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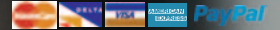
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November 2017

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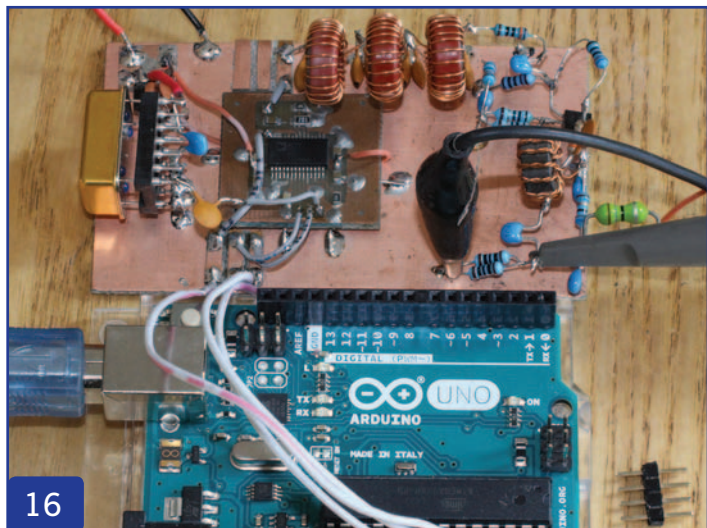
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Cover image: The Apache labs ANAN-8000DLE SDR transceiver, photos courtesy Peter Hart, G3SJX, design Kevin Williams, M6CYB

## RadCom THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

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# So what does being an RSGB Board member really mean?



We asked current Board Directors to give us their thoughts:

*"A chance to give something back for the enjoyment I have had from amateur radio over many years – here and overseas."*

Most people cite being able to give something back as being a key driver; others want to use their knowledge, skills and experience to benefit the amateur radio service through being part of the National Society. The main rewards come from the satisfaction of seeing a job well done, when someone says thank-you or when a Member is able to do something because of your input. There is no pay and only reasonable out-of-pocket expenses, so no-one does this for the money!

*"I'm working full time in a busy and responsible job, but I'm still able to help steer the RSGB; a real opportunity to make a national difference."*

The RSGB is a not-for-profit company so it needs a Board with a business head. At the same time it is all about wireless communication, so having a passion for amateur radio is a requirement.

We do need to have a good mix of skills, knowledge and experience across the Board. The two areas where we would currently like to see more volunteers are marketing/promotional work and financial management.

We have a new Strategy to take us to 2022 and the Board's job is to co-ordinate the various elements of the Society to implement that Strategy. That will require motivational skills to encourage the volunteer team to work together in delivering the projects, activities and initiatives that will take us to our goal.

You could be involved in project work, negotiating with regulators, liaising with the RSGB committees and a host of other things including the necessary issues of safety, governance and so on. As long as you can bring something appropriate to the table you will be able to contribute.

Your own amateur radio interests will often provide the link to the RSGB committees you oversee – all of the current Board are licenced amateurs who have a wide range of interests: microwaves, VHF and HF contesting, QRP, overseas DX operating, propagation, training, running rallies.

*"Being on the Board will take up as much time as you want it to; the big difference from my employment is that I do this because I want to, not because I have to."*

Like any volunteer role, it does take time to do the job properly. It is difficult to put a specific time against it but most of the current Directors also work in full-time or part-time employment. There are some fixed commitments, like the monthly Board meetings.

These are mainly face-to-face but occasionally an internet conference call will suffice. Four of the meetings each year are timed to coincide with major events that Directors are also expected to attend: the Annual General Meeting, the Convention and two Leadership Team meetings. These normally require an overnight stay, unless you happen to live nearby. Most Directors miss one or two a year due to holidays, etc. but the expectation is that you will attend most of the monthly meetings.

Other Director time is taken up by writing or responding to Board papers, liaising with Committee Chairs and/or Honorary Officers, responding to emails or Members' questions.

## How are Directors chosen?

There are two routes to the Board. You can gather support from a number of other Members and stand for election at the AGM, or you can put yourself forward for consideration by the Nominations Committee:

- Elected Directors must make a personal statement and provide a CV to show the Members why they should be elected. All elections are by secret ballot and the person with the most votes is elected.
- Nominated Directors also have to provide a CV and are appointed to fill skills gaps or to add strength to a particular area of the business.

## Legal stuff

As a Director you will be registered with Companies House so you will need to be upfront about any criminal record, bankruptcy etc. The Society is a Limited by Guarantee Company so all Members are liable for any financial loss, limited to one pound per Member. The Society carries insurance for Directors and Officers to cover any civil liabilities that may arise out of being a Director.

*"I care about amateur radio and if I can do my bit to make it a better place and secure its future, I am more than happy to."*

Helping to secure the future of amateur radio is at the core of the RSGB's Strategy 2022: [www.rsgb.org/strategy](http://www.rsgb.org/strategy) As well as helping to implement the Strategy across all of the RSGB's projects, there are many strands of the Strategy that are addressed by being a Board member. For example:

- You will be helping to guide the Society towards our **Goal**
- Your actions will need to encompass our **Values**
- Being involved is an example of the **Participation** priority in action
- New people bring new ideas that will help deliver the **Diversity** priority
- You will be in a position to ensure that the Society is effective and flexible in line with the **Organisation** priority.

## What next?

The January *RadCom* (due mid-December, see p5) will ask for applications for President, several Board members and some Regional Managers. One of the current Board Directors summed up why they chose to get involved:

*"Having spent 45 years taking the RSGB for granted (and having the occasional moan) I decided four years ago that the time had come to 'do my bit' for the Society and repay the investment from others (and deal with the occasional moan). In that time I have realised the breadth of interests that the hobby offers and our Members enjoy. I have particularly appreciated getting involved in some of the more 'hidden' activities such as AROS and the challenges of EMC issues."*

Now is the time for all Members to start thinking "Can I do 'my bit' for amateur radio"?

Steve Hartley, G0FUW and Graham Murchie, G4FSG



## Regional Club of the Year

The RSGB Region 8 Club Of The Year winners, who were announced at the RSGB AGM, were awarded their trophies at the Lough Erne Radio Rally. Mid Ulster ARC won the Large Club category and Lough ARS won the Small Club category. They were presented with their trophy by Board Member Sara McGarvey, 2IOSSW and Peter Bell from P&D CB and Amateur Radio Supplies who sponsored the Region 8 trophies.



Wearside Electronics ARS has been presented the Region 4 Club Of The Year shield by Ian, G7MFN Region 4 Manager. The club runs exam courses, electronic demonstrations, CW training and always have the radios set up for HF, UHF, VHF and digital modes, with a warm welcome by all members.



The results of the National Club of The Year competition, sponsored by Waters & Stanton, were announced at the National Hamfest. See page 74 for details and photos of the winners.

## Your votes should count!

I was proud to be elected your President for 2016-18 – but I was the only candidate. The RSGB is a Member society yet there is very little response to pleas for more volunteers to stand for President, for the Board or for Regional Manager posts. Let's change that – it's *your* Society!

Please read this month's editorial and give thought to the possibility of standing for election next April. Here is your chance to find out more about the posts and whether you wish to stand. You have a choice of people to talk to: either the Board Chairman, Graham Murchie (chairman@rsgb.org.uk) or myself (president@rsgb.org.uk).

Nick Henwood, G3RWF, RSGB President

## DRM Vacancy

Doug Fraser has decided to stand down as DRM 21 for Region 2, Scotland North & Northern Isles. The RSGB would like to thank him for his service to his fellow radio amateurs and wish him the best for the future. If any RSGB Member, living in the area, is interested in applying for the role of DRM 21, please contact the Region 2 Manager, Andy Burns, MMOCXA via email to [rm2@rsgb.org.uk](mailto:rm2@rsgb.org.uk)

## NRC volunteers

The Society is seeking additional volunteers to help with the staffing of the National Radio Centre at Bletchley Park. As a volunteer at NRC you will enjoy the benefits provided by Bletchley Park for all its volunteers and have the satisfaction of helping to run one of the leading radio communications display areas in Europe.

We seek people living within reasonable travelling distance of Bletchley Park, who are confident HF radio operators, who are prepared to adopt the 'house style' of operating, and are comfortable representing amateur radio and radio communications to members of the public visiting the facility.

You should be willing to offer one day per fortnight to this role – more if you can. For further details contact the General Manager, Steve Thomas, M1ACB, via email to [gm.dept@rsgb.org.uk](mailto:gm.dept@rsgb.org.uk)

## Legacy Sub-Committee vacancies

The Legacy Sub-Committee makes recommendations to the RSGB Board on requests for funding from the £180,000 Legacy Fund. The Board wishes to appoint a new Chairman of the Legacy Sub-Committee and also a further sub-committee member. Information about the fund is on the RSGB website and further details of these appointments are available from the General Manager, Steve Thomas, M1ACB, via email to [gm.dept@rsgb.org.uk](mailto:gm.dept@rsgb.org.uk)

## Canadian AGM

RSGB General Manager, Steve Thomas, M1ACB, attended the Radio Amateurs of Canada (RAC) AGM webinar, taking a greetings message from the RSGB. The meeting included three presentations followed by the formal AGM and interesting Q&As. RAC has apparently been watching the RSGB's strategy work closely. They mentioned our videos and especially our YOTA videos, so it looks like we made an impact. As well as recognising the importance of youth activities to bring people in to amateur radio, they are concerned about not being able to attract as many new amateurs into membership as they would like. They quoted from an ARRL survey that suggests that active amateurs are more likely to join their national society, so they intend looking into how they can use this information. This is very close to our own 'participation' priority.



## IARU Region 1 Conference

Following months of preparation, the IARU Region 1 Conference ran from 16-21 September at Landshut (near Munich) in Germany. It concluded with the final plenary adopting a wide range of recommendations for current and future amateur radio, from HF to microwaves. The Society contributed a record 26 papers out of a total of over 140 on the agenda. The RSGB team was able to cover all the key committees and working groups and were pleased to see their hard work being adopted in some form in the final plenary. The following gives a brief overview:

**HF:** Previous band plan changes agreed at Vienna in 2016 to accommodate the growth in digimodes were endorsed and the usage plan for the new 60m band was agreed. A process for further global harmonisation of band plans was considered and Ian Greenshields, G4FSU who is familiar with such issues was nominated as Vice Chair.

**VHF-Microwave:** The prospect of WRC-19 influenced 50MHz in particular as well as some microwave bands. At a more practical level, band plan changes agreed included the 144.0-144.4 range and a new IARU-R1 Contest Working Group was formed. The latter will enable the main committee to spend more time on strategic matters. As with HF, some changes to accommodate the growth in digital were made. A number of papers also highlighted the need to promote and protect microwave and millimetre wave bands from Wi-Fi expansion and future 5G telecoms – an area where the Society continues to be proactive.

**EMC:** Landshut was the first full meeting for the new Region 1 EMC Committee. Their work initially focused on the rising noise floor and a coordinated measurement campaign. However a lot of attention was also put on Wireless Power Transfer (WPT). A WRC-19 agenda item is considering a high power multi-kilowatt form for charging electric vehicles, which is expected to become commonplace in future.

**Youth & Growth:** Working Groups and the main Policy committee heard reports on YOTA and special sessions considered licensing and other opportunities to promote growth in amateur numbers. Our UK efforts were widely mentioned, but there is little doubt there are serious challenges ahead, given current trends and demographics.

**Budget:** Region 1 is financed by a levy on Members Societies in proportion to their membership numbers, and has been eating into its reserves. RSGB President Nick, G3RWF was privileged to be down-selected for key discussions on this, which has to reach a healthier position, despite priorities to protect spectrum, promote growth etc. Activities are now categorised as to whether they are core business at IARU level, but there remains some long term issues, not helped by the weak UK exchange rate in our case.

By the time this edition is published the finer detail of the numerous final plenary recommendations should be released. It should be noted that those changes affecting band plans will first be discussed in the October RSGB Spectrum Forum annual meeting, prior to the update of RSGB band plans in early 2018.



The full RSGB team at the end of the Region 1 Conference. L-R: Murray, G6JYB, Ian, G4FSU (HF), Nick, G3RWF, Barry, G4SJH (microwaves) and David, G0SNO (EMC).

## RSGB Convention video

The latest RSGB Convention promotional video is in the *About the RSGB* section of the video portal on the RSGB website. You'll hear a range of people explaining why they go to the Convention and see highlights of what you can expect during a Convention weekend. Go to <http://rsgb.org/main/publications-archives/video/about-the-rsgb/> to find out more.



## Arkwright student

RCF/Arkwright student Martin Radulov, MOYRM visited Cambridge and Camb-Hams. His parents were very supportive, spending the weekend in Cambridge while Martin camped and played radio with Camb-Hams.

## Region 8 newsreaders sought

Region 8 benefits from a small, but dedicated, team of GB2RS news readers, between them covering 80m LSB, 4m, 2m, and 70cm FM and, since 16 April this year, 70cm DMR. Using a closed talk group, TG8 on Time Slot 2, (currently only on Phoenix linked repeaters to comply with the NoV and keeping the broadcast within the region), the news goes out at 19.30 on Sundays. That first broadcast solicited 10 call-ins, with the average now around 6 each week. The DMR readings are led by Paul, MI1AIB, (also a backup reader for Dave, G14FUM on 80m), who reads via GB7LY in Derry / Londonderry, assisted when necessary by Alistair, MI0RWY reading via GB7UL in Carrickfergus.

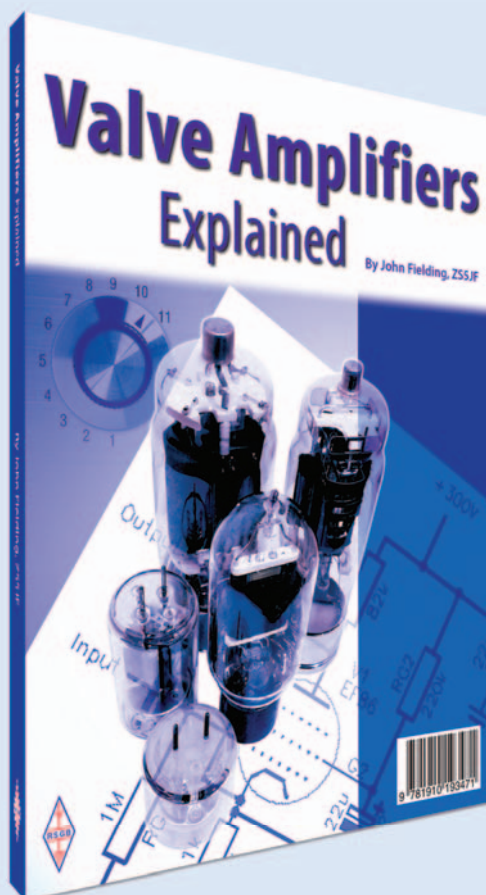
Between them, the team always endeavours to ensure the news is read every week, but this does take time and commitment, from downloading and preparing the script, to being available at the appropriate time on air each week, so the more readers we can call on the more the load can be shared. We are appealing for willing amateurs to join the team, either as a backup reader or possibly even on a rota basis.

The requirements are simple: you must be a Full licensee, a Member of the RSGB, and, of course, suitably equipped for the bands on which you can assist. For DMR this ideally means a mobile rather than handheld radio (an auxiliary input facility will help), and access to one of the four current repeaters with TG8/S2 available, currently GB7LY, GB7UL, GB7HB or GB30M.

If you are at all interested and wish to know more please contact the Region 8 Manager, Philip Hosey, MI0MSO via email to [rm8@rsgb.org.uk](mailto:rm8@rsgb.org.uk) or phone 0784 902 5760.



NEW  
TITLE



## Valve Amplifiers Explained

By John Fielding, ZS5JF

This new book by John Fielding, ZS5JF, is for everyone who uses – or is considering using – an HF or VHF linear amplifier. While some amateurs may be of the opinion that valves are an obsolete technology and semiconductors are a better way, John Fielding very definitely thinks otherwise! After reading this book you will be under no illusions that, in his opinion, valves are far superior to semiconductor devices for most linear amplifier applications. As he says, “When you need real power and very good linearity, a valve is very hard to beat.”

Essential reading for anyone building a valve linear amplifier, the author guides the reader through the choice of valves for various purposes. *Valve Amplifiers Explained* starts with a chapter on basic valve theory and explains how to interpret valve characteristic curves. The various classes of operation of amplifiers – Class A, Class B, Class AB1, Class AB2 and Class C – are all covered in detail. The relative merits of grounded cathode and grounded grid amplifiers are discussed and a chapter is devoted to the causes of distortion in valve amplifiers – and how to avoid such distortion. The author explains that linearity is primarily a function of the power dissipation of the device and the supply voltage and he devotes a whole chapter to good power supply design. The various protection circuits that an amplifier should have are also covered. While the book is equally relevant to HF and VHF enthusiasts, a chapter is devoted specifically to the design of VHF RF power amplifiers. Another chapter even discusses liquid cooling of valve amplifiers.

There is advice too for those who, instead of building an amplifier, are considering purchasing a commercially-made linear. Those who use commercial linear amplifiers and want to understand more about how they work will not be disappointed.

As John says, “There is a certain aura about valve equipment. The glowing filaments and the gentle buzz of a high voltage power supply are a sort of magic few have had the pleasure of knowing.” After reading *Valve Amplifiers Explained* you will want to join that elite few!

Size: 174x240mm, 200 pages

ISBN: 97819101 9347 1

Non Members' Price: £14.99

**RSGB Members' Price: £12.74**

Also available on



**Radio Society of Great Britain [www.rsgbshop.org](http://www.rsgbshop.org)**

3 Abbey Court, Priory Business Park, Bedford, MK44 3WH.

Tel: 01234 832 700 Fax: 01234 831 496

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on orders over £30. See Page 76

# IARU honours Colin Thomas, G3PSM

We're delighted to announce that Colin Thomas, G3PSM has been given the Roy Stevens G2BVN Memorial Award by IARU Region 1. It is appropriate, as Roy was Colin's mentor in his international work. Colin retires as Chairman of the External Relations Committee this year after a period of exemplary service to the amateur radio service and in particular the International Amateur Radio Union in Region 1.

Nothing is more important to radio amateurs than their access to the spectrum – without frequencies there is no amateur radio. Colin's contribution to the acquisition and defence of radio spectrum use by radio amateurs has been unparalleled. In particular, within Region 1 he has played a leading role in the acquisition of additional bands. They include 136kHz, 472kHz, allocations at 5MHz and the expansion of 7MHz. He has also led the successful defence of our existing allocations at a time when they are under great pressure. IARU Region 1 radio amateurs owe him a huge debt.

All of this takes skill and an enormous amount of time. Colin has been attending and contributing to the IARU Region 1 Conference since 1972. He became a member of the EC in 2008 and then as Chairman of the External Relations Committee, for which he was very well-suited. This is a record without equal and has made great demands on his time and energy. For example, World Radio Conferences typically last four weeks and Colin has given months of time to them – and their preparation. Mention should also be made of his equally great commitment to CEPT and ITU work.

Always an active radio amateur, he has also worked tirelessly for the RSGB within the UK. He was our President in 2008-9. He is an Honorary Life Vice-President and a recipient of our Founder's Trophy in recognition of his work both for the Society and for the IARU. He was our HF manager and also the first Chairman of the RSGB Spectrum Forum. His RSGB achievements were even more remarkable in view of his very successful international work.



## Congratulations

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

70 years

Sutton & Cheam RS G2XP

60 years

Mr B E Gee	G3LDG
Mr A B Plant MBE	G3NXC
Mr W J C Pinnell	G3XWK
Mr R N Jones	RS25982

50 years

Mr J Laffont	F1RJ
Mr J Evans	G3VDB
Mr JHI Parnell	G3WJP
Mr R Steed	G3YUJ
Mr J M Simpson	G4BUI
Mr A Unsworth	G8BCJ
Mr H F Bottomley	G8BCL
Mr G S Harris	ZS2GH
Mr R G Henley	VK2KXG
Mr P F Stanford	VK4DAN



The latest issue of *RadCom Plus* is now available. It contains features on vertical phased arrays, an APRS tracker and looks at how to get a professional finish to your home-made printed circuit boards. A tailored PDF version is available, as a trial for this issue, in addition to the ePUB version. Both of these options enable you to download *RadCom Plus* to read offline if you wish. For those who prefer to read it online you can still use the Flipbook version that is also available. *RadCom Plus* is a members' benefit so just log into the RSGB membership portal and then you can access both versions from the *RadCom Plus* page of the RSGB website.

## Other IARU awards

At the IARU Region 1 Conference, in recognition of their outstanding and ongoing contributions, Graham Shirville, G3VZV, Lisa Leenders, PA2LS and Gregg Mossop, G0DUB were awarded the IARU Region 1 Medal for their work on Satellite Coordination, Youth and Emergency Communications respectively. This marked a welcome change to past practice where only retiring volunteers were recognised.



**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 J Quirke, 2E0JFQ  
Mr J Dyson, 2E0JTV  
Mr E Doyle, G0OKS  
Mr M Champion, G1MPD  
Mr M Gibbs, G3PSR  
Dr N Shaxted, G4OGI  
Mr C Booth, G6HFI  
Mr C Ash, G7LWV  
Mr B Hayes, G8OUQ  
Mr S Tindale, G8XEV  
Mr J Hughes, K4YWZ

Mr J Austin, KA2RVO  
Mr G Tilford, KM5GT  
Mr T Warren, LA9QL  
Mr F Peters, M0MLH  
Mr J Hocking, M0WSZ  
Mr T Thomas, M0XGT  
Mr D Letton, M3CHE  
Mr T Sayles, M6FXV  
Mr S Fishburn, M6IDY  
Mr R Reynolds, M6IXJ  
Mr M Barrett, M6KPJ

Mr S Brooks, M6KPQ  
Mr M Ward, M6MWW  
Mr N Horne, M6NVH  
Mr P Rasmussen, M6PLR  
Mr C Whatmough, M6TXG  
Mr J Thomas, M6XJT  
Mr L Fairs, M6XLF  
Mr C Wrobel, M6XWR  
Mr D Dellett, M10MSM  
Mr K Cussick, MM0TMG  
Mr P Bingham, MM3WUI

Mr D Hui, MM6XDE  
Mr I Nicolson, MM6YYB  
Mr A Fedorishchev, RA6LBS  
Mr P F Gibson, RS204853  
Mr M Brown, RS300343  
Mr A Whybrow, RS313294  
Mr J Tyrrell, RS313898  
Mr C Borland, RS314071  
Mr G Barlow, RS314104  
Mr B Mead, RS314128

Mr D Hartley, RS314170  
Mr J Mason, RS314193  
Mr W Donnelly, RS314248  
Mr P Wright, RS314251  
Mr W Wood, RS314274  
Mr S Prince, RS314316  
Mr P Ford, RS314317  
Miss M Campbell, RS314324  
Mr J Cowan, ZL1ROQ

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

Mr R Koster, G7BHQ  
Mr J W Webster, 2E0JWW  
Mr J Stacey, 2E0YAS  
Mr P W F Kirkby, EI6FE  
Mr M Godden, G0ACQ  
Mr D P Mullaney, G0WJJ  
Mr L R Owen, G1DBL

Mr R James, G3AHE  
Mr W E Sutton, G3FWI  
Mr D L Hurrell, G3JMK  
Mr B E Moyler, G3LTM  
Mr M Wilson, G4GOU  
Mr A R Silience, G4MYS  
Mr D C Ransom, G6MRJ

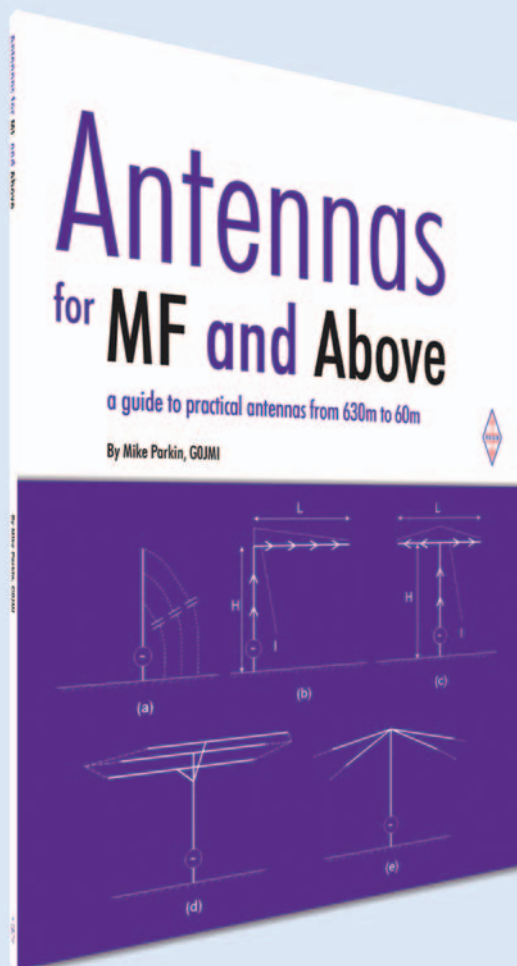
Mr B J Sayers, G7AZJ  
Mr S Hogarth, G7CZH  
Mr J Turner, G7EJK  
Mr J B Stratton, G7HMU  
Mr D M Poulton, G7NVS  
Mr J Edwards, G7SSD  
Mr J Barwell, G7VBF

Mr R Pickett, G8IXM  
Mr R Slimmon, GW0WAY  
Mr N A Maxwell, GW3UMD  
Mr D W Roberts, GW6IWW  
Mr W Vollenweider, HB9AMC  
Mr M D Singer, K7AYP

Mr T Rigdon, K8ADO  
Mr D Woodcroft, M1EMG  
Mr M E Fry, M3MEF  
Mr M Darwen, M6AVD  
Mr M J Jones, N8JVM  
Mr J Campbell, RS301070  
Mr O L Marksbury, WH7U



NEW  
TITLE



## Antennas for MF and Above

*A guide to practical antennas from 630m to 60m*

By Mike Parkin, G0JMI

Written by *RadCom* antenna guru Mike Parkin, this is a book that provides exactly what is says on the cover. *Antennas for MF and Above* is a practical guide to antennas for the relatively new 630m band, 160m, 80m and equally new 60m band.

This book is aimed at the constructor, or those who are curious to understand in further detail the theoretical aspects of the antenna techniques used on these bands. Rather than concentrating on single bands, Mike shows how you can often use the same approach or even the same antenna to work two or more bands. There are examples of how a 160m antenna can be pressed into service on 630m or even 80m ones that can be made to work on 160 and 60m. There are also specialised chapters covering, for example, antennas for 630m.

You will find examples of single band and multi-band working designs for both vertical and horizontally polarised antennas. There are explanations of the operation of antennas with radiation pattern diagrams used to help with understanding the concepts introduced. You will also find practical techniques for matching the antenna to the transmission line, which are covered using examples of baluns, transformers and ATUs to illustrate these methods.

If you are interested in experimenting with the bands below 40m, you are sure to find much to interest you in this book. *Antennas for MF and Above* is without doubt one of amateur radio's standard reference works and THE practical guide for everyone interested in antennas for the amateur bands from 630m to 60m.

Size 174x240mm, 112 pages

ISBN: 9781 9101 9346 4

Non Members' £11.99

**RSGB Members' £10.19**

Also available on



**Radio Society of Great Britain [www.rsgbshop.org](http://www.rsgbshop.org)**

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Tel: 01234 832 700 Fax: 01234 831 496

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E&OE (All prices shown plus p&p)

## Dutch radio convention

On 4 November, the VERON Ham Radio Convention will take place in the Americahal in Apeldoorn, Netherlands. Doors open from 9.30am to 5pm (local time) and tickets are 9 euros, or free for those under 16. There will be lectures (in Dutch), amateur radio sales, VERON Components and a flea market. Other activities will include a home brew exhibition, demonstrations and measuring facilities. Details are at <https://dvdra.veron.nl>



## Buying a new radio



Frank, G4WNF was the lucky first recipient of the limited edition Kenwood TS-590SG transceiver. He can be seen collecting it from Tony, MOTNY/ZB2TY at ML&S. A video of the new 70th anniversary edition radio can be seen at [www.youtube.com/watch?v=tfUcts3FdI4](http://www.youtube.com/watch?v=tfUcts3FdI4)

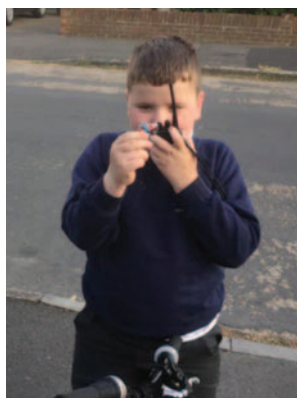


## ML&S now distributor for SGC products

Martin Lynch & Sons has new partnership with SGC of the USA. SGC manufactures remote antenna tuning units and other associated products. From September 2017 ML&S is able to offer their entire range, including the SG-230 200W and SG-235 500W remote tuners. For more information see [www.HamRadio.co.uk/SGC](http://www.HamRadio.co.uk/SGC)

## Same rally, new name

The Dambusters Hamfest is changing its name to Thorpe Camp Hamfest from 2018. Taking place on 6 May 2018 at the Thorpe Camp Visitor Centre, Tattershall Thorpe, LN4 4PL. You can find out more at the events page at <http://thorpecamp.org>



## Walkie talkie makes a difference

Project Thomas Watch came about after James Preece, MOJFP, whose 11 year old son Thomas is autistic, decided to try using walkie talkie-style radios to help give his son some independence whilst riding his bike. James stood outside watching his son riding up and down and around the block. On occasion, Thomas would take longer than expected to do a lap of the block or sometimes wander off a bit far, or just stop and sit down for a while. This made James go chasing around the street trying to find Thomas.

James wondered if Thomas would use a small walkie talkie type radio and respond to it when called. After some instruction Thomas did get used to using the radio and is able to state where he is and what he is doing. This helps give peace of mind.

Other children became curious and, after speaking to Ofcom, the idea of a business licence was suggested. Chertsey Radio Club decided to run a raffle to raise the funds and then approach the National Autistic society and share the project in their support. The project has been well received.



## Cable donation

ARCC Communications Ltd, rigging specialists, has donated 300m of coaxial cable and connectors the Scout Association that has upgraded the amateur radio station at Gilwell Park, GB2GP. Over 11,000 young people a year can use amateur radio at Scout events held at there and ARCC's donation will make a real difference to the range of activities available to young people from around the world. As a company, ARCC Ltd is always looking to recruit talent into the communications industry and welcomed the opportunity to benefit young people when they are making their career choices with this donation. As well as Scout events, Gilwell Park hosted the International Amateur Radio Union Region 1 Youngsters on the Air gathering in August 2017 and participants benefited from ARCC's donation. For more information on the company please visit their website, [www.arcc.uk.com](http://www.arcc.uk.com)



## Kenya gets 60m allocation

Following a request from the Radio Society of Kenya, the Kenyan state radio regulator has advised them that a new 60m allocation has been granted between 5275kHz and 5450kHz on a secondary basis. All modes are permitted with a maximum power of 400W PEP.

## Successful rally



Weston Super Mare Radio Society held its 2nd annual rally at The Campus in Worle, displaying and selling a great variety of radio equipment and components. The rally attracted over 200 people from across the country. Mike, MOVLN made a foot operated Morse key that was enjoyed by many of the visitors. The club is already gearing up for another successful rally in 2018.

November 2017

## Future of amateur radio video

A video, created by the RSGB, was used by Don Beattie, G3BJ, President of IARU Region 1, at the IARU conference in Landshut to spark discussion about the future of amateur radio. Five young radio amateurs from different countries (filmed at YOTA 2017) explain what they think the future of amateur radio should look like. They are optimistic, enthusiastic and knowledgeable. You can take a look at the video for yourself at <http://rsgb.org/main/publications-archives/video/young-amateurs/>

## Great Northern Hamfest Cancelled

South Yorkshire Repeater Group has reluctantly decided to cancel the 2017 Great Northern Hamfest formerly due to take place at the Barnsley Metrodome on 12 November. They would like to thank everyone for their loyalty and custom over the years and wish them the best for the future. South Yorkshire Repeater Group would also like to give due recognition to Ernie, G4LUE for his tireless efforts over the last 28 years as manager of the Great Northern Hamfest and who has decided to retire from that position.

## Mellish DXpedition appeal

A DXpedition is planned to the Mellish Reef as VK9MA in November, involving nine experienced operators from Europe and the USA. Mellish Reef is the number 28 most wanted entity in the world. They plan to operate four complete stations based on Elecraft K3S transceivers and SPE amplifiers around the clock for 13 days, commencing on the 3rd. As with many DXpeditions they are looking for donors to help defray their costs, such as boat transportation and 5000 feet of coax (among other expenses). See their website for details, [www.VK9MA.com](http://www.VK9MA.com)

## EME DXpedition

In the short time available on September 9 and 10, the 3YOZ team tested their main and backup 2m EME (moonbounce) setups and checked all items of the 6m gear. Their two stacked 2MXP22A M2 antennas were built in a car park in Atlanta. Everything worked out fine and they received the first EME signals on 2m and worked PA2CHR with very good signals both ways (-17 and -19dB). 3YOZ is a big HF DXpedition and less than 1% of the expected QSLs will be made via EME, yet 5% of the total costs are related to that way of operating. Find out more at [www.bouvetdx.org](http://www.bouvetdx.org)

# New Products

## 2/70 FM mobile transceiver

Launched at the National Hamfest, the new MyDEL AT-779VU is a very compact 2/70 FM mobile transceiver costing £89.95. Covering the 136-174 and 400-490MHz bands with 25W, 10W and 5W options, it has a solid diecast alloy construction and a full 18W output. Details are at [www.hamradio.co.uk/](http://www.hamradio.co.uk/)



## Elecraft MH4 Microphone

The new MH4 microphone is an enhanced replacement for the MH2, which is no longer available. It can be used with the Elecraft K2, K3, and K3S transceivers. The MH4 has the same sensitive, high-performance element as the MH2, and can be used with the same bias and gain settings. Other than the plug, the MH4 is identical to the MH3 mic, used with the KX2/KX3. The MH4 has UP/DN controls, already supported by K2/K3/K3S firmware. On a K3 or K3S, UP/DN can be used to move the VFO or do channel hopping. On a K2, UP/DN alternates between VFO A and B. The MH4 has a slimmer, more modern form-factor than the MH2, along with a less bulky coiled cord and a removable bracket that can be used to hang the mic in mobile applications.



## LNR products in UK

Kanga Products (Kanga UK) are now the exclusive UK/EU distributor for LNR Precision Inc from the USA. Two new products will be available for the first time in the UK – the W4OP Loop Antenna (left) and the full range of the Mountain Topper CW transceiver (right).



## New book for 11-14 year olds featuring amateur radio: *Mouse*, by Fiona Beddow

This is a rare book where amateur radio enthusiasts save the day and low-tech triumphs over hi-tech. *Mouse* is a fast-paced tale of survival in the face of police corruption and advanced digital surveillance. When her family are arrested, 13-year-old Laurel is rescued by a resistance cell who use low-tech comms to avoid detection. At a pivotal moment in the book, the rebels customise an old radio set in a last-ditch attempt to keep the airwaves open, and thus restore Britain to freedom.

It's the perfect Christmas stocking-filler for children (or grandchildren!) and you can find it on Amazon in both paperback and Kindle versions.





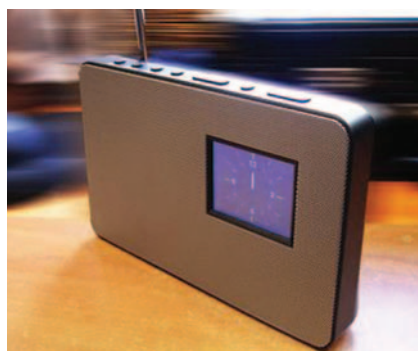
### European-made QRP transceiver

Nevada is pleased to announce its appointment as exclusive UK dealer for the new range of Aerial-51 Sky SDR transceivers, which are manufactured in Europe.

First in the range is the SKY-One SDR, an eleven band, all-mode 5 watt QRP transceiver. The SKY-SDR has most of the DSP features of larger HF transceivers – direct conversion, razor-sharp-adjustable filters, noise reduction, noise blanker, audio equaliser and even a built-in bandscope that works on receive and transmit.

Its clean transmitter has a speech processor, audio equaliser and even comes with a hand mic at no extra cost. It also includes a USB CAT control with FTDI decoder, line in/out for digital modes. The transceiver is very portable measuring just 13 x 11 x 8cm (including knobs) and weighs 580g.

The SKY-One SDR is available exclusively from Nevada Radio and is priced at £699. See [www.nevadaradio.co.uk](http://www.nevadaradio.co.uk) for details.



### Perstel DR701C DAB receiver

This new portable DAB radio with a colour LC display and clock, features a very kitchen timer function and receives FM, digital DAB and the new DAB plus standard. The DR-701C is a future proof radio, enabling you to take it on your travels around the world and to keep up with the transition to DAB plus in the UK. The new DAB plus standard is used throughout Europe and now in the UK by new stations. The radio has a contemporary design with a grille front and glossy edge and backing. It's easy to use and gives superb audio quality. The colour screen will display pictures or logos that the radio station might put up from time to time. It has clear illuminated LCD screen so it's easy and intuitive to operate. The radio has an auto scan feature, alarm clock, kitchen timer and 40 presets. As well as being powered by mains, the compact DR701C also runs on AA batteries making it perfect to take out and about – whether it's out in the garden, camping or picnics, etc. It's available £49.95 from UK distributors [www.nevadaradio.co.uk](http://www.nevadaradio.co.uk)

### New AOR products

Waters & Stanton has three new AOR products, the AR-DV10, AR-5700D and the AR-ALPHA-II.

- The AR-DV10 is a handheld version of the very popular DV-1, an analogue and digital receiver covering 100kHz to 1300MHz.
- The AR-5700D provides a 9kHz to 3700MHz coverage and, like the DV-1 and DV-10, covers a number of digital modes (10 on the 5700D) including TETRA, P25, DMR, D-Star and more.
- The AR-Alpha-II is the new flagship model and replaces the AR-ALPHA. It now has a coverage of 9kHz to 6000MHz in analogue and 10 digital modes.

Pricing is to be advised and will be detailed at [www.wsplc.com](http://www.wsplc.com)



# Homebrew

**This month we have more on oscillators, plus a quick review of Rojon TCXO modules.**

## Busy times

We have a lot to cover this month, so some of the descriptions will be brief and perhaps lacking in detail. See the project webpage [1] and source code for the microcontroller boards for more detailed information. In the following text, the abbreviation 'micro' will be used in place of microcontroller or MCU.

## Frequency display

Any radio equipped with a tuneable VFO will need a frequency display. The traditional approach was to use a linear printed scale, where frequency or wavelength was indicated by a needle on a string. In more recent times, the frequency 'dial' is usually presented on some form of electronic display. There are many different types, sizes and display technologies in common use. Liquid crystal displays offer excellent performance, low cost and extremely low power consumption. For this project, I will use a standard 16 character by 2 line 5V LCD display module (type 1602A or similar). Such LCD modules are now available from eBay and similar sources at ridiculously low prices. These displays are based on, or at least compatible with the HD44780 LCD controller IC. Older displays were always suitable for use with a 5V supply. Newer devices may be specified for 5V or 3.3V. Make sure you choose a display that is compatible with the voltage to/from your micro board.

## Connecting to the micro

There are several options for transmitting data to the display module. Standard HD44780 displays communicate over a parallel 8 bit interface. As part of the initial setup process, the display can be programmed to accept data as eight parallel bits (8 wires). Using the alternative 4 bit mode allows each character or command to be sent over a 4 bit interface. This option requires two separate write operations for each byte sent to the display. The third option is to use a display with a 2-wire serial interface. For this project, I will use a standard display in 4 bit mode, because this option will reduce the number of microcontroller I/O pins required. In addition

to the 4 data bits, the LCD module has connections for RS (register select: command or data), ENA (enable) and RW (read/write). For many applications, the RW line will not be required because there will be no need for the micro to read from the display.

I have re-written my software for driving the LCD module so that any of the microcontroller digital I/O pins can be used to drive any of the LCD data pins.

The resulting code is a bit slower and more complicated than the previous version, but allows much greater flexibility when wiring the LCD to the micro. This approach allows the constructor to build a prototype or breadboard layout, connect the data lines to the nearest or most logical choice of I/O pin, and then decide which pin does what at the programming stage. The `#define` directive in C and several other programming languages can be used to associate a pin number with a label. Example: `#define ENC_BUTTON 10` makes code easy to read and maintain. The programmer will not need to remember that the push-button switch on the rotary encoder is connected to I/O pin 10.

I have used the following connections

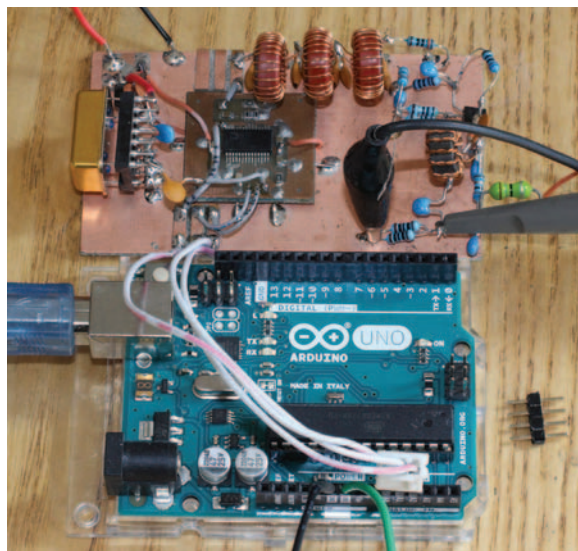


PHOTO 1: DDS under test, connected to an Arduino Uno.

between the PIC board and the LCD module: RS=19, ENA=20, D4=13, D5=14, D6=15, D7=16. As the display is in 4 bit mode, D0-D3 are not used and should be left unconnected. The other connections to the LCD are the 5V supply, Gnd (0V) and Vo (contrast).

