Radio Society of Great Britain
Advancing amateur radio since 1913

RadCom

Amateur radio goes geostationary

Es'hail-2 opens new frontier of amateur satellite communications

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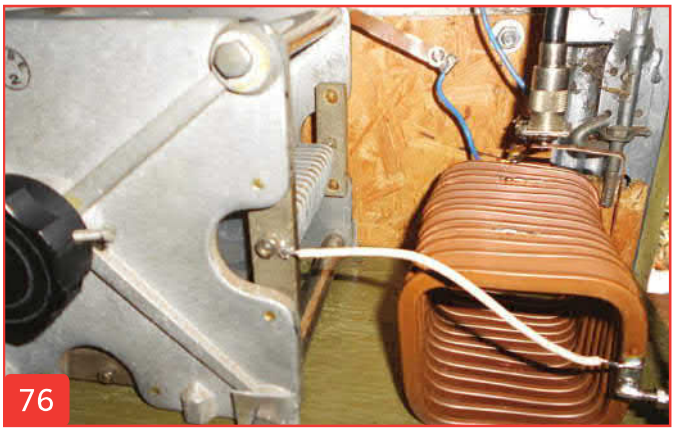

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Cover image courtesy of SpaceX.

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

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RadCom is published by the Radio Society of Great Britain as its official journal and is sent free and post paid to all Members of the Society. **The February 2019 edition of *RadCom* is expected to arrive with most Members by 25 January 2019** although this can take up to a week longer in some cases; international deliveries can take longer still.

All material in *RadCom* is subject to editing for length, clarity, style, punctuation, grammar, legality & taste. Articles for *RadCom* are accepted on the strict understanding that they are previously unpublished and not currently on offer to any other publication. Unless otherwise indicated the RSGB has purchased all rights to published articles. No responsibility can be assumed for the return of unsolicited material. See tinyurl.com/radcompix for info on taking photos for publication.

The online *RadCom* is at www.rsgb.org/radcom/
RadCom Plus is available to RSGB Members online at www.rsgb.org/radcom-plus
RadCom Basics for Members new to the hobby can be found at www.rsgb.org/radcom-basics/
Abbreviations and acronyms we use are listed at http://tinyurl.com/RC-acronyms

The RSGB is on Twitter @theRSGB

Find us on Facebook at www.facebook.com/theRSGB

Diversity in amateur radio

'But that's not real radio!' It's not a new cry directed at FT8, DMR or Network Radio, but much older than that and often made whenever someone practices a version of amateur radio different from theirs. I suspect there were similar cries when SSB was first introduced, and before that AM by the CW diehards. Radio amateurs are an inventive bunch, but paradoxically many don't like change and are set in their ways.

In the UK we are blessed with large allocations of spectrum and there are many different modes and frequencies we can experiment with. Yet many radio amateurs never stray from their preferred version, often established early in their amateur radio journey. 'Use it or lose it' has been voiced many times in the past and generally ignored as scaremongering. Ask yourself this, what is the justification for having all this spectrum if we just use a tiny part of it on a limited number of modes and frequencies?

The recent 147MHz allocation was granted on the basis of promoting innovation and not just 'more of the same', with some success. At Ofcom's request, the RSGB recently demonstrated to the business radio user community one of those innovations, reduced-bandwidth amateur TV. Traditionally this type of application has been a heavy user of radio spectrum and is another example of innovation, developed by radio amateurs, which has the potential for commercial use. Whilst not necessarily everyone's cup of tea, FT8 is another amateur radio-inspired innovation that shows that communication can be possible even under adverse band conditions. It is a useful tool as part of our repertoire of communications modes and is most definitely every bit as much 'real radio' as our traditional modes.

As part of the RSGB's Strategy 2022 priority for Diversity, a number of YouTube videos featuring different aspects of amateur radio have been published and are receiving regular large audiences. Through collaboration with special interest groups these videos have been created to promote and encourage amateur radio diversity by showcasing what's available. You may be surprised how much is. You can enjoy these at https://rsgb.org/video

Home construction is another key objective towards encouraging diversity in amateur radio and, at the 2018 National Hamfest, we held a very successful Buildathon for inexperienced constructors. It is hoped that this will be the first of many similar events that will help promote and support this aspect of amateur radio.

An RSGB awards scheme aimed at newly-licenced radio amateurs will be introduced during 2019. Delivered through registered clubs, it is designed to support and encourage those newly-licenced amateurs to enjoy the hobby to its greatest extent. It is also intended to nurture those individuals wishing to progress on their journey at any level from Foundation through to Advanced and beyond. This will be complemented by another initiative that will consist of a wide range of self-administered tasks aimed at furthering knowledge and breadth within the hobby.

During 2019 I hope to get out of my usual amateur radio comfort zone, to try something different and enjoy more of amateur radio's rich tapestry of modes and frequencies. I hope you will join me.

If you have an idea to help encourage diversity in amateur radio, I would love to hear from you. You can email me via gm0onx@rsgb.org.uk

Priorities for 2019

- Continue to build the catalogue of special interest videos. Requests for particular subjects are welcome.
- Closer working with special interest groups – supporting the appointment of the RSGB National Affiliated Societies Honorary Officer. Simon Taylor, MW0NWM will be working towards closer relationships with the diverse interests of all specialist groups in order to promote interworking, collaboration and building shared cases for mode and frequency use.
- Support and develop further Buildathons and similar practical skills events.
- Recognise the wide diversity of interest within amateur radio and avoid criticism of specialism. Over many years it is those specialists who have given us many of the technically-rich opportunities that make amateur radio of interest to so many today: SSB, DMR, FT8, NBFM, NBTV and many others.

Len Paget, GM0ONX
Board Member

Continuing priorities

- Through the Spectrum Forum and regular dialogue with Ofcom, continue to present evidence of experimental and novel research by radio amateurs in more efficient use of our allocated radio spectrum.
- Continue to take up opportunities of presenting to the wider public the rich skillset within amateur radio. Many of our volunteers are working within Government, regulatory or advanced commercial, scientific fields.
- Develop our influence within STEM (Science, Technology, Engineering and Maths) – linking our skills with those of the National Curriculum and the wider personal development opportunities of amateur radio.

Regional and Board elections 2019

This is the time of year when we call for volunteers to step forward for election at the AGM.

The 2019 AGM will take place at Jurys Inn in Birmingham on 27 April 2019. The Society is run primarily by its Members and we need volunteers who are willing and able to give their time and enthusiasm to keep the wheels turning. This is an exciting time at the RSGB because we now need to devise and deliver new initiatives to implement Strategy 2022. Mark Jones, G0MGX describes his experiences in his first year as a Director, and explains why it is important that people volunteer to help the Society progress.

In 2019 we will be looking to appoint two elected Board Directors, two nominated Board Directors and ten Regional Representatives (RRs).

The elected Board Director vacancies are as a result of two Directors reaching the end of their three-year term – neither is eligible to stand for re-election as both will have completed two three-year terms.

The Nominated Director Board vacancies are as a result of a resignation and a Director reaching the end of his three year term. Notice of these vacancies was given in the October and November *RadComs* and it is expected that the AGM will be asked to endorse two candidates for these roles.

Ten Regional Representatives vacancies also arise due to the current post holders completing their three year terms, or because they were co-opted into a vacancy after the last AGM. Philip Hosey, MI0MSO describes his experiences as Region 8 Regional Representative and explains why it is important that people volunteer to help the Society progress. Whilst several Regions have RRs who are willing to stand for re-election, **applications are welcome from all RSGB Members living in the Regions with vacancies.**

- **Region 2** – Scotland North & Northern Isles (Martin Krawczyk, 2M0KAU is currently co-opted)
- **Region 3** – England North-West (Kath Wilson, M1CNY is the current RR and is willing to stand for re-election)
- **Region 4** – England North-East (Ian Douglas, G7MFN is the current RR and is willing to stand for re-election)
- **Region 6** – North Wales (John Pritchard, MW0JWP is currently co-opted and is willing to stand for election)
- **Region 8** – Northern Ireland (Philip Hosey, MI0MSO is the current RR and is willing to stand for re-election)
- **Region 9** – London & Thames Valley (Tom O'Reilly, G0NSY is the current RR and is willing to stand for re-election)
- **Region 10** – England South and South East (Keith Bird, G4JED is currently co-opted and is willing to stand for election)
- **Region 11** – England South-West & Channel Islands (Martin Sables, G7NTY is currently co-opted and is willing to stand for election)
- **Region 12** – England East and East Anglia (Peter Onion, G0DZB is currently co-opted and is willing to stand for election)
- **Region 13** – England East Midlands (Jim Stevenson, G0EJQ is the current RR and is willing to stand for re-election)

Nominations for elected Board Directors require the support of 10 Members. Nominations for the RR vacancies require the support of 10 Members who reside in the relevant Region.

Information about the election vacancies, together with nomination forms, are available on the Election page (www.rsgb.org/nominations) or the nominations form can be obtained by post from the General Manager at RSGB HQ.

Candidates need to download, complete and post their candidate forms to the Company Secretary via HQ (an email copy is also helpful).

Nominators – the nomination process is now online. Candidates are given personal URLs and if they wish you to nominate them they will approach you directly. Know someone who would make a good Board Member or RR? Why not ask them to consider standing.

Completed papers, with their supporting nominations must be received by 2359 hours on 31 January 2019.

Volunteers are not paid but out-of-pocket expenses are covered.

If anyone has any questions about the elections or would like to discuss the roles, please contact Board Chair, Ian Shepherd, G4EVK, for the Director vacancies, via email to g4evk@rsgb.org.uk, or Philip Hosey, MI0MSO, for the Regional Representative vacancies, via rr8@rsgb.org.uk. Enquires can also be made to the RSGB Company Secretary, Stephen Purser, GW4SHF via company.secretary@rsgb.org.uk.

Stephen Purser, GW4SHF
Company Secretary

Why you should consider standing for RSGB Board – my perspective after a year on the Board

I had always wanted to put something back into the hobby of amateur radio. Having been licensed since I was 14 years old, the RSGB and the hobby in general have had quite a significant influence on my life and career.

Back in 2013 I became a deputy to one of the RSGB Honorary Officers (HO); that role progressed and I moved into the full HO role in 2014. After 5 years I was quite familiar with some aspects of the RSGB and it seemed that it might be that I could add some value to the RSGB Board. As a chartered IT professional in a customer facing role I thought that some of my skills might be of benefit to the organisation at a higher, more strategic level.

I sought some advice from several RSGB Members, achieved the required nominations and successfully stood for election as a Director at the 2018 AGM. I genuinely believe that our hobby has a huge amount to offer in the future and the strategy that the RSGB follows and how it implements it is key. I am very grateful to be able to form part of the team that steers this ship and hope that I can make a difference.

Being involved in the management of a primarily volunteer organisation brings is own unique challenges; some of which are unprecedented when compared to my professional career. However, seeing results brings me a great deal of satisfaction and I have already made several significant achievements in my role as a RSGB Director.

I published a set of objectives against my allocated key strategic aim "Growth" in the October 2018 *RadCom*. In support of these objectives I have so far helped deliver:

- The first "buildathon" held at the National Hamfest aimed at novice constructors
- YOTA camp
- YOTA month for December 2018
- Development and promotion of a scheme to help individuals on their amateur radio jurney (due for launch mid-2019)

If you think you have a set of skills that would be of benefit to the RSGB, enjoy a unique challenge and have time to spare, then please step forward and find out more.

Mark Jones, G0MGX

Why should you consider standing as an RSGB Regional Representative?

In 2013 I was elected as the Regional Manager for Region 8 (Northern Ireland) since then I have seen many changes in the Society and I have to say, in my experience, these have been positive changes. To be part of those changes has been challenging at times, but in saying that, it has been a rewarding experience at the same time.

Volunteering lets you put something back into the very diverse hobby that amateur radio is. It was only by volunteering for the RSGB that I discovered how diverse it is, by meeting skilled dedicated and knowledgeable volunteers in the Regional Teams and other volunteer leaders in the Society.

Regional Representatives, as we are known as since the 2018 AGM, meet in person with those other volunteer leaders and senior HQ staff as the Volunteer Leadership Team (VLT) three times a year. We also meet regularly via Skype as a Regional Forum (RF). Meeting as the RF and VLT gives us the opportunity to have the views of the amateur community heard by providing a conduit to share news, problems etc and, in doing so, gives us a way of keeping in touch with what is going on. It also lets us help develop the future of amateur radio in the UK and deliver on the Society's strategic goals.

As a Regional Representative, you will be the main contact between the amateur community and the Society in one of the 13 Regions. Along with a team of District Representatives you will have the opportunity to use your skills, experience and passion to have an active and thriving amateur radio community in your region.

So to get back to my question "Why should you consider standing as a Regional Representative?"

- To give something back
- Share your knowledge and skills
- You're passionate about amateur radio
- Like a challenge
- Want to make a difference
- You have dedication

If any of the above points define you, then the RSGB needs you.

Philip Hosey, MI0MSO
Region 8 Regional Representative

Direct/OQRS/Clublog/Logbook of The World, Bureau to GM4FDM.

EP6RRC – Iran

Managed by R7AL. Clublog/Direct requests to PO Box of EU7A.

VP6D – Ducie (USA address)

Logbook of The World & OQRS at VP6D. Page managed by ZL1NA. No cards mailed from USA, all cards processed and mailed from UK. $5 mailed anywhere.

VK9XG – Christmas Island

QSL via G3TXF. Use OQRS to request/Bureau/direct. Do not send us your card. This shows that there is no longer one single route to confirming a contact. Most of these actually don't wish to receive a card, due to the volume of contacts made. They are happy to either confirm the contact electronically for award purposes, or respond to an online (or in one case a direct postal) request for a card.

Some information may seem confusing where QRZ pages are managed by a different callsign from that of the QSL manager and none of the activators are resident in the country prefix. With so many DX locations now being activated, it's extremely difficult for any bureau to keep track of where to send outgoing cards. This is made harder where the activity is not recent, or there is no routing on the card, no bureau available, or the web information is not current. What is clear is that *'check before you send'* has never been more important to avoid disappointment if you want that prized QSL card for your collection.

Sub-manager information: Details of the sub managers for the new M7 and GD/MD/2D series is now available on the RSGB website. For some time, DRR Mark Stevenson, MW6KZJ has been caretaking the MW-2W series of callsigns, but now he needs to step back due to a change in work commitments. A permanent sub-manager in Wales is required to handle this active and growing group of calls. If you love cards, have time, space and some basic spreadsheet knowledge please email qsl@rsgb.org.uk for information on how you can help.

New cards from Canada: A further and large batch of interesting cards has recently arrived for the 150th anniversary of Canada's Federation in 2017 and is now being processed (see photo). To avoid disappointment, please remember to keep your sub-manager well supplied with collection envelopes, as cards are only held for 90 days before being recycled.

National Club of the Year 2018

In a change from last year, the RSGB will be judging entries in a single category regardless of club membership size. The judges want to learn about the special events that your club has run and details of other outreach activity and initiatives that you have undertaken to promote our hobby. Please use the entry form at http://rsgb.org/main/clubs/national-club-of-the-year/ to enter, which must be sent to your Regional Manager by 25 February 2019.

Once again, we are indebted to Waters and Stanton for their generous sponsorship of this competition.

In order to determine regional winners, entries will be judged and ranked by a Regional Manager from outside of the Region to ensure impartiality. These winners will be announced at the RSGB AGM on 27 April in Birmingham.

The RSGB Board will judge the National winners, which will be announced at the National Hamfest in September.

Convention talks online

Two more 2018 RSGB Convention talks are now on YouTube: *Using drones to measure antenna radiation patterns* by Jenny Bailey, G0VQH and *An Introduction to SDRs and GNU Radio* by Heather Lomond, M0HMO. Two others are available on the Members' section of the RSGB website: Don Greenbaum, N1DG talks about the *KH1/KH7Z Baker Island DXpedition* and Bo Hansen, OZ2M lectures on *P14, the digital mode for beacons, and why it is a success*. To view the videos go to www.rsgb.org/videos. All the 2017 Convention lectures are now on YouTube.

Spectrum Forum reports

The reports, presentations and minutes from the recent RSGB Spectrum Forum annual meeting are now available. This year there was a particular focus on the latest state of preparations for the 2019 World Radio Conference and developments in new digital modes. The reports are online at www.rsgb.org/sfmeeting2018

Diary dates – RSGB AGM

The 92nd RSGB AGM will be held on 27 April 2019 at Jurys Inn, 245 Broad Street, Birmingham B1 2HQ. The Society has decided to dispense with publishing its audited report and financial statements in *RadCom*. The pages that become available as a result of this decision will be used for other articles. The audited report and financial statements for the year ended 31 December 2018 will be available on the Society's website from 1 April 2019. Printed copies of the financial statements will be available at the AGM and on request from the General Manager, RSGB HQ, 3 Abbey Court, Priory Business Park, Fraser Road, Bedford MK44 3WH. The audited financial statements will also be available from Companies House.

TX Factor

TX Factor is the only UK TV show dedicated to amateur radio and Episode 22 features two new radios, the Yaesu FTDX101 and the Icom IC-R8600 receiver. Pete, M0PSX visits the 2018 RSGB Convention. Graham Shirville, G3VZV has an update on the latest news from AMSAT, including what to expect when the geostationary satellite Es'hail-2 is in full operation. Bob, G0FGX ventures into the controversial world of Network Radio! There is another free-to-enter draw with a bundle of radio-related items to win.

TX Factor is sponsored by the RSGB and Martin Lynch & Sons, and is also supported by viewer donations. TX Factor is free to watch across all platforms and Smart TVs. See txfactor.co.uk for more information.

RSGB SHOP

NEW

RSGB EUROPEAN LOCATOR MAP

If you are looking for something to grace the wall of your shack but also offers much more, then the RSGB European Locator Map could be for you.

This high quality Locator map is offset printed onto a thick 150gsm paper and contains all the features you would expect of this type of map. There is the usual QTH grid (Maidenhead) locator system covering Europe and a worldwide grid inset. You will see the various country prefixes which are easy to pick out at a glance and for extra reference large cities are also depicted. The also a European DXCC table picked out with country flag which provides a checkbox f bands worked 6m, 2m, 70cm, 23cm & UHF. There are also other useful features such as a meteor shower calendar and a 2m & 70cm beacon list.

Delivered in a sturdy postal tube these large maps are 590x980mm and the ideal addition to any radio amateur shack.

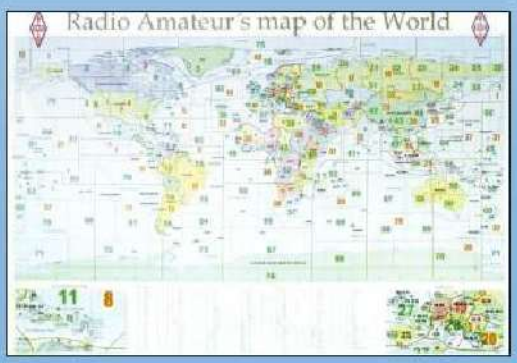
Non Members' Price £8.99
RSGB Members' Price £6.74 (25% OFF)

Members Only Offer
RSGB Map Bundle Buy Both for
Only £10.99

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.

980mm wide by 680mm tall (approx 38.5"x 27")
1: 42,000,000 scale.
Non Members' Price £8.99
RSGB Members' Price £6.74 (25% OFF)



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

Volunteer Leadership Team meeting

The Volunteer Leadership Team (VLT) comprises the Regional Representatives (our link to clubs and Members), the Committee Chairs and Honorary Officers (our specialists on topics relevant to amateur radio), as well as the RSGB Board and senior HQ staff. Its purpose is to engage the volunteers and staff in implementing the goals from Strategy 2022 (more can be found at https://rsgb.org/strategy). The VLT meets three times a year with each meeting focused on a couple of subjects. Groups work together to formulate, promote and review these selected subjects to deliver the Society's goals.

The VLT met in mid November to discuss two subjects: DoRA (Directory of Resources and Advice), which is being developed to provide online easy-to-access content on topics often raised by Members; and two new schemes, aimed at promoting progression and diversity within the hobby.

The meeting split into five groups, each containing a mix of staff, representatives and specialists present to work on these items.

On DoRA they considered the initial topic list compiled from VLT Member proposals, and identified the gaps in topics and suggested the priority for implementation. Owners were also nominated for each topic, ie who would be responsible for preparing and updating the information. A separate project team will now be set up to oversee the implementation of DoRA, which will initially be launched in March 2019.

Presentations were given about the new two schemes. VLT Members then prepared suggestions for promoting them to clubs, Members and the amateur radio community as whole, as well as providing further suggestions of activities. Material will now be prepared for their staged launch later in the year.

The next VLT meeting will take place in March 2019.

UK Spectrum Policy Forum

The RSGB recently had the opportunity to represent radio amateurs in a presentation to the UK Spectrum Policy Forum (SPF). Graham Murchie, G4FSG made a presentation and led the subsequent discussion on behalf of UK radio amateurs. The main objective of the SPF (managed by the TechUK industry association) is to harness industrial insights across the diverse range of spectrum users on the future developments in spectrum-based services and technology. The current phase is reviewing the social and economic aspects of spectrum use. This was a follow-up to the submission in June 2015.

Whilst it is recognised that amateur radio, by definition, does not necessarily contribute significantly to the economic use of the spectrum, the presentation focussed on the shortage of practical skills in the radio arena in the UK and gave examples of where the RSGB is encouraging development of the scarce skills and using them to good effect.

The session was the latest in a series of presentations by different spectrum users including mobile operators, MoD, broadcasters etc. It is vital to the Society that we are seen to be contributing to the wider debate around spectrum use.

Steve Thomas, M1ACB and Murray Niman, G6JYB were also present and contributed to the debate.

The summary of all presentations will be presented to the Department of Culture, Media and Sport over the next few months. The presentations are available at https://tinyurl.com/ybpnnwav

Congratulations

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

60 Years

Mr R G Dobdinson	G3RGD
Mr P L A Burton	G3ZPB

50 Years

Nunsfield House ARG	G3EEO
Mr G B Laycock	G3XWN
Vange ARS	RS123408
Mr S Atkinson	G3YPS

The RSGB welcomes to the RSGB family the following new Members who have joined their voice to ours, helping to keep the RSGB strong.

Mr J Bryant, 2OYEY
Mr B Chandler, 2E0GNC
Mr J Milner, 2E0IEW
Mr G Lund, 2E0NZA
Mr P Carne, 2E0PJC
Mr M Clifford, 2E0RBH
Mr J Mottram, 2E0SEY
Mr M Carus, 2E1HNK
Mr O Wood, 2E1HWE
Mr K Henney, 2EDMQ
Mr A Williams, AG6MW
Mr D Bristol, AG6VX
Mr F Edart, F5EMR
Mr J Chandler, G0JNN
Mr S Parkes, G0WXP
Ms C Howard, G1COE
Mr P Cork, G1GTX
Mr R Brown, G1LXY
Mr D Traynor, G1URQ
Mr A Course, G4HND
Mr I Bateman, G4SBC
Mr R Upton, G7AYB
Mr B Kagelmacher, G7RAY
Mr T O'kavanagh, G8XRX
Mr P Clarke, GD1JNB
Mr G Taylor, GW7GWT
Mr F Grisafi, IT9GSF
Mr J V Owen, KB7GL
Mr J Roman, KD2ETX
Mr M Young, KJ7BFE
Mr B Palmer, KT4ET
Mr L Andrews, MOLLX
Mr R Jolly, MORJL
Mr D Lodwig, MOVDL
Marsham ARS, MOVFT
Mr N Byng, M1CFK
Mr T Malkin, M3VTI
Mr D Chadwick, M6GOX
Mr C Emery, M6LKN
Mr M Quinn, M6PNF
Mr P Hutchinson, M7AAZ
Mr S Dearne, M7ABC
Mr A Hill, M7AGH
Mr P Rollason, M7AOR
Mr T Piechowicz, M7DGT
Mr. D Pitty, M7DLP
Mr J Mcdonald, M7JMC
Mr J Nichols, M7JZN
Mr W Bevan, M7WBB
Mr E Berrisford, M7WHO
Mr M Howard, M7WWT
Windmill AR DX G, MXOISJ
Mr S Hutchison, N6JJA
Mr P Stoetzer, N8HM
Mr T Dickson, NF1F
Mr L Leon, OA4DQA
Mr P Hernaelsteen, ON5AV
Mr J O Soerensen, OZ8SO
Mr R Bryce, RS320081
Mr J Bradshaw, RS320142
Mr J Howes, RS320144
Mr S Brock, RS320192
Mr G Gray, RS320198
Mr B Scelina, RS320203
Mr J Nisbet, RS320218
Mr R Coomer, RS320284
Mr E Coomer, RS320306
Mr A Dyke, RS320307
Mr J Fisher, RS320309
Mr O Williams, RS320375
Mr S Scorer, RS320393
Ms S Evans, RS320466
Mr N Winchcombe, RS320497
Mr S Williamson, RS320597
Mr R Moyse, RS320622
Mr R Kilner, RS320623
Mr O Loof, SM2DCU
Mr M Stubbs-Race, VK2ASR
Mr P Hutchings, VK4PG
Ms M Geissinger, WA0SPM
Mr G Marks, WD8ICX

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

Mr P Sands, 2E0WDK
Mr A G Weatherall, 2E0WGA
Mr D Mudd, 2I0CGZ
Mr J Edwards, G0MJZ
Mr R S Gibson, G4WGR
Mr J Read, G4WWS
Mr N Bancil, G6KKD
Mr D Robinson, G7EHY
Mr D A Cripps, G7IDB
Mr WP Miller, G8ESL
Mr V Benney, G8MUQ
Mr R Finch, GD4RFZ
Mr H J White, K1RSA
Mr K L Ketner, KA5ELD
Mr R Bell, M0GMG
Dr M Roe, M0GXM
Mr J Keefe, M0JDK
Mr T Balls, M0TAR
Mr G D Mate, M3BSF
Mr D Watkins, W7JX

New Products

Choke balun

Nevada is now importing the new common mode filter choke from MyAntennas USA. The CMC-130-3K choke balun has a patent pending and provides up to 41dB of resistive values of common mode choking impedance from 1.8 to 30MHz. The choke is ideal for curing RFI/EMI problems, whilst also helping to suppress noise pickup on the coax. The balun is constructed using high quality SO-239 PTFE (Teflon®) connectors and PTFE (Teflon®) insulated coaxial cable and can handle up to 3kW of RF power. The CMC-130-3K sell for £89.95 and is available fromNevada Radio; see www.nevadaradio.co.uk or phone 02392 313 090.

GroundBreaker

bhi has recently launched the GroundBreaker. It was developed to solve an issue that some amateur radio enthusiasts encounter as a result of connecting ancillary equipment to their radio transceiver. RF breakthrough and earth loop current issues tend to happen when a transceiver is in transmit mode (keyed). You will hear a buzz or your own distorted voice coming out of the audio. The two main reasons are a poorly matched antenna that results in RF being reflected back into the radio room or a difference in ground currents between pieces of equipment. Radio Frequency Interference (RFI) issues are usually caused by reflected waves coming back down the outside of the coax whilst earth loop problems are usually caused when the same power supply for the radio and 'add-on' audio equipment is being used. The bhi GroundBreaker is a quick and easy solution for this issue as it isolates the grounds of your external audio equipment from those of the radio system and prevents ground loops and associated RFI problems from getting into your audio. It is easy to install and simply fits in between your radio and audio equipment. Connections are 3.5mm mono or stereo and no extra leads are usually required. There are six versions available to match most impedances: 8Ω mono or stereo, 600Ω mono or stereo and 10kΩ mono or stereo, all priced at £29.95. All versions are available from bhi Ltd at www.bhi-ltd.com, 01444 870 333 or one of their authorised stockists.

Suction clamps

Campsites can give the perfect opportunity for some portable radio operating but using a mast within the constraints of a typical site pitch can be difficult. SOTABEAMS has overcome this problem with the introduction of their suction clamp kit. The kit consists of two specially selected suction clamps, a plumb line, hook and loop tape and a 22mm adapter. The clamps can easily be attached to the sides of a caravan or motorhome and provide a firm support for a mast.

Priced at £29.95, full details can be found at www.sotabeams.co.uk

GM3SEK Control Boards

Over the past 20 years, Ian White, GM3SEK has supplied more than 2000 control boards to builders of triode and tetrode power amplifiers around the world – a quiet success in a specialised market, with amateur and commercial customers from Alaska to Antarctica. However, all products eventually reach the end of their design life and some components are becoming difficult to find, so Ian is planning to 'retire' the Triode Board and Tetrode Boards by the end of 2019.

A major feature of these boards has always been the long-term technical support, direct from the designer, which will continue even after the products are no longer on sale. True to that policy, GM3SEK is giving almost a year's notice of the product withdrawal so that customers can plan accordingly.
For further details, please see https://tinyurl.com/gm3sek-boards

Heil receiver amplifier system

Waters & Stanton has now received the first delivery of the new Heil Parametric Receiver Amplifier system. This comprises an amplifier and active speaker. Whether you have a hearing problem or just want to improve your received audio, this unit promises to deliver something a lot better than you are likely to achieve with the simple built in amplifier and tiny speaker installed in most equipment.

The unit is priced at £469.95 including VAT. Go to www.hamradiostore.co.uk for more details.

Es'hail-2 launch

Following the successful launch on 15 November of Es'hail-2 on board the SpaceX Falcon 9 launch vehicle, Mitsubishi and Es'hailSat have begun the In Orbit Testing (IOT). The testing phase will take a few months, during which time the amateur radio payload will not be turned on and AMSAT-DL will be commissioning the amateur transponder ground station in Dohar. Once IOT is complete, the satellite will be moved to the final orbital slot at 26° East and there will be an announcement by AMSAT-DL when the transponders are available for use. Before this announcement, no attempt should be made to use the transponders as any interference to the test programme will delay the release and, if excessive interference is seen, this may cause the satellite owners not to make the facility available for amateur use. See p72 for more on Es'hail-2. Photo kindly supplied by DH2VA.

Exercise Blue Ham

Over the weekend of 13/14 October, the UK Cadet Forces ran Exercise Blue Ham on the 5MHz (60m) band, with '100' added to the callsign to celebrate 100 years since the formation of the Royal Air Force. Units from the Army, Sea, Air and CCF Cadet Forces applied for a unique callsign for use during the exercise period that had a prefix of MRE with numbers and a letter added that corresponded to their location in the UK. Around twenty stations were operational over different periods of the weekend. This provided amateurs with 'special short period' callsigns to hunt down. It caused some pileups at times, which gave the young operators some interesting QSOs with amateurs being patient until they got called. For those who logged 10 or more contacts during the exercise, a Certificate can be claimed from the Ex Co-Ordinator (https://alphacharlie.org.uk/exercise-blue-ham). So far 30 certificates have been issued. Operating conditions at times during the exercise were challenging due to QSB on the band, this raised some questions from the Cadets as many had not experienced this happening before when using VHF or UHF locally at their Units. It is worth noting that Cadets who operated the radio and logged calls during the exercise can use it to achieve the HF element of their Foundation licence.

More countries on 5MHz

The Indian Government's Telecommunications regulator has published a 2018 Update to the Indian National Frequency Plan, effective 25 October, which lists new bands at 5MHz/60m, 472kHz/630m and 136kHz/2300m. 5,351.5–5,366.5kHz Secondary use, 15W EIRP; 472–479kHz Secondary use, 1W EIRP and 135.7–137.8kHz Secondary use, 1W EIRP. The regulations follows current ITU criteria for these bands.

The latest update to the Montenegro National Frequency Plan from the country's telecomms regulator, EKIP, lists a new band at 5MHz/60m, 5351.5–5366.5kHz with 15W EIRP, which has been confirmed by national society, the Montenegro Amateur Radio Pool (MARP).

Lithuania has also joined those countries active on 60m/5MHz. Telecomms regulator RRT has enabled the new WRC-15 Secondary Allocation in its 2018 update to the country's Frequency Allocation Table.

News in Brief

Podcast moved

The Foundations of Amateur Radio weekly podcast, can be found at http://vk6flab.com, including a new home for the weekly net for new and returning amateurs, F-troop. You'll also find information about other podcasts, articles, links to eBooks and more. The existing URLs for podcast subscriptions will continue to work.

Graeme Platts, G4XOF SK

Graeme Platts, G4XOF lost his battle against cancer on his 63rd birthday, 26 November 2018. He originally worked at Martin Lynch & Sons in the early nineties at the stores in Ealing and was one of Martin's original employees. Graeme was known for his in-depth knowledge of scanners and communication receivers. After he was diagnosed in late 2017 he made the most of his shortened life. He drew up a bucket list and saw it all through including attending his daughter Emma's wedding and visiting the *Ross Revenge*, the original pirate ship of Radio Caroline that Graeme used to listen to as a kid. That's what got him interested in short wave radio. Totally brave and cheerful to the very end, G4XOF will be missed by his many friends and family. You can find a more detailed tribute to Graeme at www.rsgb.org/sk

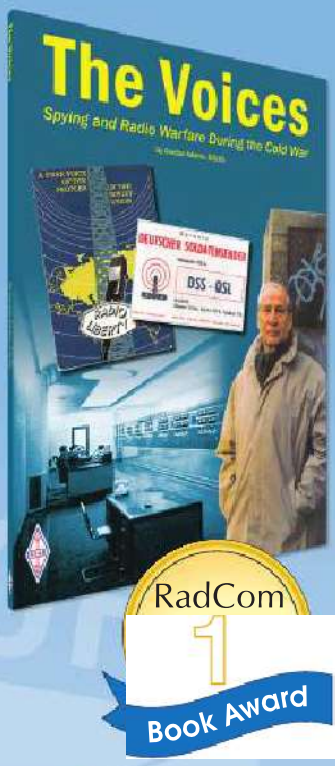
Six Metre Band news

Six News 137 is now available for UK Six Metre Group members to download from the UKSMG website. It cotains sixty pages of news and comment dedicated to the 6m band. The printed edition will be sent out to those members who take it but all group members can get the digital version via https://tinyurl.com/ya4us4no

The Voices

Spying and Radio Warfare During the Cold War

By Gordon Adams, G3LEQ



Many are aware of the spying activity that took place following WWII until the demise of the Soviet Union in 1991. Few though are aware of the radio jamming, broadcasts of encrypted messages or any of the other electronic skulduggery that took place during this time. This book shines a light on these activities.

Readers of *The Voices* will find the details of the radio warfare engaged in the Americans, Soviets and British along with a number of other countries and groups from the Middle-East to the Caribbean. You will find details of the author's first experiences of radio jamming that lead to his deep fascination as to what was happening on the airwaves at this time. There is discussion of the activities of propaganda stations such as Radio Marti, Radio Liberty, Radio Free Europe and many others. The mysterious Numbers Stations, their coded messages and the non-attributable callsigns are explained here. The author talks about where the spies operated from and the radio traffic they generated.

The Voices is an eye-opening book. Thoroughly recommended reading for those interested in the Cold War and the radio warfare of the 20th Century.

RadCom 1 Book Award

Also available on amazonkindle

Size: 174x240mm, 120 pages, ISBN: 9781 9101 9353 2
Non Members' Price: £9.99, RSGB Members' Price: £8.49

60 Antennas

you will want to build!

Edited by Giles Read, G1MFG

Whatever the type of antenna, there is always a genuine sense of achievement when you build one yourself. This book sets out to provide a huge array of designs that the home constructor can attempt and will want to build.

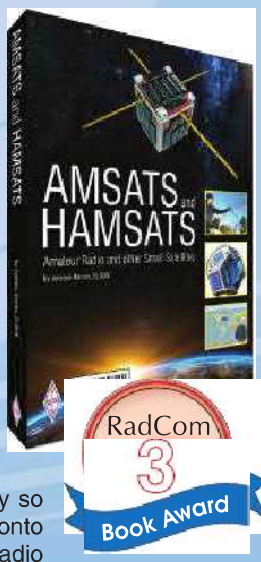
This book starts with the premise that it will provide all the information needed to construct the antenna so it is at your fingertips when you start. Broken into sections *60 Antennas* provides designs from the simple to the complex. *60 Antennas* starts with a section on Vertical Antennas which includes antennas from 2-160m and even 630m. Readers will find here mobile 'screwdriver' and Slim Jim antennas and compact verticals. The book moves onto Horizontal Antennas that also cover the amateur radio spectrum with dipoles, multi-bands and more. Directional antennas are covered with a variety of beams and quads. The section on Loop Antennas includes an indoor variant and details of how to make these as efficient as possible. For those with restrictions of what antennas they can use Stealthy Antennas provides a variety of invisible or nearly invisible options.

Selected from around the amateur radio World and from some of the great names of antenna design there is much here that will inspire 'You to want build!' your next antenna.

Size: 174x240mm, 288 pages, ISBN: 9781 9101 9355 6
Non Members' Price: £14.99, RSGB Members' Price: £12.74

Amsats and Hamsats

Amateur Radio and Other Small Satellites



By Andrew Barron, ZL3DW

Simply the most comprehensive guide available on how you communicate through amateur radio satellites and how to receive signals from other small satellites and 'weather' satellites.

Amsats and Hamsats begins by answering questions like, 'how do satellites stay in orbit' and 'why are they so expensive to launch?' before moving onto sections about the history of amateur radio satellites, the mathematics governing orbits, different types of satellite and their orbits. It covers the equipment you need, to track and use the amateur satellites and some of the satellite tracking software that is available. There are detailed sections covering feeders, masthead preamplifiers, antenna systems and automated rotator control. There are details of FUN cube Satellites, Weather Satellites and even the International Space Station. If you want to know the art of the possible and what satellites are available, where they are, new ones that are planned and even the bands you can operate, *Amsats and Hamsats* has the answer. There is much more included and this book provides the ultimate guide to operating satellites.

Size 174x240mm, 368 pages, ISBN: 9781 9101 9354 9
Non Members' Price: £14.99, RSGB Members' Price: £12.74

KW days

Every year sees an increase in the popularity of KW Days. This year it's on 5 and 6 January. Between the 1950s and the 1970s, the KW company, founded by Roly Shears, G8KW, grew to be the largest maker of amateur radio equipment ever seen in the UK. It offered an alternative to government surplus or homebrew. Initially a 'cottage industry' offering kit parts and part assemblies and AM/CW equipment, it developed into a fully fledged factory making a complete range of SSB transceivers and accessories.

KW Days offer clubs and collectors world-wide a special opportunity to activate and demonstrate KW equipment on the anniversary of the company's founding weekend.

In 2019 stations will again be active in a number of countries – including GB2KW by Sutherland ARS and GB8KW by Cray Valley ARS, who hope to have a rare KW Victor TX restored in time. The famous callsign G8KW may also appear. Of special interest this time will be the KW2000D at the RSGB's National Radio Centre at Bletchley Park. It is one of that last KW2000s ever made, featuring a Nixie tube digital readout and was originally the company founder's personal radio. Fewer than five KW2000Ds were ever made; it is an extremely rare radio.

As always, SSB/CW activity will be on any frequency ending in 77 ±QRM – 1.977, 3.777, 7.177, 14.177MHz etc. AM activity will be on VMARS frequencies.

Lindars Radios

Lindars Radios was established in 2017 by Justin Lindars. It has now been in its current premises in Yeovil since the end of September with a wide network of clientele, including many local radio enthusiasts. The collection of items is growing daily and they have made great use of the new space. Customers really enjoy looking at the vintage section where there are some vintage crystal sets and wartime Morse keys. There is also an area where customers can sit down and have a go at Morse or try an external HF antenna so customers can try out radios before they buy.
www.amateurradiosales.co.uk

ISS contact

On 24 October, Delcastle Technical School in Wilmington, USA used a G0KSC LFA Yagi, designed by InnovAntennas, to make contact with the International Space Station (ISS). The pair of 7-ele 144-146MHz LFA Yagis was built by students at the Hodgson Vocational Technical School in Newark, a sister school of Delcastle Tech. When tasked with a project to build a Yagi to use for the contact, Students found the www.g0ksc.co.uk website that has a selection of free-to-build Yagis designed by Justin Johnson, G0KSC.

Advanced distance learning course

In the seven years since the Bath team started their Advanced Distance Learning courses they are approaching 700 passes with an average pass rate of 84%.

The final Advanced Distance Learning course to be run by the Bath-based team is due to start on 1 February 2019, aiming for an exam in July or August. Once that course is completed the team will be looking at the new three-tier syllabus to see how their material might be reworked. As a result, the team expects there will be no training in Bath for 6 to 12 months.

The course is free but students must provide their own textbook, calculator and arrange their own exam when the time comes. Guidance is provided by the course team. A £40 deposit is required to secure a place on the course but the deposit is refunded to those who compete the training. Deposits from students who did not complete the course, and generous donations from students who did, have so far raised over £14,000 for charities like the RCF, British Wireless for the Blind and RAIBC.

Course places are limited and the last four courses have been full well before the start date. So, if you are interested in joining, contact Course Leader, Steve, G0FUW without delay via email to g0fuw@tiscali.co.uk

Sandringham School licence success

Sandringham School was the first school to talk to Tim Peake on the International Space Station and have continued their interest with amateur radio since then. Eight students sat the Intermediate exam at school and, according to the indicative marks, they have all passed. This needs ratifying by RSGB exams department but they all scored above the threshold so it looks promising. They were very excited, said Alan Gray, G4DJX, the school's headmaster.

INAC Magnetic Loop Antennas

ML&S has recently been appointed sole UK distributor for the Spanish range of INAC Magnetic Loop Antennas. Martin already sells the Ciro Mazzoni Loops from Italy and by adding the INAC brand, he says that it "simply increases customer choice when choosing a very compact HF antenna operating in a confined space".

