, the potential for interference in the adjacent bands seems very low if we up our game in this way, especially if you put it in the context of some quotes from the consultation document, such as, "Each year between 2010 and 2012 we (Ofcom) received between 4 and 14 cases of interference where amateurs had caused interference to other spectrum users. These instances were across all amateur bands across the UK and Crown Dependencies over 53 different bands from 135.7kHz to 250GHz." If you put this in the context of "79,779 people and 1,486 clubs hold UK amateur radio licences" and then look at the usage of 2.3 and 3.4GHz; "Narrow band: ~200 users in the 2300 and 3400MHz amateur bands" and "TV repeaters: 8 transmitting or receiving in the MoD release bands or any of the adjacent bands", I think the chances are small of Ofcom getting in to a situation where dealing with interference cases becomes too onerous.

PHOTO 1: The equipment used at Ventnor for the UK 76GHz record. Photo: G8ACE.

ACTIVITY NEWS. This month's report has a real millimetre wave flavour, with the summer bringing a burst of activity on the 76GHz band and two new records. Also, further to my recent report of the 77GHz EME tests, Sergey, RW3BP has posted a presentation on the web about his test [2].

New 76GHz World Record. On 6/13/3013 at 2342GMT, Bob, KF6KVG and Goran, AD6IW reclaimed the world distance record at 76GHz for the USA. The previous record was 228km from DL2AM and DL2GWZ, but they achieved distance of 252.49km from Mt Hamilton CM97DI to Kings Canyon National Park DM06MS. They made two way contact on FM and SSB with strong signals at both ends. The equipment they used was: KF6KVG – 1ft dish, 20dBm Tx, 6dB NF Rx, locked DRO oscillator; AD6IW – 2ft dish, 21dBm Tx, 6dB NF Rx, locked DRO oscillator, 432MHz IF using FT-817.

New 76GHz UK Record. John, G4EAT reports that during the past 12 months the UK's 76GHz operators upgraded their equipments with more power and LNAs for another go at the UK 76GHz record. On 9 June 2013, G8KQW, G8ACE and G3PYB operated from Ventnor, IOW and G4EAT, G8CUB, G0FDZ went to Ditchling Beacon in Sussex. G8KQW's 76GHz signals were immediately heard at S9! QSOs were achieved by all operators and a new UK record was established. With such big signals on the day, the Ditchling group moved to Firle Beacon, Sussex to test at 94km. From the lower car park, one by one, all operators had a QSO on 76GHz, further extending the UK distance record. QSOs were in SSB, FM and CW. John reflects that not only had all operators improved their equipment performance by typically 6 to 10dB but had been very lucky with the weather. Millimetre wave signals are attenuated by the water vapour in the atmosphere. Last August the warm humid weather gave an attenuation of 0.525dB/km but this June 2013 event was in cool dry air with an attenuation of 0.274dB/km, giving an overall 20dB+ benefit! The gear at the Ventnor end is shown in **Photo 1**.

Equipment used: G8KQW – Tx 13.7mW A1 multiplier, 250mm lens horn antenna (LHA); Rx 150mm LHA. G8ACE – Tx 4mW

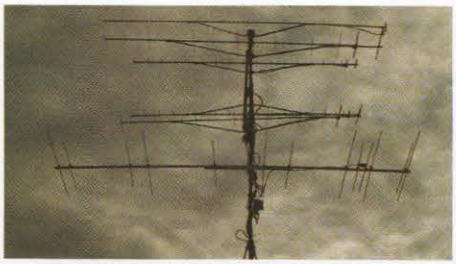


PHOTO 2: The tower at G8JVM. Photo: G8JVM.

FM, NEC Pasolink 300mm Tx ant; Rx NEC Pasolink ant, LNA. G3PYB – Tx 30mW Impatt multiplier, Tx ant 45cm; Rx ant 45cm, DB6NT mixer. G4EAT – Tx 5mW linear amp (LNA), Tx ant 130mm LHA; Rx ant 130mm LHA, MEDL fundamental mixer. G8CUB – Tx 80mW linear amp, Tx ant 130mm LHA; Rx ant 130mm LHA, LNA. G0FDZ – DB6NT transverter with 250mm LHA Tx/Rx.

OTHER ACTIVITY. There's plenty going on lower down and there is a full activity section in the excellent UK Microwave Group members' e-magazine, *Scatterpoint* [3], reporting continued interest in activity on the microwave bands from Scotland, with GM3OTI, GM0USI and GM8BJF taking to the hills and getting some excellent results with QSOs down in to the Midlands. They also mention a new mode for the 21st century: 'Wind Turbine Scatter'. I regularly get backscatter on GB3CAM on 10GHz from my local wind farm if the blades are facing the correct way. You can hear a recording of this on my YouTube channel [4].

Running and maintaining multiple GHz bands from a limited location is a real challenge and sometimes we have to make compromises as our interests vary. I for one seem to be continuously taking my two gable end poles up and down to change bands or do maintenance! G8JVM (IO82sp) updated me on his activities on that front. Richard is QRV on all bands from 50MHz to 10GHz but his recent addition of a 5+6 YU7EF antenna for 50 and 70MHz means that he's had to reduce the weight on his tower by removing all the masthead transverters and his dish to a mast on the side of the house. Remaining on the tower (**Photo 2**) he now has just his 67-ele for 1.3GHz plus his VHF antennas.

5.7GHz EME ACTIVITY. 5.7GHz seems to be gaining some traction as a popular microwave EME band. A number of well-equipped stations are operational worldwide and it has, unlike 2.3GHz, a common frequency allocation. Howard, G4CCH (IO93ql) [5] updated me on his activities on that band and **Photo 3** shows some of his hardware under test. Between May and June, using just 10W to his 5.4m dish, Howard worked 24 'initials' in 16 DXCC entities over 5 continents. Now, not everyone can sneak a 5.4m dish past their neighbours, but I've been doing the sums on my own small 1.9m dish for 5.7GHz operation and I'm convinced enough to be making plans for that band myself. It will be a challenge, but to quote JFK, "We choose to go to the moon in this decade and do the other things. Not because they are easy, but because they are hard."

RAL MICROWAVE ROUND TABLE 2013. The annual RAL Microwave Round Table is organised by Harwell Amateur Radio Club and was hosted at Rutherford Appleton Labs at Didcot, Oxfordshire on Sunday 9 June. There was the usual flea market along with Chris, GW4DGU demonstrating and selling his new 10GHz transverter PCBs. The flea market was made exceptional this year by the presence of Sam, G4DDK who has been tasked with the silent key sale of the contents of Russ, G4PBP's workshop to raise money for the Hospice where Russ spent his last weeks. Both Russ and his XYL wanted the parts to be used and appreciated rather than ending up in loft somewhere or on eBay, so attendees got some real bargains with much high quality kit and the Hospice benefitted with a fine donation!

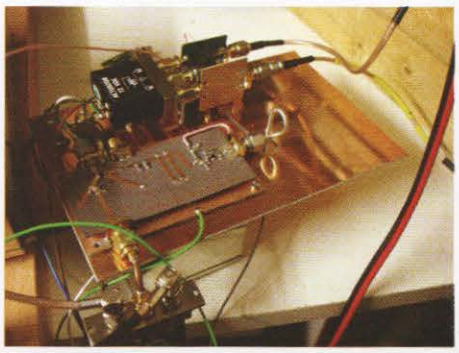


PHOTO 3: G3CCH's 5.7GHz transverter under test. Photo: G4CCH.

BEACON NEWS. Amongst the estate of the late G4PBP we found the former GB3CEM 10GHz beacon that was removed from Russ' father's QTH a few years ago. Russ had rebuilt it using a reverse DDS unit ready for JT4 mode. As I write this, I'm in the process of checking it out and reprogramming it to go in to service at Clacton. The Martello Tower Group [6] has a site and we just need to sort out the antenna. Hopefully it should be QRV by the autumn on 10368.945MHz running CW and JT4 as GB3PKT. The beacon will run 1W to a slotted waveguide antenna and during the CW sequence it will send "GB3PKT JO02MT Russ" as a fitting memorial to a much missed microwaver.

NEW UKuG CHAIRMAN. It's the end of my three year tenure as Chairman of the UK Microwave Group and I'm standing down. I'm pleased to announce that Chris Bartram, GW4DGU has agreed to become Chairman for 2013/14. Chris is a very well known, active microwaver and technical expert as well as playing a mean fiddle and double bass! I'm sure you'll join me in wishing Chris well in his new role.

FINALLY, SOME SAD NEWS. John Brown, G3DVV passed away on Sunday 16 June. John was one of the old timers of the microwave bands and will be remembered by many. Unfortunately he was not able to compete in contests over the last year, but was always listening on the bands from HF to 10GHz and had twice weekly sked with G8AIM on 2.3GHz.

UPCOMING MICROWAVE EVENTS AND CONTESTS

Jul 19–21	AMSAT-UK Colloquium, Holiday Inn, Guildford, Surrey www.uk.amsat.org/Colloquium/
Jul 21	0900 – 1700 UKuG 24GHz – 1THz Contest
Jul 23	1900 – 2130 2.3GHz And Up UKAC
Jul 28	0600 – 1800 UKuG 5.7GHz/10GHz/24GHz Contest
Aug 4	0900 – 1700 Microwave Field Day
Aug 20	1900 – 2130 1.3GHz UKAC
Aug 24-25	French 1296MHz And Above activity day
Aug 25	0600-1800 5.7GHz/10GHz/24GHz Contest
Aug 27	1900 – 2130 2.3GHz+ UKAC
Sept 9	UKuG Crawley Microwave Round Table
Sep 13-15	UKW Tagung Weinheim, www.ukw-tagung.de/
Sept 27-28	National Hamfest, www.nationalhamfest.org.uk/
Sept 28-29	French 1296MHz And Above activity day
Oct 6-11	European Microwave Week, Nuremberg, www.eumweek.com/
Oct 11-13	RSGB Convention, www.rsgb.org/rsgbconvention/
Oct 18–19	Microwave Update, Morehead, Kentucky, www.microwaveupdate.org/
Oct 26-27	French 1296MHz And Above activity day
Nov 2	Scottish Round Table, www.rayjames.biz/microwavert/

WEBSEARCH

[1] Ofcom consultation on 2.3 and 3.4GHz: http://stakeholders.ofcom.org.uk/binaries/consultations/public-sector-spectrum-release/summary/condoc.pdf
[2] 77GHz EME presentation www.vhfdx.ru/faylyi/view-details/radiolyubitelskie-raschetyi/eme_on_77ghz-pdf
[3] www.scatterpoint.org/
[4] www.youtube.com/watch?v=joKxKgOgOIE
[5] Swedish EME meeting papers: www.moonbouncers.org
[6] www.g4cch.com
[7] www.martellotowergroup.com

QRP

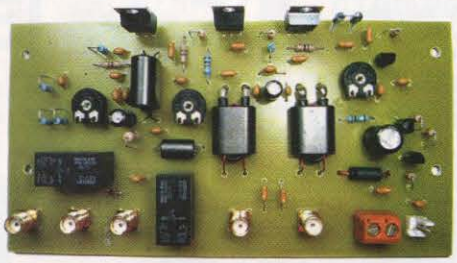
Homebrew at Dayton

FOUR DAYS IN MAY. In May I was fortunate to return to the Dayton Hamvention, the world's largest amateur radio event, in Dayton Ohio. The event takes place over Friday, Saturday and Sunday in the third week in May. But my main interest is in the QRP symposium which takes place on Thursday. The addition of this extra day gives it the title of Four Days in May. Organised by the American QRP ARCI, the event gives a complete day of lectures by international speakers followed by social events in the evenings of the following three days. The activity takes place in a Dayton hotel block booked for some 200 plus QRP enthusiasts.

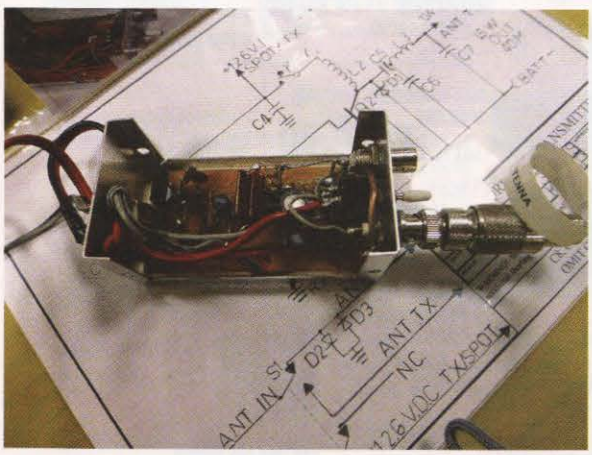
A fine replica Paraset 'spy' transceiver built by Bob Kellogg, AE4IC.

One of the evening events was a 'show and tell' of homebuilt equipment. This varied from very simple to very complex projects. One project had a definite historical context. Some readers will recall the *Kon-Tiki* expedition of 1947, when a small group under Thor Heyerdahl sailed on a balsa wood raft from Peru to Polynesian islands to show that the islands could have been settled by people from South America. On the expedition amateur radio equipment was used to maintain contact. Gary David, KD9SB is a keen QRPer and a sailboat enthusiast and decided to build a small solar powered 20 and 40 metre transmitter for his boat. He named it *Kon-Tiki* in honour of the expedition. The transmitter was on display with full information for anyone to build it.

Another exhibit with an historical context was a fine replica Paraset 'spy' transceiver built by Bob Kellogg, AE4IC. Bob was the first American I ever contacted by e-mail in the early 1980s when I was using the KA9Q DOS based software. Bob's Paraset closely follows the appearance of the original transceiver and has been used on 80 and 40 metres. A rather more complex and very well built exhibit was a 20 metre QRP SSB transceiver by Harold Smith, KE6TI. I remember Harold from the Four Days in May Homebrew Challenge of 2010. This was to build a single signal QRP transceiver using 72 parts or less. I was a judge for that competition and all the judges were unanimous in choosing Harold's innovative 80 metre transceiver.



DX Kits new 20 watt HF linear amplifier.



Gary David, KD9SB built a small solar powered 20 and 40 metre transmitter for his boat.

NEW UK KITS. Adrian Lane, 2E0SDR has written to me saying that DX Kits is a new small company run by Andy Hunter, G6LBQ and Adrian. Andy spearheads the company with his kits and modules and has gained popularity in the QRP world after developing the world famous G6LBQ Multiband BitX transceiver.

Andy is currently working on new kits and modules to form an exciting new modular multiband HF transceiver. All of their kits and modules are designed to be easy to construct and there is an active Yahoo support group to discuss projects, download information and get help should it be needed. They welcome new members to the Yahoo Group, which can be found at http://uk.groups.yahoo.com/group/g6lbq.

Whilst their kits and modules are aimed at building a multiband HF transceiver they could also be utilised for other projects.

Their most recent modules are a 20 watt HF linear amplifier and a super digital VFO module with full electronic bandpass and lowpass filter switching.

For those constructors with a good stock of parts they also offer just the PCBs for most modules. The DX Kits website can be found at www.dxkits.com and over time they will be adding some exciting projects and useful components for the avid home brewer.

NEW QRSS/WSPR KIT. Hans Summers, G0UPL has just announced a multimode QRSS and WSPR transmitter kit. The kit features DDS-controlled output frequency (through-pin DDS module, no SMD soldering); plug-in low pass filter boards (available for 9 HF bands); 24-character LCD + two-button user interface; user-programmable (callsign, message, speed, FSK, mode, etc); settings in EEPROM, GPS interface, for locking the frequency, timing and location information; on-chip generation of WSPR encoded message (no PC required); WSPR Maidenhead locator can be generated from GPS-derived latitude/longitude; selectable 'frame' size, for stacked QRSS reception; plain CW callsign identifier at selectable interval. The kit produces 150mW RF output on 30m (lower output on higher frequency bands). Higher output power may be obtained by using an additional PA transistor and/or higher PA supply voltage.

The kit supports the following modes: QRSS mode (plain on/off keyed slow CW); FSK/CW mode (frequency shift keyed slow CW); DFCW mode (dual frequency CW); WSPR mode (Weak Signal Propagation Reporter); Slow-Hellschreiber (frequency shifted slow-Hell); Full-speed Hellshreiber; Half-speed ('DX') Hellshreiber; CW (plain CW) and Customisable FSK patterns. Further details can be found at http://www.hanssummers.com/shop.

A REMINDER. Don't forget that the G QRP Club Convention (in conjunction with the Halifax Radio Society) will be held at the Rishworth School in Ripponden, West Yorkshire HX6 4QA on Saturday 20 October. It opens at 10am and has all the usual annual attractions.

Further details at www.gqrp.com.

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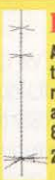

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Connectors	Length	Price
PL-259 - PL-259	0.6m	£13.99
PL-259 - PL-259	1m	£16.99
PL-259 - PL-259	4m	£24.99
PL-259 - PL-259	20m	£49.99
BNC - BNC	1m	£16.99

MT-3302

Heavy duty universal mount. **£34.99**

Includes 5m cable

SUPER-GAINER RH-9000 (BNC)

Tx: 2m/70cm. Rx:25MHz-3GHz (38cm). **£34.99**

MT-6601

Adjustable roof rack/window bar mount SO-239. **£19.99**

SUPER-GAINER RH-9090 (SMA)

SMA version of RH-9000 **£38.99**

NEW NOISE FILTER!

A superb TDK 'snap fix' ferrite clamp for use in Radio/TV/ Mains/PC/ Phone etc.

Simply close shut over cables and notice the difference! Will fit cables up to 13mm diameter. Ideal on power supply leads/mic leads/audio leads/phone leads.

2 for £16.99 / 5 for £36.99 (P&P £5.00)

6mm SNAP FERRITES NOW IN STOCK. 2 for £14.99, 5 for £30. P&P £5.00

COAX BARGAINS

True military spec real UK coax

RG-58 Military spec x 100m. **£49.99** *or 2 for £90.00*

Coax stripping tool (for RG-58).....£8.99

RG-213 Military spec x 100m (10mm dia). **£149.99**/100m *or 2 for £260.00*

WESTFLEX 103 (100m) £149.99

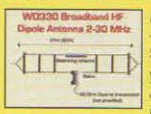
D-308B DELUXE DESK MIC

(with up/down). Many amateurs (over 4000) have been pleased with it's performance. Includes 8-pin round Yaesu mic lead. Icom/Kenwood & other leads available. Phone (£24.99 each). Replacement foam windshield £3.00 + P&P.

8-pin modular plug converting to 8-pin round Yaesu adapter £24.99

£99.99

NEW DIAMOND WD-330



Amazing performance. Twin folded dipole. 2-30MHz – and it really works. No ATU required (25mts long). Supplied with 30 mtr PL-259 feeder – ready to go. If you want great transmission, look no where else. Japanees quality made product

SALE **£219.99**

NEW DIAMOND BB6W

2-30MHz (250W) 6.4m long. End-fed wire antenna. Icludes matching balun. Sling up & away you go.

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W-8010 DIAMOND SHORTENED DIPOLE

80-10m & only 19.2m long! (Up to 1.2kW) Includes 1:1 Balun. Bargain. Superb Japanese quality antenna system.

SALE **£139.99**

Q-TEK PENETRATOR

"We've sold 100s all over Europe"

★ 1.8 - 60MHz HF vertical ★ 15 foot high ★ No ATU or ground radials required ★ (200W PEP).