The optimum voltage for Vo varies with display type, colour, viewing angle and temperature. For most practical applications, Vo from a 10k pot across the 5V supply provides a set-and-forget solution for contrast

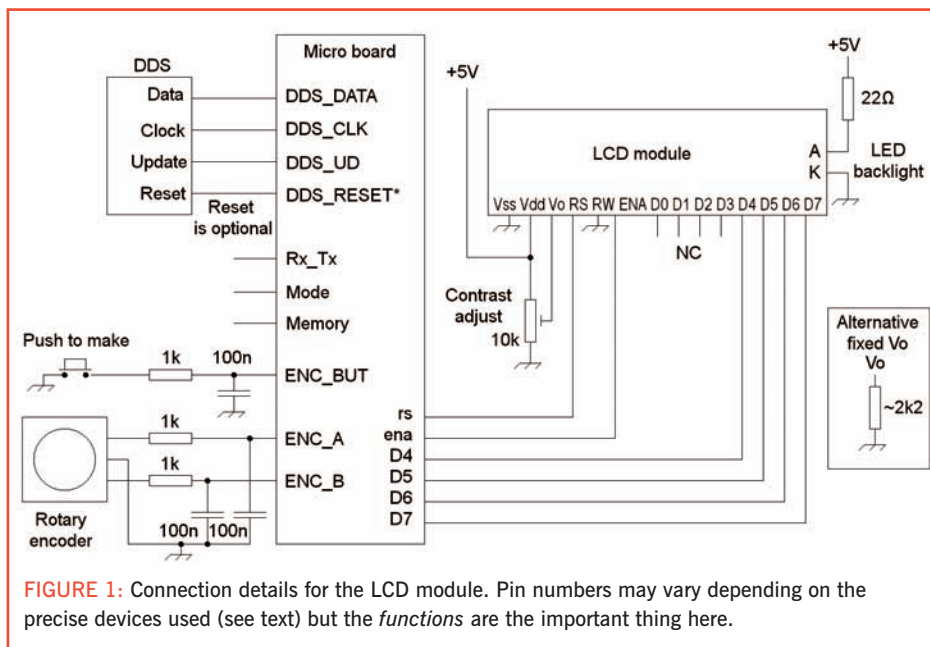


FIGURE 1: Connection details for the LCD module. Pin numbers may vary depending on the precise devices used (see text) but the functions are the important thing here.



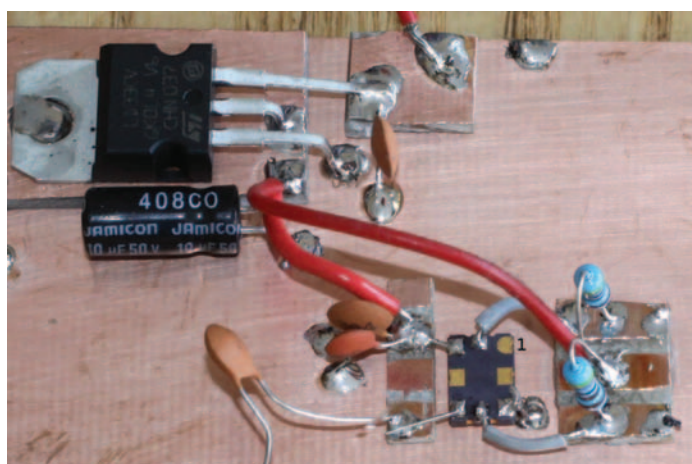


PHOTO 2: Assembled Si570 oscillator and power supply.

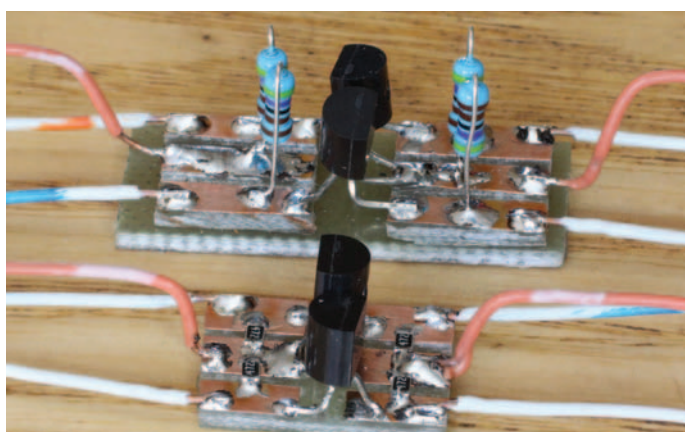


PHOTO 3: Bi-directional level shifters made with normal and surface mount resistors. Each board contains two one-transistor shifters.

adjustment. I have found the optimum  $V_o$  range is +0.8 to 1.2V depending on display type. As an alternative to the 10k pot, you can use a fixed voltage divider, consisting of the display module's internal pull-up resistor and a fixed resistor between  $V_o$  and Gnd. The internal pull-up is typically 10k, the optimum value for the external resistor will range from 1.8k to 3.3k.

## LED backlight

Most low-cost display modules will include an LED backlight. The LED cathode (K) and anode (A) connections are usually isolated from the rest of the module circuits so that on/off or brightness control can be completely independent of the micro board. Most displays will have an on-board current limiting resistor of around 68-100Ω so that the backlight can be powered directly from the 5V supply. I usually find the backlight is far too bright for indoor use. Brightness can be controlled by placing a resistor in series with the anode supply. I find 22Ω to 120Ω is about optimum. The resistor will also prevent damage if your module doesn't include a suitable resistor. Figure 1 shows the connection details for the LCD module.

## Rotary encoder

Last month we did some experiments with the cheap and widely available AD9850 DDS boards. We will now add a rotary encoder as a VFO knob for frequency tuning.

Picking a suitable rotary encoder for a VFO usually comes down to a choice between a cheap mechanical 'clicky' type or a higher quality optical encoder. The mechanical switch types are of low resolution, typically 20 pulses per revolution (PPR). Mechanical switches suffer from contact bounce, which can cause false triggering of micro inputs. Optical encoders offer much higher resolution, typically several hundred PPR

and don't suffer from contact bounce.

High resolution optical encoders used to be extremely expensive, typically tens or even hundreds of pounds per device. Thankfully, high quality encoders are now available at more affordable prices. With careful purchasing you can expect to pay from about £10 upwards for a 360 or 400 PPR optical encoder with a 6mm shaft.

Figure 2 shows a mechanical type of rotary encoder connected to the micro board. This type of encoder usually includes a push-to-make button switch. This can be used to select frequency tuning steps. I use selectable steps of 1, 10, 100 or 1000Hz. The push switch can be connected to any digital I/O pin. It is best to connect at least one of the encoder outputs to a micro pin that supports hardware interrupts (INT0 or INT1 on the Pinguino or Arduino). Note that for this application I enabled the internal pull-up resistors in the micro. If you use a pin without internal pull-ups, you must use an external 10k resistor from the input pins to Vdd. The 1k resistor and 100n capacitors act as a LPF to suppress noise due to contact bounce or RF picked up by

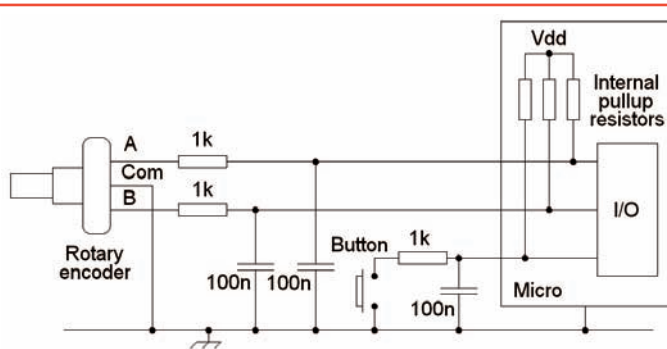


FIGURE 2: Mechanical-type rotary encoder connected to the micro board.

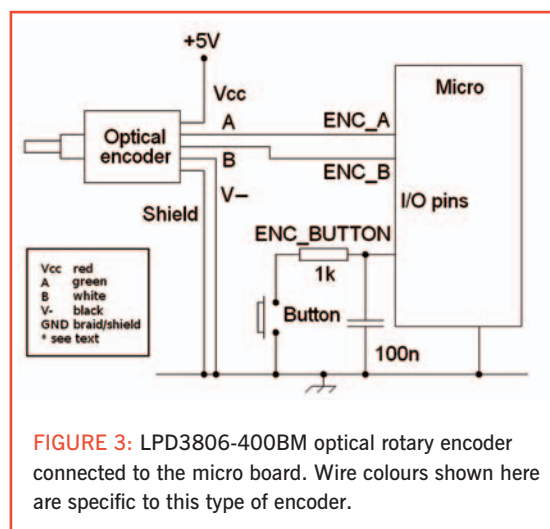


FIGURE 3: LPD3806-400BM optical rotary encoder connected to the micro board. Wire colours shown here are specific to this type of encoder.

unscreened wires from the encoder.

I have tested this circuit using both polled (checking inputs periodically) and hardware interrupts for reading the encoder. Hardware interrupts gave much better performance, so this option was used in the final design.

Eamon Skelton, EI9GQ  
hbradio@eircom.net

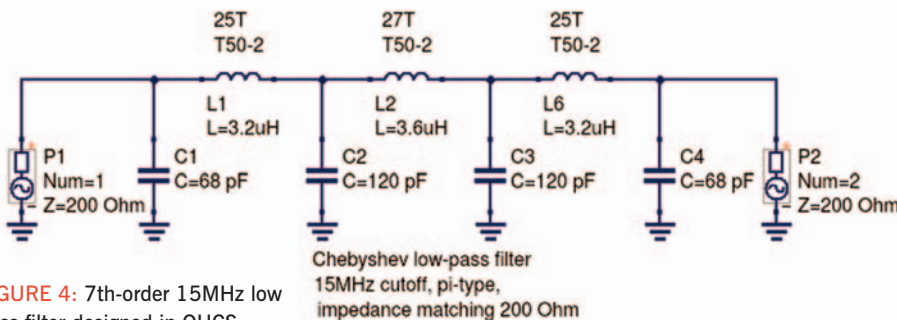


FIGURE 4: 7th-order 15MHz low pass filter designed in QUCS.

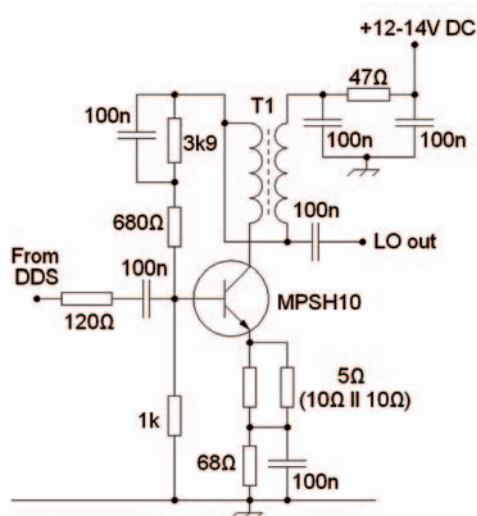


FIGURE 5: Simple broadband amplifier with 200 Ohm input impedance, capable of delivering +14dBm into a 50 Ohm load.

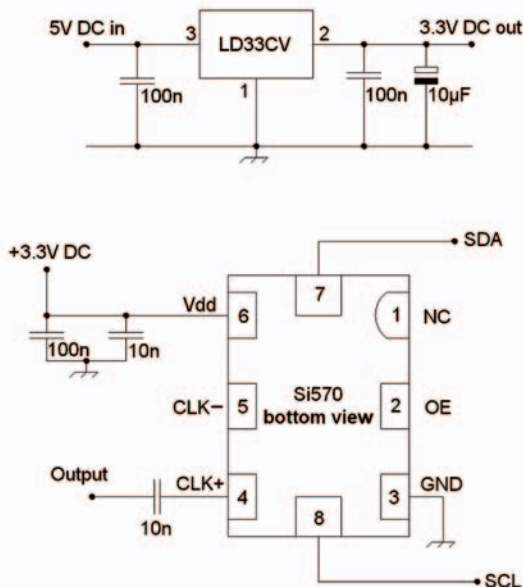


FIGURE 6: Si570 configuration and a suitable power supply circuit.

I have tested the software with both mechanical encoders and also with a LPD3806-400BM optical encoder. Figure 3 shows the simpler connection arrangements for the optical encoder. The wire colours shown are for this specific type. If you use a different encoder, check the datasheet for wiring details. As the optical encoders don't have a built-in switch, you will need a separate push-to-make button switch if you wish to use the change-frequency-step feature.

### Temperature compensated oscillator

I have decided to use a high stability temperature compensated crystal oscillator (TCXO) in place of the cheap tin-can oscillator included with the AD9850 boards. This leaves me with a choice of removing the standard oscillator and grafting the oscillator onto the board, or using one of my home-made AD9851 boards with the TCXO. I have chosen the latter option.

Rojon branded oscillators are readily available on the usual auction sites. These oscillators have a specified frequency stability of 0.1 parts per million (ppm), which makes them ideal for our application. The oscillators come in a 4-pin can that fits conveniently in

a 14 pin IC socket. Pinout complies with the usual convention where pin 7 is Gnd and pin 14 is the +5V supply. Note that pin 7 is not insulated from the metal can. Pin 1 is not connected. Some other TCXO units may use pin 1 for fine frequency control.

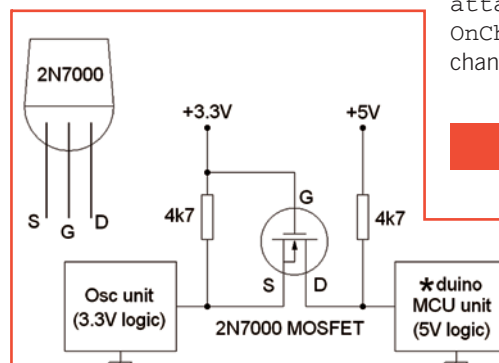
In testing with a 5V supply and frequency counter, I found the 125MHz output to be about 30-50Hz high immediately after power-up. Within 2-3 minutes, the frequency is within the specified 0.1ppm (12.5Hz). This small error will be divided by the DDS, so that the error at the DDS output will always be negligible. In practice, when the DDS is set for 10MHz output, the output will be within 3-4Hz at power-up and better than 1Hz after a few minutes warm-up.

As the stability of the Rojon unit is about the same as the TCXO timebase in my frequency counter, I had to use a GPS-disciplined 10MHz OXCO and dual-trace oscilloscope for the long term stability tests. Drift was no more than  $\pm 1$ Hz over a five hour period. The output looks clean and stable on the scope. When used as the LO source for the 160m receiver, signals are clean and selectivity is very good. This suggests that the oscillator phase noise is very low.

### Arduino

I have also tested the VFO hardware and software with the Arduino UNO and MEGA256 micro boards. The Arduino offers similar performance and features when compared to my PIC board. An added benefit of the Arduino is the huge range of library and example code published by other Arduino experimenters.

When porting my VFO code to the Arduino, many of the software routines needed little or no modification. Code for loading the DDS and driving the display just simply worked. There were a few differences, like the method of invoking input pin hardware interrupts: `attachInterrupt(*)`; instead of `OnChangePin0(*)`; However, the changes took a remarkably short time.



Continued on page 83

FIGURE 7: Bi-directional 3.3 to 5V logic level shifter.





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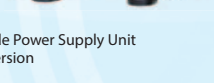


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SQBM1000P 6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239 .....	£84.95
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# Antennas

**W**hen out operating portable, or using a satellite to make contacts, a beam antenna able to cover 2m and 70cm can be an advantage. So this month we examine a dual-band Yagi based on the open sleeve dipole technique.

## Overview of the open sleeve dipole

The open sleeve dipole technique was summarised in the Antennas column last year [1] where a driven element can take on the characteristics of a shorter parallel parasitic element depending upon the space between them. When the shorter parasitic element is close enough to it, then the longer driven element energises the shorter element. The resulting interaction between the two elements enables the longer driven element to take on the attributes of the shorter element, with the system radiating an RF signal as if it were a dipole of the same length as the shorter parasitic element [2] [3].

## Dual-band Yagi beam

The open sleeve dipole technique can provide the basis for a dual-band Yagi, where two beams on different bands share a single boom. This makes an ideal compact antenna for portable use or working through a satellite. **Photo 1** shows the prototype mounted on a photographic tripod.

When the two beams' driven elements are situated close to each other, this has the effect that the larger beam's driven element energises the smaller beam due to the interaction between them. This interaction has the advantage that a single coaxial cable can be used to feed both the beam antennas. The concept of the dual-band beam is shown in **Figure 1**. The 2m beam has four elements and the 70cm beam has six elements.

The antenna was made from aluminium tubing sourced from an online warehouse, however some do-it-yourself stores stock suitable aluminium tubing. The boom was a 1.2m length of 20mm diameter tube, the elements for the 2m beam from 12mm diameter tube and the 70cm elements from 8mm diameter tube.

The lengths and centre-to-centre spacing between the beams' directors, driven elements and reflectors are summarised in **Table 1**. It is important to note that the 2m driven element, which is the only one connected to the feeder, is made from two 465mm lengths of tube with



**PHOTO 1:** The 2m/70cm dual-band beam in use. The tube in the coax contains a BNC joint.

a 10mm gap in the middle (see **Figure 1**). The 70cm driven element is driven parasitically.

The length and spacing of the elements were determined using *MANNA-GAL* [4]. The design frequencies were 145.0MHz and 434.0MHz, so the antenna should be usable for either the SSB, FM or satellite sections of both bands.

The predicted free-space gains at these frequencies were calculated for free space conditions and 7m above ground level (AGL). The results are shown in **Table 2**. The predicted radiation patterns for 2m and 70cm are shown in **Figure 2** and **Figure 3** respectively, modelled with the antenna horizontally polarised and at 7m AGL. Both plots show that the antenna radiates a significant RF signal in the forward direction, however the effect of the interaction of the 2m part on the 70cm radiation pattern is evident in **Figure 3**, which reduces the forward gain compared to what one might expect.

## Outline of construction

The dipole centre used for the 2m beam was made from a 20mm three-way electrical termination box sourced from a local electrical supplier. These boxes are usually supplied with a lid, screws and compression gasket that, when screwed in place, seals the interior from the weather.

To provide a snug fit for the 12mm diameter elements, spacers were made for each dipole leg from sections of 20mm conduit. Smaller

diameter spacers were made from the conduit by removing a lateral section to enable the spacer be a snug fit inside the outer conduit.

The centre of the 2m dipole was supported using an insulator that was slid inside each dipole leg to leave a gap of about 10mm between the tube ends. This insulator was made from a length of plastic rod that was filed to give a tight fit inside the tube ends. A connection plate was made from a scrap of single-sided PCB. A 10mm strip was etched down the centre and two brass terminals were soldered to the plate to enable the feeder cable to be connected. This can be seen in the inset to **Photo 2**. Suitable holes were drilled through the copper sections of PCB into the aluminium tubes beneath to allow the connection plate to be terminated to each dipole leg using self-tapping screws.

When the 2m dipole's correct length had been determined by testing (described later), epoxy glue was used to secure each dipole leg in place. Two holes were drilled in the base of the electrical conduit termination box to enable it to be fixed to the antenna's boom using nuts and bolts. A 20mm gland was glued to the box access hole in preparation for when the coaxial cable feeder was connected to the dipole.

The element clamps used to secure the 2m beam to the boom were obtained from a rally; the clamps used for the 70cm elements were salvaged from a scrap antenna (also from a rally). However, the element clamps could be



made using the technique shown in the May 2016 Antennas column.

The balun used for the antenna needed to be of a wide-band type that was able to support operation on both the 2m and 70cm bands. Consequently, a choke balun was used that was made from nine turns of low-loss 50Ω coaxial cable wound on the boom behind the 70cm beam's reflector. Cable ties were used to hold the choke balun in place and this arrangement can be seen on the left of Photo 2. A short length of the coaxial cable was run from the choke balun, through the 20mm gland, connected to the feed point's terminals and sealed by tightening the gland nut. The short length of coaxial cable running from the other end of the choke was terminated in a BNC plug to enable the antenna to be connected to a longer cable run to the radio equipment. To protect the BNC connection, a 20mm conduit coupling was held in place above the BNC plug using a 'bung', then a suitable length of 20mm conduit was slid over the BNC connection and into the coupling to protect the connection. This protection technique was described in August's Antennas column.

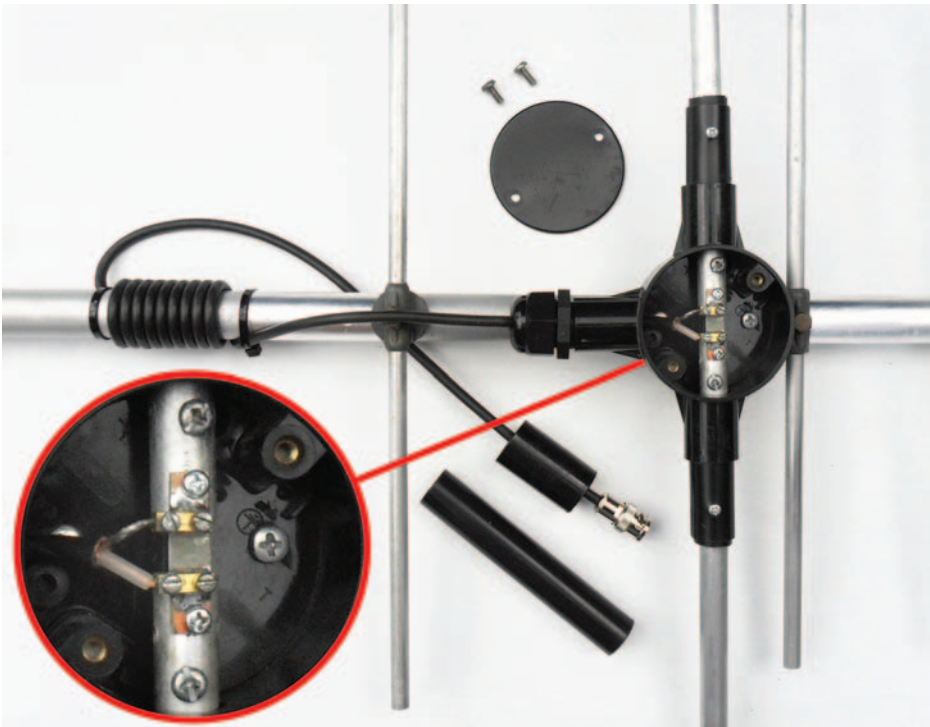


PHOTO 2: Dipole centre and choke balun arrangements.

Tuning

The spacing between the 2m dipole and 70cm driven element determines the impedance seen at the dipole's centre for both bands. A space of about 35mm between the 2m dipole and 70cm driven element gave an impedance close to 50 ohms on the 2m dipole for both the 2m and 70cm bands. An antenna analyser showed that closer spacing lowers the impedance and widening the gap raised it.

The antenna was tested on 145MHz and 434MHz using a power of 10 watts. The 2m dipole and 70cm driven element were cut slightly longer than the MANNA-GAL predictions to allow for tuning. Starting with the 2m dipole, this was carefully trimmed to obtain the minimum SWR at 145MHz. Then this process was repeated for the 70cm driven element to obtain the minimum SWR at 434MHz. Fine adjustment of the spacing between the 2m dipole and the 70cm driven element resulted in a SWR of better than 1.2:1 at both frequencies. When measured at 144.25/145.85MHz and at 432.5/435MHz, the SWR continued to be low.

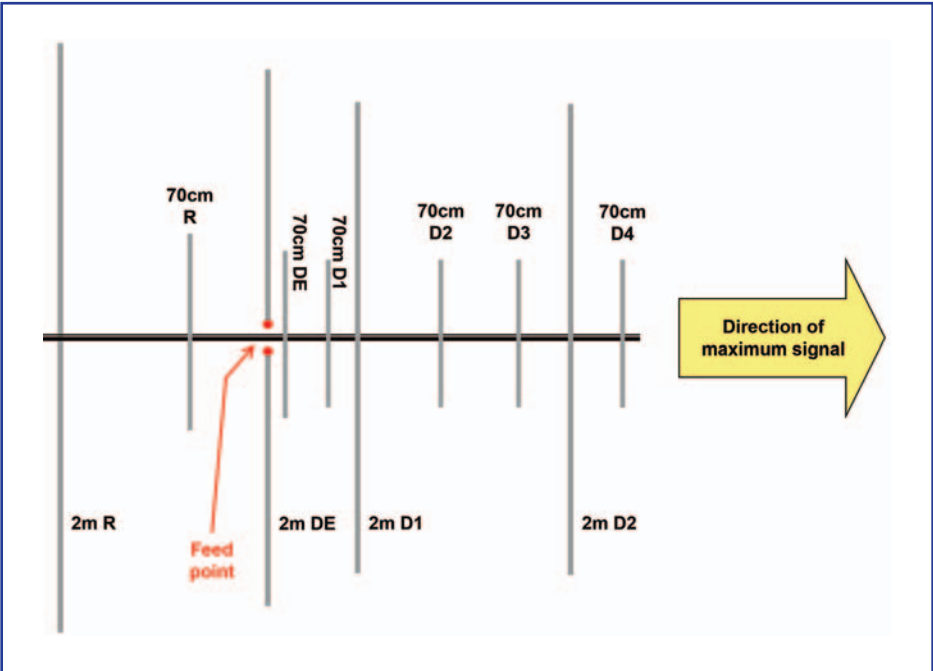


FIGURE 1: Basic configuration of the 2m/70cm dual-band Yagi beam. R = reflector element, DE = driven element, D = director element. Note that only the 2m DE is connected to the feeder.

Continued on page 32

TABLE 1: 2m/70cm element lengths and centre-to-centre spacings on the 1200mm boom.				
Element	2m (12mm Ø tube)		70cm (8mm Ø tube)	
	Length	Spacing	Length	Spacing
Reflector	1030mm	–	340mm	275mm
Driven element	940mm (2 x 465mm with 10mm gap)	410mm	316mm	445mm
Director D1	890mm	565mm	300mm	530mm
Director D2	880mm	950mm	240mm	725mm
Director D3	–	–	240mm	850mm
Director D4	–	–	240mm	1070mm

TABLE 2: Predicted performance.		
Band	Free space	7m AGL
2m	6.8dBd	13dBi
70cm	5.1dBd	12dBi

Mike Parkin, G0JMI  
email2mikeparkin@gmail.com

# Sport Radio

**This month there are big changes to Club Calls Contest, which is also known as 160m AFS.**

The Club Calls Contest takes place on the 11th. It's the second in this season's Super League series of contests. This year it has become a dual-mode event. Adding CW will give this contest a very different feel. Also, the scoring system has been changed, introducing multipliers. This is a good contest for first-timers and some clubs put a club station on the air and invite their members to share in the operation. If you intend coming on to air your club's callsign, even in a low key way, please note that club prefixes (eg GC for Wales) are welcome in this event. Club stations have always attracted callers because they are worth more points, but now they also count as multipliers, so call CQ for at least part of the time and expect a stream of replies. Then the Autumn Series continues with a datamodes session on the 13th. The 2nd 1.8MHz Contest is on the 18th. Part of the exchange in this contest is your District Code and this year there are changes. Norwich changes from NR to NK and instead of using 'BT' for all of Northern Ireland there are now individual codes for each of the six counties. There's a full list of them on the Contest Committee website.



David, G000G with his 'tea-tray' assembly.

Then it's back to the Autumn Series, with SSB on the 22nd and CW on the 30th.

The Marconi CW Contest runs for 24 hours on 144MHz over the 4th-5th. There are 6-hour and 24-hour sections for single-op and multi-op. Although the number of UK entries is low (average 35 per year) it is a Region 1 coordinated event, so there is always activity from Continental Europe. David, G000G (Photo 1) was the winner of the Single-op Fixed category last year. He is quite deaf, using a hearing aid in each ear, but he can hear CW! Lack of space indoors means he operates what he calls 'tea-tray mobile' from the balcony. For the rest of the month it's the Activity Contests, with the 144MHz FMAC & UKAC on the 7th, the 50MHz UKAC on the 9th, the 432MHz

FMAC & UKAC on the 14th, the 70MHz FMAC & UKAC on the 16th, the 1.3GHz UKAC on the 21st and the SHF UKAC on the 28th.

On the 1st, we have an SSB session of the UKEICC 80m series of contests. The Worked All Europe DX RTTY contest runs for 48 hours of the 11th-12th. In the RTTY leg everyone works everyone. The IRTS (Irish) 80m Evening Counties Contest is on the 14th. Exchange a signal report and serial number. EI and GI stations also give 3-letter county codes, which act as multipliers. There's a Low Band contest from UKuG on the 19th. Please note that it ends sooner than the others in the series, so that portables can get down from the hills in daylight. The Big One of the month is the CQWW DX CW Contest on the 25th-26th. I think conditions on the upper HF bands are going to be pretty grim for this, but I doubt it will greatly affect the number of entries. What I think will happen is that 80m and 160m will be used more, so overnight there could be some good DX to be worked on them. Finally, a CW session of the UKEICC 80m series takes place on the 29th.

**Steve White, G3ZVW**  
steve.g3zvw@gmail.com

## RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Sat 11 Nov	Club Calls (1.8MHz AFS) §	2000-2300	CW, SSB	1.8	RS(T) + SN + Club info
Mon 13 Nov	Autumn Series	1900-2030	Data	3.5	RST + SN
Sat 18 Nov	2nd 1.8MHz *	1900-2300	CW	1.8	RST + SN + District code
Wed 22 Nov	Autumn Series	1900-2030	SSB	3.5	RS + SN
Thu 30 Nov	Autumn Series	1900-2030	CW	3.5	RST + SN

## RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Sat-Sun 4-5 Nov	Marconi CW Δ	1400-1400	CW	144	RST + SN + Locator
Tue 7 Nov	144MHz FMAC	1900-2000	FM	144	RS + SN + Locator
Tue 7 Nov	144MHz UKAC	2000-2230	All	144	RS(T) + SN + Locator
Thu 9 Nov	50MHz UKAC	2000-2230	All	50	RS(T) + SN + Locator
Tue 14 Nov	432MHz FMAC	1900-2000	FM	432	RS + SN + Locator
Tue 14 Nov	432MHz UKAC	2000-2230	All	432	RS(T) + SN + Locator
Thu 16 Nov	70MHz FMAC	1900-2000	FM	70	RS + SN + Locator
Thu 16 Nov	70MHz UKAC	2000-2230	All	70	RS(T) + SN + Locator
Tue 21 Nov	1.3GHz UKAC	2000-2230	All	1.3G	RS(T) + SN + Locator
Tue 28 Nov	SHF UKAC	2000-2230 ~	All	2.3-10G	RS(T) + SN + Locator

## Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange/info
Wed 1 Nov	UKEICC 80m	2000-2100	SSB	3.5	4-character Locator (Grid) square
Sat-Sun 11-12 Nov	WAE DX RTTY	0000-2359	RTTY	3.5-28	RST + SN
Tue 14 Nov	IRTS Evening Counties	2000-2100	CW	3.5	RST + SN (EI/GI also send county)
Sun 19 Nov	UKuG Low Band	1000-1400	All	1.3-3.4G	RS(T) + SN + Locator
Sat-Sun 25-26 Nov	CQWW DX CW	0000-2359	CW	1.8-28	RST + CQ Zone (UK=14)
Wed 29 Nov	UKEICC 80m	2000-2100	CW	3.5	4-character Locator (Grid) square

\* HF Championship event. Δ VHF CW Championship event. § Super League event. ~ Different bands at different times. For all the latest RSGB contest info and results, visit [www.rsgbcc.org](http://www.rsgbcc.org) – note that in the case of differences between this calendar and the Contest Committee website, the website takes precedence.





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# Design Notes

## Component substitution

Colin Tuckley, G8TMV was interested in the remote two wire interface in September's column where serial data is being transmitted over the power wires. He writes:

"I read your Design Notes article with interest because I've been thinking about adding an 'answer' data stream to my remote antenna control system [1]. However, when I went looking for a source of parts I found that the BDX42 isn't available from any of the 'usual' suppliers. Farnell suggested the NTE253 as an alternative but neither they nor RS have those at the moment. Also, comparing them price-wise with things like the ISP742 high-side switch they are more expensive, even ignoring the extra transistor needed to drive the Darlington.

"Is there any reason you didn't choose one of the modern FET based high-side switches that are designed to be run from logic systems like a PIC? The high-side switches work as long as  $V_{BB}$  is connected, which it always is in your design. It's on if you put a logic level voltage on the input pin, which you could do with a voltage between the input and ground. Turning it off would mean using a PIC GPIO pin to ground the input, so the voltage values would have to be chosen to make sure the GPIO current limitations were not exceeded.

"But that is really only half my comments – more important, in my view, is that if you publish a design for something, you really need to make sure that the parts are available. Junk box designs are okay for a personal one-off but are really a big no-no for anything being published."

Colin makes several good points in there: I didn't use a high side switch because I forgot about those devices at the time of thinking about the interface – in spite of having written about them in the April 2014 Design Notes and even having some in my junk box! I just happened to have a lot of BDX42 Darlington devices languishing there too, so I used one of those without really thinking about it. Using obsolete devices, when semiconductors are so cheap and readily available, is less forgivable. In my defence the circuit description discusses why a Darlington was needed and constructors could easily substitute one made up from a pair of discrete transistors using whatever NPN devices are to hand. To cap Colin's input, I then received this note from Harold Weissler, AJ4CJ:



**PHOTO 1:** Part of the 'JNT semiconductor junk box that started in 1973. Devices are stored in individual labelled matchboxes, some of which may be more valuable as antiques than their contents.

"Thank you for the great article in the September 2017 issue of *RadCom*. I enjoyed it; it brings back memories of the old current loops used on teletypes before RS232. I also would like to call your attentions to a minor detail in Figure 2. It seems that the BDX42  $V_{EB}$  of 5.0V max specified in the data sheet is exceeded when a space is sent (BC846 on)."

After searching the web for a datasheet, I found Harold is quite right – the BDX42 is specified for just 5V reverse emitter-base voltage and when my interface is sending a '0', or switched off, this voltage is exceeded. OOPS! Fortunately, my hardware does actually work. Perhaps the base-emitter junction really is breaking down and it doesn't matter. If this were to be the case, it would be acting as a Zener diode with around 5V drop, in which case the current draw would be reduced well below the 25mA needed to trigger the current sensor. So data is still being transmitted.

Since I've only ever used those BDX42 devices about twice in several decades, they are now going to be firmly consigned to the dustbin and the space in the junk box allocated to something more useful.

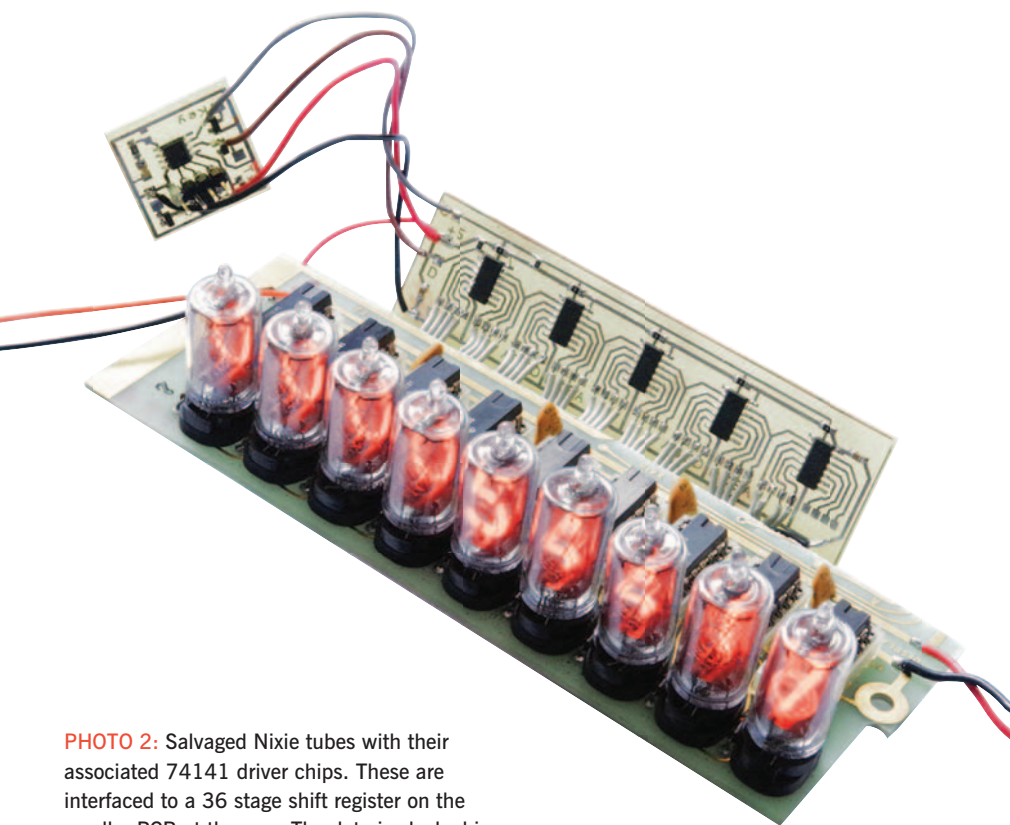
## The junk box

This is a concept dating back to the life of a radio amateur in the last century. Back then, electronic components were expensive and we collected what we could, recovered components from old chassis, dismantled,

unsoldered and saved *everything* useful that we might be able to use in future construction projects. Many such projects were built around what was available. The term 'junk box' was often a misnomer: plastic drawers, tobacco tins, glass jars, matchboxes and all manner of other containers were used to store all the stuff in a collated way.

These days, components are so cheap that for many builders it's just not worth the effort of storing old stock, especially as some devices go obsolete quickly (eg the BDX42 discussed earlier), but the junk box can take on a new meaning in modern homebrewing practice. Nowadays, electronic components are rarely sold in small quantities and, as they are so cheap, there is no reason not to buy, say, 10 transistors of one type when you only need one. At a few pennies each, you are hardly wasting money. Or manufacturers / sellers have minimum order charges, so look for other useful items they do to make up the order value to their minimum and keep the extra bits for that next thing you want to try. The junk box then becomes the repository of the surplus but new parts, ready and waiting for another construction project idea to come along. SMT components in particular lend themselves to this strategy. For example, I recently ran out of 100nF 0805 sized capacitors – the mainstay of decoupling from audio to HF. Farnell stock one type of these at a price of 2.25 pence each for quantity of 10. But, if I were to buy 1000 off, that price drops to 0.83 pence





**PHOTO 2:** Salvaged Nixie tubes with their associated 74141 driver chips. These are interfaced to a 36 stage shift register on the smaller PCB at the rear. The data is clocked in serially from the PIC module on the left.

each, or £8.30 for half a lifetime's supply. 1000 SMT capacitors take up so little room that the result was inevitable. In fact for 2000 off the price drops to 0.62p each, but there are limits even for me!

I started keeping stocks of semiconductors in the early 1970s and, thanks to a suggestion by Steve Head, G8KOS in 1973, use matchboxes that were (and still are) readily available. They conveniently fit, lying on their ends, into an old antique set of wooden desktop drawers that I happen to have. **Photo 1** shows part of the 'JNT semiconductor collection. This is frequently updated, with the *really* obsolete devices thrown out and the matchboxes reallocated to latter-day surplus stock.

There are still junk items worth looking round for at rallies and dismantling for salvage. But rarely for their semiconductors. For example, high voltage capacitors, especially silver mica types, are very expensive new, but are needed in ATUs and higher power transmitters for the LF to HF bands. They can often be found in old vintage test equipment, which is often sold non-working for scrap value. Heatsinks and metalwork generally can also be worth keeping as this is getting more expensive and harder to find new.

### Salvaging a Nixie display

While on the subject of salvage, a recent little fun project here involved removing the display and logic board from a vintage

frequency counter purchased as scrap from a junk sale. The board had a lot of old TTL ICs date coded 1973 and nine Nixie tubes. These high-voltage numerical neon displays are a bit of a collectors item now and are used by many constructors to build 'retro' products like digital clocks with a 1970s feel. The logic board from the counter very conveniently had a set of the all-important 74141 BCD decoder / high voltage driver chips mounted on the PCB adjacent to the display tubes. These particular devices are rare and often more unobtainable than Nixies themselves, so the complete unit was just asking to be made into something operational.

The PCB tracks were fortunately arranged so that by taking a pair of tin snips and cutting the large double-sided PCB straight across, the decoder-driver ICs and the displays themselves could be isolated, with many of the connections needed still in place. The driver chips take a four bit parallel BCD drive and after I'd cut the PCB, all 36 tracks carrying the parallel drive signals were conveniently accessible.

To do anything useful, the display has to be driven from a PIC or similar kind of controller. The easiest way to interface the multiple parallel drives was to build a 36 stage serial-to-parallel shift register, so data can be transferred to the 36 drive lines using a simple serial interface consisting of just clock and data signals. An auxiliary PCB was made up consisting of five 74HC164 8-bit shift register chips. The output from

these were connected to the display board via short bits of ribbon cable. **Photo 2** shows the recovered and 'snipped' PCB with the auxiliary shift register PCB attached. The configuration of tracks carrying the four BCD bits to each decoder IC on the original board is not in a 'logical' order, but rather than try to correct this by twisting and confusing the ribbon cables, the connections were 'reordered' in the PIC software via a lookup table.

At the time of writing, the display is sitting on my bench, driven by a bit of PIC code that just lets the display show a 10Hz incrementing count to prove it all works. The 170V supply for the Nixie tubes comes from a variable high voltage low current switch mode power supply.

### PIN attenuators

John Pink, G8MM wrote in to mention a PIN diode attenuator block he found, [2]:

"This looks interesting, but as we know PIN diodes do not usually perform well at HF. Maybe they have some extra-long life-time diodes."

The Skyworks SKY12239-11 is a set of four PIN diodes within a single 3.8 x 3.8 x 1mm package that also includes the necessary biasing and decoupling components. It is configured for standalone use as a voltage controlled attenuator and, according to the published data, offers up to 40dB attenuation (at 700MHz) and can handle up to 1W of RF. The specified frequency range is 10MHz to 1.5GHz and it is the lower frequency limit that prompted John's comment. PIN diodes have an intrinsic (undoped) part of the diode junction that gives them properties of a current controlled pure resistance at RF. But the linear effect is only maintained if the transit time of electrons across the I layer is long compared with the RF cycle time. Hence all PIN diodes have a lower frequency limit, below which they become non-linear as the diode junction begins to affect current flow. Normally, PINs have certain useful operating frequency ranges. This package has clearly managed, by compact integration and minimising bond wire lengths, to extend the upper frequency range of what must be essentially relatively low frequency PIN diodes.

### References

- [1] [www.tuckley.org/ant-ctrl/index.html](http://www.tuckley.org/ant-ctrl/index.html)
- [2] <https://shar.es/1SIUsu>

**Andy Talbot, G4JNT**  
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# A virtual lab to understand single sideband generation

## History

In the recent past, most single sideband suppressed carrier (SSB) signal generation has used the 'filter' method. One or the other sideband of a double sideband suppressed carrier is eliminated by filtering, leaving the upper or lower SSB signal.

