RadCom

THE RADIO SOCIETY OF GREAT BRITAIN MEMBERS' MAGAZINE. WWW.RSGB.ORG

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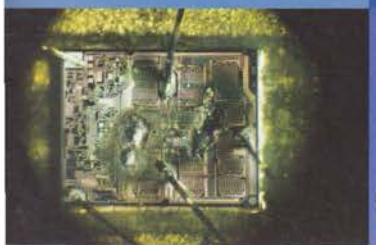
Summits on the Air

Operating from Skiddaw in the Lake District

Design Notes
Diode protection for voltage regulator chips



I-PRO Home
Centre-fed vertical dipole with capacity hat end loading

Ten-Tec Eagle
The latest HF & 50MHz transceiver

Pic-A-Yagi
Build an intelligent, self-tuning Yagi type antenna

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KENWOOD Amazing TS-590S!

"equal to the best radios available, but at a fraction of the price"
says RadCom Review Jan. 2011.

160m - 6m with superb receiver inc. dual roofing filters, Auto ATU, 32 bit f/p DSP & USB PC connection. £1369.95 D

NEW TH-D72E JUST ARRIVED!

The very latest handheld from Kenwood is a dual bander with GPS, APRS and TNC capability. The TH-D72 has a built-in SiRF Star III GPS receiver and its antenna, so that you can enjoy various GPS functions with the radio stand-alone. You also can output its GPS data (NMEA-0183) to a PC through the USB port. You can even operate dual receive on the same band.

£426.95 D

TS-480 Transceiver GREAT PRICES!

TS-480SAT	HF-6m 100W with remote head & ATU	**£779 D**
TS-480HX	HF-6m with remote head and 200W!	**£879 D**

TS-2000 Series GREAT PRICES!

A great choice for everything in one box from HF-70cms!

TS-2000E	100W 6m/2m/70cm + DSP & ATU	**£1549 D**
TS-2000X	As Above + 23cm 10W	**£1799 D**

VHF Mobiles & Handhelds

TM-V71E	Dual band mobile with echo link	**£289.95 D**
TM-271E	2m FM with mighty 60W output	**£165.95 D**
TM-D710E	Dual band mobile 50W with APRS	**£445.95 D**
TH-F7E	2m/70cm 5W SMA +FREE Clip Mic	**£236.95 D**
TH-K2E	2m 5W 4-Key Keypad SMA + FREE Headset	**£163.95 D**
TH-K2ET	2m 5W 16-Key Keypad SMA + FREE Headset	**£172.95 D**
TH-K4E	70cm 5W SMA + FREE Headset	**£163.95 D**

WATSON W-25AM

Back in stock, the W-25AM analogue power supply. The ham's favourite low noise, fit and forget, suply. Keeps RF noise to a minimum with its huge analoge transformer. With meters and variable voltage. **£92.95 D**

NEW

Illuminated Desktop Callsign

This smart illuminated Desk top callsign is a great idea to finish your station. Have it engraved with your call at very reasonable price of £59.95. Phone or e-mail us for delivery details. **£59.95**

Little Tarheel Mobile Antenna 160m - 6m!

A Screwdriver Antenna With Remote Control

LITTLE-TARHEELII

The Little Tarheel Mobile Antenna is an electric screwdriver design that will always tune to resonance and low VSWR, no matter what band or frequency. With the standard whip supplied it covers 80m - 6m and will handle up to 200W PEP. For 160m or increased /P performance on 160m to 20m add the 160m kit.

£349.95 D

Upgraded performance 160m to 20m

TH-1956

Park up and operate portable at a new level of efficiency. The 160m telescopic antenna whip kit, adds nearly 4m of whip! That gives 160m operation and a big improvement in LF efficiency. Longer whip, less coil all adds up to a new big signal from your mobile station. Even with QRP from the great idea likes of the FT-817 or the new YouKit HB-1A works well. Your own DXpedition on wheels!

£49.95 C

YAESU Major Shortage!

The production of Yaesu has been badly hit by the earthquake in Japan and there will be a severe shortage of some models. Remaining stock of the FT-950 is going fast!

FT-950 HF - 6m Transceiver - We have the LAST FEW!

HF transceivers are Yaesu's prime products and their use for contest work & DX is testimony to their quality and performance. The FT-950 represents the optimum in performance versus value. Features include:

Mic parametric 3-band EQ and processor, Tx audio monitor, Easy spot CW netting, Full break-in, SSB audio (rx) pitch control, SSB Tx bandwidth up to 3kHz, Front panel speed control, IF notch – shift and width control, Electronic iambic keyer, Contest 5 ch. memory keyer, CW audio filter, CW beacon keyer, VFO A/B with split select, Quick memory storage, Digital noise reduction, CTCSS, Repeater shift, Memory and VFO scanning, Attenuator, Pre-amp, Wide rx 30kHz – 56MHz, Roofing filters 3 / 6 / 15kHz and of course a built-in Auto ATU.

£1199 D

YAESU Two Great Mobiles

FT-2900E

75 Watt 2m mobile with 3W loud audio, CTCSS, DTMF mic and the "WIRES" internet feature.

£139.95 D

FT-7900E

2m/70cms mobile delivers 50/40W with CTCSS, DTMF, "WIRES" internet, 1000 mems and wide rx up to 999MHz.

£239.95 D

FT-2000 LAST FEW!

Another victim of the Japan earthquake is the FT-2000 series. There will be a big gap in deliveries once current stocks are gone, and maybe a price rise? This radio is a superb design used widely by DXpeditions & contest operators. Choose the 100W 160m - 6m 12v model Or the 200W model with 230V AC supply. If you want one, act quickly!

FT-2000	100W 12V	**£1999 D**
FT-2000D	200W + AC PSU	**£2599 D**

The Heavyweight Radio at a Lightweight PRICE!

HF Transceivers

FT-DX5000D	HF + 6m 200W Deluxe Transceiver + Station Monitor	**£4795.95 D**
FT-DX5000	HF + 6m 200 Watts Deluxe Transceiver	**£4339.95 D**
FT-450D NEW	As FT-450 plus 300Hz CW Filter & improved controls	**£799.95 D**
FT-450	100W HF - 6m transceiver - great value.	**£639.95 D**
FT-DX9000contest	200W HF - 6m "formula one" contest machine	**£4899.95 D**
FT-DX9000D	Deluxe fully loaded base station	**£8199.95 D**
FT- DX9000MP	Amazing 400W "legal limit" radio	**£8995.95 D**
FT-857D	HF to 2m mobile. portable or base - up to 100W	**£679.95 D**
FT-817ND	HF/6m/VHF/UHF 5W Backpack Transceiver	**£529.95 D**

VHF Mobiles & Handhelds

FTM-350E	2m/70cm Mobile Bluetooth GPS APRS	**£479.95 D**
FTM-10SE	50/40W 2m/70cms stereo FM	**£309.95 D**
FT-8800E	Dualband Mobile 50W / 30W	**£329.95 D**
FT-8900R	10/6/2m & 70cm Mobile	**£369.95 D**
VX-3E	2m / 70cm Handheld Wideband receive	**£159.95 D**
VX-7R	Waterproof dualband handy (silver / black)	**£289.95 C**
VX-6E	2m/70cms handy, 5W Wideband Receive	**£238.95 C**
VX-8DE	Triple Band 6/2m/70cm Upgraded APRS	**£369.95 D**
VX-8GE	Dualband 2m/70cm 5W + GPS Antenna	**£359.95 D**
FT-60E	2m/70cms, 5W handy Wideband Receive	**£129.95 C**

STOP PRESS!

FT-817 Short Supply

We have purchased the last few FT-817s. You are not likely to see any more for months!

YouKits FROM CHINA

W&S Appointed sole distributors of the first YouKits HF Transceivers

HB-1A-MK3-40-20 5W Transceiver

New In Stock!

Completely self-contained CW transceiver with LCD digital readout and great performance - Look at the Price!

£199.95 D

Provisional Specification:

40 & 20m	Full band coverage
Tx: CW	**Rx:** SSB CW & AM
Filters	Crystal for CW & SSB
Keyer	Built-in
Power Out	3W dry cells 5W 13.8v
Memories	20 Channels
Volts	9 - 14V
Current	Tx 950mA max on Rx 55mA
Internal	8 x AA cells
External	13.8v
Tuning Steps	100kHz - 10Hz
Size	140 x 95 x 35 (mm)
Ready Built	

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

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MFJ

MFJ-1795

Small Garden Solution
40 -6m Just 12ft Tall!

If you are looking for an HF ground mounted antenna that will fit into the smallest of gardens, take a look at the MFJ-1795. Just 12ft long, it auto switched to 40m, 20m 15m, 10m and 6m. Handles full UK power. Use it as a base station antenna for portable work. Available now.

£174.95 D

Large 6.5inch VSWR Meter "Easy Reader"

MFJ-868 / MFJ-867
(HF) (VHF-UHF)

The ideal meter as a central monitor of your transmitter and antenna. The HF version reads FSD of 20/200/2kW with PEP and RMS. The VHF version covers 20/200/400W. Both read PEP or RMS. Requires PP3 batt or ext. 12v.

MFJ-868 **£152.95 C**
MFJ-867 **£159.95 C**

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FLEX-1500

The 5 Watt tiny HF-6m transceiver that works great with a laptop. **£579.95 D**

FLEX-3000

The 100 Watt award winning HF-6m transceiver with auto ATU.

£1299.95 D

FLEX-5000A

Top range 100W HF-6m with amazing receiver and lots of options.

£2495.95 D

FLEX-5000A-ATU **£2795.95 D**
with Auto ATU built-in.

QUANSHENG

TG-UV2 2m/70cm Dual Bander

The TG-UV2 is a dual band 2m/70cm handheld. It covers 136.00 - 173.995MHz, 400 - 469.995MHz and FM broadcast 88-108MHz. The radio includes 7.2V 2Ah Li-ion battery for extended life.

- *3 Power Levels: 5W / 2.5W / 1W*
- *Steps: 5, 6.25, 10, 12.5, 20, 25, 30, 50 & 100kHz*
- *CTCSS, DCS & 1750Hz Tone*
- *Dual Watch*
- *200 Memories Alpha Numeric*
- *2 Deviation Levels*
- *2 Bandwidths*
- *CTCSS & DCS Scan*
- *Built-In LED Torch*
- *Backlit Screen*
- *PTT or VOX*

£81.95 D

TEN-TEC

TenTec, the "sports car" of the ham radio world that puts you right on the front of the grid!

NEW Eagle-599

SDR Performance in a Box!

As Reviewed in RadCom

The Eagle Has Landed! 160m-6m. A new design rom TenTec. small enough for portable or mobile with 3 IFs - the last being 0kHz DSP. We have just got the first batch of this exciting radio. It's TenTec's newest and has been getting rave reviews.

A created a transceiver combining simplified controls and ease of operation with the excellent performance of a low first IF 160-through 6-meter ham-band architecture in a compact, mobile-friendly structure. The low bass band IF brings SDR to the hardware transceiver! PC performance in a box!

£1734 D

Jupiter-538B

100W SSB CW AM FM 160m - 10m

Get a new experience in performance and innovation under the bonnet. 160m - 10m with 100 Watts output. The classic TenTec radio - it can even decode CW on the screen and send CW via a PC keyboard.

£1529 D With internal ATU £1839

Omni-VII-588

100W SSB CW AM FM 160m - 6m

Fire it up and you immediately know you are driving something different. The receiver is a delight and the transmitted audio is superb. Connect d to your home router with ethernet cable and you can remotely operate from anywhere in the world.

£2549 D With internal ATU £2849

Bob Heil's Pro-Set-6

NEW

The new Pro-Set-6 headset offers a complete new way of operation with its comfortable headset and adjustable boom mic. giving hands-free operation. But why the Pro-Set 6?

Many of todays modern radios now have EQ (equalisation) controls which allows you to finely tune the mic. preamplifier audio response to match your voice and your method of working. Bob Heil recognises this and has designed a wide response mic. insert that gives you the freedom to twiddle those knobs in your transceiver and adjust the response to suit your needs.

Pro-Set-6 **£144.95 C**
AD-1 Rig adaptor leads **£18.95 C**

HyGain
Beam & Wire Antennas

TH-3JRS

The compact 3-Band 20 - 10m 600W beam is back in stock, Less than 15ft turning radius and great performance with good bandwidth. **£399.95**

TH-1	3-Band 1.5kW dipole	£329.95
TH-2MK3	3-Band 2 el. 1.5kW	£399.95
TH-3MK4	3-Band 3 el. 1.5kW	£529.95
TH-5MK2	3-Band 5 el. 1.5kW	£799.95
TH-7DX	3-Band 7 el. 1.5kW	£949.95
TH-11DX	5-Band 11 el. 1.5kW	£1249.95

FREE UK CARRIAGE Until 30/7/11

Butternut
Vertical Antennas

These antennas are extremely efficient and use no traps. The large, air-spaced coils are the secret, and resonant adjustments can be made at ground level.

HF-2V 80, 40m DX vertical. 9.75m, Easy erect. **£299.95 D**
HF-6V 80,40,30,20,15,10m self support 7.9m **£399.95 D**
HF-9V As HF-6V but adds 17,12 & 6m. 7.9m **£449.95 D**

Watson
Cross Needle Meters

High quality, accurate VSWR meters with large, clear display featuring X-needle movements.

WCN-200 **£69.95 C**
* 1.8 - 160MHz * 0 - 30 / 300 / 3000W
* 600W max above 30MHz * 2x SO-239

WCN-400 **£69.95 C**
* 140 - 525MHz * 0 - 30 / 300 / 600W
* 2x SO-239

WCN-600 **£89.95 C**
** 1.8 - 525MHz * 0 - 30 / 300 / 3000W*
** 600W max above 30MHz * 2x SO-239*

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

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ICOM

Waters & Stanton - Another Icom Visit.

Icom chose Waters & Stanton as their prime dealer to visit in a short trip to the UK on 7th June. From left to right, Shinya Terasaki, (Icom), Jeff Stanton (W&S) and Bob Stockley (Icom). They wanted to visit Icom's major UK dealer and discuss new products (our lips are sealed!) and coming events and shows, We will all be at Friedrichshafen next month and of course the Autumn shows. Icom clearly have some great ideas and it is a pleasure for us to be chosen to work so closely with Icom Europe and Icom UK. Another reason why you get a good honest and open deal from W&S.

NEW IC-7410 HF - 6m Transceiver

Icom's Most Valued Dealer Gets First Delivery!!

Our association with Icom is second to none and so is our service.

* 100W HF-6m all modes.
* Receiver +3-dBm IP3 with 15kHz roofing filter
* 36kHz DSP IF 32 bit razor ahrp filter
* Internal auto ATU included.
* USB interface for PC control and audio out
* Large LCD Screen with comprehensive display
* Integrates speech synthesizer

Another winning design from Icom. Notice how some of the "expensive" features introduced a few years ago are migrating down to some of the more affordable radios. Well done Icom.

£1919.95 D

NEW IC-9100 HF to 23cms All-Rounder

HF/6m/2m	100W
70cm	75W
23cm (option)	10W

Satellite Mode Operation: Optional D-Star DV Mode.

The IC-9100 has received rave reviews and is THE radio for those who want everything in one box! Add the 23cms module and the D-Star board to expand your hobby even more. This radio is a real gem and comes with 2 year warranty.
UX-9100 23cms £449. UT-121 D-Star board £129.95. Roofing filters £52.95

£2999 D

IC-7600 HF Transceiver

The IC-7600 HF/50MHz transceiver is enhanced with some of the main features tried and tested on our flagship IC-7700/7800 models, highly regarded by Amateur operators world-wide. Add over 45 years of analogue RF circuit expertise and the result is the IC-7600, a new rig with outstanding performance and a multitude of innovative features including a newly employed double conversion superheterodyne system and dual DSP units and 3kHz IF (roofing) filter.

£3295.95 D

IC-7000 HF Transceiver

In your home or on the move, this radio is ideal for any occasion. The IC-7000E pack so many features and so much power into such a small space. HF-6m 100W, 2m 50W and 70cms 35 Watts. You get dual processors, multiple AGC loops, Twin pass band tuning, Digital IF filtering and Dual notch filters. You also get an extraordinary large and crisp colour display.

£1189.95 D

IC-7200 HF Transceiver

IC-7200 covers HF-6m in a distictive rugged design employing the latest digital features including extensive bandwidth and filte control. It's a great basic transceiver that allows you to enjoy the Icom quality at a very realistic price. Another Icom winner. Check out spec on pour web pages.

£839.95 D

IC-7700 HF Transceiver

The IC-7700 HF/50MHz 200W transceiver shares many features with its "big brother", the world famous IC-7800. With two independent DSP units, a +40dBm* 3rd order intercept point and ultra wide dynamic range to name but a few of the features.

£5999.95 D

IC-718 HF Transceiver

£595.95 D

Aimed as an entry-level product, the IC-718 continues all the traditions of high quality engineering that you would expect from Icom. Conveniently sized and easy to operate, the IC-718 utilises all the latest RF and digital technology and is designed to be one of the most practical rigs ever! The IC-718 offers an excellent overall specification coupled with ease of use.

ID-E880 VHF/UHF Mobile

The ID-E880 is designed to be easy to use and contain a new 'DV mode' feature which allows the operator to access D-Star repeaters in just two steps. The ID-E880 mobile is the successor to the ID-800H mobile. 50W dual bander with GPS capability, Airband receive etc.

£439.95 D

IC-E2820 VHF/UHF Mobile

The IC-E2820 dualband mobile includes popular features such as VHF/VHF, UHF/UHF simultaneous receive capability, wideband receive, independent tuning knobs and a separate controller. In addition to this new features include diversity receive capability, a full dot-matrix display & 50W output power in both VHF & UHF bands.

£489.95 D

IC-E80D Handheld

VHF/UHF dualband, D-Star transceiver. The IC-E80D is designed to be easy to use and contain a new 'DV mode' feature which allows the operator to access D-Star repeaters in just two steps on Icom site.

£319.95 D

IC-E90 Handheld

The IC-E90 multi-band handheld transceiver covers 50MHz, 144MHz & 430MHz bands and is equipped with a wideband receiver, which covers 0.495-999.990MHz in AM/FM/WFM modes.

£239.95 D

Other Radios

IC-910H	Dualband + Optional 23cm Satellite Trnscvr	£1295 D
IC-910HX	Dual Band + 23cm Satellite Transceiver	£1549 D
IC-2200H	2m FM mobile 65 Watts	£219.95 D
IC-R3	Scanner with TFT Colour Display	£399.95 C
IC-R6	Handheld scanner 0.1-1309.995MHz	£179.95 C
IC-R20	Scanning Wideband Receiver	£394.95 C
IC-R2500	Dual Communications Receiver	£639.95 C
IC-R8500	Comms Receiver 100kHz - 2GHz	£1399.95 D
IC-R9500	Comms Receiver 0.005 - 3335.000MHz	£10899.95 D

IC-T70E 2m/70cm Handheld NEW

The IC-T70E VHF/UHF dualband handheld transceiver is the successor to Icom's best selling IC-T7H. It has many impressive features including 700mW loud audio, long-lasting power, rugged construction, plenty of memory channels, all at a competitive price. In short, the IC-T70E offers practical dual band operation & ruggedness, updated for today's radio enthusiast.

£154.95 D

IC-E92D D-Star Ready

The IC-E92D is a waterproof dual band transceiver. The IC-E92D is ideal for D-STAR enthusiasts, active amateurs who are fans of outdoor pursuits or organisations that are looking for a simple GPS position reporting system. If used with the optional HM-175GPS, the IC-E92D provides GPS position reporting functions in DV mode, fully compatible with the IC-E2820 series.

£384.95 D

RadCom

THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

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RSGB MEMBERSHIP
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Subscriptions include VAT where applicable. Special arrangements exist for visually impaired persons. Details and membership application forms are available from RSGB HQ.

John, M0UKD operating from the summit of Skiddaw.

Photo: Dave, M0TAZ.

News and Reports

Sylvia Margolis (SK), centre, inducted into the CQ Amateur Radio Hall of Fame – P8

Reviews

Features

WAB stations will operate from North Lighthouse, Fair Isle in August – P16

A homebrew noise source – P19

Technical Features

Regulars

Filters and circulators can make life easier – P32

RADIO SOCIETY
OF GREAT BRITAIN

THE NATIONAL SOCIETY WHICH
REPRESENTS UK RADIO AMATEURS

Founded in 1913 incorporated 1926.
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Member society of the
International Amateur Radio Union

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Duke of Edinburgh, KG, KT**

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Details of the Society's volunteer officers can be found in the RSGB Yearbook and on the RSGB website.

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The online *RadCom* can now be found at www.rsgb.org/radcom.

Creating the New RSGB

In the nine weeks (at the time of writing) since I took on the Acting General Manager role here at Abbey Court, I've had the privilege of being able to see the operation of the RSGB at close quarters. I've also had the advantage of some very direct feedback from members. As a consequence I have come to the view that we need to be much more open and transparent about the issues the RSGB is facing and the way we plan to tackle them. This is the first in what the President and I plan to be a series of articles about creating the new RSGB. I don't see myself writing all these – perhaps the President, Treasurer or a member of newly created Advisory Group (see below) but I hope the series will continue.

This article will inevitably be my perspectives on the current position, but the Board has allowed me licence to share these with the membership, and I am looking for some response and feedback.

DELIVERING SERVICES. We must never forget that the RSGB is a member-based organisation. It is governed by a set of Articles and Byelaws last updated in 2005/6. These set out the standards by which the Society shall be run. To many members, the RSGB is not seen as simply the HQ, but a combination of HQ + Board + all volunteers. The image and perception of RSGB is therefore influenced by all these people – they number several hundred. Many carry a significant load in delivering RSGB mainline services. In general we have a devoted and loyal team of volunteers, but I wonder whether we at Headquarters engage with them well enough to enable them to be fully effective.

FINANCES. I've received a lot of comments about the financial position of the Society after recent events. Whilst we are currently owed a significant sum by the pervious General Manager and are taking all measures to recover those monies, there are other issues with our financial management. The Society made the wise decision to sell its previous offices in Potters Bar at the peak of the property boom. This released a significant amount of cash, and created a book profit for the year. Since then that cash has been used to finance the purchase of the new Abbey Court building in Bedford, relocate staff from Potters Bar, cover losses in intervening years and finance the purchase of the Bletchley Park facility. The net result of all this is that the investment cash released from the Potters Bar Sale is now exhausted, much having been converted into fixed assets (buildings). This means that we are now not in a position to sustain further losses into the future as we are operating at or below our committed minimum level of free reserves.

RSGB is operating in a diminishing market. Membership has dropped from 30,368 in 1993 to 21,416 in 2010, with a continuing projected 2% fall-off into the future. Statistics on amateur radio numbers show a steadily increasing average age, something reflected in the Society's membership profile. In past years, the Society has squeezed costs and increased subscriptions to balance the budget. There are limits to this and we now need to find new ways of maintaining our range of services. One of these must be a significant improvement in the IT infrastructure that delivers membership services. Those who have contacted me taking issue with why the RSGB is a commercial organisation should consider this: without our trading arm, our membership subscription would be significantly higher to retain current service levels.

DECISION MAKING. Now to governance – the way the organisation is run, and decisions are made. The Board has done a lot of soul-searching since recent events came to light. It now accepts that there have been instances of less than effective governance and some less than fully researched business decisions. The Board has therefore taken the view that an in-depth review is needed of the way the Society is structured and managed. This will run alongside current work on future direction, and these two strands should come together later this year. My own vision for RSGB is that it should provide:

- an outstanding membership experience (we need to be clearer what this should be)
- sound financial performance (losses are unacceptable)
- faultless internal processes (we deliver on our commitments, right first time)
- strategies that can be shown to support and grow amateur radio in the UK

We are some way from this today. And so the way we make decisions, the strategic direction underpinning them, the skill and competencies we have at our disposal and the structure of governance that oversees it all need to be overhauled. It is for this reason that we have asked some experienced business people (who are also radio amateurs) to join with a subset of the Board in an Advisory Group to make recommendations about the changes needed. I have been heartened that those who I have asked have agreed to give their time to this important activity. I shall report progress before too long. ▸▸

Whatever the proposals that emerge, we will need an extensive programme of involvement of the membership as a whole, probably culminating in an EGM to give effect to the proposals.

Whilst on the subject of membership involvement, I have been struck by the opportunities we are missing to take soundings from our membership. We have a website that could easily be the vehicle for 'e-polls' and the like. I plan to explore this as a way ahead in the next couple of months.

The basic dichotomy for the Society is this: we have converted our cash into fixed assets at the very time that we have a need for investment funds to reshape the way we run our business and at the same time need to find additional expense to fund the operation of the National Radio Centre at Bletchley Park. How we work our way through this will depend on the views of the Advisory Group we have set up, the Board and you. Whatever, it will be a challenge!

Over the past few weeks, I have been very pleased to receive unsolicited offers from some members to 'roll up their sleeves' and help us through this period. Whilst I can't guarantee to take advantage of every offer, I am really keen to find people who have time to offer (which could be at home) and who could bring a professional skill to bear on an aspect of our work. If you think YOU can help, please do get in touch – 07802 922 219 or don.beattie@rsgb.org.uk.

Finally, I have inevitably had a number of people who have expressed their concern over recent events. I have tried to reply to each of these in person, explaining our issues and why (in the case of the GM debt) we are limited in what we can say for legal reasons. It is encouraging to find that with a very few exceptions I have been able to have a mature and sensible dialogue with everyone, and that when the full picture is explained, I find I have their support.

If you want to comment on the issues raised in this article, please do so via the website (www.rsgb.org.uk/haveyoursay) or to me by e-mail to haveyoursay@rsgb.org.uk. I can't guarantee to personally reply to everyone, but I can assure you that your comments will be read and taken on board.

Right now, your Society needs you. The people at HQ need your support. The Board needs your support as of course, do I. I hope we can all rely on it.

Don Beattie, G3BJ
Acting General Manager

The syllabus of the Foundation examination changes on 1 July 2011. A new question on etiquette and dealing with abuse will be added, making 26 questions in total, with a pass mark of 19. Details were posted on the RCF examinations website in June 2010 at www.commsfoundation.org/rce/pdf/foundationsyllabus_july_2011.pdf.

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

70 years

Mr S P Shackleford	G2HAX
Mr H Barnett	G3DAM
Mr J H E Watson	GJ3EML

60 years

Mr G S Garrett	G3IJW
Mr M J Palmer	G8BOP

50 years

Mr P G O'Kane	EI5DI
Mr D G Dawkes	G0ICJ
Mr J J Davies	G3PAG
Mr J Rabson	G3PAI
Mr A J Pampling	G3RSP
Prof I A Macpherson	GM3RXU
Mr W B Bickham	G3TJH
Mr G A Hunter	GM3ULP
Mr M T Bowen	G8DWA

The Society was able to sell the tower advertised in the June *RadCom* at the original purchase price. RSGB took the decision to buy the tower when it became available at a very deep discount, in the full knowledge of the risks about planning permission. The Society took the view that if it were possible to obtain permits, the tower would make an excellent addition to the Bletchley Park National Radio Centre.

In the event, permission was not forthcoming. However, it is clear that the Society could have sold the tower several times over, based on the level of offers and expressed interest as a result of the June *RadCom* advertisement.

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

Mr M McKenna, 2E0HAH
Mr J Berrisford, 2E0RLG
Mr S Pearce, 2E0STI
Mr PMR Bingham, 2I0PBM
Mr C Thomas, 9H4CT
Mr D Lester, AE7MY
Mr D Dunkelberger, AJ4FM
Mr B Mars, AK4BL
Mr E Melton, AK9N
Mr S Schoeppe, DL7ATE
Mr A G Rodriquez, EA4GDV
Mr E Humphries, G0EZT
Mr Garwood, G4DLD
Mr N Sharples, G4NFS
Mr D Hill, G4ODK
Mr B Robertson, G4RJO
Mr I Haywood, G4SGX
Mr S Cole, G7ITD
Mr D Spooner, G8CVZ
Mr M McCutheon, GI6MTL
Pembrokeshire Contest Group, GW2OP
Mr W R Wieserman, K3YZK
Mr M McCormick, K9AMP
Mr M Stuttz, KB3TAN
Mr D Philips, KB3TOA
Mr J A Fisher, KC2TN
Mr T A Young, KC9GBL
Mr L Reynolds, KD1SQ
Mr M Schramm, KD8GIJ
Mr R Carpenter, KD8HDC
Mr R Webster, KD8OXJ
Mrs A Chavez, KD8PNY
Mr J Walker, KG4IBI
Mr N Lynch, KI4YDG
Mr G L Mannering, KJ4PZP
Mr K Richards, KU7M
Mr F G Saviers, KZ1W
Mr S Conroy, M0KET
Mr J J Simon, M0KWP
Mr C J Graham, M3PGY
Mr M S Malamkunnu, M6AQE
Mr C Redmond, M6ASV
Mr J Brownbill, M6AVN
Mr B Walstra, M6BFN
Mr R Tuffin, M6CJK
Mr C Lashmar, M6CJL
Mr RW James, M6EWA
Mr H Harrishiw, M6HRV
Mr J H Spooner, M6JBD
Mr C Braddock, M6NCL
Mr M Summers, M6PDQ
Mr c Romocea, M6ROM
Mr D Walker, M6SXR
Mr T Tiesdell Smith, M6TBY
Mr AJ Thompson, M6TLY
Mr D Wells, M6WEL
Mr E Hill, MI6ASX
Mr R McCaughan, MI6CRV
Mr T Browne, MI6DXT
Mr P Warriner, MI6PWR
Mr C Gault, MI6ZP
Mr T Burnett, MM0TOB
Mr M MacLeod, MM1EWA
Mr G Greenwood, MM6WSG
Northampton Communications Club, MX0NCC
Mr D Clark, N4YHC
Mr B Lehmann, N7UJY
Mr G Schecht, NQ7A
Mr J Shidler, NS5Z
Mr K Clond, NT9F
Mr A Mackay, RS197261
Mr S Turner, RS208090
Mr G Ward, RS208133
Mr D Pitchford, RS208180
Mr A J Mock, RS208181
Mr J Scott, RS208194
Mr E Mohsin, RS208218
Mr Doherty, RS208246
Mr S F Parker, RS208267
Mr J Skinner, RS208329
Mr G W Sawyer, RS208338
Mr S R Ring, RS208349
Mr A Taylor, RS208376
Mr L Hammar, SA6BTG
Mr M Andersson, SM0GOJ
Five Star Dx'ers Association, T32C
Mr R McFarlene, VA3AGN
Mr D Griffith, VE3KKB
Mr H Lundell, VK2ZHE
Mr D L Ranson, VK3ECG
Mr J Middleton, VK5JGM
Mr B F Alabastro, W1VM
Mr D Repici, W3HTJ
Mr R Ruhl, W4PL
Mr A M Norris, W8UJM
Mr L Friedman, WB2KHO
Mr B Gilmore, WB8FPQ

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

Mr P S Alborough, 2E0CCR
Mr C Groom, 2E0CMG
Mr N Harris, 2E0DZV
Mr E Hunter, 2E0FWN
Mr M H Price, 2E0NSS
Mr J Vann Smith, 2E0VMZ
Mr T Quiney, 2E0VXX
Mrs E Elliott, 2E1BVS
Mr C Yeates,EI7AAB
Mr R K Titmuss, G0AWY
Mr M G Wallis, G0CRD
Mr T Hamilton, G0HIN
Mr G W Coote, G1IPU
Mr RA Hudson, G1IVL
Mr L Ward, G4EPL
Mr P N Raven, G4KLM
Mr N G Pearce, G4WLC
Mr P A McBride, G6DQK
Mr S Birtwhistle, G7TYO
Mr T N Rickard, G8WQT
Mr D R Kirkby, G8WRB
Dr C V Smith, GM4FZH
Mr J A Brown, GM7SPA
Mr W Schneider Jr, K2TT
Mr R Steinberg, K9IKZ
Mr PB Martin, M0KDX
Mr M J Smith, M1ACI
Mr M Maiden, M1DPB
Mr R Wiseman, M5WIZ
Mr G Burnett, MM0YET
Mr R Krawczyk, MM1FAS
Mr K Barry, MW3AFR
Mr MTV Alvarenga, PY2MTA
Mr N W Johnson, VE3ID
Mr D Hardy, VK2JDH
Mr A Burg, W2MV
Mr J C Davidson, WB8BUZ

In the June *RadCom*, the joiners information should have read Mr B Jones, M6OXO. Our apologies to Mr Jones for the error.

Region 4 Club of the Year Winner

Pontefract and District ARS

WATERS & STANTON

2010 is the second time that Pontefract & District ARS have won the Region 4 title. Amongst the activities that caught the judges' eyes were the special events and community activities that the club has been involved in. In 2010 the club took part in 12 special event stations, from GB0SRW as part of SOS Radio Week to GB4BOB commemorating the 70th anniversary of the Battle of Britain.

Community events included JOTA with the 1st Pontefract Scouts using callsign GB1PS and the Girl Guide Centenary, when GG100UG was on the air from Upton Guides HQ. Other demonstrations with the Guides included GG100AG with Ackworth Guides and GG100FEV with Featherstone Guides.

Although not a big contesting club, P&DARS did take part in the WAS Top Band Contest and achieved the runner-up position in the multi-op fixed category.

The club has a good relationship with Carleton Community High School, a local centre of science excellence in secondary education. Two members, 2E0BSI and 2E0LUL are pupils at the school and are keen to establish a radio and electronics club there. These two young people, Catreena and Laura, ran the 2010 QRP mini convention raffle at Rishworth and raised over £200 on the day.

The club has an Outreach Officer to specifically liaise with other organisations to promote the club and amateur radio more generally. This has allowed P&DARS to focus its efforts to bring amateur radio to a wider audience. New members and visitors to the club can always get advice on all aspects of the hobby from the mentoring scheme within the club, whether that's advice on antennas, equipment or just hands-on use of the club equipment to become comfortable about going on the air. An equipment loan scheme has also been most helpful.

If you would like to learn more about the club, you can check out their website, www.pdars.com, which has a contact option if you would like to get in touch.

Operating GB0PH under canvas at Pontefract Castle.

Sylvia Margolis

The *CQ* magazine Hall of Fame is a pretty big deal in American amateur radio circles. Every year *CQ* chooses about a dozen individuals who tick these boxes:

The CQ Amateur Radio Hall of Fame honours those individuals, whether licensed hams or not, who have made significant contributions to amateur radio, as well as those amateurs who have made significant contributions either to amateur radio, to their professional careers or to some other aspect of life on our planet.

The 2011 selection was typically distinguished, mostly American, including people like film and TV producer Dave Bell, W6AQ, and the Archbishop Emeritus of Los Angeles, no less, who amazingly is also W6QYI. They also chose my mum, Sylvia Margolis.

Sylvia is listed thus: *Sylvia Margolis (SK) - Prolific CQ humour writer in the 1960s and early '70s, she was the first public relations officer for Radio Society of Great Britain.*

Sylvia Margolis was a 1950s Essex housewife when her family was hit by a tsunami called amateur radio. The pursuit pretty well took over her family's life – her husband Maurice became G3NMR in 1959; her son Laurie – that's me – became G3UML in 1965. Sylvia was in no way technical. She always argued that Ohm's Law should be repealed and sincerely wished that the American artist Samuel Morse had stuck to painting US presidents instead of inventing his silly code. But she had a sense of what had potential and what was fun, and saw all that in the original World Wide Web – amateur radio, HF DX and, specifically, the social side of the hobby. She was also a brilliant and entertaining writer, who in the last quarter of her very short life became a nationally known writer and BBC radio personality.

Sylvia didn't know one end of a piece of coax from the other, but she loved the worldwide contact that amateur radio made possible, decades before the internet and cheap telecommunications. Amateur radio was glamorous and exciting in the 1960s. Jet travel became commonplace, and interesting and exotic personalities, whose voices she heard over her husband's radio, appeared in London. There were glitzy dinners at the Royal Garden Hotel in Kensington, opulent affairs with top entertainment, the likes of which have not been seen in Britain since.

Sylvia loved all this, and started writing about it for *CQ*. She chronicled the fun social side of amateur radio, the fascinating personalities who passed through – politicians, airline pilots, diamond dealers, businessmen whose affairs didn't bear too close scrutiny. Her pieces were chatty, humorous and anecdotal, with nothing about resistors or decibels. Her American audience loved them, and, even now, 34 years after her death, I get frequent comments on the air and on QSL cards from her fans.

At the same time, Sylvia was involved with a small, cheeky, noisy organisation called the Amateur Radio Mobile Society, which grew as compact SSB transceivers came onto the market and HF mobile operating gained ground. She pretty much wrote the ARMS monthly journal, Mobile News. She was part of the ARMS team that organised enormous mobile rallies at USAF bases like Mildenhall.

Initially the relationship between ARMS and RSGB was roughly that of a dog to a lamppost, but she got to know and respect the top RSGB figures of the time. They in turn realised that Sylvia, with her dynamism and rapidly developing profile beyond amateur radio, would be an effective spokeswoman for the hobby. Hence she became the RSGB's first Public Relations Officer.

One of her first projects was typically large scale – a conservatory appeared on the pavement outside the old *Daily Mirror* building. She'd convinced the Mirror to sponsor a top-class station in a most public City of London location, with antennas on top of the Mirror's tower block. The station was seen by thousands; featured on TV and radio; it blasted a big signal all over the world from central London, making thousands of contacts. It was a typical Sylvia project.

Sylvia died of cancer aged just 50 in 1977, four years after the equally early death of her husband and my father Maurice, G3NMR. She'd have been thrilled by the honour from *CQ*.

Laurie Margolis, G3UML

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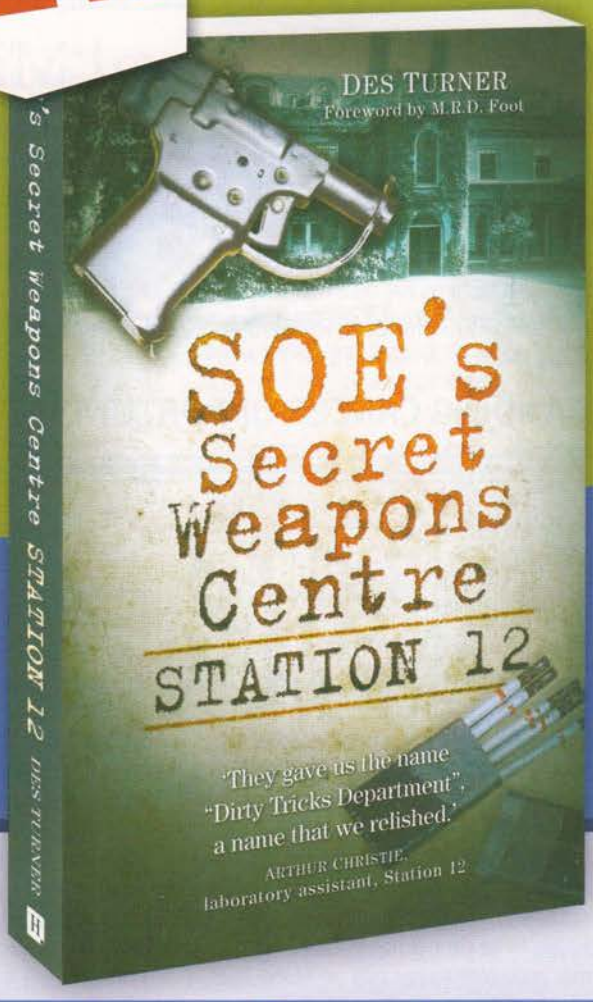

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SOE Special Weapons Centre was born out of Bletchley Park, where it began life as SIS Section 'D' (for Destruction). Station 12's scientific and military personnel invented, made and supplied 'toys' for the Commandos, Special Boat Service, SAS, and resistance groups. Included in their deadly arsenal of weapons were plastic explosives, limpet mines, pressure switches, tree spigots, incendiary bombs, incendiary liquids and arrows, and a variety of time fuses. They worked on the tools for famous operations, such as the St Nazaire and Dieppe Raids, and the assassination of Himmler's deputy in Prague. Also revealed are the human stories of personnel stationed in this extremely remote village and the explosive pranks they played on each other, and certain visitors, which add some light relief to their destructive purpose.

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Please write with your CV to me, Dave Wilson, M0OBW, RSGB President, RSGB, 3 Abbey Court, Priory Business Park, Fraser Road, Bedford MK44 3WH or e-mail gmvacancy@rsgb.org.uk. You can also call me for an informal discussion on 07860 691 056.

THIS COULD BE YOUR OUTSTANDING CAREER OPPORTUNITY.

Dayton 2011

As usual, at the Dayton Hamvention, the RSGB had a visitors book. Those known to have visited the stand include the following:

A65BD
AA3XV
AE7MY
AG4VF
AJ4FM
AK9N
DL7ATE
G0DWV
G0KFO
G2KQ
G3LUE
G3RZP
G3SDH
G3UYN
G3YSX
G4CXQ
G4GXL
G4NFS
G8NDT
G8YEV
K2TT
K5HK
K9AMP
K9GCF
K9IKZ
KA8Q
KB3TAN
KB3TOA
KC0G
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KI4YDG
KV0S
LA2NI
LA9UI
MM1CCR
N4YHC
N4ZPT
N7QA
N7UJY
N8AZT
N8GFD
NQ7A
NS5Z
NT9F
VA3AGN
VE3ID/ G4AJQ
VE3KKB
VK5JGM
VR2PW
VU2RBI
W0AIH
W0AO
W2MV
W3HTJ
W3IU
W4PC
W4TSA
W4ZYT/ EI2IM
W6ROD
W8HC
W9GL
W9KIZ
W9OP
WA2BHB
WA9BFH
WA9GQK
WB2KHO
WB8BUZ
WB8FPQ
WB8LZG
WG8S
YU3AA
ZL1LC

QSL Matters

DESPATCHES. It isn't always practical for space reasons to list every county to which we send large boxes. Last month these included Belgium, Bosnia, Denmark, Germany (x2) Italy, Finland and Slovak Republic. This month Germany scores again with 20kg whilst Denmark, Italy, Netherlands, Poland, Spain and Russia get 10kg each.

To get best value for members we have a monthly rolling programme. Checking sort bins in turn, we select around 30 smaller packages to be sent either by carrier or by normal post, aiming to cover all of the 168 smaller bureaux in a reasonable time frame. The system is flexible, to accommodate special events etc. If we see an increase in activity, additional despatches are made. Last month's selection included Algeria, China, Costa Rica, Gibraltar, Honduras, Indonesia, Kuwait, Lebanon, Malaysia, Taiwan and Tunisia. This month, amongst others, we will ship to all 15 USA bureaux, Barbados, Belarus, Estonia, Georgia, Ireland, Macedonia, Trinidad and Georgia.

With some 22 bureaux currently closed and some countries such as Morocco, Egypt Mauritius and many parts of the Caribbean and Africa without one, it's always good idea to check before you send. Avoid disappointment by downloading a full list of bureaux at www.iaru.org/iaruqsl.html.

VISITING THE ISLE OF MAN? UK Post Offices no longer stock IOM stamps. If you are thinking of operating from GD, make sure that you obtain stamps on the island to lodge SAEs with the QSL Manager Martin, GD3YUM. Envelopes bearing UK mainland stamps cannot be sent from Jersey or Guernsey either, so buy stamps during your stay for collection envelopes sent to the respective island sub managers.

POSTAGE. Tim, M0URX advised recently that for card bundles above 1kg, Royal Mail Standard Parcel is the most economic method of sending a large number of cards. See the price guide at www.royalmail.com/prices2011. So, put all your cards in one package, rather than several smaller ones.

ENVELOPES. Earlier this year, responding to pleas from sub managers wishing to clear stocks of 5 year old envelopes and unusable money value stamps, we advised that this would happen in July. If you have been inactive for some time, this is now the last chance to contact your manager.

5MHz Presentation

Dr Marcus Walden, G0IJZ, recently attended the 13th International Ionospheric Effects Symposium (IES2011) in Alexandria, USA. Marcus gave a presentation titled "Comparison of Propagation Predictions and Measurements for Mid-Latitude HF NVIS Links at 5MHz", which compared near-vertical incidence skywave (NVIS) measurements from the UK 5MHz beacon network with HF propagation predictions using VOACAP and ASAPS software. Further information and a link to the paper can be found on the RSGB website at www.rsgb.org/spectrumforum/hf/5mhzintro.php.

Marcus will also be at this year's RSGB Convention to give a presentation on NVIS frequency selection, the 5MHz beacon measurements and HF NVIS propagation predictions.

Forthcoming Meetings

The next RSGB Board meeting will take place on 9 July, with the next Regional Council Meeting taking place the following weekend on 16 July. The RSGB Management committee next meets on 12 August. If you want to comment on any issues, please do so via the website (www.rsgb.org.uk/haveyoursay) or to the Acting General Manager and President by e-mail to haveyoursay@rsgb.org.uk.

Overseas Visitors

Recently, within the grounds of Bletchley Park, the Milton Keynes Amateur Radio Society played host to a group of Belgian radio amateurs from the Radio Club de Binche who operated a demonstration radio station on the lawns adjacent to the Mansion.

Bletchley Park, the home of the code breakers, with its WW2 links was, for them, the ideal place to operate their station using the callsign M/ON4WAR. They contacted many stations throughout Europe using their homebrew replica Whaddon Mk VII spy sets. Several of the Belgian amateurs were in fact related to members of the wartime Belgian resistance and brought with them the medals issued to their relatives, along with historical documents of the time.

The Mk VII clandestine radio was developed and manufactured around 1940 at the workshops at Whaddon Hall and, later in 1942, manufacture was transferred to the workshops at Little Horwood, the latter two being in North Buckinghamshire. Manufacture of the Mk VII later began at the Bontex Knitting Mill in West London for the Special Operations Executive, where they named it the Paraset because it was dropped by parachute to agents operating in the field.

There are several examples of this piece of unique equipment on display in the museum at Bletchley Park.

Photograph courtesy Peter Davies

Yorkshire Belle

The Mexborough & District Amateur Radio Society has been lucky enough to secure passage on the *Yorkshire Belle* on 30 July for a full day of Maritime Mobile. Sailing from the coastal resort of Bridlington on the east coast of England, they intend to operate both HF and 2m stations from on board the *Yorkshire Belle* with a support station nearby on land. This is the first Maritime Mobile event for the club and a great honour to be allowed access on the *Yorkshire Belle*.

Anyone wishing to contact Full license holders working maritime mobile from the Yorkshire Belle should listen out from 9am onwards on 30 July.

Icom Visit

Waters & Stanton had a visit at their Hockley showroom from Bob Stockley, Managing Director of Icom UK, together with Mr Shinya Terasaki from Icom Europe, who is based in Germany. Icom were visiting key European Icom dealers to gather information to assist the planning of future products.

Jeff Stanton said "As an Icom dealer for more than 30 years we were able to make many constructive suggestions which we hope to see realised in future products. It's good to see Icom taking this proactive approach".

Holy Island Dxpedition

From 15 to 18 July, the team from Wakefield and District Radio Society will be making their annual activation of Holy Island off the beautiful Northumbrian coast. The island qualifies as IOTA EU-120, World Flora Fauna GFF-013 and GFF-172, WAB number NU14 and lighthouse number ENG-224. The callsign will be GB1HI and also GB5HI where necessary. Bands will be 80m to 10m as conditions allow and transmission should commence at 1200BST on Friday and end at 1200BST on Monday. QSL as usual will be via Charles, M0OXO. Visitors are welcome to the site, which is on the approach road to the castle. If you want to have a go, then please take your licence as proof of entitlement. Further details are on qrz.com.

New Linear

Vine Antennas have their first delivery of the SPE Expert 2K-FA amplifier. The amplifier is a higher-power version of the Expert 1K-FA, which is proving to be a very popular unit. Full details of the unit can be found at www.radio-ham.eu/download/Leaflet%20Expert%202K-FA%20inglese.pdf. Vine Antennas is at www.vinecom.co.uk.

NEWS IN BRIEF

• The BBC news story at www.bbc.co.uk/news/uk-wales-south-west-wales-13538545 refers to the recent conviction of the murderer of Peter Dixon and his wife, who were killed in 1989. Peter was a licensed amateur who had been operating portable on the Pembrokeshire cliffs. The RSGB helped the police in their initial enquiries.

Air Ambulance Visit

On 29 May, the Kent Air Ambulance flew in to Headcorn Airfield to receive a cheque for £250 from The Kent Weald Radio Club. Every year The Kent Weald Radio Club members set up their amateur radio station, GB1HA, on the airfield with permission of Mr Jamie Freeman, who owns the airfield, and without whose kind cooperation the events could not take place. Having persuaded friends and family to sponsor them, the members make as many contacts worldwide over the long weekends to raise as much money as they can. The Club has donated to several local charities including the Kent Air Ambulance for many years, but this was the first time the Air Ambulance has been able to call in to collect their cheque.

Kenwood Award

Martin Lynch & his team were delighted to receive the Amateur Radio Dealer of the Year award from Kenwood Electronics. The award was received by Martin Lynch at Kenwood House, HQ of Kenwood Electronics UK Ltd, in Watford, Hertfordshire. Martin and his Sales Manager, Richard Atcherley, were welcomed to Kenwood House by David Wilkins, Kenwood's Amateur Radio Sales Manager and Andy Dawson, National PMR Sales Manager, who said "the year on year increase in ML&S' sales of our radios, especially in the face of the recession, was achieved by your dedication to service combined with a first class product knowledge amongst all your staff".

Mills on the Air

Once again, Waterside New Forest Radio Club members found themselves operating at the very top of Eling Tide Mill, in the attic, during the annual special event Mills on the Air weekend. The earliest surviving reference to Eling Tide Mill appears in the Domesday Book, in 1086 AD and, over the centuries, it has had to be rebuilt many times, the last occasion in the 1770s, after extensive storm and flood damage. Today, the mill is the only fully working and productive tide mill that harnesses the power of the tide to grind wheat into wholemeal flour in the UK.

Radio station GB0ETM was set up in the mill by Tim, G4YVY, with transportation assistance from Tony, G6MNL. Club members Robin, G0OSG, Mel, G0FOH, Peter, G0RGB and Rod, G6LVJ helped to operate the station during the weekend. The club's G5RV aerial, stretched between the local yacht club's mast and the mill, was fed by the radio club's FT-757 GX MkII transceiver. Many contacts were made with UK and European radio amateurs, although it was often very hard work owing to an extremely high RF background noise level at the location. During Sunday afternoon, several mill visitors were introduced to amateur radio activity.

All club members involved agreed that in spite of technical difficulties, holding the event in such an unusual setting had been well worth while.