SEND SAE FOR LEAFLET **£219.99**

NEW Wire Penetrator 50ft long (1.8-70MHz).....£189.99

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CW-160	(160-10m) 80m long	£175.99 P&P £10.00
CW-80	(80-10m) 40m long	£150.99 P&P £10.00
CW-80S	(80-10m) 20m long	£150.99 P&P £10.00
CW-40	(40-10m) 20m long	£139.95 P&P £10.00

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SUPERB QUALITY ENCAPSULATED TRAPS (P&P £5)

80m (pair) Inductors/Traps..... £59.99
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Baluns 1:1 or 4:1 or 6:1 .....£39.99 each P&P £5

Traps 80m or 40m or 20m or 15m.....£39.99 pair P&P £5

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RS-502 1.8-525MHz (200W) .....£79.95 P&P £6.50

RS-102 1.8-150MHz (200W) .....£59.95 P&P £6.50

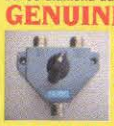
RS-402 125-525MHz (200W) .....£59.95 P&P £6.50

TM-3000 1.8-60MHz (3kW) Incls mod meter .....£69.95 P&P £6.50

RS-40 144/430MHz Pocket PWR/SWR.....£34.99 P&P £5

DL-30 diamond dummy load (100W max).....£29.99 P&P £5

GENUINE COAX SWITCHES (P&P £6.00)



2 way CX-201 (0-1GHz) SO239.....£26.99
2 way CX-201 'N' (0-1GHz) 'N' £32.99
4 way CX-401 (0-500MHz) SO239.....£79.95
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MH-IC8 8 pin Yaesu mic (8-pin round).....£44.99 P&P £5
MH-4 4 pin fits older HF, etc. (4-pin round) .....£39.99 P&P £5
MH-31A8J 8 pin modular .....£39.99 P&P £5
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20 foot swaged mast set (4 sections 2 inch x 5 foot) **£59.99**

3 sets for £99.99

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2 inch to 1.5 inch £26.99
2 inch to 1.25 inch £26.99
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No tuning required

2m/5 element	No tuning required	SO-239 feed	£47.99
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70cms/10 element	No tuning required	SO-239 feed	£52.99
70cms/15 element	No tuning required	SO-239 feed	£69.99
6m/2 element	No tuning required	SO-239 feed	£94.99

DIAMOND COLLINEARS

DIAMOND V-2000

6m + 2m + 70cm. 2 section (2.5m long) PL-259 fitting. Superb quality. Our price **£124.99**

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X-30 2M/70cm (1.3M-3.5/5.5db)	£52.99
X-30N "N"-Type version of above	£54.99
X-50 2M/70cms (4.5/7.2db-1.7M)	£64.99
X-50N "N" Type version of above	£69.99
X-200N 2M/70cms..(6/8db-) 2.5M -N type	£89.99
X-300N 2M/70cms (6.5/9db) 3.1M N type	£94.99
X-510N 2M/70cms (8.3/11.7db) 5.2M-N-type	£144.99
X-700H 2M/70cms (9.3/13db) 7.2M	£259.99
x-5000 2m/70CMS/23CMS (4.5/8.3/11.7DB) 1.8m	£129.99
X-6000 2M/70cms/23cms (6.5/9/13db) 3M	£179.99
VX-1000 6M/2M/70cm (1.4M)	£129.99

DIAMOND VSWR METER:

SX-100..(1.6-60MHz)3KW	£84.99
SX-200..(1.8-200MHz)) 200W	£89.99
SX-400...(140-525MHz)200W	£89.99
SX-400N.."N" Type version of above	£92.99
SX-600.. (1.8-525MHz) 200W	£154.99
SX-600N.."N" Type version of above	£169.99
SX-1100.. (1.8-1300MHz-with gaps) 200W	£219.99

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MX-2000 50/144/430MHz Triplexer	£84.99
TSA-6011 144/430/1200MHz Triplexer	£84.99
MX-72 144/430MHz	£39.99
MX-72 "N" 144/430	£42.99
MX-62M (1.8-56MHz + 76-470MHz)	£79.99
MX-610 1.8-30MHz + 49-470MHz (S-239 conn's)	£99.99

Q-TEK COLLINEARS (VHF/UHF)

Del £10.00

X-30 GF 144/430MHz, 3/6dB (1.1m)..... £49.99
X-50 GF 144/430MHz, 4.5/7.2dB (1.7m)..... £64.99
X-300 GF 144/430MHz, 6.5/9dB (3m)..... £89.99
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2" mast-floor base plate	£19.99
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12" T & K brackets (pair)	£24.99
18" T & K brackets (pair)	£28.99
24" T & K brackets (pair)	£32.99
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U-bolts (1.5" or 2") each	£2.00
8mm screw bolt wall fixings	£1.70
8-nut universal clamp (2" to 2")	£9.99
2" extra long U-bolt/clamp	£7.49
2" crossover plate with U-bolts	£18.99
15" long (2") sleeve joiner (1.5" also available)	£19.99
3-way guy ring	£9.99
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Heavy duty guy kit (wire clamp, etc.)	£49.99
Set of 3 heavy duty fixing spikes (~0.7m long)	£29.99
30m pack (4.4m) 480kg B/F nylon guy	£15.00
Roll of self-amalgamating tape 25mm x 10mtr	£8.99

All our brackets are of high quality, British made and galvanised.

International Marconi Day 2013

How the Gordano Amateur Radio Group took part from Flat Holm

BACKGROUND. International Marconi Day (IMD) celebrates the birthday of Guglielmo Marconi and is usually held on the Saturday closest to his birthday of 25 April. For 2013 this was 20 April.

Just three years ago the membership of the Gordano Amateur Radio Group had declined to only six members from its heyday of approximately forty members in the 1980s. I was the newest member and had recently participated in the CW Field Day contest for another local club and been bitten by the contesting bug.

During one of the Gordano club meetings at the local pub, I mentioned to the other members of the club that it might be a good idea to get involved in contesting or just general Activity Days. After a few sharp intakes of breath, a couple of the membership expressed an interest, with the remainder, although not wishing to operate, agreeing to help out in the preparations for any event.

Our first event was the 2010 SSB HF Field Day – we operated for the full 24 hours using one radio and antenna from a tent in a nearby field using our club callsign, G6GRG/P. The event was a great success and was repeated again in 2011 using the newly obtained club callsign of M0TSL/P.

During this period, I managed to get other members – Lyns, G0AZE and Dave, G4CXQ – joining in with the 80m Club Championship contests on SSB and CW which, although we never achieve particularly high individual scores, are extremely useful for general contesting practice and for bringing new blood into contesting.

Around this time our club was interested in trying to boost our membership and Bob, G8SPC, our club treasurer/secretary, put out a mail shot amongst those amateurs found in the call book who happen to live locally. From this we managed to gain five new members – Mal, G4KPM, Michael, G1UPP, Martin, M0HCT, Peter, 2E0GKA and John, 2E0WCT.

At club meetings during 2012 a topic often discussed was what other contests or events could we all participate in. As the club does not have its own fixed operating station, any events where we could all participate would have to be either field day type contests, special events or just general activity days.

Flat Holm operating.

INTERNATIONAL MARCONI DAY. Someone suggested that we might like to participate in International Marconi Day during 2013 and operate from Flat Holm Island, which can be seen from our club meeting place. This was thought to be achievable and it was agreed to do further research.

Flat Holm has significance to IMD because it is where Marconi first demonstrated that wireless signals could be sent over the open sea to Lavernock Point near Cardiff – a distance of approximately 5 miles!

PREPARATION. Research revealed that Flat Holm is a Welsh entity (GW) and has an IOTA reference of EU-124. The island is uninhabited except for a warden and day visitors and is a nature reserve. There are a few very old buildings on the island, some even having a roof, including a small farmhouse now used as accommodation for the island warden and visitors. It also has a barracks that is now used for educational purposes and could be used as our radio operating position. Electrical power on the island is provided by solar PV panels and a small wind powered generator charging up batteries. A 24kW generator is available when solar/wind generation is insufficient.

As the island was closely connected with Marconi, it is often activated on International Marconi Day by the Barry Radio Club. A courtesy call to one of their members revealed that they were not intending to activate the island this year for Marconi Day. This call was also used to 'interrogate' the Barry club member regarding the logistics of operating on the island and some very useful information was obtained regarding antenna positions and requirements. One item of equipment that he said was essential was hard hats or safety hats. When queried, the reason given is that the island is also a gull sanctuary and that the gulls deem visitors as good moving target fodder!

As our club had never undertaken anything like this before and had no club owned equipment, the logistics seemed a bit daunting – even for a very small expedition like this. I now have a new-found appreciation for those who organise the big DXpeditions to the far flung corners of the world.

PLANNING. A few planning meetings were held in the months leading up to our planned visit, with each member of our team being delegated certain responsibilities to ensure that everything was ready before we set off.

The plan was to obtain an NoV for a GBxIMD call. As luck would have it GB5IMD was available and was taken out to cover a three-day period of 19 to 21 April. International Marconi Day being designated as the 20 April for 2013.

Our intentions were to operate two stations on HF, both operating from the barracks. Station 1 would run an FT-1000MP into a doublet antenna and operate on the lower HF bands. Station 2 would also run an FT-1000MP into a 2 element SteppIR antenna. Due to equipment restrictions we would not be taking a rotator or band filtering. Logging was to be done using SD logger running on two laptops. Paul, EI5DI, the author of SD kindly gave us a special key file for this event – thanks Paul!

An extra wire antenna was also to be taken, just in case of failures.

From the clubs membership, seven were interested in travelling to the island and operating. These being Jim, M0JWB,

Lyns, G0AZE, Bob, G8SPC, Mal, G4KPM, Michael, G1UPP, Martin, M0HCT and Peter, 2E0GKA. Unfortunately, Bob, G8SPC had to pull out due to illness, leaving six of us to operate.

Arrangements were made with Cardiff Councils Flat Holm project team to book the island for our three day stay. It must be said that the cooperation provided by the staff at their offices was absolutely fantastic. They had to deal with our barrage of questions relating to island logistics and various questions of a technical nature.

All seemed to be progressing far too smoothly then, in late 2012, Cardiff Council advised us that the lease on the island maybe sold off imminently and that our trip may be in jeopardy. We were advised that a decision on whether or not our planned visit could take place would not be available until the end of February 2013. There was nothing we could do except to wait patiently for further news. Fortunately, towards the end of February news came through that our visit could now proceed as the lease on the island had been extended until later in the year. However, the company operating the ferry service on behalf of the council no longer had the contract and we now had to arrange our own ferry transport to and from the island.

A number of local ferry operators were approached and were either far too expensive or could/would not operate the ferry on the days we required. It must be remembered that the Bristol Channel has the second highest tidal range in the world and that deeper draft vessels run the risk of grounding when approaching the island slipway. Fortunately, we found a ferry operator based at Cardiff docks who was both reasonably priced and could operate on the days that we required. The ferry vessels they used were open RIBs (rigid inflatable boats) that meant that all of our equipment had to be carefully weatherproofed to avoid seawater and rain ingress. It also meant that there was a weight restriction of 1000kg of equipment including all of our personal belongings, food and water for the team.

Marconi Day is, officially, for the 24 hour period of 0000UTC to 2400UTC on Saturday 20 April. However, as we had the NoV for the entire 3 day period of our stay, we decided to operate as GB5IMD for the duration.

THE DXPEDITION. In the days leading up to our departure, spring had not yet sprung and the weather was still rather wintry. Fortunately, the weather changed for the better on the day of our travel and we all made the journey from Portishead to Cardiff docks to load up the ferry boat in glorious weather. The boat was fitted with twin 200hp outboard engines and all of our equipment was loaded in at the front. Fully loaded it could accommodate up to twelve passengers. Once out of the lock gates at Cardiff the boat skipper opened up both engines to full throttle. The bow lifted nicely up out of the water and we were bouncing across the sea towards Flat Holm. A quick look at the vessel's instruments and satnav revealed that the speed was just under 40 knots. At this speed it was inevitable that some sea spray was whipped up and blown into the boat but, as all equipment was well packaged, this was of no real concern – it would have been a different matter had the weather been worse.

The team that took part in IMD 2013. L-R (rear) Mike, G1UPP, Peter, 2E0GKA, Martin, M0HCT, Lyns, G0AZE, Mal, G4KPM, Bob, G8SPC (front) Jim, M0JWB.

Within 15 minutes we had arrived at Flat Holm and there was a welcoming committee of the island warden and a volunteer who both assisted us with unloading our equipment and transporting it up the steps leading to the top of the cliff. From here, the island tractor and trailer transported our equipment up to the barracks.

While we were assembling our two stations, the island warden filled us in on some of the practicalities of staying on the island. As the island had electrical power from solar PV and a wind generator that charged up batteries, we had assumed that this applied to the entire island. The warden told us that this only applied to the residential area of the island and not the barracks area, which is where we would be operating from. The barracks did indeed have electrical power but had its own, smaller, solar PV system but no wind generator. This simply charged up a smaller bank of batteries. This meant that it was highly likely that there would be insufficient battery capacity for us to operate throughout the night as well as day, especially with the inevitable boiling of kettles etc for refreshment. The warden then said that we could use his small diesel generator during the night and whenever the batteries were low on charge.

Once all the equipment had been set up, we began operating both stations from approximately 1400UTC on Friday 19th right through until approximately midnight on the Saturday. Sunday morning was spent doing a little casual operating and dismantling the station in readiness for our return trip on the ferry.

During the Friday evening, we decided to start up the generator, which was easier said than done. After about twenty attempts of priming, exhausting hand-cranking and having it kick back, the heavy diesel generator was finally started. We found ourselves stinking of commercial red diesel for the rest of the evening!

We had intended to operate 80m and 160m on Station 1, especially during the evening/night periods but it was immediately noticeable that this was not going to be possible as there was very high QRM levels experienced on these bands. This was thought to have been originating from the inverters used to supply the mains power from the batteries. This was a major problem as it meant that Station 1 was limited to operation on 40m with very occasional forays into 20m when Station 2 was taking a break.

Over the course of Friday afternoon and then the entirety of Saturday we had worked a total of 415 QSOs on Station 1 (lower bands) and 221 on Station 2 (higher bands). Not a particularly huge number as this was a very casual operating experience for us all. 10/12m band conditions were not very favourable and the majority of the long-haul contacts were obtained on 20m.

Just as we were leaving the island the weather conditions changed for the worse and it was rather a wet ferry trip back to shore. The equipment survived it all without any disasters though!

WHAT NEXT? Everybody who participated in GB5IMD thoroughly enjoyed the experience. I would imagine that at our next club meeting the topic of where we go next will be raised. Well, SSB Field Day is in our calendar but perhaps a natural progression to this might be participation in an IOTA event. I'm still dreaming of activating a Pacific island though!

WEBSEARCH

www.g4kpm.co.uk/flat-holm-expedition-april-2013.html

Start Here

The basics of inductors

INTRODUCTION. An inductor is an electronic component with the property of inductance. All conductors have inductance between their ends but the term inductor is usually reserved for a component that has an artificially increased inductance compared to a straight wire. This may be implemented in several ways including curling the wire into a coil, surrounding the wire by a ferromagnetic sleeve, or winding the coil on a ferromagnetic core. But first we must understand a few things about inductance.

BASIC THEORY. Inductance is a difficult concept because it uses quantities and units which are not common, everyday terms such as volts, amps and watts. We will start with the fundamentals: electric current in a wire (symbol I) always surrounds itself with a magnetic field, (H), which is proportional to the current As in the case of Ohm's Law, where volts working against resistance causes a current to flow, so here, magnetic field, working against magnetic resistance, causes a magnetic flux, Φ, to flow. Magnetic field is measured in units of amps per metre, ($A.m^{-1}$). Magnetic resistance is usually defined in terms of its inverse, magnetic permeability, μ. Magnetic flux is measured in Webers, symbol Wb. The intensity or density of magnetic flux, B, is measured in Webers per square metre, $Wb.m^{-2}$, which is given a new name, the Tesla. Hence we have a sort of analogue of Ohm's Law connecting these quantities: $B = \mu \times H$. Magnetic permeability, μ, therefore has the units of $Wb.m^{-2}/A.m^{-1} = Wb.A^{-1}.m^{-1}$.

The total magnetic flux, Φ, depends on the product of the current, I, and a factor dependent on the geometry and environment of the wire, L. So we can write $\Phi = L \times I$.

The factor, L, is a sort of 'figure of merit' for magnetic flux and is measured in Webers per amp. This figure of merit is called Inductance and the unit, Webers per Amp, is given the separate name, Henry, symbol H. (The unit Henry, H, must not be confused with the commonly used symbol for magnetic field, also H, which is measured in Amps/metre). It can now be seen that permeability, μ, can also be expressed as Henrys per metre, ($H.m^{-1}$).

IN PRACTICE. So much for the theory connecting all these strange terms. The commonest geometry referred to above for increasing the inductance of a wire involves curling the wire into a coil so that the magnetic field resulting from the current effectively couples to the wire many times. The magnetic field and flux is therefore equivalent to many wires each carrying the same current. The magnetic flux from the wires links with the wires each time they pass the reference point, resulting in the inductance L (in Henrys) being proportional to the square of the number of turns of wire. Other methods for increasing inductance include embedding the wire in, or threading it through, a material of different permeability, μ, from air. For convenience, permeability, μ, is separated into the product of μ_0, the permeability of free space, ($4\pi \times 10^{-7}$ $H.m^{-1}$), and μ_m, a simple numerical factor describing a 'figure of merit' for the material surrounding the wire, such as air (whose value is 1) or iron (value in the order of 1000).

Inductors have another vitally important property apart from increasing magnetic flux per amp. This depends upon Maxwell's equations and, in particular, upon the one stating: "A changing magnetic field generates an electric field". From this is derived Lenz's Law, which states that "a changing current through an inductor produces a changing magnetic field which tends to induce a current in a direction opposing the original change in current". Thus, an inductor offers an 'impedance' to a change in current through it. As the rate of change in current is proportional to the frequency of the current through the inductor, the higher the frequency for a given inductance, the greater the impedance. This important fact is often made use of to filter out radio frequencies from DC and lower frequencies in radio science.

The use of iron to greatly increase the inductance of a coil has its limitations, as iron is not only a magnetic material but is also a moderately good conductor. Currents can therefore also be induced in the iron. These unwanted currents, called 'eddy currents', flowing through the resistance of the iron, heat it and lead to power loss in the inductor. The eddy current loss can be ameliorated by dividing up the iron making up the core of an inductor into thin insulated slices or laminations perpendicular to the direction of the eddy currents; this is effective up to several 10s of kHz. Another similar technique is to use fine iron dust set in a plastic or fired clay mix, which is suitable for use up to the low MHz range. However, at higher frequencies, up to 100s of MHz, ferrite, a ceramic magnetic insulator, is used. Another potential problem which must be taken into account when using iron or ferrite to increase inductance is that its permeability, μ, is only constant at low flux levels. At higher flux levels it 'saturates' and its permeability falls.

The reasoning about the loss in core materials applies to both mains and audio transformers, which tend to have their cores made out of laminated iron. Transformers in switched mode power supplies, operating at 10s of kHz, and inductors for VHF, usually have their cores made of an iron dust mixture or ferrite. Inductors and transformers operating at UHF and beyond tend to have air cores. Unfortunately, a really low loss magnetic material of high permeability has yet to be developed, although some progress has been made in recent years.

Small wire ended inductors intended for use at radio frequencies are often colour coded, rather like resistors, with two adjacent spots or rings indicating digits and the third indicating a multiplier. The total figure shows the inductance in microhenries. However, colour coding of inductors is less reliable than for resistors and it is advisable to measure an inductor before replacing or inserting one in a circuit.