The 'phasing' method of SSB generation requires two amplitude matched  $90^\circ$  separated signal paths. This has not been easy or economical. However, with I/Q (quadrature) signal processing being used in billions of mobile phones, digital TV sets, broadband modems and more, plus the improved ability to hold  $90^\circ$  phase across a wide modulation bandwidth, we can expect to see its use increase.

With that in mind I put together an Excel-based 'Virtual Laboratory' [1]. The lab will allow you to look at what is happening at each stage of the phasing method of SSB generation.

Most points in the circuit are displayed on a six channel virtual oscilloscope (an Excel graph) and the SSB output is also displayed on a virtual spectrum analyser (using Excel's clever fast Fourier transform (FFT) algorithm and graphing capability).

## How it works

In concept, the phasing method of SSB generation is simple. You process the carrier and modulation in two paths. The phase difference between the paths is  $90^\circ$ , ie one path is a sine wave path (the so-called 'in-phase' or I), whilst the other is a cosine wave path (technically in 'quadrature' – which is where the 'Q' comes from). This is I/Q processing.

In each of the paths we multiply carrier by modulation to generate a double sideband suppressed carrier (DSB-SC) signal. Each path's output signal consists of the same difference and sum frequencies, including the lower and upper sidebands of the suppressed carrier. In practical electronics hardware, this multiplication is done by a 'mixer'.

The product of two sine waves is the difference frequency *minus* the sum frequency and the product of two cosine waves is the difference frequency *plus* the sum frequency. When the outputs of the two paths are added or subtracted, one sideband

doubles in amplitude while the other cancels out. The in-phase signals add and those  $180^\circ$  out of phase cancel. This results in a lower or upper sideband SSB signal without the need for complex (precise) intermediate frequency filtering. To get the opposite sideband you just invert either the I or Q signal before adding it to the other one.

## Spreadsheet

The Excel SSB lab consists of three signal generators (basically, numerical oscillators). Each has both sine and cosine outputs, plus control of their frequency and amplitude. One is used to generate the (suppressed) carrier, whilst the other two – running at a much lower frequency – are used for generating modulation. I used the availability of two tone modulation as that is what is used and reported when a SSB generator/transmitter is tested.

All three generators clip when amplitude is increased above 2 volts peak-to-peak. If you are playing 'what-if', this allows a little distortion through square waves.

The modulation generators sine outputs are summed and the summed amplitude is divided by two to hold the maximum unclipped modulation level to 2 volts peak-to-peak. The same is true for the modulation generators cosine outputs. Two multipliers are included, one for sine products (sine modulation times sine carrier) and the other

for cosine products. This is straightforward I/Q signal processing, also called quadrature signal processing.

The outputs of all three signal generators are displayed in the time domain on the virtual oscilloscope, as is the two tone modulation after summing and reducing amplitude by one half. The remaining virtual oscilloscope display is the sum or difference of the two multiplier outputs, ie the upper or lower single sideband signal being generated. As one multiplier's input to the summer can be turned off you can also display the time domain output of a single multiplier, a double sideband suppressed carrier signal.

The lab setup allows you to input errors in phase and amplitude to see what happens. Both carrier generator outputs are offset by minus 3 volts for oscilloscope display. This offset is a display only, allowing easier viewing of the six possible oscilloscope channels.

Figure 1 shows a block diagram of the Virtual Lab. A version of this diagram is included as one of the sheets within the spreadsheet. This allows you an on-screen review of all the variables when running the system.

The Excel spreadsheet can be downloaded from [1]. Please read the important notes that in the rest of this article before downloading it, because it won't necessarily run 'straight out of the box' due to the way Excel's Fast Fourier Transform is implemented.

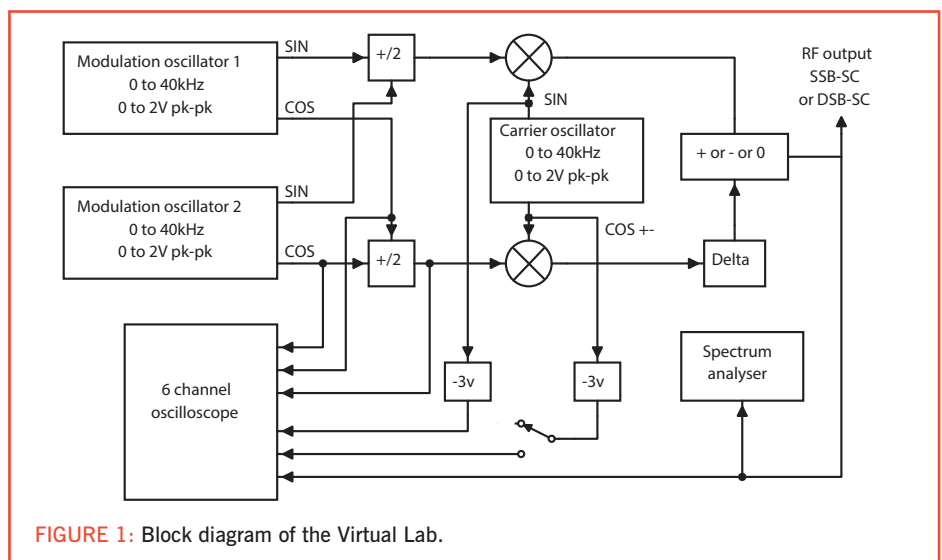


FIGURE 1: Block diagram of the Virtual Lab.



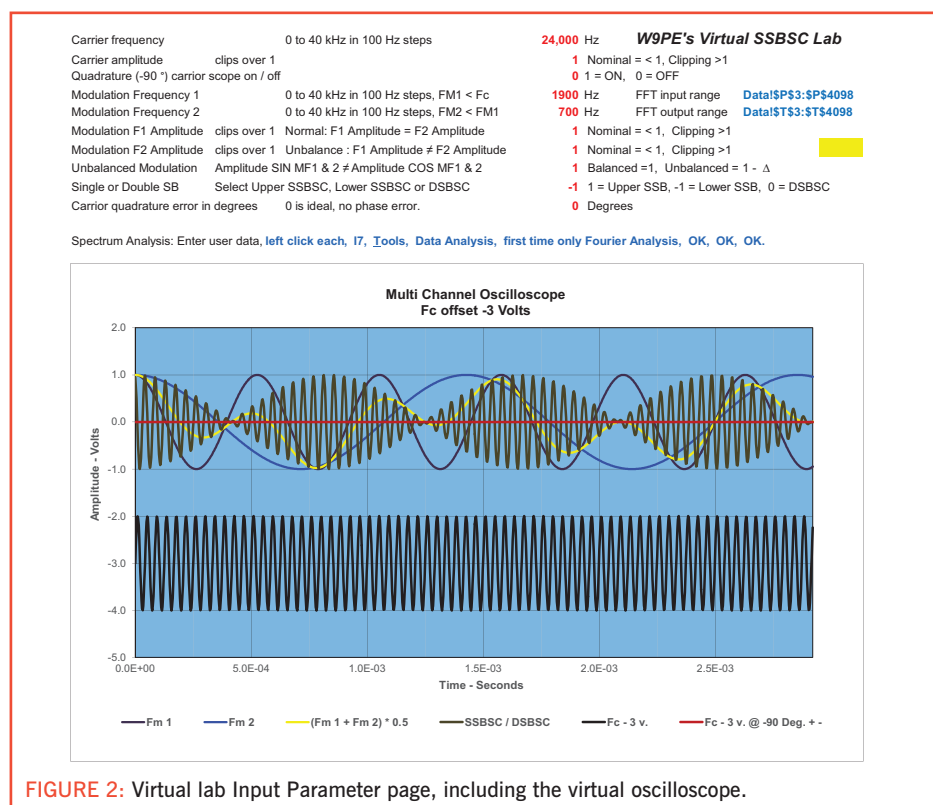


FIGURE 2: Virtual lab Input Parameter page, including the virtual oscilloscope.

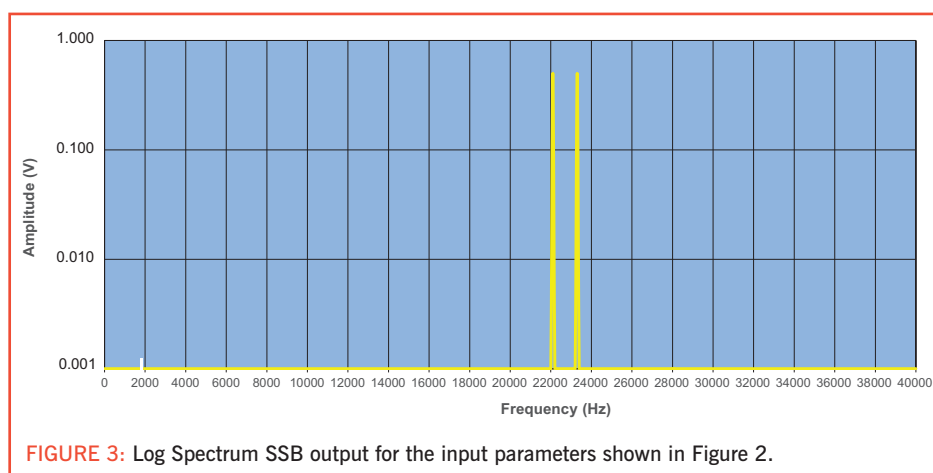


FIGURE 3: Log Spectrum SSB output for the input parameters shown in Figure 2.

24,000Hz was selected as the carrier frequency as it is easy to view on the oscilloscope. I chose 1900Hz and 700Hz as the two modulation frequencies as these are commonly used in testing SSB transceivers. I have also used these in the Maths sidebar overleaf, but you can change all three as you desire.

The first sheet is the Input Parameter page, seen at the top of Figure 2. It provides for both the input data and viewing of up to 6 channels of the multi-channel oscilloscope. The lab setup allows you to input errors in phase and amplitude to see what happens. All parameters are controlled by the settings D1 through D10 (in red) on the Input Parameter page. The multi-channel oscilloscope is also displayed on this page. The Input Parameter

sheet also has information (in blue) used to set up and toggle the FFT virtual spectrum analyser, described later.

There are three other pages of interest, accessed by clicking the tabs at the bottom of the page. The Modulation and Output page shows a clearer view of those parameters in a virtual oscilloscope. The two spectrum pages show virtual spectrum analyser displays, with logarithmic and linear axes as labelled.

Excel's fast Fourier transform (FFT) algorithm is included within all versions of Excel. At the time of writing, Libre Office and Open Office do not include an FFT algorithm. Thus the virtual spectrum analyser will only fully function in Excel.

Figure 3 shows the Log Spectrum SSB output for the parameters shown in Figure 2.

## Excel's FFT functions

Excel's FFT implementation has a few idiosyncrasies. The following will help when using it with the Virtual Lab.

- Excel's data analysis functions are loaded – but not activated – when Office is first installed on the computer. It must be *manually* activated, as described later in 'Activating FFT'. Once the feature is activated it will *stay* activated, unless and until you explicitly turn it off again.
- Excel does not save the FFT input and output (IO) range data when a spreadsheet is saved. The FFT IO range must be added manually whenever the spreadsheet is re-loaded. In the Virtual Lab the 'Output Range' is not Excel's default; it also must be selected and checked before the output range is loaded. Once added, all will remain until the program is closed. For your convenience, the FFT input and output range values that must be added manually are shown in blue at the upper right of the Virtual Lab main display, the Input Parameter sheet.
- FFT recalculations must be manually toggled as the spreadsheet does not recalculate a FFT automatically, unlike its behaviour for other data. For convenience, the manual sequence is shown in blue as the last top line of the Virtual Lab's Input Parameter sheet.
- When the FFT is run to calculate spectrum, the screen jumps to the 'Data' sheet, which I use for the calculations. To avoid the jump, I used the Excel's Format then sheet to hide sheet 2, the 'Data' sheet. This eliminated the jump; however, if the cursor is left at one of the input data locations (cells D1 through D10, the ones with Red numbers), strange things may happen. You are encouraged to change the input parameters (the red ones) but after you do, move the cursor to cell I7 (highlighted in yellow) or some other empty cell and left click. It's important to do this or the Virtual Lab may not work properly – or even crash. (Yellow highlighting is not supported in some versions of Excel.)

Now I've explained these foibles you're safe to download the Virtual Lab spreadsheet from [1]. The next step is to activate the FFT function.

## Activating Excel's FFT

Activating the FFT function is achieved differently in different versions of Excel.

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 rf.gillette@ieee.org

**TABLE 1: Notes and suggested parameters to try with the Virtual Lab.**

*Changes the carrier frequency to 1000Hz for better resolution, turns on its quadrature display and turns off both modulation signals*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
1000	1	1	1900	700	0	0	1	1	0	no

*Displays two phases of the carrier not in quadrature. Try other D10 values too.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
1000	1	1	1900	700	0	0	1	1	45	no

*Here the carrier has a little clipping and its cosine quadrature is not displayed.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
1000	1.1	0	1900	700	0	0	1	1	0	no

*Here the carrier is been amplified and clipped to a square wave. Try other D2 values.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
1000	100	0	1900	700	0	0	1	1	0	no

*Upper side band generated and displayed on the spectrum analyser.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1	1	1	1	0	yes

*Double sideband suppressed carrier generated with two tone modulation.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1	1	1	0	0	yes

*Double sideband suppressed carrier generated with one tone modulation.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1	0	1	0	0	yes

*Upper SSB not fully suppressed, due to amplitude unbalance.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1	1	0.9	1	0	yes

*Upper SSB not fully suppressed, due to phase error.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1	1	1	1	10	yes

*See what happens with distortion/clipping of the modulation.*

D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Toggle SA
24000	1	0	1900	700	1.2	1.1	1	1	0	yes

- In Excel 2003: left click on Tools, then left click on the Add-Ins... sub menu. Activate the Analysis Tool Pack check box, then left click OK.
- In Excel 2010: left click on File, then Options, then the Add-Ins category. In the Manage box, select Excel Add-ins and then left click Go. In the Add-Ins available box, select the Analysis Tool Pack check box and then left click OK. If the Analysis Tool Pack is not listed in the Add-Ins available box, left click Browse to locate it.

If you are prompted that the Analysis Tool Pack is not currently installed in your computer, click "Yes" to install it.

## Using the Virtual Lab

First, the FFT input and output data range has to be entered. With Excel 2003, left click on Tools, then left click on the Data Analysis... sub menu. In the pop-up box, highlight/left click Fourier Analysis, then left click OK. Different versions of Excel may have slight differences in the appearance of this, but your Fourier analysis range data input is the same. For the FFT Input Range insert Data!\$P\$3:\$P\$4098 and do not check the Labels in First Row box. This range data is in blue at the top right of the spreadsheet, so it is available whenever you use the program.

## The Maths

All RF engineers, amateurs and most radio enthusiasts know that when you mix/heterodyne/multiply two signals the result is the difference and sum of the input frequencies. Using the same nomenclature as the rest of this article we can convert this knowledge into an equation or two. We have two multipliers, one uses the cosines of the carrier frequency and the cosine of the modulation frequency as inputs. The other multiplier uses the signs, the quadrature of the same frequencies as inputs, ie it has the same frequencies at the same amplitude offset by 90° as inputs. The two multiplier outputs are added or subtracted for lower and upper SSB-SC generation.

$$1v \cos \text{ carrier} * 1v \cos \text{ mod} = + \frac{1}{2}v \cos (\text{carrier less mod}) + \frac{1}{2}v \cos (\text{carrier plus mod})$$

$$1v \sin \text{ carrier} * 1v \sin \text{ mod} = + \frac{1}{2}v \cos (\text{carrier less mod}) - \frac{1}{2}v \cos (\text{carrier plus mod})$$

Note in both cases we obtain (carrier minus mod) and (carrier plus mod) frequencies, the difference and sum frequencies we expected. What is important is that in sin \* sin case there is a minus sign, hence when added the two  $\frac{1}{2}v$  multiplier outputs that are (carrier less mod) add to 1v and the two  $\frac{1}{2}v$  (carrier plus mod) cancel out. This leaves a single lower sideband with the no carrier or upper sideband. If we subtract (change the signs) in the second equation and add we obtain the single upper side band again less carrier.

With the numbers in the article, 24000Hz carrier and modulation of  $\frac{1}{2}v$  at 700Hz plus  $\frac{1}{2}v$  at 1900Hz the two multiplier outputs would be:

$$+ \frac{1}{2}v [\frac{1}{2}v (24000 - 700) + \frac{1}{2}v (2400 - 1900)] + \frac{1}{2}v [\frac{1}{2}v (24000 + 700) + \frac{1}{2}v (2400 + 1900)]$$

$$+ \frac{1}{2}v [\frac{1}{2}v (24000 - 700) + \frac{1}{2}v (2400 - 1900)] - \frac{1}{2}v [\frac{1}{2}v (24000 + 700) + \frac{1}{2}v (2400 + 1900)]$$

Multiplying by the  $\frac{1}{2}v$  and adding the frequencies in the inner parentheses results in

$$+ \frac{1}{4}v (23300 + 22100) + \frac{1}{4}v (24700 + 25900)$$

$$+ \frac{1}{4}v (23300 + 22100) - \frac{1}{4}v (24700 + 25900)$$

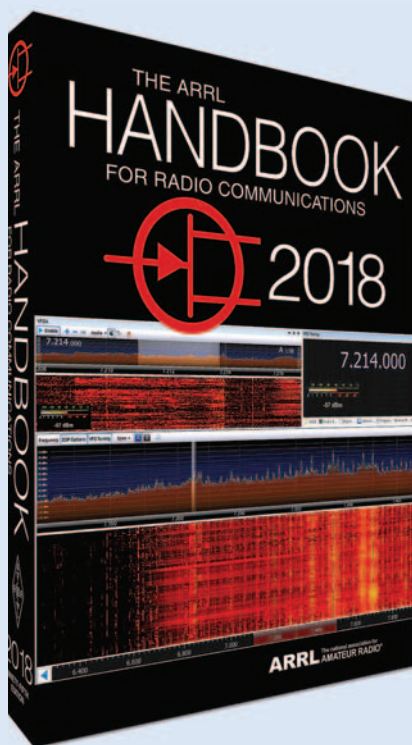
Multiplying the by the  $\frac{1}{4}v$  and adding the two multiplier output equations, you get  $\frac{1}{2}v$  at 22300Hz and  $\frac{1}{2}v$  at 22100Hz, the lower sideband of a 24000Hz carrier modulated by 700Hz and 1900Hz that were amplitude summed and divided in half. The upper sideband cancelled out and the carrier was suppressed.

If you subtract instead of adding you get  $\frac{1}{2}v$  at 24700Hz and  $\frac{1}{2}v$  at 25900Hz, the upper sideband less carrier.

If you have downloaded the spreadsheet you can view the spectrum analysers and check out the frequencies and the amplitudes.

The reason it works is the minus sign in the product of two sine equation. It allows the outputs of a pair of quadrature multipliers to add one sideband and cancel the other. The hard part is to obtain a quadrature modulating signal across the voice bandwidth. Hence filtering out one sideband of a double sideband suppress carrier has been the recent choice. However with digital I/Q signal processing and Hilbert transformation we can expect more SSB via the phasing method.





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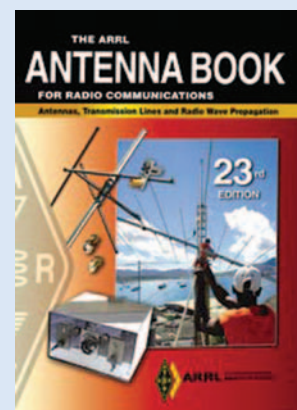
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## Glossary

An **oscilloscope** is a type of instrument that displays varying signal voltages versus time, as a two-dimensional graph with the 'Y' axis (vertical) being voltage and 'x' axis (horizontal) as time.

**Time domain** is a term used to describe the analysis of data or signals, with respect to time. The signals we see on an oscilloscope are in the time domain.

A **spectrum analyser** measures the magnitude of a signal versus frequency. A receiver sweeping across a band generating a graph of input signal amplitude versus frequency is a spectrum analyser.

**Frequency domain** is a term used to describe the magnitude of mathematical functions or signals with respect to Frequency. The signals seen on a spectrum analyser graph are in the frequency domain.

**Fourier Transform** is a mathematical operation that decomposes a time domain signal into its individual frequencies and amplitude, graphing frequency as X and amplitude as Y. Amplitudes are most often logarithmic to display a larger dynamic range.

**Fast Fourier Transform** (FFT) is a reduced-

calculation way to convert sampled time domain data to the frequency domain. The analogue equivalent would be applying the time domain signal to a bank of filters, each with an amplitude detector. The output data is therefore amplitude versus filter frequency, a frequency domain representation like that seen on a spectrum analysers. In this spreadsheet the filters are 100Hz wide centred at 100Hz increments. 'Fast' relates to its speed relative to the time to calculate a full Fourier Transform for the same input data/signal – it still takes a *lot* of arithmetic (but computers are generally good at sums).

A **multiplier** is a nonlinear electrical circuit (mixer) that creates new frequencies from two signals applied to it. The common new frequencies are the difference  $f_1 - f_2$  and the sum  $f_1 + f_2$  of the original frequencies.

A **heterodyne** is another name for the mixer/product function.

**I/Q signal processing** (or quadrature signal processing) is using two equal signal paths balanced in amplitude but different in phase by  $90^\circ$ .

The **Hilbert Transform** is a linear mathematical operation that can be used to implement a broad band  $90^\circ$  phase shift.

sheet tabs at the bottom of the display.

Note, after every time you change the red data, left click on cell I7 to move the cursor. Then you can update the spectrum analyser display as follows: left click Tools, then OK in the pop up box (Data Analysis... in the pop up box remains selected/highlighted), then OK in the next two pop up boxes. It would have been possible to add this sequence as a macro but might have run afoul of virus-detection software. This sequence is highlighted in blue on the Input Parameter sheet. It sounds longer than it really is: once you try it, you will see it is easy.

**Table 1** contains a set of demonstrations to let you get your feet wet. They start with using only the oscilloscope then the spectrum analyser use is added. Each starts with the settings for the 10 D rows (in red on the spreadsheet) and then toggling the spectrum analyser is added.

See what happens with distortion/clipping in modulation. Feel free to try other input parameters.

## Finally

My spreadsheet contains no macros or outside links. It may be distributed without cost and be freely used for educational or amateur purposes, but my credits must remain.

## Websearch

[1] [www.w9pe.us/ssbv1.xls](http://www.w9pe.us/ssbv1.xls)

For the Output Range, left click the option button dot at Output Range: as your output option, then insert Data!\$T\$3:\$T\$4098 as the output range; this is also in blue at the top of the spreadsheet. I usually use copy and paste from the blue cells to avoid having to re-type the information into the boxes. When the ranges have been added, left click OK. An over-write warning box will appear; left click

OK. The computer will then calculate the FFT data and graph it. This may take a quite few seconds, depending on the speed of your machine, as a lot of calculations are involved. The virtual spectrum analysers will show the spectrum of the signals you last input, one with a linear amplitude scale and the other with a logarithmic amplitude scale. The desired display is available by left clicking the

## Antennas (continued from page 23)

Photo 1 shows the antenna in use with it mounted on a camera tripod using a boom mount similar to that described in August's column.

## Performance

Using the 2m/70cm dual-band beam has enabled many contacts to be made using the SO-50 and AO-73 amateur radio satellites across Europe. Occasionally, contacts have exceeded 1500km depending upon the orientation and elevation of the satellite. Possibly, a 'phased' crossed-beam arrangement would improve the overall performance of the system when working stations using a satellite and this is under investigation. However, with a transmit power of around 5W, the distances worked have been surprising, particularly when the actual distance to/from the satellite is taken into consideration.

The antenna has also been used during RSGB 2m/70cm Activity Contests. Many stations were worked across the UK and near continent from home in Hampshire and when out portable with the antenna mounted on the camera tripod. The antenna is fairly compact, enabling it to be transported in the car without too much difficulty.

## Conclusion

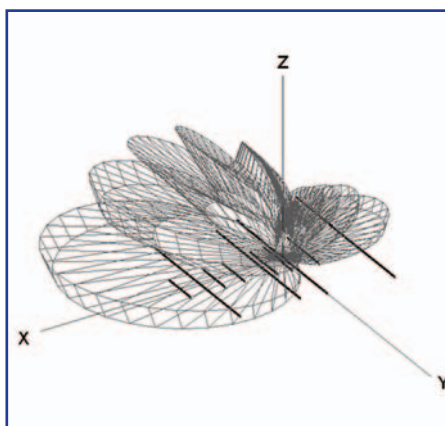
I hope this antenna has provided something to think about if you are considering multi-band working without using two separate antennas and their corresponding feeder cables.

## References

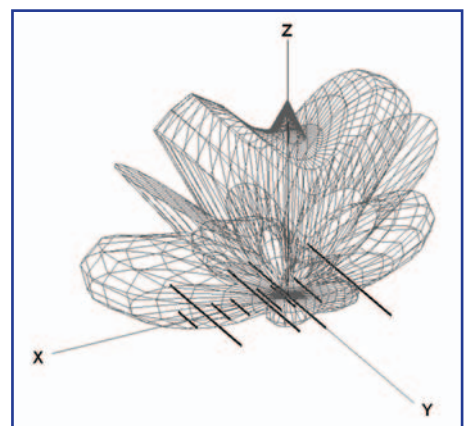
- [1] RSGB *RadCom*, Antennas, April 2016
- [2] ARRL *Antenna Handbook* 23rd edition, edited by H Ward Silver, Chapter 10, pages 10.24 to 10.26

[3] *Very High Frequency Techniques*, E L Bock, J A Nelson, A Dorn, Radio Research Lab Staff, Harvard University, Volume 1, Chapter 5, Page 119, 'Sleeve Antennas', Published by McGraw Hill 1947.

[4] *MMANA-GAL basic* V3.0.0.31, freeware antenna analysing application. Original code by Makoto Mori, JE3HHT. *MMANA-GAL Basic* and *MMANA-GAL Pro* by Alex Schewelew, DL1PBD and Igor Gontcharenko, DL2KQ; 1999 onwards



**FIGURE 2:** Predicted radiation pattern of the 2m antenna at 7m AGL.



**FIGURE 3:** Predicted radiation pattern of the 70cm antenna at 7m AGL.



# WATERS & STANTON

## EUROPE'S HAM STORE

This month I want to talk about the great value that Elecraft offers. Probably the receiver performance is one of the most important aspects today. After all, if you can't hear them you can't work them. Take for example the K3S; the only radio that is better, costs a whopping £7,800. The little KX3 is only just behind the K3S at around £1,000. Of course some operators have brand loyalty. But when it comes to value and performance, there really is only one name. Elecraft

Peter Waters G3OJV



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- Digital Voice and CW Player
- Direct keypad entry and A/B vfo
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It is hard to believe that to beat the receiver performance of both these radios you would need to spend another £3,000 at least! You get top base station performance in a radio that you can take anywhere. No other portable HF radio gives you so much functionality and flexibility. The KX2 even has a built in mic., whilst the KX3 offers 2m or 4m options. It is not difficult to see why more and more operators are moving up to Elecraft. And to add to the fun, you can even opt to build the KX3 yourself if you wish. Both are available as ready built.

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- Includes the 5MHz band
- Receiver matches the best base stations!

#### KX2 ACCESSORIES

CS40	Small compact carry case for KX2, and small accessories.....	£38.95
CS60	Large compact carry case for KX2 & MH3 mic plus more accessories.....	£54.95
KXAT2	Internal ATU to tune even non-resonant 'random' wire antenna.....	£219.95
KXBT2	Internal battery gives up to 8 hours operation from a single charge..	£69.95

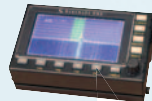
### Elecraft Accessories

#### KAT500 1kW Auto ATU



Ideal for use with the KPA500 amplifier, it matches coax systems to enable full power output.

Kit £799.95 Built £839.95



#### PX3 Spectrum Display

Plugs directly into the KX3 to give same spectrum display as P3. Bandwidth 2kHz-200kHz

Kit £569.95 Built £629.95

### XG3 Signal Generator



A highly accurate portable signal source with spot frequencies on all bands 160m to 2m with levels of:  
107dBm (1 uV)  
-73 dBm (50 uV, S9)  
-33 dBm (S9+40)  
0 dBm

£199.95



#### T1A Portable Auto ATU

The T1A is a fully assembled auto ATU that covers 160m to 6m up to 20W and matches whips, end fed wires and coax cable. Great for FT-817 etc. Totally self contained

£194.95

### Elecraft K3S 160m-6m 10W or 100W

#### Join the "Club" and Experience Real Performance



100W Kit £2849.95  
100W Built £2999.95

10W Kit £2999.95  
10W Built £2449.95

- SSB CW AM FM
- New low noise synthesizer
- USB Port & 12m-6m extra pre-amp
- Multiple Attenuator
- Improved AF output design
- Now includes rx 470kHz band
- Combines superhet and SDR
- 32 bit DSP design
- Built in RTTY and PSK send/decoding
- Firmware update USB via web

The K3S is the "sports car" of ham radio transceivers! Its under the bonnet that counts. The K3S certainly can out perform almost any other ham radio transceiver. Its fun to own and fun to operate. It is the most popular radio for DXpeditions for both performance and reliability.

#### The Optional P3



The optional P3 enable you to see any part of the RF spectrum from 2kHz - 200kHz wide. It has both spectrum and waterfall displays. Can also be use for Tx monitoring with Tx monitor option.

Kit £819.95 Built £859.95

#### Elecraft Receive Ratings\*

1st	Flex-6700	£7800
2nd	K3S	£2999
3rd	K3 no longer available	
4th	IC-7851	£8,000
5th	PT-8000	£12,000
6th	KX3	£1,000

The performance positions are based on independent tests by Sherwood US  
Check: [www.sherweng.com](http://www.sherweng.com)

#### K3 POPULAR ACCESSORIES

KRX3A.... 2nd Receiver.....	£789.95	KAT3A.... Automatic ATU.....	£449.95
8 pole Roofing filters 20Hz-13kHz.	£184.95	K144XV.. 2m Transverter.....	£449.95
MH2..... Electret Microphone.....	£79.95	KBPF3.... Gen.f coverage BP Filter.	£229.95
KDVR3.... Voice Recorder.....	£179.95	KTCX03... High stab. Ref. oscillator.	£149.95

### KPA500 600W HF-6m Amplifier

#### Matches Any HF Transceiver



Kit £2449.95 Built £2699.95

- 600W Solid State FET
- Same Size as K3D
- Built-in AC Power Supply
- Low noise analogue AC Supply
- Instant Operation
- RF sensed Band Change
- Ultra High Speed QSK
- No switching noise
- Able to receive band data
- 6 Speed temp. Sensing fan
- VSWR Protected

The KPA500 easily delivers 600W output and can be driven by any HF transceiver that can provide around 30W of drive power. Instant operation from switch on means that DX is not missed. The large bar graph give true pep indication and the small foot print will enable it to fit onto almost any desk.



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Three of the UKs leading Ham Radio Retailers (Waters and Stanton, Nevada and Innovantennas) have combined and operate from a combined distribution centre and showroom in Farlington, Portsmouth. The new facility forms the largest ham radio warehouse and

distribution centre in the country housing a wider selection of products than any other UK based company.

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[Waters and Stanton](https://www.youtube.com/WatersandStanton)





# ICOM

## ID-5100E Mobile



Dual band 2m / 70cms mobile offering 50W output on both bands and includes DTMF microphone **£574.95**

## ID-4100E Mobile



It's the latest mobile form ICOM and includes terminal mode and airband AM monitoring as well as being a dual band D-Star radio. **£469.95**

**Part  
Exchange  
Saves You  
Money  
PHONE TODAY**

## IC-7100 Mobile/Base



The IC-7100 is a complete HF-70cms radio that also includes 4m operation. You get a remote unit with extension cable and D-Star capability. **£998.95**

## IC-7200 HF Base Station



We like the IC-7200 a lot. It is a very rugged HF transceiver and covers all bands from 160m to 6m. The picture shows the side handles which are extra, but really gives it a military look. **£799.95**

## SP-10 Mobile Speaker



Get some decent audio in your car with this dedicated Icom mobile speaker. **£51.95**

## IC-7300 HF - 4m Transceiver



Almost every ham operator knows somebody who owns an IC-7300. That in itself is a great recommendation. It is the most successful radio for many years. Primarily because it is based on SDR that offers so many advantages and results in such a great receiver. And the added bonus with the IC-7300 is the 4m coverage. It's a great all in one station with lovely colour screen full of information. The internal ATU copes well with most antennas and the touch screen makes operations much easier to navigate the various functions. **£1199**

## ID-51E Plus2



The ID-51E PLUS2 is the latest generation of D-STAR handportable from Icom. This new model incorporates popular features found in the original including integrated GPS, an independent AM/FM receiver and V/V, U/U, V/U Dualwatch, but now includes new 'Terminal Mode' and 'Access Point Modes' enabling you to make D-STAR Callsign routed calls through the Internet, even from areas where no D-STAR repeater is accessible.

\* "Terminal ID" and "Access Point" features will only work through an Icom D-STAR repeater enabled with the latest G3 Software. The ID-51E PLUS2 will function only as a normal D-STAR radio until this implementation occurs. **£379.95**

# ICOM

## The NEW IC-7610 Transceiver



The new IC-7610 transceiver is now a reality. Few can fail to be impressed with the advanced technical promises. And nobody should be disappointed once their new radio arrives. We have good orders in for this radio and so will be happy to bring your dreams to reality. And if you need any additional items to go with your new radio then we are sure that we can delight you a great deal.

**Part Exchange  
Welcome!**

- 100W HF Transceiver
- USB, LSB, CW, RTTY, PSK, AM, FM
- Dual Antenna inputs plus BNC Receive
- Tuning steps down to 1Hz
- SDR Design throughout
- Dual select Pre-Amps
- Auto Antenna Tuner
- Ethernet and USB Connectors

- External Display Connector
- External Keypad and S-meter jacks
- Reciprocal Mixing DR 110dB
- Ultra low phase noise
- Dual Receive (Separate bands)
- Live Spectrum Display 5kHz to 1MHz
- 7" Colour Display
- SD slot for saving settings

**BIG SAVINGS  
on this RADIO**

At W&S we are known for our great part exchange deals and it may be that your new IC-7610 may cost you less than you think. So give us a call and we will be happy to quote you.



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## KENWOOD DEALS

OFFICIAL RE-SELLER

### TH-D74

New 144-430MHz handheld featuring Kenwood's APRS, Automatic Packet Reporting System, and the popular D-Star. Kenwood has made it possible to use this handheld in a wide range of radio applications with wideband reception function allowing the user to receive HF SSB and CW.

**New!**

£599



### TM-D710E

Kenwood's latest dual band mobile that features APRS and Echo Link. You get 50W output and wide band receive. Also has weather and Sky Command features, plus dual colour display feature.

£299.95



### TS-590SG

Be witness to the evolution of Kenwood's pride and joy - the TS-590SG HF transceiver - pushing performance and technology to its utmost limit, with the receiver configured to capitalise on roofing filter performance and IF AGC controlled through advanced DSP technology.

Call for best price



**FREE SPEAKER**

### TS-990S

HF + 6m 200W transceiver with dual TFT display with a dynamic power supply that means no external unit is required.

£4999.95

## AOR

**ONE MONTH ONLY!**



### AR-8600 MkII

Mobile Base Station

- All mode: WFM, NFM, SFM, WAM, AM, NAM, USB, LSB, CW
- Frequency range: 100kHz-3000MHz

£619.95

AR-6000.....£4699.95

AR-5001D.....£2669.95

DV-1.....One month only.....£1274.95

AR-8200D.....£664.95

AR-8200MkIII.....£459.95

### LA-400

10kHz to 500MHz Desktop Magnetic Loop Receiving Aerial

£419.95

### AR-8200 MkIII

This 100kHz-3GHz scanning receiver covers all the popular modes including FM, AM and SSB. It is regarded as the industry standard by many and is also supplied for commercial use. Includes a ferrite LF antenna system for LW and MW and MW reception

£459.95

## DIAMOND PSU Offer



Built-in Speaker

- Switching mode: 25A (continuous, 8 hours)
- Input voltage: AC230V
- Output voltage: DC5 to 15V variable
- Output current: 25A (continuous)
- Built in speaker
- Dimensions: 210Wx110Hx220Dmm

£89.95

## Perstel DR701C When the Bands are Dead!

Here is a **GREAT OFFER** that is ideal for shack or kitchen.



- FM, DAB and DAB Plus
- AC and Battery
- Large LCD Colour Panel
- Speaker or Headphones
- Alarm, Time and Presets

£49.95

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**New!**

### FT-991A

Successor to the FT-991 this all band HF - UHF transceiver which includes Yaesu's System Fusion as well as traditional modes. The FT-991A packs the same features as the FT-991 plus an added real time spectrum display and multi-colour waterfall display.

Call for best price



### FTM-3200DE

Rugged yet compact System Fusion/FM 65W mobile transceiver. Loud and Crystal Clear Front Panel Speaker with 3W of Audio Output. Instantly recognises digital or analogue transmission and adjusts automatically for flawless coexistence of both digital and analogue users.

Call for best price

### FT-891

100W HF + 6m mobile transceiver with AM, USB, LSB and CW modes featuring triple conversion, noise blanker and attenuator.

Call for best price

### FT-2DE

2m/70cm dual band handheld transceiver designed with ease of use in mind such as its 1.7 inch full back-lit touch panel display. Includes FM and System Fusion modes.

### FT-857

World's smallest HF/VHF/UHF 100W mobile transceiver including DSP.

Call for best price

## YAESU DEALS

OFFICIAL RE-SELLER

FREE UK SHIPPING



### FT-450D

Compact yet superb HF/50MHz radio with state-of-the-art IF DSP technology configured to provide worldclass performance in an easy to operate package.

Call for best price



### FT-DX1200

HF + 6m transceiver provides up to 100W on SSB, CW, FM and AM (25W carrier) and a rugged state of the art highly balanced receiver circuit configuration for top performance on today's crowded bands.

Call for best price

### FT-817 BHI-DSP

BHI DSP Filtering This micro size board fits inside the FT-817ND. A mini press button & LED are installed beneath the top cover for switching. The unit cycles through 4 levels of filtering and then reverts back to 'out of circuit' mode.

£769.95

## YAESU ACCESSORIES

### MD-100A8X

Desk mic with PTT.....£119.95

### MLS-100

Hi performance ext speaker.....£28.80

### FC-30

External ATU for FT-897 & FT-857 £259.95



## In Stock!

### FT-65E

2m/70cm Handheld Transceiver Variable 5W output £129.95



### FT-25E

2m Monoband Handheld Transceiver with variable 5W output £89.90

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### Our Exclusive IC-7300 Headset

- Padded Headset
- Hi Quality Boom Mic
- Fully adjustable
- Ready wired for IC-7300
- Exclusive for Icom

**Full Range of Heil from Stock**

## DIAMOND

### V-2000

Triband base antenna operating on frequency bands 6m/2m/70cm utilises a linear phase shift design

£99.95

### CR-8900

4 band mobile whip antenna that was designed with the FT-8900 quad band mobile in mind but works with over radios.....

£89.95

### X-30

Fixed station vertical operates on 2m/70cm with a gain of 3/5.5dB and power handling of 150W with PL-259.....

£48.95

### X-50

Fixed station vertical operates on 2m/70cm with a gain of 4/7.2dB and power handling of 200W with PL-259.....

£59.95

### X-200N

### X-200N

Fixed station vertical operates on 2m/70cm with a gain of 6/8dB and power handling of 200W with N-Type.....

£84.95

### X-300

Fixed station vertical operates on 2m/70cm with a gain of 6.5/9dB and power handling of 200W with PL-259.....

£89.95

### Diamond D-777 Airband Antenna



Lots of Ham operators also love listening to civil and military aircraft. Here is a great antenna that really pulls in the distant signals.