Available from £379.95 for an AH-521 three band Halo Loop, INAC are located in Zaragoza Spain and have a huge range including a suitcase antenna covering 40-15m. Their flagship model AX-330 covers 3.5-30MHz and retails at £999.95.

For more info contact ML&S on 0345 2300 599 or go to www.hamradio.co.uk/inac

Antennas

Improving the operational range of a doublet antenna

The doublet provides a convenient solution to HF multiple-band operation, however there tends to be a practical limit to the lowest band that can be reliably handled by the antenna tuning unit (ATU). Therefore, this month we continue with the theme of using loading coils to extend the range of an antenna using a doublet as an example.

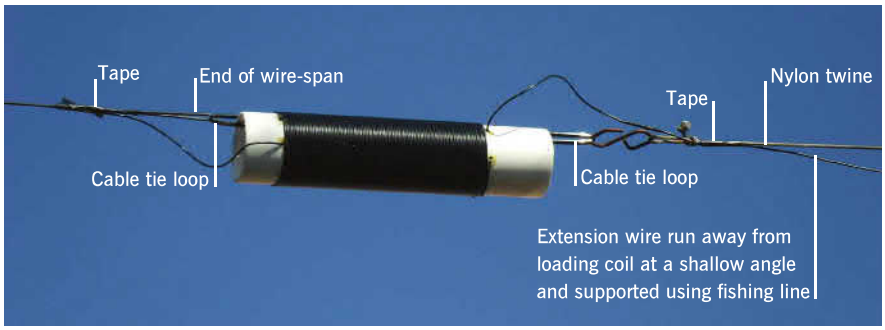


PHOTO 1: An example of how the 110μH loading coils were installed.

Doublet overview

The doublet comprises a wire-span that is centrally fed with a balanced two-wire feeder cable. Ideally, the length of the wire-span should be an electrical half wavelength ($\lambda/2$) at the lowest frequency of operation. The balanced two-wire feeder cable could be either open-wire or ladder-line; either gives a lower loss compared to coaxial cable. The length of the balanced feeder cable can be cut to suit the requirements where the antenna is to be installed.

The doublet's wire-span length can be determined using the antenna formula [1]:

$$\text{Wire-span length (m)} \simeq \frac{150 \times 0.95}{f}$$

where 0.95 is representative of the speed of the RF signal within the wire-span and f is the frequency (MHz). The wire-span should be installed as high and as far away from any close objects or structures as practical. Good practice is to run the balanced feeder cable vertically straight downwards from the antenna where possible. An example of the concept of a doublet antenna is illustrated in **Figure 1** where the balanced feeder cable has been connected directly to the ATU's balanced antenna connection.

However, there can be a problem when the wire-span's length becomes close to an electrical quarter wavelength ($\lambda/4$), or shorter, because the impedance presented at the antenna's input often tends to be outside of the capabilities of the ATU to handle.

PHOTO 2: The doublet's dipole centre made from a sheet of uPVC.

Loading a doublet

July's Antennas column described how introducing an impedance at either end of a dipole enables the coverage of the antenna to be extended to allow operation below the dipole's resonant frequency. This technique can also be used with a doublet antenna by adding a loading coil and an extension wire at each end of the antenna's wire-span allowing the antenna to operate on a much lower frequency.

To describe this loading technique, an example of actual doublet antenna has been used as follows. The original doublet's intended lowest band of operation was 40m. Using an operational frequency of 7.055MHz and the equation above gave the wire-span's length (in metres):

$$\text{Wire-span length (m)} \simeq \frac{150}{7.055} \times 0.95 \simeq 20.2\text{m}$$

This wire-span was centrally fed using an 8m length of 300Ω ladder-line cable, with each leg of the wire-span being 10.1m long.

This doublet has been successfully used for some time and its dimensions are shown in Figure 1. The antenna provided the capability to work on all the bands from 40m to 6m using an ATU. However, on the 80m band the antenna presented a high impedance at the input to the ladder-line cable and this proved difficult for the ATU to handle.

As described last month, with the wire-span installed horizontally above the ground, the ground starts to behave as if it were the second conductor of a transmission line formed between it and the wire-span such that

$$Zo \simeq 138 \log_{10} \frac{4h}{D} \Omega$$

where Zo is the characteristic impedance seen at the wire-span's input, h is the height of the wire-span above the ground (in mm) and D is the wire's diameter (in mm). Taking values of h=7000mm and D=1.6mm gives:

$$Zo \simeq 138 \log_{10} \frac{4 \times 7000}{1.6} \simeq 586\Omega$$

As described last month, an indication of the impedance of each extension wire and of each wire-span's leg can be calculated when

Mike Parkin, G0JMI
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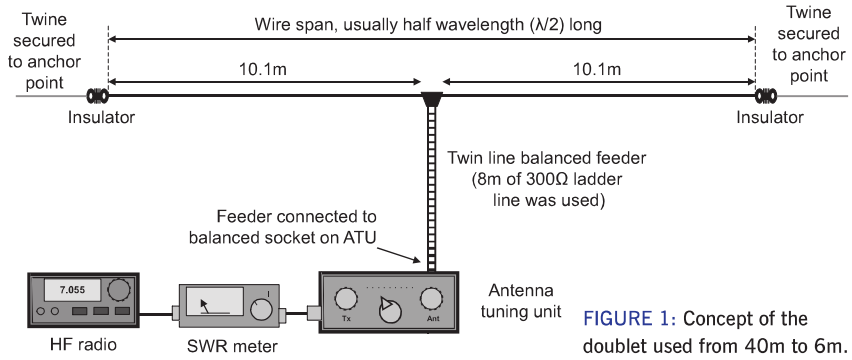


FIGURE 1: Concept of the doublet used from 40m to 6m.

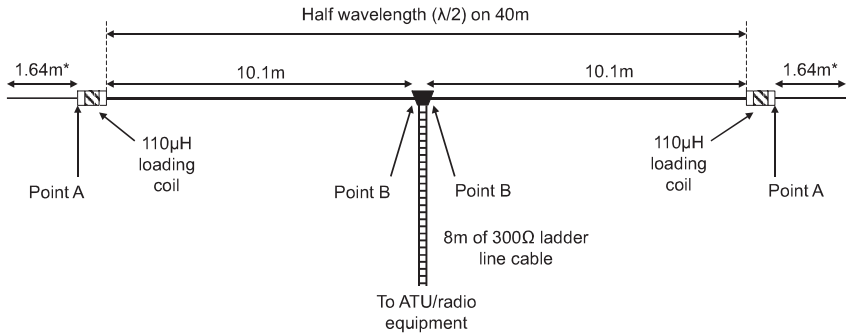


FIGURE 2: Concept of the loaded version of the doublet enabling operation on the 80m band.

operating at a desired lower frequency as seen at Points A and B in **Figure 2**. Taking 3.65MHz as this lower frequency, then a 'free-space' quarter wavelength (λ/4) is given by

$$\frac{300}{3.65\text{MHz}} \times 0.25 \simeq 20.55\text{m}$$

At **Point A** an indication of the impedance of each extension wire is given by

$$\text{Input impedance} \simeq -j\left(Zo \cot\theta\right)\Omega$$

where Zo is the characteristic impedance between the extension wire and the ground (ie 586Ω), θ is the line's electrical length (in degrees). To allow for the velocity of the wave along the wire a correction factor of 1.05 has been used. The operator *j* shows that this is a reactive impedance.

Using an extension wire of 2.3m in length, θ is given by:

$$\theta = \left(\frac{2.3\text{m} \times 1.05}{20.55\text{m}}\right) \times 90° = 10.577°$$

An indication of the impedance at Point A then is given by:

$$\text{Extension wire impedance}$$
$$\simeq -j\left(586 \cot 10.577\right)$$
$$\simeq -j3138\Omega$$

An indication of the impedance at **Point B** for each leg of the wire-span is found using

$$\text{Input impedance} \simeq +j\left(Zo \tan\theta\right)\Omega$$

Here, θ is given by

$$\frac{10.1\text{m} \times 1.05}{20.55\text{m}} \times 90° = 46.445°$$

$$\text{Doublet leg impedance}$$
$$\simeq +j\left(586 \tan 46.445\right)$$
$$= +j616\Omega$$

An indication of each loading coil's inductance (X_L) can now be found as follows:

$$X_L \simeq -1\left(\left(+j616\right)+\left(-J3138\right)\right) \simeq +j2522\Omega$$

(note: this equation gives an inductive reactance).

An indication of the inductance (L) can then found using

$$L(H) \simeq \left(\frac{X_L}{2\pi f}\right)$$

where f is the frequency (Hz) and L is the inductance (H).

$$L(H) \simeq \left(\frac{2522}{2\pi \times 3.65\text{MHz}}\right) \simeq 110\mu H$$

Figure 2 summarises the antenna derived above.

Loaded doublet construction

As illustrated in Figure 1, the original doublet used 'dog-bone' insulators to terminate the wire-span. These were replaced by the 110µH loading coils, whose formers now provided the insulators at each end of the wire-span.

Each loading coil was wound onto a 40mm diameter PVC white tube of 180mm in length. Each winding was 120mm long and used 94 turns of plastic insulated stranded copper wire (whose outside diameter was 1.28mm). Each loading coil was checked using an MFJ antenna analyser and the number of turns varied to obtain an inductance close to 110µH.

Each end of the wire-span was formed into a small loop. This was done by removing around 30mm of the insulation from the end and also at about 150mm down the wire. The bare wires were twisted together, the wire from the loading coil connected and the joint soldered. PTFE plumbers' tape was wrapped around the joint and a length of insulating tape wrapped over the top to protect it. This arrangement enabled each wire-span's end to be attached to the inductor's former using a cable tie passed through the loop and a hole drilled into the tube. The end of each extension wire was attached to a length of fishing line and this was run at a shallow angle away from the loading coil under the nylon twine used to support the antenna. **Photo 1** shows one of the loading coils mounted at the end of the wire span.

To connect the 300Ω ladder-line cable to the wire-span, a dipole centre was made up. This was described in January 2017 Antennas column and shown in **Photo 2.** In summary, the dipole centre used a sheet of 3mm thick uPVC (unplasticised polyvinyl chloride). Three holes were drilled along the upper section of the dipole centre either side of the middle. These holes were used to hold in place each leg of the wire-span by lacing the wire through the holes as shown. The 300Ω ladder-line cable was connected to the wire-span and the joints soldered. PTFE plumbers' tape was wrapped around each joint to weatherproof it and a length of heatshrink was shrunk over each joint for additional protection. Two rows of three equally-spaced holes were drilled into the lower section of the dipole centre to hold the ladder-line cable in place using cable-ties that were passed through the holes and the feeder cable in a 'figure-of-eight' configuration as shown.

Tuning and performance

Initially, the extension wires connected to the loading coils at each end of the wire span were 2.3m in length. The antenna's resonance was checked by connecting an MFJ antenna

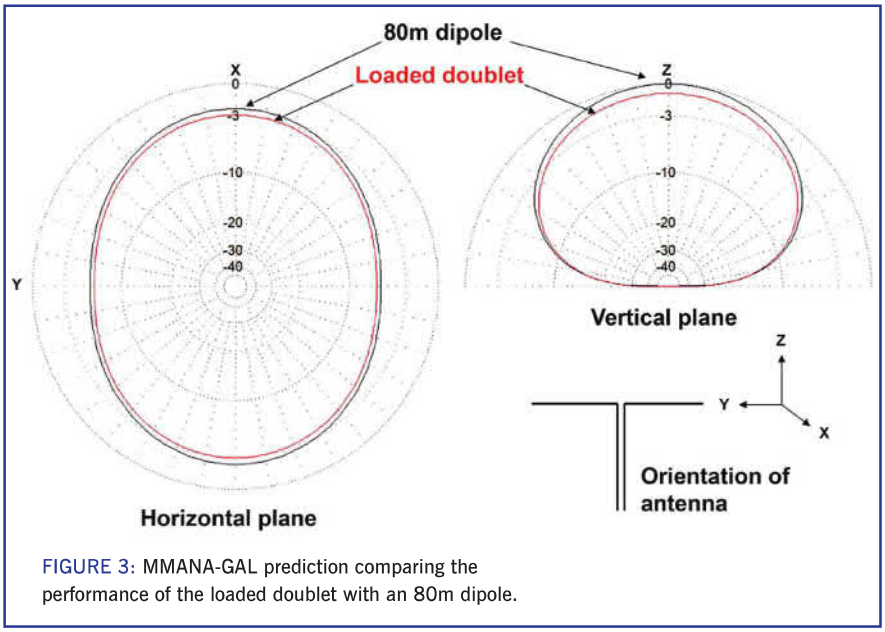


FIGURE 3: MMANA-GAL prediction comparing the performance of the loaded doublet with an 80m dipole.

analyser to the end of the 300Ω ladder-line and found to be 3.47MHz. Each extension wire was shortened to 1.64m, increasing the resonant frequency to 3.52MHz. Most of my 80m QSOs are made in this portion of the band and it was decided to leave the antenna centred on 3.52MHz. The bandwidth measured between the 2:1 SWR points was around ±30kHz.

Next the antenna was connected to the balanced socket on the ATU, through an SWR meter and then to the transceiver. Having signed on in CW, the antenna was loaded with an RF power of 10W and the ATU tuned to match the antenna. Once matched, the power was increased to 100W to check that the SWR remained stable (SWR of 1:1 was obtained thanks to the ATU). Several 80m CW contacts were made to test the antenna. The transceiver was then tuned to the upper section of 80m, the ATU realigned to obtain a good match and several stations were worked using SSB, further testing the antenna. This testing process was then repeated on the bands from 40m to 6m to verify the antenna's capability.

The antenna's performance was modelled using MMANA-GAL to compare it with an 80m dipole that was installed in a similar way. **Figure 3** shows the predicted performance for the antenna (in red) compared to the 80m dipole (in black). The prediction indicates that the loaded doublet's performance is only marginally down (by about 1dB) compared to the 80m dipole with both antennas modelled at 8.25m AGL.

This antenna preformed reliably when used with RF power levels up to 100W. However, heavier duty 110μH loading coils may need to be constructed if higher power levels are run.

Conclusion

This month, the focus has been on extending the range of a doublet using loading coils. If you are considering operating on the 80m band, or below, then a loaded doublet may provide a solution to operate from a domestic location where the space to install a longer aerial may be limited or restricted.

Reference

[1] RSGB *Radio Communication Handbook,* 13th edition edited by Mike Browne, G3DIH. Section 13, Antenna Basics and Construction. Page 13.2.

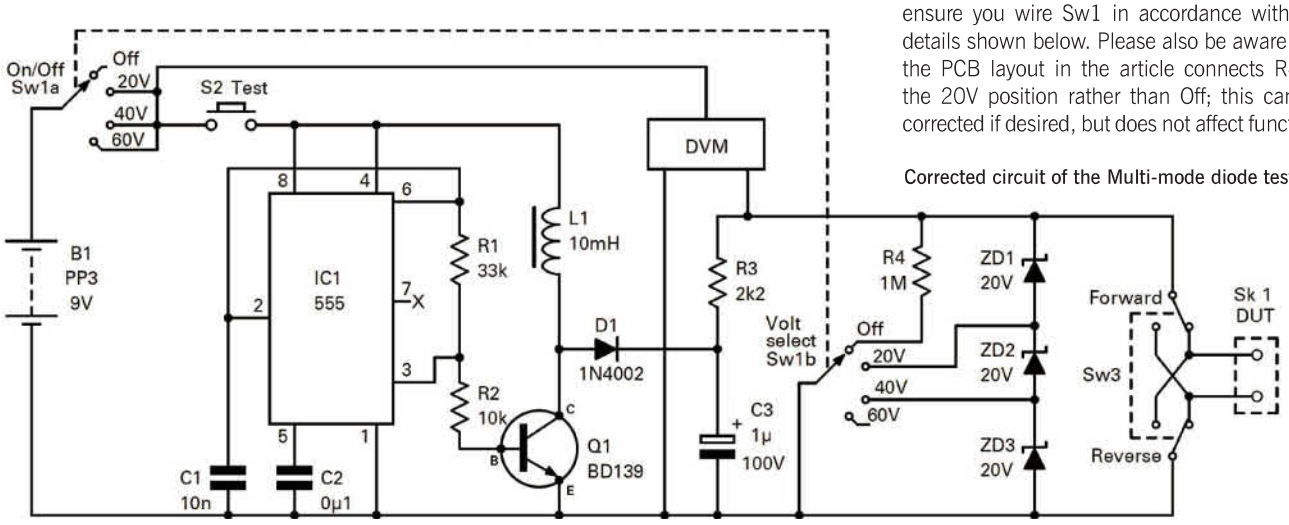
Corrigenda

Multi-mode diode tester correction

Last month we published the multi-mode diode tester article by Dave Ellis, G4AJY. Unfortunately some gremlins crept into the circuit diagram, meaning that it wouldn't work as intended.

The main problem was the 1M resistor R4. It was incorrectly shown as being connected between the +60V rail and the output. Its function is actually to 'bleed off' the 60V rail when the device is switched off, as shown in the corrected diagram below. We apologise to Dave and anyone else who may have been affected by this error.

The circuit diagram correction also affects the wiring diagram (last month's Figure 4); ensure you wire Sw1 in accordance with the details shown below. Please also be aware that the PCB layout in the article connects R4 to the 20V position rather than Off; this can be corrected if desired, but does not affect function.



Corrected circuit of the Multi-mode diode tester.

Railways on the Air

Railways on the air (ROTA) takes place on the weekend closest to 27 September. This date celebrates the anniversary of the first steam powered passenger railway on a line from Darlington to Stockton in 1825. Bishop Auckland ARC coordinates this event.

Amberley Radio Group took part in ROTA using GB2CPM from the Amberley Narrow Gauge Railway.

GB1FLR

Peterborough & District ARC took part in ROTA from the Fenland Light Railway, which is located near Ramsey in Cambridgeshire. The 10.5 inch gauge light railway gives rides to the public on trains pulled by hand-built steam and diesel locomotives on a half mile track.

Our hosts allowed the radio station to be located in a corner of the cafeteria, most convenient for tea and cake. We used a Carolina Windom 80 for HF and a W50 white stick for VHF. Our TS-590SG was used on HF while our IC-746 was attached to the VHF antenna. Our station, being located in flat Fenland had good take off in all directions.

Using GB1FLR we soon started making contacts on both radios. Being located where we were, we attracted a fair bit of public interest and as a result PADARC gained two new members who will be taking Foundation exams with us.

The radio station finished up with well over 100 contacts including many other ROTA stations. All in all, a very successful weekend, brilliantly hosted by the volunteers from Fenland Light Railway. Our grateful thanks to them. We will be back there next year.

Tony King, G0IAG

Peterborough & District ARC took part from the Fenland Light Railway.

GB2CPM

Amberley Radio Group took part in this year's ROTA weekend for the first time since 2013. We were on the air both days using GB2CPM, which is our permanent special event station callsign.

The Amberley Narrow Gauge Railway runs right alongside the Radio & Television Exhibition building that houses our shack. This meant that we could not have been physically closer to the railway line, even if we had put a tent up outside and operated 'Field Day' style instead. There was thick cloud and heavy rain for much of the weekend and I was certainly glad to be indoors.

Usually 40m is our 'bread and butter' band and we did manage a handful of inter-G contacts around Sunday lunchtime. However, for the most part, the stations we heard were few and far between, tended not to be very strong, and came from the further-flung parts of continental Europe. Fortunately, 80m well and truly rescued us and stayed open throughout – even during the middle of the day. Our tuned doublet will just about work on this band, but every time we changed frequency by just a few tens of kHz we needed to adjust our manual antenna matching unit! The noise level was high enough on 80m to make life difficult sometimes; in several cases we had to ask for repeats of callsigns four or five times. I am sorry if any stations tried calling GB2CPM unsuccessfully but we simply never heard them due to the local noise level. It goes without saying that a working heritage museum with vintage machinery is never going to be the most electrically quiet place.

There was some QSB on 80m but, generally it was nowhere near as deep or rapid as the fading on 40m that we have witnessed in recent months. I heard a solitary SSB signal on 20m and no signals of any kind on any HF band above that. It seems that many other ROTA stations had the same idea to concentrate on 80m. This allowed GB2CPM to work 13 ROTA stations on that band across the weekend, and three on 40m on the Sunday. We worked 57 stations altogether and our best DX was Germany on 80m.

Overall the weekend was a success and good fun. Thank you to everybody who called us or visited us. There is very comprehensive information about Amberley Museum, complete with photographs, on our QRZ.com page.

Ed Spicer, M0MNG

GB2LHR

Furness ARS took part in the annual Railways on the Air weekend in September from Lakeside and Haverthwaite Steam Railway in Cumbria. Using GB2LHR the team operated across both Saturday and Sunday from the club caravan using a doublet antenna and a Kenwood TS-570DG. Band conditions were not the best, but perseverance resulted in 65 QSOs in total in 15 countries as well as 7 other ROTA stations.

Chris Leviston, M0KPW

Continued on page 56

https://rota.barac.org.uk/

Looking to Bressay and Main Island from The Noss.

Shetland SOTA Expedition in June 2018

Summits on the Air (SOTA) is an amateur radio awards scheme that operates in nearly a hundred countries across the world. The summits are defined as peaks with a prominence above 150 metres, regardless of height or any other merit. In the UK, such summits are called Marilyns.

The SOTA scheme is open to both Activators and Chasers. Activation of a Marilyn earns both the activator and chaser a score that is related to its height above sea level. Certificates are available for various scores, leading to the prestigious Mountain Goat and Shack Sloth trophies. Activation requires a combination of disciplines including mountain craft, mountain navigation and a measure of self-preservation. Having sufficient personal fitness to sustain long mountain days and an ability to operate VHF and HF radio equipment on exposed mountain summits in all kinds of weather is also critical to success.

To start participating in the scheme, register your callsign on the SOTA database, then follow the rules and guidance on the website. SOTA is global, you can Chase or Activate whenever you wish, activations take place 24/7. Much more information is available on the web at www.sota.co.uk but beware, SOTA is very, very addictive and there is no known cure!

Concept

Back in February my wife, Christine, made me aware of a 'meet' of the Fell and Rock Climbing Club (of which I am a member) on the Shetland group of islands. This was to be based in a bunkhouse called the Sail Loft at Voe in the northern part of the main island.

A look on the SOTA website showed that there are 16 Marilyns on the main islands and three on outlying islands. I decided that I would attempt 18 SOTAs on eight islands, which required taking 12 ferries and two flights, in eight days. It was an ambitious plan.

Preparation and Planning

Slowly a plan was hatched. To make it workable, I converted my early scribblings to a multi-page spreadsheet detailing the hills in a logical order, timings, ferry details and parking locations. My kit included food, clothing, radio equipment and a mountain bike. It was obvious that I would need my car, so I booked passage on the overnight car ferry from Aberdeen to Lerwick.

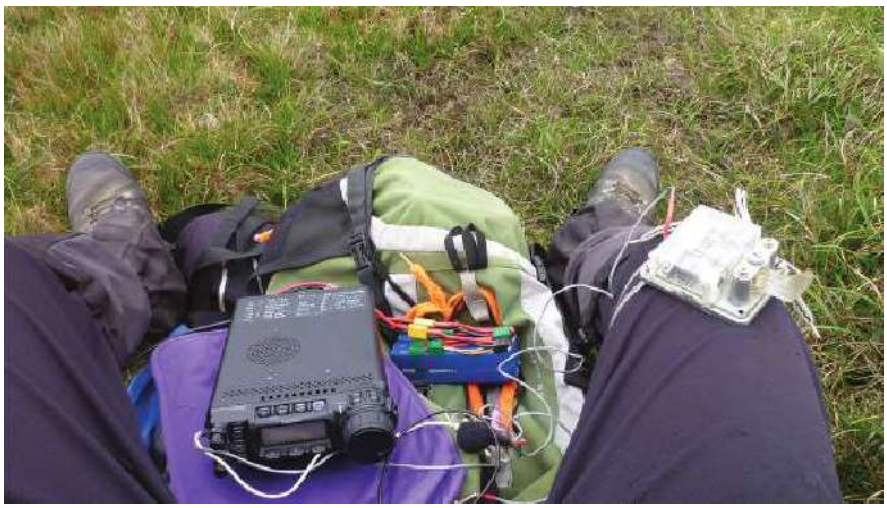
The Archipelago of Shetland consists of three main islands, Main Island, Yell and Unst plus many more smaller islands. It takes up four whole 1:50,000 scale maps and it is nearly 70 miles from south to north. In preparation I spent many hours identifying the routes, ferry termini and suitable parking spaces.

I recorded the routes and parking information on my car satnav in the form of Lat / Long. This proved to be invaluable when driving on unfamiliar roads as a single occupant whilst in thick mist. For each SOTA I prepared a 1:25,000 scale map and annotated it with my route.

Normally I do not like to activate more than two SOTAs in a day, but if this plan was to fit into eight days, three activations on some days would be needed. I would, however, only do two activations on days that included ferries. I also decided to activate the two hills on the island of Foula. A flight goes there once a day but the best day for the activation was Wednesday because that is the day that the flight leaves early and returns late.

For the most part I was able to keep to the plan and I think most of my timings were reasonably accurate.

Ready for the off.



Operating kit; the FT-857, battery and Morse key.

Propagation

Shetland is at latitude of 60° north, further from the equator than Leningrad. The only time I had operated this far north was from Iceland in 2003. I remember it was difficult to have QSOs on my only available band of 40m and 15W. In preparation, I asked Steve Nichols, G0KYA of the RSGB Propagation Committee for his thoughts. He ran a couple of models and concluded that to work UK and Europe, 40m was the best option with 60m and 30m in reserve. He also said that drop-out around noon was likely. Steve's help proved to be accurate, 60m carried little traffic whereas 40m and 30m both worked well. Best DX was Greece and Russia. The midday drop-out was noticeable on the 3-day activations, signal reports were mostly less than 599, with 579 being most common. Where possible, I aligned the dipole to run a few degrees East of North South.

Equipment and reliability

For all my activations I operated a mixture of CW and SSB. I used my standard HF equipment – an FT-857 running 80W to a link dipole for 60, 40, 30 and 20m. I supported the feed point on my non-telescopic carbon fibre fishing pole at 20ft. On Foula and Noss, where the equipment needed to be air freighted or less conspicuous, I used my telescopic SOTA pole without the top 2 and bottom 2 sections. The power supply on each summit was a paralleled pair of 5Ah, 3-cell lithium polymer batteries, so on some days three battery packs were used. Headphones, tie clip electret mic and my modified Hi-mound lamic key completed the radio equipment and as usual I logged the QSOs on waterproof paper using pencil.

My mountain bike proved invaluable in ascending and descending four tracks and crossing the island of Fetlar. All the equipment was 100% reliable but on one SOTA a high SWR indication was caused by a dipole securing peg coming loose in the unusually dry peat!

Three Challenges

Although there are few paths on the hills, navigation on Shetland is not onerous and most summits are less than 3km from a roadhead. That does not mean that they were easy road head activations. I have singled out three activations that I particularly enjoyed.

My first challenging activation was Noss GM/SI-210 on the small island of Noss. The activation zone is within an important bird sanctuary so it needed a sensitive approach. A rubber dinghy captained by the RSPB warden ferried me across the Sound of Noss from the island of Bressay. A safety briefing followed where I was advised, for my own safety, not to enter the Bonxie (Great Skua) bird colony in the centre of the island. I

David Stansfield, G0EVV
G0EVV@hotmail.co.uk

therefore took a coastal route to the trig point at the summit of The Noss (Old Norse for nose) where I set up my equipment. The RSPB Warden later arrived on site and approved the mast and aerial! One of the highlights of the activation was watching the thousands of seabirds circling above me.

Saxa Vord GM/SI-157 was my second challenging activation. This is the most northerly Marilyn in the UK and had been an RAF / Navy radar site for 50 years or more, then in 2007 the site was decommissioned and much of the land sold off. However, in 2017 the MOD took the decision to re-plant the radar head.

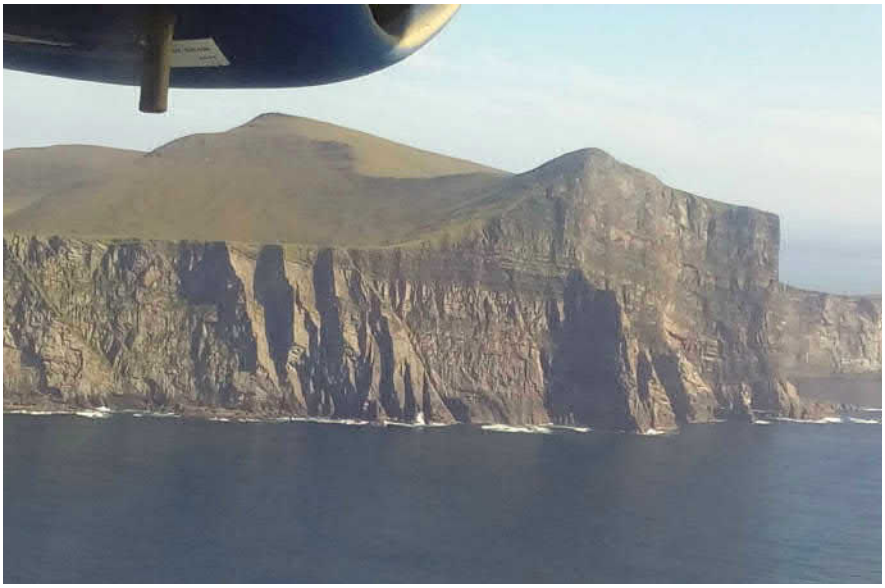
Prior to travelling north, I spoke to the manager of the Saxa Vord holiday complex that used to be the RAF domestic camp. He said that because of the change in land ownership I could now drive to the radar site lower gate and walk to within 300 yards of the summit. OK, so the road was in public ownership, but the actual summit was within a secure compound. I spent a lot of time looking at the 1:25,000 scale map of Saxa Vord before I concluded that it should be possible to access the activation zone, bounded by the 259m contour.

I picked Sunday morning for the activation, traditionally a low work activity time. Fortunately, the sea fret was particularly thick with visibility of about 10ft. I drove to the old compound lower gate and parked my car. There was a chain across the road to the upper gate preventing cars going higher. As I readied my kit, a small van descended the upper road and stopped to open the chain. This was a civilian security man. I asked him if it was OK for me to walk up the road, he said it was, but that the radar was now active. I walked up the road, entered the activation zone as identified on my GPS and set up my aerial. I made eight CW QSOs before descending to my car, grateful for the thick mist.

Located on the Island of Foula, my third challenging activations were Da Sneug GM/SI-103 and Da Noup GM/SI-183, 15 miles off the west coast of Shetland. There are two ways of getting to the island, by sea and by air on a 6-seater twin-engined Islander aircraft.

On the flight I only took one pair of 5Ah batteries, each separately insulated and packed into lithium polymer flight safe bags. This could have constrained the number of QSOs on Da Sneug and Da Noup but they passed flight inspection by our ex RAF pilot, Hughie. Landing on the bumpy dirt runway was quite an experience and baggage reclaim took just 2 minutes. I proceeded up the ridge Bodlifilds, then east to the summit and trig point. Bonxie attacks were again common, not surprising since Foula is derived from the Norse 'fugl ey' meaning 'bird island'. I set up the radio equipment, deployed the aerial and carried out the activation.

Low cloud on Scrae Field GM/SI-194.



Da Sneug GM/SI-103 from the air.

Having left the summit of Da Sneug I dropped down to Da Wasten before ascending steep grass to Da Noup. Bonxie attacks continued until I sat down on the summit, when calm prevailed. The aerial was again deployed and over 30 Chasers contacted. A pleasant descent had me back at the Foula departure lounge with 45 minutes to spare. As we took off from the island we were rewarded with a fantastic view of the sea below and the cliffs of Da Sneug.

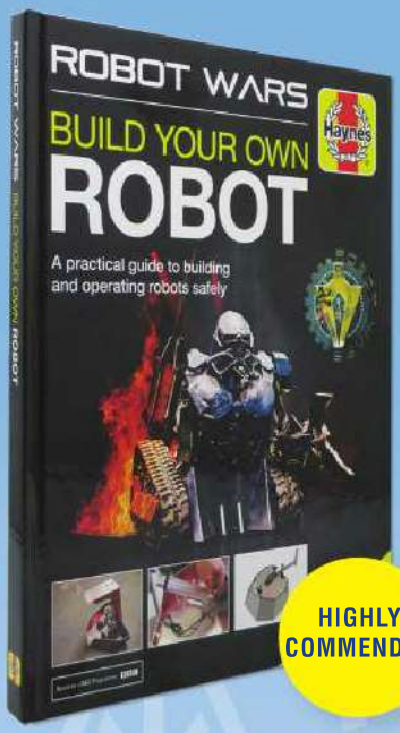
Health and Safety

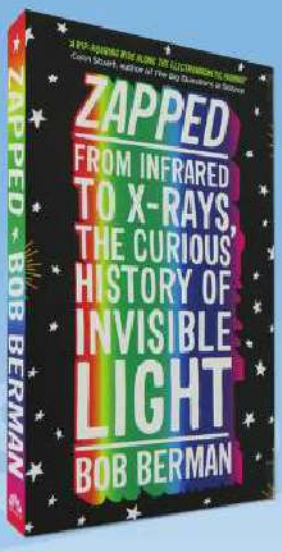
Although I was with a party of 12 people from the Fell and Rock Climbing Club, all my SOTA activities were as a solo walker. I therefore carried a mobile phone and entrusted the group leader with a copy of my plans that included parking GR, times and route maps. He was very impressed!

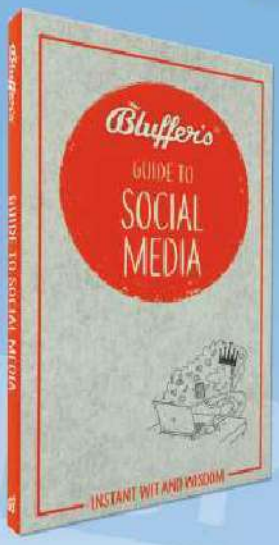
What is left (the one that got away)

I was proud to have achieved my goal, 18 SOTA Activations generating 409 QSOs and travelling 297 island road miles. I would like to thank all the Chasers (and particularly PA0INA who worked me on every summit) without whose support this could not have been possible.

However, perhaps you may have noticed that Fair Isle is also considered to be part of Shetland, making 19 SOTAs on the Archipelago. To activate Fair Isle would have taken another flight and another full day, a day I simply did not have. It will have to wait – perhaps.







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By: Susie Boniface

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Crane QRM!

PHOTO 1: My aerials have a rather good view of the construction site and its cranes.

DATV no-show

Brian, GW3NWR went portable to North Wales for an ATV activity weekend. I live near Blackpool and we were able to work each other on 3cm and 23cm analogue ATV, plus 23cm digital. Brian was able to receive my 2m digital signal – and then I tried to receive from him. Nothing seen, even though my S-meter read S9+++. The big signal was still there when Brian stopped transmitting, so something odd was obviously happening.

Using a wide-range receiver on AM showed that a noise signal was present from about 120-160MHz. Simple direction-finding from my garden and surrounding streets indicated that the signal was emanating from a park about 300m away, the site of a four-year construction project by a local utility company. The site is surrounded by a wooden fence and I was able to go all the way round and ascertain that the interference source lay within.

The interference seemed to be there all the time, even on Sundays when no construction workers were present. Thankfully the site had an on-site customer information office so I went in to see if I could gain some insight on the issue. The site engineer was keen to help but said the only item operating 24/7 was a water pump. From the

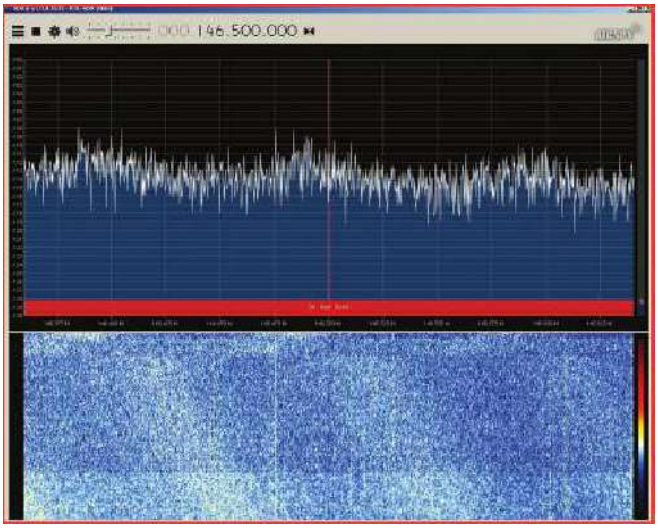

FIGURE 1: Spectrum sweep and waterfall of the 2m amateur band showing the sort of QRM I had to contend with.

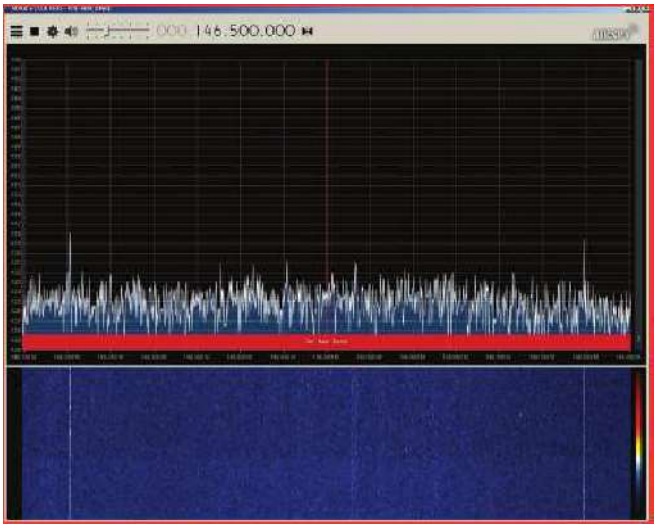

FIGURE 2: Relief! With the original lamp switched off, the noise floor returns to a reasonable level.

outside of the site I had DF'd the QRM to the approximate position of a crane, but was told that in the evenings and most weekends this (and the other two cranes on site) were totally powered down.

Although he was not at all familiar with EMC issues, the site engineer did take an interest in what I was doing and offered to take my DF receiver on site to try to find the source. After a couple of weeks he reported that his tests were very inconclusive as he could not locate the source of the QRM. I told him about radio reflections and that fact that any mains cabling could carry the signal around the site.

I was discussing the QRM with the site engineer (and holding the DF Rx) when a friendly voice enquired if I was looking for aliens! I explained what I was trying to do and said that the QRM seemed to be coming from the cranes. To my utter astonishment the visitor said he was an engineer for the company that provided the cranes to the site.

He was not familiar with RF, so I asked him if there was any equipment on the crane that ran 24/7 and he said no, but... *the crane's aircraft warning lights were left on 24/7*. They ran off the crane's 24V battery but it wasn't known whether there was an inverter or similar. I figured they would probably be LED based so asked if he could let me have any details about them. He was very helpful and asked if I'd like him to get them turned off for a while. Yes, indeed, I would!

Fortune was with us as the crane operators were just starting their shift. He was able to contact them via phone – which he had to do because the two way radios in the cranes didn't work properly. A subtle clue perhaps?

Not surprisingly, when the lights were turned off, the QRM went. Two of the cranes caused QRM. The third, with a different make of warning light, didn't cause any QRM problems.

Solution

I got a call asking if I could attend when the crane service manager was next on site. He wanted to verify that it was the light and not the cable causing the QRM. The jib was lowered, the light duly unplugged from the end of the cable and, as expected, the QRM stopped, proving that the cable was acting as nothing more than an aerial. The service manager said he would obtain a different light to try and would be back in a few days.

In order to change the fitting the crane's 45m-long jib had to be lowered. I liaised with the site staff by phone and made measurements from home. With the light off, my noise floor at 146.5MHz was about -128dBm. Switching the light on, at ground level, raised the noise floor by about 10dB.

PHOTO 2: The original, noisy light *in situ* atop the crane.

I'd previously measured an increase of some 15dB in the crane's direction when the jib was at its working height. I asked the engineers if they could raise the jib with the light on; they complied and my noise floor increase peaked at about +18dB, oddly enough when the jib was at about half height. *[Perhaps this was because of the antenna response in the vertical plane – I suspect if the antenna had had elevation control then the noise with the jib at full height might have been even more intense if the antenna pointed straight at the crane in both horizontal and vertical planes – Ed].*

The site engineer called in for a coffee on his way to site. I showed him the QRM on a waterfall display and also demonstrated the sound, turning the rotator to show how the noise only occurred in the direction of the site. He had the new light with him, which turned out to be solar powered. Rather than being on all the time like its predecessor, it flashed about once a second. We tested it with my DFing receiver on 2m and all we heard was a slight click when the light flashed – and only when very close to the light. As you may imagine, I had a big smile on my face!

Within a couple of hours the new lights had been fitted to the cranes. I couldn't wait for it to get dark and for the lights to start working. They duly did and – fabulous news – there was no QRM. Great! Now all I have to do is persuade Brian to go back to North Wales portable again!

I had fabulous co-operation from everyone concerned, particularly given that I was probably the only off-site person being inconvenienced by the QRM during this multi-million-pound project. Thanks to all involved, including the site engineer, the crane subcontractors, their service manager, and the warning light manufacturer, Nanhua. Without their help I would have been forced to wait many, many months for the end of the project before the 2m QRM went away.

PHOTO 3: The replacement – and RF-quiet – light, a Nanhua LT-101. (Photo courtesy Nanhua).