Lenz's Law, described earlier, applies equally well to a separate coil tightly magnetically coupled to the first. Here also a current can be induced, and this is the basis of the 'transformer', which is another subject.

SYMBOLS. The circuit symbols for an air cored inductor, a ferromagnetic cored inductor, a ferrite ring or bead on a wire, and an iron cored transformer are shown in **Figures 1a, b, c** and **d** respectively.

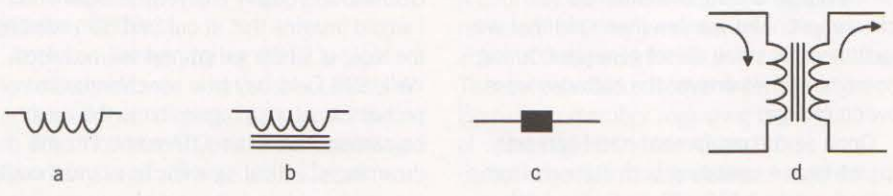


FIGURE 1: Inductor circuit symbols with (a) air core, (b) ferromagnetic core, (c) a ferrite core or ring on a wire and (d) an iron cored transformer.

Sport Radio

New milestones in HF contest participation and an original way of entering the 80m Club Championships

YOUR RSGB THE BEST CONTESTS

NEW MILESTONES. Roger Western, G3SXW is well known for taking part in major events and keeping his finger on the pulse of activity, so I was particularly interested to receive some figures and graphs from him (produced by Doug Zwiebel, KR2Q) regarding participation in a basket of major international contests.

While a few doomsayers are putting it about that contesting is on the decline, the figures for participation say exactly the opposite. Doug's data covers the last 17 years (1996 – 2012). **Figure 1** shows that over that period, the participation in all of the major series has more than doubled. Participation in some has more than trebled and participation in the CQWW WPX series has more than quadrupled. Separating the modes reveals that the one that has seen the biggest increase in participation is RTTY (**Figure 2**). Over the period, participation in each of the world's major RTTY contests has more than trebled. Once again WPX has seen the greatest increase – this time by a factor of more than twelve! Whilst modern computers and software have been the obvious driver for some – maybe even most – of the increase in RTTY activity, I think the ability for us to e-mail our logs or upload them to robots has made it easy for casual participants (who at one time might not have bothered to submit an entry) to do so. And that, of course, applies to all modes.

In the past 17 years naturally there are some events where activity has declined, indeed some have even been withdrawn, but from my perspective the overall picture of worldwide contesting is one of great health.

CONTROLLING THE COSTS. Keeping costs under control is an important aspect of all kinds of business and enterprise. They always have been, but these days it seems even more so. A few months ago some ideas were floated about how the Society might reduce the costs associated with contesting trophies. Basically, it was suggested that trophies could be presented as they are now (at the RSGB Convention), but would be kept on display at the National Radio Centre (NRC) and not taken home by the winners. Several responses were received and the decision made that if a trophy winner wants to take a trophy away it would be allowed, as long as the winner was willing to fund the cost of its return, which is the major element of the cost of running the scheme.

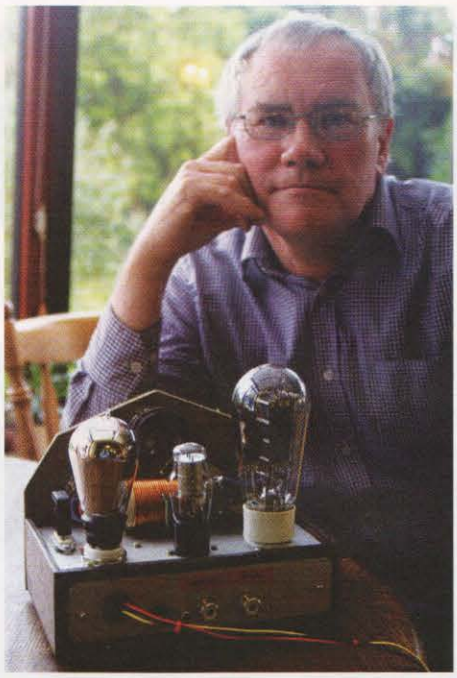


PHOTO 1: Colin Chidgey, G3YHV used a homebrew QRP transmitter using vintage valves.

Readers may remember that this subject was introduced in the April *Contest Committee Newsletter*, together with a request for input from contesters. The purposes of the suggested changes were to reduce the cost to RSGB HQ of maintaining and managing the trophies presented at the RSGB Convention, to improve the efficiency and appeal of these presentations and to provide a more lasting reminder of winners' success.

From 2014, trophies will no longer leave the custody of the Society, except when they are collected by the recipient (or someone acting on their behalf) and an undertaking obtained from the recipient to arrange and pay for the cost of their return. All winners will be responsible for trophies whilst in their possession, or in transit to/from HQ. Trophies not collected will be displayed at the NRC. Trophies (or bases upon which they stand) will continue to be engraved with the winners' names. For those who wish to attend the RSGB Convention to receive a trophy but not take it away, it will be presented and then returned to the NRC. All winners will receive a small plaque, suitably engraved, that will be theirs to keep. The plaques will be presented at the Convention or posted to winners who are unable to attend, at the Society's expense. A 'Virtual Hall of Fame' will be provided on the Contest Committee website, listing past winners.

CLUB CHAMPIONSHIPS REVIEW. Although the final events of the 2013 80m Club Championships series were still to take place when this column was written, a definite pattern of results was developing. A lead was opening up for the Three A's Contest Group in the General Clubs section and Norfolk ARC were dominating the Local Clubs section.

The most original activity I heard about in this year's series was by Colin Chidgey, G3YHV. In the CW sessions he used a homebrew QRP transmitter using vintage valves (**Photo 1**). Colin says "I built the transmitter using vintage parts given to me by the late Andy Cowley, M1EBV. Initially I used a PP5-400 triode, circa 1930, for the PA stage. The oscillator valve was even older: a Mullard PM3 from 1926. I used this in the Club Championship contest with great results. 70 contacts were achieved [crystal controlled on 3560kHz]. I later discovered the transmitter was only producing about three watts output. I have now redesigned it with a PT25H pentode PA stage and an Osram DE5A triode for the oscillator. The DE5A was first introduced in 1924 and the transmitter is now producing a healthy ten watts output. To make the contest even more interesting I used an HRO receiver, which is relatively new as it dates from 1941. It went a bit drifty on me at one stage and I had to give its coil pack a quick wipe-over with WD40. Try doing that with a TS-990!"

So where are the 80m Club Championships headed? This year the Three A's Contest Group recruited a lot of experienced contesters who were not already operating for existing teams. As there is no limit to team sizes the result is that they have put together a formidable army of operators, so it's not surprising they have done well. Whilst there is nothing illegal in doing so, I'm wondering if there should now be another review of the rules. It was only in 2012 that the Local and General

RSGB HF EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Aug 4	RoPoCo 2 *	0700-0830	CW	3.5	RST + full postcode received
Aug 14	80m Club Sprint	1900-2000	CW	3.5	Both callsigns + SN + name
Aug 29	80m Club Sprint	1900-2000	SSB	3.5	Both callsigns + SN + name

RSGB VHF EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Aug 3	4th 144MHz Backpacker	1300-1700	All	144	RS(T) + SN + Locator + Postcode
Aug 3	144MHz Low Power +	1400-2000	All	144	RS(T) + SN + Locator + Postcode
Aug 4	432MHz Low Power +	0800-1200	All	432	RS(T) + SN + Locator + Postcode
Aug 6	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
Aug 11	5th 70MHz Cumulative	1400-1600	All	70	RS(T) + SN + Locator
Aug 13	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
Aug 20	1.3GHz UKAC	1900-2130	All	1.3G	RS(T) + SN + Locator
Aug 27	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
Aug 27	SHF UKAC	1900-2130	All	2.3-10G	RS(T) + SN + Locator

BEST OF THE REST EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange/info
Aug 4	Microwave Field Day	0900-1700	All	1.3G, 10G	RS(T) + SN + Locator
Aug 10-11	WAE DX CW	0000-2359	CW	3.5-28	RST + SN (EU works non-EU only)
Aug 25	UKuG Cumulative	0600-1800	All	5.7-24G	RS(T) + SN + Locator
Aug 25	IRTS 2m Counties	1300-1500	SSB/FM	144	RS(T) + SN (EIs & GIs also give county)

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

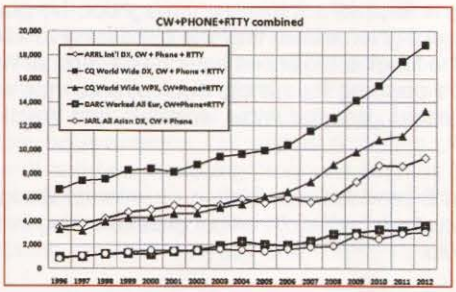


FIGURE 1: Participation figures for a basket of major international contests.

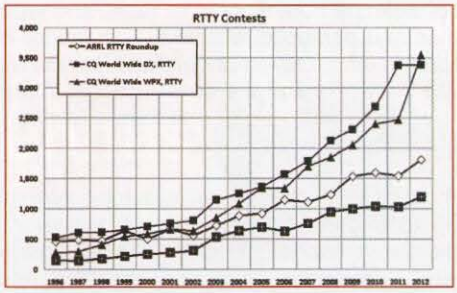


FIGURE 2: Participation figures for major RTTY contests.

categories were introduced. Norfolk ARC are definitely a strong local club and fit well into that category, while Three A's are obviously General because they have members across the whole country. What I'm wondering is whether there should also be a Regional category, for clubs that find themselves too constrained by the 35km limit of the Local category but don't have members across the length and breadth of the land. 'The squeezed middle', as we often hear it referred to. Personally, I wouldn't advocate limiting team sizes, because (1) it would turn the 80m Club Championships into something like a weekly version of the Affiliated Societies contests, and (2) it would make it impossible for the contest co-ordinators of clubs to say to their members that every QSO by every participant counts. The fact that there is no limit to the size of a team is what has made the 80m Club Championships such an inclusive and successful event.

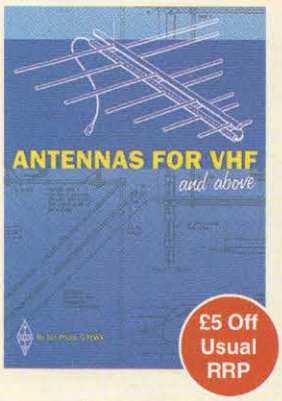
THIS MONTH'S EVENTS. RoPoCo 2 is the first contest of the month. It is held early on the morning of Sunday 4th. At one time both RoPoCo events were CW, but RoPoCo 1 (held in April) was then changed to SSB, leaving RoPoCo 2 as a CW event. To make a good score you have to be really careful to copy the postcode received precisely and then pass it on to your next contact *as received*, even if you know it to be wrong. To prove the point, in RoPoCo 1 earlier this year there were very few error-free logs. I recall receiving my own postcode back in RoPoCo 1 in a seriously mangled form! The 80m Club Championship series ended last month and the new 80m Club Sprint series begins this month. The two series are quite different in nature and require different skills, so the clubs/teams that do well in one series often don't in the other. There is rather less activity in the Sprints than 80m Club Championships, so this year – so that contestants don't start running out of stations to work – the duration of each session has been shortened from 90 minutes to 60 minutes.

On VHF, the first weekend of the month is devoted to low power operation. It begins with the 4th 144MHz Backpacker Contest on Saturday 3rd. As per usual there are 3 watt 'Backpacker' and 10 watt 'Hilltopper' sections. Overlapping it time-wise, the 144MHz Low Power Contest runs for eight hours. In this event the maximum permitted power is 25 watts. On Sunday 4th the 432MHz Low Power Contest takes place. Traditionally some of the stations who operate portable in the 144MHz Low Power make a weekend of it by camping overnight, changing antennas and taking part in a second contest the following day. Once again the maximum permitted power is 25 watts. Finally, we move into the UKACs, with 2m on Tuesday 6th, 70cm on the 13th, 1.3GHz on the 20th and 50MHz on the 27th. On Sunday 11th the fifth and final 70MHz Cumulative takes place. This is a short contest, lasting just two hours. The remainder of the month is the territory of the UKACs; 432MHz on the 13th, 1.3GHz on the 20th and 50MHz and SHF on the 27th.

The UK Microwave Group's Microwave Field Day takes place on Sunday 4th. The bands in use are 1.3GHz and 10GHz. For the entire 48 hours of the weekend of 10-11th the first of this year's Worked All Europe contests takes place. In this event (this month CW, next month SSB) stations in Europe only get points for working stations outside of Europe. There are country multipliers and the added – and challenging – dimension of QTCs (reporting the details of previously held QSOs), which enables those who choose to send and receive them to boost their score significantly. Moving on to the final Sunday of the month, there are two events. First, the UK Microwave Group Cumulative Contest takes place on 5.7-24GHz. It's the fourth leg out of the 5-leg series. Finally, the IRTS 2m Counties contest is one in which non-EI stations can win an award. Last year there were only eight entries to this event, although the leading stations made dozens of contacts, so if you take part please submit a log – especially if you live in Northern Ireland. You might be pleasantly surprised if you do!

Antennas for VHF and Above

By Ian Poole, G3YWX



The VHF, UHF and microwave bands provide an exciting opportunity for experimentation with antennas. This book from well known author Ian Poole is a fascinating guide to what can be achieved in these bands.

Antenna sizes at these frequencies mean that they do not occupy great amounts of space and most people can experiment with constructing their own antennas. Antennas for VHF and above, provides both the basic theory and constructional details for many antenna designs. Included there are different types of antenna from dipoles to Yagis, and verticals to log-periodic antennas and parabolic reflectors. The reader is taken through the essentials in Ian's easy-to-understand fashion with details of the way the antenna works and the constructional information needed. The reader will also find helpful chapters covering measurements and installation techniques.

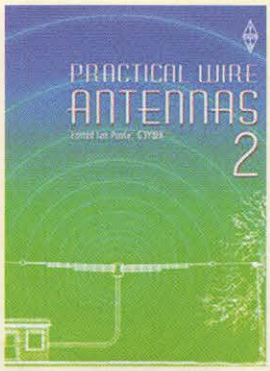
Antennas for VHF and above, is a mine of information for anyone wishing to understand or construct antennas for the VHF, UHF and microwave bands. This book is a valuable resource for anyone interested in antennas, whether a newcomer or experienced hand.

Size: 240x174mm, 144 pages, ISBN: 9781 9050 8645 0

Price £7.99

Practical Wire Antennas 2

Edited by Ian Poole G3YWX



Hugely extended and fully revised for the 21st Century. Nearly doubling in size with even more designs this book this practical book holds many complete and easy to understand recipes for a wide range of wire antennas.

Practical Wire Antennas 2 contains just about every type of wire antenna imaginable including plenty of original designs. You're sure to find one that is ideal for your own particular set of circumstances. Some will fit small urban gardens and others are best deployed by those lucky enough to have plenty of available space. Theory is kept to a minimum throughout the book, and only a few formulas are given where they are necessary to allow the reader to calculate the lengths of various antennas. *Practical Wire Antennas 2* has chapters covering feed lines, dipoles, antennas with tuned feeders, loop antennas, end-fed wires, verticals and practical aspects of antenna work.

Practical Wire Antennas 2 provides a collection of antenna designs and ideas that will help capture the enjoyment of experimenting in the true spirit of amateur radio.

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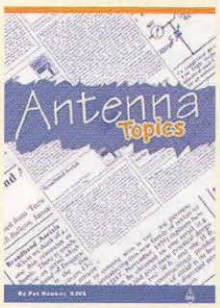
RSGB Members' Price £10.19



Antenna Topics

by Pat Hawker, G3VA

Pat Hawker has been writing his "Technical Topics" column in Radcom since 1958 and in this time has produced much excellent work in this time. This book is a chronological collection of cuttings of Pat's words over the years. Hundreds of areas and subjects are covered and many a good idea is included. Carefully indexed this book is not only a great reference work but also a history of over forty years of antenna design. At 384 pages this book is excellent value and asset to any amateur interested in antennas.

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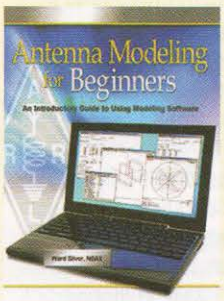

Antenna Modeling for Beginners

By Ward Silver, N0AX

Antenna Modeling for Beginners provides a basic guide to the powerful tools that can help you design antennas and optimise their performance.

With this book you' can set up basic modeling software, evaluate and adjust pre-designed models, and then create your own models.

If you have ever wondered about antenna modeling and are looking for reason to start, *Antenna Modeling for Beginners* may just provide that reason.

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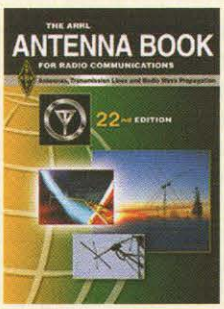

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Antenna books

RSGB shop

Successful Wire Antennas

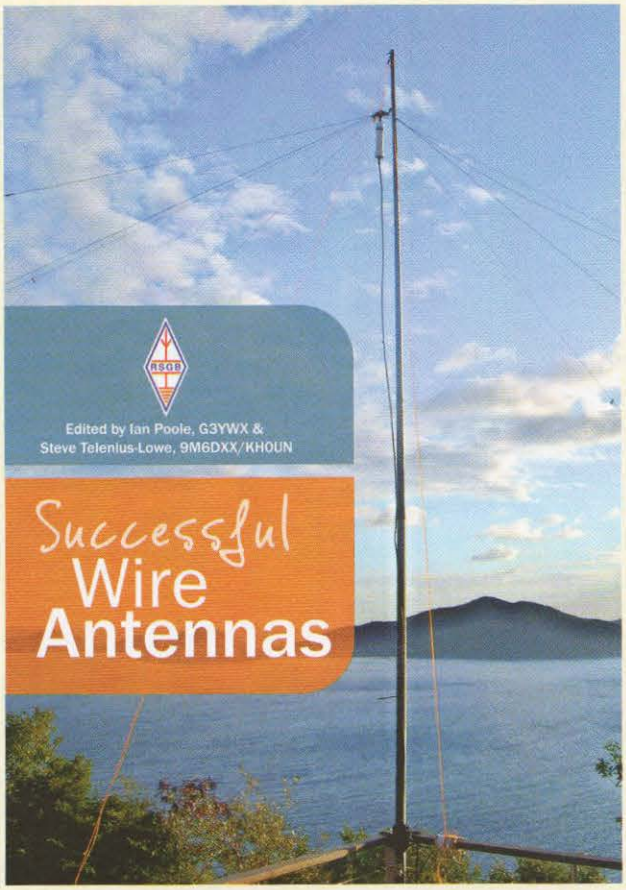
Edited by Ian Poole, G3YWX and Steve Telenius-Lowe, 9M6DXX/ KH0UN

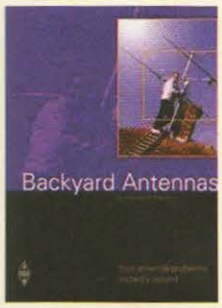
Successful Wire Antennas is an absolute must have. Packed with the very latest wire antenna designs and developments from around the world, it covers a vast array of wire antenna designs including dipoles, doublets, verticals, loops and end-fed wires, as well as subjects such as impedance matching, ATUs, baluns, feeders, antenna masts and rigging and there is even an introductory chapter covering the antenna basics.