Another excellent 'Mills on Air' weekend was held at Gleaston Water Mill. Unfortunately 80m had S9 noise levels and little activity, but 40m was excellent although very busy. The station was operated by Furness Amateur Radio Society and located in the old grain store rooms that have been converted to education and training rooms. This working water mill is used by the club for talks, films, construction evenings and to train newcomers to amateur radio.

Running a 2m all modes station, a Kenwood TS-570D and Collins linear into a 160m delta loop the group worked 35 mills in the UK, Ireland and The Netherlands, plus more than 150 amateur stations around Europe, with many requests for the QSL card.

Gleaston Water Mill was granted GB2GW as a permanent special event call in June 2009, so you may also hear them on the air during the year. Visiting amateurs are welcome to use the shack when the mill is open. Follow the brown & white signs from the A5087 Ulverston to Barrow-in-Furness coast road, just off Morecambe Bay, south Cumbria. Contact Mike Brereton, G8ALE via www.watermill.co.uk.

Using the callsign GB1WM, the Bittern DX group had a very successful weekend situated in the field next to Weybourne Mill on the North Norfolk Coast, one of the most photographed buildings in the area.

At times there were four stations in operation. Tim Chapman, G0OOD, master-minded the CW end of the market, while Ken Holloway, M6JJK managed contacts with Mexico and Cuba using PSK31. Prizes though have to go to Duncan Cooper, M0WTG who, in the early hours of Sunday using SSB on 20m, called in to a DX net and gained reports from several 4VK stations.

Peter, M3YKX, the catering manager, provided his famous 'double heart bypass all day breakfast', so even those who kept the night watches were not neglected.

This was a very happy the first outing of the season for the Bittern DX Group. As it was not actually a contest, it was an opportunity for several new members to get the feel of the transceivers and to experience a pile-up.

Bedford & District ARS had a good time at Bromham Mill for Mills On The Air with a fair number of contacts to other mills, castles and individuals. They would like to thank Preston, G4MLA; Bob, M3DPQ; Alan, 2E0GLD (who helped cutting and tuning antennas and putting up the kit), Glen, G0GBI (who rushed back from his presentation in Derby, helped to put up the kit and did some operating) and John (who stayed during the whole process and helped to put everything away, as well as up). It got a bit chilly in the end.

Thanks also go to Lorraine Daley of Bromham Mill for her kind hospitality and use of one of the outbuildings and facilities. Many thanks also to the gentleman who helped to launch the guy ropes.

The Amateur Portable Group, EI0Z, was active in Delaney's Mill in Rathfeigh, County Meath, ROI. The group would like to take this opportunity to thank all the UK stations for filling the log on 40m with the massive pile-ups. A reasonably new group, only formed August 2010, they already have ten events under their belt and all have been well supported by UK operators. Anyone waiting on QSL cards will get them as soon as they arrive from the printers.

NEWS IN BRIEF

• The Summer 2011 edition of Broadcasts in English has just been published by the British DX Club. Available as either a 32-page booklet or pdf, it's an hour-by-hour directory of English language broadcasts on short wave, completely updated for the summer (A11) season frequencies. Details of how to order are on the club's website, www.bdxc.org.uk.

The World Castles award will be holding an activation weekend on 25 and 26 July, for anyone interested in activating a site. More information can be found at www.wcagroup.org/ENG/wcw.html. The event takes place from 0000UTC until 2359UTC. All HF and VHF amateur bands can be used. If you are interested in taking part then go to the World Castle Website to register. If you require a location reference, then contact your local CASHOTA representative, who can issue one, at www.cashota.co.uk.

The Milton Keynes ARS annual rally will be held at Bletchley Park on the bank holiday, 28 August. With a beautiful park and stunning museum for visitors to enjoy, this super rally location means you can bring along the family and enjoy a fabulous day out, as well as picking up some great bargains at the MKARS rally. There's also GB2BP, the resident special event station, which will be operational throughout the event. See www.mkars.org.uk for details. Please note that entrance to the rally does not include entrance to the Park.

• Churches and Chapels on the Air will next take place on 10 September. If you intend to put a station on, please let John, G3XYF know, via g3xyf@btconnect.com or 01377 254441.

NEW

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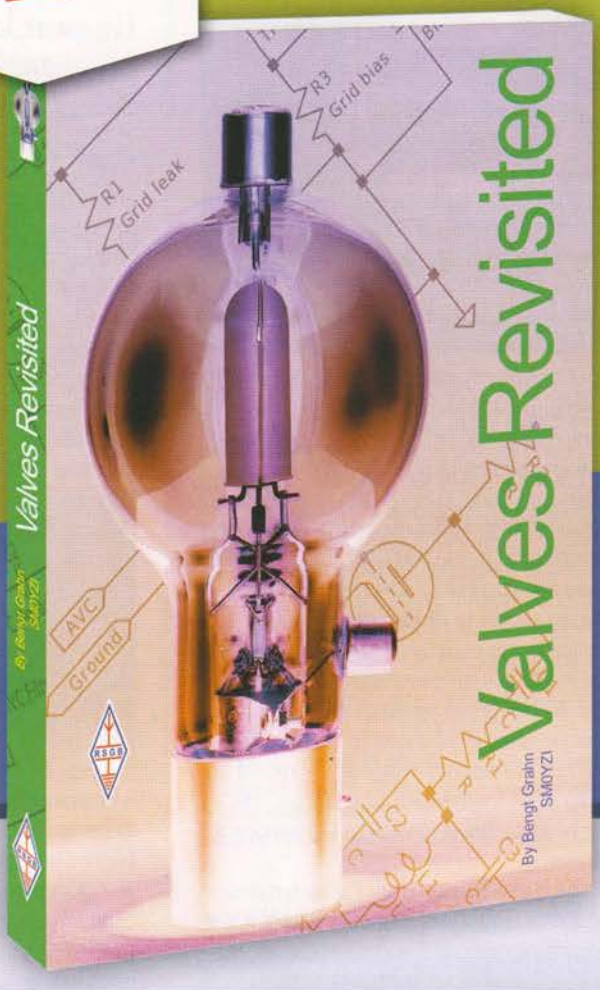

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New 10m Transceiver

Nevada has a new 10 metre SSB transceiver, the AT-5555-N, available from stock. This N suffix version is pre-programmed by Nevada to cover just the 28 to 30MHz amateur band with a 6-band 60-channel frequency selection and fine tuning to organise favourite frequencies for fast tuning. It provides AM/FM/SSB transmissions with a power output of 21 watts SSB and 12 watts AM/FM.

Priced at £149.95 and supplied complete with microphone and mounting bracket, this radio is an ideal way to enjoy the current good and improving conditions on 10 metres. www.nevadaradio.co.uk.

RSGB President visits Ayr

Dave Wilson, M0OBW, the President of the RSGB, visited Ayr Amateur Radio Group at their May meeting. Dave's presentation was both interesting and informative, covering in some detail of the 'behind the scenes' negotiations that the RSGB are involved in - in particular the EMC matters that that are becoming more prevalent in our amateur radio activities.

Prior to Dave's visit the AARG had given him 'heads-up' on four questions that were important to the group. Dave had all the in-depth answers and they all felt better informed. One of the Group was invited to expand his question to the RSGB Board at a later date.

The question of how to involve the younger sector of the community in amateur radio activities arose during the various conversations with the Group. Dave informed us that the RSGB was well aware that the need was there and suggested ways of overcoming the matter including a close look at how those who have passed the Foundation licence stage could be encouraged to move on to the Intermediate and Full levels of the licence.

FUNcube SDR Dongle at Space Colloquium

The 26th AMSAT-UK International Space Colloquium will be held on the weekend of 30-31 July at the Holiday Inn Hotel, Guildford, close to the University of Surrey. A special beginner's session is planned for Friday afternoon 29 July. The event attracts an international audience from those involved in building and operating amateur radio satellites and CubeSats to beginners who wish to find out more about this fascinating branch of the hobby.

Among the talks planned for the weekend is one on the AMSAT-UK FUNcube Dongle software defined radio (SDR). Developed by Howard Long, G6LVB, the Dongle is a VHF-UHF SDR about the size of a memory stick that plugs into the USB socket of a PC. It was developed as a low cost receiver to enable schools to receive the FUNcube satellite being built by AMSAT-UK, however, its wide frequency coverage of at least 64-1700MHz has opened up many other possible uses. Howard was awarded the Fraser Shepperd award at the recent RSGB AGM for the FunCube Dongle. He also be speaking at the RSGB Convention in October.

The event is open to all Radio Amateurs and SWLs. Either day passes or full packages comprising overnight accommodation and meals are available. Further details at www.uk.amsat.org.

GB0RMS

In May, £1000 was handed over to the Rachel Maddox Disabled School, Waterlooville by members of the Waterlooville ARC to help buy equipment for the school.

On 27 July they will be running a special event station from the school using the callsign GB0RMS on all bands to allow some of the disabled pupils to use amateur radio. Please listen out for them.

The Antarctic comes to Berwick-upon-Tweed

Members the Borders Amateur Radio Society were given a really 'cool' presentation in May. BARS would like to thank Ron Smith, G3SVW who gave an interesting and amusing talk covering some of his Antarctic adventures whilst he was employed as a radio operator for the British Antarctic Survey in the 1970s. As radio operator he was responsible for location monitoring of personnel, emergency responses, provision of weather reports on CW as well as stores requisitions on RTTY. Whilst on his two year tour of duty, he also undertook many different non-radio related activities including those of chef, co-pilot and was even present at an operation on a husky! Clearly, speaking to Ron was considered quite a coup in the amateur radio world because of his unusual location and rare callsign VP8LK.

BARS arranges and organises several radio related events and activities over the year on an ongoing basis. Anyone who wants to find out more is welcome to come along to the St Johns Ambulance Hall in Tweed Street, Berwick-upon-Tweed at 7.30pm on the second Friday of the month or alternatively call Chairman Danny Fleming, 2M0CDO on 01890 882850 for more information.

Antenna Sponsorship

M0CVO Antennas provided sponsorship in the form of an antenna to Grantham Amateur Radio Club for their special event station GB5GSA (Grantham Scout Anniversary) in May. The antenna supplied was the LW-20 long wire antenna used for 80 and 40m on the day. M0CVO Antennas also provided a 4:1 balun to the Martello Tower Group to be used with a 40m full wave loop during their activation of GB4MTG, Point Clear Martello Tower CASHOTA station, also active in May. More information on M0CVO Antennas products can be found at www.m0cvoantennas.co.uk.

Regional Visit

Denby Dale Amateur Radio Society was pleased to welcome Harold Scrivens, G0UGE, Region 4 Manager, to their recent meeting in May. Harold updated members on the latest news from Region 4 including Club of the Year and a proposed White Rose contest to be held between clubs in Yorkshire and near neighbours Lancashire, which is sure to bring out the best between these fierce rivals. He then went on to outline recent news from Abbey Court and answered questions from members which included how stations might operate during the forthcoming Olympic Games 2012.

Harold, G0UGE (centre, with red badge) with members of DDARS.

W&S Open Day

Waters & Stanton held their 21st Annual Open Day in May. The sunny day brought around 200 visitors to Hockley, many of whom made their purchases, sampled the refreshments and then went to the nearby free Southend Airshow to see the Red Arrows and, amongst others, the Vulcan bomber.

Yaesu, Kenwood, Icom & bhi supported the day, as did CARS, Essex Repeater Group, the RSGB with their bookstall and the Essex CW Club. Several hundred pounds was raised in the raffle with subsequent donations to Marie Cure Cancer Care and Hockley Methodist Church.

The Essex CW Club also took the opportunity to receive the trophy as winners of the Region 12 national Club of the Year. Waters and Stanton sponsor both the Region 12 trophy and the National competition.

Radio Active weekend

Norfolk Amateur Radio Club staged its fifth Radio Active weekend in June, attracting radio amateurs of all ages and raising £478 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 two HF CW contest stations that ran throughout the whole 24 hours of NFD, with some amateurs choosing to make a weekend of it and camping overnight. G4ARN/P (open section) made 1,050 contacts and G6NRC/P (restricted) made 575. Another station on site, G8QR/P, made a valiant effort in the 6m contest that was also taking place over the weekend.

Other events included talks on Solar activity, HF and Sporadic-E propagation, APRS tracking and a fun family 2m foxhunt on foot where you had to track down hidden beacons using direction-finding equipment, jointly-owned by NARC and a local Scout group. Morse assessments with certificates were also available all weekend.

Sunday lunch came courtesy of Club Chairman David G7URP and a raffle was held with prizes donated from a variety of radio manufacturers and retailers, including Icom, Waters & Stanton, Kenwood, Rapid electronics, RSGB, JPR electronics and Martin Lynch.

NEWS IN BRIEF

• Bobby, MI0RYL will be activating Scrabo Tower in Newtownards on 1 July, using various HF bands (propagation allowing). Then on 8 July he will be activating Quoile Castle, Downpatrick. All details can be found at www.cashota.co.uk.The GI HF Conference will take place on Saturday 20 August in the Technology Education Centre, Omagh BT78 1FA. Registration is from 11am.

Verulam 50th Anniversary

In June Verulam Amateur Radio Club celebrated their 50th anniversary with an open day. Over 60 club members, ex-members and friends came along and enjoyed demonstrations, lectures and a hog roast. The Club was the runner up in the 2009 National Club of the Year competition.

The club had a very comprehensive display of radio equipment through the ages from an untuned spark gap transmitter and coherer to a modern SDR receiver. John, G0NVZ demonstrated a Tesla coil to the three newest members of the club. Ben, M6RTX, Michael, M6CRN and Kenny, M6AEH all passed their Foundation exam at Sandringham School on a course run by Verulam ARC.

There were demonstration stations run by the club and Mid Herts Raynet as well as the Camb Hams demonstration vehicle set up on the school playing field. Matthew, G6WKZ assisted by Andre, M0JEK were using Matthew's Icom IC-7700 for a data station. They had had some success over the weekend having worked various VK and SA stations.

After the official opening by Chairman Norman, G8ATO, he welcomed founder member Brian Cockell, G8BJK and the three newest members to the open day. In a brief pictorial history, G8ATO showed visitors how the club has taken part in many events over the 50 years – field days, the local carnival, JOTA, rallies, DF hunts and the Great Erg race to mention just a few. The final talk of the day was on the Wireless Secrets of St Albans by Stan Ames.

All in all a well attended and enjoyable open day.

Look out for a new Club News section that will appear in the August issue of RadCom.
Items for inclusion, such as exam courses and results, special events and local activity, should be sent to radcom@rsb.org.uk.

Worked All Britain Awards

A short history of this gentlemanly scheme

PHOTO 1: OV00 can only be accessed at low tide.

HISTORY. The Worked All Britain Awards group was formed in 1969 by the late C John Morris, DFC, G3ABG. A geography teacher, John intended the group to educate others about the layout of the British Isles and used the Ordnance Survey 10km reference plus the County as a way of identifying areas. The awards scheme was originally run by the local Cannock Chase Amateur Radio Club. The WAB book was blue and listed minute details of each 'WAB' area. Some were only accessible portable and many were quite 'rare'. It was run off in the local classroom and checked by John's school children. Some visitors to the WAB stand at rallies recall those early days.

ACTIVATIONS. The most 'rare' area has actually been activated quite a few times. OV00 can only be accessed at low tide. It is at the foot of a crumbling two-tier cliff face and a small area of beach (handily marked by an old ship's boiler). This is the only part of the coast that touches the whole of the large OV 100km square.

As you can see from **Photo 1**, the terrain is quite rocky. There are adders on the way down, ticks that can give a nasty bite and a plateau half way down, where deer graze. The cliff face is nearly 550 feet in height.

Back in the 1990s, there was an annual visit to OV00. This went on for seven years and was supported by many, but organised by Steve, G0SGB (G1SGB at the time). The amateurs would go down the cliff to activate the square, everyone else camped at the top of the cliff in a farmer's field and games, barbecues etc were held during the 'OV' weekend, which always fell in the August bank holiday.

Photo 2 shows one of those barbecues in progress. Apologies to any and all that I miss here. Sitting to the far left is Peter, G4BXA, above him is Steve, G1SGB. Eating a burger is Ann, G0LAN and to the right of the gentleman leaning is Dave, G4VID (an early Awards Manager). The child in the pink is Sarah, our daughter. The chap in red is Dave, G4IAR (my OM and current Treasurer and Awards Manager). I'm in the light blue and our elder daughter Rachel is sitting to the right of me.

It was all quite jolly. We would sing (led by Steve on the guitar) and have games such as 'CB wanging' (closely related to 'welly wanging', it was amusing to see how far these items would go!). Various things brought this to a halt: it was expensive to run, the cliff face fell in and the farmer sadly died. There was a lull in activities at OV for quite a while.

In 2006 John, G4YSS decided to activate OV00 again. He made nine sorties up and down the cliff, cutting steps, erecting ladders and ropes before his actual activation on 30 April. He is an avid SOTA activator and he decided to use his rock climbing skills for the benefit of WAB. There was a very large net on frequency that day and many were able to collect this 'rare' area. Our thanks go to him for this kindness.

PHOTO 2: The 'OV' weekend.

WAB AWARDS. 2009 was WAB's 40th Anniversary year. We decided to do something special. A 'ruby' award was issued for that year only. The award took the form of a 'ruby' paperweight. A certificate was issued for the earlier stages of the award. It proved very popular and, for those who managed to do the whole thing several times over, a ruby bowl was awarded.

The Bound Skerry Trophy is issued to the person who has activated the most areas in a given year. The white piece of rock on top originates from Bound Skerry Lighthouse, visited by GM4WAB/P on a fund-raising trip in 1989. WAB has raised funds for six guide dogs and a lifeboat over the years. This was one such intrepid trip.

In honour of the founder of WAB, this crystal bowl is a replacement for the original, which had become a bit tarnished. It is given to the person who has contributed most to the group 'off-air' during the previous year. This is awarded at the AGM.

WAB TODAY. WAB is now run by a committee. The current committee comes from many parts of the country – as far south as Cornwall, as far north as Durham. There are regular daily nets on 3.760 or 7.160MHz, depending on conditions, 144.345MHz on a Friday night and an evening Top Band net on 1.935MHz.

The group has a variety of awards on offer. Most are based around the 'square', but there are some purely fun ones too, such as the Christmas Party Award – an opportunity for members to come on air and exchange friendly greetings. A different symbol is used each year, so that the 'song' progresses. It is not a contest, just aimed at encouraging activity.

New for this year is the Tidal and Coastal award. This is a 'one year only' award and has produced an enthusiastic response. The award has already been issued up to the Honour Roll

PHOTO 3: In 2006 John, G4YSS decided to activate OV00 again.

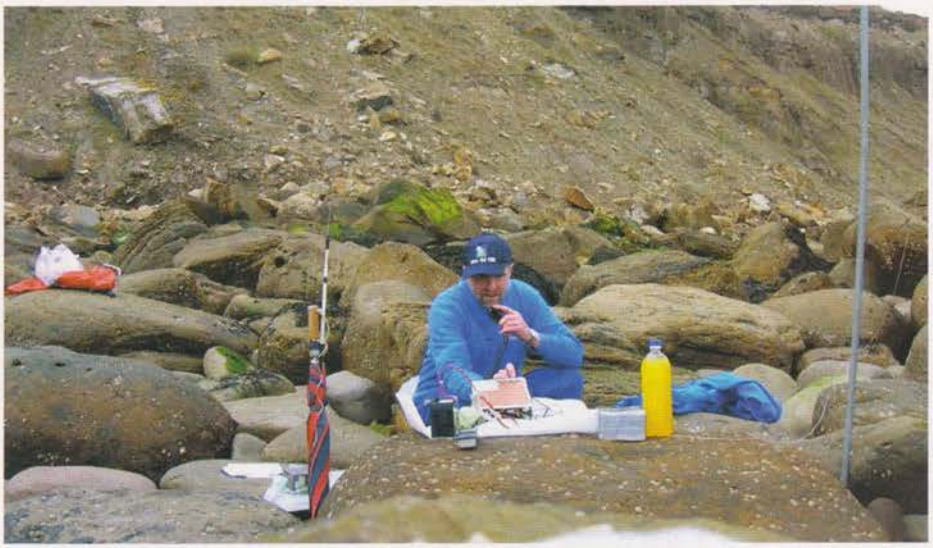

PHOTO 4: G4YSS made nine sorties up and down the cliff, cutting steps, erecting ladders and ropes before his actual activation.

level. It can be endorsed as Basic, Bronze, Silver, Gold, Sapphire, Platinum and Diamond. Again, full details are on the WAB website.

We hold a variety of Contests. Our current Contest Manager, Tony Beardsley, G3XKT, has honed the rules in order to make the scoring as simple as possible. Details and downloadable Contest sheets can be found on the website www.worked-all-britain.co.uk. The contests are very friendly, with the intention of making friends being more important than 'winning'. However, certificates are issued to the winners and trophies issued at the AGM.

CHARITABLE SUPPORT. John Morris, G3ABG intended the group to promote friendship via amateur radio and to help others less fortunate than ourselves. The original charity that John supported to this end was RAIBC. WAB still maintains a very strong connection with RAIBC, but we support others as well.

In June 2006, Norman Marshall, G1NTW (a serving Committee Member) sadly passed away. He left WAB a substantial sum of money, which we have tried to use as we think he would wish. We now make large charitable donations every year and have renewed any broken or missing trophies. The Norman Marshall Memorial Trophy was bought in his honour and is awarded to the winner of the 50MHz contest. We decided to do this as 50MHz was Norman's favourite band and the contest date fell close to the time that we lost him. He was the founder of the original website and also formed a Yahoo activity site, well-used and loved by all.

DXPEDITION. In August, a group will be going up to Fair Isle to activate the extremely rare 'Large Square' HZ. The trip has been arranged to coincide with Lighthouse/Lightships on the Air weekend to give the maximum benefit to all.

The callsigns used will be GS4WAB and GS7WAB. The group will be using all bands and as many modes as possible. Please listen out for more details closer to the time. A full report will be given on their return. Permission to use the picture of the North Lighthouse for the QSL cards has been kindly granted by the Shetland Tourist Board.

The group intends to activate all areas on the way to Aberdeen on 16 August using the nominated WAB frequencies. Once on Shetland (the following day), they will activate a number of smaller islands on their way to *Good Shepherd IV* ferry to Fair Isle itself. On the return journey, they will activate the island of Bressay and the lighthouse there as well.

For further information, please go to our website, www.worked-all-britain.co.uk. For those without internet access, further information can be obtained from Graham Taylor, G4JZF, QTHR.

PHOTO 5: WAB 40th Anniversary Trophy.

PHOTO 6: The award given to the person who has contributed most to the group 'off-air' during the previous year.

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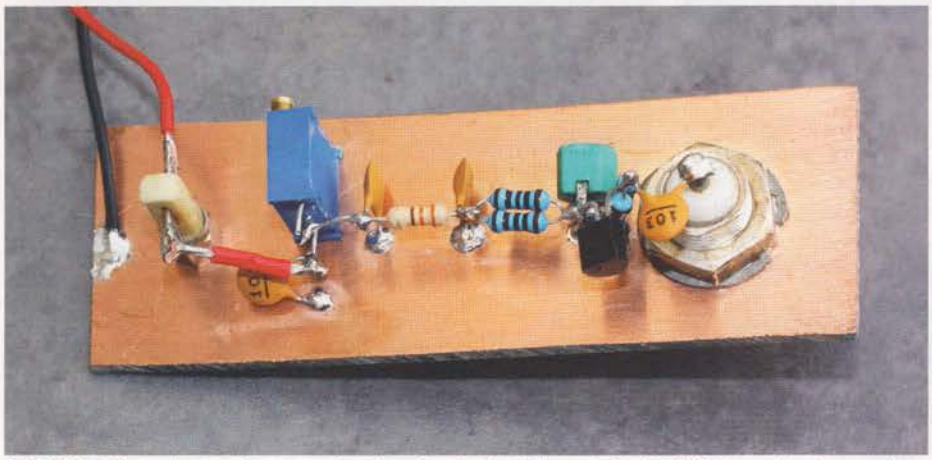

PHOTO 1: A homebrew noise source based on the circuit of Figure 2. An MPSH10 transistor base-emitter junction is used in place of the Zener diode (see text).

FRONT END IS KEY. All of our recent receiver projects have placed great emphasis on the need for strong receiver frond ends. These receivers are 'strong' in the sense that they can tolerate strong signals at frequencies close to the frequency of the wanted signal. Our MF and HF receivers have no particular need for extreme sensitivity. There is little point in having a receiver with sub-microvolt sensitivity on bands where man-made and atmospheric interference is at a relatively high level. The situation is quite different on the VHF, UHF and microwave bands, where atmospheric and man-made noise is at a very low level. The use of directional aerials also tends to reduce noise, especially when the aerial is pointed at a quiet region of the sky.

A simple definition of dynamic range (DR) is *the ratio between the weakest signal we can receive and the strongest off-channel signals we can tolerate*. An excellent receiver might have a two-tone dynamic range of 100dB or so. The lower limit of this range is the minimum discernible signal (MDS); the upper limit is the input signal level where distortion products generated within the receiver start to appear above the receiver noise floor, an input 100dB above the MDS. Nothing in the above DR specification defines the absolute levels of these upper and lower limits. At MF/HF, priority is usually given to good strong signal handling, even if this comes at the cost of reduced sensitivity to very weak signals. This is a reasonable compromise, because very weak signals will surely be below the noise level on 160, 80 and 40m. On the higher HF bands (and certainly on VHF), receiver sensitivity is more of a priority. Most HF transceivers will allow the operator to shift the upper and lower limits of the receiver dynamic range by using switchable RF preamplifiers and/or attenuators.

It is possible to increase the weak signal sensitivity of a receiver by using one or more stages of RF preamplification. There are, however, limits to the sensitivity that can be achieved. Excessive RF gain will lead to unacceptable levels of noise and distortion. Noise will limit the sensitivity of the receiver; distortion will limit the ability of the receiver to cope with strong signals. At some point, adding more RF gain will reduce the overall dynamic range of the receiver.

NOISE. A dictionary definition of noise, "Sound or a sound that is loud, unpleasant, unexpected, or undesired" describes acoustic noise very well. Unpleasant and undesired is also a good description of some of the RF noises that interfere with radio reception.

Noise comes from a variety of sources. The radio Q code QR*M* refers to *man* made interference. QR*N* refers to interference from *natural* sources.

Man made interference can be caused by faulty or badly designed equipment. Unsuppressed sparks from motor brushes or vehicle ignition systems can cause radio interference at frequencies from HF to VHF. My 2m receiver often hears ignition noise from engines that are more than 50m from the aerial. Motorcycles, scooters and lawnmowers seem to be the worst offenders. Many radio amateurs are troubled by noise from switch mode power supplies, arcing power line insulators, plasma television receivers, power line networking devices, lighting dimmers and many other sources.

The strongest sources of natural interference are electrostatic discharge due to thunderstorms, local static discharge and static-charged rain or snow. When I was testing the ATU project for the September 2008 Homebrew, I disconnected the metal chassis of the ATU from the shack earth. As soon as the connection to earth was broken, I received a hefty electric shock. When I regained my composure, I saw that there were sparks jumping between the ATU and the earthed case of my linear amplifier. The spark length was approximately 2mm, which indicates a potential of several thousand volts. At the other end of the scale, one of the weakest natural sources of radio noise is the cosmic microwave background (CMB), which is so weak that it remained undetected until the 1960s.

Man made interference tends to be sporadic. It may appear or disappear at random, or it may be predictable as in the case of interference from equipment controlled by a timer. It is sometimes possible to plan your operating times so that interference problems are reduced. For example, a VHF EME (moonbounce) station might only operate very late at night when noisy domestic or industrial equipment is switched off. Natural interference may also be sporadic, as in the case of static rain or thunderstorms. Some noise is due to fundamental physical properties of materials, such as in the case of thermal noise.

THERMAL NOISE. We live in a warm, noisy and chaotic universe where electrons go around randomly crashing into things. This random movement is proportional to temperature. At absolute zero (0K or -273.15°C) all movement stops and no noise is generated. At any temperature above absolute zero, a resistor will produce electrical noise at a power level that is proportional to the resistor temperature. The available noise power is kTB, where k is Boltzmann's constant (approximately 1.38×10^{-23} joules per kelvin), T is absolute temperature on the Kelvin scale and B is the bandwidth of the measuring system in Hz. A value of 290K (17°C) is often used as a standard value for room temperature. A resistor at a temperature of 290K has an available noise power of $1.38\times10^{-23}\times290\times1$ watts in a 1Hz bandwidth. This is an extremely small fraction of a watt. It is more convenient

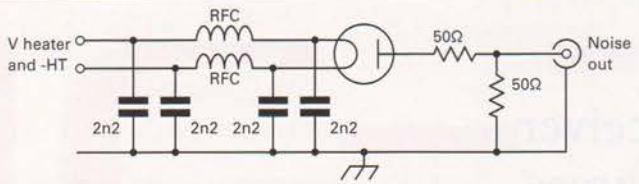

FIGURE 1: A thermionic diode-based noise source.

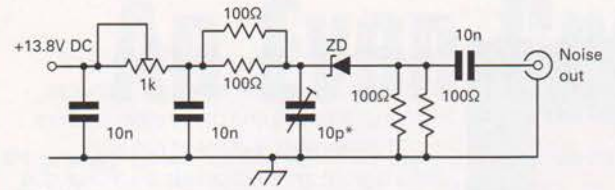

FIGURE 2: A HF/VHF noise source based on a Zener diode.

PHOTO 2: Homebrew 50Ω stripline made from a carefully filed offcut of fibreglass PCB (see text).

to represent such small power levels in dBm, decibels relative to 1mW.
10log(k×290×1×1000) = -174dBm. Note that power has been multiplied by 1000 to convert from watts to milliwatts. -174dBm is the power available in each Hz of bandwidth.
Thermal noise (also known as *Johnson noise*) is 'white' noise, which means that it has a flat power spectral density – the power available in a given bandwidth is identical regardless of the centre frequency of the measurement bandwidth. Thermal noise is independent of resistance. The available noise power from a 1MΩ resistor is the same as the available noise power from a 50Ω resistor.

Shot noise is associated with electrical current flow. This type of noise is caused by random fluctuations in current flow. Like thermal noise, shot noise is white noise with a flat spectral power density.

Flicker noise is a form of electronic noise that does not have a flat spectral power density. It is a form of 'pink' noise (or 1/f noise), where power density is inversely proportional to frequency. This means that noise power is greatest at low frequencies and noise power decreases with increasing frequency.

Avalanche noise comes from reverse-biased semiconductor junctions. A diode junction that is biased to its reverse breakdown voltage can produce high levels of noise. Avalanche noise tends to be white noise, at a higher level than kTB thermal noise. A Zener diode or reversed biased transistor base-emitter junction is a common source of avalanche noise.

In the world of radio communication, all noise is generally considered to be undesirable. However, noise is unavoidable in any electrical circuit or in any conductor at a real-world temperature. It is possible to keep noise to a minimum by careful circuit design, using components that are less prone to avoidable forms of noise, using the minimum bandwidth that is compatible with the modulation method used and using highly directional aerials so that noise from the back and side of the beam pattern is kept to a minimum. Radio telescopes often use large dish aerials with very high gain and excellent rejection of signals from the back and sides of the dish. To keep thermal noise to a minimum, the RF front end may be cooled to very low temperatures using liquid nitrogen or helium.

Noise sources can be very useful for some applications. The simple noise generator project (April 2006 Homebrew) can be used in conjunction with a spectrum analyser to measure the pass-band or stop-band of filters. Expensive test gear is not a requirement. The spectrum analyser can be a simple RF-AF converter, PC sound input and spectrum analysis software like *xanalyser* or *baudline*. Noise sources can also be used for specialised applications like generating strings of random numbers for encryption systems. Several thousand bits of random noise will make a much stronger encryption key than using a key based on your car registration number or your cat's birthday.

NOISE FACTOR/FIGURE/TEMPERATURE.

Noise factor is an indicator of the amount of noise generated within a circuit. The circuit may be an RF amplifier, mixer or even a complete receive system. A perfect noiseless amplifier would generate no noise, so that the output signal to noise ratio (SNR) would be identical to the input signal to noise ratio. A real-world amplifier will always generate some noise, so that the output SNR will always be less than the input SNR. The noise factor F is simply the ratio SNRin/SNRout. Noise figure (NF) is the same ratio expressed in decibels; NF=10log(F). Unfortunately, there is great potential for confusion here because NF has been used to describe both noise figure and noise factor at various times in the past. The modern convention is to use 'F' for noise factor and 'NF' for noise figure.

One advantage of using NF as a measure of receiver sensitivity is that it is independent of bandwidth. NF is based on the assumption that the input termination is at the standard noise temperature (usually 290k).

The amount of noise in a circuit can also be expressed as a noise temperature. This is an amount of noise equivalent to the thermal noise in a resistor at the specified temperature. The relationship to NF is NF=10log(1+(T/290)), where T is the noise temperature (in kelvin).

As an example: 10log(1+(290/290)) shows that a noise temperature of 290K is equivalent to a NF of 3dB. As this is close to the temperature of the environment we live in, a 3dB NF is just about ideal for a VHF receiver used for normal terrestrial communications. The EME operator or radio astronomer will benefit from a lower NF because they will be using beam aerials that are pointed skywards, away from the warm earth and sources of man made noise. Low noise VHF/UHF amplifiers will typically have a NF below 1dB. State-of-the-art amplifiers based on GaAsFET and HEMT transistors can achieve noise figures lower than 0.5dB.

MEASURING NOISE. There are several ways of measuring NF. The most commonly used method uses a pair of noise sources. As one noise source is at a higher equivalent temperature than the other, this method is known as the 'hot and cold source' or Y-factor method. Another method uses a single cold source, usually a 50Ω resistor at a known temperature. As the source temperature is known, the output noise from the device under test (DUT) will be the input noise multiplied by the gain of the DUT. Any noise above this level must be generated within the DUT. This method assumes that the DUT gain and input/output impedance is known to a high degree of accuracy.

THERMIONIC NOISE DIODES. Some types of thermionic diode can be used as a noise source that has a predictable noise power output. Special noise diodes like the CV2171 and A2087 produce noise with a flat spectral density up to about 220MHz. **Figure 1** shows a noise source based on a diode valve. Noise produced in the anode circuit is proportional to cathode current. Noise output is set to the required value by varying the cathode heater voltage. The positive DC supply to the anode is via ground. A negative HT supply is applied to the cathode.

The noise source is connected to the receiver input. The receiver output is measured using a power meter. The most common method is to use a resistor in place of the loudspeaker and a true RMS voltmeter to measure output power. An audio spectrum analyser based on a PC sound card is a good alternative.

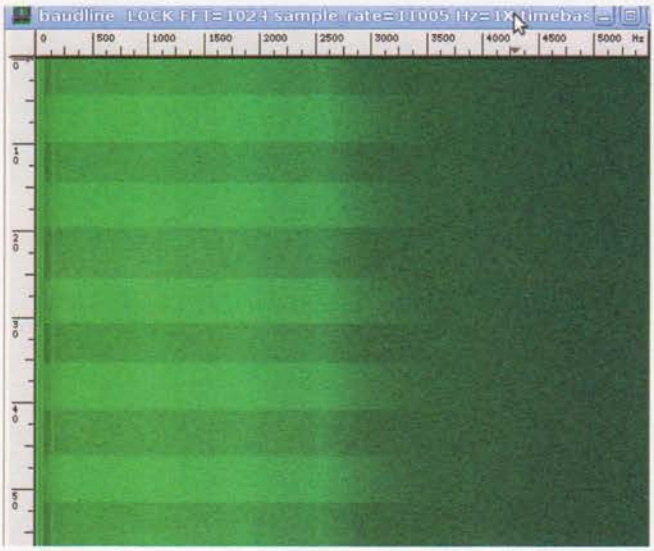

FIGURE 3: Monitoring my receiver output with Baudline shows the effect of switching the noise source on and off; there is a clear increase in noise when the source is active.

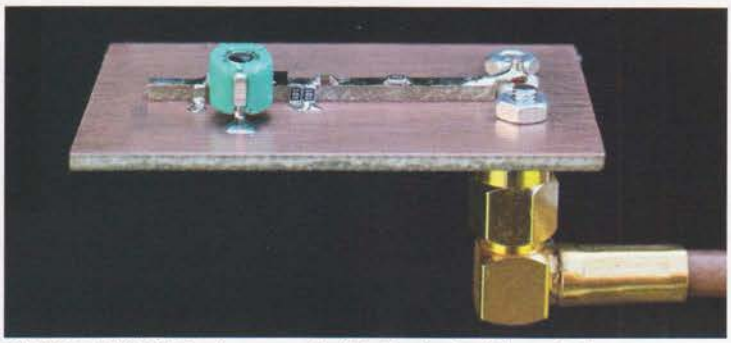

PHOTO 3: UHF SMD noise source, built to the circuit of Figure 4. The output connector is SMA.

Obviously, the receiver AGC must be disabled for these tests. Once the cold source output level is established, the noise diode should be powered up and the heater voltage gradually increased until the receiver output increases by 3dB. At this point, the noise from the diode source is equal to the receiver's internally generated noise. NF is calculated as $10\log((20\ I_d\ R_s)/1000)$, where I_d is diode current in mA and R_s is the source resistance in ohms. For the standard resistance value of 50Ω, a measured diode current of 5mA would indicate a NF of 7dB. This noise source is based on a design from the *RSGB VHF/UHF Manual* [1].

HOT/COLD NOISE SOURCES. It is possible to make a homebrew NF measurement rig using a pair of noise sources. A pair of 50Ω resistors can be used at the noise sources, one heated to a high temperature and the other held at a much lower temperature. Both resistors should have the same value, but this should be checked carefully because resistance changes with temperature. Hot/cold measurements are not easy to do unless there is a substantial temperature difference between the two sources. If one source is heated to the temperature of boiling water (373K) and the other is cooled to the melting point of ice (273K) the available noise powers are -172.882dBm and -174.237dBm, a difference of just 1.355dB. Some commercial NF measurement systems use a resistor cooled by liquid nitrogen (77K) as the cold source and a heated resistor as the hot source.

At UHF and microwave frequencies, it is possible to use the noise temperature of the earth and the cold sky as the hot and cold sources. Sky temperature is about 45K at 432MHz and only about 10K on 1296MHz. Very accurate NF measurements are possible if you use a receive aerial with good rear and side lobe suppression. Beamwidth should be sufficiently narrow so that only the warm ground or cold sky can be seen by the aerial when measurements are taken. Simple corner reflector and horn aerials are ideal for this kind of measurement. OE5JFL [2] uses a pair of dipoles mounted over a plane reflector for 70cm measurements and a W2IMU horn for 23cm.

AVALANCHE NOISE SOURCES. A reverse biased Zener diode makes a good white noise source. **Figure 2** shows details of a HF/VHF noise source. As the voltage drop across the Zener diode is almost constant, regardless of diode current, the power supply will be a constant-current source provided that the supply voltage is stable. I used a very stable 13.80V DC supply for my tests. If you are using battery power, you should use a voltage regulator. A pair of 9V batteries and a 12V regulator (7812 or similar) will be suitable. An assembled version of the noise source is shown in **Photo 1**. Noise output is via the BNC connector.

Unlike the diode valve source described earlier, noise output is not fundamentally related to diode current. This makes calibration of the noise source quite difficult unless you have a known good standard to compare it with.

I used an 8.2V Zener diode for my first attempt. This provided plenty of noise with a flat spectral power density between 40MHz and 200MHz. The low frequency end of the spectrum was dominated by 1/f noise at a level significantly higher than the VHF output power. Several other Zener diodes were tried in this circuit. I got good results using a 7.5V Zener from the junkbox. With this diode in circuit, 1/f noise was not evident above 10MHz and noise power was flat up to 250MHz.

As I have successfully used transistor base-emitter junctions as Zener diodes in the past, I tried using a few UHF and microwave transistors as noise sources. In Photo 1, I used an MPSH10 transistor as the Zener diode. The emitter is the diode cathode and the base is the diode anode. The collector terminal is not connected. To keep stray reactances to a minimum, the collector lead was cut off close to the transistor body. Looking at the output on a spectrum analyser showed a nice flat output from LF to more than 400MHz. After some time experimenting, I noticed that the noise source was behaving in a strange and unstable manner. When power is first applied, the output power kicks up to a level about 10dB higher than normal. After a few seconds, the output gradually falls back to a steady level. At this point the output is stable and flat for a few minutes until 1/f noise starts to appear at the LF end of the spectrum. Replacing the MPSH10 completely cured this problem. Out of five different MPSH10s tested in the circuit, two showed this strange behaviour. Surface mount MMBT3904 transistors behaved very well in this circuit, showing flat noise output from LF to 400MHz and no sign of instability. The star performer was an MMBT3904 at a diode current of 15mA. Zener voltage is 8.7V and, with careful trimming of the compensation capacitor, power density is flat to well within 1dB from 1MHz to 500MHz. Output power, measured on a spectrum analyser with IF bandwidth of 400kHz, was -99dBm. This indicates a noise output of -99 – 10log(400000) = -155dBm/Hz, or an excess noise ratio of 19dB. Excess noise ratio (or ENR) is the increase in noise power above the kTB thermal noise power.

We can calculate F using the Y-factor method, F=ENR/(Y-1), where Y is the receiver output power difference between the cold (noise off) and hot (noise on) states. Using my 2m transverter and HF transceiver as the receiver, plus Baudline software to

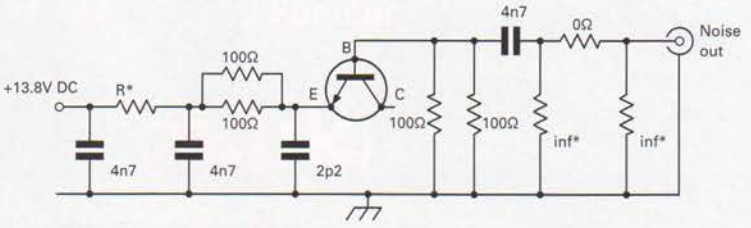

FIGURE 4: UHF SMD version of the noise source (* see text).

k = Boltzmann's Constant = 1.38065×10^{-23} joules per kelvin

B = bandwidth (Hz) T = absolute temperature (K)

$P_n = k \cdot T \cdot B$ watts

$V_n = \sqrt{4 \cdot k \cdot T \cdot B \cdot R}$

At T = 290K (17°C), $P_n = 10\log(k \cdot 290 \cdot 1 \cdot 1000) = -174\text{dBm/Hz}$

MDS = -174dBm + NF + 10log(B)

$F = \frac{SNR_{in}}{SNR_{out}}$ $NF_{dB} = 10\log(F)$

$NF_{dB} = 10\log\left(1 + \frac{T}{290}\right)$

$F = \frac{ENR}{Y-1}$

Cascaded stages: $F = F_1 + \frac{F_2-1}{G_1} + \frac{F_3-1}{G_1G_2} + \ldots$

FIGURE 5: Some useful figures and calculations on noise.

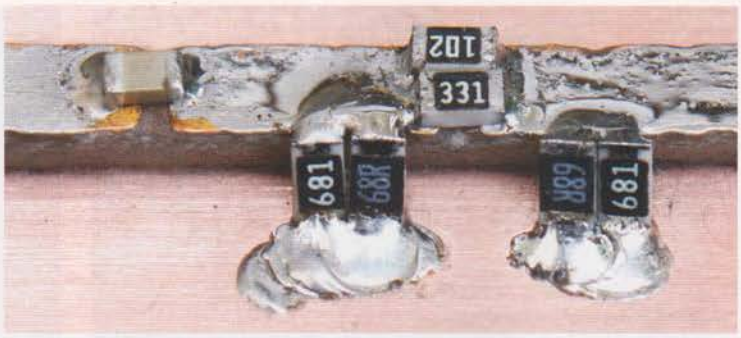

PHOTO 4: Stripline 50Ω π attenuator built using surface mount resistors.

monitor the audio output power, I observed a 15dB increase in noise when the noise source was powered up (**Figure 3**). 19dB is a power ratio of 79.433 and 15dB = 31.622, so F = 79.432/(31.622−1) = 2.594, thus NF = 10log(F) = 4.1dB.

Figure 4 shows the schematic of a UHF version of the noise source, built from surface mount components. The transistor is a BFR193, which has an f_T of 8GHz. All of the resistors and capacitors are SM 0805 types. The circuit is built on a 50Ω stripline made from a strip of single sided fibreglass PCB. For the most commonly available type of fibreglass board, the correct width for a 50Ω line is 2.77mm. **Photo 2** shows how the line was filed to the correct width and the copper foil was cut into several segments that will be bridged by the SM components. I used superglue to fix the 50Ω line to the PCB ground plane. The finished unit is shown in **Photo 3**. You might be surprised by my decision to include a 0dB attenuator between the noise diode and the SMA output socket. This consists of a zero ohm link and a pair of (non existent) infinity ohm resistors.

Once the ENR of the diode source has been established accurately, the attenuation value will be adjusted to give the required value of ENR. Placing an attenuator between the noise diode and the noise source output greatly improves return loss when the noise source is on (hot). **Photo 4** shows a 50Ω pi attenuator built using stripline techniques and SM resistors. This circuit performs well from DC to UHF and beyond.

Note that the trimmer capacitor seen in Photo 3 was replaced by a 2.2pF chip capacitor. Testing on the spectrum analyser shows a flat output spectrum up to the 550MHz limit of the analyser and ENR of around 22dB.

REFERENCES:

[1] *RSGB VHF/UHF Manual, 4th edition,* G R Jessop, G6JP

[2] Noise Figure Measurement using Standard Antennas: www.qsl.net/oe5jfl/noisefig.htm

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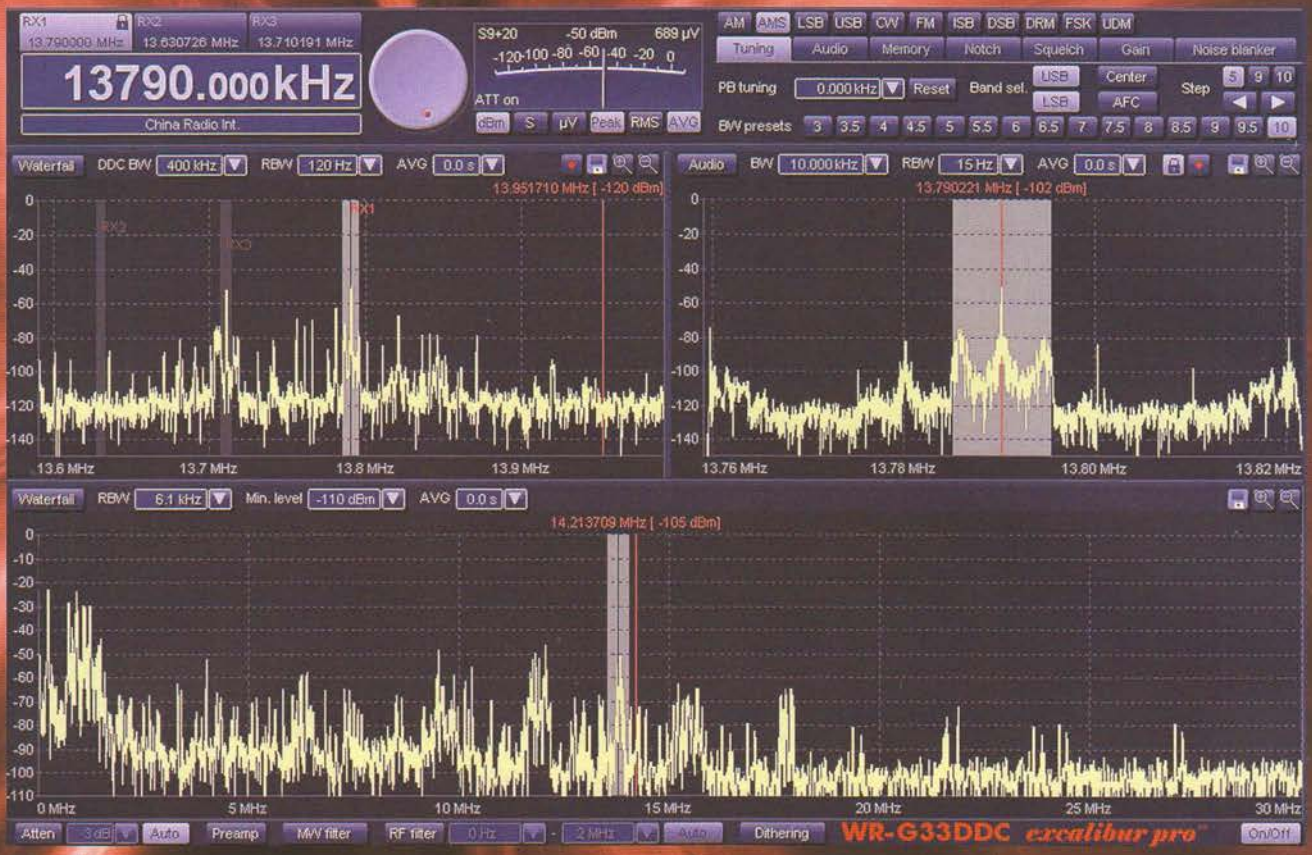

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RSGB Convention

7 to 9 October, Horwood House, near Milton Keynes

EARLY BIRD OFFER. The online shop is now open for RSGB Convention bookings. If you book before 14 August you can take advantage of the early bird special offer and save on the overnight packages available. If you plan to visit for the day, you may also purchase five day tickets for the price of four, saving 20% on the normal entrance fee. Weekend tickets are also available. Prices start at just £6.50.

LECTURES. This year, the Contest University programme is now completely filled and will have 6 talks on Saturday and 4 on Sunday. There will be a range of subjects from Ionospheric Sounders, what they are and how to use them for contesting by Steve, G0KYA to how your logs get adjudicated by Ian, G0FCT. A new feature this year will be the Contest Exchange. This is where there will be a mixture of 'hosts' and 'guests'. Hosts are those willing to open their contest stations to an operator that does not have those kind of facilities available. Guests will get the chance to meet hosts, to network and, hopefully, secure a deal to visit the contest station to operate in a contest.

A talk on the next generation beacon by Bo Hansen, OZ2M is planned. Traditionally, amateur radio beacons have used professional land mobile radios with analogue CW identification. Given the latest developments in digital modulation techniques and RF circuits, Bo argues it is time to take advantage of these technologies for beacons too. Machine generated modulation provides many benefits for automated monitoring of conditions such as long term averaging and deviation reporting. However, digitalisation must fit into the existing world of operation techniques. The solution is mixed mode, both MGM and CW, where humans can decode the CW by ear and MGM way below what is audible. Therefore it can be used for 'pre-human-conditions' or early warning monitoring. The presentation will address these issues based upon the requirements of the world's oldest beacon, OZ7IGY, by providing the next generation beacon platform involving DDS technology, low noise VCOs and PLL, GPS synchronisation, sequence and modulation.