Dave Woodhall, G3ZGZ
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An introduction to error-correcting codes

Digital communications – binary sequences

In digital communications information is often sent as a sequence of 1s and 0s. Such a sequence is called a *binary* sequence and the individual 1s and 0s are called *binary digits* or *bits*. One of the earliest such systems was that devised in 1870 by Emile Baudot, where each letter of the alphabet was represented by a sequence of five bits. A later variant of this system called ITA2 (International Telegraph Alphabet No 2), informally referred to as *baudot*, is still in use on the amateur bands today for the RTTY mode (radio teletype).

A much more modern system called American Standard Code for Information Interchange (ASCII) was developed during the early 1960s and a revised version of ASCII is still widely used today in computer systems. In ASCII, each symbol (capital letter, lowercase letter, numeral, punctuation mark, plus various non-printable control characters) is assigned a decimal number in the range 0 to 127. Each of these decimal numbers may in turn be represented by a sequence of seven bits. For example, a capital letter J is assigned decimal number 74, which is 64 + 8 + 2 and hence represented by the seven-bit sequence 1001010. Having seven bits, rather than just five, gives four times as many binary sequences and allows a much larger set of symbols to be represented.

Binary data may be sent over a communication channel by a variety of means. For example, in amateur packet radio, data is sent using an FM signal modulated with a 1.2kHz audio tone for 1 and a 2.2kHz audio tone for 0. In practice, no communication channel is perfect and noise or interference may cause a 1 that is sent to be received as a 0, or vice versa. Clearly such errors compromise the integrity of the data. For example, suppose the seven-bit ASCII binary sequence 1001010 representing the capital letter J is sent and the final bit is received as a 1. The received sequence, 1001011, represents the decimal number 75 – assigned to the capital letter K. Hence, an operator's name sent as JIM will be received as KIM.

The purpose of error correcting codes is to enable recognition of such errors when they occur and, if possible, to correct them. Error correcting codes have been used in the amateur radio community for several decades. An early example is the data mode Amateur Teleprinting Over Radio (AMTOR), developed in the 1970s. AMTOR has a very basic error detection facility: each character is represented by a seven-bit sequence with precisely four bits equal to 1 and three bits equal to 0; any deviation from this pattern in the received sequence is recognised as an error. Many later data modes make use of error correction, including the WSJT suite, which was developed in the late 1990s; Opera, which is in widespread use on the LF bands; and several other HF data modes such as the very popular WSPR and JT65. For packet radio, an enhanced version of the AX25 packet protocol incorporating error correction, called FX25, was created in 2005.

The principal aim of this article is to make the theory of error correcting codes more widely known and understood within the amateur radio community, particularly those involved in the development of new data modes. Moreover, the subject is interesting and elegant in itself and underlies much of the digital technology that we all use on a daily basis, so should be of interest even to readers who do not use data modes.

Since its emergence in the 1950s, coding theory has grown into a deep and complex area of mathematics, and in this article we shall only scratch the surface of the myriad coding schemes now in use. We restrict our attention here to binary block codes, using the two symbols 0 and 1 transmitted in blocks of a given fixed length, since these are the most basic codes and the starting point for the development of more sophisticated coding schemes.

Repetition and parity check

The simplest scheme for detecting an error is a repetition code. For example, each bit of the sequence representing the capital letter J may be sent twice: 11 00 00 11 00 11 00. The two bit blocks 11 and 00 are called *code words*. Suppose that once again an error occurs in the final bit, so that the following sequence is received: 11 00 00 11 00 11 01. The recipient examines each block to check that it is a code word. The first six blocks pass the check but the final block, 01, is not a code word. Hence the error has been detected. However, there is no way of knowing whether the code word that was sent was 00 or 11.

For each bit in the original data, the repetition code requires that two bits be sent, and we say that this code has a *rate* of ½ = 0.50. It is desirable to achieve as high a rate as possible, and there are ways of improving upon the repetition code.

The *weight* of a binary sequence is the number of bits in the sequence that are equal to 1. For example, the sequence 1001010 has weight three, whilst 1001011 has weight four. A *parity check* code works by restricting code words to sequences of *even* weight. Beginning with the seven bit sequence representing J, we may pad the sequence with an additional 0 bit at the front and then break the eight bit sequence into four blocks of two bits: 01 00 10 10. We then append a third bit to each block, so that each resulting three bit block is of even weight: 011 000 101 101. This is called a *parity check* bit. Suppose that once again an error occurs in the final bit so that the following sequence is received: 011 000 101 100. The recipient sees that the final block, 100, has odd weight, and hence the error has been detected. Once again, there is no way of knowing which of the bits was erroneous: the code word sent may have been 000, 110 or 101.

The number of bits in the code words for a code is called the *length* of the code, denoted *n*. The number of data bits that are encoded in each code word is called the *dimension* of the code, denoted *k*. The rate of the code is given by *k*/*n*. The parity check code above has length 3 and dimension 2. Hence the code has rate $^2/_3 = 0.67$, which is an improvement over the rate of the repetition code. Further improvement of the rate may be made by lengthening the blocks to which the parity check bit is attached. We may break the eight bit sequence above into two blocks of four bits: 0100 1010. A parity check bit is then appended to each block to give 01001 10100. This code has length 5 and dimension 4, and so the rate is $^4/_5 = 0.80$. However, the improvement in rate has to be paid for in loss of information about the error that has occurred. For example, if the block 10101 is received then we know that an error has occurred. But, assuming that only a single error has occurred, the code word sent may have been 00101, 11101, 10001, 10111 or 10100.

Arithmetic modulo 2 & linear codes

In arithmetic modulo 2, as in binary, we work with a pair of symbols: 0 and 1. We have 0 + 0 = 0, 0 + 1 = 1 and 1 + 0 = 0. However, whereas in binary arithmetic we have 1 + 1 = 10, in modulo 2 arithmetic no bit is carried to the next place so that we have 1 + 1 = 0. We may extend modulo 2

arithmetic from pairs of single bits to pairs of sequences of bits of equal length, by adding bits in the corresponding positions. For example 10101 + 01110 = 11011. In a similar way, we may add together three or more sequences of the same length. For example, 11001 + 01101 + 00011 = 10111.

A *linear code* is one in which the sum of any two code words is itself a code word. For example, in the parity check code of length five from the previous section there are sixteen code words:

Weight zero: 00000
Weight two: 11000, 10100, 10010, 10001, 01100, 01010, 01001, 00110, 00101, 00011
Weight four: 11110, 11101, 11011, 10111, 01111.

It is easily checked that the sum of any pair of these is also a code word. For example, 11101 + 01111 = 10010. In this article, we are concerned only with linear codes.

An important concept for linear codes is *Hamming distance*, named after Richard Hamming, who first introduced the concept in 1950. For a pair of binary sequences X and Y of equal length, the Hamming distance between X and Y is defined to be the number of bits in which X and Y differ. We write this as d(X, Y). For example, d(1110101, 1111010) = 4 since the two seven-bit sequences agree in the first three bits but differ in the remaining four. Notice that the weight of a sequence X, which we write as w(X), is its Hamming distance from the all-zero sequence of the same length: w(X) = d(X, 0). Notice also that we may find the Hamming distance between sequences X and Y by finding the weight of their sum: d(X, Y) = w(X + Y). For example,

d(1110101, 1111010)
= w(1110101 + 1111010)
= w(0001111)
= 4.

Examining again the parity check code of length five, we see that the Hamming distance between any pair of distinct code words is either 2 or 4. It follows that the minimum Hamming distance between any pair of distinct code words is 2. The minimum Hamming distance, denoted d, is an important parameter of a linear code as it determines the number of errors in each block which can be corrected.

Single error correction – Hamming codes

In the second section we looked at repetition and parity check codes that enabled us to detect a single error in a sequence of bits. However, these codes did not enable us to *correct* an error that has occurred. The simplest way in which we can correct a single error in a block is to repeat each bit three times. For the seven bit sequence 1001010 representing J we get
111 000 000 111 000 111 000

Two code words, 000 and 111, are separated by Hamming distance 3.

Suppose once again that an error occurs in the final bit, so that the following sequence is received:
111 000 000 111 000 111 001

The first six blocks are code words, but the seventh block is not. Since 001 has a Hamming distance of two from the code word 111, but a Hamming distance of only one from the code word 000, if only a single error occurred then the code word sent must have been 000. Thus the triple repetition code allows us to correct a single error per block. However, the rate of this code is only ⅓ = 0.33, motivating the need for error correcting codes that have a higher rate.

An important class of linear codes known as *Hamming codes* (again named after Richard Hamming, their discoverer) allow the correction of a single bit error per block in a received sequence. The Hamming code of length 7 is defined by the rectangular array shown in **Figure 1**, known as a *generator matrix*.

Row 1	1	0	0	0	1	0	1
Row 2	0	1	0	0	1	1	1
Row 3	0	0	1	0	1	1	0
Row 4	0	0	0	1	0	1	1

FIGURE 1: Generator matrix for Hamming code of length 7.

0	0	0	0	>	0	0	0	0	0	0	0
0	0	0	1	>	0	0	0	1	0	1	1
0	0	1	0	>	0	0	1	0	1	1	0
0	0	1	1	>	0	0	1	1	1	0	1
0	1	0	0	>	0	1	0	0	1	1	1
0	1	0	1	>	0	1	0	1	1	0	0
0	1	1	0	>	0	1	1	0	0	0	1
0	1	1	1	>	0	1	1	1	0	1	0
1	0	0	0	>	1	0	0	0	1	0	1
1	0	0	1	>	1	0	0	1	1	1	0
1	0	1	0	>	1	0	1	0	0	1	1
1	0	1	1	>	1	0	1	1	0	0	0
1	1	0	0	>	1	1	0	0	0	1	0
1	1	0	1	>	1	1	0	1	0	0	1
1	1	1	0	>	1	1	1	0	1	0	0
1	1	1	1	>	1	1	1	1	1	1	1

FIGURE 2: Coding scheme for the Hamming code of length 7.

The number of rows in the array is the dimension of the code, denoted k. So for the Hamming code of length 7 we have $k = 4$. We encode four bit sequences of data by adding together the rows of the array that correspond to bits in the sequence that are equal to 1. For example, 1000 is encoded as the first row of the array, 1000101. The four bit sequence 0101 is encoded by adding together the second and fourth rows of the array to give 0100111 + 0001011 = 0101100. This leads to the coding scheme shown in **Figure 2**.

We notice that all of the non-zero code words are of weight 3, 4 or 7. For any code word X of non-zero weight w there are a pair of distinct code words separated by Hamming distance w, namely X itself and the all-zero word 0. Conversely, for any pair of distinct code words X and Y separated by Hamming distance w, there is a code word of weight w, namely X + Y. It follows that any pair of distinct code words in the Hamming code of length 7 are separated by Hamming distance 3, 4 or 7, and hence that the minimum Hamming distance of the code is $d = 3$.

Because the minimum Hamming distance is 3, if an error occurs in a single bit then the sequence that results will have Hamming distance one from the code word sent, but Hamming distance two or more from all other code words. Hence, on the assumption that only a single error has occurred, the error can be corrected. To implement error correction, we use a second rectangular array, known as the *parity check matrix*. This is shown in **Figure 3**.

Suppose that we break up the eight bit sequence representing J into two blocks of four bits as before: 0100 1010. This is encoded using the Hamming code to give two blocks of seven bits: 0100111 1010011

Let us suppose that errors occur in the seventh bit of the first block and in the second bit of the second block, so that the following sequence is received: 0100110 1110011

Because the first block has 1s in the second, fifth and sixth bit, we add together the second, fifth and sixth rows of the parity check matrix: 111 + 100 + 010 = 001

The three bit sequence 001 is called the *syndrome*. In this case the syndrome is precisely the seventh row of the parity check matrix, which tells us that the error occurred in the seventh bit.

The second block has 1s in the first, second, third, sixth and seventh bits. We add together the first, second, third, sixth and seventh rows of the parity check matrix: 101 + 111 + 110 + 010 + 001 = 111

This time the syndrome 111 is the second row of the parity check matrix, telling us that the error occurred in the second bit.

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Row 1	1	0	1
Row 2	1	1	1
Row 3	1	1	0
Row 4	0	1	1
Row 5	1	0	0
Row 6	0	1	0
Row 7	0	0	1

FIGURE 3: The parity check matrix for the Hamming code of length 7.

Row 1	1	0	0	0	1	0	1	1
Row 2	0	1	0	0	1	1	1	0
Row 3	0	0	1	0	1	1	0	1
Row 4	0	0	0	1	0	1	1	1

FIGURE 4: Generator matrix for the extended Hamming code of length 8.

1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1
0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	1
0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0
0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1	1
0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1	0
0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	1
0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0
0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0
0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1
															1	0	0	0
															0	1	0	0
															0	0	1	0
															0	0	0	1

FIGURE 5: Generator matrix and parity check matrix for the Hamming code of length 15.

Table 1: Parameters of each of the codes discussed and those of some related codes.

	No parity check bit					With parity check bit			
	k	n	d	r	δ	n	d	r	δ
Strength 1 codes:									
Repetition code	1	3	3	0.33	1	4	4	0.25	1
Hamming codes	4	7	3	0.57	0.43	8	4	0.50	0.5
	11	15	3	0.73	0.2	16	4	0.69	0.25
	26	31	3	0.84	0.1	32	4	0.81	0.13
Strength 3 codes:									
Repetition code	1	7	7	0.14	1	8	8	0.13	1
RM(1, 4)	5	15	7	0.33	0.47	16	8	0.31	0.5
RM(2, 5)	16	31	7	0.52	0.23	32	8	0.50	0.25
Golay code	12	23	7	0.52	0.3	24	8	0.50	0.33
Strength 7 codes:									
Repetition code	1	15	15	0.07	1	16	16	0.06	1
RM(1, 5)	6	31	15	0.19	0.48	32	16	0.19	0.5
RM(2, 6)	22	63	15	0.35	0.24	64	16	0.34	0.25
RM(3, 7)	64	127	15	0.50	0.12	128	16	0.50	0.13

A linear code is described by giving three parameters, the length n, the dimension k and the minimum Hamming distance d, in the format $[n, k, d]$. In this notation, the Hamming code described above is a [7, 4, 3] code, and has rate $4/7 = 0.57$, a significant improvement upon the [3, 1, 3] triple repetition code.

Notice that if errors occur in *two* bits, then the resulting sequence will be incorrectly decoded. This can be remedied by appending an additional parity check bit to each code word. This is easily implemented by appending a parity check bit to each row of the generator matrix, as shown in **Figure 4**.

The resulting code is an [8, 4, 4] code, and is called an *extended Hamming code*. Errors in two bits are detected, but cannot be corrected. This improvement comes at the expense of a slightly reduced rate of $^4/_8 = 0.50$.

The Hamming code that we have described is the first in a sequence of Hamming codes of increasing length. For each positive integer m greater than 2, there is a Hamming code of length 2^m-1, dimension 2^m-1-m and minimum distance 3. The case $m = 2$ is the triple repetition code, and the case $m = 3$ is the Hamming code of length 7. For $m = 4$ we get a Hamming code with parameters [15, 11, 3]. The generator matrix and parity check matrix for this code are shown in **Figure 5**.

Because the minimum distance is 3, this code can also correct an error in a single bit. The rate is $^{11}/_{15} = 0.73$, an improvement upon the [7, 4, 3] Hamming code. For $m = 5$ we get a Hamming code with parameters [31, 26, 3], and an even higher rate of $^{26}/_{31} = 0.84$. However, as the length of the code words increases it become more probable that two or more errors will occur within the same block, leading to incorrect decoding.

As with the Hamming code of length 7, an additional parity check bit may be appended to each of these codes to give [16, 11, 4] and [32, 26, 4] extended Hamming codes.

The Hamming code of length n has the following remarkable property: every binary sequence of length n is either a code word, or has a Hamming distance of one between it and an unique code word. A code having this property is called a *perfect code*.

A code that can correct a single error in each block is said to have *strength* 1. If signals are weak or interference is present then it may be expected that more than one error occurs per block, rendering a code of strength 1 useless. For this reason, more robust codes have been developed that are capable of correcting multiple errors in each block.

Multiple error correction – first order Reed-Muller codes

We have already seen that the triple repetition code can correct a single error. A repetition code of length 5 can detect up to two errors per block, and a repetition code of length 7 can detect up to three errors per block. However, the rates of $^1/_5 = 0.20$ and $^1/_7 = 0.14$ respectively are very low.

1	1	1	1	1	1	1	1
1	1	1	1	0	0	0	0
1	1	0	0	1	1	0	0
1	0	1	0	1	0	1	0

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

FIGURE 6: Generator matrices for the Reed-Muller codes RM(1, 3) and RM(1, 4).

The first order Reed-Muller codes RM(1, 3) and RM(1, 4) have generator matrices shown in **Figure 6**. These are named after Irving S Reed and David E Muller. Hopefully the pattern in these will be clear to the reader. RM(1, 3) is an [8, 4, 4] code, and turns out to be equivalent to the extended Hamming code.

In RM(1, 4) each non-zero code word is of weight 8 or 16. It follows that the minimum Hamming distance is 8, and so RM(1, 4) is a [16, 5, 8] code. Because $d = 8$ the code can correct up to three errors per block, and can also detect (but not correct) a fourth error. We have seen that a Hamming code may be extended by appending a parity check bit to each code word; conversely, a Reed-Muller code may be *punctured* by deleting the final bit in each code word. Doing this with RM(1, 4) reduces d by 1 to give a [15, 5, 7] code, which also corrects up to three errors per block and but has a marginally higher rate. These codes are said to have strength 3.

More generally, for each positive integer m, the first order Reed-Muller code RM(1, m) has length 2^m, dimension $1 + m$, and minimum distance 2^{m-1}, and hence is a $[2^m, 1 + m, 2^{m-1}]$ code.

For example, RM(1, 5) is a [32, 6, 16] code, and is able to correct up to seven errors per block. This code was employed by the Mariner spacecraft in the early 1970s to transmit images of Mars back to Earth.

Second order Reed-Muller codes and Golay codes

The generator matrix for the second order Reed-Muller code RM(2, 4) may be obtained from the matrix for RM(1, 4) by the following procedure: consider the four rows that correspond to code words of weight eight (all but the top row). For each pair of such rows, obtain a new row by multiplying the two rows together bit by bit. For example,
1111111100000000 x 1100110011001100 = 1100110000000000

There are six pairs of such rows, and hence the dimension of the new code is 11. The generator matrix for RM(2, 4) appears in **Figure 7**.

RM(2, 4) is a [16, 11, 4] code, and turns out to be equivalent to the extended Hamming code of the same length. But RM(2, 5) is a new code with parameters [32, 16, 8] that, like RM(1, 4), is capable of correcting up to three errors per block but has a higher rate than RM(1, 4).

More generally, RM(2, m) has parameters $[2^m, 1 + \frac{1}{2}m(m+1), 2^{m-2}]$. For example, RM(2, 6) has parameters [64, 22, 16] and is able to correct up to seven errors per block.

Higher order Reed-Muller codes may also be constructed. For example, to construct the third order Reed-Muller code RM(3, m) we include additional rows in the matrix corresponding to the result of multiplying together any two rows or any three rows (excluding the top row) of the generator matrix of RM(1, m).

Finally, we mention the binary Golay code, discovered by Marcel J E Golay in 1949. This is a [23, 12, 7] code. Remarkably, this code achieves the same error correction capability as the punctured [31, 16, 7] Reed-Muller RM(2, 5) code, with marginally higher rate but significantly shorter block length. As with the Hamming codes, the Golay code may be extended by appending a parity check bit to each code word to give a [24, 12, 8] code. The generator matrix for the extended Golay code appears in **Figure 8**.

This code was used by the *Voyager 1* and *Voyager 2* spacecraft to transmit colour pictures of Jupiter and Saturn back to Earth from 1979 through to 1981.

The Golay code of length 23 is also a perfect code: every 23 bit sequence is either a code word, or has a Hamming distance of three or less between it and a unique code word. It has been proved that any perfect binary linear code has the parameters of the Golay code or a (non-extended) Hamming code – there are no other cases.

There are other binary linear codes that are beyond the scope of this article, notably the BCH codes, named after the French mathematician Alexis Hocquenghem, who discovered these in 1959, and Raj Bose and D K Ray-Chaudhuri who discovered them independently in 1960. The BCH codes achieve a better rate than Reed-Muller codes of comparable minimum Hamming distance and length. Codes may also be defined over larger alphabets. For example, a *ternary* code has an alphabet with three symbols: 0, 1, 2. Alphabets of size a power of two are particularly useful. For example, the hexadecimal alphabet comprises sixteen symbols – numerals 0 through 9 and letters A through F. Each hexadecimal symbol is equivalent to four bits, so that the bit rate for a hexadecimal code is four times the symbol rate. The Hamming codes and Reed-Muller codes can be constructed over alphabets of different sizes. There are also powerful codes constructed over larger alphabets that are not applicable in the binary case, notably the Reed-Solomon codes. These are used in compact discs, and also in the FX25 packet protocol.

Table 1 summarises the parameters of each of the codes that we have discussed, and those of some related codes. For each code, the table gives the dimension k, the length n, and the minimum Hamming distance d. The rate r is calculated as k/n, and the relative distance δ is calculated as d/n. Notice the trade-off between rate and relative distance: as r increases, δ tends to decrease, and vice-versa. Values of n, d, r and δ are given for codes with and without an additional parity check bit.

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0
1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0

FIGURE 7: The generator matrix for RM(2, 4)

1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	1
0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	0	
0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	
0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	0
0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	1	1	0	1
0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	1	1	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	1	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	1	0
0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	1
0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	0	1	1	0
0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	0	1	1	1
0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	1	0	1	0	1	1

FIGURE 8: The generator matrix for the extended Golay code.

ATV

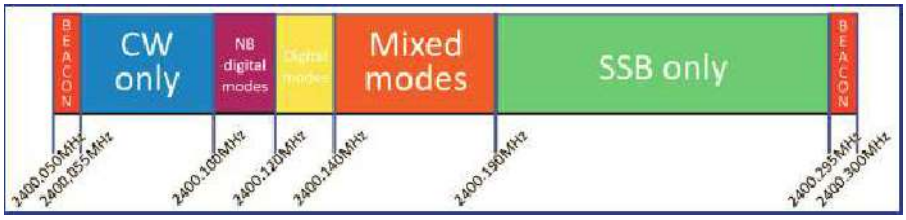

FIGURE 1: Narrowband band plan for Es'hail-2. Downlink spans 10489.55MHz to 10489.80MHz.

Es'hail-2 Launch

The Es'hail-2 satellite was successfully launched towards its geostationary orbit on 15 November, carrying the two transponders that will be available for amateur radio use. The satellite will take a few weeks to reach its allocated position in the geostationary orbit, and also needs to be commissioned and handed over from the manufacturer (Mitsubishi Electric Corporation) to the operating company Es'hailSat, before it is available for amateur use. See p12 and p72 for more information.

I published the band plan for the wideband transponder in the November 2018 *RadCom*; the band plan for the narrowband transponder has now been drawn up and is shown in **Figure 1**.

The latest news about the satellite and its availability for amateur use will be published on the AMSAT-DL website **[1]** with further discussion and analysis of the ATV aspects on the BATC Forum.

PHOTO 1: Pictures received by M0DTS/P.

New digital ATV DX records

The enhanced tropospheric conditions on 24 October were well forecasted and a number of ATV stations pre-arranged portable operations and skeds for the day via the BATC Forum **[2]**. Rob, M0DTS went out on the North York Moors (IO94MJ) and his first contact was with Shaun, G8VPG/P who was at Penn Hill on the Mendips (IO81QF) using 6cm FM TV at 370km.

Conditions continued to improve. Rob then saw Malcolm, G0UHY in Paignton (IO80EK) on 146MHz at 477km. Unfortunately, a 2-way contact was not possible. However, Rob did go on to work Adrian, G4UVZ in Taunton 2-way on 146MHz at 407km for a new DATV record on the band. Adrian and Rob then tried 10GHz and again managed a 2-way DATV QSO at 407km – another new record.

Other stations active during the day (and "only" managing 300km or so) were Tony, G4CBW, Noel, G8GTZ/P, the G3NWR/P team, Arthur, G4CPE, John, GI7UGV/P and Richard, GI4DOH.

PHOTO 2: M0LCR and 2E0DHQ assisting G4EWJ operating as G3NWR/P.

Digital ATV loan equipment

Tim, G4WIM reports on how he has been promoting activity in the Blackpool area by providing a set of loan equipment for digital ATV. Whilst the idea is not new, I believe that it is the first time that such a technically advanced station has been made available for general loan. This has enabled a number of amateurs to have their first local contacts and also contacts through the Blackpool TV repeater GB3FT.

The Tx equipment is based on a Portsdown system **[3]** with a Raspberry Pi, Pi Camera, 7" touchscreen, Lime SDR Mini and a PE1RKI 23cm PA. On receive, a 23cm LNA feeds a MiniTiouner **[4]** connected to a laptop.

Control and monitoring of the PA and switching is provided by an Atmel controller with an LCD display. It's a really well-built and well thought-out solution. Well done Tim.

PHOTO 3: The DATV loan equipment provided by G4WIM.

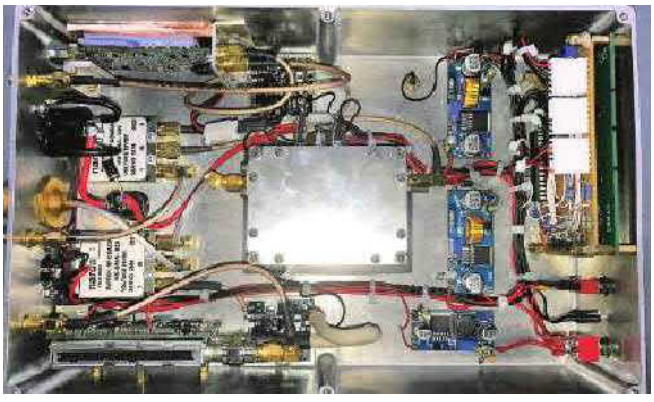

PHOTO 4: The 23cm switching, control and PA box.

Websearch

[1] https://amsat-dl.org/eshail-2-amsat-phase-4-a
[2] https://forum.batc.org.uk
[3] https://wiki.batc.org.uk/The_Portsdown_Transmitter
[4] https://wiki.batc.org.uk/MiniTioune

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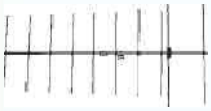

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A bi-directional JFET amplifier

Some time ago, a fellow amateur asked me for a simple wide band bi-directional amplifier for use in RF and IF in a SSB/CW transceiver.

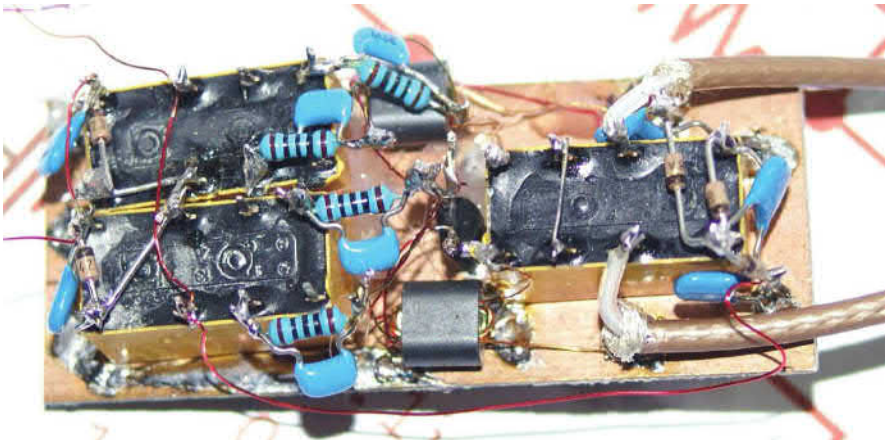


PHOTO 1: General view of a prototype amplifier, built 'ugly'-style. The size of the circuit is determined mainly by the relays, which are mounted to the PCB baseboard here using hot melt glue.

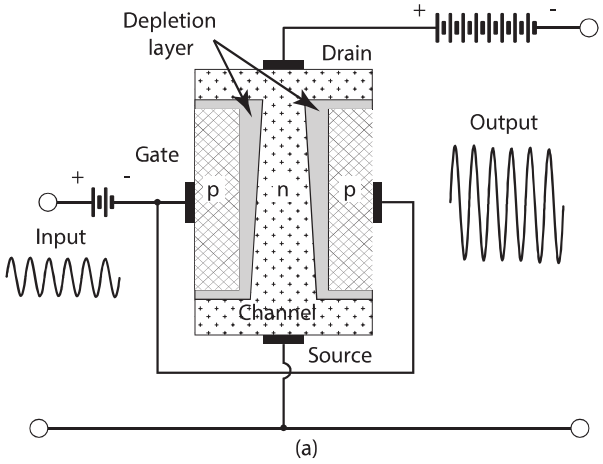


FIGURE 1: Classic JFET structure; the two PN junctions are visible.

Bi-directional amplifier schematics of varying complexity can be found in magazines, handbooks and on the internet. This request was a trigger to check a circuit I had sketched back in the 1990s but never tried.

As we all know, the function of an SSB transceiver is to translate an audio spectrum from the frequencies at RF to the audio ones (Rx) and from the audio to the RF ones (Tx). This is essentially a reversible procedure in the analogue domain and employs the same translation schema but in the opposite directions. Transceivers do combine a receiver and a transmitter in a single unit, generally employing the same conversion schema for each function. For this reason, in a transceiver, the receiver and the transmitter may use common circuits, passive and active. Filters and passive mixers are easy as bi-directional stages for these applications. Generally, the amplifiers are double in the IF stages, one for Rx and one for Tx, plus the ones in the RF.

Bi-directional amplifiers maybe utilised to simplify the circuits in common between Rx and Tx functions, with the possibility of a more compact equipment and reduction of space, components and money. This aspect is valid for commercial, military and amateur radio equipment, but these solutions may not be simple or easy to implement.

A JFET, used as an amplifier, could make easy the bi-directional stage. It is bi-directional; the structure is made by two P-N junctions, as shown in **Figure 1**. In the manufacturing process of small signal JFETs there is not much difference between drain-gate and source-gate junctions, as long as the gate is properly polarised; the current direction depends only by the potential DC voltage applied to the source and the drain. Thus a JFET, with its inherent reversibility, can be an ideal bi-directional amplifier in a common gate configuration. The amplifying direction is only determined by the DC voltage applied to the transistor (+Vdrain or +Vsource). [*Manufacturers do not normally specify the characteristics when connected in the reverse direction so there are no performance guarantees and the frequency response will be determined by the symmetry of the inter-electrode capacitances on the device substrate – Ed*].

In a common gate JFET, the output current is the same as the input current and the input impedance is low. The high impedance connected to the drain gives the stage gain. At this point, the signal voltage has to be matched to a low impedance to develop the required gain towards the load. Generally, this drain to load matching it is using an L (inductor) circuit on a resonating IF or RF stage. On a wide band amplifier a transformer type is used. The JFET low input impedance maybe connected directly to the signal source, if this represents a satisfying input matching, contrary, using a low Q matching circuit.

Figure 2 shows a wide band common gate JFET amplifier schematic. It has two transformers, one at the input and one at the output. **Figure 3** shows the output sweep of the tracking generator used to test the amplifier from <1MHz to 100MHz with the signal level of -10dBm. A gain of circa 5dB was noted.

If we look at the amplifier schematic in Figure 2 and swap the two transformers, plus the input and output, we should have the same configuration and results. **Figure 4** shows this configuration. Now, we can arrange the final JFET bi-directional amplifier as shown in **Figure 5**. This configuration

has both transformers with three windings each, which L2 and L3 are controlled by two small RF relays, RLY1 and RLY2. As shown, the two relays are not energised. In this configuration the input is associated to the source, via L2 common through a parallel R-C, while L3 is not connected. The output is at the drain through L2 in series, with L3 connected to +12V via a parallel R-C. This is the configuration for a receiver. The tracking sweep output signal shown in **Figure 6**. The amplifier has a power gain of circa 5dB, quite similar to the one of the unidirectional amplifier output of Figure 2.

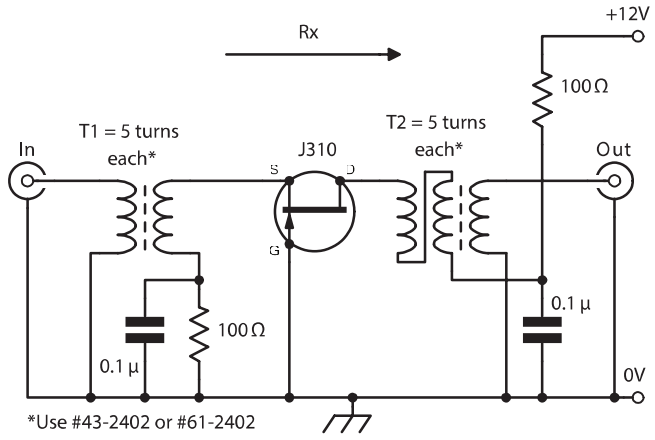


FIGURE 2: Classic common gate unidirectional JFET amplifier for use as a receiver RF or IF amp.

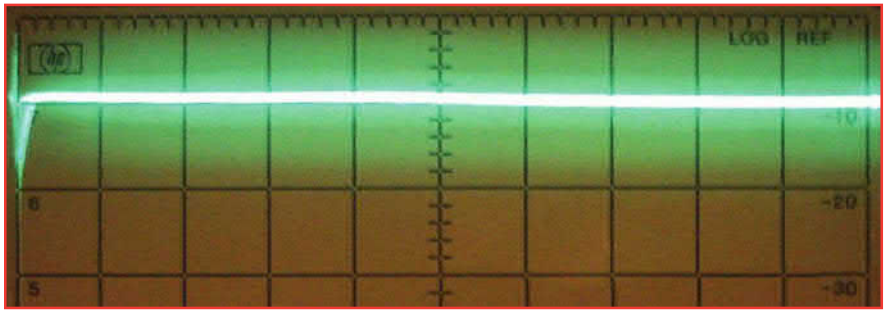


FIGURE 3: Sweep from tracking generator, spectrum output <1MHz to ~100MHz at -10dBm level, used to test amplifier.

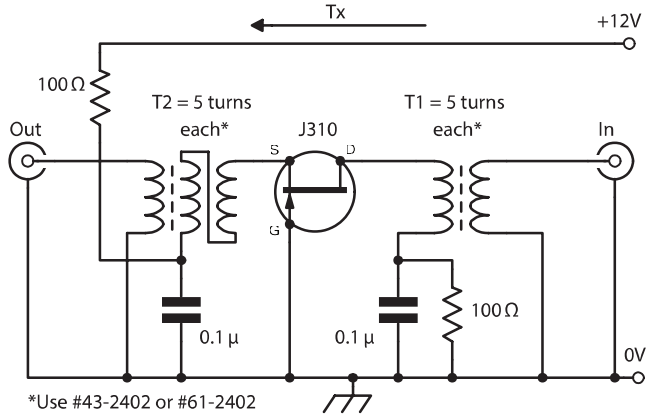


FIGURE 4: Mirror configuration of circuit diagram in Figure 2 to show change of signal direction.

To invert the signal direction, for the Tx function, RLY1 and RLY2 have to be energised. In this configuration, we have the input at the drain with T2 L2 winding taken to ground through a parallel R-C and L3 not connected to +12V. The output is at the source (Tx direction) with L2 in series with L3, connected to +12V through a parallel R-C. In this configuration the power gain is less than 5dB and droops in the 80-100MHz range. The drop of gain maybe due to the C_{sg} capacitance (4.1-5pF), double than the C_{dg} (2.0-2.5pF).

If the bi-directional amplifier is a stage of an RF front end, RLY3 will switch it ON and OFF. When RLY3 is in the OFF selection, the amplifier is switched ON, for the Tx function, when +12V Tx is applied.

It is important to note that relays Rly1 and Rly2 are switching DC, not radio frequency. Rly3, the bypass relay, may of course be omitted if not required.

We don't have to use 12V relays, which may be an advantage if there is a risk of the +12V rail going low – in the worst case the relays might drop out momentarily, but what is more likely is that they will switch on more slowly than normal. 5V (or other voltage) relays can easily be used instead, with suitable voltage regulators. **Figure 7** shows a suitable arrangement – note that the regulators shown are 6V to help take account of diode voltage drops.

The relays I used are 16-pin DS2Y type that I happened to have on hand. However, the smaller 10-pin TQ2 type is suggested, resulting in a more compact amplifier. This selection will require pins number connection changes. **Figure 8** shows the pinout for the DS2Y and **Figure 9** has pins for the TQ2.

I used home would balun type transformers on BN-43-2402 cores, with 3 windings of 5 turns. The impedance presented at the drain is 200Ω, with an output load of 50Ω. For this arrangement the amplifier gain is around 5dB. To have a higher gain it is possible to use two or more JFETs in parallel, increasing the transconductance, g_m ($Gp=g_m*R_{load}$). Another solution is to increase the number of turns associated to L3, in both transformers. I did not measure the input impedance but it is expected to be around 80Ω, dropping at around 40Ω using two JFETs in parallel ($R_{in}=1/g_m$). JFET J310 has transconductance $g_m=G_{fg}*10^{-6}$ which equates to $G_{fg}=12000\mu S$.

This JFET bi-directional amplifier does require a fair amount of PCB space due to the relays, but I believe it simplifies the stages.

Giancarlo Moda, I7SWX
i7swx@yahoo.com

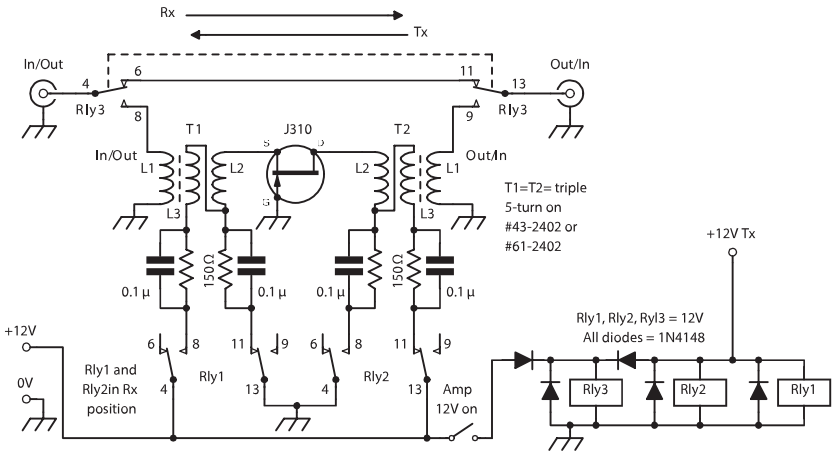


FIGURE 5: JFET bi-directional amplifier final solution. Two relays are to switch the two transformers winding connections of L2 and L3. Third relay is used if stage is an RF amplifier, to switch it on and off, as in an Rx front end. The 12V Tx voltage switches relay 3 on if off on receive, as part of Tx stage. Pin numbers refer to DS2Y relays.

Assembing this circuit on a PCB using SMD components and Fujitsu FTR-B3 2 pole relays (10x7x5mm) it can be built in a space of just over 20x25mm including transformers.

Figure 10 suggests a SSB/CW transceiver block diagram. The many common stages of bi-directional mixers, amplifiers and filters are quite visible; there is no RF signals switching except at the PA. Gain distribution has to properly be defined and the H-Mode Mixer will give a strong front end.

[Editorial note: Our Technical Panel reviewer built a version of this amplifier using a J310 and slightly different transformer cores. The gain with conventional connections (drain positive) was found to be 17dB at 10MHz with a drain current of 10mA. With the drain and source reversed the gain was 15dB and the drain current was 9.3mA. So the 5dB gain reported in the article may be pessimistic, but it will depend on the precise characteristics of the individual JFET you use.]

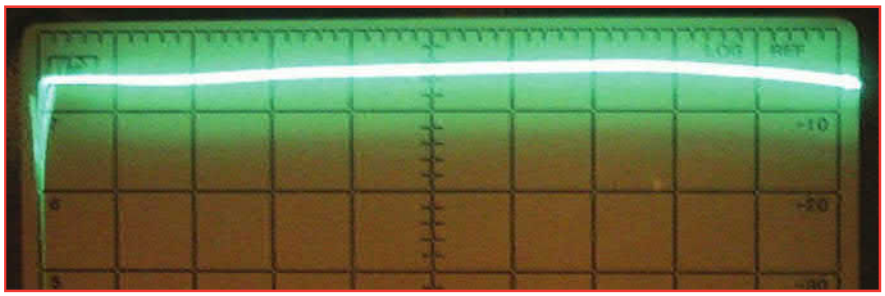


FIGURE 6: Amplifier output of sweep tracking signal as a bi-directional stage in the Rx configuration, with input into the source and output on the drain. Power gain is around 5dB.

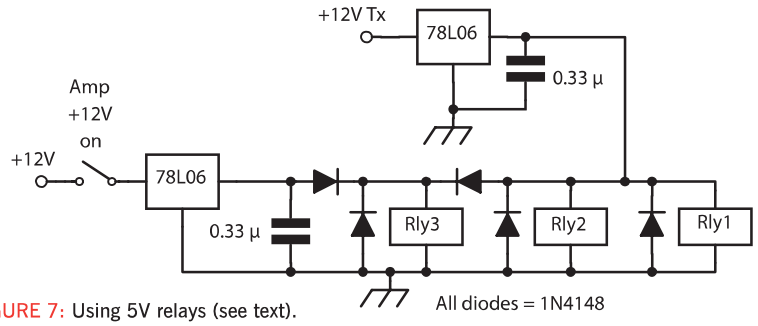


FIGURE 7: Using 5V relays (see text).