Successful Wire Antennas is part of the hugely popular family of Practical Wire Antennas books published by the RSGB. Many subjects get covered for the first time or in much greater detail than before. The chapter on vertical antennas runs to 49 pages alone, covering a huge array of vertical antennas, from the standard quarter-wave vertical through extended quarter-wave verticals and their matching, shortened verticals, vertical dipoles, folded verticals, quarter-wave slopers, 5/8-wave verticals, the ever-popular inverted-L, the 'T' vertical for 160m, end-fed half-wave verticals and vertical Zepps, J-poles, wire verticals for DXpeditions, a vertical Moxon wire beam, a wire vertical Yagi design, the use of fishing poles as supports for efficient vertical wire antennas, kite-supported verticals and the use of radials. There is much more besides and the old favourites have not been forgotten, as we go back to the original words used by Louis Varney, G5RV, to describe his eponymous antenna - as well as providing a 21st century analysis of it. The use of antenna modelling programs such as EZNEC which make it possible to predict the gain, azimuth and elevation patterns, feed impedance and SWR of an antenna design, as well as the effects of different types of earth on the antenna are also covered here.

Size: 174x240mm, 240 pages, ISBN: 9781 9050 8677 1

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





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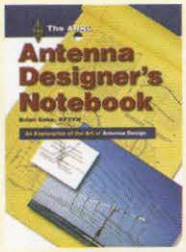

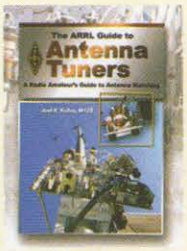

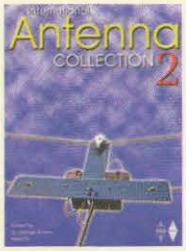

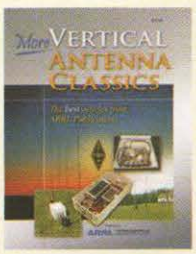

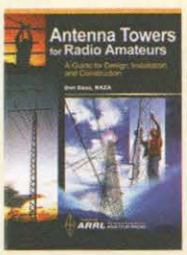

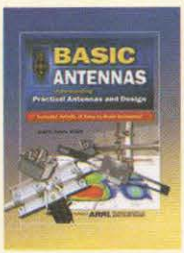

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RadCom

HF F-Layer Propagation Predictions for August 2013

Compiled by Gwyn Williams, G4FKH

Time (UTC)	3.5MHz 000011111220 246802468020	7.0MHz 000011111220 246802468020	10.1MHz 000011111220 246802468020	14.0MHz 000011111220 246802468020	18.1MHz 000011111220 246802468020	21.0MHz 000011111220 246802468020	24.9MHz 000011111220 246802468020	28.0MHz 000011111220 246802468020
*** Europe								
Moscow	6.....677	85.....4888	47.432447887	..777777784.	...7877787..	.....6...	.....	.....
*** Asia								
Yakutsk	.....	.....	42.....35665	..666667667.	...575.....	.....	.....	.....
Tokyo	.....	.....37..	.....4..	.....	.....	.....	.....	.....
Singapore	.....22.	.....888.	.....673.	.....65..	.....365..	.....	.....	.....
Hyderabad	.....	454	3555	.....3455.	.....3....	.....	.....	.....
Tel Aviv	92.....1899	99.....28999	37874	...3...577..	...4....66..	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	.....	.33.....5..	.24.....3..	..3.....3.	.....	.....	.....	.....
Perth	.....	.....2..	.....53..	.....	.....	.....	.....	.....
Sydney	.....	.....67..	.....366..	.....	.....	.....	.....	.....
Melbourne (LP)	.....	.597.....	78993.....4	77895.....58	...7.....77	.....7.	.....	.....
Honolulu	.....	.....	..53.....	...34.....	....5.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....4...	.....	.....	.....	.....
W. Samoa	.....	.....	.....	...343.....	....554.....	.....	.....	.....
*** Africa								
Mauritius	2.....122	6.....6887	8886	.....5887.	.....54..	.....	.....	.....
Johanesburg	.....	452	8873	.....87..	.....7...	.....6...	.....	.....
Ibadan	11.....11	67.....656	673.....4777	.47....37874	..66..3.88..	...7....88..	.....77..	.....
Nairobi	4.....33	84.....2888	64.....4666	6666	..3....5665.	.....4666..	.....5...	.....
Canary Isles	67.....566	877.....2888	8884...27888	5.853...8888	88899987	....8887997.	.....66..	.....4..
*** S. America								
Buenos Aires	.....	534.....3	768.....78	..5.....376	.....55.	.....5..	.....	.....
Rio de Janeiro	.....	554.....46	878.....788	4.4.....887	.....86.	.....7..	.....5..	.....
Lima	.....	533.....3	7663.....68	...4.....76	.....	.....	.....	.....
Caracas	.....	32.....3	7784.....78	4.474....588	....6544578.	.....474.	.....	.....
*** N. America								
Guatemala	.....	222.....	6563.....7	35	.....	.....	.....	.....
New Orleans	.1.....	662.....2	666.....6	56	.....	.....	.....	.....
Washington	33.....	774.....6	777.....57	3577	.....4.455.	.....	.....	.....
Quebec	65.....5	773.....57	3.....377	.....34567.	.....	.....	.....	.....
Anchorage	.....	.....	543.....35	66663	.....677.	.....	.....	.....
Vancouver	.....	.....	.....	.....	.....3..	.....	.....	.....
San Francisco	.....	.....	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....	.....	.....	.....	.....

Key: Each number in the table represents the expected circuit reliability, eg '1' represents reliability between 1 and 19% of days, '2' between 20 and 30% of days, etc. No signal is expected when a '.' is shown. **Black** is shown when the signal strength is expected to be low to very low, **blue** when it is expected to be fair and **red** when it is expected to be strong. The RSGB Propagation Studies Committee provides propagation predictions on the internet at **www.rsgb.org.uk/propagation/index.php**. An input power of 100W and a dipole aerial has been used in the preparation of these predictions; therefore a better equipped station should expect better results. The predicted smoothed sunspot numbers for July, August & September are respectively (SIDC classical method – Waldmeier's standard) 56, 55 & 54 and (combined method) 75, 78 & 80. The provisional mean sunspot number for June was 52.5. The daily maximum / minimum numbers were 95 on 21 June and 11 on 11 June.

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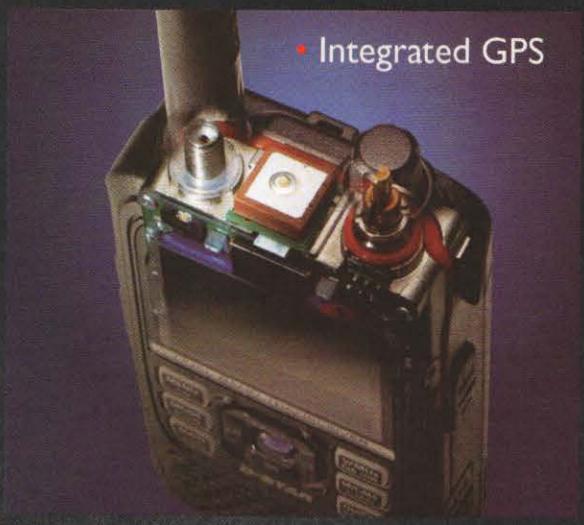

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Count on us!

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 September *RadCom* is 25 July and for the October edition it's 21 August. For GB2RS,the deadline is 10am on the Thursday for the week of broadcast. If you need to amend your club details, please visit www.rsgb.org/clubupdates.

INTERNATIONAL

PAFOS RADIO CLUB, CYPRUS
Richard, 5B4AJG, 00357 97857891, 5B4AJG@cyprusliving.org

NATIONAL

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

Cockenzie & Port Seton ARC
Bob, GM4UYZ,
01875 811 723,
www.cpsarc.com
2 Normal club night
9 20th annual mini-rally night
17 Weekend event Lighthouse weekend, Barns Ness GB2LBN

Kilmarnock & Loudoun ARC
Graham, MM3GDC,
mm3gdc@btinternet.com
13, 27 Club night
Livingston & DARS
Norman, GM1CNH,
07740 946 192,
uk.groups.yahoo/group/ms0liv
6, 20 Club evening
13 Operating evening
27 Morse code practice

Lothians RS
Alan J Masson, GM3PSP,
0131 623 4580,
alanjmasson@virginmedia.com
14, 28 Pub night

Stirling District Amateur Radio Society
John McGowan,
gm0fsv@gm6nx.com
1, 8, 15, 22, 29 Club meeting
4, 11, 18, 25 Construction, RCE training, projects as well as operating, 10.30am till late afternoon

West of Scotland ARS
info@wosars.org.uk,
www.wosars.org.uk
2, 9, 16, 23, 30 Club night with talks, quiz & raffle
7, 14, 21, 28 Construction night & licence preparation

Falkirk and District ARS held both Foundation and Intermediate exams in May. Congratulations go to Stewart, MM6CXA on passing his Foundation exam and Sandy, now 2M0TXR, on passing the Intermediate exam, both with flying colours. Best wishes go to both as they continue with their studies. The photo shows Stewart, MM6CXA (left), Ken, GM4NTX course tutor (middle) and Sandy, 2M0TXR (right).

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

REGIONAL MANAGER: DENNY MORRISON, GM1BAN, RM2@RSGB.ORG.UK

Aberdeen ARS
Fred Gordon MM0ODL, 01975 651 365
1 Junk sale
8 Visit to Aberdeen Lifeboat
15 Preparation for Lighthouse and Lightship weekend

REGION 3: NORTH WEST

REGIONAL MANAGER: KATH WILSON, M1CNY, RM3@RSGB.ORG.UK

Bolton Wireless Club
boltonwireless@gmail.com
12 Meteor scatter live, Richard, G4HGI & friends
26 Closed

Mid-Cheshire ARS
Peter Paul Fox, G8HAV,
01606 553 401
7 Final reassembly of equipment from VHF NFD
14 Test all stations
21 Committee meeting
28 Mast refurbishment

South Manchester R&CC
Ron, G3SVW, 01619 693 999
1 On the air
4 Car boot sale
8 Health and Safety in the shack, Ged, G8RSI
15 Secret War DVD
19 Technical forum
22 471kHz Activity Day review, Ged, G8RSI & Terry, G6CRF
29 LS3020 Pro desktop laser engraving and cutting machine, Chris, G8KRG

Stockport RS
Nigel Roscoe, 07973 312 699,
info@g8srs.co.uk
6 Antenna modelling, Carsten Steinhoefel, G0SYP/DL1EFD

Thornton Cleveleys ARS
John E Rodway, G4FRK,
01253 862 810
5 Normal club night
12 Lightship & Lighthouse weekend discussion
19 SSB & 2m Trophy contest discussion
26 2m net 8pm

Workington & D AR&IT Group
Barry Easdon, G0RZI,
01946 812 092,
barrydrm31@hotmail.co.uk
5 Phased vertical antennas, Paul, M1PAF
19 Club meeting and OTA

Newton le Willows Amateur Radio Club has been re-formed. The club initially closed after losing its regular venue in 2000. Members all kept in touch vowing to resurrect the club as and when possible. After a very long wait the Club has found new premises and the first meeting took place 22 May at Newton le Willows Sea Cadet Unit, 9-11 Cross Lane, Newton-le-Willows. Meetings are held every Wednesday from 7.30pm. www.nlwarc.co.uk.

REGION 4: NORTH EAST

REGIONAL MANAGER: HAROLD SCRIVENS, GOUGE, RM4@RSGB.ORG.UK

Denby Dale RC
Richard, M0RBG, 07976 220 126, m0rbg@talktalk.net
1 Yorkshire Day SES GB6YD from Cartworth Moor
7, 21 Club night
14, 28 Net, 7.30pm, 145.575MHz

Paul and Vicky Fleming both passed their Intermediate exam in June at the **Wakefield & District Radio Society**. The course tutor was Chris Lashmar, M0KJP.

South Tyne Traction Engine Society would like to say a big thank you to the **Northeast Amateur Radio Society** for putting on a good event at the Corbridge Steam Rally.

In May there were 9 Foundation level passes at **Hull & District ARS** and 3 Intermediate level passes at **Humber Fortress DX ARC**. Congratulations to all involved.

In May, **Wakefield & District Radio Society** had three successes in the Intermediate exam. Left to right are Michael, M6FMC, Mick, M3ZKU and Paul, M6MEB. The instructor was Chris, M0KJP.

Three candidates from **South Tyne Side Amateur Radio Society** passed their Foundation exam. They are, from left to right, Ray Overy, Adrian Forrerter, Robert, M0LGV (instructor), Allan, M0HGV (instructor) and Ryan Mason. Congratulations to all candidates. The Society is taking names for the Foundation and Intermediate courses, so if you are interested please contact Darren, 2E0MTY on 0751 1968 073 or call into the club on Monday from 7pm at Saint Peters Church Centre, York Avenue, Jarrow NE32 5LP.

Halifax & District Amateur Radio Society is pleased to announce its latest successes in the amateur radio examinations. In May, all three candidates passed the Intermediate exam and in June, all six Foundation exam candidates (pictured below) passed their exam. From left to right: (back) John, Sean Eric, Ronnie, (front) Darren, Vicky. The club is pleased that most of the Foundation candidates have expressed the desire to continue with the Intermediate course.

After collecting many QSL cards over the years, the **Pontefract & District ARS** finally had sufficient countries confirmed to be awarded the ARRL DXCC certificate. They had the certificate framed and presented to the Club secretary, Sue Jones, 2E0SUJ in May when 13 members of the club put on a field day station in Sue and Dave, G0SDO's garden. They provided excellent food, teas and coffees throughout the day.

Pontefract & District ARS members and their families met at the home of Sue and David Jones on Saturday 6 July. It was glorious weather, though band conditions were not so good. The event was more of a social occasion for the group rather than operating, though good contacts were made including 7X2ARA. The photos show Nigel, G0BPK slaving away over a hot BBQ and Mark, M0ZIM, at the microphone.

Many congratulations to the RSGB and the foresight of the founders for ensuring that we would have such glorious weather 100 years later for the BBQ!

REGION 5: WEST MIDLANDS

REGIONAL MANAGER: VAUGHAN RAVENSCROFT, M0VRR, RM5@RSGB.ORG.UK

Aldridge & Barr Beacon ARC
Albert, G0KFS,
01922 614 169
5 On air
19 CW tuition

Bromsgrove & DARC
Chris, M0BQE,
01905 776 869,
g3vgg@hotmail.com
2 Mobile operation from the club garden
9 VHF night
16 Committee
23 Training on the FT-1000 and FT-2000 operation
30 HF night

Central Radio Amateur Circle
Martin Hallard, G1TYV,
07906 905 071,
radio-circle@live.co.uk
1, 29 On the air
15 Group meeting

Cheltenham ARA
Derek Thom, G3NKS,
01242 241099,
treasurer@caranet.co.uk
15 Natter night with data comms
20 Lunch at Cross Hands, Brockworth
24 Garden party

Coventry ARS
John, G8SEQ, 07958 777 363
2 Coventry's waste management, Andrew Walster
5, 12, 19, 26 Club net on 145.375MHz
9 BBQ & society portable night at Newbold Comyn
16 3rd Round G4ZMC Trophy at Parkfield Rd, Newbold on Avon
23 Closed
30 Radio workshop

Gloucester AR&ES
Anne, 2E1GKY,
01242 699 595, daytime,
www.g4aym.org.uk
5, 19 Closed
12 Operating/picnic, antennas of own choice, Saul Junction
26 Operating at Crickley Hill

Midland ARS
Norman, G8BHE,
07808 078 003
7, 21 Open meeting, shack on the air and training classes
14 General meeting and ragchew
18 Rugby Radio rally at Princethorpe College
28 Members holiday discussion, shack open

Rugby ATS
Steve, G8LYB,
01788 578 940,
stephen@tompsett.net
3 RF connectors, Steve, G8LYB
10 Final rally preparations
18 Rugby ATS annual radio rally
24 Rally post mortem
31 Practical project session

Salop ARS
www.salop-ars.org.uk
1 Tabletop sale
8 Natter night / committee meeting
15 Summer social
22 Fox hunt with Ken, G8DIR as the fox

South Birmingham RS
Mick Cleary, G7RRP,
07595 696 359,
g7rrp@btinternet.com
2, 9, 16, 23 Shack and aerial work
5 Open meeting and ragchew
6, 13, 20, 27 Coffee morning 11am to 1pm
19 Sorting out equipment for Telford Rally
26 Closed
30 Loading trailer for Telford rally on Sunday

Sutton Coldfield ARS
Robert Bird,
spirit.guide@hotmail.co.uk
5, 19 Open net, 145.250MHz, 7.30pm
13 Open net, 70.475MHz, 7.30pm
12, 26 Meeting and on the air at Warmley Rugby Club, 7.30pm

Telford & DARS
Mike, G3JKX, 01952 299 677,
mjstreetg3jkx@blueyonder.co.uk
7 Committee meeting and GX3ZME on the air
14 Beginners' practical project proposals
21 Hamfest preparations
28 4th DF hunt

Wythall Radio Club
Chris, G0EYO, 07710 412 819
2, 9, 16, 23, 30 Shack social
4, 11, 18, 25 Club net on 145.225MHz, 8pm
6 Morse class, free 'n' easy, 144MHz UKAC Contest
13 Morse class, committee meeting
26 Curry night at the Monsoon
27 Morse class
29 RSGB 80m Club Sprint Contest

Lew Williams was a grand man who taught many of the senior members of **Wythall Radio Club** the joys of Morse code. When Lew passed away a few years ago, it was thought appropriate to honour his memory in a suitable manner and so the Lew Williams Shield was born. In order to win this trophy, Wythall Radio Club members are asked to view the 31 days of May as a Morse code activity month. The shield is awarded to the club member who has shown some kind of commendable contribution to the event. It involves showing some evidence of improvement, however small, in some aspect of his/her Morse skills. The presentations this year

were made by top CW UK contester/DXpeditioner and Wythall Club Member, Lee, G0MTN.

John Daws (no callsign yet!) joined the club Morse class during 2013 as a precursor to getting a licence. His progress has been phenomenal and when he passes his licence later this month, he will be Wythall Radio Club's first ever Foundation licensee to make his debut on air on CW! He received a Certificate of Merit. Another certificate went to Alf, G1MJO. Alf is in his late 80s and never passed the old 12wpm Morse test but has shown real stick-ability and persistence, even appearing on air and taking some faster Morse sent by other members with a very high level of accuracy. The main award however went to John, G4OJL, who was an original founder member of the club in the early 1980s. He rejoined both the club and the hobby last autumn, after nearly 30 years QRT! Returning to the club, he found a new love for radio but especially learning the code and has spent every day (bar one!) since last autumn doing 30 minutes of practice a day! Now he is exclusively a Morse man on HF. So in case anyone thought otherwise, Morse code is most definitely **not** dead, not at Wythall Radio Club anyway!