- 1.7m long • VHF and UHF Airband
- 3.4/5.5dB gain • Radial: 550cm

£64.95

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MFJ-926B.. 200W auto ATU.....	£330.95
MFJ-927.....200W remote ATU.....	£286.95
MFJ-928.....200W ATU.....	£229.95
MFJ-935B.. Loop tuner.....	£231.95
MFJ-936B.. Loop Tuner.....	£286.95
MFJ-939A.. Auto ATU for Alinco.....	£176.95
MFJ-939I.. Auto ATU for Icom.....	£176.95
MFJ-939K.. Auto ATU for Kenwood.....	£176.95
MFJ-939Y.. Auto ATU for Yaesu cable.....	£176.95
MFJ-941E.. Manual HF ATU.....	£165.95
MFJ-945E.. Mobile HF ATU.....	£154.95
MFJ-948.....Manual ATU 300W.....	£187.95
MFJ-949E.. Above + Dummy Load.....	£209.95
MFJ-962D.. Manual ATU 1.5kW.....	£352.95
MFJ-969.....Manual 160-6m ATU 300W.....	£253.95
MFJ-971.....Portable HF ATU.....	£143.95

### MFJ-969

HF+6m 300W antenna tuner with roller, antenna switch and XMTR. £249.95

### MFJ-998

ATU with full 1500 Watts SSB/CW Digital & Analog SWR/WattMeter. 1.8-30MHz. £729.95



### MFJ-16010

200W variable random wire antenna tune capable of matching almost any length wire from 160-10m. £79.95

## MFJ - Made to Measure!



Remember, if you need more information you can download the MFJ User Manuals from [www.mfjenterprises.com](http://www.mfjenterprises.com)



### MFJ-223

A compact handheld antenna analyzer that covers 1 - 60MHz. It features a high quality colour screen. It not only measures VSWR, but reactance and resistance with graphic plots. £532.95



### MFJ-225

This wide range analyser covers 1.5 - 180MHz. It has USB connection and internal battery that can be charged. The screen has large clear characters. A graphic display provides response curves of VSWR and impedances etc. £472.95



### MFJ-259C

This is the antenna analyser that started it all. Covering 1530kHz - 230MHz. If you prefer analogues metering then this meets the bill. But you can measure a lot more than resonance with all kinds of impedance and reactance figures to enable antenna adjustments, coax measurements, lengths, short circuits etc. £330.95



### MFJ-269C

Here's one of our best selling analysers with a very wide coverage from 530kHz - 470MHz. It is capable of handling very complex impedances and reactances. It's a great investment that can save so much time with antenna design and matching. But there is much more that it can also for for RF work. £439.95

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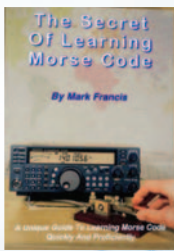
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## Diamond Yagi Antennas

A great range of 6m, 2m and 70cms light weight Yagi antennas rated at 100W with Japanese engineering



A-502HBR..... 6m 2 El. Phased 6.3dBi 400W..... **£93.95**  
 A144S10R..... 2m 10 Element 11.6dBi 2.13m boom. **£96.95**  
 A144S5R..... 2m 5 Element 9.1dBi 1m boom..... **£49.95**  
 A-430S10R..... 70cm 10El, 13.1dB 1.19m boom..... **£54.95**  
 A-430S15R..... 70cm 15 El. 14.8dB 2.24m boom..... **£73.96**  
 A-1430S7..... Dual 2m/70cm 7/9dBi 1.25m boom.. **£129.95**

## WATSON BASE VERTICALS

Colinear (fibreglass) with 2" mast fittings

### W-30

45 Amp variable voltage switched mode power supply with 'noise shift' feature. .... **£54.95**

### W-50

2m/70cm, 4.5/7.2dB gain and 1.8 meters long..... **£64.95**

### W-300

2m/70cm, 6.5/9dB gain and 3.1 meters long. .... **£104.95**

### W-2000

6m/2m/70cm, 2.15/6.2/8.4dB gain and 3.1 meters long. .... **£104.95**

## WATSON SWITCHES

### CX-SW2PL / CX-SW2N

2-way Coaxial Switch N-type or SO239 connectors. .... **PL259 £34.95**

..... **N-type £41.95**

### CX-SW3PL / CX-SW3N

3-way Coaxial Switch N-type or SO239 connectors. .... **PL259 £54.95**

..... **N-type £59.95**

### CX-SW4PL / CX-SW4N

4-way Coaxial Switch N-type or SO239 connectors. .... **PL259 £69.95**

..... **N-type £79.95**

## WATSON PSU

### Power-Mite

20 Amp micro PSU variable voltage switchmode power supply, excellent value. **£84.95**



### Power-Max-45

45 Amp variable voltage switched mode power supply with 'noise shift' feature. .... **£119.95**

### Power-Max-65

65 amp variable voltage heavy duty switched mode power supply with 'noise shift' feature. .... **£259.95**

## AV-202e Power Supply

**New!**



This power supply features a digital current and Voltage display.

- Dual Display.
- Variable 5 - 15V
- 25 Amps
- £89.95**

## WATSON MULTI-RANGER

### Multi-Ranger-9

HF-UHF Mobile antenna fitted with PL259 1.9m long rated to 120 Watts. .... **£59.95**

### Multi-Ranger-200

HF-VHF Mobile antenna fitted with PL259 1.6m long up to 200 Watts input! .... **£79.95**

## BUDDIPOLE



The Buddipole is the world's leading portable HF band antenna system. It allows you to put it in a rucksack and enjoy true portable DX operation. It covers all bands from 40m to 2m.

### Buddipole

The complete dipole system with elements, coils, versa-T, Balun and 25ft of coax with BNC and SO-239 adaptor. **£234.95**

### Buddipole Deluxe

All you need for working DX with a setup that goes together in minutes. You get the Buddipole as above, telescopic mast, tripod, rotating arm kit and extra coil taps and robust carry bag. **£470.95**

### Buddipole Deluxe - Long

If you want extra height (up to 20ft) then this package with the extra long mast is just the job! **£512.95**

## FLEX RADIO



**Next-Gen SDR from Flex Radio!**

**Flex 6400**..... Now with preselectors..... **£1999.95**

**Flex 6400M**..... Including front panel ..... **£2999.95**

**Flex 6600**..... Now with 2 x SCU's..... **£3999.95**

**Flex 6600M**..... Including front panel ..... **£4999.95**

All 6400/6600 versions can have optional

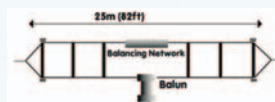
GPS Disciplined Oscillator (GSPDO)..... **£724.95**

**Flex 6700** 8 slice Receiver flagship..... **£6899.95**

**Flex 6500** 4 slice Receiver ..... **£3799.95**

**Flex 6300** 2 slice Receiver..... **£1849.95**

## DIAMOND WD330 COMPACT DIPOLE



80M - 10M  
25M Long

This is a dipole that covers all bands from 80m to 10m. It also comes with 30m of coax feeder terminated in PL-259 plugs. The antenna will handle up to 150W and typically has a VSWR of 2:1 or better. This is easily matched with internal ATUs. Can be erected as an inverted V, sloper or horizontal. **£199.95**

## Hustler HF Verticals

### 4BTV

40m - 10m 4 Band vertical that will handle full legal power and can be ground mounted Height is 6.52m..... **£209.95**

### 5BTV

The ever popular 5-band model that covers 80m to 10m. This is a great backyard antenna that can be ground mounted. The height is 7.64m ..... **£269.95**

### 6BTV

This antenna is identical to the 5BTV above but has the 30m band added. Again it handles full legal power and stands 7.3m high..... **£289.95**  
 All antenna are rated at 1kW.

## Diamond HF Mobile Whips

Here is a great range of single band whips that have PL-259 bases and an easily adjustable upper tuning section for quick hand adjustment.

**HF-10FX**..... 10m whip 1.1m long..... **£58.95**

**HF-12FX**..... 12m whip 1.1m long..... **£58.95**

**HF-15FX**..... 15m whip 1.2m long..... **£56.95**

**HF-16FX**..... 17m whip 1.2m long..... **£40.95**

**HF-20FX**..... 20m whip 1.2m long..... **£63.95**

**HF-30FX**..... 30m whip 1.4m long..... **£63.95**

**HF-40FXW**..... 40m whip 1.4m long..... **£64.95**

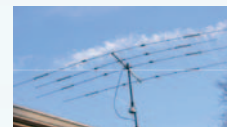
**HF-80FX**..... 80m whip 1.4m long..... **£71.95**

### W-300S Magnetic Mount

This is a 3-way mount that is great for HF operation. SO-239 socket and 4.5m cable terminated in PL-259.... **£39.95**



## Mosley Mini Beam 5 Bands



- 10-12-15-17-20m
- 3 element on 10-15-20
- 1 Element 12m and 17m
- Boom approx 2m
- Longest El. approx. 6m
- £689.95**

## MFJ Loops

The Ultimate Compact Antenna



- Just 1m Diameter
- Dipole Efficiency
- Remote tuning
- Controller included
- Mast mount kit
- VSWR Tuned
- Very Low Noise
- Coax fed control
- Cross Needle Metering

**MFJ-1786**..... 10MHz - 30MHz Continuous..... **£531.95**

**MFJ-1788**..... 7MHz - 21MHz Continuous..... **£589.95**

## Palstar ATUs



Here is a range of high power antenna tuners made by Palstar in the USA. An ideal investment for keen HF operators

**AT-500**..... Differential Tuner 160-6m 500W..... **£529.95**

**AT2K**..... Manual ATU 160-6m 2KW..... **£599.95**

**AT2KD**..... Differential 160-6m 2kW..... **£599.95**

**AT4K**..... Hefty 160-10m 2.5kW Tuner..... **£1024.95**

**AT5K**..... 160m-16m 3.5kW..... **£1249.95**

**HF-Auto**..... 160m-6m 1.8kW Auto ATU..... **£1599.95**

## Create Japanese Rotators



These are ideal for 3-4 element HF Yagi or large VHF arrays.

**RC5-1..** Rotator with control... **£509.95**

**RC5-3..** Rotator with control... **£609.95**



call: **01702 204965** email: **sales@wsplc.com**

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Waters and Stanton



# Apache Labs ANAN-8000DLE SDR transceiver

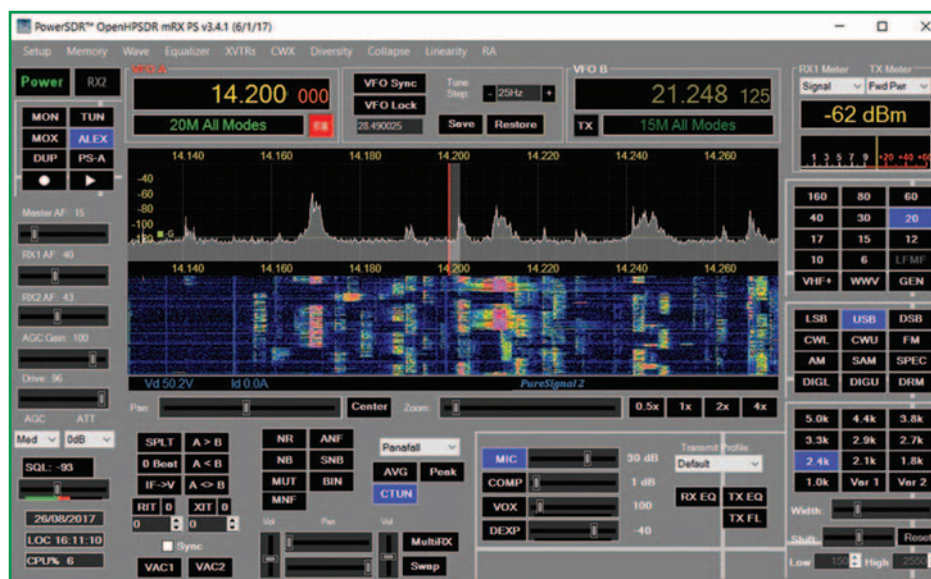


The ANAN-8000DLE is a 200W HF and 6m band SDR transceiver, the latest from Apache Labs.

**T**he HPSDR (High Performance Software Defined Radio) project started in 2006 as an open sourced hardware and software activity by a multinational group of SDR enthusiasts. The project exploits the use of the latest technology in a state-of-the-art modular SDR design and has been covered in a number of articles in *RadCom* over the years.

Apache Labs, based in India, has brought to the market a range of complete transceivers all adopting the board designs developed by the HPSDR group. Since the original introductions about four years ago, the range has grown to include single and dual independent receiver options with transmit power outputs of 10 or 100W, all based on the same fundamental processing architecture. The latest model is the ANAN-8000DLE, a rugged 200W output dual receiver design adopting a number of interesting enhancements. Covering the HF and 6m bands, the full continuous receiver coverage is from below 9kHz to over 60MHz. It operates from a standard 13.8V supply drawing up to 35A on full power transmit.

The features and functions provided by an SDR are determined in part by the hardware but also by the firmware and controlling software and this also provides the user interface. A number of controlling packages are usable with the ANAN series. PowerSDR was created by FlexRadio to control their



PowerSDR screenshot with one receiver operating panadapter and waterfall display.

earlier SDR units several years ago and this has matured and expanded greatly in terms of features under open source code development. The PowerSDRmrX version has been developed specifically for the HPSDR and Apache radios and was the package used in this review.

## Overall Design

The ANAN-8000DLE adopts a direct digital SDR approach with direct sampling at signal frequency. There are two hardware receiver paths, each with an identical and independent set of front-end filters, preamplifiers and

attenuators and with separate 16-bit A to D converters clocked at 122.8MHz. Clocking is phase synchronous and adjustable that allows the effective use of dual channel diversity operation in its various forms. A matrix of three selectable SO-239 antenna connections feeds the main receiver path and this is also the routing for the transmitter output. The second receiver path has a separate single BNC antenna socket.

The front end receive filters cover the frequency range using six bandpass filters and the switchover frequencies are all user settable if desired. There is also a bypass option and on 6m an additional low noise





The coupler output and the PureSignal processing input are made available using SMA connectors on the rear panel with an external link provided.

preamplifier is also provided. The filters are relay switched to ensure the best signal handling.

The outputs from the A to D converters pass to a field programmable gate array chip (FPGA) that produces narrower slices of spectrum via a process of decimation at a suitable rate that can be passed to the PC for further signal processing. A high speed Altera Cyclone IV device with 150k logic elements is used that has plenty of spare capacity to allow for future firmware expansion. The interface to the PC is via Ethernet. This has the advantage of being fast, needs no drivers or additional software and is directly compatible with routers, networks and remote operation. The ANAN-8000DLE firmware provides support for up to seven independent software receivers assignable to either ADC. The limit, however, is the control application software running on the PC. The current version of PowerSDRmx supports the two hardware receivers and a second software sub-receiver linked to the main receiver. Other software packages can promise more but I did not check these out. The user set-up functions are extremely flexible. It is possible to allocate both hardware receivers to the same ADC and hence share the same antenna but then both will use the same front-end filter setting and the limitations that this implies. Although both hardware receivers can operate independently over the entire frequency range, the sub receiver only functions within the panadapter full frequency scan range.

The transmit signal is generated directly by a high speed 16-bit DAC and amplified to the final output level of 200W maximum. With full carrier modes on any extended transmit period such as with FM and data operation, the power output should be limited to 50W to prevent overheating. A single push-pull LDMOS device is used in the PA stage operating from a 50V supply. This is derived internally from the 13.8V supply using a low-noise four-phase boost converter. There is no ATU built into the radio.



PowerSDR screenshot with one receiver operating panadapter display.

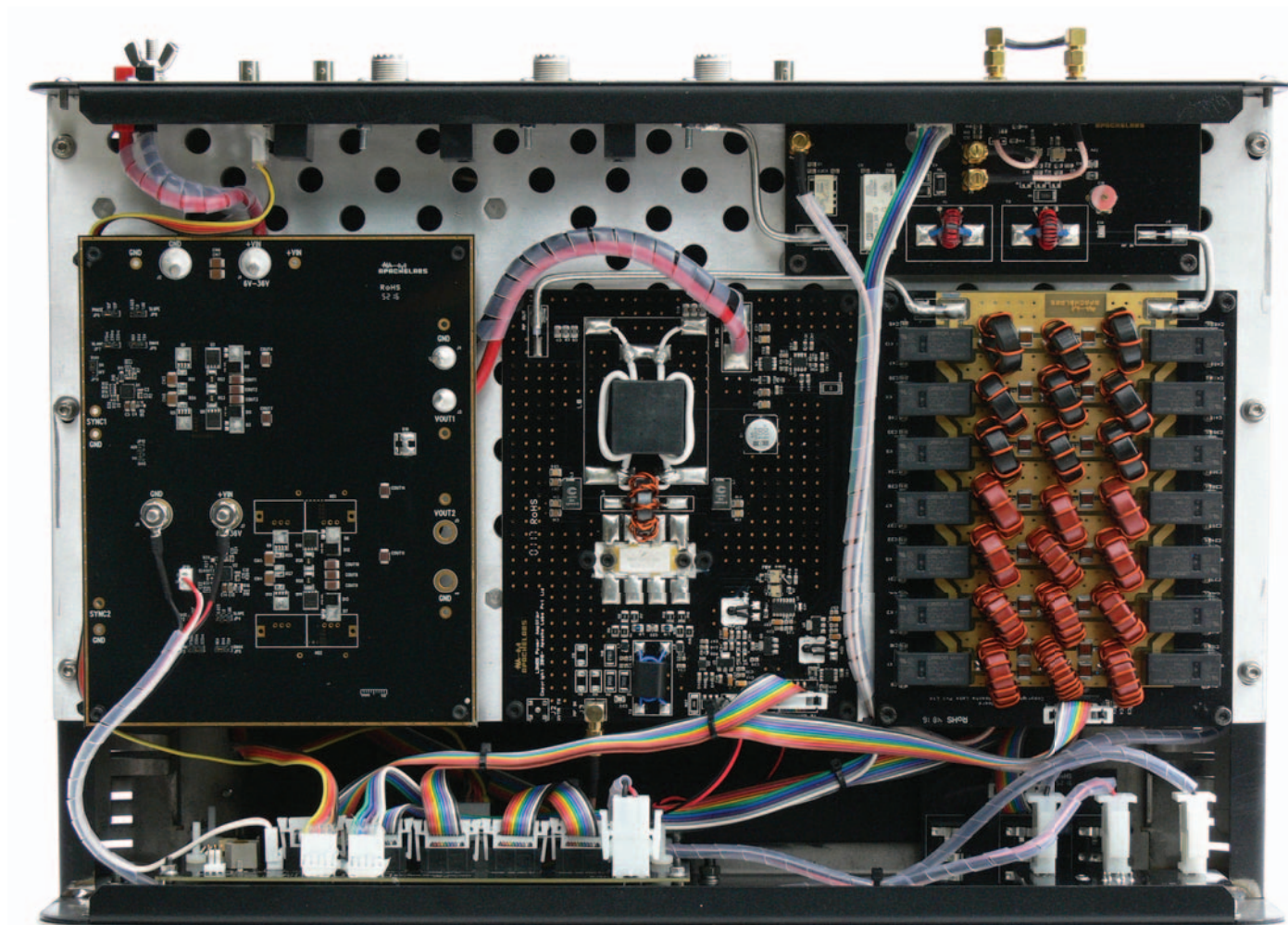
One interesting feature that has been incorporated into the ANAN series is the use of PureSignal linearisation. This uses adaptive pre-distortion on SSB transmit modes to reduce intermodulation distortion to low levels and hence provide a much cleaner and narrower transmission. Implementation of PureSignal in the ANAN-8000DLE has been greatly improved to make it more automatic in operation and require less initial setup. It can also be used in conjunction with an external linear amplifier, meaning that the benefits of PureSignal can extend to the whole station. A coupler in the transmitter output feeds back a sample of the transmitted signal to the low level processing stages for correction. The coupler output (about +5dBm) and the PureSignal processing input are made available using SMA connectors on the rear panel (with an external link provided). To include an additional linear amplifier, the link is removed and a suitable external coupler on the amplifier output is connected to the PureSignal input.

## Hardware

The ANAN-8000DLE is housed in a surprisingly large cabinet compared with other SDRs, measuring 483 x 123 x 320mm (w x h x d) and is quite heavy at about 12kg. It is constructed from a heavy gauge stainless steel chassis and wrap-around cabinet and an internal thick aluminium dividing plate provides the heatsink. A fan on the case bottom keeps the unit cool. The fan is reasonably quiet but runs continuously even when on receive. Inside the box, the layout is quite spacious with the transmit PA, output filter and PSU boards on the topside, and with the SDR transceiver and front-end filter boards underneath.

The three pushbuttons on the front panel provide power on/off with a particularly bright red indicator, a system reset button which

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Under top cover of the ANAN-8000DLE showing the Tx power amplifier, output filters and power supply unit.

initiates a self test, and a standby button. This disables transmit operation and the 50V PSU. The liquid crystal display panel shows the operational status, PA supply voltage and current, forward and reflected relative transmit power in bargraph format, antenna SWR and temperature. Three 6.3mm stereo jacks provide front panel access for headphones, microphone and CW key and these are duplicated as 3.5mm jacks on the rear panel. A wide range of microphones can be accommodated including a bias voltage for condenser microphones and with or without PTT. The computer space bar also toggles the PTT line. Similarly various CW keying arrangements can also be accommodated.

Other connections are provided on the rear panel. DC power input uses an Anderson PowerPole connector. Left and right speaker outlets (2W into 8Ω) are balanced outputs and should not be grounded. These are not muted when the headphones are connected; both can be used simultaneously. Phono connectors provide for PTT in and PTT out for switching linear amplifiers and accessories. Audio line inputs are provided and also two virtual audio cables within PowerSDRmx to transfer audio directly to and from the computer. This is probably the

preferred method of interfacing to data mode applications. A 9-pin D connector provides additional open collector switching lines (no details available) and a low level transmit output of around 10mW is available to drive transverters. The reference oscillator uses a temperature compensated crystal oscillator accurate to within 0.1ppm and this can be synchronised against an external 10MHz reference.

### Software

Before the radio can be used, it is necessary to download and install a suitable controller application and carry out some initial setting up. PowerSDRmx PS is recommended for Windows and is a good all-round application. It will run on Windows 7, 8 or 10. The minimum recommended PC specification is an Intel i3 processor clocked at 2.8GHz with 4GHz RAM but a faster machine will have definite advantages. For this review, I used a PC having an Intel i7 quad-core processor clocked at 2.5GHz and 16GB RAM. Installing or updating the software was relatively straightforward and trouble-free. The first time that the software is run an optimisation routine will be performed

and this can take 10 minutes or more. If the radio firmware needs updating, the process is rather more complex.

Apache Labs also have available the PiHPSDR controller. This is an external unit allowing standalone operation without the need of a PC and is based on a Raspberry Pi computer. It uses physical buttons and knobs including a rotary tuning knob and touchscreen to access all the functions.

PowerSDRmx adopts a conventional dashboard console style layout with separate buttons and sliders for each control, duplicated when both receivers are active. The central area of the screen shows the panadapter spectrum display, waterfall or various scope functions with both RF spectrum and waterfall being displayed for a single receiver active or one function only if both receivers are enabled. The panadapter scan width is determined by the sample rate (on the setup audio tab) up to 384kHz maximum. Up to 14 separate transverters can be supported, with fully configurable independent drive settings and offsets to give display readouts up to 99GHz.

All the usual operating modes are provided including SSB-based data modes and synchronous AM. Channel filtering is



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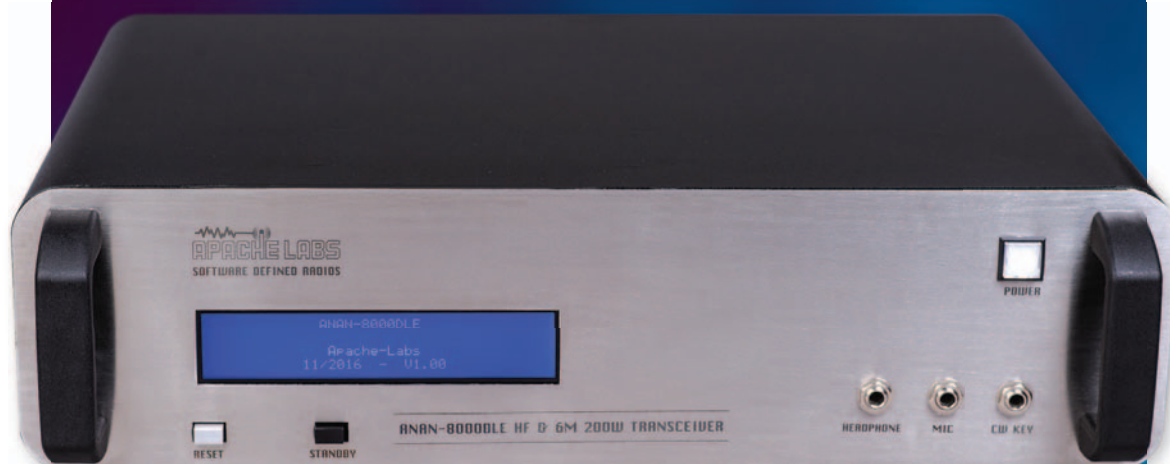
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## NEW ANAN-8000DLE

**APACHE LABS**  
SOFTWARE DEFINED RADIOS

**Click!**  
[www.HamRadio.co.uk/8000DLE](http://www.HamRadio.co.uk/8000DLE)

*Peter Hart says; "An excellent fully-featured and high performing SDR transceiver, the current top of the range model from Apache Labs."*



### HF & 6M 200W SDR

Available from stock and on demonstration at our London Showroom.

We say; "The ANAN-8000DLE HF & 6M 200W SDR Transceiver meets and exceeds the requirements of even the most discerning Amateur Radio Operator, it is based on the work of the OpenHPSDR community. Housed in a metal construction enclosure, this beast of an SDR Base Station produces 200W output on 160-6m and features an entirely new redesigned transmit chain. The PureSignal (Predistortion) offers astounding IMD performance, typically 1000 times lower than usually achieved by a typical modern transceivers available today. It's the world's first Ham transceiver to use a 50V LDMOS device in the finals."

## NEW ANAN-7000DLE

**APACHE LABS**  
SOFTWARE DEFINED RADIOS

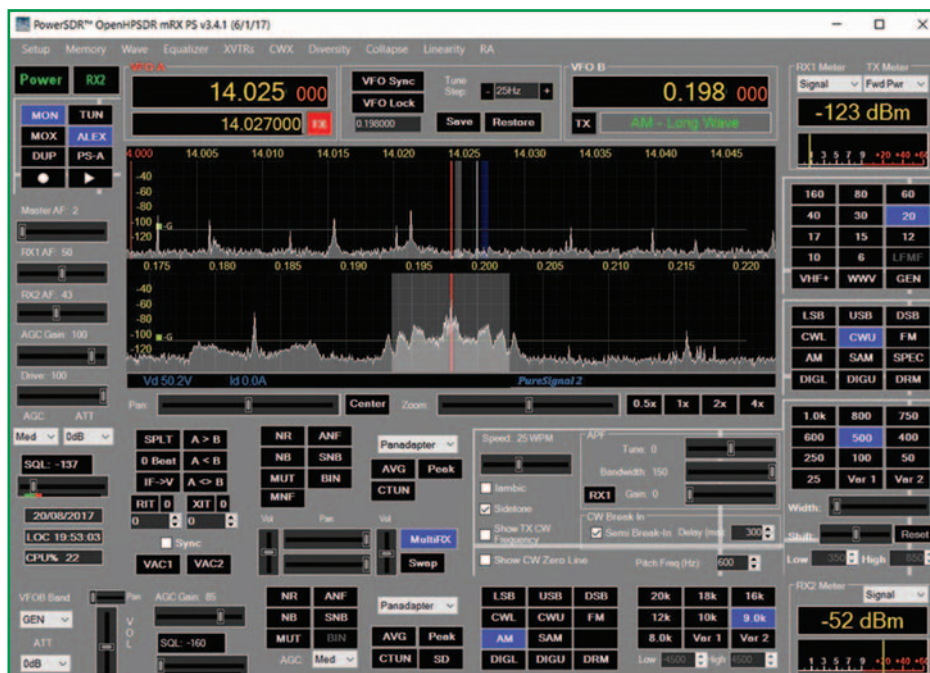
**Click!**  
[www.HamRadio.co.uk/7000DLE](http://www.HamRadio.co.uk/7000DLE)

Available towards the end of 2017, the 7000DLE uses Direct Down Conversion with an ultra low phase noise clock yields an RMDR of 116dB @ 2kHz separation, meaning close-in weak signals will not be masked by the receiver's phase noise. Rugged construction, 100W output 160-10m using Class-A with IMD of -68db. Like its big brother, the 8000, it uses 2 x 16-bit phase synchronous ADCs, allowing for advanced applications such as Diversity Reception for ultimate noise mitigation and effects of signal fading.



### 100W HF+6M TRANSCEIVER

Soon to be available from stock and on demonstration at our London Showroom.



PowerSDR screenshot with two receivers operating.

very comprehensive, widely adjustable with notches, noise reduction modes and much more. Extensive audio filtering includes multi-band audio equalisers on both receive and transmit. On CW a keyboard sender and a set of transmit message stores are included. The memory storage interface is very comprehensive, virtually unlimited in capacity and allows frequencies to be stored in groups, named with no restriction on length and a comment tag as well as all the radio parameters. There are also quick access save / restore buttons but for one frequency only. A wave file recorder allows the receiver to be recorded for playback later on receive or on transmit. Support for diversity reception is included and it is even possible to use the radio for radio astronomy data collection.

## Measurements

Performance measurements made are shown in the table and are similar in many respects to those measured previously using the ANAN-100D. The sensitivity is good and holds well down into the VLF region. On 50MHz the additional preamplifier further improves sensitivity. The S-meter calibration closely follows the recognised standard of 50µV for S9 and 6dB per S-unit on all bands, except on 50MHz where it is 20dB higher. Spurious responses and birdies are better than 100dB down (with one or two minor exceptions).

The panadapter clearly shows signals that are nearly inaudible. A signal that gives an audible 10dB signal to noise ratio in the receiver shows up to 30dB above the noise floor on the panadapter at narrow spans. The amplitude calibration linearity across the

extensive display range is also excellent and far superior to the spectrum displays on most conventional radios.

SDR receivers using direct digital conversion respond to strong signals in a totally different way from conventional analogue designs. They remain linear up until the point that ADC overload or clipping occurs, at which point the receiver performance collapses. This point occurs at about +2dBm for the ANAN-8000DLE with the input attenuator set to 0dB and when approaching this level a message is flagged on the screen. No blocking occurs up to this point. With multiple strong signals intermodulation can occur at quite a low level, but then does not worsen until close to the ADC overload point. This low-level intermodulation can cause problems on quiet bands such as 6m when multiple strong signals are around. With the ANAN-8000DLE intermodulation products appear about 10dB above the noise floor with input signals around -52dBm but remain around this level as input signals increase to within about 10dB of ADC overload. At this level it corresponds to an intermodulation limited dynamic range of 105 to 108dB in 500Hz bandwidth and is independent of spacing down to very close spacings. Low-level intermodulation can be significantly improved by selecting dither and random in the setup menu (General / HPSDR tab). This had a minimal effect on reducing sensitivity, as often seen on dither implementations in other SDR radios. Inband intermodulation measured with two tones 200Hz apart was excellent, below the noise floor at -70dB.

The radio incorporates a low noise reference oscillator and as a consequence the reciprocal mixing figures due to phase noise

are excellent. At spacings greater than 50kHz the limit is ADC overload. Transmit noise is also very low.

On SSB transmit the two-tone distortion products with PureSignal off are generally fairly typical and the higher order products drop away quite rapidly. With PureSignal adaptive pre-distortion enabled, distortion products are reduced by around 20 to 30dB to some impressively low levels. See the spectrum plots. I also checked out PureSignal operation driving my linear amplifier inside the feedback loop with a sensor/coupler on the amplifier output. The feedback signal was set to be around +5dBm, the level used internally by the ANAN-8000DLE. The results were virtually identical although setting the level correctly was a bit critical. I also carried out another check on PureSignal with the radio driving a mismatched antenna up to 3:1 VSWR and again the results were similar. PureSignal does seem to be fairly robust in operation.

On CW transmit the characters were nicely shaped with around 4ms rise and fall times and minimal character distortion due to equal and fully adjustable key up/down delays. The receiver latency measured around 38ms at the faster settings for buffer size and sample rate. This may be less with a faster PC and Apache claims it is possible to reduce this to 20ms. The audio sidetone closely follows the keying and full and semi break-in give similar results. The receiver recovery speed limits listening between characters to around 12 wpm.

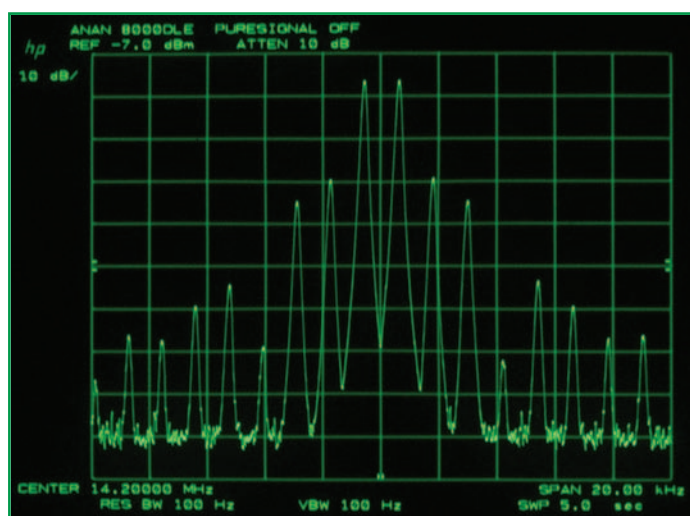
The maximum transverter output measured +10dBm and the output was clean except for an output related to the system clock frequency (245.7MHz), which would be easy to filter out.

## On-the-air performance

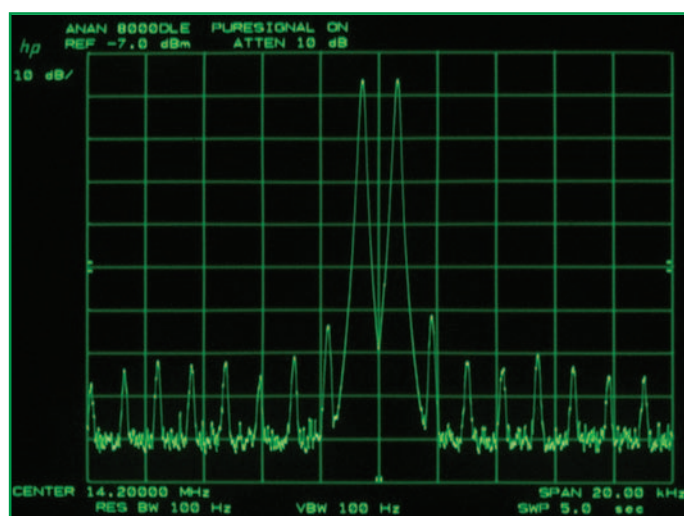
After installing the control software, a few simple setup steps are needed before the radio is ready for use. One important step is to set the maximum transmitter output so that 200W and no more is achieved with the drive level set to 100%. The internal power meter is quite accurate. There is a separate setting for each band and I found that the default settings gave far too much output on the higher bands. Other transmit settings such as microphone gain and audio filtering can be saved as a profile, with separate profiles stored for different operating styles.

The ANAN-8000DLE User Guide is available from the Apache website. Currently 81 pages in length, it gives a reasonable description of the hardware, installation of the software, essential setups and brief operation with PowerSDRmr. However, there are some discrepancies and omissions. PowerSDR has no user manual and learning is largely down to trial and error. Fortunately the software is well structured and although there are a huge





ANAN-8000DLE two-tone Tx spectrum with PureSignal off.



ANAN-8000DLE's impressive two-tone Tx spectrum with PureSignal on.

number of setups and features they are fairly intuitive and time spent playing around will generally produce results. The software is well supported by mouseover tooltips, helpful hints when the cursor hovers over the various buttons or menu items. The web can also be a useful source of information of course, and there is also the Apache Labs User Group.

The panadapter display is central to the use of the radio and tuning the receiver can be accomplished in a number of ways. Dragging the receiver display line, dragging the background, clicking on a displayed signal, mouse wheel tuning are all fundamental to the use of the radio. Keyboard shortcuts can also be used to access many of the functions.

If you prefer analogue-style round knob tuning, third-party accessories are available.

The panadapter and waterfall displays are most impressive and excellent for monitoring weak beacons. The receiver sounds very clean across the whole tuning range and filters, notches and noise reduction are very effective, the NR2 function is particularly impressive. Audio level and panning sliders allow each receiver to be positioned between the left and right channels, useful when multiple receivers are in operation.

On transmit, I used my Heil headset microphone. The audio quality was reported as excellent and is highly adjustable. Coloured messages indicated the operation

of PureSignal. It appeared to function well but needs to be driven fairly well into ALC. CW keying also performed well but the changeover relay is rather noisy if full break-in is used. A lack of time prevented use of data modes or checking out remote operation over a network.

## Conclusions

The ANAN-8000DLE is an excellent fully-featured and high performing SDR transceiver, the current top of the range model from Apache Labs. It is currently priced around £4,200 including VAT and my thanks to Nevada of the International Ham Stores Group for the loan of the radio.

## ANAN-8000DLE MEASURED PERFORMANCE

Sensitivity on SSB 2.4kHz bandwidth for 10dBs+n:n

Frequency	OdB attenuator
100kHz	0.6 $\mu$ V (-112dBm)
1.8 - 28MHz	0.35 $\mu$ V (-116dBm)
50MHz	0.18 $\mu$ V (-122dBm)

Frequency offset	Reciprocal mixing dynamic range 500Hz BW, CW, 7MHz
1kHz	114dB (-141dBC/Hz)
2kHz	116dB (-143dBC/Hz)
3kHz	117dB (-144dBC/Hz)
5kHz	119dB (-146dBC/Hz)
10kHz	120dB (-147dBC/Hz)
15kHz	121dB (-148dBC/Hz)
20kHz	122dB (-149dBC/Hz)
30kHz	124dB (-151dBC/Hz)
50kHz	127dB (-154dBC/Hz)
100kHz	see text

Transmit noise, 7MHz, 100W output
-126dBC/Hz
-130dBC/Hz
-131dBC/Hz
-132dBC/Hz
-135dBC/Hz
-135dBC/Hz
-135dBC/Hz
-138dBC/Hz
-140dBC/Hz
-147dBC/Hz

Transmitter measurements at 100W output

Intermodulation products					
Puresignal Off				Puresignal On	
Frequency	Harmonics	3rd order	5th order	3rd order	5th order
1.8MHz	-58dB	-30dB	-44dB	-62dB	-70dB
3.5MHz	-47dB	-32dB	-40dB	-62dB	-70dB
7MHz	-56dB	-30dB	-45dB	-68dB	-72dB
10MHz	-42dB	not measured	not measured		
14MHz	<-70dB	-30dB	-36dB	-62dB	-70dB
18MHz	-60dB	-28dB	-35dB	-62dB	-63dB
21MHz	-68dB	-28dB	-35dB	-53dB	-50dB
24MHz	-60dB	-28dB	-32dB	-52dB	-52dB
28MHz	-63dB	-30dB	-34dB	-55dB	-59dB
50MHz	-53dB	-30dB	-48dB	did not function	

Intermodulation product levels are quoted with respect to PEP.

# An effective, easily made HF balun

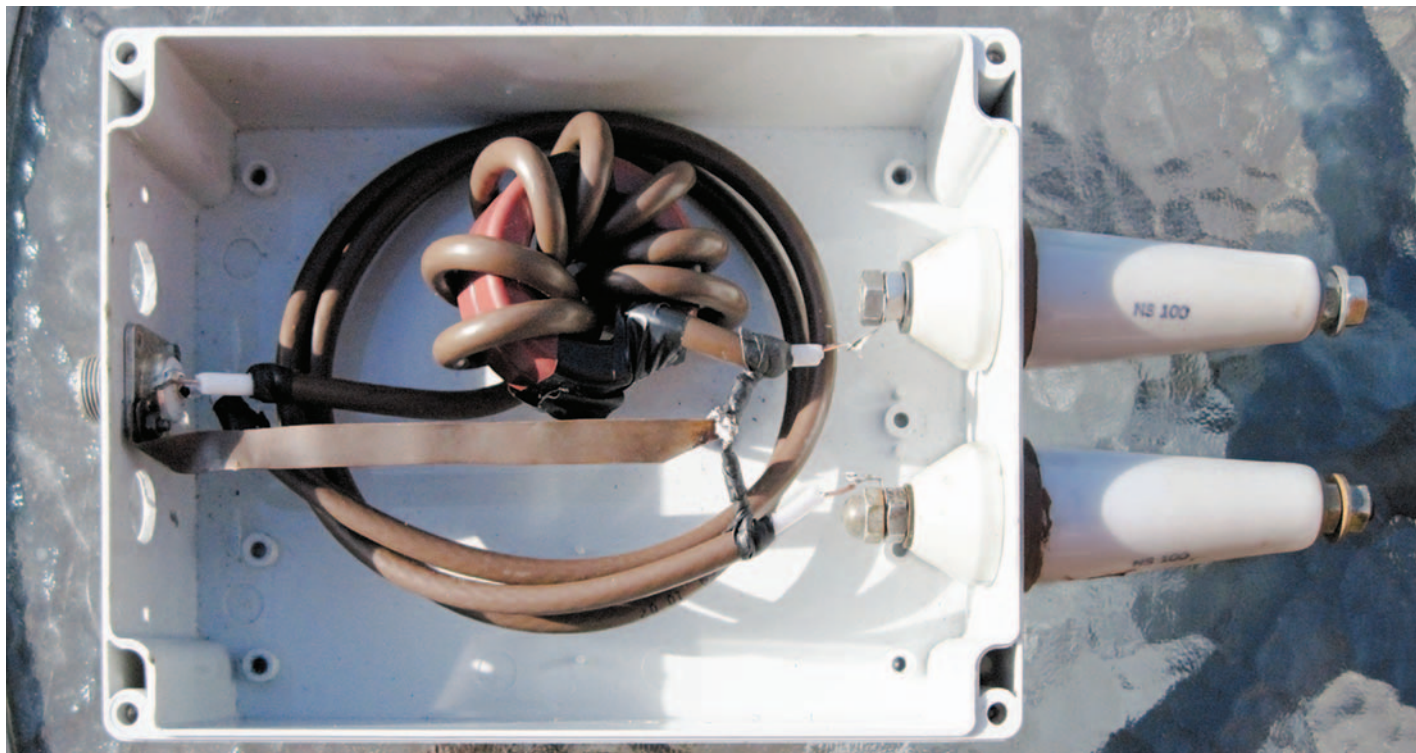


PHOTO 1: Completed balun, showing construction.

**Readers may recall that I used a novel form of balun with the Skeleton HF beam antenna described in *RadCom* January 2014.**

At that time I received feedback from some people who could not understand how the balun worked. Here I show how it was derived from the type used in high power HF broadcast transmitters and describe how easy it is to make.

Most balun designs place emphasis on achieving low insertion loss and wide bandwidth. These are, of course, desirable. There is another, probably more important, parameters that should also be considered and that is common mode attenuation. Low SWR or low loss will not confirm that the balun is doing the primary job required of it, which is to impede the transformation of common mode currents or potentials between an antenna and the associated coaxial cable. These are the signals often resulting from local interference sources that can render a QTH unusable, particularly on the lower HF bands. Because common mode energy causes unbalance between the currents in each leg of a nominally balanced twin wire transmission

line we can measure its effect by putting some power into the antenna and comparing the difference between currents in each leg, which we will call  $i_1$  and  $i_2$ .

Common mode relative to balanced mode current is  $20 \log ((i_1 - i_2) / (i_1 + i_2))$  dB.

Common mode attenuation in this respect is dependent on how the balun is incorporated into an individual's radio/antenna system. Consequently no two stations are likely to get the same measurement results even if using the same balun.

Let us assume here the most common balun application, between the twin feeder of a multiband doublet and the coax that leads to the radio or tuner. A choke balun for example may, at one frequency, introduce an impedance of  $1000\Omega$  between its balanced and unbalanced terminals but this will not significantly attenuate potentials in common mode unless the impedance presented by the braid of the radio's coaxial cable is at least an order of magnitude less than  $1000\Omega$ . The characteristic braid impedance of a long (in terms of wavelengths) coaxial cable is about  $300\Omega$ . Assuming, for simplicity, that the two impedances are not reactive and form a simple potential divider, attenuation in this case would be  $20 \log (300 / 1300) = 12.7$  dB.