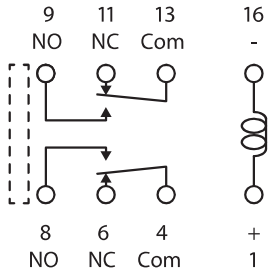


FIGURE 8: Pinout for the 16-pin DS2Y relay.

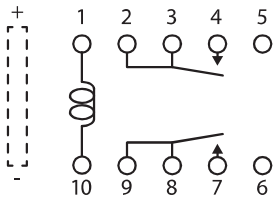


FIGURE 9: Pinout for the 10-pin TQ2 relay.

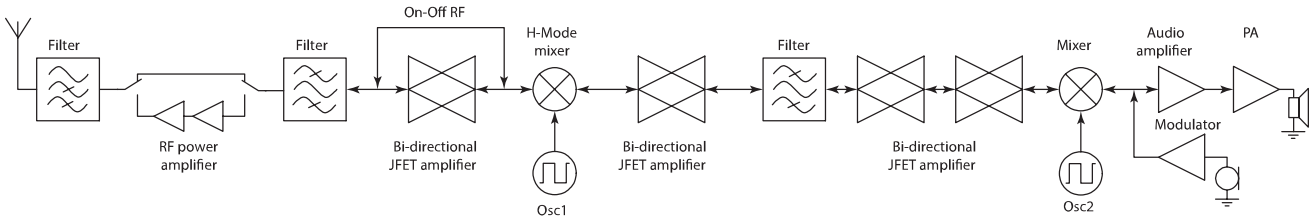
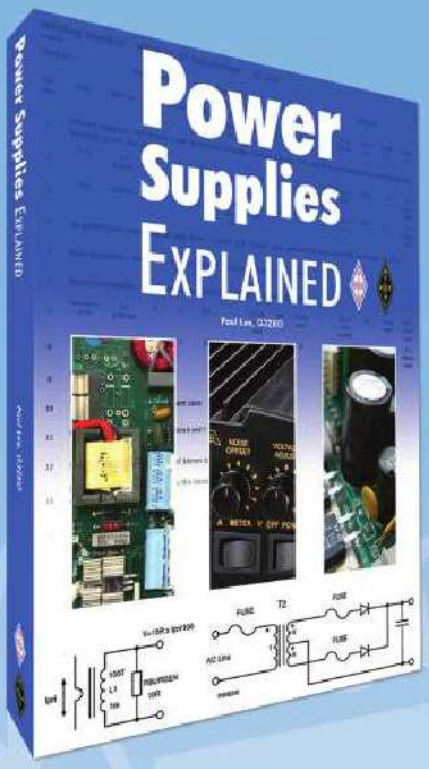
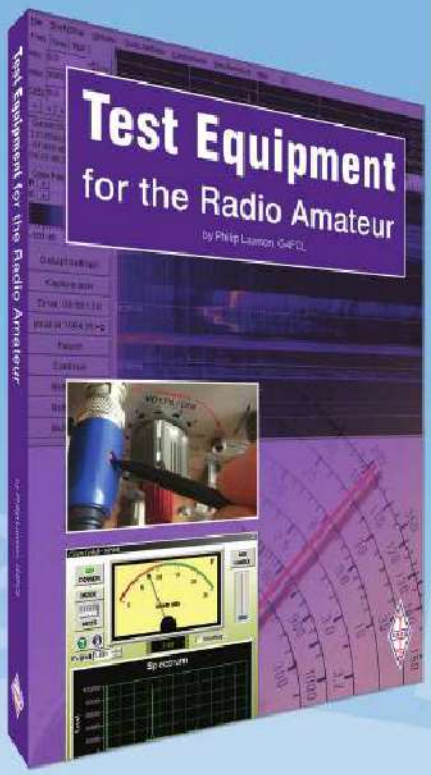


FIGURE 10: Suggested block diagram of a SSB/CW transceiver. There are several common, bi-directional stages, and there is no need for RF switching (= expensive RF relays) except at the power amplifier.





RSGB SHOP

NEW

Power Supplies Explained

By Paul Lee, G3ZKO

A power supply is something that is often overlooked by radio amateurs, as for many it is simply the box that provides stable DC voltage. A modern power supply is though much more, combining theory that dates back to the nineteenth century incorporating the latest techniques in digital control, with a wealth of electronics practice in between. *Power Supplies Explained* sets out to explain what that box is doing, through to designing your own bespoke power supply.

Beginners are wary of the challenging mixture of digital, analogue, magnetics and control loops, with cooling, EMC and safety to contend with as well. *Power Supplies Explained* seeks to detail how circuits are chosen for the application and how circuits are designed including their inductors and transformers. Calculations are outlined in a simple way so that the reader can use them as a basis for their own designs.

Chapters include descriptions of 'linear' supplies and a wide range of 'switched-mode' types from simple buck converters to the latest off-line high-efficiency topologies. Examples are based around typical radio amateur requirements and are versions of commercial products that the author has successfully designed. There are also chapters on magnetics theory, control loops, EMC, practical construction techniques, test equipment and much more. High voltage power supplies are included with comprehensive guidance on safety.

Power Supplies Explained sets out to dispel the mystery and encourage readers to 'have a go' with their own designs.

Size 174x240mm, 320 pages
ISBN: 9781 9101 9364 8
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Test Equipment for the Radio Amateur

By Phillip Lawson, G4FCL

This book is aimed at the radio amateur, listener and electronic enthusiast who wants to make a variety of measurements without necessarily spending a fortune on expensive test equipment. It is a very practical book, designed to help you develop care and skill in making the most common and important measurements, quickly, safely and affordably.

In this new fifth edition of *Test Equipment for the Radio Amateur*, the reader will find, for the first time, extensive links to internet sources for access to the very latest information on construction projects, equipment and measurements. The sections on commercial and home-brew equipment have been separated for clarity, new items added and some dated items removed. Timeless reference data has been retained; some items of technical theory have been given their own section, and extended, for those who wish to deepen their understanding of these areas. This book is designed to give an overview of how each item of test equipment works, what it can be used for and even how much it might cost. Many general measurements, plus specific measurements on transmitters and receivers, are described in detail. Matters such as the effect of the test equipment on the circuit to be measured are especially considered, so that the measurement results may be interpreted correctly. A large section of the *Test Equipment for the Radio Amateur* is devoted to home construction, as it is frequently possible to make an extremely useful item of test equipment for a fraction of the price of its commercial counterpart.

Test Equipment for the Radio Amateur is a practical guide to getting the most out of your equipment and understanding exactly how your station is performing. It is simply a must have book for every radio amateur.

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SOTABEAMS ContestConsole for Icom radios

PHOTO 1: The ContestConsole used with the IC-7300.

PHOTO 2: The rear apron of the ContestConsole.

Over the years since the introduction of the computer chip, amateur radio contesting has developed into an interesting fusion of this technology and operator skills, such that there seems a black box for just about everything in this wonderful hobby of ours. This review is about one such 'gadget' aimed at making the contesters life a little easier.

Contesting aids

In contesting, the aim is to work as many stations as possible in a given time period, maximising both points per contact and contact rate per hour. In long 24 or 48 hour contests, this can place quite a strain on the operator, especially in SSB phone contests where one can end up speechless or, at the minimum, with a sore throat.

Things aren't as bad in CW or datamode contests where the computer takes on much of the load, using keyboard macros to send the contest exchanges and do the logging. For SSB operators, however, talking into a microphone for hours on end can become quite stressful. So, when I was invited to try out and review the SOTABEAMS ContestConsole for Icom radios, I was keen to see if it could make contest operating easier.

Just a month earlier, I had been the very fortunate winner of one of the major prizes, an IC-7300, at the RSGB Convention so I was keen to try the ContestConsole with my new equipment.

ContestConsole features

The SOTABEAMS ContestConsole comes in a very neatly presented 11 x 7.5 x 4cm black ABS enclosure, with very clear labelling of the eight operator push buttons on the top (**Photo 1**)

The top surface of the ContestConsole houses eight push buttons in two groups of two and one group of four. Two red buttons provide instant TX PTT and a Tune facility (to be described later). Two white buttons provide instant up and down frequency control – a feature of great value and safety in, say, a mobile installation. The other four (blue) buttons are programmable message memories that can be set up for contest CQs or test messages, both on phone, CW or PSK.

Note that the actual messages are stored in the station transceiver rather than the ContestConsole, which basically is a switch unit to access the messages remotely from the transceiver.

The rear apron of the box (**Photo 2**) has an 8 pin socket for an Icom microphone, plus a mini jack socket for an auxiliary microphone. Another mini jack socket offers an external PPT connection to your station footswitch while a four pin DIN socket is connected, via an optional (supplied in my case) cable, to the 4 pin white Molex connector found on most Icom transceivers. This is often used to provide +13VDC for external auto ATUs but, in this case, it allows the ContestConsole to switch the transceiver to a low output (10W) tuning transmission for such as amplifier or manual ATU adjustment.

Without this console, IC-7300 owners would either have to make their own lead and switch assembly or reduce power manually using the front panel control on the transceiver, together with either pressing the Morse key in CW mode or switching to RTTY and pressing the PPT – altogether a tedious process! With the SOTABEAMS console, all it takes is a press of the red Tune button on the top of unit.

The ContestConsole was designed with the IC-7300 in mind but it works with a wide range of other Icom radios:

IC-2300H	IC-2730	IC-275
IC-575	IC-7000	IC-703
IC-706	IC-707	IC-7100
IC-718	IC-7300	IC-7400
IC-746	IC-746PRO	IC-756
IC-756PRO	IC-756PROII	IC-756PROIII
IC-7600	IC-7610	IC-7700
IC-78	IC-7800	IC-7850
IC-7851	IC-9100	IC-910H
ID-4100A	ID-4100E	

PHOTO 3: The Console installed at G3PHO with the IC-7300 transceiver (right).

PHOTO 4: Programming IC-7300 voice memories.

PHOTO 5: The SB Contest Console being used in the 70MHz UKAC Contest at G3PHO, IO93GG.

Setting up

The ContestConsole could not be easier to set up and use. Plug the flying lead of the ContestConsole into the microphone socket on your radio and plug your normal microphone into the socket on the rear of the unit (Photo 2). Install a separate footswitch lead if required. In my case, I already had a footswitch directly connected to the transceiver so I didn't use the Console facility.

In less than five minutes I was up and running with the IC-7300 and testing all the push buttons prior to programming the four memories using the IC-7300 memory facility. There are usually some radio settings that need changing before the memory buttons will function – look for 'external keypad' in the radio manual for details.

Do not connect two microphones at the same time. If connecting a microphone via the ContestConsole, use either the 3.5mm socket or the 8 pin socket, not both. I always use a Heil Pro headset that has its own PPT connection to the footswitch in preference to the fist mic that comes with the IC-7300.

On some radios, an external storage device (memory card or USB stick) might be needed for voice memories to work. Full detailed instructions can be downloaded in PDF format from www.sotabeams.co.uk/content/CCICOM.pdf

The next step was to program the four memories. This process is detailed in the IC-7300 manual. The IC-7300 has eight such memories, all of which can be displayed on the transceiver front panel screen (**Photo 3**). It is very important to set the initial recording levels and the Tx audio drive levels so that you do not overdrive the transceiver. The adjustments can be accessed via the on screen buttons shown on the right in Photo 3. The transmit audio can be can be conveniently monitored using the Icom transceiver monitor or by listening on a suitably attenuated external receiver.

The ContestConsole controls Memories 1 to 4, so I decided I would have the ContestConsole do the most commonly used ones such as CQ Contest, CQ DX and QRZ contest. I programmed two CQ memories (T1 and T2 in the photograph), one with my personal callsign and the other with my club call, G5TO, so that the unit could be used on field days and other club contests. It is a real advantage to use the ContestConsole buttons instead of the touch screen on the IC-7300 as it reduces the chance of greasy marks being put on the transceiver screen. I also set up the IC-7300 to display all eight memories, including those of the ContestConsole. Voice Memories 5 to 8 can be programmed to less used functions such as "Is this frequency in use?" or just one's callsign. Ideally, all eight memories would have been on the ContestConsole but this would have meant smaller push-to-operate buttons in order to allow an extra four to be placed on the upper surface of the black box and, maybe, a small increase in the price of the unit. Other operators may prefer having no on-screen memory display in preference to the spectrum and waterfall display of the IC-7300. In that case they would need some sort of separate reminder of which memory keys did what.

The ContestConsole in operation

The ContestConsole arrived at my house just a few days before the RSGB November 2018 70MHz UK Activity Contest, so this was an ideal occasion to put it through its paces.

A pre-Contest net with some of Sheffield and District Wireless Society members confirmed that the Voice Memory's audio was excellent quality and at the correct level, indistinguishable from the microphone-generated audio.

I used the CQ Contest memory from soon after the contest started. Just one press of blue key M1 sent out "CQ Contest from G3 Papa Hotel Oscar, G3PHO Contest" and back came the replies. The change from Tx back to Rx was very fast, with no discernible delay. The QRZ key, M4, was also used from time to time.

The UK Activity Contest was not as hectic as, say, the CQ Worldwide SSB contest, so the ContestConsole has not yet been subjected to hour after hour of continuous use but even the short UK Activity Contest event proved its worth in contest conditions, allowing a sip of tea in between QSOs! I should mention that I have also programmed M1 to M4 on CW with suitable Morse messages. However, since I use Wintest, an integrated contest logger-cum-keying program, any ContestConsole contest memories are rather superfluous. Instead, I have programmed M1-4 with non contest macros: M1: CQ DX DE G3PHO, M2: G3PHO, M3: 599 TU, M4: QRZ?

I don't think I will use these often as I am quite competent with a keyer and paddle but, for those operators whose CW is a little shaky, these programmed memories could help them chase DX more successfully. The documentation says it can also be programmed for PSK but I have not tried that.

Summary

The SOTABEAMS ContestConsole is a low priced but effective aid to successful contesting, especially those in voice modes. It would be a very useful adjunct to field day equipment and long 24 to 48 hour DX Contests. It is extremely simple to install and use and is highly recommended. My thanks to SOTABEAMS (www.sotabeams.co.uk) for letting me try out this product. Richard, G3CWI from SOTABEAMS tells me that many users find the ContestConsole of great benefit for general operating - not specifically contesting.

The ContestConsole is available for £69.95 either direct from SOTABEAMS or from Martin Lynch & Sons.

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The new amateur radio exam syllabus

For some years now, under a schedule of terms agreed with Ofcom, the RSGB and affiliated clubs have been providing the route to gain an amateur radio licence. This involves setting the syllabus for the three licences and ensuring the club volunteers are adequately trained in order to deliver the necessary preparation that aspiring radio amateurs need.

As some adjustments were made to the revised syllabus in August 2018, the commencement date for the new exams has been revised and will now be 1 September 2019. The three-month overlap period for retakes of exams based on the old syllabus will be similarly adjusted.

Documents on the website

There are a number of new documents published in the Syllabus 2019 section of the website. Indeed, for those involved in any aspect of training and examinations, this section of the website should be regularly reviewed. www.rsgb.org/syllabus2019

The documents now include:

1. The specification and schedules formerly known as Parts 1, 3 and 4
2. A horizontal side-by-side presentation of the syllabus showing all three levels and how the subject matter progresses from the Foundation to Full licence requirements
3. A vertical presentation for each of the Foundation, Intermediate and Full syllabi.

Items 2 and 3 above were formerly known as Part 2 of the syllabus

4. The old Examination Schedule that maps syllabus section numbers to the corresponding question number in the actual exam has been replaced by items 2 and 3 above.
5. A version of the horizontal specification that is colour coded to see what has changed or moved and what is new.
6. A source document in vertical format for each of the levels showing in detail the new syllabus item side-by-side with the old syllabus and from what level in the old syllabus the item originated.

Priority is being given to developing the Schemes of Work required for the Full syllabus (as this is by far the longest course), and for those aspects of the syllabus that are new – most notably software defined radio.

Proposed new Foundation practical

The Examinations Group (EG) received several representations from clubs concerning the inclusion of an additional practical assessment at the Foundation stage (10B2) – the one involving a bulb, an LED and a battery. After careful consideration it has been decided to remove this from the syllabus but with a recommendation that the exercise be included in the Scheme of Work as it serves to illustrate some of the fundamental concepts in the technical basics section.

Developing Syllabus 2019

This has been the result of five years' work, mainly by the Examinations Group, the Examinations Standards Committee (ESC) and a sub group of the Training and Education Committee (TEC) called the Syllabus Review Working Group (SRWG). The syllabus has been modernised to bring it up-to-date with the current needs of amateur radio.

With the number of changes that were made, across all three levels of the syllabus, it was to be expected that there would be some critical comments. The clubs, who are of course in the front line of teaching have, during the consultation phase, made representations concerning the number of changes and on what is perceived to be an increase in the standard of the exams. All of the volunteer groups working in connection with the syllabus will be involved in providing additional help for the clubs in the implementation of the new syllabus. Full details will be published on the Syllabus 2019 section of the website.

A major change to the new syllabus is the level of detail that is provided. Gone are the 'one liners' in the syllabus that require considerable expansion by the tutors, and in their place are more detailed explanations. The requirements of the new syllabus are more concise and explained in greater detail. You will find that many of the items considered as 'new learning points' are simply topics that tutors would have included in the tutorials to explain the item in full. The number of changes and the new practical content may mean that clubs have to revise their existing tuition schedules.

Has the bar been raised?

Regarding the overall level of difficulty of the syllabus, it has not been the intention of the EG to raise the bar of the Foundation and Full licence exams any higher than it is at the present time. There will be new material for the tutors to learn, but in terms of the students who are encountering the material for the first time, the impact should not be significant.

The new Intermediate syllabus is intended to be pitched more evenly between the Foundation and Full licence exam in the hope that candidates passing the Intermediate, based on Syllabus 2019, will be better prepared for the Full licence exam. This will place the new Intermediate syllabus more in line with Ofcom's expectations.

Future changes

One thing is abundantly clear: the new syllabus cannot remain as a static document for years at a time. It will be kept under constant review and the changes will be debated by the whole training community with the ESC's responsibility to ensure that proposed changes are in accordance with the proper development of education in amateur radio.

Continued on page 48

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Design Notes

Feedback

After November's lament I received a number of comments from readers, many sympathetic, and saying what they would like to be covered in future columns. Unfortunately, though, none included any actual work in progress, ideas, or anything of a technical nature to write up and pass on here. So, I repeat, *what are you doing?* Send in details for publication and discussion. While we will never be able to reach the level of practical and constructional input from readers that Pat Hawker, G3VA used to receive for Technical Topics, I'd like to post some other people's work.

One comment received from Dave, GW4GTE said, "You have my sympathies, struggling to come up with a never-ending series of projects and circuit ideas to suit the widest audience possible. As a suggestion, if you aren't already aware of the stuff I put together some years ago, take a look at the projects at **[1]** then select *plus-kits*.

"I originally, like you, made stuff for my own amusement then bumped into Eric, GW8LJJ who has the ability to make PCBs in small runs. He said he was happy to make boards and do the kitting for anyone wanting to build any of the projects. We set this up (and it's still going albeit, to a lesser extent) to promote home construction and Eric supplies the parts pretty much at cost.

"There may be something on the site that fires off an idea, though stuff like Multi-Rock II is yet another DDS/PIC unit. In fact a lot is PIC based – I like them! I particularly liked doing *Netometer* [*a frequency error indicating meter – 'JNT*] as it was a way of displaying relative frequency as opposed to actual frequency, since at the time I couldn't find anything similar. That was intended for wandering VFOs, but there may be other applications where a relative display is what's needed.

"What I never got round to doing but always intended to, was integrate the various bits into a simple QRP AM 160m transceiver local/club project. A few watts and a wire up a roach pole will get you across town to your mate. Maybe you could do a version with a direct conversion DSP receiver to a sound card and produce the Tx carrier frequency from a harmonic of a sound card tone?

"Some projects were published in *Signal*, and Eric re-wrote some for *Practical Wireless* but the original copyright 'common ancestor' is what's on my site. Pretty much all the projects have extensive documentation."

PHOTO 1: Keypad for direct frequency entry on the Elad FDM-DUO transceiver.

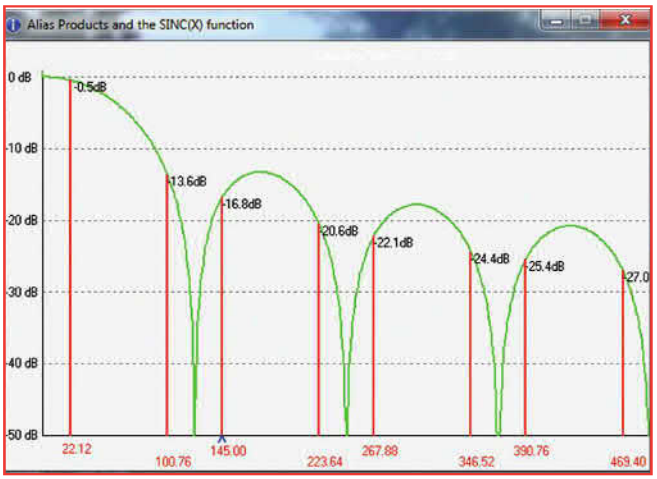

FIGURE 1: Aliasing products shown graphically. On a direct sampling receiver, all the frequencies shown marked will appear on top of one another and all but the wanted one need to be removed by filtering the RF before it reaches the A/D converter. The shape of the curve reflects the amplitude response of the sampling function that follows a SIN(X) / X or SINC(X) law. The same alias products with the same amplitude weighting also appear when used to generate a waveform via a D/A converter, and are present on any Direct Digital Synthesiser with no output filtering.

A new transceiver

Wanting to tidy up my overall receive and transmit capabilities on the lower bands I decided to buy an Elad FDM-DUO SDR transceiver. That way the Icom IC-746 transceiver and SDR-IQ radios (that are both quite dated) could both be replaced by a smaller, neater single unit. The FDM-DUO is a direct sampling transceiver that can be operated either standalone or in conjunction with a computer, where it then offers a multiple-receiver or a wideband capability. It was thoroughly reviewed by Mike Richards, G4WNC in the March 2015 *RadCom*. The receiver is of the direct sampling type using F_S = 122.88MHz and, in normal use, a low pass filter cutting off at 54MHz keeps

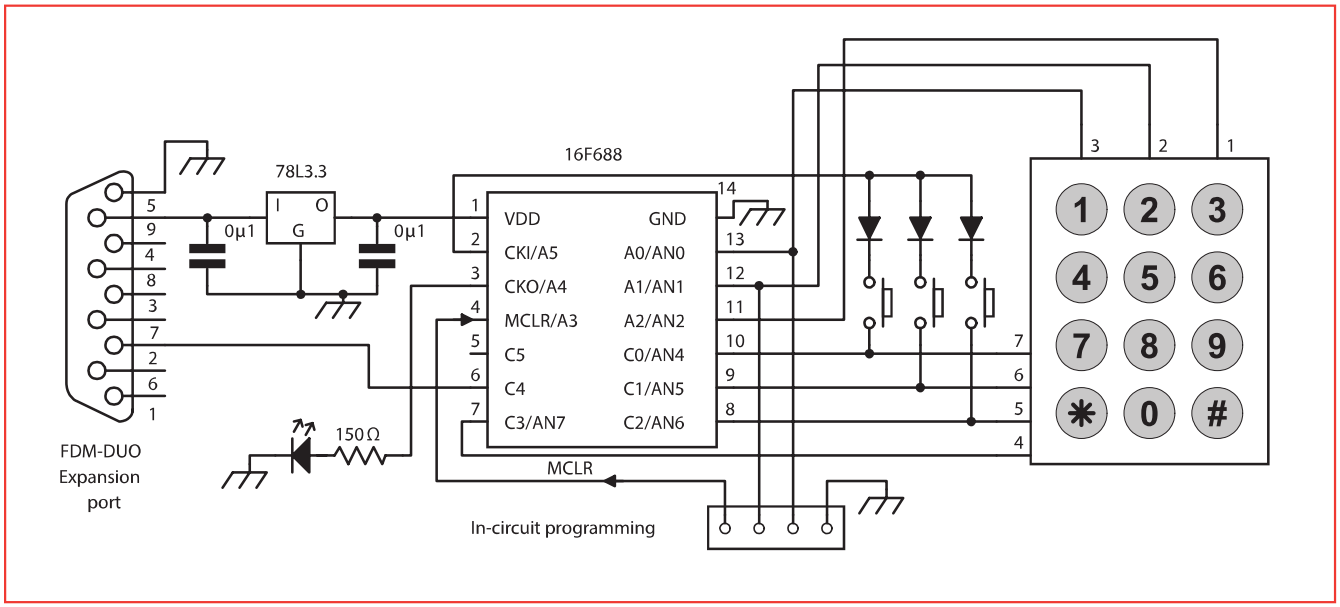

FIGURE 2: Circuit diagram of a keypad interface for direct frequency setting on the Elad FDM-DUO.

signals below the Nyquist limit. However, the filter can be switched out, allowing direct access to the A/D converter for use at higher frequencies via alias products – the radio is programmed to function up to 165MHz.

Full transmit coverage with 5W output is possible from 1.8 to 54MHz, but there is a facility on Tx of far greater significance where my real interest lies – and which made my decision to buy this radio. The transmit side is generated internally in an AD9957 IQ upconverter / DDS chip clocked at 368.84MHz, three times the receiver clock. A front panel menu selection allows the low power transmit signal generated within this device to be sent to an SMA socket on the back panel at a level of 0dBm instead of to the HF PA. At this high a clock rate, the full frequency coverage up to 165MHz can be delivered to the low power port without relying on alias products, ready for avid experimenter types to use for transverter driving or external power amps.

Nyquist and aliasing

So what are these alias products? Sampling has been covered many times before, here and elsewhere, but a recap will do no harm. Any analogue to digital (A/D) conversion starts out by first sampling the instantaneous value of the input waveform at a fixed sample rate; the process is akin to multiplying the input by a series of short sharp impulses. The sampler is essentially a fast switch and a storage capacitor. The resulting latched values are then converted to numbers via the A/D converter. The sample rate has to be at a higher frequency than any component making up the input and Nyquist worked out that, provided you sample at least twice the maximum input frequency, ALL information in the input is preserved. So the FDM-DUO's receiver sampling rate of 122.88MHz theoretically allows signals up to 61.44MHz to be processed, but it's not that simple.

Imagine an input signal F_{IN} way above this, actually AT the sampling rate of F_S = 122.88MHz. The input signal will now be sampled at exactly the same point on every cycle, which will make it indistinguishable from sampling a DC input. In fact, at any frequency between 0.5 x F_S and up to F_S, after sampling will appear as if it were a component equal to F_S - F_{IN}. So a real 70MHz input will be treated as is it were an input at 122.88 – 70 = 50.88MHz. And don't forget, without any input filtering, the A/D will also be responding to 'real' 50.88MHz signals as well, with the resulting A/D values from them both all overlapped. 70MHz is said to be aliased down to 50.88MHz.

It doesn't stop there. Signals above F_S also get aliased down as F_S - F_{IN} so 145MHz appears as if it were at 145 - 122.88 = 22.12MHz, where is also appears mixed up with an input at 100.76MHz – that one really is bad news, as it is very close to the wideband Band 2 radio broadcast Classic FM. And so on for all multiples of F_S, alternating between N.F_S – F_{IN} and F_{IN} – N.F_S all the way up to the GHz arena where the hardware really does roll off. For normal operation, a low pass filter cutting off below the Nyquist limit of F_S/2 is used before the ADC. This is the case in the FDM-DUO at 54MHz; but the LPF can be deactivated.

Figure 1 shows the frequency mapping, but also illustrates another fact about aliasing. The amplitude of the aliased products (the A/D converter values) fall off as they go higher in frequency. This is not a function or limitation of the hardware, but a real mathematical fact. The amplitude of any sampled product follows an exact law such that

$$\text{Normalised amplitude} = \left|\frac{\sin(\pi \times X)}{\pi \times X}\right|$$

where X is the normalised frequency, F_{IN} / FS. This is commonly referred to as the SINC(X) response.

Practicalities

If we want to use the FDM-DUO on receive at 144MHz we need to filter out, particularly, signals at 100MHz and 21MHz, but also 223MHz and so on that would all alias on top of one another. So a properly designed bandpass filter is mandatory. Sensitivity is reduced by SINC(X) and we can calculate its effect quite accurately. X = 145MHz / 122.88MHz = 1.18 and, putting this value into the equation above, results in an amplitude of 0.144, or 16.8dB down on the response at HF. The externally generated noise at 145MHz is also down by this amount so 145MHz S/N alone won't suffer from the alias. Any aliased noise at 100MHz and 22MHz that may be generated in the A/D and by amplifiers after the input filter is, however, added-in. The combination results in lower sensitivity when alias products are used and in practice the receiver's noise figure at 145MHz is around

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30dB. Nothing that a decent preamp or two with filtering can't sort out.

On transmit the same sampling rules apply and alias products are generated either side of multiples of F_S. On transmit F_S = 368MHz so Nyquist lies at 184MHz and Tx coverage up to 165MHz does not need a bandpass filter. That's not to say no filtering is needed. At 145MHz the first alias is at 368.64 - 145 = 223.64MHz and can be seen on the output from the DUOs low power output port when viewed on a spectrum analyser, but this is far enough away to make filtering a simple matter.

External keypad

When used in standalone mode, setting any arbitrary frequency is a bit tedious, especially when changing bands or moving to completely new frequencies. Various menu settings or button pushes have to be used to get different tuning steps. I had the same problem with the FT-817 a few years ago, and built a keypad for direct frequency entry, sending frequency-set commands via the CAT computer control port. That keypad was described in the October 2014 edition of this column. Details can also be found at **[2]**.

The CAT interface for the FDM-DUO doesn't have a direct connection, but instead makes use of a USB interface with embedded COM port – so is completely unsuited to a simple PIC interface. However, there is an expansion socket on the back of the radio that, according to the manual, carries a range of different logic signals. Two pins have the labels TX-DUO and RX-DUO so, suspecting these may be useable, I posted the question on the Elad user group. Almost immediately one of the design team got back to say it does not behave like a CAT port, but the RX input pin, with 3.3V logic levels, will take the same commands sent at 115200 baud stop-start as are used for CAT control. The TX port sends out a lot more data and CAT commands are not echoed. Another pin carries a +5V supply. So all looked to be ideal – my PIC keypad interface only sends commands, it doesn't look for anything echoed back. A bit of rewriting of the PIC code used for the FT-817 interface to reformat CAT commands, and redoing the serial interface so it transmits at the faster baud rate, and that was it. The PIC's internal UART couldn't be used at this speed with the internal clock oscillator, as was done with the FT-817 at 9600 baud, so the 115200 baud serial commands had to be generated by bit-banging **[4]**.

The DUO wants 3.3V logic levels so the easiest route was to replace the voltage regulator with a 78L33 device supplied from the 5V pin and run the PIC at 3.3V. Any frequency, specified in megahertz can be typed in and the radio is set immediately. At the moment, any frequency above 54MHz still needs the front panel menu settings changed. The LPF must be switched out and the low power port selected for transmit. At frequencies below 1.8MHz the low power port is used for Tx, although the LPF remains in circuit. These selections can be done via commands on the CAT interface, so there is no reason why the keypad controller should not be modified to send the appropriate setup commands automatically, based at the frequency entered.

The circuit diagram of the keypad interface is shown on **Figure 2** and full details, including PIC code and a PCB layout for home construction can be found at **[3]**.

References

[1] GW4GTE Projects Page – www.s9plus.com
[2] FT817 Keypad controller – http://g4jnt.com/FT817_Keypad.pdf
[3] Elad FDM-DUO Keypad – www.g4jnt.com/FDM-DUO_Keypad.pdf with full construction information at www.G4JNT.com/EladKeypad.zip
[4] 'Bit banging' is the process whereby logic signalling waveforms are generated directly from inside microcontroller code by toggling an output line, paying special attention to the timing. It is often used for non-standard baud rates, protocols and polarities where the internal UARTs or serial interface peripherals can't cope. Sometimes, especially for transmitting, it is a lot easier to just program a bit-bang interface than it is to set up and properly drive the chip's own serial communications hardware.

The new amateur radio exam syllabus continued from page 44

To this end, consideration is being given to a change system where items are discussed point by point, one at a time and with widespread involvement of the whole training community. The model being considered is on the lines of the 'Request For Comments' (RFC) system used to develop internet standards. An idea for an addition, modification or deletion of a syllabus item can come from any relevant person. Each point will be subject to discussion and scrutiny and, if it is approved, will become part of the syllabus from an agreed date. This approach should end the workload of implementing large numbers of new syllabus items.

Education Group

Changes are underway to the committee structure for all matters concerning education and examinations that will bring these under the focus of the Examinations Standards Committee with the Examinations Group now becoming the Education Group, which will include the Syllabus Review Working Group (SRWG) to provide closer involvement of the club training community. The aim is to enable an efficient, unambiguous and quick means of ensuring that all revisions and suggestions are fully debated by all interested parties.

Examinations

There is a very clear intention to promote the online examination system as widely as possible. The online exams can be less stressful for many students to sit and the results are available immediately. It is the intention of the RSGB that we move towards a situation where successful online candidates are able to apply for their licence within two working days of the actual exam.

There will be a continuing need to provide paper exams not least because some candidates have special needs.

Clubs may be nervous about online exams and this is completely understandable. It is natural to trust what you know, ie paper. Many of those who have tried the online system report that it is quick and easy to administer and is now their preferred exam format.

One very significant concern is a break in internet connectivity during the exam. Again, whilst the system is very robust and can be restarted, the experience of losing internet connectivity must inevitably raise stress levels and could make the difference between a marginal candidate passing or failing. The exams service provider, TestReach, has a local area networking product where the exam can be downloaded to the invigilators' PC, which acts as a local area network 'server' for the session, alleviating the concern about a break in connectivity. This is under discussion and further announcements will be made in *RadCom*, social media and on the website.

One of the changes that we are hoping to introduce will be for the mock exams to also be available online to candidates who have registered and booked an exam with the RSGB. Of course, the mock exam does not have to be taken under exam conditions and a pass in the mock will not count as a pass in the real exam, but it will require invigilation. This will give the candidates and invigilators hands-on experience of the online system and highlight where additional learning is necessary.

A great deal of effort involved in preparing the new syllabus and materials and the task is nearly complete. The RSGB is committed to assisting clubs and the training community to deliver the training to candidates.

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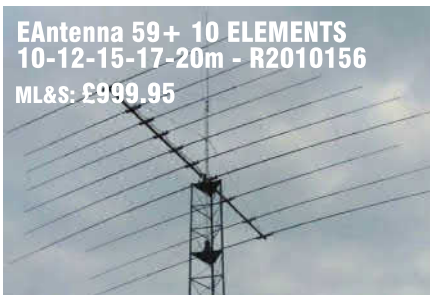

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DX ENGINEERING

DX Engineering are an American manufacturing company that specialises in Antenna Hardware built to the highest quality. Their product range is so huge the entire list would fill this magazine.

Call us or check out www.HamRadio.co.uk/dxengineering

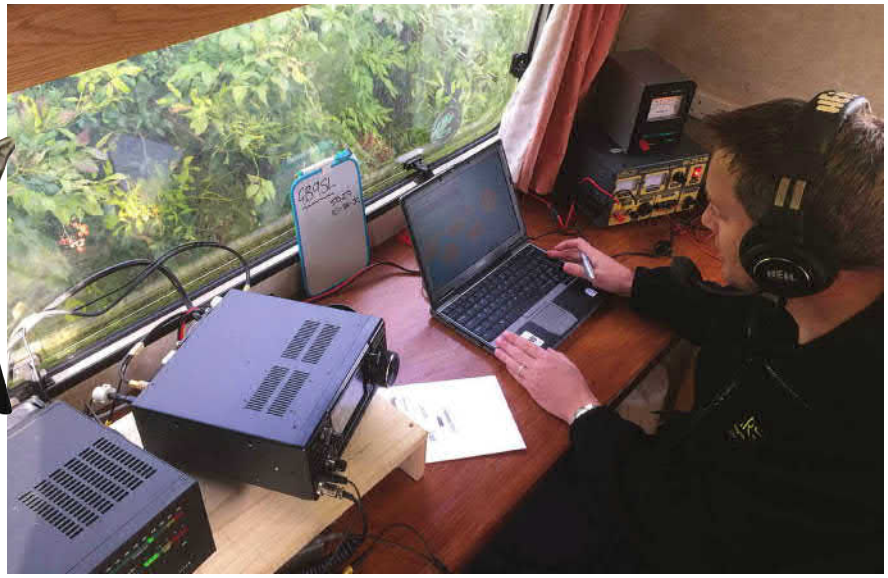
LDG Electronics are the largest manufacturer of Automatic Antenna Tuners in the World.

LDG

LDG Auto Tuners are intelligent and designed from the start to work seamlessly with your radio. Press the Tune Button and the rig and the tuner will do the rest; reduces power, transmits a carrier, automatically matches the antenna to the rig, then restores the original power and mode.

ML&S have the largest stock of LDG outside the US.

GB9SL – a joint venture celebrating Laurel and Hardy



The Laurel & Hardy statue in Ulverston (left). The Furness ARS caravan shack was used at Gleaston Water Mill for GB9SL in conjunction with the Amateur Radio Club of Columbia County, USA.

Back in November 2017, Furness ARS were contacted by a member of the Amateur Radio Club of Columbia County (ARCCC) in the USA. One of the annual events their club supports is the Oliver Hardy Festival, which is held during the first weekend in October. He was born in Columbia County.

They were keen to organise a special event station in 2018 to mark the 30th annual Oliver Hardy Festival. And they were also interested in the idea of having a companion special event station operating in the UK during the same weekend, commemorating Stan Laurel. They discovered that Furness ARS had operated a special event station to commemorate Stan Laurel in the past (in 2015 for Stan Laurel's 125th birthday). Stan Laurel was born in the market town of Ulverston, then in Lancashire (now Cumbria) and Furness ARS are based only a few miles from Stan's home town.

Furness ARS were keen to run a companion station and help support the USA team, plus it would be a good exercise in two clubs, from different countries, working together for a joint event.

The next few months were spent sending emails back and forth between the two clubs, with discussions on locations, kit, manpower, modes (the Furness team would concentrate on SSB only) and other arrangements. ARCCC advised by early summer of 2018 that their location on site at the festival had been confirmed and they had secured the callsign W4O.

Part of the plan was for the two stations to work each other, so thought needed to be given to the aerial and bands most likely to make this possible. The aerial of choice was to be a hexbeam that has worked well for many other special event stations and was, in fact, used for GB125SL with great success three years previously

The Furness team thought long and hard about the location to use. It was not practicable to operate from the house where Stan Laurel was born in Ulverston, as this is a private house and having a bunch of radio amateurs in someone's house is a tall order, and that's before you start to think about room for an aerial and all the other kit. Other locations in Ulverston were considered and finally Gleaston Water Mill was decided upon. This is situated in a small village just a few miles from Ulverston and is very conveniently owned a by Furness ARS club member. There is plenty of land for the mast and aerial, and the club's caravan 'shack' could easily be accommodated. After a search, GB9SL was chosen.

A QRZ.com page was created and QSL cards were designed – with a picture of the Stan and Ollie statue in Ulverston. The W4O team had been busy publicising their event, and they had been featuring the Furness ARS companion station. Both stations planned to be on the air on 6 October, with some minor operating on days either side if possible. Due to the time difference this would mean both stations would only be on the air

Continued on page 88

Chris Leviston, M0KPW
m0kpw@aol.com

Portishead Radio – 90 years on

July 2018 saw the 90th anniversary of the establishment of Portishead Radio, probably the world's most famous long-range maritime communications radio station.

PHOTO 1: **The main building at Highbridge, latterly used as the entrance building. Courtesy BT.**

The early years

The service of Portishead Radio can be traced back to 1920 when a site at Devizes, Wiltshire was utilised, using the call Devizes Radio/GKT. It soon became clear that as more and more ships became fitted with radio equipment the site could not cope with the demand; therefore in 1928 a new transmitter site at Portishead Down (on the Bristol Channel coast, southwest of Bristol) became operational, with a receiving site at Highbridge, near Burnham-on-Sea. There was already a short-range station at Highbridge (Burnham Radio) and the building was increased in size to incorporate the new equipment *(see* **Photo 1***)*.

The transmitters at Portishead were keyed by operators at Highbridge, using landline connections to the site. It is normal practice for the station name to be called after the transmitter site, which is how Portishead Radio came to be known.

The station handled a vast amount of radio traffic during the 1930s, including high levels of business from the transatlantic liners and the large flying boats popular during that time.

The war years from 1939-1945 saw a great change in handling traffic; it was forbidden for ships to transmit from certain areas of the world (except in distress circumstances), as this would give away their position to enemy monitoring stations.

Instead, traffic was broadcast 'blind' from transmitters at Portishead and Rugby, and it was assumed that correct reception had taken place. The station became more of a monitoring station, listening for calls from allied forces and occasional SoE stations, as well as training Radio Officers for service on Allied vessels.

To aid communication to and from vessels, an 'area scheme' was established to allow the sending and receiving of traffic from Admiralty radio stations worldwide, with messages being relayed via Admiralty teleprinter circuits. This method of traffic handling became so efficient it remained in service until the early 1970s.

Post-war expansion

At the cessation of the war, the receiving station at Highbridge was expanded with additional wings being added to the large control room, with large steel maps adorning the walls showing the last known position of vessels worldwide.

A 'Ship's Bureau' was established that recorded such information and was used to assist in ensuring traffic was sent by the most efficient means.

Each wireless telegraphy (W/T) console comprised a Marconi CR-150 receiver, an aerial switch that selected the most appropriate aerial (the receiving site consisted of highly-direction rhombic aerials spaced every 15°), a transmitter selection unit, a standard Post Office Morse key, and an Imperial typewriter on which to transcribe incoming traffic *(see* **Photo 2***)*.