Worcester Radio Amateurs Association would like to congratulate its latest Intermediate and Foundation candidates. All six passed with flying colours. Richard, 2E0RUC, Richard, 2E0RHE, Terry, 2E0TEH, Steve, 2E0WFO and Duncan, 2E0TLG, who travelled from Presteigne on his Moto Guzzi motorcycle and, finally, a new Foundation licence for Nick, M6NUR. They are all very keen to get on the air with their new calls. They were tutored by lead instructor Pete, G0WXJ. Both Richard, Steve and Terry are now studying hard towards the Advance exam. Well done all. If anyone is interested in an attending the upcoming course or sitting the Advanced exam, please contact secretary@m0zoo.co.uk. From left to right are Steve, 2E0WFO, Terry, 2E0TEH, Rich, 2E0RUC, Pete, G0WXJ, Rich, 2E0RHE, Duncan, 2E0TLG and Nick, M6NUR.

The regular Wednesday meeting of **Midland Amateur Radio Society** was a BBQ evening that was arranged by the social secretary Jackie. Many members attended and plenty of food was consumed.

REGION 6: NORTH WALES

REGIONAL MANAGER: MARK HARPER, MW1MDH, RM6@RSGB.ORG.UK

Dragon ARC
Stewart Rolfe, GW0ETF, 07833 620733
19 Homebrew DDS based signal generator,MW0SEC

North Wales Radio Society
Liz Cabban, lizcabban@vodafoneemail.co.uk
1 General meeting
8 Technical topic
15 On the air
22 Natter night
29 Rally planning meeting

Powys ARC
Dave, GW4NQJ, 07870 827 887, www.parc.care4free.net
1 Garden party at QTH of G4JUW & Chris
24 On air at the Berriew Show

REGION 7: SOUTH WALES

REGIONAL MANAGER: JIMMY SNEDDON, MW0EQL, RM7@RSGB.ORG.UK

Aberystwyth & DARS
Ray, GW7AGG, 01970 611 853, ray@clocktower.go-plus.net
8 Closed
29 Club night on the air on 145.500MHz then 145.550MHz

Carmarthen ARS
Lloyd, 2W0LLT, 01239 711 297, 2W0LLT@talktalk.net
6 Annual barbecue
20 Open night

Llanelli ARS
Craig, MW0MXT, 01269 845 773, craig@mw0mxt.co.uk
5 GC0EZQ on the air
12 Social evening and club raffle
19 DVD night
26 Closed

REGION 8: NORTHERN IRELAND

REGIONAL MANAGER: PHILIP HOSEY, MI0MSO, RM8@RSGB.ORG.UK

Mid Ulster ARC
Brian Burns, MI0TGO, muarc.secretary@yahoo.co.uk
6, 13, 20, 27 Shack night including 20m radio constructor sessions
17 Lighthouses on the air weekend from Haulbowline Lighthouse
24 Club display and demo at the Ulster Aviation Society open day

In June, **Bushvalley Amateur Radio Club** activated Kilrea Royal Observer Corp Bunker. A great day was had with quite a few contacts and a barbecue. Future activations are planned in other ROC bunkers and details will be published at www.freewebs.com/bushvalleyarc/.

Mid Ulster ARC have two shack nights planned for late July – the 23rd and 30th. There is also mini DXpedition to Coney Island, Lough Neagh, Northern Ireland to coincide with the Islands on the Air weekend on 27 and 28 July. Details on their website, www.muarc.com.

REGION 9: LONDON & THAMES VALLEY

REGIONAL MANAGER: LARRY SMITH, G4OXY, RM9@RSGB.ORG.UK

Bromley & DARS
Andy, G4WGZ, 01689 878 089
20 BBQ and operating evening
Burnham Beeches RC
Dave, G4XDU, 01628 625 720
5 Pub meeting at Dorney
19 Shack evening
Chesham & DARS
Terry, G0VFW, 01442 831 491, cdars.club@ntlworld.com
3, 4 144MHz Low Power Contest
7 General meeting & on the air
14 PCB design, Mike, 2E0ERE
21 Members' forum
28 Preparing for HF SSB Field Day
Coulsdon ATS
Steve Beal, G3WZK, secretary@catsradio.org
12 Barbecue at the QTH of G4RWW
Cray Valley RS
Lawrie, G4FAA, 0208 300 1894 evenings and weekends, secretary@cvrs.org
1 Natter night
15 Club meeting
Dorking & DRS
Garth, G3NPC, 01737 359 472, www.ddrs.org.uk
27 Social evening
Edgware & DRS
Mike, G4RNW, 02089 500 658, michael.stewart5@ntlworld.com
9 Closed
23 Natter night
Newbury & DARS
Rob, G4LMW, 01635 862 737, g4lmw@btconnect.com
14 80m Club Sprint CW
28 DF techniques at the London Olympics, Chris, G3VEH
29 80m Club Sprint SSB
Radio Society of Harrow
Linda, G7RJL, 02083 868 586, www.g3efx.org.uk
18 GX3EFX/P at Old Redding
25 GX3EFX/A at Harrow in Leaf weekend event
Reading & DARC
Pete, G8FRC, 01189 695 697
8 On the air and outside broadcast blue van, Tony, G1HDB
22 Meet in the bar
Southgate ARC
Mr K Mendum, G8RPA, g8rpa@arrl.net
14 Barbecue in the Spinney
Stevenage & DARS
Martin Juhe M0XJP, 07973 793 770, m0xjp@mjdesignprint.com
6 Talk
10 Worked All Europe DX CW contest
13 APRS / Nick's latest project, Nicolas, M1HOG
20 QSL night
25 Milton Keynes ARS Rally
26 Huntingdon ARS Rally
27 Synthetic aperture microphones, Martin, G8KDF
30 Net, 7.30pm, 145.450MHz
Surrey Radio Contact Club
John, G3MCX, 020 8688 3322, john.g3mcx@btinternet.com
5 The curious story of the Crystal Palace 'lost' railway by Barrie McKay of the Crystal Palace Museum
19 Informal chat, move-it-on and fix-it evening
Sutton & Cheam RS
John, G0BWV, 020 8644 9945, info@scrs.org.uk
15 Contesting decomposed, Alun Cross, G4WGE
Verulam ARC
Ralph, G1BSZ, 01923 265 572, g1bsz@aol.com
8 Social with GB3VH repeater group at the Rose and Crown Pub, Sandridge
20 The sun and propagation, by Roger, M0RKB, plus members' Bring & Buy
Wimbledon & DARS
Andrew Maish G4ADM, 02083 353 434
2 Barbecue at summer camp

On 19 and 26 June, **Verulam ARC** were the holders of the RSGB's Centennial Special Events callsign G100RSGB. By operating on the majority of bands and using a range of modes, the Club logged a grand total of 2746 QSOs. Videos of the club in operation can be seen on the Verulam ARC YouTube channel.

Four students passed their Intermediate exam at the end of May after attending a course run by Roger, M0RKB of **Verulam ARC**. The picture shows them holding items that they constructed as part of the course and exam requirements, left to right are Peter Alley, Godfrey Hope, Steve Cotton and Rari Miranda. The Club is planning to hold a Foundation course starting in September 2013. More details from Ralph Nash, G1BSZ on 01923 265572 or e-mail g1bsz@aol.com.

Newbury and District ARS had a special 4 hour mini Intermediate course in May 17. This was just to hold the practical for two candidates and the exam, neither of whom were local to the area. One had been ill at the previous course, the other had been too late to enrol. One candidate was MW6BWZ who flew back from India where she was working purely for the exam! She is now 2W0CUD. The other candidate was Robert, M6CEK. The photo shows, from left to right, Heather MW6BWZ, course assistant Tom, G4TPH, invigilator Stuart, M0RXX then Robert, M6CEK on the right.

The weather held off just enough for the Newbury Radio Rally on Sunday 16 June at the Newbury Showground in Berkshire. This was its 26th year; it has become an extremely popular and enjoyable rally and something that the members of the **Newbury and District Amateur Radio Society,** who run the rally, are very proud of. Demonstration areas on amateur radio were available for people to see and try, and many trade and club stands attended this year. NADARS Chairman Jeremy, G4DOQ said "Every year the number of attendees increases, with interest not just from the amateur radio fraternity wanting a bargain from the 100+ traders, but also from the general public who come to find out more about our fascinating hobby. With people travelling from all parts of the UK, the Newbury Radio Rally is one of the largest gatherings of its kind in the south of England with well over a thousand visitors coming through the gates this year. In fact the callsigns of some of the people entering the rally's free prize draw of a 2m/70cm transceiver (kindly donated by Yaesu) showed us that they also came from outside the UK including Germany, Holland and America!" The photo shows Roger, G4RUW, Steve, M0SEL and Kevin, G6FOP on the NADARS club stand.

REGION 10: SOUTH & SOUTH EAST

REGIONAL MANAGER: MICHAEL SENIOR, G4EFO, RM10@RSGB.ORG.UK

Basingstoke ARC
Tim, G3PJD, 07754 132 859
19 Emerging technology
Brede Steam ARS
Steve, 01424 720 815, M0NUC@aol.com
3, 6, 13, 20, 27 At the shack
15 Lighthouses on the Air
Crawley ARC
John, G3VLH, 01342 714 402
21 EME demo and talk, Mike, G0KAD
Fort Purbrook ARC
Neil Hoare, M0NEH, 02392 378 559
30 AGM and natter night
Harwell ARS
Malcolm, G8NRP, 01235 524 844, info@g3pia.org.uk
13 Closed
Hastings E&RC
Gordon, 01424 431 909, gordon@gsweet.fsnet.co.uk

www.radioclubs.net/herc/
28 Natter night & radio operation at the Taplin Centre
31 Away day to *HMS Belfast* radio room

Horndean & DARC
Stuart, G0FYX, 02392 472 846, www.hdarc.co.uk
1 Natter night/social evening
4 Coach trip to Gloucester
15 Restoration of a CR-100 receiver, Andrew,G0AMS

Horsham ARC
Alister, G3ZBU, 01932 242243, www.harc.org.uk
1 How Space weather affects radio comms, Dr Colin Forsyth
15 Social at The Cricketers, Wisborough Green

Southdown ARS
John, G3DQY, 01424 424 319
5 Coils and capacitors, Peter, G6GVM
7 Operating at Hailsham shack

Worthing & DARC
John, G8FMJ, 01273 593 232
4 Monthly breakfast meeting at the Goring Café
7 The internet and why my PC runs slow, Andrew, G1VUP
14 Discussion evening + 80m CW Sprint Contest
21 Club barbecue
28 GX3WOR on the air
29 80m SSB Sprint contest

REGION 11: SOUTH WEST & CHANNEL ISLANDS

REGIONAL MANAGER: PAM HELLIWELL, G7SME, RM11@RSGB.ORG.UK

Appledore & DARC
Brian Jewell, M0BRB, 01237 473 251
Zepp Net Monday, Tuesday and Thursday from 4pm, 145.450MHz
Wednesday via GB3DN 4pm
HF net on Friday at 4pm, 7.185MHz ±QRM

Bristol RSGB Group
Robin, G3TKF, 01225 420 442
26 RSGB training update from the T&E Chair G0FUW

Cornish Radio Amateur Club
Steve, G7VOH, 01209 844 939, G7VOH@btinternet.com
1 Main meeting
15 Workshop evening
16 3 days operating GX4CRC at the Steam Engine Rally
23 3 days operating GB2VWJ at the Volkswagen Jamboree

Exeter ARS
Nick, M0NRJ, 01363 775 756, info@exeterars.co.uk
5, 12, 19, 26 Net on 3.675MHz at 7.45pm
6, 13, 20, 27 Net on 145.575MHz at 7.45pm

Mid Somerset ARC
Nick, 2E0FGQ, 01749 346320, nick.bennett@midsarc.org.uk
13 Club night
27 Social at The King's Arms,

Plymouth RC
Robert Goodall, 01752 777888, robert.2e0itn@gmail.com
13 Myth buster evening, Chris Wingate, M5CJW
17 Weekend event for ILLW at Smeaton's Tower

Poldhu ARC
Keith Matthew, G0WYS, g0wys@yahoo.co.uk
6 Telecommunications in WW1, Dr Elizabeth Bruton

Poole Radio Society
Bill Coombes, G4ERV, secretary@g4prs.org.uk
2, 16, 23, 30 Activity Night
9 10-minute talks on antennas
11 Hamfest
18 Day in the park

Riviera ARC
Alan Wyatt, G2DXU, rivieraarc@gmail.com
2 3 day event at Torbay Steam Fair with GB4TSF on air
6, 13, 20, 27 Club meeting, MX0RIV on the air
7, 14, 21, 28 Net on 145.425MHz, 8pm
9 Operating MX0RIV or SES at Brixham Harbour

South Bristol ARC
Andrew Jenner, G7KNA, 07838 695 471
1 Darts tournament
8 APRS
15 Lighthouses briefing
17 International Lighthouse Lightship Weekend
22 Cell phone forensics
29 Open house and OTA

Torbay ARS
Dave, G6FSP, g6fsp@tars.org.uk
2, 9, 16, 23 Natter nights
30 Mid Cornwall Beacon & Repeater Group, Keith Holland

John, M0HFH has taken over from Tony, G0WMB as **Thornbury and South Gloucestershire ARC** secretary. The club would like to thank Tony for the many years of service and his assistance with the changeover.

REGION 12: EAST & EAST ANGLIA

REGIONAL MANAGER: MARK SANDERSON, M0IEO, RM12@RSGB.ORG.UK

Bittern DX Group
Linda, G0AJJ, 01692 218 562, secretary@bittern-dxers.org.uk
29 Club meeting at The Roman Camp Inn, Aylmerton

Braintree & DARS
John, M5AJB, 01787 460 947
5 Evening DF hunt
19 Aerial clinic

Bredhurst Receiving and Transmitting Society
Charles G4VSZ, 07982 244 788, secretary@brats-qth.org
8, 22 Club meeting

Cambridge & DARC
David, M0ZEB, 01353 778 093
9 Outdoor practical, construction and measurement of wire aerials
23 Outdoor practical, measuring polar diagram of VHF/UHF arrays

Chelmsford ARS
Martyn, G1EFL, 01245 469 008, www.g0mwt.org.uk
6, 13, 20, 27 Net, 7.30pm
9 Constructors' competition

Coalhouse Fort ARS
Tony Reynard G7HJT, 07976 553 345
25, 26 GB1CHF on the air

Colchester Radio Amateurs
Jeff, G7TAT, 07899 894 435, g7tat@live.co.uk
15 PSK evening

Dover RC
Pete, M0PKH, peter.halloway@sky.com
7 Operating from the monument
14 Natter night
21 A look at the Rigol DSA815 spectrum analyser, M0PKH & G3ROO
24 Family fun day, Walmer Green, Deal
28 Useful handheld instruments part 2, M0PKH

Felixstowe & DARS
Paul, G4YQC, pjw@btinternet.com
5, 19 Net on 145.400MHz, 8pm
20 Advanced exam

Harwich ARIG
Kevan, 2E0WMG, 07766 543 784 kevan2e0wmg@live.co.uk
14 Radio afloat, 2E0WMG, M0ZZO & 2E0XIS

Hilderstone R&EC
Chrissie Turner, hilderstoneclub@gmail.com
8 Intermediate exam followed by natter night
12 RSGB Centenary special event station 9am to 9pm

Norfolk ARC
Chris Danby, G0DWV, 01603 898 678, cmdanby@btinternet.com
5, 6 RSGB Centenary callsign
7 Trophy foxhunt
14 Informal, workshop and beginners' workshop
17, 18 Lighthouse Weekend at Happisburgh
21 Raspberry Pi amateur radio applications, Jim, M0HPJ
28 Informal, Bright Sparks, shack & workshop open, contest workshop

South Essex ARS
Dave, G4UVJ, 01268 697 978, g4uvj@btinternet.com
7, 8 RSGB Centenary Station GB100RSGB
13 Updates on upcoming ARISS contact, Dave, G4UVJ
25 GB2BM at Bay Museum

Thames ARG
Pete Sipple, M0PSX, 07940 579 116
2 Photography, Laura Sanderson, M3LIQ
5-11 Camping field event
9, 10 G100RSGB field station

West Kent ARS
Keith G4JED, info@wkars.org.uk
12 Natter night

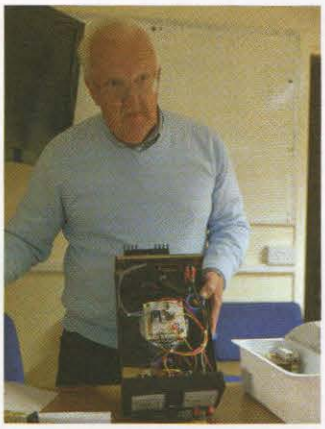
Norfolk Amateur Radio Club staged its seventh highly successful Radio Active weekend in June, attracting radio amateurs of all ages and raising £450 for cancer charities. The event was held in conjunction with the Radio Society of Great Britain's 24-hour National Field Day CW contest. A variety of radio-related activities and fun events were held throughout the

two-day event, along with three HF CW contest stations that ran throughout the whole of NFD, with some choosing to make a weekend of it and camping overnight. G4ARN/P (open section) made 1,008 contacts and G6NRC/P (restricted) made 568. A QRP entry, G8QR/P, run by Malcolm, G3PDH and Roger, G3LDI managed 435 QSOs. Another station on site, G4ANT/P, made a valiant effort in the 6m contest that was also taking place over the weekend, making 108 contacts.
Sunday lunch was a roast carvery, courtesy of David, G7URP and Tammy, M3PLU, and a raffle was held with prizes kindly donated from a variety of radio manufacturers and retailers – bhi, DCP, Icom UK, JPR Electronics, Martin Lynch & Sons, Plummer Electrical and Rapid Electronics.
The event was hosted at DCP Microdevelopments' business premises, Bryon Court near Attleborough, named after Bryon Palmer (the late father of NARC Chairman David, G7URP). Bryon died from cancer and the raffle raised £450, which was split equally between Cancer Research and Norfolk's own Big C Appeal.

Colchester Radio Amateurs was formed by some folks at the Colchester Institute College in 1963, and is therefore celebrating its 50th anniversary. The club had a strong tradition from its early days in training and education and still offers training courses for the current amateur licence structure. In this special year, it is undertaking a number of events to celebrate the 50 years.
The first was to have a birthday cake at a meeting early in the year, beautifully prepared by the XYL of the secretary. Secondly, CRA will be hosting the RSGB anniversary callsign G100RSGB in July as part of the Region 12 operations. In an extra twist, the station will be hosted and demonstrated to the public at Colchester's Zoo site, as the zoo has its own 50th anniversary this year too! In the autumn, the club will have its own Field Day for its members to operate using club equipment from a field site with bigger antennas than many can use from home. The club is also running a 50 year anniversary challenge this year as an award scheme – full details from the website www.g3co.org.uk.

Dover Amateur Radio Club was very lucky to have Roger, G3SXW from the Voodoo Contest group attend recently. Roger gave a great talk on the group's adventures around Africa. On the same night the club was also hosting a Foundation exam and the picture shows the four successful candidates. The club has a number of activities happening in the coming weeks with the annual club BBQ coming soon. There are also many interesting talks scheduled with a two part talk on useful handheld instruments and a live demo on the Rigol 815 spectrum analyser (as recently featured in *RadCom*). The club welcomes members new and old and would love to see some older members from the YMCA days come out, they will be amazed at the fantastic facilities. On 25 September, the club has a table top sale, there is no charge for tables just £1 entry for all. This will be an opportunity to have a clearout or look out for that winter project. This is open to all amateurs in the area.

