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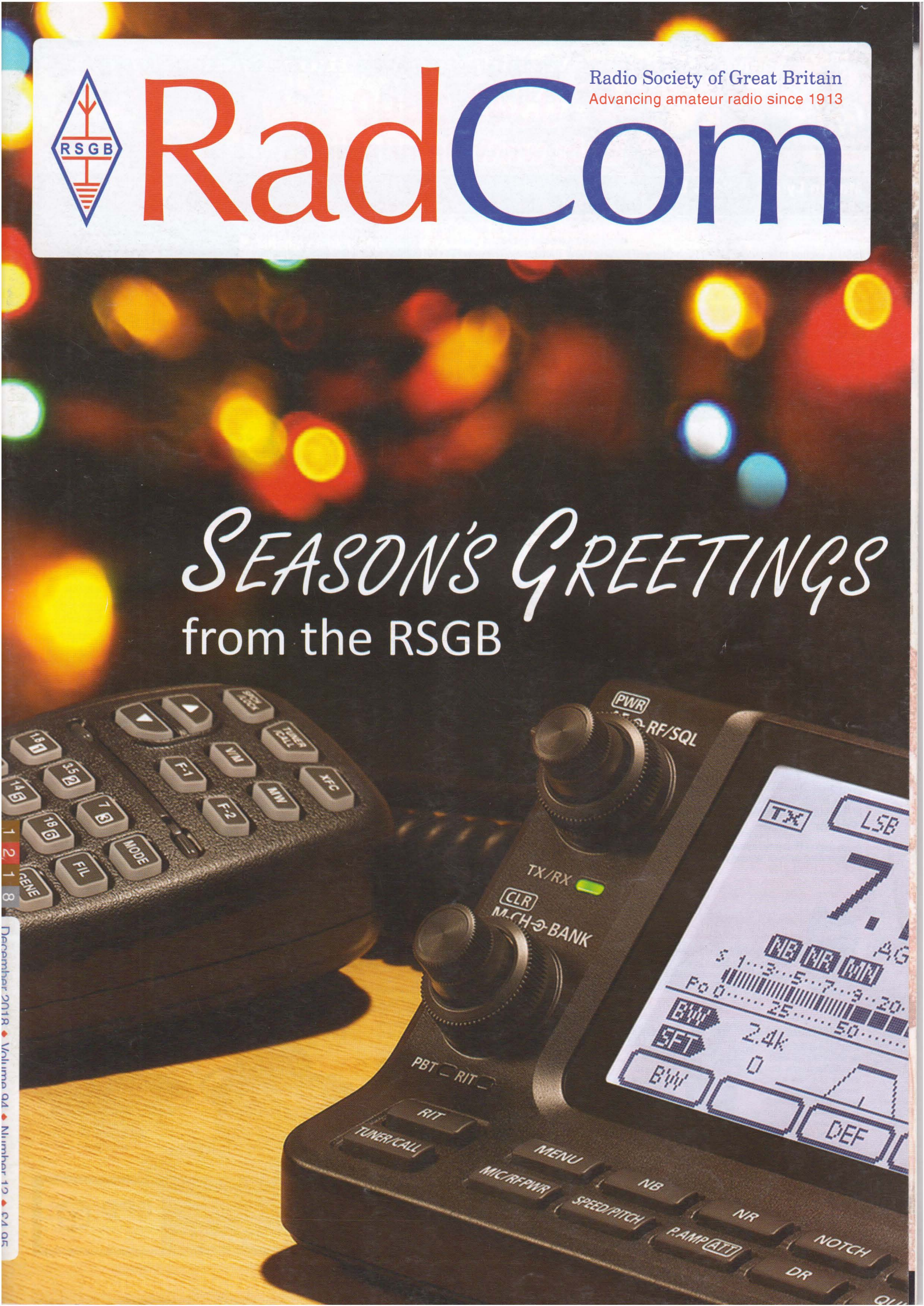

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FOR MORE INFORMATION CLICK WWW.HAMRADIO.CO.UK/ICR30

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NEW PRODUCT

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ML&S: £574.95

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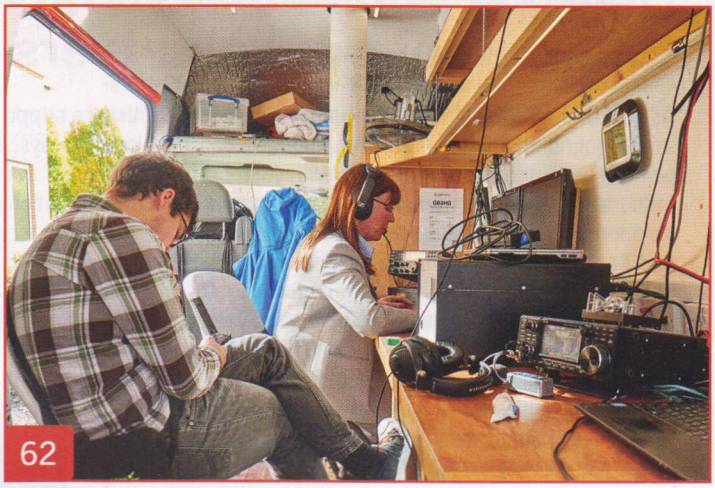

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Technical Features

Features

Cover image designed by Kevin Williams, M6CYB

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

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Abbreviations and acronyms we use are listed at http://tinyurl.com/RC-acronyms

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Recognition: Supporting, encouraging and recognising the work of our volunteers and staff

As part of the RSGB's five-year strategy, we strive to enhance support and recognition of our volunteers, as well as developing ways of working with them more closely. With just 11 full-time and 5 part-time members of staff managing all of the commercial and operational functions of the Society, our 800-plus volunteers, who deliver local and national services, are the backbone of our organisation.

Regional advice and support activities are coordinated locally by District Representatives (DRs) and regionally by Regional Representatives (RRs). To enable our representatives to provide the most accurate and up-to-date information relating to all of the Society's activities, a project is underway to update and improve the availability of information through our website.

How can we ensure that our volunteers feel part of the organisation?
Our volunteers need to know the differences that their efforts make to the success of the RSGB.

We have many opportunities for self-development or to take the lead in one or more of the Society's wider roles. We have over 20 specialist Committees and Groups, each with a specific focus and all need continued injection of new and updated expert input. Several Committees have formal recognition outside of the RSGB and are represented by our volunteers in Government and academic policy groups, both in UK and internationally.

Work is in progress to develop clearer definitions of individual Committee responsibilities and a better way of ensuring interaction and sharing of information between our experts. It is important that the views of all interested Members are properly represented through the appropriate Committees. The volunteer structure within the RSGB is being examined to ensure that it continues to meet the changing needs of our volunteers and Members.

How can we improve our communication with our volunteers?
The RSGB is committed to improving the communication with both its Members and volunteers. Technology allows for efficient distribution of information to volunteers. We centrally administer many targeted email circulation lists that keep volunteers up-to-date with news and changes, together with RSGB Affiliated Club News and GB2RS news bulletins. Plus, of course, there's *RadCom*, sent to all Members.

The Volunteer Leadership Team (VLT) was launched in 2018 to provide a vehicle for formal interaction between the Regional Teams, Committees, Honorary Officers and the Board. Mixed working groups during the meetings ensure that input is captured from all the volunteer groups. Focusing upon specific topics at each meeting ensures that the Board is alerted to the needs of volunteers and can more confidently make decisions based upon meaningful input.

How can we better prepare our volunteers for the roles they undertake and regularly update them?
To be effective, volunteers must be regularly kept abreast of changes to policy and aware of organisational changes and projects.

Proposed changes are carefully cascaded to relevant groups of volunteers in a planned order to ensure that each receives the necessary information in advance of publication in *RadCom*, GB2RS and on social media. Where time allows, and for larger initiatives, the VLT is briefed ahead of any wider publicity to ensure that our volunteers are able to confidently answer queries from Members and clubs.

Training for the Regional Team has been in place for some years and efforts are being made to ensure that new appointees receive training soon after appointment, together with regular updates for existing DRs and RRs.

How will our volunteers know that they are fulfilling the organisation's objectives for their role?
Every volunteer deserves regular feedback on their performance. It is important that volunteers not only secure personal satisfaction from their efforts, but that they are also aware of the benefit of their efforts to the wider organisation. Honest, constructive two-way feedback is encouraged.

Committee Chairs, Honorary Officers and the Regional Team report to their respective Board Liaison Member. Any shared or major issues are identified and tabled at each Board meeting.

Further support and training will be given to Committee Chairs, Honorary Officers and the Regional Team to ensure that volunteers know the value of their individual contributions.

Summary

- Further development of the Volunteer Leadership Team (VLT) – three meetings are planned for 2019 (March, July and November). A small planning group drawn from the VLT meets regularly to consider suggested meeting topics and priorities. Ideas for future VLT meetings may be sent to John Rogers via email to MOJAV@rsgb.org.uk
- Initiatives are underway to improve the toolkit available for Regional and District Representatives in supporting clubs and individual Members. These additional resources build on the already popular seasonal club briefings highlighting news and progress.
- The volunteer organisation of the RSGB is being studied by a Board member to establish if any changes are necessary. The objective is to improve and clarify volunteer communications between each other, the Board and HQ. An interim report for discussion and consideration is expected by early 2019.
- An ongoing review to update the terms of reference of all Committees and Honorary Officers is to seek clarity of purpose. This work started in 2017, and will identify and seek to resolve overlaps in responsibility between Committees and fill any gaps.
- We have seen a recent increased number of responses to advertisements for committee and other volunteer vacancies. The recruitment and selection process will continue to be transparent and is based on experience and knowledge. All short-listed applicants will have the benefit of an interview, either face-to-face or via Skype. Current volunteer vacancies are listed on the RSGB website at https://rsgb.org/main/about-us/volunteering-for-the-rsgb/ or for those Members interested in seeking election to the Board, please send an email to company.secretary@rsgb.org.uk
- Work to increase feedback to volunteers and provide individual support continues. Whilst a formalised process would be time-consuming, we must ensure that all volunteers are able to discuss any issues in an open and constructive manner and any priority issues addressed (and actioned promptly, where possible).
- We are increasing the links with external Specialist Interest Groups (SIGs) who may not have an obvious or designated route for communication with the RSGB. An additional Honorary Officer has recently been appointed (see page 8) who will co-ordinate the dialogue with all SIGs. Early discussions have been very positive and we look forward to more closely supporting the groups.
- What further should the RSGB be doing for its volunteers? If you have ideas or requests that you would like to share then please email them straight to me via chairman@rsgb.org.uk

Ian Shepherd, G4EVK, RSGB Board Chairman
chairman@rsgb.org.uk

RSGB Convention Construction Competition winners

The RSGB Convention Construction Competition 2018, sponsored by Martin Lynch and Sons, was judged by Bo, OZ2M, Sam, G4DDK and Stewart, G3YSX. Congratulations to all the category winners:

- Innovation – Antony Watts, MOIFA, for a series of tools to help people learn to code and understand radio
- Technical Merit – Andrew Vare, G4XZL, for his approach to measuring noise
- Judges' Merit – Camb-Hams G3PYE team, for building 'Flossie 2' communications vehicle and for using it to serve the community
- Construction and overall winner of the Pat Hawker G3VA trophy – Dean Brice, GOUIL (below, left), from RAIBC, for his SDR transceiver.

Spectrum Forum minutes available

The annual Spectrum Forum meeting took place in London on 27 October. The Spectrum Forum brings together the RSGB spectrum managers with other stakeholders, including committee chairs, special interest groups and other specialists that share an interest in spectrum management. Minutes can be found at www.rsgb.org/sfmeeting2018

Region 9 volunteers wanted

Due to two Region 9 District Representatives standing down after many years of service to the RSGB and their areas. Region 9 Regional Representative Tom O' Reilly, GONSY is looking for volunteers to take over the positions. Stephen Richardson, MOSLP covered Bedfordshire and Larry Smith, G4OXY covered Buckinghamshire. The RSGB would like to thank them for their service to their fellow amateurs. The prime duties in this annual and renewable post will be to liaise with the clubs and individuals in that area. There are opportunities to assist others and develop your own ideas to promote interest in amateur radio with the help of a team within Region 9 (London north of the River Thames and the Home Counties). Anyone wishing to step into these roles should contact the Regional Representative Tom, GONSY, via rr9@rsgb.org.uk

New Planning Guide

The RSGB's Planning Advisory Committee has released its latest Planning Guide for Members. Now in its ninth edition and edited by PAC Chairman John Mattocks, G4TEQ, this popular guide draws on John's many years as a professional planning inspector and the work of the RSGB Planning Advisory Committee. The guide has been updated to reflect recent changes in the planning system and includes advice on making planning applications, enforcement notices and also appeals for amateur radio aerials and masts. The planning guide can be downloaded in PDF format from www.rsgb.org/new-planning-guide

Barney, GI3KYP, Silent Key

Alexander Davidson Patterson (Barney) OBE FIEE, GI3KYP, RSGB Past President

Barney Patterson, GI3KYP / EI4BC died on 10 October 2018, peacefully, at home, surrounded by his family. He was the loving husband of Anne, beloved father of Alec, Janet, Hilary and Claire, and devoted grandfather to all his grandchildren.

He was a native of Delgany, Co Wicklow and a long-time Belfast resident. A skilled and patient mentor to many newly-licensed amateurs in the 1960s and 70s, there are tributes from some of those he mentored on the RSGB website. He was RSGB President in 1967 and IRTS President in 1971-1972 – the only person to have been President of both societies.

Barney, GI3KYP was installed as the 33rd RSGB President at the AGM held on 17 January 1967, when around 100 people attended the Presidential Installation. During his Presidential year he attended many local club meetings, often making presentations such as when he visited the Manchester Group RAEN when they received the RAEN trophy award. Internationally, he also attended the IARC Convention at Geneva, the Knokke Convention and made a private visit to the ARRL National Convention in Montreal.

Two events stand out during his presidency. The first was the purchase of a property in Doughty Street, London for the Society's headquarters. After much discussion and many reports, the contract was signed on 26 June 1967 and the Society had a new home. The other major event during his term in office concerns *RadCom*. In 1967 the magazine was called the *RSGB Bulletin* and Council – the forerunner to today's RSGB Board – wanted to change the name. Barney, GI3KYP steered the various meetings whilst this was discussed. At a meeting on 12 May 1967, the Council agreed to the use of the secondary title *Radio Communication* and eventually agreed that the new title of *Radio Communication* would be used from 1 January 1968. Other events that stand out were the re-titling of the *Handbook* to *The Radio Communication Handbook* and, sadly, the death of John A Rouse, G2AHL who had been General Manager of the RSGB and Editor of the Society's publications until his death in May 1967.

The RSGB sends condolences to Barney's family and many friends.

QSL Matters

The National Hamfest at Newark is always interesting. It's great to meet many of our users and QSL volunteers. This year the QSL Bureau stand featured many frequently asked questions. In addition, staff are able to answer many questions from radio amateurs. Here are the top five queries received during the show.

Q1. How do I sign up for the bureau?
A1. *No need it's an automatic Membership or affiliated club/group benefit.*

Q2. How do I collect my cards in my Region?
A2. *Every callsign group has its own sub volunteer, it's not Region based.*

Q3. Who is my sub-manager?
A3. *All QSL details can be found on the RSGB website or in the current* RSGB Yearbook. *Every affiliated club receives a free* Yearbook, *if you don't have your own.*

Q4. Is there a limit on what I can send or receive, via the bureau?
A4. *Every member has a personal outgoing limit of 15kg each year, for single page, 140 x 90mm standard size QSL cards. (The limit is 20kg for affiliated clubs or groups). There is no limit on incoming cards.*

Q5. Collection envelopes with large value stamps, sent to my sub-manager come back with only a few cards – why?
A5. *In 2012 we introduced the 'send-all-send-any' policy to avoid cards waiting (often up to a year) before being sent out when the stamp value was reached. This has had a dramatic and positive on-going effect, reducing reply times for many users. Our recommendation is to only use 2nd Class stamps on collection envelopes.*

Another popular topic was *'I've sent out thousands of cards and only had a few replies'.* Whilst the bureau has no magic answer to that one, we can offer many suggestions from our experiences. Computerised logs and card printing make it exceptionally easy to generate large numbers of cards very quickly. Sadly this takes little account of the availability destination, membership status of the recipient and their ability or desire to receive cards. In past times most amateurs QSLed one way or another. For many reasons this has changed and it's always advisable to check during the QSO if an exchange of cards is appropriate (or by searching QRZ.com before hitting the print button). Many successful UK stations do now operate a responsible QSLing agenda, responding to incoming cards received direct, via the bureau or by email request.

Region 12 Regional Club of the Year

Essex Ham's 23rd field event of the year was a chilly but rewarding one. Four stations were active on multiple bands from the group's popular Galleywood Common location, and the event saw the presentation of the Region 12 Large Club of the Year trophy by RSGB Regional Representative Peter Onion, GODZB (right).

A new Legacy Committee member wanted

The RSGB Legacy Committee considers applications for funding from the sizable Legacy Fund. One of the current members is coming to the end of his terms and will step down if a new member can be recruited. There are only three or four meetings a year, with applications general discussed via email or Skype conference calls.

Information about the Committee and the projects it has supported is available via https://rsgb.org/main/about-us/committees/legacy-committee/

If you are interested in helping the Society to use the Legacy Fund to help deliver the RSGB's Strategy for 2022, please get in touch with Steve Hartley, GOFUW, via email to legacy.chairman@rsgb.org.uk

YOTA from South Africa

In the article last month about YOTA South Africa, it should be noted that the article was adapted for *RadCom* from the RSGB blogs and images prepared by Nathan, MIONPR whilst the team were in South Africa. Peter Barnes, MOSWN and *RadCom* would like to thank Nathan for giving permission for his blog to be used as the basis for the article. The annual index on page 82 has been changed to reflect this.

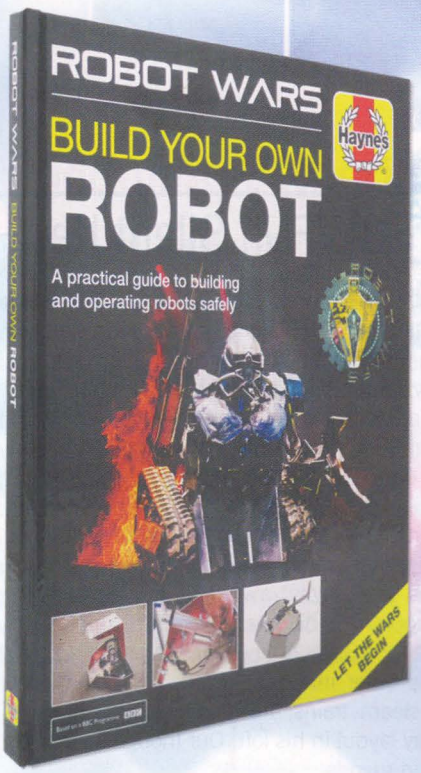
National Affiliated Clubs & Societies

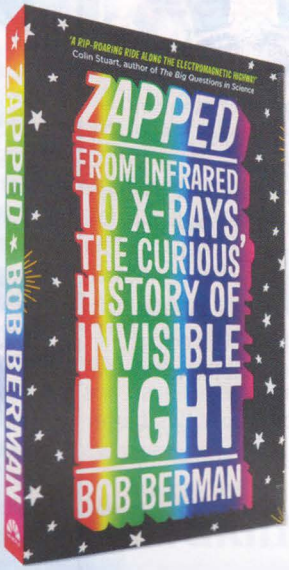
To help the RSGB forge closer links with its National Affiliated Clubs and Societies, we have recently appointed Simon Taylor, MWONWM as Honorary Officer responsible for this task. The RSGB would welcome feedback on the best way it can help and promote its National Affiliated Clubs and Societies. Simon can be contacted via sig.manager@rsgb.org.uk

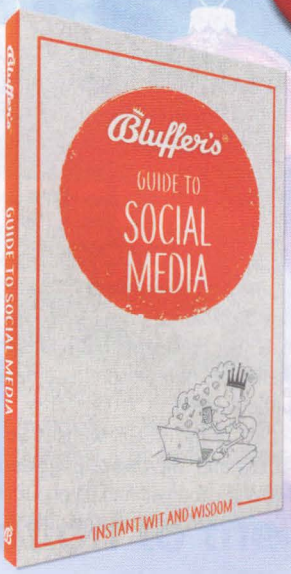
An unfortunate typo

An unfortunate typo crept in the RSGB Matters item on the World Radio Conference Preparations step up in the November *RadCom*. It should, of course, refer to 50MHz not 5MHz the first paragraph. Apologies to the author and Members who may have been puzzled by the error.

GREAT CHRISTMAS GIFTS







Haynes - Build Your Own Robot Manual

By James Cooper

Whether or not you are a follower of the highly successful TV series *Robot Wars*, this Hardback book is well written and detailed. This Haynes manual is produced in a similar style to the familiar 'how to' guides, but doesn't just include details about building robots.

Haynes - Build Your Own Robot Manual provides a behind-the-scenes look at the show – the arena, and both house and competitors' robots. Lavishly illustrated with high quality pictures there are step-by-step illustrated instructions for building three project robots, from a simple 'self-navigating' robot, to a fully controllable Robot Wars challenger. Why not indulge yourself whilst reading about construction techniques and of course competitor teams battling each other and the fearsome 'house robots. Essential reading for all *Robot Wars* fans and anyone interested in something different to construct.

Size 216x279mm, 176 pages
ISBN: 9781785211867
Special Offer Only
£13.79 (40% OFF)

ZAPPED

From Infrared to X-rays, the Curious History of Invisible Light

By Bob Berman

The universe is made of light. As you read this you are being swarmed by radio waves; step outside and you'll get a dose of ultraviolet and infrared from the sun. *ZAPPED',* written by Bob Berman, tells the story of all the light we cannot see, tracing infrared, microwaves, ultraviolet, X-rays, gamma rays, radio waves and other forms of radiation. This book provides a view of the historic, world-altering discoveries in the 19th century through to their central role as invisible light in our modern way of life.

ZAPPED tells the story of the unseen energies all around us. Bob reveals what microwaves from smartphones do to our brains, how birds use ultraviolet light to track prey, why gamma rays are the most powerful form of light, and much more. *ZAPPED* offers a teasing peek into the future and some of the startling technologies we might yet live to see. With a unique talent for making science relatable and fun, Bob Berman provides a lively, and informative book.

Size 190x198mm, 272 pages
ISBN: 9781 7860 7373 0
Non Members' Price: £9.99
RSGB Members £7.49 (25% OFF)

Bluffer's Guide to Social Media

By: Susie Boniface

This new edition of the Bluffer's Guide to Social Media is as the name suggests an insight into all things social media. This fun guide is packed with interesting information, insights and tips, making it perfect for both pros and those who are new to social media.

Designed so you can instantly acquire all the knowledge you need to pass as an expert in the world of social media. Know what to say, what not to say, what to post, what not to post, and what excuses to make if you don't know the difference between a tweet and a dweet, or even a retweet (which, any tweeple worth their salt will know is always called an RT). Never again confuse a LOL with an ROFL, a selfie with a shelfie, or Godwin's Law with the Streisand Effect. Bask in the admiration of your fellow social media aficionados as you pronounce confidently on the chances of Facebook going the way of Friends Reunited and Bebo, and why MySpace could be the Casio keyboard of the 21st century. Above all don't hold back when it comes to saying what you really think of trolls, pointing out that there has never yet been one who had a healthy mental attitude, a steady job and the requisite intelligence to write anything worth reading.

Written by experts and offering readers the opportunity to pass off appropriated knowledge as their own, the Bluffer's Guides provide hard fact masquerading as frivolous observation in one witty, easy read.

Size: 178x110mm, 128 pages
ISBN: 9781785212291
Non Members' Price: £6.99
RSGB Members' Price: £4.68 (33% OFF)

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

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on orders over £30. See Page 78

RSGB Convention video releases

The RSGB Convention 2018 was a great success with over 600 visitors attending. We video many of the lectures and then release them throughout the year, first to Members via the RSGB website, then, later, publicly on YouTube to help advertise the Convention and to generate wider interest in amateur radio. We have started by releasing four important videos, including two straight to YouTube to get things moving.

- The Convention video of Tim Duffy, K3LR, giving his keynote speech *The K3LR Super Station* is now on YouTube. Tim is amongst the leaders, if not *the* leader, in the contesting field. He talks about his contest station and, as he puts it, 'keeping ham radio fun and alive'.
- Don Beattie's talk *So what has the IARU ever done for us?* is now live on YouTube too. Don Beattie, G3BJ, President of IARU Region 1 describes what the IARU is doing, the changing challenges of representing amateur radio globally, and what the world would be like without IARU.

On the Members' part of the RSGB website you will find *FT8 Performance Secrets* by Neil Smith, G4DBN and *Microwave Engineering – From Death Rays to Dinner*, by William Eustace, MOWJE. You will find all of our videos at www.rsgb.org/videos/ – follow the links to RSGB Convention lectures and then 2018 for the latest ones. More to come!.

NRC news

The RSGB's National Radio Centre (NRC) at Bletchley Park (BP) is now open seven days a week, with the experimental Tuesday opening becoming permanent. As always, they need more volunteers to help ensure that they are fully staffed, so if you know someone who might join the team, do please email Martyn.Baker@rsgb.org.uk

Visitor numbers continue to be strong, especially in the school half term week when it was particularly busy. The NRC recently welcomed two pre-booked groups: a party from the Blind Veterans Association and a contingent of Air Cadets from Gloucestershire, who were specifically interested to come to the National Radio Centre. NRC volunteer Mervyn did a great job engaging them.

Recent visitor Tom Howie is an RSS veteran (see photo) who worked at Arkley View, Barnet (for MI5/6) and was also stationed in Cairo for the RSS. The volunteers were privileged to be able to talk with him, during which he was able to confirm to procedures for handling the VI log sheets, that the volunteers readily tell to NRC visitors, and the importance of the VI contribution to BP. RSGB Members can download a free admission voucher to Bletchley Park from the RSGB website at www.rsgb.org/bpvoucher

John, G3WFM, Silent Key

John Crabbe, G3WFM, passed away in the early hours of 18 October 2018 at the age of 87, after having been unwell for some time.

For many years John volunteered for the RSGB at Potters Bar, working as archivist/historian, RSGB National Amateur Radio Museum curator, and manager of the RSGB shack. A very active amateur in his own right too, right to the end, he had diverse interests ranging from HF DX up to satellites, microwaves and amateur television.

In 2008 John was awarded the prestigious Founders' Trophy for his many years' distinguished service to the RSGB (see *RadCom* June 2008, page 7). His other interests included dancing, jazz music and steam trains; he also had an extensive model railway layout in his loft. Our thoughts are with his family and friends.

Congratulations

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

70 Years

Derby & District ARS	G2DJ
Mr R Staniforth	G3EGV
Mr J D Forward	G3HTA
Mr I M Waters	G3KKD

60 Years

Mr R W Emery	G3FYX
Mr D Blake	G2FT
Mr C K Richardson	G3NAE
Dr J E Larson	G3NBL
Mr M S Box	G3RZG

50 Years

Swindon & District ARC	G8SRC
Mr J Wresdell	G3XYF
Mr I Wilson	G3YUZ
Mr J D Garner	G3ZJG
Mr J F Greenwood	G3ZJY
Mr J Reed	G3ZMD
Mr P W Brown	G4AJE
Mr M Richards	GW4APF
Mr D G Hobro	G4IDF
Mr R B Geddes	G8GGI
Mr R B Kerr	GM4FDT
Mr D S Jones	GW3XYW
Mr T H Clark	K4SHY

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 P Norman, 2E0BJP
Mr E Scott, 2E0EVM
Mr M Jenkins, 2E0EYB
Mr R Johnston, 2E0IJJ
Mr A McDonald, 2E0LDG
Mrs L Johnston, 2E0LIN
Mr A Eid, A92FF
Mr P Mialon, F1EMX
Mr R Alders, G0CCK
Mr S B Venner, G0TAN
Mr C Abrey, G3RZY
Mr P Sharpen, G3XXG
Mr R Johnston, G3YEK
Mr D OKeeffe-Pemberton, G6HZJ
Mr S Hayter, G6RAQ
Mr A Pilkington, G6YGC
Mr A Bates, G7FTP
Mr M Jones, G7UQN
Mr M W Keeping, G8AVZ
Mr M Jennings, G8EJN
M M Hearne, G8FBA
Mr N Humphreys, G8SEW
Mr A Ferguson, GM6UFJ
Mr H Richards, GW4DWN
Mr D Buhrman, KODSP
Mr E Seacord, K2AVP
Mr R Rischpater, KF6GPE
Mr S Holmes, M0HYY
Dr B Witvliet, M0IJQ
Central England Contest Group, M0IOX
Mr A Rawlinson, M0ZJQ
Mr T Broom, M6IEH
Mr A Browning, M6JYF
Mr S Goodwin, M6KGY
Ms E Troupe, M6MXT
Mr J Blackwell, M6NMS
Dr M Sayed, M6OUF
Mr M Kincaid, M6PLQ
Mr M Thompson, M6PPU
Mr I Chilton, M6UYT
Mr P Mircea, M6VSS
Mr M Daniels, M6WLZ
Miss S Burdis, M6WZB
Mr D King, M6YZR
Ms C Pischke, M7CAR
Mr D Ward, M7DVP
Mr G Sangwell, M7GLS
Mr C Sharp, MM6XCS
Mr P Green, MW0RJG
Mr E Maher, MW6PQU
Mr K Hasenbank, N0IZE
Mr M Brodeur, N2NSL
Mr D Pearl, N2SLO
Mr G Kelley, N9FQF
Mr E D Christensen, OZ1EHJ
Dr F Archangelo, PY2ZX
Mr K Campbell, RS308893
Mr T Jones, RS313867
Mr M Sprague, RS317020
Mr I Harbert, RS317286
Mr S Gibson, RS319315
Mr I Gould, RS319410
Mr K Polston, RS319747
Mr T Cottington, RS319774
Mr J Baines, RS319784
Mr G Goddard, RS319801
Mr R Hewitt, RS319814
Mr S Kent, RS319815
Mr J Thompson, RS319816
Invicta Contest Group, RS319824
Mr J Cox, RS319834
Mr T Campbell, RS319835
Mr J Howarth, RS319875
Mr E Mansfield, RS319876
Mr D Blanchard, RS319889
Mr A Selwood, RS319893
Mr J Townsend, RS319909
Mr P Goodier, RS319921
Mr R Wood, RS319976
Mr M Morgan, RS319987
Mr P Walmsley, RS320001
Mr K B Tang, RS320005
Mr G Clarke, RS320014
Mrs C Campbell, RS320030
Mr M Campbell, RS320031
Mr J Daniels, RS320032
Mr D O'Mahoney, RS320074
Mr P Harclerode, RS320123
Mr L Williams, RS320125
Mr A C Kwok, VR2ZVD
Mr W Heilsnis, WB2VSJ
Mr J Eichorn, WD1P

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

Mr A Teed, 2E0LWT
Mr G Stephens, 2E0ONC
Mr D Meehan, EI2EMB
Mr K Danks, G0DBI
Mr P A Griffin, G0DJF
Mr D J Harding, G0DJH
Mr T D Opie, G0FHW
Mr P J Copeland, G0FJS
Mr A B Beard, G0GJR
Mr P Trigwell, G0VRR
Mr S D Glazzard, G1XYO
Mr K A Butcher, G4NLO
Mr L R Odell, G4ROC
Mr G Starkey, G4ZBF
West Tyrone ARC, GN4OMA
Mr A Evans, GW4HDR
Mr G R Jones, GW4UCK
Mr J Jesson, KC2VGL
Mr J E Brooks, M0HJO
Mr I Johnson, M0OCM
Mr P J Tomlinson, M0PJT
Mr A Vitiello, M0SPV
Mr R J Moles, M0UVA
Mr I Leather, M1ICL
Mr I McMahon, M3WUN
Mr R Read, M3YAR
Mr W Millar, MI0NUM
Mr B Thomson, MM0GTX
Mr B P Lionel, MW0BUD
Mr R Hammond, MW5EPA
Mr A Mackay, RS197261
Mr D Swanger, RS312332
Mr R Turpin, WA4KCN

Upcoming DXpeditions

The Holy Land DX group (4Z5FI, 4Z4KX, 4Z4AK, 4Z5LA, 4X6HP, 4Z5IW, 4X6YA, 4X4DZ and 4X1VF) will operate from the heart of Masada fortress between 4 and 6 January 2019. They will use 4X0M. Starting at 0730UTC on the 4th and ending at 0600UTC on the 6th, they will run two stations on the 10 to 80m bands using CW and SSB. The QSL manager is Antonello, IK2DUW.

Ronald, PA3EWP, Martin, PA4WM and Tom, GM4FDM are participating in a DXpedition to Tonga in November. They will leave Europe on 13 November and will leave Tonga on 27 November. The callsign to look out for is A35EU. They intend to operate from the Heilala Lodge Resort, which is at the north end of the main island. They hope to operate three stations and use vertical antennas including VDAs. They will be attempting operations on 160 and 80m using inverted L type antennas. CW/SSB and RTTY into Europe will be the main priority. They will use Elecraft K3s along with amplifiers and have already constructed 2-element VDAs for 30 20 and 17m with verticals for 15,12 and 10m. 40 and 80m vertical raised and tuned radials, 160m will be Inverted L. QSL direct using OQRS Clublog, Logbook of The World and the bureau to Tom, GM4FDM, whose details are on QRZ.com. See http://tonga.lldxt.eu for further information.

Taking Education to the Stars

Dave Honess, M6DNT writes on pages 84/85 of the popular Raspberry Pi magazine *MagPi*, issue 75, about 'Taking Education to the Stars'. He covers Astro Pi, Tim Peake KG5BVI / GB1SS and, of course, ARISS – Amateur Radio on the International Space Station – whose amateur radio educational work has reached tens of thousands of young people world-wide. You can download a free PDF of the magazine at www.raspberrypi.org/magpi-issues/MagPi75.pdf

National Hamfest

The LAMCO team had a great time at this year's National Hamfest. Thanks to everyone who showed their face at their stand. They hope to see you all again next year, so put the dates in your diary – 27 & 28 September 2019.

Summits on the Air (SOTA)

David Stansfield, GOEVV, from Morpeth, has reached SOTA Mountain Goat status after six years of participating as an activator. His first SOTA activation, in May 2012, was on Place Fell G/LD-027 in the Lake District, while his 1000th point (to achieve Mountain Goat) came on Ben Macdui, GM/ES-001, in the Cairngorms, on 11 September 2018. Congratulations to David, who looks set to continue activating extensively in Scotland and Northern England. For more information about the Summits on the Air programme, please visit the website at www.sota.org.uk

Birthday celebrations

Kevin Ayriss, G8MXV recently celebrated his 60th birthday. His wife organised for a birthday cake that was a little bit unusual – but entirely appropriate for a radio amateur.

National Hamfest Winners

At the 10th anniversary National Hamfest, Icom UK kindly donated a 'station-in-a-box' for the raffle. The winner of the Icom IC 7300 was Grant Cratchley, G4ILI. From left to right are Graham Boor, G8NWC from the National Hamfest organizing committee, Grant, G4ILI, Sam Taylor-Nobbs from Icom UK and Chris Danby, *RadCom* Advertising Manager.

Yaesu UK also kindly donated a 'station-in-a-box' at the National Hamfest and their prize caught up with the winner later. He was W Jones, MOYAV from Hereford, seen here with his prize including the Yaesu FT-991A and everything else needed to put a complete station together.

Special event stations

Grey Point Fort ARS will be on the air with the permanent Special Event Station callsign **GB0GPF**. During 28 days of operation they will be commemorating the 100 year anniversary of the end of World War 1. They will be using all modes on the HF, VHF, UHF bands including D-Star and DMR. More information can be obtained on QRZ.com. QSL cards and a special certificate will be sent by email for confirmation of two way contacts.

Santa's Radio Club will be active from 1 to 8 December from the Artic Circle as OH9S. Activity will be mainly on 80m-6m on all modes also including the popular FT8 digimode. For additional information see https://oh9s.fi and https://fb.me/oh9santa

Next steps on the road to WRC19

IARU volunteers have been working for three years to progress Agenda Item 1.1 for the World Radio Conference 2019. This agenda item seeks a Region 1 allocation around 50MHz for the Amateur Service in the Radio Regulations Table of Frequency Allocations, to align with the allocations in Regions 2 and 3.

Extensive work has been undertaken in the African Telecommunications Union, CEPT, Arab Spectrum Management Group, RCC and of course ITU to gain support for such an allocation rather than the current country-by-country allocations under Article 4.4 of the Regulations. IARU has represented the global voice of amateur radio in these meetings, arguing that new applications in amateur radio require significant bandwidth at 50MHz and has set out a proposed utilisation of the band that supports its claim. IARU has also engaged in extensive work on sharing studies using propagation models recognised by ITU and CEPT.

After many weeks of planning and meetings in both regional and global forums post WRC-15, the next step on the route to WRC-19 took place recently, where CEPT project team PTD considered its position on this agenda item in preparation for the CEPT Conference Preparatory Group meeting in November and the ITU CPM in February 2019. The work during this meeting was enhanced by the presence of EURAO, which cooperated with IARU to seek the best possible outcome for the amateur service on this WRC-19 agenda item. The Amateur Service has met strong opposition from a few nation states who argue that the 50MHz band is already allocated to other services in their countries (following the closure of many broadcasting stations in recent years which operated in this band) and believe that sharing the band presents problems.

At this meeting two options were prepared. The first, preferred by the majority of CEPT administrations actively participating in discussions, proposes a 2MHz secondary allocation for inclusion in Article 5 of the ITU Radio Regulations. The second option, which is the result of a major compromise brokered by the amateur movement following the last PTD meeting and is preferred by EURAO and IARU, would see a 500kHz primary allocation from 50.0 – 50.5MHz and a secondary allocation from 50.5 – 52.0MHz. Either option would improve the current 50MHz international mechanisms that permit amateur operation on a non-interference, non-protected basis. These options will be further considered at the next PTD meeting.

It is hoped that the co-operation between IARU and EURAO will continue in future CEPT activities, which are relevant to amateur radio.

Get on air and make some noise

"Get on air and make some noise" is a phrase often used to encourage amateurs to be active on the air and use the bands that are available to us. One thing that's often glossed over is how to actually *make* that noise. It can be scary to make that first contact. In his podcast, Onno, VK6FLAB discusses making your first contact and has lots of advice to offer. To listen to the podcast, visit http://podcasts.itmaze.com.au/foundations/ and scroll to the bottom for the latest episode.

CDXC presentation

Don, G3XTT travelled to the Clipperton DX Club meeting at Troyes in France to present a plaque from the Chiltern DX Club congratulating CDXC France on their 40th anniversary.