These consoles remained in use throughout the 1950s and 1960s, the only change of note being the replacement of the receivers from the trusted CR-150s to Racal RA1217s.

Throughout the 1960s the station continued to expand dramatically with traffic figures reaching record levels. Radiotelex equipment was installed to provide cost-effective communication to passenger ships and other high-traffic vessels.

One of Portishead Radio's most famous incidents occurred in 1968. Donald Crowhurst, one of the competitors in the Single-handed Round-the-world yacht race was a regular customer of the station, and it was through the vigilance of the Radio Officers at Portishead that the organisers were alerted that his position reports bore no resemblance to the aerial direction his signals were being received from. Despite his reports stating positions in the Indian Ocean, the aerial direction from Portishead indicated otherwise. There have been numerous books and films made about the incident, with a recent film *The Mercy* starred Colin Firth as Donald Crowhurst. A mock-up of Portishead Radio was constructed specifically for the film.

A new operating wing was constructed to cater for increasing radiotelegraphy (R/T) traffic levels, and the Radiotelephone service was brought to the Highbridge site in the early 1970s replacing the terminals at Brent and Baldock *(see* **Photo 3***)*.

The facilities at Highbridge were inadequate to handle the traffic levels so staff were taken to Somerton Radio near Yeovil where extra R/T consoles were installed. The area scheme was terminated in 1972 and with it ended the Royal Navy presence at the station.

The ageing transmitters at Portishead closed in 1979 and were replaced by sites at Rugby, Leafield, Ongar and Dorchester; however the familiar name 'Portishead Radio' continued to be used. The Portishead site eventually became the location for the Avon & Somerset Police Headquarters.

The new building and closure

Plans were made for a purpose-built station adjacent to the existing site in Highbridge, which opened in 1983, featuring state-of-the-art message handling systems and new Racal MA1075 remote receivers, connected to the aerials at Somerton by a microwave link.

The prominent aerials at Highbridge, once a familiar sight on the local skyline, were dismantled.

PHOTO 2: W/T console shortly after construction in 1948. Courtesy BT.

PHOTO 3: W/T position at the new station c. 1984. Courtesy BT.

PHOTO 4: Station entrance being demolished in 2007.

The station continued to provide a high level of involvement with the numerous high-profile yacht races held during the 1970s and 1980s, and many yachtsmen visited the station in order to familiarise themselves with the protocols necessary for efficient radio communications.

Many radio amateurs would have taken their Morse code examinations at Portishead Radio, and most were pleased to celebrate their visit with a tour of the station.

Satellite systems started to make inroads into HF traffic during the 1980s, and although a new and popular aeronautical radio service commenced, it soon became clear that the traffic levels would drop to such an extent as to make the station unsustainable. Introduction of the 'Gateway' service, which provided radiotelephone and radiotelex links to remote locations for relief agencies and companies based in areas where the communications infrastructure was poor or non-existent, proved popular. However, despite these new services, the writing was on the wall. The introduction of the satellite-based GMDSS (Global Maritime Distress and Safety System) in 1999 was the final nail in the coffin for terrestrial radio services worldwide. Staff who retired were not replaced, and surplus staff were redeployed to other BT departments.

On 30 April 2000, Portishead Radio broadcast the final message and the famous station was no more, an occasion that was witnessed by local television and over 100 former staff. The final message, transmitted in Morse code, read:

CQ CQ CQ de GKB2/4/5/6 =

This is the last broadcast from Portishead Radio. For 81 years we have served the maritime community. We say thank you to all those who have supported and used our station.

We pay tribute to Marconi who made it all possible. His first transmissions across water were made from nearby here and so started the radio era. We are proud to have been part of that era.

As this historic time in the commercial messaging world comes to a close the manager and radio officers wish you farewell from Portishead Radio/GKB + SK

The same message was transmitted by radiotelephony and radiotelex and a recording is available on the Portishead Radio website.

The famous buildings were demolished in 2007 (see **Photo 4**) to make way for a housing estate called Mulholland Park, named after Don Mulholland, a former station manager and his father Robert, also ex-station manager.

Since then, representations have taken place to mark the site with a suitable plaque or memorial, which has the support of the local MP for the area; however at the time of writing no confirmed memorial has been agreed.

90th Anniversary

2018 saw the 90th anniversary of the Highbridge site, an occasion marked by a grand reunion of ex-staff, a local exhibition of radio station memorabilia, talks to local groups, and a new revised station website at www.portisheadradio.co.uk. An original GKA Morse key was donated by an ex-staff member, which raised over £500 for Marie Curie.

In addition, special event radio stations were operated during July; GB0GKA, operated by Tony, G3ZRJ; GB0GKB, operated by Larry, G4HLN; and GB0GKC, operated by Pete, G3TJE. All are ex-Portishead Radio Officers, and many contacts with ex-seagoing R/Os were made. Ex-GKA keys were used whenever possible, and it was most enjoyable to use these keys 'in anger' once more.

HF conditions during July were not good; most contacts were made on 20m, with 40m and 80m being preferred by GB0GKA and GB0GKC. However, the following contacts were made;

GB0GKA – 690 contacts from 53 countries (see **Photo 5**).

GB0GKB – 670 contacts from 56 countries (see **Photo 6**).

GB0GKC – 151 contacts from 38 countries (see **Photo 7**).

It is hoped that these callsigns will be re-activated for the next Maritime Radio Day (MRD) scheduled for April 2019.

Larry Bennett, G4HLN
ex-Radio Officer, Portishead Radio
portishead.radio@btinternet.com

PHOTO 5: The operating area of GB0GKA (Tony Roskilly, G3ZRJ).

PHOTO 6: GB0GKB (Larry Bennett, G4HLN) in action.

PHOTO 7: GB0GKC (Pete Smith, G3TJE) in his shack.

Thank you to all stations who contacted us. I know that many stations tried to arrange schedules with us but alas we were very much at the mercy of the conditions. Special commemorative QSL cards will be dispatched as soon as the combined logs have been checked and verified.

Although the station is long gone, the callsigns continue to be heard on the amateur bands thanks to many ex-staff who are keeping the name alive.

Railways on the Air continued from page 18

GB0CVR

Colne Valley Railway once again welcomed Braintree & District ARS to their heritage railway to operate GB0CVR. A good turnout of members set up the station in the usual motor rail carriage with a Windom held high above a run of three carriages and a DMR beam offset a distance from the Windom feed point so as to prevent cross interference. There were fewer HF contacts made than on previous years due mainly to the band conditions and being situated in the valley of the river Colne but DMR and 2m made up the shortfall. Bad weather meant that our interaction with the public was not as great as we would have wished for.

On one occasion the NoV holder had to leave the location and we were able to make use of the new arrangement whereby responsibility for the station was transferred to another fully licensed member.

A total of 37 HF stations were worked of which 11 were ROTA, 16 using DMR of which 2 were ROTA and a further 16 on VHF. Most distant ROTA contacts were East Somerset to the SW and Royal Deeside to the N, and best overall DX was to Lichtenstein.

Our thanks go to Bishop Aukland ARC for organising the event, to our generous hosts at Colne Valley Railway, to club members both those on site and those contacting the station and to Thomas and Friends for showing up on the day.

Geoff Marshall, G1WRH

GB0NVR

At 7am on 22 September, a team of Huntingdonshire ARS members arrived at the Nene Valley Railway (NVR) at Wansford Station, Peterborough to set up and operate for ROTA. Once we had set up the full sized G5RV antenna and gazebo in the car park and connected the Icom IC-7200, we were ready to start operating GB0NVR. Our first QSO was at 8.28am with Mike, G0NEV on the south coast with a signal report of 5 and 9 both ways – the kit all worked! As a team we continued throughout the day changing operators and loggers when required and gently completed the third page by 2.24pm, with the final page for the day being competed with a QSO to Chris, G8GWK before closing down the station at 4.30pm. A count up of the logbook at the end of the day revealed we had worked 101 QSOs, 11 of the being ROTA stations, 1 Museum (Duxford), 1 SES (Marconi) and a handful of European stations – operating conditions had been good for us. We had planned to operate only on Saturday but decided that we would all return to operate again.

On the Sunday we were operating from 9.07am with the first QSO to Mario, OR4KW 5 and 7 both ways, with others calling into the station once a spot had been logged on the DXHEAT website. Occasional CQ calls were put out with replying stations returning and at times we had to control the pile ups that we experienced. Our final tally for the day was 105 QSOs, 9 of them other ROTA stations and, for the first time that the team can remember, we had logged a QSO from George, 2J0GUR over in Jersey. Operating conditions had been good for us during the operating period with only occasional QSB effecting our QSOs.

During the weekend we ran solely on 12V leisure batteries (75 and 120A); these gave us ample power for our IC-7200 putting out 100 watts.

Over the weekend the occasional toot or whistle or clang-clang sound from the 60163 Tornado Class A1 locomotive in the background may have come over the air as she was running up and down from Wansford to Peterborough station after being repaired in the workshop. We also caught site of the 0-6-0T engine No 1800 *Thomas the Tank* engine, which is also at NVR. Others are available around the UK but this is the real one as Rev W Audrey who, in 1947, wrote his second book in the Thomas the Tank engine series at the time that the train was built. The author lived just 5 miles south of Wansford.

Thanks go to NVR for accommodating us in their busy car park so that we could run the station over the weekend, also to club members for their time – Mervyn, G4KLE, David, M0VTG (organiser), Steve, G1KWF, David, M0SKT and for the Sunday morning stint Richard, 2E0FRQ.

David Webb, M0SKT

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941E.....300 Watts max Versa Tuner II.....£159.95
945E.....1.8-60MHz 300W manual tuner £145.95
948.....300W PEP reading antenna tuner.....£187.95
949E.....300W tuner + Dummy load.....£199.95
959C.....Receive antenna tuner + pre-amp.....£145.95
969.....300W tuner 160-6m £253.95
971.....Portable Ant. tuner 1.8-30MHz £143.95
986.....1.5kW HF tuner.....£399.95
989D.....1.5kW HF tuner.....£451.95
993B.....Auto Tuner 150W/300W.....£297.95
994BRT.....600W remote Auto Tuner.....£440.95
998.....1.5kW Auto Tuner 1.8-30MHz £771.95
998RT.....1.5kW remote Auto ATU.....£848.95
1020C.....Tunable Active Antenna £110.95
1025.....Noise canceller/signal enhancer £199.95
1026.....QRM eliminator + active antenna.....£220.95
1118.....High Current DC Multi outlet.....£94.95
1700C.....6 Way coax switch.....£132.95
1701.....6 Way coax switch 2kW (SO239).....£89.95
1704 (P).....4 way coax switch 2.5kW (SO239) £94.95
1704 (N).....4 way coax switch 2.5kW (N type).....£99.00
1705H.....RF By-pass switch.....£32.95
1707.....Auto RF sensing Ant switch £99.95
1708.....RF Sensing T/R Switch.....£89.95
1708SDR....Transceiver SDR switch £89.95
1763.....3 Element 2m beam £60.95
1775.....Rotary dipole 6 band.....£275.95
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1786X.....Loop (10-30)MHz 3ft dia. £529.95
1788X.....Loop (7-21)MHz 3ft dia £589.95
1789.....Rotary dipole 9 bands.....£399.00
1799X.....9 Band vertical £440.95
1848.....Hexbeam 40-6m 1.5kW.....£699.95
1868.....Discone antenna with cable.....£79.95

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HF

Dom, M0BLF, Dan, M0WUT and Rob, M0VFC on the roof of their DXpedition station at VP2MUW in Monserrat.

Arnie, N6HC, Steve, W1SRD and Chris, N6XG at the VP6D SSB camp on Ducie Island. Photo courtesy of Gene, K5GS.

There were a couple of sunspots during November but the solar flux index remained around the 70 mark and conditions were poor. However, there was still DX to be worked – just less of it and on fewer bands.

By mid-December, 80m conditions should be peaking with long path W7s audible around 1600UTC and excellent morning propagation to the Pacific around 0730UTC. 10m will be mostly silent but will have occasional openings. At the end of November, M6T worked into 5R8, V5 and JA on 10m during CQWW CW – admittedly with a 7 element beam at 100ft. Their 40m station was working the world around the clock! Several UK stations worked KH6 on 160m in CQWW CW as well.

Readers will recall that Ducie Island is in a good spot for propagation, about 9,000 miles from London on a bearing around 280°. Gene, K5GS sent me some statistics from the VP6D log that show just how good it is. Just over 500 different British Isles calls made it into the log across all bands from 10-160m. Four British Isles stations made QSOs on 10m and 12 on 12m. 28 got through on Top Band!

I remarked last month that A35EU in Tonga would be rather different and so it seems. Tonga is 10,300 miles away, so a little further than Ducie but, more significantly, it is directly over the North Pole where the winter ionosphere is weakest and most disturbed by the incoming solar wind. With a few days of operating to go at the time of writing, Club Log shows no A35EU QSOs on frequencies above 14.350MHz. There were 17 on 20m, 31 on 30m, 10 on 40m, 6 on 60m and 1 on 80m. There are no Top Band QSOs so far. Only 45 British Isles stations appear in the log. Tom, GM4FDM, one of the ops, commented that propagation is very poor to trans-polar destinations 10° either side of north.

The Cambridge University group of M0VFC, M0BLF and M0WUT made around 7500 QSOs from Montserrat as VP2MUW. Their website at VP2MUW.com has more info and a link to a 360° panorama from the top of the antenna at Gingerbread Hill.

Since I have referred to Club Log it is worth noting that its founder and architect Michael, G7VJR issued a notice this month to mark the 10th anniversary of the site and to acknowledge the financial support of the amateur community as well as the assistance of other members of the Club Log team. The Club Log database now contains over 500 million QSOs from across the globe (allowing users to research point to point propagation based on actual QSOs), has facilitated over two million dollars worth of online QSL requests (saving users a similar amount in postage), and has become the main source of callsign to DXCC matching for many logging programs. In addition, Club Log is the only routine way for IOTA chasers to get an electronic credit for island contacts. Our thanks should go to Michael, G7VJR and his team of helpers – Alan, 5B4AHJ (DXCC matching), Marios, 5B4WN (OQRS, propagation reports and other features), and Jim, KE8G and Joe, WL7E (User helpdesk).

Not all DXpeditions take advantage of Club Log and I'm not quite sure why some don't. The OQRS features are disabled by default so if they wish to use a different system there is no conflict. Similarly if they wish to delay QSO matching for IOTA credit it only takes an email to VE3LYC in IOTA management to arrange this. Unlike Logbook of The World, logs can be deleted or edited on Club Log at any time after upload. It seems a win-win to me.

DXpeditions

It is possible that the 3YOI team will be QRV from Bouvet (AN-002) at some time in December. The team assembled in Cape Town at the end of November but no departure date had been announced at the time of compiling this column. See bouvetoya.org or other DX news services for the latest info.

Harald, DF2WO is heading back to Rwanda and will be active as 9X2AW from 18 January to 14 February.

The Provins Club (F6KOP) 9L DXpedition to Banana Island (AF-037) has the callsign 9LY1JM (sic) from 9-21 January. See www.f6kop.com for more info.

André, ON7YK is back in Gambia and will be QRV as C5YK until 9 March. He is using a KX3 and linear with up to 1kW.

Danilo, IZ1KHY will be working and travelling through Antarctica (AN-016) until the end of February 2019. He plans to stay a week or more in the following camps: MZS-Mario Zucchelli station, Scott Base, McMurdo Station, Jang Bogo Station and Concordia Station, and hopes to be able

to operate from each location using the equipment and antennas on site.

Adam, ZL4ASC is at Scott Base, Antarctica (AN-016), for the next 12 months and will activate ZL5A from time to time. See www.adamcampbell.co.nz.

Next year Derek, G3KHZ, Hans, SM6CVX and Eddy, K5WQG will be active again from Papua New Guinea: 31 January to 5 February as P29VCX on Manus Island (OC-025) and 6-11 February as P29NI on Daru Island (OC-153). They will operate CW, SSB and RTTY on the 40-15m bands, and possibly on 80 and 160m.

The SSB antenna field at VP6D on Ducie Island. Photo courtesy of Gene, K5GS.

Correspondence

Peter, G3HQT was struggling to work A35EU but found a few rare ones: 15m – CW4MAX; 17m – EP6RRC, VP2EAQ; 20m – 5R8UI, 8P9AE, PJ2/K2PLF, FG/F6ARC, VP2MUW, 6V7A; 30m – A52BH.

Peter, G4XEX was chasing the LY100 stations but found LF tough going so only managed the Bronze and Silver awards. He's now looking for the HG90s. Other DX worked included: 15m – ZS6UB, 3B9FR; 17m – 5R8IC, 8P9AE, EP6RRC; 20m – ZS6UB, VP6D, 5H3MB, S01W, PJ2/K2PLF, 5X1XA, V26K, XT2AW, V26K, 5X1XA, PJ2/K2PLF, PZ5K, 8P5A, PJ4Q, PJ4G, 4M1K, OD5ZZ.

Andy, G0SFJ has been using his off-centre fed dipole (OCFD) on 17 metres to good effect, working, in order of time UTC from dawn to dusk: UE70AR, TU5MH, EP6RRC, R9MM, 8P9AE and Z23MD, all on CW except for TU5MH that was on USB. All 100 watts and an ageing Icom IC-728.

John, G3PQA worked YJ0GC on 80m and 40m during November. He notes that the polar path has been open on LF, with signals heard from KL7 and KH6 on 80 and 160. KH6AT apparently worked at least one UK station on 160. ZL3IX was worked by several Gs on 160 just after UK sunrise.

Fred, G3SVK was busy chasing the special event stations as well as working DX. He found: 17m – 9Q6BB, 5R8IC, 8P9AE, EP6RRC, XT2AW; 20m – VU2TMP, E44WE, 8P9AE, ET3AA, PJ4/KU8E, V26K, 5X1XA, HR9/LZ5VV, 9Y4GR, BY2MC, PJ4/K4BAI, TI7W, HH2AA, 5Z4LS, A47RS, PZ4T, PY0F; 40m – V26K, DP0GVN, A71A, VP6D, PZ5K, D4C, 9Y4W, A61YHA, P40T, FY5KE, J42L, 8P5A, 5U9AMO, A5A, FY5FY, FJ/F6CUK, HC2AO, VP9KF, A52BH, C6AAT, PJ2/KB7Q, 8P9AE, VP9/DK7LX, FM5FJ, EP6RRC, D41C, VP2MUW, PJ4/K4BAI, VP2EAB, D41CV, FM5KC, TI5/KL9A, V47NT, CP4BT, 6Y3T, NP2P, J68GU, CX9AU, ZF2MJ, HC5M, PJ2/G4IRN, HR9/SP4Z, 6Y3T, HC5M, KP2M, HP3SS, TI7W.

Gordon, G3PXT reported in with around 4000 QSOs in November! He was mainly on FT8 (italics) and found: 15m – *4K6N, 4O4A, A44ZZ, D41CV, LUs/PYs, TR8CA*, V26K, *Z23MD ZSs*; 17m – *3B8FA,* 8P9AE *9V1XX, A4s, A65DR, CO8LY, CXs,* EP6RRC, FH/DJ7RJ, *HIs, HK3EU*, JY5MM, *LUs, NP2Q, PYs, SU9JG, VP8LP, YBs, ZSs*; 20m – 3B8FR, *9M2TO, DUs, E44WE, EP6RRC, HI3T, HP1CDW, HS0ZIV, J68GU, VKs, VK9XQ,* VP2MUW, *VUs, YBs*; 40m – 8P9AE, 8Q7DX, *5T2AE, 9M2VRD, CO2OY,* D41CV, EP6RRC, *ER1PB, EX7DY, HC2AO, JAs, TG9IN, PY7GE, VKs,* VP2MUW, *VR2CO, YV5DRN, ZL1LC, ZL2BH;* 80m – 8P9AE, *J68GU, J8NY, JW4PUA, T77C, UN1O, YV5JLO*, PJ2T, TI7W.

Ken, CT7AGZ had no luck with A35EU but otherwise found lots to work: 10m – 6V7A, J68GD; 12m – *8P9AE*; 15m – 9X4XX, UN9L, 6V7A, 5U9AMO, D41CV, XQ6CFX, ZF2MJ, V26K, EP6RRC, *XE2FGC,* 8Q7DX, VP2MUW, PY, J68GD, *RI1ANL,* VP9/DK7LX, 4J100A, E44WE; 17m – HC5M, P40W, *8P9AE,* VP2MUW, EP6RRC, VP9/DK7LX, *E44WE, BU2EL, V47JA,* OD5PY, TR7CA; 20m – 5X2B, 5U9AMO, J8NY, HC5M, *J8NY, 5R8UM,* EP6RRC, VP2MUW, PJ2/G4IRN, 5T2AI, PJ4/KU8E, TI7W, VP2EAB, VP9/DK7LX, PJ2ND, J68GD, HC5ARC; 30m – V26K, 5U9AMO, 8P9AE, J68GD; 40m – VP5M, V47T, FY5KE, ZF1A, OH0V, 4U1ITU, *J68GU,* VP2EAB, EP6RRC, *TR8CA, JA2BAW, TR8CA, S01WS;* 80m – PJ2T, P40C, PJ4Q, TI7W, J8NY, VP2EAB, PZ5F, V26K, V47T, 6Y3T, 6V7A, VP2MUW, 4U1ITU, KH7XS, FG/F6ARC, *8P9AE, NP2Q, J68GU, 5T2AI,* 8P9AE, ZL2IFB, *HR9/SP4Z, S01WS, KP4JRS;* 160m – 3V8SF, CN3A, EA9CD, S01WS.

TABLE 1: 2018 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	163	152	220	265
M0NKR	172	205	180	264
G0DWV	176	174	168	251
G3TBK	238	156	129	241
G3PXT	113	129	207	223
CT7AGZ	199	1	170	222
GI4DOH	177	9	90	196
G3SVD	123	139	0	195
G3SVK			193	193
G4XEX	91	94	126	174
G3HQT	169	0	0	169

TABLE 2: Forthcoming DX activity.

Dec?	3Y0I
18 Dec – 19 Jan	YJ0AFU (80/160)
Until 9 March	C5YK
9-21 Jan	9LY1JM
18 Jan – 14 Feb	9X2AW
31 Jan – 11 Feb	P29 IOTAs by G3KHZ et al
16 Feb – 5 March	T31EU
1-15 March	7P8 by LA7THA team
27 Feb – 6 March	HD8M
August 2019	St Paul Island
October 2019	VP6 Pitcairn

Finally

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

Martin Atherton, G3ZAY
g3zay@btinternet.com

VHF/UHF

More intense and exciting openings during November with some disappointments too.

Once again, and unusually for the month, some excellent propagation conditions occurred during November and there were some notable events taking place – in fact, there was something for everyone on the higher and lower VHF bands.

Tropo DX

A big surprise was a super tropo opening on 16/17 November supported by a huge, fairly static high pressure system from the east covering most of western Russia, eastern Europe and Scandinavia stretching right over to western France. Ducting was strong on 2m and 70cm with 1000km+ QSOs being made on SSB, CW and digital modes. It has to be said that 144.174MHz was a wall of FT8 signals, some of them particularly strong from the west coast of France and literally end stopping on 2m in IO83.

The Marconi CW contest, which is a major European 24hr event, took place on 3/4 November. This is the chance to work some excellent DX as there are some very high performance, well sited, stations on the air from Europe. They are often beaming to the UK but it is hard to try and break a pile up at 900-1000km. Two stations in particular that were very strong at times in the UK were DA0FF and DR9A, both of whom have excellent elevated locations.

From a UK activity perspective it is very sad to note that this 'CW only' contest seems to be on the decline in terms of entrants, which maybe in no small part as a result of the rise of the digital tide. I would certainly recommended to try and work this DX even if it takes a considerable amount of time. From this QTH in IO83 it has been known to take up to an hour of calling to break through.

It's very interesting to take a quick look at these two contest teams and their locations as both stations are such consistently good signals in the UK.

DA0FF (JO40XL). Team members of VHF Contest Team Wasserkuppe include DK5MX, DK5OH, DL2ZXA, DL4XX, DL6FBL, DF9IC, DJ4FM, DF5HC, DL8AAU and DO3HMU. The contest site is at 950m ASL with open horizon and descending terrain giving almost the full 360° aspect. Four independent systems of 4x 9-ele at 14m each give a full compass coverage. The group are always looking to work over 900-1000km and also make use of aircraft scatter techniques [1].

The antennas at DR9A. You can see fixed Yagis covering the full 360 degrees.

DR9A (JN48EQ). Operators and supporters of The Northern Black Forest Contest Group Team include DB1BM, DB1TP, DF1GL, DF5HC, DF8IJ, DF9IC, DG3IAM, DH5IAE, DK1CM, DK6XZ, DK7UX, DK8SG, DK9IP, DL2EAA, DL2GWZ, DL3YM, DL4ZX, DL5NAH and DL8AAU.The contest site is located in the northern part of the Black Forrest in the south-west of Germany. The mountain Hohloh has a flat top at about 988m and forms the highest point east of the main ridge of the northern Black Forest. Its counterpart is the Hornisgrinde (1164m), which is the highest point of the main western ridge. Unfortunately, at an azimuth 230° the presence of Hornisgrinde blocks the take off slightly however there is little in that direction so the team are very lucky to have this site available with such a clear take off. During contests the team can regularly make QSOs >1000km (144MHz), >900km (432MHz) and >800km (1296MHz) [2].

Meteor scatter

The Leonids take their name from the location of the radiant in the constellation Leo. The meteors appear to radiate from that point in the sky. The Leonids have been a prolific meteor shower associated with the comet Tempel-Tuttle and the Zenithal Hourly Rate (ZHR) predicted to be 15, year on year. The Leonids were predicted to peak in the late evening of 17 November to the early morning of the 18th. It would seem, despite the press hype that the shower is well past its best, after the huge outbursts of a decade or more ago. Whilst there were some characteristic long strong bursts of over 30 seconds, in general reflections seemed to be poor and very little above what could be considered random meteors. All in all, the Leonids are quite a disappointment and certainly seem to be on the decline.

EME

Moonbounce enthusiasts were able to operate in the ARRL EME contest that took place on the 24th and 25th. This was on all bands from 50-1296MHz and as the weekend coincided with low degradation, this was an ideal time for the smaller antenna array stations to pick some new initials.

Sporadic-E

6m enjoyed a few occasional Sporadic-E openings commonly known as Winter Es. These openings are unusual as they don't seem to follow the pattern or intensity of the summer events. UK stations worked down to the Balkans and Southern Spain with strong signals.

Band reports

David, G4RQI (IO93) notes a stunning tropo opening on 16 November with great DX on 70cm. All worked using 200W and 2x10-ele with the following stand-out QSOs despite activity being a little low especially on SSB. Highlights using FT8 were DG0KW (JO64) 937km, OZ1SKY (JO56) 790km and DJ8MS (JO54) 851km. David also used CW to good effect working SM7GVF (JO77) 1062km and SM6FHZ (JO67) 932km. On the 17th, YL3AG was worked at an amazing distance 1497km using CW to locator KO06WK. Other 70cm QSOs over the 2-day opening were PB0AHX (JO22), OZ1JMN (JO46), OZ2OE (JO45), GM4FVM (IO85), ON4BCV (JO21), DL1KDA (JO30), DF1KS (JO30), OZ1BEF (JO46) and ON4GG (JO20) on SSB.

Lyn, G8JLY (IO82WG) has completed the onerous task of moving QTH from GW to G land. Whilst only active on 2m the new stations results are starting to bear fruit and he recalls getting to grips with everything at the new QTH. "The 2m band has produced several significant tropo openings during October and November since the move from Cardiff. On 9 October I was able to work many DL, OZ, PA and ON stations. Some of these QSOs were on SSB but most were using the FT8 digital mode. It appears that most stations use FT8 in tropo openings these days. The most interesting QSOs in this opening were with OZ1BEF (JO46), OZ6HQ (JO45), DG0KW (JO64), DL2MDQ (JO64), DL2SUN (JO53), DO2HSP (JO53), DJ9MG (JO52), DK5AI (JO51), DL3AMI (JO50) and DJ9YE (JO43). JO43, JO53 and JO45 were all new locators here.

"On 19 October the 2m band opened again and I worked OZ1BEF (JO46), DG0KW (JO64) and DJ8MS (JO54). JO54 was another new locator here. Between 24 and 25 October, tropo on the 2m band was at its best. Again, I worked a lot of DX stations, this time from F, PA, DL, HB9, OZ and best of all Italy. New locators at my new QTH came from F5CT (JN08), F8DBF (IN78), F1FHP (JN28), F4HEX (IN96), F6FUR (JN05), F4CYH (JN26), F8GGD (IN95), DJ0JJ (JN38), OZ8ZS (JO55), HB9AOF (JN36) and IK2OFO (JN45PB). The QSO with IK2OFO was quite amazing as he had to beam over the Alps and I have to beam right through my roof in that direction (my 6-el short boom Yagi is fixed to a north facing wall of my house and its only at eaves height). We used JT65a mode for our QSO and for some periods Roberto's signal was at speaker copy. In fact, if I could have used CW (I can't), we could probably have made the QSO with CW and, maybe, even with SSB if we had tried.

"On 5 November, 2m opened once more but I only worked a few stations in this event. DG0KW in JO64 provided me with the longest distance this time. Outside of these openings, I made tropo QSOs with GI0OTC (IO65) and EI4KP (IO52) for two more new locators."

2m meteor scatter

I have been very busy looking for new locators to work using meteor scatter (MS). In October and early November new locators and a new DXCC entity came from S51AT (JN75), I3MEK (JN55), OE3NFC (JN88), DG3YEV (JN68), IV3NDC (JN65), ES3RF (KO29), EU3AI (KO22), IK0BZY (JN61), SM4IVE (JO79), DF1AN (JO63), IW4BET (JN54), LA4YGA (JO48), OH1MN (KP10), SP8SN (KO11), E72U (JN94), GM6VXB/P (IO98) – operating from an oil platform in the North Sea, YU7TT (KN05), OZ1CT (JO75) and YL3HA (KO26).

Trends for 2019

With the start of the New Year it's hard to see how 2019 can exceed the superb propagation enjoyed by many on the VHF/UHF bands as 2018 could be classed as one of the best in recent memory.

6m enjoyed numerous openings to IARU Region 2 in particular North America and the Caribbean. There were also openings to Japan and the Far East with many stations taking to FT8 to working this DX, which seemed to diminish the SSB activity on the band during the same opening. Developing operating skills using this mode will no doubt continue and its clear to see from reports coming in that FT8 usage will probably expand during 2019.

4m also supported some excellent openings and with 2019 in mind clarification of the spot frequencies is probably in order. Thanks to information from a couple of correspondents, the centres of activity changed quite a bit during the year as activity particularly on FT8 progressed. As MSK144 is in use on the band for meteor scatter working, to satisfy the 4m band allocation in Germany this centre frequency was moved from 70.280MHz down to 70.174MHz. This is not a great frequency for a datamodes as it clashes with SSB during contests. The move was to try and find common ground with other countries' 'allocations. With an increase in FT8 usage 70.154MHz was voted for as the centre frequency because 70.164/.174 is the centre of (DL) DX band for SSB/CW operation. It is hoped that the German allocation on the band will return in 2019.

2m The development of FT8 on the band has certainly been quite meteoric. As other bands embraced the mode, 2m was initially a bit slow join the party but as the year developed it was clear that during any decent opening it could be used very effectively. Also stations were keen to test over long distances with considerable success. The debate that needs to be had is that 'is FT8 a weak signal mode'? After testing, opinions vary from the decoding level at -22dB or the many comments that "I could quite easily work the same stations on CW". As FT8 increased activity on 2m where there are few SSB alternatives, 2019 could be an ideal time to really test and find out what the possibilities are with this mode.

MGM contests

The inaugural RSGB VHF MGM Contest was held earlier in the year, taking place on the weekend of 21/22 April, which was the first such dedicated MGM contest on VHF and was well received by entrants. Once again good DX was worked with the ODX on 6m being GM4VVX to IK0BSR at 2336km and on 2m the top ODX went to SM4GGC (Stig) and UT8LE (Anatoly) for their 1790km QSO. This illustrates the wide appeal and inclusive nature of the contest.

The second leg is scheduled for 14/15 December again with dual band 6 and 2m operation available. Conditions will certainly be different – but with the lack of extended Sporadic-E it will be interesting to see how the bands/modes are changed to get the best advantage in DX QSOs.

There has been a recognition that with the rise of MGM modes and with FT8 in particular that a new series of MGM contests are to be run on 6m and 2m in the 55 minute period before the 6 and 2m UK Activity Contests in 2019 **[3]**.

The scoring and requirements for a valid QSO are the same as the weekend events and the key factor is that it is open to all. The feel of the contest will be very much different from a traditional UKAC. In effect it could look like a 'non contesters contest'!

Further information on both the weekend and weekday series, please check out the RSGB VHFCC website **[4]**.

Sign off

It would seem that 2019 could be a year of change and opens up some incredible possibilities in experimenting with new digital modes. VHF/UHF bands are still an area of expanding the boundaries of the tools we have available. Looking forward to it in IO83!

Websearch

[1] www.qrz.com/db/da0ff/
[2] www.dr9a.de/qth.htm
[3] www.rsgbcc.org/cgi-bin/readcal.pl?year=2019
[4] www.rsgbcc.org/vhf/

Richard Staples, G4HGI
g4hgi@live.com

GHz Bands

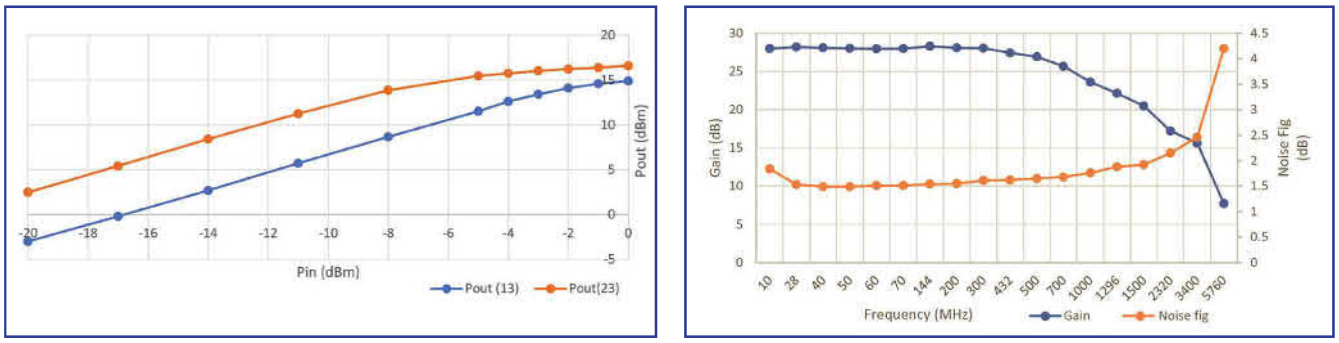

FIGURE 1: Measured performance of the 'ten-quid LNA'. Left: power sweep. Right: gain and NF vs frequency.

An inexpensive GHz gain block

After the last couple of months focussing on software for SDR I'm returning to hardware with a look at one of the Chinese gain blocks available inexpensively from eBay. For under £10 you can buy a boxed up and connectorised module claiming a 1.9dB noise figure useable from 50kHz to 4GHz **[1]**. This 'ten-quid LNA' costs half that if you buy just the assembled PCB **[2]** and there is a sub-1dB noise figure version **[3]** available for just a few pounds more. I bought a boxed 1.9dB unit from [1] and put it to the test in my lab, looking at noise figure, gain and frequency response to see how it lived up to the hype.

Figure 1 shows a noise figure (NF) and gain sweep from <10MHz to 6GHz, plus a power sweep at 23cm and 13cm. The results are summarised in **Table 1**. I have to say that they are very useful gain blocks for less than the price you might pay for two SMA connectors and a box! I can't see me designing any PCBs for UHF gain blocks ever again!

PHOTO 1: The 'ten quid LNA'.

Activity

The end of October brought a welcome return of tropo to the GHz bands with Dave, G7RAU (IN79jx) making 31 QSOs in 18 squares and 7 DXCC on 1.3GHz from 23 to 25 October. Running just 2W via 43m of coax and no preamp to a 35-ele Yagi, his haul included 7 DLs in JN49 and EA1CRK, who Dave describes as a "monster signal". Being in that rare square on the Lizard in Cornwall makes Dave a VERY attractive prospect for DX stations.

November 5 brought some nice daytime intra-UK tropo on 10GHz. I was alerted to this at lunchtime when I heard the GB3LEX beacon (IO82iq) on 10368.955MHz while I was beaming south west towards the Madingley ridge close to Cambridge. It was clearly a reflection and, on turning to the direct path, the beacon came up to 589. I looked at the F5LEN Tropo site **[4]** and it showed some weak ducting centred on the Midlands. I immediately put out alerts on Twitter, ukmicrowaves.io and the Zello SHF chat and managed QSOs with G4DBN (IO93nr), 59 both ways on SSB, then G3YJR (IO93fj) on CW and SSB, 55 both ways. G4DBN worked G0UVZ a little later but the tropo was gone by teatime. This highlights the advantage of having a decent home station to pick up these brief openings.

Beacons

Last month I reported on the rebuilt beacon GB3KBQ (IO80lx01) on 10368.870GHz and I'm pleased to say that the extra 6dB of EIRP means it is received fairly regularly here by troposcatter over a very obstructed 269km path, showing up as a faint line on a waterfall display.

The Bell Hill site (IO80uu59) now has a 47GHz beacon again. Built by G8ACE and installed by G3LDR, it operates on 47088.905MHz using the call GB3SCQ. It uses a horn antenna, fixed on 75° and produces around the same power as the old G8BKE/P beacon that failed some years ago. It sends 'GB3SCQ IO80UU P0', the P0 indicated that the output power from the transmitter is nominal; any other 'P' number indicates power has dropped or there is an antenna mismatch. The beacon is mounted on a pole attached to the equipment cabin and is 5m above ground but it's hoped to get it higher next time the mast is taken down for service.

Finally

As you may have heard, Es'hail-2 launched successfully in November. It's the world's first geostationary satellite carrying amateur radio transponders, 2.4GHz up and 10GHz down. It's capable of linking stations as far apart as Brazil and Thailand. A 1m or less dish should suffice for most users. See page 72 for more details on how to receive this fascinating new bird. All being well, initial operation may commence in time for me to report on the activity in the February edition.

Websearch

[1] https://bit.ly/2JRIx9v
[2] https://bit.ly/2AYrwrr
[3] https://bit.ly/2T1I4ab
[4] http://tropo.f5len.org/forecasts-for-europe/

TABLE 1: Summary of test results.

Band	NF	Gain	P_{1dB}
23cm	1.9dB	22dB	-1dBm
13cm	2.2dB	17dB	-6dBm
9cm	2.5dB	16.6dB	
6cm	4.2dB	7.7dB	

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Contesting

There are significant changes to some RSGB contests taking place this month, so please read on and refer to the Contest Committee website for more information (www.rsgbcc.org).

On HF we start 2019 with three more events in the Super League series, the 80/40m AFS contests. This year, to avoid clashes with other contests, there are some changes to the dates and the sequence of modes. CW is on Saturday 5th, datamodes on Sunday 13th, and SSB on Saturday 19th. Because we are now moving towards the end of the Solar Cycle, the Maximum Usable Frequencies are low during the day and even lower when it gets dark. Consequently the timing for all three events is being brought forward by one hour.

On VHF, 2019 contesting starts with changes on New Year's Day, Tuesday 1st. The 2m FM Activity Contest (FMAC) will now end five minutes earlier than it did previously. A new 2m MGM contest is also being introduced. The 2m UK Activity Contest (UKAC) follows. On Tuesday 8th the 70cm FM Activity Contest will also end five minutes earlier than it did before. The 70cm UKAC follows. On Thursday 10th, the 6m FMAC is replaced by a new 6m MGM contest, which is followed by the 6m UKAC. On Tuesday 15th there is no change to the 23cm UKAC, but on Thursday 17th there is a change to the format of the 4m Activity Contests. The UKAC remains, but the FMAC is gone. On Tuesday 22nd we have the SHF UKAC. To sum up, there are two new 55-minute long MGM contests and one less FMAC, the remaining FMACs ending five minutes earlier.

The Worked All Britain Christmas Party started on Boxing Day and continues until Sunday 6th. The UK Six Metre's Group's Winter Marathon started at the beginning of last month and continues until the end of January. The IRTS (Irish) 80m Counties Contest takes place on the evening of Tuesday 1st. After its customary break, the UKEICC 80m series restarts with an SSB session on Wednesday 2nd. The ARRL (American) RTTY Roundup runs for 30 hours over the weekend of 5-6th. Send a signal report and serial number, but expect to receive a signal report plus a State code from US stations and a Province code from Canadians. Multipliers count just once, not once per band, and entrants are limited to a maximum operating time of 24 hours. Next come the two sessions of the European 160m CW Party. The first is on the evening of Saturday 5th and the second is in the early hours of Sunday 6th. You can work the same stations in each session. What you send your QSO partners depends on whether you are a member of a club affiliated to the Association (in the UK that means FOC, FISTS, G-QRP and the Essex CW Club). If you are, send RST + name + club abbreviation + membership number; otherwise send RST + name + 'NM' (for non member). The Worked All Britain 1.8MHz Phone contest takes place for four hours on the evening of Saturday 19th. The CQ 160m DX Contest starts on Friday 25th and runs for 48 hours. The CQ Zone for the UK is 14. The BARTG RTTY Sprint contest runs for 24 hours, starting midday on Saturday 26th. Exchange a serial number only. Finally, there is a CW leg of the UKEICC 80m series on Wednesday 30th.