In May, at **Harlow Radio Club**, Paul, M0PHO was awarded the **Essex CW Amateur Radio Club** Memorial Key for the most promising CW operator for 2013. The picture shows from left to right, Andy, G0IBN, who made the nomination; Steve, G4ZUL presenting the award on behalf of ECWARC; Robert, G0AGO with his 12wpm receiving/transmitting certificate and



Paul, M0PHO the Memorial Trophy award winner. Essex CW Club is a unique group supporting and encouraging the learning and use of Morse code. Details at www.essexcw.org.uk

Braintree and District ARS held two meetings in June, the first hosted a presentation by volunteers from the Essex Air Ambulance Trust. They explained that it costs £250,000 per month to hire, run and crew the McDonald Douglas Explorer helicopter. After the talk a presentation of £100 was made by Jim, G0DCR from sale of bits and pieces at club meetings, and the club made a donation of £50. In the annual Construction Contest, entries were diverse with an entry of a pair of homebrew hi-fi speakers and another of a portable mixer desk for hospital radio. Other entries included a QRP ATU, a capacitance meter, a desk mic, a diplexer and a rebuilt elderly power supply. The winning entry was a variable voltage, multi outlet 10 amp shack power supply. It was built with parts old and new sourced from local rallies, at an estimated total cost of £23, including the case that originally was a faulty Yaesu filter speaker. This power supply was built by Edwin, G0LPO who retained the trophy he won last year.

Hilderstone AR & EC took part in Museums on the Air 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.

REGION 13: EAST MIDLANDS

REGIONAL MANAGER: STEVE BODEN, G4XCK, RM13@RSGB.ORG.UK

Derby & DARS
Richard Buckby, radio@dadars.org.uk
6 Junk sale
13 Committee meeting
20 Antennas and planning
27 On the air

Hucknall Rolls Royce ARC
Dave Wilde, G1YAI, treasurer@hrrarc.com
2, 9, 16, 23, 30 Club meeting starting and members' forum

South Kesteven ARS
Nigel, M0CVO, 01476 402 550
7, 21 Informal evening

Spalding & DARS
Graham Boor G8NWC, 0775 4619 701, secretary@sdars.org.uk, www.sdars.org.uk
2 DXpedition to Papua New Guinea, Derek, G3KHZ

Welland Valley ARS
Peter D Rivers, G4XEX, 01858 432 105, g4xex@fsmail.net
5 Club net on 145.275MHz FM
19 Vintage radio evening

Sheffield Amateur Radio Club has its own TV channel at www.batc.tv/streams/GX3RCM as a result of correspondence with the British Amateur Television Club who has most generously allocated SARC this special live channel. From now on this new channel will be used to stream live TV from special events attended by the SARC's own communications trailer GX3RCM whenever a high speed internet link is available. This trailer was formerly the RSGBs GB4FUN travelling exhibition and demonstration vehicle. RSGB has generously donated it to the club who intend to take the exciting hobby of amateur radio out to the wider public at summer festivals, in schools and at other events such as Scout Jamborees.

For Sale

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 email: radiorepairs@btconnect.com

DISPLAY STOCK – we have the following showroom display models (all BRAND NEW with FULL warranties) for sale at reduced prices, Icom 7600, Yaesu FTDX3000, FT-950, Kenwood TS480HX, call for prices. Nevada tel: 02392 313090 www.nevadaradio.co.uk

Computer Software

PROGRAMMING CABLES & SOFTWARE FOR YAESU RADIOS Http://www.g4hfq.co.uk bob.freeth@g4hfq.co.uk (01425) 618092

CONTEST LOGGERS - SD by EI5DI. Free and Unrestricted in all RSGB HF Contests. www.ei5di.com

Cards & Design

QSLERS SPECIAL OFFER 1000 full colour both sides qsl cards £40 plus postage. 07720 580968 www.QSLers.co.uk

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Aerials

HF PORTABLE CAN BE GREAT FUN! Search: I-Pro Traveller G0KYA "Amazing" review! www.proantennas.co.uk

THE NEW 9 BAND ROTARY DUAL BEAM PRO 1000 Watts, slim profile, neighbour friendly! www.proantennas.co.uk

THE NEW 9 BAND I-PRO HOME VERTICAL 1000 Watts, efficiency without the hassle of radials! www.proantennas.co.uk Carl: 01489 789960

M0CVO ANTENNAS for all your amateur radio antenna needs. Full details at: http://www.m0cvoantennas.com

10M AND 7M TELESCOPIC ANTENNA POLES from £22.50 inc p&p. Voucher code "SOTApoles" gives you 10% off! Valid until end of month. www.sotabeams.co.uk

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

REMOTE TUNE G4TPH MAGLOOPS now available. Installations such as in the loft are now possible. There are 2 remote tune models, the ML40 covering 40m - 15m and the ML20 covering 20m -10m. Full details and online ordering at www.g4tph.com

NEED A LOW PROFILE (2.3m), Neighbour friendly, Very Rugged Telescopic Mast with 77 lbs Headload capability. Affordable Reconditioned CLARK SCAM 12m MASTS. Like No Other! Details m0rbs@btinternet.com

Wanted

UNWANTED VALVE AMPLIFIERS, working or not. Known makes only (Kenwood, Yaesu, Drake, Linear Amp, etc), not homebrew. Also 3-500Z/ZG valves. Cash paid. Contact Peter G3ZRS on 01482 862323 or g3zrs@hotmail.co.uk

NEW PRODUCTS/INVENTIONS for Amateur radio or wider markets required. We arrange manufacture, branding, sales. Contact G4abt@yahoo.com

Miscellaneous

CALL IN ON THE UK 'GOOD NEWS' CHRISTIAN NETS! Every Sunday morning at 8am local on 3747kHz, 2pm on 3747 or 7147KHz (propagation) and 144.205 SSB at 3pm sharing Christian fellowship. Go to www.wacral.org for more information or contact G3XNX at 51 Alma Road, Brixham, South Devon, TQ5 8QR,
Tel: 01803 854504 or derekg3xnx@talktalk.net

PAFOS, CYPRUS. Pafos, 2 bed villa. Simple HF station 300m ASL. www.domsvilla.co.uk

ACCOMMODATION NORTH COAST SCOTLAND. Self catering, B&B, camping. Discounts for licensed amateurs. GM4JYB Tel: 01847 851774. Web: www.letsgonorth.co.uk/dunnet_head Email: briansparks@dunnethead.co.uk

UES & S LTD ARE HOLDING AN OPEN DAY and we invite you to take this ideal opportunity to browse through our thousands of components and hundreds of test equipment. The Open Day will take place on site at Bayfield Brecks Business Centre, Holt, Norfolk, NR25 7DZ, on Sunday 15th September 2013, 10am - 4pm. Test Engineering Services (our new test and Cal Laboratory) will also be available, where we will PAT test your electrical appliances for £1 per item with an issued certificate in minutes (by appointment only)!.. Other business taking part in the open day include Yetman's Brewery, Berber Interiors and Bray's Cottage Pork Pies, other businesses taking part to confirm. Other vendors are welcome, but please contact 01263 710054 beforehand. On-site parking available, all donations will go to McMillan Nurses Charity. Any further details please contact us on 01263 710054 or have a look at our website at www.surplus-electronics.co.uk

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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 90).

FOR SALE

AE9RB PEABERRY SDR transceiver V1 module. 1 watt output 80/60/40m. PCB 130mm x 65mm, £100. Also Funcube DonglePRO+, as new, £120. John Rollason, G3WCO, 01279 876 607 (Nr Chelmsford).

AERIAL MAST 30', aluminium, comprising one 20' length, OD 50mm x 5mm wall, inner section 13.5' OD 35mm x 3mm wall. FREE. Buyer collects. Email or phone for details. Dave, G3LUL, 01622 681 294, g3lul@btinternet.com (Maidstone).

ANRITSU MS-610 J1 spectrum analyser. Sensible offers only to David Morton, G4LQT, g4lqt@yahoo.co.uk (Stafford).

CDG2000 PROJECT. Incomplete, builder SK. The following well constructed 7 boards, mostly complete, but not yet populated with ICs: post mixer pre driver, low pass filters, synthesiser, transmit exciter IF amplifier, CW osc, AF amp, transmit exciter controller. Plus boxes of new sealed components assumed to be for the project. Full documentation, £190. Buyer inspects and collects or carriage extra. Peter, G3LDO, g3ldo@o2.co.uk (West Sussex).

EX ARMY 30ft telescopic steel aerial mast, complete with base, guys and stakes in canvas bag. FREE for collection. G3OCA, 01332 720 976, g3oca1@ntlworld.com (Derby).

ICOM AT-500 AUTO ATU 500W with Icom leads and manual, £180. TGM mini hybrid quad antenna model MQ-1, 20-15-10-6 metres, with coax balun and rotator, £250. Terence Green, G3GLL, g3gll@msn.com (Tollesbury, Essex.)

ICOM IC-7000 transceiver with mounting kit and head mounting plate plus extension cable The radio is in good clean working order, has had the extended frequency modification carried out and is boxed with user manual, £800, no offers. A G Harris, G4SJI, 01964 615 073 (East Yorkshire).

ICOM IC-7400 with wideband TX enabled, boxed in mint condition from a non-smoking home. Also included is a hardly used Heil Pro headset. All ready for your 60m NOV, £875. Would be happy to demonstrate or can post at cost. Ian, MOIAA, 07929 505 683 (Wakefield).

ICOM IC-910HX 2/70/23cm, DSP, voice, £995. Yaesu FT-1000mp AC, £775. Yaesu FT-990 AC, SSB/CW filters, £695. Yaesu FT-450, £395. Icom IC-D92E D-Star, £250, GPS mic, £95. AOR AR-8600 MK2 100kHz-3000MHz Rx, £465. Yaesu FT-840, mint, £325. All AS NEW, boxed. Patrick, GONMP, 07927 386 805 (Watton).

ICOM IC-E2820 dual band FM D-Star transceiver. Never used mobile and owned from new by non smoker. In new condition, includes HM-133 mic, mobile stand, GPS antenna and manual. £450 + P&P or buyer collects. Bill, GOPZP, 01925 815 705 (Cheshire).

KENWOOD TS-950S HF transceiver, digital dual frequency receive. Hardly ever used, boxed, instruction manual, can be seen working. Offers around £850, plus delivery. David Hogg, MOGDH, 01900 816 228, gdavidhogg@talktalk.net (Maryport, Cumbria).

LAPLACE RF200 ANTENNA 30MHz to 1GHz broadband antenna with tripod + SA500 preamp. Ideal for EMC evaluation. See Laplace website for details. Cost over £1500. Packs into a tube for shipping. £500. G3UUU, 01647 432 120 (Devon).

LARGE BOX of old back copies of *RadCom* and *QST* plus possibly some manuals. Happy to give to a good genuine home with a radio amateur who would like then, rather than take to the recycling bank. Ann, 07803 958 757 (Sevenoaks, Kent).

MOSLEY TW-33 3-ele beam for 12/17/30m, still in box, never used. Offers over £299. Buyer to collect on cash payment. MOVAG, 01937 844 755, alan.grant2@ntlworld.com (Wetherby).

PALSTAR BT-1500A 1.5kW balanced tuner, brand new, £250. This is one of the best tuners on the market for doublets/loops. Cost over £600. Matching new DL1500 dummy load, £50. Both plus carriage. Dave, G3MWV, 01263 512 872 (Cromer, Norfolk).

PALSTAR ZM-30 antenna analyser in full working order and excellent condition. Includes wall PSU, manual, calibration resistors, balanced antenna adaptor, £180 OVNO inc p&p. John, G3UCQ, 01736 752 982, email@johnfarrar.plus.com (Hayle, Cornwall).

RANGER 811H linear amp. One careful owner – and that's me. Just fully serviced with new valves by Peter Rodmell. Just a few minor scratches to case, otherwise in excellent condition, £745. Buyer to collect or can deliver locally. Ian, GOVGS, 01524 421 164 (Morecambe).

YAESU FT-1000MP with CW filters, narrow SSB filters and key click mods. Excellent condition, original box, £650. Frank, GM3JKS, 01465 821 228, frank@knockycoid.demon.co.uk (South Ayrshire).

YAESU FT-1000MP with narrow CW filters, original box, £700. Flex-5000A, original box, £1,350. Sharman Multicom SPS-94000 40A digital PSU, £60. Gwyn Williams, G4FKH, 07984 073 007, g4fkh@sky.com (Chelmsford).

YAESU FT-200 plus PSU. Working order but needs alignment and TLC. Spare valves and mic. Collect only, as very heavy. £50. Martin, MOWZM, 01962 713 741 (Winchester).

YAESU FT-857D HF/VHF/UHF all mode xcvr, very good condition, hardly ever used. All original packaging, box, and manual, £550 ONO. Buyer to inspect and collect. George, G7ODM, 01827 331 881 (Tamworth).

YAESU FT-920 c/w power lead, mic, CW filter, £500. Yaesu FT-900 + separation kit, CW filter, £300. Alinco DJ-195 VHF handheld, £35. MFJ-461 Morse reader, £35. Start Masterkey mk2 electronic keyer, £60. KT34a balun, 5kW, new, £50. All plus postage. Brian, GMOEGI, 01786 850 377, gmOegi@btinternet.com (Stirling).

WANTED

DRAKE 4-NB noise blanker for R-4C receiver. G4BMH, 07910 135 341, skoorbn55@gmail.com (Oakham).

MAPLIN SCANMASTER MKII. I am looking for construction and user instructions for this antenna (any costs will be covered). Please contact me by email only: Steve, G4CLG, Steveaw56@gmail.com (Canberra, Australia).

MUTEK FRONT END for FT-221/225, working or not, must be complete. G4OQG 01249 443 037(Wiltshire).

REDIFON MORSE KEY wanted please. Looking for a large straight Morse key made by Redifon, UK. Also any interesting early Marconi Morse keys. John, GORDO, 01626 206 090, john@morsemad.com (Newton Abbot).

ROTATOR CAGE for Altron SM235 3 section tower and suitable rotator. Can collect within reasonable travelling distance. Mike, G4ADE, 01964 534 365, g4ade@btinternet.com (East Yorkshire).

YAESU FRB-707 OR FRB-757 relay boxes. Will collect or arrange collection. Dereck, GOLJJ, 01488 683 349, dereckmackenny@yahoo.co.uk (Hungerford).

HELPLINES

RADIO AMATEUR with severe EMC issues seeks services of solicitor knowledgeable of BS 7671, 17th ed IEE regs inc amendments, to represent him in law. Phone in first instance. J Baker, GW3MHW, 07766 264 800 (Welshpool).

TYPEWRITER RIBBON GROUP LIST WANTED. Equivalents of CARMA, OMEF and other groups. Widths would help. Godfrey, G4GLM, 020 8958 5113, cgmm2@btinternet.com (Edgware).

RALLIES & EVENTS

4 AUGUST - 24TH KING'S LYNN ARC RALLY & CAR BOOT – Gaywood Community Centre, PE30 4DZ. OT 10am, £2, TS, CBS pitches £8, C, CS (by prior arrangement), TI G3XYZ S20. Ray, G3RSV, 01553 849 700, ray-g3rsv@supanet.com. [www.klarc.org.uk].

4 AUGUST - SOUTH MANCHESTER RADIO CLUB BOOT SALE – Trafford Metrovicks Rugby and Cricket Club, Finnybank Road, Sale, Cheshire M33 6LR. Sellers transits £15, cars £10. Admission £1, OT 09.30 (No cars in after 10.20 no exit before 2pm), TI S22. Terry Baily, G6CRF, Terry.Baily@gmx.com.

9 AUGUST - COCKENZIE & PORT SETON ARC 20TH ANNUAL MINI-RALLY NIGHT – Community Centre, Main Hall, Port Seton. Bring along your own junk and sell it yourself. Tables on first come first served basis. £2 for everyone. OT 18.30 to 21.30.

11 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].

18 AUGUST - RUGBY AMATEUR TRANSMITTING SOCIETY ANNUAL RADIO RALLY – Princethorpe College, Princethorpe, Rugby CV23 9PX. OT 10am – 4pm, £2, CP, TI, C. Tony, GOOLS, 07759 684 411, rally@rugbyats.co.uk. [www.rugbyats.co.uk].

25 AUGUST NEW VENUE - MILTON KEYNES ARS RALLY – Longueville Hall, Hammond Park, Whaddon Road, Newton Longville, Milton Keynes MK17 0AT. Why not combine a visit to our rally with Bletchley Park and visit the National Radio Centre (NRC) as well? Modern venue with large indoor and outdoor areas. Free CP, OT 10am, £3.. TS, FM, CBS, LB, C, RSGB book stall. Steve, G6KJU, 07866 673 192. [www.mkars.org.uk/mkars/rally].

26 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.

26 AUGUST - PONTEFRACT & DISTRICT ARS FAIR & JUNK SALE – Carleton Community Centre, Carleton Road, Pontefract WF8 3RJ. TS, RSGB bookstall, B&B, LB, C, TI S22. OT 10.30, £2.

1 SEPTEMBER - TELFORD HAMFEST – Enginuity Technology Centre, Coalbrookdale, Telford TF8 7DU. OT 10.30, £3 inc reduced admission to the hands-on exhibits at Enginuity. TI S22 & GB3TF, 433.200MHz. TS, B&B, SIG, free CP, LEC, FAM. Guest Speaker Rob Mannion, G3XFD/EI5IW will present My Adventures as Editor of Practical Wireless. Martyn, G3UKV, 01952 255 416. [www.telfordhamfest.co.uk].

8 SEPTEMBER - FRISKNEY & EAST LINCOLNSHIRE COMMUNICATIONS CLUB RALLY – The Friskney Village Hall, Church Road, Friskney, Lincs PE22 8RD, 6.5 miles south of Skegness. OT 9.30, C, B&B, A, WIN & equipment test centre. Details on 07534 624 559. [www.felcc.com].

15 SEPTEMBER - TORBAY ANNUAL COMMUNICATIONS FAIR – Newton Abbot Racecourse, Newton Abbot, Devon TQ12 3AF. TS, B&B, C, DF, RSGB book stall, OT 9.30/10am, £2. Mike Dixon, 01803 557 941, rally@tars.org.uk.

21 SEPTEMBER - FOG ON THE TYNE RALLY – Whitehall Road Methodist Church Hall, Bensham, Gateshead NE8 4LH, organised by Angel of the North ARC & South Tyneside ARS. £1.50, OT 10.30, TS, B&B, C, CP, RSGB bookstall. Nancy Bone, G7UUR, 01914 770 036 (eves), nancybone2001@yahoo.co.uk. [www.anarc.net].

22 SEPTEMBER - PENCOED TABLE TOP SALE – Pencoed RFC, Felindre Rd, Pencoed CF35 5PB. Leave M4 at J35. OT 9:30am, C. Contact Gerry on 01656 860761 and Phil on 01656 745219, prandalluk@yahoo.co.uk.

27 & 28 SEPTEMBER - NATIONAL HAMFEST – brought to you by the RSGB in association with the Lincoln Short Wave Club. George Stephenson Pavilion, Newark and Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark NG24 2NY (close to junction of A1/A46/A17). Free CP, TS, B&B, CB, C, SIG, Morse proficiency tests on demand, RSGB book stall, RSGB Services & Committees, DF, FM. [www.nationalhamfest.org.uk].

6 OCTOBER - AUTUMN MILITARIA & ELECTRONICS & RADIO AMATEUR HANGAR SALE – Hack Green Secret Nuclear Bunker, Nantwich, Cheshire, CW5 8AL. OT 10am, civil, military and vintage radio equipment plus vehicle spares and more. Contact Lucy Siebert, 01270 623 353, coldwatr@hackgreen.co.uk. [www.hackgreen.co.uk].