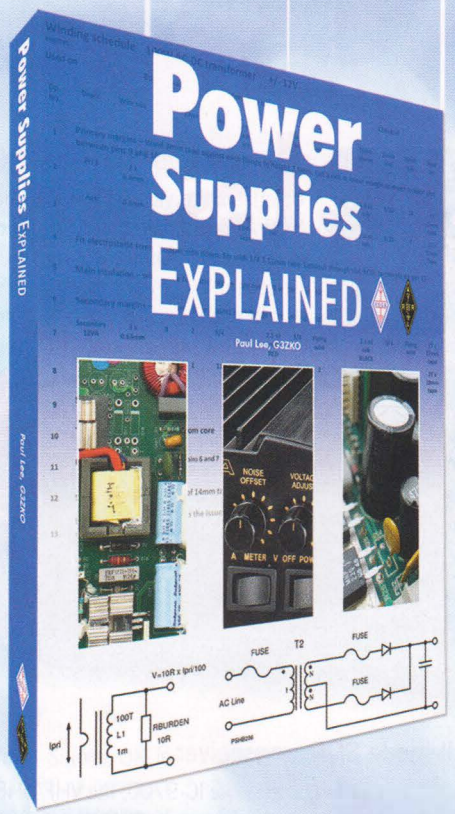
ML&S Hog Roast date

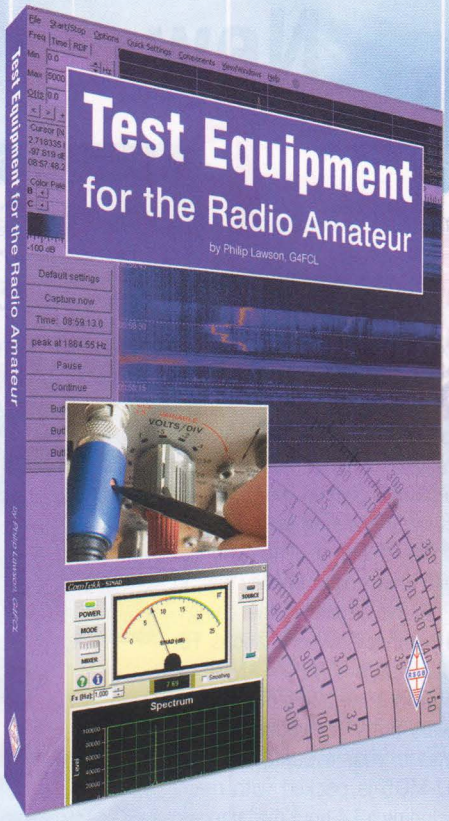
The ML&S Annual Hog Roast & Open Day will be on Saturday 1 December. Sponsored by Yaesu, Icom & Kenwood, the store will have its usual extra-low prices, lecture streams and manufacturers on site. Bacon butties for the early birds and a succulent pig in a bun for lunch! Doors open 8am and close at 4pm. For more details, see hamradio.co.uk/hogroast

News in Brief

The Caboolture Radio Club reports the start of operation of a new beacon station on the 2200m band. The Australian Communications and Media Authority has granted permission for continuous operation of a beacon on 137.444kHz using the callsign VK4RBC at QG62lw using WSPR2 (6HOOF1D) plus CW ident. Power is 1W EIRP into a 500m long wire, 40m max height. In the gaps between transmission, the station will report all WSPR decodes to WSPRnet.org

The Minister of Economic Development approved, with a Decree on 5 October, an update to the Italian National Frequency Distribution Plan between 0 and 3GHz. Within this plan, the frequency band 5351.5 - 5366.5kHz is also attributed to the amateur radio service with the status of a secondary service. The stations of the amateur radio service using the 5351.5 - 5366.5kHz frequency band must not exceed the maximum equivalent isotropic power of 15W EIRP (WRC-15). In the absence of an express indication of any different sign, the Decree will enter into force 15 days after publication. The Italian national society's website says the decree was published on 19 October, so 15 days from then is 3 November, so Italian actrivity on 60m should be well under way by the time you read this!





NEW TITLES

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
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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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New Products

New Alinco DMR/analogue handheld

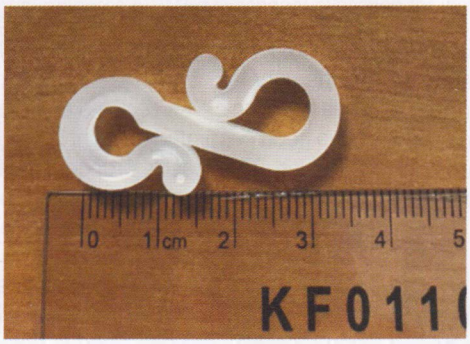
The new Alinco dual band digital/analogue handheld is available with or without GPS capability. It is a feature packed transceiver in a super compact body covering both 2m and 70cm with up to 5W RF output. The handheld has a large, easy to read, colour display that, in the GPS version, shows amongst other things, co-ordinates and distance between stations. For crystal clear audio it utilises DVSI's AMBE+2 vocoder with a powerful 1W audio output. The receiver also covers the VHF broadcast band with 100 memories for your favourite broadcast stations. The DJ-MD5 is packed with many other features including a 14 hour digital record capability. It sells for £139.95 (non-GPS) and £149.95 (GPS version). The unit is available from UK Importers Nevada Radio and all UK Alinco dealers. www.nevadaradio.co.uk

IC-9700 VHF and Up all-mode SDR transceiver

Icom Inc has released more details about the launch of the IC-9700, the VHF/UHF/23cm all-mode SDR transceiver. Icom plans to release this high-performance SDR transceiver early next year and it should be available for sale in the UK in February 2019, with a suggested retail price of £1795.95 inc. VAT. Please note that this target price and UK availability may be subject to change. You can contact your Icom amateur radio dealer who will be able to put you in their order books. Some of the planned features for the IC-9700 include

- All mode, tri-band transceiver covering 144MHz, 430MHz as well as 1.2GHz
- Supports CW/AM/SSB/FM/RTTY and D-Star digital voice and digital data modes
- 144MHz and 430MHz band is direct sampling. The 1.2GHz uses down conversions as well.
- PA will provide a powerful 100W (144MHz), 75W (430MHz) and 10W (1200MHz) output
- Smooth satellite operation with normal/reverse tracking and 99 satellite channels
- CW full break-in

www.icomuk.co.uk

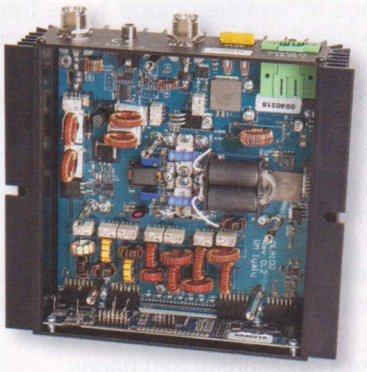


Gutter clips for stealth wire antennas

Many radio amateurs face restrictions when they want to install HF antennas at home. Often the best solution is a wire antenna installed around the plastic rain gutter of a house. SOTABEAMS now stocks some handy hooks that can be used to clip a wire round guttering. A pack of 36 clips is priced at £1.50. www.sotabeams.co.uk

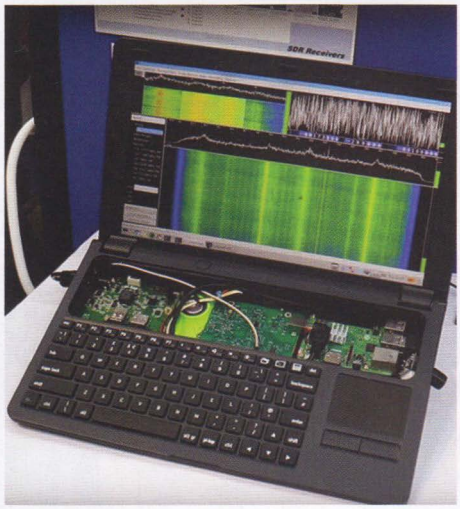
Two new linears

RM Italy (www.rmitaly.com) has two new linears, the MLA100 12V HF and 6m 100W linear amplifier and the BLA600 a 500W AC HF and 6m linear power amplifier. The MLA100 is a compact wideband HF and 6m linear amplifier capable of 100W HF (80W 6m) output from 5W input drive, suitable for any of today's QRP transceivers. It features automatic / manual band selection, rapid switching between receive and transmit by PIN diode RF switching, making it suitable for all modes of narrow band modulation and QSK operation. Both output power and antenna VSWR are displayed on the front panel by dual LED bar graph displays. The amplifier is fully protected against excessive temperature, antenna VSWR and input overdrive. It utilises a pair of Mitsubishi RD100 MOSFET transistors. Weight: 1.5kg. Dimensions: 190mm x 185mm x 80mm. Available with or without the heatsink cooling fan.



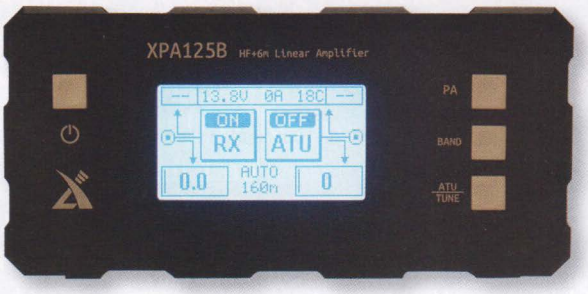
The BLA600 is a fully automatic compact AC (selectable 100, 115, 230 and 240V AC), wideband HF and 6m linear amplifier capable of 500W+ output. It features fast PIN diode RF switching has a user selectable mode for CW QSK operation. It has a 2x16 character liquid crystal display, separate LED displays for output power and antenna VSWR. Input drive is from 1 to 40W. It has 3 user configurable antenna outputs. Dual large diameter MCU-controlled variable speed cooling fans for quiet operation. It has a quiet 1200W linear power supply with an active bridge rectifier for greater efficiency. It utilises the NXP MRFE6VP5600 50V MOSFET. Weight 21.5kg. Dimensions: 430mm x 142mm x 324mm.

All-in-one SDR receiver laptop



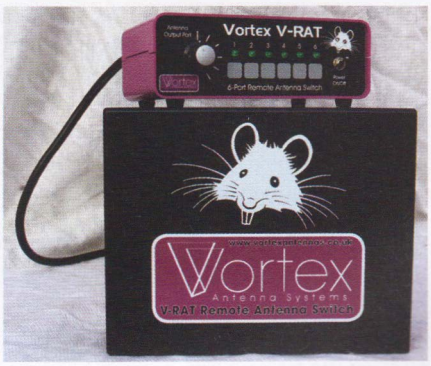
At the RSGB Convention, SDRplay demonstrated how easy it is to put their wideband RSP1A SDR receiver into a Pi-top computer. The Pi-top is (quoting from Pi-top website www.pi-top.com) "a modular laptop that gives you the tools to complete amazing DIY projects and bring your inventions to life. It's the perfect tool to help you learn to code, create awesome devices, and take your knowledge to the next level". The objective was to create a highly portable and self-contained Raspberry Pi/Linux platform capable of exploring the radio spectrum and new radio architectures. The latter is possible due to the recent availability of GNU Radio source blocks created by Frank Werner-Krippendorf, HB9FXQ. For more on this, visit www.sdrplay.com

100W HF linear



Now available from Sinotel UK is Xiegu's new XPA125B, a compact solid state HF and 50MHz linear amplifier delivering up to 100W on the HF bands and 80W on the 6m band. Although ideally suited for use as a companion amplifier for Xiegu's X5105 QRP transceiver, it can be used with transceivers from other manufacturers. The amplifier has a large, backlit, liquid crystal display to display input and output power, SWR, voltage, current, temperature, amplifier status and any warning messages, making operation of this modern amplifier simple and user friendly. The inbuilt ATU and power amplifier stage can be used independently of each other. The ATU can match loads of 14-500Ω from 1.8 to 30MHz and 50 to 54MHz. The amplifier measures 265 x 162 x 80mm (excluding protrusions) and weighs 3.25kg. It requires an external DC power supply delivering between 12 and 15V DC. Maximum current draw is 30A. The XPA125B retails at £449.99 (shipping excluded). Contact Sinotel UK for further details or www.sinotel.co.uk

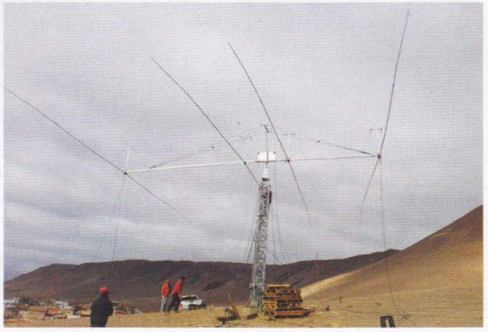
Vortex Remote Antenna Switch



The VRAT (Vortex Remote Antenna Switch) was designed by Steve, GOUIH at Vortex with the RF work by Camtech PCB in Haverhill. It consists of two parts, the indoor Switching Box that would normally be located in the shack and the outdoor/external Relay Box. Both enclosures are professionally manufactured in the UK from 2mm aluminium complete with silk screen graphics and logos. The switch box also includes fully detachable front and rear panels and LEDs showing the output port and the 'Rat's Eyes' on power up. The switch operates 6 ports, covers all HF bands and is an impedance controlled design. To optimise port isolation, two relays per port are used. The bespoke relays are rated at 30A by ganging 2 x 15 amp outputs. Power rating is estimated at around 5kW and at 2kW key-down the relay box never got warm. The VRAT is available with either SO239 (PTFE) sockets as the outputs or 'N-Type' (PTFE) as an option. The VRAT is currently available direct from the Vortex Antennas website and is priced at £380. www.vortexantennas.co.uk

New 40m antenna

Innovantennas recently designed a 40m 4-element Yagi. The finished antenna is shown in the photograph. It was tested by Nick, XQ1KZ from the Antofagasta DX Contest Group location in Chile by beaming to EU and the USA with good reports. The antenna will be used at the CB1H site.



IC-R30 App

After recently being demonstrated at the Tokyo Hamfair, the new RS-R30I (for iOS)/RS-R30A (for Android) remote control software for the IC-R30 Communications Receiver is now available to download for free from the App Store and Google Play. RS-R30I and RS-R30A enable you to wirelessly connect to the IC-R30 and remotely control VFO operation, memory channels, a variety of scans and the voice recording functions. Using the optional VS-3, Bluetooth headset, the VS-3 and iOS™/ Android™ device can be wirelessly connected to the IC-R30 at the same time. You can control the IC-R30 from the connected device while listening to the received audio on the VS-3 optional Bluetooth headset. A brochure about this new software can be downloaded from www.icomuk.co.uk/files/icom/PDF/productLeaflet/RS-R30I_RS-R30A.pdf

New books

Currently, around 300+ Kiwi-SDRs are available at www.sdr.hu and most of these cover the entire HF spectrum. Consequently, monitoring and decoding of professional HF digital data stations is more convenient than ever before. Hundreds of screenshots will be published in the new 2019 editions of the various Klingenfuss books. Published on 10 December will be the 2019/2020 Guide to Utility Radio Stations, the 2019 Shortwave Frequency Guide, the 2019 Super Frequency List on CD and the 2019 Frequency Database for the Perseus LF-HF Software-Defined Receiver. www.klingenfuss.org

Mast Rating System

Telescopic glassfibre masts are a popular option for portable antenna supports. However, as they vary widely in strength and stiffness, it can be hard to compare them. SOTABEAMS has developed a simple metric that allows an objective comparison to be made. The SOTABEAMS Mast Rating System (SBMRS) uses the length and the weight of the mast to calculate a strength figure for a mast. This makes it very easy to compare different products. Details at www.sotabeams.co.uk/blog/strength-rating-system-for-telescopic-fibreglass-masts/

Antennas

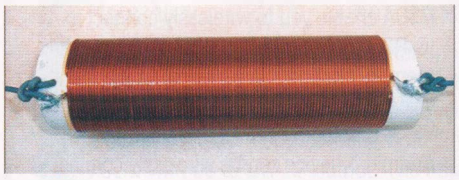


PHOTO 1: Example of a 120μH loading coil used in the G3TKN loaded 80m & 40m dipole.

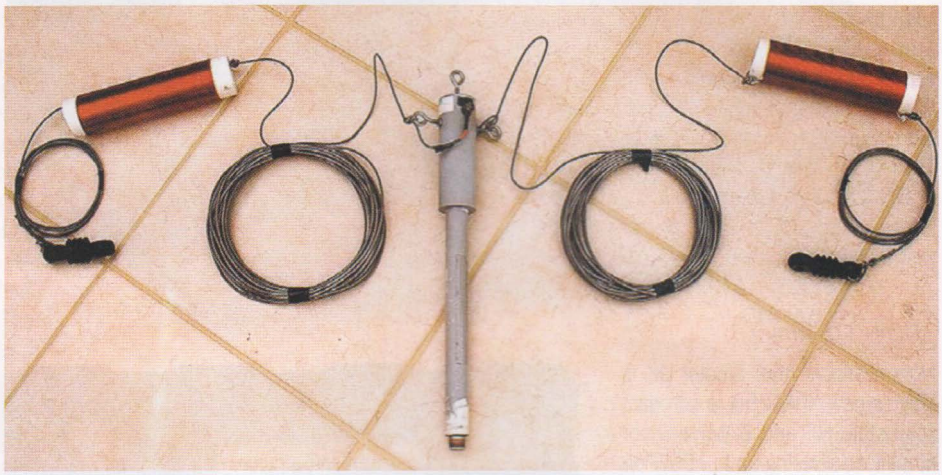


PHOTO 2: G3TKN's 80m & 40m loaded dipole that used a ferromagnetic 1:1 balun.

A dipole is a convenient antenna for getting active on a specific band. However, it is possible to modify a dipole to enable it to resonate on another band providing a two, or even a three, band antenna.

When is a transmission line an antenna, or an antenna a transmission line?

When examining the impedance at the input to an open ended transmission line, this tends to be either a capacitive or inductive reactance depending on the electrical length of the transmission line. When the transmission line's length is not significantly long, the line's resistance tends to become insignificant compared the reactance presented at its input, such that:

$$\text{Input impedance} \simeq -j(Zo\cot\theta)\Omega \quad \text{(eq 1)}$$

where Zo is the characteristic impedance of the transmission line, Θ is the line's electrical length (in degrees) and cot (coangent) is the reciprocal of the tangent. The operator j is used to show that this is a reactive impedance.

When an RF signal is applied to the open ended transmission line, as the electrical length of the line increases towards an electrical quarter wavelength (ie towards λ/4 or Θ = 90°), the reactance is capacitance. However, as the line's length exceeds an electrical λ/4, but is less than an electrical λ/2, the reactance is inductive. This situation then repeats as the line's length is extended.

Similarly, if the transmission line is terminated in a short-circuited load, then the reactance at its input can be found using:

$$\text{Input impedance} \simeq +j(Zo\tan\theta)\Omega \quad \text{(eq 2)}$$

However, the reverse now occurs for the terminated line's reactance and this is inductive up to λ/4 and capacitive above λ/4 to λ/2. The concept of this situation for both open-circuited and short-circuited transmission lines is shown in **Figure 1** [1].

When a span of wire is installed horizontally above the ground, provided the ground below the wire is conductive, then the ground starts to behave as if it were the second conductor of a transmission line formed with the wire-span, such that:

$$Zo \simeq 138\log_{10}\frac{4h}{D}\Omega \quad \text{(eq 3)}$$

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). Interestingly, Zo calculated by this equation does not depend upon the length of the wire-span making it useful as will be shown later. The concept of a wire-span run horizontally above the ground is shown in **Figure 2** where Zo is the impedance as viewed from one end. This equation is a derivative of the transmission line equation, although its derivation is outside the scope of the Antennas column you can find more information at [2].

To summarise, when an RF signal generator is connected to one end of the wire-span and ground, then as the line's length is varied so the impedance seen by the generator tends to be a capacitive or inductive reactance depending upon the wire-span's length.

Note: it is important not to confuse Zo with the impedance seen between two wire-spans forming a dipole where a feeder cable is to be connected (ie the feed point impedance).

A theoretical loaded dipole for the 80m and 40m bands

The length of resonant half wavelength dipole for the 40m band centred on 7.1MHz can be calculated using:

$$\text{Wire-span length} \simeq \frac{150}{7.1}\times 0.95 = 20.07\text{m}$$

where the '0.95' factor allows for the reduced velocity of the wave along the wire-span that occurs from factors including the effect of radiation, the wire's insulation dielectric properties and how the ends of the dipole are terminated [3].

When installed above the ground at a height of around 9 to 10m, with its ends terminated with 'dog-bone' type insulators, the wire-span can be expected to have a feed point impedance of close to 70Ω when operated at 7.1MHz. As a result, this arrangement provides a low SWR and a good match to 50Ω. However, if this antenna was to be operated at 3.65MHz, then the feed point impedance is closer a capacitive reactive impedance of around -j1000Ω, giving a poor match to 50Ω.

To enable the antenna to operate on 3.65MHz, a suitable loading coil and a short length of wire can be added to each end of the wire span as shown in **Figure 3**.

As described in the July 2018 Antennas column, the effect of the loading coils and

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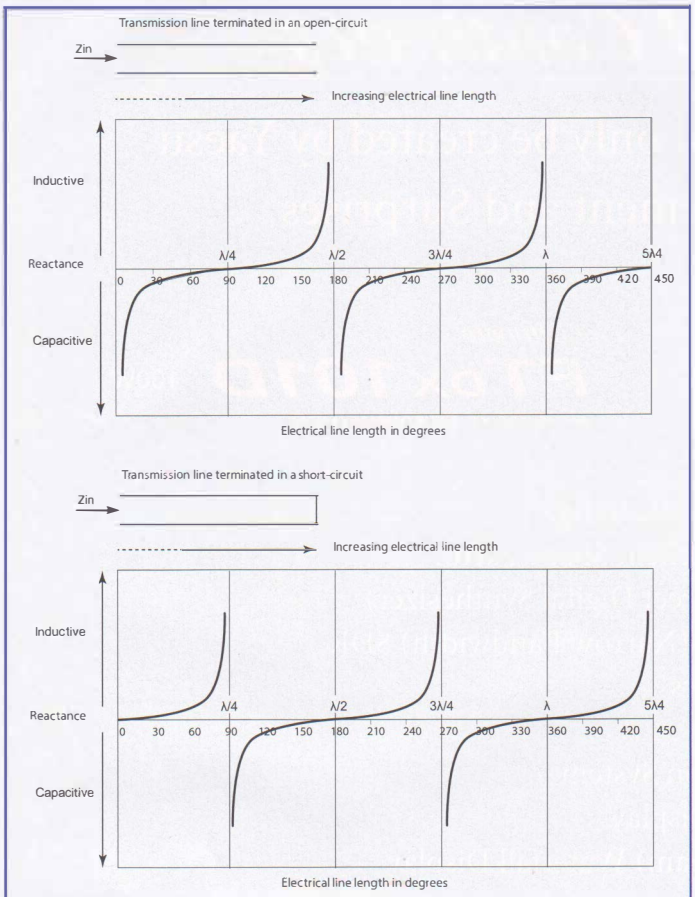

FIGURE 1: Concept how the reactive impedance (Zin) seen at the input to a transmission line changes with its electrical length.

the additional short wires (EW) is to tune the antenna to a desired lower frequency.

Assuming sufficient space is available, then an inner wire-span of 20.07m could be extended using two wires of 2.2m in length each. This gives an overall length of the antenna of close to 24.5m, however this is smaller than a λ/2 resonant dipole centred on 3.65MHz whose length is closer to 39m.

With the 20.07m long wire-span of diameter 1.6mm that is installed at 10m above the ground, and well clear of any close objects or structures, the impedance of each leg of the wire-span can be found using equation 3:

$$Zo \simeq 138 \log_{10} \frac{4 \times 10,000}{1.6} \simeq 607\Omega$$

To determinate the impedance at Point A in Figure 3 at 3.65MHz, this requires the value of Θ (ie electrical length of the wire-leg) to be determined as follows:

At 3.65MHz, a 'free-space' quarter wavelength (λ/4) is given by

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

To allow for the velocity of the wave along the wire, a correction factor of 1.05 has been used.

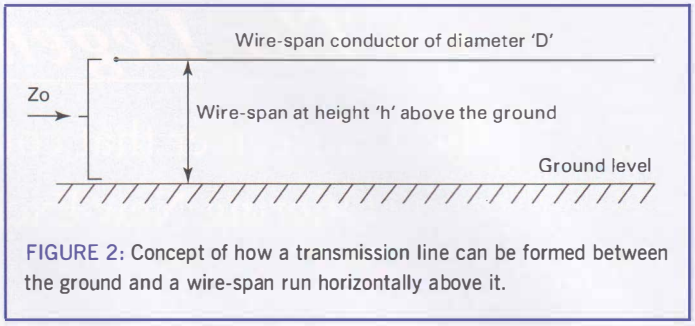

FIGURE 2: Concept of how a transmission line can be formed between the ground and a wire-span run horizontally above it.

Therefore to find Θ, for an extension wire of 2.2m in length, this is given by

$$\left(\frac{2.2\text{m} \times 1.05}{20.55\text{m}}\right) \times 90^{\circ} = 10.117^{\circ}$$

The reactance seen at Point A is given using equation 1:

$$\text{Extention wire impedance} \simeq -j\left(607 \times \cot 10.117\right) \simeq -j3402\Omega$$

(Note: this is a capacitive reactance.)

Next, it is necessary to determine the impedance at Point B in Figure 3 (ie for each leg of the 40m dipole). Each dipole leg is not an open-circuit because the end is terminated by an inductor followed by the extension wire. Consequently, at 3.65MHz, the impedance at Point B in Figure 3 can be determined using equation 2 [4]:

Here Θ is now given by

$$\frac{10.035\text{m} \times 1.05}{20.55\text{m}} \times 90^{\circ} = 46.146^{\circ}$$

$$\text{Dipole leg impedance} \simeq +j\left(607 \tan 46.146\right) \simeq +j631\Omega$$

(Note: this is an inductive reactance.)

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

$$X_L \simeq -1\left(+j631 + \left(-j3402\right)\right) \simeq +j2771\Omega$$

(Note: this equation gives an inductive reactive. This inductive reactance neutralises the overall capacitive reactance to resonate the antenna on 3.65MHz).

An indication of the inductance (L) can then be determined from:

$$L(\text{H}) \simeq \frac{XL}{2\pi f}$$

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

$$L(\text{H}) \simeq \frac{2771}{2\pi \times 3.65\text{MHz}} \simeq 120.8\mu\text{H}$$

Figure 3 summarises the theoretical antenna derived above.

80m and 40m loaded dipole designed by Vince Lear, G3TKN

An example of a loaded 80m and 40m dipole was produced by Vince Lear, G3TKN, and published in *RadCom* several years ago [5] [6]. This antenna was based on a design by W J Lattin, W4JRW, which was published in *QST* [7]. The concept of the antenna is shown in **Figure 4**, where it can be seen that each inner dipole leg has been extended to 10.66m to enable the inner dipole to resonate at 7.1MHz. This effect was also found by W4RJW when he constructed his antenna. (Interestingly, multiplying 10.66m by four gives a value close to the free-space wavelength for the inner dipole.)

The loading coils used for the antenna comprised 104 turns wound onto a 40mm diameter plastic tube of length 178mm, with a coil length of 140mm. An example is shown in **Photo 1**. This arrangement gave an inductance of close to 120μH. G3TKN found that to resonate the antenna on 3.774MHz required each extension wire to be 1.27m long (ie around 930mm shorter than shown in Figure 3). However, the length of each extension wire could be equally adjusted to suit the section of the 80m desired. It is also useful to note that the antenna's bandwidth on the 80m band is about ±30kHz of the desired frequency (ie between SWR points of 2:1).

The antenna's feed point impedance is low and should provide a reasonable match to 50Ω on the selected part of the 80m, 40m and 15m band (where the inner dipole operates as a third harmonic antenna). 50Ω coaxial cable was used as the antenna's feeder, however a 1:1 balun was necessary to minimise the effects from common-mode currents. G3TKN used a commercially available ferromagnetic 1:1 balun, however a 1:1 current choke could be made by winding around 8 turns of the coaxial feeder (eg RG58) around a pair of stacked ferrite rings. However, it is good practice to use an ATU to maximise the performance of the antenna.

This antenna performed reliably when used with RF power levels up to 100W. However, heavier duty 120μH loading coils may need to be constructed if higher power levels were to be run. **Photo 2** shows the completed loaded dipole, which may be used for reference.

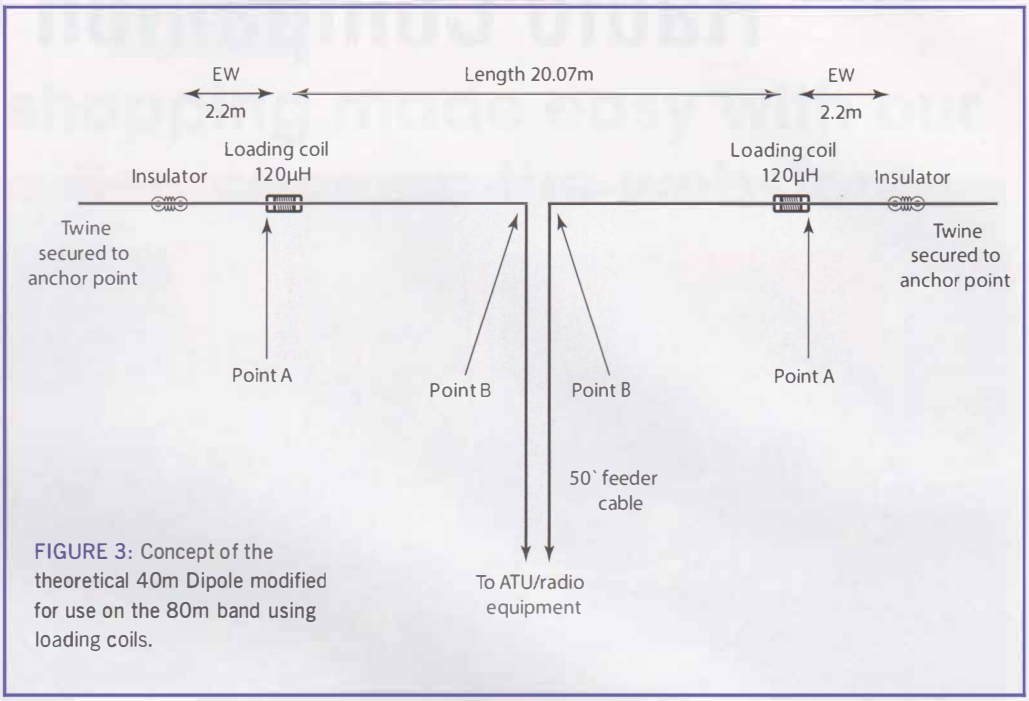

FIGURE 3: Concept of the theoretical 40m Dipole modified for use on the 80m band using loading coils.

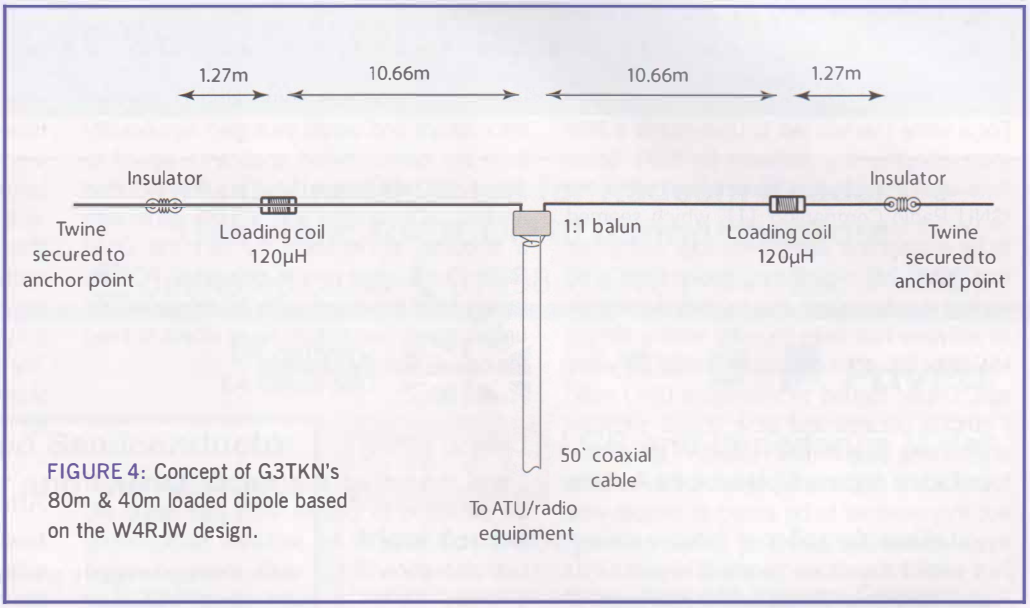

FIGURE 4: Concept of G3TKN's 80m & 40m loaded dipole based on the W4RJW design.

Acknowledgments

Following the July Antennas column, my thanks are passed to John Lenahan, KORW for his help and time with the material forming the basis for this Antennas column. John sent in several *QST* references providing invaluable background to the equations used. Thanks are also passed to Mike Hall, G3USC, for his comments and observations related to loaded antennas.

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[1] 5th edition, Chapter 12, HF Antennas, pages 12.26 to 12.28
[3] 13th edition, edited by Mike Browne, G3DIH, Section 13, Antenna Basics and Construction, Page 13.2
From ARRL *QST*:
[2] October 2003, Designing a Shortened Antenna by Luiz Duarte Lopes, CT1EOJ, Pages 28 to 32
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[5] *RadCom*, October 2004, An 80m and 40m Loaded Dipole by Vince Lear, GTKN, Pages 84 to 86
[6] *HF Antennas for Everyone* edited by Giles Read, G1MFG, Chapter 1, Horizontal Antennas. Pages 73 to 77

GNU Radio Companion Course

Deep concentration during the GNU Radio Companion course!

Introduction

For a while I've wanted to understand a little more about writing software for SDR. Some time ago I discovered something called the 'GNU Radio Companion' [1], which seemed to be a graphical environment for doing just that. Now, my engineering background is in analogue radio design, and my only experience in software has been recently writing simple low-level PIC code and some Pascal 30 years ago. Once I started to investigate GNU radio I quickly became lost in a sea of software engineering jargon that I couldn't get past. I found a few beginners' pages on the internet, but they seemed to be aimed at people who already knew the basics of software design. Not until I found an excellent 4-part GNU Radio Companion Primer on the web pages of Professor Sharlene Katz, from California State University, Northridge [2] did I realise that getting the basics was quite simple.

Using the old adage of "if you want something doing properly, do it yourself" I decided that it would be fun to try and organise an 'absolute beginners' course on the GNU Radio Companion, so that I could learn more about it and help others. A chance meeting with Derek Kozel, KOZEL (now MWOLNA) and Heather Lomond, MOHMO at the RSGB Convention in 2017 kicked off a series of events that led to this course being born.

With the help of RSGB Legacy Committee funding, I organised a 1-day seminar on the Friday before the 2018 RSGB Convention. Although billed as a 'beginners' course we felt it necessary to make sure that participants were those who had some kind of relevant track record and would thus gain significantly from the event. Invited applicants agreed to pay a £60 fee to join it. This fee included an RTL SDR dongle and a USB stick with a bootable environment to run the GNU Radio Companion on the delegates' PC. We rapidly filled the course with 20 delegates and unfortunately had to turn away others to keep the course size manageable.

Course content

I was determined that the course should be attractive to people with just basic PC skills but little or no software background, but also allow those with more advanced Software skills to learn something. The team of three made this easy as Derek is a recognised expert in GNU Radio from his time at Ettus Research and Heather and I have backgrounds in electronic engineering and education. Heather specialises in real time software and my background is in RF hardware. I came up with a syllabus and we decided that we would make it hands-on.

Heather began the course with a quick guide to the Linux environment and the GNU Radio Companion (GRC), which ended up with everybody using GRC to generate a 1kHz tone from their PC sound card and apply filtering to it. I then followed on by covering a little introductory theory behind DSP and Heather continued to take the delegates through adding software instrumentation such as oscilloscopes, spectrum analysers and waterfall displays. The next step was to use the RTL dongle to build a 50MHz SSB receiver and receive a real signal off air. After lunch, Derek demonstrated SDR transmitters using GRC and the delegates built an FM receiver to listen to the signals generated by them. He moved on to more advanced topics such as downloading new signal blocks such as a range of satellite decoders and support for a number of SDR transceivers using GitHub. The day finished with a demonstration by the team from SDRPlay describing GRC support for their receiver range.

Aftermath

Feedback on the course was VERY positive, with a number of delegates asking when the next one would be! The answer to that is "watch this space", as plans are afoot to run the course again in 2019. You'll find further mentions of the course in my own GHz Bands column, plus Andy, G4JNT has a lot of positive words about it in this month's Data.

Websearch

[1] GNU Radio – www.gnuradio.org
[2] GNU Radio Primer part 1 – http://bit.ly/2z3axDq

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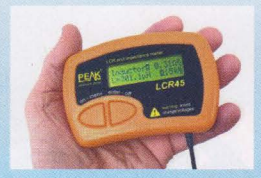

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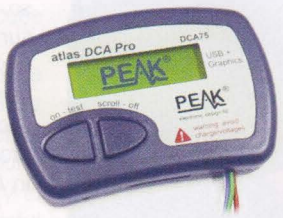

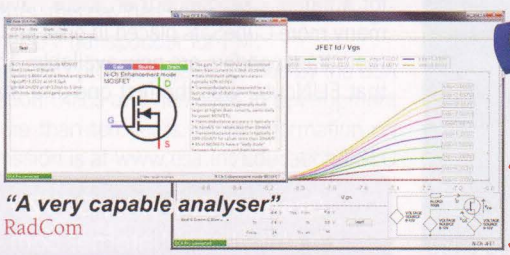

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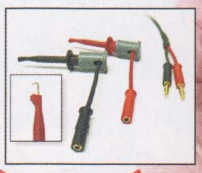

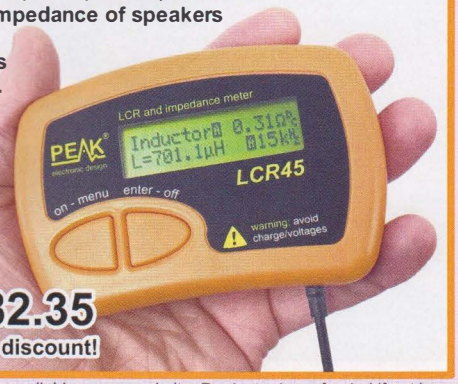

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The FUNcube Project – five years since launch

On 21 November, we were able to celebrate the fact that FUNcube-1 (aka Oscar 73) has been in space for five years.

The FUNcube project commenced not long after the concept of CubeSats (spacecraft as small as 10 x 10 x 10cm and with a mass of around 1kg) had been created, and very soon after an infrastructure and industry to develop and support the launches of such spacecraft had begun.

The initial idea was to produce the simplest possible 1U CubeSat that could be used by schools and colleges for educational STEM outreach (Science, Technology, Engineering and Mathematics) and also by radio amateurs for communications through a transponder. The original working title for the project was actually KISScube – which clearly shows where the work started.

At that time AMSAT-UK had never developed a complete satellite of its own and had never even considered doing so. We were therefore lucky that the development of CubeSats and some bequest funding, through the RCF, enabled the idea to become a reality. We were also fortunate to be able to put together a small team of specialists with skills covering the software and hardware needed both on the ground and in space. Additionally, a close relationship with ISIS – Innovative Solutions In Space BV – enabled us to gain access to cost effective subsystems and structures and also their test facilities when required.

The AMSAT-UK FUNcube MissionPatch.

Launched from an underground silo in Russia on a DNEPR rocket, actually a converted intercontinental ballistic missile (ICBM), the first signals were heard, by ZS1LS in South Africa, at 0737UTC. The data was then automatically uploaded by the FUNcube Dashboard to the Data Warehouse in the cloud, and, as if by magic, the telemetry values appeared within a few seconds, on the screens at the RSGB's National Radio Centre at Bletchley Park.

The AMSAT-UK FUNcube team toasting the successful launch at the RSGB's National Radio Centre.

Since launch more than 1250 stations have provided data to the Warehouse and many schools and colleges have used the signals for demonstrations and all manner of STEM activities – exactly as planned.

The spacecraft has continued to operate nominally since launch and we have experienced fewer than ten unexpected restarts of the microcontroller that is responsible for most of the on-board operations. Generally, we have operated under autonomous control with high power telemetry when the spacecraft is in sunlight and with low power telemetry and transponder on when in eclipse. One of the original constraints that we were very concerned about was the power budget. Less than 2 watts orbit average was all we expected from the sun-synchronous orbit, with 60 minutes in sunlight and 35 minutes in eclipse. In reality, the battery voltage has never dropped below 8.01V so all has been well in that department.

The original illumination level experienced by the spacecraft during each orbit was planned to be about 65 minutes in sunlight and 30 minutes in eclipse. Due to a drift in the orbit, his has now changed and the spacecraft will be experiencing continuous sunlight for the next six months, so our concern is now more about on-board temperatures and how to ensure that the battery is not over charged!

It is believed that the spin rate is affected, to some degree, by the amount of current flowing in the wires between the solar panels and the EPS (electrical power system board) so, whilst the spacecraft is in continuous sunlight the plan is to have extended period of high power telemetry and either lower power telemetry (safe mode) or transponder on. This should show up in the graphs that are kindly produced for us by Colin, VK5HI and his team in Australia.