A piece of cable that is grounded at the radio a quarter wavelength beyond the balun should present a much higher impedance, perhaps several thousand ohms and one that is either very short or twice this length will present a low impedance of less than  $50\Omega$ . Obviously the choke balun will have little impact in the first example, but will attenuate common mode current in the second example by more than 26 dB. We can see from this if the choke balun is to be effective over a wide frequency range its optimum position is at the radio or tuner's output socket. If this is not practicable, as it will be if the antenna relies on a specific length of twin feeder for impedance matching or if there are aesthetic objections to twin feeder entering the house, the alternative is to ensure a low impedance ground connection for the braid of the coax where it connects to the choke. Personally I would avoid relying on the twin feeder for impedance matching and rather choose a length that fits between the doublet and the balun/tuner/radio because with negligible loss the SWR on the twin feeder is not dependent on its length. You can then use a minimal length of coax where loss due to SWR is otherwise likely to be significant.

HF transmitters in commercial services such as short wave broadcasting, with which I have been professionally associated, are normally



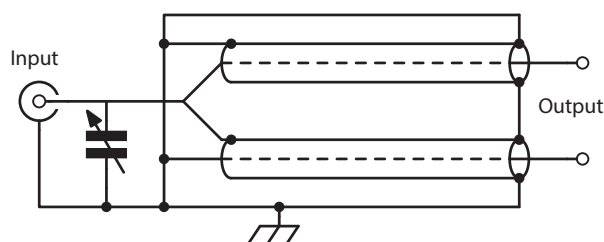


FIGURE 1: General balun arrangement. The coaxial cables should be approximately  $\frac{1}{6}$ th wave at the highest planned operating frequency. See text for details.

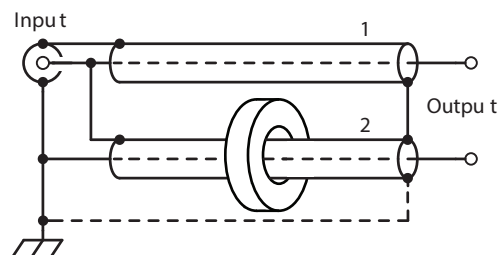


FIGURE 2: Practical balun arrangement. Note that the cable should be wound as many times as possible on the core (see Photo 1), not just once as shown here.

TABLE 1: Measured results.

Frequency	1.81MHz	3.6MHz	5.3MHz	7.1MHz	10.1MHz	14.2MHz	18.1MHz	21.2MHz	24.9MHz	28.5MHz
Choke	1.7dB	16dB	12dB	9.3dB	5.7dB	21dB	20dB	34dB	20dB	34dB
G3LNP	28dB	34dB	>40dB	26dB	>40dB	>40dB	26dB	>40dB	26dB	>40dB

designed to operate into unbalanced loads, usually 50Ω, whereas their associated curtain or rhombic type antennas present a nominally balanced impedance of several hundred ohms. On sites where there are several transmitter-antenna systems working simultaneously, there is a high risk of common mode coupling between antennas and feeder lines, causing the output devices of the transmitters to produce undesirable intermodulation products. In this case a balun is a valuable defence. Because of the high power involved, sometimes up to the megawatts range, the balun must primarily cause minimal loss of power with maximum common mode rejection – which is just what we want to achieve. Figure 1 shows the balun arrangement that is commonly used to meet these requirements. It consists of a pair of solid, air dielectric coaxial lines of approximately  $\frac{1}{6}$ th wave at the highest operating frequency (eg 26MHz). They are enclosed within a metal box to prevent radiation. One of the lines has its connections twisted to introduce a phase shift of 180°. This ensures that any current common to both legs of the balanced line will not appear at the transmitter. On the transmitter side the two coaxial lines are connected in parallel, whilst they are in series at the output side. Thus we achieve a 4:1 impedance transformation. The coaxial lines have a characteristic impedance of 100Ω, or twice the transmitter's output impedance. Common mode attenuation is maintained regardless of both the operating frequency and balanced line impedance. At any broadcast frequency the outer conductor of the twisted section presents shunt inductive reactance to the transmitter, which is countered by programmed automatic adjustment of a shunt capacitor. On a high power system, a 2000pF water cooled vacuum dielectric type might be used.

In this case, what is good for transmission is equally good for reception. We could therefore adapt the broadcast balun for our power levels with just two pieces of coaxial cable and a variable capacitor, but we have to consider radiation from the twisted line because this carries a large current. A more practical arrangement for our application is shown in Figure 2. In this case the cables, labelled 1 and 2, are each about  $\frac{1}{10}$ th of a wave at the highest frequency. As the lines are shortened a 4:1 impedance transformation becomes less dependent on their impedance. We do not therefore have to search for 100Ω cable. Shunt reactance is maximised here by winding as many turns as possible of cable 2 onto a ferrite toroid (only one turn is shown in Figure 2 but Photo 1 shows the real arrangement). Having no external field, the toroidal winding overcomes the potential radiation problem and allows us to dispense with a metal enclosure. Cable 1 is then made the same length and coiled so it will fit into a weatherproof box. Wide bandwidth is achievable when there is sufficient cable and core material of high enough permeability to make the shunt reactance more than 50Ω at the lowest operating frequency. Unless working on its resonant frequency, SWR due to the antenna will most likely be more significant than that due to the balun.

Photo 1 shows my 'broadcast balun', made from two 1m lengths of 75Ω PF100 satellite coax cable and some 50mm iron powder toroidal cores, housed in a plastic box. Ferrite cores may also be used. The copper tape is optional (shown dotted at the bottom of Figure 2, joining the junction of the outer conductors on the output side to ground). My balun is interposed between an unbalanced T type ATU and the balanced 600Ω feeder to a

55m doublet. 2m of RG214 cable connected the balun to the tuner. Table 1 shows the results of measurements of common mode rejection on our HF bands. These were obtained by adding transformers to sample the current in each leg of the 600Ω line of the doublet antenna. Results are shown for my balun and a conventional choke type formed by winding several turns of coax onto a ferrite toroidal core (40dB was the limit of my measuring capability).

The doublet, of course, presented a wide range of impedances over the 1.8 to 30MHz frequency range, which made the SWR very high on some bands. Power loss due to this balun is about 0.2dB at 28.5 MHz with SWR of 10:1 on the twin wire feeder and about 0.03dB with SWR of 1.4:1 when terminated by a 300Ω resistor. Loss at this highest frequency is attributed mostly to the untwisted cable. At 3.5MHz and below loss is mostly that due to dissipation in the core material because the cables have negligible loss due to their highly conductive solid copper sheath. However, the core is only subjected to half of the transmitted power and I could not detect any heating when running 400W CW at this frequency. Even though the SWR at 1.8MHz was about 30:1 the balun was still effective. Substituting the 'broadcast balun' for the choke resulted in a significant reduction in noise on this band. Several friends have reproduced this design and all found it more effective in reducing QRM, particularly at 3.5MHz from G5RV antennas, when compared to what, if anything, they had been using previously.

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g3lnp@talktalk.net



# National Hamfest 2017

The biggest two-day amateur radio show in the UK continues to go from strength to strength and this year was a superb success for all concerned. Some traders said they had sold as much on the first day as they'd expected for the whole weekend, which shows that amateur radio is alive, well and truly thriving!

If you didn't manage to make it to Hamfest this year, these photos will give you a flavour of what went on.



British Young Ladies Amateur Radio Association chairman Carol, 2E1RBH (left) and Treasurer Judith, G4IAQ presented Lauren, M6HLR with the G3HCQ Memorial Award and Rose Bowl.



RSGB President Nick, G3RWF, GM Steve, M1ACB, Chairman Graham, G4FSB and Communications Manager Heather being filmed for TX Factor.



Dave, G8GKQ with his fully-loaded Portsdown digital ATV transmitter.



Cathy, G1GQJ speaking with Martin, M1MRB for the ICQ Podcast.



Hans, G0UPL with his QCX kit designed for YOTA 2017.

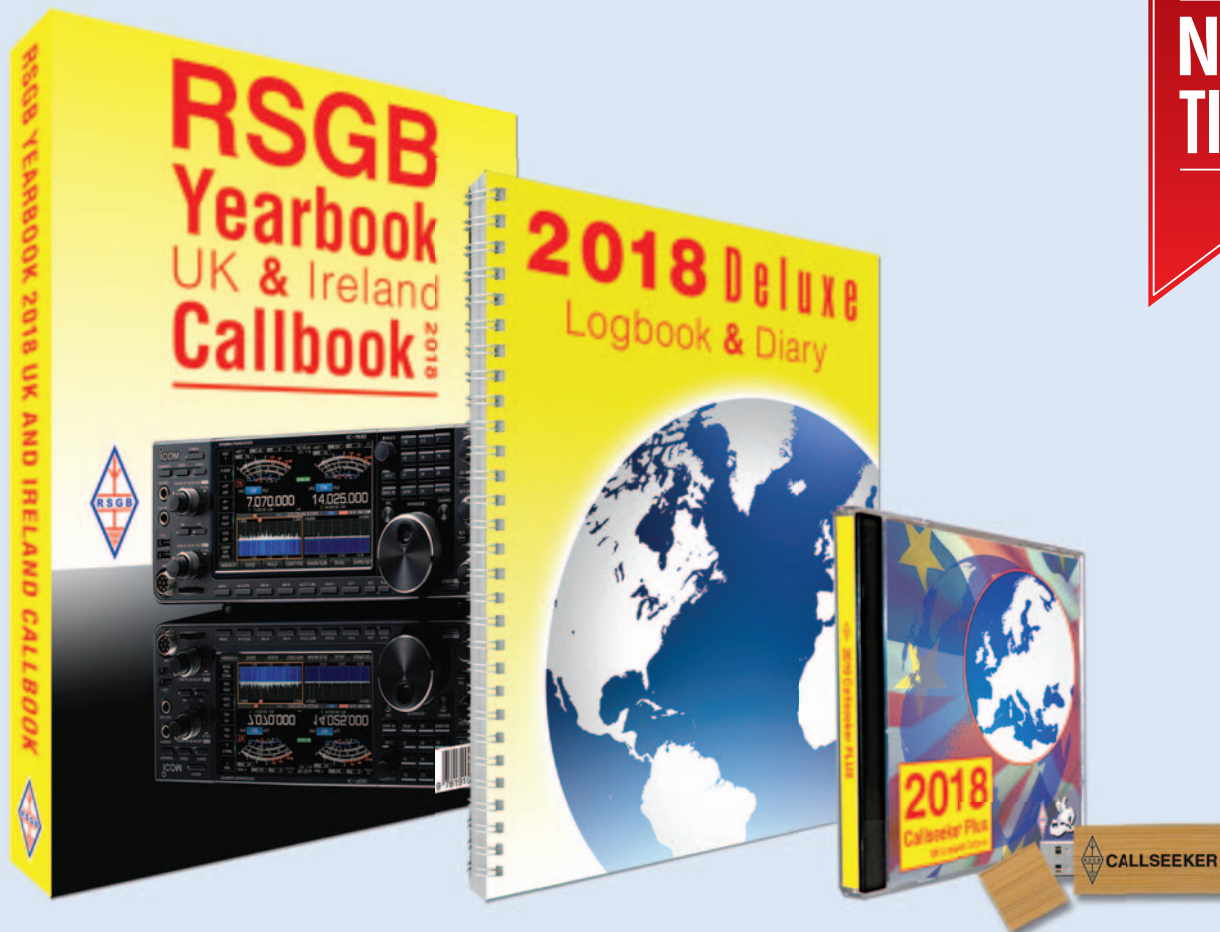
All sorts of stuff could be found outside in the car boot sale area.



Big-name dealers were out in force, many offering show specials.



**NEW  
TITLES**



## RSGB Yearbook 2018

Edited by Mike Browne, G3DIH

**New lower price too!**

There are more UK and Ireland callsigns on issue than ever and they are all included in the *RSGB Yearbook 2018*. This book contains the very latest details available of over 87,500 UK and Irish Republic callsigns in 544 pages.

This is the most comprehensive guide to amateur radio in the UK and worldwide. Over 170 pages of invaluable reference material. All the latest information on every aspect of the RSGB from how the Society is organised, the services it offers, committees, who to contact for assistance, etc. Regional information provides details of the RSGB Regional Manager Teams, local clubs, contest, repeater and much more. There is a huge range of information sections included from Repeaters, Beacons, Band Plans, RSGB Awards, RSGB Contests and HF Propagation. Also listings of special contest callsigns, permanent special event callsigns and much, much more.

If you haven't purchased a copy in a while, the updated information is an essential for every well-equipped shack.

210x297mm, 544 pages,  
ISBN: 9781 9101 9341 9

**Non Members' Price £17.99**

**RSGB Members' Price £15.29**

## RSGB Deluxe Logbook & Diary 2018

Looking back over old log books can bring back memories of old friends, satisfying and challenging QSOs. For many there is nothing like it and even today nothing sits better on the bench of an amateur radio shack than a well maintained log book. If you are looking for an attractive way to record your log year by year, the *RSGB Deluxe Log Book & Diary 2018* provides an ideal solution.

This popular annual logbook contains a wealth of extra material just where you want it, when you want it, right at your fingertips in your shack. The *RSGB Deluxe Log Book & Diary 2018* contains the latest UK Band Plans, RSGB Contest Calendar, DXCC prefix list and RSGB QSL Bureau information. The information doesn't stop there either, a locator map (and an explanation of how locators work), repeater information, diary section, notes pages, handy lists of operating abbreviations & codes - pretty much everything you want to know when operating is included. The logbook section isn't forgotten either and there is a generous log section with plenty of space for you to record a whole year activity. If you want to keep your log for years to come and make it easy to look over then the *RSGB Deluxe Log Book & Diary 2018* provides an attractive logbook that will grace any shelf for years to come.

Size 210x255mm,  
ISBN: 9781 9101 9344 0

**Non Members' Price: £4.99**

**Members' Price: £4.24**

## Callseeker Plus 2018

**NOW with a Raspberry Pi interface**



*Callseeker Plus 2018* is the electronic version of the *RSGB Yearbook 2018* and much more. Now not only can you run this software direct from either a CD or Memory stick on your PC you can also run it with a Raspberry Pi.

As always *Callseeker Plus 2018* provides the latest UK and Republic of Ireland callsign data but as a bonus you also get call information from 9A, DL, EA, ES, F, HA, HB9, I, LX, LY, OE, OH, ON, OZ, SM, SP, SV and Z3 as well. All this takes up no computer hard disk space as it runs straight from the CD or memory stick. You can search by callsign, name or location and navigating through the search results is quick and easy. You can print the results in a variety of formats. *Callseeker Plus 2018* is the ideal way to search for European QSLs

### Two formats – one price

The *Callseeker Plus 2018* is available as either a traditional CD ROM or an USB Memory Stick version. The CD is in the full jewel case whilst the memory stick is encased in an Eco bamboo shell. Both are highly portable and easy to use.

**Non Members' Price: £16.99,**

**RSGB Members' Price: £14.44**

**E&OE (All prices shown plus p&p)**



**Radio Society of Great Britain [www.rsgbshop.org](http://www.rsgbshop.org)**

3 Abbey Court, Priory Business Park, Bedford, MK44 3WH.

Tel: 01234 832 700 Fax: 01234 831 496

**FROM FREE P&P**  
on orders over £30. See Page 76



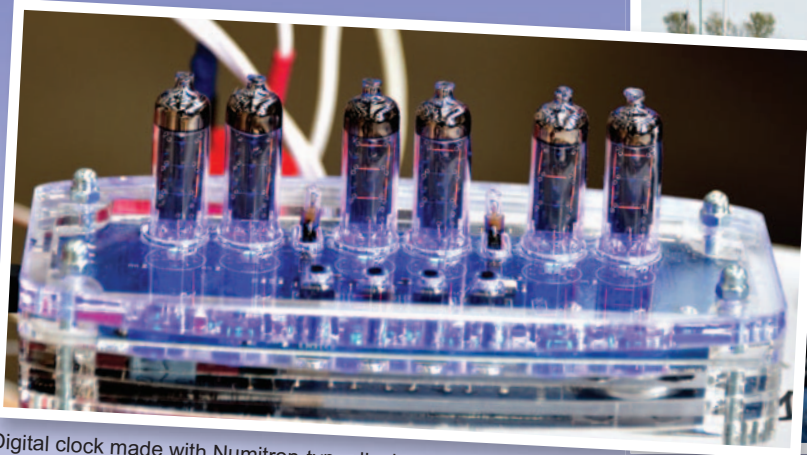




Jim, G3YLA on his WQRadar stand.



Immaculate WWII B2 'spy set' on display.



Digital clock made with Numitron-type displays.



Club of the Year presentations were avidly watched by many (see p74).

Continues on page 95



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Sunday 4th Nov.  
8am - 3pm.

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## YAESU FTdx5000MP Ltd

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**Twin RX**

**ML&S NOW ONLY**  
**£3199.95**

**Add SM-5000: £3599.95**

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**HF/6m Base.**  
**Sister Rig to FTdx3000**

Can't quite stretch to the FTdx3k? No worries! The ever dependable FTdx1200 is available at a special price still less than £1000.

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[www.HamRadio.co.uk/ftdx1200video](http://www.HamRadio.co.uk/ftdx1200video)



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**VHF/UHF 2m/70cm Dual Band FM Handheld**

The Yaesu FT-65e dual-band 2 metre/440MHz has three output power levels: 5, 2.5 or 0.5 watts. Receive coverage is 65-108 (FM broadcast band), 136-174 and 400-500MHz. The FT-65e is compact and light, yet ruggedly constructed. The speaker provides a full 1 Watt of powerful, clear audio. **ML&S: £89.95**



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Want to work HF mobile? Thousands of Hams around the world use the FT-857D. 160m-70cm, add the optional ATAS-120D to your car and you have an instant HF station on 4 wheels. We even include the YSK-857 remote kit for mounting FREE.



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Advanced FT-2DE C4FM/FM 144/430MHz Dual Band Digital Handie.

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## YAESU FTM-400DXE

**ML&S: £479.95**



**Large LCD display**

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**Large Colour Touch Screen Display**

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[www.HamRadio.co.uk/ftm400dx](http://www.HamRadio.co.uk/ftm400dx)

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**FREE YSK-8900 Remote Kit**

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Opening Hours: Mon - Fri: 8.30am to 5pm. Sat: 9am to 4.30pm. International Tel: +44 1932 567 333

We're open Sunday the 4th of November from 8am until 3pm. That's the same day as Kempton Park Rally & since we are only twenty minutes away from the show, it seemed daft not to open. I've told Richard my Sales Manager & the team to sharpen their pencils even more than usual because I want to see you dragging your new toys out of the store with HUGE grins on your faces. Better still, "admission", parking and cups of TEA & COFFEE are FREE!



## New to the ML&S range! Great value, dual band mobile and handheld transceivers.

**ML&S AT-778VU**

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**DVMEGA** is a collective name for digital voice and data related kits and modules. C4FM, DMR and D-STAR is supported with more digital voice and data modes added all the time.

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This shield is compatible with Arduino UNO or MEGA. This module has a 10mW UHF and VHF transceiver on board. In combination with an Arduino you make your own stand-alone dual band hot spot. This module, together with the AMBE3000 forms the basis for a self-assembly D-Star kit transceiver.



**PHONEMA SPEAKERS**



The **Phonema KSP3** Speaker has been designed to match the Elecraft K3 series. Handling 30W of audio with a frequency range of 100Hz - 20kHz. Only £145.99

**These hand-crafted high performance communications speakers from Spain are now available exclusively from ML&S. You might change your radio but you will keep your Phonema speaker for ever.**

The **Phonema Miranda** handles 10W with a frequency response of 120-1200Hz. It's housed in a compact enclosure featuring Rubber HM6, Acoustic Foam AG150 & Basotex. Minimalist design utilising a high-performance driver & best acoustic internals. Only £149.95

The **Phonema Rhea** Speaker uses beautiful Succupira wood and employs the same internal construction as the Miranda. Has a two input switch for two rigs, selectable via the front panel. Frequency range is a very low 75Hz through to 18kHz. Weighing in at a very solid 2.25 kilo's. Only £219.95

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The EQ20 and EQ20B can be used with bhi Dual In-Line, Compact In-Line and NEIM1031MKII.

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**NES10-2 MK3** Amplified DSP Noise Cancelling Speaker **Dual In-Line** Dual Channel DSP noise eliminating module

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**SharkRF**

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ML&S PRICE: £209.95

[www.HamRadio.co.uk/rfexplorer](http://www.HamRadio.co.uk/rfexplorer)

### MyDEL Sark110 Vector Impedance Antenna Analyser

Pocket-sized Antenna Analyser providing fast and accurate measurement of vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits). Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths.



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### 160-6M BASE WITH ATU

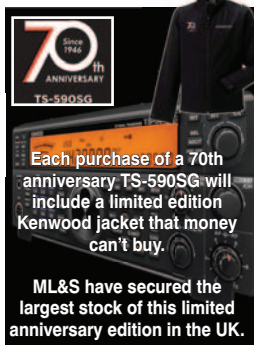
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[www.HamRadio.co.uk/id4100](http://www.HamRadio.co.uk/id4100)



The ID-4100 makes using DSTAR more fun and more comfortable thanks to the terminal mode/access point mode for the first time in mobile devices. This feature enables DSTAR via the Internet from any location you do not have access to a DSTAR repeater.

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The Icom IC-7610 is a complete redesign of the former IC-7600 following on from the huge success of the IC-7300. 100W, Dual band receive, Huge widescreen display. Delivery schedule is September/October 2017.

For more information with prices

**click!**

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**FREE MBF-4**



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Transceiver from Icom. Bluetooth connectivity and second station control through an Android device.

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Simple to use, bomb-proof performance DMR 70cm Handie. In stock now! MD-390 also available.

**click!**  
[www.HamRadio.co.uk/md380](http://www.HamRadio.co.uk/md380)



## NEW MINI-APRS-TRANSCIVER PICOAPRS WITH GPS RECEIVER (KIT)

The World's smallest APRS transceiver with TNC offers many applications. Matchbox-sized, built-in GPS receiver.

The transceiver can not only be used as an APRS tracker and receiver for APRS data, but also as TNC (KISS protocol) for computer. £159.95.



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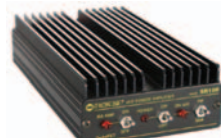
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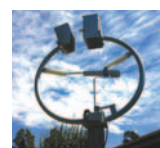
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R2010904	5 band cobweb 500W antenna	£284.95
R20109043	5 band cobweb 3kw antenna	£369.95
R2010050	ea101520dx dipole 3band HF dipole	£72.95



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# HF

**S**eptember started with a rash of sunspots and a number of explosions from the sun in the form of enormous flares and coronal mass ejections. The K index hit 8 on many occasions and took DX out of the equation for several days.



Ile aux Marins – the CUWS FP QTH was the house on the right. Photo: G7VJR.

Things eventually settled down and the seasonal improvement in MUFs meant there was a lot to be worked. Looking forwards, both HF and LF conditions should be steadily improving as we approach late autumn.

As I write, the Chiltern DX Club HF Challenge on 21MHz and up is drawing to a close but there are still a few more days to go and the final positions are not yet known. Norman, 5B4AIF is currently leading the field with 154 DXCCs, pursued by Roger, G3LDI and Lionel, G5LP. As I suspected, FT8 is playing a major role with 5B4AIF working over 35 DXCCs and G3LDI working around 75% of his DXCCs using the mode. The winning score will probably be down on last year as conditions haven't been as good but I note that 15m QSOs have been made with HL, JA and ZL from the UK. 5B4AIF also managed North Cooks, E51WL, on 15m FT8. More next month when the final scores are out.

IOTA enthusiasts are looking forward to the next 'new one' 5L3BI (AF-111) in early November. The latest report from the team says "The wet season is in full force in Liberia this year and this makes any road travel tricky and potentially dangerous, which in turn has so far prevented Richmond, EL2BG and Dickson, EL2DT from making a second reconnaissance trip. Since we believe road conditions may never fully recover between now and the end of October, we have recently managed to reserve seats on a MAF (Mission Aviation Fellowship International)

flight that will take most of the team directly to Greenville Sinoe airstrip. From there we will meet Richmond, EL2BG who will have made the treacherous road journey south in his 4x4 vehicle." With the extra flight costs the team are still seeking donations so if you can help please go to <https://af111new.com/support/>

The new IOTA site is at [www.iota-world.org](http://www.iota-world.org). Registered users on [rsgbiota.org](http://rsgbiota.org) will not have to re-register on IOTA World, because they will be able to log in with the same credentials as they used on the old website. The point of contact for help and comments is [info@iota-world.org](mailto:info@iota-world.org). Note that any IOTA chaser who has not updated since the database went online in 2007 has had his record archived.

The Cambridge University Wireless Society DXpedition to St Pierre & Miquelon made over 10,500 QSOs in 4 days including 1100+ on Top Band. Antennas were all simple verticals or dipoles.

## DXpeditions

A very large team will be active from Burundi with five stations from 6-17 November. The website for the DXpedition is at [www.mdx.org/9u4m/](http://www.mdx.org/9u4m/)

Keith, GM4YXI and Chris, GM3WOJ will be active again as VK9CZ from Cocos-Keeling (OC-003) from 24 October to 7 November, including a M/2 entry in the CQ WW DX SSB Contest. They will operate SSB, CW



Bert, CX3AN boarding a plane to operate as YJOCX.

and some RTTY on 160-10 metres with two stations. The website is now up and running at [www.vk9cz2017.com/](http://www.vk9cz2017.com/)

Bill, G0VDE, hopes to be on the air as ZD7VDE (AF-022) for a week or so from 14 October. He is expecting to be on the first commercial flight into the new airport. The operation will be SSB, RTTY and maybe FT8.





The FP-G6UW Group, G7VJR in foreground then (L-R) M0BLF, G3ZAY, DH5FS, DK2AB (M0INN), M0ZXA, M0WUT. Photo: G7VJR.



The 5W0HA shack in Western Samoa, surprisingly loud in the UK for 100W to a wire antenna.

Leo, PP1CZ, reports that he will be using his new call of PY0FW from Fernando de Noronha (SA-003) from 22-27 October.

For the next two years Peter, G4ENL/HB9DVG will be on the air from Kigali as 9X9PJ. Listen for him mainly on SSB on 20 through 10m. He is using a KX3 with an HLA 300 amplifier and a Buddipole vertical.

SP9FIH will be active as E44WE from 18-29 October. Janusz will have an IC-7200, running 100 watts to a Spiderbeam, plus a vertical for 30m. See [www.e4.dxpedititions.org](http://www.e4.dxpedititions.org) for info.

## Correspondence

Tom, G4IDL asks if there is a major shift in the hobby underway. His early morning CW CQs on 80 and 40 are going unanswered while there is a lot of traffic on JT65 and FT8 – often at S9. FT8 and JT65 can be great modes and Tom reports working VK with 35W to a low dipole – but if they are used when other more flexible modes would work perfectly well then I personally think the

pendulum has swung too far. Tom found: 15m – V53DX; 17m – FP/DH5FS; 20m – 9G1SD, 5T5OK; 40m – FK8IK, T12KWN, VK/ZL, KP4JRS; 80m – VK2DX.

Ken, CT7AGZ also notes a mass migration to FT8 and says he has been using the mode sitting outside the shack with a laptop and a glass of wine, having a QSO without even realising it. With a bit more software he reckons he could dispense with the laptop and just enjoy the wine! His QSOs included on 10m – 5T5OK, CX2DK, PY's, XR1SDC, ZP6CW, FY5KE, TY2AC; 15m – ZP6CW, FP/DK2AB, 5T5OK, PY's, LU's, V53DX; 17m – FP/DH5FS, OY1CT, 5T5OK, OJ0/UA4WHX, TA1PB, PJ4/PA3BWK; 20m – FP/MOWUT, 5T5OK, A71BO, T6/I21CCK; 30m – 5T5OK, S01WS, FP/G3ZAY, MU/ON4ANN, E77EA; 40m – FP/MOBLF, 5T5OK, MU/ON4ANN, EH9SDC, KP4TF.

Peter, G4EX found the bands electrified by the sudden appearance of sunspots but is still handicapped by his ground level beam. He worked: 10m – 5R8UI; 17m – AR25BE, 5T5OK; 15m – 5T5OK, 20m – E28AD, JG1VGX, ZP6CW, PJ4/PA3BWK, RI1ANO, CP4BT, PZ5RA, YB5QZ, JT5DX.

Andy, G3SVD missed much of September while his antennas were down for maintenance but got back on the air in time for some good conditions. He found: 10m – FY5KE, OJ0/UA4WHX; 15m – 5T5OK, ZF2CT; 17m – A26SP, 5T5OK XW1IC; 20m – FP/G3ZAY, HK0RMR, FK4QX, FK8IK, VKs; 30m – A25BE, OJ0/UA4WHX.

Fred, G3SVK had an amplifier fault but worked: 17m – 5T5OK, YB72RI/1, OH0/OF5C, 9K2NO, JA's, 5T5OK; 20m – ZP6CW, HI3A, JA's, V85T, YB2TJV, RI1ANO (S Shetlands), 5T5OK, 9M2ZAK, 9M2PUL, FP/Z3ZAY; 30m – VK2IR, OJ0/UA4WHX, FP/MOBLF; 40m – OX3LX, OH0Z, PJ4/PA3BWK, 5B4AMX, XQ6CFX, KP2X, OJ0/UA4WHX, A25BI, VK3CWB, VU2GSM, 5T5OK, ZL3AGY.

Gordon, G3PXT was focussing on 15m and above for the CDXC Challenge and had a score of 100 entities worked at my deadline. He found: 10m – CX, EA6, ISO, OJ0, PY, SP, V5, PZ5, TY; 12m – 9A, CT1, DL, LU, S5, SP; 15m – CO, CE, HK3J, VK9VKL, SU9JG, VP8LP, 9G1SD, YBs, TZ4PR, 5T5OK, 3B8CW, 9N1AA, RI1ANO, CXs, S01WS, 9J2BO, ZPs, JT5DX, CV7S, PZ5RA, ZF1A, V53DX, PY0FW, HP3SS, V31VP, CN8YZ. Gordon has now worked 125 DXCCs on FT8.

## Finally

Thanks as always to my correspondents, to DX-World, 425 DX News and Daily DX.

**Table 1: 2017 Worked DXCC entities (ranked by All), showing Top 4 from RSGB or British Isles table in Club Log plus submitted scores or Club Log scores of recent correspondents where available.**

Call	CW	SSB	Data	All
G4TUK	176	166	177	256
M0IKW	159	106	42	255
M0NKR	186	207	130	255
G4PTJ	200	100	0	248
G3SVD	167	169	56	235
G4IDL	192	0	60	201
G3PXT	92	105	142	190
GI4DOH	186	20	62	189
G4EXE	126	108	104	181
CT7AGZ	174	-	42	176
G3HQT	171	0	0	171
G3SVK	158	0	0	158
G8APB	72	57	64	107

**TABLE 2: Forthcoming DX activity.**

Until 20 Oct	KG4 ops
Until 16 October	VK5CE/8 (OC-198)
Until 19 Oct	N6SJ in Bhutan
Until 21 Oct	S9CQ
15-18 Oct	AS-140 Bangladesh
18-29 Oct	E44WE
21-25 Oct	AS-127 Bangladesh
22-27 Oct	PY0FW
24 Oct – 7 Nov	VK9CZ (OC-003)
27-30 Oct	AC2AI/KH2
27-31 Oct	ZC4MK
1-4 Nov?	Baiyah Island (AF-111)
3-16 Nov	VK9MA (OC-072)
6-17 Nov	9U DXpedition
7-10 Nov	VK9AR (OC-216)
6-20 Nov	VP2MDL
13-25 Nov	AF-020
Early 2018?	D2 IOTA (AF-108)
Early 2018?	3Y0Z Bouvet (AN-002)
March 2018	Pajaros Rocks (SA-100)
10-20 March 2018	9MOW Spratly (AS-051)
April 2018	St Brandon by F ops

**Martin Atherton, G3ZAY**  
[g3zay@btinternet.com](mailto:g3zay@btinternet.com)

# VHF/UHF



Black Sheep Contest Group, MOBAA/P, operating in the 2016 VHF NFD.

## A major auroral opening with some superb and surprising QSOs.

The main event during September was a superb aurora, one of the best for many years. On 6 September at just after 1200UTC sunspot AR2673 erupted producing a major X9.3 class solar flare, with many observers confirming it to be the strongest flare in more than a decade. Typically the X-ray and UV radiation from the flare caused a strong short wave blackout over Europe, Africa and the Atlantic Ocean. As the huge blast was earth directed, warnings were issued for the possibility for VHF DX and in extreme cases up to UHF.

### Aurora reports

David, G4DHF (IO92) reports, "This event was well-anticipated and so activity levels were very high from the start. I had changed to my homemade array of 4 x 9 element (4.6m) fishing pole Yagis only the day before as I wanted to be more able to select the reflection areas, so as to optimise the DX capabilities. During the event, the reflection area covered the full 90° from North to East.

For OH, SM2 and EW, I was beaming 35° and for I4, HA, 9A, UT and YU beamed 85°. The QRM levels were very high, requiring frequent 'QRZs', which slowed the CW QSO rate. I know from stations after the event that I was being heard by many more to the South and East but it wasn't either fair or practical to ask the middle distance stations to continually call again. Events that extend so far South are rare and everyone was excited to hear such an extensive number of strong Au signals, which included such a large area of EU. When I finished at 1740, the Aurora was still going strong and stayed so for around another hour. This event reminds me of the strong Au we had in the 80s and was the best for me in many years. Out of an incredible 100 plus QSOs, the top ten were LY2WR (KO24), HAOLZ (KN08), HA0HO (KN07), OH6KTL (KP02), UT4WT (KO20), YU1EV, YU1LA (KN04), EU3BDE (KO32), EW6FS (KO35) and the best DX OH7RJ in KP33 at 1985km."

Nick, G4KUX (IO94) says that, "This was one of the largest ever experienced at this QTH in 35 years of living here, although admittedly I was abroad during a good part of SS23 so missed most of the events during that cycle. I basically sat on one frequency throughout and worked whatever came, the pileups were

huge and, while no doubt there would have been some good DX among those calling, it was just simpler to wade quickly through the more local stations (less than 1000km) than try to discipline the pack, which is not easy when you're faced with a morass of hissing tones. David, G4DHF adopted a similar strategy. Many of those calling, although not particularly DX, may be in places that makes tropo contacts impossible in my direction, so why should I deny them the opportunity of working me even if it causes me, occasionally, to miss more distant DX. I also heard/was heard with some signals on 70cm from PA/ON but no contacts resulted."

Let's hope what remains of this SS24 has some more surprise events like this one to come, and as autumn/winter draws on perhaps some nice tropo to the east as these seasons have in my experience always yielded the best in long haul tropo openings in the past (up to 2400km). Nick's top ten QSOs were SM2A (KP04), HA6VV/P (JN97), EU3AA (KO12), SM2JAE (KP05), ES6DO (KO27), EU3AI(KO22), SM2CEW(KP15), EW6FS (KO35), EU3BD (KO32) and OH7RJ (KP33) at 1913km.

John, G4SWX (JO02) is also well placed on the east coast for the Aurora and made numerous CW QSOs with LZ2FO (KN13)





G4DHF's 2m fishing pole Yagis caught some superb Auroral DX.

being a real gem. QSOs with YU/S5/I were also in the log and an Auroral SSB QSO with Reg, G8VHI that is generally not easy due to the distortion on the signal. The Persieds meteor shower was very good in JO02RF, however not a great many QSOs over the magical 2000km boundary except R3ICQ (K077) at 2199km who was probably the best QRB, although I had several incomplete QSOs around 2300km. OY, TF and other 'classy' calls were in the log and various expeditions gave four new squares. EA8TX (IL18) on tropo + MS was worked again – achieving QSOs over a terrestrial path of over 3000km on 2m is always a highlight moment. EME yielded quite a load of new calls E71EEE (JN93, a very rare square), JT0YPS (NN58) Mongolia and LB6GG (KQ50) that is right at the top of Norway near the Finland/Russia border. More new squares via EME included BV0FISU (PL05) Taiwan, XV4F (OJ29) operated by Keith, G4FUF, YC2MDU (OI53) Vietnam and last but not least G4EEV (IO94) being his first G EME QSO. On many occasions reading the various internet chat channels that there is 'no DX around' maybe that isn't the case and having achieved around 130 QSOs tells a different story.

Lyn, GW8JLY (IO81) reports that the Persieds meteor shower in mid August was not as good as last year. "I did manage to work a new locator via MS with SN5R (K001) on 12 August. I had been looking for K001 for many years and I was very pleased to finally complete a QSO. I was also pleased to work EI/ON5GS (IO54) on 10 August. Dirk was operating from IO54 on meteor scatter but kindly switched to JT65 to give me the locator. A tropo opening to the Canary Isles (EA8) during the evening of the 6th gave me another opportunity to make a QSO with Fernando, EA8TX in IL18. This was the third time in a three month time span that tropo to the Canaries was available here in South

Wales. This is quite exceptional for me as these opportunities usually occur just every few years at my QTH. A significant Aurora occurred on 8 September, unfortunately I can only operate on SSB as I have never quite mastered CW. As always the real DX was only available on CW and I missed some of the amazing opportunities to work stations at very great distances in this event. Working stations using SSB via Aurora is never easy but I completed 27 QSOs with stations in GM, EI, G, LX, ON, PA and DL best DX being DL8YAU (JO41) at 819km. I was heard however by OE5OLL (JN68), OK1TEH (JO70), SO3Z (JO82) and OZ1BEF (JO46). Although all these could copy me, I was unable to resolve their SSB signals in the high noise levels I experience at my QTH.

During the major aurora Tim, G4DBL, who was out in his camper van, actually achieved an Auroral QSO on CW while parked up on his favourite spot on the Ridgway in Oxfordshire. Using just 20 watts of power Tim worked Paul, G4RRA with 20W to the 5/8 over 5/8 mobile whip on the roof of the camper-van! Also several EU stations were heard, strongest of which was an OK. This shows how remarkable these auroral conditions were, so it's always worth taking a listen even with small antennas in these major events.

"Who says 6m is dead?" is the first comment from Gordon, G3PXT (JO02) this month. He has been taking part in the CDXC Challenge and has worked 32 DXCC entities during September and seems to be in competition with Roger, G3LDI for the top spot. Modes used were digital (FT8, MSK144, JT65B) and also SSB and CW. Gordon continues with his 2-element InnovAntenna 6m quad mounted in the tree – fixed direction – no rotator and the results continue to be outstanding. The list of contacts supplied were too numerous to mention and is a result of experience, time and watching bands conditions to get the best results. Gordon has also taken delivery of a new Acom amplifier that provides significant RF headroom when using the digital modes so extensively.

Continuing activity from his usual spot in IO85PX on FT8 mode, [1] Dale, 2MOWDG has managed a few contacts. However, with the decline of Sporadic-E conditions, he has still worked in to France and Germany on a couple of occasions. Dale comments how much fun it was during the summer to experience new modes and propagation for the first time. During the RSGB 144MHz Trophy Contest, Dale completed with Martin, GM8IEM (IO78) despite the weak signals. "This was a first for me; actually working someone nearly 300km away with my meagre kit of a 10W FDK Multi-750x and a hand-held HB9CV antenna. Given the whole of Scotland was between us and my antenna

was pointing away from him, it was possibly by some scatter/reflection. Envy set in looking at the QSOs on the cluster during the periods of aurora – perhaps next time!"

Andrew, G4XZL got in touch and said, "With the forthcoming Marconi contest I thought you might be interested in some interesting propagation I've noticed over the last couple of years. In 2015, out of interest, I monitored the 144MHz Marconi CW Contest using my SDR beaming east from IO90 and, due to my poor location and high local noise levels, I didn't really hear much, just a few of the big UK stations. However, late on Saturday evening the band came alive for just a few seconds due to a large meteor burst, suddenly there were maybe 15-20 stations showing on the waterfall. Sadly I didn't get a chance to record it otherwise I would have replayed it and found out who they were. It was really quite amazing. I did hear a few other smaller bursts. I think that the fact that it was a CW contest as against SSB accentuated the effect. There is no major shower on that date so I assume it was due to random meteors. In 2016, I listened again and again heard a few bursts. It is possible to detect a dozen stations across the waterfall amongst all the interference. Using Simon Brown's great piece of software called SDR-Analyzer and knowing from the DX Cluster that DA0FF was on 144.050MHz I used the software to dig right down into the noise floor and eventually found it. The resolution bandwidth was 0.046Hz, some 47dB below SSB bandwidths! This year I plan to upgrade my hard disk to enable longer I/Q recordings and have a better chance of spotting MS bursts and then, after the contest, some inaudible DX signals – it's quite fun. Of course, I'd much rather have a better location and lower noise levels so that I could actually work them! So I would encourage anyone with an SDR to have a listen and see what they hear and see."

## Sign Off

An exceptional auroral event in September and many thanks for all the contributions.

Also thanks to Bill, VE3CRU with an interesting view on 222MHz and up activities in North America, which will be a focus soon.

## Websearch

[1] <http://physics.princeton.edu/pulsar/k1jt/wsjsx-doc/wsjsx-main-1.7.1-devel.html>

**Richard Staples, G4HGI**  
g4hgi@live.com

# GHz Bands

## UK Microwave Group

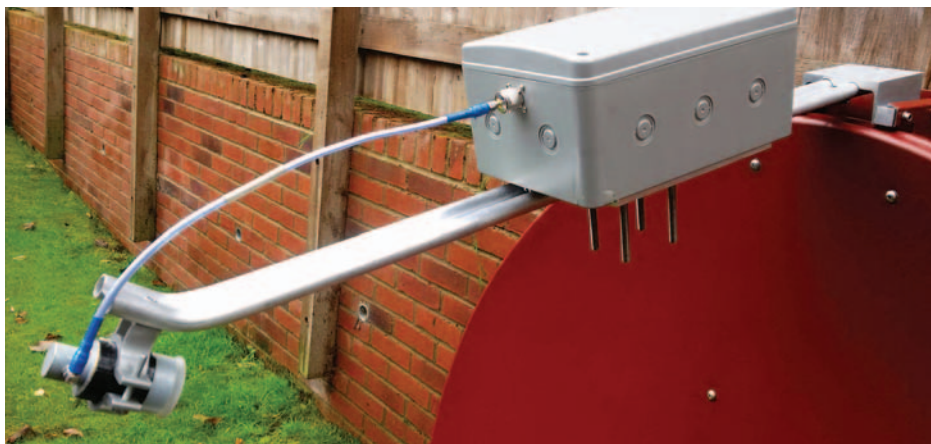
Apologies for the shameless plug, but I reckon that for £6 a year, the UK Microwave Group (UKuG) [1] subscription is the best value in amateur radio. Not only do they provide the free 'Chipbank' service [2] run by Mike, G3LYP, which provides a large range of modern surface mount components for absolutely no charge, they have sets of loan equipment for 5.7, 10, 24 and 76GHz available for members to try out new bands. Add to this the *Scatterpoint* E-magazine, their regular funding of beacon hardware and their tech support members who have a huge range of test equipment and expertise between them, I think it's a 'no brainer' to join.