6 OCTOBER - BLACKWOOD AND DISTRICT ARS RALLY – Coleg Gwent, Risca Rd, Cross Keys NP11 7ZA. TI V44 (S22), CP, OT 10am, £2, TS, SIG, CBS, B&B, C. Dave, GW4HBK, 01495 228 516, gw4hbk@talktalk.net. [www.gw6gw.co.uk].

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 not.

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 R P Hughes, G3HAG	10/4/2013
Mr J A J Dalrymple, GM3JSX	
Mr D F Borne, G4CYW	
Mrs B Thomson, G4SDF	
Mr D E Barnes, G6VLP	
Mr G Stubbings, G8FIZ	26/5/2013
Mr C W Shelton, G0GJS	
Mr R L Timings, G0IZH	2013
Mr P L E Bennett, ZS1AAQ	24/6/2013

OBITUARIES

As part of the improvements to the RSGB website, an obituaries section is being opened at www.rsgb.org/sk and we welcome obituaries from clubs or individuals when someone sadly passes away. Please send submissions by e-mail (only) to sk@rsgb.org.uk. All submissions will be moderated.

SILENT KEY ENTRIES

The Silent Keys column is separate from the 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.

6 OCTOBER NEW DATE - 24TH GREAT NORTHERN HAMFEST – Barnsley Premier Leisure Complex, Queens Road, Barnsley S71 1AN or follow the brown Metrodome signs. GNHF in association with SYRG. OT 10.30, £3.50. DF, TS, SIG, RSGB book stall, LB, C, FAM. Ernie, G4LUE, 07984 191 873. [www.gnhf.co.uk].

11-13 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/].

13 OCTOBER - HORNSEA AMATEUR RADIO CLUB RALLY – Floral Hall, 7 The Esplanade, Hornsea, East Yorks HU18 1NQ. OT 10.30, CP, TS, B&B, SIG, RSGB, RAFARS, LB, C, DF, WIN. Details from Rick, MOCZR, 01964 533 712, R106221@aol.com. [www.hornseaarc.co.uk].

19 OCTOBER - CARRICKFERGUS AMATEUR RADIO GROUP RADIO RALLY – Downshire Community School, Carrickfergus BT38 7DA. OT 11.30, £3, TS, B&B, CP, C, DF, SIG, RSGB, MT. Details from Tim, MI0TBL, carg@hotmail.co.uk. [www.radioclubs.net/carg].

20 OCTOBER - GALASHIELS AND DISTRICT ARS RADIO RALLY – The Volunteer Hall, St Johns Street, Galashiels, Scottish Borders TD1 3JX. OT 11.30 /11.15, £2.50. B&B, TS, C. Jim, GM7LUN, 01896 850 245, gm7lun@qsl.net.

27 OCTOBER NEW VENUE - NORTH WALES RALLY – Abergele Leisure Centre. Faenol Avenue, Abergele, Conwy, LL22 7HT. 10am – 4pm, £4.50, TS, B&B, CP, DF, DIS, C, SIG. Details from Gordon, MW0GBR 0773 3531 766 or rally@nwrs.org.uk. [www.nwrs.org.uk].

3 NOVEMBER - FOYLE & DISTRICT ARC RALLY – White Horse Hotel, 68 Clooney Road, Londonderry BT47 3PA. OT 11.30, TS, SIG, B&B, WIN, LIC, C. Tables available £5. Nigel, GI7FJY, 07514 101141, gi7fjy@hotmail.com.

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
01/08/2013	GB0SYD	Skipton Yorkshire Day	North Yorkshire	LH2	M0YBC
	GB2PPS	Papplewick Pumping Station	Nottinghamshire	LH	G0UYQ
	GB0YD	Yorkshire Day	Hutton-le-Hole	LHV2	G0BPK
02/08/2013	GB2NBL	New Brighton Lighthouse	New Brighton	LH	M0BZZ
03/08/2013	GB1VR	1st Viking Raid	ALNWICK	TLHV27	M0DSS
09/08/2013	GB4HFW	Hotel Foxtrot Whiskey	Chesterfield	TLHV27	G6IBQ
10/08/2013	GB2SHL	Sugar Hotel Lima	Cleethorpes	TLHV27	M0KWK
16/08/2013	GB1DLH	Dungeness Light Houses	Kent	LHV27	M0SSR
	GB0REL	Rathlin East Light	Co Antrim	TLHV27	GI0PGC
	GB0NLH	Needles Light House	Isle of Wight	LH2	M0DSF
	GB2BML	Blakeney Mariners Light	North Norfolk	LHV2	G3YOA
17/08/2013	GB0THL	Tiumpan Head Lighthouse	Isle of Lewis	LH	G4IAQ
	GB2LSH	Strumble Head	SM 892 413	LHV27	GW3CR
	GB5PSL	Plover Scar Light	Lancashire	LHV	M0JME
18/08/2013	GB2RL	Roker Light	Sunderland	LHV27	G0GFG
	GB2MAS	Mottram Agricultural Show	Mottram	LH2	G4GHB
25/08/2013	GB2SIM	St Ives Mansion	Bingley	LHV27	G4JJS
31/08/2013	GB4AUK	Age United Kingdom	Isle of Wight	LH2	G0NTH

3 NOVEMBER - HOLSWORTHY AMATEUR RADIO RALLY – Holsworthy Community College, Victoria Hill, Holsworthy EX22 6JD. Contact Don g0rql@hotmail.com qthr or qrz.com.

10 NOVEMBER NEW DATE - 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].

16 NOVEMBER - HALTON & DISTRICT RADIO AMATEURS RALLY – The Heath Business & Technical Park, Runcorn, Cheshire WA7 4QX. OT 10am, £1. TS, B&B, C, DF, SIG, cash machine, prize draw. All proceeds after costs to charity. George Low, G0RLF, 07919 935 725 (daytime), g0rlf@talktalk.net. [www.haltonradiorally.webs.com].

24 NOVEMBER - CATS RADIO & ELECTRONICS BAZAAR – 1st Coulsdon Scout HQ, r/o Council Car Park, Lion Green Road, Coulsdon, Surrey. OT 10am, £1, B&B, C, DIS, free CP. Glenn, G4FVL, chairman@catsradio.org.

24 NOVEMBER - PLYMOUTH RADIO CLUB RALLY – Harewood House, The Ridgeway, Plympton, Plymouth PL7 2AS. CP, TI, OT 10.00, £2, TS, C. Contact pippa117@hotmail.co.uk.

30 NOVEMBER - 18TH ROCHDALE & DISTRICT ARS TRADITIONAL RADIO RALLY – St Vincent's Church Hall, Cutgate, Rochdale OL12 7QL. OT 10.15, £2.50 (concessions U12 & Seniors), B&B, C. Pitches £7.50. Dave, G0PUD, 0161 285 1600, info@vintage-radio-repair.co.uk. [www.radars.me.uk].

1 DECEMBER - BISHOP AUCKLAND RADIO AMATEURS CLUB RALLY – Spennymoor Leisure Centre, Co Durham DL16 6DB. CP, TI S22 (V44), OT 10.15 /10.30, £2 (U14 free). TS, B&B, C, LB, DF, FAM. Mark, G0GFG, 01388 747 497.

7 DECEMBER - SOUTH LANCS WINTER RALLY – Bickershaw Labour Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. OT 10am, traders 8am. Tables £9 pre-booked, entry £2.00, TI, B&B, C, DIS, CP, SIG, DF, TS, LB. Jason 01942 735 828, rally@slarc.co.uk.

RSGB MEMBERS' ADVERTISEMENTS

RSGB Members wishing to place an advertisement may do so free of charge by e-mail, or by post provided the advertisement is accompanied by a payment of £5.00 to cover administration costs.

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. Please ensure you include .uk on the end of the e-mail address.

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, in that order.**

3) The Ad may not contain more than 40 words, excluding the information in (2), and maybe 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.

2 FEBRUARY 2014 - 29TH CANVEY RADIO & ELECTRONICS RALLY – 'The Paddocks', Long Road, Canvey Island, Essex SS8 0JA (southern end of A130). Free CP, OT 10.30. C, DF, TS. Vic Rogers, G6BHE, 01702 308 562, nvr@blueyonder.co.uk. [www.southessex-ars.co.uk].

8 JUNE 2014 - 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 10.00. TS, SIG, C, LB. Anya Lawrence, 2E0BQS, 0115 930 7322, adylawri@btinternet.com. [www.snadarc.com].

RADIO SOCIETY OF GREAT BRITAIN

THE NATIONAL SOCIETY WHICH REPRESENTS UK RADIO AMATEURS

Founded in 1913 incorporated 1926. RSGB is a trading name of Radio Society of Great Britain, a limited company registered in England and Wales with company number 00216431. Member society of the International Amateur Radio Union.

Patron: HRH Prince Philip, Duke of Edinburgh, KG, KT

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the Subscriptions Department from which full details of Society services may also be obtained.

RSGB MEMBERSHIP

Annual rates from 1 January 2011

Full membership (by Direct Debit). £47.00
(individual & club)
Family membership (by Direct Debit). £56.00

Paying other than by Direct Debit attracts a £4 premium.

Student (21-25). . . . . Free
Ham Club (under 21). . . . . Free

Subscriptions include VAT where applicable.
Special arrangements exist for visually impaired persons.
Details and membership application forms are available from RSGB HQ or see www.rsgb.org/join.

YOUR RSGB

This page provides names and contact details for Board Members, Regional Managers, Committee Chairmen and Honorary Officers. Members seeking advice and guidance on any aspect of Amateur Radio of the Society's work are free to contact the relevant person below. But before doing so, please do check the comprehensive FAQs on the RSGB website, www.rsgb.org/faq/ to see if your question is answered there.

For HQ staff below, both e-mail addresses and telephone details are provided, including the option to select when dialling through the RSGB switchboard (01234 832 700).

Chairmen and Honorary Officers:
These are all volunteers and give their time freely to support the Society. Members should respect the fact that many also have full time day jobs, and so e-mail is the appropriate method of communication.

General Manager:
Graham Coomber, G0NBI,
e-mail: graham.coomber@rsgb.org.uk

Honorary Treasurer (Acting):
Richard Horton, G4AOJ, e-mail: g4aoj@rsgb.org.uk

Company Secretary:
Rupert R Thorogood, G3KKT, e-mail: g3kkt@rsgb.org.uk

THE RSGB BOARD

Dr Bob Whelan, G3PJT (President), e-mail: g3pjt@rsgb.org.uk

Graham Murchie, G4FSG, (Board Chairman)
e-mail: g4fsg@rsgb.org.uk
Phillip Brooks, G4NZQ, e-mail: g4nzq @rsgb.org.uk
Stewart Bryant, G3YSX, e-mail@ g3ysx@rsgb.org.uk
Stan Lee, G4XXI, e-mail: g4xxi@rsgb.org.uk
Len Paget, GM0ONX, e-mail: gm0onx@rsgb.org.uk
Dr John Rogers, M0JAV, e-mail: m0jav@rsgb.org.uk

Note: The General Manager, Company Secretary and Acting Honorary Treasurer are not Directors, but are in attendance at Board Meetings.

REGIONAL MANAGERS

Region 1 – J O'Neill, GM7VSB, e-mail: rm1@rsgb.org.uk
Region 2 – D Morrison, GM1BAN, e-mail: rm2@rsgb.org.uk
Region 3 – K A Wilson, M1CNY, e-mail: rm3@rsgb.org.uk
Region 4 – H Scrivens, G0UGE, e-mail: rm4@rsgb.org.uk
Region 5 – V Ravenscroft, M0VRR, e-mail: rm5@rsgb.org.uk
Region 6 – M Harper, MW1MDH, e-mail: rm6@rsgb.org.uk
Region 7 – J Sneddon, MW0EQL, e-mail: rm7@rsgb.org.uk
Region 8 – P Hosey, MI0MSO,
e-mail: rm8@rsgb.org.uk
Region 9 – L Smith, G4OXY, e-mail:rm9@rsgb.org.uk
Region 10 – M Senior, G4EFO, e-mail: rm10@rsgb.org.uk
Region 11 – P Helliwell, G7SME, e-mail: rm11@rsgb.org.uk
Region 12 – M Sanderson, MI0EO, e-mail: rm12@rsgb.org.uk
Region 13 – S Boden, G4XCK, e-mail: rm13@rsgb.org.uk

SPECIALIST AREAS – CHAIRMEN & HONORARY OFFICERS

Abuse and poor operating
Amateur Radio Observation Service (AROS), Keith Bassett, G7NBU, AROS coordinator, e-mail: aros@rsgb.org.uk, www.rsgb.org/aros/

Amateur Radio Direction Finding
Bob Titterington, G3ORY, Chairman, ARDF Committee, e-mail: ardf.chairman@rsgb.org.uk, www.rsgb.org/ardf/

Contests
Ian Pawson, G0FCT, Chairman, Contests Committee, e-mail: cc.chair@rsgb.org.uk, www.rsgb.org/radiosport/

EMC
John Rogers, M0JAV, Chairman, EMC Committee, e-mail: emc.chairman@rsgb.org.uk, www.rsgb.org/emc/

General Technical Matters
Andy Talbot, G4JNT, Chairman, Technical Forum, e-mail: tech.chair@rsgb.org.uk, www.rsgb.org/technicalmatters/

General Spectrum & Regulatory Matters
John Gould, G3WKL, Chairman, Spectrum Forum, e-mail: spectrum.chairman@rsgb.org.uk www.rsgb.org/committees/spectrumforum/

GB2RS News Service Management
Gordon Adams, G3LEQ, GB2RS Manager, e-mail: gb2rs@ntlworld.com
(GB2RS news items should be sent to gb2rs@rsgb.org.uk)

HF Matters
Ian Greenshields, G4FSU, HF Manager, e-mail: hf.manager@rsgb.org.uk

Intruders to the Amateur Bands
Chris Cummings, G4BOH, e-mail: iw@rsgb.org.uk www.rsgb.org/intruders/

IOTA Activity Programme
Roger Balister, G3KMA, IOTA Manager, e-mail: iota.manager@rsgb.org.uk, www.rsgbiota.org/

Microwave Matters
Murray Niman, G6JYB, Microwave Manager, e-mail: mw.manager@rsgb.org.uk

Planning Advice
Stephen Purser, G4SHF, Chairman, Planning Advisory Committee, e-mail: pac.chairman@rsgb.org.uk, www.rsgb.org/planning/

Propagation Studies
Steve Nichols, G0KYA, Chairman, Propagation Studies Committee, e-mail: psc.chairman@rsgb.org.uk, www.rsgb.org/psc/

Repeater and Data Communications
John McCullagh, GI4BWM, Chairman, ETCC, e-mail: etcc.chairman@rsgb.org.uk, www.ukrepeater.net

RSGB Awards
John Dunnington, G3LZQ, Awards Manager (Contact HQ in the first instance on 01234 832 715), e-mail: hf.awards@rsgb.org.uk, www.rsgb.org/operating/awards/

Training & Education
Steve Hartley, G0FUW, Chairman, Training & Education Committee, e-mail: tec.chair@rsgb.org.uk, www.rsgb.org/clubsandtraining/

VHF Matters
John Regnault, G4SWX, VHF Manager
E-mail: vhf.manager@rsgb.org.uk

Details of the Society's volunteer officers can be found in the RSGB Yearbook and on the RSGB website, www.rsgb.org.

HEADQUARTERS STAFF

General Amateur Radio Issues
Carlos Eavis, G0AKI
E-mail: AR.dept@rsgb.org.uk
Telephone: 01234 832 700, Option 5

Amateur Radio Examinations
E-mail: exams@rsgb.org.uk
Telephone: 01234 832 700, Option 4

***RadCom* (news items, feature submissions, etc)**
Elaine Richards, G4LFM or Giles Read, G1MFG
E-mail: radcom@rsgb.org.uk
Telephone: 01234 832 700, Option 3

GB2RS and Club News
E-mail: GB2RS@rsgb.org.uk
Telephone: 01234 832 700, Option 3

Sales department
(membership, books and other products)
E-mail: sales@rsgb.org.uk
Telephone: 01234 832 700, Option 1

Subscription renewals
Telephone: 01234 832 700, Option 2

IOTA
E-mail: IOTA_HQ@rsgb.org.uk
Telephone: 01234 832 700, Option 5

General Manager
E-mail: GM.dept@rsgb.org.uk
Telephone: 01234 832 702

HEADQUARTERS AND REGISTERED OFFICE

3 Abbey Court, Fraser Road,
Priory Business Park, Bedford MK44 3WH,
Telephone: 01234 832 700
Fax: 01234 831 496

QSL BUREAU ADDRESS

PO Box 5, Halifax HX1 9JR, England
Telephone: 01422 359 362
E-mail: qsl@rsgb.org.uk, www.rsgb.org/qsl

PLAY YOUR PART IN YOUR RSGB

Have Your Say
Let us know how we're doing! Through "Have Your Say" you can let us know your views and you will receive a reply from the General Manager or a Board Member.
Write to haveyoursay@rsgb.org.uk or go to www.rsgb.org/haveyoursay/

Consultations
From time to time you will find we are consulting the membership on aspects of Society policy. You can find current consultations at www.rsgb.org/consultations/

National Radio Centre
Don't forget to tell your friends about the National Radio Centre at Bletchley Park. Full details can be found at www.nationalradiocentre.com

Licensing & Special Event Stations
Licensing and Notices of Variation (NoVs) for special event stations are handled by Ofcom, 0207 981 3131, www.ofcom.org.uk

FAQs
The RSGB has compiled the questions most frequently asked by Members at www.rsgb.org/faq/

Band plan
The latest version of the band plan is always available on the website at www.rsgb.org/committees/spectrumforum/band-plans.php

Good Operating Practice
The RSGB fully supports the code of conduct and encourages all amateurs to read the advice. www.rsgb.org/tutors/pdf/good_operating_practices.pdf & www.rsgb.org/operating/ethics/docs/ethics_and_operating.pdf

RSGB Tech
The purpose of this service is to be the first port of call for technical queries on amateur radio matters. It is open to all radio amateurs. http://groups.yahoo.com/group/rsgbtech/

RSGB Shop
All RSGB goods - books, filters, clothing - can be purchased online at www.rsgbshop.org/

Club Finder
Use the website to find your nearest radio club and check out the facilities they have to offer.
www.rsgb.org/clubsandtraining/

WEBSITE

Main website: www.rsgb.org
Members Pages

Log in using your callsign in lower case as the user name and your membership number, without the leading zeros (see your *RadCom* address label) as the password.
If you need to update your membership details, please visit www.rsgb.org/myaccount/.

CONGRATULATIONS ON THE CENTENARY ISSUE

Bruce, GW4XXF

The picture of Margaret Mills, G3ACC using a Marconi Marine Electra receiver at NFD 1950 was especially nostalgic for me. The Electra was introduced in 1948 and must have cost an absolute fortune at the time. I sailed in the Merchant Navy as Radio Officer in the late 60s and they were still very much in use on board ship.

My shack is a reconstruction of a W/T Office of that era. Indeed, an Electra and matching Mercury are in daily use in my shack, together with the ubiquitous Oceanspan Tx, famous 365A key and other contemporary gear – 65 years on! The photo shows me operating during the cross-service/cross-band special event celebrating the final close-down of the famous long-range maritime coast station Portishead Radio in 2000. I was even appropriately dressed for the occasion!

Even more poignant is the thought that all my equipment is from ships and would have been used many times for QSOs with Portishead on HF CW.