When FUNcube-1 was launched there were almost no linear transponders available for amateur use. Since then there have been many more CubeSats placed in orbit and many more transponders are now available. The fact that FUNcube was the first one and that it is

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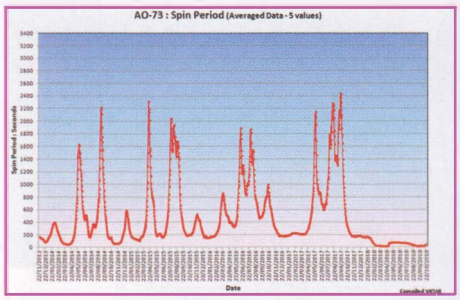


AO-73 Averaged Spin Rate 18th October 2018
The plot that shows the average spin rate of AO-73 on 18 October 2018.

still working gives the team some considerable pleasure.

Since the launch of FUNcube-1, the AMSAT-UK team has also supported the FUNcube-2 payload on UKube-1 for the UK Space Agency. Additionally, another CubeSat called Nayif 1, from the United Arab Emirates, was launched early in 2017 and that also carries a FUNcube payload.

As well as these spacecraft, which are already in orbit, it is expected that two more will be launched later this year. At the time of writing, they are both scheduled to be on the same Space-X launch from Vandenberg in late November 2018.

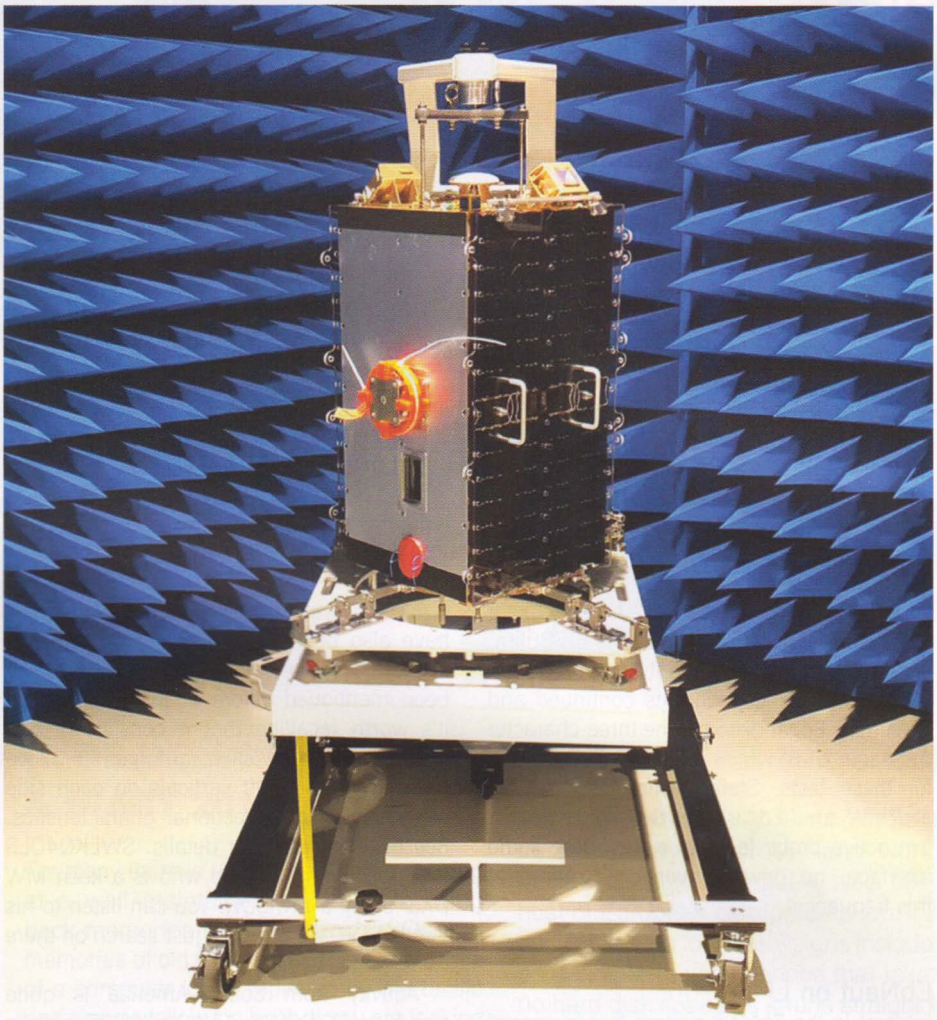
The first is an enhanced FUNcube called JY1Sat. This is being developed by the Crown Prince Foundation in Jordan. The spacecraft has been named in honour of the Crown Prince's grandfather, King Hussein, who operated using his personal amateur radio callsign which was simply JY1.

In addition to the usual suite of FUNcube capabilities it will also be capable of downlinking images in SSDV format. This image format, developed by Phil Heron, MIOVIM, for use in High Altitude Balloons, is now also being used from lunar orbit by AO-94.

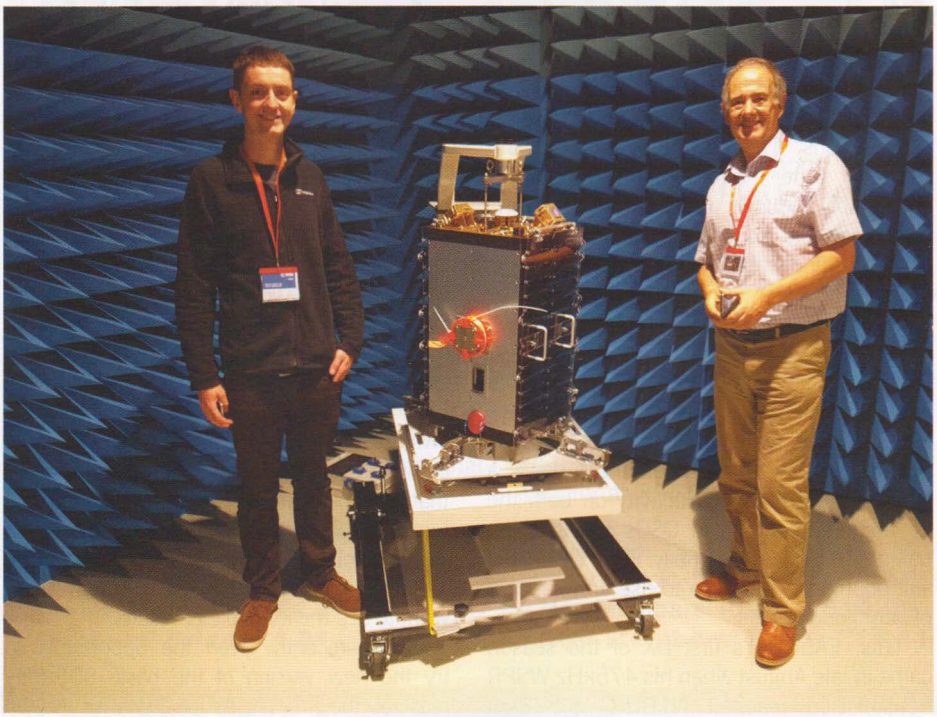
A new Dashboard has been developed for this mission and it will be made available, nearer to the launch date, from the FUNcube website.

AMSAT-UK has also developed a FUNcube payload for the ESEO mission. ESEO is a 50kg class microsat that incorporates experimental payloads from a number of universities around Europe. This will provide similar telemetry to its predecessors but will have a more powerful transmitter and thus be even easier to hear. For amateurs, this payload will also provide a single channel L/V transponder for FM.

The ESEO project is being funded by the ESA Education Office and has been in development for more than ten years. More information on this mission is at www.esa.int/Education/ESEO and up-to date details about FUNcube activities can be found on the FUNcube website, https://funcube.org.uk/



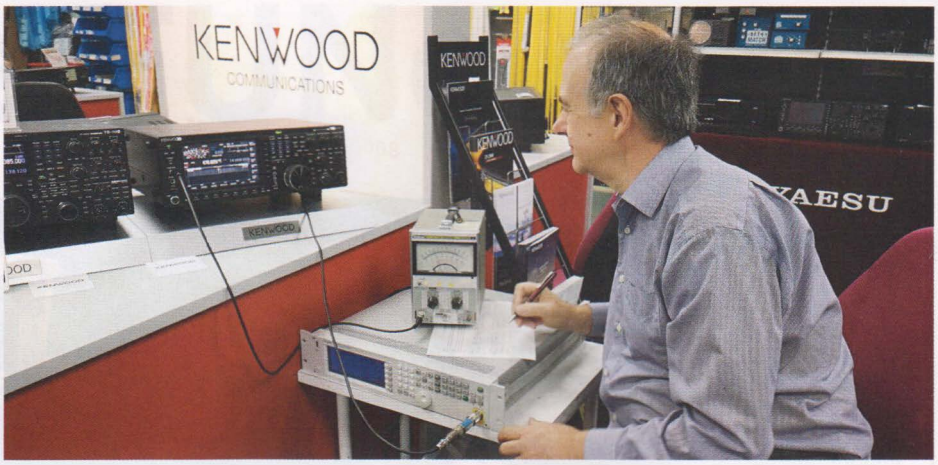
The European Student Earth Orbiter (ESEO) is an ESA educational programme.



David Bowman, GOMRF and Pete Bartram admiring the finished spacecraft in the anecoic chamber at ESA's ESTEC facility in the Netherlands.

LF

All the latest news on the LF bands from receiver tests to DX working.



Tests on the LF capability of some current transceivers at the recent RSGB Convention.

Stefan, DK7FC has obtained permission to carry out experiments on 17.47kHz, not far from SAQ's frequency. His vertical wire antenna is pretty good but still very small compared to the sort of thing that traditional VLF stations such as SAQ might use. After many days of continuous transmission using EbNaut, Edgar in Moonah, Tasmania successfully decoded the two-character message '73'. The distance is 16,786km, an astonishing achievement for an amateur station on VLF. Experiments continued and eventually Edgar decoded the three-character message 'UFB' which was the ultimate goal for these tests. Stefan estimates his ERP at 2mW and Edgar's receive setup was a 1m active probe fed into a Steinberg audio interface, no down-conversion required at this frequency!

EbNaut on LF

Interest in the EbNaut system has increased thanks to such impressive results and a few experimenters in both Europe and the USA have been trying it out on the 136kHz band. Whilst these tests have been taking place, Dominico, IZ7SLZ has been running an EbNaut auto-decoder. At the end of September it decoded K3RWR's 15 character message 'K3RWR_FM18QI_73' on a couple of occasions. The advantage that EbNaut has over other narrow bandwidth modes is probably reduced on 136kHz due to the more unstable conditions, but this proves that it is still capable of excellent results.

DX News

I wouldn't like to give the impression that EbNaut is the only mode in use these days but it is the focus of some experimental interest. In day to day operating there is a huge amount of WSPR activity on both the LF and MF bands and QSOs taking place using JT9 and occasionally FT8. OPERA is still popular, it is simple to use and capable of very good results.

Luis, EA5DOM's first DX of the season came in late August when his 475kHz WSPR transmission reached N1BUG, 5,578km away. Luis runs 80W into a 90m wire on the side of a tower block.

Mal, G3KEV reports that winter conditions are starting to take effect on 472kHz. In one October night his WSPR transmissions were copied by AA1A, N1BUG and W1TAG.

WH2XND near Phoenix, Arizona is regularly spanning the Pacific to VK using WSPR on 136kHz, whilst on 472kHz Roger, VK4YB is being received all over the USA at distances greater than 15,000km. His signals have also been recorded by 'SWLKQ40LS' in northern Norway. Roger's antenna has been mentioned before in this column but it's worth recalling that it consists of two half waves on 472kHz arranged to place the current in 120ft verticals on each side of a hill, giving directional characteristics. See his QRZ page for details. SWLKQ40LS is in fact Bjarne Mjelde who is a keen MW DXer using a KiwiSDR. You can listen to his 'Arctic SDR' via SDR.hu, just search on there for 'arctic'.

Activity from South America is quite rare but LU1DOW's 472kHz WSPR signals reached LA2XPA in late September, a distance of 12,365km. He has also been received by WA2ZKD and N3FL on the east coast of the USA at over 8,000km. In Uruguay, CX4DI tells me that CX2DDP/B has been testing a 500W beacon on 473kHz. At the time of writing the signal has been copied in Brazil by PY3CRX.

Receiver tests

For a presentation at the RSGB Convention, David, G0MRF gained permission from Martin Lynch to test the LF receive capability of some current transceivers. In general he found that most sets work quite well on 472kHz but get a little worse on 136kHz. Many radios have an attenuator which is automatically switched in below 1,600kHz, this obviously compromises the LF performance. I know that Kenwood radios usually have an internal jumper to bypass this if desired. A PDF of the presentation is available on my website at wireless.org.uk and on G0MRF.com if you want to see the full table of results.

I was recently given the opportunity to try the new version of the basic SDR-Play receiver, the RSP1A. As an owner of the old RSP1 I was interested to see how the two compared in LF and MF use.

I live 12 miles from the high-power transmitters at Droitwich and in the major lobe of the medium wave antenna. The combination of 198, 693, 1053 and 1215kHz at high level gives any receiver a hard time. I can't even use an IC-7300 on 160m without installing a high-pass filter! My LF and MF receivers have band-pass filters in front in order to make them useable, but just out of interest I decided to try the RSPs on a 100ft untuned wire antenna to see how they coped. This is the situation that many casual users may be in when they first try receiving on LF.

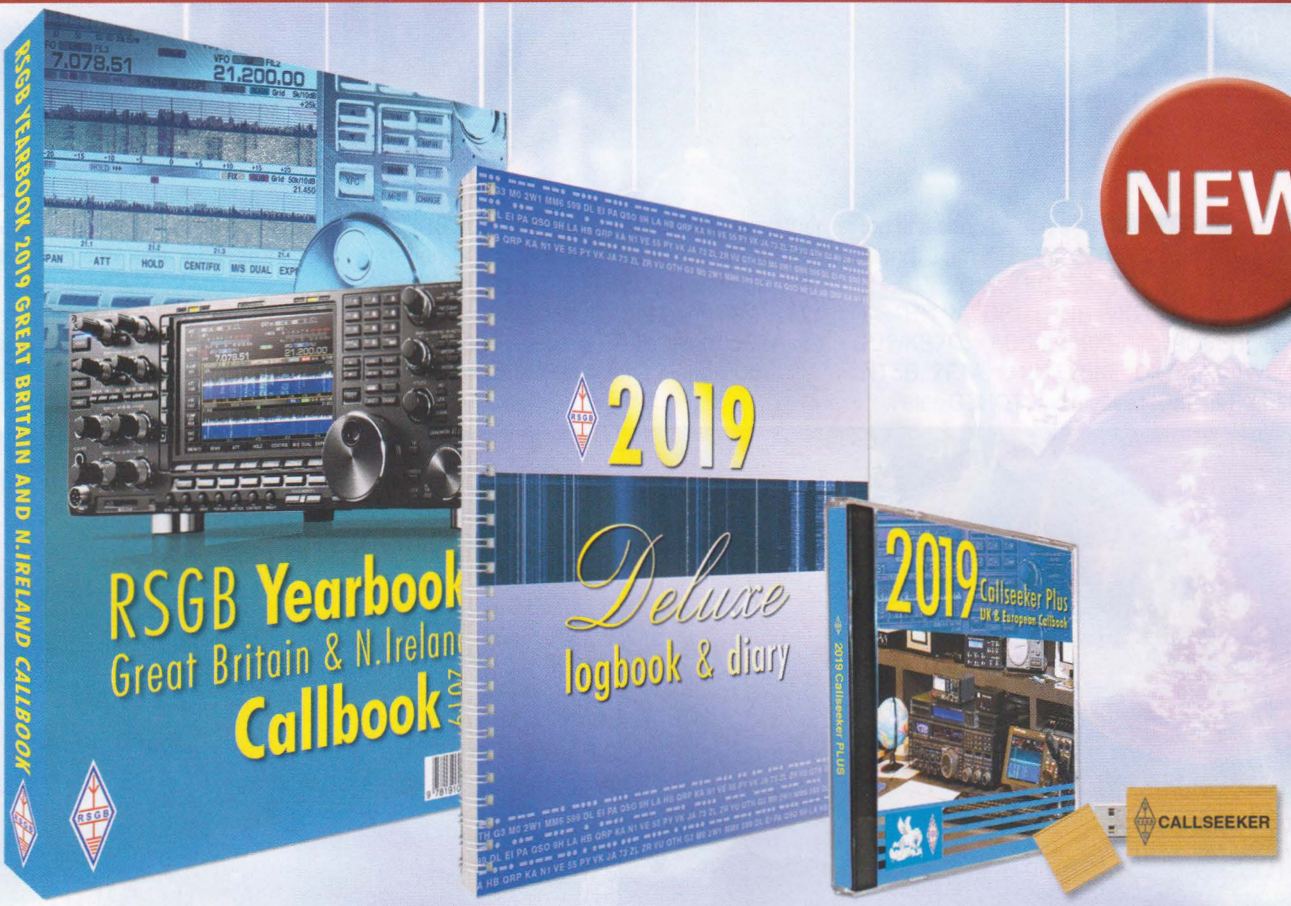
I used the SDRuno software recommended by the manufacturers and tried listening to two known signals: the German data transmission on 138.8kHz and Birmingham airport's NDB on 406kHz, both of which should be '5 & 9' on a properly set up LF receiver. The RSP1 managed to receive 138.8 at 25dB above noise in a 2.2kHz bandwidth whereas the new RSP1A managed 35dB with the MW band-stop filter in use, a very worthwhile improvement. Tuning to 406kHz I noticed a similar improvement on the new RSP: the old receiver gave 22dB above noise and the new one managed about 30dB, again with the MW filter in use. A 6dB improvement over the RSP1 was also seen at 60kHz when I checked the MSF time broadcast from Anthorn.

The key to the improved performance at my QTH is definitely the new MW notch filter, which has more than 30dB attenuation between 660kHz and 1,560kHz. The RSP1A also has FM band 2 and DAB notch filters.

Whilst experimenting with SDRuno I tried starting a second 'VRX' (virtual receiver) and found that I could monitor both the 136 and 472kHz bands simultaneously by routing one VRX to the left channel of my sound card and the other to the right. This may be a way to implement a dual band grabber if ever my SoftRock receivers fail!

The RSP1A is available from various outlets, including SDRplay themselves, for about £90. Thanks to SDRPlay for the loan of the RSP1A.

Dave Pick, G3YXM
daveyxm@gmail.com



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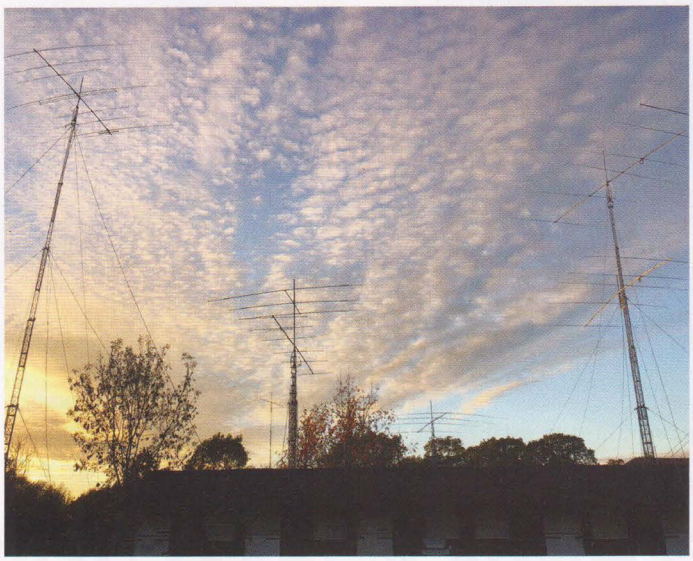

Some of the antennas at the M6T contest station in Suffolk. Photo courtesy M0SDV.

Some of the antennas at VK9XG. Photo courtesy G3TXF.

Despite a zero sunspot count for much of October and a Solar Flux Index around 70 (as low as it gets) there was some remarkable DX propagation on the higher bands.

Two simultaneous DXpeditions were on the air providing a lot of excitement. VK9XG, by the 6Gs, was active from Christmas Island at a range of 7,500 miles and a bearing just north of east. VP6D was active from Ducie Island at a slightly greater range of 9,000 miles and a bearing just north of west. Adjusting for time differences you might expect similar propagation to both islands and so it turned out. Both were worked from somewhere in the British Isles on all bands from 160 – 10m! Ducie was the harder one on HF with a few very brief openings on 15m and above between 1630 and 1900UTC, but may have been the easier one on LF. Sunrise shut down the morning LF propagation to Ducie from the rest of Europe before it affected the UK whereas for Christmas Island the UK always had to penetrate the wall of callers to the East.

I have noted before that the area around Pitcairn Island (including Easter Island and part of French Polynesia) is a propagation hotspot. But, as your target moves west across the Pacific, the path becomes more northerly and more difficult. Tonga is pretty much over the North Pole and you'll see what a difference that makes when the A35EU team are on (see later). Moving further west from Tonga takes the path to a north-easterly direction and propagation improves to places like Guam, Palau, and Australia.

The CQWW SSB Contest at the end of October was a great test of propagation. Morning signals from the east on 15m were remarkable, with stations worked in China, Japan, Guam, Macao, Hong Kong, Malaysia (E & W), Indonesia, Philippines, Australia (VK2, 4, 8 and 9) and Cambodia. Even 10m produced Reunion Island, India and Christmas Island. The afternoon was less good as there were some openings to the US East Coast and the Caribbean but they were very patchy and generally only to the better-equipped contest stations.

Chris, G3SVL sent in a report from VK9XG, "The CQWW SSB Contest coincided with the last weekend of the 6Gs DXpedition to Christmas Island (VK9X). There was no record set for multi-two from VK9X and our aim was to remedy that. Our claimed score is 1.4m points from 1,500 QSOs. Doing the contest from the southern hemisphere was a new experience for the four of the team who operated. We found it difficult to break EU and NA pile ups and were largely search and pounce. It was hard going at times, with 10 of our 34 operating hours achieving fewer than 20 QSOs. On the plus side, the sheer joy in the voice of someone we had called when they worked out we were a contest-rare DXCC and Zone 29 mult made up for the low rate. We made 41 QSOs across the bands with 30 different UK stations – M6T making it on all bands except 160m. Across the bands, UK QSOs looked like this: 160/0; 80/1; 40/3; 20/1; 15/30; 10/6."

The IOTA Management Team announced six new IOTA groups at the RSGB Convention last month. Details can be found on the IOTA-World website but in summary the islands are: Kataja Island (Sweden/Finland – Gulf of Bothnia), Morane Atoll (Tuamotu Islands), Puerto Rico's Coastal Islands (already activated by EI9FBB), Yakutat County Group (Alaska), Bering Sea Coast East Group (Siberia), and Kuril Islands North (Siberia). Two teams have announced plans for the Swedish/Finnish island as soon as the ice melts, a Russian team including R7AL and RA1ZZ will visit both the Siberian groups next summer, and Cezar, VE3LYC with Adrian, KO8SCA will head for Morane Atoll (OC-297P) and the very rare Acteon Group (OC-113) from 4-18 December this year (see http://tx0a-tx0m.weebly.com). A few more groups will be announced at Friedrichshafen next year.

DXpeditions

PA3EWP, PA4WM, EI5IX and GM4FDM set out for Tonga (OC-049) to arrive mid-November to operate for approximately two weeks as A35EU. They will have three stations on the air, with vertical antennas (including VDAs), and may try 160 and 80 with inverted-Ls. Their licence does not include 60m but they will ask about it when they arrive. CW, SSB and RTTY for

the European openings will be the main priority. The rigs are K3s with amplifiers. See https://tonga.lldxt.eu/

The Russian Robinson Club will be active from Shif Island (AS-189P) in Iran from 17-23 November. They will be using the 160-10m bands on CW, SSB and FT8.

Nobu, JA0JHQ has announced plans to activate T32NH (OC-024) from the Captain Cook Hotel from 5-11 December, including the ARRL 10m Contest. Listen for him on FT8 and CW on 1.8 - 50MHz.

Sookun Chae, 4W/HL1AHS and Tae-Su Song, 4W/DS3EXX plan to be on the air from East Timor (OC-148) from 26 Nov to 3 Dec.

Stan, K5GO, will be operating from Cayman Brac (NA-016) as ZF9CW until early December.

DS4NMY is active as DT8A from King Sejong Station on King George Island (AN-010) in Antarctica until 18 December. He has an FT-1000MP Mark V Field with 100 watts to a dipole on 40/20/17/15/12. He operates FT8, CW and SSB.

Former RSGB President, Nick, G3RWF will be active as 5Z4LS from Kenya around the time of the CQWW CW contest in late November.

WB2IQU will be in Samoa (OC-097) as 5W2IQ on 40-10m from 18-27 November.

JA1FMN plans to be on the air as V63PSK from 19-25 November, from Weno Island in Chuuk State (OC-011). This will be a holiday style operation on 40-15, FT8 and JT65.

6V1A will be on Goree Island (AF-045) from 7-9 December with 6 local ops.

Alex, K2BB and Paul, UU0JR plan to be on the air from Nosy Be Island (NA-057) from 19-29 November. They are hoping to operate as 5R8R on CW, SSB and Digital modes on 1.8 to 28MHz.

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
M0NKR	164	203	180	263
G4TUK	156	144	213	261
G0DWV	175	172	166	250
G3TBK	235	156	127	239
G3PXT	104	125	204	222
CT7AGZ	196	1	165	217
G8APB				198
G3SVD	123	139	0	195
GI4DOH	175	6	87	193
G3SVK			179	179
G4IDL	165	0	64	168
G4XEX	81	87	125	168
G3HQT	161	0	0	161

JG8NQJ will be back at the weather station on Minami Torishima (OC-073) until mid-February 2019. In his spare time he will perate as JG8NQJ/JD1 mostly on CW, RTTY and satellite using an FT-450 with 50W into a two element HB9CV for 17 and 20m.

Correspondence

(FT8 in italics where known). New correspondent Paul, G3XKQ, wrote in with an exclusively 40m CW report. He uses 400W to a ground plane with elevated radials – and it clearly works well. He found: 3B9FR, 6D50I, 7Q6M, 8Q7s, 9K2NO, 9V1YC, 9X0T, A75GM, CEs, DP0GVN, DT8A, FM5FJ, FY/DL5FAB, HC2A0, JY5HX, KL7SB, LUs, P4/DL1AOB, PZ5JW, RI1ANL, TI5/N3KS, VP6D, VK9XG, VK9XT, VKs, Ws 0-9, XE1RK, XT2SZZ, YB0ARJ, YJ0GC, Z23MD, ZD9CW, ZLs.

Ken, CT7AGZ said October had been a bumper DX month with two ATN0s in the form of YJ0GC and VP6D. He found: 10m – *LU8EX, HI8S, 9Z4Y, J35X,* LU5UEA, XQ6CFX, D44TWO, 9Z4Y, *TR8CA,* CX7CO, *3B9FR, P4/DK8YY,* 9X0T; 12m – J68GD, TU5MH, *VP6D, SU9JG, A41ZZ, RI1ANL, D44TWO, YB1TAM, J35X, VU2ABS, CE7KF, KG4HF, Z21MH, 3B8FA, FR4KL, 3B9FR,* 9X0T; 15m – 6D50I, VP6D, XT2SZZ, PJ4/NE9U, TU5MH, *DT8A, KG4HF, J6/K1ZZI, TI2CC, V51MA, V47JA, P4/NN5E, PZ5RA,* 9Q6BB, *FR4PF,* ZD9CW, 8Q7YC, *SU9JG, D44TWO,* TT8K0, 3B9FR, *YV6CA, A61FK, A92GE, VK8AW, A41ZZ, 9X0Y,* T060K, 9X0T; 17m – *VP9/W4GE,* VP6D, J68GD, TU5MH, VK9XG, 7X5FG, A75GA, 8Q7PE, *D44TWO,* OY1CT, *KG4SS,* 4J100R0; 20m – Z23MH, VP9/K4AJA, VP6D, 4U1ITU, 8Q7YC, 9X0T; 30m – TU5MH, YJ0GC, 8Q7YC, 9X0T, 7X5FG, 0X3XR; 40m – VP6D, VK9XG, *VP6D,* YJ0GC, 8Q7YC, *9X0Y;* 80m – ZL3I0, *V31MA, P4/DL1AWD, D44TWO, V31MA, 4S7AB,* 7X4AN, *A41MS, 9K2HS;* 160m – *D44TWO.* It seems that southern Europe is the place to be for DX.

Peter, G4XEX comments that DX stations should pay more attention to the information on the cluster to avoid putting their pile-ups on top of a simplex operation just above them. He found: 15m XT2SZZ, ZS6JES; 17m – FM5FJ, J68GD; 20m – KG4SS, YV5AAX, P4/NN5E, KG4HF, VA7DP, ZL3NB, VK2QV, FP/DK7L/M, PJ2/KB7Q, 6D50I, 9X9PJ, 9Q6BB, P4/NT5B, ZF1A, D4C, FY5KE, OX7A, E44WE.

Peter, G3HQT was pleased with his DX haul achieved without using FT8: 15m – ZD7BG; 17m – KG4HF, XT2SZZ; 20m – D44TWO, FK8IK; 30m – 9X0T, VK9XG, VP6D, YJ0GC; 40m – 8Q7YC.

Fred, G3SVK found: 17m – ZS2I, S01WS, 9X0T, ZD9CW, T060K, XT2SSZ, VK9XG; 20m – T060K, P4/DL1AOB, V85TL, HS5NMF, 9M2YDX, HS0ZJU, HS2NBR, YC6MYO, D44TWO, 9M2PUL, SV2ASP/A (Mt. Athos), HS2KWO, 3B9FR, XT2SZZ, 9M6ZAE, 5R8UI, PZ5K, VP9/AA4V, VP9/K4AJA; 40m – FM5FJ, 9X0T, P4/DL1AOB, TT8K0, FY/DL5FAB, HZ1TT, 8Q7YC, RI1ANL, 8Q7PE, PJ2/QI9WI, TF3WK, C02WD, P40T, XT2SZZ, PJ4/NE9U, J88GD, LU1DK, VP6D, JT1C0, VK9XG, 9K2NO, N4SF/VP9, F6CUK/FJ, ZF2IN, ZF2RR, PZ5K, VP9/AA4V, 3B9FR, BD7LMD, JH1HDT, Z61DX, 7Q6M.

Chris, G8APB found a wide range of DX on his verticals and 4-ele SteppIR: 10m – CA3JBD, VP8NO, FR5FC; 12m – TA4SO, ZS6WN; 15m – CM2RSV, HI8S, KG4HF, HK3W, PYs, ZP6ARO, CE5AUC, CX1RL, LUs, VU2IBI, YC1CUZ, 9G5AR, ZS6WW; 17m – T060K, XE2JS, C03JR, VP2ETE, NP3DM, KG4HF, HK3C, CE2SQE, LU5VV, TA9P, AP2MQ, VK8ZI, YB4NY, ZS6WB, FR40S, 3B8GF; 20m – VP9AD, HI8MDQ, T45FM, CE30P, AP2HA, VU2AF, 9K20F, BG9NJY, BX2AFU, JAs, DS2G00/3, HS5NMF, DU1/JH1FNS, YF3ESW, VK7BBB, VK2DX, ZL3NB, JW9L; 30m – VK3VM, ZS3AZ, ZS6JES; 40m – EX7DY, A41ZZ, BG9HKP, BV2FB, BI4SDT, HS1EDI, VR2IL, YF7SPN, YC8PB, VK2LAW, VK3GL; 160m – OX3LX.

Finally, Gordon, G3PXT had another busy month: 15m – K4AJA/VP9, *KG4HF, YB;* 17m – *D44TWO, BY, CO, JA;* 20m – *P49X, D44TWO, VK9XT, HK4GSO, HI8S, KG4WV, JA, ZL, VP6D,* E44WE, VP5W, ZF1A; 40m – *LU, VK, VP9AD, BY, HI8PAP, YB, KV4FZ, VP6D,* P40T, VK9XG, ZF1A, ZF9CW, KP3Z, PZ5K; 80m – *LU, CO, TR8CA, XE1USG,* ZL20K. He has now automated FT8 so that he doesn't need to touch the keyboard at all. His slightly-bent-at-the-ends 80m dipole has produced 90 DXCCs this year.

TABLE 2: Forthcoming DX activity.

Until 27 Nov	A35EU
Until 18 Dec	DT8A
17-23 Nov	VP2MUW
17-23 Nov	Shif Island AS-189P
18-27 Nov	5W2IQ
19-25 Nov	V63PSK
19-29 Nov	5R8R
21-28 Nov	J8NY
26 Nov – 3 Dec	4W activity
5-11 Dec	T32NH
6-16 Dec	OC-113 and OC-297P
7-9 Dec	6V1A (AF-045)
August 2019	St Paul Island
2020	Sable Island

Finally

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

Martin Atherton, G3ZAY
g3zay@btinternet.com

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VHF/UHF

Last month we saw more high pressure systems across Europe and excellent DX on 2m and 70cm.

The 2m EME (moonbounce) antenna at 9N7AP - with a stunning backdrop.

There were extraordinary conditions for October with two separate significant high pressure systems covering large swaths of Iberia, Central and Northern Europe. October is not usually known for such intense openings but many will recall back in the 1980s one of the UHF weekend contests occurred during super conditions on all UHF bands with 70cm sounding something like 40m!

On 6m there were isolated Sporadic-E openings to the Balkans and Italy coinciding nicely with the RSGB 6m AFS contest on 21 October. There were also QSOs into Scandinavia with SM4KYN (JO69) being very popular.

The main story however is the super tropo that occurred on 23-25 October favouring mainly south coast UK stations with some QSOs in Italy on 70cm, which are quite extraordinary.

Band Reports

Dave, G7RAU (IN79) reports an amazing three days from 23-25 October with 2m wide open to DL, EA1, EA2, EA3, EA4, EA8, EI, F, G, GD, GI, GJ, GM, GU, GW, HB, I, OE, OK, ON, OZ, PA and SM. During the period Dave worked 492 QSOs on 2m in 102 squares and 18 DXCC. On 70cm 49 squares and 14 DXCC were worked. These QSOs were all a mixture of SSB/CW and FT8.

Highlights on 2m were 17 Italians stations with best DX to IK0IXO (JN52) and IK0BZY (JN61 Rome) at an amazing distance of 1634km. Notwithstanding the conditions on 2m, Dave completed with IK2OFO (JN45), which is an incredible distance on 70cm. On 2m again the strongest signal on the band by far was I3MEK (JN55) who was 59+30dB. Dave worked 38 EA stations across locator squares IL18, JN11, JN12, IN52, IN62, IN71 and IN82. A got-away was an EA4 in IN80, where Dave couldn't break into the local QSO.

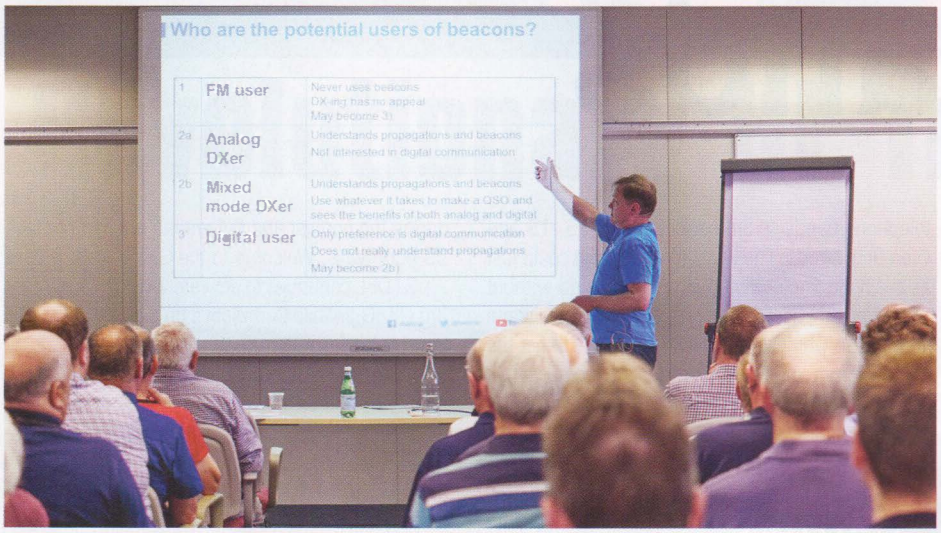
Conditions to the east were excellent with nine OE stations worked on 2m and two on 70cm. Best was JN78, OK in JN69, JO60 and JO70 and DL as far as JO73 and OZ / SM in JO55, 46, 47 and 65. On the 24th, as Dave left for work at 0500UTC, beacons from Corsica (JN41) were very strong. Dave saw another 14 different Italian stations in FT8 on 2m whilst he was stuck in meetings. The big point to this opening was the intensity. Dave had ±100kHz blocking issues in the EA1 direction due to one of the ED1 beacons overloading the rig pegging the S-meter. On 2m and 70cm, HB9 beacons were the same strength, clearly some very select and low loss ducting. Dave spent most of his time using CW/SSB with some on FT8 and JT65. Dave comments that although he is in a well sort after locator, the activity when conditions are good it quite amazing.

Jon, G4MCU (JO01) writes, "After several decades of absence, I have been operational on 2m SSB since the end of February 2018. I have been using an old Eighties FT-290R and a small amplifier running only 25 watts to a 7-element antenna. I had not observed any spectacular tropo openings from Essex until 8 October when there was an excellent duct from JO01 to Scandinavia. During the evening I worked: OZ6OL (JO65) 878km, SM7DTT (JO65) 923km and SM7NR (JO76) at an excellent distance of 1091km. During the morning of the 9th I worked SM7NR again with minimal activity detected from UK.

"On 70cm with 1W SSB from an FT-790R I worked OV2T (JO46) 774 km, OZ9FW (JO65) 882km and, in the 70cm UKAC on the 9th, with 1W SK7MW (JO65) 923km. The opening seemed very localised. There was not much good propagation in between; at least as far as my location in Hockley, Essex was concerned. However, good results can be had with a modest station."

Paul, G3YDY (JO01) has been very active on a number of the VHF bands. However, embracing the use of FT8 has brought a number of new locator squares and DXCCs. Using 2m FT8 he managed 8 new locator squares and one new DXCC this month. Best DX being DK4MD in JN68. He was called by an OE on the 20th but that QSO was not completed. Some stats: 464 QSOs completed in 15 DXCC and 75 squares. A few SSB QSOs have been completed on 2m but nothing special worked. One less common QSO completed on 23 October was a JT9F Fast with DL9LBH in JN59 781km. Perhaps more use of this mode should be made on 2m. On 70cm FT8 there were 3 new locator squares worked this month, best DX being DG0KW (JO64) 890km on the 8th. Some stats for this band are 39 QSOs completed in 7 DXCC and 21 locator squares. There was also some nice DX for the October UKAC on this band best DX being SM7NR in JO76 1096km, S9 reports each way.

Bob, G8HGN (JO01) had an interesting and productive month. A few new squares worked and plenty of activity. Openings noted on the 5th to EA, 8th to 10th to OZ/SM and 18th to 25th starting to OZ/SM, through DL/OK, then HB/I and, finally, HB9 and southern F. He made 178 QSOs this month, 20 over 600km, 12 over 700km, 11 over 800km, 9 over 900km and just 1 over the 1000km mark. His highlights, oddly, were a partial QSO with IK4ADE in JN54 on FT8, both reports received but no final rogers, and seeing his call spotted on PSK reporter by IQ3AZ in JN65 on the I/9A border. Whether that was tropo or meteor scatter it is unsure. Either way it shows how pushing the boundaries of FT8 is very interesting. A completed QSO with OK1NI JO70 (2m FT8) on the 20th was his best DX at 1035km. Next best DK4MD in JN68 at 996km same day and mode. On 70cm noteworthy were OZ1SKY JO56 at 825km on the 8th, and DL9LBH (JN59) at 776km on the 25th, again FT8.



One of the many lectures in the VHF & Up stream at the RSGB Convention.

RSGB Convention

One again the VHF lecture stream, compiled and chaired by G4SWX and G4HGI, at the RSGB's Convention was very well attended with excellent lectures. There's a full report on page 54.