Carl, K9LA, an Associate Member of the RSGB's Propagation Studies Committee, will look at greyline propagation on both the low bands and the high bands. He'll review typical greyline paths and look at the ionosphere under greyline conditions. In conjunction with data from the February 2006 3Y0X DXpedition, he'll challenge the age-old adage that greyline propagation is efficient on the low bands.

Justin, G0KSC will be explaining how to make a Yagi yourself and how to ensure it works as it should. In a recent 144MHz contest, the top two places were occupied by stations using G0KSC antennas.

Details of the provisional programme will be appearing on the website soon.

Ten-Tec Eagle HF & 50MHz transceiver

PHOTO 1: Ten-Tec Eagle front view with bail stand.

INTRODUCTION. The latest radio from Ten-Tec is the Eagle – also given the model number 599, which is most appropriate considering the high esteem that Ten-Tec commands in the CW community. The Eagle is an HF and 50MHz transceiver, 12V operated with the usual 100W output power. It is small in size, light in weight and aimed at the operator who desires a high performance radio without the front panel being cluttered with little-used features. The focus is on performance rather than features and only key functions are included. Many operators find that they never use most of the bells and whistles found on modern radios and simply desire a well-implemented set of key basic functions. This is just what the Eagle offers.

BASIC FUNCTIONS. Measuring 216mm (w) x 74mm (h) x 265mm (d) and weighing around 3.3kg, the radio is sufficiently small and light to fit most available situations, yet large enough to be comfortable to operate.

The receiver tunes from 500kHz to 30MHz and from 50 to 54MHz, with the transmitter enabled on the amateur bands. Full VFO all-mode coverage across the 5MHz (60m) band is provided but the discrete channels are probably best stored to memory for easy access. Only SSB and CW modes are provided as standard; AM and FM operation requires the additional roofing filters to be fitted. Data mode provision is fairly rudimentary, using SSB with external audio input/output routed to a PC soundcard via the accessory connector on the rear panel. Bands and modes are selected by single scroll buttons.

The front panel controls are easy to access; there are no cramped buttons. Dedicated rotary controls provide tuning, AF and RF gain, bandwidth selection and passband tuning. All other functions are selected by pushbuttons with a common additional rotary control where adjustment is required. All buttons are dual function: they have a primary function plus a secondary function that is enabled after the function key is pressed. This means that some functions such as setting the transmit power level, RIT and AGC etc involve a multi-step process.

The display uses monochrome LCD technology. It is clear and bright, with a good viewing angle. It retains excellent visibility in bright lighting or direct sunlight, unlike many other display technologies. The backlight colour is fully adjustable. Separate control of the red, green and blue backlight levels results in a wide range of possible colours. The display includes a single bargraph meter display of rather coarse resolution. A conventional S-meter on receive, on transmit it indicates VSWR as seen by the PA, a useful indication to show whether the ATU (if fitted) needs tuning. Nothing else is indicated, such as the actual transmit power level. Frequencies of both A and B VFOs are shown to a resolution determined by the tuning step size, which can be as fine as 1Hz.

The rear panel contains a single antenna connector, a DIN accessory connector, a single key jack, external speaker jack, two accessory power jacks and a USB port. There is no provision for a separate receive antenna often used on the lower bands, but an application note on the Ten-Tec website shows how to patch a second receiver or an external RF noise canceller into the Eagle front end. This does involve some internal modification and hole drilling. The DIN accessory connector is used for auxiliary audio input/output, PTT and linear switching. The key jack automatically detects the presence of either a stereo plug used with a keying paddle for the internal keyer or a mono plug used for external keying. The PTT line on the accessory connector also doubles as a keying line on CW, allowing the simultaneous use of both the internal keyer and an external keyer such as a PC controlled contest logger.

The USB port is used for two functions: first for external control of the radio or reading data from the radio for a logging program and secondly for downloading firmware updates. Necessary software and drivers may be downloaded from the Ten-Tec website. Audio is not routed via the USB port. Recent production runs (post-dating the review model) also include an additional auxiliary connector on the rear panel for routing the 9MHz IF output (on both receive and transmit) to external units.

There is no menu system in the normal sense. Some functions may be set directly via button access. A short start-up menu identifies which options are installed and sets the backlight colour. An auto ATU is available as an option. Covering the bands from 1.8 to 30MHz but not 50MHz, it is a reversible L-network with relay switched inductors and capacitors and claims to match up to 10:1 VSWR. This wide tuning range can be useful for extending the useable bandwidth of sharply tuned antennas such as short verticals that are fed with coaxial cable. End-feeding wire antennas will result in RF field problems and should not be considered. The ATU is fitted with one store of settings per band. Other options include a noise blanker board (not fitted as standard) and additional roofing filters. These options are easy to fit and full instructions are given. The radio is provided with a hand microphone and a manual with quick start guide. I found the manual a bit sketchy and not particularly well laid out but it does include an excellent, detailed specification. Later manual releases available on the Ten-Tec website include a number of addenda. Also available on the website are circuit diagrams, additional technical data and various downloads.

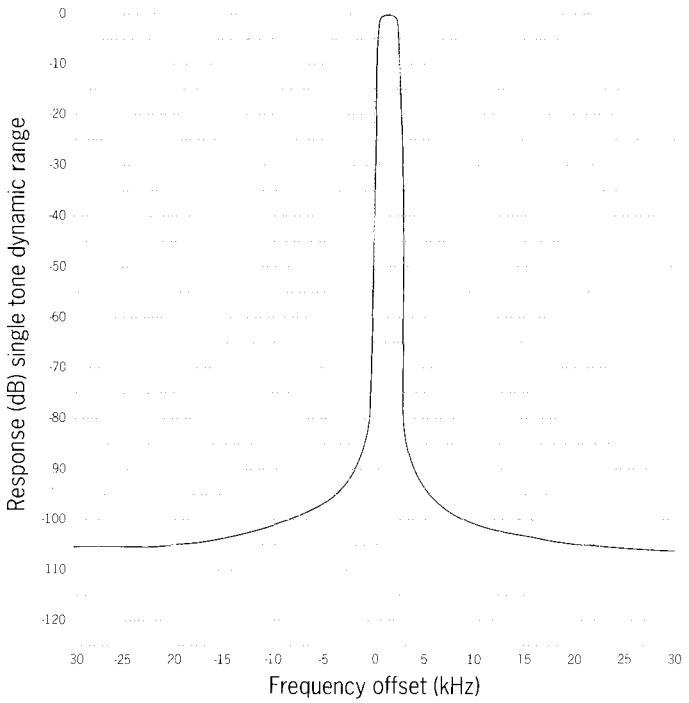

FIGURE 1: Composite selectivity curve on USB. Channel bandwidth 2.4kHz. Red line = phase noise at 21MHz; black line = phase noise at 1.8MHz.

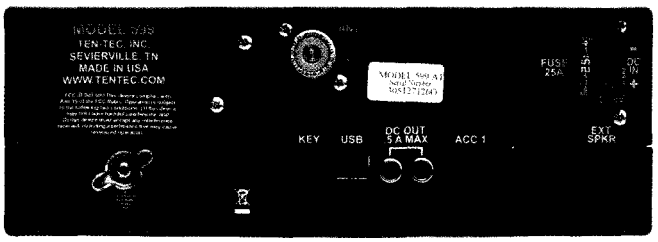

PHOTO 2: Eagle rear panel.

In common with many of the recent high performance radios, the receiver in the Eagle uses a low first IF, 9MHz, in conjunction with narrow roofing filters directly following the first mixer. The radio is fitted with a 2.4kHz bandwidth filter and there is space to fit two further filters (the same filters that are fitted into the Orion II). If AM is required, even just for receive, then the 6kHz filter is needed and for FM the 15kHz filter must be installed. 300Hz, 600Hz and 1.8kHz filters are also available. Partial AGC is applied prior to conversion to the second IF of 22.5kHz. This feeds the 32 bit / 40 bit floating point DSP via a 24 bit ADC for all further signal processing including channel filtering, demodulation, noise reduction, audio processing and AGC functions.

A separate bandpass filter is used in the front end for each amateur band and a quad diode mixer is used for the first mixer. The 12dB gain RF preamplifier uses a monolithic IC amplifier with high dynamic range. The frequency synthesiser uses a fractional-N PLL design with a temperature-stabilised reference. The transmit signal generated by the DSP is passed in reverse through the receiver conversions and all filters to final frequency and uses a bipolar power amplifier to give 100W output.

The radio is neatly constructed inside with lightweight aluminium screens, a plastic front panel and a two-part wrap-around case. A bail stand tilts the front panel to improve visibility and operating ease. The internal PA heatsink is quite small and is blown by two internal fans. The speed of the fans is dependent on heatsink temperature. They are normally very quiet but can become fairly noisy and shift a lot of air if the temperature rises sufficiently. A 7cm diameter speaker fits in the case top.

The radio is fitted with a 45mm diameter main tuning drive with a moulded finger indent. There are five tuning rates from 1Hz per step to 10kHz per step and although there are around 480 steps per revolution of the knob at very slow tuning speeds, this reduces to around 100 steps per revolution at fast speeds. Turning the knob faster does not speed up the tuning as much as you might expect. A button scrolls through the step sizes but in one direction only.

The usual A/B twin VFOs are provided together with swapping and equalising the two frequencies and split frequency operation. There is no facility for checking or setting the transmit frequency in split operation other than swapping to the transmit VFO and then back again to the receive channel. Incremental tuning is provided for the receiver (RIT) but not for the transmit frequency (XIT). 100 memories are provided for storing frequencies (both A and B) and mode.

The channel bandwidth is set by a rotary control from 100Hz to 2400Hz in 25Hz steps unless the AM or FM roofing filters are fitted in which case the upper limit of the bandwidth setting increases to 6kHz or 15kHz respectively. As the bandwidth is varied, the appropriate roofing filter is selected automatically; there is no provision for manual selection. A second rotary knob provides passband tuning, moving the passband high or low in frequency from the normal unshifted setting. The settings of both controls are independent of mode so if you are changing between CW and SSB you will need to change the bandwidth appropriately. Similarly, if you are using RTTY with a high tone set you will need to adjust the PBT control to a suitable value and then back again when you change to SSB or CW.

An automatic notch function is provided that will null out multiple carriers but there is no provision for a manual notch. Adjustable DSP noise reduction is also provided and an IF noise blanker with two levels of aggressiveness if this option is fitted. The front-end includes a switchable preamplifier of nominally 12dB gain and a switchable 10dB attenuator. Three AGC settings are provided, fast, medium or slow but the parameters are not user adjustable. The selected AGC setting is stored against mode.

The transmitter power output is variable in 1W steps all the way down to zero and the set level is indicated on the display. There is no indication of the actual RF level except via the ALC LED indicator, which lights when the set level has been reached. The bargraph indicates SWR only. On SSB, a speech processor and VOX are provided, as is a transmission monitor. There are no user-selectable audio filters or equalisers provided on transmit or receive. On FM, where this mode has been activated, a CTCSS tone encoder is included.

On CW, an electronic keyer is built in, with adjustable speed and weighting. The speed range is 5 – 60 WPM and the speed in WPM is indicated on the display. Full and semi break-in is provided. The drop back delay is adjustable and at minimum setting this provides full break-in. Although the radio provides a 17ms delay between pressing the key and RF appearing to allow for switchover, in particular for relays to operate, the semi break-in drop back delay is not applied to the linear amplifier control line. This is a surprising omission and precludes the use of non-QSK linears on CW mode unless additional external circuitry is added or a footswitch or other external control is used.

The full set of measurements is given in **Table 1**. Although the radio tunes down to 500kHz, the sensitivity drops sharply below 1.8MHz. The S-meter shows broadly S9 for about 40 to 50μV and 6dB per S-unit calibration. The reading is independent of the setting of the preamplifier and input attenuator, which is a nice touch. The S-meter did however exhibit some odd effects, hysteresis showing different readings with increasing or decreasing signals and a tendency to dwell or jump on some signal changes.

The rejection of the 9MHz IF was better

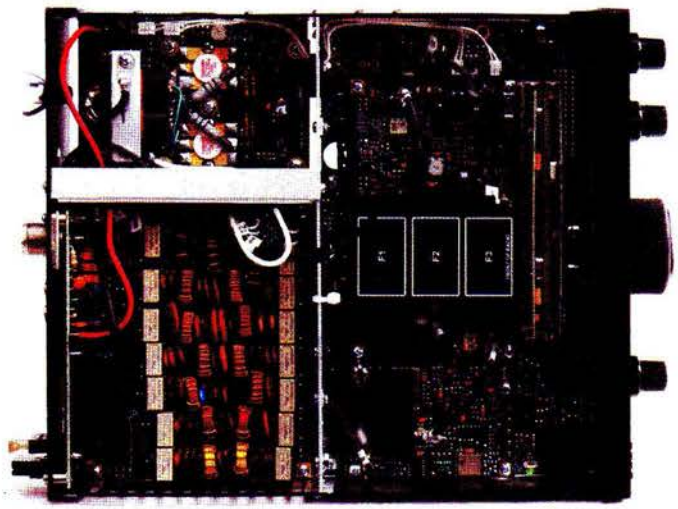

PHOTO 3: Top view with covers removed showing TX PA, output filters and receiver board.

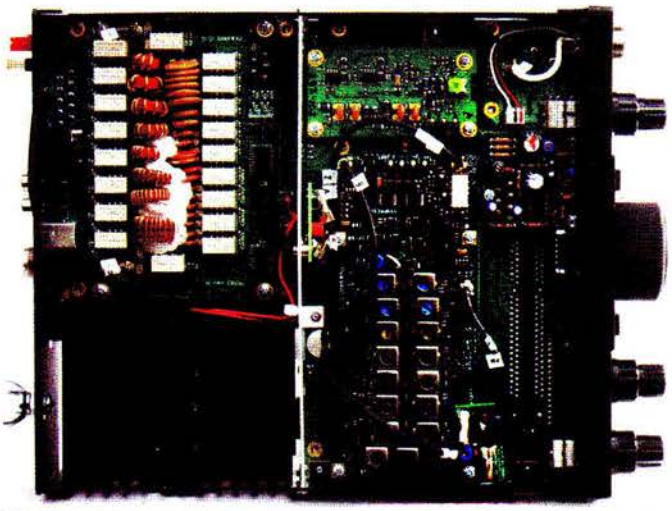

PHOTO 4: Bottom view with covers removed showing ATU, bandpass filters and noise blanker board.

than 70dB except on 10MHz (57dB) and image rejection better than 90dB except on 50MHz (70dB). Rejection of the second mixer image 45kHz below the on-tune channel measured 75dB. Other spurious responses were very low although a number of self-tuning spurii (birdies) up to S5 (-100dBm) were audible principally on the higher bands often tuneable with the PBT.

The AGC characteristic was clean. The receiver audio was fine with an 8Ω speaker load but with 4Ω some high frequency instability was observed on peaks with levels greater than 0.5W.

The measured results for receiver two-tone intermodulation are very respectable, showing third-order intercepts above +20dBm on most bands although a little lower on 1.8 and 3.5MHz. Equivalent 2.4kHz bandwidth dynamic ranges are well into the nineties in dB. Close-in measurements made in 500Hz bandwidth comparing the performance with the 2.4kHz and 600Hz roofing filters are shown in the table and clearly show the benefits of the narrower roofing filter at very close spacings. Close-in measurements were starting to be compromised by reciprocal mixing noise particularly on the higher bands. With the review radio, inband intermodulation measured using two signals 200Hz apart was very poor indeed, at around –20dB and, with multiple signals in the passband, intermodulation components were clearly audible in the speaker and headphones. Reducing the RF gain control to the point where signals start to reduce made a significant improvement to the result. Ten-Tec has investigated this issue and a firmware change to the AGC parameters claims to reduce this down to –50dB, a very respectable figure. Ten-Tec advises that this change will be included in the next firmware update, probably by the time this review appears in print.

Reciprocal mixing figures are given in terms of dBC/Hz (see separate note) and in general are very good especially on the lower bands where the close-in result is excellent. This enabled the channel filters to be measured down to about 90dB before reciprocal mixing and AGC affected results. The filters have narrow skirts and sidelobes were only just becoming visible 80dB down on the 100Hz filter, an excellent result. **Figure 1** shows the overall effect of channel filter and reciprocal mixing.

On transmit, two-tone distortion products were reasonable on the lower bands but rather poor on the higher bands. The audio was very clean with low distortion and most tolerant of high levels of overdrive. The speech processor was clean with negligible increase in distortion products. The CW rise and fall envelope was nicely shaped with 5ms rise and fall times and negligible distortion or character shortening at 40 WPM even in full break-in mode. There was a 17ms delay between keying and the RF output changing. The keying characteristic held well at all power levels and there was no first character shortening but a slight creep upwards in power was observed from a cold start.

ON-THE-AIR PERFORMANCE. In side by side checks with other radios the receiver performed well. No strong signal effects were observed, the channel filters were excellent even down to 100Hz bandwidth with minimal ringing and enabled weak signals to be easily resolved amongst the strong. The noise blanker (optional extra) was very effective in dealing with ignition noise but I found noise reduction not that effective in improving readability of marginal signals, although it certainly removes background noise on armchair copy signals. The audio quality was in general very good but there is a significant background hiss audible at low volume levels. This was most noticeable and distracting with my Heil headphones but not so much of a problem with my lower sensitivity cheap hi-fi headphones or the built-in speaker.

On transmit the supplied hand microphone gave good quality but it is a bit of a handful with a stiff PTT spring that acoustically couples into the microphone audio. On CW, QSK and changeover performed very well when working but I had a problem using external keying with my WinKeyer USB keyer. This would not function via the normal key jack but keyed satisfactorily using the accessory PTT line. WinKeyer USB uses opto-coupled outputs and has a residual 0.6V output on key down. The Eagle requires less than 0.5V key down to operate with the main key jack but is less restrictive on the PTT line.

During the course of this review, I upgraded the firmware from version 1.688 to version 1.795. Full information and instructions are given on the Ten-Tec website and the process was completed without any problems. The later software improved ATU speed and resolved issues of AGC and QSK delay settings not being stored on power-down, amongst other items.

When it comes to ergonomics, what appeals to some users will not appeal to others and I am sure that the way the Eagle operates will generate a lot of opinion. I found the two-level function of the pushbuttons awkward to use. Often the function button would be left pressed - and at a quick glance it is – it is not easy to tell. This would result in the wrong function being selected. Changes to all the front panel controls are not stored to memory until 15 seconds after no control has been changed. This is fine if your radio is left on all the time but if your style involves a lot of tuning around and then turning off you will lose the most recent settings. I found the tuning rather tedious. The relatively coarse resolution of the main tuning knob under normal operation means that the step size button is frequently used to move between fast navigation and fine tuning. As this button selects five rates and scrolls only one way, it often involves five button presses to change between desired rates.

There is no positive indication when some functions are selected, such as ATU and speech processor. Bandwidth needs adjusting each time you change mode. Perhaps I am being over-critical but it is a shame that the ergonomics don't match the excellence of the overall RF performance.

CONCLUSIONS. The Eagle has a very good RF performance and, in common with many Ten-Tec radios, is a delight to use on CW. It implements a basic set of essential functions and has an uncluttered layout that appeals to the desires of many. Some aspects could be better implemented, in my opinion, perhaps by software updates. It is priced in the UK at £1735 for the basic unit or £1940 with ATU (plus more for the noise blanker and additional roofing filters).

ACKNOWLEDGEMENT. I would like to thank Waters and Stanton PLC for the loan of this radio.

TABLE 1: TEN-TEC EAGLE MEASURED PERFORMANCE.

RECEIVER MEASUREMENTS

	--------SENSITIVITY SSB 10dBs+n:n-------	
FREQUENCY	----PREAMP OFF----	----PREAMP ON----
1.8MHz	0.56μV (-112dBm)	0.32μV (-117dBm)
3.5MHz	0.5μV (-113dBm)	0.28μV (-118dBm)
7MHz	0.45μV (-114dBm)	0.25μV (-119dBm)
10MHz	0.63μV (-111dBm)	0.28μV (-118dBm)
14MHz	0.56μV (-112dBm)	0.25μV (-119dBm)
18MHz	0.56μV (-112dBm)	0.32μV (-117dBm)
21MHz	0.63μV (-111dBm)	0.32μV (-117dBm)
24MHz	0.63μV (-111dBm)	0.32μV (-117dBm)
28MHz	0.63μV (-111dBm)	0.35μV (-116dBm)
50MHz	0.7μV (-110dBm)	0.35μV (-116dBm)

AGC threshold: 2.2μV preamp off, 0.5μV preamp on
AGC attack time: 1ms
100dB above AGC threshold for <1dB audio output increase
AGC decay time: 150ms (fast), 800ms (medium), 2.5s (slow)
Max audio at 1% distortion: 1.4W into 8Ω (4Ω: see text)
Inband intermodulation products: see text

BANDWIDTH/ROOF	----------BANDWIDTH----------			
SET TO	-6dB	-60dB	-70dB	-80dB
2.4kHz/2.4kHz	2197Hz	2916Hz	2962Hz	2994Hz
500Hz/600Hz	458Hz	1004Hz	1056Hz	1102Hz
100Hz/600Hz	249Hz	812Hz	940Hz	1166Hz

INTERMODULATION (50kHz tone spacing) 2400Hz bandwidth, 2.4kHz roofing filter, USB

	----------PREAMP OFF----------		----------PREAMP ON----------	
Frequency	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range
1.8MHz	+14dBm	91dB	+10dBm	91dB
3.5MHz	+16dBm	93dB	+7dBm	90dB
7MHz	+22.5dBm	98dB	+10dBm	93dB
14MHz	+20dBm	95dB	+8dBm	91dB
21MHz	+25.5dBm	98dB	+10dBm	91dB
28MHz	+24dBm	97dB	+11.5dBm	92dB
50MHz	+28dBm	99dB	+12dBm	92dB

CLOSE-IN INTERMODULATION ON 7MHz BAND 500Hz bandwidth, CW, preamp off

	-------2.4kHz ROOFING-------		-------600Hz ROOFING-------	
Spacing	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range
1kHz	-14.5dBm	78dB	+8dBm	91dB
1.5kHz	+3dBm	89dB	+12.5dBm	94dB
2kHz	+15dBm	98dB	+15.5dBm	96dB
3kHz	+21.5dBm	102dB	+23dBm	101dB
4kHz	+21.5dBm	102dB	+23dBm	101dB
5kHz	+21.5dBm	102dB	+23dBm	101dB
7kHz	+22dBm	102dB	+22dBm	100dB
10kHz	+23dBm	103dB	+23dBm	101dB
15kHz	+23dBm	103dB	+23dBm	101dB
20kHz	+23dBm	103dB	+23dBm	101dB

FREQUENCY	RECIPROCAL MIXING PHASE NOISE	
OFFSET	--21MHz BAND--	--1.8MHz BAND--
1kHz	-119dBC/Hz	-127dBC/Hz
2kHz	-117dBC/Hz	-128dBC/Hz
3kHz	-118dBC/Hz	-128dBC/Hz
5kHz	-123dBC/Hz	-130dBC/Hz
10kHz	-131dBC/Hz	-135dBC/Hz
15kHz	-134dBC/Hz	-137dBC/Hz
20kHz	-136dBC/Hz	-138dBC/Hz
30kHz	-138dBC/Hz	-139dBC/Hz
50kHz	-139dBC/Hz	-141dBC/Hz
100kHz	-139dBC/Hz	-143dBC/Hz
200kHz	-139dBC/Hz	-143dBC/Hz

TRANSMITTER MEASUREMENTS

	----CW----		INTERMODULATION	
	-POWER-		------PRODUCTS------	
FREQUENCY	OUTPUT	HARMONICS	3rd order	5th order
1.8MHz	97W	-60dB	-30dB	-45dB
3.5MHz	101W	-62dB	-32dB	-49dB
5MHz	102W	-65dB	-32dB	-51dB
7MHz	106W	-70dB	-30dB	-48dB
10MHz	107W	-58dB	-28dB	-45dB
14MHz	106W	-62dB	-26dB	-40dB
18MHz	106W	-62dB	-28dB	-40dB
21MHz	107W	-61dB	-30dB	-47dB
24MHz	100W	-75dB	-28dB	-47dB
28MHz	97W	-60dB	-24dB	-38dB
50MHz	97W	-66dB	-20dB	-32dB

Transmit intermodulation product levels are quoted with respect to PEP.

Carrier suppression: >70dB
Sideband suppression: 70dB @ 1kHz
Transmitter AF response at -6dB: 300Hz – 2600Hz
Transmitter AF distortion: <1%
Microphone input sensitivity: 1mV for full output
Data T/R switch speed: mute-TX 20ms, TX-mute 10ms, mute-RX 70ms, RX-mute 1ms

NOTE: All signal input voltages given as PD across antenna terminal. Unless stated otherwise, all measurements made on USB with receiver preamp switched out, 2.4kHz bandwidth with 2.4kHz roofing filter.

Changes to published measurement figures

With this review, I have started to quote reciprocal mixing (RM) figures in terms of dBC/Hz which, in most cases, relates to the phase noise performance of the synthesiser used for the first local oscillator. All my early reviews used a measurement bandwidth of 2.4kHz on SSB. More recently I have been measuring in 500Hz bandwidth on CW, as this is more appropriate for close-in spacings. The actual bandwidth is usually quoted in the review table or implied in the text. 500Hz figures are 7dB higher than 2.4kHz figures. To compare phase noise figures in dBC/Hz to earlier reciprocal mixing results, subtract 34dB to give 2.4kHz figures or 27dB to give 500Hz figures. For example –130dBC/Hz will yield a reciprocal mixing dynamic range of 96dB in 2.4kHz bandwidth or 103dB in 500Hz bandwidth.

All my early reviews measured third order intercept (IP3) and two-tone intermodulation-limited dynamic range (ILDR) in 2.4kHz bandwidth on SSB. I continue to measure wide-spaced results this way to allow comparison with earlier reviews but for close-in measurements I now publish results using 500Hz bandwidth on CW. Third order intercept (IP3) is independent of bandwidth and, unless there are other influencing factors, both bandwidths will yield the same IP3 figure. 500Hz bandwidth dynamic range figures will be about 4 to 5dB higher than 2.4kHz bandwidth results.

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MR2 POWER ROD 2/70cm, Gain 3.5/6.5dBd, Length 50cm, PL259 fitting (fibreglass colinear) **£26.95**
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SQBM500N 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, N-Type **£79.95**
SQBM800N 2/70cm, Gain 8.5/12.5dBd, RX 25-2000MHz, Length 520cm, N-Type **£139.95**
SQBM1000P 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239 ..... **£84.95**
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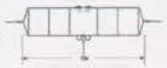
SQBM223N 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type **£74.95**

MTD-300 2-30M Broadband wire dipole antenna **£149.95**



The MTD-300 broadband dipole antenna is designed to provide optimum performance over a wide frequency range and is very easy to assemble and use.

● Frequency 2-30MHz ● Radiator length: 25m (82ft) ● Type: Terminated Folded Dipole ● Radiation: directional ● Feedline: 50 Ohm coax (30m) ● Connector: SO239 ● SWR: <2.0:1 to <3.0:1 depending on factors ● No transmatch required ● Power: 150W (PEP) ● Spreaders: 46cm (18in) ● Weight 3.1kg.

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The CHAMELEON V1 HF/VHF/UHF Multiband AntennaTM is a revolutionary antenna that stands at a mere 8.5 feet tall and contains a unique trap coil design. This antenna is ideally designed for mobile, portable or base station purposes were limited space is a concern.

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ATV

Filters for protection & fun

PHOTO 1: Circulator (left) attached to a commercial 13cm interdigital filter.

SHOULD I FILTER? The question is often raised whether to use a transmitter RF filter to stop interference to other users. It is often assumed that homebrew equipment requires filtering, while commercial gear does not. In practice this depends on many factors. And what about RF filters for receivers? Interference works both ways.

Amateur television more often suffers interference to receivers than ATV transmitters cause. However, due to being a wideband transmission in a shared band it is very important not to cause interference to other, more critical, users such as airfield approach radar.

Correct transmitter modulation/FM deviation setting can go a long way to minimising potential interference. Using RF filters can go a lot further, particularly for receiving ATV signals, given the high power radars on 23cm and Wi-Fi etc at 13cm (and above).

PRACTICAL FILTERS. Two types of filter, 'Interdigital' and λ/2 line, are well proven for ATV use. Interdigital filters can sometimes be picked up at rallies and are commercially available. Both types are relatively easy to fabricate, given the right information and access to test equipment for final setting up.

Figure 1 is an example of one of several very useful programs produced by Doug, VK3UM [1]. This one is for 4 pole interdigital filters at UHF and above. You can adjust various parameters, which the software validates. For the example in Figure 1, the expected through loss is <0.8dB. VK3UM's program allows for frequency trimming screws as shown. It is based on work by Jerry Hinshaw, N6JH and Shahrokh Monemzadeh that was featured in the January 1985 *Ham Radio*. I have used this original *BASIC* program since the article came out. It enables 3 to 7 pole filters to be designed and also indicates the expected loss through the filter. There is an online version at [2].

For a filter to work correctly in must be terminated by the correct impedance. This is particularly important at the antenna side of the filter as weather and other factors can change the antenna impedance. One way to minimise this effect is to use an RF 'circulator'; often a ferrite device but it can be made using coaxial lines or PCB strip line. I suggest a web search for the background on these devices. **Photo 1** is an example of a 13cm filter with an input circulator.

Photo 2 is a 4 pole, λ/2 line filter fabricated from copper clad (PCB) board that I use for 'lookthrough', of which more later. Interdigital and λ/2 line filters can both be fabricated using copper clad board, which has proven to be physically and temperature stable for most applications. There are some advantages with the λ/2 line filter – the elements are supported at earth potential at both ends. Off-frequency attenuation can be greater than for the equivalent Interdigital filter. Again, the lines are shortened by about 5% and a tuning screw (capacitor) is used at the centre point of the line for fine frequency adjustment. Filters of this type usually have the λ/2 lines in 'troughs' linked by a 'hair pin' element (see [3] for a construction example). My 1316MHz repeater receive filter gives an attenuation of about 79dB at the repeater input frequency, 1249MHz.

The information so far has been biased to receiver filters, but is equally appropriate for transmitter filters. Where a transmit filter is required, subject to such things as proximity of sensitive radar receivers, it may only be necessary to use a 3 pole version to ensure transmitter harmonics are suppressed. With appropriate setting of 'ground plane' spacing, resonator diameter and minimum number of 'poles', the through loss can be reduced to about 0.2dB.

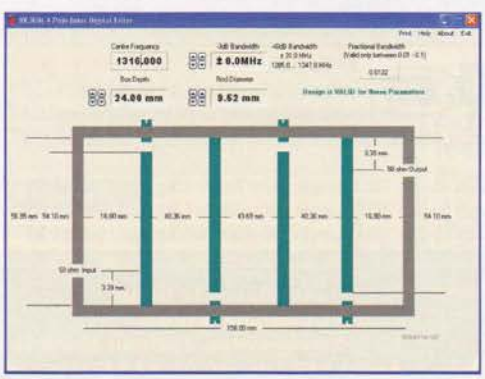

FIGURE 1: Designing an interdigital filter using the VK3UM software.

PHOTO 2: Homebrew 4 pole λ/2 line lookthrough filter made from PCB material.

LOOKTHROUGH. From the early days of voice repeaters and, in more recent years, with ATV repeaters, it has been both a technical challenge and fun to be able to receive your signal whilst transmitting through it. This is useful when done well, as it makes it possible to see what your transmission looks like after going through the repeater. An alternative lookthrough is to view a repeater output via the batc.tv stream facility. But the digital delay of 1 or 2 seconds can be disconcerting if you are making transmitter adjustments.

There a few rules of thumb that help to make lookthrough relatively easy. Whilst possible with a single antenna, using separate transmit and receive antennas has definite advantages. At a separation of 1 wavelength between two aligned/facing dipoles, the signal attenuation between them is 32.5dB. Due to the inverse square law, electromagnetic waves further decrease in strength by 6dB every time the distance is doubled. If the dipoles are end-on to each other, a further 10 to 20dB attenuation can occur. If beams are used, assuming they have minimum side lobes, more attenuation is achieved. With a repeater, the transmitter and receiver frequencies are different so, assuming no receiver overload occurs at the transmit frequency, the expected transmitter 'noise' at the receive frequency will be the order of -70dB relative to the transmitter output level.

A good ATV receiver can have a noise floor below -106dBm, so for the transmitter to have little or no effect on the receiver its signal and noise must at this level or less. Using the filter of Photo 2 and a transmit power of 18-20 watts (~ +33dBm), the numbers are:

33dBm - 70dB = -37dBm
(the expected signal at the receiver)
-37dBm -79dB = -116dBm after the filter, ie at the receiver input.

Nothing is quite that simple but bear in mind I have not even considered the attenuation due to antenna separation – it's looking good. It should however be noted that direct coupling between the transmitter and receiver in the shack can be significant.

My antennas are set up with only about 0.5m between them, one above the other and offset by about 0.3m because that was a 'convenient' arrangement. I am able to receive acceptable signals in the region of P1 to P2 whilst transmitting - very useful under enhanced conditions when no-one appears to be available to give a report of my signal through a distant repeater.

WEBSEARCH

[1] www.vk3um.com, then go to 'software'
[2] www.wa4dsy.net/cgi-bin/idbpf
[3] *CQ-TV* 190, May 2000
http://www.batc.org.uk/cq-tv/archive/2000.html

* Optional FGPS-2 unit is required to automatically display your station information (shown with optional CT-136 antenna adaptor connected in picture above).

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Antennas

Shorted turn tuning

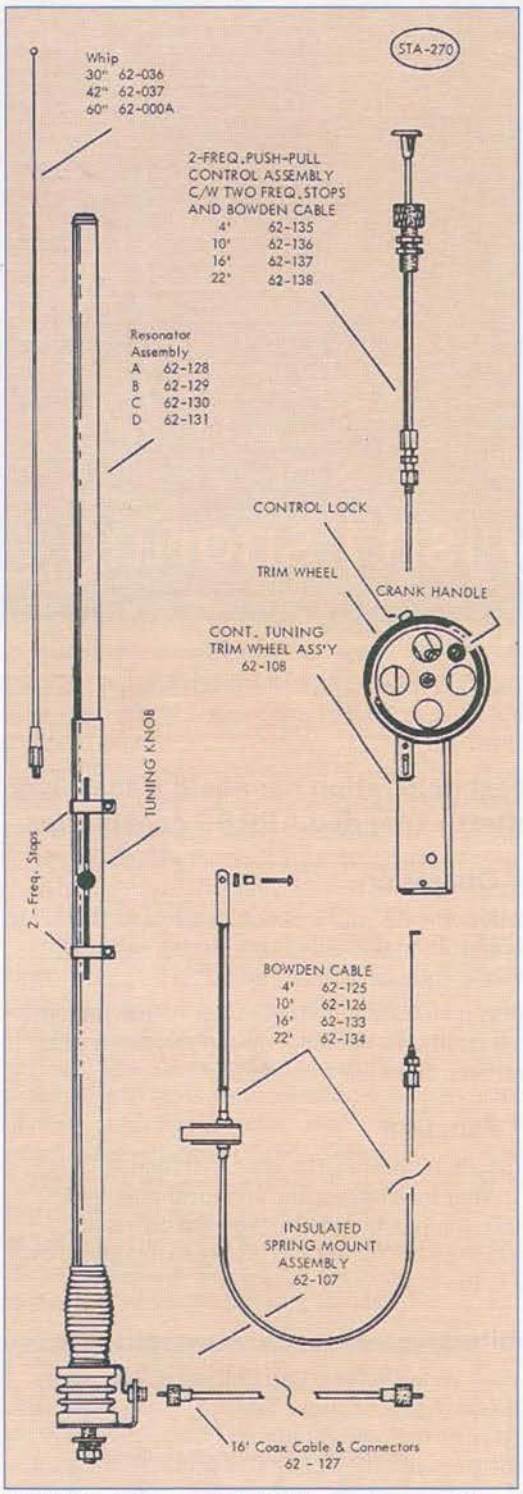

FIGURE 1: A diagram of the Spilsbury antenna and its remote tuning method using a Bowden cable (taken from Spilsbury Communications brochure).

RECAP. In the February edition of Antennas I described a method of tuning a loaded mobile whip antenna from an *ARRL Handbook* using the 'shorted turn technique' that I had never seen before or since (at the time of writing). Martin Feeney, K1OYB, e-mailed to say "Your recent articles on Shorted Turn tuning inspired me to do some research into the matter. There are several versions of slug and other 'non-contact' tuned antennas in old *QST* articles including W2ABS, August, 1950; W1BDV, August, 1951; W1IKU, February, 1952 and W0DQW, October, 1953.

"The W2ABS version reports a 3.9 to 4.0MHz tuning range with a 10kHz bandwidth. W1IKU appears to be the originator of the 'Figure 4B' version discussed in the February 2011 column. He reports a 100kHz tuning range at 4.0MHz with most change in the centre of the coil. Also W1HDQ and W1QDF describe a shorted turn tuning system for a 50MHz amplifier in the November 1970 *QST*."

THE SPILSBURY COMMUNICATIONS ANTENNA. Martin Ehrenfried, G8JNJ, e-mailed to say "I saw your notes regarding shorted turn antenna tuning and thought you may be interested in an antenna I bought at the Newbury rally two years ago. It's a commercial HF mobile antenna made by a Canadian company Spilsbury Communications (no longer trading). I think it was intended for use on logging trucks. It consists of a loading coil and short whip antenna. The coil is tuned by sliding a copper/ferrite core stack in and out of the winding. My antenna tunes from 3.5 to 13.9MHz with the standard whip." See **Photo 1** and **Photo 2**.

A diagram of this antenna from the brochure is shown in **Figure 1**. Note that this antenna can be also be tuned remotely using a Bowden cable.

G8JNJ included a copy of a patent [1] and a sales brochure. From this latter document it appears that Spilsbury Communications produced four different antennas that covered 1.6 to 6.5MHz, 2.0 to 8MHz, 2.3 to 9.1MHz and 3.5 to 13.4MHz. They were designed specifically for commercial concerns such as logging companies, who needed HF communications in hilly areas outside the range of VHF systems.

HOW THE SHORTED TUNE TUNING WORKS. The patent is very detailed and includes a description of how the shorted turn method works, which is as follows: "The inductor ring operates in accordance with Lenz's Law, which shows that the current induced in the inductor ring has 180° phase difference to the current in the coil. The flux in the inductor ring opposes the flux in the main coil and reduces the total inductance of the coil. This has the effect of increasing the resonant frequency of the antenna. In order to attain the maximum effect it is necessary that the outer diameter of the inductor ring closely approximates the inner diameter of the coil. In other words, the space between the inductor ring and the coil must be kept to a minimum consistent with providing the required insulation between the two."

Spilsbury Communications had obviously done a lot of research into the most effective construction of the inductor ring and found copper tube to be the most effective but it had to be the right shape. "...if the inductor ring length extends over a considerable part of the total length of the coil a capacitively coupled circuit is presented across the axial length of this portion of the coil and across the high RF voltage existing therein. This results in an unwanted and wasteful current being set up through the length of the inductor ring, which lowers the voltage across the coil and reduces its effectiveness. In order to minimise this loss it is necessary to divide the inductor ring into a number of sections. The number of divisions used is limited only by the added complexity and cost of the design. In practice, it has been found that an acceptable compromise is to reduce the length of the individual inductor ring section to a figure not exceeding its diameter.

"In order to further reduce the loss current set up through the inductor rings it is desirable to reduce the wall thickness of the rings as much as possible to reduce the electrical capacity between rings. The point beyond which the thickness cannot be effectively reduced is reached when the current carrying capacity of the ring becomes insufficient and/or the mechanical strength of the ring is insufficient. As an example a wall thickness of 0.001in has been found to be satisfactory in this antenna".

In practice the conductor rings are in the form of a cup to allow them to be fixed to central rod together with spacing insulators to maintain the distance between them and to prevent them touching.

PHOTO 1: The Spilsbury Communications antenna.

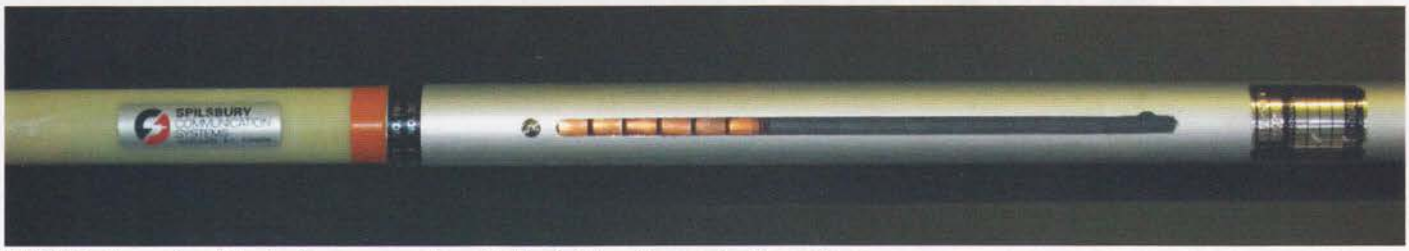

PHOTO 2: Closer view of the tuning arrangement used in the Spilsbury Communications antenna.

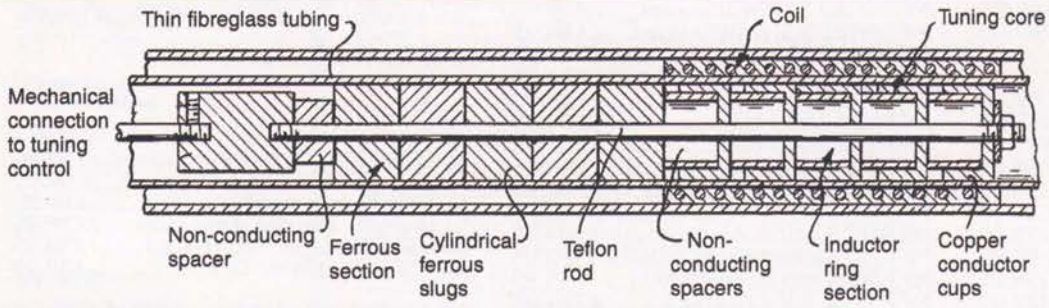

FIGURE 2: The arrangement of the tuning core as used in the Spilsbury mobile antenna showing the copper cups section of the core inside the coil resulting in minimum inductance.

CONSTRUCTION OF THE SPILSBURY ANTENNA. The antenna comprises a metal tube, a coil section and a top whip section as used in a conventional mobile antenna. However, the diameter of coil is small but is relatively long to allow it to be used with a tuning core.

The tuning core is arranged so that it can move into and through the coil. In addition to the conductor rings described above this core also has a section made of short cylindrical ferrous slugs, which are held together under tension on the same conducting rod as the conductor rings.

The lengths of the ferrous and ring sections and are positioned relative to each other so that at the extreme lengths of travel one section is completely within the coil, the other section is completely outside it, although most of the tuning range of both sections will be in the coil at the same time. The arrangement is shown in **Figure 2**.

The loading coil is space wound on a thin-wall fibreglass tubing and embedded in an epoxy resin. The size and spacing of the turns of wire of the coil are determined to provide the correct inductance for the frequency range desired and also with regard to the amount of RF power for which the antenna is designed. The patent gives an example of an antenna designed to cover 2-8MHz and with a maximum power rating of 120W peak power, which used 196 turns of wire wound on a 22mm round coil form and evenly spaced over a total length of 7in (175mm).

The patent is described in detail in [1] and the method of tuning proposed was an electro-mechanical method as used in most 'screwdriver' antennas. However, the production model described in the brochure uses a local tuning method at the antenna, which simply moves the core up and down with a knob as shown in Figure 1. Provision for remote tuning using a Bowden cable was also available.

It is probable that the customers who purchased these antennas would have been allocated a single frequency in the lower HF bands. A continuously tuneable antenna was not necessarily required for this service but the ability to conveniently set the antenna to a given resonant frequency was obviously a good selling point. Provision was made for two separate frequency settings by the simple expedient of using two hose clamps to restrict the movement of frequency selector knob as shown in Figure 1.

THE LABGEAR PORTABLE ANTENNA. Peter Chadwick, G3RZP, informs me that in the 1960s, Labgear had a line of commercial HF SSB equipment. They used loaded whip antennas with ferrite slugs, which were moved mechanically to achieve tuning. For pack sets, this was less than ideal because keeping water and dirt out was difficult. G3RZP goes on to say, "For the Compak 8 transceiver, Ian Leybourne, (whose callsign I can't remember but he was a G3S) came up with a different approach in 1969. He put the loading coil in the antenna, with some ferrite, to make a sealed, robust antenna. Ian's approach to tuning was to use a plastic sleeve with embedded rings of metal, such that it could slide it over the loading coil to increase the frequency".

The tuning could have been done using a metal tube but this results in capacity across the coil, which has an adverse effect on Q; metal rings circumvent this problem. G3RZP adds, "Anyway, the system was very good in the pre-production trials: I don't know if it was used in production, as I left Labgear at the end of 1969, but I'm pretty sure that it was patented. So, as usual, there's nothing that new in radio! Biggest problem with shorted turns is the same as the variometer – as the inductance reduces, so does the Q, since there is the same amount of wire in the inductor and thus the same resistance".

It could be that Ian Leybourne thought of the multiple ring shorted turn tuner first because the Spilsbury Communications US patent was not registered until June 1972. On the other hand I do not have access to the early *QST* articles mentioned at the beginning of this column.

SHORTED TURN TUNING FOR LF. For the LF fraternity the shorted turn may be a solution to fine tuning the inductance of the loading coil at 136kHz and 501kHz. A variometer can be relatively difficult structure to construct. Indeed Kevin, ZL4MD, has used the shorted turn approach on LF. He says, "I use a large ex-NDB loading coil that can be tapped on any single turn. For fine-tuning there is a single rotary shorted turn. To minimise losses the cross-section of the shorted turn is large [about 40mm x 10mm] and the whole thing is constructed using silver-plated brass.

"Although I have never bothered to measure the inductance variation it works well for transmitting on 180 and 500kHz. I intend to try it on 136kHz over our coming southern hemisphere winter".

LOOP CORRECTION. The sharp-eyed amongst you spotted an error in the May 2011 Antennas in the description of low band version of the magnetic loop. Walter, DF2NC noted "You probably meant circumference instead of diameter in the third line of paragraph LOOP DESIGN FOR THE LOWER BANDS".

Ken, MODKC, also noted the error. The figure of 11.7m is quoted as CIRCUMF in GOUVR's loop calculation program in Figure 3 of the article.

REFERENCES

[1] US Patent 3,671,972
www.freepatentsonline.com/3671972.pdf

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Emergency communications

The inspiration for this article came in an unusual way on 23 April when we were hiding under the kitchen table in Lexington, Kentucky, waiting for the funnel clouds to pass over. Just as the power went out, Tatiana remarked how nice it would be to have a radio! In this month's Start Here we look at the role that amateurs play in emergency communications around the world and how you can assist.

Lately, amateurs have played substantial communication roles around the world in times of disaster. From the Japanese tsunami and Christchurch earthquake to the Texas wildfires and multiple tornados across the Southern USA, amateurs have provided communication by either bolstering the existing infrastructure or replacing it entirely when it no longer exists. But what do these amateurs do, how can we prepare and how can we help in these times of need?

Although the examples above took place far away from the UK, the tasks that were performed could easily take place in a different situation in the UK. During the snows of the previous two winters, British amateurs helped keep hospitals and other critical infrastructure running. Using a combination of VHF/UHF networks and APRS they were able to keep track of people and supplies being transported in difficult conditions and to make sure that they were aware of conditions along their routes. Other incidents UK amateurs have helped in include relief operations during times of flooding and going on standby for support in case of unexpected problems. Essentially, as amateurs, we are simply there to pass messages and support the local or national infrastructure as required. In practice, this means accurately passing information such as the number of people in a temporary shelter or the supplies that may be needed. Passing messages is a two way operation – not only do you have to decide what information to pass on but you must do so swiftly and carefully, as it is often time sensitive. Further, having passed the message, it's essential to listen to the confirmation; this may be a simple "Roger" or even repeating the message back to you to verify it. Finally, having passed a message, usually it involves some form of an answer in which case you may have to act on this information locally.

Relaying information from an authorised third party can also happen. This may mean you follow a key person in the local infrastructure to ensure they have communications and pass on any messages they may have. It may also mean acting as a repeater – if you can hear someone who needs to talk to someone else but can't quite make it then you can it relay (QSP) to them. This can get quite involved, particularly in large scale operations/exercises, where it may be necessary to coordinate information across multiple bands and Sometimes, communications even need to be logged word-by-word to provide traceability after the event.

3.663MHz	RAYNET national emergency coordination and weekly news
7.030MHz	Japanese tsunami emergency
7.090MHz	RAYNET national emergency coordination
7.268MHz	Hurricane Watch net
7.290MHz	West Gulf Emergency Health and Welfare net
14.325MHz	Hurricane Watch net

Amateurs can also act as observers, allowing authorities to gain a larger, more detailed picture of what's happening or likely to happen. A particular example of this is in the recent Japanese earthquake, which triggered a tsunami that rippled across the Pacific Ocean. Amateurs were observing up and down the coasts of North, South and Central America plus on some of the Pacific Islands in order to report on the size of waves and any damage associated with them so that a response could be formulated quickly and effectively.

Finally, amateurs can act informally, for example running a local net to check up on fellow amateurs and their families. Whilst this is not so common in the UK, in many other areas of the world amateurs make sure that others around them are keeping well whether by checking if they need help with their antennas or even if they need assistance getting groceries.

Since most of us are relatively unlikely to be involved in a major incident, we'll first look at how you can help from a passive perspective. Probably the most important and useful thing to do is keep the frequency clear. While this may seriously inconvenience your evening chat or net (a group of amateurs in contact with each other at once – normally with one station acting to control who is talking), please QSY speedily and politely. Otherwise listen carefully, being sure to avoid unwanted transmissions. This is why it's important to ask if the frequency is in use before calling – just in case someone is struggling to copy that fading station on battery power you can't hear. Of course if you are monitoring an emergency frequency and someone asks if it's in use but the emergency operators can't hear them ask, then you can briefly and politely let the other station know the frequency is in use. A list of commonly used emergency frequencies is given in **Table 1**.