One member who benefitted from the 10GHz loan system was Tony, G8DMU in Yorkshire. He borrowed the loan equipment back in 2013 and used it for several months until demand from others meant he had to return it. He got the 10GHz bug and obtained his own DB6NT pro transverter with an 8W PA. He then started putting it together in a system. With help from Finningley Amateur Radio Society and UKuG secretary, G3XDY, plus G4KUX and others, he incorporated it all into a masthead box together with a sequencer, relays and suitable switching. He is now QRV again with a 1.2m offset dish and GW4DGU feed, as seen in **Photo 1**. Look for him during the SHF UKAC contest or contact him via the ukmicrowaves Yahoo reflector [3] for a sked.

## New microwave Wiki

UKuG committee members are often asked where to look for information for beginners, so, with the help of UKuG and BATC committee member Noel, G8GTZ, the UKuG is in the process of putting together a GHz bands version of the popular BATC Wiki [4]. It is currently at [5] and content is slowly being added. If you have items to contribute to this new service, email it to me direct and I'll either arrange to get it on there when it goes fully live or, if you're a UKuG member, you can add it yourself by requesting an account.

Remember that all groups like the UKuG rely on YOU, its members, to provide information and to make things happen. Don't rely on the few committee members to do everything for you, step up to the plate and be an evangelist for the GHz bands. The UKuG Committee are looking for someone who is internet and IT-savvy to join them as many of the members (like me) don't have the sort of skills we need for our web presence. Contact the secretary, John, G3XDY via [secretary@microwavers.org](mailto:secretary@microwavers.org) and tell him what you can do to help the group.



**PHOTO 1:** G8DMU's 10GHz dish and transverter system (photo: G8DMU).

## 47GHz cloud scatter tests

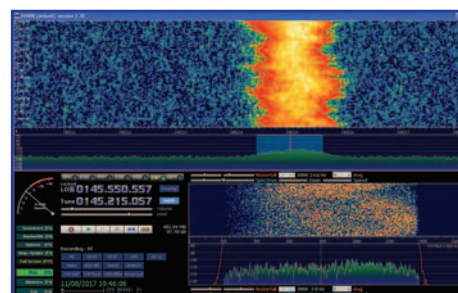
Our millimetre wave enthusiasts continue to lead the experimentation charge on the GHz bands. I covered the basic of rain scatter in July 2015 and John, G8ACE has been investigating rain cloud backscatter on 47GHz. He rigged up a stable, locked Gunn transmitter at the front of his house, pointing skywards and shielded as much as possible from the back garden by the garage door. There he set up the receiver, a 40cm dish with an LNA, just sensitive enough to see sun noise.

The scattered received signal was about 1.5kHz wide and was 2kHz wide at one stage. **Figure 1** shows this very clearly. In earlier tests over a 23km direct path with Neil, G4LDR, the same Gunn signal was only 200Hz wide. Neil suggests that, as the rain radar showed it was raining over John's QTH at the time but none was seen falling, the raindrops were small and evaporated before they reached the ground.

With LNAs and amplifiers appearing for 47GHz let's hope we can see more experimentation on this band soon. Even 24GHz rain scatter was almost unknown a few years back, but technology advances and now it's commonplace – as beacon reports show. The smaller droplet size of light rain often produces a second scattered signal on my local 24GHz beacon, GB3CAM. I've often noticed that the 24GHz GB3SEE beacon (at 190km over the hills from me) shows up as a rain scatter signal before the 10GHz one on the same site.

## Beacon news

The 5760.925MHz beacon GB3KEU has completed its move to Finningley (IO93NN). It took a while to get Ofcom clearances but it's now on air again. Thanks to Kevin, G3AAF at the Finningley club and the RSGB team for pushing



**FIGURE 1:** 47GHz signal received by raincloud scatter (image: G8ACE).

it through. Please report to Beaconsport [6] if you hear it.

## Finally

Please get on the bands! Keep reports and technical snippets coming in to me by email and join the Twitter conversation @g4bao and @ukghz using the hashtag #GHz\_bands.

## Websearch

- [1] [www.microwavers.org/](http://www.microwavers.org/)
- [2] [www.microwavers.org/chipbank.htm](http://www.microwavers.org/chipbank.htm)
- [3] <https://groups.yahoo.com/neo/groups/ukmicrowaves>
- [4] <https://wiki.batc.tv>
- [5] [https://wiki.microwavers.org.uk/Main\\_Page](https://wiki.microwavers.org.uk/Main_Page)
- [6] [www.beaconsport.eu](http://www.beaconsport.eu)

**John C Worsnop**  
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# ATV

## DATV from the Analog Devices Pluto

Analog Devices has recently made available a new SDR transceiver called the ADALM Pluto [1]. It is primarily aimed at education and the first batch (now sold out) had an introductory price of \$99. Its internal structure is similar to DATV Express (see *RadCom* March 2017). Within a few days of receiving his Pluto, Charles, G4GUO had modified the DATV Express software to work with it.

After reconfiguring the Pluto's firmware, it can generate a DATV signal on any band from 71MHz up to 5.8GHz. The output level is around 1mW so it needs significant amplification, but initial reports are that it is a very impressive device for generating digital ATV signals. All that is required is a normal Windows PC and the Pluto. Chris, MWOLLK has already used it to access his local TV repeater (GB3TM in Anglesey).

**Photo 1** shows a Pluto generating a 5665MHz DATV signal, which is then downconverted to 1665MHz using an ADF4351 4GHz signal source and a passive mixer, then demodulated using a MiniTiouner with MiniTioune software (**Figure 1**). There is a lively discussion about using the Pluto on the BATC Forum [2].

## 2017 ATV Convention

The 2017 BATC Convention for Amateur Television (CAT 17) at Finningley Radio Club was well attended and it was standing room only during many of the presentations. The proceedings were streamed online to a worldwide audience who also had the opportunity to question the speakers. All the presentations are now available on YouTube – just search for 'BATC Online'. Hot topics for the weekend were the



**PHOTO 1:** Pluto being bench tested at 5.6GHz.

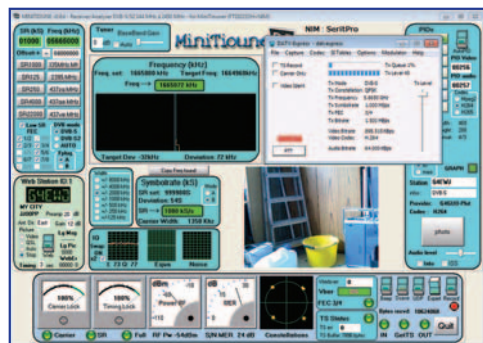
Portsdown DATV transmitter project, the Pluto SDR and the use of 5.8GHz drone modules for FM ATV. Eight home-constructed Portsdowns were on display. Chris, MWOLLK won the construction competition with his very small Portsdown transmitter mounted in a Hammond box with 3D-printed fittings (**Photo 2**).

Over 175 Portsdown transmitters are now under construction. Full documentation, including a beginners' guide, is available on the BATC Wiki [3].

## 3.4GHz success

I was so impressed with the level of activity in this year's IARU Region 1 ATV

Contest that I forgot to mention that, for the third year running, Terry, G1LPS won the



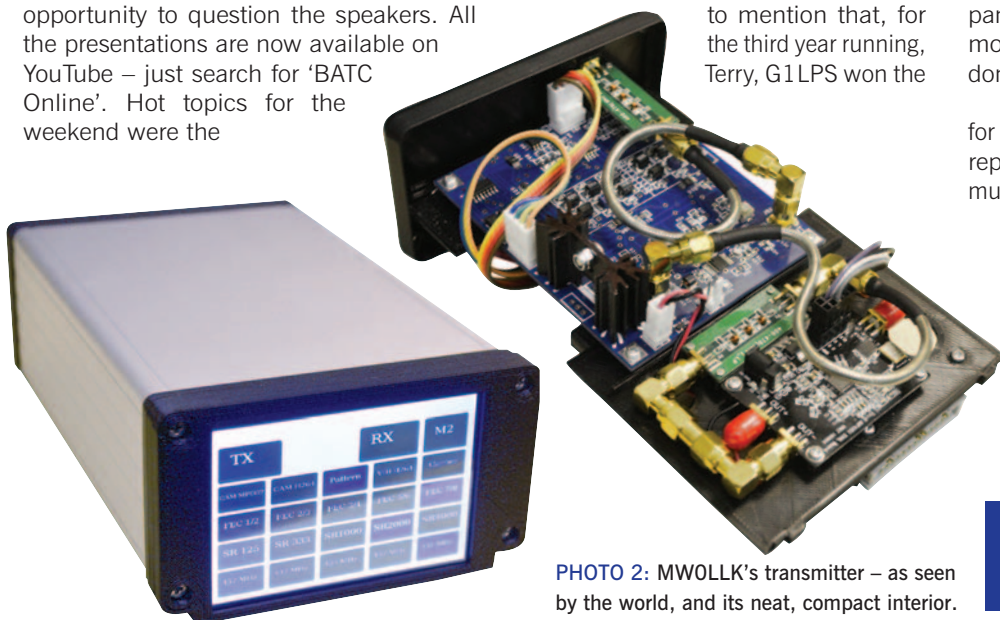
**FIGURE 1:** Pluto's DATV output being demodulated and displayed using a MiniTiouner with MiniTioune software.

International 3.4GHz section. He used a flat panel transmit aerial and a horn for receive, mounted in among his Yagi array. Well done Terry!

Don't forget that 3.4GHz is a great band for digital ATV – for example, the GB3HV ATV repeater can be seen on 3408MHz across much of West London and the Home Counties.

### Websearch

- [1] <https://wiki.analog.com/university/tools/pluto>
- [2] [www.batc.org.uk/forum/viewtopic.php?f=15&t=5129](http://www.batc.org.uk/forum/viewtopic.php?f=15&t=5129)
- [3] [https://wiki.batc.tv/BATC\\_Wiki](https://wiki.batc.tv/BATC_Wiki)



**PHOTO 2:** MWOLLK's transmitter – as seen by the world, and its neat, compact interior.

**Dave Crump, G8GKQ**  
dave.g8gkq@gmail.com





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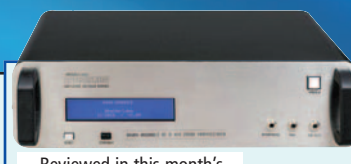
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RCS-4LX.....4 Way 2.5kW SO239 100MHz.....£219.95	RCS-10X.....8 Way 5kW SO239 100MHz.....£194.95
RCS-8VX.....5 Way 5 kW SO239 250MHz.....£189.95	



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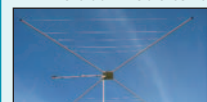


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# International lighthouses and lightships

## on the air 2017

**T**he International Lighthouse and Lightship Weekend (ILLW) is an annual event held on the third full weekend of August each year.

ILLW was started by John Forsyth, GM400U and Mike Dalrymple, GM4SUC, members of the Ayr Amateur Radio Group in 1998 and it has grown into an international event with over 90 countries taking part. The event is currently managed by Kevin Mulcahy, VK2CE. The event coincides with the International Lighthouse Heritage Weekend when many lighthouses across the world are open to the public.

### GW4WXM

On 19 August, Wrexham ARS travelled to the coast of Talacre in North Wales to take part in ILLW using the club call of GW4WXM. The Saturday morning was one of the windiest I have witnessed in sometime. It took just over two hours and four members of the team to get the station accommodation and operating area complete and ready to operate. We made 204 contacts, working 15 other lighthouses or lightships and total of 18 countries. The farthest DX was Venezuela. The station used a Cushcraft HF vertical, an Icom 756 and a power of 100 watts.

Eifion Parry, MW6EYU

### GB4NPL

Members of Barry ARS were active during ILLW from Nash Point Lower Light at Marcross. It was a great event and the club gave extra training to our youngest operator, Jack, MW6JRI, who is only 15 and taking his Duke of Edinburgh Award. (Communications is part of it). Operators Phil, MWODHF, Bernard, MW0GBW, Ken, 2W0KPH, Glyn, GWOANA and Jack, MW6JRI were working from inside the Fog Horn station alongside the lighthouse. Ken, GW1FKY ran satellite communications from the lighthouse itself.

Glyn, GWOANA



Bushvalley ARC went to Rathin Island.

### GB0HL

Norfolk Amateur Radio Club made 170 contacts with other amateurs while operating from Happisburgh Lighthouse on 19/20 August using the callsign GB0HL as part of ILLW.

Happisburgh Lighthouse was extremely busy with many visitors climbing up to the light, enjoying the location and views. For the radio event, a 132-foot antenna wire was suspended from the top of the light to the ground. This proved to be very effective on the short wave bands of 40, 30, 20 and 17 metres. The amateurs made 170 contacts around Europe and into the USA using SSB and CW, reflecting the traditions and history of maritime communications. Many other lighthouse stations were also contacted within the UK and Europe.



Norfolk ARC operated from Happisburgh lighthouse.

Happisburgh Lighthouse is the oldest working light in East Anglia, and the only independently-run lighthouse in Great Britain. Built in 1790, and originally one of a pair, the tower is 85ft tall with the lantern 134ft above sea level. Today the lighthouse is painted white with three red bands, and has a light characteristic of three white flashes, repeated every 30 seconds, and with a range of 18 miles. Saved as a working light by the local community, it is maintained and operated entirely by voluntary contributions.

Norfolk ARC wishes to thank the Happisburgh Lighthouse Trust for allowing us to operate from the site and to members of the Lighthouse staff for their assistance.

Steve Nichols, GOKYA





Steve Webb, G4GHO of Norfolk Amateur Radio Club.



Jack, MW6JRI operating with Barry ARS.



Barry ARS operated from Nash Point Lower light.



Dundee ARC operated from Scurdie Ness lighthouse.

**Moray Firth ARS** had enjoyable and successful weekend when they descended on the Lossie lighthouse, with kind permission from the lighthouse committee for which we wanted to convey many thanks. A number of successful contacts were made in both CW and SSB from as far away as America and Russia. Although the radio propagation was not good, we made contact with both lightships and other lighthouses throughout Europe and Britain. They say it's a small world – we made contact with a maritime mobile station just off Norway and the operator was a member of our twin town radio society, Hersbruck. Jutta told us she had sailed to Lossie for her holidays and enjoyed her days with the twin town members in Lossie. MFARS has invited Jutta to visit our club when she returns on her next stop over in Lossie. Radio is one of the very good ways to encourage visitors to our area (although not purposely *advertising*, as per our licence conditions) as many stations worldwide is to look up Lossie or Elgin to see where the signals originated from.

A special thanks to club members who worked hard to make this weekend happen together with Captain Scott of the TA and the RAF dive club for the transport of our radio tower.

Finally, we had interest from as far away as Invergordon from a chap wishing to go through his training and licence exam in our Elgin based club.

Robbie Stewart, MM6IXH

### GB2JMB

A team from Furness ARS set up GB2JMB at the Sir John Barrow Monument, known locally 'The Hoad', to help celebrate ILLW. Although not an official lighthouse, The Hoad is modelled on an Eddystone lighthouse and is easily one of Cumbria's most recognisable landmarks.

An aerial was rigged to the flagpole in near gale force conditions but, thanks to some excellent rigging skills, the antenna stayed in position all day. Due to access, it was only possible to operate for the one day – Saturday – but contacts were made with a number of other lighthouses on 40m and 20m including Naze Tower in Walton, Burry Port harbour lighthouse in Wales, Barnes Ness in Scotland, Fluegge lighthouse and Wehldorf Oberfeuer, both located in Germany, Wadden Island in the Netherlands and La Lanterna lighthouse in Genoa, Italy. Contact was also made with two light ships in Germany, *Lightship Elbe I – Burgemeister O'Swald II* and *Amrumbank* that was originally built in 1914.

Contacts were also made other stations within the UK, Germany, Italy, the Netherlands, Austria and Solevia. Although the monument was closed to the public on the day in question, there were a number of people who took shelter from the wind and rain and the team spoke to those interested in amateur radio in general and also about the Sir John Barrow Monument. It is hoped Furness ARS will be able to return to the site again for 2018.

Chris, MOKPW

### GB1BPL

Members of Llanelli ARS took part in ILLW from Burry Port lighthouse. The picturesque Burry Port lighthouse is a harbour light with a reflector and is situated on the west breakwater of the outer harbour. It was built in 1842 and the light consists of a 24ft white painted, stone, circular tower with a black gallery and red lantern. The lighthouse now enables the harbour to accommodate up to 260 boats to be moored safely on the floating berths at all states of the tide. Burry Port Harbour lighthouse also makes up part of the much larger Millennium Coastal Park network in Wales.

The society used a caravan kindly loaned by a club member as a base station. There were a total of five operators including one mobile throughout the weekend.

The best contacts of the weekend were 4U1A (United Nations, Geneva), Prince Edward Island (off the coast of Canada), N4J )Jupiter lighthouse, Florida), DJ8KW (Dusseldorf Airport) and DLOEM (at 65m, the tallest lighthouse in Germany). Other contacts included Newfoundland, Puerto Rico, USA, Canada and Namibia.

Once again our thanks go to the Harbour Master, Bob Hockey and Carmarthenshire County

**Elaine Richards, G4LFM**  
radcom@rsgb.org.uk



Furness ARS set up GB2JMB at the Sir John Barrow Monument.



Dundee ARC operators used a dome tent on Sunday due to the weather.



Moray Firth ARS went to Lossie lighthouse.



Llanelli ARS went to Burry Port.

Council for allowing us to transmit from Burry Port lighthouse. We are delighted to confirm that we have already applied for next year's event and that our application has been accepted.

**John Williams**

## 2MOKAU

With a location like ours in Dundee, Dundee ARC has an abundance of lighthouses fairly close by; our first task was to work out which light we would be activating. This in itself was a task, as each has its own pros and cons including QRM, location and access. With this mind, we chose Scudie Ness lighthouse near Montrose. Permission was kindly granted to us from the property owner and the Northern Lighthouse Board for access and vehicles to be parked on site. In the spirit of creating inter-club relations the local radio club based at Montrose Air Station Museum joined us.

Saturday saw us struggle with the club's marquee so we swapped to using a large dome tent to house us on Sunday. Our generator also

had problems but thanks go to Ewan, MMOBIX for finding another one we could use. Our G5RV soon gave us another problem with a loose connector, so we decided to pack up our first day.

Sunday went better, with fewer problems and the QSOs starting getting notched up quickly. Several locals came around asking if we had anything to do with the recent Humpback whale sightings; they still seemed interested after telling them what we were doing!

We would like to thank all who helped each day, as well as our QSOs, to make the event such a success.

**Martin, 2MOKAU**

## MNOGKL

Over the weekend of 19 and 20 August, members of Bushvalley ARC spent the weekend on Rathlin Island for ILLW. Robert, GIONCA, along with Paul, MI1AIB and XYL Sharon, 2IOSHZ, made their way on the Friday to the keepers cottage at Rathlin East Light where they (and other club members who joined them for various times

over the weekend) were able to make use of the facilities and operate for the whole weekend.

Band conditions were not great, with barely 100 in the log for the whole weekend, however the opportunity was taken to operate mobile and increase activity further by activating the three WAB (Worked All Britain) squares across the island on three days – much sought after by the WAB community.

The mobile activities also allowed the group to attempt to activate all three of the lighthouses on Rathlin. Unfortunately, despite the best efforts of Paul, MI1AIB with his 100W mobile setup, the poor HF conditions meant that Rue Point (south) light remained un-activated on this occasion.

There was a further bonus on Sunday when Esther and Ian, GIOAZA and GIOAZB joined the group for the day. They were able to claim a first activation of a HuMP (slightly less than a Summit), before joining the rest of the group for a most enjoyable lunch overlooking Church Bay.

It is hoped that this will become an annual activation for the club.

**Paul, MI1AIB**





## More Arduino Projects for Ham Radio

by Glen Popiel, KW5GP

Building on the success of the original ARRL book *Arduino for Ham Radio*, this book *More Arduino Projects for Ham Radio* includes 15 completely new practical and functional Arduino projects for ham radio. This book branches out to use some of the newer Arduino variants and devices. Each project is complete and functional but room has been left for you to add personal touches and enhancements. That's part of the fun of the Arduino and Open Source communities building on the work of others, and then sharing your designs and innovations for others to learn, modify and improve.

*More Arduino Projects for Ham Radio* builds a solid foundation through descriptions of the many new Arduino boards and add-on components, followed by a collection of practical ham radio projects. Readers will find a wide variety of applications with projects including Wireless Remote Coax Switch, Yaesu Rotator Controller, Antenna SWR Analyser, two 40 Meter QRP Transceivers and much more.

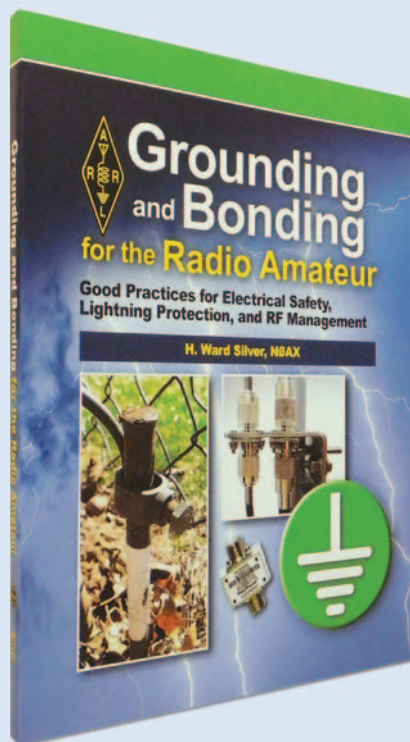
There is something in *More Arduino Projects for Ham Radio* for everyone interested in Arduino. This is thoroughly recommended reading for beginners or a seasoned programmer alike.

Size: 208 x 276mm, 500 pages

ISBN: 9781 6259 5070 3

Non Members' Price: £39.99

**RSGB Members' Price: £33.99**



## ARRL Grounding and Bonding for the Radio Amateur

By Ward Silver, N0AX

Proper Station Grounding is important and this ARRL book sets out to explain how to do it safely. This book is specifically aimed at US radio amateurs and provides an intriguing insight into a different electrical system even if it absolutely shouldn't be used as a guide to UK regulations and methods.

*ARRL Grounding and Bonding for the Radio Amateur* provides information on AC safety in the US and their National Electrical Code but there is much more. Many parts are useful regardless of supply differences and you will find fascinating information on for example lightning protection. The chapter on 'RF Management' describes preventing unwanted RF currents and voltages from disrupting the normal functions of equipment whilst the 'Good Practice Guidelines' chapter contains a wealth of information that is applicable both here and internationally.

If you are interested in different electrical standards and how they affect station management across the globe *ARRL Grounding and Bonding for the Radio Amateur* provides a hugely interesting read.

**Caution: This book is not intended as a guide to setting up a station in the UK or Europe and some solutions are not compliant with UK/European electrical regulations and thereby may be illegal or deemed dangerous in these areas.**

Size: 184 x 229mm, 176 pages

ISBN: 9781 6259 5065 9

Non Members' Price: £22.99

**RSGB Members' Price: £19.54**

# The selfie-stick Yagi

**M**any people have one of those selfie-stick things hanging around. Well, I have found a much cooler use than taking blurry I'm-the-centre-of-the-universe photos: turn it into an amateur radio aerial.

## History

I have been experimenting with small (ish) directional antennas for a while for my summit and portable operating. Two years ago, I tried a roll-up Yagi. This was achieved by mounting the elements on a length of webbing tape. A gamma match was employed for tuning. I also found that it was possible to mount a 144MHz and 432MHz beam on the same piece of tape and employ one feed to a pair of gamma matches, thereby making a rather useful 4-element VHF and 8-ele UHF antenna. To deploy it, the elements were attached to a walking pole with releasable zip ties. A small bracket bolted to the walking pole allowed it to be mounted horizontally or vertically on a **Photo 2** and **Photo 3** show how this worked.

Some very good contacts were made with this antenna. The elements were made from old archery arrows, which made for a robust design when deployed, but it was a little time consuming to set up.

My next 2m antenna was a simple Moxon. It used lightweight plastic pipes for the spreaders. This collapses down nicely for transport and is very quick to deploy. It became our antenna of choice on lightweight activations, such as that shown in **Photo 4**.

But, what I really wanted was something for the occasional activation and to pick up signals from the ISS. Ideally this would be a beam that fitted in a pocket of my rucksack.

## Selfie-sticks

In case you haven't come across selfie-sticks, they have much in common with telescopic antenna rods found, for example, on broadcast FM portable radios (remember them?). My daughter, Lauren, M6HLR had a couple of selfie-sticks given to her at Christmas and she gave one to me and I wondered if I could do anything constructive with it. The length looked useful so I started to see if it was possible to make a beam antenna with one. **Photo 1** shows the result and I'll describe the various steps I took to create it. Note, however, that the dimensions I've listed here are all specific to the bits and pieces I used. The materials you find to build yours will be different and so will be the exact dimensions. It's



**PHOTO 1:** The prototype selfie-stick antenna.



**PHOTO 2:** Earlier roll-up dual band Yagi, ready for transport. The walking pole in the foreground shows the mounting bracket.

easy enough to find Yagi dimension calculators online and plug in the sizes of whatever you've got to hand. Go with what the calculator says: only worry if it gives you lengths *markedly* different from mine (eg a reflector of about 1500mm instead of about 1000mm).

**Figure 1** shows the general layout and dimensions of my prototype.

I purchased 6 x 50cm telescopic whips for the elements (making 7 in total), intending to make a 3-element Yagi. The rest of the components came from the shack and DIY stuff in the garage. Nothing is particularly special and you can merrily substitute items – just remember to put the dimensions into the online calculator.

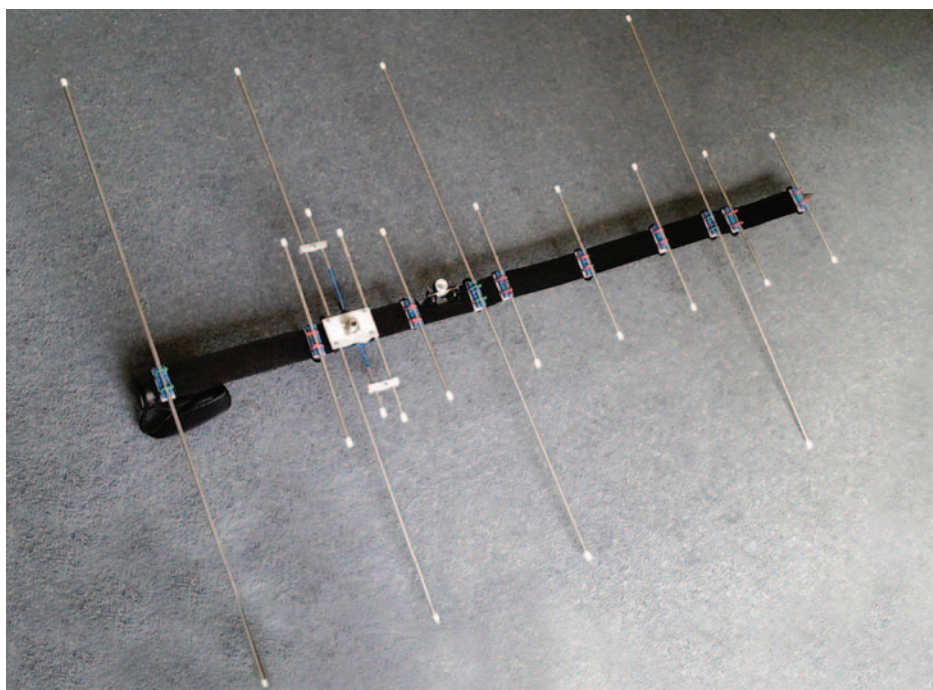
The selfie-sticks each came with a bracket to

hold the phone. When I removed that, it left a C-shaped brace, ideal for mounting the director (frontmost) element. I carefully drilled out the bolt so that two whip elements could be slotted through and bolted together with an M3 nut and bolt. I found that drilling a small hole directly down the middle of the bracket allowed the M3 bolt to slot in, thereby stopping the element from twisting. **Photo 5** shows the result.

My attention then went to the director (the rearmost element). To make the mount, I used furniture (or 'modesty') blocks – those little plastic widgets that let you attach sheets of timber at right angles to each other.

The first step was to cut two grooves for the whips. This was done by clamping two blocks





**PHOTO 3:** Roll-up Yagi attached to a walking pole and ready for use.



**PHOTO 5:** C-shaped bracket adapted to mount the reflector.



**PHOTO 6:** Modesty blocks after drilling.



**PHOTO 4:** Lightweight Moxon mounted on our guyed fiberglass fishing rod atop Red Screes.



**PHOTO 7:** Finished director centre.



**PHOTO 8:** Dipole centre.

back to back and simply drilling down to the fixing hole. The same concept was employed to make the larger curved groove that attaches the bracket to the selfie-stick. To make the retaining clamp, I used a plastic strip from a zip tie and drilled it with two 3mm holes. **Photo 6** shows the blocks just after drilling and **Photo 7** the finished director centre. You will notice that the two whips are not joined. I used a bridging wire to connect the elements together, thereby increasing the overall element length by 20mm.

Now on to the driven element. I used a small project box, a bulkhead BNC socket and another modesty block to form the centre. I drilled into the narrow ends of the modesty block and then cut in half lengthways. This left the slots for the elements. Then it was just a matter of drilling a couple of holes in the plastic box for the elements and a bigger hole for the BNC socket.

Connections between the BNC socket and elements were made using a couple of M3 solder tags attached to small bit of coax. The

**Kevin Richardson, G0PEK**  
avckev@btopenworld.com



half section of modesty block was then secured to the plastic box with the same M3 screws that hold the driven element in place. **Photo 8** shows the finished thing.

I used a couple of zip tie wall mounts bolted to the underside of the box, which made it easy to zip tie the driven element assembly to the selfie-stick.

## Testing

Using dimensions from whichever Yagi calculator you used, extend the selfie-stick and secure the driven element the correct distance from the reflector. You may find a strip of rubber tape stops the element from sliding on the selfie-stick boom.

I found that when fully extended, the director and driven element were more or less the correct length. The director was a bit long, so I retracted the the thinnest section.

To tune the aerial, I used a piece of stainless steel wire left over from another project to make a hairpin match (but any other similar piece of solid wire will do). This was bent into a C shape and slotted into the gaps of the hinge section on the two driven element whips. Experimenting with the length of the hairpin, we were able to tune the antenna. Figure 1 and Photo 8 will probably help you see what I mean.

## In use

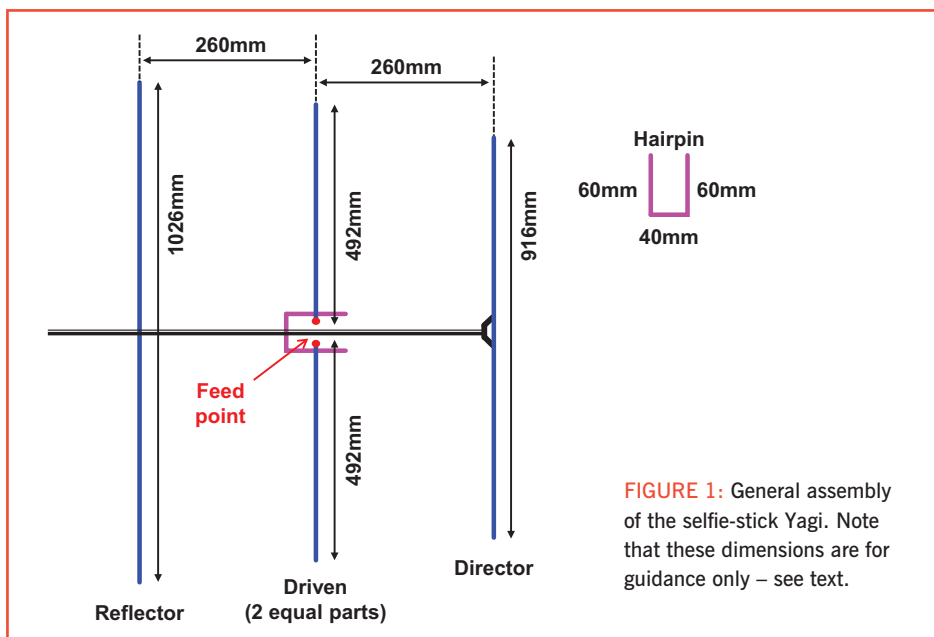
I first tested the aerial during a QRP Backpacker Contest by mounting it on our 4m telescopic pole. Perhaps it isn't the most efficient contesting antenna but several 100+ mile contacts were made.

The biggest issue when using the antenna like this is the wind. I constantly had to straighten the elements, as the hinges would fold in the wind. There are probably several solutions for this. I used a couple of biro pen tubes and a piece of insulation tape across the element hinges, which temporarily stiffened them, however this isn't really an issue if you are hand holding the antenna.

## Finally

The end result may not be the most robust antenna around but, for quick activations and portability, you will find it hard to beat. **Photo 9** show me using the aerial – with M6HLR acting as a combined mast and voice-activated rotator.

This is a fun and simple project to make. With a bit of experimentation it should be possible to use the same basic method to create a 70cm version, but I haven't tried it yet. Naturally, all the dimensions will be about one-third those for the 2m version, so the selfie-stick telescopic rods may not be the best choice. However, let the online Yagi calculators be your guide. *[Also, this month's Antennas column may give you some hints for a dual band version – Ed].*



**PHOTO 9:** Selfie-stick Yagi in use, wielded by Lauren, M6HLR.



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# IARU Region 1 ARDF Championships



Andrew, G4KWQ in hot pursuit of the foxes in the Sprint event. (Photo courtesy Donatas Lazauskas Photography).

**The 2017 Region 1 (in effect, European) Amateur Radio Direction Finding Championships found the RSGB Team of ARDF enthusiasts heading to the pleasant spa resort of Druskininkai, situated in a forested area on the southern border of Lithuania.**

Three British team members arrived in the week prior to the main programme in order to benefit from a series of 'training events', while three others joined them for the actual Championships competitions from 4 to 10 September. Altogether, some 300 participants representing 26 nations were accommodated with full board in the Eglės Sanatorija, which could best be described in English as a Health Spa and Leisure complex.

The opening ceremony in the main auditorium was refreshingly brief and business-like, and dispensed with parades of the teams that had previously been the norm. There was, however, some tasteful entertainment in the form of the customary folk dancing and a local choir.

## The four events

The Championships comprised four distinct

events. First off was the Foxoring, in which 15 low power transmitters (10mW) were distributed around the woodland adjoining the accommodation grounds. These were allocated in three groups of five – on three different frequencies in the 3.5MHz band – and each sending its identity continuously in CW. The groups were differentiated by the speed of sending as well as frequency. The various categories of competitor (determined by age and gender) were required to find particular selections of transmitter, using approximate locations marked on maps issued on the start line. It was essential to

use the DF receivers to track them down in the final few metres where their signals could be detected.

This was followed by the Sprint event, again using the 3.5MHz band. Here, the maps were unmarked, except for the start, finish and a midway 'spectator' beacon. Ten transmitters were set out to be located, in two groups of five, on two different frequencies and sending at slow or fast speeds. If you consider that each transmitter was on the air for just 12 seconds before the next one began sending – such that each group maintained a one minute cycle – you may



The teams were transported by buses to the forest for the Classic competitions. (Photo courtesy M3WDD).





Before the transmitters came on the air, each national team had to deposit their receivers in the secure pound area allocated to them. (Photo by G3ORI).

begin to appreciate why it was called 'Sprint', since very rapid taking of bearings, decision making and speed between transmitters were called for! It should be mentioned that the 'spectator' beacon, sending continuously on its own dedicated frequency, needed to be visited between the two groups, as well as the 'finish' beacon at the end of the course. As for the previous day, different age categories had different numbers of transmitters to find.

The remaining two events were similar, following the Classic format. Each event required the contestants to be taken by bus to a large area of forest a few kilometres outside the town, where roughly half strove to determine the locations of a set of five transmitters on 144MHz – whilst the remainder had a similar challenge on 3.5MHz. The various age categories had different numbers of transmitters to find – and the first problem was to attempt to resolve roughly where they all were, so that an optimum route could be planned to visit them all and get to the finish. These forests were a delight to compete in: very little undergrowth to impede progress and with gentle hills that were enough to cause some interesting reflections on 144MHz. Here there was a grid-like network of paths, which usually seemed to lead in the wrong directions. Apart from those competing, the few other people around were mostly gathering baskets full of the edible fungi that sprouted in abundance on the forest floor.

After the exertions of the first Classic race, the organisers had arranged a rest day with the opportunity for a boat trip on the river to visit an interesting monastery with beautiful church. Alternatively, there were options to enjoy the other attractions in the town. Although the weather had been rather overcast and drizzly up to this point, some



Team leader David, M3WDD discussing his route with John, M00JM and Robin, RS213497. (Photo courtesy G3ORI).

more persistent rain dampened the latter part of the day.

In contrast, a most glorious sunny day set the scene for the second Classic event, in a different but similar area of forest nearby. Everyone now competed on the other band, from that allocated to them in the previous event.

Any remaining energy was expended after the final prizegiving and closing ceremony, where a Hamfest with delicious refreshments and wines had been arranged. There were opportunities to socialise with friends from around Europe, and for the youth element to dance to the music.

### Best performances

In retrospect, this was a week of first class competition in delightful terrain. Perhaps predictably, the bulk of the medals went to those East European nations that were

able to field much larger teams than Great Britain. Whilst our small team all performed competently, there were unfortunately no podium appearances to report this time. Credit must be given for the best Individual British performances to Andrew, G4KWQ and David, M3WDD, achieving 6<sup>th</sup> and 7<sup>th</sup> places for 50+ Men in the Sprint Race. The British Team of 50+ Men (Andrew, David and Robin, RS213497) also attained a creditable 6<sup>th</sup> place in the 3.5MHz Classic race.

Enquiries on amateur radio direction finding are always welcomed via email to [ardf.chairman@rsgb.org.uk](mailto:ardf.chairman@rsgb.org.uk) and there is more information about RSGB ARDF activities at [www.nationalradiocentre.co.uk/ardf/index.html](http://www.nationalradiocentre.co.uk/ardf/index.html)

**Robert Vickers**  
[rvhoc-rsgb@yahoo.com](mailto:rvhoc-rsgb@yahoo.com)



# Club of the Year

## Hot competition for top prizes!

The 2016 RSGB Club of the Year Competition, kindly sponsored by Waters and Stanton, was again hotly contested by clubs from up and down the country. As usual, there were two 'divisions' – Small Club, for those with fewer than 25 members, and Large Club for bigger associations.

Competition takes place at two levels. First, Small and Large clubs in each of the 13 RSGB Regions compete and winners in each category are decided by the Regional Managers. Small prizes and/or plaques are awarded at this stage, and reported in *RadCom*. The winners from each Region then compete head-to-head, resulting in three finalists being selected for each category. These six clubs are invited to attend the National Hamfest, where the final announcement is made.

### And the winners are...



In third place for the Large Club category is Mid Ulster Amateur Radio Club. Seen here are Philip Hosey, M10MSO (RM8) and club chairman George Frazer, G14SJQ, receiving the prize certificate and £50 in RSGB vouchers from Jeff Stanton, G6XYU and RSGB President Nick Henwood, G3RWF.



Third place for Small Club was awarded to South Bristol Amateur Radio Club. Club secretary Andy Jenner, G7KNA delightedly accepted the award and £50 RSGB vouchers prize on behalf of the club.

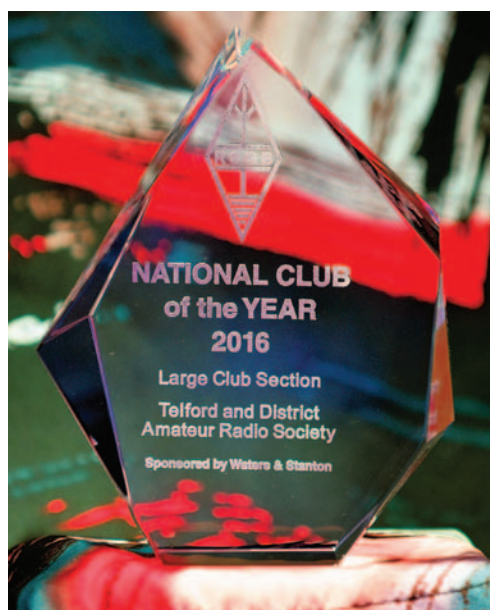


Moving on to second place, the Large Club award went to Radio Society of Harrow. Accompanied by Region 9 Manager Tom O'Reilly, G0NSY, club chairman Chris Friel, G4AUF and president Damian McSorley, G4LHT accepted the award and £100 in W&S vouchers.