Thanks to all the lecturers who gave up their time to share their knowledge. Some of the lectures will be available to view on the RSGB Members website later. In addition to the lectures highlighted on page 54, I would like to mention the FT8 Performance Secrets lecture by Neil, G4DBN. This was in great demand and he gave the lecture both on Saturday and Sunday. He investigated what really matters when starting to use FT8. Neil focused on some of the pitfalls in operation that were totally relevant for the VHF and microwave bands. For any VHF and up operator, Neil's superb website is certainly worth a visit [1]. Another point to mention is that the video of Neil's lecture is one of the first released by the RSGB on to the Members' area of the RSGB website. Go to www.rsgb.org/videos amd look for RSGB Convention 2018 lectures, where you will find this fascinating talk.

Following on from his RSGB Convention lecture, another DXCC was worked on 2m taking John Regnault, G4SWX's DXCC entity count to 155. 9N7AP (Nepal) was worked on 26 October, the station operating from the Hotel Annapurna in Pokhara (NL18xf). Graham, G4DML (JO02) also worked 9N7AP soon after to complete his DXCC 100 entities on 2m.

Thanks to the good work done by Make more Miles on VHF there are full details and a list of QSOs on their website. [2]

Ian White, GM3SEK has been a valued regular contributor to the RSGB Convention with technically sound and practical solutions as the basis for his lectures. Ian took a critical look at some long-established methods for feeding Yagi antennas and identified a new list of Do's and Don'ts for modern conditions in his lecture entitled VHF Baluns – Fact and Fancy. The focus was very much on suppressing unwanted common-mode RF currents, to reduce both the received noise levels and the risks of causing interference on transmit. I am sure that it won't be long before Ian's lecture joins the list of 2018 RSGB Convention lectures available to Members on the RSGB website.

FT8 calling frequencies

There was considerable discussion at the RSGB Convention regarding the original de facto 'allocation' of the calling frequencies or Centre of Activity, which were originally set in the WSJT-X and subsequent software packages like MSHV and JTDX. Discussion, because one frequency in particular is quite unsuitable, whereas the lower band frequencies seem to have now taken hold.

On 6m, 50.313 and 50.323MHz have grown in popularity and become bolt holes. The summer of 2018 established 70.174MHz as a calling frequency for 4m, chosen as a low enough frequency to coincide with as many countries' frequency allocations as possible.

70cm was allocated a frequency of 432.174MHz in the software, which really is in an odd place (for Region 1), being very close to the main SSB calling frequency of 432.200MHz. Whilst activity on 70cm is not in the higher reaches like 6m it would be constructive to try and find a more suitable frequency lower in the band before FT8 activity increases. The 70cm band plan on the RSGB website shows the following:

432.000 – 432.100MHz Telegraphy (CW) and Machine Generated Modes (MGM)

This 100kHz wide sub-band is allocated to modes with a maximum transmission bandwidth of 500Hz. Earth-Moon-Earth (EME) activity using CW may often be found in the bottom 25kHz of the band. Occasionally you may also hear JT65 EME activity around 432.065MHz.

432.100 – 432.400MHz Narrowband Modes (CW/SSB/MGM)

Narrow-band modes with a maximum bandwidth of 2.7kHz are always located at the low frequency end of any VHF or UHF allocation. This is where you will find Morse (CW), telephony (SSB) and machine generated mode (MGM) activity such as JT65C and FSK441. In addition to the separate CW sub-band this is the area of the 432MHz band where operators make long-distance (DX) contacts. Even though FT8 has a 50Hz bandwidth, it has been used by numerous DX operators on the band to good effect. It would therefore be worthy of a lower frequency, maybe 432.124 to 432.154MHz.

This would also keep FT8 out of any possible contest activity should the two try to co-exist at the same time. All software packages can be configured to different frequencies easily so maybe there is a case to try and establish a new frequency for 70cm FT8.

The UKSMG Winter Marathon

The UK Six Metre Group aims to promote and encourage activity on the 6m band and the Winter Marathon is an ideal opportunity to raise activity. The UKSMG Winter Marathon is open to *all* amateur radio operators world-wide (UKSMG membership is *not* required). The objective is to work as many 4 digit grid squares as possible on the 6m band between 1 December 2018 at 0000UTC and 31 January 2019 at 2359UTC. Logs can be submitted until 17 February 2019 [3].

Sign off

An excellent month for VHF DX in October – but looking forward to the continuing storm season, its hard to see where any tropo conditions will come from. But the VHF bands are always full of surprises. Many thanks to all contributors this month and all the many conversations had at the RSGB Convention

Websearch

[1] www.g4dbn.uk/
[2] www.mmmonvhf.de/latest.php?id=4671
[3] www.uksmg.org/winter-marathon.php

Richard Staples, G4HGI
g4hgi@live.com

GHz Bands

SDR on the GHz bands

I've just returned from the RSGB Convention and from the GNU Radio [1] SDR software course that I organised on the Friday. As usual, I've come back buzzing with ideas for GHz bands projects. Continuing the recent theme of setting up a GHz bands station, this month I'm going to park the traditional transverter approach and look at using an SDR. It's becoming more obvious to me that the transverter approach from the 1970s is now rapidly becoming a thing of the past. The SDR course speakers, Heather, MOHMO and Derek, MWOLNA/KOZEL brought along several transmit/receive SDRs and showed us how to use GNU Radio Companion to rapidly prototype transmitters and receivers to run on a small computer. With RF hardware readily available that covers HF to 10GHz it's obvious that, for GHz experimenters, this will become the starter approach to getting on the low GHz bands up to 9cm, or to make a transverter driver for the higher bands. I won't cover the software aspects in any detail here, but I'll point you again to the excellent 4-part GNU Radio Companion primer [2] on the web pages of Professor Sharlene Katz, from California State University, Northridge. Judging by a letter in this month's Last Word from one of the course attendees, former RSGB President, Bob, G3PJT (and this month's Data column by G4JNT), it's clear that creating your own transmitters and receivers in software can be akin to first discovering radio, so I urge you to give it a go. You of course have the alternative of trying the SDR hardware with many of the ready-made SDR programs that I've mentioned in the past.

A GHz bands setup using SDR

Figure 1 shows a concept triband transceiver setup using one of these GHz-capable SDRs. Remember that these units are optimised for the cellular telephony bands so are perfect for our 23, 13 and even 9cm bands. The transceiver concept could just as easily be implemented as a single band without the extra complication of switching. There are some very cheap Chinese gain blocks on eBay to get the few mW from an SDR transmitter to a more useable level and I hope to review a typical one next month. Key components in Figure 1 are the band-specific bandpass filters and that is where the analogue world suddenly comes back to haunt us. Many will already have such filters on their existing transverter systems or alternatively, they could be implemented in 'pipe cap' technology [3]. Many of the high-power ex-cellular PAs for 13 and 9cm can be driven with just 0dBm (1mW) so in a single unit you could go from the filter output to QRO. There are triband dish feeds available such as [4] and surplus SMA coaxial relays can be used to perform the band switching.

A new GHz bands email reflector

As many people seemed to be having trouble with the Yahoo ukmicrowaves email reflector, in October, Andy, G4JNT took it upon himself to create a new reflector [5] on groups.io. It seems to have met with almost universal approval and by now most people and the files have been migrated over to the new system. As was the case with the Yahoo reflector, this is not run by the UK Microwave Group so please refer any issues to Andy, not to them.

Activity

Stuart, G1ZAR paid me a visit in September under the UKuG's Tech Support scheme [6] and we checked out and repaired his newly-obtained 10GHz system. He then went out portable in the SHF UKAC and made his first ever 10GHz QSO with GOLGS/P. This was a SOTA from G/CE-004 to G/CE-001 over 99km. It was done by tuning around during the contest and tail ending another contact. 59 both ways. Welcome to the GHz bands, Stuart!

G1DFL continues to activate 24GHz. During the 3rd UKuG 24GHz Cumulative he took a Nortel ODU transverter, loaned from Mike, G0MJW, to a couple of locations. From Remenham Hill (IO91NM78VW), with a bit of a struggle he worked Barry, G4SJH/P who was at Walbury Hill (IO91GI44EN) at 45km. He then moved on to Britwell Hill (IO91LO98FM) and, using 144.390MHz talkback, found G3ZME/P on Brown Clee (IO82LS) some 188km distant. Unfortunately, the path is obstructed and despite several tries, 24GHz, unlike 10GHz, just would not go! He then worked Barry, G4SJH/P again and worked each easily on 24GHz SSB at 40km. This time signals were at good strength both ways.

EME

G4LDR is now QRV on 3.4GHz EME with a 3m dish with f/D 0.45, fed by an OK1DFC septum feed without choke ring. On receive he uses a G4DDK VLNA9 preamplifier and a Kuhne Electronic 3.4GHz to 432MHz transverter and PA running 70W output. He had his first 9cm QSO with Peter, G3LTF, who has given Neil (and many others) a tremendous amount of encouragement and advice to get his EME system up and running.

Beacons

G4UVZ reports that the GB3KBQ 10368.870MHz beacon has been upgraded and should have about 6dB more EIRP. It still uses the Pye HS400 high stability oscillator as a reference and FSK keying, but long-term plans are to install JT modulation. Reports are welcomed on Beaconspot.uk. In the autumn openings, the Martlesham 2320.830MHz beacon was spotted deep into Europe, including Austria and Poland. On 26 September at 15.09 it was spotted at 1010km by OE5VRL (JN78DK) and on 9 October at 1311km by SP4MPB (K003HT).

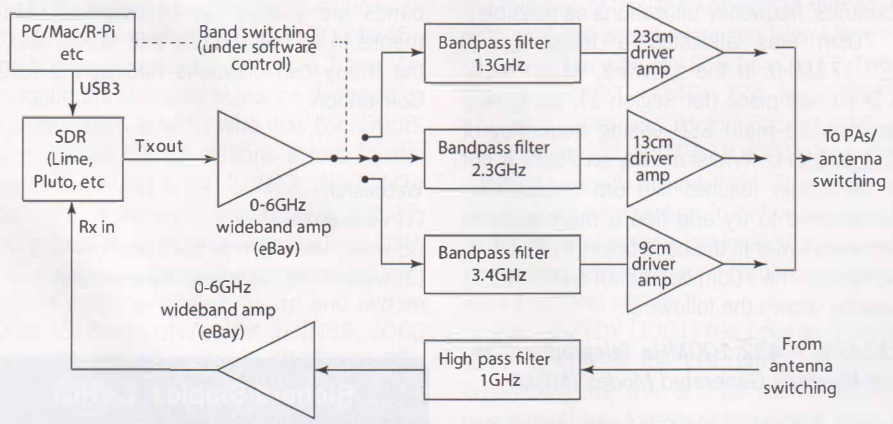


FIGURE 1: Concept of the triband SDR transceiver for the low GHz bands.

Websearch

[1] www.gnuradio.org
[2] http://bit.ly/2z3axDq
[3] https://bit.ly/2P18IzL
[4] https://bit.ly/2QWOeaa
[5] https://groups.io/g/UKMicrowaves/topics
[6] www.microwavers.org/support.htm

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Data

FT8 Chat

The trouble with writing a bi-monthly column with nearly two months lead time is that news, when it appears, can be nearly four months late! In October's column, after discussing how a chat mode using FT8 type signalling and messaging protocols could be designed, I summarised thus "... It is starting to look like a chat mode with the speed and weak signal performance of FT8 won't happen soon ..." Well, guess what. Within days of the text being sent in to the editor, news of a new FT8 Chat mode was announced. Named *FT8CALL*, it had been written completely independently of the WSJT-X suite by different authors, based on the FT8 work placed in the public domain.

That was the situation a couple of months ago. But even that has changed: it has now become *JS8CALL*. Which is fair enough, as the FT of FT8 stands for Franke – Taylor, the names of the two main authors and designers of the original code. JS belongs to the new independent writer. The User Group can be found at **[1]** which, although it was only started on 11 July, appears to have attracted over 6000 members (at the time of writing, mid-October). Full information on the mode and the download can be found at the rather long URL at **[2]**. It may be easier to use the term *'JS8CALL'* in a search engine to find the site.

It looks as if chat messages are encoded using source compression like Varicode, then the resulting bit pattern split into blocks and sent using FT8 type signalling. So chats are split in the middle and assembled from successive blocks.

GNU Radio Companion

I write this a few days after attending a one day course on the GNU Radio Companion SDR design suite. (The course was organised by the RSGB, the day before the Convention and had 24 Members sign up for it). The GNU Radio suite is a plug-and-play software package; a fully graphical solution to designing a complete digital signal processing (DSP) system and support for hardware, giving a real time software radio on a PC without having to understand the inner details of DSP or having to write any code.

On the course we used a Linux based suite with that operating system and the GNU software pre-installed on a USB stick supplied to each delegate beforehand. Within just two hours of the course starting, all of us had simple processing systems up on screen, whistling and shouting into microphones, generating sine waves and noise, filtering the results and displaying them on scope traces or in the frequency domain as FFT plots, or coming out of the computer speaker. By mid-afternoon we had all got the RTL 'Dongle' receivers, also supplied as part of the course, up and running and were receiving and decoding and displaying a test signal transmitted on 50MHz SSB. "It's just like using LEGO", was a comment heard more than once.

And it really was that easy. Using the graphical GNU Radio support package, you just drag and drop various blocks, like "Audio Source", "Bandpass Filter", "Audio Sink", "Frequency Domain FFT GUI" and "Waterfall Plot". Then type in a few settings, join the inputs to the outputs using mouse clicks and press 'GO'. There's a lot to learn as you go along, but this basic one-day introduction was more than enough to instil confidence to do a lot more with the package and learn how to take it a lot further.

Details of GNU Radio Companion can be found at **[3]** where it can be downloaded – and it is free. It is also available for Windows although, judging from a few comments on the course, that version is a bit slower than the Linux one. It is a bit unfortunate for me, as a dyed-in-the-wool Windows user, that the package we were using was Linux based. Although that part was plug-and-play and I didn't have to learn Linux commands for basic operation, my laptop did have to be closed down and rebooted from the USB stick. Afterwards it then does take an awful long time to get Windows back up and running so I shan't be using this particular laptop for GNU radio much. However, my shack desktop machine is always switched on from cold every time it is used, so booting from a Linux USB stick is no big deal there – although I've yet to do it. Another laptop, one purchased without a pre-installed operating system – may be a personal prezzie before too long. But will have to install and investigate the Windows version – just to see, if nothing else.

GNU Radio for new data modes

Whilst wading through the menus to find the blocks needed for the course practicals, I saw a lot of interesting things listed in there that will be worth further study. Blocks like error correction and synchronisation packages, OFDM, PSK and modulators and demodulators for other waveforms. Clearly using those will take a lot of studying, but it does look as if the modulation and demodulation of complicated digital waveforms is supported. So new modes and applications will come along as we plug these blocks together on screen and connect the RF hardware to an antenna.

The Companion will support many wideband SDR types; not only the RTL dongles and other simple ones, but also advanced high speed SDR interfaces likes the Analog Devices Pluto board, Lime SDR and other package types, receive or transceive. Even the venerable and long-in-the-tooth SDRIQ is listed. More are coming along with the GNU Radio designers are adding and updating all the time.

Websearch

[1] JS8CALL user group https://groups.io/g/js8call
[2] Information and download site for JS8CALL https://docs.google.com/document/d/159S4wqMUVdMA7qBgaSWmU-iDI4C9wd4CuWnetN68O9U/edit
[3] GNU Radio Companion https://wiki.gnuradio.org/index.php/GNURadioCompanion

Andy Talbot, G4JNT
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This month I have highlighted the Elecraft KPA500 which is now becoming our best selling HF amplifier. It's one of the most compact designs around and has stood the test of DXpeditions around the world. I often tell customers that this amplifier will add 6dB to your signal - rather like a three element Yagi. But you get the Yagi gain on all bands from 160m to 6m! We can build it for you and install the latest firmware.

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- **Switching**
  It switches faster than you can send CW and is totally silent.
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- **Cooling**
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- **Warm Up Time**
  None!
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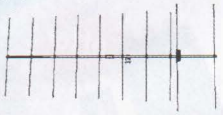

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A rugged dipole centre with built-in Balun. Completely weather sealed.

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- 3W for FSD
- Cross Needle
- SO-239

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40m - 10m 4 Band vertical that will handle full legal power and can be ground mounted
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5BTV
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.....£269.95

6BTV
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HF-30FX.....30m whip 1.4m long £63.95
HF-40FXW .....40m whip 1.4m long £64.95
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This is a 3-way mount that is great for HF operation. SO-239 socket and 4.5m cable terminated in PL-259....£39.95

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MFJ-935B	Portable multiband Loop ATU 150W	£231.95
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MFJ-939A	Plug and play auto ATU Alinco cable	£176.95
MFJ-939I	Plug and play auto ATU Icom cable	£176.95
MFJ-939K	Plug and play auto ATU Kenwood cable	£176.95
MFJ-939Y	Plug and play auto ATU Yaesu cable	£176.95
MFJ-941E	1.8-30 MHz antenna tuner 300W	£159.95
MFJ-945E	1.8-54 MHz mobile antenna tuner	£154.95
MFJ-948	1.8-30 MHz antenna tuner 300W	£187.95
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MFJ-956	SW/MW/LW Preselector/tuner	£77.95
MFJ-974B	3.6-54MHz 300W Balanced ATU	£231.95
MFJ-974HB	HF 300W Balanced line ATU	£253.95
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MFJ-989D	HF 1500W SSB/CW roller tuner	£451.95
MFJ-991B	HF Auto antenna tuner 150W	£253.95
MFJ-993B	HF Automatic antenna tuner 300W	£289.95
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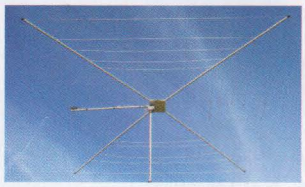
MFJ-994B	HF automatic antenna tuner 600W	£396.95
MFJ-994BRT	HF remote auto antenna tuner 600W	£440.95
MFJ-9982	HF 2.5kW antenna tuner	£771.95
MFJ-998RT	HF1.5KW remote auto antenna tuner	£848.95

The Small Garden Solutions from W&S

MFJ-1836H Cobweb



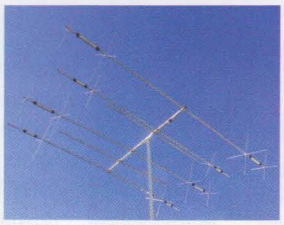
What is a cobweb? It's in effect a full size dipole bent into a square. This results in 1/8th wave sides. The antenna can be formed of multiple dipoles with a common feed via a balun. It is easy to support on a single mast and requires no rotating. This model covers 6 bands from 20m to 6m and will handle up to 1.5kW.

£269.95

Cushcraft MA-6B

Here is a new exciting design that operates as a 3 element Yagi on all bands from 20m to 10m. It uses end loading to reduce the element length to enable it to fit into quite small gardens. End loading enables the high current region to flow through full thickness element sections. Bandswitching is automatic and the whole antenna offers a light weight antenna solution in a compacy array.

£699.95



MFJ-1786X

The MFJ-1786X covers 30m to 10m and handles 150W. Includes remote tuner and is around 1m in diameter. You also get low noise reception!

£539.95

MFJ-2389

80m - 2m 8.5ft! Heres a realy cool little vertical. Less than 9ft tall, all bands, counter-poise radials and handles 200W.

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MFJ-945E Compact 300W ATU

Compact tuner for coax systems. Meters power and VSWR. 1.8-60MHz

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MFJ-260C Dummy Load 300W

A great 50 Ohm dummy load, air cooled. Up to 650MHz with max. of 300W.SO-239.

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Here is an auto ATU with models dedicated for Yaesu, Kenwood, Icom and Alinco. Each one comes with a lead that plugs directly into your radio that provides power and operating signals back to the ATU. Tell us the model of your radio when ordering.

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MFJ-902H Travel ATU 150W 80-10m

A complete package that fits into a small spac. Matches wire, coax or balanced.

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MFJ-212 Matchmaker

Allows you to precisely adjust your ATU without transmitting. Just insert between transceiver and antenna or transceiver and Amp. Switch on and adjust for minimum noise. Auto bypass on transmit.

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MFJ-991B Auto ATU

Similar to the MFJ-993BRT but without LCD display, antenna switch and balanced feed option. Ideal for coax or end fed wire.

£253.95

MFJ-413

Morse code tutor.

£55.95

MFJ-557 CW Trainer

This unit comprises CW key, oscillator and speaker unit. Great for CW sending practice.

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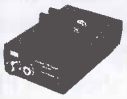
MFJ-1799 Vertical

Here is a great design from MFJ. It gives you true all band coverage - 80 40 30 20 17 15 12 10 5 and 2m! All you need from just one antenna. It requires no radials and stands approx 6m high. Power rating is 1.5kW. So with an amplifier you are set to radiate a great signal.

£503.95



MFJ-403P Micro Keyer

Here is a little micro keyer with twin paddle and built in side tone. Ideal for QRP operators who want to travel light.

£79.95

MFJ-402 Nano Keyer

A very compact little electronic keyer. Just 2" x 3" it will generate CW with its paddle from 5 - 65 spm. You keyer can be powered simply by plugging into transceiver key socket. Video link on our site.

£77.95

MFJ-223 Antenna Analyser

This very compact and handy antenna analyser covers 1 - 60MHz. It has a full colour LCD which offers a very clear graphic display. Includes recharge-able battery with USB lead. A great little bit of test gear.

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MFJ-225

1 -180MHz measures a wide range of parameters including, VSWR, Impedance, Return Loss, Phase, Capacitance, Inductance, Cable length external 12v or USB power.

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Multi-mode diode tester

I have a plastic container half-filled with mixed diodes on my workbench. Many are unmarked but cover the range of signal and power types, Zeners, LEDs and even varactors (variable capacitance diodes). I recently decided it was time to sort these out so that I can use them in various projects.

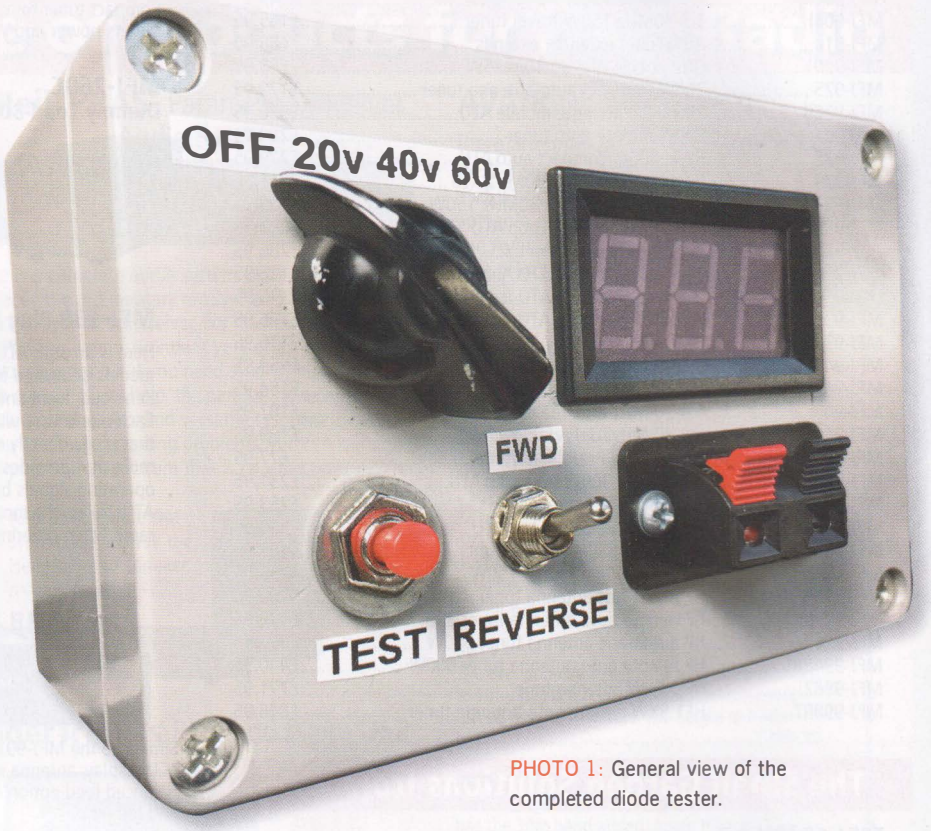

PHOTO 1: General view of the completed diode tester.

Tester required

I needed a simple tester that could do all the necessary tests in one low-cost, easy-to-build box or the job of sorting my diodes would be too tedious to even start. I came up with a really useful diode tester you can make for yourself for well under £20. **Figure 1** shows the circuit diagram and the finished device is shown in **Photo 1**.

It's powered by a PP3 battery. The current demand is low, so the battery will have a long life. The circuit is based on a NE555 oscillator driving fast pulses via Q1 into L1, thus forming a simple switch-mode inverter with D1 and C3.

Those who are familiar with the NE555 may wonder at the way it's wired up. The conventional oscillator circuit, shown in **Figure 2**, uses a resistor (R2 in Figure 2) from open collector output pin 7 to the Threshold and Trigger pins 6 and 2. However, I found that if I connected the resistor to the sink *and* source-capable output on pin 3 – which has the same logic state as pin 7 – I could get much narrower pulses, which are more suitable for driving the BD139 switching transistor.

These high frequency, short pulses briefly turn on Q1, producing a very spiky, high voltage pulse at its collector due to the current flow and collapse in L1. This high voltage is rectified by D1 and smoothed by C3 to around 75V. This is fed via current limiting resistor R3 to a shunt regulator chain formed by the three 20V Zener diodes ZD1, ZD2 and ZD3. Switch SW1b is arranged to take the anodes of either ZD2 or ZD3 to ground, thus changing the voltage limit from 60V to 40V or 20V. The final voltage is fed to the digital voltmeter (DVM) module and also to the test terminals at SKT1. SW3 is configured as a changeover switch to swap the polarity of the output, very convenient for checking forward and reverse voltages.

The output impedance is high, limited to a maximum of about 7mA regardless of settings. At this current, the output will drop below 1V. It will rise to the correct voltages

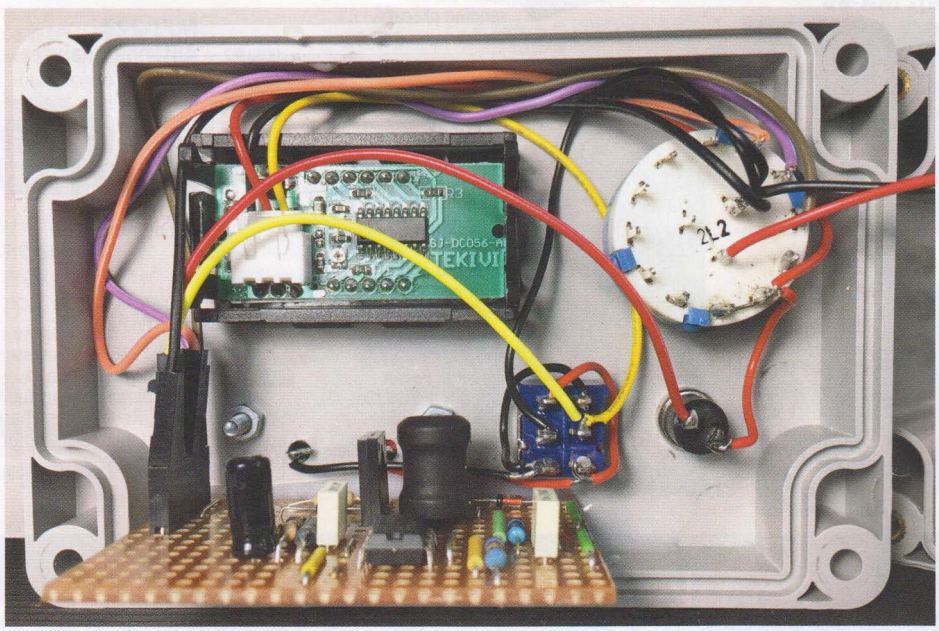

PHOTO 2: Inside the device (battery not shown).

Dave Ellis, G4AJY
djellis32@yahoo.com

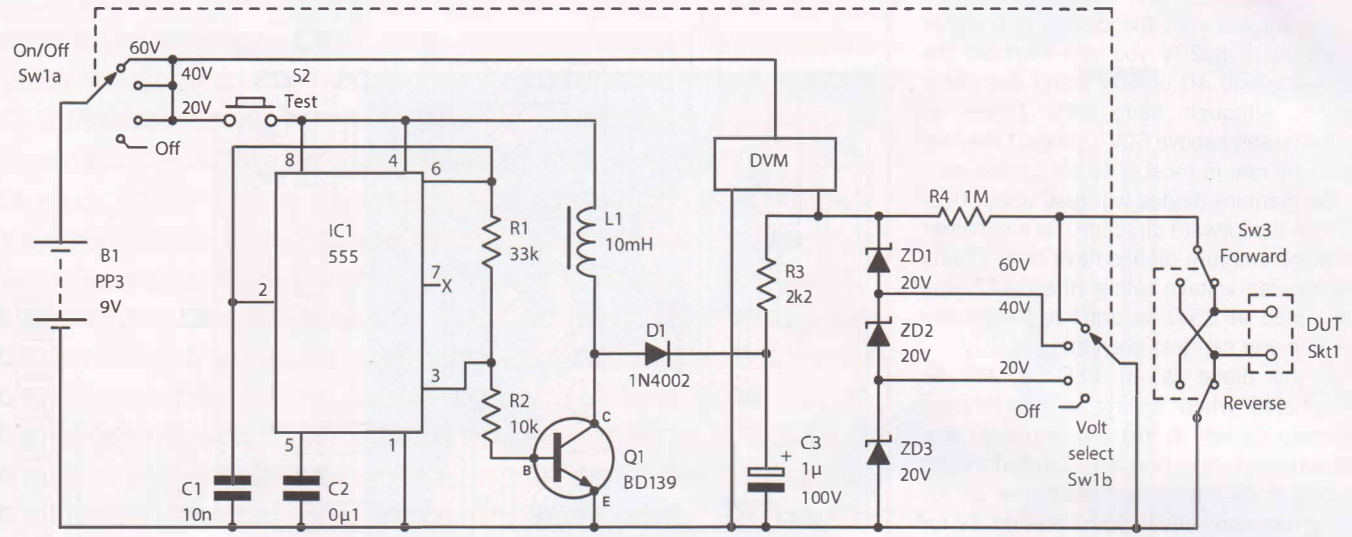

FIGURE 1: Full circuit diagram of the diode tester.

PHOTO 3: Typical test showing the 3.1V forward voltage of a blue LED.

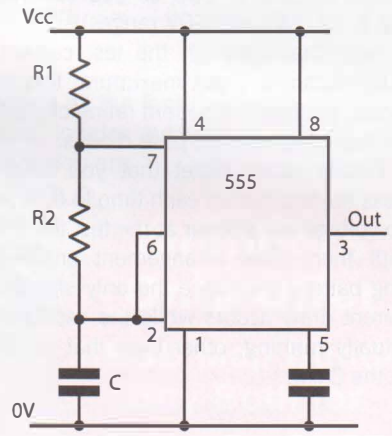

FIGURE 2: The 'classic' NE555 circuit.

as the current reduces to 2mA or less. This is sufficient to illuminate even low brightness LEDs, but too limited to over-drive an LED or to damage it in reverse test mode. So, when making tests you don't need any ballast resistors to protect your LEDs and Zeners – the tester takes care of that for you. And the tester will help you determine what sort of diode you have and its polarity, even if it's completely unmarked.

Construction

Construction is very straightforward. There are no particular layout requirements. I built my prototype on stripboard, mounting the switches and DVM onto the front panel of the enclosure. The plastic box I used was 60 x 80 x 120mm that cost me about £3.50. My suggested stripboard layout is shown in **Figure 3**, whilst **Figure 4** shows the general wiring diagram. **Photo 2** gives a general guide to how I wired up my prototype. I built everything onto the front panel except the battery, which is mounted in the case itself. This makes for much easier building and service.

Mode d'emploi

In use, the DVM is illuminated as soon as the tester is switched on. It should read 0V because the inverter circuit isn't yet energised.

Set the voltage to 20V and place a diode between the two terminals. It doesn't matter which way round. In Forward mode, the red test socket is positive, but you never have to physically reverse the diode under test thanks to the Forward/Reverse switch, S3. Press S2 to run the oscillator and note the voltage reading. Then reverse the voltage by switching S3 and note the voltage again.

Silicon signal and power diodes should read about 0.7V in one direction and 20V (or 40V or 60V) in the other direction, ie they are not conducting. A specific voltage

reading such as 12V indicates a Zener. If you suspect that the device is a Zener of higher than 20V you can increase the test voltage to 40 or 60V using the rotary switch. Although there exist Zeners of (considerably) above 60V, I suspect they are relatively rare in most people's junkboxes.

Germanium diodes will read about 0.2-0.3V in the forward direction. Be aware that some germanium diodes have only a fairly low reverse voltage rating (the OA47 was only rated at 25V) so don't automatically assume you can test everything at 60V.

If the diode is an LED, it will be illuminated when testing in the forward direction (anode to the red terminal) and extinguished in reverse. The forward voltage is displayed (approximately 2V for red, green and yellow types, around 3V for blue and up to 4V for white). LEDs generally have very low allowable reverse voltage *ratings* – perhaps as low as 5V – but my experience is that I have never damaged a LED by applying up to 20V reverse voltage. (If you're expecting to test a lot of LEDs it may make sense to reconsider the voltage ratings of ZD1 to ZD3 so you can have, say, 5.1V, 24V and 60V ranges).

Note that although the test current is relatively small, 7mA maximum, this may exceed the forward current rating of a small number of special purpose diodes.

Finally, don't forget that you have to press the test button each time to do a test. No voltage will appear at the test terminals until then. This arrangement ensures a long battery life, since the only significant current draw occurs while the oscillator is actually running, other than that required by the DVM.

Component availability

All the components are fairly inexpensive and readily available via eBay, the usual component distributors, or even at rallies. The only mildly unusual item is the 100V DVM, a small, panel mounted all-in-one digital voltmeter, but these are available as snap-in modules on eBay and elsewhere for a pound or so. The photos should give you a guide. Make sure you get a three-wire version (supply, ground, input) rather than the 2-wire versions that have a limited measuring range, typically 3-30V.

SW1 was a 4-way 3-pole unit (only two poles are used), which was under £1. You could choose to use a 6-way 2-pole switch to give a wider range of voltages, as hinted earlier – perhaps, with suitable Zeners, 5.1V, 12V, 24V, 40V, 60V.

The 10mH choke and 20V Zeners were bought in packs of 10, again for low cost. Everything else in the circuit should be even easier to obtain.

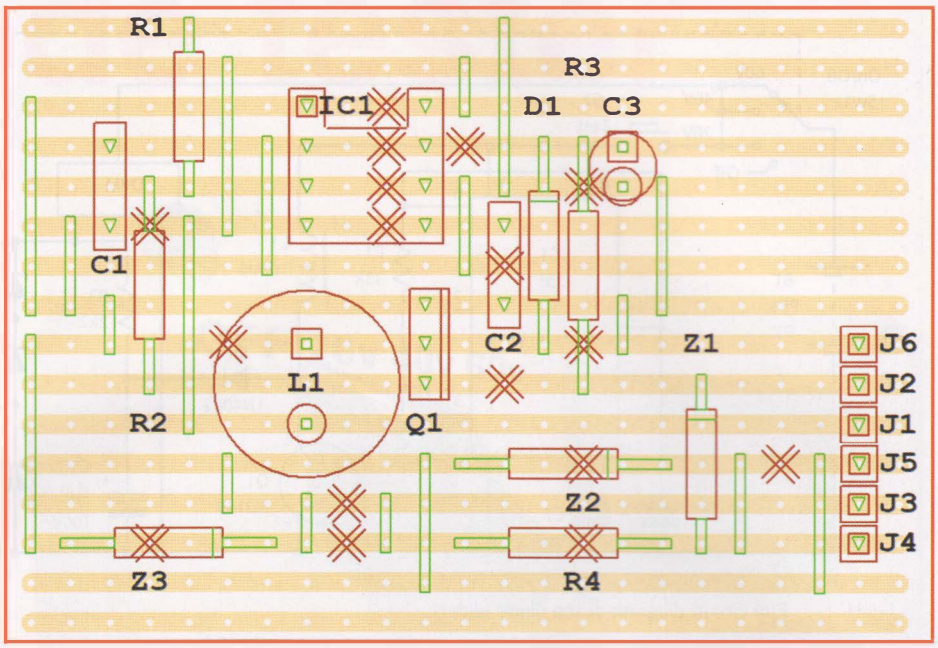

FIGURE 3: Suggested stripboard layout, from the component side. A 'double X' indicates a track break.

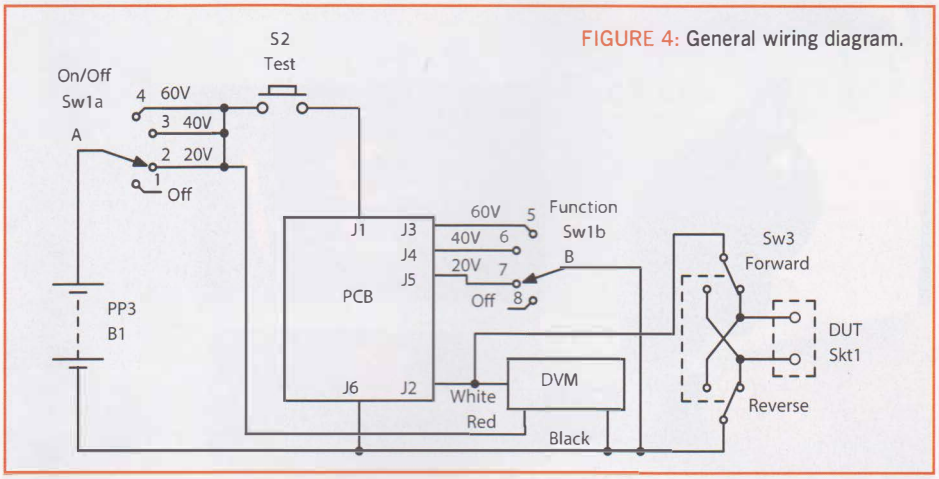

FIGURE 4: General wiring diagram.

PHOTO 4: Testing a 5.3V Zener diode.

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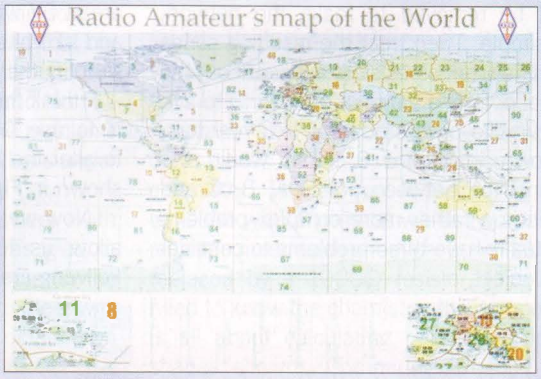

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Competition

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Resistor polyhedra

Years ago in *Elektor Electronics* there was an interesting contest that related to an infinite array of resistors [1]. I note that infinite cubic arrays of resistors have already been considered at great length in the physics community [2]. Flat, 2 dimensional polygonal arrays of resistors and capacitors have also been pondered at length [3]. So I wanted to consider something else. Being a chemist, I tend to think about polyhedral shapes other than cubes. I was thinking about infinite arrays of things like hexagonal prisms (but then I discovered someone else [4] has already done them). The crystal structures of diamond and zinc blende was the one I was thinking about. I wanted to restrict myself to small, non-repeating shapes.

The first polyhedron I thought of is a tetrahedron, seen in **Figure 1**. This is the same shape as a molecule of white phosphorous. If all the chemical bonds in white phosphorus were to be replaced with 1000Ω (1kΩ) resistors and two wires were fixed to two different P atoms, what would the resistance be between the two? The answer is simple: it would be 500Ω.

Now we should move onto something more interesting. If we stick a node in the centre of four 1000Ω resistors linked to each of the outer nodes (**Figure 2**) then things get a little more complex. My chemical mind notes that it also starts to look like basic zinc acetate.

We can go through the method of how to deal with this type of problem. The first step I think should be always to look for resistors that, due to symmetry, will have no current flowing through them. These should be removed to make the network more simple. Then treat the resulting series parallel network of resistors and work out the resistance. I got a value of 400Ω.

If I was to have a cube of 1kΩ resistors, as shown in **Figure 3**, what would the resistance be between points A, B, C and D? This is a rather more complex problem. We actually have three problems to consider in one object.