Also, if you're monitoring and hear two stations struggling to make effective contact, you can break in and offer to relay. However keep in mind what you might be letting yourself in for – assuming you're a good signal with both stations you might end up being the relay for the duration of the event...

Preparing to help can be as simple as keeping your station in good, reliable working order. Often there is very little time once you become involved, so preparations such as keeping batteries charged and knowing where spares or connectors are can make a difference. More advanced preparations can include designing your station to go portable using off-grid electricity, or even just making it versatile and mobile.

Other means of preparing can include practicing handling large volumes of contacts for prolonged periods of time and accurately recording information – in other words, contesting and DXing can hone operating skills that may prove useful. However, if you really want to be prepared, then join a group such as RAYNET (Radio Amateurs Emergency NETwork), where you can learn from experienced people and take part in training exercises such as providing communications for a local fun run.

In short, amateur radio plays a very important part when other modes of communication fail. By knowing what we can do to help, radio operators can have a crucial role in running efficient emergency management and saving lives.

WEBSEARCH

Home page of RAYNET: www.raynet-uk.net
Full list of RAYNET frequencies:
www.raynet-uk.net/main/RAYNETfreqs.asp
RSGB RAYNET information: www.rsgb.org.uk/emergency
Information on severe weather spotting and amateur radio in the US: www.mke-skywarn.org/skywarn_misc.html

Working motorcycle-mobile

Yes, you can work /MM on dry land...

PHOTO 1: The author aboard 'Thunderbird 1', ready to work 2m or 70cm FM.

INTRODUCTION. I live in Plymouth in south west England. In summer the roads are a bit busy – to say the least. Car parking in the city can be a nightmare and, of course, it's the most popular time to play the 'let's dig up the roads' game. So, apart from the pure fun of riding my two-wheeled beastie, it is also a quick and practical way of getting around. I have been asked many times how I work stroke motorcycle mobile. It's a bit unusual in the RAYNET and amateur radio world, though fairly common in the emergency services.

SO HOW DOES IT WORK? My trusty steed, 'Thunderbird 1', is a Honda ST1100 Pan European. The radio is a FTM-10 dual bander, designed for use on motorcycles. It has a waterproof control head and speaker; the controls are easy to use, even in motorcycling gloves. The rig is rugged and does everything I need.

MOUNTING THE RADIO. The first consideration was to find somewhere that the radio's main unit would be dry and safe. Inside the frame under the seat is a good place, as shown in **Photo 2**. But it must be firmly fixed with as little vibration as possible. I used foam to hold it gently in place. Watch out for airflow around heatsinks and/or fans so the rig can stay cool.

Be very careful if you plan to use screws to mount the radio. Check and double check that you won't be drilling or screwing into something vital like the petrol tank, a wire or a brake line – remember, it may be concealed beneath or inside the thing you're drilling.

POWER SUPPLY. Although the bike has a fairly large battery to run all the normal bike bits, I have added a second 20Ah battery linked via an intelligent switched charge (ISC) relay, similar to a caravan split charger system (**Figure 1**). The radio is connected to this secondary battery. If I forget to switch off the radio when I park, I can still start the bike and ride home. Power lines should be as short as possible; don't scrimp on the fuses.

For safety – and because the FTM-10 always draws power even when switched off – I have added an in-line power switch. This is actually a relay, switched from the right handlebar. When choosing a relay, remember that the radio can draw significant current (the manual quotes 8.5A on 70cm Tx at high power).

NOTE FROM THE TECHNICAL PANEL

Please keep safety foremost if you operate mobile; distraction when driving can be a hazard.

It is prudent to position the antenna as far away as possible from the fuel tank and your body. Check the VSWR carefully - it may change when you're on the bike. A bad mismatch might cause the transmitter to overheat.

CONTROL HEAD AND MIC/SPEAKERS. The control head mounts quite easily on the handlebar, as shown in **Photo 3**. The control head cable follows the standard wiring loom paths. The connections to the PTT, mic and speakers all come from the appropriate sockets on the back of the FTM-10 body. You could use the DATA port if you prefer.

To keep things simple, I took a spare microphone for the FTM-10, removed the mic capsule and PTT switch from the circuit board, leaving the rest of the unit in the case as an 'interface box'. The FTM-10 uses a non-standard plug and condenser mic element (which needs to be exactly 1.2kΩ); also, the PTT uses the microphone's Up/Down switches and needs both to be activated to trigger the PTT. I mounted the microphone and a small speaker in my helmet.

The wires run as follows:

- The two PTT lines go to a non-latching switch on the left handlebar and,

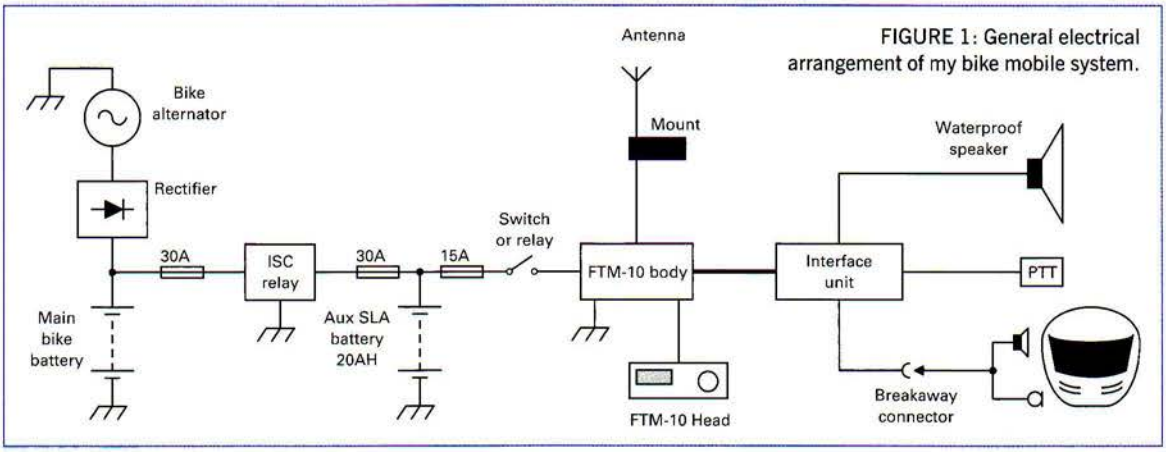

FIGURE 1: General electrical arrangement of my bike mobile system.

PHOTO 2: The main unit is tucked in place under the seat. I used foam for cushioning, but not so much that the radio would overheat.

PHOTO 3: The control head and external loudspeaker mount neatly around the dashboard area.

PHOTO 4: The antenna is mounted on a flat bar that's secured to the top box mounting frame.

in parallel, to a switch on the right handlebar switch pod.

- Mic (and ground) go from the helmet via the interface box (the old mic unit)
- Speaker (and ground) go via the speaker socket to the helmet.

A second speaker line has been run from the speaker socket to a waterproof loudspeaker on the bike dash, which can be seen in **Photo 3**. I have a switch that silences the speaker.

The speaker and mic cable to my helmet has a safety breakaway connector. This allows disconnection when getting off the bike but, more importantly, will come away easily if I unexpectedly part company with the bike whilst riding it! I use a waterproof 6 pin DIN plug and socket (plug = helmet end) although you could use a ¼" stereo jack and line socket. The important thing is the socket should be waterproof, to prevent corrosion.

MOUNTING THE ANTENNA. A poor antenna is worse than useless – and could damage the rig. Mounting the antenna on a bike could be tricky, but I have found a decent solution.

Whatever type of antenna you use, the mount must be strong and part of the best ground plane you can manage. When fitted on a car, there is a massive ground plane under the antenna. You don't have this on a bike. I found the best mounting method was to fabricate a flat metal bar at least 3mm thick and ~60mm wide. The bar should be long enough to pass completely under any top box and leave enough room on the off-side to fit the antenna mount. I drilled holes in the flat bar the same diameter and spacing as the top box bolts. The bar is mounted between the top box and its metal mounting frame to ensure a good earth and to stop the antenna moving around. My relatively discrete effort is shown in **Photo 4**.

I have gone for a solidly built dual band antenna, the Comet SBB2 (46cm long, 2.15dBi/3.8dBi) that is ideal for general round town work. I also have an SBB4 (92cm long 3dBi/5.5dBi) for RAYNET work or longer runs.

THAT'S IT. It works and I have had quite a few interesting chats with various other radio hams, not just locally but via the repeater networks literally all over the world. It always raises an eyebrow when you sign as *"stroke motorcycle-mobile!"*

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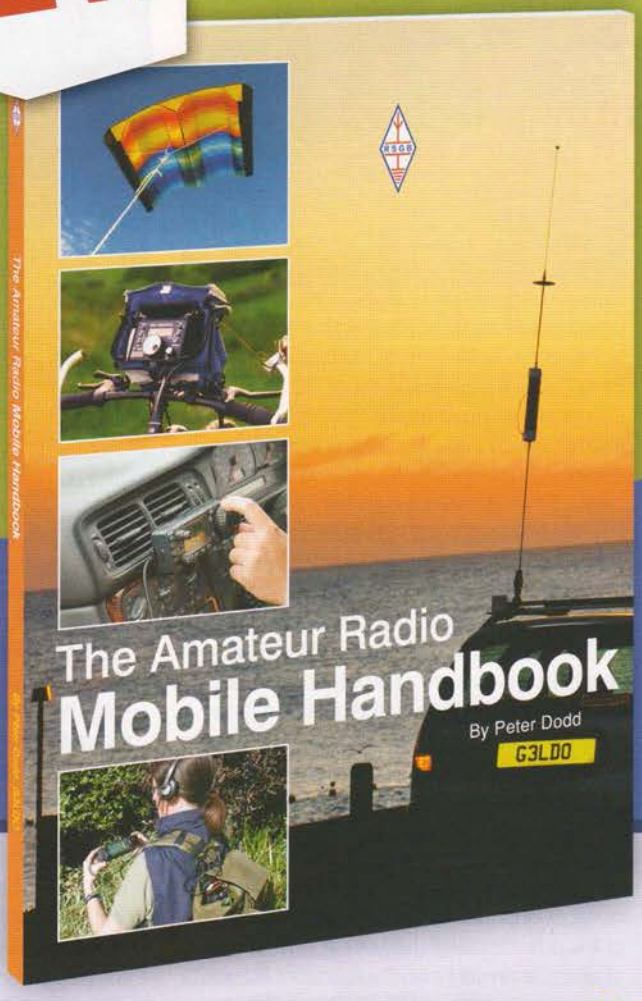

Amateur Radio Mobile Handbook

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By Peter Dodd, G3LDO

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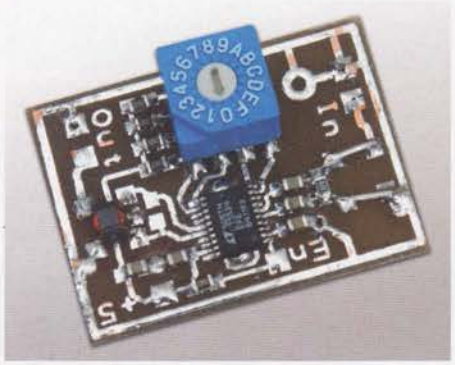


PHOTO 1: Chip of the Month LT5524 amplifier breadboard.

IC OF THE MONTH. Each month I will try to include outline details of a useful, low(ish) cost, readily available, modern chip suited to home construction of amateur radio equipment. To kick off I'll start with the LT5524 and LT5514 Digitally Gain Controlled Amplifiers. The LT5524 is a 20 pin packaged chip giving a flat gain response from DC to 500MHz and capable of delivering up to +17dBm output (50mW) linearly. The chip is mainly aimed at driving high speed A/D converters but is equally suited for anywhere a low to medium power wideband gain stage is needed. The gain can be set using four digital control lines in binary steps of 1.5dB over the range typically 5 to 27dB. The circuit diagram of the basic gain stage is shown in **Figure 1** with a practical version shown in **Photo 1**. Here the gain is defined by a hex DIP switch. The device is designed for push-pull input and output, although single-ended input is acceptable. A trifilar wound broadband transmission line output transformer sets the optimum output impedance and allows dynamic range to be optimised.

Since the output stage of the amplifier chip is a high impedance current source, the circuit as shown needs to drive a 50Ω load in order to give a proper transformed resistive load to the LT5524 output stage. If the load impedance is unknown, an additional resistor should be connected between pins 15 and 16 to give a better resistive termination. The resistor will define the output impedance of the amplifier through the transformation ratio of the transformer, but will lead to reduced gain and output power capability. The data sheet gives more details of how and when to install an additional load resistor.

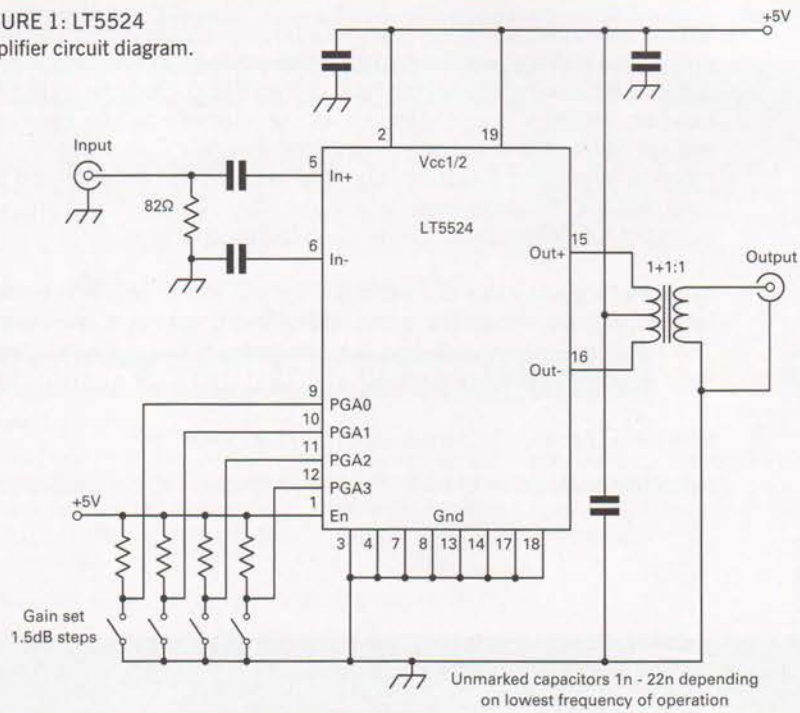
The LT1154 device is functionally similar, but rated up to 850MHz with a dual output stage that can be optionally switched in to increase output power at the price of higher power consumption. The gain control range is the same. Both devices are available from Farnell and RS as well as other US and European suppliers at prices ranging from £5 to £9 each. Data sheets can be downloaded from the suppliers' websites.

CARE AND PROTECTION FOR VOLTAGE REGULATOR CHIPS. The LM338 voltage regulator IC is the 'big brother' of the LM317 device covered in some depth in the January 2010 Short Circuits: an adjustable voltage regulator capable of delivering up to 5A at up to 40V. It is a very nice chip to use for a medium power 24V PSU – or at least it was! I had been using such a PSU to run a 24V motor – and swapped over the motor connections while it was running at full speed (don't ask!). The fast-spinning motor acted as a very effective generator that was now connected backwards across the output of the power supply – dumping several tens of amps in reverse into the regulator. Result? Instant death of the LM338 (**Photo 2**). My PSU was no more. Whilst destroying a power supply with a motor/generator is a somewhat unusual situation, the setup is identical if the PSU charges a lead-acid battery that is accidentally connected the wrong way round. Reverse output volts is also something that could happen when two PSUs are connected in series for an increased voltage, should the output from the pair get shorted. If one PSU has a significantly higher current rating than the other, significant current may be forced backwards through the smaller unit, potentially destroying it.

Figure 2 shows the concept, along with a simple way of protecting the voltage regulator chip against inadvertent application of reverse polarity to its output. A reverse biassed diode, D1, across the output connections, clamps the voltage that can appear there to less than one volt. This keeps the regulator chip safe. But this diode has to carry the entire short circuit current of the other supply. If a big lead-acid battery has been connected, the diode has to be a really big chunky device and may not survive on its own. A fuse in the output line will protect the diode and keep everything safe. A big stud-mounted Schottky diode (as used in many computer type PSUs) will do well in this position.

And while we're looking at this particular voltage regulator chip, there is another damage mechanism that is worth guarding against. If voltage is applied to the output pins (from a battery being charged) before the input power is applied, the regulator's input pin is held at ground via the reservoir capacitor. A pulse of current will try to flow backwards to charge the capacitor. This reverse current can damage the regulator and, although the damage may not be as spectacular as in Photo 2, a dead chip is the same end result. Again, an additional diode, D2 in Figure 2, will protect things, bypassing the reverse current and clamping the reverse voltage across the regulator chip. A high current rating is not essential for D2 as it only has to charge the reservoir capacitor.

FIGURE 1: LT5524 amplifier circuit diagram.



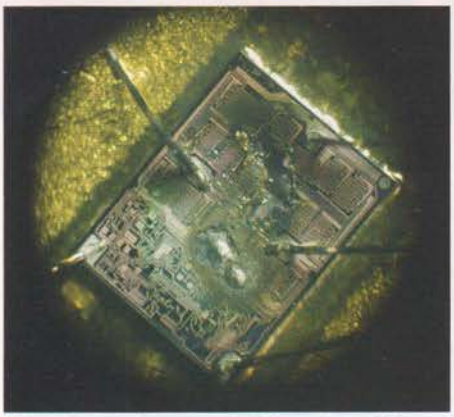


PHOTO 2: As the dead LM338 was in a TO3 metal can, a hacksaw was used to remove the top of the casing and examine the destruction under a microscope. This shows the silicon die inside. Note the blobs of melted aluminium from the bond wires spattered over the silicon surface, the result of dumping tens of amps, backwards, into the chip.

It's all getting very complicated for a PSU that may only occasionally be subjected to this danger. But you can guarantee that at some point it will, usually when least expected. So, when building your PSU, it's well worth including a diode across the regulator and a chunky diode across the output with associated output fuse.

SALVAGED AUTO-ATU. Many useful items can be found in the bins and boxes under the tables at rallies. The best finds are when the seller doesn't realise what he's got and is just selling as a piece of junk for components. The circuit board shown in **Photo 3** is just such as lucky find. It is the antenna tuner module from a Racal manpack HF transceiver. Small high voltage reed relays switch the inductors (that are clearly visible) and a bank of capacitors (mounted on the underside). Twelve inductors are present; these form a binary tree, giving an adjustment range from a few tens of nH up to about 80μH. Eight input capacitors (on the other side) give a binary tree with a value adjustable from 20pF to 4000pF. Two more high voltage

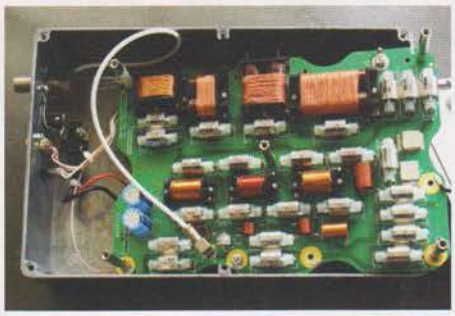


PHOTO 3: The relay switched antenna matching PCB found at a rally and turned into a semi-auto ATU with digital storage.

capacitors are available for switching in on the output side to give a solution for matching the majority of short wire antennas. 25 relays are used and I traced out the circuit diagram to see how these were controlled. Each relay was of a latching type, having a pair of coils which are pulsed to place it into either the on or off state. Latching relays are used to minimise power consumption in manpack equipment as no battery power is needed to hold the relay on, once set. Each relay has a pair of FETs driving its two coils; these FETs are in turn controlled from a 50 stage buffer made up from seven 74HC595 8-bit serial-in, parallel-out shift registers with output latches. The three connections needed to load the data serially into this buffer, along with 5V power, ground, a monitor signal and not much else, were bought out to a 10 pin header. If the module wasn't damaged, what a wonderful opportunity for a standalone semi-automatic ATU!

I wrote some code for the 16F819 PIC controller that read the voltage from three potentiometers, digitised these and formatted them into a serial word to drive the ATU buffer. One voltage sets the input capacitors, the second the inductors and the third the output capacitors. Once the code was operational, I discovered that some relays were not being driven. Examination under a microscope revealed an after-production modification that had added a tiny 0204 size resistor in series with every one of the 50 FET gate drives. The resistors had been mounted by lifting up the gate leg of each SOT-23 packaged device and installing the resistor between the leg and its original SMT pad. That must have been a horrendous, time-consuming modification to make on the production line. Several of these resistors had been damaged by rough handling – probably while in the rally seller's bucket of goodies – so I simply shorted them out, as series resistors are not essential to driving MOSFETs such as the 2N7002. Result – an almost fully functioning, tuneable ATU. The relay on the highest-value coil was a bit sticky and stayed with that L out of circuit, but otherwise I had a fully functional ATU for short wire antennas running with a few tens of watts.

New PIC code was then written so the ATU could be controlled using a 1200 baud serial interface, its L and C values adjusted using keys from a PC keyboard. When a matching solution is found, the resulting values can be stored in non-volatile memory on the PIC for instant recall later. 16 separate matching solutions can be stored and any one of these recalled by issuing a single letter command on the serial interface. The aim was to make an automated ATU that could be quickly set to any of 16 pre-stored solutions (one for each amateur band plus some spares) with a command sent from a WSPR beacon transmitter. The beacon transmitter will automatically step around the bands as needed, setting the ATU onto each frequency by issuing the serial commands straight to it.

An alternative solution, used in the past on another (much larger) salvaged auto ATU, is to measure the band switching DC output voltage from the accessory socket of some amateur transceivers, digitise this and use it to call up one of the pre-stored solutions as an antenna pre-match. Together with the internal ATU in the rig, an instant tuning antenna system becomes possible. For any new antenna, a few minutes have to be spent manually finding and storing a new set of matching solutions; thereafter these can be called up and used until the antenna configuration changes.

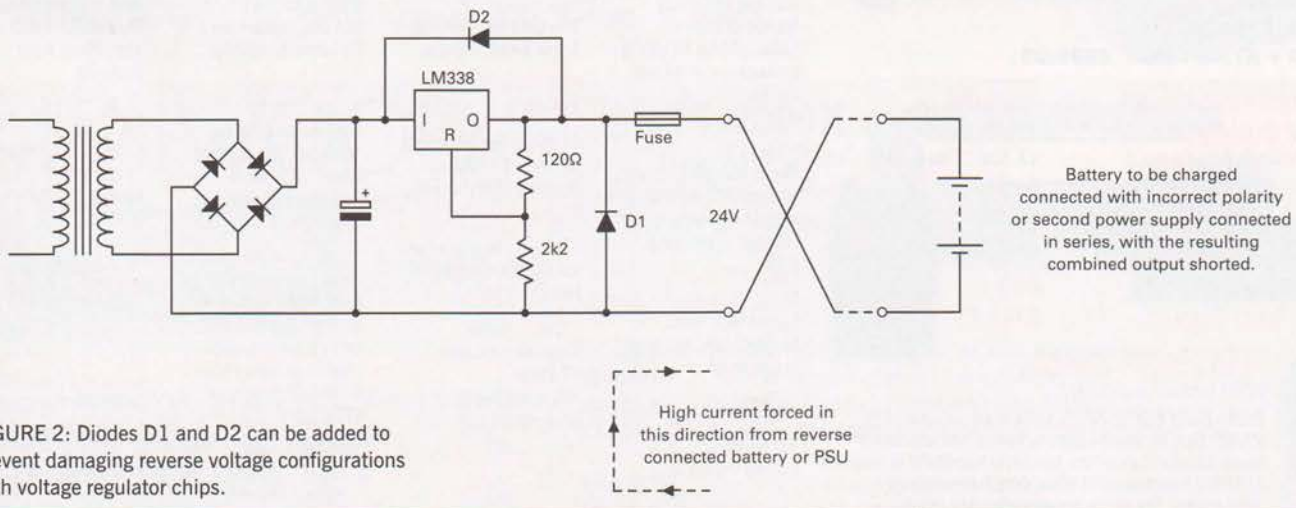


FIGURE 2: Diodes D1 and D2 can be added to prevent damaging reverse voltage configurations with voltage regulator chips.

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Summits On The Air

Guidance for a new SOTA activator

The operating location on the summit of Skiddaw.

TRYING SOTA. If you have ever visited the Lake District you will know this area provides some of the best hill walking in the UK. The Lake District is also SOTA country and provides both hard and easy opportunities to activate summits. The Lake District has some 56 recognised SOTA sites and they are all listed online [1]. The programme is accessible for both SOTA activators and for operators at home working stations on the hills. The full rules of SOTA activation have been very well defined; the programme is based on points, the most points being given to the hardest to activate summits.

LAKE DISTRICT. In the Lake District (code LD) you have the option to activate / work 56 recognised locations, ranging from LD 001 Scafell Pike at 978 meters (worth 10 points) to LD 056 Arnside Knott at 159 meters (worth 1 point). Our chosen activation site was LD 004 Skiddaw, mainly because we could identify a clear route up the mountain and the site was located just 7 miles from our campsite near Keswick. We had pencilled in the SOTA activation on two previous days, but the weather in the Lake District is changeable and we could see no point in trying to complete the walk in wet and windy conditions.

July was chosen mainly because the weather was forecast to be 'reasonable' and activity is usually high at the weekend, giving us the maximum chance of working as many stations as possible. The VHF calendar also showed Sunday was a 144MHz backpacker's contest day, so we knew this would add further band activity. John was keen to try out HF, while I was mainly focused on VHF, so we opted to take both antennas. We had already completed some hill walking earlier in the week, although never with this much equipment, so we were prepared for a slow accent taking everything in our stride. The route we chose meant that the car park was at 295m ASL, meaning we already had a head start over other routes. Parking was limited and if you don't arrive in good time you will find no spaces available.

STARTING OUT. We left the camp site at 9.30am giving plenty of time to get parked, check back packs once again and prepare for the ascent. We used a GPS to track our progress and had the 2m hand-held monitoring S20. The path is well defined; we had a large scale map, compass and GPS so felt reassured in our navigational skills. At the start of the path it was quiet, just 2 or 3 other people on the route. With the temperature around 13°C it was reasonably warm once you're walking.

Just before 1pm we reached the summit. The temperature had dropped significantly and wind chill was now becoming a problem. Thankfully we had packed hat, gloves and extra layers and these were needed. We had gained around 630 meters in total accent and the temperature had now dropped to 9°C; this, coupled with the wind-chill, could have been a real SOTA stopper.

PREPARATION. Thankfully, our preparation paid off, and we headed for shelter behind some rocks. Our first activation was going to be VHF SSB and we quickly set up the VHF beam and FT-817, getting on the air in around 15 minutes. The wind was quite strong, maybe gusting to around 30mph, so we decided on a two person strategy. I would hold the antenna support and rotate the beam, leaving John to log and operate. The band was very busy, so we decided to use 2.5W to conserve battery power.

Almost immediately we received calls and, once the spot had been placed on the SOTA website, we had some

Dave, M0TAZ.

FT-817 setup from the top of Skiddaw.

Activating Skiddaw LD-004 at 931 metres (3,054ft)

Equipment Taken: FT-817, 2 x 3Ah gel cells, roach pole, HF inverted V, home made 5-el 144MHz beam, 145MHz handy, various tools, logbook, MFJ Tuner, Gamin GPS, digital camera, warm clothing, 3 litres water, lunch (x2).

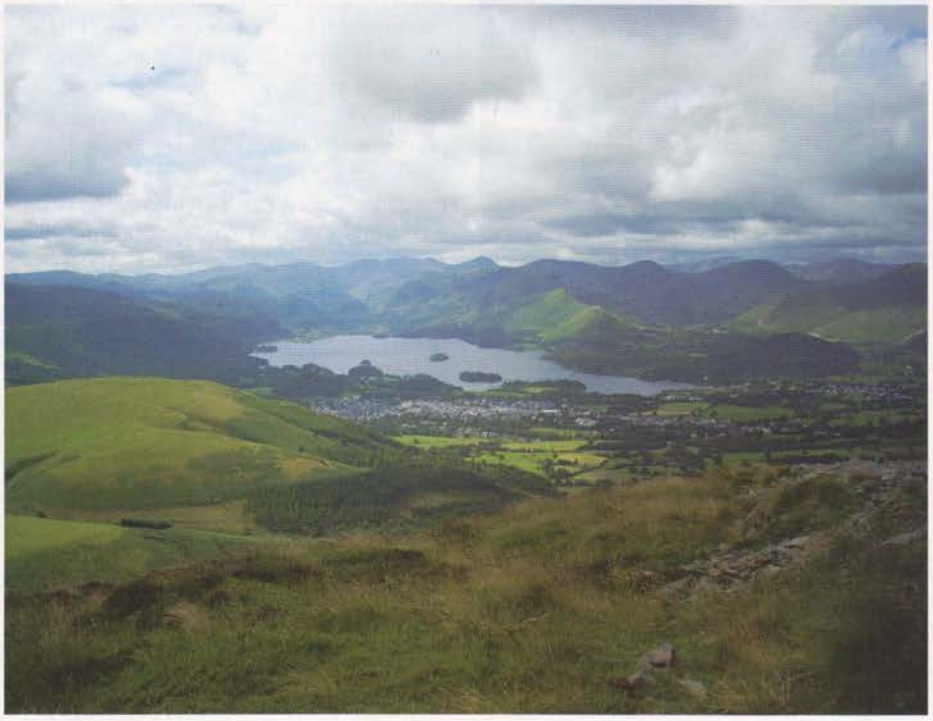
Start location: 54°37'4.76"N, 3° 6'54.84"W

Start ASL: 295 meters

Distance walked: 5.2km (each way).

John, M0UKD working HF from Skiddaw, using FT-817. They worked 80m and 60m from the summit.

John, M0UKD holds the home made 5-el 144MHz beam.



The view from Skiddaw.

mini pile ups. We worked 27 stations in quick succession. Many stations wanted to work us for the back packer points, but we also completed some SOTA to SOTA QSOs with GW4EVX on NW051 and 2E0PHL on NP016.

SUMMER WEATHER. I had planned to take some video footage of us operating VHF, but this was nearly impossible due to the wind and cold. We decided it was best to operate first, completing as many QSO as we could in our limited operating time, fighting against the wind, cold and limited battery power.

Lunch was taken sheltering behind the rocks, after a successful VHF SOTA activation. Other walkers looked on inquisitively, with the odd person asking, "Can you get Channel 5 from up here?" We were conscious that the summit is enjoyed by many people and tried to make our activation as unobtrusive as possible.

Once we had completed around 2 hours of operating – and explored the summit – we decided to move down a little for the HF activation. It would have been impossible to set up the roach pole and large HF antenna right on the summit as this would have caused a major obstruction to walkers. SOTA does allow for this and recognises the need to operate in a way sensitive to the needs of other hill walkers.

Having found a suitable location a few metres away from the summit, at 4pm we set up the roach pole. Our plan was to try 3.5, 5 and 7MHz using a 66ft doublet fed with 300Ω ribbon and tuned with a MFJ tuner. HF was slow to start, needing quite a few 'CQ SOTA' calls to generate any activity. One of the contacts added a SOTA spot on the cluster and that prompted many of the stations that had worked us on VHF to find us on HF. We completed 18 contacts and still had plenty of battery power available.

At one point a very strong gust of wind, probably 40+mph, almost ripped the ribbon feeder from the tuner. Everything worked as planned, although we did have a small drama when the HF antenna would not present anything like 50Ω to the radio. Checking and re-checking the connections cleared the problem.

By 6pm we were almost back to the car, having been on the hills for eight hours. We had packed in a great walk and highly successful VHF and HF SOTA activation – and very tired legs! We obviously didn't learn our lesson and Monday was followed with a further SOTA activation of Robinson LD 021 at 731 meters ASL...

REFERENCE

[1] www.sotawatch.org/summits.php

HF

All the HF news

QSLs from previous Southern Sudan activations (see text).

UNSETTLED BANDS. I'm writing this in the aftermath of the CQ WPX CW contest weekend. While solar activity was up, there was also a high A index, so the higher bands were unsettled. For my own part, I did a single-band entry on 80m and was rewarded with (among others) contacts with V26E (Antigua), J25DXA (Djibouti), A73A (Qatar), WP2/OL0A (US Virgin Is), HH2/PY1ZV (Haiti), ZA/S59AA (Albania), various Brazilian stations and the usual plethora of odd prefixes from what would otherwise be considered pretty mundane locations. 20m was probably the 'money band' in the contest, with good openings across North America and also to the Far East, but 15 and 10 were disappointing, having had some good moments earlier in the month.

CALLSIGN CONFUSION. The WPX contest brings out, as you would expect, some unusual prefixes. But whether you are a contester, a DXer or even a casual HF operator, it pays to have a good working knowledge of international prefixes and of who is active on the bands at any given time. It is all too easy to see a Cluster spot for, say, VO3A and take it for granted, whereas active contesters will immediately realise this is likely to be bad copy for 4O3A who is a fixture in major contests (and the two callsigns, on CW, are of course separated by just one dot). Another such example is a reader who e-mailed me recently about a contact he had logged with VS7DXG, saying that he hadn't realised that the old VS7 prefix was back in use again. The answer I gave him was that it isn't but that 4S7DXG (again, just one dot difference) has been very active of late, as any reader of DX bulletins will be aware. They would also be aware, as it happens, that there is quite some controversy over the legitimacy of this particular operation, so I did tell my correspondent not to hold his breath over getting credit for a Sri Lanka contact (as 4S7 would be). Having said all that, when HK3R decides to use 5K3R in the CW contest, that's a recipe for confusion all round!

Good callsign awareness comes primarily from being active on the bands. A mistakenly logged callsign can sometimes be obvious for the sort of reasons I have mentioned above, or maybe by a basic knowledge of propagation – is the band really going to be open to that part of the world, or I am miscopying? But at the basic level, just get familiar with all the usual prefixes. I don't normally mention the country each time in this column (as I have above) as my assumption is that most readers will know at a glance (unless it is ambiguous, as with VP8, for example, which can be any of several DXCC entities). In any case, there really isn't the space. But if you are new to the game, then go through the reports here with a prefix list next to you, maybe in the *RSGB Yearbook*, the excellent RSGB Prefix Guide or from the internet, until they become second nature. Remember that every prefix should fall within the overall ITU allocations, even where it is one not commonly heard on the amateur bands (amateurs are adept at trawling the possible prefixes for their country and asking their licensing people for unique assignments for special events, contests, etc).

PREFIXES. Apropos of which, there was a discussion recently on the CDXC reflector about what constitutes a valid amateur radio prefix. Prefix allocations are made by the International Telecommunications Union and extend to all licensing, not just amateurs. So G is assigned to the UK and, for example, aircraft callsigns will normally consist of five letters starting with G. Even the BBC's transmitters all have a callsign, although unlike US medium wave broadcast stations (WOR, WINS, etc), they don't announce them on the air. Amateur calls have a number following the ITU prefix, and then a sequence of letters. That was all very well and good until the ITU got as far as ZZ (assigned to Brazil) and new countries started demanding their own allocations, often when they gained independence. So the ITU then started a new sequence consisting of a number and letter, starting with A2 (Botswana), A3 (Tonga), etc. There are plenty of others, right through the alphabet (S9 for Sao Tome, V5 for Namibia, Z3 for Macedonia, etc). In these cases a commercial licence (aircraft, ship, broadcast facility) would consist of letter, number and letters (A2ABC, for example). Take a look at the tail fins of an Etihad or Emirates aircraft next time you are at an airport and you will see what I mean. An amateur callsign should have a second number, to be consistent with previous practice, hence A25 for Botswana, A65 and similar for the UAE. Unfortunately, just to confuse things not all administrations are consistent, so you will find J7A, C4N and similar callsigns on the amateur bands although, strictly, these are not conformant to ITU guidelines. Confusing, isn't it!

DX NEWS. First and foremost this month is the (possible) addition of a new entity to the DXCC list by way of Southern Sudan. Since the vote for independence earlier this year, two groups that I am aware of have made plans to be active from 9 July, when independence comes into effect. One team is from the Intrepid DX Group, which brought you YI9PSE. Another group appears to centre on OH2BH, S53R (who has been active as ST2AR) and 5Z4DZ/PA3DZN. I have also seen mention of a team led by EA5RM, but this might be related to one of the others. No doubt all will become clear when the pile-ups commence! Sudan has long been a country divided and Southern Sudan has previously counted as a separate DXCC entity, with contacts made between 7 May 1972 and 31 December 1994 counting. However, in line with current DXCC rules, rather than the earlier entity being restored, a new entity is likely to be added to the DXCC list but, at the time of writing, no decision has been announced and it is by no means a foregone conclusion that the start date will be 9 July. But, as it always the case in such instances, the best advice is WFWL (Work First, Worry Later)!

Malcolm, GM3TAL (gm3tal@kars.org.uk) writes that Explorer Scouts on the Scottish Scout 'New Horizons' Expedition will carry out practical development work at the Malawi National Scout Campsite near Zomba where Malcolm, GM3TAL, will operate 7Q7MH during July. "Although not a DXpedition as such, we will operate on the upper HF bands, with SSB and CW. This will be a month long 'Field Day' under canvas – no towers or comfy resort-style shacks and no internet! We are delighted to have received lots of support in kind already." Meanwhile, if anyone would like to make a contribution to help cover the expedition's equipment expenses, please contact Malcolm. More details on their website.

DK1IP, DL7OR, DJ4KW, DL1CW and DJ9KH will be active from Ascension Island between 24 July and 9 August as ZD8D. They will start on digimodes and move to CW and SSB later in the operation. They will also be in the IOTA Contest.

There will be an 8-man DXpedition this month to Lord Howe Island, signing VK9HR, from 8 to 17 July. QSL manager is EB7DX. Details of equipment, antennas, operating

frequencies, etc appear on their website.

CE0Y/I2DMI will be RTTY-only from Easter Island from 30 July to 8 August 2011. He hopes his operation will be able to include 30m, which requires special permission for Chile and its possessions.

A large team including EI6FR will activate Jan Mayen from 6 to 14 July. They will be on all bands and modes. Further details are available from their website.

A US team will activate American Samoa (KH8) from 30 July to 14 August. High power activity is expected on all bands and modes, with verticals on 160 and 80 and beams on 40 through 10. QSL via WA8LOW.

A German group will sign MD9Y from the Isle of Man from 7 to 15 July, including the IARU HF Championship. They will be on all bands and modes.

The two big international contests this month are the IARU HF Championship on 9/10 July and the IOTA Contest on 30/31 July. Both are great opportunities to catch some interesting counters.

CQ DX HALL OF FAME. This year *CQ* magazine inducted just one DXer to their prestigious Hall of Fame. This was Mike McGirr, K9AJ, well known in the UK as a regular speaker at the RSGB Convention, particularly on matters IOTA. His many radio journeys have ranged from an Arctic expedition to Nunavut to Heard Island, off the coast of Antarctica – and a variety of places in between, including islands in the Indian Ocean, Caribbean and South Pacific. Mike is also a director of the Island Radio Expedition Foundation (IREF) and 2010 recipient of the W9DXCC Award of Excellence in DXing.

CORRESPONDENCE AND TABLES. Those wondering what happened to the 9-band all-time table may like to be aware that a new table has been prepared by Henry, G3GIQ for the new *RSGB Yearbook*. Unfortunately Henry has been unwell and has also made a major house move recently, so has been unable to prepare the table on his usual regular basis.

Colin, MU0FAL made just over 1500 contacts in 80 countries during his operation as MR0FAL. Following that little aside, he returned to his regular call to add PJ4/K4BAI on 10, D2EB on 12, HZ1PS on 15, PJ4A on 15 and 20, ZL4AS long-path on 17, LX1RFJ on 17 and 12, and plenty of short-skip Es on 10 and 12.

Peter, G3HQT reports his best DX for the month as 6W2SC, D2SG, HR5/F2JD, BA7IO and H77REX on 30 CW, HK3O on 30 RTTY, JT1CS, T6JC and 8J1ITU (Antarctica) on 17 CW, BD1MWH on 17 PSK, FJ/OS1T on 17 RTTY and 5H3EE on 12 CW.

Dave, M0BVE mentions VP8KF (G4BKI) on 20, FS/F5JSD, XE2WWW, HI8A and YV/UC4UL on 30 and YN7SU on 40, all CW.

Ron, G4DXW has been busy on 17, adding 5V7CC, A71CT, JT5DX, KP2/AG1LE, VR2XMT, 9V1SV, FM5BH, OX3KQ, A61AS, PJ2/W6NN, YI9OBM, 8P9XB, HZ1FI and others. But then the weather improved and he spent time outside rather than in front of the radio!

SILENT KEY. Several vintage DXers passed away recently, but I particularly wanted to mention Frank, AH0W, who was just 61 years old and will be remembered by many as the holder of callsigns such as OH2LVG, ZF2FS, PJ8X, XE2FIN and 4J1FM as well as being a member of many DXpeditions including OJ0, Market Reef; OH0, Aland Island; Finland special event operation OF2C; M-V Island, 4J1FM/4J1FW; XF4M from Revilla Gigedo; PJ8X and PJ7/OH2LVG from Dutch Sint Maarten; ZA9B Albania; AH4/AH0W and K4M from Midway; K7K Kure Atoll; and XW3O from Laos. Frank was the Chairman of the Midway-Kure DX Foundation and was working on operations from 3B9 and A51. Frank had 5-band DXCC and DXCC Honor Roll.

QSLs from previous Southern Sudan activations (see text).

2011 TABLE

(starting 1/1/11, WARC bands and all-band)

Call	30m	17m	12m	ALL
G3HQT	139	109	30	
MU0FAL	65	54	69	142
G4XEX	25	32	8	80
G6CSY	19	7	2	23
G3SED	17	16	40	
G4FVK	4	12	1	75
M0VKY	0	15	1	164
M0BVE	0	0	0	111
G4DXW	0	60	18	

THANKS. It's been a few months since I've included this acknowledgement, largely to save space. But, as always, special thanks go to the authors of the following for information extracted: OPDX Bulletin (KB8NW), The Daily DX (W3UR) and 425 DX News (I1JQJ). The deadline for the next issue is generally the penultimate weekend of the month (which usually means a few days after you receive your *RadCom*). I particularly welcome photos of HF interest. It is too easy to assume they are available nowadays on the internet, but many photos on the web are of low resolution and have copyright issues.

WEBSEARCH

Jan Mayen: http://janmayen2011.org
VK9HR: www.lordhowe2011.com
ZD8D: www.zd8d.de
7Q7MH: www.7q7mh.org

VHF/UHF

Sporadic-E propagation openings on the 50, 70 and 144MHz bands

PHOTO 1: The 144MHz antenna systems used by the Colchester VHF Contest Group, G0VHF.

PROPAGATION EVENTS. Ionospheric propagation on the VHF bands was excellent during May with numerous Sporadic-E openings being reported on both the 50MHz and 70MHz bands throughout the month. These conditions were so intense at times that they even reached as high as the 144MHz band on four occasions. The 50MHz band was particularly interesting with a multi-hop Es opening into the Caribbean area and trans-equatorial propagation into Africa and South America. Auroral-Es openings were also reported on the 50MHz band with reports of Canadian stations being heard by Scottish operators. Auroral back-scatter propagation was also reported during May with a small number of contacts being made on all the VHF bands. Tropospheric propagation on the 144MHz band was quite exciting at times with contacts being made into the Azores archipelago some 2300km distant from the UK.

50MHz SPORADIC-E PROPAGATION. Es propagation was quite prolific during May with 26 days during the period when 50MHz stations were reported making contacts into the UK. Stations throughout much of Europe and sometimes beyond, such as A92IO (Bahrain), EA9AK (Ceuta), 4X1FQ (Israel) and 7X2GX (Algeria) were easily worked with quite low powers and simple antennas. Some of the more interesting stations to be found on the band included IE9Z, a DXpedition to Ustica Island (EU-051), IR2ITA, celebrating the 150th anniversary of Italy's unification, IR50NU, a special event station promoting the work of UNICEF, LZ855SRKM, created in honour of the Bulgarian Saints Ravnoapostoli, Kiril and Metodii, OL100VP, celebrating 100 years of the football club FC Viktoria Plzen, Champions of the Czech Premier league and OM75IHWC, a special callsign at the 75th Slovak Ice Hockey World Championships

Graham Dawes, M0AEP (Lincolnshire, IO93) mentions that due to gale force winds during May he was forced to tilt over his Strumech tower on which is fitted a tri-band co-linear (6m, 2m, 70cm) vertical antenna. With the tower luffed over the tip of the collinear vertical was literally touching the grass and, on returning to the shack, he was surprised to hear SSB signals from HA6NL (Hungary). Just running 10W into the 'grounded' vertical he exchanged 59 reports and mentions that he never ceases to be amazed what can be achieved on this band during the summer Es season.

David Barber, G8OQW (Essex, JO01) was pleased to notice that DX signals had returned to the 50MHz band during May. Running 80W from a Kenwood TS2000 transceiver to a Create CLP-5130 log periodic antenna, he made SSB contacts with stations in 7X, 9A, CT, DL, E7, EA, EA6, ES, HA, HB9, I, ISO, LA, LY, OE, OH, OK, OM, OZ, SM, SP, YL, YO and YU. Nothing particularly spectacular but best DX were the stations of ES5GP (1805km) IK7LMX (1819km), ES4RC (1827km) and IW7DKS (1861km).

An excellent early season opening to the Caribbean area was reported between 1700-2000UTC on 31 May. Stations from Guernsey, through England and Wales and up to Northern Ireland reported making CW and SSB contacts with FG5FR, FG5GP (Guadeloupe), FM5AA, FM5WD (Martinique), KP4EIT, NP4A (Puerto Rico), PJ2BVU (Curacao) and 9Y4VU (Trinidad & Tobago).

TRANS-EQUATORIAL PROPAGATION. Some brief TEP openings into Africa and South America continue to be reported in the UK, the latest occurring on 1, 9, 11, 23, 24, 27 May. All these six opening occurred in the time-frame between 1700-2030UTC, with the South American stations being heard towards the end of the period. The stations worked from the UK included C5YK (Gambia, IK13), TR8CA (Gabon, JJ40), TJ3IC (Cameroon, JJ53), TZ6TR (Mali, IK95), Z22JE (Zimbabwe, KH52), LU4FW (Argentina, FF97), LU5FF (FF99) and PP5XX (Brazil, GG53). The low-power beacons 9Q1D (Democratic Republic of Congo, JI75) and Z21SIX (Zimbabwe, KH52) were heard on 1 and 11 May.

Ken Osborne, G4IGO (Somerset, IO80) reports that he made QSOs with Z22JE and YO4RYU/MM (wet square IK06) on 11 May, TR8CA on 24 May and TJ3IC on 27 May. Ken thinks the contact with TJ3IC was a UK first but if you know otherwise please let me know. Incidentally the call sign was specially chosen to celebrate the 51st anniversary of the Independence of Cameroon and was operated during May from the fixed station of Henri, TJ3AY. The contact was first established on CW but then swapped to SSB after 5 minutes when signals peaked to 55. During the next half hour the transmissions peaked to S9 but mainly stayed around the S5 level. Ken is ideally located in the south of the country for this type of propagation. Of course his antenna system of 4 stacked and bayed 5-element NBS Yagis certainly helps!

THE 70MHz BAND. Openings via Es propagation were reported on 14 days during the month with some particularly good openings on the 70MHz band from 20 May onwards.

Contacts were reported to have been made into Belgium (ON), Germany (DI), Denmark (OZ), Norway (LA), Czech Republic (OK), Slovakia (OM), Croatia (9A), Slovenia (S5), Greece (SV), Portugal (CT), Spain (EA) and the Balearic Islands (EA6). This is pretty well representative of the European countries now active on the 4m band. There was also some activity from a few misguided operators in countries either waiting for permits or those who previously had temporary permission to access the band. Cross-band activity appeared to be high with a number of stations calling for contacts on the 50MHz

band or making announcements on the ON4KST 6m chat page (www.on4kst.org).

Kev Piper, G0CHE (West Sussex, IO90) mentions that his 70MHz setup consists of an Icom IC-756 Pro transceiver driving a Spectrum transverter, a 100W amplifier and a 5-element YU7EF Yagi. A selection of the DX stations worked in May included 9A7PJT (JN83), CT1JAD (IM57), EA5TT (IM99), ES1II/8 (KO18), LA4YGA (JO48), OH1ND (KP00), OK1MAC (JN79), OM3CLS (JN79), OZ8UW (JO46), S51ZO (JN86) SV1DH (KM18), SV2DCD (KN00), SV3BSF (KM08) and SV8CS (KM07).

THE 144MHz BAND. There is no doubt that Es openings on 2m create much excitement for seasoned DX operators. Within seconds a very quiet 144MHz band can be transformed into bedlam more akin to a CQWW contest on 14MHz. During May there were four such openings.

The first 144MHz Es opening of the summer season was reported on 21 May between 1525-1620UTC and, as luck would have it, coinciding with the RSGB 144MHz contest. However, the reflection point was a long way south and propagation only just made it into the south-east corner of the UK. John Lemay, G4ZTR, one of the operators of the Colchester VHF Contest Group, G0VHF/P (**Photos 1 & 2**) reported that the team made SSB contacts with the stations of IZ8DWF (Italy, JM78) at1894km and 9H1CG (Malta, JM75) at 2053km. Bob Harrison, G8HGN, (Essex JO01), running 50W into two 15-element Yagis, found IW8PQU (JM88) and I8YGZ (JN70); other UK operators reported working Italian stations that included IC8TEM (JN70) and IK7UXW (JN80).

An Es opening on 24 May was extremely brief and I have only received one report, from the station of G8HGN. At 1719UTC Bob was calling CQ on 144.300MHz and received a reply from SV2JL (Greece, KN10), some 2112km distant.

An infinitely better opening lasting 3 hours between 1330-1630UTC was reported on 26 May. The event covered much of England and Wales and enabled SSB contacts to be made into Austria, southern France, Spain, Balearic Islands, Italy, Croatia, Slovenia, Corsica, Sardinia, Sicily, Greece, Bulgaria and Serbia. Some of the 144MHz DX included the stations of EB3DYS, EA6RF, F4FEQ/M, IT9CHH, IW1CHX, LZ2TW, OE6IWG, S53X, SV2JL, TK5JJ, YU7ON and 9A2Y. Bob, G8HGN mentions working EA3DJL (JN11), EB3DYS (JN11), EA6RF (JM19), F1DVP (JN12), F1EYB (JN23), F1USF (JN23), F4BDV (JN03), F5TMJ/M (JN03), F9HS (JN23) and IS0SWW (JN40).