SIR OLIVER LODGE

Peter Martinez, G3PLX

It was a real treat to be able to see reprints of some historic articles in July *RadCom*, but I am puzzled by one statement in Sir Oliver Lodge's 1922 paper. Sir Oliver explained that the product of the permittivity of free space (k) and its permeability (μ) are related to the speed of light (c). This had been shown theoretically by Maxwell and later verified by a clever force-balance experiment. However, Sir Oliver then makes the surprising statement that although this fixes the product of k and μ, their individual values were unknown (in 1922). He even expressed the hope that some member of the audience may discover their actual values one day.

Modern textbooks give the value of k as 4 x pi x 10^{-7} Henries per metre – an absolute constant that derives only from the definition of the unit of current (the ampere). The equation relating k, μ, and c thus implies that the absolute values of both k and μ can be known, either by definition or by measurement. The ratio of ratio of k to μ can also be measured in an impedance-balance experiment that effectively measures the characteristic impedance of free space.

But surely all this would have been well established science in 1922 when Lodge presented his address to the Society? I am aware that there were difficulties with rationalising diverse systems of units around this time but I don't think this solves the puzzle. If the individual values of k and μ were not known in 1922, the concept of 'characteristic impedance' would have been meaningless at that time.

ENCOURAGEMENT OF FOUNDATION LICENCE HOLDERS

Tony Wilson, G3MAE

Re: A SAD LOSS by Chris Whitelaw, M0RKF

I was saddened and very angry to read Chris Whitelaw's letter about the way his daughter Kendra, M6BEL, had been treated on the air. These very ignorant self opinionated people do a great disservice to amateur radio. They have probably put little or nothing back into the hobby. They should be named and shamed. It is a pity the new Ofcom Fixed Penalty Regime can't be applied to them.

Foundation and Intermediate licence holders deserve all the help they can be given. This is the only route open to them to gain a Full licence.

I gained my licence just after my 17th birthday in 1957 thanks to all the help and encouragement I received from the members of Scarborough ARS.

Please don't let this small group of ignorant people put you off the hobby otherwise they have won and that would be a great travesty of justice. Local club members are always there for you and many Special Event Stations leave gaps for M3, M6 and QRP stations.

It is also useful to have your amateur licence on your CV.

I hope I have the pleasure of working you in the future.

David Kennedy, M5DNK

I felt sad when I read the letter from Chris Whitelaw in the June edition of *RadCom*. Please assure him and his daughter that we are not all bad mouthing old g**s. Is it not about time that we started printing callsigns of these little minded people? After all we know who they are as they have to identify themselves on air as part of their licence conditions!

Here is another idea: we could set up a new award – Worked all Wallies!

Please pass this e-mail to Chris and his daughter with my regrets, and hope that she may try again. If they are ever down in Sussex pop in or contact the Amberly Heritage Museum: a warm welcome awaits.

MOMENT IN HISTORY

David, G3LXQ

It was good to read the letter from Dave, formerly G3HLW, in 'The Last Word' for July 2013. I was a member of the Bournemouth club while in training at Christchurch for several years before inevitably moving away from the area. My mode of transport in those days was a push-bike and I rode up to Stoney Cross for the rally. I believe the talk-in station in the back of the Hillman Husky used the Top Band transmitter of John, G3KYU, who regularly put in a very good clean signal for the Sunday School AM net on 1880kHz, usually conducted by Norman, G2NS. Three visitors to the rally particularly impressed me: Cliff, G2HIF, from Wantage, had a very compact 2 metre transmitter-receiver on a shelf fitted to the back of the front seats of his car; Bert, G2FIX, visited from nearby Salisbury using mobile CW – on his motorcycle! – and Ernie, G3ERN, from Harlow, was a very impressive signal most of the way back home using his Bedford van with a whip antenna loaded by a large horizontally-mounted coil on the roof. I would guess that all three used completely home-brewed equipment. And my spectacles are only slightly rose-tinted!

At around that time, my parents also had a Husky that suffered from having rather flimsy plastic internal door-pulls. After a couple of casualties I took it upon myself to sand-mould cast replacements out of aluminium as an apprenticeship exercise!

FOC 75th ANNIVERSARY

Roger Western, G3SXW

The First Class CW Operators' Club celebrated its 75th anniversary in May 2013. We organised a month-long QSO Party, CW only naturally, to celebrate this major event, to thank Samuel Morse and those visionaries of 75 years ago who established the Club and to enjoy high-calibre CW operating. Over sixty of our members around the world acquired special callsigns with the *FOC suffix and made some 200,000 contacts with other members and especially with non-members. This turned into a major operating event, filling the bands with the sweet sound of Morse code for the whole month!

The Club wishes to thank RSGB, especially G3WKL and Ofcom for facilitating the special callsign GB75FOC that was aired every day during May, logging over 13,600 QSOs. A beautiful participation certificate 'FOC75' is available, see www.g4foc.org.

EMC

Robert Dancy, G3JRD

There was a problem with our Siemens Gigaset C475 cordless telephones when I was transmitting on 80 and 40 metres SSB, running at around 60 watts. When I was

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transmitting, my wife, indoors, kept hearing a message on the telephone master unit saying "You have no new messages". My shack is in the garden, and the antennas (both extended Marconi type) are about 5 and 7 metres from the house.

An ADSL filter is connected to the incoming twisted-pair telephone line, the low-frequency telephone output going via a line of about 12 metres through the house, to one of the rooms at the back. I moved the master unit into the shack, to avoid the forebearing XYL jumping out of her skin every time she suddenly heard "You have no new messages", and moved the shack telephone unit into her room. I now received these messages instead of the XYL.

A couple of ferrites on the line close to the phone input made no difference, but adding another ADSL filter close to the master unit input completely solved the problem. It seems strange that 3.5 and 7MHz signals could interfere with a unit working in the GHz range. The RF pickup on the telephone line was perhaps being detected by some non-linearity in the input to the master unit, and operating the voice-mail message interrogation system?

WORKED ALL COUNTIES AWARD

Chris Pickett, M5LRO

I personally think its time for a new award programme run by the RSGB in the shape of a Worked All Counties Award. I think it would stimulate interest worldwide and give the G/M call stations some appeal on the band.

I understand that something like this has been done before by the WAB group but have not read or heard anything of it for years and the last time I spoke to someone from the WAB group they suggested that it had been dropped because of county borders or boroughs changing.

My thoughts are for a county award that focuses on the main UK counties of England, Scotland & Northern Ireland as an award programme that permits the collection of points towards an award for success.

I don't think the DX will be interested if there has been a hedge-row change of border as often happens but the main counties remain just that the main counties and their shape or border does not change – at least not very often, the last major shake up being in 1931 caused by the Provisional Order Confirmation aimed at the elimination of so-called exclaves.

A simple awards programme exactly the same and the WAS award run by the ARRL would stimulate interest in a way only recently seen with the Jubilee and Olympic call signs and would, I would hope, make us all hotter property on the bands.

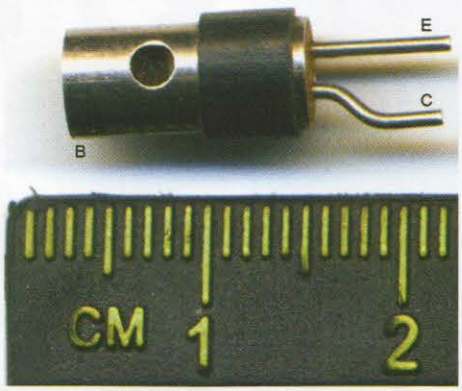
Bands and Modes could form separate awards and enable the applicant great challenges for the future.

So RSGB Awards guys and girls – please put this forward at a general meeting as I am sure I am not the only English amateur who feels that such an award would be a grand idea.

EARLY TRANSISTORISED TRANSMITTERS

Godfrey Manning, G4GLM

The early Top Band transmitter (July *RadCom* page 24 Figure 1) incorporated an OC50 point-contact transistor. Here is a macro photo to show what that device looks like.



HELP

Barry, GM8SAU / G8SAU

Does any one know were to find Tony ex GM6UNJ now GOITA? We were both living and very active in the Outer Hebrides and St Kilda during the 1980s and 1990s. Any assistance is welcome or if Tony is reading this, look me up on QRZ.com and send me an e-mail.

MISSING A TRICK

Alex, G7KSE

We had some very worthy winners of cups and trophies presented in last month's *RadCom* and I am very glad to see that individuals are recognised by the Society. But it appeared that they were all, how can I put this, of an age group where experience is immediately obvious. Let's make this clear. This is not about any of those winners. It is about the lack of young people and newcomers shaking hands with the President. With nothing obvious for those Members to really aim for, no 'best in show for the 16-24 ages group' or similar for newly licensed. We are really missing an opportunity. What are we doing to recognise talent in each of those groups?

The second point is linked to the first in as much as we had a review for a piece of outstanding equipment in the TS-990. It seems like a great rig but I should hope so for that money because it cost more than my car. We need to spend time looking at the state of the art but it reminds me of when I was younger and had posters of sports cars on my walls. At 40 I still don't own a Ferrari, but I have a very capable hatchback.

Second hand gear is generally the way to get involved for those of us with limited budgets, but why does it have to be this way? An advert for HF on a budget recently showed the cheapest rig at just under £600. Granted, using VHF can be a lot lower cost, but is entry to common bands dictated to by the depth of your pocket? It would appear so if you want to buy new. Can we at least open the debate and consider what may be done to lower the entry bar.

We, as a community, do a lot to engage with the community and especially younger potential members but I feel as though we lose sight of their potential by not rewarding them enough and pricing them away from the hobby. I am sure that the RSGB board recognise this and have had consider discussion over time. Please could they put some thought into how best to reward the 'Youth' and help in driving down the cost of new equipment. After all, we all like a new toy but I perceive that cost is a significant barrier to the hobby.

When the Interim Board was ratifying the AGM trophy awards earlier this year it made the observation that there was little recognition for newcomers and asked the incoming Board to give it some consideration. All of the trophies of the RSGB are awarded on merit only, they are open to any member regardless of age or length of membership. Indeed one might expect that some trophies, especially those for novel articles or innovative techniques, might well go to newcomers.

The G5RP trophy is specifically for newcomers to DXing, of course. The RSGB did have a Young Amateur of the Year many years ago and maybe that could be re-examined and, if suitable, rejuvenated.

As far as the point about the cost of equipment is concerned in my opinion there is plenty of inexpensive HF equipment available if you know who to ask and where to look. Your local club is a good starting place. The RSGB newcomers' e letter and the RadCom *'Getting started in...' series are also sources.*
Bob, G3PJT, RSGB President

We often get asked for copies of reviews that are several years old by people considering purchasing second hand equipment. Today's latest and greatest radios are tomorrow's affordable used gear.
Giles, G1MFG,* RadCom *Technical Editor

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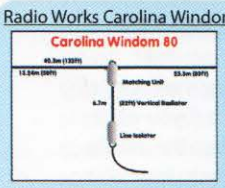

The Carolina Windom antenna require the use of an ATU to achieve best performance. Most internal ATUs

CW-160	160m 1kW 265ft 160-10m bands. 50 Ohm feed with balun and isolotar.	**£164.95c**
CWS-160	Short 160 1kW 133ft 160-10m. s. 50 Ohm feed with balun and isolator.	**£164.95c**
CW-80	80m 1kW 133' 80-10m bands. 50 Ohm feed with balun and isolator.	**£134.95c**
CWS-80	Short 80m 1kW 67' 80-10m. 50 Ohm feed with balun and isolator.	**£139.95c**
CW-40	40m 1kW 67' 40-10m bands. 50 Ohm feed	

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Rotators with USB controllers

SPID-RAU Azimuth Rotator **£449.95**

Angle of turn: 360 degrees + / -180 °
Time of tour: 60 sec.
Supply: 12V-18V DC
Weight: 6.5 kg
Input signal: pulses (one pulse per degree)
Vertical pressure: 120 kg
Maximum net torque: 180 Nm

SPID-REAL	Elevation Rotator	£549.95c
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SPID-BIG RAK	Azimuth for big beams	£874.95d
SPID-RAS	Azimuth & Elevation Rotator	£924.95d
SPID-BIG RAS	Azimuth and Elevation	£1374.95d

A step up from mainstream rotators, they provides direct mast mounting. Can be incorporated with an Elevation rotator and integrated with Ham Radio Deluxe software.

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Here's a quick guide to going mobile the Hustler way!

A top resonator is needed for each band (there are standard ones and high power ones) and you need a common lower mast as a one off purchase.

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RM-10-S	£24.95c
RM-11-S	£29.95c
RM-15-S	£29.95c
RM-20-S	£34.95c
RM-40-S	£42.95c
RM-80-S	£56.95c
Regular Resonators	
RM-10	£21.95c
RM-12	£21.95c
RM-15	£21.95c
RM-17	£26.95c
RM-20	£26.95c
RM-40	£29.95c
RM-80	£32.95c

There are several mounting options that can be used all base around the 3/8" threaded mounts. The SSM-2 ball mount can be mounted on a flat surface with the optional SSM-3 spring. Alternatively you can use our three way magnetic mount.

Mounts

Lower Mast Options		
MO-1	137cm - folds at 56cm	£39.95d
MO-2	137cm - folds at centre	£39.95d
MO-3	137cm non folding	£29.95d
MO-4	69cm non fold -for car roofs	£27.95c

MA5B Mini Beam for Small Gardens

- *Bands: 10, 12, 15, 17, 20m*
- *Max gain: 5.3, 0, 4.8, 0, 3.6dBi*
- *Front to back ratio: 10, 0, 12, 0, 22dB*
- *Power rating: 1.2kW*
- *VSWR: 2:1*
- *Boom length: 2.2m*
- *Boom diameter: 3.8cm*
- *Longest element: 5.2m*
- *Turning radius: 2.7m*
- *Max wind surface area: 0.3m²*

Made by the famous Cushcraft works in the USA, this offers great performance for the smaller garden. It covers the most popular DX bands at full legal power.

£529.95d

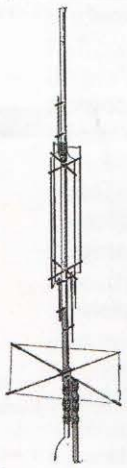
Multi Band Dipole

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

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

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

CHALLENGER-DX £329d

- *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 £359d

- *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 lbs 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 technology as in the Challenger DX-VIII to "open up" the low bands.

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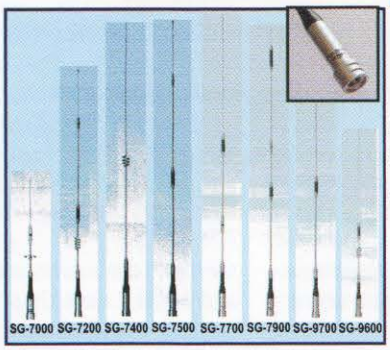

SG-2000	2m/5.2dB 1.59m	£84.95 c
SG-7000	2m/70cm 2.1/3.8dB 0.47m	£66.95 c
SG-7200	2m/70cm 3.2/5.7db 0.96m	£82.95 c
SG-7400	2m/70cm 2/5.5dB 0.99m	£71.95 c
SG-7500	2m/70cm 3.5/6dB 1.06m	£72.95 c
SG-7700	2m/70cm 4.3/6.8dB 1.27m	£92.95 c
SG-7900	2m/70cm 5/7.6dB 1.58m	£104.95 c
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SG-9600	6/2/70cmdB 0.82m	£86.95 c

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K-11	Gutter mount adjustable tilt	£36.95 a
K-600M	Trunk lip adjust + cable	£66.95 b
K-33	Hatch Mount adjustable	£43.95 a

K-400	Heavy Duty Hatch mount	£39.95 a
CRM	Roof rail / Mirror Mount	£14.95 a
K-512	Roof bar mount	£44.95 c
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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. **£134.95 C**

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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**

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144-LFA-8	8el	3.73	13.32	£164.95c
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Carriage Charges: A-£4, B-£5, C-£8.50, D-£11

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Peter Waters G3OJV says: *"I have operated the KX3 both at home, portable and mobile. I can honestly say that this is by far the best transceiver for QRP that I have ever used. It does everything I could ask for or imagine I would need and performs flawlessly. "*

MH3	Hand Microphone	£64.95 B
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Here's a great way to enjoy RTTY and PSK-31 using a keyboard without the need for a PC. Purchase the P3 panadaptor and the P3-SVGA board. This allows you to connect a large display that not only duplicates the P3 but also has a USB socket for keyboard and shows transmit and receive data signals for RTTY and

Spare and unlisted items?

Just call us. We have regular deliveries from the factory and will be happy to help you out.

KPA500 500W Linear

A 500-watt solid-state amp that's so well integrated, you'll think its reading your mind. The KPA-500 features 160-6m coverage, instant RF based band switching with any radio, alphanumeric status display, bright LED bar graphs, and a rugged, built-in linear supply. The amp's manual band switches can also be used to change bands on the K3. Also the K3 can even select per-band amplifier drive levels automatically when the amp is placed into operate mode, so you'll rarely need to adjust power output. But the KPA-500 is not just limited to use with the K3 – It is fully compatible with most radios.

KPA-500 IMMEDIATE DELIV-
Built £2199 D Kit £1999 D

P3 Panoramic Adaptor

"Up to Laboratory Standard" - RSGB Review.
Built £759 D Kit £709 D

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.

The NEW KXPA 100W Linear Amplifier The new 100W Amplifier for KX3 (and others!)

We are pleased to be able to announce the new KXPA100 amplifier that heralds a new way of working. This is not just a 100W amplifier block. It offers a lot more features, as you would expect from Elecraft. The unit provides a perfect match for the KX3, itself the best ham radio receiver performance bar none. Just a few Watts will drive it and we believe it will also offer a perfect match for the FT-817. The beta testing is almost complete and we are now taking orders.

KXPA-100-K £699. Built and tested, £749.

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

ML&S are pleased to announce the new Yaesu FTdx1200 HF/6m Base from Yaesu Musen

Features:

- TX Frequency Coverage: 160 to 6 meters
- RX Frequency Coverage: 30 kHz to 56 MHz
- Spectrum Scope
- IF Width & IF Shift
- Roofing Filters (3/6/15 kHz)
- 5 to 100 watts (2 to 25 watts AM)
- 32 Bit High Speed IF DSP
- 4.3 in TFT full colour display
- Automatic Tuner
- Contour, DNR, IF Notch and APF

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YAESU FTdx1200

Release date expected August/September.

For more information see: www.HamRadio.co.uk/ftdx1200

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E-mail: sales@hamradio.co.uk
Web: **www.hamradio.co.uk/ftdx1200**

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The Yaesu FTdx1200 provides sophisticated operation on 160 to 6 meters with up to 100 Watts on SSB, CW, and FM (25 Watts AM carrier) and a rugged state-of-the-art highly balanced receiver circuit configuration for top performance on today's crowded bands.

It uses 32-bit high speed floating point DSP. Yaesu's acclaimed superior DSP algorithm is highly effective in weak signal processing and enhancement.

The 1st IF frequency is protected by selectable 3kHz, 6kHz and 15kHz roofing filters that effectively attenuate interfering signals. The triple conversion circuit structure allows highly flexible gain distribution at each stage. This enables elimination of unwanted signals through filters at each stage as well as optimized gain distribution.

A built-in 4.3-in TFT wide full colour High Resolution Display with loads of information provides superior operability and visibility for the FTDX1200 owner.

A High Speed Spectrum Scope located just below the LCD, displays the information needed to place them at the right place on the band with the right receiver set-up.