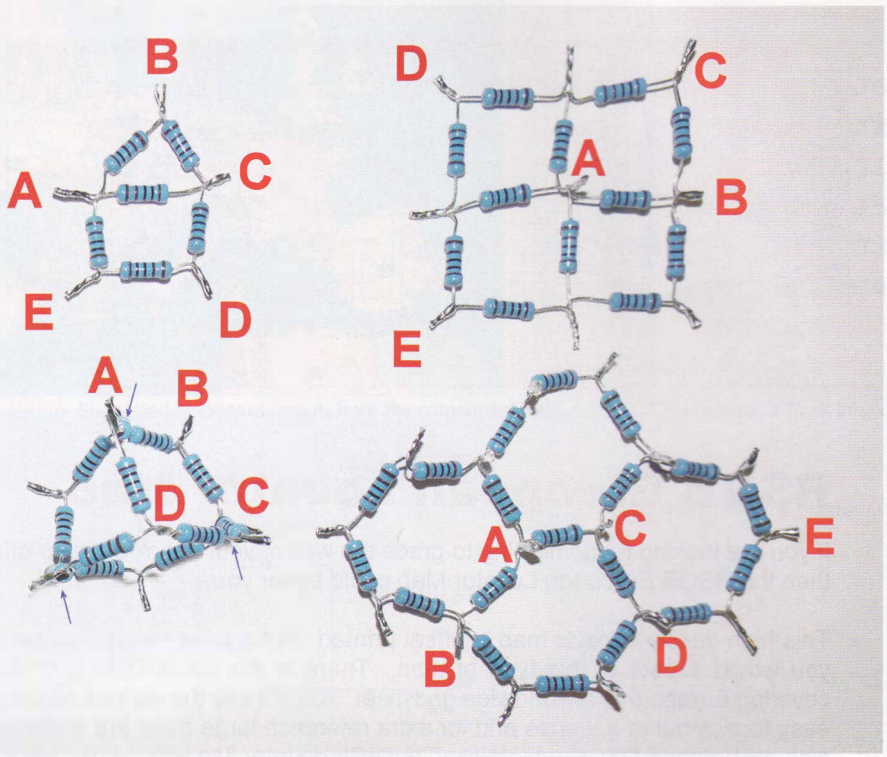

PHOTO 1: Some example networks with labelled points. Top left, Puzzle 1, top right Puzzle 2, bottom left Puzzle 3, bottom right Puzzle 6. Note that the Puzzle 3 network has three hard-to-see resistors end-on, indicated by (very) small arrows.

For the problem of the path A to B we can reduce the number of resistors we need to consider. If A is at +1 volt and B is at -1 volt then the centre point of four resistors will be at 0V. I would advise you to look at the networks for such an equipotential line where the junctions or centres of resistors are at 0V when the two terminals are at +1 and -1 volts. **Figure 4** shows how we can simplify the network.

I think the best way to attack the problem is to use Delta (Δ) / Wye (Y) conversions to alter the arrangement of the resistors, as shown in **Figure 5**.

Now we have some equations which will allow us to interconvert these networks. Follwing are some example equations.

$$R_\alpha = \frac{R_{\alpha\beta}R_{\alpha\gamma}}{R_{\alpha\beta}+R_{\alpha\gamma}+R_{\beta\gamma}}$$

$$R_{\alpha\beta} = \frac{R_\alpha R_\beta + R_\alpha R_\gamma + R_\beta R_\gamma}{R_\gamma}$$

If we do our first transformation we end up with the network shown in **Figure 6**.

Now, using the equation for resistors in parallel, we can get the network shown in **Figure 7**.

After a lot of transformations between delta and wye networks and using the series / parallel equations for resistors I obtained a

TABLE 1: Results of van Steenwijk's calculations for variously shaped polyhedra.

	R1	R2	R3	R4	R5
Octahedron	416.667Ω	500Ω	-	-	-
Icosahedron	366.666Ω	466.667Ω	500Ω	-	-
Dodecahedron	633.333Ω	900Ω	1066.667Ω	1133.333Ω	1166.667Ω

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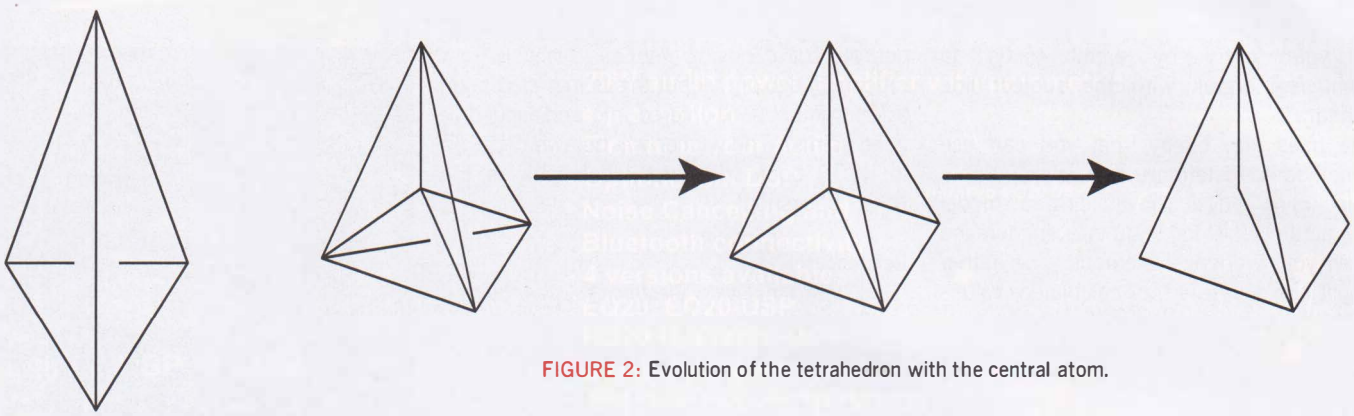


FIGURE 1: The tetrahedron (P_4).

FIGURE 2: Evolution of the tetrahedron with the central atom.

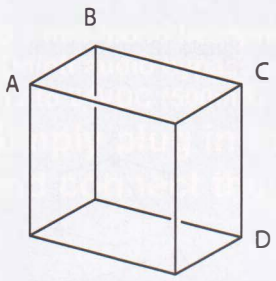


FIGURE 3: The cube.

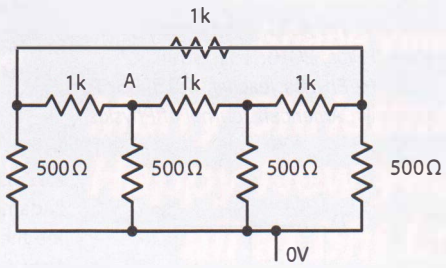


FIGURE 4: A circuit diagram for half of the cube (considering the A to B resistance).

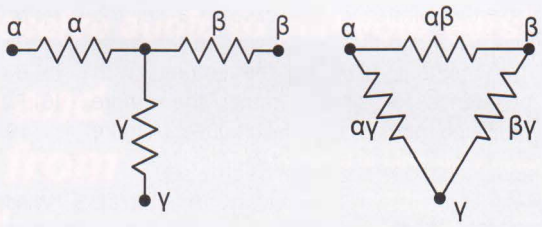


FIGURE 5: Figure 4 after Delta (Δ) / Wye (Y) conversion.

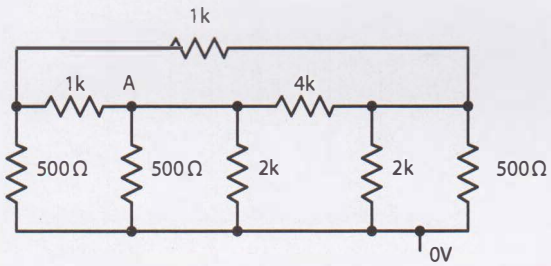


FIGURE 6: Circuit after the first transformation.

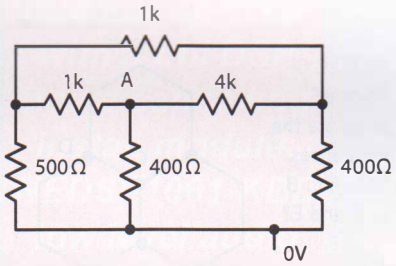


FIGURE 7: Simplifying the parallel resistances.

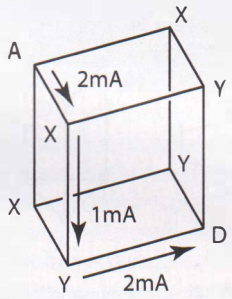


FIGURE 8: Applying Kirchhoff's first law.

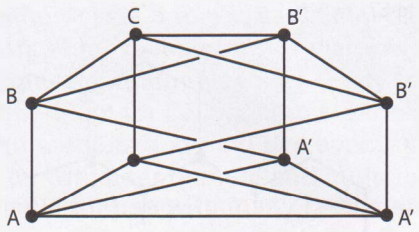


FIGURE 9: The square antiprism is much harder to solve than the cube.

resistance between the terminals A and zero volts of 291.6666Ω, which works out as a resistance of 583.3333Ω between A and B. Terminals A and C were a little easier: I got a value of 750Ω. Terminals A and D were easier still: I got a value of 833.3Ω. For the path A to D we can use the symmetry (C_3 axis) of the cube to solve it with greater ease. Here we use Kirchhoff's first law (current or junction law), which states that the sum of the currents entering a junction must always be equal to the currents leaving the junction. **Figure 8** shows the currents flowing through only three resistors in the cube.

If you add the currents in the other two AX, YD and the other five XY resistors you will get a total of 6mA flowing from A to D. By using Ohm's law you can calculate that the potential difference between AX, XY and YD are 2, 1 and 2 volts respectively. Thus the overall potential difference between A and D is 5V. Use Ohm's law again to give you 833.3333Ω. I then discovered that my approach to the A to D path in the cube has already been published by Allen and Liu **[5]**. Anyone who is struggling with the problems might find that reading Allen and Liu's paper will give them further clues.

When I compared my answers with those of van Steenwijk **[6]**, I was glad to see that I had got the same answers for the tetrahedron and the cube. Van Steenwijk also did the dodecahedron, the octahedron and the isosahedron. His values for the resistance between the vertexes of the polymedia are tabulated in **Table 1**. The values of R1, R2, R3, R4 and R5 indicate the resistance between a pair of vertexes where the smallest number of resistors in the path between them is the subscript number.

We also have some other things such as the square antiprism seen in **Figure 9** to consider. This one is much harder than the cube and I'll leave it to you.

Brain-teaser competition

What we have for you is a contest for the 12 days of Christmas. There are twelve resistor networks of increasing complexity, based on a series of interesting molecules from chemistry. The carbon in each has been replaced with a point at which two or more resistors meet; each chemical bond has been replaced by a 1000Ω resistor. (You don't need to know the chemistry; the competition is all about calculating resistances in the shapes shown). Comparing **Photo 1** with Puzzles 1, 2, 3 and 6 should give you a good idea how the puzzles are built up. Basically, any straight line is a 1000Ω resistor and there can be several resistors in series.

Send your entry by email (only) to radcom@rsgb.org.uk with the subject line "Polyhedra".

The rules are, briefly, that you can use any method to determine the values (up to and including physically building a model out of actual resistors). You are encouraged to show your working / methods. The author has built and measured, or calculated, values for all of the puzzle questions (some are seen in Photo 1 and Photo 2). Any answer within 2% of his values (other than an obvious pure guess) will be accepted as "correct" and the person who gets the most answers "correct" will be the winner. In the case of a tie, the author will judge the 'best' entry on the basis of the methods used by the entrant, with a preference for simpler rather than more complicated mathematical techniques. (A more detailed set of judging criteria is available from radcom@rsgb.org.uk but this is intended to be a fun competition, entered into and judged in good spirits). The winner will be awarded £25 in RSGB book vouchers (redeemable in the RSGB bookshop).

References

[1] M Ohsmann, *Elektor Electronics*, 2004, 30 (335), September, 80

[2] M Q Owaidat, *American Journal of Physics*, 2013, 81, 918

[3] H A Mavromatis, *American Journal of Physics*, 1995, 63, 85

[4] M Q Owaidat and J H Asad, *The European Physical Journal Plus*, 2016, 131, 309

[5] B Allen, T Liu, *The Physics Teacher*, 2015, 53, 75

[6] F J van Steenwijk, *American Journal of Physics*, 1998, 66, 90

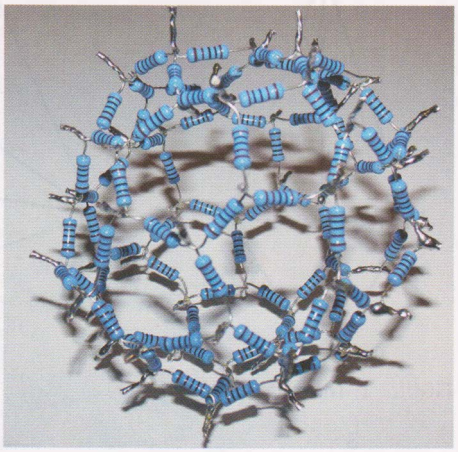
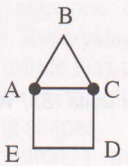
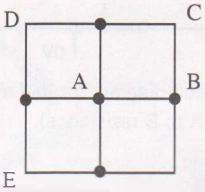


PHOTO 2: Proof that Puzzle 12 *can* be built.

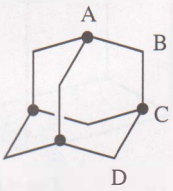
PUZZLE 1: "Houseane". What are the resistances from A to B, C, D and E?

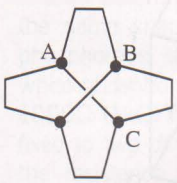


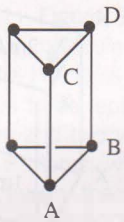
PUZZLE 2: "Windowpane". What are the resistances from A to B and C, B to C, B to D, C to D and C to E?



PUZZLE 3: "Adamantane". What are the resistances from A to B, C, and D?



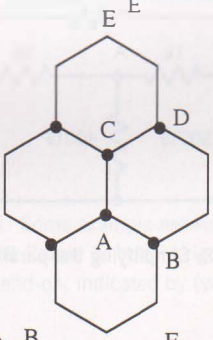


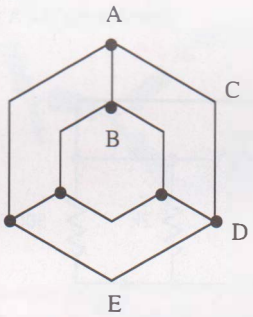


PUZZLE 4: "Twistane". What are the resistances from A to both B and C?

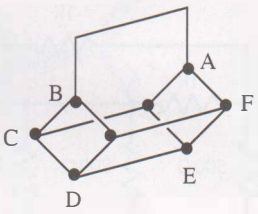
PUZZLE 5: "Prismane". What are the resistances from A to B, C and D?

PUZZLE 6: "Pyrene". What are the resistances from A to B, C, D and E?

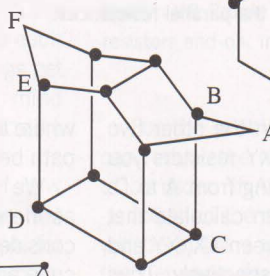




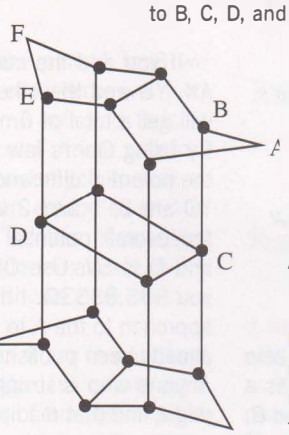
PUZZLE 7: "Iceane". What are the resistances from A to B, C, D, and E?



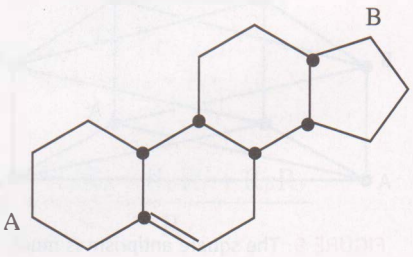
PUZZLE 8: "Basketane". What are the resistances from A to B, C, D, E and F?



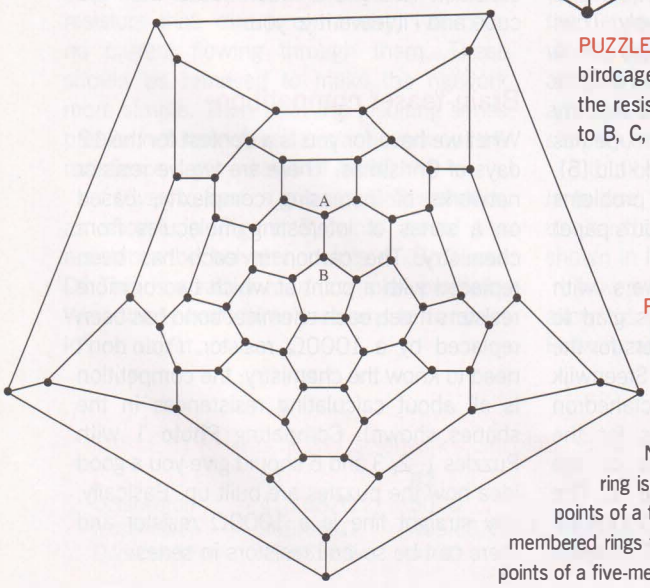
PUZZLE 9: "Birdcage". What are the resistances from A to B, C, D, E and F?



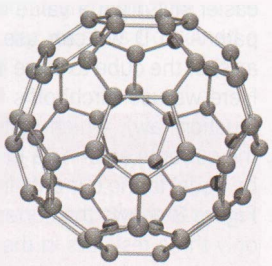
PUZZLE 10: "Bigger birdcage". What are the resistances from A to B, C, D, E and F?



PUZZLE 11: "Cholesterol" (some side groups removed); the double line is for two 1000Ω resistors in parallel. What is the resistance from A to B?



PUZZLE 12: "C60". This is a sphere made up of five- and six-membered rings (pentagons and hexagons) that are linked together. To help visualise your quest we've added an additional view of Puzzle 12: in the same form as the other puzzles (left) and as a sphere with the nodes marked with blobs (right). No two five membered rings share a side; each five-membered ring is surrounded by five six-membered rings. If you go from one of the points of a five-membered ring along the resistor shared between two six-membered rings that is perpendicular to the circle made by going through all five points of a five-membered ring then it will take you to the next five-membered ring.



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Sport Radio

December is a quiet month for RSGB contests and on HF that is particularly so because there aren't any.

The first RSGB VHF contest is 2m AFS, which runs for six hours on Sunday 2nd. It is the third event in the 2018-19 Super League series. After that we have some Activity Contests; the 2m FMAC and UKAC on Tuesday 4th, the 70cm FMAC and UKAC on Tuesday 11th, and the 6m FMAC and UKAC on Thursday 13th. The 2nd Machine Generated Modes (MGM) Contest runs for 24 hours over the weekend of 15-16th. In addition to new modes such as FT8, more traditional modes such as RTTY and PSK are permitted, but CW and EME (moonbounce) are not. Then it's back to the Activity Contests, with the 23cm UKAC on Tuesday 18th and the 4m FMAC and UKAC on Thursday 20th. This is the final Activity Contest of the year. There is no SHF UKAC this month, because it would fall on Christmas day.

The ARRL 160m Contest continues until Sunday 2nd. Because the only stations that count for points are in the USA and Canada, pretty much all activity takes place when the entire radio path is in darkness. The UK Six Metre Group's Winter Marathon begins on Saturday 1st and runs until the end of January. There are no specific operating periods. Just work as many Locator squares as you can, when you can. The ARRL 10m Contest runs for the entire 48 hours of the weekend 8-9th. Propagation for this one is likely to be challenging, to say the least, so although this is an ARRL contest I am going to issue a Wallpaper Alert for it. The reason I'm doing this is because there are likely to be so few entries from this side of the Atlantic you may only need to make a few QSOs to come first in your country/entity. The DARC (German) Christmas Contest takes place on the morning of Boxing Day, on 80m and 40m. For UK stations the band that will carry the bulk of the traffic will be 40m. The Worked All Britain Christmas Party runs for twelve days, starting on Boxing Day. The Stew Perry Top Band Challenge runs for 24 hours over the weekend 29-30th. Entrants may operate for a maximum of fourteen hours. This is a contest where distance is king, so an antenna with some low angle radiation is likely to serve you better than – say – a dipole or long wire. During adjudication entrants get their scores boosted, for working Low Power and QRP stations.

Looking ahead to 2019, the name of this column will be changing to 'Contesting'. This is news that was well received when it was mentioned in the Contesting Forum at the RSGB Convention, back in October. On HF, something that should also make people happy is that the timings of the 80m/40m AFS contests in January are being changed. All three are being brought forward by one hour, to 1300UTC. This means 40m will stay alive for longer, before the skip goes long, and the final hour (now 1600-1700UTC) will be before high angle absorption prevents short range 80m QSOs from taking place. The dates are also changing a little, to avoid clashes with other contests. Next, two summer lunchtime QSO parties are being introduced, on 40m. The 80m Club Champs and Autumn Series will henceforth have Assisted and Unassisted categories in each section (10W and 100W). Finally, some experimental FT8 contests are likely to appear in the calendar. On VHF/UHF, some FM Activity Contests are likely to be replaced with MGM contests, but a firm decision hadn't been made at the time this column was written because an online poll was running.

Steve White, G3ZVW
steve.g3zvw@gmail.com

RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Sun 2 Dec	144MHz AFS §	1000-1600	All	144	RS(T) + SN + Locator
Tue 4 Dec	144MHz FMAC	1900-2000	FM	144	RS + SN + Locator
Tue 4 Dec	144MHz UKAC	2000-2230	All	144	RS(T) + SN + Locator
Tue 11 Dec	432MHz FMAC	1900-2000	FM	432	RS + SN + Locator
Tue 11 Dec	432MHz UKAC	2000-2230	All	432	RS(T) + SN + Locator
Thu 13 Dec	50MHz FMAC	1900-2000	FM	50	RS + SN + Locator
Thu 13 Dec	50MHz UKAC	2000-2230	All	50	RS(T) + SN + Locator
Sat-Sun 15-16 Dec	Second MGM	1400-1400	Any MGM	50, 144	RST + 4-character Locator
Tue 18 Dec	1.3GHz UKAC	2000-2230	All	1.3G	RS(T) + SN + Locator
Thu 20 Dec	70MHz UKAC	1900-2000	FM	70	RS + SN + Locator
Thu 20 Dec	70MHz UKAC	2000-2230	All	70	RS(T) + SN + Locator
Tue-Fri 26-29 Dec	Christmas Cumulatives	1400-1600	All	50-432	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
Fri 30 Nov - 2 Dec	ARRL 160m	2200-1600	CW	1.8	RST (Ws & VEs also send ARRL/RAC section)
1 Dec - 31 Jan	UKSMG Winter Marathon	All	All	50	RS(T) + Locator
Sat-Sun 8-9 Dec	ARRL 10m	0000-2359	CW, phone	28	RS(T) + SN (Ws, VEs & XEs send State/Province code)
Wed 26 Dec	DARC Christmas Contest	0830-1100	CW, SSB	3.5-7	RS(T) + SN (DLs send DOK or 'NM')
26 Dec - 6 Jan	WAB Christmas Party	All	All	All	WAB Book number
Sat-Sun 29-30 Dec	Stew Perry Top Band Challenge	1500-1500	CW	1.8	4-character Locator (Grid) square

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

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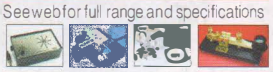

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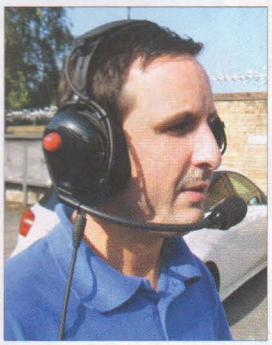

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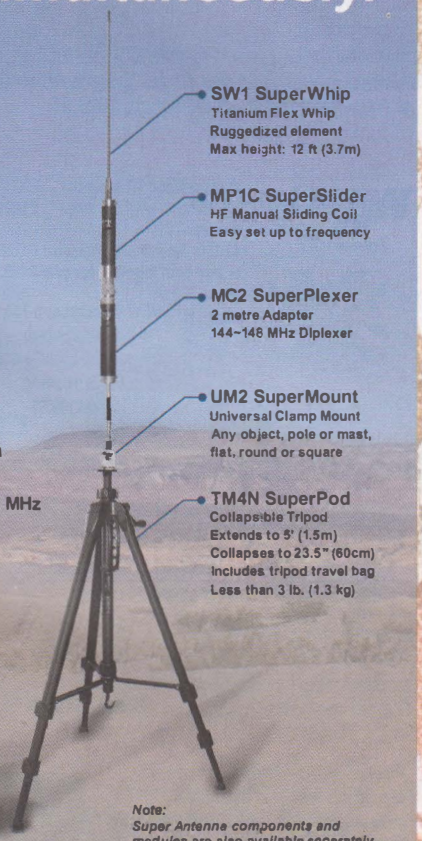

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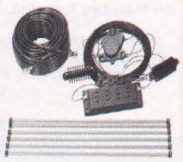
YAESU YA-30



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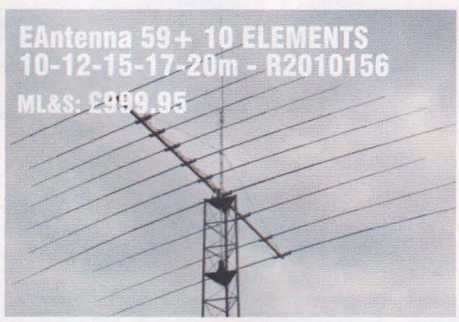

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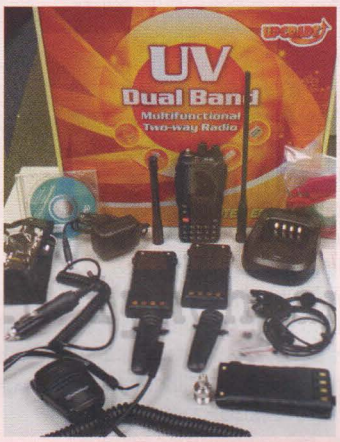

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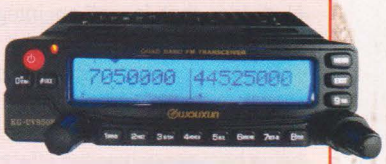

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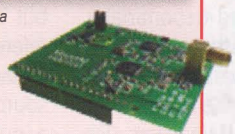

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Design Notes

Fractional synthesisers again

We first saw Fractional-N synthesisers in the April 2012 Design Notes, then looked in more detail of how they work in the November issue of that year. The June 2017 issue carried an update on calculating register values from first principles for the ADF4351 device, popular as a ready-to-go module available on eBay. To recap; a Fract-N synthesiser is a normal phase locked loop (PLL) synthesiser that operates with a high comparison frequency. The division ratio is 'jiggled' in a pseudo random manner to interpolate for an effective N divider that is not an integer. The result allows fine tuning steps to be obtained, at a small fraction of the comparison frequency. But the process does rely on the reference input to the phase-frequency detector (F_{PFD}) being high enough so the effects of the jiggling can be filtered out.

We looked at two typical Fract-N synthesiser solutions: the LMX2470/LM2541 devices that both have the same Fract-N engine. Those can resolve to F_{PFD} / 2^{22} so can give particularly fine tuning that is useful for generating multi-frequency coded (MFSK) digital signals. Unfortunately the LMX2541, which is particularly convenient as it has an internal VCO, has a number of complications that make MFSK programming inelegant and tricky if wideband spurii are to be avoided when the frequency is changed even minutely. The other device we looked at, the popular ADF4351, is easier to program and control but can only offer a coarser tuning grid, typically a few kHz (or hundreds of Hz at lower frequency output).

Neglecting any output dividers used to supply lower frequencies, traditional Fractional-N synthesisers give an output frequency of

$$F_{VCO} = F_{PFD}\left(N + \left(\frac{F}{D}\right)\right)$$

The frequency setting resolution is therefore equal to F_{PFD}/D. If D is set to its maximum allowed value of 2^{22} for the LMX devices and F_{PFD} is 20MHz (for example a 10MHz reference with the internal doubler active) it means a tuning resolution of 4.77Hz is possible. In practice, for generating MFSK modes, D is chosen so the tuning step is equal to that needed for the MFSK tone shift and F is then programmed in units of the tone number.

For example, JT4G modulation needs a tone shift of 315Hz, so for F_{PFD} equal to 20MHz we would use a value for D of 20MHz / 315 = 63492. It works well enough and several V/UHF beacons have gone on air using such a scheme to generate JT4 and JT65 modulation. But it's not the best way to proceed, especially as the LMX2541 has to be treated in a slightly different way to avoid glitches and spurii due to the internal VCO recalibration process.

The next generation

But there is now a new device, once again already popularised with ready-built modules available on eBay.

Photo 1 shows such a module with a small PIC controller module added to program its registers via a serial interface from a PC. The additional 1000μF capacitor shown in the photograph helps clean up phase noise – see later. The ADF5355 is a next generation product capable of producing frequencies between 54MHz and 13.6GHz and, at the same time, giving exceedingly fine, sub-Hz frequency setting resolution. It's even finer than the LMX family can offer. It has an internal VCO covering 3.4 to 6.8GHz and an output divider in binary steps up to 64 for the 54MHz lower limit. The chip also has an output RF doubler, allowing a separate output port that delivers 6.8 to 13.6GHz

The ADF5355 achieves a fine frequency resolution with a dual Fractional-N engine. The output frequency is given by

$$F_{VCO} = F_{PFD}\left(N + \frac{F1 + \left(\frac{F2}{D2}\right)}{2^{24}}\right)$$

So now, not only can it offer the slightly higher resolution of F_{PFD} / 2^{24}, set using just the F1 register against the fixed denominator D1 (which is already better than the LMX family can offer), but now there is an additional 'fraction of a fraction' term available using a second set of F and D registers, F2 and D2. D2 can be programmed by the user up to a maximum of 16383 so the ultimate frequency resolution available with a much higher 125MHz reference (see later) is now

$$\frac{125\text{MHz}}{2^{24} \times 16383} = 0.00045\text{Hz}$$

That's *surely* more than accurate enough for most purposes. And this is at the *VFO* frequency; at VHF or UHF even this fine tuning resolution will be divided down to give microhertz steps.

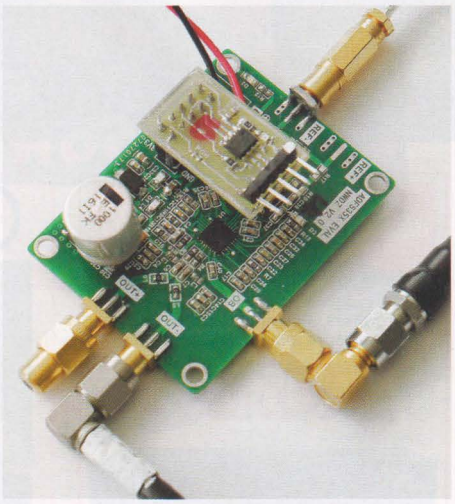


PHOTO 1: ADF5355 Fractional Synthesiser module from an eBay supplier. The small extra PCB carries a PIC for translating serial commands from a PC. The 1000μF capacitor gives some extra supply decoupling to improve phase noise.

Reference input

There is a price to be paid. The dual Fract-N process works best with a high frequency reference, or F_{PFD}. The 10 or 20MHz typically used with the LMX and ADF43xx devices is not really good enough for optimising low levels of spurii. The maximum specified input to the phase-frequency detector is 125MHz and the various eBay modules typically come with 25, 40 or 125MHz clock oscillators on board. The loop filters are designed for this PFD input and, as I discovered, testing with a 10MHz reference doubled to 20MHz gave poor results with the loop filter components built onto the module. Low frequency references could no doubt be made to give better results by redesigning the loop filter, but it all gets a bit complicated – and a high reference input is better anyway. Fortunately I have a commercial 40MHz lockable TCXO source, so with the reference doubler in use a quite acceptable 80MHz F_{PFD} is available for testing. But if the stability of the on-board supplied clock oscillator is adequate for your purposes, just use that.

Calculating register values

First calculate F_{PFD}, the frequency into the phase frequency detector. In most cases this will be the input reference, which can be doubled by the on-chip reference doubler up to a maximum of 125MHz. Of the two modulus dividers, the first F1 works with

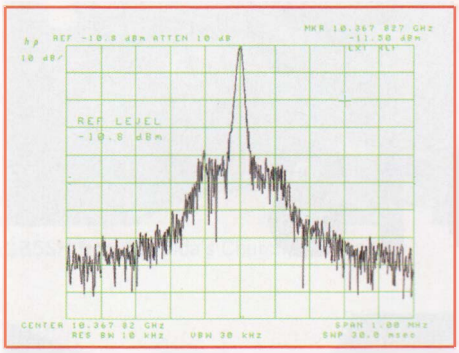


FIGURE 1: ADF5355 phase noise from the eBay board as supplied. (Courtesy of Brian, GM8BJF).

a fixed modulus of 2^{24}, and the second F2 with the programmable denominator D2. Rearranging the equation shows better how the registers are set for any given output frequency.

$$F_{VCO} = F_{PFD}\left(N + \frac{F1}{2^{24}} + \left(\frac{F2}{2^{24}D2}\right)\right)$$

For an example, we'll use a reference frequency of 40MHz, doubled to 80MHz, and an output after the RF doubler of 10368.345MHz on output B, meaning that F_{VCO} = 5184.175MHz:

$$\frac{F_{VCO}}{80\text{MHz}} = 64.80215625$$

The integer portion gives N = 64 to be put into the INT N register. Subtract this from the value calculated above, leaving a residue of 0.80215625. Multiply the residue by 2^{24}, the fixed-value modulus of the first stage, to get the F1 value:

$$0.80215625 \times 2^{24} = 13457948.672$$

The integer portion of this is the F1 register, leaving a residue of 0.672.

Choose a value for the second modulus D2. Maximum frequency resolution can be achieved by making this the highest allowed, 16383. Here we will (arbitrarily) use the nearest exact binary multiple below that, 8192. Multiply the final residue by D2 to get F2:

$$0.672 \times 8192 = 5505$$

Discard any fractional part (but see later for exact frequency setting):

$$F_{VCO} = 80\text{MHz}\left(64 + \frac{13457948}{2^{24}} + \left(\frac{5505}{8192 \times 2^{24}}\right)\right)$$

The resulting N, F1, F2 and D2 values then need to be formatted and correctly aligned into the bits that make up the 32 bit words sent to the chip registers. The data sheet [1] contains full information.

Ultimate frequency setting resolution is a function of F_{PFD} (the multiplied or divided F_{REF}) and the two modulus values.

$$\text{Resolution} = \frac{F_{PFD}}{2^{24} \times D2}$$

so for F_{PFD} = 80MHz and D2 = 8192, the VCO frequency step or resolution is around 0.00058Hz. This step is either doubled or divided by Odiv as appropriate.

If an exact frequency is needed, the second residue (0.672 in the example) needs to be manipulated. Find the lowest integer that, when multiplied by that figure, results in another integer. The lowest in this case is 125. So by making D2 = 125 and F2 = 84, an output of exactly 10368.345GHz will result (assuming the 40MHz reference is spot-on).

Shortcuts

When the device is used for real-time programming with frequencies calculated on the fly in a dedicated microcontroller, it can be very convenient to make D2 = 4096. Then the precise fractional frequency part is set by a continuous 36 bit word, the highest 24 bits forming F1 and the lower 12 bits F2. Since D1 is also a power of two, the integer N divider value can be stuck on the end of this, making a 48-bit (six-byte) binary word representing the VCO frequency in units of the grid size, or step. The 48-bit number can then be manipulated using straightforward binary addition and subtraction to change tone frequencies; the resulting F2, F1 and N registers will then fall out directly. The following bit pattern shows how the word is made up. The bits labelled 'N' correspond to the integer divider, 'B' the F1 first fractional value and 'a' to F2:

```
NNNNNNNN NNNNBBBB BBBBBBBB
BBBBBBBB BBBBaaaa aaaaaaaa
```

The values ends up with a 4-bit offset in the individual bytes and although this looks messy, it is actually remarkably useful. It means that byte alignment for many of the values correspond with their positions in the chip's registers as there is a four-bit offset present there for the register address. All of this simplifies microcontroller code and speeds things up, a useful prerequisite for real time reprogramming. See the data sheet for full details of register settings.

It's worth noting here that 48-bit integer arithmetic is beyond the capabilities of many of the high level languages used to program microcontrollers, at least to do so directly. It is even beyond the capability of an Excel spreadsheet but is, however, easily achieved by extending standard assembler routines. Any PIC can manage 48- or 64-bit arithmetic.

Cleaning up the ADF5355

In the September 2018 Design Notes we saw the problems far-out phase noise can have on wide band modulation such as DATV and noted that the DATV community had found this issue with the ADF5355 synthesiser. Brian Flynn, GM8BJF, looked at this and

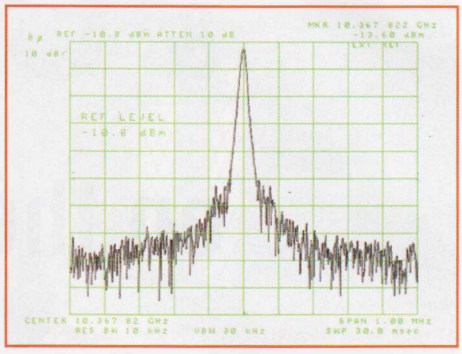


FIGURE 2: The reduced phase noise possible by placing a 3300µF low-ESR capacitor across C30. (Courtesy of Brian, GM8BJF).

wrote up his findings in the December 2017 issue of *Scatterpoint* [2]. He wrote "My initial hunch was that the power lines were the source of the noise. There are two voltage regulators on the boards, one a LT176333 (which powers both the 3.3V analogue and digital Vdd lines) and a LT17635 (which powers the VCO and charge pump circuitry with 5V). This is powered directly from the output of the regulator and there is no further on-chip regulation, whereas the 3.3V rails are further regulated down to 1.8V on-chip. Both the LT parts are billed as 'low-noise' in the data sheet, but I noted that the AD evaluation PCB design used AD parts that are considerably more expensive that the LT parts. Their respective data sheets reveal that the AD parts were about ten times less noisy. The simple expedient of adding a 3300µF low ESR capacitor across C30 (on the black PCB) bypasses the noise from the regulator output quite effectively. I used a Rubycon MBZ series 6.3V part with an ESR of 12mΩ."

The plots before and after can be seen in **Figures 1** and **2** where a very pronounced reduction is phase noise in the area 30–200kHz either side of the carrier, and beyond is visible, ie just outside the loop filter bandwidth. The improvement is so great it makes me wonder if some of my previous synthesiser designs such as the LMX2541 might also benefit from such cleaning-up. Since that article, Brian has done some further work on lowering phase noise from these modules. Details can be found at [3].

References

[1] www.analog.com/media/en/technical-documentation/data-sheets/ADF5355.pdf

[2] www.microwavers.org – *Scatterpoint*

[3] https://gm8bjf.joomla.com/2-uncategorised/15-reducing-phase-noise-pn-on-chinese-adf5355-boards

Andy Talbot, G4JNT
andy.g4jnt@gmail.com

Churches & Chapels on the Air 2018

Churches and Chapels on the air (CHOTA) is an annual event organised by the World Association of Christian Radio Amateurs and Listeners (WACRAL). In 2018, the event took place on 8 September.

Many radio clubs activate special event stations on the same day that churches put on events for the public to raise funds and their profile.

GB900BC, a special year for Peterborough cathedral because it is 900 years old.

GB900PC Peterborough Cathedral

The first of Peterborough & District ARC's autumn events was CHOTA. This year we were lucky enough to set up our station in the Cloisters area of Peterborough Cathedral. This is a special year for the Cathedral because it is 900 years old, so we requested (and were given) GB900PC. We set up an offset dipole for HF and a white stick vertical for VHF. We were very much shielded by the massive size and height of the Cathedral, so contacts in certain directions were almost impossible. However, we persevered and made over 50 contacts in nine countries on 40 and 80m, with just a few on VHF. We had a lot of interest from the public plus the space capsule that Tim Peake used was inside the Cathedral, which brought extra people toward our radio station. A great day and good PR for the hobby.