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RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Sat 5 Jan	CW AFS §	1300-1700	CW	3.5, 7	RST + SN
Sun 13 Jan	Datamodes AFS §	1300-1700	Data	3.5, 7	RST + SN
Sat 19 Jan	SSB AFS §	1300-1700	SSB	3.5, 7	RS + SN

RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Tue 1 Jan	144MHz FMAC	1900-1955	FM	144	RS + SN + Locator
Tue 1 Jan	144MHz MGM	1900-1955	MGM	144	Report + 4-character Locator
Tue 1 Jan	144MHz UKAC	2000-2230	All	144	RS(T) + SN + Locator
Tue 8 Jan	432MHz FMAC	1900-1955	FM	432	RS + SN + Locator
Tue 8 Jan	432MHz UKAC	2000-2230	All	432	RS(T) + SN + Locator
Thu 10 Jan	50MHz MGM	1900-1955	MGM	50	Report + 4-character Locator
Thu 10 Jan	50MHz UKAC	2000-2230	All	50	RS(T) + SN + Locator
Tue 15 Jan	1.3GHz UKAC	2000-2230	All	1.3G	RS(T) + SN + Locator
Thu 17 Jan	70MHz UKAC	2000-2230	All	70	RS(T) + SN + Locator
Tue 22 Jan	SHF UKAC	1930-2230	All	2.3-10G	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
26 Dec - 6 Jan	WAB Christmas Party	All	All	All	WAB Book number
1 Dec - 31 Jan	UKSMG Winter Marathon	All	All	50	RS(T) + Locator
Tue 1 Jan	IRTS 80m Counties	1500-1700	SSB/CW	3.5	RS(T) + SN (EIs & GIs also send County)
Wed 2 Jan	UKEICC 80m	2000-2100	SSB	3.5	4-character Locator
Sat-Sun 5-6 Jan	ARRL RTTY Roundup	1800-2359	Data	3.5-28	RST+ SN (Ws send State, VEs Province)
Sat 5 Jan	EUCW 160m CW Party	2000-2300	CW	1.8	See text
Sun 6 Jan	EUCW 160m CW Party	0400-0700	CW	1.8	See text
Sat 19 Jan	WAB 1.8MHz Phone	1900-2300	SSB	1.8	RS + SN + WAB square
Fri-Sun 25-27 Jan	CQ 160m DX	2200-2200	CW	1.8	RST + CQ Zone (Ws send State, VEs Province)
Sat-Sun 26-27 Jan	BARTG RTTY Sprint	1200-1200	RTTY	3.5-28	SN
Wed 30 Jan	UKEICC 80m	2000-2100	CW	3.5	4-character Locator

§ Super League event. For all the latest RSGB contest information and results, visit www.rsgbcc.org

19th World ARDF championships

The 19th World ARDF championships were held in South Korea in September 2018. This IARU-governed competition is a biennial event comprising competitors from all three IARU regions.

The British team for this year's event was somewhat depleted due to availability, injury and the location of the event. Instead of the usual nine or ten members that would normally be available for a European based event, the British team only had two participants in South Korea – John Marriott, M0OJM (class M70) and Robin Bishop, RS213497 (class M50). RSGB competitors are all self funded.

Format of competition

The ARDF World Championships comprise four events during the week. The four different formats have been described in detail in previous *RadCom* articles. Before the competitions start there is a short training session with each of the different transmitter types. This allows the competitors to check the tuning of their receivers, measure signal strengths and mark up corresponding distances on their receivers in order to compete effectively.

Terrain and environment

The area chosen by the Korean Amateur Radio League (KARL) was around Sokcho. This is about 50km north of Pyeongchang, 30km south of the North/South Korean border and on the eastern edge of the Korean peninsula. Pyeongchang was the host for the last Winter Olympic games. Typically, ARDF events are held entirely within a forest. However, in Korea, there was a mixture of forest ridges and farming land in the form of flat paddy fields. The ridges were 500m wide, 50m high and covered in dense vegetation.

It became obvious early on that staying on the paths, tracks and the most light vegetation was the way to approach these races. Straying off the paths into the thicker vegetation risked being blocked off from where you were trying to get to. I wouldn't classify it as a jungle, but you still didn't want to get caught out.

John, M0OJM on the podium collecting his bronze medal for the M70 FoxOring race.

The temperature in Korea at the start of September is about 25 to 30°C in the sunshine. Nice for a holiday, but a different matter if you're trying to get from A to B in the shortest time.

Day 1: FoxOring

In FoxOring there are a number of hidden transmitters to find in the area, typically seven to ten. These are low strength (10mW) and have a maximum range of 150m. To find them you need to navigate to a circle marked on the map, from where you can hear the transmitter. Then it is a case of direction finding to the exact transmitter location.

This event is suited to people who can orienteer effectively. Both John and Robin are members of UK orienteering clubs and looked forward with expectation to this event.

Given the terrain, the orienteering was not difficult, though a little physical on the warmest day we had. John, in M70 class, made a great start to the week. He navigated effectively, stayed on the paths and put in a concerted effort to get around the course. His reward was a 3rd place bronze medal at a World Championship.

Robin, in M50 class, was doing well until the last but one transmitter (4th place). However failing to directly get back to a path, he ended up in the vegetation. This resulted in a 10th place at the finish.

World championship medals are hard to obtain. A great start to the week, and the onus on Robin to match John's feat.

Day 2: 2m Classic

With the 2m Classic event there are between three and five transmitters to find depending on age class. Both John and Robin had to find four for this event and both chose to run in the M50 class to make up a team. The trouble with 2m is that hills and ridges give a plethora of multi-path propagation. The indications of both the distance to the transmitter and its true direction can be erroneous and confusing. The 2m event was difficult, with transmitters screened by

Robin, RS213497 wearing the Welsh dragon at the awarding ceremony.

The RSGB team pictured with Ken Harker, WM5R of the ARRL team. John, M0OJM (left) and Robin, RS213497 (centre).

hills and the vegetation blocking the ideal route choice. Not a good day for either team member.

Day 3: 80m Sprint

Sprint is the event where everything happens very fast. There are two sets of five transmitters to locate, a Slow-keyed set and a Fast-keyed set. Each set is on a different frequency with each of the five transmitters sending for 12 seconds each in a one minute cycle. Fast running, quick decision making, the ability to create a mental picture of the location of the transmitters followed by choosing the optimum route between them is the challenge.

There was an added problem during the race when the antenna of Fast transmitter number 2 was inadvertently detached. This made direction of the transmitter extremely difficult to evaluate.

John completed the course in a respectable time, even with the trouble of Fast 2 and not taking the optimum route. Robin started very well with the Slow set. He then also found Fast 2 troublesome. This then led to a small mistake at the end of the course. Even with that, his time was good enough for 3rd place, and another bronze medal for the UK team. P A Nordwaeger, SM0BGU, one of the Referees, on seeing Robin on the podium wearing his Welsh tee shirt, opined "It's good to see smaller countries winning medals, and not just the Czechs, Russians and Ukrainians."

Day 4: 80m Classic

Finally came the 80m Classic, with again five transmitters, each one sending for one minute in a five minute cycle. As ever the object is to obtain good initial bearings and an estimate of the distance to each one, in order to locate the transmitter efficiently.

Another added feature of the terrain was the power lines alongside all the roads, which have the effect of distorting the bearings that are measured on 80m. It came down to a choice between using the roads with rubbish bearings or heading into the thick vegetation, which meant slow movement.

John, again, had a reasonable race and Robin had a good run only marred by a misunderstanding of the signal strength from one transmitter. He came in 5th in his class.

Overall this turned out to be a great event. Two individual medals for the GB team, one for each member.

The post-race analysis of these Championships leads to a number of conclusions. If we had avoided the obvious mistakes and understood more of the information presented to us then the results could have been very much better. There is some training to be done over the next year before the European (Region 1) Championships in Solvenia during September 2019. We expect a larger UK team to be at that event, full of enthusiasm and looking to do well.

Events

The ARDF group hold regular events throughout the year. If you would like to try and have some of this radio fun, then please come along. Details of events can be found on the RSGB website www.rsgb.org, go to the On the Air tab, then click on ARDF, then events.

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Getting ready to receive Es'hail-2

FIGURE 1: Es'hail-2 footprint.

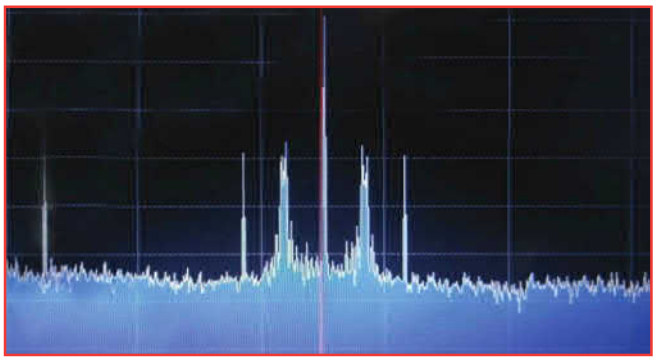

FIGURE 2: BADR7 beacon received by G7JTT on an RTL dongle.

Es'hail-2 is a broadcast transponder satellite owned by the Es'hailSat Qatar Satellite Company, launched on 15 November 2018 by SpaceX (see cover photo). It will occupy a geostationary slot at 26° East of South and carries two dedicated amateur radio transponders. The amateur radio transponders (AMSAT reference P4-A) are a joint project between the Qatar Satellite Company (Es'hailSat), the Qatar Amateur Radio Society (QARS) **[1]** and AMSAT Deutschland (AMSAT-DL) **[2]**, which provided the technical lead.

The two transponders are intended for different purposes. The 250kHz-wide transponder will carry narrowband analogue (SSB) voice and CW communications. The second, 8MHz wide transponder is intended for digital ATV communications. **Table 1** shows the basic uplink and downlink transponder parameters.

Both transponders will use a very wide beam and provide coverage for about a third of the earth's surface, as shown in **Figure 1**.

Remote listening to Es'hail-2

In order for it to be as easy as possible to listen to the satellite, the British Amateur Television Club (BATC), in co-operation with AMSAT-DL, will be operating a fully tuneable webSDR for the narrowband segment and a spectrum viewer for the wideband (DATV) segment **[3]**. Goonhilly Earth Station is kindly supporting the project, by providing hosting for the ground station facility at their site in Cornwall.

Receiving Es'hail-2 directly

Whilst the BATC webSDR at Goonhilly will provide a means to listen to the narrowband segment, it will only provide a spectrum monitor for the wideband DATV segment and if you want to decode any of these signals, you will need to set up a system at home.

The expectation is that the wideband DATV transponder will be able to be received in most of the UK using a 1 metre dish. An 80cm offset dish should be adequate for the narrowband segment.

Equipment required

Just like any consumer satellite system, you will need a 'low noise block' (LNB) at the dish to convert the 10–12GHz (Ku band) signals down to L Band (~1-2GHz), which can then be fed in to a satellite or SDR receiver.

Any modern Ku band satellite LNB will receive the Es'hail-2 signals. However, it is recommended that you use a phase lock loop based LNB; the poorer frequency stability of a standard free-running dielectric resonant oscillator (DRO) unit will make it difficult to receive SSB and reduced bandwidth DATV (RB-TV) signals. The most common unit is the Octagon Optima PLL OTLSO LNB **[4]**. You will still see *some* frequency drift when resolving SSB signals with this LNB and it is possible to improve the frequency stability by locking to an external source but that is beyond the scope of this article.

Assuming a 9.75GHz local oscillator LNB, you'll see the narrowband transponder at 739.55MHz to 739.80MHz and the wideband transponder at 741.0MHz to 749.0MHz.

To receive the narrowband transponder you can simply use an SDR receiver such as FUNcube Dongle, Lime SDR or one of the cheap (£10) RTL dongles that will cover the IF frequencies from the LNB. Alternatively, if you wish to use an amateur band receiver on HF, 144 or 432MHz you will need an additional unit to covert the IF frequencies to your amateur band of choice.

You will also need to feed 12V DC up the coax to power the LNB – this can either be done internally in your receiver or by an external bias tee.

Wide band receive equipment

To receive the wide band, horizontally polarised DATV transponder you will need a DATV receiver covering 741 to 749MHz. This is outside the normal tuning range of a consumer digital TV set top box (STB). You can use an additional upconverter to shift the IF frequency to be in the STB tuning range of 950 – 2150MHz. Such converters are available; alternatively there is a USB-based tuner designed specifically for amateur TV use that covers down to 143MHz and is suitable to receive Es'hail-2 with no modifications or additional upconverter. These are called MiniTiouner **[5]** and are available from the BATC and other sources. They are used with the MiniTiouner software developed by F6DZP to receive and decode DATV signals down to less than 500kHz wide.

Aligning the dish

Even an 80cm dish will have 30dB-plus gain at Ku band and thus has a very small beam width, approximately 2.5°, making mounting and aligning the dish very critical. Whilst the date for the Es'hail-2 amateur service has not yet been released, it is already possible to set up and align your dish and test your decoder using the existing broadcast satellite BADR4, which is in the same orbital slot (26°E) and has a European beam carrying free to air TV channels including the BBC Arabic service.

The first step is to check that you are going to mount your dish in a position where it can see the satellite. As a rough guide, Es'hail-2 is 2° to the south of the Sky/Freesat satellite at 28°E. These bearings are referenced to the south and therefore Es'hail-2 is further to the west – which means, looking south, you point your dish 2° further *right* than for Sky.

A very useful resource is at **[6]**. You just enter your postcode and select BADR4 as the satellite. The site will overlay the satellite direction on a Google satellite view so you can see which neighbour's house to aim for!

Aligning the dish with a DATV receiver

Once you have the dish mounted and pointing in roughly the right direction, it is recommended that you use a standard free to air satellite box or satellite finder to align the dish on BADR4. To do this you need to know what parameters to set in your STB. Most people have used BBC Arabic as the test signal. The parameters to set for this are:

- Frequency = 11.996GHz, which means you need to select the LNB LO frequency as 'high' (10.600GHz, 22kHz tone on), then set your Rx frequency to 11.996GHz
- Horizontal polarity, meaning you need 18V on the LNB feed
- Symbol rate 27500 and 3/4 forward error correction (FEC) (selected in the satellite setup menu)

A wide band software defined radio receiver or spectrum analyser is useful (but not essential) during the alignment process and should be connected in to the LNB feed via a DC blocking splitter, with the STB on the conductive leg providing volts and 22kHz tone.

The easiest way is to find the strong satellite from Astra (Sky) at 28°E and use the SDR, sat finder or analyser to watch for several 27MHz wide signals to appear. Once you have peaked on the signal you need to decode a program to try and identify which satellite you are actually receiving. Do a satellite or transponder scan with 27,500 SR, H and V polarity and auto FEC and see what appears – these are very common parameters and almost all European satellites have signals which will decode using them. Now refer to Lyngsat.com **[7]** to try and identify which transponder you are actually viewing by looking at the various satellite channel lists.

Make your dish a happy dish with signals from Es'hail-2!

(SETI League photo of the 'Smiley' dish at Pisgah Astronomical Research Institute, used by permission, see www.setileague.org).

Once you know which satellite you are receiving, work out which way the dish needs to be rotated and set your receiver for the BADR4 BBC Arabic service (11996MHz, 3/4 FEC and 27500 SR), then tweak the dish round until you see it start to decode. If you are looking on an analyser or SDR, BADR4 is much weaker than Astra at 28° or Eutelsat at 13°; if you are starting to see another set of very strong signals, you have probably gone too far.

Once you are sure you are receiving BADR4, tweak the horizontal and vertical mounting and LNB skew using either the satellite strength meter or STB quality meter for best MER / SNR / signal quality.

Aligning the dish using an SDR

Every geostationary satellite runs a narrowband telemetry beacon that can be used to align a dish using just a simple SDR such as FUNcube or RTLdongle. The beacons are on different frequencies so can be used to easily identify which satellite you are receiving – unfortunately the BADR4 beacon is in the higher frequency band above 12GHz and requires the LNB to be fed with a 22kHz tone to switch in the higher local oscillator (not easy to do using a standard SDR). However, the BADR7 satellite is in the same orbital slot and has a telemetry beacon on 11.2005GHz, receivable throughout Europe and which gives an IF signal on 1450.5MHz – you may have to tune ±100kHz depending on the stability of your LNB.

Use the same dish alignment procedure described earlier but monitor 1450.5MHz on your SDR waterfall – you will see a high level of wideband noise from other satellite signals such as Astra at 28° but should clearly see the beacons carriers when aligned on BADR7 at 28°.

Note that the BADR7 beacon is horizontally polarised so you will either need to feed the LNB with 18V or physically rotate it by 90° if you only have 12V available. And don't forget that Es'hail-2 narrowband is vertically polarised so when alignment is complete on BADR7 you will need to switch back to vertical polarisation. **Figure 2** shows the BADR7 beacon received by G7JTT on an RTL dongle.

Conclusions

Es'hail-2 will revolutionise amateur satellite communications by providing our first-ever geostationary capability – and it is available to a third of the globe. Whilst no actual in-service date has been announced for Es'hail-2, it is envisaged that the amateur transponders will be turned on before the end of the first quarter of 2019.

Using the BADR4 signals or the BADR7 beacon to align and test your system means that once the Es'hail-2 amateur transponders are commissioned, all you will need to do is tune down to 739.550 to 739.800MHz for the narrowband transponder and 741 to 749MHz for the wideband (or DATV) transponder. A new world of experience awaits us and you can prepare your shack for it right now.

TABLE 1: Narrowband (250kHz) and wideband (8MHz) transponder uplink and downlink frequency data.

	Lower end	Upper end	Polarisation
Narrow uplink	2400.050MHz	2400.300MHz	RHCP
Narrow downlink	10489.550MHz	10489.800MHz	Vertical
Wide uplink	2401.500MHz	2409.500MHz	RHCP
Wide downlink	10491.000MHz	10499.00MHz	Horizontal

Websearch

[1] www.qsl.net/a71a/
[2] https://amsat-dl.org/eshail-2-amsat-phase-4-a
[3] https://eshail.batc.org.uk/
[4] The Octagon Optima PLL OTLSO LNB typically costs about £20 or less. Ensure you buy the PLL unit, rather than a DRO (standard) LNB
[5] https://wiki.batc.org.uk/MiniTioune
[6] www.dishpointer.com
[7] www.lyngsat.com/Badr-4-5-6.html

Noel Matthews, G8GTZ
G8GTZ@batc.org.uk

Great

Antennas for MF and Above

By Mike Parkin, G0JMI

A practical guide to antennas for 630m, 160m, 80m and 60m bands.

Aimed at the constructor, or those curious to understand 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 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.

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' Price £11.99
RSGB Members' Price £10.19

Valve Amplifiers Explained

By John Fielding, ZS5JF

A book 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! 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."

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.

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: 9781 9101 9347 1
Non Members' Price £14.99
RSGB Members' Price £12.74

50 Projects for Radio Amateurs

Edited by Mike Browne, G3DIH

Many radio amateurs love to design and construct electronic projects from the very simple right through to the very complex. *50 Projects for Radio Amateurs* draws together a wide array of projects that the Radio Society of Great Britain has published. You will find projects as diverse as antennas, simple test equipment through to 70cm handhelds.

50 Projects for Radio Amateurs is broken into sections that cover Measurement & Filters, Morse, Antennas and a large section covering useful station accessories, peripherals and other diverse projects. Projects included range from complex DIY antenna analysers through to a simple electronic keyer and builds on simple strip board. There are two transceivers that you can build alongside antennas for bands from Microwaves to HF. There are also four handy reference guides explaining Using 10Ghz, Screening, Baluns and Aerial Maintenance. This book has something for everyone whatever their level of construction ability and all will find something interesting to construct and build. Most projects are also straightforward, and can often be built in a weekend or over a few evenings.

Size 174x240mm, 256pages
ISBN: 9781 9101 9352 5
Non Members' Price £14.99
RSGB Members' Price £12.74

OPERATION LENA AND HITLER'S PLOTS TO BLOW UP BRITAIN

By By Bernard O'Connor

'The couple were found to be carrying forged identity and ration cards, a wireless transmitter and receiver set, a torch with 'Made in Bohemia' on it, a revolver, ammunition, a coding device, graph paper, about £400 and a half eaten German sausage. Given the evidence they were arrested and escorted to London for interrogation'

Many are familiar with the stories of SOE and the activities of agents working across Europe for the Allied cause during WWII but far fewer are aware of the extent of the German activities. This hardback book sets out to describe these activities with the sometimes comical outcomes and the Allied counter espionage activities. This book tells the complete story of the successes and failures of the Nazi terror offensive on mainland Britain during 1938-1944.

Size 156x234mm, 320 pages, ISBN 9781 4456 6963 2
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A Mind at Play

By Jimmy Soni & Rob Goodman

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Claude Shannon's career stretched from the era of room-sized computers powered by gears and string to the age of Apple. *A Mind at Play* brings this singular innovator and creative genius to life.

Size: 156x233mm, 384 pages, ISBN 9781 4456 8277 8
Non Members' Price £16.99, RSGB Members' Price £11.99

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books from 2018

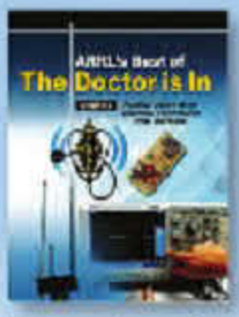
Software Defined Radio

By Andrew Barron, ZL3DW

Everyone is talking SDR, but is it right for you? *Software Defined Radio* sets out to explain the basics, without getting too technical.

Software Defined Radio covers a huge range of material. The use of SDR by radio amateurs is growing rapidly in popularity, as they become aware of the great features and performance on offer. This book covers how SDR works, it details the different types of software available, what is different about them and what is better. There is a wealth of useful information included, and guides to what to look for when you are buying equipment. If you are interested in the technology of what was once, the domain of a few dedicated hackers and experimenters, the future of this exciting and fast developing area of radio or simply want to buy a SDR radio, this book is thoroughly recommended reading.

Size 174x240mm, 304 pages
ISBN: 9781 9101 9349 5
Non Members' Price £12.99
RSGB Members' Price £11.04



ARRL's Best of The Doctor is In

By Joel Hallas, W1ZR

If you have not yet discovered the regular *The Doctor is In* column in the ARRL magazine *QST* then this book is a revelation. Written in a question and answer format the column dispenses practical answers, myth busting, and great ideas covering a range of topics.

The *ARRL's Best of The Doctor is In* distils more than a decade of the advice and ideas of Joel Hallas, W1ZR covering antennas, transmission lines and more. Masses of questions are broken down into sections covering VHF/UHF Antennas, HF Wire Antennas, HF Vertical Antennas, HF Yagi Antennas and Transmission Lines. Each question is treated to an answer that informs, provokes and stimulates.

Having *ARRL's Best of The Doctor is In* at hand is the next best thing to a visit from W1ZR himself!

Size 184x229mm, 128 pages
ISBN: 9781 6259 5074 1
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ARRL Receiving Antennas for the Radio Amateur

By Eric P. Nichols, KL7AJ

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Looking to maximise your receive capabilities, this book provides the ideal guide.

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ARRL's Hands On Radio Experiments - Volume 3

By: Ward Silver, N0AX

This book covers material from the ARRL's *Hands-On Radio* column, published in their magazine *QST* from 2013-2017. It provides a host of basic electronics experiments, designed to increase your understanding of radio fundamentals, components, circuits and design.

The book is broken down into eight different sections. You will find sections covering experiments to get the best out of antennas and another on transmission lines and impedance matching. You will also find sections on electronic circuitry, electronic components and electronic fundamentals. Other sections included cover Tests and Test Equipment, RF Techniques and Practical Station Practices. This is recommended reading for everyone interested in practical 'Hands-On' amateur radio experimenting.

Size 184x229mm, 128 pages
ISBN: 9781 6259 5079 6
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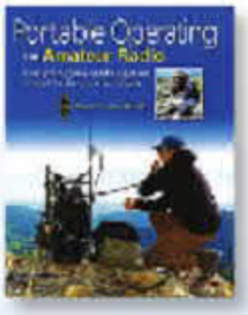

ARRL Portable Operating for Amateur Radio

By Stuart Thomas, KB1HQS

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Portable Operating for Amateur Radio offers a wealth of practical information to help your portable amateur radio operations.

Size 208x265mm, 176 pages,
ISBN: 9781 6259 5080 2
Non Members' Price £22.99
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ARRL Handbook 2019

The *ARRL Handbook 2019* continues to advance the pursuit of experimentation and innovation. First published in 1926 this book aims to be a complete reference to radio technology.

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A compact helical vertical for Top Band

Introduction

Perhaps you have an unsatisfied interest in Top Band but feel starved for aerial space? What if there was a relatively easy DIY project by which you could make your own helical monopole around 75mm PVC pipe and some recycled household or mains extension cord wires?

For more than a decade I was fortunate enough to have quite large inverted-L aerials for low band working, however a sudden change in my health obliged us to downsize our house and cull many things. That included my extensive LF-MF amateur station including all the bulky homebrew and ex-marine radio gear – and of course the aerials. Much of the gear was re-homed and given a new life by other VK amateurs.

We did much thinking, planning and discussing about how I might be able to create a more compact operation for Top Band at least, sacrificing 600-630m (my favourite band since 1964 as a ship-shore station professional telegraphist). The quest became pursuit of a much smaller profile 160m aerial that could be easily mounted on my metal workshop shed roof, acting as a ground plane. Thus a short (relative to wavelength) + fat (75mm) = compact helical monopole became my initiative for the year. I had to forget any expectations of aerial performance comparable to what I'd enjoyed in previous years, but I *did* want to be able to work *some* Top Band AM and ICW, my two modes of choice. 160m DX is not easy from any land-based VK5 station.

Generic design considerations

My next step was to research a range of aerial design options. I share the following background and technical information gleaned that I found to be very useful for this phase of the project. Vertical aerials are typically mounted perpendicular to their supporting surface and this helical was to be no different. There were some important points to keep in mind during the planning stage, including the space occupies, the aerial's dependency on earth (ground), the radial wire size, quantity, arrangement and location (above or below grass level).

Worm's-eye view of the completed 160m helical antenna.

Occupied space

There are some, including more than one commercial aerial manufacturer, who would have us accept that vertical aerials are "space savers", not requiring any earthing system. Such a claim may have some merit for the vertical radiator portion but is open for debate if ground dependency necessitates having an earth mat, particularly for the low bands (40m and below). Unless installed over salt water, an effective earth system for a short MF vertical (say, less than 7/16 wavelength) is likely to occupy a large footprint.

Radials serve to collect return currents from their vertical radiators, for which the earth conductivity quality up to half a wavelength from the aerial feed point is important for efficiency. Both the Brewster angle [1] and Fresnel Zone [2] are subjective

The author winding wire onto the former.

in the earthing matrix quality for more than that half wavelength if the aerial is mounted at ground level. An effective earth for the largest area possible may help result in a lowered take-off angle with respect to the horizon. Earth conductivity as far out as 100 wavelengths in a target direction may possibly influence the angle of radiation. The subject is complex; the technical literature contains comprehensive information.

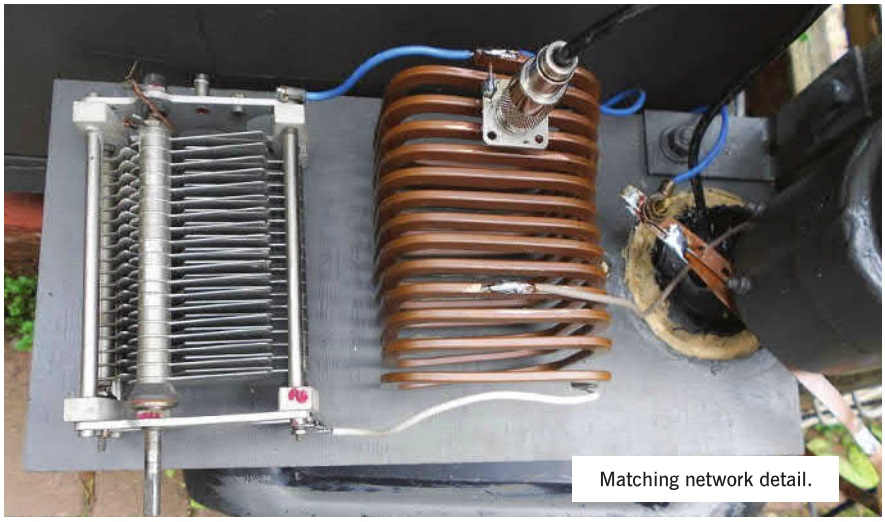
I do not subscribe to allowing 'pursuit of the perfect' to inhibit achieving something less: we ARE going to have both radiator and earthing systems compromised when establishing an amateur Top Band station on compact living allotments. Let us get on with doing the best we can!

Ground dependency and earthing

Common rhetoric would assure us that four radials may be satisfactory for a vertical monopole, and there is evidence to endorse their usefulness in the case of an above-ground 20m vertical (ground plane) for example, but not for a 160m vertical sitting on your average backyard earth. Adding another four to perhaps 96 radials may improve signals by about 3-4dB over average to poor ground.

If using a small number of radial wires, such as eight or twelve per band, the heavier the wire gauge used, the better. If many wires are employed, the return current may be spread over many more paths, in which case the actual wire diameter becomes less significant.

The antenna former was held in a larger-diameter support pipe by shims.



Matching network detail.

Adding a heavy duty galvanised aviary wire mesh earth mat is reported to perform well as part of an MF earthing system, being addressed by Brown, Lewis & Epstein [3], Sherwood [4], Wescombe-Down [5] and others. Sherwood has been a keen advocate of such mesh being used in conjunction with a radial pod or system, as have I with two 6m by 900mm of 12mm galvanised aviary wire mesh strips beneath my 80-10m earth-mounted vertical, simultaneously also being part of the 60 radial wires, metal fencing, extensive copper water pipe network and metal clad shedding remaining from my dismantled inverted-L [6]. This helical project aerial is also connected to the entire earth mat via my workshop shed frame bonding at the aerial base tuning point.

Although my preference would be to have a copper earth rod on as many radial wires and aviary wire mesh strips as possible, only one rod per five radials was manageable. Verrall [7] suggested, "use as many ground radials and separate earth rods as are practical". Keep them as damp as possible.

Research has shown that elevated radials make for a 'better bang per buck' earth system than buried ones. This is due to the earth system return currents not going through the higher resistance soil. The next preference would be for insulated wires to be laid on the earth's surface, though if they must be buried for safety and convenience, try to locate them in the top 50mm of soil.

Although not necessarily an engineering principle or mandate, it is suggested having tips of adjacent radials (for the same band) being separated by no more than half the height of the radial system above earth. How many will that mean? As many as is sensibly practicable and for low band operation 60 to 120 is appropriate (but site dependent).

Helical aerials and earthing

Helical aerials are earth-dependent devices and have part of their loading inductance incorporated within the actual helix itself, thus its inductance and capacitance are both better distributed over the entire aerial conductor. The aerial voltage increases across the loading coil when the height is increased, and this in turn improves the current distribution because where the voltage is lower (towards the helix base), more aerial current will be present. Therefore, without a capacity hat to complicate things, the radiation resistance of the helix will be 1.54 times that of a linear vertical monopole of the same height, ie a gain of 1.19dBi.

However, if a capacity hat is added to this type of vertical aerial, any advantage through being a helix evaporates due to the increased distributed inductance. The larger diameter of the helix conductor diminishes the necessary capacitance (and therefore advantage) conferred by top-loading.

Physically and structurally, a suitable large and tall outdoor helix for MF is an engineering challenge, which has probably caused helical MF monopoles to be less popular in the back yard than they deserve. So, enter this Top Band aerial project!

Short vertical aerials

Bill Orr [8] advised us in 1978 that, "An antenna that is electrically small (with respect to wavelength) can perform as an efficient radiator *provided* power can be efficiently applied to the antenna. Generally speaking, very short antennas have low values of radiation resistance and very high Q. At all frequencies below self-resonance, the equivalent circuit of the short antenna comprises a low value of resistance in series with a large value of capacitive reactance. In order to establish a state of resonance (and for 50Ω source matching) the reactance must be cancelled out and an impedance transformation effected. Both requirements demand high-Q networks … Generally, the higher the radiation resistance [of the antenna], the easier it is to match and the higher will be the efficiency of the network."

Why did I choose a helical?

A helix may be thought of as a dipole-loop hybrid. Although presented from a higher frequency perspective, we may extrapolate the general nature of helices from [9]: "Helical antennas offer many advantages … relatively compact … geometry is wavelength dependent … offers a good gain factor and can be a narrow or wide band device."

The paper considered high voltage applications for UHF use in defence and medical applications, with the general geometry of appropriate helices having relevance to some amateur radio applications. In the case of my 160m version, the turn circumference is not one wavelength (as the UHF iterations were), but much, much less and not a lot appeared to have been empirically researched or published regarding 75, 100, 150 or 200mm standard diameter PVC pipes as formers, for compact LF, MF or even HF application.

This 160m helical aerial project emerged as another creative experiment, intended to produce a worthwhile low band performer, while also serving as a distraction from my ongoing health issues. Its has achieved both objectives.

Dr David 'Doc' Wescombe-Down, VK5BUG
d.wd@bigpond.com

Winding the 160m helix

Discarded mains extension leads provided the helix winding material.

Select the desired resonant frequency plus whatever lengths of 75mm PVC piping that suits your preferred overall length/height of aerial. I had two pieces that, when joined, provided a 5.35m-long former. At this point a decision may be made to prepare three or four sections for a portable MF aerial, or a re-scaled version for 80m home station use.

My chosen centre frequency was 1825kHz. Working on the rule of thumb of slightly more than half a wavelength of wire being required, the total wound conductor length was 80.7m (262 feet). The turns were spaced 16mm apart. Adding a top-mounted 2.1m stainless steel whip aerial, also on hand, brought the total conductor length to 82.8m (269 feet).

The overall length of the PVC pipe plus whip came to 7.45m, which I consider to be quite compact for a 160m aerial. The total weight was less than 8kg.

I measured and marked the turns spacing with a permanent marker pen on both pieces of PVC pipe, then hand wound the formers with them resting across my lap. Initially I close wound each section then soldered their ends together and spread them along the formers to match the markings made earlier.

Once both PVC sections were completely wound and checked, all turns were given a dab of exterior grade fast-drying glue and left to set. Both tubes were then given two coats of exterior grade acrylic paint plus a patchwork of camouflage greens and browns, followed by two coats of satin finish marine varnish. Apart from the obvious long-term environmental benefit, these applications provided extra integrity to the wound helix turns over the entire joined 5.35m. The two pipe former sections were PVC offcut shimmed, secured by four stainless self-tapping screws, with the joint and screws being liberally protected with silicone sealant.

The tuning network

I found a large (200mm^3), very wide plate spacing 1000pF variable capacitor from a dismantled 630m 833A triode linear for the base tuning network. For 100W, a 450pF broadcast type capacitor would suffice.

Trial-and-error tests with a roller inductor suggested that 15-25μH would be needed. An inductor of about 20μH was made from 7x2mm copper, square-wound on a 90 x 90mm profile with suitably radiused corners.

Tuning using a GDO and two SWR meters (one in the transceiver, one at the tuning network) resulted in a 50Ω match at 1825kHz. With the inductor tapped four turns up from the earth end and the capacitor about 45% meshed, the 2:1 VSWR bandwidth was 37kHz; the 1.5:1 bandwidth (my preferred data) was 23kHz. Connections were made with heavy-duty copper strip and a 45cm heavy earth lead was fastened securely to the metal shed framing, part of the bonded earth system described earlier.

Detail of top end cap and mount for whip.

Final mounting

The aerial was mounted on the gable end of my metal workshop roof. I secured to it a 1.2m length of stout timber as the main mount. The 100mm diameter base tube was then attached to the timber using three saddle brackets. Small wood offcuts were used as stand-offs.

The end of the helix wire needs to be weather protected and away from metal for its entire route to the tuning network. I routed it inside the 100mm PVC vertical socket pipe and through the gable end via the Delrin disc. There would be various ways for achieving the same outcome.

I guyed the aerial at 5m using three 3mm UV-stabilised black poly rope guys.

Ready to go!

Helical results to date have been excellent: my 25W 807 AM transmitter produces S9+20dB signal reports from our local ground wave Top Band AM net participants out to 400km; ICW RST reports of 539-579 over distances up to 10,000km (UA4 Ukraine & Russia); nil rain static, even from the whip aerial; and the pleasantly surprising 1.5:1 VSWR bandwidth of 23kHz allows multi-mode Top Band operation based on VK band segment allocation.

I usually spend about 12 months (four seasons) making observations by which I may footprint any of my homebrew aerials, but protracted cancer treatment and the recovery process has precluded nocturnal radio operation for some time. I am not getting carried away by results thus far: just pleasantly heartened and confident enough to share it with *RadCom* readers.

My neighbours tell me that it is not an unsightly structure, no interference is generated, and they appreciate the camouflage paint job. I am back on 160m having successfully executed a very rewarding and cathartic project while enduring the worst protracted medical episode of my seven decades. I hope this article encourages others to also have a go!

630m addendum

Encouraged by the 160m helical vertical project outcomes, during 2018 I designed and built a 630m version. It is compact for the frequencies involved and suitable for either rooftop or ground mounting (as mine will be). It consists of a 110mm diameter PVC pipe former approximately 7.5m long, wound with 305m/991.5ft of insulated stranded copper wire, turns spaced 8.6mm apart, and a 1200mm stainless whip on top. The former was wound on four separate pipe sections, joined by internal 600mm PVC sleeves using silicone sealant and four stainless steel self-tapping screws at each junction. The wire winding adds to the structural integrity and the whole thing is quite robust. Much of the assembly work was done using four timber saw horses as a supporting 'cradle'. In between construction sessions I lifted it out of the way up into two rope slings on my workshop roof rafters where it has sat happily for a few months. No base tuning or on-air testing has been undertaken to date. However, I have done my sums and followed sound construction practice, anticipating performance not vastly dissimilar to that of the 160m 'junior version' described here. Watch this space!

Websearch

[1] https://en.wikipedia.org/wiki/Brewster%27s_angle

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[3] G H Brown, R F Lewis & J Epstein, 'Ground systems as a factor of antenna efficiency', *Proceedings of the Institute of Radio Engineers,* June 1937

[4] R Sherwood, NC0B 'Ground screen – an alternative to a buried ground system', *Ham Radio,* May 1977, p22-24

[5] D Wescombe-Down, VK5BUG, *Cellar-dwellers on the go: operating 2200m, 630m & 160m away from home* (2017) Adelaide, SA: Author: pp 34-35 & 138-139

[6] D Wescombe-Down, VK5BUG. 'A W1BB-inspired 160 & 630m Inverted-L aerial for suburbia', *RadCom,* Oct-Nov 2015

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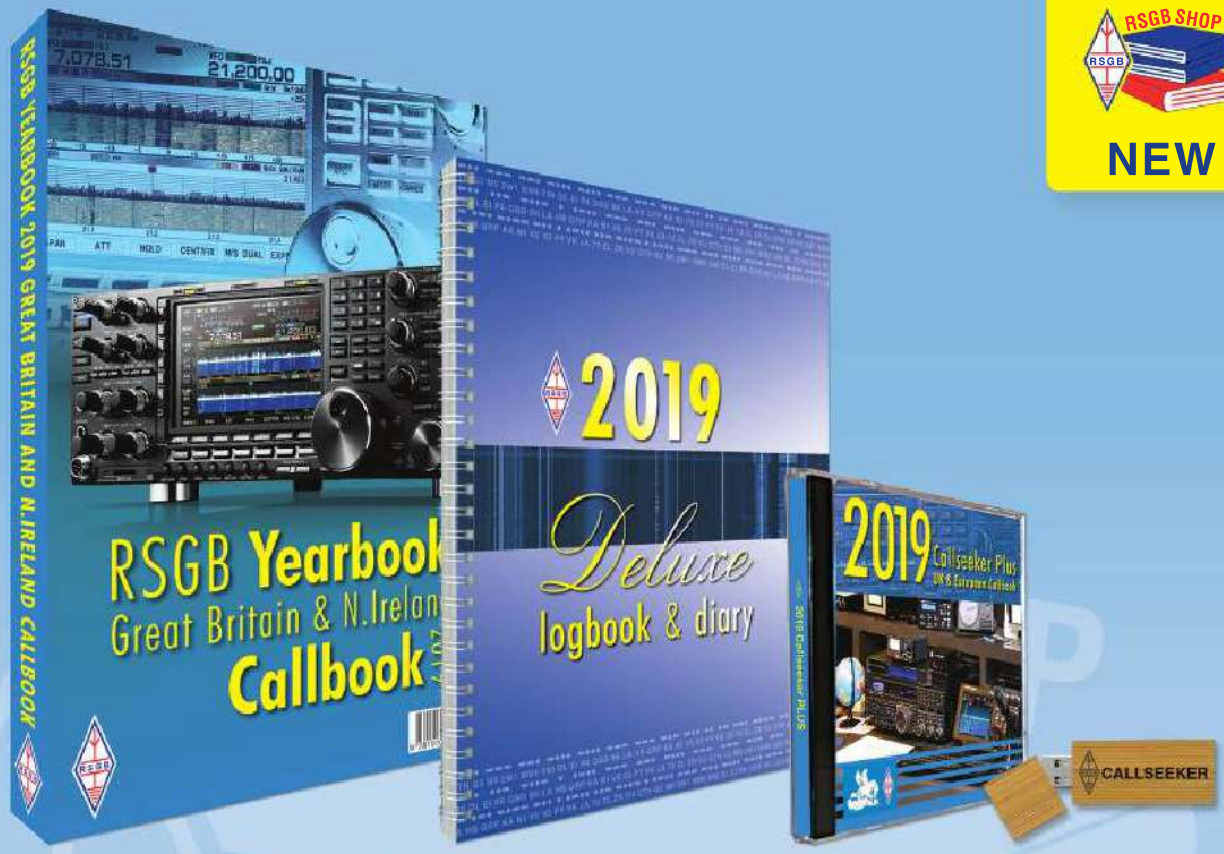
[8] W I Orr, W6SAI, *Radio Handbook, 21st ed,* Howard Sams & Co Inc (1978), p27-10

[9] J R Mayes, M G Mayes, W C Nunally & CW Hatfield, 'Helical antennas for high powered RF', *Applied Physics Electronics USA* (see www.apelc.com/pdfs/25.pdf)



RSGB SHOP

NEW

RSGB YEARBOOK 2019

Edited by Mike Browne, G3DIH

There are more Great Britain and Northern Ireland callsigns on issue than ever and they are all included in the *RSGB Yearbook 2019*. With thousands of changes and updates included, this book contains the very latest details available with around 88,000 callsigns

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Size 210x255mm, 80 pages
ISBN: 9781 9101 9344 0
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Members' Price: £4.24

CALLSEEKER PLUS 2019

The *Callseeker Plus 2019* not only benefits from the very latest UK and Northern Ireland callsign data but it also offers a host of European callsign data too. It is so easy to search for the callsigns included all on a simple to use interface that takes up no hard disk space as it runs straight from the CD or memory stick. You can search quickly by callsign, name or location and navigating through the search results is quick and easy. You can even print the results in a variety of formats including straight to an address label.