Peter Holmes, 2I0VAX (Co Antrim, IO64) reports that he had been working many Spanish and Italian stations on 50MHz and then decided to take a listen on the 144MHz band. Using a Yaesu FT-847D transceiver running 35W into a Comet GP15 tri-band vertical antenna he was surprised to hear and work the station of IS0SWW (Sardinia, JN40) with 59 reports.

Thirty minutes after this southern European opening had faded out the 144MHz band opened up to stations in Belarus (EU), Russia (UA) and Ukraine (UT). In this Russian opening Bob, G8HGN contacted the SSB stations of RA3WDK (KO81) at 2434km and UA3WM (KO72) at 2369km. He also heard EU4AG (KO13) briefly but he was only peaking 42 on SSB. Up in the north of England David Storrs, G8GXP ((Yorkshire, IO93) found a slightly different path and managed to work UT4UFL (KO50) and UT5UI (KN59).

The last 144MHz Es opening of the month occurred around 1630UTC on 30 May with the station of Tim Fern, G4LOH (Cornwall, IO70) making SSB contacts with EA8AVI (Canary Islands, IL28) at 2598km and EA8BRZ (IL27) at 2607km. Unfortunately, signals weren't reported making it any further into the UK as it appears that the main propagation path was from EA8 to stations in northern Spain and France.

144MHz TROPO OPENING TO THE AZORES. Last year I reported that the elusive 2300km marine tropo path to the Azores finally opened up, enabling 144MHz contacts to be made with stations situated in Cornwall and the south coast of the UK. I term it as elusive as the longer 3000km tropo path to the Canary Islands (EA8) is much more productive, being reported every year on an almost monthly basis between May and September. The path to the Azores (CU) is rarely reported; indeed, I believe that it was only in September 2010 that the first significant contacts were achieved with UK stations. I find this surprising as there are a number of active CW and SSB operators scattered amongst the nine major islands that make up the Azores archipelago.

The first indication that tropo propagation existed between the UK and the Azores came during the morning of 15 May when stations in south-west England reported hearing the *Dubus* sponsored beacon CU8DUB (144.420MHz) with signals peaking up to 579 at times. (*Dubus* is an amateur radio magazine, published in Germany, intended for the serious VHF and up operator). News then spread amongst the islands, which extend for more than 600km, that propagation was excellent towards the UK. For around 8 hours between 1200-2000UTC the 144MHz stations of CU3EQ and CU8AO made CW and SSB contacts with a few stations in Cornwall and Devon.

Jose Vitor, CU3EQ (Terceira Island, HM68), running a Kenwood TS-2000 transceiver, 100W and a 10-element DK7ZB, reports that it was a great time making all these long-distance tropo

PHOTO 2: The 144MHz station of G0VHF operated by Dave Gilligan, G1OGY.

contacts, as normally it's just local stations that can be heard. Fred Fournier, CU8AO (Flores Island, HM49) was also very pleased to work into the UK again. He uses a Yaesu FT-847 transceiver driving a 100W amplifier and a 9-element F9FT Yagi. Paul Pasquet, G4RRA (Devon, IO80) mentioned that it was seriously exciting when the station of CU8AO at 2457km distant came back to his CQ call. He had been hearing the CU8DUB beacon for some time and reports that it exhibited very long and slow fading. This is similar to the other Azores stations (and EA8 stations) so if you're listening out for them you need to spend some considerable time tuning around as they may not be audible immediately. Paul also tried listening for the CU2VHF beacon (Sao Miguel, HM77) on 144.401MHz but heard nothing.

The marine duct was still in place on the following day, 16 May, with the CU8DUB beacon being heard all day long right through to midnight. By this time the propagation path extended along the south coast with stations such as G4LOH (Cornwall, IO70), G4RRA (Devon, IO80), G6HIE (West Sussex, IO90), G7RAU (Isle of Wight, IO90), M0HJO (Cornwall, IO70) and M0VRL (Cornwall, IO70) making contacts in excess of 2300km.

Colin Roberts, G4ZFJ (Essex, JO01) reports that the signals from CU8AO even made it to his QTH, more than 2785km distant. He heard CU8AO peaking 53 on SSB and received a 51 report in return. Surprisingly the duct made it further east into Belgium with the station of ON4KHG (JO10) also making an SSB contact over a remarkable 2985km path. In the Netherlands the station of PA4EME (JO20) also reported hearing the low-power CU8DUB beacon over an incredible 3125km. Quite amazing! By 17 May it had all fizzled out, although ON4KHG continued to hear the beacon through to 0630UTC that morning.

DEADLINES. Good luck – and if you do hear or work any DX stations on the VHF or UHF bands or have any other news then please send your reports to g4asr@btinternet.com to reach me *before the end of each month*. Alternatively you can send letters to Yew Tree Cottage, Lower Maescoed, Herefordshire, HR2 0HP.

National Hamfest

30 September & 1 October, Newark & Notts Showground

The outside flea market area was packed in the Saturday sunshine.

BUYING & SELLING. Visitors to the National Hamfest will have the opportunity to buy and sell equipment, components, books and other radio related items. There will be the usual traders in the main hall as well as an outside flea market that can be booked in advance. Last year, the outside flea market/car boot sale was extremely popular in the glorious sunshine on Saturday. Spaces are available for £10 when pre-booked; extra 2m tables spaces are £4 each to a maximum of three in all (6m) and, although tables are not supplied, they can be hired on the day at £3 each. Trailers are chargeable at £5 extra. See the website www.radioclubs.net/acatalog/Bookings.html for full details. Access for setting up is from 7am on both Friday and Saturday. You must finish setting up by 9.15am as vehicle movements are restricted after this time.

Main traders booked at the time we went to press are:

Waters & Stanton plc	Linear Amp
Radioworld	WiNRADiO
Kenwood Electronics	Byvac Electronics
Martin Lynch & Sons	M0CVO antennas
Moonraker	HiFi ssb
KMK UK Ltd	bhi ltd

OVERSEAS VISITORS. Following the successful first visit of the ARRL, we are please to say that they are planning a second trip. Many visitors enjoyed the opportunity to discuss amateur radio matters with the ARRL and the stand was popular throughout the two-day event.

ADVICE & INFORMATION. As in previous years, many RSGB committees and services will be represented at the National Hamfest. This gives members and non-members alike the opportunity to discuss issues from planning to propagation and contests to band plans.

BOOKINGS. If you buy your ticket before 21 September you can save 50p on the entry price of £4.50. You can get even greater discounts on your tickets if you buy them for small groups. Five tickets are available for the price of four, or 13 tickets are available for the price of 10. As with the advance day tickets, these must be purchased before 21 September. Again, these can be purchased from the website www.radioclubs.net/acatalog/Bookings.html.

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- CTCSS enabled
- SWR Protection built in
- Size: 240 (W) x 94 (H) x 255 (D) mm
- Weight: 4.1 kg (approx)

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- DC cable
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Optional Accessories
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GHz Bands

Moon's up!

PHOTO 1: Group shot from the Orebro EME meeting. Every attendee at the meeting is shown in this photo, together with their callsign.

WHAT'S HAPPENING ON THE MOON?

It is a little while since we visited the moon so I thought it might be a good time to look at what has been happening 'up there', whilst taking a brief break from all the terrestrial activity that has tended to dominate the column for the last few months.

Spring tends to be a very busy time for EME (moonbounce) enthusiasts. Dishes are being refurbished and new feeds tried now that the warmer weather is here and the sun is higher in the sky (for sun noise measurements). The popular DUBUS and REF European EME weekends are also a great attraction for many EME operators as they fall in the spring and early summer and are a great opportunity to check that everything is working as it should. During the month of May the big EME contest is the 13cm (2.3GHz) DUBUS and REF event [1] on the weekend of 7 and 8 May. It runs for 48 hours from 0000 to 2400UTC. Modes are CW and SSB.

MAY EME ACTIVITY. First a report from Mike, JA4BLC, in Japan. He thanked the EME community for listening inside the very noisy 2400MHz segment where the Japanese stations are permitted to work. To add to the noise problems from Wi-Fi etc in his 2424MHz window, JA4BLC found that the elevation actuator of his 6m dish made a lot of noise right across the band. After he replaced the actuator with a spare and was again able to listen in the 2304MHz North American window he worked Grant, VE6TA. On the Saturday, during the European window, he worked 10 stations: OK1CA, OH2DG, ES5PC, F2TU, SP6OPN, OZ4MM, G3LTF, PA0BAT, CT1DMK and SV1BTR. Heard but not worked were SM2CEW, RK3WWF, LZ1DX and OK1KIR. Mike also reported that JA8IAD worked OK1CA, F2TU, SP6OPN and G3LTF.

Gudmund, SM3BYA (SM2BYA) reported that he monitored 2301.975MHz (the Australian 13cm EME sub band) from about 0830UTC and at 1041UTC, with the moon finally above the tree tops, he copied VK3NX working SV1BTR, F2TU and ES5PC, all these transmitting on the VK's frequency.

Peter, G3LTF, worked 34 stations on the Saturday and three more on the Sunday for a total of 37. On the Sunday he worked VK3NX with a very nice signal, G4RGK, WA6PY and NA4N. He heard LX1DB, IZ2DJP, W7JM, and W5LUA all on 2304MHz only. He heard and called SM3JQU on his CQ but, like OH1LRY the previous day, he couldn't get Peter's call and in the end OK1CA worked him.

Just in case you are thinking you need to be rich and have a large dish for EME John, G4BAO, reported working PY2BS on JT65C. John runs just a 1.4m dish on a polar mount on his patio! In turn, using my 2.3m dish, I worked a total of 11 stations on 13cm EME. 10 of these were on 2320MHz and WW2R was worked cross band 2320MHz to 2304MHz. Sun noise, on a declining Solar Flux Index (SFI), measured 11.0dB against cold sky.

Talking of small dishes, RF Hamdesign in The Netherlands [2] is currently advertising various mesh dish kits. The 0.45 f/D 1.9m diameter dish at €368 looks particularly interesting and could advantageously be extended with a consequent reduction to, maybe, 0.4f/D.

Howard, G4CCH, worked 31 stations during the 13cm EME event. He had a very bad start due to a faulty latching relay driver and then a preamplifier fault. EME operators seem to be visited by Murphy more often than most.

Günter, DL4MEA, had very limited time for operating during the contest weekend. However, on the Saturday he worked G4CCH, IW3FZR, CT1DMK, F2TU, OH2DG, DL1YMK, SM2CEW, ES5PC, LA8LF, OK1KIR, PA0BAT, OK1CA, SP6OPN, G3LTF, OZ4MM with WW2R and K2UYH on crossband 2320 to 2304MHz). On the Sunday he added SV3AAF and PA3DZL.

Finally, Paul, WA6PY reports that he was QRV on 13cm on his eastern horizon and had QSOs with OH2DG, LZ1DX, SV1BTR, SP6OPN, RK3WWF, ES5PC, OK1KIR, OZ4MM, W7JM, OK1CA, CT1DMK, S59DCD, F2TU, PY2BS, VE6TA, W5LUA, WW2R, SM2CEW, G4CCH, LA8LF, DL1YMK, K2UYH, PA0BAT, SD3F, WD5AGO, NA4N, LX1DB, VE4MA and G3LTF. He heard but didn't manage to work IW2FZR and SV3AAF. Paul comments that it is difficult to synchronise crossband operation without recourse to a chat system such as HB9Q.

Paul noted that libration on VE6TA and LX1DB was so bad that he had a hard time copying calls. Also there was strong libration on W5LUA's signal, on the first day but on the Sunday it was hardly noticeable.

American stations have a particularly hard time listening in the 2320MHz window due to the North America Sirius satellite broadcast system and operation below 2320.050MHz is almost mandatory for success. I used 2320.050MHz with WW2R who could still just hear digital modulation noise from the satellite on his eastern horizon. Transmitting access to 2304MHz is a definite advantage for our European neighbours.

FORTHCOMING MICROWAVE EVENTS 2011/2012

Finningley, 9-10 July.
Details www.g0ghk.co.uk.

Weinheim, 10 September.
Details www.ukw-tagung.de.

Microwave Update, Enfield, Connecticut, USA, 13-16 October 2011.
Details: Bruce Wood, N2LIV, n2liv@arrl.net

15th International EME Conference, Cambridge, UK, 16-19 August 2012.
Details: www.eme2012.com.

PHOTO 2: Mart, SM0ERR, conducted many of the Orebro measurements. Seen here with David, G4DHF, in the background.

PHOTO 3: G4BAO (left) negotiates the purchase of some 13cm PA parts from Per, SM0DFP (checked shirt) whilst Michael, DL1YMK, looks on.

The 23cm section of the DUBUS REF EME contest is to be held on the 4 and 5th June. I hope to bring some reports from that in the August column.

ÖREBRO EME MEETING. Örebro is a small university town some 200km west of Stockholm. Lars, SM4IVE, organised a small EME meeting in Örebro on 13-15 May. I was able to attend this meeting with several other British EME enthusiasts. There were also attendees from HB9, ON, PA, DL, OZ, SM and GM. **Photo 1** is the now-obligatory group shot from the meeting.

The meeting was held in the Örebro Gustavsviks leisure and conference centre with the nearby Ibis hotel providing accommodation, breakfast and evening meals. The hotel was literally just across the car park from the Gustavsviks centre.

The conference dinner starter was a Swedish speciality: three types of herring with potato salad. This was delicious, although I noticed one or two people were less keen on trying it! The main course was pork with potato au gratin with ice cream and raspberries for dessert. Beer was very expensive, though but that didn't seem to stop some visitors.

Although Lars originally meant this to be just a social occasion, the presence of so many operators from outside SM and the promise of a number of talks turned the event into something more. It was an extremely successful mini conference with the opportunity to meet with other like-minded EME operators from many parts of Europe. Since there were only four talks over the two days of the conference proper, these were well spread and gave an unrivalled opportunity for discussion, talking content and to be involved more closely in the accompanying measurements sessions. **Photo 2** shows part of the noise measurement facility whilst **Photo 3** shows intense negotiations over the purchase of some 13cm power amplifier parts.

On the Sunday morning there was a very useful and productive session led by Peter, SM2CEW, on how to entice more people to try EME and in particular to try CW as well as JT digital modes. One notable outcome of the meeting was the decision to set up a dedicated EME web 'portal' **[3]** that will eventually contain a lot of information about EME and have links to many personal web pages with interesting EME information.

I mentioned that there were four talks at the meeting plus the Sunday morning discussion session. I had the privilege of being the first speaker and chose as my subject an update on my Very Low Noise Preamplifiers for 23, 13 and 9cm. The talk was basically an update on my talk on the same subject from the 2010 International EME Conference held in Dallas. Since then there have been further updates to the basic preamplifier design. I like to provide statistics to show performance. Often the results from a single modification can be misleading. When consistent results are obtained across a wide range of samples, the results become much more reliable.

John, G4BAO, spoke on the subject of 'The Bodgers' guide to solid state QRO at VHF', although he did stray into the area of microwaves in this popular and informative talk. It was clear that the audience at Örebro were fascinated by John's style of delivery and his ability to make some difficult concepts much clearer for the listeners.

Antenna tracking is a subject dear to the heart of any EME operator, whether it is a fully automated tracking system or a basic feedback indicator system. It was interesting therefore to hear Per, SM3JQU, give a brief talk on using a commercially available Velleman kit **[4]** for automatic tracking. Per and his son Erik developed the software to use with the control board. Contact Per for more details **[5]**.

Our final talk was by Michael, DL1YMK and his XYL, Monika. Many of you will have met Michael and Monika at the Martlesham Microwave Round Tables. This intrepid pair have activated so many rare DXCC entities by EME that they are now regarded as the experts in the field of portable EME operation. At Örebro they spoke about their efforts in gaining permission to operate from Kaliningrad (R2) and their subsequent experiences of operating from this very rare DXCC entity. It was clear that persistence was the key to this particular operation. My own impression of Kaliningrad is that if you like comfort when visiting abroad, this may not be the place to go to, even though it has lovely Baltic coast beaches and some really interesting relics of the cold war period.

The DL1YMK pair are off to yet another rare DXCC entity at the end of May. They never disclose in advance where they are going, so it ensures that you genuinely copy their EME signals and decode the CW or JT65C callsigns in use. This system has worked very well for their DXpeditions to both the Aarland Islands (OH0) and Kaliningrad (R2). Michael has clearly stated that the May destination would not be R1! If all goes according to plan I should be able to give a brief report on their expedition in the next column.

Lars, SM4IVE, is to be congratulated on organising a fine meeting. We all went away saying that we would love to attend the next Swedish EME meeting.

Just a reminder that the International EME Conference is to be held in Cambridge in August 2012 **[6]**.

That's all for this month. Please send your reports on microwave activity to my e-mail address at the top of the page.

WEBSEARCH

[1] DUBUS EME contests: www.marsport.org.uk/dubus/EMEContest2011.pdf
[2] RF Hamdesgn: www.rfhamdesign.com
[3] EME Portal: www.moonbouncers.org
[4] Velleman: www.velleman.eu
[5] SM3JQU: www.sm3jqu.com
[6] International EME Conference EME2012: www.eme2012.com

The ground mounted quarter wave vertical antenna

A clear understanding of this antenna leads to better exploitation in different situations

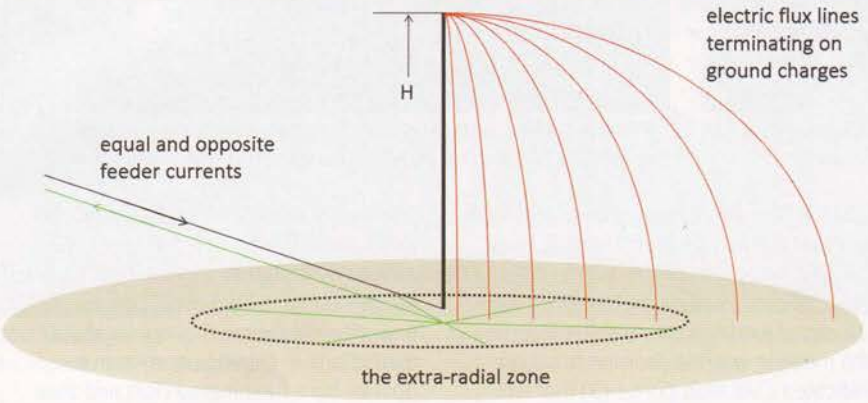

FIGURE 1: Schematic diagram of the vertical monopole and its ground system.

INTRODUCTION. Early research on vertical monopole antennas was carried out with broadcasting as the aim [1]. Today beam antennas are preferred for HF communications and radio amateurs have tended to use verticals only when space was at a premium. This type of antenna offers omnidirectional low angle radiation; a disadvantage is its reception of noise from all directions. This is overcome when it is used in a directionally switchable array. The design of such an array relies critically on an accurate characterisation of the quarter wave vertical antenna, both in isolation and in the presence of its neighbours [2]. This was the motivation for a careful characterisation of a 21MHz quarter wave ground mounted antenna with insulated radials on the ground.

Often, advice that one receives is lore and the experimental basis is now quite distant. Its modelling depends critically on assumptions about the ground system, which is seldom well characterised. In reviewing previous work it is soon clear that the experimental domain is vast, with many possible experimental variables. These include number of radials, height above ground, ground properties and frequency, to mention a few. See [2], [3], [5] and [6].

This work is based on a narrowing of this domain by using frequencies around the 21MHz band, using wire radials of a fixed length, about λ/4, lying on the ground (but insulated from it) and attached to a metal ground post against which the vertical element was driven.

CONSTRUCTION. The vertical element was formed from three sections of aluminium tubing having diameters of 15.5, 11.5 and 7.5mm. These were locked together with M3 stainless steel screws and wing nuts. A top section consisted of a short telescopic whip with a maximum length of 72cm, allowing the length of the antenna to be continuously adjusted with a precision of ±1mm.

The radiating element was fixed with U-clamps to a short aluminium post driven into the ground. Insulation from the post was provided by a short sleeve of polythene. The post carried a coaxial socket connected by a short wire link to the driven element. When radials were used they were of 3.47m long 7-stranded copper wire with an overall diameter of 1.5mm, sleeved in PVC. The radials were soldered in groups of eight to copper plates that could be attached to the ground post using the U-bolt studding. The radials lay in a symmetrical pattern on the ground, insulated from it by the wire sleeving. A schematic diagram of the system is shown in **Figure 1**.

MEASUREMENT METHOD. The antenna was characterised by measurements of the driving point impedance at the connection socket. The measurements were made with a MFJ-269 antenna analyser remotely connected to the antenna by a RG58 coaxial cable, thus allowing the observer to stand well away from the antenna. The cable's transforming effect was removed mathematically by taking into account its characteristic impedance, length, velocity factor and loss, all of which were measured independently and found to be 46Ω, 10.52m, 0.657 and 0.06dB/m respectively.

A spreadsheet allowed the raw data to be converted into the series elements of driving point impedance. Care was required in order to differentiate between positive and negative reactance observations. Measurements were made point by point with frequencies set to an accuracy of ±10kHz.

Figure 2 shows typical frequency responses of the series impedance elements of the resonant antenna, in this case with 16 quarter wave length radials. The reactive response illustrates the capacitive behaviour below the resonant frequency, changing to inductive behaviour above. At resonance, the driving point impedance was a pure resistance of 46Ω. This is the sum of three equivalent resistances: Rr, the radiation resistance of the resonant monopole, a resistance attributable to the conductors

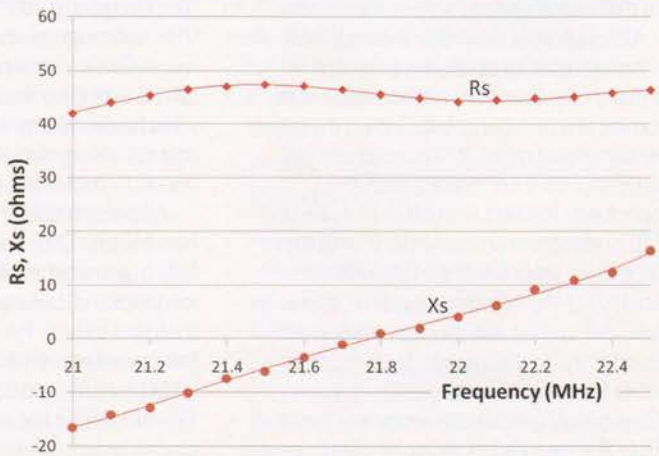

FIGURE 2: Series resonance responses of the quarter wave vertical antenna (H=3.337m, 16 radials 3.47m long).

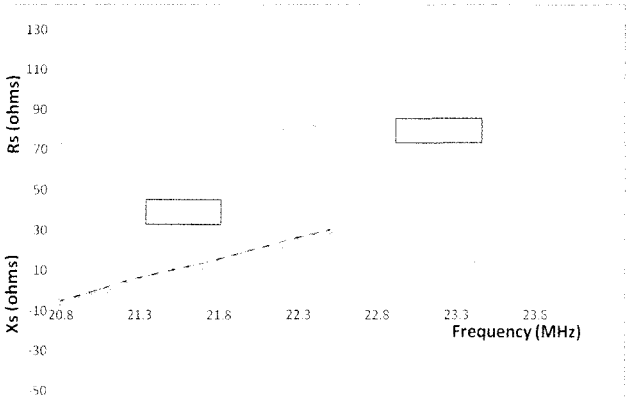

FIGURE 3: Responses of the antenna with no radials and with four radials (H=3.337m, radial length 3.47m).

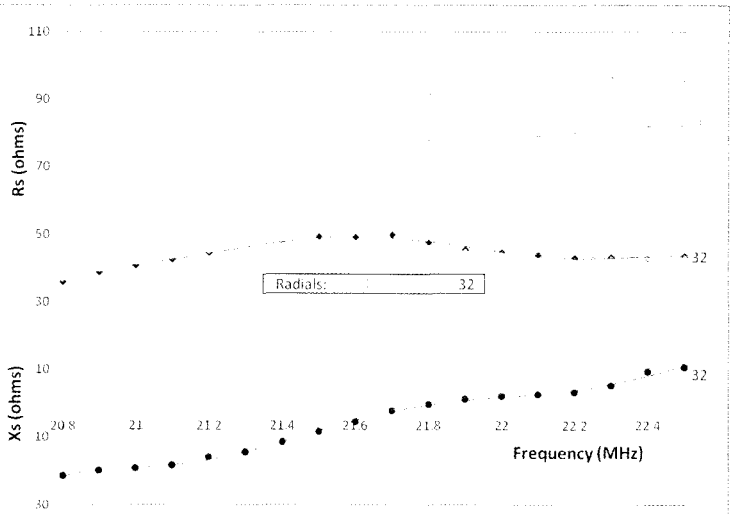

FIGURE 4: Variations with frequency of the series impedance components for increasing numbers of radials (H=3.337m, radial length 3.47m).

of the antenna, Rc, and a component due to energy loss in the ground system, Rg. Taking the radiation resistance of a quarter wave monopole as 36Ω [6], the fraction of input electrical energy radiated, η, was calculated using

$$\eta = \frac{R_r}{(R_r+R_g+R_c)} = \frac{36}{R_{res}}$$

In this case the radiation efficiency turned out to be 78%. Even taking into account the skin effect, the conductor resistance, Rc, was unlikely to be more than a fraction of an ohm, so the radiation efficiency is largely set by the ground system resistance, Rg.

OBSERVATIONS. **Figure 3** compares the antenna driven without radials (red) and with four radials (blue). Comparing the resistances at resonance, the radiation efficiency increased from 29% to 48% when the radials were added. This was accompanied by a 10% reduction in the resonant frequency caused by an inductive shift in reactance. The result points the way to further improvement and poses the often asked two-part question: how many radials should be used and is there an optimum number?

The first body of work that sought to answer this was by Brown in 1937 [1]. This led to an FCC specification for medium wave broadcast antennas that required 120 half wave radials. This design has become part of antenna lore; amateurs often strive to use as many radials as possible. One of the aims of this study was to examine this belief, at least at 21MHz.

Using a fixed monopole of 3.337m, the feed point impedance was measured in the range 20.8 to 22.5MHz as the number of radials was progressively increased from 2 to 32. Similar measurements were made with no radials and with just one, in order to capture the higher frequency resonances - in these cases the measurement range was between 22 and 26MHz.

Figure 4 shows that as the number of radials was increased from 2 to 32, the resistance at all frequencies tended to decrease and reached a lower limit when 16 radials were used. Importantly, there was no further decrease in loss when further radials were added.

A similar limiting tendency in the series reactance occurred in the range 6 to 32 radials. It became increasingly capacitive and was constant with more than 16 radials. As a consequence the resonant frequency moved higher but levelled out at 16 radials. **Figure 5** shows the variation in the resonant frequency as the number of radials was increased from 0 to 32.

With fewer than six radials there was a quite different behaviour. As remarked earlier the antenna without radials had a high resonant frequency. Adding the first radial produced only a small reduction; thereafter the frequency fell sharply until, with six or more, it began to increase as the reactance became increasingly capacitive. The abrupt initial reduction corresponded with an increase in the inductive reactance of the system, as shown in Figure 3.

Figure 6 shows the effect of the resistance at resonance on the radiation efficiency as the number of radials was increased from 0 to 32. Adding one radial had a negligible effect but further radials had a continuously reducing effect with the resistance reaching a lower limit beyond 13 radials. The ground system loss reached a lower limit at exactly the stage at which the resonant frequency became constant, see Figures 5 and 6. This had occurred because the gradually increasing capacitive reactive effect had reached a limit. It was with 13 or more radials that the antenna exhibited its greatest radiation efficiency, 78%.

THE COLLECTION OF INDUCED CHARGES. Explanations must be sought in terms of the charge induced on the ground and its collection as a return current to the driving point of the antenna. When the monopole is driven there is a distribution of charge on it which varies periodically in time in sign and magnitude. At any instant there is an equal and opposite amount of charge induced around the antenna. If there were no near objects this would be on the ground. Current continuity requires that the current fed to the monopole is matched by an equal returning current caused by the periodic displacements of charge on the ground ensuring that the ground and antenna charges are always equal and opposite. Figure 1 depicts this situation using electric flux lines linking the pairs of charges. Most of the charge is induced on the ground near to the monopole but even the remote charge must be fully accounted for and collected at the driving point. It is useful to consider two regions, the circle containing the radials, the radial zone, and the surrounding region, termed the extra-radial zone.

THE RADIAL ZONE. The role of radials is primarily to provide highly conducting

TABLE 1: Summary of Brown's 1937 experimental results.

F (MHz)	Radial length (m)	Radial length (λ)	Minimum number of radials, N	Radial to Height ratio	Inferred (2011) collection range (m), $P = R \tan\frac{\pi}{N}$
3	41.2	0.412	113	1.69	1.15
3	27.4	0.274	60	1.12	1.44
3	13.7	0.137	15	0.56	2.91

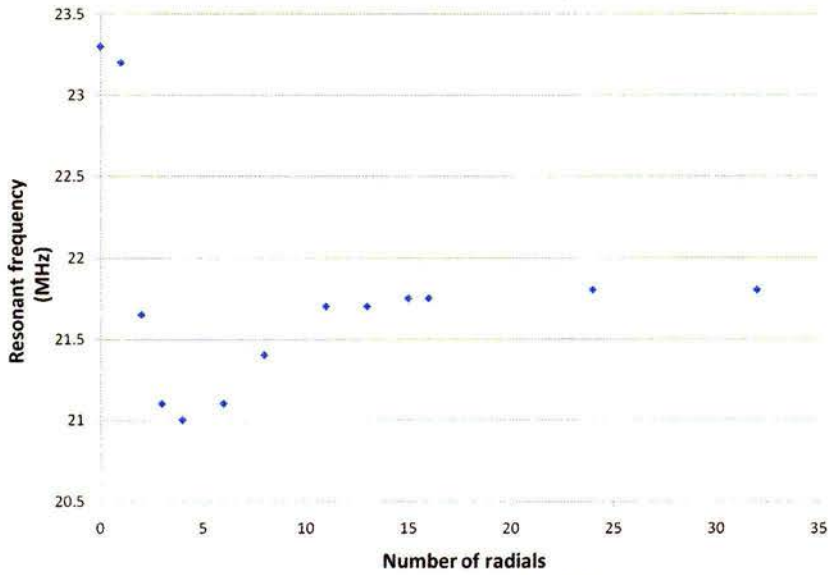

FIGURE 5: Variation of resonant frequency with number of radials (H=3.337m, radial length 3.47m).

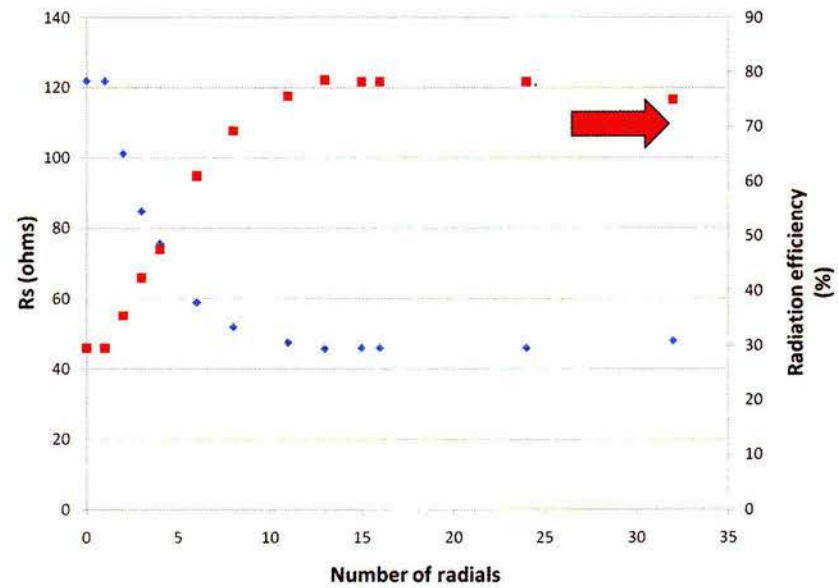

FIGURE 6: Variation of resistance at resonance and radiation efficiency with number of radials (H=3.337m, radial length 3.47m).

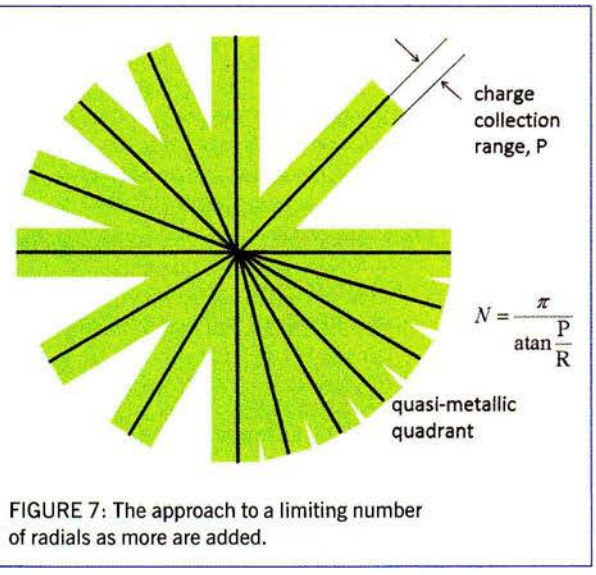

FIGURE 7: The approach to a limiting number of radials as more are added.

pathways for the charge induced on the ground to return to the antenna terminal. Ideally, this zone – and the surrounding area – should be covered with metal. The addition of every new radial is a step towards this ideal situation, making collection easier by reducing the resistance of the return path. One would therefore suspect that more radials would always be desirable. However, these experimental observations show that there was no further reduction in antenna resistance when more than 13 radials were used. Furthermore, the resonance frequency approached a lower limit at this point as the negative capacitive reactance added by the radials had reached an upper limit. This is the behaviour that one would expect with complete metal coverage of the radial zone; charge collection from it could not be further improved and the capacitance of the monopole with respect to the radial zone would reach a maximum value. The radial zone might then be regarded as a quasi-metallic disc.

Charge induction within this zone was entirely on the radials or was partly induced on the ground between them sufficiently close to a radial wire to be easily collected. The half separation of the radial wires at their extremities could then be regarded as an effective collection range. It is easily shown trigonometrically that the range, P, is given by

$$P = R \tan\frac{\pi}{N}$$

In this case, with N = 13 radials and R = 3.47m long, the range was 0.86m.

Figure 7 shows how this limit is reached as radials are added.

THE EXTRA-RADIAL ZONE. It was observed that the least antenna resistance with the maximum number of useful radials was 46Ω, 10Ω more than the radiation resistance of a quarter wave monopole. So far this has not been accounted for.

Charge induced on the ground outside the radial zone must also return to the antenna terminal along (or in) the ground, probably to the edge of the radial zone where it would add to the radial currents. This outer region extends to infinity with a radial distribution of induced charge that is highly non-uniform but nevertheless theoretically predictable. In the following analysis the charge distribution along the monopole was assumed to be linearly increasing with height.

Taking into account the displacement current entering thin toroidal elements of width δr and thickness Δ, one can mathematically sum the elemental resistances to obtain the resistance of the zone extending from some inner radius, r, to infinity, as shown in **Figure 8**. The thickness Δ of the conducting sheet is the skin depth, which is dependent on frequency and the electrical parameters of the ground.

The result of the summation is shown in **Figure 9**. It is useful first to examine the form and use of such a curve. The resistance is of a zone extending from a selected radius to infinity. Beyond a radius of one antenna height, H, this resistance falls very slowly, approaching a value of zero at infinity. With a zone having a small ratio of radius and antenna height the resistance rises quickly, tending to infinity at zero radius.

In practice the inner radius might be the radius of a ground post or, as in this case, the radius of the radial zone. The measurements were made with radials that were the same length as the monopole so that R/H=1. The ground electrical conductivity

and relative permittivity had not been measured but were chosen to provide an extra-radial zone resistance of 10Ω, to account for the residual antenna resistance. The fitting parameters, σ=0.025S/m and εr=4, are close to those used in the NEC2 modelling programme to represent a 'good' ground [4]. The corresponding skin depth at the test frequency was 0.76m. Thus, with reasonable ground electrical parameters, the residual resistance of 10Ω can be accounted for as the resistance of the ground outside the radial system.

DISCUSSION AND COMPARISON WITH BROWN'S EXPERIMENTS. These experiments have shown that, at 21MHz, the maximum worthwhile number of quarter wave radials was 13. They appear to create a radial zone that behaves metallically. If indeed there is a maximum collection range for a radial then one might consider extending the radials, but more would need to be added to ensure that the maximum radial extremity separation was two range lengths. It should be remarked that in these experiments the range was 0.86m, not very different from the skin depth of 0.76m, suggesting that it might be the skin depth that sets the maximum radial spacing.

One should ask what benefit would result from extending the radial system beyond a quarter of a wavelength. The answer is provided by Figure 9. When the radial zone is extended, the resistance of the extra-radial zone is diminished. Beyond a quarter of a wavelength, at R/H=1, the improvement is very slow and a factor of 10 extension produces only a 10% reduction in the residual ground resistance.

It is interesting to reconsider Brown's pioneering work [1] at lower frequencies. **Table 1** summarises the results of three of his experiments in which the maximum number of useful radials was determined using three different radial lengths at 3MHz. The ground electrical parameters are not known and it is presumed here that the ground was the same in the three tests. They provide sufficient information to infer the radial collection range in the three experiments.

The three values of P are not accurately consistent but they are of the same order of magnitude, suggesting that this parameter influences the minimum number of radials required to form a quasi-metallic radial zone. The ground conditions for the three tests might not actually have been the same and it is unfortunately not possible to test whether these ranges corresponded to the skin depths in those grounds.

ANTENNA DIMENSIONS. Measurements made here were based on fixed monopole and radial lengths. Resonance occurred at 21.8MHz when 13 or more quarter wavelength radials were used and a radiation efficiency of 78% was achieved. Figure 5 shows that the resonant frequency could be shifted lower by using fewer radials but this would have been at the expense of radiation efficiency. It was therefore of interest to see how the monopole length could be used to vary the resonant frequency and examine the effect on radiation efficiency when a fixed number of radials was used. Sixteen were used to ensure operation with a well established quasi-metallic radial zone.

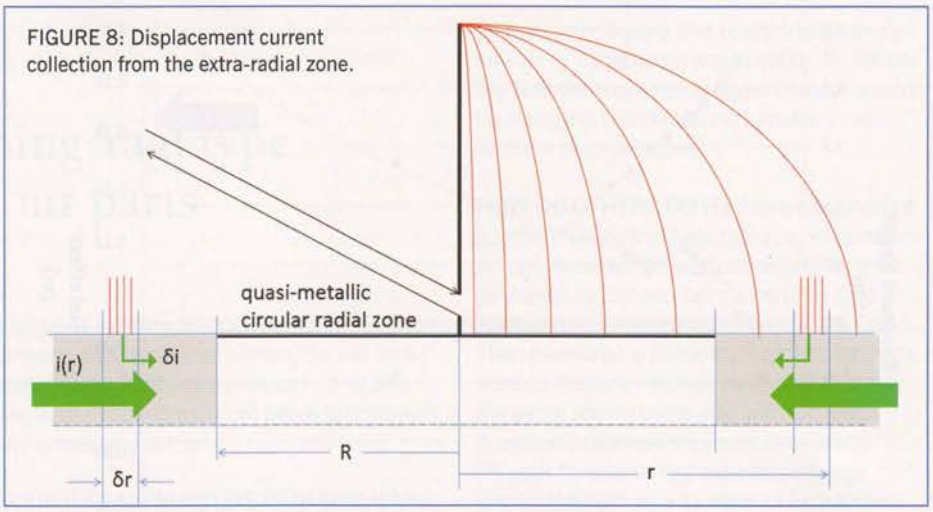

FIGURE 8: Displacement current collection from the extra-radial zone.

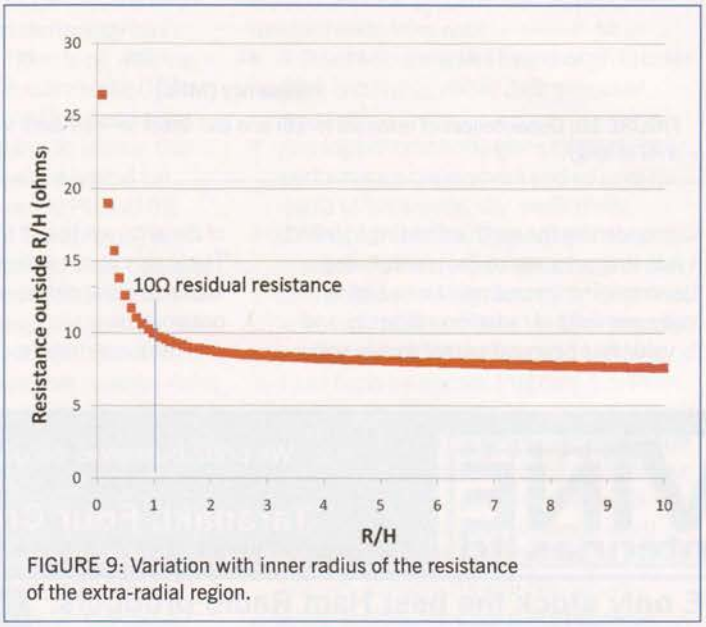

FIGURE 9: Variation with inner radius of the resistance of the extra-radial region.

As the resonant frequency was varied from 20.5 to 25.5MHz, the feed point resistance remained steady at 46Ω, giving a constant radiation efficiency of 78% independent of the monopole length. The radial length could have been adjusted to maintain the same wavelength length but this was not practical. The variation of monopole length therefore corresponded to a variation of R/H from 0.98 to 1.26. The resulting change in extra-radial zone resistance may be deduced from Figure 9; the decrease in monopole length causing a 20% increase in frequency corresponded to a reduction in the ground resistance of 0.5Ω. This change approaches the experimental accuracy of the observation and the constancy of the observed radiation efficiency suggests that the exact radial length was not important over this 20% change of frequency. This behaviour accords with the work [5] of Rudy Severns who measured the variation in current along radial wires and showed that the current declines significantly beyond the first quarter wave length so that charge collection towards the end of this length fell sharply. This is consistent with the model that has been advanced here and is exactly how the antenna behaved when the resonant frequency was raised to 26MHz with a fixed radial length.

The exact relationship between monopole length and resonant frequency has also been explored. In practice the resonant length was shorter than the free space quarter wave length and the difference can be regarded as an end effect. Their frequency dependences are shown in **Figure 10**.

CONCLUSIONS. A stable and reproducible electrical environment for the 21MHz vertical monopole can be created with as few as 13 quarter wave length insulated radials on the ground. In this circumstance the antenna system had a radiation efficiency of 78%. When more radials were used the resonant frequency remained constant. A maximum of 32 radials were tried but there was no benefit in using more than 13 quarter wave radials.

With the minimum number of radials, the ground system could be regarded as a low resistance quasi-metallic radial zone

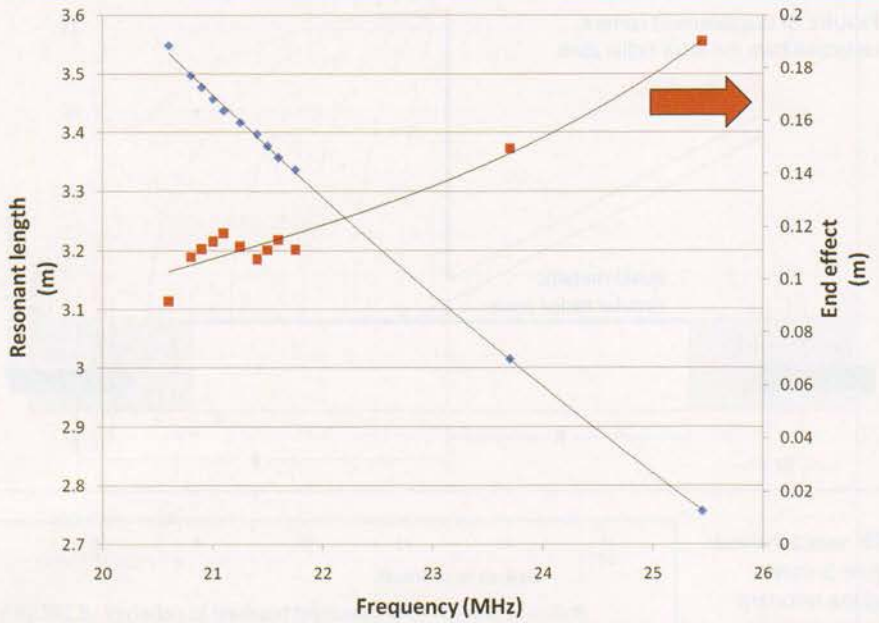

FIGURE 10: Dependences of resonant length and end effect on resonance frequency (16 radials, 3.47m long).

surrounded by the earth extending to infinity. It was this outer region that contributed the remaining ground resistance seen in measurements of radiation efficiency and its value has been calculated as a function of the antenna height to radial length ratio. There was good agreement with experiment with a realistic choice of ground electrical parameters.

The quasi-metallic condition of the radial zone was achieved when the separation of the radial extremities was approximately equal to the ground skin depth. This seems to provide a basis for the design of ground level radial systems and merits further work.

An experiment with 16 fixed length radials showed that when the monopole length was shortened to increase the resonant frequency by 20% the radiation efficiency remained constant. This was equivalent to increasing the R/H value by 20% and demonstrated that the radiation efficiency was scarcely altered by this change when more than the minimum number of radials was used.

The quarter wave monopole operating with 16 radials exhibited an end effect which reduced the physical length for resonance; the reduction varied from 10cm at 20.5MHz to 19cm at 25.5MHz.

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[2] John Devoldere, *Low-Band DXing*, 2nd edition, ARRL, 1995
[3] Efficient Ground Systems for Vertical Antennas – A C Doty Jr et al, *QST*, Feb 1983, pp 20-25
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[6] *The ARRL Antenna Book*, 20th edition, Chapter 3, 2008

PICaYAGI

An intelligent, self-tuning Yagi type antenna described in four parts

PHOTO 1: G3XJP/M during early proof of concept trials in Spring 2010.

ONCE UPON A TIME. In 1926, Yagi and Uda invented their beam antenna. We were soon building monoband Yagis for 20/15/10m and, shortly thereafter, the popular trapped 3-element tribander. Then along came the WARC bands and since then we have been struggling for a viable single beam to cover all five bands. Several different commercial approaches have evolved over the years but none of them met my requirements – for reasons discussed shortly.

PROJECT SUMMARY. This is a constructional project to build your own 5-band (20m-10m) Yagi that automatically grows and shrinks its element lengths as a function of your Tx frequency. This is intended as a repeatable design but, by the very nature of mechanical construction, I would expect significant variations in implementation. This is not therefore a prescriptive approach. You may need to choose different materials (eg tube sizes) and you may think of better engineering implementations. To this end, some of the blind alleys and false trails are also mentioned since there is rather more learning to be derived from mistakes than from success.

All my previous PICaPROJECTS **[1]** were rigorously tested for reproducibility by multiple builds prior to publication. This one is different. In fact, as of Spring 2011, my PICaYAGI is the only one in existence. So although the formal engineering drawings have been rigorously checked for accuracy, this can never be a substitute for verification by building. Further, this design uses some novel concepts that inevitably increase the risk. So, although mine works brilliantly, there can be no absolute guarantee that this is reproducible. There is much good faith and conviction – but no warranty.

This project also has attitude! This is homebrew amateur radio so the project objective is about more than just acquiring a beam. It is also about increasing personal skills and learning through doing. It has been an incredible source of learning for me and was chosen for that very reason – and also because I wanted a decent beam to complete my homebrew station.

YOUR INFRASTRUCTURE REQUIREMENTS. As in all the other PICaPROJECTS, the need for any serious workshop technology has been carefully avoided. There is no welding, lathe or milling work. There are some GRP (glass reinforced plastic, or fibreglass) parts to be fabricated, but nothing so serious that they can't be addressed with a typical car repair kit. You will need an old PC and the means to program a PIC. The software itself is provided as both source and object code at no charge – strictly for your personal amateur use. You need a cheap pop rivet gun and the ability to shrink heatshrink tube. Some RF performance modelling software is useful – and the best, in my experience, is free. You also need to be able to make your own PCB - see [1].

This antenna can be built entirely from your own amateur resources and you don't need to pay anyone else to do any of it for you. So I won't be authorising any commercial PCBs to circumvent the project objective, though there may possibly be scope for bulk buys of raw materials.

ACKNOWLEDGEMENTS. This concept has been evolving since November 2008 on the PICaYAGI Yahoo Group **[2]**. This has a large number of members – a few of whom have been active and completely indispensable. My special thanks to Dave, G3SUL, Harold, W4ZCB and Chris Stake. And not least Fran, who has been frequently called upon for a second pair of eyes and hands – and for her ability to proofread stuff she doesn't claim to understand to see if it makes sense.

The latest software and the latest updates are available at [1] with general build advice and support on the PICaYAGI Group [2].

MY PERSONAL REQUIREMENTS. Like everyone else I want multi-band coverage but, being greedy, I also want mono-band performance. Actually, I want better. I want mono-frequency performance. That is, a beam tuned for the spot frequency I'm on at the time, not compromised by the need for coverage of an entire band. But for me, the dominant consideration has to be visual impact and, at least in the UK, I suspect it is for many others too. Frankly, I don't want some monster polluting my skyline and I can't imagine why any of my neighbours would either. So I guess my fictional engineering figure of merit would be along the lines of 'dB performance per metre of obstructed sky'.

HOW DO OTHERS DO IT? Always a good first question! Taking the 3-ele Yagi as a performance datum, there are several radically different strategies for 5-band beams on offer. One approach is the interlaced 5-band 2-ele Quad. Then there are log periodic arrays and log-Yagis. Various designs interlace multiple Yagis on the same boom, some also with log cells. A radically different approach is taken by SteppIR™, whose Yagi elements change electrical length as a function of frequency. None of these approaches satisfy my basic requirements. Why not?

- A Quad with spreaders long enough to cover 20m is a highly visible 3-dimensional structure
- Any log periodic array gives relatively poor performance per element and so uses its quota of 'obstructed sky' inefficiently
- On that same scale, 5-band interlaced designs are even worse since most of the elements do nothing most of the time – so, when you hear someone on 20m proudly announce that he is using an 11-el Yagi, I just hope he realises that only 3 of them are actually in use
- The SteppIR Yagi is fixed in mechanical size (as opposed to electrical size) so whatever band you are on – and even when not in use – the visual impact is always worst case, namely that of a 20m beam.

For me, all these approaches deliver ~ 3-el Yagi performance but score poorly on visual impact.

With commercial offerings, there are also significant value for money considerations and some performance issues. A glance at any price list shows the former is self-evidently an issue. The latter will be addressed later.