Tony King, G0IAG

GB0LOW, St. Martins, Lowthorpe

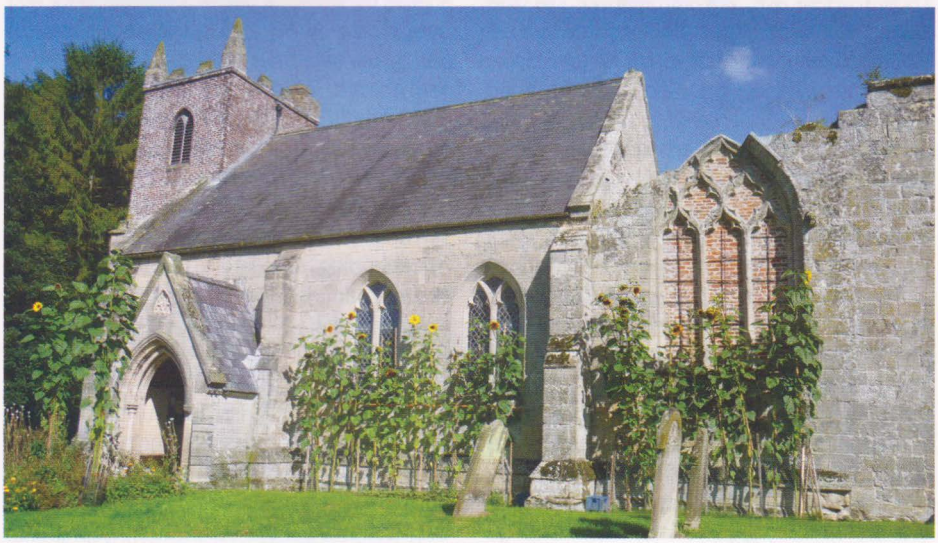
The tower at Lowthorpe makes a good aerial mast. I fastened the centre of my 60m long doublet to one of the pinnacles and the ends to trees in the churchyard. This antenna worked well on 80, 40 and 20m with OWF down the tower to a 4:1 balun and coax to the Kenwood TS-450 transceiver. 40m was useless for inter G working, fortunately 80m was in good shape. The case has often been the reverse in previous years. I was delighted to work 17 churches out of about 30 active. A total of 41 QSOs were made, including USA on 20m. DX always impresses the visitors even though it was a contest. Looking forward to next year, which will be on Saturday 14 September 2019.

John Wresdell, G3XYF

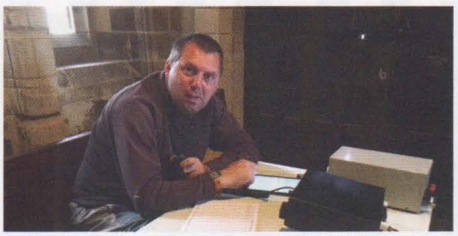
GB5SH, St Hilda's, Hartlepool

On HF we made 73 contacts, including two CW, and nine that were with other CHOTA stations (GB0LOW, GB0SLE, GB1SKC, GB1SMB, GB2ASF, GB2STC, GB4DCF, GB4SBC, GB8CSM). We used an W3DZZ trap dipole in inverted V configuration with an IC-7300 and a KW Z-Match. On VHF/UHF we made 23 contacts using a VHF/UHF collinear and an FT-900R/E. The operating team were G0KVL, G4DXP, G4GTX, M6OEQ, M6TJI, 2E0HPI and G8DST (who masterminded the antennas and took the photographs).

John Hogg, G3NUA

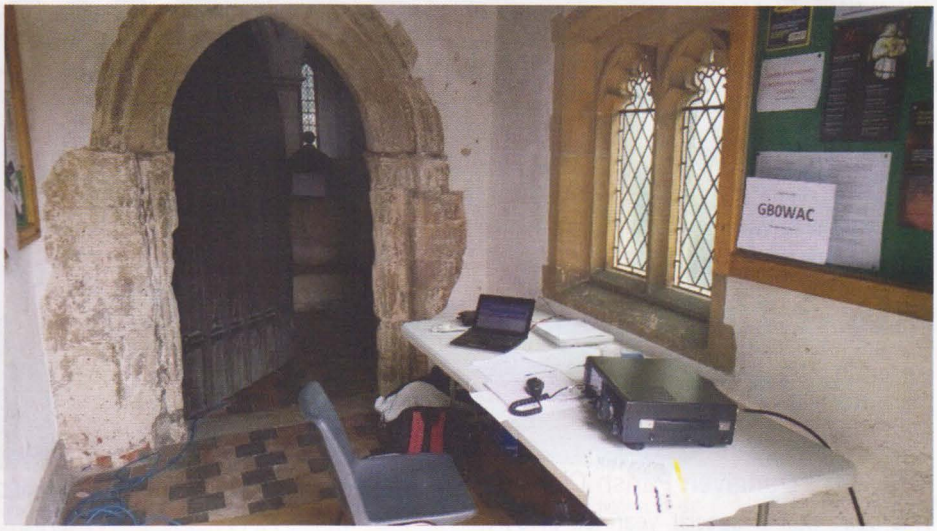


GB0LOW on the air from St Martins church in Lowthorpe.



GB5SH from St Hilda's Church, Hartlepool.

GOSJB relocated to the car due to the weather.



GB0WAC operated from the porch of St Mary the Virgin, Wendens Ambo in Essex.

GOSJB, St John the Baptist, Wantisden

The morning was grey as I set up outside Wantisden Church – a remote church with no houses or cottages within 3 miles – and only a single-way track leading to it, more suitable for walkers than motor vehicles. I was using my FT-450D and an Atas mobile whip. I had decided against climbing the crumbling tower, for this truly is a church in advanced stages of decay. I sat on a chair beside the car, with all the gear on a small table, and that was roughly the time that the drizzle began. Not wanting to get the little radio too wet, I hastily dismantled everything and reinstalled it all inside the car. Band conditions were...interesting. We've had several months when all bands have been quiet – or totally dead – and I'd wondered if I would make any contacts at all. Sadly, I subsequently learned that one of the major opened bands was 80m and the Atas aerial covers all bands – except 80m. I managed contacts on 20m and 40m. I had volunteered to be the church representative if we had any visitors on the Suffolk Ride and Stride day – folk get sponsored for each church they visit in their area – many walk, but most come by bicycle. Over the five hours I was there, about eleven cyclists visited. At the end of the day I managed just 14 contacts – 11 different countries – with an additional ten who wanted 'outside Europe only' and wouldn't even give me a signal report. Nevertheless it was great fun and I'm already looking forward to 2019.

Steve Nicholls, G0JFM

GB0WAC, St Mary the Virgin, Wendens Ambo

I operated GB0WAC from the porch of St Mary the Virgin church in Wendens Ambo, a small village in north west Essex. When I had got the mast ready to put up in the churchyard I realised that I hadn't brought my 40m dipole with me, so had to pop back home (3 minutes away, fortunately), remembering that it wasn't in my portable pack because since last year I had added traps and extensions to make it into a 40m/80m dipole. That proved to be a stroke of luck, since 80m turned out to be the band to be on. Out of 22 QSOs I tallied 12 with other churches, which was a best from here. Two QSOs were made on 40m – Dungiven Parish Church MNOGKL and the Orkney Wireless Museum GB0OWM. The remainder were on 80m. Equipment in use was an FTDx1200 running about 75W and the antenna a thin-wire trap inverted V trap dipole for 40m and 80m, with the centre at about 8m. The weather was overcast, with a little rain when setting up and in the middle of the day, but otherwise dry. CHOTA coincided with Essex Ride and Stride, so I was on hand for any riders or striders – only four this year.

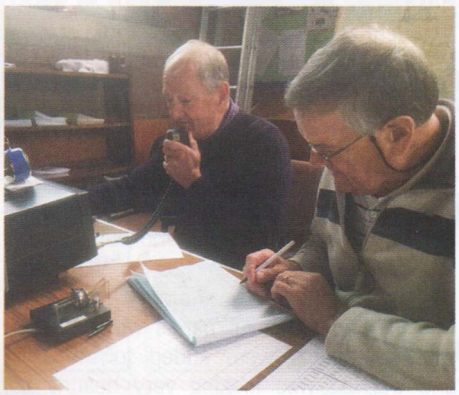
Robert Wilson, G3YZO

GB4SBC, St Barnabas Church, Franche

Having listened to the 80 and 40m bands for a few weeks before the event, I was not optimistic that we would make this year's event a success. However, having set up on Friday at 2pm, successfully hoisting the G5RV to the top of the church's flag pole, we were away.

This year we kept both ends of the aerial well away from the church building and also raised each end to about 20/25 feet above the ground, on telescopic poles. On Saturday, the station was soon making its first contact on 3.750MHz at 8am. We stayed on this frequency all day, without a break and it was good to have the support of 8 operators that made the operating so much easier.

Band conditions were far from brilliant, but I would say that GB4SBC performed successfully. It was a very happy, fun-filled-day; we made lots of contacts, all over the UK, including 19 churches and chapels. It was certainly the best effort we have made since embarking on CHOTA, thanks to the 8 operators, who included: Mark, G4OBC, Ann, G0BIR, Fred, G0EHQ, Tony, G4ZIB, Barry, G4CTU, John, G3SZG, James, M0IGV and Geoff, G4ACS. A very good team effort.



GB4SBC had a team of 8 operators in Franche.

The transceiver used was the old faithful, FT-1000, the 200W model that performed very well, barefoot, receiving both good signal and audio reports.

We had just a few visitors during the day, including John, G4GMA and the Vicar of St Barnabas Church, Rev Bridgett, who was able to pass on a message to the vicar of Otley Church in Yorkshire at their station, GB2ASF. Total contacts made (including during set up) were 191 in eight countries.

It would be wrong to forget to say a big thank you to the Church Warden of St Barnabas Church, Barrie Lewis. Without his help we could not have put on the station.

Geoff Weale, G4ACS

radcom@rsgb.org.uk

GB2MAG, St Magnus Church, Bessingby

Due to only having a linked dipole for 40/20m, we missed out on 80m. Consequently, on 40m only 11 stations went into the log including four churches, two in Cornwall, one in East Sussex and one in East Yorkshire. We also managed two GM, two DL, one HB, one F and a local G/MM berthed in Bridlington Harbour. We lost quite a few more due to QSB. We still enjoyed the day and will hopefully have something sorted out for 80m next year.

Dave, GODEB

MNOGKL, Dungiven Parish Church

This year was a special year for CHOTA from Dungiven Parish Church, it was the 200th anniversary of the church building and Bushvalley ARC were very happy to assist and demonstrate their portable radio station from the ever popular Community Vintage Vehicle and Craft Fair. The radio club this year procured the use of an excellent radio shack, a double horse trailer and MNOGKL was well and truly aired on the day. It was especially exciting to have another Church from Co. Down on the air and we had our first 'Church to Church' QSO on VHF with St. Johns who were on the air with the call MNOVFW. On the HF bands various other CHOTA stations were added to the tally and the log was looking very healthy as mid day approached. Esther, GIOAZA, Ian, GIOAZB, Jason, MI3UIW, Steve, MIOKXT and John, MIOWJC all got involved with chatting, working and logging the V/UHF and HF contacts from around the EU, UK and Canada.

Ian Evans, GIOAZB

GBOSLE St Lawrence Church, Eyam Village

Planning for GBOSLE at St Lawrence Church, Eyam Village (the "Plague Village", IO93DG, Derbyshire Dales, Peak District National Park) started in March when it was identified that CHOTA in September could be preceded with a Short Wave Workshop in August at a 'Holidays At Home' event for over 50s from the village and surrounding area. I decided to apply for an NoV for 2 days, the 7th and 8th. With the help of Colin, M5FRA, a 38m long-wire was erected, end-fed via a 9:1 un-un at 2m (with a couple of counterpoises), dog-legged in a sloping fashion via some trees in the churchyard and supported at its top end from the church tower flagpole at approx. 18m. This served as a NVIS antenna with ability to operate multi-band (if required) with a tuner. The 7th was test day but due to conditions it was decided to adopt 80m as band-of-choice. The station comprised an FT-847 transceiver, old FL-2100Z linear (400W) with manual ATU and was set up in the choir vestry. I was ably assisted by my XYL (Angela), who put up posters, signs and a 'scoreboard' to keep visitors informed of the number of churches, stations and countries worked. Over six hours leisurely operating, GBOSLE contacted 107 other amateur radio stations (with 90% on 80m and others on 40/20m) in Holland, France, Germany, Norway, Republic of Ireland, Switzerland, Italy, Belarus plus all parts of the UK, from Dumfries & Galloway, Isle of Skye and Edinburgh in the North to Cornwall, Kent, Oxford, Sussex and Essex in the South. 16 other CHOTA stations were worked and greetings were passed, along with notable information about the churches. Throughout the event there were many visitors into the church, many popping into the choir vestry to see what was going on, and all of them delighted to see activity within the church building. Another memorable visitor was an American amateur "still licensed but not transmitted for years" and who was keen to see an operating station within the church. All in all a highly enjoyable day and one that we may well look to repeat for CHOTA 2019!

Nick Garbett, M1DDD

GBOSLE at St Lawrence Church, Eyam Village in Derbyshire.

GB4DCF Driffield Christian Fellowship Church

The station was set up at Driffield Christian Fellowship Church early Saturday morning. The weather was overcast initially however it rained later in the afternoon. The station was operated by Mike, G4SMB and the equipment consisted of the IC-7000 mounted in the newly constructed 'Go Box' running around 80W into a G5RV erected in limited space down the side of the building but up around 20ft at its centre. 40m operation was the initial plan, however conditions were very poor on 40m. Moving to 80m proved to be a bit of a struggle at this QTH but was reasonably good. Six CHOTA stations were worked. The station was visited by our Pastor Mark, Steve and Kim two of the church elders, XYL Pamela and some more church folk. Many questions were asked about the station and the purpose of CHOTA. In addition, a quick skirmish on 20m to demo CW operation netted a station in Russia and another conversation about Morse code and its characters. All in all a good day on the wireless and some long interesting conversations with visitors; much better than last year! See you next year.

Mike, G4SMB

St Johns, Church of Ireland, Moira

On the 8th, Mid Ulster ARC activated a CHOTA station for the first time. During a day with difficult HF conditions, the most of our 70 contacts were on VHF & UHF. Two contacts made using a homebrew(ish) antenna. On 20m we worked OK2RZ and on 40m it was LZ1WIN. An enjoyable day and we certainly did put the Church on the Air!

Dave, 2IOSJV

GB1SKC, St Keverne Church, Helston

Members of Poldhu ARC had a very successful day operating GB1SKC at St Keverne Church, located on the Lizard Peninsula, Cornwall. Operators included Ivan, G4WIA, Malcolm, GMODBW and Cliff, G3UYN. The antenna was tethered between the base of the St Keverne church steeple and the sign of the Three Tuns public house, with the radio equipment in the garage of the Temperance B&B. We thank all our friends in the Three Tuns and The Temperance House (who also kept us going with great coffee), plus Ellis, MOKAV and Bob Bevan who climbed the tower to hoist the antenna. Another successful event, we worked 84 stations including 8 registered churches. Apart from our excellent operators, I put our success down to running 400W to a high dipole that was accurately resonated and needed no tuner! We found a frequency and sat on it for the day. The radio this time was an IC-7300.

John Farrar, G3UCQ

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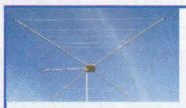

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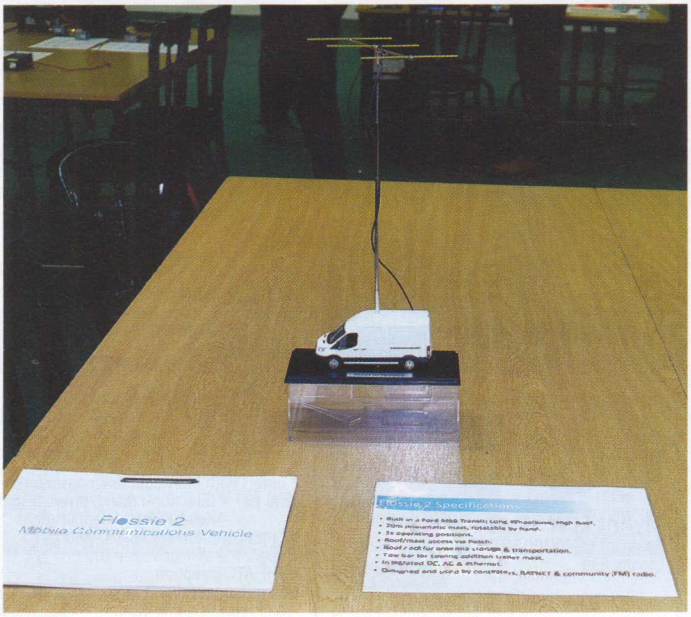
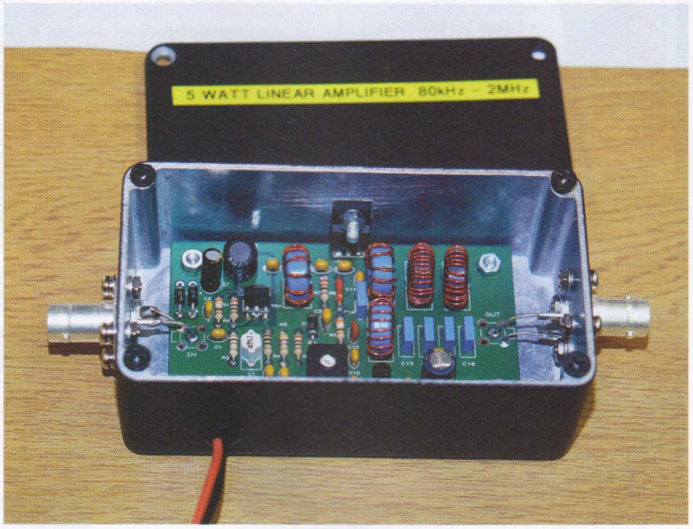
RSGB Convention 2018





Two of the entrants to the annual RSGB Construction Competition. Left: the model of Flossie 2 showing the fitting out of the vehicle. Above: A 5W linear amplifier.

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The RSGB Convention took place over the weekend of 12 to 14 October and over 600 visitors attended the many lectures, demonstrations, award presentations and social gatherings.

The RSGB would like to thank Martin Lynch & Sons, who were the principal sponsor again this year, for their continue support of this event. AMSAT UK again joined the event with a complete lecture steam devoted to all matters space and amateur radio.

Over the weekend there were more than 50 unique lectures, some via Skype, covering HF, VHF, space, technical matters on all levels and DXpeditions. Regardless of your level of expertise or interest there was something for everyone and that includes a Buildathon too in 2018 (more on that later).

Lecture videos

Over the year, many of the lectures will be available to RSGB Members to view via the RSGB website. The 2017 lectures are being made available to non-Members via the RSGB's YouTube channel. So far this year, the 'keynote' lecture from Tim Duffy, K3LR and the lecture from Don Beattie, G3BJ, President of IARU Region 1 are available on the YouTube channel. Tim is amongst the leaders, if not *the* leader, in the contesting field. He talks about his contest station but also, as he puts it, focusing on 'keeping ham radio fun and alive'. The lecture is called *The K3LR Super Station*.

Don's talk *So what has the IARU ever done for us?* describes what the IARU is doing, how the challenges of representing amateur radio globally are changing, and what the world would be like without IARU.

On the RSGB Members' website you can find *FT8 Performance Secrets* by Neil Smith, G4DBN and *Microwave Engineering – From Death Rays to Dinner*, by William Eustace, MOWJE.

You will find all of our videos at www.rsgb.org/videos/ Follow the links to RSGB Convention lectures and then 2018 for the latest ones, with more to follow.

Lectures

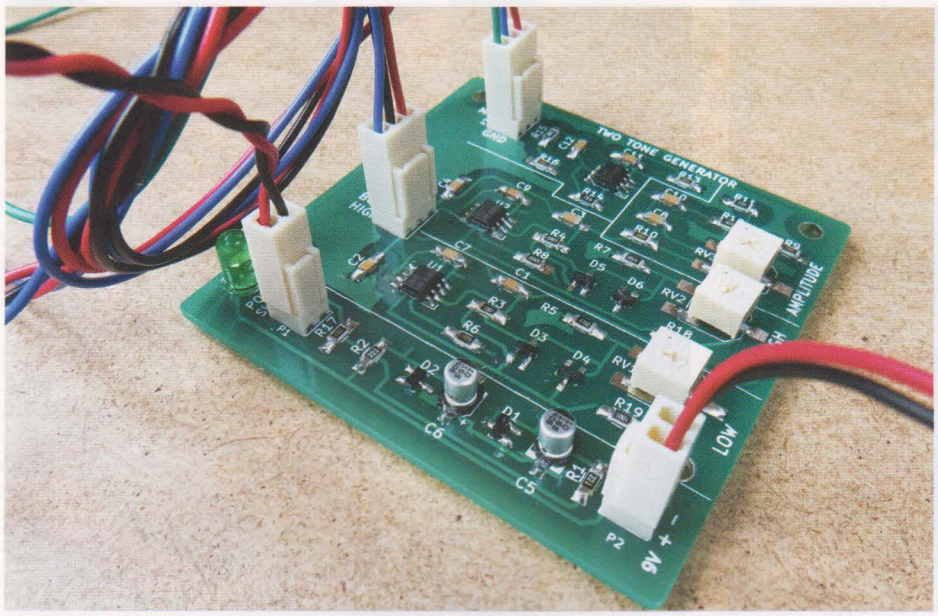
In the space available here it is only possible to outline a few of the lectures that took place. Those visiting the Convention know the dilemma of trying to choose which ones to attend, which is why it is fortunate to have so many released on the website over the year. Thanks to those who have given me an insight into the lectures they attended.

James Patterson, M1DST gave a very informative presentation with lots of practical advice to help people getting started with 3D printing. In addition to the various printer types, James provided lots of useful information on 3D printing materials explaining their characteristics, how to use them and how to get the best prices.

John Regnault, G4SWX has spent over 45 years chasing DX on 144MHz and is now one of the few stations in the world to have worked over 150 DXCC countries on the band. In his talk, Beyond 150 Countries on 144MHz – the science of extreme VHF DXing, he addressed the range of key technical issues that are important to working 144MHz DX, ranging from how to select the right equipment and antennas, through to understanding your site, to tools and operating techniques for both terrestrial modes and Moonbounce.

John Worsnop, G4BAO gave an impassioned presentation to encourage the audience to join in the Wednesday night microwave digital modes activity sessions. John explained that many of our higher frequency bands are under severe threat by commercial demands for more bandwidth. John very clearly explained that we will lose these bands if we don't start using them. The wide bandwidths available on microwave frequencies gives us the freedom to experiment with many wide-band digital modes that are not usable on the lower bands.

Bo Hansen, OZ2M's presentation on Digital Modes for Beacons explained the



The successful Buildathon project, the two tone tester kit from Kanga UK.

background behind the initiative to change to digital mode beacons. Bo demonstrated how the PI4 digital mode is ideal for use with beacons and explained very clearly the many benefits.

The Farnham WebSDR – DC to Microwaves on your Smartphone by Noel Matthews, G8GTZ gave an overview of the Farnham WebSDR [http://farnham-sdr.com] that currently covers the LF bands through to 10GHz. He described the system architecture and antennas currently used on each band and how the team has used RTL dongle receivers, available for under £10, to give good RF performance on all bands from DC to 10GHz.

Jenny Bailey, G0VQH works for Ofcom and provided a comprehensive view of the requirements for operating drones in the UK, complete with the training and licensing requirements. Jenny also had several large drones on display and gave a detailed description of how Ofcom use drones to measure antenna radiation patterns. In addition to providing an insight into Ofcom's work with drones the presentation gave lots of useful information for amateurs that may want to use consumer grade drones for antenna measurement.

The RSGB Board held a session to introduce who they are and what they do, providing an opportunity to ask them questions about their roles, the important challenges faced by amateur radio and how they are tackling them with the projects underpinning Strategy 2022.

Heather Lomond, M0HMO provided a useful overview of GNU Radio showing how radio devices can be created using visual programming. The audience was also introduced to the use of functional blocks and flow charts to create receivers and other RF devices.

Jim Bacon, G3YLA, as well as being a regular weather presenter on Look East, always has sound theories about Sporadic-E propagation particularly in the light of this year's superb conditions on 6m over to North America, Caribbean, South America and Japan/Far East.

70cm is still a haven for constructors, particularly in the high performance transverter area. Sam Jewell, G4DDK has spent considerable time developing transverter kits for 70cm, with the latest in the family, ICENI, that exhibits exceptional strong signal performance together with high sensitivity. ICENI can be built from scratch, with the support of a professional PCB, or from a kit. Sam described the latest upgrades that mean that the receive converter side of the transverter has exceptional strong signal performance together with high sensitivity. The transmit converter side features high spectral purity and the ability to frequency lock the transverter for high stability makes it perfect for both digital and analogue operation.

Awards

Two prestigious awards are presented at the RSGB Convention each year. The ROTAB trophy went to Paul Simmons, G4CCZ for his outstanding and consistent DX work. The G5RP trophy went to William Eustace, MOWJE. His lecture, Microwave engineering – from death rays to dinner, is available on the RSGB website.

Exams

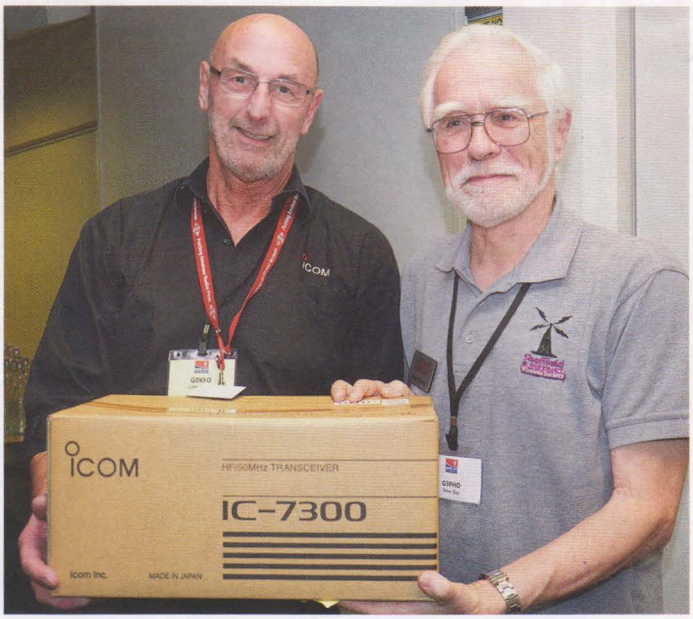
As usual there were several candidates for the various levels of amateur radio exam at the Convention. Both those sitting the Foundation exam passed, as did the Intermediate candidate. Of the six sitting the Advanced exam there were four passes. Well done to all that achieved their goals.

Amongst the people sitting their exams over the weekend was Eliot Mansfield who sat, and passed, both his Foundation and Intermediate exam. He first got interested in radio in late 2015, when he bought a cheap RTLSDR and worked his way through the various things you can do with them, such as listening to amateur and the air band but also DMR, PSK31, digital taxi data, weather satellites and ADSB – he then lost interest

Martin Lynch & Sons, the principal sponsor, saw brisk business over the weekend.

Elaine Richards, G4LFM
radcom@rsgb.org.uk

Victor Brand, G3JNB receives his Yaesu from Paul, G3WYW.



Peter Day, G3PHO receives his Icom prize from John, G0KFO.

once he'd gone as far as he could with receiving. He listened to the ICQ Amateur Radio Podcast, run by a former work colleague Martin Butler, M1MRB. Episode 271 featured Network Radios where Martin interviewed Ian, G3ZHI. It was a fascinating conversation. It spurred him on to getting licensed. Thanks to the efforts of Bedford and District ARC and the online course run by Essex Hams he started studying. He would like to thank the team behind network radios (Ian, Karl, Hairy Paul etc) and Bedford and District ARC – Glen, GOGBI, Rob, M5RPT, Wayne, Marc, 2E0YWO and his assessor Mark, M0MYG for their help and support.

ISS contact

Astronaut Serena Aunon-Chancellor, KG5TMT, currently one of the three crew members on board the International Space Station, has been delighting radio amateurs all over the world by activating NA1SS to make random contacts between the ISS and amateurs on earth. These activations occur only when the crew have the space in their schedule and have been relatively rare in recent times. As a result, they usually cause a pileup as radio amateurs attempt to get the NA1SS callsign in their log book.

With the full ARISS ground station assembled and in use during the Convention, Ciaran, M0XTD, the ARISS UK Operations Team Lead was aware that opportunities existed over the course of the weekend for such a random contact. After one unsuccessful attempt on the 13th, Serena surprised those present by returning the GB4AUK call on Sunday afternoon, just as the Convention was drawing to a close. After a brief exchange, greetings were passed to Serena, Alexander Gerst, KF5ONO and Sergei Propopev and Serena was free to fulfil many other amateurs' wish of a random contact.

The full Convention-to-spacecraft exchange was recorded by Steve Thomas, M1ACB and is posted on the RSGB YouTube channel at www.youtube.com/watch?v=H4eWKuslVBs

Buildathon

This year's Buildathon was different in a number of ways. First, it took place on the Saturday evening so no-one had to miss any of the excellent lectures, and secondly it used a kit to introduce builders to surface mount devices (SMD). The Two Tone Tester kit from Kanga UK has been developed specifically to use the larger SMDs and to

William Eustace, M0WJE was presented with the G5RP trophy.

have plenty of room between the devices making it ideal to try SMD construction for the first time.

Seven delegates took part in the workshop. In terms of knowledge and experience, they ranged from Foundation to long-standing Full licence holders, and from one who had never built a solder project before to those who had lots of soldering experience but who had only dabbled with SMD. Steve, G0FUW, and Lewis, G4YTN, who have run over twenty Buildathon events, provided guidance and support throughout the evening. Dennis, G6YBC, from Kanga UK also chipped in with help until he was required elsewhere. Many thanks to Dennis who also donated some SMD tools to the RSGB Loan Tool Kit.

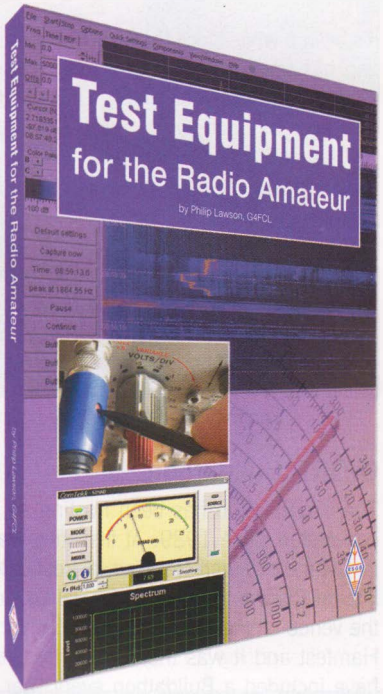
They used the RSGB Loan Tool Kit for the build (see *RadCom* October) so most of the work was done with conventional soldering irons and head-set magnifiers and tweezers. Steve also brought along his hot air solder station and a tube of solder paste. This technique proved very popular with most of the builders saying that was a quicker and easier method.

Continued on page 95

Book Review

Test Equipment for the Radio Amateur

By Philip Lawson, G4FCL



First published in 1974 when penned by Clive Smith, GM4FZH, *Test Equipment for the Radio Amateur* has been periodically updated to reflect the changes in technology, practices and availability. Clive has retired as an author and Philip Lawson, G4FCL has taken up the baton. He has thoroughly revised the book and brought it right up to date.

Starting with some very useful safety advice and suggested basic tools, Philip soon moves on to actual test equipment, starting with the relatively simple and low cost 'essentials' such as a multimeter, component tester, logic and RF diode probes. Next comes the oscilloscope, which is discussed in some depth to aid an understanding of what it can and (more importantly perhaps) can't do, along with a look at traditional CRT vs LCD (digital) and various PC-based alternatives. The book continues in a similar vein, examining myriad device classes including spectrum analysers, AF/RF signal generators, counters, frequency standards, power and SWR meters, antenna system analysers, current probes, field strength meters, RF bridges, samplers and couplers, network analysers (including the wobbulator – a word I love), noise figure meters, modulation analysers, signal injectors & tracers, PSUs and more.

Next, we look at practical measurements, eg of transmitted power and frequency, and the linearity of power amplifiers. Receivers are examined too, with critical features such as sensitivity, selectivity, noise figure and intermodulation distortion just some of the topics under the microscope.

My favourite chapter covers test equipment and ancillary items you can make for yourself. This is a mix of small practical projects that you can construct from the information presented, supplemented by well-researched call-outs to other resources such as pertinent *RadCom* articles and various internet resources.

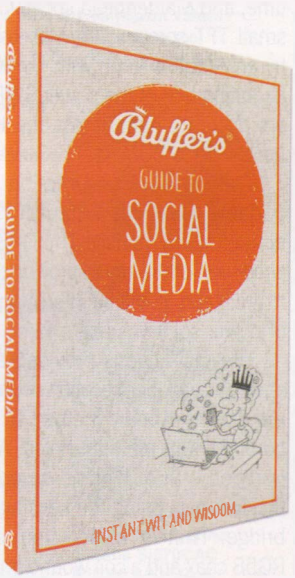
Appendices cover the detailed workings of various types of meter (moving-coil, moving-iron etc), the fascinating subject of noise, a quantity of useful reference data carried over from previous editions and, very importantly, PCB and component layouts for many of the practical projects described in the text.

This is a very good book that covers an extremely wide subject particularly well. As a good, all-round description of an extensive subject area, supplemented by a large number of intelligently chosen external references, I have no hesitation in recommending this book to the beginner and more-experienced amateur alike.

Size: 174x240mm, 192 pages, ISBN: 9781 9101 9365 6
Non Members' Price: £14.99
RSGB Members' Price: £12.74

Bluffer's Guide to Social Media

By Susie Boniface



So you're looking for an enlightening (and amusing) Christmas present for a friend, colleague or partner? Perhaps you (or they) have been left behind in the wake of recent advances in online communications, or feel excluded from the barely disguised self-promotion on LinkedIn or spats on the Twittersphere. Even 'normal' conversation today is peppered with references to online life – and heaven help you if you know any Millennials! Feeling left out? Well, this is the book for you.

Bluffer's Guides are renowned for their "instant wit and wisdom" and this is no exception. It is crammed with a remarkable amount of informative facts delivered as light-hearted explanations, complete with examples of wild online successes and hilarious too-late-to-delete failures. As another reviewer put it: "This little book is the perfect guide to the pleasures and pitfalls of our brave new world."

Susie Boniface instantly makes the subject accessible and invites you in. Social media is not to be feared if you follow her rule of thumb – behave online in the same way you would at a bus stop, no worse; and only put up with the same, "not an insult more". She offers more fine advice throughout in the form of *Bluffer's Tips*, all neatly interwoven and signposted at just the apposite moment. For example, after a light examination of current and past social web phenomena (remember MySpace, Bebo or Friends Reunited?) she cautions: "If the product is free, you are the thing on sale." How true! There's a handy (though disappointingly brief) glossary, and lots of tiny revelations to add to your arsenal of understanding, such as the difference between a tweet and a dweet.

Whether digested in one go, or dipped into by topic or chapter, the guide is full of succinct and pithy observations that ring true and are bound to both enlighten and amuse. This is testament to the acumen of the author, a well-known journalist who herself has a substantial social media following. She really does know what she's talking about. I am glad I read her counsel and caveats before taking another step through the eye-poppingly hazardous but potentially rewarding social mediascape.

If any of this strikes a chord, then this book is for you, in time for Christmas, to gift or keep.

Size: 178x110mm, 128 pages, ISBN: 9781 7852 1229 1
Non Members' Price: £6.99
RSGB Members' Price: £4.68 (33% OFF)

Giles Read, G1MFG
Jonathan Andrews
radcom@rsgb.org.uk

QRP – devoted to low power

It's been a while since the last QRP column. The gap has been as a result of Reverend George Dobbs, G3RJV, becoming unwell. George continues as Secretary to the G-QRP Club but he is still quite poorly and we all wish him well. I took on the role of Club Chairman earlier this year and am grateful to the *RadCom* team for agreeing to a return for the occasional QRP page. We hope to bring you some new QRP projects and maybe some kit reviews in future QRP columns but this time we are going to take a look at the G-QRP Club Convention, which included building a brand new kit.

PHOTO 1: Heads down at the Buildathon.

G-QRP Buildathon

The G-QRP Club has been hosting an annual convention since 1989. At first they were held in George's church facilities in Rochdale, then later at Rishworth School near Halifax. In 2017 the venue changed to co-locate with the Telford Hamfest and it was there again this year. We have included a Buildathon every year for the last decade and a different kit has been used every time; transmitters, receivers, an ATU and a power meter have all featured. This year the kit was dubbed the 'HF Swiss Army Knife' designed by Heather Lomond, MOHMO.

'The Knife' is an all-in-one test set covering voltage, resistance, frequency, power, SWR measurements as well as showing the current UTC time, and Maidenhead Locator, all displayed on a small TFT screen. The processing is carried out by an Arduino Nano with firmware that provides for calibration of the power/SWR readings, which are accurate right across the HF spectrum and usable up to 50MHz.

The current consumption is quite high for portable use, with a standard 9V battery being drained quite quickly. The GPS module needs a good view of the sky to provide the necessary data to the Nano. It will be interesting to see what kind of power solutions users come up with.

The instructions provided at the Buildathon showed good identification of parts and the screen print on the board helped to ensure the right parts went in the right holes. All of the parts are traditional through-hole components, with the trickiest part being the sensing coil for the SWR bridge. That is formed from a short length of RG58 coax and a coil wound on a T-50-43 toroid. Most of the builders at the Buildathon completed the project in about four hours, more or less.

The initial feedback was that most builders found 'The Knife' a bit of a challenge but everyone enjoyed it. Out of the twenty kits Heather made available, only a handful needed some fault finding attention to get them working. It is worth noting that the RSGB's Legacy-funded loan tool kit was used to provide all builders with their own soldering, meter, etc.

G-QRP Convention at Telford

The Buildathon was on the Saturday evening and the Telford Hamfest followed on the Sunday. We had three talks as part of the Convention. The first one, by Barry Cook, G8PHG, was entitled *The Flying Laptop* and gave a great insight into building a satellite – one that is now in orbit and sending back useful research data. The laptop reference was nothing to do with the on-board computer but the unfolding solar panels, which look very much like a laptop screen being opened. It was fascinating to hear about such a large scale 'homebrew' project.

Vic Winton, GW4JUN, then looked back at the achievements of the late George Burt, GM3OXX, famous for working over 300 countries with no more than one watt. The G-QRP Club is running a challenge to commemorate George's work. The idea is to do something with one watt before the end of March 2019 and send details to Vic via email to gw4jun@gmail.com. Every entry will receive a certificate and the entry judged to be best will receive a wee trophy.

The final 'talk' of the Convention was a real

Steve Hartley, G0FUW
g0fuw@tiscali.co.uk

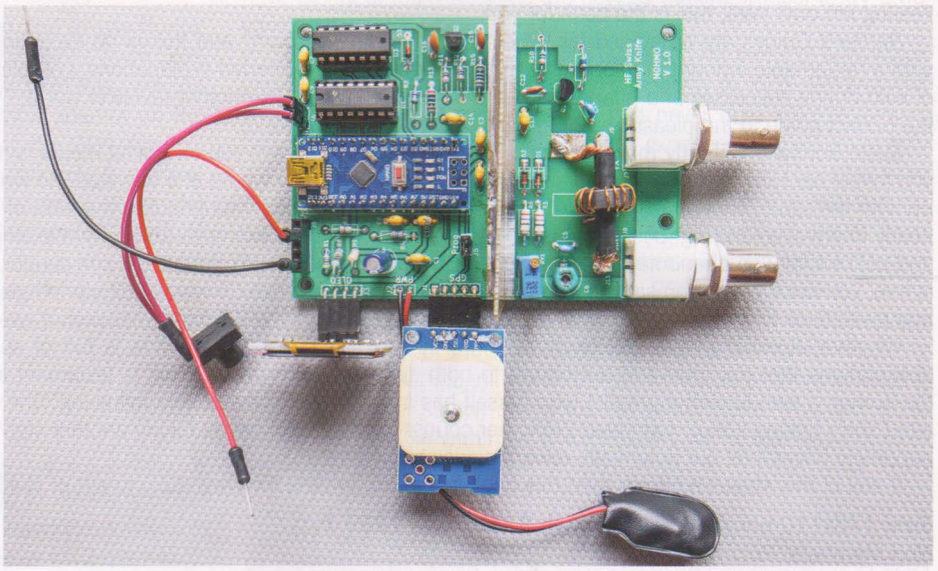


PHOTO 2: The HF 'Swiss Army Knife' project.