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CD Version: ISBN: 9781 9101 9358 7
Memory Stick: ISBN: 9781 9101 9359 4
Non Members' Price: £16.99,
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E&OE (All prices shown plus p&p)

How much power *are* you running?

Comments heard on the air seem to suggest that many are not clear about what transmitted power means, and how much we are actually allowed to use. In order to understand this, it's probably best to start by seeing how the power limits developed.

Note that I am going to give power levels in watts, rather than dBW (decibels referenced to 1W). The Licence document shows both; I've never heard anyone ever give their power in dBW! [*except, perhaps, microwavers, in dBm, and WSPR users – Ed*].

A little history

Before single sideband (SSB) became generally used, the usual modes on the HF bands were AM and CW (and perhaps a little mechanically-generated RTTY). The allowed power was specified as 150W DC input to the final stage of the power amplifier. This is because it's relatively easy to measure DC volts and DC current with a reasonable degree of accuracy, multiply them together, and get the wattage. Back in these early days the output device was usually a valve operating in Class C, which gave a maximum efficiency of about 66% (the theoretical maximum is about 80% but requires special techniques). So, 150W DC in x 66% efficiency = 100W RF output, more or less.

When a carrier is fully modulated with AM, the peak voltage is twice the mean. When voltage is doubled, power is quadrupled *[only at the peak of the modulation envelope; it's much less at the lowest part of the modulation envelope – Ed].* This reading at the top of the modulation is the Peak Envelope Power (PEP) of the AM signal. If we have a 100W (RF) transmitter, 100% amplitude modulated, the peak power will be 400W. The average, however, will be much less than this (probably about 100W).

It wasn't easy to measure the peak envelope power – ways include a carefully-calibrated oscilloscope or, nowadays, a peak-reading power meter (though they're not always as accurate as you might hope).

Once SSB appeared on the scene, the concept of 'carrier power' became meaningless – there is no carrier. So peak envelope power (PEP) – defined as the "average power supplied to the antenna by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions".

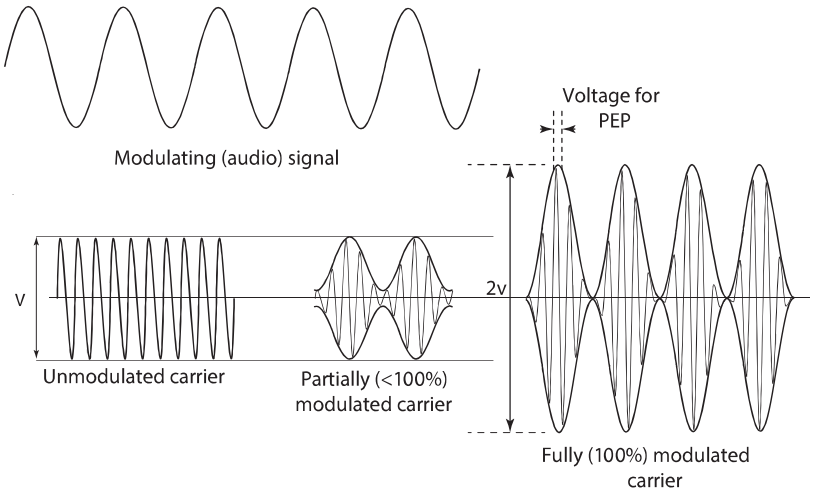

FIGURE 1: **Measuring the peak envelope power on an amplitude modulated signal. An SSB signal looks different but the principle is the same – one RF cycle at the peak of modulation.**

Back in the day, Top Band (160m) had interference issues. We shared it with marine coastal stations, who were the Primary User. They used AM; it was a safety-of-life service and so amateurs were limited to a power that wouldn't normally stop the much higher powered coast stations from getting through. We were therefore limited to 10W DC input – an easy figure to remember and stick to. (If you had a valve output stage then, with 250V on the valve, you loaded it for 40mA). Output power would then be around 6⅔W. When SSB came along, this equated to 26⅔W – not so easy.

More recently

So we were permitted to use 400W of SSB but still only 100W on CW. There is little sense in this if power limits are intended to reduce potential interference. So the limit for CW was brought into line by increasing it to 400W also.

Another increase was at the lower end of 160m. Below 1850kHz the limit is now 400W. Over the rest of the band, we still have a limit of 32W PEP (or carrier for CW). In my opinion the authorities don't seem to have considered the possibility that anyone might still want to use AM, but assuming it is still permissible, 32W PEP seems appropriate, so 8W output of carrier.

The recently acquired allocation at 5MHz has a limit of 100W output, irrespective of mode, so if you want to use AM, you must assume you (at least occasionally!) modulate fully, so 25W carrier power is your lot.

The problems

These seem to fall into two groups – ignorance of what the power limit on a particular band or frequency actually is, and how it is measured and expressed. I have on several occasions heard people on SSB at the top end of 160m say they are running 100W or even (much) more – obviously unaware of what the limit actually is (32W). Another mistake sometimes heard is on 80m, on the AM operating frequency of 3615kHz, where

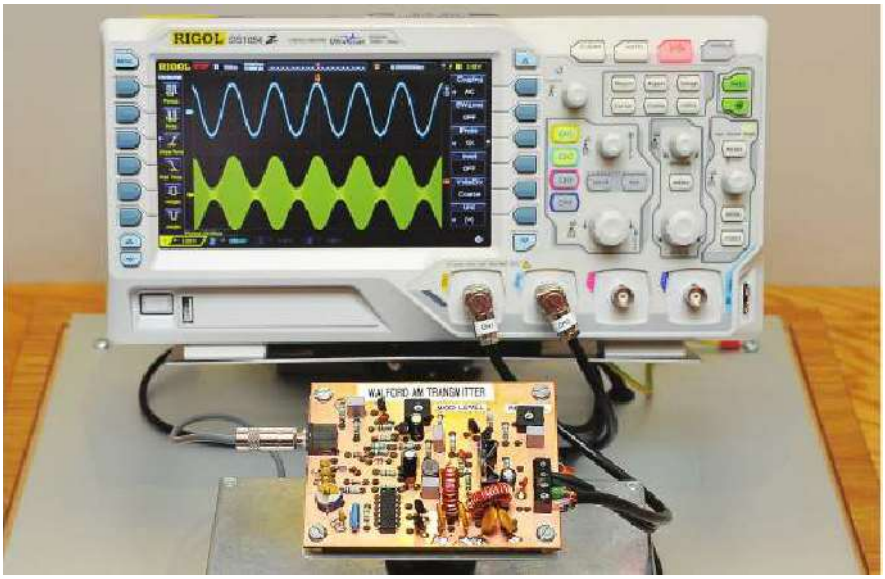

PHOTO 1: This permanent demo at the the RSGB's National Radio Centre at Bletchley Park clearly demonstrates how amplitude modulation affects the instantaneous power output of an AM transmitter. Compare the screen of the oscilloscope to the drawing in Figure 1.

it is not unknown for an AM transmitter to be used with a linear amplifier giving more than 100W of carrier power, with the operator presumably not realising that this results in operation outside the UK licence conditions.

Before we had the WARC bands and other recent allocations, the limits were easily committed to memory. Now it's not quite so simple. Add to this the limitations of different categories of licence and examples of Murphy's law applying are probably inevitable. However, it is unlikely that you will want to operate on every frequency allocation with every permitted mode, so the best advice here is probably to thoroughly familiarise yourself with the conditions applying to what you *do* want to do. You'll find *all* the details about what frequencies and powers you can use in the tables at the back of your licence document. And no, I'm not talking about BR68, which was superseded years ago.

Measuring your actual power

Now we come to the measurement part. Do you know what PEP actually is? As mentioned earlier, it is power calculated from the RMS value of the voltage of one cycle at the peak of modulation. You would need to have an oscilloscope connected to your output while operating into a known load to measure it like this, though. Which is not really convenient. Most people simply use a power meter. But always bear in mind that this device is intended to work with a specific impedance, usually 50Ω. It should be in the coax feed from your Tx to your ATU (or, ideally, a suitably-rated dummy load) and, for best accuracy, the match should be as close to 1:1 as possible. Don't rely entirely on your power meter to tell you how much power is going out, though. You should already have some idea – your transceiver is almost certainly capable of 100W CW and modern radios can usually have their output set quite accurately at this or lower levels.

Older transceivers with valve power amplifiers seem to cause problems where power is concerned for some people. The trouble is that power was usually quoted by the manufacturers as input power, but as we've already established, the output will be much lower, typically around 50% of the DC input if the PA is operating in Class AB1. There are still quite a few transceivers from the FT-101 series in regular use. The handbook for the oldest ones gives a power *input* of 260W for SSB (180W for the FT-101ZD). No mention is made of power output, but if you use one of these, consider yourself lucky if you get 120W. Personally, I wouldn't drive it that hard anyway: I'd rather have a clean output and decent valve life. Overdriving = splatter.

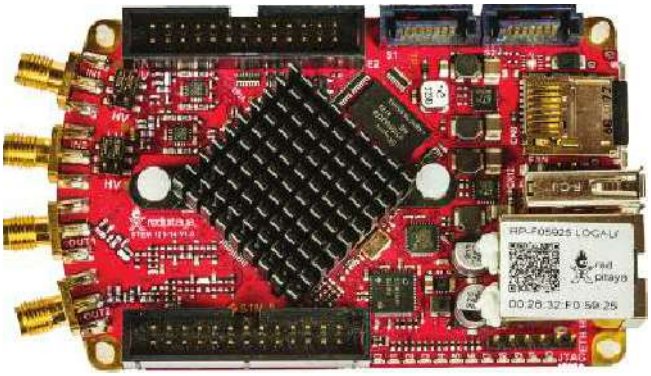

PHOTO 2: Modern test equipment such as the Red Pitaya (reviewed in October 2018) can make many measurements like PEP automatically.

Good reasons to reduce power

The main reason to keep your power below its flat-out maximum is better linearity of the PA stage and a cleaner signal. Remember – if the station you are in contact with can hear you at S9+10dB and you decrease power from 100W to 10W, you will still be S9. In a 'round the UK' net on 80 or 40m, there is little point in running 400W if everyone is S9-plus; your strong signal could easily be causing interference further afield. And if you operate equipment with a valve PA or linear, remember that replacement valves are becoming increasingly hard to find. A small reduction in power will more than likely result in a worthwhile increase in valve life.

Consider, also, good operating practice that suggests that power used should be no more than is necessary to make and maintain contact. It is unfortunate that a lot of amateurs run high power levels simply in order to compete with others who are doing the same. I suspect that if power were to be limited to, say, 10W worldwide, it would only slightly reduce the number of contacts made.

Finally

There is no simple and universal way to determine exactly what power you're running, whether you want to look at it as average or PEP and express it as watts, dBW or dBmW. Inexpensive power meters are generally good enough for most practical purposes. Be sensible: for example, if you have an Intermediate (50W) licence then there's not a lot of point in having a kilowatt amplifier in line and your prime mover radio turned down to milliwatts of drive. And finally finally, our licencing conditions specify the power limit as what reaches the antenna drive terminal(s). Yes, coaxial cable is lossy but it's not generally *so* lossy that you need to run a kilowatt to get 50W at the aerial.

Bruce Edwards, G3WCE
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Count on us!

Book Review

It's January, that time again when we look back at the books from last year to select our favourite three. This time it was a really hard job to narrow down the shortlist but after many late nights and cups of tea we succeeded.

The Voices

By Gordon Adams, G3LEQ

'The Voices' was originally a series of articles published in *RadCom* in 2000-2001 that described many decades of radio intrigues by the world's intelligence agencies. It is compelling reading; some of the things mentioned, such as Numbers Stations, were readily heard on even simple equipment by any interested reader. Originally, Gordon had planned to expand his *RadCom* series into a full-length book but for a variety of reasons this never happened. He sadly passed away in early February 2018 so this edition, which includes some additional material that did not appear in the original *RadCom* serialisation, stands as a tribute to his fascinating life.

Whether your interest is in the 'black arts' of radio, jamming techniques, Numbers Stations, psyops, quirks of propagation or even the fabled 'Cobra Mist' installation at Orford Ness, you'll find a wealth of fascinating detail from someone who clearly knew a lot first-hand, though perhaps occasionally indulged in some mild embroidery of the facts. *The Voices* is an unmissable read.

Size 174x240mm, 120 pages, ISBN 9781 9101 9353 2
Non Members' Price £9.99, RSGB Members' Price £8.49

60 Antennas You Will Want To Build

Edited by Giles Read, G1MFG

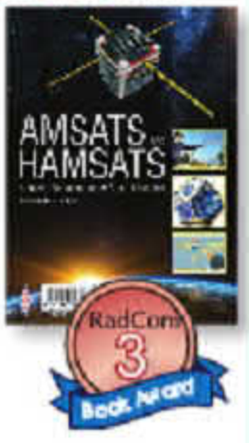
This is exactly what it says on the cover: 60 designs that all include the information needed to construct antennas that can actually be expected to work.

Covering the best of more than 20 years of *RadCom* features, lightly edited and re-formatted to suit the size of the page, there are also articles drawn from the *RSGB Radio Communications Handbook*, *DIY Radio*, *Electron* (the Dutch equivalent to *RadCom*) and *DQ-DL* (the German equivalent). A *lot* of research clearly went into curating this book.

There's something of interest for everyone, covering LF bands to microwaves. If you build just *one* of the antenna designs, the money you save on a commercial equivalent can easily save you far more than the cost of the book.

Size 174x240mm, 288 pages, ISBN 9781 9101 9355 6
Non Members' Price £14.99, RSGB Members' Price £9.99

AMSATS and HAMSATS – Amateur Radio and other small satellites



By Andrew Barron, ZL3DW

Now is an exciting time for amateurs who are interested in amateur satellite operations, particularly with the new geostationary Es'hail-2 coming on stream shortly (see page 72). It joins at least seven other amateur satellites that carry easy to use FM transponders and ten or so with linear SSB/CW 'bent pipes'. Many other satellites have digital links for amateur use such as APRS and telemetry.

Starting with straightforward 'how-to' guides, this comprehensive book covers everything you need to know about amateur satellites – up to and including some really techy stuff. It has just the right balance between the practical challenges that amateurs face when building and operating their ground stations and the technical issues that affect such operations.

This is the first book to cover all aspects of this part of the amateur radio world in such a detailed way and will be of great assistance to all amateur satellite users or anyone remotely interested in arguably the highest-tech bits of amateur radio today.

Size 174x240mm, 368 pages
ISBN 9781 9101 9354 9
Non Members' Price £14.99
RSGB Members' Price £12.74

Highly commended

These were also firm favourites from the year but didn't quite make the top three.

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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 Thursdays at the Hole in the Wall Restaurant, Coral Bay, 6 for 6.30. Visitors 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 & Camping Club, membership@arcc.org.uk
www.aarc.org.uk

AMSAT-UK – http://amsat-uk.org/
Open net every Sunday, 10am, 3.780MHz (±)

British Railways ARS
Ian, G4EAN, www.brars.info
Nets: Tuesday 7pm on 3.68MHz, Friday 4pm on 3.685MHz

British Young Ladies Amateur Radio Association www.bylara.org.uk
Net Thurs, 3.688MHz±, 6.30pm. All YLs welcome.

Civil Service Amateur Radio Society
Weekly net every Tuesday, 8pm, 3.763MHz

CDXC – The UK DX Foundation – cdxc.org.uk
For all interested in HF DX and contesting

Radio Amateur Old Timers' Association
MemSec@RAOTA.org, www.RAOTA.org
Diamond Jubilee year. Nets: see website

Worked All Britain Awards Group www.worked-all-britain.org.uk
Nets most evenings, 3.760MHz±, time variable with propagation. Non-members welcome.

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

RR: Anthony Miles, MM0TMZ, RR1@rsgb.org.uk

Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723
6-12 On-air activity day, pick a day
11 Club night

Kilmarnock & Loudoun ARC
Len, GM0ONX, Klarcinfo@gmail.com
8, 15 Club meeting / Training & construction
22 AGM

Mid Lanarkshire ARS
Joseph, 2M0JHY, mlarsclub@gmail.com
4, 11, 18, 25 Club night and tuition

West of Scotland (Glasgow) ARS
Jack, GM4COX, www.wosars.org.uk
2, 4 Closed
5, 13, 19 RSGB AFS 80m & 40m Contest
9, 16, 20, 23 Solder Group
11, 25 Club night
18 Taking the heat out of a situation, Barry, GM0KZX

Wigtownshire ARC
Bob, GM4DLG, info@gm4riv.com
3 Antennas next to salt water, Bob, GM4DLG

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

RR: Andrew Burns, MM0CXA, RR2@rsgb.org.uk

Aberdeen ARS
Fred, GM3ALZ, 01975 651 365
3 Closed
10, 17 Quiz night / Video evening
24 Writing articles for magazines, Graham Knight
31 Construction & on-the-air

Dundee ARC
Martin, 2M0KAU, 0776 370 8933
8, 15, 22 Club night & Foundation training
29 Talk

Inverness & District ARS
John, GM0OTI, 01463 791 444
2 Club net, 8pm 145.575MHz & GB7BI slot 1, 8pm
9, 23 Club night

REGION 3: NORTH WEST

RR: Kath Wilson, M1CNY, RR3@rsgb.org.uk

Central Lancs ARC
Peter, G3UCA, g3uca@blueyonder.co.uk
5 Club meeting
6, 13, 20, 27 Net, 1.940MHz, LSB, 11am
7, 14, 21, 28 Net, 70.425-70.475MHz, 8pm

Oldham Radio Club
Mike, M1CVL, 0740 276 3203
2, 9, 16, 23, 30 2m FM net, 8pm
3, 10, 17, 24 Club night
6, 20 D-Star Net - REF 14B, 9.30am
13, 27 C4FM Net, FCS004-55, 9.30am
31 Construction group

South Manchester R&CC
Ron, G3SVW, 01619 693 999
3 Members' reports on Christmas activities
10 SDR development on GNU radio, Steve, M6PPF
17 Contests large and small, Ron G3SVW
24 Mini lectures by all members

Stockport Radio Society
Heather, M6HNS, 0750 690 4422
4, 11, 18, 25 Net, 433.575MHz, 7.30pm
8 Vector network analysis
15 Net, 51.550MHz FM, 7.30pm
17, 29 Net, 145.375MHz FM, 7.30pm; committee meeting
18 Social evening & trophy presentation
22, 29 Radio night / Skills night
26-27 Foundation course

Thornton Cleveleys ARS
John, G4FRK, 01253 862 810
7 Natter night/practical/club on air
14, 28 Video / Digital modes evening
21 Discussion on new project

REGION 4: NORTH EAST

RR: Ian Douglas, G7MFN, RR4@rsgb.org.uk

Bishop Auckland RAC
Gail, M3GBB, 0191 372 0473
3, 10, 17 Club night and training

Denby Dale RC
Darran, G0BWB, 0797 442 3227
2, 16 Club night
6, 13, 20, 27 Club net via GB3HD, 10.30am
26 Foundation class
30 Real Ale night, Star Inn

Durham & District ARS
Michael, G7TWX, 0782 692 4192
2, 9, 23, 30 Club night
16 AGM

Hambleton ARS
John, M6BHP, 0798 000 3293
9 ATV demonstration
23 Operating night

Hartlepool ARC
Stan, G7VGM, stan.g7vgm@gmail.com
4, 18 Foundation/Intermediate training
11 AGM
25 Morse night

Hornsea ARC
Gordon, G3WOV, 01377 240 573
9 Bring a mystery object night
16 My shack, Gordon, G3WOV
23 DXpeditions, Richard, G4CGG
30 Shack and video night

Newsham ARTC
John, 2E0DCV, 01912 371 729
9, 16 Club night, Foundation training
23, 30 Club night, Morse training

Sheffield ARC
David, G6DCT, littlewood20@btinternet.com
7, 21 Shack night operating GX3RCM
14 Club night

Spen Valley ARS
Russell, G0FOI, 01274 875 038
3 Shack meeting/on the air
17 AGM

Tynemouth ARC
mail@g0nwm.com, www.g0nwm.com
4 Closed
11 Social media and amateur radio
18 Club night
25 Operating award programmes and special event callsigns

REGION 5: WEST MIDLANDS

RR: Martyn Vincent, G3UKV, RR5@rsgb.org.uk

Burton ARC
Rob, G6EIH, 0781 214 6333
2, 9, 16, 23, 30 Club night, non-members welcome
3, 10, 17, 24, 31 Open net, 145.575MHz, 8pm
6, 13, 20, 27 Net, 145.575MHz, 10am

Coventry ARS
John, G8SEQ, 0795 877 7363
1 1st round G2FDC 2m DF Trophy
4 Radio Workshop
11 Annual dinner at The Holyhead
18, 25 Club night

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595 daytime
2, 9, 16, 23, 30 Club net, 145.475MHz FM, 7.30pm
3, 10, 17, 24, 31 Club net, 145.475MHz, then on 80m SSB, 7.30pm
4, 11, 18 25 Club net, 432.220MHz SSB, 7.30pm
7, 21, 28 Informal Activities
14 This is my shack – guess who the photo belongs to

Malvern Hills RAC
Dave, G4IDF, 01905 351 568
8 Show & tell
22 Informal

Nuneaton & District ARC
Neil, M0NKE, info@ndarc.co.uk
3, 10, 17, 24, 31 Club net, 145.475MHz, 9.30pm
4 Pint & chat, The Griffin Inn, Nuneaton Rd
18 AGM & Rugby Radio talk

South Birmingham RS
Gemma, M6GKG, gemmagordon.m6gkg@gmail.com
1 Closed
4 Work in shack
7, 21 Checking club equipment
8, 15, 22, 29 Coffee morning, 11am, all welcome
10, 17, 24 Training classes, Dave, G8OWL
14 Checking club aerials and feeders
25 Review of this year's rally visits
28 Sorting rally stock

Telford & District ARS
John, M0JZH, 0782 473 7716
2 Informal social meeting
9 Club forum – bring your ideas
16, 23 Committee meeting / Winter projects review
30 Surplus sale

Wythall Radio Club
Chris, G0EYO, 0771 041 2819
1, 8, 15, 22, 29 Morse class, club night & activities
6, 13, 20, 27 Club net, 8pm, 145.225MHz or GB3WL

REGION 6: NORTH WALES
RR: John Pritchard, MW0JWP
RR6@rsgb.org.uk

North Wales Radio Society
Liz, GW0ETU, 0776 019 0355
3, 24 General meeting / natter night
10, 31 Technical topic / OTA evening
17 Marconi in Wales, Peter, GW4UWD

REGION 7: SOUTH WALES
RR: Glyn Jones, GW0ANA, RR7@rsgb.org.uk

Aberystwyth & District ARS
Ray, GW7AGG, 01970 611 853
6 Junk sale, 11am
10 Propagation perils, Bruce, GW4XXF
31 Club net, 145.500MHz then QSY

Carmarthen ARS
Andy, GW0JLX, 0776 828 2880
8, 22 Club night, social & on the air

Llanelli ARS
Steve, MW6CCG, 0787 849 4337
7 On the air night and club raffle
14, 21 DVD night / Social evening
28 Junk sale and club raffle

REGION 8: NORTHERN IRELAND
RR: Philip Hosey, MI0MSO, RR8@rsgb.org.uk

Bangor & District ARS
Harry, GI4JTF, 0289 042 2762
3 Annual quiz

West Tyrone ARC
Philip, MI0MSO, 0784 902 5760
9 Meeting night
23 Activity night

REGION 9: LONDON & THAMES VALLEY
RR: Tom O'Reilly, G0NSY, RR9@rsgb.org.uk

Aylesbury Vale RS
avrs@rakewell.com
9 Annual dinner

Burnham Beeches RC
Greg, G4EBY, ebytronics@gmail.com
6, 13, 20, 27 Club net, 145.500MHz, 10.30am
7 Planning future meetings & DX picnic
21 Club night & licence exams

Chesham & District ARS
Terry, G0VFW, 01442 831 491
9 FT8, James, M0JCQ
23 AGM

Edgware & District RS
Mike, G4RNW, 020 8950 0658
10 AGM
24 Pay your subs tonight

Milton Keynes ARS
Phil, G4FVZ, 0780 263 6998
all meetings now at Irish Centre, Manor Fields MK2 2HX
12 100 years of maritime wireless, John, G1AWJ
21 Operating skills discussion night
28 Building a WWII radio station, Peter, M0PJD

Newbury & District ARS
Rob, G4LMW, 0797 088 5614
23 Running RIAT, Tim Prince OBE FRAeS

Radio Society of Harrow
Linda, G7RJL, lcasey100@outlook.com
4 Hands-on measurements
6, 13, 20, 27 Club net, 1938kHz LSB, 12 noon
7, 14, 21, 28 Net, 145.5MHz FM & QSY, 8.15pm
12-13, 19-20 Foundation course, 10-4pm
18 Club night
27 Sunday activity, shack, 2-5pm

Reading & District ARC
Laurence, G2DD, 0758 470 6625
10 Club equipment demo and review
24 Charles Wheatstone, Colin McEwen

Shefford & District ARS
David, G8UOD, 01234 742 757
3 Welcome back meeting
10, 24 RADAR evening / Construction contest
17 How fast is your internet?
31 Antenna modelling, Gareth, M5KVK

Whitton ARG
Ian, G0OFN, 0795 620 3495
4 Social meeting in the bar
11 Raspberry Pi demo
18, 25 Club night and on the air

REGION 10: SOUTH & SOUTH EAST
RR: Keith Bird, G4JED, RR10@rsgb.org.uk

Brede Steam ARS
Martin, M0MJU, m0nuc.bsars@gmail.com
1, 5, 8, 15, 22, 29 Operating at the shack 9am-2pm
3, 10, 17, 24, 31 Club net, GB3ES, 8.15pm

Bredhurst R&TS
Nicky, secretary@brats-qth.org
3, 10 Club night
5, 24 Coffee morning / Committee meeting
17 Bring & talk
31 GB3VHF & GB3UHF story, Chris, G0FDZ

Bromley & District ARS
Andy, G4WGZ, 01689 878 089
2, 9, 15, 23, 30 Net, 145.500MHz and QSY, 9pm
15 AGM and programme planning
29 Club meal

Chippenham & District ARC
secretary@g3vre.org.uk
1 Closed
8, 15 Club night

Cray Valley RS
Dave, G8ZZK, 0773 954 9822
5 GB8KW KW Electronics special event day
17 Planning for 2019

Crystal Palace R&EC
Bob, G3OOU, 01737 552 170
1 AGM
4 Video evening

Dorking & District RS
David, M6DJB, djb.abraxas@btinternet.com
22 Magnetron history, Prof Mike Underhill, G3LHZ

Hilderstone RS
Ian, 2E0DUE, secretary@g0hrs.org
10, 24 Natter night / talk
12-20 RNLI operating

Hog's Back ARC
Ray, G4LUA, 0118 981 4174

14 Natter night, CW practice
28 Amateur satellites, Frank, M0AEU

Horndean & District ARC
Stuart, G0FYX, 02392 472 846
4, 18 Natter night / Club night

Surrey Radio Contact Club
John, G3MCX, 020 8688 3322
3, 10, 17, 24 Net, 8pm, 70.300MHz
4, 11, 18, 25 Net, 8pm, 145.350MHz
6, 13, 20, 27 Net, 9.30am, 1905kHz
7 FT8, Alan, G0TLK
21 Fix-it, move-it-on, skills, chat and advice night

REGION 11: SOUTH WEST & CHANNEL ISLES
RR: Martin Sables, G7NTY, RR11@rsgb.org.uk

Callington ARS
John, G4PBN, 01822 835 834
2 Club night

Cornish RACub
Steve, G7VOH, 01209 844 939
2 Committee meeting
3 Main meeting

Exmouth ARC
Mike, G1GZG, 01395 274 172
2 Pub night quiz & social
16 Ad hoc talk or demo

Newquay & District ARS
Terry, 2E0XTM, 01841 540 142
16 AGM
30 Club night

Poldhu ARC
Keith, G0WYS, 01326 574 441
8 Business meeting
12 Christmas lunch at Wheal Dream
18 Marking first USA-UK two way contact

Riviera ARC
rivieraarc@gmail.com
3 Club night
17 7th birthday party, Precinct Centre

Weston Super Mare RS
Martin, G7UWI, g7uwip@googlemail.co.uk
7, 14, 28 Construction, Morse tuition, operating
21 AGM

Yeovil ARC
Bob, G8UED, 01963 440167
3, 24 The Red Tent DVD, Morse practice
4, 18 Sparkford on air and practices
17 Practical applications of the Smith Chart
19 Coffee morning

REGION 12: EAST & EAST ANGLIA

RR: Peter Onion, G0DZB, RR12@rsgb.org.uk

Braintree & District ARS
Edwin, G0LPO, 01376 324 031
1 Club net, 145.375MHz, 8pm

Essex Ham
Pete, M0PSX, news@essexham.co.uk
5 Essex YL Net, GB3DA, 8pm
6 Online Foundation course starts
7, 14, 21, 28 Net, GB3DA, 8pm, www.essexham.net

Harwich ARIG
Kevan, 2E0WMG, 0749 352 1049
9 Bitesize Topics, G0DVJ & 2E0WMG

Huntingdonshire ARS
David, M0VTG, secretary@hunts-hams.co.uk
10 Natter night
24 Baluns, Steve, G1KWF

Leiston ARC
John, G4XVE, secretary@larc.org.uk
8 Quiz night

South Essex ARS
Terry, G1FBW, 0798 607 0040
8 Pre-Canvey rally meeting

Thames ARG
Patrick, G8JLM, 01621 855 461
4 Two talks: Fraud and Knots
11, 25 CW net 144.250MHz, 7.30pm Net on GB3DA, 8pm
18 Practical radio projects

Thurrock Acorns ARC
Gordon, M0WJL, acorns@taarc.co.uk
1 SSTV net, 144.500MHz, 7.30pm
3, 9, 10, 17, 24, 31 Net, 7.30pm, 145.500MHz FM
15 Basic propagation, Gwyn, G4FKH

REGION 13: EAST MIDLANDS

RR: Jim Stevenson, G0EJQ
RR13@rsgb.org.uk

Kettering & District ARS
Ed, M0TZX, M0TZX@yahoo.com
3, 10, 17, 24, 31 Net, 145.300MHz FM, 7pm

Leicester RS
Sandra, G0MCV, 0793 027 4044
7 Morse class, RSGB video
14 Morse class, free 'n easy, committee meeting
21 Morse class, soup and a roll
28 EGM followed by AGM

Melton Mowbray ARS
Phil, G4LWB, 01664 567 972
18 Quiz night

Nunsfield House ARG
Paul, G1SGZ, pr@nharg.org.uk
3, 10, 17, 24, 31 Club net, 145.325MHz, 8pm
4 Natter night
7, 14, 21, 28 Shack night
11 Surplus sale
18 Programme planning
25 3D printing

Spalding & District ARS
Graham, G8NWC, 0775 461 9701
18 AGM

RAF Waddington ARC
Bob, G3VCA, 0797 116 6250
4, 18, 25 Nibbles and club night
7, 14, 21, 28 Club net, 8pm, 145.325MHz
11 AGM

Deadlines for the next three issues of *RadCom* are:
19 December (February edition)
23 January (March edition) and
20 February (April edition)

GB9SL – a joint venture celebrating Laurel and Hardy continued from page 53

simultaneously for a few hours on the 6th, but it was hoped there would be enough time to allow stations to work each other.

Special event station can only take place if there is available manpower, Furness ARS is a small club but we are always lucky to have enough people available to make the events work. A team met at Gleaston Water Mill on the Friday where the hex beam was assembled and mounted on a rotator and portable mast, the club's Icom IC-7300 was set up along with an Elecraft linear amp, meaning 400W were available. The decision to use the hex beam meant the bands that could be used were 20m, 17m, 15m, 10m and 6m – but the reality was 20m and 17m would be the bands of choice given current conditions and operating times. There was talk of putting an aerial up for 40m, but the logistics didn't make it possible.

To alleviate the pressure of the main day of operating, GB9SL and W4O had a QSO on 20m SSB and FT8 on the 5th, but it was hoped that a QSO could also take place on the Saturday.

The day of operating GB9SL started around 8am. SD Logger was used for logging and the first QSO was in the log by 8.30am, which was a PY station. We then missed a JA calling CQ due to QSB. It was a slow start with only 4 QSOs in the log in the first hour. Band conditions didn't improve massively over the course of the day, but sheer determination and perseverance – thank goodness for the IC-7300's voice keyer – kept the QSOs coming in on both 20m and 17m. Including "CQ Golf Bravo 9 Stan Laurel" definitely helped bring the QSOs in and a lot of people commented on watching their films when they were younger, which shows the worldwide attraction Laurel and Hardy had. We told every one of our QSOs to listen out for W4O that would be on the air later in day, and many were keen to try and get both stations in their logs.

A total of 110 QSOs were made. All were made in SSB, except for two FT8 contacts.

Austria (3), Bosnia and Herzegovina, Brazil, Canada (2), Canary Islands, Ceuta and Melilla, England, (3) Finland (4), France (7), Germany (9), Guernsey, Hungary, Kuwait, Israel (2), Italy (22), Morocco, Poland (3), Portugal (3), Romania, Russia (4), Sardinia, Serbia, Slovenia (4), Spain (12), Sweden, Switzerland, Ukraine, USA (18 – States: Alabama, Florida, Georgia (including W4O on both SSB and FT8), Illinois, Kentucky, Maryland, Massachusetts, New York, South Carolina, Virginia, West Virginia).

We didn't manage to work W4O on the Saturday, so we were pleased we'd work on the prearranged sked the previous day. The plan to operate into the evening was abandoned when our CQs stopped delivering results around 5.30pm. We later heard the W4O station didn't fare too much better with band conditions on that particular day. It was a great way for two clubs in two countries to work together on a joint event and we hope to join ARCCC in another joint event in the future.

The hex beam was assembled and mounted on a rotator and portable mast.

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

Wigtownshire ARC elected a new committee for 2018-19 at their recent AGM. The new committee comprises President Bob, GM4DLG, Webmaster Oli, 2M0OOS, Exam Sec Nadine, MM0WNW, Lead Instructor Clive, GM4FZH, Secretary Liam, 2M0XSE, Treasurer Peter, GM7NFF, Shack Mgr, William 2M0WML and QSL Manager Wul, 2M0WUL. The main base for the club is in Stranraer, where a shack is maintained for members' use. Meetings are held on Thursdays, the first of each month is a talk or presentation. The club's catchment area is large, covering the whole of Dumfries & Galloway, and several of the 70 members make long distance journeys to attend meetings. One member covers 100 miles each way – by bus. Some of this session's talks, as well as visits to sites of interest, will be held in other venues further to the east, which should assist the more remotely located members. Practical sessions, aimed particularly at beginners in the hobby, are held on other club evenings. The club prides itself on being the only exam centre in South West Scotland, and puts especial effort into this aspect of its operation.

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Dundee ARC would like to congratulate Garry, MM0XET for passing his Advanced exam. He was the first person in the club to pass the online exam. Garry's training was carried out via the Bath Distance Learning course.

REGION 3: NORTH WEST

November saw the AGM for **Furness ARS**, where the majority of the committee were re-elected for another year. The committee consists of Chris, M0TES, Chairman, Chris, M0KPW, Secretary, Martyn, M0TEB, Treasurer and Andrew, M6GUM, committee member and Exam Secretary. During the AGM, a certificate of thanks and bottle of Lamb's Navy rum were presented to Bill, G4USW who has been the club's QSL manager for over 25 years. Bill has decided it's time to retire from QSL duties and take a well earned rest, having produced and administered QSL cards for all the club's special events and activities. A Foundation weekend took place in November, with tutoring and the practical assessment followed by the exam, which was taken online by all candidates. Congratulations to those who passed, and club members look forward to hearing those new M7 calls on the air soon. At the end of the month Chris, M0KPW gave a talk and presentation of his and Nick, G0HIK's recent SOTA activities. 16 activations were made in late August and throughout September in the Lake District and North Pennines. It was a light hearted look at the routes taken to the summits, kit used, QSO counts with photos.

Isle Of Man ARS would like to congratulate the eight members who attend the recent Intermediate course and passed the exam. The candidates were Gavin, 2D0PEY, Allistair, 2D0XCE, Nick, 2D0EYK, Chris, 2D0VES, Mark, 2D0OMY, Daniel, 2D0XPS, Richard, 2D0WFK and Dylan, 2D0NAU. The theory side was tutored by Dan, GD0VIK and Andy, GD0AMD, practicals supervised and completed by Richard, GD8EXI, Matty, MD0MAN, John, GD0TFG and Andy, GD1MIP. The exam was invigilated by Liz, MD3EEW. Many of the candidates are now on the Full licence course being run by Richard, GD8EXI.

REGION 4: NORTH EAST

On 18 November, members of **Hartlepool ARC** visited the Humber Coastguard Station at Bridlington. The trip was arranged by club member Dave, M6IYH who had been a serving officer at Humber Coastguard before retirement. The officers on duty spent over two hours with club members explaining the many aspects of their job and demonstrating the vast amount of state-of-the-art computer, electronic and radio equipment they use in their work. The station's duties are varied, including everything from co-ordinating cliff rescues, rescues at sea involving RNLI lifeboats and Coastguard helicopters, dealing with shipping and pleasure craft to dealing with beached marine life! Hartlepool ARC is very grateful to Humber Coastguard for allowing them to visit and they fully appreciate the sterling service carried out by their experienced, professional officers.

REGION 8: NORTHERN IRELAND

Bangor & District ARS held a surplus equipment meeting in November that was very busy. Thanks to all who attended. Some changes have taken place within the Society. It is aimed to create a more social meeting so talks will still take place but will be strictly time limited. Some activities will be curtailed to encourage more interactive activities. The next meeting is the annual quiz on 3 January, which is open to all radio amateurs and their families. The photo below shows Stephen, GI0HHV puzzling how to assemble the club's hex aerial.

Lough Erne ARC is proud of young member, Nathan, MI0NPR. Alongside A-levels at Fivemiletown College, he took the Advanced Distance Learning Course. In August, he got excellent A-level results and a Full licence with his first QSO at the YOTA gathering in South Africa. His YOTA reports included a video presentation to a club meeting. The Armistice Centenary events included a special event station GB1918EKN at Enniskillen Castle. Nathan, now an RSGB Youth Representative, relished the challenges of amateur radio in an interview with Radio Ulster's John Toal. A link to his interview is within the club's online GB1918EKN report. Go to https://learc.eu/gb1918ekn/

REGION 9: LONDON & THAMES VALLEY

Raspberry Pi was the subject of **Verulam ARC's** October meeting. It started with a viewing of the presentation Mike Richards, G4WNC, gave at the RSGB Convention in 2017. Afterwards members talked about the use they were making of this powerful little device for both amateur radio and other purposes. In November, eight students at Sandringham School, St Albans, together with two adult members of VARC, passed their Intermediate licence examination. Interestingly the only two girl students had passed their Foundation exam together, just in time to take part in the School's contact with Tim Peake aboard the ISS in January 2016.The training and exam arrangements were organised by club member Greg Beacher, M0PPG. *[Presentations given at RSGB Conventions may be downloaded from the RSGB website – Ed].*

REGION 10: SOUTH & SOUTH EAST

Horndean & District ARC has completed the latest Intermediate class with the exam held in November. All three students passed. Congratulations to all the successful candidates and thank you to the club's Intermediate licence assessors Simon, G0IEY, Frank, G0LFI and Russ, G4SAQ and the training manager, Ken, G0JWL. Contact Julia, G0IUY (on 023 9278 5568) with any enquiries about future courses at all three levels. Club chairman Ken, G0JWL presented Jon, M6HZQ with the Sid Jenkins Memorial Trophy for his winning antenna club project for 2018, which was a half wave flowerpot antenna for 2m/70cm (see photo, right). Sid, G4CHO, was a founder member of the club in 1975.