DREAM ON. For several years I have been idly contemplating ways of building an HF Yagi that grows and shrinks in size as a function of frequency. Plasma? Conductive liquids? A scaled-up version of those evil party blow-out toys? In September 2008, with the prospect of some sun spots, I decided to get full-time serious. And with the end of 10 years of previous project support commitments, I was able to.

I want something about the size of a 10m Yagi when not in use (ie the vast majority of every 24 hour day). There are three themes that were pursued in parallel and that needed to converge to turn the dream into reality.

Changing element resonant frequency. I began by looking at the most obvious approach, namely telescoping aluminium tubing. The fundamental issue is that any rubbing aluminium surfaces will promptly seize. Any other metal is way too heavy and any metal-to-metal contact has a very short life outdoors. After much debate

Dave, G3SUL came up with the brilliant idea of using heatshrink tubing applied to an inner sliding aluminium tube as a dielectric layer. This provides a reactive coupling between the sliding and fixed tubes. The engineering detail follows later – but this has remained the approach ever since.

Frequency span is, however, a problem. The essential issue is that from the bottom end of 20m to the top end of 10m is more than a 2:1 ratio. And the nature of any telescoping tube arrangement (given an overlap) is that the length range is less than a 2:1 ratio. The reality is worse than that because the smaller diameter inner tube increases the resonant frequency, as does any element droop. Dielectric coupling also reduces the effective length near full extension. So for many months we looked at telescopes within telescopes and some extraordinary pulley arrangements to drive it all in and out. None of it felt engineeringly realistic.

At about this time I decided on a Yagi with a fixed length boom and fixed element spacing – simply to bound the task. **Figure 1** shows the chosen tubing configuration. The essential approach was to make the fixed inboard length of each element from two ~4m tubes, overlapped, clamped together and fixed to the boom. This gives a net length of just over 2m per side, which can be pre-adjusted by altering the overlap to make a director, reflector or a driven element for the top end of 10m. Then, with sliding inner tubes also ~4m in length and with a minimum overlap of ~1m, these elements can be extended to over 5m per side to hopefully cover down to the bottom end of 20m.

Motive power. I started out looking at pneumatics. This has the appeal that air is invisible, not very heavy and comes for free. I was already using compressed air for the mast, though that is not a prerequisite for others and certainly not part of this project. Ultimately I think I could have made it work but the problem lies in measuring the resultant element length. There is little virtue in formulae like '2.3 bar applied for 3.7 seconds = QSY down 50kHz'.

Stepper motors are an instinctive choice for repeatable positioning but, given the torque requirement, they were immediately ruled out as too bulky, too heavy and too expensive. On the basis of size, weight, torque, price and availability I finally settled on a £6 electric screwdriver from a DIY chain. This has a 3.6V motor and an epicyclic gearbox that delivers 1.5Nm of torque. I use one per element.

Measuring element length. My first approach was using sonar range-finding with a piezo sounder on each element tip and an electret microphone near the centre of the boom. Unfortunately, the speed of sound in air varies significantly with temperature. The complication of adding a temperature sensor and all the inevitable calibration curves in the software felt entirely disproportionate. So I pragmatically abandoned this otherwise excellent bird scarer.

Laser range-finding is prohibitively expensive.

The obvious approach was to attach some sort of 'string' to the element, spool it on a shaft and then count turns with a shaft encoder. Having made that leap, the obvious next step was to use that same string to also pull the element in and out – abandoning the pneumatics.

For the string itself, my first thoughts focussed on beaded cord, as commonly used on domestic window blinds. This is basically nylon braid with moulded nylon balls at about 10mm intervals. The idea was to drive it with a sprocket, much like a water wheel. The great virtue of this approach is that you can pass the cord once round the sprocket and the same length of cord is used for both IN and OUT purposes. In other words, there is no spooling requirement. In trials, I could not get it to work effectively because the diameter of the sprocket needed to grip several balls was too large; the screwdriver didn't deliver enough torque. Also, fitting the ball diameter in the gap between the fixed and moving parts of the element was distinctly marginal.

On the recommendation of Paul, G0ILO, I went instead for braided fishing line. I tried several on the basis of their advertising claims but 'zero stretch' proved to be somewhat overstated. Some of them appeared to just go on stretching forever! On advice from Steve, G4ZBV I avoided anything based on Kevlar on the grounds that it is self-abrading, ie fine until you spool it tightly.

Finally, I got in touch with some serious kite-flyers on the West Coast and ended up with some Dyneema braided braid that is less than 0.5mm diameter and has a breaking strain of 80lb / 36kg. That is incredible performance. It is also essentially (if not actually) zero stretch at the loads I am applying, which greatly simplifies the inevitable software task of converting counted shaft encoder slots into a repeatable element length. This wonder braid is inexpensive and readily available around the world.

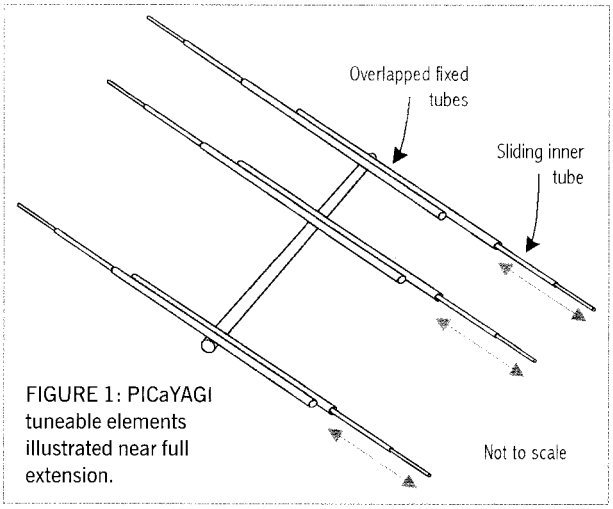

FIGURE 1: PICaYAGI tuneable elements illustrated near full extension.

SUMMARY SO FAR. Having settled on the underpinning mechanical technology, there followed the engineering to make it work reliably and all the issues of RF performance. There were still several outstanding conceptual problems:

- Would this approach produce enough change in element length? Indeed, how much is needed to achieve the frequency span?
- What sort of boom length would be needed to give good performance on all 5 bands? And what exactly is "good performance"?
- How do you feed a driven element – that cannot be split – across all 5 bands?
- Could it all be made to withstand a wind? Time for some antenna modelling.

WHY MODEL AT ALL? For the simple reason that it would be essentially impossible to find the optimum dimensions of the real antenna by cut-and-try. In this design, you start out with at least five interdependent variables: element lengths, boom length and element spacings, to say nothing of the feed arrangements. The task is to determine the best dimensions such that it will perform well over all five bands and at the same time, have enough mechanical strength to have a reasonable chance of survival.

The task is iterative and it would cost a fortune in time and materials to attempt on a real antenna. Frankly, you would be unlikely to ever get there. Most likely you would probably produce something that worked, but was far from optimum. Worst of all, you would never know it. This topic is therefore particularly relevant if you are considering changing any of the element spacings or tube diameters – and of interest to anyone designing or assessing any antenna.

The subject of modelling splits, by tradition, into the inter-dependent tasks of ensuring mechanical integrity and optimising RF performance.

MODELLING MECHANICAL BEHAVIOUR. How do the professional designers do it? A commercial manufacturer cannot know, for example, the likely wind speeds or ice loading at the customer site because, obviously, they are all different. So they have to design to some established standards, which typically have generous margins for error. These are typically national standards so there are then all the issues of certification if you want to market the product abroad. All this costs much money and it inevitably finds its way to the bottom line price.

For the one-off amateur it can (and should) be very different. Round here, for example, earthquakes, tornados, hurricanes and significant ice storms are all very rare events. Not unknown, but we are talking typically once in 50 years stuff here in up-state Herefordshire.

PHOTO 2: First installation on the pump-up mast in late Spring 2010. The mast also helps reduce visual impact – the castle on the hill shows why I need all the help I can get. I also have a bit of a ground slope challenge.

Would you really want to design to handle them all? Because if so, you go very fast down the road of diminishing returns and end up using gargantuan tube wall thicknesses and need a beefy (but very low) tower to hold it all up – and a rotator that would start a jumbo jet on a cold morning.

A lot of these rugged designs originate in the USA, where they certainly do need to design for significant environmental extremes. By UK standards they have some extremely tolerant planning legislation for amateur antenna installations. Pragmatically, the most likely outcome of designing to handle those same risk levels in most parts of the UK is that you would end up with no antenna in the sky at all.

Ultimately, only you can assess the risks and the consequences that you face. The realistic consideration I believe is the price of failure. I'm lucky (actually it's long term life-style choices) to have my mast in a field that is well out of range of any human activity. The only person that ever ventures into the drop radius of the beam is me – and I can choose when I do so. But obviously, I still want to design for reasonable survivability of my precious antenna.

Needless to say, we are always trying to hold down the total weight, turning radius and cross-sectional area in order to minimise cost, visual impact, wind loading, mast requirements and rotator torque. However, all this down-sizing tends to work against both RF performance and the ability to withstand ice loading. It is a vicious circle.

I don't have a wind-tunnel here and I'm also not inclined to add weights to the elements to discover when they would break under ice loading. My pragmatic approach in the end was to design for RF performance using materials that were available and 'felt' as though they might handle the stresses – using the *ARRL Antenna Book* HF Yagi mechanical designs for guidance.

About the same time Dave, G3SUL pointed me in the direction of the basic equations for cantilevered beams. This is frightening stuff. Each half of an element is a cantilevered beam fixed at one end. The equations show that the droop of an element under its own weight rises as the cube of the length. So if the tube diameter or the wall thickness is inadequate, you can easily get to the point where as you extend the element, the tip is moving rather more down than out. It is how to make an inverted-U. Anything even approaching this is a disaster for achieving the frequency span target, let alone mechanical integrity. It is why the element diameter is tapered down as we approach the tip. We also need to find the optimum wall thickness, since increasing it is a trade-off between adding strength but also increasing weight. After that, any ice loading just increases the weight and windage.

At this stage I made the decision that I was only ultimately concerned with stresses on a *parked* PICaYAGI, with the elements fully retracted. For visual impact reasons, I already have the discipline of parking the elements whenever it is not in use – and certainly overnight. And if we have gales or any evidence of serious icing then I simply forgo the pleasures of the lower frequency bands.

The practical approach I use is to wind the elements out and, if they start flaying about, I wind them back in and move up a band until they are not. You quickly learn to correlate the movement of tree branches with what is reasonable. You may consider this approach to be very amateur and I would proudly agree. It is no more onerous than asking a sailor not to raise all the sail in strong winds and, if gale force, to stay in the harbour. It happens very rarely.

The upshot of all this is that the parked elements are comparable, dimensionally, with the design of the 10m Yagi in the *ARRL Antenna Book*, falling between their heavy duty and medium duty designs. The medium duty design will handle "wind speeds of 96 mph with no icing and 68 mph wind with ¼" of radial ice." That will do for me!

To balance the rotator wind torque, I also need to add a small torque compensator plate to the boom.

Finally, in order to reduce friction on the sliding tube, it is important that the fixed tube remains as straight as possible as the elements extend. To this end some vertical cord bracing is essential. However this bracing has no other function when the element is parked than to withstand any ice loading. So that is indeed the icing on the cake!

RF PERFORMANCE MODELLING. First we need to define some terms. I both regret and resent having to do this here – but 85 years since Yagi and Uda (and despite heroic efforts by the ARRL), there appears to be little consistent practice out there. The three parameters we typically want to tune for are gain, front-to-rear ratio (F/R) and SWR. Guess what? These – and the definition of the environment – are all open to abuse.

Environment. We can define our performance in hypothetical free space, or at a specified height over specified ground. The merit of free space is that nobody has access to it so we are all equal. Thus we can validly compare one configuration to another or one antenna to another on the basis of calculated performance. The merit of using real ground is that you can make real measurements and it is generally possible to determine if you have improved your antenna – but it is desperately difficult to define the measurement circumstances such that you can validly compare it with others.

All PICaYAGI performance numbers used to evaluate concept feasibility were calculated in free space. All subsequent measurements of achieved performance were made under some precise circumstances I will carefully define later.

Gain. This is the performance in the main lobe relative to either a dipole in free space (dBd) or relative to an isotropic point source in free space (dBi). Either will do fine and one can convert using the formula dBd + 2.15 = dBi. The confusion creeps in when one unit is maliciously used in free space and the other over real ground. You end up comparing apples with oranges.

Back and Rear. Wikipedia (and others) say front-to-back and front-to-rear ratio are the same thing. Not here they are not.

I use the definition in the *ARRL Antenna Book*. Front-to-back ratio (F/B) is the gain ratio between the main lobe and the lobe at exactly 180° off the back. By contrast, front-to-rear ratio (F/R) is the gain ratio between the main lobe and the worst lobe anywhere to the rear. Both are measured in the same plane as the gain. F/R is the more strenuous criterion and is always the one used here.

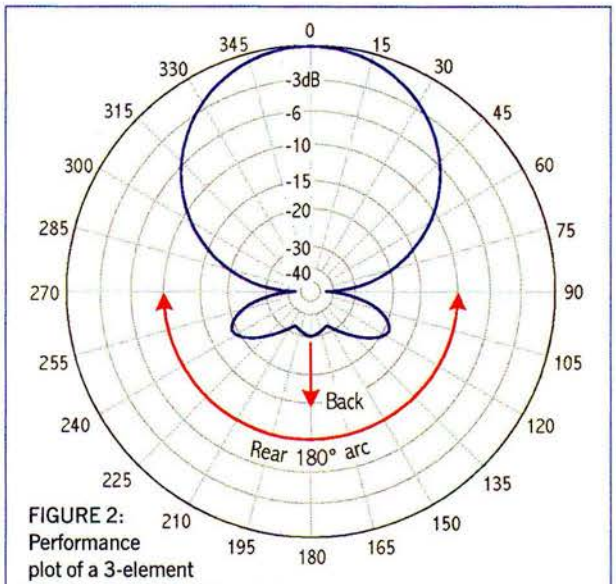

FIGURE 2: Performance plot of a 3-element Yagi tuned for best F/B – at the expense of F/R.

A plot for a typical 3-element Yagi is shown in **Figure 2**. This antenna has been tuned for good F/B and it achieves a very attractive-sounding 30dB. This tremendous performance directly backwards is always accompanied by unacceptable rear lobes in other directions. The F/R is a much less exciting 18dB. Except for specialised applications, quoting only F/B is misleading and unhelpful, not least because QRM rarely chooses to be exactly on a reciprocal bearing.

SWR. The other modelled performance parameter that must never be taken for granted is SWR. One behaviour that modelling any antenna teaches you is that if you allow the SWR to drift up even slightly then it is possible to produce significantly better apparent numbers for the gain and rear performance.

Provided that the beam can indeed be tuned for unity SWR at the chosen feed impedance then I don't accept anything over 1.01:1 as a mandatory maximum. If it's more than that I just keep on optimising until it isn't – while typically watching the gain and rear performance fall way. That way the results are validly comparable with others. In real life, I'm perfectly happy with modest SWR on the feeder but in trying to optimise a design, the practice of letting the SWR drift up is one best confined to the production of doubtful advertising copy.

IS MODELLING EASY? In his penultimate In Practice column **[3]**, Ian White, GM3SEK said that one (of many) aspects of an antenna design that we need to consider is "ease of computer modelling and whether a design can be converted into real-life hardware with a minimum of uncertainty." Although Ian was referring at the time to VHF/UHF long Yagis, the sentiment is equally true for any Yagi.

However, at VHF/UHF, the task is more straightforward – because you mostly use straight, untapered elements. There tends to be a lot more of them, of course, but that only increases the scale of the modelling task, not its validity. These elements don't fall into the grey zone of what the modelling software will validly handle. This got me thinking. Could it be that most of the popular HF Yagi designs are what they are only because they could be easily modelled? Is that why they are so unadventurous?

ARRL **[4]** does not publish antenna advertisements that include gain figures unless the advertiser can provide certified results from an antenna range or antenna modeling data that indicates that the antenna *should* have the gain described. Suitable modeling packages include *YO* (*Yagi Optimizer*, for Yagis only) or the latest version of *NEC*. One can only applaud their desire to eliminate misleading advertising claims.

PICaYAGI can be validly modelled with either of these packages – but it is not easy. Why? Because literally every unusual aspect of this design falls outside the scope of what these packages will handle without significant creativity.

I confine this discussion to the use of *NEC2* – since that is what I actually used. It is free and later versions (which are not) offer little if any incremental benefit for Yagi design.

The trap for the unwary is that *NEC* itself will not prevent you from entering pretty well any complex structure you like. All it needs is the radius of all the tubes and the co-ordinates of both ends. You can add reactances and a feed point and other forms of discontinuity. Having entered all those physical parameters, *NEC* will then do the sums and give you the answer. This is great, but in the case of PICaYAGI (or anything else with unusual features) you would be well-advised not to believe it.

This is not a criticism of *NEC* in any way. It is great – if used carefully and within its specified limits. All mathematical models depart from reality in some ways and the *NEC* documentation goes to a lot of trouble to point them out.

The problem is that if you model PICaYAGI literally, you break most of the rules, produce some spectacular numbers and, in many cases, no warnings. So, regrettably, it doesn't meet GM3SEK's criterion for ease of modelling. It is rather difficult – and this is why:

Element cross-section. As shown in Figure 1, the centre of the elements has an overlapped section. This is simply not allowed and you have to replace those two clamped tubes with one round tube of somewhat larger diameter. How much larger?

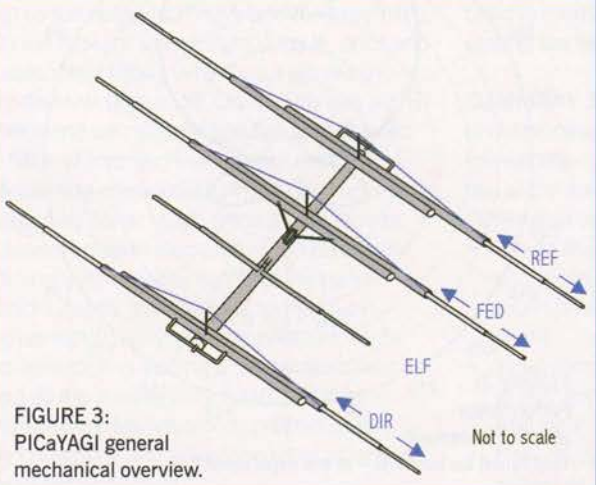

FIGURE 3: PICaYAGI general mechanical overview.

PHOTO 3: PICaYAGI at full element extension showing modest element droop.

Tapered elements. *NEC* is notoriously inaccurate in modelling any discontinuities in element diameter. PICaYAGI has a large % step in diameter where the sliding tube enters the fixed tube. In general, there is an excellent way to handle this, called Leeson's Correction. It replaces all the tapered tube lengths with one of the same total length but with one equivalent diameter. But Leeson's Correction has several restrictions and infringing any one of them prevents us from using it. Needless to say, PICaYAGI infringes the whole lot. Specifically, you are not allowed any reactive loads on the element and the elements must be perfectly straight. No droop!

Element droop. This causes a problem in its own right since, if you model it as a series of wires at increasing angles, the model rapidly becomes unstable – producing wild swings in output for small changes of droop.

Feed point. My tentative idea for the feed arrangement has a fine and detailed structure compared to the elements. It uses differing diameter tubing at apparently arbitrary angles to the driven element. There are precautions you can take with careful segment alignment – but you are taking a big chance.

So how to get around all this? The only way I know is to take the real element, put it up in the sky, measure its self-resonant frequency and then enter it back into *NEC* as tubing of the same length but with one net diameter that resonates on the same frequency. This is in effect manual Leeson's Correction but without the restrictions. **Photo 4** shows some early measurements being made on my driven element. These were later refined at the intended install height.

You will have spotted the catch. You have to commit to the materials to build the antenna to build the model to prove the antenna will work. In reality, you creep tentatively up to that point with an ever-increasing sense of confidence.

Finally, having built the model you can (and must) run validity checks to test whether you have got adequate segmentation and that the sum of the

TABLE 1: Main mechanical parameters of the prototype PICaYAGI.

Boom length	4360mm	**Weight**	16.8kg
REF to FED	1524mm	**Turning radii**	
REF to ELF	2823mm	**– Parked**	3498mm
REF to DIR	4320mm	**– Max**	6355mm

PHOTO 4: Scoping the frequency span of the driven element.

power radiated in all directions is equal to the input power. These tests give you significant confidence that the modelled performance results can be trusted.

CHOOSING A MODELLING PACKAGE. There are many PC packages around which provide a user interface to the ubiquitous *NEC* core – with much variation in price and facilities.

I am indebted to Ray, WB6TPU for pointing me towards *4NEC2* by Arie Voors **[5]**. It is an absolute delight to use. Arie has devoted countless years to getting this package right and he makes it freely available, in the true spirit of amateur radio.

The critical *4NEC2* feature from this project's perspective is the inclusion of a genetic optimiser. Most traditional antenna optimisers use a hill climbing approach to optimise your specified variables (eg element lengths) against your chosen criteria (eg Gain, F/R, SWR). They will indeed get you to the top of the hill. But what they don't tell you (simply because they don't know) is that it may not be the highest hill in the mountain range. By contrast, a genetic optimiser behaves as Charles Darwin decreed and it throws off random mutations (aka sports) to see if they lead anywhere useful. So your chances of ending up on the summit of Everest and not K2 are greatly improved.

The only practical downside is that this does take much longer. I have spent literally months of nightly runs on the PC in search of the very best answers. Having posed the right questions, at least you don't have to actually be there while it finds the answers! But exactly what are the right questions? If you don't ask the right questions, the answers will mislead you. It would appear there is some significant ambiguity out there.

TUNING FOR PERFORMANCE. The crunch question is, what exactly do you want to tune for? Very rarely do best Gain, F/R and SWR coincide. What I want is my Yagi optimised for good performance in every direction other than that of the station I am having a QSO with. It might sound strange put that way, but I know that there is almost nothing I can do which will influence the strength of the signal I can receive or transmit in the main lobe off the front. But off the rear, that is another matter. On 15m for example, I could indeed trade 0.05dB gain improvement off the front for 11dB degradation off the rear.

Contemplate that horrendous and typical trade-off. It is inherent in any and every 3 element Yagi.

I live near the NW edge of a small rural village. When beaming away from the village to the USA, my receiver noise floor is some 9dB better versus beaming into the village. This is far more important to me than any fractional dB gain improvement in the main lobe.

Further, much of the literature refers to the wonders of beam performance on transmit but mentions nothing about the mayhem you can cause to others if you tune for maximum gain at the expense of rear performance. And for what? Next to nothing. I regard it as precisely analogous to tuning your linear for 0.05dB more output – at the expense of 11dB increase in IMD products. Am I missing something here? I claim no expertise and I really would love to know.

There are indeed occasions where the facility to listen off the rear – and even at times to transmit off the rear would be useful. But that is a story for later.

In fact, PICaYAGI can store up to three tuning solutions per frequency so it is entirely possible to retain Best F/R and Best Gain as alternatives. The only time I use the latter is if the band is closed behind me and I'm working a station that is having trouble copying me. I can't say it gives much obvious improvement and, generally, I would prefer to suppress my local noise floor, there 24 hours a day. And I have a quiet location.

Finally in this context, there is one significant advantage we have over most of the antenna manufacturers. They cannot predict the customer's installed height or their ground characteristics. Since most of these offerings are designed to be used essentially out of the box they need to adopt a relatively low Q approach so that the antenna will deliver acceptable performance over a reasonable range. This is a compromise we don't have to make since, ultimately, this antenna is tuned from *your* shack at *your* installed height and over *your* ground. So we can indeed design for better mono-frequency performance. Which is not only better, it is easier!

PICaYAGI MODELLING PROCESS. For a multi-band design the process is somewhat iterative. The first task is to find the best values for the relatively uncritical variables. That is, boom length and driven element spacing – which are indeed uncritical by comparison with the element lengths. This entails modelling all the variables over a plausible range of boom lengths and spacings for at least a few representative frequencies in each band, certainly including the bottom end of 20m and somewhere near the top of 10m.

If building a mono-band design, there are some well-established guidelines for boom length. So a good starting point is to choose a 3-element boom length that is about right for 17m, use it somewhat short on 20m and increasingly long on 15/12/10m. I finally settled for 4360mm (just over 14'), mostly because I already had a suitable pole of that length.

The other observation from the modelling is that the position of the driven element on the boom is not critical and anything from about 1/3 to 2/3 from either end is fine. The classic issue with a short boom is the narrow SWR bandwidth. But with the element lengths adjustable, this is a non-problem in our case. On the other hand, a boom that is too long gives poor F/R and there is no obvious way round this.

Much trawling of the web looking at other solutions gave nothing helpful. For example, the FAQ on the SteppIR website **[6]** quotes 10-20dB F/R on 12m and 10m for the 3-ele design. Their brochure quotes F/R of 15dB on 12m and 11dB on 10m. This is with a 16ft boom – even longer than mine.

Because this is nothing like the sort of performance I wanted off the rear, I decided to add a fixed-length ELement Four (known as the ELF) – with switched stubs – for 12m and 10m only. This makes my 4360mm boom just about perfect for these two bands as well and, what's more, it delivers 4-ele performance.

Having chosen the best boom length and element spacings, the final task is to determine if the elements would tune from the bottom of 20m to somewhere near the top of 10m. All the modelling indications were that it was distinctly marginal.

So a switchable linear resonator was added to both the main director and to the reflector to increase their effective maximum lengths by about 1.5%. That may not sound much, but it is 200kHz on 20m. I don't like linear resonators for large changes in resonant frequency because they radiate and potentially upset the pattern. They also have high circulating currents that can increase the losses. But a small one is harmless enough. By luck (not by design), the ability to switch the linear resonators on and off gives some valuable instant pattern switching options.

The final configuration is shown in **Figure 3**. This also defines the names of the elements, which I'm going to use from now on. (For the User Interface I need some distinctive and intuitive 3-letter abbreviations with a unique first letter). **Table 1** describes the main mechanical attributes.

You can also see the linear resonators on the REF and the DIR, the anti-droop cords on the three main elements and an early glimpse of the matching arrangements. More detail on that and the electronic aspects next month.

WEBSEARCH

[1] http://groups.yahoo.com/group/picaproject
[2] http://uk.groups.yahoo.com/group/PICaYAGI
[3] *RadCom*, June 2010
[4] www.arrl.org/advertising-opportunities/#Acceptance_Policy
[5] http://home.ict.nl/~arivoors
[6] www.steppir.com/FAQ.html

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(2 for £89.99)

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11 band (80-10 6/2/70cm). PL-259 fitting. Colapses to 95cm (~ 3 ft).
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(2 for £70.00)

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6m + 2m + 70cm. 2 section (2.5m long) PL-259 fitting.
Superb quality
£134.99

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9kHZ-50MHz (all mode) receiver with spectrum analyser. Most manufacurers try to follow standards - WINRADIO sets them! WR-G3100C pack includes:- receiver + software + PSU + USB cable + BNC adapter. Requires PC.
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IN CAR CHARGER.....£24.99
SPEAKER MIC.....£16.99
£82.99 P&P £5.00

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2m + 70cm Handie. Includes nickle metal N.M.H.I and charger.
Includes free speaker mic
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KENWOOD TH-F7E

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Includes free speaker mic
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WOUXUN HANDIES

FREE POST
UVPD1P (2m/70cm) £92.99
KG-679E2 (2m) £59.99
KG-679E70 (70cm) £59.99
KG-699E (4m)
SPECIAL OFFER £79.99

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 (£19.99 each). Replacement foam windshield £3.00 + P&P.

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£79.99

LIMITED STOCK

10m PNEUMATIC MAST

We have a small quantity of "military spec" pump-up masts (part of a Government order). All brand new in a crate and supplied with cover (close HT – 6 foot). Anodised green finish.

40m guy kit pack £49.99
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(Can be hand operated or by compressor/foot pump)

Del £40 10m MAST, ONLY **£1199.99**

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80-10m & only 19.2m long! (Up to 1.2kW) Includes 1:1 Balun. Bargain. Superb Japanese quality antenna system. **£184.99**

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2-30MHz (250W) 6.4m long. End-fed wire antenna. Icludes matching balun. Sling up & away you go. **£199.99**

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Delivery £15.00

MA5B	Mini beam 10, 12, 15, 17, 20m ..... WOW	£499.99
A4S	4 ele beam (10 - 20m)	£675
A3S	3 ele beam (10-20m) ..... WOW	£599.99
R-8E	Vertical (40 - 6m) "special"	SPECIAL £525

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).

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80mtr inductors + wire to convert ½ size G5RV into full size. (Adds 8ft either end) ..... £34.99 P&P £4.00 (a pair)

TRAPS BACK IN STOCK

BALUNS & TRAPS (1kW)

Baluns 1:1 or 4:1 or 6:1 ..... £39.99 each P&P £4
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2 way CX-201 (0-1GHz) SO239 ..... £24.99
2 way CX-201 'N' (0-1GHz) 'N' £29.99
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(POST £4.00)

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MH-31A8J 8 pin modular ..... £39.99 P&P £5

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True military spec real UK coax

RG-58 Military spec x 100m.
£69.99 or 2 for £100.00
Coax stripping tool (for RG-58) £4.99

RG-213 Military spec x 100m (10mm dia).
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Q-TEK TRI-MAGMOUNT

Very heavy duty. Available:- SO-259 or 3/8 – specify. **£44.99**

HEAVY DUTY 24ft SWAGED MAST SET

New extra heavy duty 2" mast set. 4 sections x 6 foot that slot together. SPECIAL BUY

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24 foot mast. 1½" – 4 sections (6ft long). (Swaged)
£49.99 OR 2 SETS £84.99

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H/DUTY CAR BOOT MAST SET

18 foot (1½" dia).
18 foot – 6 x 3 foot (1½") slot together ally sections.

£49.99 each. TWO FOR £79.99 DEL £13.00

NEW CAR BOOT MAST SET

Superb 18 foot (6 x 3 foot sections) that slot together. Dia: 1¼" ideal to take anywhere. **£34.99**

2 for £74.99 del £13.00

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 £14.99 / 5 for £33.99 (P&P £4.00)

MAST HEAD PULLEY

A simple to fit but very handy mast pulley with rope guides to avoid tangling.
(Fits up to 2" mast) **£13.49** + P&P £4.50

30m pack (4.4mm) nylon guy rope £15.00
132m roll 4.4m nylon guy (480Kg b/f) ..... £45.00 Del £7.50

NEW EASY FIT WALL PULLEY

Pulley will hang freely and take most rope up to 6mm. (Wall bracket not supplied).

£13.49 + P&P £4.50

Wall bracket, screws not supplied. Simply screw to outside wall and hang pulley on WALL BRACKET £2.99 P&P £1.00

30m pack (4.4mm) nylon guy (480kg) £15.00
132m (4.4mm) nylon guy (480Kg) £45.00

HANGING PULLEY

Heavy duty die-cast hanging pulley. Hook and go! **£24.99**

BARGAIN WINCH

500kg brake winch. BARGAIN PRICE **£89.99** Del £10.00

(Now includes cable grip)
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HF-2V (80/40m) £279.99
HF-6V (80/40/30/20/15/10m) £375.00
HF-9V (as HF-6V + 17/12 & 6m) £425.00

TONNA YAGIS

22089 9ele 2m £79.99
220811 11ele 2m £109.99
220817 17 ele 2m £139.95
220818 9ele 2m XD £129.95
220921 21ele 70cm £109.00
2208938 9ele 70cm XD £135.99

NISSEI PWR/SWR METERS

RS-502 1.8-525MHz (200W) ..... £79.95 P&P £6.50
RS-102 1.8-150MHz (200W) ..... £49.95 P&P £6.50
RS-402 125-525MHz (200W) ..... £49.95 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

LOW LOSS PATCH LEADS

£4.50 P&P

Connectors	Length	Price
PL-259 - PL-259	0.6m	£11.99
PL-259 - PL-259	1m	£14.99
PL-259 - PL-259	4m	£19.99
PL-259 - PL-259	20m	£49.99
BNC - BNC	1m	£12.99

MT-3302

Heavy duty universal mount.
Includes 5m cable **£29.99**

MT-6601

Adjustable roof rack/window bar mount **£19.99**

YAESU G-450C

Heavy duty rotator for HF beams, etc. Supplied with circular display control box

WOW **£319.99** or £369.99 with 25m cable/plugs

G-650C extra heavy duty rotator. ..... £359.99 or £419.99 with cable
G-1000DXC extra heavy duty rotator. ..... £459.99 or £519.99 with cable
G-2800DXC The goliath of rotators £845.99
GS-065 thrust bearing £59.99
GC-038 lower mast clamps £35.99

AR300XL

Quality rotator for VHF/UHF. Superb for most VHF-UHF Yagis, 3-core cable required. 3-core cable £1 per mtr. GS-050 stay bearing £39.99 OUR PRICE **£89.99**

DIAMOND YAGIS

No tuning required

2m/5 element	No tuning required	SO-239 feed	£47.99
2m/10 element	No tuning required	SO-239 feed	£84.99
70cms/10 element	No tuning required	SO-239 feed	£54.99
70cms/15 element	No tuning required	SO-239 feed	£69.99
6m/2 element	No tuning required	SO-239 feed	£89.99

Q-TEK COLLINEARS (VHF/UHF)

Del £12.50

X-30 GF 144/70, 3/6dB (1.1m) £44.99
X-50 GF 144/70, 4.5/7.2dB (1.7m) £59.99
X-300 GF 144/70,6.5/9dB (3m) £79.99
X-510H GF 144/70, 8.5/11dB (5.4m) £139.99
X-627 GF 50/144/70, 2.15/6.2/8.4dBi (2.4m) £89.99

DUPLEXERS & TRIPLEXERS

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

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Del £10.00

DB-7900 2m/70cm (5.5/7.2dB) 1.6m (PL-259) £39.99
DB-770M 2m/70cm (3.5/5.5dB) 1m (PL-259) £24.99
Diamond HV-7CX 7/14/21/28/50/144/430 ..... £129.99
Diamond CR-8900 10/6/2m/70cm (1.26m) £99.99
Diamond AZ-506 2m/70cm – only 0.67m long £39.99
PL-62M 6m/2m (1.4m) PL-259 ..... £23.99
PL-627 6m/2m/70cm (1.7m) PL-259 ..... £44.99

RH-9000 BNC

40cm flexible whip for the ultimate in gain. **£32.99** P&P £5.00
Tx:- 2m + 70cm (Rx:- 25MHz-2.9GHz).

RH-9090 SMA

40cm flexible whip that is ideal as replacement. Tx:- 2m + 70cm. Rx:- 25MHz-2.9GHz **£36.99** P&P £5.00

EP-300

Over the ear earpiece. **£9.95** P&P £4.00

RH-770H (BNC)

2m/70cm Tx + wide Rx. High gain up to 5.5dB.

£59.99 P&P £5.00

STATION A4 LOG BOOK OFFER

3 FOR £10.00

P&P £6.00

EARPIECE/BOOM MIC

Over ear earpiece + boom mic. Available in Kenwood version or Yaesu/Alinco/Icom.

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DOUBLE THICK FERRITE RINGS

A superb quaility ferrite ring with incredible properties. Ideal for "R.F.I". Width 12mm/ OD35mm. 6 for £14.00 P&P £4.00
12 for £24.99 P&P £5.00
30 for £49.99 P&P £10.00

COPPER ANTENNA WIRE ETC

Hard drawn (50m roll) ..... £40.00 P&P £7.50
New: 50m roll, stranded antenna wire ..... £19.99 P&P £7.50
Flexweave (H/duty 50 mtrs) ..... £44.99 P&P £7.50
Flexweave H/duty (18 mtrs) ..... £21.99 P&P £7.50
Flexweave (PVC coated 18 mtrs) ..... £24.99 P&P £7.50
Flexweave (PVC coated 50 mtrs) ..... £59.99 P&P £7.50
Special 200mtr roll PVC coated flexweave ..... £180.00 P&P £10.00
Copper plated earth rod (4ft) ..... £14.99 P&P £8.00
Copper plated earth rod (4ft) + earth wire ..... £24.99 P&P £8.00
New RF grounding wire (10m pack) PVC coated ..... £14.99 P&P £5

METALWORK & BITS (Del Phone)

2" mast-floor base plate £14.99
6" stand off brackets (no U-bolts) £8.99
9" stand off brackets (no U-bolts) £10.99
12" T & K brackets (pair) £19.99
18" T & K brackets (pair) £24.99
24" T & K brackets (pair) £29.99
U-bolts (1.5" or 2") each £1.50

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

8mm screw bolt wall fixings £1.70
8-nut universal clamp (2" to 2") £7.99
2" extra long U-bolt/clamp £6.99
2" crossover plate with U-bolts £14.99
15" long (2") sleeve joiner (1.5" also available) £18.99
3-way guy ring £5.99
4-way guy ring £6.99
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
Special offer:- Self-amalgamating 3 rolls £20.00

The I-PRO Home from Pro Antennas

A centre-fed vertical dipole with capacity hat end loading

The IPro Home - if installing it permanently we recommend guying.

VERTICAL DIPOLE. The I-Pro Home Multiband HF Vertical Antenna, to give it its full name, is the latest product from Carl Kidd, G4GTW, at Pro Antennas. Having tested his DMV Pro, I-Pro Traveller and Dual Beam Pro antennas previously, I was keen to see what this one had to offer.

The antenna is a centre-fed vertical dipole with capacity hat end loading, looking like an H on its side. Capacity hat loading was chosen to keep the inductive loading to a minimum and so reduce losses. It is designed to be non resonant on all of the amateur bands. A large un-un transformer (of unspecified impedance transformation) is fitted to the centre of the dipole, which reduces the resultant SWR down to something your rig's internal ATU can handle. The maximum power is 400W PEP.

The antenna is 5m long, with the top and bottom elements spanning 2.5m. It comes with a heavy duty galvanised mounting bracket, suitable for posts of between 1.5"–2". Once mounted on a suitable stake (not supplied) it actually sits just under 6m tall and weighs in at 4.5kg.

If the antenna looks familiar, it is very similar to Carl's Dual Beam Pro reviewed in May's *RadCom*. The difference being that this one is ground mounted and, being vertical, it is omnidirectional.

Aerospace alloys are used throughout, as are non-corrosive stainless steel fittings. Solid GRP rod is used for the important insulating sections. This material provides excellent dielectric properties with great structural strength.

The antenna will cover all five amateur bands from 20m-10m. If you have an external ATU it can also be persuaded to cover 40m and 30m (an average internal ATU will not handle the high SWR the antenna presents on these bands.) There is no reason why the antenna shouldn't be used for short wave listening either, from about 5-30MHz.

HARDWARE. The I-Pro Home comes in two boxes – one containing the hardware and balun, the other being a long cardboard tube with the elements. On unpacking everything it was time to study the instructions – carefully. Do take the time to read them as it is very easy to put the antenna together incorrectly (as I found out).

First you attach the un-un to the centre insulator and vertical elements. Then you bolt on the aluminium support rod, which holds the un-un firmly with a worm-drive (Jubilee) clip. You then add the capacitive end-loading elements at each end. I managed to put the whole thing together in an hour, but I did have to remove and reattach the un-un as I had it on the wrong side of the support rod.

Having assembled the antenna you then attach the coax, via a PL259, with suitable weatherproofing such as self-amalgamating tape and drop it onto the mounting post. The instructions say that for all-weather use the antenna should be guyed (guys not supplied). I would endorse this – if leaving it up for more than a few hours, guying with nylon cord is essential as the antenna is quite top-heavy. The coax has to be arranged to come away from the antenna at about 45°. This minimises interaction.

On connecting the antenna up to about 20m of Mini-8 coax I found the raw SWR figures as shown in the table. As you can see, an internal ATU should be able to find a 1:1 match on all of the bands 14MHz – 29MHz. My rig could also match 10MHz, but I know

The antenna attached to the ground post.

The coax must come away at an angle.

A close up of the un-un at the feed point.

that other manufacturers' internal ATUs won't match much beyond an SWR of 3:1.

IN USE. As for performance, I set up a five-band commercial trap vertical for the test for comparison, complete with a ground stake and eight 25ft tape measure radials, courtesy of my local pound shop. This antenna cost about the same as the I-Pro Home. Purists will argue that for an effective ground plane you really need 60-120 radials, but space and time prevented this.

The benefit of the I-Pro Home is that it doesn't need a ground plane, which was reflected in the shorter setting-up time. This shouldn't be underestimated, as you will be up and running in an hour or so, whereas you could spend days putting a decent set of radials down for a ground-mounted vertical.

On bands where the five-band trap vertical wouldn't work (17m and 12m) I compared the antenna with my usual doublet and dipoles.

Pro Antennas will soon offer an optional 30 and 40m resonating kit for £179.95, which will improve performance on those bands. This was not tested and therefore we decided to look at the I-Pro Home on the 5 bands from 20m through to 10m.

On 20m (14MHz) the antenna shone, with noise levels similar to my doublet and signal strengths the same to UA3 (European Russia), EW8 (Belarus) and HG (Hungary). Compared with the five-band trap vertical, signals from around Europe including Russia were generally better on the I-Pro Home by about 1-2 S-points. This was very significant as just about every EU signal I found on 20m was better on the I-Pro Home than the trap vertical. On longer paths the difference was less marked.

The five-band trap vertical doesn't cover 17m, so I switched to my dipole/doublet. The I-Pro Home was better on 17m with RW3XZ in Moscow, up 2 S-points on my dipole/doublet.

Other signal strengths pretty much matched my other antennas on this band, but sometimes the I-Pro Home bettered them by about 1-2 S-points. There were some weak CW signals that were inaudible on anything other than the I-Pro Home.

On 15m (21MHz) the I-Pro Home bettered my doublet (which doesn't work well on 15m) and generally beat the trap vertical by about 2 S-points. Despite poor band conditions at the time, a number of stations were worked, each giving better reports on the I-Pro Home. A station purporting to be T31A (Kiribati), but in reality a pirate, was much stronger on the I-Pro Home – shame he wasn't real!

Imam, YB4IR in Sumatra, Indonesia was much louder on the I-Pro and would not have been workable on the trap vertical. The I-Pro Home is a good performer on 15m.

On 12m (24MHz) it was once again equal to or slightly better than my other wire antennas into Russia and Ukraine. 5B4AGQ (Cyprus) was better on the I-Pro than the doublet by 1 S-point. Once again the trap vertical doesn't play on 12m.

The 10m (28MHz) band was pretty dead at the time of testing, but with the few stations I did hear, performance appears to be similar to 12m. The I-Pro Home and trap vertical were neck and neck on contacts into Spain and Italy and it easily beat the longer wire antennas. It was neck and neck with the dedicated 10m horizontal wire dipole around Europe.

In conclusion then, the I-Pro Home will give good service on 20m-10m and, as pointed out in the specifications, reduced performance is to be expected on 30m and 40m.

It is a simple design with no traps or loading coils to break. With the coax coming away at 45° it does take up quite a lot of space, but is otherwise low profile. It could be argued that the area required to lay out a number of quarter wave ground radials required for the trap vertical would take up considerably more space. If you are an occasional operator you could also erect the I-Pro Home in a few minutes, perhaps for just contests/special events, storing it on the floor of your garage or laying it flat in your garden out of sight of the neighbours when not in use.

You don't have to bother about setting up a decent array of radials and it covers bands that most trap verticals can't. The un-un feed method has a lot to commend it, being simple and sturdily built. Losses appear to be low and as long as your internal or external ATU can handle the small mismatch you should be fine.

I would, however, urge you to guy the antenna carefully for safety's sake and longevity.

The I-Pro Home costs £229.00, plus next day UK shipping of £9.95. For more information about the antenna see www.proantennas.co.uk or call 01489 789960.

Manufacturer's Comment

The I-Pro Home is a very low angle radiator and this is best demonstrated during greyline periods. A small reservation is that the reviewer missed the opportunity to exploit this property against the horizontal wire antennas. However, I am pleased my centre feed arrangement was shown to be much more efficient without the requirement of radials or grounding when compared to the trapped vertical. The 1 to 2 S-point advantage on some signals is impressive, especially when you consider the simplicity of the I-Pro Home installation.

Carl Kidd, G4GTW
www.proantennas.co.uk.

SWR Results (at end of 20m of Mini8 coax)

7.10MHz - SWR 10.5:1
10.1MHz – SWR 5.6:1
14.2MHz – SWR 2.5:1
18.14MHz – SWR 1.9:1
21.2MHz – SWR 1.7:1
24.9MHz – SWR 1.9:1
28.5MHz – SWR 2.0:1
29.6MHz – SWR 1.9:1
50.1MHz – SWR 2.3:1

International Marconi Day 2011

Spotlight on three stations that were active this year

Keith Johnson, M0DZB, making contacts on one of the radios at GB0CMS.

GB5LT. This year, on 30 April, the Waterside New Forest Radio Club set up GB5LT in Marconi's Workshop, located in the Manor of Cadland. Maldwin Drummond, Trustee of the Manor, kindly gave the club permission to operate the station from the workshop, which is not far from Eaglehurst and Luttrell's Tower, where Marconi carried out many experiments between 1911 and 1916. When Eaglehurst was requisitioned during WWII, Maldwin's father, Major Cyril Drummond, moved Marconi's Workshop, an outbuilding, from Eaglehurst to Cadland and, in more recent times, Maldwin, a keen short wave listener in his youth, took steps to preserve the building by adding a new external cladding.

During the morning of the 30th, the club made a presentation of radio and Marconi memorabilia to Maldwin, to mark their grateful thanks for the event venue and also to wish him a happy birthday, which fell on the same date!

The Workshop provided a relatively luxurious venue for the GB5LT radio station and two transceivers were installed: the club's FT-757 GX Mk II, feeding the club's G5RV aerial oriented roughly east-west, and Tony, G6MNL's FT-747 feeding a vertical aerial, the Cushcraft R6000. The station was set up and operated by Tim, G4YVY, Tony, G6MNL, Robin, G0OSG, Mel, G0FOH and Rod, G6LVJ.

About 70 contacts were made during the day, in spite of considerable electrical storm activity over Europe in the afternoon. Many contacts were, of course, in the UK, but there were also several foreign contacts from Europe and elsewhere, including Canada, the USA, Poland, Russia, the Ukraine, Italy, Germany and France. A most noteworthy contact from France was Mike, F8VOU (G4HXT), now resident in France, but a founder member of the GB5LT group.

GB0CMS. Radio amateurs at the Caister Lifeboat Visitor Centre in Norfolk managed to contact more than 160 other radio amateurs in 24 different countries on Saturday 30 April. The Caister station was connected by land line to Great Yarmouth Post Office and the Caister Coast Guard Station. The main aerial mast behind the house was 150 feet high, the aerial wire being suspended between this and a slightly shorter mast situated on land where Lacon Road was later built. The large front room of the house contained the main apparatus and was also used as the operating room. The engine for charging the accumulators was situated in a shed adjoining the house and the accumulators themselves were housed in a specially constructed annexe. The range of communication was 150 to 200 miles on the 'long' wave (600m) and 100 miles on the 'short' wave (300m).

In 1909 all the Marconi coastal stations were taken over by the Post Office. In 1911 the Caister station was used to train lightship men in the use of telegraphy equipment. In January 1915 the telegraph equipment on the Cross Sand lightship was transferred to the Parlour lightship and the Caister station was changed to 'general working' and not used for ship-to-shore work. Public use of the telegram facility provided at Caister was suspended for the duration of WWI.

In 1921 plans were made for the reinstallation of wireless on Trinity House lightships, but this time the new wireless telephony was to replace telegraphy (Morse). New technology made the Caister station out of date and it finally closed in 1929. (Historical details with thanks to local historian Colin Tooke.)

Using the callsign GB0CMS, notable contacts included American amateurs in Louisiana and Virginia, plus amateurs aboard *HMS Belfast* in London. Other contacts included a special Marconi station in Italy at the Italian Navy Technical Naval Museum in La Spezia. Contacts closer to home included many other radio amateurs around the UK, including some of the other Marconi stations in Daventry, Salisbury and Fraserburgh, Scotland. Conditions were far from ideal as a solar flare had disrupted the ionosphere earlier on Saturday and they also had to contend with near gale-force winds coming off the North Sea.

Norfolk Amateur Radio Club ran the all-day special event station at Caister Lifeboat Visitor Centre to commemorate the village's original Marconi Wireless Station that was established at Caister in 1900.

GB2MT. With the kind permission of Writtle Agricultural College, GB2MT took to the air again this year. The site, on the outskirts of the village of Writtle, had been used for the historic 2MT broadcast test transmissions between February 1922 and January 1923 and for a demonstration to Chelmsford Engineering Society in November 1922. It continued as a Marconi site until the 1980s when sadly it was wiped from the map by a housing development.

As has been the case in recent years it was a glorious spring morning, silent, sunny and a fresh breeze. However, the silence was soon to be shattered. The ground was rock hard so some serious persuasion was required to insert the antenna base and guy pegs but, that done, the antenna (a Comet H-422 HF dipole atop a 6m mast) was raised and tested.

Within 10 minutes of the first CQ calls on 40m a pileup developed, which was to last virtually without a break for the next 11 hours. Running only 100W from an Icom 7700, over 220 SSB contacts were made without any time to explore the other bands. The level of activity really was unprecedented compared to recent years.

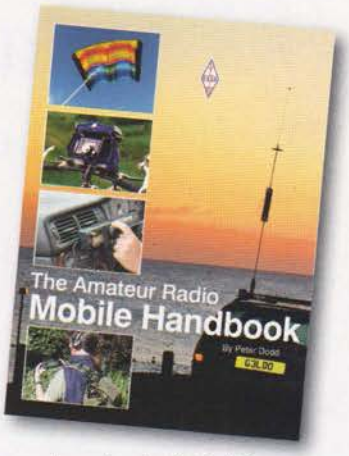
Thanks to the Cornish Radio Amateur Club for organising the event and the many stations that waited patiently for a contact.

GB5LT in Marconi's Workshop, located in the Manor of Cadland.

The club made a presentation of radio and Marconi memorabilia to Maldwin Drummond, who owns Marconi's Workshop.

Book review

Everything you need to know about mobile operating plus SOE's 'dirty tricks department'



The Amateur Radio Mobile Handbook (2nd edition)

by Peter Dodd, G3LDO

There's a lot more to mobile operation than just putting a FM black box in the car and adding a magmount. Peter Dodds' thoughtful book goes a lot deeper than this, looking at equipment, practices and much more. First published in 2001, this second edition has been revised and updated to reflect the changes in technology and practices in the intervening decade.