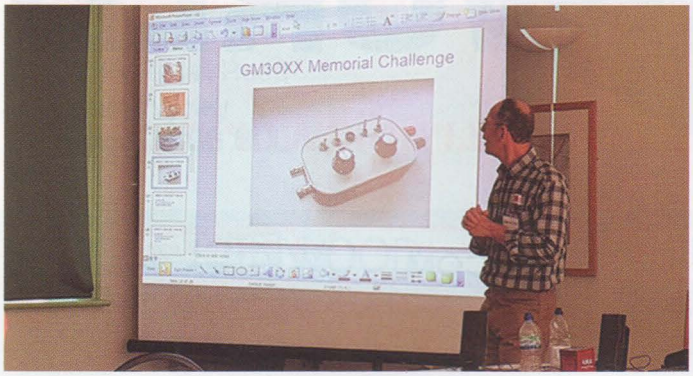


PHOTO 3: Vic Winton, GW4JUN, presenting on the QRP work of GM3OXX.

PHOTO 4: Soldersmoke live on screen at the GQRP Convention.

treat in that Telford was linked with Washington DC and Newbury Park in California for a live episode of the Soldersmoke podcast. Bill Meara, N2CQR and Pete Juliano, N6QW talked about the influence of the G-QRP Club and the quarterly journal *SPRAT* on their amateur radio experience. They also paid tribute to the technical and spiritual guidance provided by George, G3RJV. There was a short Q&A session with sagely advice from the Soldersmoke team and I challenged them to take part in the GM3OXX Challenge. Will they join in?

Several QRP-friendly traders were selling their wares at the Hamfest and a good time was had by all, judging by the comments on social media. If QRP is your thing, pencil it in your 2019 diary now: Buildathon Saturday 31 August, Telford Hamfest Sunday 1 September.

Websearch

G-QRP Club: www.gqrp.com

Telford Hamfest: www.telfordhamfest.org.uk/

The Flying Laptop: https://earth.esa.int/web/eoportal/satellite-missions/f/flying-laptop

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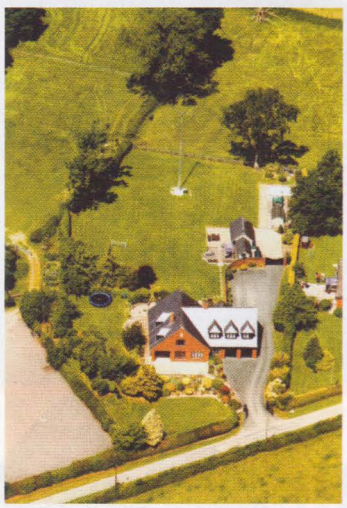

A dedicated shack is located away from the main house, allowing a cosy full-time DXing and Contesting, including multi-op entries.

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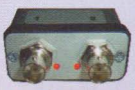

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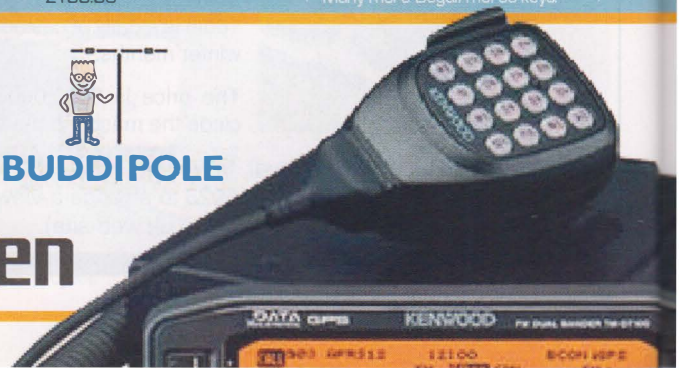

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VDSL2 noise?

A Member reports that a number of radio amateurs local to her have noticed considerable broadband noise, raising the noise floor on reception of amateur band signals and that a suspected cause is that some of their neighbours have had Sky Q boxes installed. She wonders how this is possible because the satellite signal will be in the UHF region and wonders whether it could be something to do with the power supply, especially if it is a switching power supply.

The first thing to note in this type of situation is that while you may suspect that a particular piece of electronic equipment is the source of some new interference, the only way to prove conclusively whether the source has been correctly identified is to switch off the equipment in question (and also other associated equipment) to see whether the interference goes away. Clearly this isn't always easy to do in practice so identification may be difficult.

Another consideration is that modern satellite receiving systems are connected to other associated equipment and networks that may radiate interference in the amateur bands. Users can receive 'off-air' TV signals via a satellite dish and they can also stream TV programmes or video via the internet. This in turn requires a broadband internet connection. Sky is one of a number of communications providers that provide a broadband internet service that uses a VDSL2 service provided by BT/Openreach. VDSL2 networks can radiate noise-like signals on some amateur bands, particularly if the phone wiring is overhead. Another issue is that most VDSL2 installations are 'self-install' so any issues of poor RF balance in legacy indoor telephone extension wiring may not be resolved.

Although VDSL2 noise has similar characteristics to natural 'white' noise, VDSL2 noise does have certain unique characteristics that can be identified using software that has been developed by the RSGB EMC Committee Chair for this specific purpose [1].

VDSL2 noise on its own normally has noise 'steps' at certain frequencies, as has been reported elsewhere. It sounds like a steady hiss when received using an AM detector (or any other type). If there is a 100Hz buzz when listening on an AM detector then there is some other type of interference present although there may also be VDSL2 noise underneath.

Another consideration is how the internet data gets from the VDSL2 modem/router to the satellite TV box, if these are separate. A direct cable connection using an Ethernet network cable is one possibility and wireless local area networking (LAN) at 2.4GHz (or 5.1-5.7GHz) is another. A third possibility is powerline networking, where data is sent via mains wiring. Although Sky Q boxes have the capability for powerline networking built in, it is understood that this capability is not actually being used at present. Nevertheless, separate stand-alone powerline networking adaptors (PLAs) are available and these are sometimes used with VDSL2 broadband internet services provided by any communications provider.

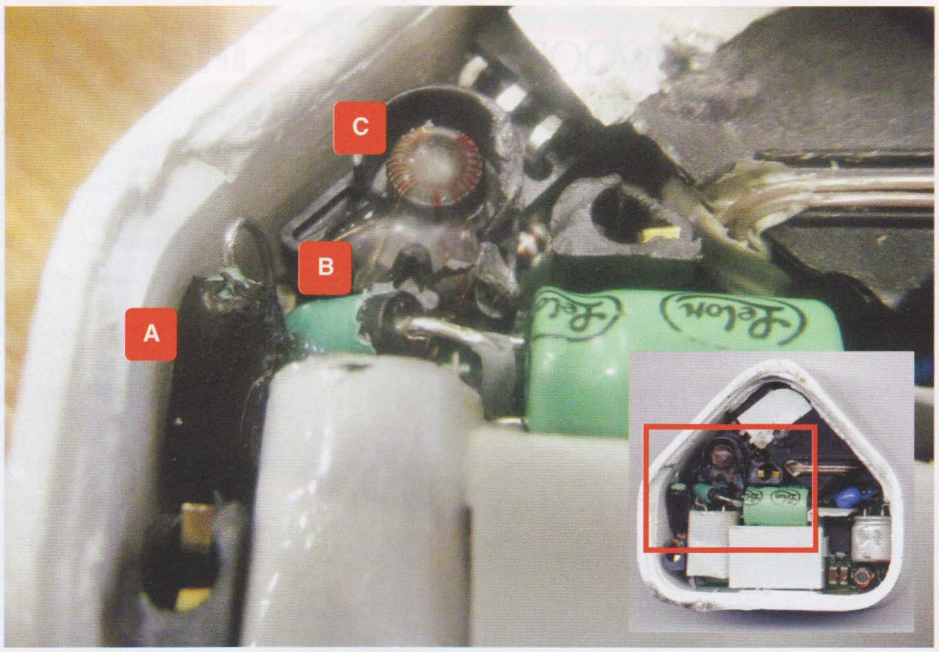

PHOTO 1: A genuine Apple iPhone charger dismantled, showing (A, B, C) some radio interference filtering components – see text.

Frequencies used by PLAs *should* have all the HF amateur radio bands 'notched', plus the 50MHz and 70MHz VHF amateur bands, although the EMC Committee is aware of PLAs that do not appear to have 'notches' at VHF. Interference from powerline networking generally has very different characteristics from VDSL2 noise. PLA interference typically consists of regular clicking for 'polling' and this changes to longer bursts or continuous interference when video or other data is being streamed via PLAs. As it is transmitted via the mains it is generally modulated with a 100Hz buzz when received with an AM detector.

We would be interested to hear from any members who have their own Sky Q boxes about whether these are 'quiet' in amateur bands.

Electric Trains

According to BBC News [2], new trains planned for the East Coast mainline do not work properly with track-side equipment. It is reported that the 'Azuma' trains cause electromagnetic interference to older signals and points in the north of England. The trains can run on diesel or electricity but until the issue is resolved, they will only run on diesel, travelling much more slowly than their promised speed.

According to other sources, the issue appears to be a matter of what EMC standards the train should meet for emissions and what EMC standards the signalling equipment should meet for immunity. European Norms EN50121, EN50126 and EN 50128 are important in the rail industry but it appears that most of the signalling on the East Coast Main Line north of Colton Junction was installed before the European EMC Directive – and just before electrification. A lot has changed since then. UK overhead electric catenary systems have always been fed by 50Hz AC power but in the past, this was transformed down and rectified on board the train; the traction motors were powered by DC. More recently, AC traction motors have been used with high power electronic inverters to produce variable frequency AC drive. These inverters use switching techniques and they also require high current filtering circuits to reduce the amount of switching frequency that is fed back via the overhead electric line (and also via the running rails that form the return path for the current). A nine-car Class 800 Intercity Express (IEP) train would have five powered vehicles with a total of 10 powered bogies and 20 traction motors plus traction inverters.

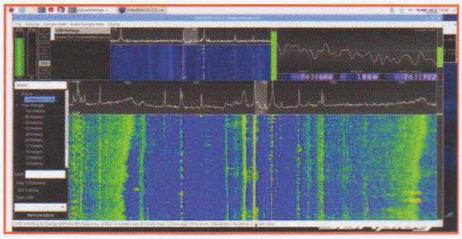

FIGURE 1: An SDR waterfall display showing a source of interference with unstable frequency.

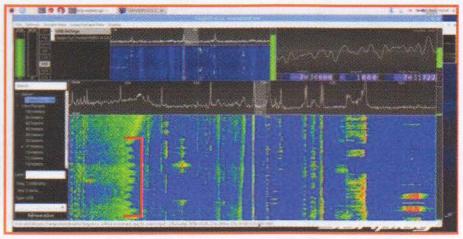

FIGURE 2: Waterfall display showing an interference source with frequency steps (peaks within] mark).

It has been reported that discussions are taking place between Network Rail and the train manufacturer to find a long-term solution. It would appear that either the immunity of the signalling equipment needs to be increased or the emissions from the trains need to be reduced, or possibly a combination of measures could be applied. According to a recent article in *New Civil Engineer* magazine, Network Rail is said to be putting 'electrical earmuffs' on lineside equipment to combat the electrical interference from the new trains.

The electromagnetic interference to the signalling system is likely to be below radio frequencies but we would be interested to receive any reports of about any RF emissions from the Class 800 trains when running on electricity.

Mobile phone chargers

The subject of electrical safety of cheap imitation mobile phone chargers has been in the news again with an item on the BBC *Rip off Britain* TV series episode 3 (29 August 2018). Further information about unsafe phone chargers is also available on the Electrical Safety First website [3]. According to Electrical Safety First, counterfeit chargers normally have a number of components missing and some are also electrically unsafe.

Based on EMC Committee tests, some radio interference filtering components are likely to be missing (either deliberately not designed-in or simply not fitted). Presumably the designers thought that as the charger will still work without the interference filtering components, no-one would notice if they didn't fit them. Radio users *do* notice however and imitation chargers can advertise their presence by radiating interference across the short wave radio spectrum, particularly at the lower frequency end up to a few MHz.

An example of what components should be fitted is shown in **Photo 1**. This is a genuine Apple iPhone charger with the lid removed to reveal the circuitry inside. Although the DC output power is only 5W, even a low power charger like this needs adequate RF interference filtering to comply with EN55022 Class 'B' conducted emission limits. There are *three* inductive RF interference filtering components visible plus some filtering capacitors that are not visible. 'A' and 'B' are two RF chokes, each inside a ferrite tube with a green coating that has been partially removed from 'B' to show what is inside. There also a miniature ferrite ring core 'C' with two windings that acts as a common-mode choke.

Mobile phone chargers that are not genuine may have no RF filtering inductors at all or at most one inductor but no ferrite ring core with two windings. These missing components will cause much higher levels of RF interference compared to the well-designed genuine item. This provides a simple way to identify a suspected fake charger if a genuine type is available for comparison. If anyone has a fake or suspected fake iPhone charger then I would be very interested in borrowing it for EMC testing to compare with the genuine item and to evaluate the effectiveness of EMC testing as a way to spot fake mobile phone chargers.

7MHz mystery

Further to the item in October EMC Column about a 50MHz mystery, a Member reports a 7MHz mystery in the form of interference that also comes in on the mains supply and overhead telephone lines, which makes direction finding very difficult. Our Member's current interest is in WSPR on 40m, hence the frequencies of interest are centred around 7.040MHz. The 'main' source of interference "wafts around", ie the frequency drifts.

In order to obtain more information about the source, our Member analysed the interference using an SDR Play RSP1 with Cubic SDR software to show spectrum plots and a waterfall display. He also set up automatic captures of still screen images at 600 x 300 resolution that were used to create a time-lapse video. This proved to be a powerful technique for visualising the time-varying characteristics of an interference source.

Capturing a screen image every five minutes over a period of nearly five days gave a total of 1259 frames. As each frame is almost completely different from the previous frame and the next frame, commonly used video compression CODECs such as MPEG are not suitable and Motion JPEG Video (MJPEG) was used instead. The video lasted 2 minutes 5 seconds at 10 frames per second.

Two frames from the video are shown in **Figure 1** and **Figure 2**. The WSPR direct conversion receiver local oscillator at 7.0386MHz can be seen as a straight line in the centre of the screen. As these were automatically captured and saved as JPEG, no higher resolution image is available but in Figure 1, two broad wavy green lines are clearly visible. These are two drifting harmonics of the interference source and the frequency difference between these lines corresponds to the fundamental frequency. This suggests that the source is some sort of switching power supply unit or LED light driver but it doesn't give any other clues about the source.

In Figure 2, only one wavy green line of interference is visible but this has an interesting characteristic that was only recorded occasionally during the five days. There is a stepped effect like a castle wall on its side (in the] mark) and this indicates that the frequency of the harmonic is shifting slightly in a regular manner. A likely cause is that the load is being switched on and off, which is characteristic of some types of battery charger. This could be for a mobile phone, laptop computer, cordless power tool or other battery powered equipment and it could be a replacement charger not the original. Another possibility is an uninterruptable power supply (UPS) or emergency light where the battery has failed so that the charger keeps trying to charge it.

Noise cancellation

The Member who reports the 7MHz mystery above has designed a partial solution to the problem of unstable frequency until the mystery is solved and the source is identified. He has designed a passive noise canceller using two antennas with switched attenuation/phase steps to achieve a null. This method of noise cancellation is well established when used with manual tuning but as this particular interference source drifts around, the settings on the noise canceller would need to be adjusted frequently. The solution is a fully automated and adaptive noise canceller for which further details have been provided and which merits publication in its own right. This is reported to give a noise reduction that is most welcome, up to 20dB or so. Nevertheless, it should be noted that creating a null in a certain direction is also likely to reject any wanted signals that arrive from that direction or from the opposite direction.

Websearch

[1] VDSL radiation and its signal characterisation, *RadCom* November 2018 pp 28-31

[2] East Coast Azuma trains thwarted by Northern track – www.bbc.co.uk/news/uk-england-tyne-45435683

[3] Buying chargers – www.electricalsafetyfirst.org.uk/guides-and-advice/electrical-items/chargers/

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RF meter for low power using an Arduino and LCD

I really enjoy making things but as I have gotten older I find that smaller projects have become more appealing. Sometime after article [1] was published I came across the SV1AFN website [2] that has a number of interesting goodies – not least of which are fully populated power meter PCBs. I have purchased a number of items from SV1AFN and found him to be reliable and, for the items I have purchased, his products do what they say on the tin. I particularly liked the look of the AD8307 module. It cost approximately €12 plus VAT and postage. I had also been enjoying my first usage of modern credit card sized computers, in this instance an Arduino Uno. I had purchased "The Arduino Starter Kit", then available from the now-defunct Maplin but still offered by other sources. It comes complete with various experiments, and I used the Arduino and the 2 row x 16 column LCD display from that kit in this project. Interfacing the display with the Arduino is covered in [3].

PHOTO 1: General view of the completed unit.

The application notes for the AD8307 [4] covers some 24 pages and shows that the device is quite linear *for any particular given frequency* – probably more than good enough for most amateur needs. Clearly if one wants the last word in accuracy then the answer is to spend lots of money and buy a used but recently calibrated HP or similar power meter. However, I guess most of us want something that gives a reasonably good indication of power and, for a given frequency (or small range thereof) a very good *relative* measurement from one power level to another, without the professional-quality *absolute* accuracy – or cost! Anyway, there is much detail in the datasheet about the workings of the IC but the information of most use to us is the linearity, the slope of the linearity, the impact of frequency and the offset (ie the output voltage when no input is applied).

Figure 1 shows that over a range of frequencies of 10MHz to 300MHz the error in the reading is in the region of 4dB, with higher frequencies reading being lower than expected.

There are various kinds of AD8307 power detector modules available on eBay and elsewhere. The notes here refer specifically to the module offered by SV1AFN, which has features not found on the cheaper alternatives. You may well be able to adapt my suggestions to suit another module if you so choose.

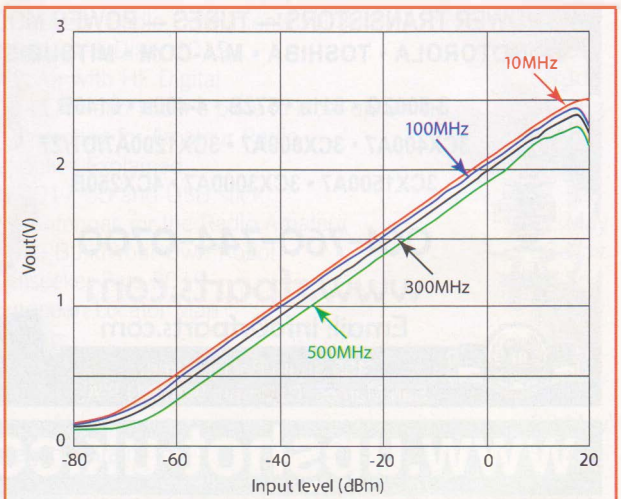

FIGURE 1: Typical AD8307 responses at different frequencies. Adapted from [4].

The SV1AFN module has three outputs. Output 01 is 100mV per dBm, 02 gives 50mV per dBm and 03 is the direct output of the AD8307, 25mV per dBm. Using output 01 there is very good linearity over the range of at least -60dBm to 0dBm (1mW), sitting on top of an offset voltage of approximately 200mV. With a supply of 5V one is limited to a range of less than 40dB (allowing for some room to spare – if lower sensitivities are selected using pin 02 or 01 then the range will be greater but one must sacrifice granularity of measurement due to the limited number of bits in the Arduino ADC).

Setting up the board is easy. All that is required is that the supply jumper is set for 5V and that three connections are made: 9V (supply), 0V (ground) and output (marked as 03). The interconnections between the sensor board, Arduino and LCD are shown in **Figure 2**.

I used an Arduino type 9V wall wart to provide power. It plugs into the socket on the Arduino board, which is also the take-off point for the 9V supply to the SV1AFN AD8307 module. The LCD was an industry-standard 16x2 module with a blue backlight (in fact a WINGONEER 5V 1602 but

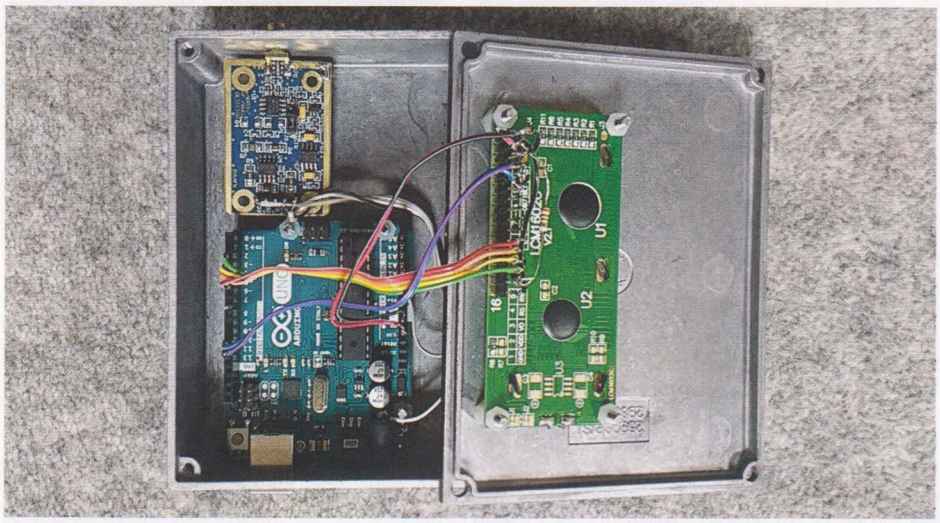

PHOTO 2: Inside the device.

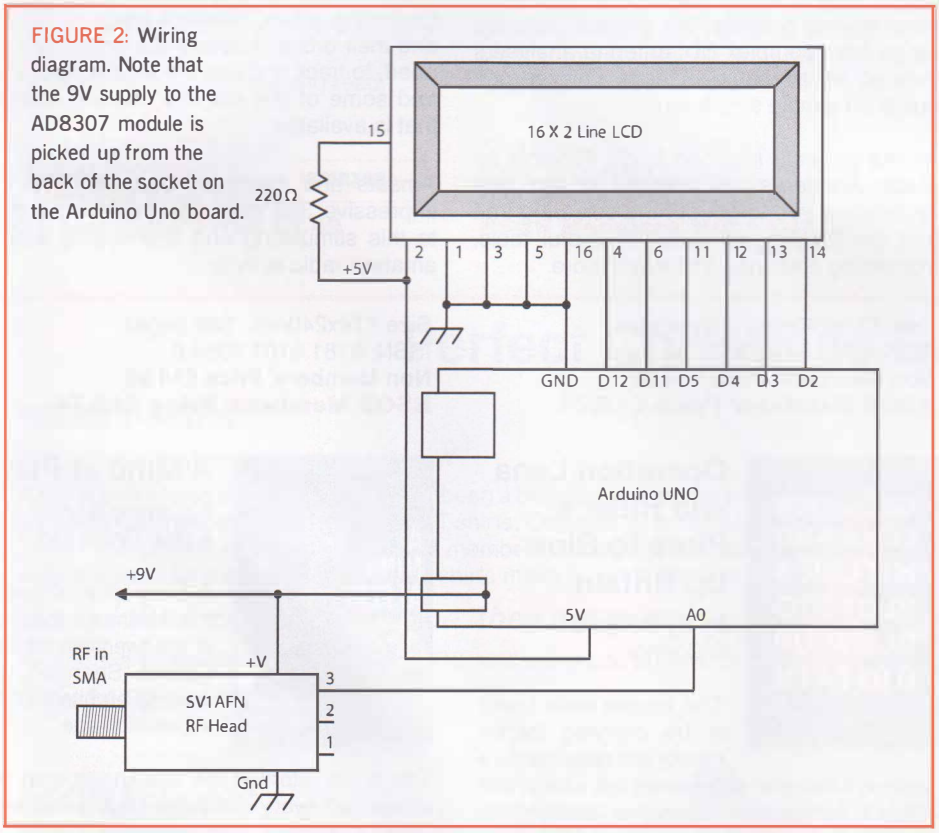

FIGURE 2: Wiring diagram. Note that the 9V supply to the AD8307 module is picked up from the back of the socket on the Arduino Uno board.

essentially all 16x2 modules compatible with the Hitachi HD44780 have the same pinout and software commands).

Software

Now I had put together the hardware I had to think about software. The Arduino Uno analogue to digital converter (ADC) has 10-bit resolution, so it represents the incoming voltage as one of 1024 discrete levels. This information can be processed by the Arduino to generate a relevant display. I chose to display power in dBm but once one has the raw data then the Arduino code can manipulate it as desired.

I learnt to code in 1969 and I was aware then, as indeed I am now, that coding is not something that everyone takes to! Most of my colleagues (we were all studying Chemistry at the time) thought it both terminally frustrating and a total waste of time. The code required for an Arduino is not that complex for a simple task such as this. Considered opinion and best practice is that one starts with the simplest aspect of the task and once that is proven to work as anticipated one adds additional complexity as required, so that was the approach I adopted. My code is reproduced here in the box on page 89. I have added comments in red to assist the reader to make changes of their own.

Calibration

One needs a known source of *low* power at not less than 10MHz. I used my transceiver as a source and a Telepost LP-100A digital vector RF wattmeter as my calibration reference, but a Bird Thruline meter or other well calibrated device may be used to calibrate from a known reference. SMA attenuators were then used to reduce the power into the AD8307 and verify that the readings on the display were as expected.

Once one has suitable levels of power (say 0dBm and -40dBm), measure the output of the AD8307 on your selected pin (in my case pin 03). I found that 0dBm gave 1.835V and -40dBm gave 0.810V. Therefore, a 40dB change in signal levels gave rise to a change of 1.025V, NOT 1V as thought. Similarly 0dBm gave 1.835V and NOT >2V as expected. So I had to factor these into the equations. I was expecting a 40dB change would give 1V but it gave 1.025V so we need to multiply the voltage change not by 40 but by (40/1.025), or 39. Running the calculations manually shows that we need an adjustment of 71.6 to bring the display into line with the power. I have included these correction factors into the Arduino sketch presented here. When you check your meter you may find you have to calculate different calibration factors (but they shouldn't be too far adrift from mine – or indeed the 'perfect' answers).

The final step is to vary the input power and check that the display responds accordingly.

Further work

The software I've written only has a single display mode. If you add a pushbutton to the circuit you can arrange all sorts of options – changing units, displaying the raw ADC count (for diagnosis) and all sorts of other possibilities. An output to a buzzer could be used to sound when the power is above (or below) a certain threshold. I leave it to you to experiment: the nice thing about the Arduino is that it is designed to make it easy to try out different experiments.

Continued on page 91

Andy Nehan, G4HUE
andy.nehan@btinternet.com

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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 and it provides great results. This book sets out to provide a huge array of designs that the home constructor can attempt and more importantly will want to build.

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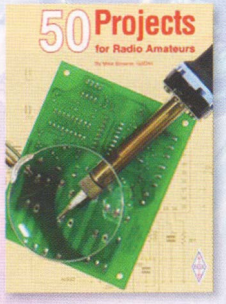

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Edited by Mike Browne, G3DIH

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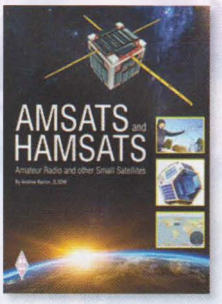

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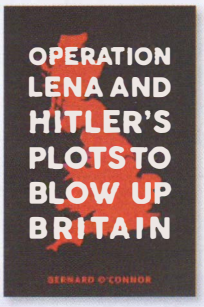

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By By Bernard O'Connor

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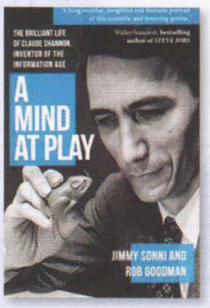

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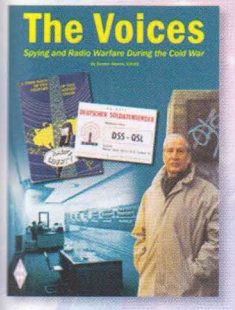

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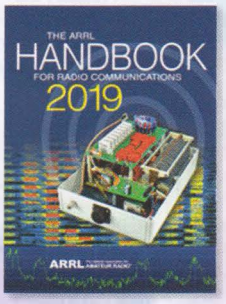

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by Alan Betts, G0HIQ

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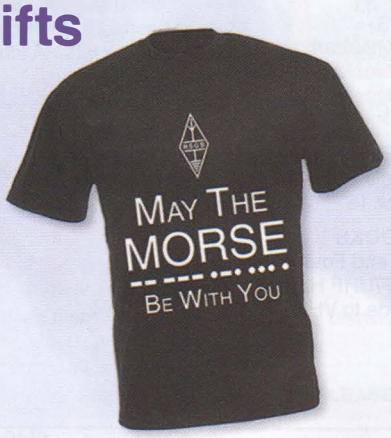

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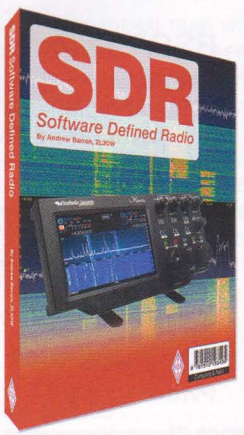

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30 minute J-pole

What is it?

The J-pole antenna, more properly known as the J antenna, was first invented by Hans Beggerow in 1909 for use in Zeppelin airships. It consisted of a single element, one half wavelength long radiator with a quarter wave parallel feedline tuning stub. This was typically trailed behind the aircraft (for HF: no VHF back then!).

Figure 1 shows the basic way the antenna is configured. In effect, we have an end-fed omnidirectional half-wave antenna that is matched to the feedline by a quarter wave parallel transmission line stub. Being a half-wave antenna, it provides a small gain over a quarter-wave ground-plane antenna, typically 2.2dBi. Interestingly, the 2m J pole will work effectively on 70cm!

The J-Pole is very sensitive to conductive support structures and will achieve best performance with no electrical bonding between antenna conductors and the mounting structure. It is influenced by outside factors so should be kept away from other conductors including drain pipes, metal window frames, flashing, etc by a distance of two to three times the spacing between the parallel stub conductors. DO NOT USE A METAL MAST.

Feeder

The J-pole antenna and its variations may be fed with a balanced line or coax feeder. If a coax feed line is used it can be beneficial to include a means to suppress feedline RF currents. Generally, three to six turns of the coax feeder close wound either on a former or air wound will work. In **Photo 1** you can see how I used the 40mm plastic pipe 'mast' as the former for the feeder choke.

The feed point of the J-pole is somewhere between the closed low-impedance bottom and open high-impedance top of the J stub. Between these two extremes exists a match to any impedance between the low to high impedance points. However, you must consider that this will have to be matched at the radio end to 50Ω.

Construction

Photo 2 shows the main parts I used for the prototype – 15mm copper pipe, a pair of right angle elbows (Yorkshire or plain type), two copper saddle clamps (for fixing the feed points), two 5mm bolts, nuts and washers, plus a SO239 socket.

As you will have noted from Figure 1, all the dimensions are calculated as fractions of a wavelength for the frequency of interest. The bandwidth of the antenna is reasonably broad but, as most vertically polarised operation takes place in the upper 1MHz of the 2m band, we'll choose 145.500MHz as the design centre frequency. But – and it's an important but – the simple calculation doesn't take into account velocity factor and any odd 'strays' so I recommend you add 5-10mm or so to the dimensions you calculate. It's easy enough to trim a bit off later if necessary but the converse is not true.

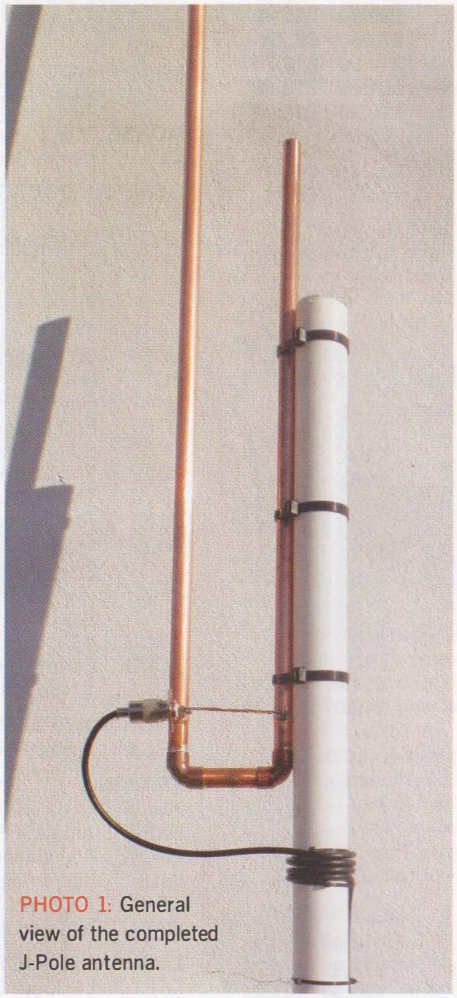

PHOTO 1: General view of the completed J-Pole antenna.

For the radiator section we need ½ + ¼ wavelength at 145.500MHz, which is 1485mm. The matching stub section is ¼ wavelength at 145.500MHz, which is 495mm. The element spacing is about 45mm, but this is not critical.

As mentioned earlier, the feed point can match to just about anything you want. However, the 50Ω point is about 49mm from the base. The construction method described here allows for the feed point to be adjusted for best match. The only thing worthy of note at this stage is that the braid and centre should each be at the same height from the base.

The neatest way to cut copper pipe is with a proper pipe cutter [1]. These are small hand-operated devices that have a sharp wheel and adjustable jaw grips. These are used by rotating it around the pipe and repeatedly tightening it until it cuts all of the way through. They are inexpensive, starting at about £3. The alternative is to use a hacksaw or, if you have the facility, a metal-cutting bandsaw or similar. Whatever method you use, take all necessary safety precautions.

Cut 1490mm of 15mm copper pipe to form the radiator section, 500mm for the matching stub and 30mm for the bottom section. (Remember that the elbows will add a bit to each of these lengths). Clean the ends with emery paper or wire wool to remove any oxidation, leaving bright shiny copper. The radiator and matching stub will need at least 75mm or so cleaned up, not only so that they will solder cleanly but also to ensure a good electrical connection to the saddle clamps.

I assume that anyone building this 'plumber's delight' will be reasonably familiar with soldering copper pipe to elbows using a blowtorch or similar but is important to point out that of you're using Yorkshire (pre-soldered) fittings, the ends need to be smeared with a little flux to help the solder flow inside the joint. Failure to do so will result in a mechanically weak joint.

Assemble the three pipes and elbows on a fire resistant surface and heat the pipes and fittings evenly. They do not need to be cherry red, but just to the point where the copper starts to 'rainbow'. If using Yorkshire joints and flux, you should see the solder appear as a ring. At this point remove the heat and allow the assembly to cool. DO NOT MOVE ANYTHING WHILST IT IS HOT or you'll result in mechanically weak joints.

If using non pre-soldered joints, heat as before and, when the joints are hot enough, apply electrical solder to the joint and as it melts you'll see the solder sucked in by capillary action. As previously noted, allow the joints to cool before moving the assembly.

Whilst waiting for it to cool, use emery paper or wire wool to clean the copper saddles. It's particularly important that the inside should be clean, as this will be making contact with the elements.

Once the pipes are cold enough to handle, slide the saddles onto the radiator and stub. Wrap the ends round so that the holes line up – this will take some force. Use the 5mm bolts through the holes, position the saddles 49mm from the base of the tube, then tighten the nuts just sufficiently that they won't slide whilst testing. It will likely be necessary to move them a bit for best match so there's no point doing them up tight yet. **Photo 3** shows the general arrangement.

Now it's time to measure the radiator and stub and cut to final lengths. Place the base of the antenna on a flat surface and measure 1485mm for the radiator and 495mm for the stub. Trim the pipes to length. A couple of mm either way is close enough.

The final steps are down to you to decide. In the example shown in **Photo 3**, I mounted

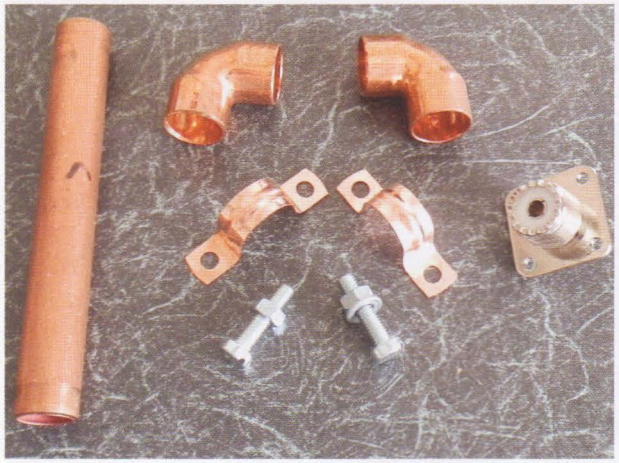

PHOTO 2: Main parts used to make the J-Pole antenna. You will, of course, need rather more copper tube than is shown here.

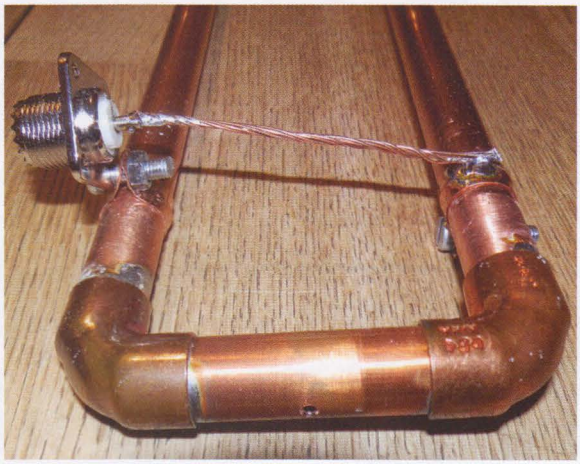

PHOTO 3: Completed base section and feed. Note the drain hole drilled in the bottom of the spacer.

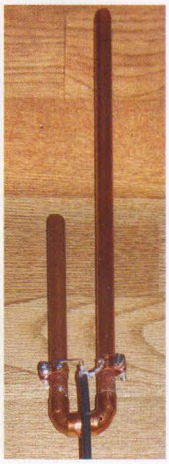

PHOTO 4: Version built for 70cm.

a SO239 socket to one saddle clamp, with a wire extending to the other saddle clamp. Alternatively, the coax or balanced feeder can be soldered directly to the saddle clamps, which is what I did with my experimental 70cm version, seen in **Photo 4**.

Drill a hole of about 3mm in the base cross pipe (see Photo 3). Even if you cap the ends, capillary action will still 'wick' moisture into the pipework.

How you attach the aerial to the mast is again left to you. As you can see from Photo 1 I simply cable-tied the stub to the plastic mounting pole, which worked well enough.

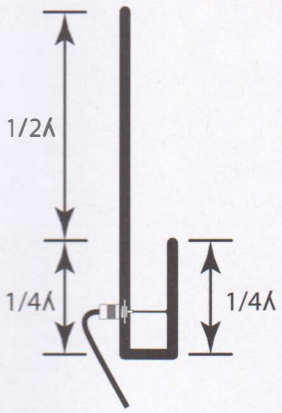

FIGURE 1: General arrangement of the J-Pole antenna.