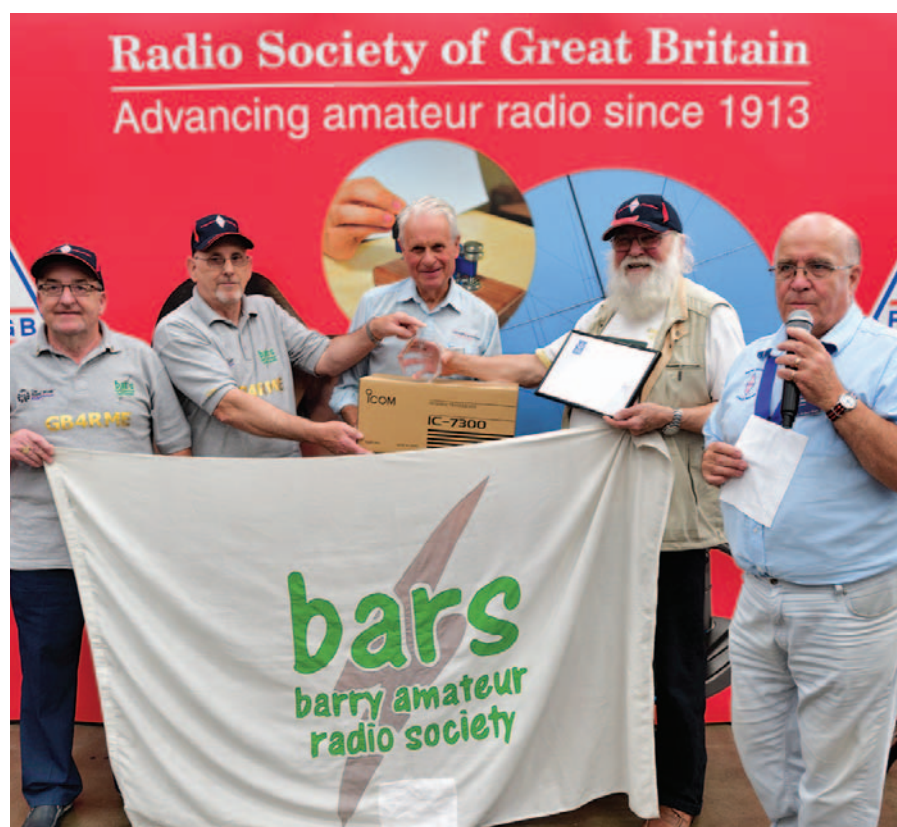


Small Club second place was awarded to South Kesteven Amateur Radio Club. Eight members of the club attended to receive their award, including one of the youngest members who accompanied his dad to the prize-giving. They were delighted to receive their certificate and £100 from W&S.





Telford & District Amateur Radio Society took first place in the Large Club category. Flanked by many of his fellow club members Eric Arkinstall, MOKZB accepted the attractive glass trophy – and a whopping £250 in vouchers from Waters and Stanton.



#### Overall winner – RSGB National Club of the Year and Small Club First Place

This year was more than a bit special because Waters and Stanton generously extended its sponsorship to include a fabulous top prize for the club selected as the overall winner. A brand new Icom IC-7300 accompanied the glass trophy to Small Club of the Year First Place winners and overall Club of the Year winners Barry Amateur Radio Society. RSGB Region 7 manager Glyn Jones, GWOANA (holding certificate) helped Bernie Collins, MW0GBW (l) and Bob Critcher, GW0WKR accept their amazing prizes from Jeff Stanton (centre) and RSGB President Nick Henwood, G3RWF (right).

Over the next few editions we will spotlight these winning clubs in more detail so that everyone can see just what it is that they do to make them stand head and shoulders above other clubs around the country.

Giles Read, G1MFG  
radcom@rsgb.org.uk



# Antennas, Maps



## Stealth Antennas

By Steve Nichols,  
G0KYA

Many amateur radio operators are faced with the fear of interference being caused to televisions, telephones, and anything with a plug on it. In these circumstances a stealth antenna may be the solution to allow you to get on the air.

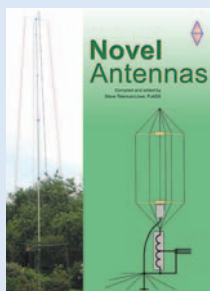
This brand new second edition provides even more for those with tiny postage stamp-size gardens, intolerant neighbours, or planning permission problems.

From using house rain gutters and drain pipes, or a magnetic loop in the loft, through to a tuned loop around the window frame *Stealth Antennas* provides a wide range of ingenious antenna solutions, and continues to be the 'must have' antenna book for everyone.

Size 174x240mm, 224 pages  
ISBN: 9781 9101 9305 1

**Non Members' Price £14.99**

**RSGB Members' Price £12.74**



## Novel Antennas

Compiled and edited  
by Steve Telenius-  
Lowe, PJ4DX

Many Radio Amateurs often experiment with antennas to get the best performance. But few have ever considered anything beyond the basic antenna designs - this book tries to set that right with a myriad of 'novel' antenna designs from around the world.

In this book, you will find the choke dipole; the 'Super Moxon', which adds a pair of directors to the standard Moxon Rectangle design; an orthogonally steered receive antenna that provides incredible levels of rejection of interfering signals; the home-made 'Wonder Whip' for QRP portable operation; a mobile antenna that can double as a car roof rack and the original Spiderbeam construction project described by its designer. With designs from numerous countries there will be something of interest to all antenna experimenters.

Size: 174x240, 192 pages,  
ISBN: 9781 9101 9310 5

**Non Members' Price £14.99**

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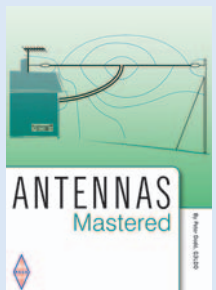
## Radio Auroras

Radio amateurs know that sunspots affect VHF as well as HF propagation, and the solar cycle has a direct bearing on the prevalence of radio auroras. The extent and usefulness of this mode of propagation is perhaps still not widely known, though. *Radio Auroras* sets out to explain this phenomenon.

*Radio Auroras* tells the story of the radio amateurs who discovered this mode of propagation and how they made use of it. There are descriptions of how auroras are caused, how they can be forecast and how best to use them to work DX. This book also describes radio auroras at 28MHz as well as outlining the effects of auroras on the other HF bands. Occurrences of Sporadic E can also accompany auroras to provide Auroral E propagation and this too is covered in *Radio Auroras*. *Radio Auroras* is a unique guide to this topic, but for those studying and experimenting, or those keen to work DX on VHF, it is a real 'must have' book.

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## Antennas Mastered

By Peter Dodd,  
G3LDO

Peter Dodd, G3LDO has long been acknowledged as one of the leading experts on antennas

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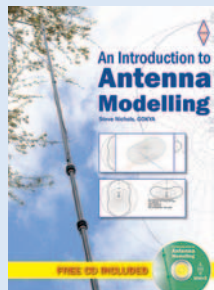
*Antennas Mastered* is packed with everything imaginable connected with antennas. Readers will find practical solutions that cover all bands, antenna types, ATUs, Meters, Software and much besides. Readers will be staggered by the breadth of material covered.

Peter has created in his 'Antennas' column one of the best archives of antenna material available and *Antennas Mastered* provides this for everyone.

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## An Introduction to Antenna Modelling

By Steve Nichols  
G0KYA

This book looks at the MMANA-GAL antenna modelling program that will let you design and

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*An Introduction to Antenna Modelling* has been written by antenna guru Steve Nichols G0KYA and shows you step-by-step how to input antennas designs into MMANA-GAL, how to adapt designs you are given and how to optimise your designs for the best performance. By the time you have finished you should be able to model a whole host of antennas including dipoles, the G5RV, the W3DZZ trapped dipole, verticals, off-centre fed dipoles (OCFD), magnetic loop antennas and many more.

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# & Propagation



## Radio Propagation Explained

Steve Nichols, G0KYA

Understanding radio propagation is essential for anyone with an interest in radio communications who wants to know how signals travel from A to B.

Looking at HF to VHF, UHF and beyond *Radio Propagation Explained* provides a practical understanding of radio propagation. It looks at the sun, sunspots, ionospheric propagation, ionospheric storms and aurora, tropospheric propagation, meteor scatter and space communications, including satellites and Earth-Moon-Earth signals. The book also includes information on computerised HF propagation predictions, greyline propagation, low frequency (LF) propagation, sporadic E, amateur radio modes like WSPR, PSK and JT, web resources and much more.

*Radio Propagation Explained* draws on material from the hugely popular *Radio Propagation Principles & Practice* book previously published by the RSGB and enhances it with the latest advances in the field of propagation.

Size 184x226mm, 256 pages,  
ISBN: 9781 6259 5027 7

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**RSGB Members' Price £11.04**

## International Antennas

Edited by Stephen Appleyard G3PND

Much is published across the world about amateur radio antennas. *International Antennas* brings together some of the very best material that has been published in recent years. There are over 50 articles included with authors from Australia, Scandinavia, South Africa, United Kingdom, USA and more.

*International Antennas* has an emphasis is on practical rather than theoretical. You will find descriptions of the construction and performance of antennas enabling the reader to build their own versions. These articles have been written by experienced radio amateurs who have been so pleased with the performance of their particular antenna, that they have been moved to put pen to paper to share this experience.

There is a huge range of antennas included in this book, covering 17 bands from VLF through to 70cm. You will find articles covering the 'stealthy' antennas through to novel approaches to classic antennas. There are verticals, loops, beams and a host of unusual designs. There is so much in fact that the editor has provided a cross reference to see at a glance the bands antennas are designed for and if they are intended for fixed use or mobile/portable operation.

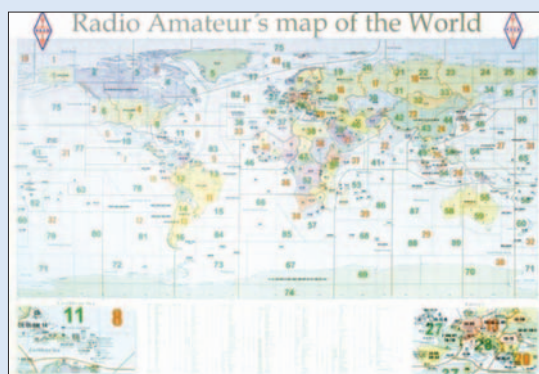
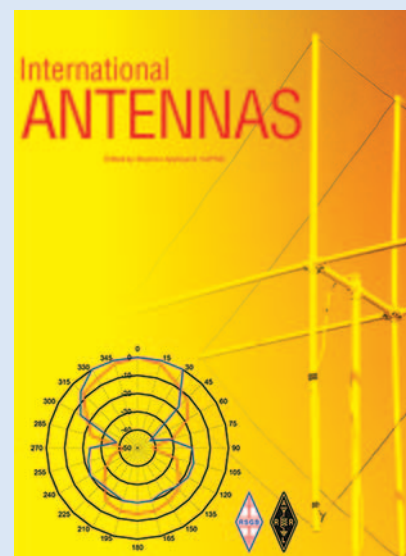
*International Antennas* is a fabulous collection of antenna articles from around the world. It is intended for everyone who is interested in amateur radio antenna design or is just looking for practical antennas to study and build.

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## RSGB World Prefix Map - Radio Amateur's Map of the World

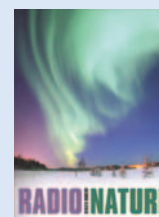
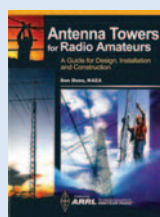
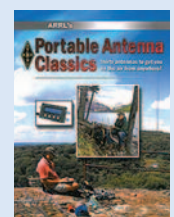
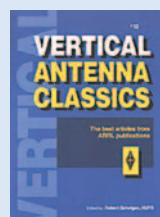
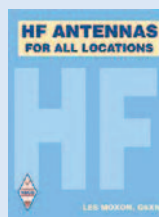
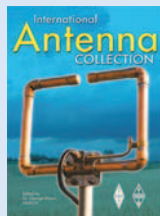
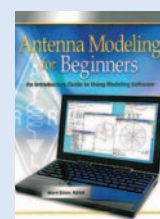
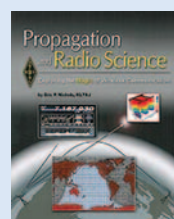
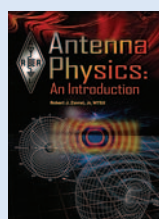
Not only does this map show the location of worldwide prefixes there is an A-Z list of prefixes and expanded map sections covering the Caribbean and Europe making them much easier to read. The handy countries list also shows the DXCC entities with their continent along which CQ and ITU region that they fall in.

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# GB4RME at the Royal Mint



The GB4RME team: kneeling (l-r) MW6JRI, GW1FKY, GW1CUQ. Standing (l-r) 2W0KPH, 2W0JYI, MW0GBW, GW0WKR, GW0ANA, GW4BVJ & MW0DHF.

**In the winter of 2016, Glyn, GW0ANA began talking with the Royal Mint management with the view to Barry ARS putting on a special event station there. GB4RME went on the air in August 2017 and we believe it's the first time a special event station has operated from inside a Mint anywhere in the world.**

Getting the special event sorted brought several difficulties ranging from the technical (trying to get RF to radiate in a restricted space from within the steel razor wire perimeter fence) to public safety (the management were unfamiliar with amateur radio). We also had to ensure the station was as clean as we could make it RF-wise so as not to cause any *radiating* harmonics that *could* interfere with the Royal Mint in any way.

I met with Claire Evans (Royal Mint Marketing Manager) and Anthony Williams (General Manager Royal Mint) with their ideas. As The Royal Mint makes coins for over 80 countries we would try and contact

as many of these countries as possible. There would also be activities for young people visiting the Royal Mint Experience such as a certificate for sending their name in Morse code. Other displays would include one on space and satellites.

## Preparations

As the special event station would be operating every day for a week from 30 July to 5 August, we needed a team who could afford the time off work or other commitments. We ended up with Barry ARS members Glyn, GW0ANA, Bob, GW0WKR, Bernie, MW0GBW, Phil, MW0DHF, Ken, GW1FKY, Nigel, GW1CUQ, Richard, GW4BVJ, James, 2W0JYI, Ken, 2W0KPH and 15-year-old Jack, MW6JRI. Sadly, two team members had to drop out at the last moment, Brian, GW0PUP and Chris, MW0XFU.

As the RSGB Regional Manager for South Wales, I asked the RSGB for promotional help and support. This was forthcoming and Heather Parsons, RSGB Communications Manager, helped us get maximum publicity for this event, including the RSGB Twitter, Facebook and GB2RS News. Working closely



Nigel, GW1CUQ and Bob, GW0WKR working the pile up. Bob was doing the logging.





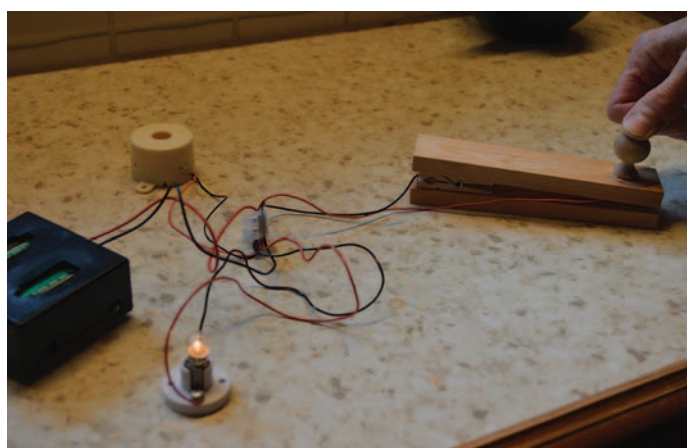
Bernie, MW0GBW working data using RTTY, PSK31, JT65 and FT8.



Rich, GW4BVJ working CW, with the best DX being an FO station.



Jack, MW6JRI working his first ever HF QSO.



The GW0ANA CW training station, a home made wooden Morse key.

with the Royal Mint's own publicity team we had promotion in local newspapers and online. Dr James Blaxland even got the event onto the Cardiff University STEM (Science, Technology, Engineering and Maths) website with an estimated readership of >100,000.

Bob, GW0WKR, Bernie, MW0GBW and I conducted a site survey looking for suitable locations for antennas and the safe running of coax cable runs. We gained permission to photograph and accurately measure the small area available to install the tower and antenna so we could draw up very detailed plans. Understandably, we were always accompanied on site and our photos were vetted. This cooperation led to a smooth operation.

### Station preparations

Having publicised that our operations would include satellite, SSB, CW, JT65, PSK31 and RTTY we organised the stations to be used.

GW1FKY liaised with AMSAT-UK and he secured a link on FUNcube-1 that would transmit the following message continually: *Greetings from space to visitors, staff and team G B 4 R M E. Amateur Radio special*

*event and demonstrations at the Royal Mint Experience South Wales. 30 Jul to 5 Aug.* Ken would work as many satellites as he could and also answer the satellite technical questions from visitors.

Ken, GW1FKY and his satellite exhibition was undeniably the star of the event. He put on such an amazing display for the visitors with linkups to FUNcube-1 and full scale models of the FUNcube and other satellites in superb detail. He went to the Royal Mint at all hours to get the passes from the satellites so other amateurs could have the QSO in the log.

GW4BVJ, assisted by MW0XFU, used his TenTec OmniV, WinKeyer and Morse key, (running a TenTec amp at 400W, if needed) for the CW operations. He bought a Cobweb antenna that worked like a dream right out of the box. The best CW DX was FO, French Polynesia. The Hexbeam Cobweb and rotator were fixed to an electrically driven aerial working platform (AWP-25S) at 12m, a one man hoist operation. Richard also designed the QRZ.com page for this event, which resulted in over 4,000 hits.

MW0DHF assembled a superb Yaesu lineup using 200W into an end-fed antenna at 10m. His supporting SSB team was

GW0WKR, GW1CUQ, 2W0JYI, K2W0KPH and MW6JRI. The team battled on despite terrible band conditions, making contacts the hard way. There were a few harmonic difficulties from the Cobweb but these were expected. We filtered most out with Dunestar filters.

This SSB station was also intended as a draw to visitors who would send greetings messages, but the satellite exhibition and space paraphernalia stole the show as far as the children were concerned! All the children wanted to do was to put on the space jacket and helmet and listen to FUNcube-1 transmitting the message (they queued to do it). Ken had converted the digital data coming from FUNcube-1 into a digital voice that the children could understand.

MW0GBW was the data guru who stuck at his post for days on end with awful band conditions trying to give the DX a new one. Bernie was using mostly JT65 with PSK31

**Glyn Jones, GW0ANA**  
glyndxis@talktalk.net





The team in the 'money room' with over a million pounds in new coins inside the boxes.



Bob, GWOWKR and Ivor fixing coax to the Hex Beam.



Nigel, GW1CUQ and Ken, GW1FKY.

as back up. He was using an Icom IC-7600 into a vertical antenna along side a small river with loads of radials. The vertical was mounted on a specially fabricated base for total stability and safety in a public area, although it was fenced off and high visibility marked. The coax run to this antenna was well over 60m. This coax then had to be secured to the underside of a pedestrian bridge across a river to avoid any trip hazards.

My role was public relations. I introduced a fun element for the children visiting where they could learn to send their name in Morse code. They could either send their name using a homebrew wooden clothes peg key or a commercial Kent 'brass pounder' – both were connected into an oscillator. It was funny: the clothes peg key was preferred by most youngsters. When successful they were awarded a Royal Mint-produced certificate.

Judging from the smiles, they enjoyed their achievement. I gave out over 200 certificates whilst also explaining a little of the history of radio and amateur radio in particular, so perhaps this will bear fruit in the future.

On one occasion I was teaching a young girl how to send her name in Morse when her mother rang her brother in Indiana – he was a radio amateur. They used Skype and she showed her brother around the special event station and also his niece as she was learning Morse and receiving her certificate – all in real time. It was a special moment for all concerned.

### Thanks

An event like this cannot take place without the hard work and dedication of many people. Some warrant special thanks and

these include the team at Barry ARS. Thanks in particular to the Royal Mint Management for believing that Barry ARS would deliver a memorable special event station – we did, to everyone's satisfaction.

Special thanks go to Anthony Williams (General Manager, Royal Mint Experience); Claire Evans (Marketing Manager, Royal Mint Experience); Steve Thomas, M1ACB (RSGB General Manager); Heather Parsons (RSGB Communications Manager); AMSAT- UK; Mike, WA9PIE (Ham Radio Deluxe software); Speedy Hire (AWP 25S aerial working platform); Bob Critcher, GWOWKR (fabrication of heavy duty vertical antenna base); Sandpiper Communications (compact vertical antenna); G3TXQ Hexbeams (for the Hex Beam); DX bulletin boards and DX News and, last but not least, all those who worked us.





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Count on us!

## Homebrew (continued from page 18)

**Photo 1** shows the DDS connected to the Arduino UNO. The TCXO is at the top left of the photo. Both the commercially made AD9850 units and my home-made AD9851 DDS board are designed for a 200Ω output load as used in the Analog Devices application notes. **Figure 4** shows details of the 7th order, 200Ω, 15MHz LPF used at the DDS output. **Figure 5** shows a simple broadband amplifier that takes the 200Ω DDS output up to +14dBm into a 50Ω load. This is just about ideal for driving a diode mixer.

### Oscillator modules

Programmable oscillator modules like the Silicon Labs Si570 offer an attractive alternative to DDS oscillators. My prototype Si570 was built dead-bug style on a strip of copper PCB laminate. Having previous experience of soldering very small surface mount ICs by hand, I was ready for a difficult challenge when installing the Si570. While I was waiting for my temperature-controlled iron to heat up, it decided to expire after many years of service. This left me with no option but to proceed using a standard 25W iron with a totally unsuitable tip.

As it turned out, the Si570 was remarkably easy to solder. The pads on the bottom are reasonably well spaced. The level of difficulty is about the same as for a standard 8 pin DIL device. **Figure 6** shows the details for the Si570 and the 3.3V regulator. Note that

this is a bottom view of the package. Pin 1 is easily identified by its different shape.

The pinout for the LD33CV and most other 3.3V regulators is not the same as the familiar 78xx devices. Check your connections carefully.

The assembled Si570 oscillator is shown in **Photo 2**.

The Si570 uses an I<sup>2</sup>C serial interface for communication with the micro. The Si570 is a 3.3V device and the serial pins are not 5V tolerant. So this poses an obvious problem because all of my available micro boards run from a 5V supply. Many Si570 users have found simple solutions to this problem. Typically the serial clock (SCL) and serial data (SDA) pullups are wired to the 3.3V line instead of the 5V line on the micro board. As I only have one Si570 available and they are relatively expensive devices, I decided to play it safe and use a voltage level 'shifter' between the micro and the Si570. Philips application note AN97055 provides a simple solution. The MOSFET-based level shifter is shown in **Figure 7**. As there are two lines involved, two shifters will be required. **Photo 3** shows a pair of shifters, one using surface-mount resistors. The MOSFETs are 2N7000 and the PCB circuit tracks were simply cut using a hacksaw.

Rather than re-inventing the software wheel, I searched for a suitable Si570 library. Ideally, I wanted something that provided an interface as simple as `570_Freq(freq);` I found exactly what I was looking for in code

published by Nick Kennedy, WA5BDU [2]. I was able to add my LCD and encoder routines into Nick's example code and had a working, fully featured VFO in a matter of minutes!

If all of the above is just too much trouble, the Adafruit Si5351 clock board [3] offers a Silicon Labs clock generator with three independent outputs at a very reasonable price. Output frequency can be set from 8kHz to 160MHz. A 3.3V regulator and a pair of level shifters are included on the board. Just connect Gnd, +5V, SCL and SDA to your micro board to get started. I used open-source Arduino code from Paul Warren and Jason Milldrum [4] to drive mine. Adding my display and encoder software took just five minutes. This is truly the golden age of homebrew radio – just a few minutes' work and an \$8 device to make a clean and stable LF-to-VHF VFO. Frequency stability is not as good as the TCXO, but usually stays within 10Hz of the desired frequency over several hours. Magic.

#### Websearch

- [1] [http://homepage.eircom.net/~ei9gq/DDS\\_AD9850.html](http://homepage.eircom.net/~ei9gq/DDS_AD9850.html)
- [2] <http://wa5bdu.blogspot.ie/2015/07/si570-revisited-flexible-arduino.html>
- [3] <https://www.adafruit.com/product/2045>
- [4] <http://platformio.org/lib/show/708/Etherkit%20Si5351>

## Feature

# Get the best from RSGB publications

Clubs and other organisations are welcome to publicise their events through the pages of *RadCom*, GB2RS, RSGB website and social media. Here are some simple tips to getting the best results.

### Club Events Calendar and GB2RS

A single database is used to produce the entries in Club Calendar and Local News for GB2RS and online news. All entries should be sent in English by email to [radcom@rsgb.org.uk](mailto:radcom@rsgb.org.uk) – please DON'T copy or duplicate (CC) the information to other editorial or HQ addresses.

At the start of your email, please put the FULL club name (NOT just initials) and your RSGB Region. Keep your Calendar entries simple and short. Remember to include contact details explicitly. Always include the club contact's name, callsign, email and phone number. An ideal calendar email is along these lines:

Fraser Road Radio Club, RSGB Region 9  
 Contact: Steve Thomas, M1ACB, 01234 832 700, email [gm.dept@rsgb.org.uk](mailto:gm.dept@rsgb.org.uk)  
 February 2017 club programme  
 3 Club night in shack  
 12 Club net, 145.525MHz, 8pm  
 23 My Pet Aardvark, talk by Phil, G9ABC

### Events Roundup

Keep your news item concise, no more than 175 words about each event. If you think you'll need more space for something major please talk to us *well* in advance – by the time you receive your *RadCom* we have already allocated all the pages in the next edition.

Send all submissions for Events Roundup to [radcom@rsgb.org.uk](mailto:radcom@rsgb.org.uk)

### Deadlines

You will always find the deadlines in the red bar at the very start of the Club Events Calendar. If you can send your information well before the deadline, it's much appreciated. The deadline for GB2RS News is normally 10am on the Thursday before broadcast.

[radcom@rsgb.org.uk](mailto:radcom@rsgb.org.uk)



# Book Review

## Valve amplifiers explained

John Fielding, ZS5JF

In the case of high power HF amplifiers at least, valves remain highly competitive with semiconductors despite, or maybe perhaps *because* of being a 'mature' technology. Expensive semiconductors are now beginning to appear that can compete on power, but less so on ease of use and many other parameters including tolerance of abuse. So valves – and this book – are highly relevant today.

Sensibly, John starts with a discussion of UK-US valve terminology and then gets straight on to safety – the voltages associated with valves, particularly in power amplifiers, can be instantly lethal. We then move on to a very clear description of how valves actually work, with electrons whizzing their way from cathode to anode and dodging round the various grids, an explanation of valve characteristics, and more. We then learn about using valves in the various Class configurations including A, AB, C and so on, then move on to sources of distortion in valve amplifiers – some of which are a lot less obvious than you'd think, but still very important.

Now the basics have been covered, we start seeing the nitty-gritty of designing an amplifier, with coverage of classic designs such as the G2DAF (including details of how people often misunderstand that design), Grounded Grid principles (and how their input impedance varies with instantaneous drive level), plus notes on various types of valve including the Russian variants that can perform remarkably well.

A valve is no use without a power supply, so that's where we go next. When you're talking kilowatts, kilovolts and amps it pays to know what you're doing! You'll find plenty of information here to avoid exploding capacitors, excessive ripple and wavery screen grid supplies, plus a whole chapter dedicated to protection circuitry.

Of course, not all of your mains input power goes out of the antenna connection. Quite a lot gets turned into heat and it's important to dissipate this properly without letting things get too hot. One option is liquid cooling and we learn ways to apply this to Emiac 4CX250 valves, using principles that can be applied to other devices.

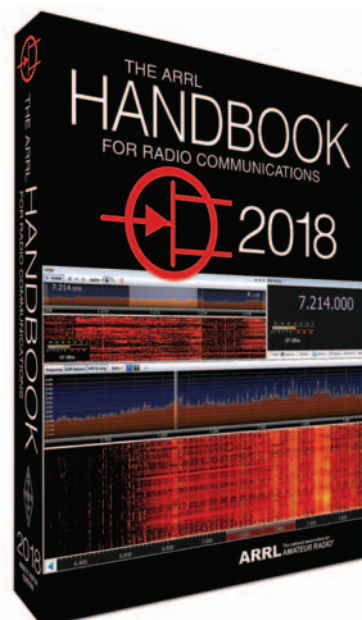
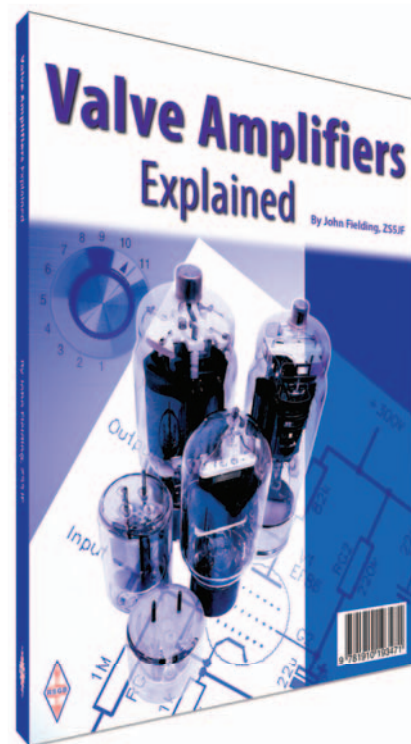
But what if after all this you decide that designing and building an amplifier is too much like hard work? John again comes to the rescue here, with a discussion on what to consider when buying a new or used amplifier, plus some really useful advice on how to actually use your new toy to maximise its life, power output and spectral cleanliness.

VHF and UHF aren't ignored, either. Specific valves and circuit topographies suitable for higher frequencies are discussed in remarkable detail, including some detailed photos of a homebrew 2m amplifier under construction.

This well-illustrated book contains a wealth of information for anyone even remotely interested in the mechanics of valves and, particularly, high power valve amplifiers for HF or above. The clear text is supported by a good number of drawings and photographs, and will leave you with a far better understanding of all aspects of valve amplifiers.

Size: 174 x 240mm, 200 pages, ISBN: 97819101 9347 1  
Non Members' price: £14.99, RSGB Members' price: £12.74

Also available on  
**amazonkindle**



## ARRL Handbook 2018

H Ward Silver, NOAX (et al)

The *ARRL Handbook* is something of an institution. It is revised and republished at least annually since 1926 and is now in its 95th edition – an amazing achievement.

One of the secrets to the *Handbook's* success is that it is updated on a rolling basis, so that every new edition contains a proportion of brand-new material. This year's update is a particularly comprehensive one, with the largest update since 2014. Six chapters have been rewritten to incorporate more material on software defined radio, many new projects and much more. New authors have joined the writing team, which draws from the best amateur radio authors in the world.

At 1280 pages it is a huge volume and contains several lifetimes' worth of amateur radio experience. Whether your interests are operating, construction, propagation, contesting or anything else amateur-related, you'll find a wealth of information and new ways of thinking.

Whether this is your first encounter with the *ARRL Handbook* or you've seen earlier editions, the 95th edition is a great leap forward and, while not cheap, the information it contains makes it an excellent investment for any individual or club.

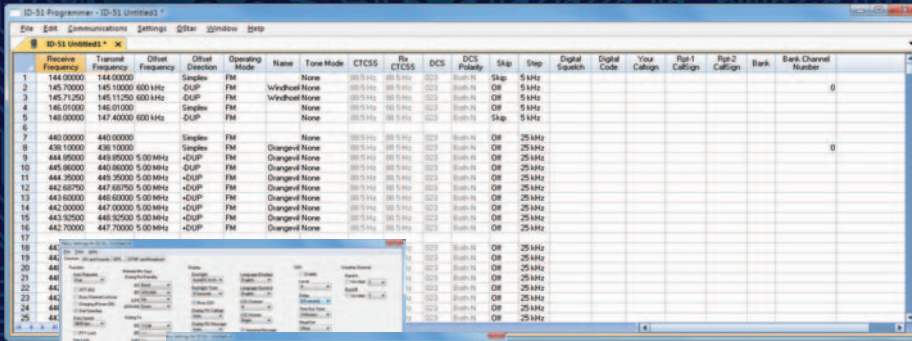
I can't recommend it highly enough.

Size 208 x 274mm, 1280 pages  
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## CLUB EVENTS CALENDAR

### INTERNATIONAL

**Pafos Radio Club, Cyprus**  
Richard, 5B4AJG, 00 357 97 857 891,  
5b4ajg@gmail.com www.cyhams.org  
Meets 3rd Thursday at DT's Bar. Visitors and  
holidaymakers welcome.

**International Federation of Railway Radio  
Amateurs (FIRAC) www.firac.org.uk**  
Nets Sun 14.320MHz at 0830UTC, Wed  
21.3MHz at 1430UTC g4gnq@hotmail.co.uk

### NATIONAL

**Amateur Radio Caravan and Camping Club**  
membership@arcc.org.uk, www.arcc.org.uk

**AMSAT-UK, http://amsat-uk.org/**  
Open net every Sunday, 10am, 3.780MHz (±)

**British Railways Amateur Radio Society**  
m0zaa@brars.info, www.brars.info  
Net Friday 1600 on 3.685MHz

**Civil Service Amateur Radio Society**  
Weekly net every Tuesday, 8pm, 3.763MHz.

**Radio Amateur Old Timers' Association**  
MemSec@RAOTA.org, www.RAOTA.org  
Nets: Wed 3.763MHz 1000, 1.963MHz 2100  
Thurs 7.163MHz, 1100, 3.763MHz 1930  
Sun 3.763MHz 1000

### REGION 1: SCOTLAND SOUTH & WESTERN ISLES

Regional Manager: RM1@rsgb.org.uk

**Ayr ARG**  
Derek, MM0OVD, 0744 793 1941  
10, 24 Club night

**Cockenzie & Port Seton ARC**  
Bob, GM4UYZ, 01875 811 723  
3 Club night

**Livingston & District ARS**  
Cathie, 2M0DIB, 01506 433 846  
7 Training  
14 Talk  
18-19 Field Day  
21 Operating/feedback from Field Day  
28 Operating/training

**Lothians RS**  
Mike, MM0MLB,  
secretary@lothiansradiosociety.com  
8 Talk, James, GM4WZP  
22 Aerial modelling, Brian, GM4DIJ

**Mid Lanarkshire ARS**  
Kevin, 2M0KVM, 0772 509 6279  
3, 10, 17, 24 Club night

### REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Regional Manager: Andrew Burns, MM0CXA  
RM2@rsgb.org.uk

**Aberdeen ARS**  
Fred, GM3ALZ, 01975 651 365  
2 Junk sale  
9 Beginners' guideto amateur radio test  
equipment  
16, 23 club night

**Dundee ARC**  
Martin, 2M0KAU, 0776 370 8933  
7 VHF hands-on  
14, 21 Club night, tuition  
28 FT8 mod talk, Garry, MM6KYW

**Glenrothes & District RC**  
Dougie, MM6KNR, dougie@digitalmaker.co.uk  
1 Planning permission talk, Ken  
8 RSGB/DX Factor videos  
15 Construction night  
22 How can we do better in contests?  
29 Club night discussion

### REGION 3: NORTH WEST

Regional Manager: Kath Wilson, M1CNY,  
RM3@rsgb.org.uk

**Bolton Wireless Club**  
boltonwireless@gmail.com  
13 Show and tell evening  
27 3-band Moxon, Mick, M0ICK

**Macclesfield & DRS**  
Greg, M0TXX, Info@gx4mws.com  
6 Shack on the air  
13 Film night  
20 Building a 12V solar power pack, M0TXX  
27 Fox hunt

**South Manchester R&CC**  
Ron, G3SVW, 01619 693 999  
2 The BBC micro:bit, Phil, M1CYV  
9 Lightning protection, Peter, G3XGE  
16 Space weather, Ron, G3SVW  
23 Morse practice  
30 Amateur radio for the disabled, Dave, G0BJK

**Stockport Radio Society**  
Heather, M6HNS, 0750 690 4422  
6, 20 Advanced class  
7 Society meeting  
14 Club net, 51.550MHz FM, 7.30pm then QSY  
50.270MHz SSB, 8.15pm  
16 Club net, 7.30pm, 145.375MHz  
20 Advanced class  
28 Skills night

**Wirral ARS**  
William, G4YWD, 0780 488 4245,  
1 Bygone lamp standards  
2, 7-9, 14, 16, 21-23, 28, 29 Club open from 7pm  
15 RSGB HF propagation video with Skype  
talk back

### REGION 4: NORTH EAST

Regional Manager: Ian Douglas, G7MFN,  
RM4@rsgb.org.uk

**Angel of the North ARC**  
Nancy, G7UUR, 01914 770 036  
6 Prep for rally, on the air  
11 Fog on the Tyne Rally  
13 On the air, rally roundup

**Bishop Auckland RAC**  
Gail, M3GBB, 0191 372 0473  
2, 9, 16 Club night and training

**Blyth Radio Club**  
John, 2E0DCV, 0191 237 1729  
1, 8, 15, 22, 29 Club night  
1, 22, 29 Morse training  
8, 15 Foundation training

**Denby Dale RC**  
Darran, G0BWB, 0797 442 3227  
5, 12, 19, 26 Club net, GB3HD, 10.30am

**Ripon & District ARS**  
David, G3UNA, 01423 860 778  
2, 9, 16, 23, 30 Club night

**Sheffield ARC**  
David, G6DCT, littlewood20@btinternet.com  
6, 27 Club night  
13 Raspberry PI PSK xcvr, David, G6DCT  
20 Shack night

**Spenn Valley ARS**  
Russell, G0FOI, 01274 875 038  
2 Shack meeting  
16 On the air

**Tynemouth ARC**  
www.G0NWM.com  
3, 24 Club night  
10 Junk sale  
17 Making and avoiding interference!

**Wakefield & District RS**  
Charles, M0OXO@wdrs.club  
3, 10, 17, 24 Social and natter night

### REGION 5: WEST MIDLANDS

Regional Manager: Martyn Vincent, G3UKV  
RM5@rsgb.org.uk

**Coventry ARS**  
John, G8SEQ, 0795 877 7363  
2, 9, 16, 23, 30 Open net, 50.175MHz SSB, 8pm  
3 Bangers & mash  
6, 13, 20, 27 Open net, 8pm, 145.375MHz FM  
and or 7.16MHz ± QRM SSB  
10 Committee forum & project discussion  
17 Skittles night  
24 Radio workshop

**Malvern Hills RAC**  
Dave, G4IDF, 01905 351 568  
14 Junk sale and silent key auction  
28 Informal

**Midland ARS**  
Norman, G8BHE, 0780 807 8003  
5 West London Radio and Electronics Show  
15 General meeting, ragchew, training classes  
22 On the air, equipment review, training classes  
25 Committee meeting, training classes  
29 Planning Christmas party, training classes

The next deadlines are 26 October, 23 November and 19 December.  
Send your news, dairy dates and photos to radcom@rsgb.org.uk

**Mid-Warwickshire ARS**  
Don, G4CYG, 01926 424 465  
14 Club net, 145.275MHz  
28 Video afternoon

**Salop ARS**  
salopamateurradio@gmail.com  
1, 8, 15, 22, 29 Club net, 8.30pm, GB3LH  
2 Natter night / Foundation course  
7, 14, 21, 28 CW net, 4.30pm, 144.070MHz  
9 Natter night / committee meeting  
16 Shack night, G3SRT on the air, Foundation practicals  
18 Foundation exam  
23 Chair's forum  
30 Discussion on NFD

**South Birmingham RS**  
Gemma, M6GKG,  
gemmagordon.m6gkg@gmail.com  
1 AGM, 8pm  
2, 9, 16, 23, 30 Training classes with G8OWL  
3 Sorting old equipment for dismantling  
6, 13 Ragchew  
7, 21, 28 Coffee Morning, 11to 1pm  
10 Sorting old equipment for dismantling  
20 Checking aerials and feeders  
27 Discussion on Christmas Party

**Stratford upon Avon & District RS**  
Clive, G0CHO, 01608 664 488  
6, 20 Club net, 145.275MHz FM, 8pm  
13 Meteor detection by radar, Clive, G0CHO  
27 Heat treatment metallurgy, John, G8RIM

**Sutton Coldfield ARS**  
Robert Bird, rob2e0zap@gmail.com  
6, 20 Open net, 145.250MHz, 7.30pm  
13 Club meeting  
14 Open net, 70.475MHz FM, 7.30pm  
27 AGM plus renewal of membership  
28 DMR open net, GB7FW slot/local2, 7.30pm

**Telford & District ARS**  
John, M0JZH, 0782 473 7716  
1 Committee meeting, GX3ZME OTA  
8 Antennas on DX, Dom Baines M1KTA,  
15 Winter projects construction evening  
22 The PIXIE CW Transceiver  
29 Batteries, G6UDX

## REGION 6: NORTH WALES

Regional Manager: Ceri Lloyd Jones, 2W0LJC  
RM6@rsgb.org.uk

**Dragon ARC**  
John, MW0JWP, 0751 503 1025  
6 Junk sale  
20 AGM

**Marches ARS**  
marchesars@hotmail.co.uk  
6, 13, 20, 27 NE Wales open net, 9pm,  
145.425MHz

**North Wales Radio Society**  
Liz, GWOETU, 0776 019 0355  
2 General meeting  
9 Technical topic  
16 On the air  
23 Story of a Radio Officer, Tony, GW4PVU  
30 Discussion on 2018 programme

**Wrexham ARS**  
Eifion, mw6eyu@gmail.com  
1, 8, 15, 22, 29 Net, 145.300MHz, 7.30pm  
21 Passchendaele, by Simon Jarman MBE

## REGION 7: SOUTH WALES

Regional Manager: Glyn Jones, GW0ANA,  
RM7@rsgb.org.uk

**Cleddau ARS**  
Heinz, MW0ECY, 0774 804 7008  
2 TRRG meeting  
12 Patrick Hill operations

## REGION 8: NORTHERN IRELAND

Regional Manager: Philip Hosey, M10MSO  
RM8@rsgb.org.uk

**Bangor & District ARS**  
Harry, G14JTF, 0289 042 2762  
2 Surplus equipment sale, 7pm,  
all welcome, entry £2

## REGION 9: LONDON & THAMES VALLEY

Regional Manager: Tom O'Reilly, G0NSY  
RM9@rsgb.org.uk

**Aylesbury Vale RS**  
vic@rakewell.com  
8 Quiz vs Chesham club

**Bracknell ARC**  
David, MOXDF, MOXDF@alphadene.co.uk  
1, 15, 22, 29 Open net, 8pm, 145.375MHz

**Burnham Beeches RC**  
Charles, G0SKA, 01753 647 101  
6 Second construction evening  
20 Broken kit evening

**Chertsey Radio Club**  
James, M6FLT, chertseyradioclub@hotmail.com  
7 Social on-line gathering

**Edgware & District RS**  
Mike, G4RNW, 02089 500 658  
9 Visit by Mark Haynes of Kenwood  
23 Steam railways in the Age of Elegance,  
Vic Burgess

**Harwell ARS**  
John, G6LNU, 01235 223 250  
9 Demo: Minos, ON4KST, 6m contest station

**Radio Society of Harrow**  
Linda, G7RJL, lcasey100@outlook.com  
3 Know your tools Colin G1IGA & Brian G3YKB  
5, 12, 19, 26 Club net 1938kHz LSB, 12 noon  
6, 13, 20, 27 Net, 145.5/145.35MHz FM,  
8.15pm  
17 Surplus equipment sale