I was surprised to learn that mobile operation was illegal when amateur radio operation re-commenced after the Second World War. When, after much campaigning, it was eventually permitted in 1954, it required a separate licence. Mobile rallies soon started, as more and more people fitted radios to their vehicles. Safety standards then were somewhat lower than today; I was pleased to note that the themes of safe installation and operation run throughout this book.

There is a useful chapter on fitting radio equipment into a car and best methods of operating. This sets the tone for much of the rest of the book, as it includes some very helpful, practical hints and tips.

Mobile antennas next come under the spotlight, looking at both theory and practice. There are detailed descriptions of several HF mobile antennas you can build, matching and loss considerations, plus a section on exploiting novel resonance modes on certain commercial multiband mobile antennas. Mounting strategies are also covered in detail, ranging from bull bars to tow bars via magmounts and roofracks, to mention just a few possibilities that are discussed.

The concept of mobile operating also extends to static mobile, which gives a huge scope for antennas you can't use at home – such as big balloon- or kite-borne verticals. There's even enough information to build your own aerostat (a cross between a balloon and a kite) to fly aerials in very low wind conditions.

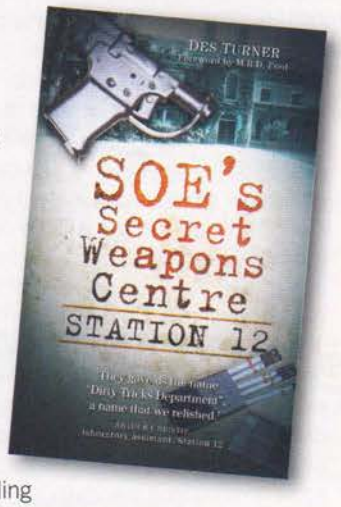
But mobile operation isn't limited to four wheels. Maritime mobile operation is covered in some depth, including very useful hints and tips on using the rigging as an HF antenna, suitably locating and powering your radio. There's a bike mobile chapter, examining the installations by G3LDO, VE3JC, KB8U and G4AKC and discussing the merits of phone and CW when on two wheels. Pedestrian mobile is also covered, with equipment ranging from V/UHF handhelds through to full-blown HF manpack setups. Two useful appendices by invited authors describe D-Star and APRS, both increasingly important to today's mobile operators.

Peter Dodd has clearly researched his subject well. He conveys the information clearly, in a similar style to his regular Antennas column in *RadCom*. I learned a lot as I read my way through; having recently changed my car, I'm sure I'll take some of the suggestions on board as I plan my own mobile installation – and use much of the other information in future operations. Definitely a book worth a look.

128 pages, 174 x 240mm
ISBN 9781-9050-8671-9
Published by RSGB
Non-members' price £11.99
Members' price £10.19

SOE's Secret Weapons Centre – Station 12

by Des Turner



In common with many people, I am fascinated by the secret work that went on in the Second World War. This book describes, through the eyes of people that were actually there, some of the goings-on at the Special Operations Executive's 'Dirty Tricks Department' based at Aston House near Stevenage, Hertfordshire. It is fascinating to hear people describe what was happening. Those interviewed range from the former Commanding Officer through to storemen and FANYs.

The remit for Aston House was to study and develop sabotage methods and materials. This necessarily meant the development of novel technologies and methods. For instance, the 'pencil' time-delay fuse was born there, as were numerous other special explosives such as shaped charges and limpet mines. Other specialised equipment such as air-droppable mini motorbikes, midget submarines and submersible canoes were also developed and/or manufactured there. Some items were only produced in very small quantities, such as the single-shot 0.22" gun that was indistinguishable from a fountain pen; others were produced in the tens of thousand.

There are photographs of many of the people who are mentioned in the book, plus a small selection of the special 'gadgets' that they made. And what a range! Explosive mule droppings, booby-traps of all shapes and sizes, hollowed-out lumps of coal with high explosive inside, fighting knives, special guns, silencers – you name it, they came up with it. Who knows how many special-purpose items were only used once and have since been forgotten about? The whole site operated on a need-to-know basis, with people often not knowing the final purpose of parts they made. Only now, many years on, Des Turner's conversations with people who worked there has shed some light on what actually happened.

Some of the anecdotes are quite hair-raising, for example how a demonstration of how to blow up a car nearly ended with the vehicle squashing Winston Churchill. Others were more of a practical joke nature, such as putting explosives into a chap's bed – the blast calculated to lift him up to the ceiling yet not cause any physical harm.

This book puts a very human face on the story of the real 'Q' branch of SOE and is a pleasant read to boot.

256 pages, 125 x 197mm
ISBN 978-0-7524-5944-8
Published by The History Press
Non-members' price £9.99
Members' price £7.49 (25% off)

Sport Radio

Developing the AFS Super League, how to avoid losing lots of points and the IARU HF Championship

PHOTO 1: Pete, G4CLA and Jonathan, G0DVJ operating the GR2HQ 80m SSB station.

AFS SUPER LEAGUE. The inaugural Super League included the four AFS contests – 2m, 80m CW, 80m SSB and 70cm – and ran from December 2010 to February 2011. One thing that can be said for certain is that it persuaded some groups who are traditionally associated with HF contesting to give VHF a serious try, because 2m and 70cm entries increased significantly. Entries to the 80m events however stayed about the same. It soon became apparent that four groups were going all-out to win, with the Bristol Contest Group coming through to become AFS Contest Club of The Year, winning one of the four AFS contests and scoring very well in the other three.

At their recent meeting the Contest Committee decided to increase the scope of the Super League for 2011-2012, by including two more events. Consequently, this winter a 6m contest and a 1.8MHz contest will join the four AFS contests in the Super League. Look out for details in due course. For the time being at least there will be no changes to the rules of the 6m and 160m contests. Just like other events in the Super League, Super League Points (SLPs) will be calculated and awarded automatically to clubs (who do not actually need to make an entry in the Super League, since their score is calculated automatically).

CONTEST LOGGING BASICS. There have been a number of incidents recently where contest logs have been submitted that contained some pretty basic errors. It has mainly been inexperienced operators who've done this, but not exclusively. Either way it seems appropriate to discuss the subject.

Incidentally, most of the errors were made by those who logged on a spreadsheet or paper and then created an electronic log later, either by editing a pro forma log or keying it into the online log generator. Here's a list of some of the mistakes seen by adjudicators:

The wrong date. Your log will be rejected or you will lose all your claimed QSOs if the date in your log is wrong.

The wrong times. QSOs need to be at the correct time. That means using GMT and certainly not all QSOs at the same time. Yes, the latter has been seen!

The wrong order. There have been instances of logs with the received report and serial number for each QSO before the sent report and serial number. The logging standard is SENT *before* RECEIVED.

Default data. Logs have been received where all the received reports have been 59(9), which is certainly not the way contests are conducted at VHF.

The wrong mode. This applies more to the datamodes sessions of Club Championships than anything else, because some logging packages don't record the mode correctly. The adjudicator might be lenient if he can see that you were, say, operating in the PSK segment of 80m when your log states that a QSO was on RTTY but your QSO partner says PSK, but if you log all your QSOs on the same frequency there's no way he can know and you will lose all the QSOs that are adjudged to have the wrong mode against them.

The wrong callsign. Suffixes (/A, /M and /P) are often left off callsigns, which will invalidate the QSOs concerned. And O's and 0's get confused, as do 1's and I's. Some logging software will alert you to an impossible callsign.

Impossible locators. For VHF QSOs a quick check will tell you if any of the people you worked appear to be in unlikely place (eg in the sea).

The wrong section. If you admit to running, say, 100 watts but enter the QRP section of a contest, may not be awarded any points. The same applies if there are antenna restrictions in a section. If you make a mistake in the opposite direction, the QSOs will be valid but your position in the results table is likely to be rather low.

The wrong contest! It is not unknown for someone to do everything right, but then upload the wrong log.

Now, the life-saver. At the end of the online log submission process entrants are sent an e-mail, advising them of any errors the robot has found – and it does find several of those listed. VHF entrants are also e-mailed a map of where all their contacts were. There is no penalty for correcting and resubmitting a contest log (as long as you do it before the deadline), but ignore any warnings at your peril!

By way of a tail end to this item, personal UBN reports (Uniques [stations that nobody else worked], Busted [a QSO in which an error has been made], Not in [the corresponding station's] log) became available to entrants of UKACs and Club Championships from June. The IOTA Contest already had personal UBN reports available and they will be introduced for other events later. For a full description of UBN reports, see the January issue of Sport Radio.

IARU HF CHAMPIONSHIP. I don't often highlight personal contesting activity, but this month I would like to relate the story of my participation in last year's IARU HF Championship UK HQ Team who operated GR2HQ. I was one of a sub-team of three who operated the 80m SSB station in Suffolk, the other two operators being G0DVJ and G4CLA (see **Photo 1**). As is the custom, other teams operated GR2HQ on other bands and other modes from various sites around Britain. The antennas for 80m SSB were a high dipole and a 4-square, but despite the impressive antennas our station didn't perform as well as we would have liked, indeed we were criticised on the DX Cluster a few times for being deaf. For part of the time we did indeed have problems hearing people, because we were being deafened.

Allow me to explain. Last year the contest took place when the weather was extremely hot. It was 32°C when I arrived on site on the Friday afternoon and we all know what happens in the summer when we have enjoyed a few hot days – thunderstorms. Soon after the contest began the storms kicked off. As the evening progressed they intensified in the Low Countries and South West Germany (see **Photo 2**). At no time did we see any flashes of lightning or hear any thunder, but the electrical noise was tremendous. Even beaming away from it with the 4-square didn't help a lot, because

RSGB HF EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Jul 4	80m Club Championships	1900-2030	CW	3.5	RST + SN
Jul 13	80m Club Championships	1900-2030	SSB	3.5	RS + SN
Jul 17	Low Power Contest	0900-1600	CW	3.5-7	RST + SN + power
Jul 21	80m Club Championships	1900-2030	Data	3.5	RS + SN
Jul 30-31	IOTA Contest *	1200-1200	CW/SSB	3.5-28	RS(T) + SN + IOTA ref

RSGB VHF EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Jul 2-3	VHF NFD	1400-1400	All	50-1296	RS(T) + SN + Locator
Jul 3	144MHz Backpackers #3	1100-1500	All	144	RS(T) + SN + Locator
Jul 5	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
Jul 12	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
Jul 17	70MHz Trophy +	1000-1600	All	70	RS(T) + SN + Locator
Jul 19	UHF UKAC	1900-2130	All	1.3	RS(T) + SN + Locator
Jul 26	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
Jul 26	SHF UKAC	1900-2130	All	2.3 & up	RS(T) + SN + Locator

BEST OF THE REST EVENTS

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
Jul 9-10	IARU HF Championship	1200-1200	CW, SSB	1.8-28	RS(T) + ITU zone (UK=27)
Jul 24	WAB QRO 2m Phone	1000-1400	All	144	RS(T) + SN + WAB square

**HF Championship event +VHF Championship event*

For all the latest RSGB contest information and results, visit www.rsgbcc.org.

the skip distance was just right for propagation between the storms and us. We were aware that we were being called by stations that under normal condition we would work easily, but because of the QRN we had no prospect of working. Nevertheless we had to carry on in a bid to build the biggest score we could. The storms finally abated overnight, leaving the band QRN-free for the Sunday, but with no long distance propagation.

Returning to the topic of the temperature, in the shack we were extremely hot, even with the door propped open and two desk fans blowing air in from outside. During the day the temperature was in the mid 30s. Even in the middle of the night it didn't drop below 28°C, so dehydration was a constant concern.

Overall, GR2HQ ended up coming 4th out of 48. Just a few more points would have seen us achieve 3rd place, but just a few less and we would have been 5th. Hopefully conditions will be more favourable when it takes to the air again in this year's Championship on 9-10 July. Once again certificates are available to clubs and individuals who contact GR2HQ, so please work us on as many bands/modes as possible. If you want to know the frequency that any of the stations is on, all you have to do is ask one of them, because all will be linked and will know the working frequencies of all the others.

THIS MONTH'S EVENTS. The final month of this year's series of Club Championships begins with CW on the 4th and continues with SSB on the 13th. The Low Power Contest follows on the 17th. For many years this event was known as a Field Day, but I don't know why because it always had sections for fixed stations. It was only in 2009 that it was given its new, accurate name. There are two power levels – 3 watts and 10 watts – and to underline the fact that this is not the most frantic contest you'll ever take part in there's even an hour off for lunch! Then, on the 21st, it's back to the very final Club Championship session of the year, datamodes. This leaves the biggest HF event to the end – the IOTA Contest. Over the years IOTA has become RSGB's flagship contest. These days it attracts over 2000 entries worldwide. Casual participants are likely to pick up some new countries and serious entrants will make thousands of QSOs in the 24 hours, although there are also 12-hour sections for single-op stations. The IOTA Reference is part of the exchange, the one for mainland Britain being EU-005. All the IOTA references can be found on the Internet at www.logiciel.co.uk/iota/shtlist/europe.html.

PHOTO 2: Image of lightning activity on the Saturday evening of the 2010 IARU HF Championship.

The action on VHF begins with VHF NFD on 2-3 July. Apart from the various sections for portable stations of differing powers and complexities, as of 2009 there is also the 'Sweepers' section. This was introduced to encourage fixed stations to work the portables and expanded in 2010. As a non-participating fixed station there's no reason why you shouldn't call CQ while the contest is in progress, because there will be a whole band of people looking for QSOs, especially during the quieter hours. The third 2m Backpackers runs for the last three hours of VHF NFD and continues for an hour after it ends. After that we move into the UKACs, with 2m on the 5th, 70cm on the 12th, 1.3GHz on the 19th, and 6m and SHF on the 26th. In the middle of it all the 70MHz Trophy Contest takes place on Sunday 17th.

There are just two non-RSGB events I would like to mention this month, the first being a real biggie! It's the IARU HF World Championship on 9-10th. I mentioned this one last month, saying that once again the UK HQ station GR2HQ will be active and looking for as many QSOs as possible on as many bands and modes as possible with as many people as possible. You don't have to be taking part in the contest to call GR2HQ; the operators will be delighted to work you and also pass you around the bands and modes, to help you work towards one of the free certificates that are available. The Worked All Britain QRO 2m Phone Contest takes place on Sunday 24th. You don't need to be a member of the scheme to participate. Exchange a report, serial number and WAB square (the first, second, third and sixth digits of your 8-digit National Grid map reference).

ARDF

ARDF Festival and British Championships 2011

YOUR RSGB
ARDF: DEDICATED TO DF HUNTING

PHOTO 1: President Dave Wilson pictured at transmitter number 4 which he located. In his left hand is the portable DF receiver that he used.

CHAMPIONSHIPS. The ARDF Committee organised the bi-annual RSGB ARDF Festival in Shropshire and Herefordshire this year. This was combined with the 2011 British ARDF Championships.

Day 1 was centred on the Brampton Bryan Estate, west of Ludlow, with its magnificent woodland making it a superb area for this radio sport. Robert Vickers, G3ORI planned and organised the 144MHz race that went off flawlessly, with the weather improving as the day proceeded. There were a number of ARDF enthusiasts from the Continent visiting the UK, some to combine some ARDF with a short holiday in this country. We hosted visitors from Germany, the Netherlands and Sweden.

British 144MHz champion was David Williams, M3WDD, by the narrowest of margins as he squeezed home just 42 seconds ahead of Steve Stone, RS193217, which is not much of a margin in a race lasting nearly an hour and a half. The Champion is decided on the basis of the fastest time of the day irrespective of age class. The older competitors have to hunt fewer transmitters and this gives some sort of level playing field.

The fastest overseas competitor was Jenny Fijlstra from the Netherlands, competing in W50.

For Day 2 we moved to the big Forestry Commission area at Mortimer Forest and switched to the 3.5MHz band for the competition. This area is intensively managed and is also heavily contoured to give a big physical challenge as well as the challenge of locating the transmitters. There were one or two technical issues with the transmitters but this did not stop Andrew Soltysik, G4KWQ grabbing his first British title, when he came home well clear of his rivals. Andrew is relatively new to ARDF and placed 11th in the World Championships last year. His winning margin was a healthy eight minutes.

The fastest overseas competitor with a full 'bag' of transmitters was Dick Fijlstra, PA0DFN – the husband of the Day 1 overseas winner. He was running in the M60 class.

At the end of Day 2 we were delighted to welcome the President of the RSGB, Dave Wilson, who had kindly come to make the presentations. Before officiating he was able to meet the competitors as they returned from the forest with varying tales to tell. Michael Dunbar, M6MDD then took Dave out into the forest to try his skill at hunting down one of the competition transmitters that was one of the five deployed. The photograph shows that the President was clearly successful in doing this. In the process he gained a real insight into this form of competitive radio.

Following the presentations, the President was able to meet and chat to a number of both overseas and home based competitors.

Day 3 was different in two ways. First, after weeks of unusually low rainfall, the skies were grey and it rained heavily at the National Trust estate at Brockhampton in Herefordshire, where we had gone for the last day of competition. To round off the three day Festival with something a little less intense than the previous days, a FoxOring competition was organised. This format has the approximate locations of ten very, very low power transmitters marked on the map. Each is audible at ranges up to 100 – 200 metres. To give an idea of just how low the power is, the PA comprises just two gates of a CMOS 4001 in parallel.

Now, readers might have thought that setting out into a wet piece of woodland, in which there were some short but very slippery slopes - and in pouring rain - would have seen people coming back moaning and groaning in true British style. But no! Everyone arrived back full of the joys of finding all their assigned transmitters and enjoying the challenges of deciding the best route to use to visit them all.

The planner had arranged some of the transmitters on opposite sides of a deep stream valley, which was hard to cross except in a couple of places. Competitors were given their map on the start line and then had not only the physical challenge of getting round the estate but the mental challenge of map reading, choosing which transmitter to visit first and then deciding the sequence in which to visit the others so as to minimise the distance. It is this that makes our radio sport so addictive.

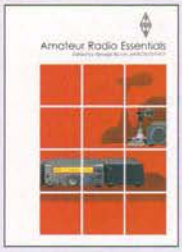
There were tales to be told – such as the overseas competitor who thought it would be a good idea to go outside the estate boundary and run down the A44 to his next transmitter. He got there only to find that there was a wall too high for him to climb over at this point!

The organisers would like to thank the National Trust, the Harlequins Orienteering Club and Wrekin Orienteers, for all their help and assistance in making these Championships possible.

PHOTO 2: Andrew, G4KWQ receiving the 80m trophy from RSGB President Dave Wilson.

RSGB shop

Amateur Radio Essentials



Edited by George Brown, M5ACN

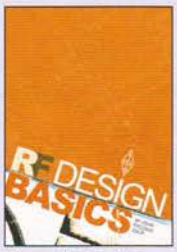
This is a book for everyone, beginner and old hand alike, who is interested in amateur radio. *Amateur Radio Essentials* aims to answer frequently-asked questions that the editor has fielded on the telephone while working for the RSGB. The subject matter covers everything from Rho to Radiation Resistance, from Filtering to Fractal Aerials, and from Solar Indices to Spurious Signals. The content is divided into six broad sections covering a huge range of amateur radio material. Beginners can find basic information about most of the things that matter in amateur radio, whilst old hands can find data that other textbooks often don't include. Edited from articles originally published in the RSGB house journal, *RadCom*, this is a reference book and guide to the FAQs of amateur radio. It is unmatched in its scope and relevance.

Size 240x174mm, 288 pages, ISBN 9781-905086-12-2

Non Members' Price £15.99 **RSGB Members' Price £9.99**

RF Design Basics

SALE SALE SALE



By John Fielding, ZS5JF

RF Design Basics is the latest book by acclaimed author John Fielding, ZS5JF. This book is a practical guide to Radio Frequency (RF) design rather than the more usual text book written for post-graduate electronics engineers. Aimed at those who wish to design and build their own RF equipment, this book provides a gentle introduction to the art and science of RF design. The fourteen chapters of *RF Design Basics* cover subjects such as tuned circuits, receiver design, oscillators, frequency multipliers, design of RF filters, impedance matching, the pi tank network, making RF measurements, and both solid-state and valve RF power amplifiers. One chapter explains the meaning of S parameters, while another is devoted to understanding the dual gate Mosfet. Much attention is given to the necessity of cooling valve PAs and there is even a practical design for water cooling a large linear amplifier, a subject overlooked by most other publications. *RF Design Basics* neatly fills the gap between a beginner's 'introduction to radio' and RF design text books. Written for the average radio amateur, this book is an accessible and useful reference work for everyone interested in RF design.

Size 210x297mm, 192 pages, ISBN 9781-9050-8625-2

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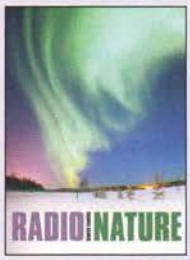
Radio Nature



By Renato Romero, IK1QFK

Radio signals are not, as is commonly thought, recent phenomena. Nature has spoken through radio signals since the origins of the Universe. *Radio Nature* is fascinating look at these signals, a guide to receiving and analysing them. *Radio Nature* describes these strange signals coming from our own planet and beyond. There is information about tweeks, insects, whistlers, choruses and even flying saucers (nothing to do with spaceships). Readers are provided with details of artificial and false signals that can confuse the natural radio listener. For the more committed there are designs for simple receiving equipment and antennas along with guides to how you can use simple receiving equipment to hear natural radio. *Radio Nature* is truly a book for all. If you are a beginner the book opens up a fascinating area for you. For the more committed this provides a comprehensive guide to natural radio and useful reference work.

Size 174x240mm, 256 pages
ISBN 9781-9050-8637-5

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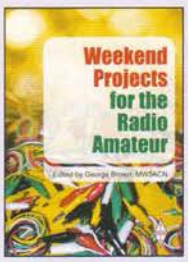
Weekend Projects for the Radio Amateur



By George Brown, MW5ACN

If you are interested in construction or just good advice this is a book for you. As the title suggests *Weekend Projects for the Radio Amateur* is packed with over sixty articles covering a wide variety of projects for every radio amateur. This book is broken down into two main parts: Build It Yourself and Reference with the first part split further into three sections Aerials, General and Station Accessories. The Aerials section, contains six antennas for you to try along with antenna information and maintenance. The reader is treated to a design for an 80M transceiver and getting into the 10GHz band in the General section. The Station Accessories section contains dozens of projects. The books Reference part is packed full of interesting articles. *Weekend Projects for the Radio Amateur* has something for everyone, from those just looking for construction ideas to newcomers to the hobby, looking to expand their knowledge.

Size 240x174mm, 224 pages
ISBN 9781-9050-8641-2

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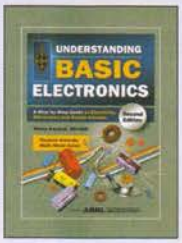
RSGB Members' Price £11.89

ARRL Understanding Basic Electronics



By Walter Banzhaf, WB1ANE

A Step-by-Step Guide to Electricity, Electronics and Simple Circuits

This is new edition of the highly popular *Understanding Basic Electronics.* The book is designed as a gateway into the exciting world of electricity and electronics, written in an easy-to-understand style. It is ideal for beginners and non-technical readers searching for more information on the basic principles of electronics. Written in "bite-sized" chunks, readers will find material from digital electronics, DC and AC circuit concepts and even explanations of semiconductor material, integrated circuits, FETs and much more. There are many "real world" examples and illustrations along with small "kitchen table" projects which help to bring abstract concepts to life.If you are interested in widening your knowledge of electronics or simply filling in gaps in your knowledge *Understanding Basic Electronics* is recommended reading.

Size 274x208mm, 384 pages
ISBN 9780-8725-9082-3

Non Members' Price £26.99
RSGB Members' Price £22.94

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Technical books

RTTY/PSK31 for Radio Amateurs

By Roger Cooke, G3LDI

Data modes appear to be a daunting prospect to newly licensed radio amateurs, but they do not have to be. This book is a practical guide to the two most popular data modes, RTTY and PSK31.

RTTY is the oldest real Data mode and was first used on the amateur bands over 50 years ago. In those days it was a complex mode to use, with teleprinters and home made transmitters to modify. However, in the computer age, it is much easier to both use and set up. *RTTY/PSK31 for Radio Amateurs* provides you will all you need to know to get the most out of this fascinating area of amateur radio. Readers will find details of where to find data modes on the amateur bands, through getting started, to making the most from both these modes. DXpeditions and contests use these modes and there is lots of information on getting the best from these too.

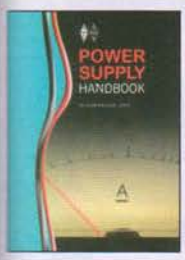
Free CD

The free CD that accompanies this book provides an A-Z of amateur radio data mode programs, equipment reviews, lots of reference material and web links, essential reading for anybody interested in Data.

Size 240x174mm, 32 pages, ISBN 9781-9050-8652-8

Non Members' Price £7.99
RSGB Members' Price £6.79

Power Supply Handbook



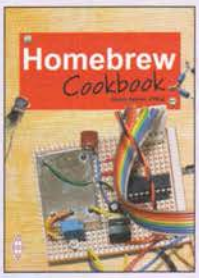
By John Fielding, ZS5JF

Have you ever wondered how your power supplies work? Have you ever wanted to build or modify a power supply but haven't had the confidence? Do you need a supply that is difficult to find or expensive to buy? The *Power Supply Handbook* answers all of these questions, and much more. This book provides all that is required to understand and make power supplies of various types. *Power Supply Handbook* is written in an easy to approach style and explains how to select each of the components in a power supply, how the various types of circuit work and how to measure the finished supply. This book teaches the reader how to be confident with building, maintaining and using power supplies of all types. From the new home constructor looking for a straightforward guide through to those seeking a practical reference book, all will find this book a useful and a must for their bookshelf.

Size 240x174mm, 288 pages, ISBN 9781-905086-21-4

Non Members' Price £15.99
RSGB Members' Price £13.59

Homebrew Cookbook



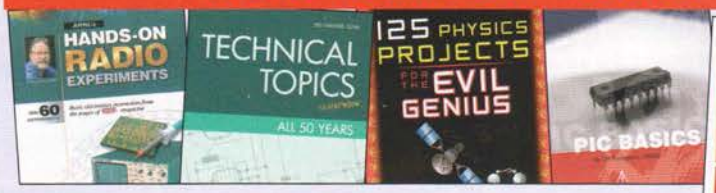
By Eamon Skelton, EI9GQ

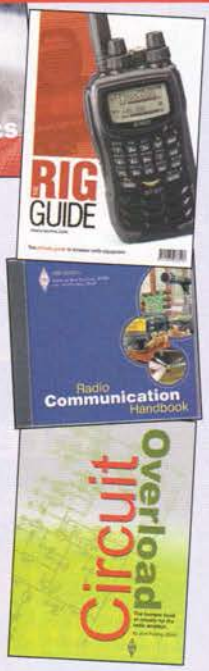
If you are interested in home construction, Eamon Skelton, EI9GQ is the acknowledged expert in this field. The RadCom columnist on the subject, Eamon brings his enthusiasm, common sense and easy to understand approach to the Homebrew Cookbook, such that readers will be reaching for their soldering iron with inspiration. Homebrew Cookbook starts with the very basics of hombrew and progresses to advanced topics. There are construction methods that take you right through all the main techniques from dead-bug layouts through to dedicated printed circuit designs. The PCB section is packed with simple ideas that will allow you to make PCBs cheaply and easily without any specialist equipment. Eamon even shows you how to use sunshine or cheap halogen security lights as a UV source! Construction projects start with receiver designs and a simple direct conversion receiver, followed by a more sophisticated superhet receiver. Homebrew Cookbook also includes an SSB transmitter, PA and a VHF transverter. All the designs are modular, making it very easy to extract sections for other uses and adapt the designs to suit your needs. Where test equipment is required Eamon has simple circuits on hand to allow you to build your own rather than have to buy commercial equipment. Eamon also deals with homebrew antennas with lots of useful tips for making practical and effective antennas with junk-box components. Through the book is an adherence to homebrew principles as all projects use simple construction techniques with cheap, readily obtainable, components. Eamon even tells you how to make the most of eBay to find what you need. The Homebrew Cookbook is an edited, updated book of Eamon's writings from the pages of RadCom and a fantastic reference with simple, well-proven solutions to most construction problems. Homebrew Cookbook will have you itching to dust off the soldering iron and start construction.

Size 174x240mm, 208 pages, ISBN 9781-9050-8657-3

Non Members' Price £12.99 **RSGB Members' Price £11.04**

More Technical Books





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125 Physics Projects for the Evil Genius	£14.99	**£12.74**
ARRL Hands-On Radio Experiments	£14.99	**£12.74**
HF Amateur Radio	£12.99	**£11.04**
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ARRL Emergency Power for Radio Comms	£14.99	**£12.74**
25 years of Hart Reviews	£14.99	**£12.74**
ARRL's RF Amplifier Classics	£14.99	**£12.74**
Digital Modes for all Occasions	£16.99	**£14.44**
RSGB Technical Compendium	£17.99	**£15.29**
Technical Topics Scrapbook - All 50 years	£14.99	**£12.74**
Technical Topics Scrapbook 1995-99	£14.99	**£12.74**
Technical Topics Scrapbook 1990-94	£13.99	**£11.89**
ARRL Experimental Methods in RF Design	£34.99	**£29.74**
ARRL Hints & Kinks for the Radio Amateur	£13.99	**£11.89**
ARRL Image Communications Handbook	£19.99	**£16.99**
ARRL Digital Signal Processing Technology	£34.99	**£29.74**
Introduction to Radio Frequency Design	£29.99	**£25.29**

RSGB Members' Prices displayed **BOLD**

3 Abbey Court, Priory Business Park, Bedford, MK44 3WH
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E&OE **All prices shown plus p&p**

Radio Society of Great Britain
www.rsgbshop.org

HF F-Layer Propagation Predictions for July 2011

Compiled by Gwyn Williams, G4FKH

	3.5MHz	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	24.9MHz	28.0MHz
Time	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220
(UTC)	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020
*** Europe								
Moscow	77	74......3688	87..2..27888	.37777777874	...7776678..	.....	.....	.....
*** Asia								
Yakutsk	.....	.....	3......34554	766676677777	....544.....	.....	.....	.....
Tokyo	.....	.....	.....	.....	.....	.....	.....	.....
Singapore	.........22.	........788.	........563.	........53..	........5...	.....	.....	.....
Hyderabad	.....	355	2666	5555	........4...	.....	.....	.....
Tel Aviv	8........899	98......8999	573....47888	...33..4785.	........56..	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	.....	68.......73.	997......899	987.......99	5.........66	55	.....	.....
Perth	.....	2622	........34.5	3	.....	.....	.....	.....
Sydney	.....	........37..	........67..	.........3..	.....	.....	.....	.....
Melbourne (LP)	.....	2992.....	8998.......7	9997......59	8.8.......79	68	.....	.....
Honolulu	.....	.....	.....	.....	....4.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....	.....	.....	.....
W. Samoa	.....	.....	.....	.....	...444.....	.....	.....	.....
*** Africa								
Mauritius	2.........22	5.......5887	8886	.......3876.	.......475..	........5...	.....	.....
Johanesburg	.....	.........22.	8873	.......485..	.....	.....	.....	.....
Ibadan	1.........11	66.......556	772.....3777	.47.....7777	..76....873.	...7....75..	........6...	.....
Nairobi	3.........34	8........888	63......2666	.5......6676	..3....5666.	......4466..	.....	.....
Canary Isles	76.......267	886......788	8874....6888	8684....8888	..7988899998	...88787998.	........56..	.....
*** S. America								
Buenos Aires	.....	652........3	888.......78	756.......78	565	.........45.	.....	.....
Rio de Janeiro	.....	66.........26	885......389	75........788	776	.........65.	.........4..	.....
Lima	.....	653........3	8872......68	7455......78	66	.........5.	.....	.....
Caracas	.....	33.........3	8873......78	86873....588	65445787	764	.....	.....
*** N. America								
Guatemala	.....	33..........	877........7	644.......37	44	.....	.....	.....
New Orleans	.....	65..........	776........6	73........56	.........3.	.....	.....	.....
Washington	2..........	662........4	8863......37	85..4....577	.........56.	.....	.....	.....
Quebec	5..........	76.........7	775.......68	5675	.....	.....	.....	.....
Anchorage	.....	.....	33.........3	556543556666	..55...66676	.....	.....	.....
Vancouver	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco	.....	.....	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....	.....	.....	.....	.....

KEY: Each number in the table represents the expected circuit reliability, eg '1' represents reliability between 1 and 19% of days, '2' between 20 and 30% of days, etc. No signal is expected when a '.' is shown. **Black** is shown when the signal strength is expected to be low to very low, **blue** when it is expected to be fair and **red** when it is expected to be strong. The RSGB Propagation Studies Committee provides propagation predictions on the internet at **www.rsgb.org.uk/propagation/index.php**. An input power of 100W and a dipole aerial has been used in the preparation of these predictions; therefore a better equipped station should expect better results. The predicted smoothed sunspot numbers for July, August and September are respectively (SIDC classical method – Waldmeier's standard) 61, 67 & 73 and (combined method) 64, 69 & 75. The provisional mean sunspot number for May 2011 was 41.6. The daily maximum / minimum numbers were 82 on 30 May and 8 on 24 May.

RadCom

Getting listed here and on GB2RS is easy. 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. August *RadCom* is 1 July and for the September edition it's 2 August. For GB2RS, the deadline is 10am on the Tuesday for the week of broadcast.

1 SCOTLAND SOUTH & WESTERN ISLES

REGIONAL REP: LEN PAGET, GM0ONX, RM1@RSGB.ORG.UK

BORDERS ARS
Danny, 2M0CDO, 01890 882850
8 Visit by RSGB President Dave Wilson, M0OBW
16 Special event station at Birgham Village Fete

COCKENZIE & PORT SETON ARC
Bob, GM4UYZ, 01875 811 723
2 Weekend event: VHF Field Day
30 Weekend event: RSGB IOTA Contest from the Island of Tiree

KILMARNOCK & LOUDOUN ARC
Graham, MM3GDC, mm3gdc@btinternet.com
12, 26 Club night

LIVINGSTON & DARS
Norman, 07740 946192, uk.groups.yahoo/group/ms0liv
5, 19 Club evening
12 Operating evening
26 Morse code practice

2 SCOTLAND NORTH & NORTHERN ISLES

REGIONAL REP: DENNY MORRISON, GM1BAN, RM2@RSGB.ORG.UK

No entries received this month

3 NORTH WEST

REGIONAL REP: KATH WILSON, M1CNY, RM3@RSGB.ORG.UK

BOLTON WIRELESS CLUB
boltonwireless@gmail.com
11 Walking the Pennine Way, Tom, M1EYP & Jimmy, M3EYP
25 Activity night

SOUTH MANCHESTER R&CC
Ron, G3SVW, 0161 969 3999
7 Antenna clinic, Ron, G3SVW
14 Antenna clinic
21 Simple electronic test equipment, Ged, G8RSI
25 Tech forum
28 Component overview – RLC, Ron, G3SVW

SOUTH NORMANTON ALFRETON & DARC
A Lawrence, 2E0BQS, adylawri@btinternet.com
4 Night at the shack, fish and chips £1.50 each
11 Natter night
18 Junk sale
25 Crich (tbc)

THORNTON CLEVELEYS ARS
www.tcars.org.uk
4 Natter night
11 Oscilloscopes by Mick, G4EZM
18 Barbeque at John, G4FRK's
25 Field day on the beach (weather permitting)

4 NORTH EAST

REGIONAL REP: HAROLD SCRIVENS, GOUGE, RM4@RSGB.ORG.UK

ANGEL OF THE NORTH ARC
Nancy Bone, G7UUR, 0191 477 0036, nancybone2001@yahoo.co.uk
4, 11, 25 OTA, natter night
18 Talk by Geoff Darby on RAYNET with exercise following a disaster

DENBY DALE RC
Richard, M0RBG, 07976 220126, m0rbg@talktalk.net
23 Weekend event GB200HNC – Huddersfield Narrow Canal bicentenary celebrations

EAST CLEVELAND ARC
Alistair, G4OLK, 01642 475 671, alistair.mackay@talk21.com
1, 15, 29 On the air
8 Bring in something interesting evening
22 Radio components catalogues evening

HAMBLETON ARS (NORTHALLERTON)
Tony Wilson G3MAE, 01609 881530
13 Valve theory, Tony, G8FLV
27 Junk sale

HORNSEA ARC
Gordon MacNaught, G3WOV, 01377 240573, gmacnaughtwov@yahoo.co.uk
4 80m CC CW
6 USA trip, Andy, G0VRM
13 80m CC SSB plus DVD
17 Low Power Contest
20 Foxhunt, Richard, G4YTV
21 80m CC Data
27 Club SSB and Bewholme BBQ
30 Weekend event – IOTA Contest, Bewholme

RIPON & DARS
Rob Hall, M0RBY, 0787 608 5631, www.ripon.org.uk
7 Poundshop antenna challenge
14, 21, 28 On the air and club night

SHEFFIELD ARC
Peter Day, G3PHO, sarc@g3pho.org.uk
2 Weekend event: VHF NFD Contest, G2AS/P at Wharncliffe
4 Informal social evening + RSGB 80m Club Contest (CW)
11 Make your own balun, G3PHO
18 Portable at Whitely Woods & Club Fields; BBQ at club HQ
25 Summer fox hunt
30 Weekend event IOTA Contest

5 WEST MIDLANDS

REGIONAL REP: VAUGHAN RAVENSCROFT, M0VRR, RM5@RSGB.ORG.UK

CHELTENHAM ARA
Derek Thom, G3NKS, 01242 241099, chairman@caranet.co.uk
21 The PIC-a-STAR project by G3LVP

COVENTRY ARS
John, G8SEQ, 07958 777363
1 Talk on the Projected Picture Trust
3 Weekend event, GB4BLC at the 30th Signal Regiment open day, Gamecock Barracks
8 Bunkers On The Air – Meriden, Haseley Knob & Wolston
15 3rd Round G2FDC 2m DF Trophy
22 Video night
29 Radio workshop – PSK31/RTTY

GLOUCESTER AR&ES
Anne, 2E1GKY, 01452 548478, daytime, www.g4aym.org.uk
4 VHF operating or digimodes
11 Saul Junction Canal – picnic/operating
18 Informal meeting
25 Closed

MIDLAND ARS
Norman, G8BHE, QTHR, 01214 229 787
6 Open night, shack on the air and training classes
13 Committee meeting and training classes
20 Laptop computers and training classes
27 Outdoor social: BBQ, party food and drink

MID-WARWICKSHIRE ARS
Don, G4CYG, 019 2642 4465
12 DF activity – John, M0JDB
26 Technical topics

SOUTH BIRMINGHAM RS
Don, 0121 458 1603, www.radioclubs.net/southbirmingham
1 Loading trailer for VHF NFD
2 VHF NFD weekend event on site at Waysley Hills
4 Field day debrief and shack on the air
6 Lecture in the main hall
7, 14, 21, 28 Training classes with Dave Murphy, G8OWL
8, 15, 22, 29 Construction evening
11 Painting the shack
18 Open meeting with shack on the air
25 Rally visits and field day planning

STRATFORD UPON AVON DRS
G0CHO, 01608 664488, cousbey@theiet.org
11 BBQ and night on the air
25 Construction competition

TELFORD & DARS
Mike, G3JKX, 01952 299 677, mjstreetg3jkx@blueyonder.co.uk
2 VHF NFD weekend event at Long Mynd – all welcome
6 Committee meeting & HF/VHF OTA
12 Hamfest committee/ A at Stafford Park
13 NFD debrief/scores etc
20 Build/fly a kite at LWVH field, quiz if inclement.
27 Guernsey prep, scopes practice

WORCESTER RAA
Rich Moles, 2E0MOL, secretary@m0zoo.co.uk
12 Open meeting, all welcome to join us
26 Construction night

6 NORTH WALES

REGIONAL REP: MARK HARPER, MW1MDH, RM6@RSGB.ORG.UK

DRAGON ARC
Stewart Rolfe, GW0ETF, 07833 620733
4 Open meeting
18 IOTA contest planning

WREXHAM ARS
Patrick, 2W0HUU, 07947 701 927, www.wrexham-ars.co.uk
5 Fox hunt
19 Quiz

7 SOUTH WALES

REGIONAL REP: JIMMY SNEDDON, MW0EQL, RM7@RSGB.ORG.UK

No entries received this month

8 NORTHERN IRELAND

REGIONAL REP: PETER LOWRIE, MI5JYK, RM8@RSGB.ORG.UK

BANGOR & DARC
Mike, GI4XSF, 028 4277 2383
2 Annual BBQ, Crawfordsburn Country Park

GREENISLAND ELECTRONICS AMATEUR RADIO SOCIETY
Peter Lowrie, MI5JYK, mi5jyk@rsgb.org.uk
13 2m VHF OTA

9 LONDON & THAMES VALLEY

REGIONAL REP: ALISON JOHNSTON, G8ROG, RM9@RSGB.ORG.UK

BROMLEY & DARS
Andy, G4WGZ, 01689 878089
19 Practical operating evening

BURNHAM BEECHES RC
Dave, G4XDU, 01628 625 720
4 McMichael Rally meeting
18 The RSGB by R9 RM Alison, G8ROG

COULSDON ATS
Steve Beal, G3WZK, secretary@catsradio.org
11 Radio Susy by John, G8MNY

CRAY VALLEY RS
Bob, M0MCV, 020 8265 7735 after 8pm
7 Whirlwind tour of Central America by Roger Western, G3SXW
21 Summer social, The Bull PH, Shooters Hill

CRYSTAL PALACE R&EC
Bob, G3OOU, 01737 552 170, g3oou@aol.com
1 Construction evening

DORKING & DRS
Garth, G3NPC, 01737 359472, www.ddrs.org.uk
26 South Downs evening

ECHELFORD ARS
John, G4GSC, 01784 451898, jho_g4gsc@talktalk.net
14 The GB3VHF Story by Chris Whitmarsh, G0FDZ
28 Bring & Buy, CW practice, natter night

EDGWARE & DRS
Mike, G4RNW, 020 8950 0658, michael.stewart5@ntlworld.com
14 DVD: The spies who lost the Battle of Britain
28 Natter night

NEWBURY & DARS
Rob, G3LMW,
01635 862737,
g4lmw@btconnect.com
17 Low power contest
23 Club BBQ
30 IOTA contest

RADIO SOCIETY OF HARROW
Linda, G7RJL, 0208 386 8586,
www.g3efx.org.uk
8 Cave radio and electronics by Rob, G8DSU
22 Talk
30 Weekend event, BiWOTA at Rickmansworth Canal

READING & DARC
Pete, G8FRC,
01189 695 697
7 Wireless workshop evening: what if my antenna won't load up?
14 Radio at the London 2012 Olympics by Tom Grady, G6IGA
17 McMichael Radio Rally at Reading Rugby Club

SHEFFORD & DARS
David, G8UOD,
01234 742 757,
www.sadars.co.uk
2 VHF National Field Day weekend event
7 Pedestrian 2m DF hunt

SOUTHGATE ARC
David Sharp, M0XDS,
david.sharp1@tesco.net
13 Talk about aerials

SURBITON HERITAGE, AMATEUR RADIO & ELECTRONICS SOCIETY
Phil, M0PBM, 020 8390 6053
6, 20 Event details are only arranged near the date

SURREY RADIO CONTACT CLUB
John, G3MCX, 020 8688 3322,
john.g3mcx@btinternet.com
4 Club BBQ
18 Fix-it, advice, chinwag & move-it-on

VERULAM ARC
Tony, 2E0WAP, 01727 853087
7 Social with GB3VH, 7.30pm White Horse, Sandridge
19 Data Modes, radio to PC connection, CAT etc, Peter, G4HSO

WEY VALLEY ARG
www.weyvalleyarg.org.uk
1 Summer barbecue
15 Club night

WIMBLEDON & DARS
Andrew Maish, G4ADM,
020 8335 3434
8 Summer camp preparation
29 Summer camp setup

10 SOUTH & SOUTH EAST

REGIONAL REP: GAVIN KEEGAN, G6DGK, RM10@RSGB.ORG.UK

BREDE STEAM ARS
Steve, 01424 720815,
M0NUC@aol.com
2, 5, 12, 29, 26 At the shack

HARWELL ARS
Malcolm, G8NRP,
01235 524844,
info@g3pia.org.uk
12 Summer DF hunt
26 Shack activity night

HASTINGS E&RC
Gordon, 01424 431 909,
www.herc.uk.net
23 Trip to Bletchley Park

HORNDEAN & DARC
Stuart, G0FYX,
023 9247 2846,
www.hdarc.co.uk
3 Club coach trip to Bath
7 Natter night/social evening
21 St Helena talk by Mrs Matthews

HORSHAM ARC
www.harc.org.uk
7 Radio researches, David Sumner, G3PVH
14 Social, The Royal Oak, Wineham
28 Thursday evening fox hunt

MID-SUSSEX ARS
Peter, G4AKG,
01444 239371
1 Windmills evening (hall closed)
8 Radio night and prep for NFD
15, 29 Radio night
22 Chairman's BBQ at G6YPY QTH (hall closed)

SOUTHDOWN ARS
John, G3DQY,
01424 424 319
4 Annual barbecue at Hilary's, M1HLG
6 Operating at Hailsham shack

SWINDON & DARC
Den, M0ACM,
07810 317750,
www.sdarc.net
7 DF contest
14 Activity night
21 The building of aerial tuning units, Peter, G3RZP
28 Activity night and prep for IOTA contest

TROWBRIDGE & DARC
Ian, G0GRI,
01225 864 698, E/W
6 Antenna Tuning Units, Peter Chadwick, G3RZP
20 Natter night

11 SOUTH WEST & CHANNEL ISLANDS

REGIONAL REP: PAM HELLIWELL, G7SME, RM11@RSGB.ORG.UK

APPLEDORE & DARC
Brian Jewell, M0BRB,
01237 473251
18 My trip to Patagonia/Easter Island by Beryl, G1SVP

BRISTOL RSGB GROUP
Robin, G3TKF,
01225 420442
17 Bring and Buy at QRP in the country, G3PCJ's, Long Sutton, Langport
25 Chat night / potted lectures

CORNISH RADIO AMATEUR CLUB
Steve, G7VOH,
01209 844939,
G7VOH@btinternet.com
6 Committee Meeting at Gweal-An-Top School
7 Photo Shop by Ian
9 Setting up Cornish Rally 2-4pm
10 Cornish Rally, Penair School
14 Workshop evening

EXETER ARS
Nick, 01363 775756,
info@exeterars.co.uk
11, 25 Club night at the Moose Centre

MID SOMERSET ARC
Nick, M6NJB,
01749 346320,
nick.bennett@midsarc.org.uk
12 Beer, BBQ, natter, Bring and Buy sale

PLYMOUTH RC
Chris M0ZCP, 07834 767 161,
chrisparker33@hotmail.com
2 RSGB VHF NFD weekend event at Tor Royal Lane field, Princetown
12 Demo of SSTV over HF and VHF to a laptop
30 Islands On the Air weekend event, Tor Royal Lane field

SOUTH BRISTOL ARC
Andrew Jenner, G7KNA,
07838 695471
2 VHF National Field Day weekend event
7 VHF National Field Day debriefing
14 Thermionic valves
21 ROTA second planning session
28 On the air

TAUNTON & DARC
William, G3WNI,
01823 666 234,
g3wni@btinternet.com
6 Amateur & professional deep space comms networks, Michael Johnson
17 Attending QRP in the Country rally
20 Committee meeting

TORBAY ARS
Dave, G6FSP,
g6fsp@tars.org.uk
1, 8, 15, 22 Natter night
29 G8XST and the GB3TR repeater

WEST DEVON RC
Jules Cuddy, M1AGY,
01752 291588
5 Bring & Buy and general natter night
19 Digital modes night, practical demos

YEOVIL ARC
Steve Crask, G7AHP,
steve@g7ahp.co.uk
7 4m antenna, G0VFK
14 Propagation band by band, G3MYM
21 VHF, UHF portable solutions
28 Committee meeting & on the air

12 EAST & EAST ANGLIA

REGIONAL REP: NEIL WHITESIDE, G4HUN, RM12@RSGB.ORG.UK

BITTERN DX GROUP
Linda, G0AJJ, 01692 404154,
secretary@bittern-dxers.org.uk
2 RSGB VHF Field Day contest weekend event
14 Informal meeting, Pinewood Park Leisure Club
16 Banningham Village Fete
28 Club meeting at Pinewood Park Leisure Club
30 RSGB IOTA contest weekend event

BRAINTREE & DARS
John, M5AJB, 01787 460 947
4 Evening DF hunt
18 6m/10m operating evening

CAMBRIDGE & DARC
Ron, G3KBR, 01223 501712
8 Active probe construction evening, Mike, M0BLP
22 Video evening: PYE, how we began and The Wonder Jet

CHELMSFORD ARS
Martyn, G1EFL,
01245 469 008,
www.g0mwt.org.uk
5 Quality Table Top Sale, Colin, G0TRM

12, 19, 26 Club net night
13 Committee meeting, Danbury Village Hall

COALHOUSE FORT ARS
John Parker, M1DUC,
coalhouserad1o@yahoo.com
31 Classic vehicles

COLCHESTER RADIO AMATEURS
Kevan, 2E0WMG, 07766 543784,
kevan2e0wmg@live.co.uk
21 Club equipment night

EAST KENT RS
Karl Davies, M1DFM, 01227 710120, karl.davies@talk21.com
2 BBQ at Paul Nicholson's house

FELIXTOWE & DARS
Paul, G4YQC, pjw@btinternet.com
3 Darrell Day, SES GB2FX, Landguard Museum, Felixstowe

HARWICH ARIG
Kevan, 2E0WMG, 07766 543784
kevan2e0wmg@live.co.uk
13 Scrap Heap Challenge by Matt, M0ZZO

HAVERING & DARC
John, M0UKD, 07890 222111,
john@m0ukd.com
6 Quarterly business meeting
13 BBQ at Fairkytes Arts Centre
20 Informal evening and Morse class, Peter, G3JSR
27 Beginners guide to contesting, Dave, M0TAZ

LOUGHTON & EPPING FOREST ARS
Marc Litchman, G0TOC,
020 8502 1645
2 Air Britain fly-in, North Weald Airfield, GB2NWA
10 Scout's Donkey Derby
16 Annual summer get-together, Aylmers Farm, Old Harlow

LOWESTOFT & DISTRICT PYE ARC
Lee, 2E1LJL, 01502 564242,
leejlewis@hotmail.co.uk
2 VHF Field Day weekend event, G8PIR/P
7, 14, 21, 28 Club night at shack
17 RSGB Low Power Field Day

NORFOLK ARC
Chris Danby, G0DWV,
01603 898678,
cmdanby@btinternet.com
3 NARC Barford Rally
4 RSGB CC CW contest
13 Informal / Construction / Shack / RSGB CC SSB contest
17 Radio by the Seaside at West Runton, North Norfolk (including Low Power Field Day)
20 The DX Cluster GB7RDX and BBS GB7LDI by Roger Cooke, G3LDI
21 RSGB CC Data contest
27 Informal / Construction / Shack / Bright Sparks

WEST KENT ARS
Les, G6UBM,
westkentars@googlemail.com
11 Club EGM and natter night

Continued on page 86

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 89).