Marsham ARS is a new radio club, recently affiliated to the RSGB. The club meeting place is the Club House, Wood Fields, Fairlight. Meeting dates vary, so email Steve at sec.m0vft@gmail.com for full details.

Over the Armistice weekend, a joint collaboration between Chertsey RC and Echelford RC took place to operate GB1WAR. Over 300 QSOs were made using CW, satellite, FT8 and SSB. The station respectfully acknowledged 100 years since the end of WWI and the sacrifices of those in WWII and more recent war efforts, their families and friends for which we owe our freedom.

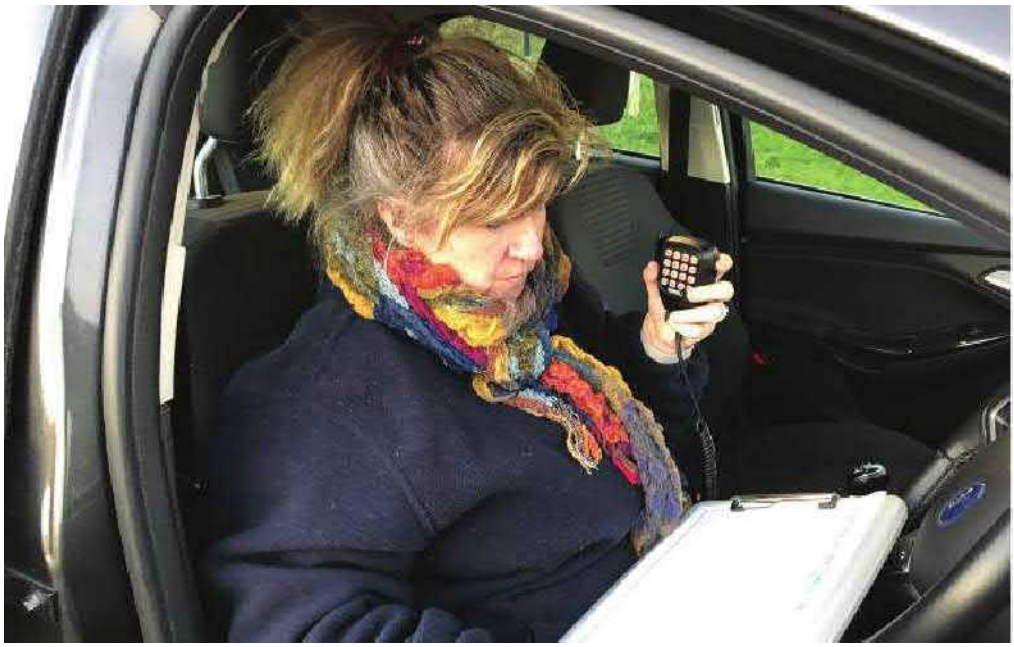
REGION 11: SOUTH WEST & CHANNEL ISLES

Terry, ex coxswain of the Sennen Cove lifeboat and top LF band DXer, gave **Poldu ARC** a very entertaining and interesting talk in November. He described the various lifeboats he has served in up to the present day Tamar class multi-million pound boat *City of London* and the various 'shouts' he has been on, many of which have involved towing stricken trawlers and coasters back to port. All the crew except for the coxswain and engineer are volunteers so after a day's work to have your pager go off means it is down to the lifeboat station, get kitted up and out to sea, possibly not returning to port for 8 hours or more. Then back to work in the morning, so it takes a special type to volunteer for this work. Finally Terry gave quick rundown of his LF band antennas, which consists of verticals together with a K9AY listening antenna. With this setup Terry can put a good signal into the Pacific on 160m and 80m. A most entertaining evening.

Members of Poldhu ARC commemorated the end of the First World War by operating a special station from the Marconi Centre at Poldhu between 9 and 12 November. GB100MPD was used, as 'MPD' was the callsign used by the station at Poldhu during WW1. The wireless station at Poldhu used the callsign ZZ until the outbreak of the war when the Admiralty took over the running of the station. The day war broke out, the station sent a signal to all British ships that hostilities had begun and the ships were not to enter German ports. MPD was the callsign used throughout the war and on 11 November 1918, Marshal Foch sent a signal from Paris stating that hostilities had ended. This message was transmitted to all the British ships from Poldhu again using the callsign MPD. Nearly 300 members of the Marconi Company lost their lives in the conflict, many aboard ships as radio operators. Now their lives have been commemorated by the radio amateurs at Poldhu. The event proved to very successful with stations contacted all over Europe and Asia and also into North America using voice and Morse code. On the Friday, a BBC reporter, Jen Smith, and a cameraman came to Poldhu to film the operation and interview some of the members. The piece was broadcast on local BBC Spotlight at 6.30pm. Poldhu ARC ran two stations. On HF an IC-7300 drove a linear with a hex beam antenna. The 40m SSB station used a FT-950D, also with a linear amplifier into a 40m dipole. Nearly 2,000 QSOs went into both logs. Most QSOs were SSB and CW but 70+ were on PSK63. Operators were G3PLE, GM0DBW, G3UCQ and G3UYN.

REGION 12: EAST & EAST ANGLIA

The November talk at Thurrock Acorns (Grays in Essex) was by founder member, Nick, G4HCK, on his experience of MMSSTV, ie sending pictures via SSB, FM and repeaters. *"I've no idea what all the buttons do, but it works!"* he said to encouraged those who might have been overwhelmed by all the settings. This is the value of club meetings, Nick showed how easy it is to send and receive pictures (visual medium) over the radio (audio medium) using free MMSSTV software and he instantly answered questions that might have taken ages to look up in the manual.



In the closing weeks of 2018, Essex Ham ventured out to a very cold Shoebury East Beach for a field event in support of the Thurrock Acorns 2m Activity Day. This activity day takes place twice a year to help encourage more activity on the 2m band, and over a dozen Essex Ham members turned up in support. Special thanks to Geoff, G0DDX and Linda, G0TPX who travelled from Cambridge for a few chilly hours on the Essex coast, and to Nick, M0NFE and Majbritt, M6YAX for bringing along their two-week old harmonic to meet the Essex Ham team. Several contacts were made on 2m FM and SSB from the warmth of vehicles to avoid the River Thames chill.

Colchester Radio Amateurs has improved its position in the CC contests from 10th to 4th in 2017/18 and overall in their standings from 56th to 10th in the 2017/18 AFS Super League. After consultation with the committee, a new HF contest team was formed within the group to engage in and promote activity in future contests, the first of which saw five operators taking part in the recent CQWW DX competition making a creditable 525 QSOs despite having to shut down for nine hours due to local bad weather. Currently the main group members, Garry, M0MGP, Mark, M0LTG, Herbie, G6XOU and Caroline, 2E0SXH are encouraging other members of the club to join the team and take part in the various RSGB contests with Jonathan, G0DVJ, acting as mentor to the team. The team are planning for the 2019 contests with a view to gaining their Short Contest Call for the club. At the same time a purpose built trailer will be transformed into a mobile shack complete with 60ft pump up mast, two radio positions, monitoring station and more. This will also be used for Special Event days when displays will be put on for members of the public so that they can engage with them and inform them about the hobby. Their last two special events saw five people enter and pass the Fast Track Foundation training. One of the newest Foundation successes, Nic, M6XTN, has already joined the contest group and made his mark in the recent contest, taking to the operators chair like he was born to do it.

REGION 13: EAST MIDLANDS

Steve Marsh, 2E0WCG, gave a talk to the members of **South Kesteven ARS** on FT8 and the experimental JS8Call modes. A total of 186 reception reports were made on 40m and 80m as well as several QSOs that were logged whilst the presentation was underway. The ATV presentation at the previous meeting prompted Alan Moriss, G4ENS, to dig into his archive where he found some of his display cards from the 1970s when he was active on VHF TV. He also found a map from his involvement with the UHF repeater committee showing the allocations of the then-new UHF repeaters to a grid map to make sure that they weren't too close to each other. It is quite noticeable that the only repeaters at that time were in the South East! Andrew Garratt, M0NRD gave a very interesting talk to the club on his experimentation with amateur television, demonstrating his setup and kit he had built including small bowtie antennas and repurposing 2.4GHz high gain Wi-Fi antennas to work on 5GHz (right) to help with DX QSOs in the UK. Sadly, his attempts to make a successful QSOs to date have been unsuccessful either due to equipment failure or the other party forgetting to turn up, but he plans to keep going! He also explained how he hoped to make use of the new Es'hail-2 satellite and club members look forward to hearing about the next instalment.

Nunsfield House ARG had five successful candidates in their Intermediate exam on 3 November. They were John Raybould, Ronald Jones, Christopher Emery, James Woodcock and Vipin Ajayakumar. Special thanks to the course tutor Steve, M0OSI, exam invigilators Ken, G0JKC and Richard, 2E0ZDY as well as Ken, G3OCA for organising the course.

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Best price / performance of any commercial HF vertical. See www.m0mcx.co.uk and check out DX Commander on YouTube. qrz@m0mcx.co.uk

Equipment

REPAIRS TO RECEIVERS, TRANSMITTERS
New/Old, valve/transistor. Call 07903 023437 for details: www.kent-rigs.co.uk

RADIO REPAIRS BY M0NKL
Icom, Yaesu, Kenwood etc, plus linear amplifiers, please contact Nick on 07770 397668 or email np262@yahoo.com

Wanted

VINTAGE RADIO & VALVES WANTED national cash settlement for silent key, shack clearouts 07552 678725, vintageradio@btinternet.com

Recruitment

CUSTOMER SUPPORT ENGINEER VACANCY
for UK-based Company providing email-skype technical support from own home 5-15 hours weekly. Theoretical knowledge plus practical experience building and troubleshooting radio related hardware and software , computer literate, previous Customer skills, Please write to: TCSE c/o Danby Advertising, Fir Trees, Hall Road, Norwich NR103LX

Aerials

M0CVO ANTENNAS
For quality HF Wire antennas, BALUNs, UNUNs, VHF/UHF base or mobile antennas, all made in England, for QRP to QRO. Also available accessories and kits for home builders. At a price to suit your pocket. www.m0cvoantennas.com

WESTERN HF 10
67ft wire dipole 160-6m, full details lookup m0bzi at: www.qrz.com buy direct: m0bzi@outlook.com or 07748331458 reviews at: http://g0kya.blogspot.com/2010_08_01_archive.html **or** http://www.eham.net/reviews/detail/9424

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10/6/2/70 Quad band 2.5/2.5/3.5/5.5 dbi gain only 1.2m length £59.95 ea 6/4/2/70 Quad band yes Includes 4m, 2.5/2.5/3.5/5.5 dbi gain 1.2m length £59.95 ea 2/70 Dual band 3.5/5.5 dbi gain 1.1m length only £37.95 ea. UK post £7.95. Website: mirfield-electronics.co.uk Email: martin.stokes@hotmail.com or Tel: 07825549430

NEW ANYTONE ATD868UV 2/70 DMR + ANALOGUE handheld radio, 4000 channels,built in GPS, Multiple DMR ID's , inc charger, program lead, handbook etc£139.95, QYT KT8900D 2/70 25/20w mobile only £79.95 ea, Mirfield Electronics 07825549430 www.mirfield-electronics.co.uk

HAMTENNA UK
Manufacturers of Antennas, Baluns, Ununs and suppliers of antenna wire and accessories. Checkout www.Hamtenna.co.uk

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Professionally made commercial baluns and matching transformers, multicore Mil spec, resin potted, IP68, custom made by Geoff Brown G4ICD. www.rfcomms.co.uk

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Happy New Year from Pro Antennas. Why not get the new year off to a good start with a new, compact HF antenna. Visit www.proantennas.co.uk for details.

Miscellaneous

ALL UK STATIONS – CALL IN ON OUR 'M1CRA' CHRISTIAN NETS!
WACRAL welcomes all amateurs & listeners to our Sunday morning 'GOOD NEWS' nets, now at 0730-0830 on 3.747 MHz +/- QRM and, again, at 14.00-15.00 on 7.147 MHz. Or, do join us on Wednesdays 07.30 3.747 MHz +/- QRM, 10.00 on 7.147 MHz (if no contact established after 5 mins QSY to 3.747 MHz and 21.30 on 3.751 MHz, for nationwide Christian fellowship and relaxed chat. All UK Local times. See www.wacral.org for more net info and WACRAL details or just call Ian G4OPP on 01622 746650 or g4opp@wacral.org

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Classified advertisements 58p per word (VAT inc.) with a minimum of 14 words £8.12. All classified advertisements must be prepaid. Please write clearly. No responsibility accepted for errors. Latest date for acceptance is 1st of the month prior to publication
Payment to: RSGB, 3 Abbey Court, Priory Business Park, Bedford, MK44 3WH

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

Business Cards

Advertisers Index

FREE MEMBERS' ADS

Members may email a Members' Ad of up to 40 words to memads@rsgb.org.uk. **You must include** your name, callsign, phone number, email address and location (these details are not counted in the 40 word limit). Optionally, attach your own photo of the item (*at least* 800 x 600 pixels, in good focus and well lit). DO NOT just download a photo off the internet. Maximum of 1 ad per Member per month; other terms & conditions also apply (see tinyurl.com/MemAdsInfo). We no longer accept ads by post or phone.

FOR SALE

ICOM IC-2KL HF AMP and IC2KL PSU in near new condition, little use, comes from smoke and pet free home. £800, will post at cost. Joe, M0AJO, 0796 688 5638 after 7pm, axe.man@aol.co.uk (Watford).

SK SALE BARGAIN. Yaesu FT-840, c/w PSU, Drake MN-4 ATU, Heil HM-5 desk mic, and manual. All for £300 OVNO. Carriage to be arranged. John, GW3GUX, 01248 490 762, john.micro@pobroadband.co.uk (Anglesey).

YAESU FT-1000MP, good condition with original box, manual and accessories. Complete with full set of Yaesu filters in main and sub Rx. Collection or carriage at cost. £650 ONO. Mike, G4PFF, 0115 987 6744, potsnots@gmail.com (Nottingham).

JAYBEAM MINI MAX TRIBAND, 10m, 15m and 20m bands covered in the aerial. Good condition with 2 manuals and all parts present. £135. Andrew Pyatt, M6HYG, 01732 354411, andrew_pyatt@hotmail.co.uk (Tonbridge, Kent).

RCA AR88 in working order. Downsizing the shack equipment so must sell. In acceptable condition considering the age. Handbook. Sensible offers. Buyer collects. G3ZUB, 01509 561050 (Leicestershire).

FUNcube DONGLE PRO+, £85. Cross Country Wireless SDR-4+, £100. G4TPH remote-tune magloop with PSU & fly leads, £125. All items boxed and excellent condition. Collect or will post at cost (UK only). Mark Budd, G7JZS, 0789 979 2260, mark.budd@btinternet.com (Hornsea).

SK SALE OBO ANDY HOWDEN, M0MCA, late of Scarborough North Yorkshire. Various transceivers, mostly Yaesu, and some receivers. Email for detailed list. Bob, G0CCK/M0GAP, bobm0gap@btinternet.com.

HRO. Parts or refurbish, with manual.no mods. Never had case off or valves out, last used 1940s. Original owner. Prefer collection only. Free PSU. £55. Don, G4GLH, 01539 720654, donald.lakes@icloud.com (Kendal).

ELECRAFT K3 100W with installed KAT3 ATU, KFL3A 400Hz 8-pole filter, KFL3A 200Hz 5-pole CW filter, and KX3VA interface for use with a P3 panadapter, £950. AV-200 VSWR power meter, £25. P&P extra at cost, or collect. Chris, M0PSK, 01568 610186, chrism0psk@gmail.com (Leominster).

TREND ELECTRONIC TELEPRINTER. In storage for 25 years. Offers. Ray Elgy, G8EZT, 0740 305 5475 (Shepherds Bush, W12).

KENWOOD TS-830S, with hand mic MC-43S, original box, 2 copies of instruction manual, plus service manual. Clean condition. Serviced by ML&S. GWO, £350 or sensible offer; prefer buyer collects. John Totten, G7LWF, 01380 729197, pingledoce@gmail.com (Devizes, Wilts).

KW 2000A, WORKING, see my *PW* article May 2017. Would benefit from a good overhaul. Front panel pot marked, not sure of cause, doesn't look like corrosion, paint ok. Manual, no microphone, hi-Z. £150 collect or plus £13-65 post. Ken Waters, G8HOD, 01733 235870, kenjwaters@yahoo.co.uk (Peterborough, Cambs).

SHACK CLEARANCE. Elecraft K3, 100W, £1100. Elecraft K1 4 band + ATU, £450. Kenwood 590s, £800. FT-857D, £800. FT-7, £200. FRG-7, £125. FRG-100, £300. Also assorted shack accessories & PSUs. Buyer collects. Stephen Walters, G7VFY, 0795 654 4202, mister35mm@yahoo.co.uk (Barnet, N London).

WANTED

CREED 6S6M or similar tape reader. I have assembled a mechanical HF RTTY station and would like to add a tape reader. If you have one please contact me. I can collect or arrange carriage. Rex, G8UBJ, 0790 532 5849, g8ubj.io91uj@gmail.com (Surbiton).

ICOM IC-751A, must be the A model please. Anything considered, can pick up or meet if needed. John, G4LGX 01423 567390, jra_hall@hotmail.com (Harrogate).

OT REQUIRES HIS FIRST TX – a Codar AT5 plus matching PSU. Paul, G3VCN, 01752 339738, paulg3vcn@blueyonder.co.uk (Devon).

SATELLITE DISH for moonbounce experimentation. Offset or central focus, from 1.5m up to 3m diameter. May collect. M Martin, M0HAO, 0779 891 5510, maxmartin3@yahoo.com (Reading).

YAESU FRG-8800 Rx, must be in excellent condition, ideally with VHF module. Can pick up or will arrange courier. Laurence, M0LSK, 0798 409 9405 (London).

HELPLINES

HELP NEEDED to get Marconi 2380/2383 operational again – or at least identify fault/s. Basic circuits all OK, including GPIB. Rog, G3ZLM, 01452 531 000, g3zlm@roger-hook.com (Gloucester).

UP FOR GRABS

80cm DISH free to anyone who will collect it from near Weston super Mare. Was used for Freesat, NLM shot, motor seized up, but dish may be of interest. Steve Mann, G6XID, 01934 863887, steve@interleaf-pc.co.uk (Wrington, N Somerset).

VHF AMPLIFIER CHASSIS. Band 1 TV. No PSU transformer. 2 x 4CX250B and other components present. Also available 2 x 4CX250B spares, new old stock. Circuit diagram, design notes on conversion to 2m, photos. Heavy item – new owner liable for transport. Dave, GM4NFI, 01397 704361, djcleckie@dive-boats.co.uk (Highlands).

RALLIES & EVENTS

Members of the RSGB Regional Team will be present 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

We know of no rallies occurring in January 2019.

The following lists ALL 2019 rallies we know about as of 3 December 2018.

3 FEBRUARY
35th CANVEY RADIO & ELECTONICS RALLY
New venue for 2019: Cornelius Vermuyden School, Dinant Avenue, Canvey Island SS8 9QS Doors open at 10am (disabled: 9.45am). Free car parking and easy level ground floor access to two large halls. Admission is £3. Tea, coffee and soft drinks available, as well as bacon butties. There will be radio, computing and electronics traders and special interest groups. For info contact tony@tonystreet.net.

SPECIAL EVENT STATIONS

No special event information had been received at the time this page was sent to press, but if any does arrive we will publish it on the RSGB website *RadCom* pages.

RSGB will do its best to publicise your special event and its callsign, but you must help us to help you. On the back of Ofcom's Special Event Station NoV application form there is a Data Protection section. Unless you specifically tick the Yes box, Ofcom cannot tell RSGB about your event, which means it won't appear here, on GB2RS, or on the RSGB website. (If you don't tick either box, it's automatically assumed to be 'no'). So please tick Yes!

Please also send advance publicity information about your special event to radcom@rsgb.org.uk so we can feature it in Club Calendar, the News pages and/or other parts of RadCom*, the Newsletter and on the RSGB website.*

This edition of RadCom *is likely to arrive in time for you to work one or more of the GB18YOTA Youth on the Air (YOTA) special event station in late December. The clubs and groups running the calldign in the latter part of the month are*

12 Dec	*Southampton University Wireless Society*	*22-24 Dec*	*Chertsey Club*
14 Dec	*Durham & District Amateur Radio Society*	*28-29 Dec*	*M0SDV*
15-16 Dec	*RSGB National Radio Centre*	*30 Dec*	*Telford & DARS*
21 Dec	*Castle Rushen High School Radio Club*		

Listen out for these groups putting GB18YOTA on the air and give them a call when you hear them – you could well be giving a young person their first taste of amateur radio.

8-10 FEBRUARY
73rd ORLANDO HamCation®
Central Florida Fairgrounds and Expo Park, 4603 W Colonial Drive, Orlando, Florida 32808, USA
Over 150 commercial vendors and >200 swap table vendors. Over thirty forums. Second largest ham shows in the United States and third largest in the world. [www.hamcation.com].

10 FEBRUARY
HARWELL RADIO AND ELECTRONICS RALLY
Didcot Leisure Centre, Mereland Rd, Didcot OX11 8AY (3 miles from Milton Interchange on A34)
Talk in on 145.550MHz using G3PIA. Free car parking. Doors open 10am to 3pm. Admittance £3 (under 12s free). Traders, special interest groups and RSGB book stall. Refreshments available all day. Ann, G8NVI, rally@g3pia.net [www.g3pia.net/radio-electronics-rally].

17 FEBRUARY
RADIOACTIVE RALLY
Nantwich Civic Hall, Cheshire, CW5 5DG
Free car parking. Doors open 10.30am. Bring & Buy, traders and RSGB book stall. A raffle ticket is included with the entrance programme (additional tickets available). Catering on site. Stuart Jackson, 07880 732 534.

24 FEBRUARY
RAINHAM RADIO RALLY
Victory Academy, Magpie Hall Rd, Chatham ME4 5JB
Talk in on 145.550MHz. Doors open 10am to 4pm, £2.50 entry (kids free). Local and national traders, BRATS Kitchen, interactive zone for kids.

3 MARCH
EXETER RADIO & ELECTRONICS RALLY
America Hall, De la Rue Way, Pinhoe EX4 8PW
Doors open at 10.30am (disabled 10.15am). Admission £2 (under 16s free). Trade stands, Bring & Buy (book in from 10.15am), catering available. Details from Pete, G3ZVI, 0771 419 8374, g3zvi@yahoo.co.uk.

17 MARCH
34th WYTHALL RADIO CLUB HAMFEST
Wythall House, Silver St, Wythall B47 6LZ
Doors open at 9.45am (disabled 9.30am). Free on-site parking. Admission £4. Four halls of traders including Bring & Buy and a club stand. Refreshments available all day, bar facilities from midday. Contact Ian Reeve, M0IDR, 01386 839655, wrc4hallsradio@outlook.com [www.wythallradioclub.co.uk].

24 MARCH
HAMZILLA RADIO FEST & ELECTRONICS FAIR
Discovery Science Park, Gateway House, Ramsgate Road, Sandwich, Kent, CT13 9FF
Free parking. Open 10am to 4pm. Admission £3 - £5. Tables £10. Bring & Buy, catering, lectures/seminars, RSGB book stall, special interest groups, trade stands inc Icom & SDRPlay, digital village. Licence exams will be held, see website. Aaron Coote, M0IER, 0771 465 4267, M0IERDX@gmail.com [www.hamzilla.uk].

24 MARCH
CALLINGTON RADIO RALLY
Callington Town Hall, Callington PL17 7BD
Organised jointly by the Devon & Cornwall Repeater Group and Callington ARS. Free parking. Doors open 10am to 1pm, admittance £2. Bring & Buy (10% commission) and trade stands. Catering on site. Information and bookings: Roger, 2E0RPH, 0785 408 8882, 2e0rph@gmail.com.

14 APRIL
WEST LONDON RADIO & ELECTRONICS SHOW
Kempton Park Racecourse, TW16 5AQ
Talk in. Free car parking, doors open 10am (disabled: 9.50am). Trade stands, Bring & Buy, special interest groups and lectures. Catering on site. Paul, M0CJX, 08451 650 351, info@radiofairs.co.uk [www.radiofairs.co.uk].

28 APRIL
NARSA EXHIBITION (Blackpool Rally)
Norbreck Castle Ex Centre, Blackpool FY2 9AA
Talk-in, plenty of parking. Doors open 10.30am (disabled: 10.15am). Trade stands, Bring & Buy, special interest groups, RSGB book stall. Catering on site. Dave, M0OBW, 01270 761 608 dwilson@btinternet.com [www.narsa.org.uk].

9 JUNE
JUNCTION 28 RADIO RALLY
Alfreton Leisure Centre, Alfreton, Derbyshire
Anya, 2E0BQS, 01773 535 117, adylawri@btinternet.com.

9 JUNE
E SUFFOLK WIRELESS REVIVAL (Ipswich Rally)
Kirton Rec Ground, Back Road, Kirton IP10 0PW
Kevin, G8MXV, 07710 046 846 [www.eswr.org.uk].

15 JUNE
ROCHDALE & DISTRICT ARS SUMMER RALLY
St Vincent de Paul's, Norden OL12 7QR
Robert, M0NVQ, 0777 811 3333, m0nvq@outlook.com.

SILENT KEYS

We regret to record the passing of the following Members.

Name, callsign	Date
Mr J L Procter, G0FQN	06/11/2018
Mr R Finch, G1NZQ	9/2018
Mr A Bard, G1XKZ	11/2018
Mr J F Moseley, G2CIW	05/11/2018
Mr A A Lawrance, G3RZV	08/11/2018
Mr R Goodall, G3ONQ	29/09/2018
Mr E H Coventon, G4LHY	9/2018
Mr L France, GW3PEX	20/09/2018
Mr J R Cramond, GM4NHI	03/11/2018
Mr C W Lindsay, G4VJI	06/11/2018
Mr G Davies, GW6SBD	11/2018
Mr P Shield, G8BXM	11/2018
Mr S Edwards, G8GEF	01/11/2018
Mr D J Bucknell, G8ZPH	11/2018
Mr S Legg, M0SKL	01/11/2018
Mr M B Greenberg, RS20443	11/2018

Late last year we incorrectly listed Mr David Jackson, G4JYY as having passed away. We are happy to correct the record and confirm that he is safe and well. We sincerely apologise to Mr Jackson and anyone who may have been distressed by this regrettable error.

To notify us that a Member has passed away, pleae email details to sales@rsgb.org.uk or phone 01234 832 700, option 1. This will ensure that their Membership will be ended properly and that they appear in the Silent Keys list. We need to know the name, callsign and date of death.

Ofcom must also be informed, on 0300 123 1000 (calls charged at same rate as normal 01 or 02 numbers). From outside UK call +44 207 981 3131. We are not permitted to pass on details on your behalf.

16 JUNE
16th WEST OF ENGLAND RADIO RALLY
rallymanager@westrally.org.uk [www.westrally.org.uk].

21-23 JUNE
HAM RADIO FRIEDRICHSHAFEN
[www.hamradio-friedrichshafen.de].

23 JUNE
NEWBURY RADIO RALLY AND BOOT SALE
NewburyRally@nadars.org.uk [www.nadars.org.uk].

28 JULY
WILTSHIRE RADIO RALLY & ELECTRONICS FAIR
Brian, G6HUI, 0772 224 2741, rally@g3vre.org.uk.

11 AUGUST
FLIGHT REFUELLING ARS HAMFEST
G3PFM, tbaker@tiscali.co.uk [www.frars.co.uk].

27-28 SEPTEMBER
NATIONAL HAMFEST
Newark & Notts Showground, NG24 2NY
By RSGB in association with the Lincoln Short Wave Club. Free parking. Trade stands, Bring & Buy, car boot area, flea market, special interest groups, RSGB book stall, RSGB Services and Committe Representatives. On site catering and seating areas. [www.nationalhamfest.org.uk].

11-13 OCTOBER
RSGB CONVENTION
Kent's Hill Park Centre, Milton Keynes MK7 6BZ
Principal sponsor Martin Lynch & Sons.
[www.rsgbevents.org].

16 NOVEMBER
ROCHDALE & DISTRICT ARS WINTER RALLY
Robert, M0NVQ, 0777 811 3333, m0nvq@outlook.com.

RadCom

HF F-Layer Propagation Predictions for January 2019

Compiled by Gwyn Williams, G4FKH

Time (UTC)	3.5MHz 000011111220 246802468020	7.0MHz 000011111220 246802468020	10.1MHz 000011111220 246802468020	14.0MHz 000011111220 246802468020	18.1MHz 000011111220 246802468020	21.0MHz 000011111220 246802468020	24.9MHz 000011111220 246802468020	28.0MHz 000011111220 246802468020
*** Europe								
Moscow	9995....8999	847654567777	..3765563..3	...66663....	...3664.....	...1442.....	....221.....	....11.....
*** Asia								
Yakutsk	5.......6667	...4...45...	...3........	.....	.....	.....	.....	.....
Tokyo	.....	...55.55....	....4.33....	.....	.....	.....	.....	.....
Singapore	.....	......55...4	......54....	.....33.....	.....2......	.....	.....	.....
Hyderabad	5.....	5......5555.	.......4....	.....	.....2......	....22......	.....	.....
Tel Aviv	88......7888	7764...57777	3.6533353..3	...55443....	...3533.....	...121......	.....	.....
*** Oceania								
Wellington	.....	....66654...	....5654....	....443.....	.....2......	.....	.....	.....
Well (ZL) (LP)	.....	.....	.....	.....	.....	.....	.....	.....
Perth	.....	.......5444.	......54....	......4.....	......2.....	.....	.....	.....
Sydney	.....	.....565....	.....553....	....334.....	....2.......	.....	.....	.....
Melbourne (LP)	.....	....5.......	....5.......	....4.......	....2.......	.....	.....	.....
Honolulu	.....	.....4......	.....	.....	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....	.....	.....	.....
Samoa	.....	....5.......	....44......	.....	.....	.....	.....	.....
*** Africa								
Mauritius	.....	4.........5	.......4....	.....	.....	.....	.....	.....
Johannesburg	.5..........	45.......555	.........4..	.....	.....	.....	.....	.....
Ibadan	7775.....777	7466....5777	6..64...5644	...543.4....	...34444....	....442.....	....11......	.....
Nairobi	66..........	.55.....6666	........5...	...3...3....	......3.....	.....	.....	.....
Canary Isles	9996.....889	88775...6888	773664456775	22..5555.3..	....22......	.....	.....	.....
*** S. America								
Buenos Aires	...5........	45.5........	.....	.....	.....	.....	.....	.....
Rio de Janeiro	...5........	55.5........	...3........	.....	.....	.....	.....	.....
Lima	.....	.....	.....	.....	.....	.....	.....	.....
Caracas	...6........	55.54......5	....4.......	.....3......	.....32.....	.....	.....	.....
*** N. America								
Guatemala	.....	.4..5.......	....4.......	.....	.....	.....	.....	.....
New Orleans	.....	.5.54.......	.....	......3.....	.....	.....	.....	.....
Washington D.C	77765.....57	46.45.....54	.....	......33....	.....	.....	.....	.....
Quebec	7766......56	44.......4..	.....3333...	......44....	......32....	.....	.....	.....
Anchorage	565.........	........4...	.....	.....	.....	.....	.....	.....
Vancouver	5555........	.....	.......3....	.....	.....	.....	.....	.....
San Francisco	.....	....4.......	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.......3....	.......3....	.......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. 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 January, February & March 2019 are respectively (SIDC classical method – Waldmeier's standard) 3, 2 & 2 and (combined method) 4, 4 & 6. The provisional mean sunspot number for November was 5.9. The daily maximum / minimum numbers were 15 on 12, 16, 17 & 24 November and 0 on 1-7, 11, 20-23 and 27-30 November.

WITH GRATEFUL THANKS

Elle Chauvelaine

Along with my carer, who is also a G0 licenced radio amateur, I became a member of the Bromsgrove & District Radio Club earlier this year. Despite being severely disabled and deaf, I was encouraged to consider taking my Foundation examination.

Initially the idea caused some consternation within the club, but because of the increased availability of data and digital modes to which I was introduced, taking the exam seemed like a natural progression to use these modes instead of voice.

I subsequently took and passed the Foundation exam and now have my licence. Hopefully this is just the first in the sequence.

I am writing to you because I feel that the tutors and indeed all the members of Bromsgrove & District Radio Club need a formal recognition of their service to the induction and support of new members, specifically the disabled members of whom there are more than one.

I enjoy reading the *RadCom* for the letters and technical articles. Being deaf, I currently have a UHSDR-QRP radio that I use with PSK and FT8 with a 204ft doublet that my carer erected for me. I am currently working the world on 5 watts.

Jon Lynch, M5DZH

I recently had to call on the assistance of the RSGB planning department. John Mattocks, G4TEQ did a sterling job guiding me through the process and with his support we eventually got the local council to grant planning permission at my home.

I thanked Mr Mattocks for his time and effort and the great deal of patience that he gave me through the long and drawn out process. But the reason I wrote to *RadCom* was to thank not just John but the whole RSGB team for their efforts within the hobby and for all its Members.

May the RSGB provide the same high level of service and assistance for many years to come.

Thank you for your kind words, which I'm sure John will appreciate. The RSGB is very lucky to have John as our Planning Commmittee Chairman as he is a retired Planning Inspector and brings with him a wealth of professional knowledge and exprience.

John has also recently edited and updated the Planning Permission Advice for Members *booklet, a guide on making planning application, appeals and what to do if you receive an enforcement notice. Members can download it from www.rsgb.org/pac*

The Planning Advisory Committee is not a one-man operation and John heads up a small team of planning advisors, however we are always on the lookout for volunteers with planning experience, particularly in Wales and Scotland. If you think you can assist with this important Members' service, contact John Mattocks via email to PAC.Chairman@rsgb.org.uk

Len Paget, GM0ONX
Board Member

Andy Thomas, G0SFJ

Through your pages I'd like to thank Hans Summers, G0UPL for his kindness in tackling my almost-built QCX transceiver. My soldering would win no prizes, but he trekked through endless solder bridges, too-long axial leads, tracks I had broken and forgotten, and the famous transformer T1, to success. He did this, he told me, because he wanted me to end up with a working kit. Thanks to him, I'll be on 17 metres QRP.

THE FUTURE OF CTCSS

Adrian Soane, M0ABY

Further to recent correspondence regarding 2m and 70cm FM in *RadCom*.

Please may I ask that we ditch CTCSS. This added facility has taken away all the interest and spontaneous excitement that these bands were capable of, no wonder people don't use them as much anymore.

When I was first licensed as a Novice, I made good use of 70cm and talked to a lot of young people who were clear thinking and keen. There were also a lot of much older people, with many years experience, who were very glad to have a chat, but all on a much more personal level than HF. It was surprising how far you could get when there was a lift on. I once worked into Sweden at about midday on just 4 watts. If you could hear a repeater and you had a tone burst, you could open it. You never knew where you were going to get. Amateur radio should be fun.

One wonders, is it not the case that the manufacturers of radio equipment and their dealers really promoted the use of the CTCSS facility in order to force the amateur community to have to purchase further equipment?

For many of us, it is the distance covered, using our own power, which is the real challenge. It is **NOT** using the internet, however useful this can be at times.

Please remember that not all of us want to use computers in amateur radio.

With all the new modes now available, can't we have at least one system that is easy and spontaneous to use?

I have some sympathy with these comments and also remember the 'good old days' of 1750Hz or even whistling to bring up any repeater. Sadly, the realities of the modern world, with the ever rising RF noise floor, has made this virtually impossible to sustain. The use of carrier squelch alone for repeaters is almost impossible nowadays with the plethora of equipment and power supplies radiating signals which will hold the repeaters open and even some that generate modulation with enough 1750Hz content to access the repeaters!

In addition to that, 70cm repeaters suffer increasingly from perfectly legal licence-free transmitters for such uses as remote control, telemetry etc that produce a variety of signals on the repeater inputs, which carrier squelch alone allows through. My own mobile operation is also curtailed by the noises around me, to the extent that I only scan channels with CTCSS enabled to avoid perpetually adjusting the squelch. CTCSS is certainly not a plot by manufacturers, although it is a mandatory requirement for repeater receivers in some countries, and a strong recommendation here as well as being the minimum access requirement. Simplex operation on VHF/UHF FM is still predominantly without CTCSS but in some urban areas this requires a squelch setting of several microvolts.

Andrew Barrett, G8DOR
ETCC Chairman

CREATING A MINI VICE

Bob Houlston, G4PVB

Loop an elastic band tight over the handles of a pair of pliers to create a mini vice for soldering components, eg a lead to a 6.35mm jack plug. You may be interested to know that Boots 'non-slip silicone ponybands black' costing just £2.50 for ten (also known as scrunchies) make an excellent alternative to elastic bands and look more professional. Of course, other sources for these bands are available! Elastic bands are best kept away from (for fear of damage to) silver electrical contacts eg switches.

HELP WANTED

Lars Wiik, SA5LOW

I am a Swedish amateur who would like to find some technical documentation about an old mobile antenna with the name G-whip Flexiten. It was probably manufactured in UK about 40-50 years ago. If you know anything about this antenna, please let me know.

I hope to be able to mount it on my car, so I am looking for the owner's manual or at least a brochure in order to learn how to

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use this antenna that I have bought second hand. It is a lot of different pieces! Thank you in advance

IF THE CAP FITS, WEAR IT

Bob Houlston, G4PVB

I've been wearing the RSGB peaked cap for some time now and it's certainly an ice breaker. It gets a discussion going: *"Amateur radio? What is that... is it AM or FM?"*

MYSTERY ANTENNA

Terry Roeves, G3RKF, Chairman NCRC

One of the North Cheshire Radio Club members discovered this possible aerial in his loft, mounted vertically to chimney brickwork. The solid copper elements are swaged into the centre post. Their lengths are equal and suggest resonance at UHF. The connection is to some very old rubber insulated twin flex. The white insulator is glazed porcelain. It's a mystery to us all and to members of the Tall Trees Contest Group. Do any of the readers recognise it? Some information would be much appreciated.

VDSL INTERFERENCE

Bill Kitchen, G4GHB

I read with interest the letter from G3XGK and the mandatory prevention of interference in the amateur bands with notching in the 160, 80, 40, 30 and 20m bands. I had previously heard of this notching and only suffered interference on 30m for many years; I could live with that because all other frequencies were fine.

The research and specifications leading to legislation sounds good for us but is just worthless and not worth having been written down.

I have virtually given up amateur radio. 160m to 17m have been wiped out here for eleven months. I hear only very strong signals. I've heard three QSOs in those eleven months on my receiver, a few more if you add in Hack Green SDR when I have used it to listen on the internet.

Nobody will take responsibility. I contacted Ofcom who did investigate the source for me and came to the conclusion it was my line, my thanks to them for that, but it seems they have no power. I contacted BT Openreach who don't want to know even though Ofcom investigated for three hours and said it is their line radiating. I contacted the office of the Minister for Telecommunications and Online, they don't have a clue. What is the point of that department if nobody knows what is going on? Do they know about this legislation? If not, why not? Both Openreach and the Telecomms office give their standard reply of get in touch with your service provider. I can never get past a secretary who knows nothing and can only send out standard replies.

Openreach are shirking their responsibilities under this legislation and this proves no action will be taken against them. Openreach say they will charge me to have my line taken down.

Amateur radio is doomed when illegal and interfering radiation can be allowed to pollute our bands and make a huge range of frequencies useless. If I radiated and caused this much interference I would be told to close down. My hobby is ruined but I guess a few hundred radio amateurs don't matter when money can be made from a larger population who experience no interference.

I'm at the stage I no longer even try to go on air for months at a time now on amateur radio and need to look for something else. I have renovated a piano recently so it seems I'll be spending a lot more time learning to play now.

IS THIS THE WAY AHEAD?

Tony Falla, VK3KKP/G8HIM

We are being inundated, in many radio magazines, with enthusiastic articles and editorials trying to convince licensed radio amateurs that our activities could all be done on cut down mobile phones running an appropriate app and fitted with a push-to-talk switch. Forgetting for the moment that apps like this already exist (Echolink, HamsShere etc) we are really experiencing a final push.

I'm told this is just another step on the way to a new golden age where we wouldn't have to listen carefully to our conversations with each other and we wouldn't need to solve the problems of atmospheric noise or of erecting any sort of antenna. And best of all is that we don't need a licence to participate and we don't need to study to avoid interference with essential services.

Ultimately, we'll have no need for bands of frequencies to be reserved for us to use in our experiments - and no need for national bodies to protect those rights.

I'm partially to blame for that. The young people I have been helping to get their licences think a walkie talkie is terrific, as I did as a teenager, but we need to follow up Foundation call holders and help them to overcome the more difficult yet rewarding aspects of the hobby. To divert them so they get to phone a stranger in America is not the same as helping them transmit low power radio signals around the world.

I really feel any enthusiasts of converting the activity of amateur radio have no real idea what amateur means to its proponents.

All these phone technologies are great fun. Many radio amateurs have and are working on developing new apps and systems in their professional life. I enjoy using FaceTime and Skype to communicate with family and friends but I see no need to pretend that I'm using a walkie talkie to do it.

ANT-ENNA POWER

John Totton, G7LWF

One of my HF antennas is a Western 10 as an inverted V. Support is via an 8m fibreglass pole and the feeder balun starts about 2m above ground making a total height of 10m.

Imagine my surprise when one hot night last summer I saw a stream of flying ants emerging at ground level and making a 'bee line' (sorry) for the start of the pole and then climbing – well, most of them did – to the very top. Having reached the dipole joint it was time to jump/fly for the best take off around.

Perhaps they are more intelligent than we think?

No, they were not following the electrostatic lines, as the rig was off.

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