**Reading & District ARC**  
Laurence, G2DD, 0758 470 6625  
9 Construction contest, Robin, G4IWS  
23 History of Wood & Douglas, Alan Wood

**Shefford & District ARS**  
John Burnett, john@hobart-europe.co.uk  
2 Clive Sinclair and Cambridge Instruments,  
by Brian, G8GHR  
16 Most Secret telephone exchange, G8UOD  
23 Quiz

**Southgate ARC**  
Keith, G8RPA, g8rpa@arri.net  
8 Autumn junk/surplus sale

**Verulam ARC**  
Greg, M0PPG, 01582 413 345  
9 Social with GB3VH Repeater Group  
21 Construction

## REGION 10: SOUTH & SOUTH EAST

Regional Manager: Michael Senior, G4EFO  
RM10@rsgb.org.uk

**Bredhurst Receiving & Transmitting Society**  
Nicky, secretary@brats-qth.org  
2, 16, 23, 30 Club night  
9 Junk sale, 8.30pm

**Bromley & District ARS**  
Andy, G4WGW, 01689 878 089  
1, 8, 15, 22, 29 Net, 9pm,  
145.500MHz (and QSY)  
21 Regenerative receivers, Adrian, MOYRG

**Coulsdon ATS**  
Andy, G0KZT, secretary@catsradio.org  
13 Quiz v Sutton & Cheam club

**Crawley ARC**  
Richard, G3ZII, 01342 843 545  
2 HARC-CARC challenge (held at Horsham ARC)  
22 Transmission lines, Richard, G3ZII

**Cray Valley RS**  
Dave, G8ZZK, 0773 954 9822  
2 Noise in radio systems, Colin, G3SPJ  
16 Video editing for amateur radio, G3SXE

**Crystal Palace R&EC**  
Bob, G30OU, 01737 552 170  
3 Millimetric microwaves, Chris, G0FDZ

**Dorking & District RS**  
David, M6DJB, djb.abraxas@btinternet.com  
28 AGM and RSGB Film

**Dover RC**  
Aaron, 2E0FQR, 0771 465 4267  
16 Dover's wartime tunnels, G Wise

**Fort Purbrook ARC**  
Chris, G3WIE, g3wie@fparc.org.uk  
24 Show and tell evening

**Hastings E&RC**  
Gordon, 01424 431 909  
22 Discussion on amateur radio

**Hilderstone R&EC**  
Ian, 2E0DUE, secretary@g0hrs.org  
9 AGM  
23 History of DXpeditions, Peter, G3MLO

**Horndean & District ARC**  
Stuart, G0FYX, 02392 472 846  
3 Natter night/social evening  
17 Club meeting

**Horsham ARC**  
Alistair, G3ZBU, 0785 526 8666  
2 HARC/CARC Challenge  
16 Social at The Royal Oak  
26 Fox hunt

**Itchen Valley ARC**  
Paul, G6MCX, 01725 578 004  
3, 17 Club net, 145.525MHz  
10 Green radios, Rhodri, MORHO  
24 Social evening & IOTA Lundy presentation

**Mid-Sussex ARS**  
Dennis, MOYDC, 0747 630 1044  
3 Surplus equipment sale  
10 Radio night  
17 Radio night and table top sale  
24 How I became a radio amateur

**Surrey Radio Contact Club**  
John, G3MCX, 020 8688 3322  
2, 9, 16, 23, 30 Net 70.300MHz, 8pm



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5 Net 1905kHz, 9.30am  
12, 19, 26 Net 1905kHz, 9.30am  
6 The Metropolitan Police comms system,  
Jeffery Bolper  
20 Chat and fix-it, John, G8MNY

**Worthing & District ARC**  
AI, MOOAL, information@wadar.org.uk  
1 Tea and chat night  
5 Sunday breakfast  
8 Lecture  
15 On the air  
22 Practical evening or workshop demo  
29 Quiz

## REGION 11: SOUTH WEST & CHANNEL ISLES

Regional Manager: Pam Helliwell, G7SME  
RM11@rsgb.org.uk

**Appledore & District ARC**  
Alan, M6CCH, 01237 422 833  
20 Bring & Buy

**Callington ARS**  
John, G4PBN, 01822 835 834  
1 Club night

**Cornish Radio Amateur Club**  
Steve, G7VOH, 01209 844 939  
1 Committee meeting  
2 Main meeting  
15 Social evening

**Gordano Amateur Radio Group**  
Malcolm, G4KPM, info@g4kpm.co.uk  
22 Club meeting

**North Bristol ARC**  
Mat, G7FBD, g7fbd@gb3bs.com  
3, 10 Relax, chat, operating & training  
10 Bring and buy  
24 Video evening, relax and chat

**Poole Radio Society**  
secretary@g4prs.org.uk  
3, 17, 24 Activity night  
10 Transceivers, under covers, G4JQX

**Saltash & District ARC**  
Mark Chanter, MOWMB, 0781 054 8445  
2, 16 Club night, all welcome

**South Bristol ARC**  
Andrew, G7KNA, 0783 869 5471  
2 Cellphone forensics, Nick, G8YJM

9 Start of Christmas raffle  
16 Homebrew evening  
23 The year in review  
30 Open house and on air night

**Torbay ARS**  
John, g4vud@tars.org.uk  
3, 17, 24 Club night  
10 Club night and business meeting

**Weston Super Mare RS**  
Martin, G7UWI, 01934 613 094  
6, 3, 27 Construction, operating & natter night  
20 Portishead Radio in WWII, Larry Bennett

**Yeovil ARC**  
Rodney, M0RGE, 01935 825 791  
2 Mini talks  
3, 17 Construction and on-air at Sparkford  
9 Which amateur band to go on? G3MYM  
23 Morse practice, G3MYM  
30 Problem solving and committee meeting

## REGION 12: EAST & EAST ANGLIA

Regional Manager: Keith Haynes, G3WRO  
RM12@rsgb.org.uk

**Braintree & District ARS**  
Edwin, G0LPO, 01376 324 031  
7, 21 Club net, 145.375MHz, 8pm  
14 Digital radio  
28 Surplus equipment sale

**Bury St Edmonds ARS**  
g3lpt@btinternet.com, 01359 259 518  
15 Remote station operation, G4SWX

**Chelmsford ARS**  
secretary@g0mwat.org.uk  
7 Urban noise and SDRs, William, G8CYK

**Colchester Radio Amateurs**  
Tony, 2E0FTQ, 0783 177 4669  
16 Canadian adventures, Kevan, 2E0WMG

**Essex Ham**  
Pete, M0PSX, news@essexham.co.uk  
4 Essex YL Net, GB3DA, 8pm  
6 Online Foundation course  
6, 13, 20, 27 Net on GB3DA, 8pm,  
www.essexham.net

**Felixstowe & District ARS**  
Paul, G4YQC, pjw@btinternet.com  
6 VHF propagation, RSGB presentation  
20 Junk sale

**Huntingdonshire ARS**  
David, M0VTG, secretary@hunts-hams.co.uk  
9 Show & tell  
23 Bring and Buy

**Loughton & Epping Forest ARS**  
MOMBD, 0798 016 5172  
10 Club night  
24 Club night and auction

**Norfolk ARC**  
Chris, G0DWV, 01603 898 308  
1 International antennas, Steve, G3PND  
8 How to be heard without spending loads  
of money, Nick, G3RWF  
15 Triumphs of Voyager pt1, Paul Money  
22 Informal, Morse in the back room  
29 Informal, Bright Sparks

**Norfolk Coast ARS**  
Steve, G3PND,  
info@norfolkcoastamateurs.co.uk  
2 International antennas  
9 WSJT-X  
16 Kite antennas  
23 Test equipment  
30 SDR

**Peterborough & District ARC**  
Alan Ralph, secretary@padarc.co.uk  
6, 13, 20, 27 Net 1.980MHz  
7, 21 Net 145.400MHz  
29 WAB, Dave, G3SQA

**Thurrock Acorns ARC**  
Gordon, M0WJL, acorns@taarc.co.uk  
2, 9, 16, 23, 26 2m FM open net, 7.30pm  
7 2m SSTV open net, 7.30pm  
18 Essex 2m activity afternoon  
21 Activating uninhabited Scottish islands,  
John, G4LTH

## REGION 13: EAST MIDLANDS

Regional Manager: Jim Stevenson, G0EJQ  
RM13@rsgb.org.uk

**Melton Mowbray ARS**  
Phil, G4LWB, 01664 567 972  
17 TX Factor video

**Nunsfield House ARG**  
Paul, G1SGZ, pr@nharg.org.uk  
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3 TX Factor video  
6, 13, 20, 27 Shack night  
10, 17, 24 Club night

**RAF Waddington ARC**  
Bob, G3VCA, 0797 116 6250  
2, 10, 17, 24 Club night  
6, 13, 20, 27 Club net, 145.325MHz, 8pm

**South Kesteven ARS**  
Andrew, M0NRD, 0796 906 2859  
1, 8, 15, 22 Club net via GB3GR  
3, 17 Club meeting

**South Normanton Alfreton & District ARC**  
A Lawrence, 2E0BQS, 01246 456 625  
6 Talk  
13, 27 Natter night  
20 Junk sale

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### REGION 3: NORTH WEST

Wirral ARS formally opened their new shack on 16 September. On a very sunny Saturday, club members, their families and fellow radio amateurs from Preston, Liverpool, Chester, Warrington, Stockport and the sister club on the Wirral joined in the celebrations. Chairman, Bill, G4YWD opened the proceedings and the Reverend Christine Broad gave the club a blessing. The ribbon was cut by 3-year-old Max, son of Colin, M0ATZ and the club flag was raised by Dennis, 2E00QH

on the 80' mast. Guest proceeded to the clubroom and the buffet, the celebration cake was cut and transmission on various bands followed. The proceedings were transmitted live on ATV and streamed to the BATC website. Fellow amateurs as far away as France followed the event. The club wish to thank all who attended the event and hope to work all on the various bands and modes in the years to come. The club meets on a Tuesday, Wednesday and Thursday evenings from 7pm.

### REGION 4: NORTH EAST

Bishop Auckland RAC meet every Thursday night at the Stanley Crook Village Hall at about 7.45pm and everyone is welcome. Their rally will take place at the Spennymoor Leisure Centre on 26 November. This venue has good parking and easy access to a large ground floor hall. There will be the usual radio, computer, electronics and Bring & Buy stalls as well as catering and bar facilities. There is plenty to do for all the family within the confines of the leisure centre for those not interested in radio. Doors open at 10.30am (10am for disabled visitors). Admission is £2 – under 14s accompanied by an adult are free of charge. (Postcode DL16 6DB for satnav users).



On 2 September, Hambleton ARS members Brian, G8AOE and Ian, 2E0GBA operated a 24 hour Field Day station from above the village of Osmotherley using the call G8AOE. Using 100 watts into a G5RV suspended between two masts and the FT-857D powered from the generator, a total of 181 contacts were made, mainly around Europe. Conditions were rather noisy at times but they did get plenty of 599 reports. Brian did the night shift solo, a brave man as temperatures during the night were 'nithering', to say the least, normal for the North Yorkshire moors.



On 5 September a special event station took place at Shildon Railway Museum in memory of Peter Hawes, M6MOB on what would have been his 72nd birthday. Using GB6MOB (thanks to Ian Adamson from Ofcom), a number of clubs in Region 4 took part. Thank you to Pam Porter for the use of the venue and arranging a plaque to be placed in the museum for Peter. From left to right are Ian, G7MFN (WEARS), Tom (Houghton), Pam Porter (Shildon Locomotion Museum), George, M5GHT (Houghton) and Ian, G7ESY (Bishop Auckland). The Museum has a permanent special event call sign, GB4SRM; entry to the museum is free and well worth a day out.

### REGION 8: NORTHERN IRELAND

Bangor & District ARS will hold their annual surplus equipment sale on 2 November, with entry from 7pm. Admission is £2 and there will be refreshment available. Everyone is welcome. [www.bdars.com](http://www.bdars.com) has details.

On 2 July, Mid Ulster ARC was proud host to the RSGB President, Nick Henwood, G3RWF. The President had been invited to the official ribbon cutting and opening of a meeting room extension. The work was carried out by club members, a sort of 'homebrew building works'. The extension enables the club to fit in all of its members at any club meetings or events, to seat more candidates for licence training and opens up doors for the members to diversify into subjects like electronics and antenna building that would not have been possible beforehand due to space. The day was well attended and finished up with a club BBQ that was enjoyed by all members and visitors. [www.muarc.com](http://www.muarc.com)



### REGION 9: LONDON & THAMES VALLEY

At Verulam ARC's club meeting in September, Peter, G00IK gave an illustrated talk on the equipment needed and the procedures followed for taking part in the CQ World Wide CW contest and how the club intends to go about taking part in this year's event. The plan is to operate four stations from the club's cabin, located high in the Chiltern Hills, by a team of ten with each operator allocated one or two bands to concentrate on. Alex, M0UKR continued the presentation with an explanation of the Reverse Beacon Network and DX Clusters and how these can help with assisted contesting.





## REGION 10: SOUTH & SOUTH EAST

Farnborough & District RS had a close call during the RSGB's HF SSB contest on 2 and 3 September, when an ancient oak tree collapsed into the field narrowly missing members cars and a camper van. The vehicles had just been moved after strange creaking noises were heard in the night. The photo shows the substantial damage to the tree, which would doubtless have necessitated very expensive repairs to any vehicles it fell upon.

On the Saturday evening they had a fantastic BBQ that had been arranged by Bob, Anne and David.

The station ran 100W from a FT-900 to a fan dipole using the club call G2DX/P and made 334 contacts – significantly more than last year. The performance of the equipment was excellent, with virtually every station called coming back on the first call.



## REGION 11: SOUTH WEST & CHANNEL ISLES

Poole Radio Society operated from Kingston Lacey House over the weekend of 2 & 3 September. GX4PRS was visited by many visitors, particularly on the Saturday. Younger visitors were shown how to send their names in Morse and received a certificate for their efforts. In addition to on-air contacts, there was also a demonstration of a rotator system used for tracking amateur satellites. Many thanks to the National Trust staff for making them so welcome. The picture shows Phil, GOKKL demonstrating the use of a Morse key.



## REGION 12: EAST & EAST ANGLIA

The 106 Squadron Air Cadets set up camp ready for the Orsett Show in September. As well as having a fund raising tent, the squadron had a communication tent that was manned mainly by the Air Cadets with support from members of the Thurrock Acorns ARC. During the day, the two stations contacted over 50 stations located in the UK and Europe including Germany, Holland, Poland and Spain. As part of the Cadets training program there is the opportunity for cadets to be trained on the Squadrons two-way hand-helds that were used by many of the Cadets who acted as marshals during the day. An option in the Cadets communication training scheme gives them the opportunity to train for their amateur radio licence and, to date, five Cadets have passed the exam with two more on the training scheme. If you wish to know more about the air cadets the 106 Squadron meet on a Monday and Wednesday evening at the Thames Gateway Cadet Centre, Hogg Lane, Grays RM17 5BW.



Chertsey RC celebrated the 33rd anniversary of the maiden voyage of the Space Shuttle Discovery between June and the end of August with special event call sign GB8SSD. The club enjoyed making many contacts on HF, VHF / UHF, local repeaters, DMR and via the satellites. The club also had two different messages sent through FUNCube-1 satellite and sent packet messages via the ISS. On 8 July, they were very lucky to be able to send voice communications via the ISS, whilst the Tanusha satellites were being swapped over. They sent the signal on 437.050MHz and the downlink was 145.800MHz. The initial contact was with EA4SG. Keeping with the space theme, to celebrate 20 years of amateur radio in space 12 SSTV images were transmitted over three days and members of the club were able to receive the sounds and convert them into images when the ISS was in range.





Peterborough & District ARC held an Activity Day at the club QTH. Members brought projects to work on and equipment to test. Testing a home brew HF vertical against a Sigma multi band SE HF 360 for the club QTH proved interesting with the Sigma coming out the winner. As antenna space is limited, it has to be a vertical.

Chip, G1FJD brought along his FT-817 to fit a bhi noise reduction unit and a couple of VHF antennas he had been given for analyser checking.

Tracey, M5ATR started construction of the 10 watt linear kit to go with the dual band Weekender radio she had recently completed.

Tony, G0IAG brought along a Clansman PRC 320 to show members how to set up and operate it while other members used club HF radio's on voice and PSK31 modes.

Over the summer there was a Thames ARG challenge to build a 40m light bulb aerial. On 15 September, six very different constructions were submitted to see which CW signal was the strongest at a distance of 400m using 10W and an ATU. The entries consisted of ladder line, an artificial ground, long filament, ordinary bulb, sky dish and a loudspeaker shaped cone. The ladder line won by one S-point above the other entries, the receiving station using an attenuator to normalise the relative signal strengths. Well done to John, MOJRW for winning and everyone learnt something from the fun exercise. Left to right are John, MOJRW, Nigel, MOICH, Mel, 2E0TRZ, Bejoy, 2E0KFB, Del, 2E0EVZ and Huw, M0LHT.



In preparation for Thames ARG's fourth field event of 2017, Mark, M0EIO gave a presentation on the planning that goes into such an event. He explained the issues around insurance, permission as well as the practicalities of what equipment to take and how to set it up.



Over the August Bank Holiday weekend, Braintree & District ARS held its summer camp in a paddock beside the QTH of John, M5AJB. Fifteen members attended, used the radios – some unfamiliar to them – and carried out numerous experiments with nine antenna and six transceivers. Over the period 18 contacts were logged in the shared book, with the same number noted by members personally.

Dave, G0DEC made contact with the AMSAT satellite during one of its passes using a dual band beam and a Kenwood handheld.

Geoff, G1WRH tested his homebrew 4m antenna, and members helped Derek, G3MMA to erect and test his 20/40m homebrew loop.

Peter, G0DZB made some CW contacts, and visiting XYLS followed the busy weekend air traffic across the near cloudless skies using the Flightradar24 app. Thanks to the hosts John and Rosemary for their hospitality and help.

### REGION 13: EAST MIDLANDS

Over the August Bank Holiday weekend members of Lincoln Short Wave Club put on a special event station at the Fir Park Wings and Wheels Show near Market Rasen. The exhibits included aircraft, an ambulance, a fire engine, motorcycles, stationary engines, steam engines, model aircraft, classic and military vehicles and an amateur radio station. Licenced helpers and visitors to GB5WW were G1LQB, M6TSJ, G0EUN, G4DBS, G0EJQ (Regional Manager), G4OSB, G4XFC, M5ZZZ, G7KPM, G4STO, G8THR, M3PCC, M0RPD, G3PVU and G3YPS.

On 17 September, Edward, 2E0HRB (smiling, centre) from Kettering & District ARS successfully took his online Full exam. The picture shows Edward after he'd received his result with Steve (left) and Lorna who officiated the exam and KDARS Chairman Ray, M0HMP and Adrian 2E0ERO – currently studying for the Advanced exam.



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**DRAKE R4B/C RECEIVER.** Clean unmodified condition. Can collect up to 50 miles. Brian Tibbert, G3RKZ, [brian.tibbert1942@hotmail.com](mailto:brian.tibbert1942@hotmail.com) (Derby).

**MAIN PCB FOR YAESU 897D**, in working order please. Peter, M6PDJ, 0771 229 7628, [peter.davies12345@gmail.com](mailto:peter.davies12345@gmail.com) (Wolverhampton).

**MARTELEC MSR50** integrated weather satellite receiver control details. Technical handbook, original control program (DOS?) whatever needed for computer control. Alistair, G7IET, 01959 534 459, [ajdunlop@btinternet.com](mailto:ajdunlop@btinternet.com) (Orpington).

**ONE 572B** or two if the price is right. Also looking for the cover for a PS213 GPO Morse key. Brian, G4CJY, 01494 530 018, [g4cjay@gotadsl.co.uk](mailto:g4cjay@gotadsl.co.uk) (High Wycombe).

**RACAL 9082 SIGNAL GENERATOR** – renovating one and need a bottom cover and optical encoder. However, as there are probably other faults a scrapped/non-working unit would be acceptable. Thomas, GW8WEY, 0747 317 1591, [thomas.jones80@ntlworld.com](mailto:thomas.jones80@ntlworld.com) (Cardiff).

**YAESU FT-7(B) HF TRANSCEIVER**, non-working OK as long as it's complete and a reasonable price! Chris, GONGN, 0796 803 7416, [chrisjordan26@gmail.com](mailto:chrisjordan26@gmail.com) (Ludlow).

## RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond.

**If your rally or event is not listed here, PLEASE SEND US FULL INFORMATION by email to [radcom@rsgb.org.uk](mailto:radcom@rsgb.org.uk)**

## 5 NOVEMBER

**WEST LONDON RADIO & ELECTRONICS SHOW**  
Kempston Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ.

There will be a talk in station and on site car parking is free. Doors open at 10am with disabled visitors gaining access 10 minutes earlier. There will be trade stations, a Bring & Buy and special interest groups. Other attractions are lectures, a raffle and catering on site. Details from Paul, MOCJX on 0845 165 0351, [info@radiofairs.co.uk](mailto:info@radiofairs.co.uk). [www.radiofairs.co.uk].

## 5 NOVEMBER

**BUSH VALLEY RADIO RALLY**  
United Services Club, 8 Roe Mill Rd, Limavady BT49 9DF

Doors open at 11am and entry is £3 with a free draw ticket. Talk-in on 145.400MHz. There will be traders and a Bring & Buy, RSGB reps but no RSGB book stall. Refreshments available on site. Tables are free, book with Jack, 0788 529 2545.




## SPECIAL EVENT STATIONS

Ofcom informs us that there are no Special Event Station NoVs for the month of November 2017 that have given consent to be publicised.

## 11 NOVEMBER (NEW DATE)

## FOG ON THE TYNE RALLY

 Whitehall Road Methodist Church Hall, Bensham, Gateshead NE8 4LH

Car parking now available. The car park entrance is on Whitehall Road. Doors open at 10.30am and entry is £2. There will be traders and RSGB bookstand and a junk stall. Catering will be available on site. Nancy Bone, G7UUR on 0799 076 0920 or by email to nancybone2001@yahoo.co.uk

## 12 NOVEMBER

## GREAT NORTHERN HAMFEST CANCELLED


## 18 NOVEMBER

## RADARS TRADITIONAL RADIO RALLY

St Vincent de Paul's, Caldershaw Rd, off Edenfield Rd (A680), Norden, Rochdale OL12 7QR  
Doors open at 10.30am with disabled visitors gaining access 15 minutes earlier. Admission is £2.50 with those under 12 years free. There will be a Bring & Buy as well as commercial traders, a junk stall and amateur radio sellers. Traders can set up from 8am. Pitches must be booked at least 2 weeks beforehand with prices starting at £5. There will be refreshments available including bacon and sausage butties. Dave, G3RIK by email to rally@radars.me.uk [www.radars.me.uk]

## 19 NOVEMBER

## PLYMOUTH RADIO CLUB RADIO RALLY

 Harewood House, Ridgeway, Plympton, Plymouth PL7 2AS

There is car parking available and the venue has disabled facilities. Doors open from 10am to

## SILENT KEYS

We regret to record the passing of the following Members, including those whose details we were unable to include last month. We apologise for any distress the delay may have caused.

Name, callsign	Date	Name, callsign	Date
Mr P Lawson, G0ABY	15/06/2017	Mr K G Pollard, G4KGP	28/07/2017
Mr R Coleman, G0BXP	26/07/2017	Mr S R Griffiths, G4SWN	9/2016
Mr A J Quy, G0FEO	16/07/2017	Mr B Moorecroft, G4UDY	1/08/2017
Mr K C Chappell, G1OPG	31/08/2017	Mr I E Tebboth, G6FIP	8/2017
Mr J Sagar, GW3ARS	20/09/2017	Mr A J Blakemore, G8FFN	12/08/2017
Mr G T Allen, G3JTK	8/2017	Mr A M Norrie, GM1MQE	25/08/2017
Mr D W Blakeley, G3KZN		Mr G Burt, GM3OXX	20/09/2017
Mr A Sedman, G3LAA	14/07/2017	Mr M J Mackinnon, GM4AJV	
Mr R C Evans, G3LQC	6/09/2017	Mr J L Davidson, GM4BVZ	1/07/2017
Mr G C Price, GW3MPP	11/08/2017	Mr J I Fraser, GM8MHU	2/08/2017
Mr D R Paice, G3MXK	26/08/2017	Mr D C Hyde, MODCH	
Mr A W Tomalin, G3PTB	02/08/2017	Mr A L Nesbitt, MOGSV	21/08/2017
Mr D Ashworth, G3SYA	2/05/2017	Mr J Bennet, M0IIE	6/07/2017
Mr C E Houlty, G3UHS	07/09/2017	Mr R Laight, M0PML	13/09/2017
Mr H R Christopher, G3VBI	17/08/2017	Mr S Whitfield, MJO5IT	1/08/2017
Mr G Bentley, G3XHB	28/08/2017	Mr K Wagner, OZ5WK	12/2016
Mr B Dodds, G3YRH	26/08/2017	Mr K Brown, RS96335	20/08/2017
Mr R C Perry, G3ZRP	1/09/2017	Col G Lyon, VK6LK	18/07/2017
Mr K W Turner, G4GZB	20/05/2017	Mr O A Wiesner, DJ5QK	30/04/2017

2.30pm with disabled visitors gaining access from 9.50am. Admittance is £2. There will be trade stands, special interest groups, a Bring & Buy and RSGB bookstand. A raffle will take place on the day. Catering is available on site. Information from David Beck, 2EODTC on 0777 766 4822 or by email to d.beck123@outlook.com.

## 19 NOVEMBER


## CATS 40th ELECTRONICS RADIO BAZAAR

Oasis Academy Coulsdon, Homefield Road, Old Coulsdon CR5 1ES

Doors open 10am to 1pm and admittance is £1.50. Car parking and disabled facilities are available. There will be a Bring & Buy and flea market. Catering will be available on site. Details from Andy Briers, G0KZT on 0772 986 6600 or email bazaar@catsradio.org.

## 26 NOVEMBER

## BISHOP AUCKLAND RAC RALLY

 Spennymoor Leisure Centre, 32 High Street, Spennymoor, County Durham, DL16 6DB

Venue has good parking, disabled facilities and a large ground floor hall. There will be the usual radio, computer, electronics stands and a Bring & Buy. Catering facilities and a bar are on site. Doors open at 10.30am (10.15am for disabled visitors). Admission is £2, under 14 free with an adult. Details from John, G4LRG on 01388 606 396.

## 14 JAN - Red Rose Winter Rally

## 15 APR - West London Radio &amp; Electronics Show

## 6 MAY - Thorpe Camp Hamfest (formerly Dambusters)

## 10 JUN - Junction 28 Radio Rally

## 24 JUN - West of England Radio Rally

## 4 NOV - West London Radio &amp; Electronics Show

## More National Hamfest photos (continued from page 48)



Camb-Hams' GB17NH aerials.



# HF F-Layer Propagation Predictions for November 2017

Compiled by Gwyn Williams, G4FKH

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Time (UTC)	3.5MHz	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	24.9MHz	28.0MHz
*** Europe								
Moscow	6651...35666	626432355346	1.4544452.11	1.55553...	65551....	2.2553.....	1.1221.....	111.....
*** Asia								
Yakutsk	32.....13333	1.1.1...31.4	2.....	.....	.....	.....	.....	.....
Tokyo	.....22222	3.3223212.	32122....	2.....	.....	.....	.....	.....
Singapore	.....22221	343222	2431....	331....	122.....	1.....	.....	.....
Hyderabad	2.....23333	3.....23333	.....331....	11231....	1221....	22.....	.....	.....
Tel Aviv	551.....5555	5551...35555	1.5322352.1	34443....	5444.....	2221.....	.....	.....
*** Oceania								
Wellington	.....2122....	355542....	355541....	13442....	232.....	1.....	.....	.....
Well (ZL) (LP)	.....	.....	.....	.....	.....	.....	.....	.....
Perth	.....1111.	.....34322.	.....431....	232....	22.....	11.....	.....	.....
Sydney	.....2111..	.....34421..	2443....	3431....	232.....	12.....	.....	.....
Melbourne (LP)	.....	3.....	32.....	12.....	1.....	.....	.....	.....
Honolulu	21.2....	32223....	112.2....	.....	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....	.....	.....	.....
W. Samoa	11.1....	34333....	13442....	232....	2.....	.....	.....	.....
*** Africa								
Mauritius	2.....2222	3.....33323	1.....32.1	12.....	1.....	.....	.....	.....
Johannesburg	31.....233	43.....3433	21.....23222	131....	1112....	1111....	1.....	.....
Ibadan	5551.....3455	55531.24555	525421235522	432333...	44334....	24442....	222....	1.....
Nairobi	33.....3333	442.....14444	2.31...241.1	21.23....	3221....	1.13....	.....	.....
Canary Isles	6665.....2566	666531125666	663543345644	211354455311	1232231..	11111..	.....	.....
*** S. America								
Buenos Aires	2222.....2	3324.....23	11.4.....11	2.....	1.....	.....	.....	.....
Rio de Janeiro	332.....13	4433.....233	22.3.....211	21...1...	11.11....	1.11....	.....	.....
Lima	2222.....1	2213.....12	.....	.....	.....	.....	.....	.....
Caracas	3333.....23	33.42.....133	13.....2..	12111...	221....	22.....	.....	.....
*** N. America								
Guatemala	2222.....1	22.32.....12	211.....	11.....	1.....	1.....	.....	.....
New Orleans	33331.....2	31.32.....3	1.1.....	21....	21.....	.....	.....	.....
Washington	44442.....23	43.432...1233	21122...	3223....	133....	31.....	.....	.....
Quebec	34431.....133	32.121.1223	1122....	2331....	33.....	1.....	.....	.....
Anchorage	1232.....	1.121...	.....	.....	.....	.....	.....	.....
Vancouver	22221.....1	2.11.....1	11.....	.....	.....	.....	.....	.....
San Francisco	22121.....	21.32.....2	.....	1.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	1.....	1.....	1.....	.....	.....

**Key:** The figures represent approximate S-meter readings, whilst the colours represent expected circuit reliability. **Black** equals low to very low probability, **Blue** equals good probability and **Red** equals a strong probability. No signal is expected when a '-' is shown. The RSGB Propagation Studies Committee provides propagation predictions on the internet at [www.rsgb.org.uk/propagation/index.php](http://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 November, December and January 2018 are respectively (SIDC classical method - Waldmeier's standard) 21, 20 & 19 and (combined method) 23, 23 & 24. The provisional mean sunspot number for September was 43.6. The daily maximum / minimum numbers were 119 on 5 September and 11 on 12 & 19 September.



**COMPULSORY CW****Richard Phillips, MOPHE**

Regarding Laurie Booth, G4XEC's letter about compulsory Morse – marine transmitters could not send Morse on 2182kHz. The 2MHz marine band was speech only and marine transmitters were not equipped to use WT on it. Marine transmitters were only equipped to transmit on the marine frequencies (500kHz et al/2MHz et al/4/6/8/12/16/22/25MHz) – not frequencies to which the radio amateur would be listening.

Also the diplomatic service/GCHQ had their own frequency allocations that were completely outside the amateur bands. So I suspect that this is another myth.

(I have a Marine Radiocommunication General Certificate GM/1313 and was 10 years a marine Radio Officer).

**Stephen G Small, G4HJE**

I note the commentary by Laurie, G4XEC and whilst he is quite correct that 2182kHz was a calling frequency for maritime communications it was for voice based emissions and not CW. 2182kHz was also designated as the international maritime voice distress frequency and silence periods of three minutes were set after each hour and half hour. 500kHz was the MF CW calling frequency and designated as the international CW distress frequency with three minute silence periods maintained at quarter past and quarter to each hour.

CW was deemed obligatory for radio amateurs using the HF bands to ensure the ability to receive 'polite requests' to move if interfering with commercial or military wireless operation that had priority.

I can well recall a time in the 1970s whilst serving on a frigate operating in the waters off Portland covering a submarine CW guard frequency that was within a band shared by my fellow radio amateurs. During my watch a G3 decided to call CQ and continued to do so despite my politely asking him to QSY. He acknowledged and promptly continued his calling. Fortunately the submarines' surfacing signal was received and acknowledged despite the continued operation by this particular G3. Missing that signal would have had significant operational impacts.

**CW TRAINING FUN****Graham Yoxall, MOCYX**

Just had some fun off the wall thoughts re CW training how about; CW Scrabble, same board but with Morse on the tiles. Or CW Battleships, same board but with a sounder and key on each side (for Scouts, etc, provide the Morse characters). And how about Morse I Spy? With a group, this would give pile-up training. This could be fun at that last meeting before Christmas.

**Ray J Howes, G4OWY/G6AUW**

Now, it's not really my wish to pour a bucket of cold water upon G4NPU's suggestion (CW training October 2017) to begin at 5wpm and then slowly increase the receive speed until the desired CW speed is reached. Although everyone is different, I still believe the easy way and the quickest way to succeed is to start off fast not slow. Start off, say, at 15wpm. This method ensures that the infamous 10 wpm plateau is consigned to history.

One more thing. Can I congratulate M6IEM (same issue) for ignoring the 'diehards' within our midst who still insist that DMR is not 'real radio'. Of course, DMR is real radio. Just the same as SSB was real radio when the AM'ers proclaimed that it wasn't. A few diehards said FM wasn't real radio once upon a time too!

**HELP WANTED****Tony, G3OVH**

I am volunteer at The National Museum of Computing. I went to the National Hamest on 28 September and bought a piece of WWII equipment off a flea market stall – an Undulator, used for creating human readable Morse and teletype recordings direct from FSK signals. In order to get this into the Bletchley archive I need some additional information on the provenance of this kit, bought from a trader from Northern Ireland. I was so excited to buy it that I forgot to ask him how he had acquired it. So if that person or anyone else knowing anything about it, sees this request, please get in touch with me, QTHR. This unit, GNT Undulator Model 310, was manufactured in Copenhagen, Denmark, by the Great Northern Telegraph Works, s/n 140421.

**JOINING COAX CABLE****Roderick Williams, GW8YPR**

Re page 101 in *RadCom* Sept 2017; letter by Robert Dancy, G3JRD regarding joining coax. The purists will no doubt have a lot to say on this matter and it cannot be denied that a neat joint using some kind of waterproofed pair of coax connectors look very good and are of textbook quality. However, for receive only I can see a more rustic approach is probably all that is required as long as it is waterproofed. I remember in the days of VHF broadcast TV,

waterproof tape was more often the norm to join two coax cables. Band I signals seemed virtually unaffected and Band III seemed to be reasonable to excellent if the transmitter was not too distant. Digital UHF TV (and above) may well be a different matter.

However, returning to the lower short wave amateur frequencies and transmitting as well, has any amateur done any experiments on deliberately made 'rustic' connections? I find it difficult to comprehend that pushing say 100 watts up two sections of coax cable with a joint in it might cause some havoc back in the transmitter even though the supposed 50Ω joint is sound. Or have I been reading too much gobbledygook written by purists? I have often been tempted to join coax with say plastic block connectors CB radio style (4 watts max) that worked or soldering the two inner cables together, insulated those then joining the two outer screens together and waterproof tape over that. Theory is fine but in practice can the rustic approach work safely? Surely there must be many jointed cable connections covered in tape, hidden under flowerpots or in jam jars in amateur radio installations that have worked for years.

*A CB enthusiast once asked me for help because "his new twig wasn't getting out". Investigation revealed short bits of coax at the radio and aerial ends, perhaps a bisected patch lead, joined via plastic block connectors to a remarkable length of bell wire. Replacing that arrangement with a single run of RG58 significantly improved matters for him.*

**Giles Read, G1MFG****RadCom Technical Editor****HELPED WITH EMPLOYMENT****Bob Houlston, G4PVB**

I concur with Peter, G3NBQ (VE7NBQ) *RadCom* October 2017: "certificates also helped me get the jobs". At my previous job, my manager confided: "I'm studying for the licence so when I saw your application form with: 'Radio Telegraphy'..."

At the company's annual dinner dance, I met even more licensed operators and the company even had its own callsign: G4MTL. It was a good working environment. So to all youngsters I say: get a licence... get a job.

**NEW ONLINE AMATEUR LICENCE****Eric Edwards, GW8LJJ**

Thanks to all that have commented on the letter New Online Amateur Radio Licence published in the September *RadCom*. It appears it has been taken a little out of context. The comments made by Ian Shepherd, G4EVK at the bottom of the article and by Laurie Booth, G4XEC in the October issue both refer to the reason why CW was necessary. I am quite aware why it

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was necessary but I did not ask that specific question. What I did question was, why it was the **only** requirement for obtaining the Class A licence as it was then. It seems that the main body of the letter was not commented on.

## TRAIN THE TRAINERS

David, MM9HQD

Saturday 2 September was a glorious sunny day near Loch Lomond where 25 or so GM hams came together to be trained by four people from the RSGB Train the Trainers team: David, G0EVA, Alison, M6COV, Derek, G7LFC and Steve, G0EAK.

We began at 9.15am and finished at 5pm and not once did I nod off. The material was well presented, with great hints and tips along the way from teachers that care – and happily share. Of course it wasn't all perfect, we're radio amateurs and, hey, technology often plays up, But WOW! Overall, I thoroughly enjoyed the day and learnt much. So thanks RSGB!

I was grateful to benefit from this RSGB event and hope that this great resource – and the RSGB – will continue to be well promoted around GM land. OK, I must away... I've got some Foundation lesson plans to write up (thanks Ali) and put into practice.

*We are pleased you found this training useful. Look out for more sessions in other areas in the coming months.* **Steve Thomas, M1ACB, General Manager.**

## FORGOTTEN ANTENNA LORE

Paul Billingham, MOKIA

I just wanted to say thank you to Bruce Edwards, G3WCE and the RSGB for publishing his article in *RadCom*, (September 2017), in regards to basic wire antennas. At a time when the hobby of amateur radio has progressed immensely, even in recent years, and the ways of sending and receiving information via radio have expanded to undreamt of ways and modes, this article was, in my view a breath of fresh air in revisiting how simple the hobby can be. I thought that Bruce's article was one of the most enlightening articles I have read in *RadCom* for some time.

I fully realise that the Society has a hard job in producing a monthly magazine that has something for everyone in a hobby that has become so vast and far from my earliest idea of amateur radio. That said, whether we are a

Foundation, Intermediate or Advanced licence holder, the basic licence privilege is to be able to experiment with radio communication within your licence limitations. Having built many end feds, dipoles and doublets in my few years in the hobby, I realise how much about radio and propagation can be learnt from these simple types of aerial, something which can only be learnt by giving it a go.

Having read the update in October's *RadCom* of how the new exam syllabus is taking shape, I can only agree with the findings of this committee. That said whilst there are new modes and new ideas that must be acknowledged and some new study included in each licence level. I am concerned that in trying to include a bit of everything and adding more to the syllabus there may be the danger of moving far away from how simple the hobby can be.

Whilst change is good and also inevitable, perhaps the Society could do more in promoting what is basic radio, especially to newcomers to the hobby. The joy of intercontinental communication on HF, or even a good old rag chew on Top Band or 80m is not only possible, but cheap and, in my humble opinion a good basis for learning.

My current 80' of SOTAbeams stealth wire and counterpoise has enabled QSOs as far as the Philippines and the South Sandwich Islands. All this for what equates to pence for an antenna and a few quid spent at rallies on the bits and bobs required to build an antenna match. The most technical piece of kit I own is a 50 year old grid dip oscillator. I realise there is a *RadCom Basics*, but feel the basics are not being promoted anywhere near enough with the potential that some may miss out on a fascinating and rewarding part of the hobby.

## PRICING AT RADIO RALLIES

C J Osborn, G3XIZ

Each year I attend several radio rallies and have done so since the 1960s. I must have spent thousands of pounds over that period, mainly on discrete components as I'm a keen constructor. For the past few years I've been becoming quite annoyed at the lack of displayed pricing.

At my last rally I found a variable capacitor on one stall that would have been ideal for my current project but no price was shown on that or any other item. The stall-holder was deep

in conversation with an old friend, whom he presumably hadn't seen for at least 30 years, so I had a long wait before I could ascertain the price of the said capacitor. He wanted a ludicrous sum for it (the capacitor doubtless being made from solid gold, insulated with myrrh) so my time spent waiting was entirely wasted. A simple label on sale items showing the price would save me and others much wasted time and frustration.

In future I shall avoid any stalls where the prices are not shown.

## THE RACE TO OBLIVION?

Francis P Donovan, G4ALD

I am growing tired of calling many CW DX stations, whom I hear calling CQ on the HF bands, only to be confronted with a terse 599 at around 28wpm. No name, location, or any information that would make the effort worthwhile! After a far from standard sign-off, the said station will then resume calling CQ at ridiculous, obviously machine speeds, looking for other stations to consume in the same cold, robotic manner!

Whilst one has come to accept this frantic pace in contests, it seems a shame that it is becoming mainstream. Indeed, it is a refreshing change these days when one seems to actually generate a meaningful conversation that lasts more than thirty seconds.

Just this evening, I was tuning around 20m and heard a W calling CQ. I replied, and was pleased to receive an immediate report (599, even though he was only 579 – another meaningless trend). However, nothing more was received at this point, before my reply was due. After sending the correct callsign exchange, I gave his report, my location and my name. Upon handing over to him once more, there was 73, and then more CQs. One almost feels apologetic and regretful, having interrupted his flow. Shortly after this, I worked a PY station. Exactly the same response.

Is this the future of our communication abilities? Are we now supposed to consult websites such as QRZ.com to fill in the blanks? If this is a sample of what is to come, we may as well hand over to the machines, and go out for the evening!

## PRAISE FOR EXCELLENT SERVICE

Phil Davidson, G0DOR

After 5 years of sterling service my G3LIV traveller Isoterm data interface started acting up. An email to Johnny Melvin explaining the fault got a speedy response asking for it to be returned. An unusual fault was found that prompted Johnny to replace the board free of charge – including postage. And all this in the space of 4 working days! Thanks Johnny.

PS: I did make a decent donation to my chosen charity.



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Sunday 4th Nov.  
8am - 3pm.

*We're open Sunday the 4th of November from 8am until 3pm. That's the same day as Kempton Park Rally & since we are only twenty minutes away from the show, it seemed daft not to open. I've told Richard my Sales Manager & the team to sharpen their pencils even more than usual because I want to see you dragging your new toys out of the store with HUGE grins on your faces. Better still, "admission", parking and cups of TEA & COFFEE are FREE!*