FOR SALE

SOLID STATE PA. This is a commercial PA unit, just requires 50V supply. Unit has 4x MRF150 high power transistors and a 27.12MHz crystal oscillator. It has wideband ferrite transformers so would easily convert to HF bands. £50. G4UVZ, 01823 421751, adrianwhatmore248@btinternet.com (Taunton).

80' HD TOWER with multi ele Q Quad plus other antennas, separate radio shack and other equipment for sale all within 16 acre smallholding, 5 bedroom house in its own grounds. Will not split. POA. GW3NAS, 01545 581108 (Synod Inn, Wales).

800mm OFFSET FEED satellite dish with fixings for pole. Used, but in good condition, free for collection from Wadhurst, East Sussex. Jack Edgecock, G1NZH, 01892 784128, (Wadhurst, East Sussex).

ALTRON 3 section triangular mast with head and luffing winches, base and wall mounted, £150. G3KZN, 01474 355736 (Gravesend).

AMERITRON AV-620 vertical antenna plus manual, 20m to 6m, no radials required, minor repair required hence £150. Marconi Instruments signal generator AM FM CW 1.5 to 220MHz, deviation up to 75kHz, £50. All buyer collects. Bernard Whitty, G3HWX, 01704 840328 (Ormskirk, Lancs).

bhi NES10-2 MK II noise eliminating speaker. As new and boxed, £65 ono plus carriage costs. Ray, G4OWY, 0790 9383 475 after 6pm please, g4owy6@gmail.com (Weymouth).

CAPCO SPC-3000 ATU, £125. CapCo SPC 300 ATU, £95. Nevada TM-1000 ATU, £105. Heath Cantenna dummy load, £35. Black Star Meteor frequency counter, £35. Tektronix 485 osc, £75. Marconi VTVM TF 1041, £25. KW SWR meter, £25. Collect Bath area. Fred, G1OPZ, 01373 834483, fred.g1opz@gmail.com (Somerset).

CHALLENGER 3 GS35 AMP. Hardly used, £1200. SPC Super Tuner, £250. Very special 70cm 1500W GS35 tube amp, one-off build by Linear Amp, 5k transformer, £1800. 2x Icom IC-7400 with TXCO, £725 each. 2x 8-ele 4m Yagis, £200 the pair. Trev, G2KF, 0797 4892179 (Cornwall).

ICOM RC-70 in superb condition, no marks. FM board fitted, circuits, handbook, ICOM receipt. Not used for 4 years except to power it up. £100, no offers. Collect/carriage at cost. John, G3YJD, 01908 379250, john80davies@btinternet.com (Milton Keynes).

J A EWEN, G3HGM, is dismantling his station and offers his equipment for measuring current, voltage, resistance, capacitance, inductance, frequency etc and calibration of homebrew gear at very moderate cost. E-mail or phone for list. J A Ewen, G3HGM, 01582 733436, john.ewen@mypostoffice.co.uk (Luton).

JRC NSD-515D transmitter. 100W version with matching power supply. Good condition, £550. Buyer inspect/collects. David, G4HMC, 01844 347376, jdoliver500@aol.com (Princes Risborough, Bucks).

KENWOOD PS-430, DC power supply, for spares or repair, £35. Avometer 8 Mk 5, reasonable condition, £25. Ken Scott, G4FOY, 07867 858069, mail@kenscott.biz (Alton, Hants).

KENWOOD TS-2000E, very little use, immaculate, almost new, boxed with manuals, fist mic, DC cable and unused rear DIN connectors. Owned since new, £1000. Buyer to collect please, or by arrangement. Hugh, M0ACF, 01480 394679, m0acf.philps@ntlworld.com (St Ives, Cambs).

KENWOOD TS-870 nine-band HF transceiver complete with built-in antenna tuner, mic and DC leads. Little used and in excellent condition. Boxed with manual, £525 ono. Demo can be arranged. Prefer buyer collect and inspect or carriage extra. John Nelson, G4KLA, 0121 476 6537 after 6pm (Birmingham).

MICROWAVE MODULES MML-144/100S 100W 144MHz linear amp & preamp, £110. Diamond GZV-2500 12V 25A PSU, £80. Plus postage. Graham, G3OHC, 01483 808419, g3ohc@uksmg.net (Guildford - not QTHR).

MQ-26SR 6 band quad hybrid antenna with balun, immaculate condition. £450. GB Tri-band base antenna for 6/2/70, immaculate condition, £100. Buyer collects. Alan, G7CDK, 01763 262443, aj.flo@virgin.net (Cambridge area).

SHACK CLEARANCE. Yaesu, Kenwood, Icom, Tarheel, Realistic. Many rigs and accessories. Contact me for list. Terry Genes, G4POP, 01621 784984 (Burnham on Crouch).

SHARMONS X300 2/70cm 7.5dB, 10.5dB on 70cm. Same antenna as a Diamond quality. 6 months old, £75 ono. F Sadler, M0CVS, 01629 823025 (Matlock, Derbyshire).

SILENT KEY SALE. Kenwood R-5000 receiver, VGC, 0-30MHz, 108-174MHz. Instruction manual and power lead included. Fully tested. £350 ono, collect or + P&P. David Brunton, G1XWX, 01986 875920, kkk49@hotmail.co.uk (Beccles, Suffolk).

SK CLEARANCE SALE. Alinco DX-70, Icom IC-706 MK2, FRG-7, Alinco DJ-G7. Icom IC-T8E, MFJ loop tuner, RigBlaster, Sennheiser HD215, 2x 4CX250 144MHz amp. Eddystone EC-10, 940 plus much more. Details from Leicester Radio Society secretary Alex, G8FCQ, 07531 201640 or http://g3lrs.co.uk (Leicestershire).

SK SALE on behalf of the late Mike Goodey, G3RPC. Kenwood TS-480HX HF-6m, 200W, £625. GZV-4000 40A switching power supply, £150. Prices include Royal Mail secure postage and insurance. Contact John, M1IOS (obo G3RPC's family), e-mail only, to m1ios@btinternet.com.

SMALL HOLIDAY GITE to rent, between Rennes and Nantes, will sleep 4 possibly 5 (2 adults + children). UK TV, totally self contained and detached. G6HKF, 01223 911263, rogermewtehig@yahoo.co.uk (Loire Atlantique, France).

TRIO/KENWOOD TR-9130 2m all mode transceiver. The radio is in excellent cosmetic condition for its age. Every function and mode works perfectly. See a pic on my QRZ page. Prefer for buyer to inspect/collect from Cardiff. £155 ono. Lyndon Leach, GW8JLY, 02920 576225 (Cardiff).

YAESU FT-847 Earth station. All HF, 6m, 2m, 70cm bands. Full two-way CAT interface. Wide Rx outside amateur bands. Complete with original MH31 dynamic mic, power leads and manual. Excellent condition. Non-smoking shack. Buyer collects or carriage arranged. £750 OVNO. Alan Martin, M0BMZ, 0208 394 1196, amartin@btinternet.com (Worcester Park).

WANTED

CIRCUIT DIAGRAM or manual for Katsumi electronic Morse keyer EK150. G3XXO, 01909 472316. eric.birks@virgin.net (Worksop).

COLLINS KWM-380 transceiver, also 30S-1 or 30L-1 linear. Can collect. Steve Westell, G3YFG, 07793 665000, g3yfg@btconnect.com (Clitheroe).

COMPLETE R234 RECEIVER or ATU, power supply, mains distribution unit and the 4 foot rack with slide bars. Money or swap ham gear. Joe, G4MGX, 07796 064199, g4.mgx@virgin.net (Bedford).

KENWOOD TS-870S. Must be 100% working, late serial number (starting with 8), cosmetic condition not so important. Delivery/collection to be discussed. Would exchange for my TS-480HX, just over 1 year old, excellent condition, with all mounting hardware and hand mic. Rob, G4FAX, 07713 084 244, rob.macfie@gmail.com (Luton).

KENWOOD TS-940S or TS-940SAT. Would also like accessories for this (AT-230 ATU, SM-200 station monitor, SP-940 speaker, SO-1 TCXO, optional crystal filters etc). David Kirkby, G8WRB, 01621 786052 (Althorne, Essex).

R1155 DF oscillator transformer L23, L/R crossover needle meter and loop aerial. Also circuit diagram for DF Test Set type 65. M0BGA, 01637 875848, rcry100@yahoo.com (Newquay).

SIMOCO SRM9000 transceiver, low band E0 model for 4m, with any microphone / control head or none at all. Matt, M3COX, 07836 326983, m3cox@live.co.uk (Berkshire).

SPARK KEY wanted please. Looking for a Marconi Morse key, Marconi's Wireless Telegraph Co Ltd, or any interesting Morse key from the spark era or more recent. John, G0RDO, 01626 206090, john@morsemad.com (Newton Abbot).

WIRELESS SET NO 38 MK 3, headgear no 11 or no 14. Stuart, M6AVC, 0161 928 2636 shfur@tiscali.co.uk (Altrincham).

WODEN UM3 modulation transformer. Variable capacitor 500pF split stator type as used in 1960s Z-match. Ferrite toroids, min 1.5" diameter, for use as balun cores. Ferrite rods, min 3/8" diameter, 6" long. All wanted for current projects/repairs. Bruce, G3WCE, 01692 538794, g3wce@grimblepoos.co.uk (North Walsham).

YAESU FRG-7 HF communication receiver in very good condition. Bose, VU2AMB, 00 91 93309 21105, vu2amb@gmail.com (Calcutta, India).

13 EAST MIDLANDS

REGIONAL REP: JIM STEVENSON, G0EJQ, RM13@RSGB.ORG.UK

BOLSOVER ARS
Alvey Street, G4KSY, 01246 827135
6 Natter night
13 DF test night
20 On the air
27 Project night

DERBY & DARS
Richard Buckby, radio@dadars.org.uk
5 Junk sale
12 Committee meeting
19 High Performance Software Defined Radio demo, Steve Haseldine, G8EBM
26 On the air

EAGLE RG
Terry, G0SWS, 01507 478590
12 Lincolnshire Integrated Emergency Service

FRISKNEY AND EAST LINCOLNSHIRE COMMS CLUB
Chris, M0MFP, 01507 442240
5 Repeaters, Brian, G7AJP

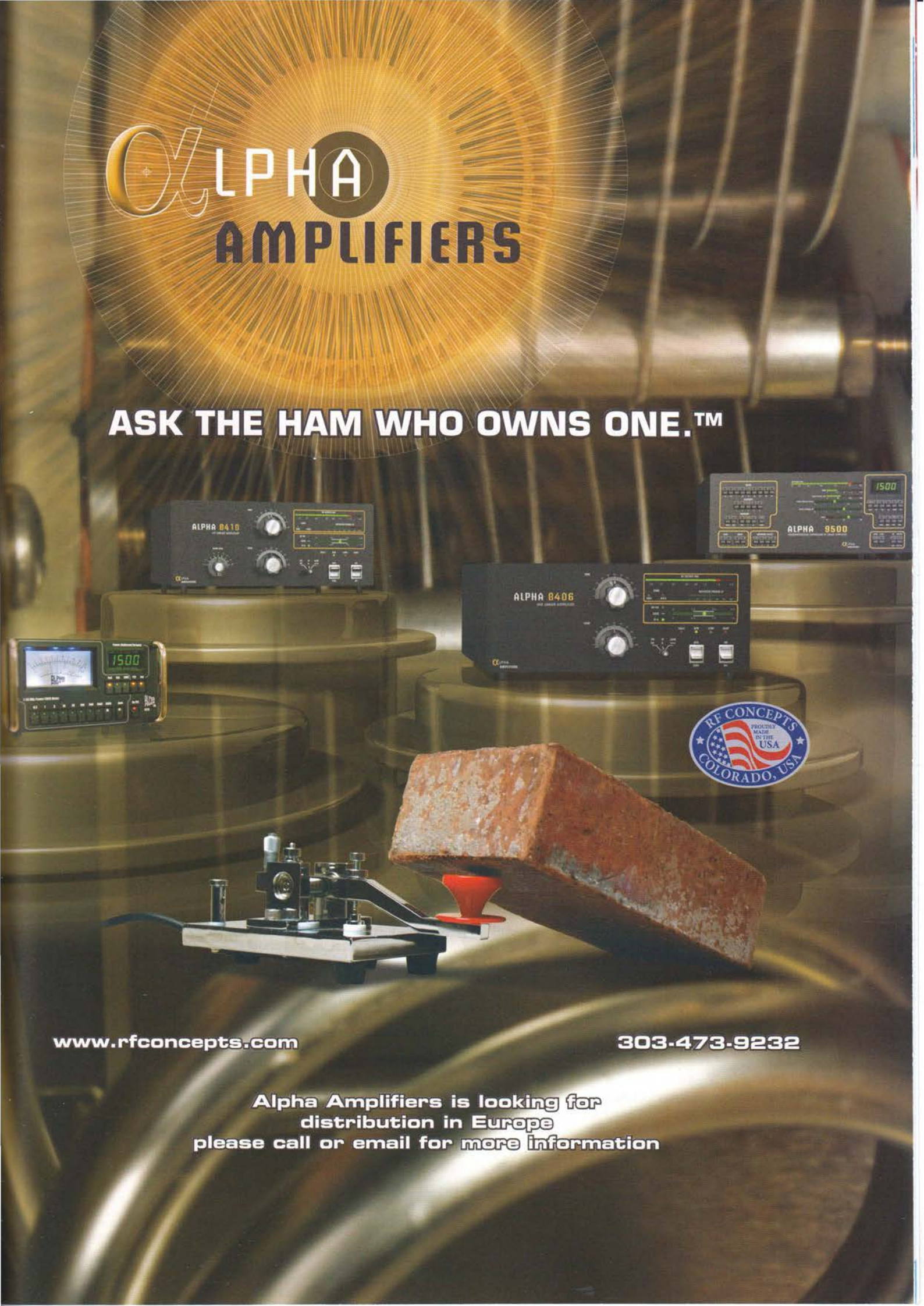
HINCKLEY ARS
John, M0JAV, 07836 731544, m0jav@lowgables.co.uk,
17 Low power Field Day

HUCKNALL ROLLS ROYCE ARC
Dave Wilde, G1YAI, 0844 4355593, secretary@hrrarc.com
2 VHF Field Day weekend event at Crich in Derbyshire
7 Fox hunt, starting at 19:15 GMT

LINCOLN SHORT-WAVE CLUB
Pam Rose, G4STO, 01427 788356, pamelagrose@tiscali.co.uk
1 VHF National Field Day weekend event
6 Clear up after field day; G5FZ on the air
9 In the Shack, Boutham Park, GB2CWP East Kirkby on the air
13 Antenna workshop: homebrew antennas
16 In the shack plus antenna workshop continued; GB2CWP East Kirkby OTA
18 Committee meeting
20 Formal meeting
23 In the shack; GB2CWP East Kirkby OTA
27 On the air; sort out for IOTA Contest
29 IOTA contest weekend event

SOUTH KESTEVEN AMATEUR RADIO SOCIETY
Nigel, M0CVO, 01476 402550
13 Questions and Answers evening
27 Dambusters Rally trip

WELLAND VALLEY ARS
Peter D Rivers, G4XEX, 01858 432105, g4xex@fsmail.net
18 DF Hunt & BBQ at Rupert's Viewpoint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RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond.

2 JULY – BANGOR AND DISTRICT ARS RALLY – Donaghadee Community Centre, County Down BT21 0HB. OT 12 noon, £2, TS, B&B, SIG. Ian White, GM3SEK, of RadCom fame, is giving a presentation on ferrite cores and baluns. Bill, GI4AAM, 028 9181 6707, bill.langtry@btinternet.com [www.bdars.com].

3 JULY – BARFORD NORFOLK RADIO RALLY – Barford Village Hall & Green, Barford, Norwich NR9 4AB, 9 miles SW of Norwich, close to A11 and A47. OT 9am, £1.50, children free, CP, TI S22, CBS, B&B, TS, WIN, DF, C. Contact radio@dcpmicro.com [www.norfolkamateurradio.org].

2 JULY – 2nd STOCKPORT RALLY (formerly REDDISH RALLY) – Walthew House, Shaw Heath, Stockport SK2 6QS. OT 10am, £1, TS, DIS, CP, C. Tables available £10 each. Details Bernard, G3SHF, 01625 850088 (daytime & weekends), info@stockportrally.co.uk [http://stockportrally.co.uk].

10 JULY – CORNISH RAC 48th MOBILE RALLY – Penair School, Truro, Cornwall, TR1 1TN. TS, B&B, C, TI, CP. OT 10.30, £2. Details Steve, 01209 844939, g7voh@btinternet.com. [www.cornishradioamateurclub.org.uk].

17 JULY – MCMICHAEL RALLY AND BOOT SALE – Reading Rugby Club, just off the A4 east of Reading. TI, free CP, £2, LB, C, SIG, WIN, TS, CBS. OT 9.30. Details Pete, G8FRC, 01189 695697, g8frc@radarc.org [www.McMichaelRally.org.uk].

17 JULY – QRP IN THE COUNTRY – Upton Bridge Farm, Long Sutton, Langport TA10 9NJ. SIG, B&B, LEC, C, LB, FAM. Free entry. Tim Walford, G3PCJ, 01458 241224, walfor@globalnet.co.uk [www.walfordelectronics.co.uk].

30-31 JULY – AMSAT-UK SPACE COLLOQUIUM – Holiday Inn, Guildford, GU2 7XZ. Lecture programme, GB4FUN, AMSAT Shop [www.uk.amsat.org].

31 JULY – HORNCASTLE SUMMER RALLY – Horncastle Youth Centre, Willow Road, Horncastle, Lincolnshire LN9 6DZ. 10.30, £1.50, DF, C. Tony, G3ZPU, 01507 527835.

31 JULY – COLCHESTER RALLY – CANCELLED

7 AUGUST – KING'S LYNN ARC RALLY & CAR BOOT – Gaywood Community Centre, PE30 4DZ. OT 10.00, £1.50, TS, CBS, C, CS (by prior arrangement). Ray, G3RSV, 01553 671307, ray-g3rsv@supanet.com [www.klarc.org.uk].

7 AUGUST – LORN RADIO AMATEUR RALLY – Crianlarich Village Hall, Crianlarich, near Oban FK208QN. OT 10.00 TS, B&B, C, WIN. GM0ERV, stewart.mciver@btinternet.com.

12 AUGUST – COCKENZIE & PORT SETON ARC 18th 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.

14 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 Mike, M0MJS, 01202 883 479, frars@frars.org.uk [www.frars.org.uk].

14 AUGUST – FRISKNEY & EAST LINCOLNSHIRE COMMUNICATIONS CLUB RALLY – The Friskney Village Hall, Church Road, Friskney, Lincs. 6.5 miles south of Skegness. OT 10am to 4pm, £1.50, CP, C, WIN, TI S22, DIS. Details Bren, 2E0BDS, 01754 820 060, felcc@btinternet.com [www.felcc.com].

20 AUGUST – GI HF CONFERENCE – Technology Education Centre, Omagh, BT78 1FA. Registration from 11am. Philip, MI0MSO, e-mail mi0mso@yahoo.co.uk.

21 AUGUST – RUGBY (PRINCETHORPE) ANNUAL RADIO RALLY – Princethorpe College, Princethorpe, Rugby CV23 9PX (SP395710). OT 10am – 4pm, £2, CP, TI, C. Contact Tony, 07759 684 411, rally@raugbyats.co.uk [www.rugbyats.co.uk].

28 AUGUST – MILTON KEYNES ARS RALLY – Bletchley Park, Sherwood Drive, Bletchley, Milton Keynes MK3 6EB. TS, SIG, GB2BP. Why not make this a family day and visit the Betchley Park museum too? www.mkars.org.uk.

29 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, RSGB bookstall. Booking required for indoor tables. Contact Clive Burchell, G3NKQ 01480 810473, clive.burchell@btinternet.com.

4 SEPTEMBER – TELFORD HAMFEST – Enginuity Technology Centre, Coalbrookdale, Telford TF8 7DU. OT 10.30. TI S22 & GB3TF 433.200MHz. TS, SIG, discounted admission to Enginuity Centre. Details from Martyn, G3UKV, 01952 255 416 [www.telfordhamfest.co.uk].

11 SEPTEMBER – TORBAY ANNUAL COMMUNICATIONS FAIR – Newton Abbot Racecourse, Newton Abbot, Devon TQ12 3AF. TS, B&B, C, DF, RSGB Books, OT 9.30/10am, £2. Details by e-mail to rally@tars.org.uk.

17 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. £2, OT 10.30. Nancy Bone, G7UUR, 0191 477 0036 (eves), E-mail nancybone2001@yahoo.co.uk. [www.anarc.net]

18 SEPTEMBER – 21st GREAT NORTHERN HAMFEST – Metrodome Leisure Complex, Barnsley S71 1AN. OT 11.00, DF, TS, SIG, LB, C, FAM. Details Ernie, G4LUE, 01226 716 339 [www.greatnorthernhamfest.co.uk].

23 OCTOBER – CALLINGTON AMATEUR RADIO SOCIETY RALLY – Callington Community College, Launceston Road, Callington, Cornwall PL17 7DR. TI, CP, OT 10am, £2, TS, B&B, C, DF, WIN. Contact Chris G7UDX, 07973418371, e-mail g7udx@me.com.

SILENT KEYS

We regret to record the passing of the following members:

Mr J H Pickersgill, G0DZG	19/4/2011
Mr J Harding, G0GKC	3/2011
Mr E F Bottomlely, G1MCZ	5/5/2011
Mr G F Weller, G3DNJ	5/5/2011
Mr J L Salter, G3DQC	14/5/2011
Mr N J Bond, G3IHX	
Mr C J Dempster, G3OAK	21/2/2011
Mr A H Dicker, GW3VEN	1/6/2011
Mr J Roney, G4FYP	20/4/2011
Mr D J Wilkinson, G4KHF	18/3/2011
Mr J Thorogood, GW4UWI	30/5/2011
Mr F A G Belfield, G4YAG	
Mr R V Lumbard, G4YIF	
Mr S R Chapple, G6SC	16/3/2011
Mr E W K Ford, G7AHZ	2/2011
Mr R F Kent, G7TNP	19/5/2011
Mr J K Law, G8BTR	14/5/2011
Mr F J Vinnicombe, G8KHN	6/5/2011
Mr R Forrester, K4RRF	
Mr G Bishop, M0CXV	30/4/2011
Mr W Murphy, WA2QLT	

30 SEPTEMBER & 1 OCTOBER – 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). TS, B&B, CB, C, SIG, Morse proficiency tests on demand, RSGB Bookstall, RSGB Services & Committees, DF, FM [www.nationalhamfest.org.uk].

7-9 OCTOBER – RSGB CONVENTION – Horwood House, Little Horwood, near Milton Keynes. Full convention programme with lectures for all interests and all levels of technicality [www.rsgb.org/rsgbconvention].

9 OCTOBER – AUTUMN MILITARIA & ELECTRONICS & RADIO AMATEUR HANGAR SALE – Hack Green Secret Nuclear Bunker, Nantwich, Cheshire, CW5 8AL. OT 10.00, £2.50, civil, military and vintage radio equipment plus vehicle spares and more. Contact Rod Siebert, 01270 623 353 or coldwatr@hackgreen.co.uk [www.hackgreen.co.uk].

16 OCTOBER – BLACKWOOD AND DISTRICT ARS RALLY – Coleg Gwent, Risca Road, Cross Keys NP11 7ZA. TI V44 (S22), CP, OT 10.30/10.40, £2. TS, B&B, SIG, C, WIN. Details Dave, GW4HBK, 01495 228 516, gw4hbk@talktalk.net [www.gw6gw.co.uk].

16 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, M0CZR R106221@aol.com [www.hornseaarc.co.uk].

This list shows all rallies and events we are aware of as at 8 June 2011. 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.

TI Talk-In; CP Car Park; £ Admission; OT Opening time - time for disabled visitors appears first, (eg 10.30/11am); TS Trade Stands; FM Flea Market; CBS Car Boot Sale; B&B Bring and Buy; A Auction; SIG Special Interest Groups; MT Morse tests; MA Foundation Morse Assessments; LB Licensed Bar; C Catering; DF Disabled Facilities; WIN prize draw, raffle; LEC Lectures/Seminars; FAM Family attractions; CS Camp Site.

SPECIAL EVENT STATIONS FOR JUNE 2011

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.

Those running Special Event stations who wish to receive QSLs via the Bureau are reminded that they should lodge sufficient envelopes with the GB series manager Davina Williams, MOLXT, 20 Neale Close, Wollaston, Northamptonshire NN29 7UT. There is NO VIA SYSTEM (nor has there ever been) - you MUST send stamped SAEs to MOLXT to receive your Special Event QSLs.

Date	Callsign	Phonetics	Location	Bands	Keeper
02/07/2011	GB2WVF	Warcop Village Festival	Cumbria	LH2	M5TXJ
	GB4BLC	Beouonth Lions Club	Nuneaton	LHV27	G8GMU
	GB5WRS	White Rock School	Paignton	L2	G3LHJ
06/07/2011	GB0RAF	Royal Air Force	Barnard Castle	LH27	G0NRK
08/07/2011	GB0VWW	Vintage Wheels & Wings	Grimsby	TLHV27	M0LUY
09/07/2011	GB0AWT	Aslockton and Whatton Trust	Nottingham	TLHV27	G0FOG
	GB2GMF	Gustonbury Music Festival	Lancaster	TLH2	G3UCA
10/07/2011	GB0IS	Theydon Bois	Essex	LHV2	G0TOC
	GB0PLF	Pontefract Liquorice Festival	Pontefract	LH2	G0BPK
	GB8OTH	Oscar Tango Hotel	Birmingham	LHV27	G1TYV
15/07/2011	GB1AVR	Ackworth Vintage Rally	Ackworth	LH2	G0BPK
16/07/2011	GB0BDS	Basingstoke District Scouts	Winchester	LH27	G8PLL
	GB0FWW	Firpark Wings and Wheels	Lincolnshire	LH2	M0OOO
	GB4BBR	Birgham Bonanza Radio	Berwickshire	LHV27	GM4CXP
	GB4MVF	Middleton Village Fete	Tamworth	TLHV27	G8ACA
	GB4PIP	Party in the Park	Isle of Wight	LH2	M0GUN
	GB5OLR	Loughton and Epping Forest	Essex	LHV27	G0TOC
17/07/2011	GB6MMR	McMichael Mobile Rally	Reading	27	M5ALG
20/07/2011	GB4WP	War & Peace	Kent	LHV	M1CCF
25/07/2011	GB0SRO	Sussex River Ouse	East Sussex	LH27	G6DGK
	GB2COS	Chesteroldfield Scouts	Chester	LH27	G7BQY
	GB2HR	HR Wartime Airfield Ident	Dorset	TLHV27	G8NSV
	GB4IG	Island Games	Isle of Wight	TLHV27	G0EHR
27/07/2011	GB0RSC	Radio Society Carmarthenshire	Carms	LH27	GW7VJK
29/07/2011	GB2TWF	The Waterways Festival	Staffs	LHV27	M0JAV
	GB2VET	Veterans	Yorkshire	LH27	G0SWO
	GB5RL	Ribble Link	Lancashire	TLH27	G3UCA

1 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, WIN. Details from Jim, GM7LUN on 01896 850 245 or mail@gm7lun.co.uk.

29 & 30 OCTOBER – **NORTH WALES RALLY** – John Bright School, Llandudno LL30 1LF. 10am – 4pm, TS, B&B, CP, DF. Details from Liz Cabban, GW0ETU on 01690 710 257 or lizcabban@vodafoneemail.co.uk.

30 OCTOBER – **HOLSWORTHY AMATEUR RADIO RALLY** – Holsworthy Community College , Victoria Hill , Holsworthy EX22 6JD. Details Roger Williams, 07773 983691, email gsowter@talktalk.net.

6 NOVEMBER – **WEST LONDON RADIO & ELECTRONICS SHOW (Kempton Rally)** – Kempton Park racecourse, Staines Road East, Sunbury on Thames, Middlesex TW16 5AQ. OT 10.00. TS, FM, DF, free CP, RSGB, LEC, TI S22 (V44). Paul, MOCJX, 0845 165 0351, info@radiofairs.co.uk [www.radiofairs.co.uk].

7 NOVEMBER – **ROCHDALE & DISTRICT RS TRADITIONAL RADIO RALLY** – St Vincent's Church Hall, Caldershaw Road, Rochdale OL12 7QL. NB This is a Saturday rally. OT 10.15/10.30am, £2.50, concessions for U12 and seniors. B&B, C. Details Dave, G0PUD, QTHR, 07710 243 107, e-mail dave.shaw1@sky.com. [www.radars.me.uk].

13 NOVEMBER – **34th CATS RADIO & ELECTRONICS BAZAAR** – 1st Coulsdon Scout HQ, r/o Council Car Park, Lion Green Road, Coulsdon, Surrey. 10.00-13.00, £1, B&B, C, DIS, CP free. Details Glenn, G4FVL, chairman@catsradio.org.

20 NOVEMBER – **PLYMOUTH RADIO CLUB RALLY** – Elm Community Centre, Leypark Walk, Estover, Plymouth PL6 8UE. CP, TI, OT 10.00, £2, TS, B&B, C, WIN. Bob Griffiths, G7HNB on 01752 3431277, frecbobx@yahoo.com.

4 DECEMBER – **BISHOP AUCKLAND RADIO AMATEURS CLUB RALLY** – Spennymoor Leisure Centre, Co Durham DL16 6DB. CP, TI S22 (V44), OT 10.15/10.30, £1.50 (U14 free). TS, B&B, C, LB, DF, FAM. Details Mark, G0GFG, 01388 747497.

2013

5 FEBRUARY – **27th 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. Dave, G4UVJ, 01268 697 978 (evenings) [www.southessex-ars.co.uk].

22 APRIL – **28th YEOVIL QRP CONVENTION** – Digby Hall, Hound Street, Sherborne, Dorset DT9 3AA (adjoining the central shopping car park). OT 9.30am, TI S22, CP, TS, LEC, B&B, C, DIS. Contact Derek, M0WOB, 01935 414 452, yarc-contact@tiscali.co.uk.

3 NOVEMBER – **HOLSWORTHY AMATEUR RADIO RALLY** – Holsworthy Community College , Victoria Hill , Holsworthy EX22 6JD. Details Roger Williams, 07773 983691, e-mail gsowter@talktalk.net.

RSGB MEMBERS' ADVERTISEMENTS

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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.

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CLASSIFIED ADS

NEVER GIVE UP

Bill Watson, G4EHT

Members may recall that last Spring I submitted a letter to *RadCom* regarding aerial planning permission. In response to that letter, I received several letters from members who commented that they felt that I had been treated very unjustly by the local council, taking into account all the true facts of my case. I would like to thank those who took the time and effort to write.

After putting in a planning application for my Butternut vertical, I am pleased to report that it was granted, although at some expense, with plans having to be drawn up professionally along with the application fee.

This year, only a few weeks ago, I submitted a further planning application for a Tennamast that is mounted on the gable end of our small bungalow. I am pleased to report that this too was granted – once again at some expense.

The support of many immediate neighbours along with several radio amateurs scattered around the country was overwhelming. Again, I'd like to say thank you.

In conclusion, anyone who may be considering putting up aerials/masts, first get the support of your neighbours (in writing) and submit your application as appropriate. In the unlikely event of refusal then the RSGB planning department will always be there to assist you.

WASTE OF TIME

Bill, G4GHB

Another weekend, another contest, another waste of my time and another switching off. Calling CQ for no reply, as I refuse to call CQ Test.

Contests are a pointless waste of time and frequencies for anyone wanting more than a standard 59(9) report when the station you contact can't even get your callsign first time, which is *not* a perfect full copy worthy of giving readability 5.

If this is all amateur radio is about then my hobby is doomed to building equipment that I cannot use. I only bother to go on about every two months now due to what appears to be a contest most weekends.

All a contest proves is how much time you have spent in front of your radio (and self gratification that your aerial and power level is bigger than anybody else's in a lot of cases). Not much self training in the hobby there then.

Radio to me is about making contact, whether readability 5 or 1, finding out about the other station – not just contacting some unknown operator to boost your score. It is argued that contests activate the bands; if this is the case, why are these people not interested enough to come on the air normally? Perhaps they are doing the wrong hobby.

I can see me looking for another hobby shortly. Is this why people are leaving? A lot of callsigns I used to work are no longer heard on the bands.

TIME TO REVIEW ENTRY METHOD TO AMATEUR RADIO HOBBY

Glenn Bates, G6HFF

I write this as a plea for to RSGB to review the three tier entry system to our hobby. I am a registered instructor with Bolton Wireless Club and we are just completing a Foundation Course. I have no doubt that, as all the candidates are of such a high quality, we will produce a 100% pass rate. My point is that these candidates should not have to sit a Foundation course but start with the Intermediate course at a minimum or, in one or two cases, the Advanced. The necessity to go through each course seems a waste of time and effort on the part of candidates and instructors.

This entry system can produce Foundation groups of mixed ability and, as instructors have to teach at the pace of the slowest candidate, some candidates may start to lose interest, which is the last thing that we want to happen.

I know that the Foundation course has an operating practical section, but in 1981 when I took the RAE there was no operating practice taught, some may say it still shows in my operating, but we all learned by listening to experienced operators on the air over time.

The bottom line is, each prospective candidate should be able to look at the various levels and decide which would be right for themselves, not be forced to go through a three tier entry system, with all the costs and time that that requires.

It is a common misconception that new entrants must undergo Foundation and/or Intermediate courses, *this has not been the case for many years and people are free to undertake the examinations in 'quick succession'. Indeed, some do at the RSGB Convention each year, when they complete all three examinations over the Convention weekend. The numbers availing themselves of this facility are not high, suggesting that demand is limited. If Glenn has candidates wishing to progress quickly to Full licence, then he is free to arrange the required assessments and examinations just prior to the regularly scheduled Advanced examinations, as others have done. Incidentally, the UK is not unusual in expecting those who aspire to the higher licence to pass the lower examination. For example, to obtain an American Extra, you must pass the Technician and General examinations first.*

Brian Reay, ARDC Chairman

FRENCH CONNECTION

Roger Mew, F5VIC/G6HKF

This is just a note to mention that those coming on holiday to France or moving here must be made aware that France has not completely complied with various 'harmonisations'. Here in France, 70MHz (the 4m band) has not been ratified and a rather large chunk of the FM bit of 50MHz (the 6m band) also has not been accepted. I discovered that using 4m is absolutely illegal. French amateurs try to work crossband with 6m but, unfortunately, as they are blocked from using above 51.2MHz, this means that contacts are all but impossible.

Worse still, many Departments of France don't allow 6m operation anyway, or reduce the power to 5 watts. Many repeaters in the 2m band are also non-standard in where they are in the band.

Please check the licence regulations before you think of operating here in France.

DAB

Jeremy Wilcox, G4GBW

David, MODJT, was lucky to get his BBC 5 'loud and clear'. When I treated my SWMBO to a new DAB radio I found that it only would work in the window of the kitchen where she wanted it to listen to Wogan. Not bad since I live in London and not the back of beyond. This meant I also had to use batteries and, with mine using 6 'C' cells, I soon resorted to the NiCads! Interestingly they took as long to charge as they did to discharge – 20 hours in my case was a good session.

Like David I am appalled at the environmental costs DAB produces and have found that any investigations into this are met with heads so deep in the sand they must be in the Sahara. I have yet to receive any response from any of my enquires and must now believe that the agenda is more about the monies to be made available by the sale of released frequencies than about anything else. It certainly is not about the technical quality of the DAB broadcasts – most seem no better than AM to my ears. Indeed since Wogan left BBC 2 I really can't remember when this DAB set of ours was last used – a sad indictment of just how the listener count to broadcast radio is going these days.

VALID QSOS

Don, G3XTT

I wouldn't normally comment on the content of articles, but I found the one on July P42 (What Makes a QSO Valid) woolly and misleading. There is no rigour to the discussion and I suspect it leaves a beginner totally confused. Essentially there are three elements:

1. For day to day ragchewing, etc a contact must conform to licence regulations. Other than that, it can be whatever you want it to be!
2. For awards purposes, it must conform to the requirements of the relevant Awards Manager. This requires a reading of the rules – DXCC requirements are different from IOTA, for example. Obviously it must also still conform to licence regulations.
3. For contest purposes, again, what matters is what the contest sponsor stipulates.

Obviously, again, it must also still conform to licence regulations.

End of story! I cannot think of any other cases where anything other than your own personal satisfaction is relevant. The definition quoted from the *VHF/UHF DX Book* is (partially) relevant in the case of a VHF contact, but misleading in the case of most (generally accepted) HF contacts. There are cases where a contact is valid for the IOTA contest, but not for Awards purposes and *vice versa*. What he doesn't mention, under what might be considered the 'ethics' is obtaining confirmation by way of an Internet link (eg ON4KST). I cover this and other ethical matters in the 6m Handbook, but it is an area that tends to be overlooked.

Very little of the above comes over in the article, at least to my way of thinking. Off soapbox now!

Thanks to G3XTT for pointing out another excellent source of material on this subject. The article was not intended to be a detailed treatise on the subject but instead to encourage amateurs to think about operating skills and ethics and to generate healthy debate.
Jonathan Constable, M5FUN

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UKAC M5 MULTIPLIER

Tony, G4NBS

I am sure this debate will rumble on and on but I agree with the new rule and most of Ray's comments. No scoring system will be entirely fair to all, they are all a compromise but Ray's point is that activity has increased as a result and that is proven by QSO numbers and the record entry levels. What is strange is that those claiming to be disadvantaged are choosing to not enter under the new rule whilst at the same time expected those on the extremities to have happily participated with next to no chance of a good score for the last 20 years or so.

I see the change giving a more level playing field whereas the old rule definitely gave the East coast an advantage. It is still very true that in major contests most beams are stuck on the continent, to the detriment of inter-UK QSOs. In contrast it is pleasing to see UK activity increasing monthly in the ACs.

My reading of this years claimed scores on 2, 70 and 23 suggests to me that the positions are fairly closely correlated to the points claimed before multipliers already. At first sight the multipliers don't have a major effect on the positions, so Sam's suggestion of pts/QSO might seem appropriate - until you consider it is the requirement for multipliers that ensures beams are turned in all directions, not just to the east. You can still beam east and work the DX for points; just remember to beam around the UK to pick up the multipliers and you can still get a winning score.

Apologies for naming stations but this is proven by G0XDI/P in JO01 and G4DEZ in JO03 still doing well despite having the same perceived problem of few adjacent squares as JO02. In contrast, IO74 is surrounded by more squares, yet GD8EXI regularly appears out of place in the claimed scores as he achieves initially higher points but works fewer multipliers than others.

The problem is not adjacent squares but the number of squares in a workable radius with active stations in them. Try counting those within 500km and I think those in the East had a much greater advantage than those up north might appear to enjoy now.

I say congratulations to VHFCC for daring to try something new; we can't all hope to win every contest, so let's just enjoy the increased activity.

BT HOME HUB

Peter Elliot, G3MFO

Having read the articles by Derek, G3MVO and Gordon, G8WWD in May and June *RadCom* I would like to add my experiences. When I changed over from dial-up to broadband some time ago, I choose BT as my ISP and received a white router (now obsolete) with a power supply fitted into a three-pin mains plug. It took a while for me to realise the noise I was experiencing was coming from the PSU supplied with the router. Up until then I had no experience with switch mode power supplies. I contacted BT, explained my problem and asked if they could supply me a replacement power supply. I was told that this was not possible and they would supply a complete new router. This duly arrived and was the later version, a black curved type, again with a power supply. I was keen to see if this router power supply caused any problems and, as soon as I turned it, on the noise was horrendous. As in the case of G3MWO, I was forced to find a suitable standard 12V power supply from Maplin and I am pleased to say that all the noise disappeared. I find that the router works well and is not affected by my radio equipment, with cables running close by and transmitting 400W. It is unfortunate that BT does not appear to be carrying out any research into equipment imported from China, which causes these EMC problems. There are too many cheap and unfiltered switch mode power supplies coming into the UK and it is time the government took action on these issues.

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MX-610 This has 2 inputs, one for HF & 6m and the other VHF-UHF, and has one output. £79.95 C

Amazing Noise Cancelling 'Phones

NC-2

These are superbly designed noise cancelling head-phones that make a dramatic difference to reception and concentration when operating. Can be instantly switched out of noise cancelling mode. Also great on aircraft!

£24.95 C

Watson
Power Supplies

Power-Mite-NF

Compact Cont. 22 Amp Switch Mode PSU variable voltage & noise offset.

£71.95 C

Power-Max-25-NF

Slightly larger than the Power-Mite and ideal companion for any 100W radio.

£89.95 C

Power-Max-45-NF

38 Amp cont, 45 Amp Peak, Switch Mode PSU with variable voltage, V/A meters, & noise offset.

£129.95 C

Power-Max-65-NF

65 Amp Low Noise power supply. Patented Noise Control that permits you to move any noise away from the operating frequency.

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Samlex
Power Supplies

SEC-1212

Switch mode PSU offers 10A of cont. current output & 12A peak. Ideal for low power, designed with RF in mind, it is totally noise free & utterly stable. ** Input 230V AC * Output 13.8V DC * Output current 10A cont (12A peak) * HF & VHF filtering* £81.95 C

SEC-1223 23A Cont S/Mode £99.95 C
SEC-1235 30A Cont S/Mode £149.95 C

Avair
Power SWR Meters

Great Value Superb Performance!

All models have 12V backlight and include DC Cable.

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AV-400 £49.95 C
140-525MHz 5/20/200/400W

AV-601 £69.95 C
1.8-160MHz / 140-525MHz

AV-1000 £79.95 C
1.8-160MHz, 430-450MHz, 800-930MHz, 1240-1300MHz. 5W, 20W, 200W, 400W.

Cross Needle Models - Even Lower Prices!

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30W / 200W, 3.5-150MHz

AV-40 £39.95 C
15W, 0-150W, 144-470MHz

Watson
Dummy Loads

They feature high tolerance, air-cooled housings with extremely efficient heat ducting. This results in a realistic continuous power rating, together with an impressive VSWR curve.

DM-150PL £34.95 C
DC-1GHz PL-259 30W cont 100W 90 secs

DM-200N £49.95 C
DC-3GHz N-Type 35W cont 100W 2 mins

Cushcraft
HF & VHF/UHF Antennas

A50-3S

6m 3 Element Beam 8dB Gain, 1kW, 1.8m long. £149.95 D

A50-5S
6m 5 Element Beam 10.5dB Gain, 3.7m long. £209.95 D

MA5B

10/12/15/17/20m 3 element mini beam with balun. Max Power handling 1.2kW, 12kg. £529.95 D

R-6000
6, 10, 12, 15, 17 & 20m vertical 5.8m long No ground radial, automatic band changing, 1.5kW. £449.95 D

R-8
8 band Vertical. Covers 40m to 6m (inc. WARC bands) this is an ideal vertical for those with limited space. £559.95 D

A3-S
10, 15, & 20m 3 element yagi 8db gain 2KW 4.27m long. £629.95 D

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NEW

£259.95 D

SOLO DXPEDITION

We are pleased to announce the introduction of the new QRP CW transceiver from MFJ. Covering 80m to 15m, it is supplied with one plug-in module of your choice. Built-in CW keyer, digital display and switchable bandwidth filters. A full 5 Watts output in the palm of your hand, with full break-in.

Now You Can Mount Your Own One-Man DXpedition!

** Frequency 80m-15m with modules * RIT * 8 memos per band * LCD backlighted * TX/RX CW * RX SSB * CW offset 700Hz * Full QSK * 0.1uv sens. * 600Hz / 2.5kHz bandwidth * Iambic or straight key * CQ & callsign memory * Rx current just 40mA * CW speed 3-45 wpm * Transmit 0.9A @ 10v & 1.2A @ 14v * Supply volts 8-14V * Size 120 x 80 x 34mm * Weight 7.4oz.*

MFJ-561

Tiny iambic keyer, small enough for any QRP rig and great for the MFJ-9200 or our Dual-Band YouKit model. £27.95 A
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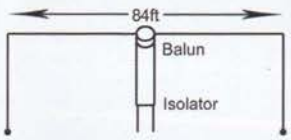
Separate Band Modules for 80m, 40m, 30m, 20m, 17m, 15m £29.95 Each

Radio Works Compact Dipole

NEW SHORT-80 80-10m Dipole 8-Bands - One Feeder!



This new design lets you squeeze an 8-band dipole into a small space. The antenna can be configured into one of two layouts giving either an 84ft top or 100ft top. Its off centre fed design results in a near constant feed impedance that is transformed down to 50 Ohms with a high ratio balun. The centre feed section empoys a 22ft radiating stub that produces vertical radiation for DX, whilst the top section favours higher angle for intermediate distances. Much better than the G5RV, this antenna works on all bands with most internal ATUs. No traps & handles full UK power. £147.95 D

"The World's Best Auto ATUs Buy with Confidence! Just Press PTT You're TUNED!"

MFJ-998 AUTO TUNER

**Digital & Analogue x-needle VSWR*
**1.5kW SSB & CW *1.8 - 30MHz*
**20,000 memories*
**Built-in antenna selector*
**Auto bypass protection*

W&S £664.95 C

MFJ-929 AUTO TUNER

1.8-30MHz 200W, LCD readout, 20,000 memories, long wire & coax, radio interface.

A great Auto ATU that needs just a single coax feed and 12V DC. Press the PTT and you are tuned!

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MFJ-925 Compact auto tuner	£174.95 D
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MFJ-991B Auto atu 150W	£214.95 D
MFJ-993B Auto atu 300W	£254.95 D
MFJ-994B Auto atu 600W	£349.95 D
MFJ-931 Artificial ground	£114.95 C
MFJ-932 Mini loop tuner	£143.95 C
MFJ-934 Artificial ground + ATU	£204.95 C
MFJ-935B Portable loop system	£204.95 C
MFJ-945E Mobile atu 300W	£134.95 C
MFJ-962D 1.5kW ATU	£299.95 D

MFJ-962D

MFJ-969 160m - 6m 300W	£219.95 D
MFJ-971 Portable atu	£122.95 C
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New Lower Prices!

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600W of PEP power from a desk top linear that covers 1.8 - 30MHz. And offered at a great price. £899.95 D

AL-811HXCE

800W of PEP power from a desk top linear that covers 1.8-30MHz. Check out the new low price. £999.95 D

AL-82XCE

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MFJ Vertical HF Antennas

MFJ Vertical HF Antennas. Ideal for small gardens.

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MFJ-1798 80m-2m vertical	£309.95 D
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MFJ-461 Pocket morse reader	£101.95 C
MFJ-4726 6-way remote ant switch	£164.95 C
MFJ-490 Memory keyer + paddle	£249.95 C
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MFJ RF Current Meters

If you are using an end fed wire, the only true way to make sure it is matched correctly is to adjust for max current flowing through the wire with an RF Current Meter.

All cover 1.8 - 30MHz

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MFJ-834H 3, 10 & Amps	£92.95 C
MFJ-835 Bal line X-Needle 0.3-3A	£131.95 C
MFJ-836 Combined VSWR & Ampmeter using cross needles 0.3, 1 & 3A	£141.95 C
MFJ-836H As above but 3, 10 & 30A	£152.95 C

MFJ Field Strength Meters

Great for measuring RF levels & tuning antennas, particularly mobile and portable.

MFJ-801 is a compact handheld model that covers 100kHz - 500MHz. £32.95 A

MFJ-802 has a larger meter and employs a telescopic dipole to reduce affects of stray reflections £55.95 A

MFJ-801

MFJ-618 Received Audio Enhancer

There can be two types of receiver audio problems. The first is QRM and hetrodynes, the second is the human form where certain frequencies need to be adjusted to compensate. This unit deals with both! Accepts audio from two receivers and output in mono or stereo. £219.95 D

MFJ Antenna Analysers

NEW MFJ-266

The new model from MFJ that is totally digital. A highly accurate analyser that extends from 1.5 - 490MHz. Fitted with a 10:1 vernier dial for smooth accuracy.

Wide range from 1.5 - 490MHz (with gaps between 65-85MHz and 185-300MHz. As well as VSWR it also measures complex impedance and impedance magnitude, capacitance, inductance, field strength, frequency, and is a frequency generator. Use it for stub adjustment, coax test, baluns, and lots of other RF tests. £339.95 C

MFJ-269

The analyser that covers 1.8MHz - 440MHz and makes antenna design and installation so easy. Measure VSWR, impedance, reactance and even measure the length and losses in coax. £369.95 C

MFJ-259B

If you don't need coverage up to UHF, this 1.8 - 170MHz will do the job. A great favourite of antenna reviewers, it makes antenna installation and design so easy. £269.95 C

HyGain Vertical Antennas

AV-14AVQ

10-15-20-40m Vertical Antenna 15.kW 18ft / 5.5m **(pictured right)** **Self-Supporting *Automatic Band Switching *Power: 1500W PEP * Gain: 3dBi nominal * VSWR: < 1.5:1 typical *Connector: SO-239 *Vertical angle: 16 degs *Horizontal angle: 360 degs* £199.95 D

AV-640 6-40m vertical	£429 D
DX-77A 10-40m vertical	£479 D
AV-6160 The new 160m to 6 m self supporting vertical. Designed for ground mounting, this is an ideal all-band antenna for those with small gardens.	£429 D

AR-303X

Lightweight Rotator for small beams.Check out this new low price.

£99.95 D

AR-40X	VHF or Mini HF	£309.95 D
CD-45IIX	Small HF	£489.95 D
HAM-IVX	Medium HF	£669.95 D
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Flex 1500 SDR Low cost SDR Transceiver, connect via USB & you have 5W 160-6m! £579.95
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The Entry Level QRP Software Defined Radio that is suited to be the ideal starter transceiver using SDR. All mode 160-6M 10Watt Transceiver.

FlexRadio Systems introduces the FLEX-5000A family of ultra high performance Software Defined Radio transceivers. The FLEX-5000A family builds on the very popular FlexRadio SDR-1000, and now integrates all I/Q data and hardware control over a single FireWire® (IEEE-1394) connection to a user provided computer. Sound cards and multiple cables are no longer necessary. Convenience and ease of setup are built right in!

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