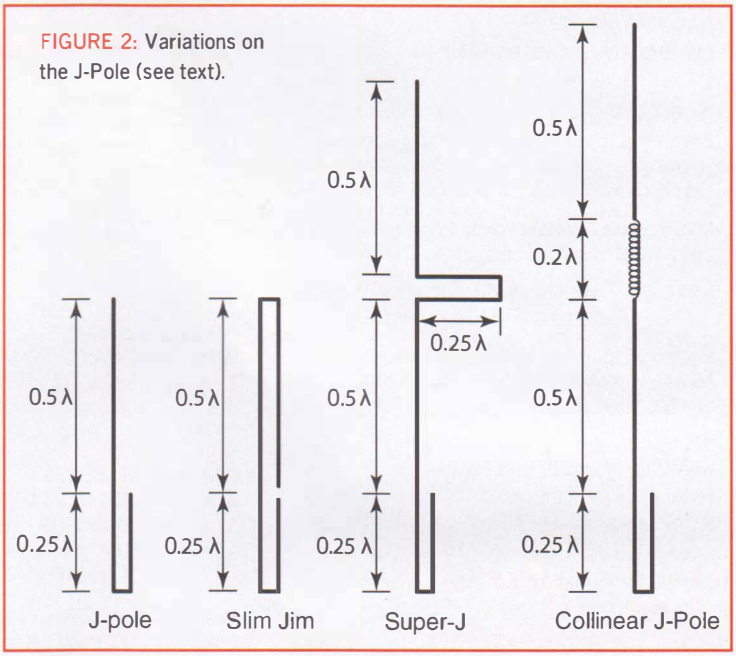

FIGURE 2: Variations on the J-Pole (see text).

Final tuning

There are many variables at this point depending on where the J pole is mounted. If you set it up in the shack or workshop and then install in its final place, I can guarantee that re-tuning will be necessary. But, in its final place it's just a case of moving the clamps up or down the pipes until you have a best match at 145.500MHz, then tightening the nuts.

I do suggest you add a choke to the feeder at the antenna end to suppress feeder RF currents. As mentioned earlier, three to six turns of coax will suffice. And, once again, only use a PLASTIC mast.

The weather

I haven't mentioned anything about waterproofing. If you mount the antenna in a sheltered position (eg in a loft) this obviously won't be a problem. Another straightforward possibility is to mount the assembly inside a larger diameter pipe, ideally with a cap to keep the rain out, if you can contrive an arrangement that's not too heavy. Otherwise, simple measures like a good coat of paint over the saddle clamps, joints and electrical connections (including the back of the SO239 socket) will provide quite a lot of protection. So-called 'liquid electrical tape' is even better still. Don't forget to put something like self-amalgamating tape over the PL359 plug too, because otherwise moisture will definitely get into the coax over time.

Variations

The J Pole has many 'cousins', which opens up a rich vein of avenues for the intrepid antenna experimenter to explore. **Figure 2** shows some of the common types. From left to right we have the J-pole we've built here, the co-called Slim Jim, which has similarities to a folded dipole. The Super-J increases gain by adding a further half-wave radiating section above the main radiator, phased using the 2 x 0.25 wavelength 'kink'. Finally, the collinear J-Pole achieves a similar effect by means of a phasing coil and physically separating the elements. There is a more detailed discussion of these alternative types at **[2]**.

Websearch

[1] eg www.screwfix.com/p/3-28mm-manual-multi-material-pipe-cutter/49428
[2] https://en.wikipedia.org/wiki/J-pole_antenna

Mark Hales, 2E0ERX
waxinglyrical28@gmail.com

York Radio Club
www.yorkradioclub.uk
2 Breakfast meeting, 10am
5, 12, 19, 26 Club net, 8pm, 145.450MHz
6, 13, 20 Club night

REGION 5: WEST MIDLANDS

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

Bromsgrove & District ARC
John, G4OJS, 0788 967 8303
7, 14, 21 Club night

Burton ARC
Rob, G6EIH, 0781 214 6333
2, 9, 16, 23, 30 Net, 10am, 145.575MHz
5, 12, 19, 26 Club night, non-members welcome
6, 13, 20, 27 Open net, 8pm, 145.575MHz

Coventry ARS
John, G8SEQ, 0795 877 7363
7 Further reflections on Iceland
14 Project 2019introduction & video night
21 Christmas social evening
28 Open net, 145.375MHz, instead of meeting

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595 daytime
3, 17 Informal activities/ Christmas raffle
5, 12, 19, 26 Club net, 7.30pm, 145.475MHz FM
6, 13, 20, 27 Club net, 7.30pm, 145.475MHz, then moving to 80m SSB
7, 14, 21, 28 Club net, 7.30pm, 432.220MHz SSB
10 Christmas meal, informal activities for those not attending
24, 31 No meeting, venue closed

Malvern Hills RAC
Dave, G4IDF, 01905 351 568
11 Christmas meeting
25 No meeting

Midland ARS
Norman, G8BHE, 0780 807 8003
5 Open meeting, shack on the air & training classes
12 Club Christmas party
19, 26 No meeting

Mid-Warwickshire ARS
midwarwicks@gmail.com
11 Christmas meeting

Rugby ATS
Steve, G8LYB, 01788 578 940
1 Antenna discussion, HF & VHF shack OTA
2 Hut maintenance & committee meeting, 2pm
4, 11, 18 UKAC, CW practice & training, radio & projects
8, 15, 22, 25 HF & VHF shack on the air
29 What did Santa bring?

Salop ARS
Eamonn, M0MEB, salopamateurradio@gmail.com
4, 11, 18, 25 Club CW net, 4pm, 144.070MHz
5, 12, 19, 26 Club net, 8.30pm, GB3LH
6 Natter night / committee meeting
13 Mince pie/Christmasraffle evening

Solihull ARS
Roger, G4BBT, 0121 743 7277
6, 13, 27 Net, 8pm, 145.450MHz
20 Christmas party

South Birmingham RS
Gemma, M6GKG, gemmagordon.m6gkg@gmail.com
3, 28 Work / meeting in the shack
4, 11, 18 Coffee morning, 11am visitors welcome
7 Planning the Christmas party
14 Christmas party
21 Sorting rallies and visits for 2019

Stratford upon Avon & District RS
Clive, G0CHO, 01608 664 488
3, 17 Club net, 8pm, 145.275MHz FM
10 Quiz, Ron, 2E0EKW
25 Christmas greetingson the air from 10.30am 145.275MHz FM

Sutton Coldfield ARS
Robert, rob2e0zap@gmail.com
3, 17 Open net, 7.30pm, ±145.250MHz
10 Club meeting and Christmas party
11 Open net, 7.30pm, 70.475MHz

Telford & District ARS
John, M0JZH, 0782 473 7716
5 Committee meeting
12 Christmas meal
19 Mulled wine & mince pie social
26 Club net for meeting on the air

Wythall Radio Club
Chris, G0EYO, 0771 041 2819
1 MLS Hog Roast trip
2, 9, 16, 23, 30 Club net, 8pm, 145.225MHz or GB3WL
4, 11, 18 Morse class eith G0HVN, 7.30pm
4 Free & easy social evening
11 Antennas for tricky Locations, G0HVN
18 Christmasclub contest briefing
27 Christmas fox hunt

REGION 6: NORTH WALES

RR: John Pritchard, MW0JWP
RR6@rsgb.org.uk

Dragon ARC
John, MW0JWP, 0751 503 1025
3 Natter night
17 Christmas get-together

North Wales Radio Society
Liz, GW0ETU, 0776 019 0355
6 Night on air
13 Quiz and buffet
20, 27 Closed

Porthmadog & District ARS
Peter, GW0DFK, 0773 177 1319
20 Christmas party

REGION 7: SOUTH WALES

RR: Glyn Jones, GW0ANA, RR7@rsgb.org.uk

Aberystwyth & District ARS
Ray, GW7AGG, 01970 611 853
1, 27 Club net, 145.500 then 145.550MHz
13 Quiz night

Blackwood & District ARS
Rob, MW0CVT, 0797 471 7152
1 Start of Pixie Challenge, see www.gw6gw.co.uk

Llanelli ARS
Steve, MW6CCG, 0787 849 4337
3 Closed (Christmas dinner)
10 Social evening
17 Christmas party, club raffle & auction
24, 31 Closed (Christmas holidays)

REGION 8: NORTHERN IRELAND

RR: Philip Hosey, MI0MSO, RR8@rsgb.org.uk

Bangor & District ARS
Harry, GI4JTF, 0289 042 2762
6 Amateur TV, John Gaunt

West Tyrone ARC
Philip, MI0MSO, 0784 902 5760
8 Christmas dinner
12 Meeting night

REGION 9: LONDON & THAMES VALLEY

RR: Tom O'Reilly, G0NSY, RR9@rsgb.org.uk

Aylesbury Vale RS
avrs@rakewell.com
12 Christmas get-together hosted by G3MEH

Bracknell ARC
David, M0XDF, M0XDF@alphadene.co.uk
5, 19, 26 Open net, 8pm, 145.375MHz
12 Christmas social

Chesham & District ARS
Terry, G0VFW, 01442 831 491
5 Informal Christmas get-together
19 No meeting

Edgware & District RS
Mike, G4RNW, 020 8950 0658
13 Christmas fish and chip supper

Hammersmith ARS
Selim, M0XTA, M0XHS@outlook.com
6, 13, 20 Club net, 8pm, 144.700MHz FM
14 General club night with radio operations
28 Closed

Harwell ARS
John, G6LNU, 01235 223 250
13 AGM

Newbury & District ARS
Rob, G4LMW, 0797 088 5614
12 Christmas dinner

Radio Society of Harrow
Linda, G7RJL, lcasey100@outlook.com
2 Club shack 10am-3pm
2, 9, 16, 23, 30 Club net, 1938kHz LSB, 12 noon
3, 10, 17, 24,31 Net, 8.15pm, 145.500MHz / 145.35MHz FM
7 Construction contest, Blackwell Hall, 8pm
14 Christmas Social, Club Shack, 8pm

Reading & District ARC
Laurence, G2DD, 0758 470 6625
13 AGM

Shefford & District ARS
David, G8UOD, 01234 742 757
6 Antique and unusual electrical equipment – bring yours in!
13 Club mince pie evening

Silverthorn Radio Club
Robbie, M0HVC, 0742 913 1105
7, 14, 21, 28 Club night, 7.30pm

Southgate ARC
Keith, G8RPA, g8rpa@arrl.net
13 AGM

Verulam ARC
Greg, M0PPG, 01582 413 345
11 Annual Bun Fight, 8pm

Whitton ARG
Ian, G0OFN, 0795 620 3495
7 Club night, HF / VHF on the air
14 30th Anniversary Christmas dinner, 7.30pm
21, 21 Social meeting (in the bar), 8pm

REGION 10: SOUTH & SOUTH EAST

RR: Keith Bird, G4JED, RR10@rsgb.org.uk

Bromley & District ARS
Andy, G4WGZ, 01689 878 089
5, 12, 19, 26 Net, 9pm, 145.500MHz and QSY
18 Christmas quiz & mince pies

The January deadline is 21 November

Chippenham & District ARC
secretary@g3vre.org.uk
4, 11, 18 Club night
25 Closed

Crawley ARC
John, G3VLH, 01342 714 402
21 Fish and chip supper

Cray Valley RS
Dave, G8ZZK, 0773 954 9822
6 Broadcast radio, Pete Sipple, M0PSX
20 Christmas buffet

Crystal Palace R&EC
Bob, G3OOU, 01737 552 170
5, 12, 19 Net, 8pm, 145.525MHz ± QRM
7 Christmas social evening

Darenth Valley RS
Mike, G8AXA, 0788 415 7776
12 Quiz plus fish 'n chips

Farnborough & District RS
Mel, M0JMR, sec@farnboroughradio.org.uk
12 Christmas dinner
26 No meeting

Hilderstone R&EC
Ian, 2E0DUE, secretary@g0hrs.org
1, 8 YOTA (TBC) – Wellesley House School
13 Club meal

Hog's Back ARC
Ray, G4LUA, 0118 981 4174
10 Natter night and mince pies etc
24 No meeting

Horndean & District ARC
Stuart, G0FYX, 02392 472 846
7 Quiz night plus mince pies
14 Christmas meal at The Crofton
21 No meeting

Mid Sussex ARS
Peter, G4AKG, 01444 239 371
7 Christmas dinner
14 Christmas quiz
21, 28 Closed

North Kent Radio Society
Stephen, G8JZT, 0798 575 3370
4 Musical Keyboard, Robin Gilbert, M0RJT
18 Christmas EGM with mince pies

Surrey Radio Contact Club
John, G3MCX, 020 8688 3322
2, 9, 16, 23, 30 Net, 1905kHz, 9.30am
3 Construction Contest
6, 13, 20, 27 Net, 8pm, 70.300MHz
7, 14, 21, 28 Net, 8pm, 145.350MHz
17 Pre-Christmas social

REGION 11: SOUTH WEST & CHANNEL ISLES

RR: Martin Sables, G7NTY, RR11@rsgb.org.uk

Callington ARS
John, G4PBN, 01822 835 834
5 Club night

Cornish RAC
Steve, G7VOH, 01209 844 939
6 Main meeting
20 Social evening

Exmouth ARC
Mike, G1GZG, 01395 274 172
5 HF & VHF night & computers explained
19 Christmas party

Mid Somerset ARC
David, G8BFV, 01749 670 085
10 Equipment sale & Christmas supper

Newquay & District ARS
Terry, 2E0XTM, 01841 540 142
5, 19 Club night

North Bristol ARC
Mat, G7FBD, g7fbd@gb3bs.com
7 Relax & chat, operating, committee
21 Relax & chat, operating
14 Christmas party
28 45–minute video

Poldhu ARC
Keith, G0WYS, 01326 574 441
11 Christmas 'bring a plate' evening

Riviera ARC
rivieraarc@gmail.com
6 Christmas social / meal at the Ship Inn
20 Club night (last of 2018)

Saltash & District ARC
Mark, M0WMB, 0781 054 8445
6 Open meeting, all welcome
20 No meeting

South Bristol ARC
Andy, G7KNA, 0783 869 5471
6 Table top sale, 8pm
13 Christmas social
20 Open house and on air night
27 No meeting

Torbay ARS
John, G4VUD@tars.org.uk
7, 14, 21, 28 Club night
28 Club night with speaker

Weston Super Mare RS
Martin, G7UWI, g7uwip@googlemail.co.uk
3, 10 Construction, Morse tuition & operating
17 Christmas party

Yeovil ARC
Bob, G8UED, 01963 440167
6 Fictitious radio antennas, G3MYM
7, 21 Sparkford on air and various practices
13 Christmas lecture: Smith charts, G8UED
20 Mince pies
27 Morse practice
28 2nd annual table top sale

REGION 12: EAST & EAST ANGLIA

RR: Peter Onion, G0DZB, RR12@rsgb.org.uk

Braintree & District ARS
Edwin, G0LPO, 01376 324 031
4, 18 Club net, 8pm, 145.375MHz
11 Christmas social
25 Natter night

Cambridge & District ARC
Richard, G4AWP, 0770 229 5300
14 Christmas Social, coffee, mince pies & quiz
28 No meeting

Colchester Radio Amateurs
Garry, M0MGP, 0774 031 8521
2 Net, 7pm, 50.225MHz LSB
4, 11, 18, 25 Net, 7pm 433.425MHz; 7.45pm 1.925MHz LSB
5,12, 19, 26 Net, 7pm, 145.350MHz
6, 13 Net, 7pm, 3.685MHz LSB
20 Christmas party

Essex Ham
Pete, M0PSX, news@essexham.co.uk
1 Essex YL Net on GB3DA, 8pm
2 Start of online Foundation course (www.hamtrain.co.uk)
3, 10, 17, 24, 31 Net on GB3DA, 8pm, with chatroom at www.essexham.net

Felixstowe & District ARS
Paul, G4YQC, pjw@btinternet.com
10 Christmas noggin, video & mince pies
24 No meeting

Great Yarmouth RC
Simon, M0TRJ, g3yrc.radioclub@gmail.com
14 Club night & radio operation, 7.30pm

Harwich ARIG
Kevan, 2E0WMG, 0749 352 1049
12 AGM & Christmas social

Huntingdonshire ARS
David, M0VTG, secretary@hunts-hams.co.uk
6 HARS Christmas dinner – Buckden
13 Mince pies and chat night

Loughton & Epping Forest ARS
Dave, M0MBD, 0798 016 5172
6, 13, 20 Net, 8pm, 144.725MHz

Lowestoft District & Pye ARC
secretary@ldparc.co.uk
6, 20, 27 club evening
10, 24 Informal/operating evening
13 Talk / film

Norfolk ARC
Chris, G0DWV, 01603 898 308
5 Clublog, Michael Wells, G7VJR
12 Christmas party

Peterborough & District ARC
Alan, G8XLH, secretary@padarc.co.uk
3, 10, 17, 24, 31 Club net, 8pm, 1.980MHz
4, 18 Club net, 8pm, 145.400MHz
12 Christmas social

South Essex ARS
Terry, G1FBW, 0798 607 0040
11 Christmas social

Thames ARG
Patrick, G8JLM, 01621 855 461
7 Christmas social

REGION 13: EAST MIDLANDS

Regional Manager: Jim Stevenson, G0EJQ
RR13@rsgb.org.uk

Leicester RS
Sandra, G0MCV, 0793 027 4044
3 Open meeting
10 Morse practice & committee meeting
17 Christmas party
24 No meeting

Loughborough & District ARC
Chris, G1ETZ, 01509 504 319
4 Valve principles, Ian, G8SNF
11 Open forum on fox hunting – 2m & 160m DFs
18 Christmas fun night
25 no meeting

Melton Mowbray ARS
Phil, G4LWB, 01664 567 972
8 Christmas dinner
21 Christmas raffle etc

Nunsfield House ARG
Paul, G1SGZ, pr@nharg.org.uk
3, 10, 17, 24, 31 Shack night
6, 13, 20, 27 Club net, 8pm, 145.325MHz
7 QSL Bureau, Ken, G3OCA & Stefan, 2E0VKM
14 Committee meeting / shack night
21 Mince pie evening
28 Natter night

RAF Waddington ARC
Bob, G3VCA, 0797 116 6250
3, 10, 17, 24, 31 Club net, 8pm, 145.325MHz
7, 28 Club night
13 Christmas dinner
21 First nibbles night

REGION 3: NORTH WEST

In early October, **Furness ARS** put on a special station, GB9SL, to celebrate the life of Stan Laurel (of Laurel and Hardy fame) – arguably one the area's most famous sons. The event was to help celebrate the 30th annual Oliver Hardy Festival in Harlem, Georgia, USA (the birthplace of Oliver Hardy). A team of American radio amateurs from the Amateur Radio Club of Columbia County made contact with Furness ARS to see if they would put on a companion station in the UK. What better location than the beautiful Gleaston Water Mill to use for this special event? It's just a few miles away from Stan's birth town of Ulverston, in South Cumbria. Furness ARS set up a hex beam antenna and their IC-7300 plus a club member's Elecraft linear for 400W output. Band conditions were not fantastic, but perseverance on both 20m and 30m resulted in QSOs from South America, North America and all over Europe. Best of all the team at GB9SL were able to make contact with the US team (W4O) in Georgia during the festival to pass messages to each other to celebrate Laurel and Hardy.

REGION 5: WEST MIDLANDS

A Foundation licence course will be run by **Cheltenham ARA** over the weekend of 19 and 20 January 2019, followed by the exam on Sunday 27 January. For further details please contact Barry via training@g5bk.uk

Several hundred participants recently explored the thrills of undertaking a Mud Run on the Land Rover test tracks, based in the grounds of Eastnor Castle near Ledbury. RAYNET was asked to provide communications safety cover on the estate in association with the medical services due to the terrain and extremely poor mobile coverage. Despite various minor injuries and a few runners who completely got immersed in the 'swamp', all survived to tell the tale. The group is always looking for new members, and contact details can be found at www.msvraynet.co.uk/

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REGION 8: NORTHERN ISLAND

Bangor & District ARS Rally was very well attended last July. The door reported over 100 people through and trade was brisk. In addition they had an excellent demonstration of digital amateur television from Richard White, GI4DOH, which can be transmitted and received on the 70cm band. The photograph below depicts Paul Abram, GI6KJC (left) and David Best, MI0OBC (right) enjoying the event. Next meeting is on 6 December.

REGION 11: SOUTH WEST & CHANNEL ISLES

Torbay ARS' monthly meeting started out with Jeff, the club chairman, welcoming everybody in Croatian, the native tongue of the subject that night – Nikola Tesla. Alec, G8GON showed a video of the life of Tesla who was born in 1856 in Croatia where he was educated. He showed a flair for inventions from a very early age and in 1884 he was asked by Eddison to work for him but he soon left. Working on his own he came up with over 700 inventions. His ultimate goal was to transmit electricity through the air, something that is still being experimented on today. Alec, ably assisted by his wife, displayed and explained in detail the Tesla machines, many of which he had built himself. The sparks certainly flew when the spark generated made a fluorescent tube glow with the plasma. Whilst the members sat spellbound, many ideas were shown culminating with two machines; one sending a spark two feet or so between two globes and the other playing music when the spark hit the air. A very enlightening evening for us all.

Newquay & District ARS will now be meeting on alternate Wednesdays rather than Thursdays. The venue and time, 7pm, remains the same: Treviglas Community College just off Porth Bean Road, TR7 3JA.

Yeovil ARC will be holding its 2nd Table Top Rally on 28 December in Sparkford Village Hall, Church Road, Sparkford, Somerset BA22 7JN. This is on the A303 north of Yeovil. There will be light refreshments available and the venue has adequte off road parking. Admission is £2 and doors are open10am to 3pm. More from Bob Harris on 01963 440 167 or by email to wjh069@gmail.co.uk

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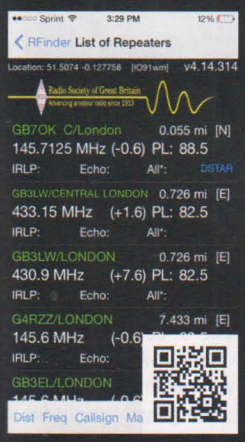

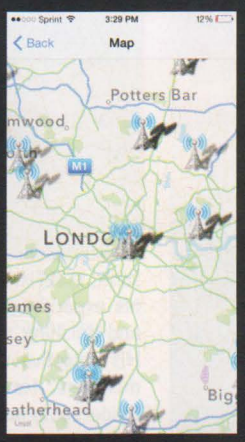

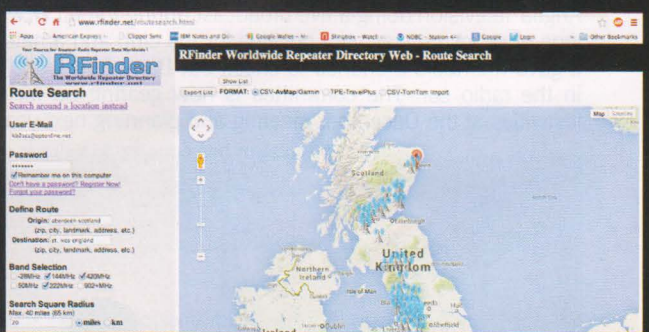

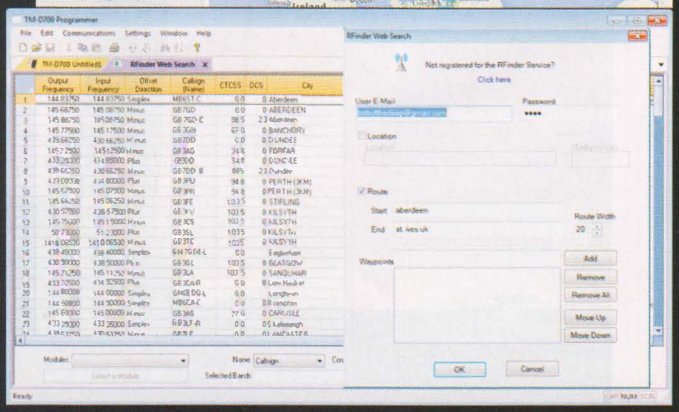

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radcom@rsgb.org.uk

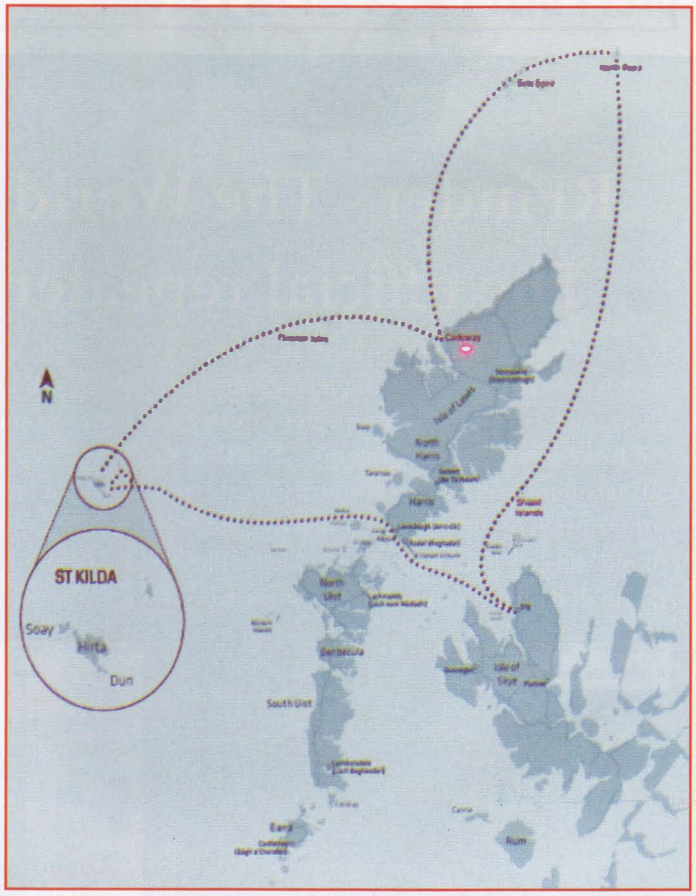
REGION 12: EAST & EAST ANGLIA

Cambridge & District ARC entered the RSGB DX Contest on Sunday 7 October using the club's FT-2000, a DX Commander fan vertical and 140 foot doublet. G4AWP, G0LRD and G8CRB managed to activate GX2XV for the best part of 18 hours, making 110 QSOs.

The main September meeting of **Peterborough & District ARC** was a talk by club member, Derek G3KHZ, on his DXpedition to Bangladesh last year. The station was set on two rare islands, Bhala Island, IOTA AS-140 and St Martins Island, AS-127 respectively. Derek was accompanied by SM6CVX, G4EDG, DL6KWA. Local amateurs S21ED and S21TV helped with officialdom and local arrangements as well as taking part in the DXpedition. The two islands had not been activated for many years and the callsigns used were S21ZDC, S21ED and S21TV. Derek said the DXpedition was a huge success and he is grateful to all those involved. Details of the equipment used and contacts made can be found at http/s21iota.weebly.com/ Derek's next DXpedition will be to Papua New Guinea in 2019.

Conveying a sense of enthusiasm is the key to any good talk – as demonstrated by club member Gary, M6GPM when he gave a presentation and demonstration of DMR at the October club meeting of Thurrock Acorns ARC. He brought two hand-helds and a hotspot connected to his mobile phone, from which those present were able to listen in to a conversation with a station from America in Grays, Essex. The hands-on demo was followed by a YouTube video covering the more technical aspects of Talk-Groups, Time Slots and Code Plugs. A useful encouragement into this aspect of the hobby.

What a year it has been for **Colchester Radio Amateurs**. A full monthly meeting calendar has included talks on remote operation, aircraft scatter, the internet, contesting and many other interesting subjects. The new assessors and trainers this year have also taught and, more importantly, successfully assisted many Foundation and Intermediate candidates through their exams, with only one person needing a retake. Another Fast Track Advanced course is in full flight. The club has also seen an increase in the number of people supporting the outside events, which take amateur radio to the public. Special event stations GB6WLB (raising awareness of the work that Walton and other Lifeboats do around the coastline) and GB6NT (to raise the awareness of Lighthouses & Lightships) were really well supported and saw a couple of new Foundation candidates. A field day for members only was held on one of the hottest days but still had many members set up in the farm field to either test their equipment or have a good old rag chew while the main CRA tent was set up to give a chance to operate on a larger setup. GOVHF/P was on site, which gave members a chance to see a top-flight contesting station in operation. The club has also been fortunate this year in attracting good media coverage with the surprise visits (organised by members of the committee) of the local radio station Dream 100 on their Sunday morning Quest program and Anglia Television doing a live broadcast during the ILLW weekend. This type of exposure was very positive for the club and amateur radio and it gave members a chance to check out Barry and Liana's equipment in the radio car. The committee is now gearing up for the season's festivities at the December meeting and planning next year's events.



John, G4LTH, Vice-Chair of Thurrock Acorns ARC, gave a presentation on his experiences of operating /P from remote islands in Scotland, starting and finishing at the Isle of Skye, including the Isle of Lewis and St Kilda. His objective was to activate rare squares for Worked All Britain (WAB) members. He used an Elekraft KS2 transceiver running 5W phone, a Spiderbeam aerial 51, model 404–UL and long lasting light-weight lithium ion battery that lasted all week on a single charge – after all, there is no mains to plug in for a top up.

REGION 13: EAST MIDLANDS

Jim, GOEJQ (RR13) and Graham, G8NWC (DR135) supported the Fishermen's mission special event station GB4RNF with RSGB promotional material and answering questions on the Society's role in amateur radio. The photo (right) shows the town Mayor sending her name in Morse, showing a big interest in disaster relief, highlighting that we provide communication support for many events, disasters not only in the UK but worldwide, and the recent flooding problems on the east coast and amateur radios involvement.

Spalding & District ARS supported the charity tandem bike ride from Whitby to Boston for The Fishermen's Mission, using GB4RNF raising awareness of the Fishermen's Mission and provide a fundraising opportunity to support vital work along the Yorkshire and Lincolnshire coasts. visitors to the event were able to learn of Amateur radio, send their name in Morse code, and take away promotional material of the club and RSGB.

RF meter for low power using an Arduino and LCD, continued from page 77

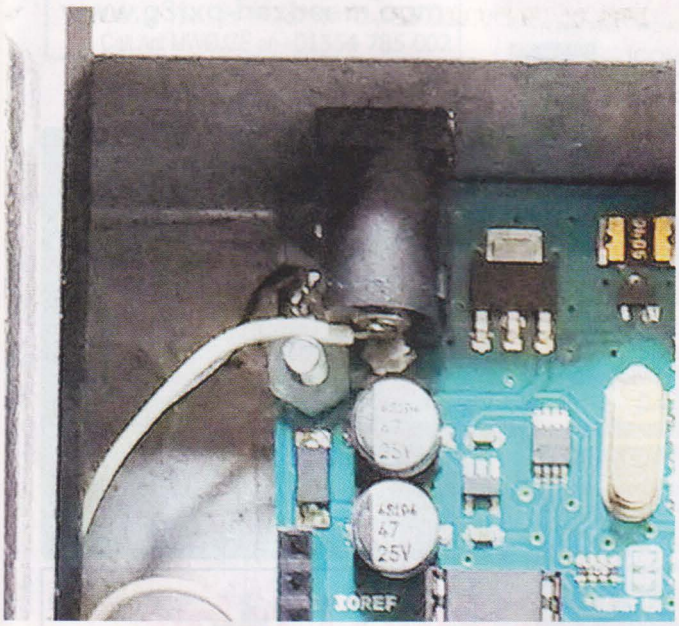


PHOTO 3: Picking up the +9V supply from the socket on the Arduino circuit board. Be careful not to use too much heat or you risk damaging the socket. It may be better to pick up the supply from where the terminal is soldered on the other side of the board.

Arduino sketch

The explanatory notes in red are not part of the Arduino sketch.

```
The lines of code down to "// power in" setup the Arduino so that it knows what it is connected to and on what pins to expect an input voltage
// include the library code:
#include <LiquidCrystal.h>
This tells the system that a liquid crystal display is connected
// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
This tells the Arduino which pin numbers are connected to the display. I used the same pinout as the Starter Kit.
//pwr sensor stuff
const int sensorpin = A0;
Pin A0 is set to expect an input
void setup() {
 // set up the number of columns and rows on the LCD
  lcd.begin(16, 2);
 // Print a message to the LCD.
Tells the Arduino that the display has 2 rows of 16 characters
}
void loop() {
 // power in
  int sensorval = analogRead(sensorpin);
Read the input from the AD8307 on A0 (which I have named sensorpin)
  float voltage = (sensorval/1024.0) * 5.0;
Convert to 1024 levels referenced to 5V – which is the Arduino input voltage limit. So a 2.5 V input becomes 512 (half of 1024) etc. When divided by 1024 and multiplied by 5, this gets us back to 2.5 – so we now have the input voltage again.
  float pwr = ((voltage * 39) – 71.6;
39 and 71.6 as discussed in the 'Calibration' section
  delay(1000);
update the display every second
  lcd.setCursor(0,0);
  lcd.print("Pwr ");
  lcd.print(pwr, 1);
  lcd.print("dBm");
  lcd.setCursor(0,1);
  }
Print the results on the LCD along with the text
```

Websearch

[1] Design Notes, *RadCom*, May 2015
[2] www.sv1afn.com
[3] The many sources include www.instructables.com/id/How-to-use-an-LCD-displays-Arduino-Tutorial/
and www.arduino.cc/en/Tutorial/HelloWorld (amongst others)
[4] www.analog.com/media/en/technical-documentation/data-sheets/AD8307.pdf

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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

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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
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This year's HOG ROAST takes place on Saturday December 1st!

Now in its 29th year, Martin & his gang put on a show in store offering unprintable prices across their product range. Representatives from Yaesu, Icom, Kenwood, BHi, RSGB and more are on site with the FAMOUS HOG ROAST kindly sponsored by Icom & Kenwood. Doors open at 8am and close at 4pm.

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FOR SALE

EDDYSTONE 668(?), circular loudspeaker, 7" diameter case, black crackle finish, matches Eddystone 640/740 sets. Microwave Modules Morse Talker MMS1, portable Morse tutor, 2-20 wpm, key socket, instructions and diagram, good condx, working order. Each item £50, carriage extra or collect. Carl, G3XGK, 01502 564 160, carl.langley@talkatalk.net (Lowestoft, Suffolk).

ENHANCED VISION MERLIN DESKTOP MAGNIFIER for reading/viewing pictures with impaired sight, macular degeneration, etc. Extremely flexible user modes. Like new with stand, one third of new price for quick sale, £500. Can deliver and demonstrate for cost of fuel. Steve, G0FUW, g0fuw@tiscali.co.uk (Bath).

HEATHKIT IO-12U OSCILLOSCOPE for spares. Mains transformer missing. Offers. Buyer collects. Richard, GOFXIm, 0117 963 6981 (Bristol).

HF TRI-BAND ANTENNA, Force 12 C-3SS 6-ele Yagi, 10, 15 & 20m. All parts refurbished ready for assembly. 20m elements linear-loaded, small footprint, very robust antenna with easy on-mast mounting, £450. See reviews online. Transport to be agreed, or collect. Tony, G3KAG, 01335 324 393, g3kagroston@yahoo.co.uk (Roston, Derbyshire).

ICOM IC-706 MkIIG, almost mint condition and fully working. Smoke free environment. 160m – 70cm (not 4m), DSP. Complete with microphone, power lead, manual and original carton. £500. Andrew Thomas, G8GNI, 0771 471 5300, g8gni@outlook.com (Bicester, Oxon).

KENWOOD TR-751E, 2m multimode, GWO, £275 ono. Yaesu FTM-3200D, FM/C4FM, GWO, £125 ono. Yaesu FT-7800 2/70 FM, GWO, with YSK 7800 sep kit, £125 ono. MICROSET RV 45 2m all mode linear, GWO, £75 ono. Contact John, G0NAJ, 0161 304 9327, john.g0naj@btinternet.com (nr Manchester).

microHAM microKEYER II including DB37 cable for Elecraft K3; DB37 cable for Yaesu FT-1000MP; iLINK cable and microphone RJ45 – Foster 8 adapter cable. Excellent condition. £185 including insured delivery. Ian, G3YUZ, 01202 767 001, i.c.wilson@open.ac.uk (Bournemouth, Dorset).

PALSTAR ZM30 antenna analyser, £150. KK7UQ IMD meter for PSK, £40. Elecraft N-gen wideband noise generator, £20. Elecraft DL1 20W dummy load, £5. P&P extra at cost, or collect. Chris, M0PSK, 01568 610 186, chrism0psk@gmail.com (Leominster).

QTH DESIRABLE VILLAGE SETTING, fields on three sides, low QRM. 3 bedroom detached bungalow, garage/workshop, garden shed, greenhouse. 2 bathrooms, lounge, large sunroom. Nearby school, medical centre, pub. Antennas optional! £245k negotiable. Email for photos & details. David, VK3DBD, 0797 441 4419 (SMS best), david.g3scd@gmail.com (nr Horncastle, Lincs).

RETIRING BARGAINS due to my great age. FT-120DX with Watson voltage source, £475. CP6 vertical antenna with wall brackets, £125. FT-101ZD, £115. FL-2100B linear, £105. Spare valves with latter two and all with manuals. Cash only please. Harold, G3DZS, 01805 628 045, glynisnweinand@gmail.com (Devon).

SDRplay RSP2 software defined radio receiver. Bought new earlier this year. Complete with USB cable and antenna connector. £130 inc p&p (Cost £165). John, G3EGC. 01204 301 502, jvhoban@gmail.com (Bolton).

SILENT KEY SALE (ex G4IZI). Yaesu FT-897 HF/VHF/UHF transceiver, £450. Hunter 750 linear amplifier, £500. Heathkit Decade Resistance Box, £10. CT212 signal generator, £15. VHF/UHF coaxial wave meter, £10. S Tompsett, G8LYB, 01788 578 940, stephen@tompsett.net (Rugby).

SK SALE on behalf of G0ETA: SG230 Smartuner in excellent condition and working order. Hardly used, manual and boxed, £275 post paid. Unused 2m 7-ele ZL-Special antenna from Moonraker. Original price £69.95, going for £40 + postage. Photos on request. Rob, G2BKZ, 0798 636 7537, rob_g2bkz@talktalk.net (Stevenage, Herts).

SK SALE. Kenwood TM-D700E, £150. Kenwood TM-G707E, £100. LDG Z817 auto ATU, £50. Signalink USB interface, £55. DV access port dongle and Shark open spot, £45. Icom ID-31E UHF h/held, no charger, £95. Miracle Whip portable antenna, £50. Chris, G0RDK, g1puvg0rdk@gmail.com (Kidsgrove, Staffs).

SWL SK. JRC NRD549 Rx, £450 ono. TRIO 9R-59DS, £100. RACAL RA-17 rack mount Rx, £50. All good working condition. Buyer collects, or might be able to arrange collection in Paisley area. Stuart, GM4MTI, 01631 562 843, dsm.spence@btinternet.com (Oban).

TENNAMAST 12m plus tower with quad and G-1000DXC rotator. Three bedroom house and 1 bedroom gite with income or granny flat. Attached barn/garage. Very quiet location, 140m ASL in the beautiful Vienne department of South West France. Much reduced: £169,950. John Bell, F5VHC, 0033 (0) 5 4987 0544, john.f5vhc@gmail.com (Le Magnou, 86700 Romagne, La Vienne, France, JN06DG).

YAESU FT-221R multimode 2m transceiver. Good working order and condition. Fitted MuTek front end board plus 11 fixed channel xtals. Includes microphone, power leads and original boxes. £195. Collection, or carriage £25. Mike, G4OQG, 01249 443 037, g4oqg@hotmail.co.uk (Wiltshire).

YAESU FT-450D HF/50MHz TRANSCEIVER. Owned from new, hardly used and in good condition. Comes complete with manual, MH31 microphone, Sharmon switch mode sm23 PSU, AC & DC leads, £450. No split, no offers. Buyer inspects and collects. Mick Down, G4ALR, 07851 670 629, michaeldown95@icloud.com (Hitchin, Herts).

YAESU FT-450D TRANSCEIVER. Excellent condition. Little use and as receiver only. Boxed with manual and microphone, £395. Icom IC-R6 handheld wideband receiver, vgc, 0.1-1300MHz. 1300 memories. Box, manual and mains adapter, £95. Collection or insured postage at cost. Neil, 2E0EDG, 01472 399 830, neil.chamberlain@btinternet.com (NE Lincs).

YAESU FT-817ND HF/VHF/UHF QRP transceiver, mic, DC lead, charger, instruction manual. New battery pack. Full working order, £295. Doug, G8KOM, 01628 822 453, satmobile@hotmail.com (Reading, Berkshire).

WANTED

DIAWA CNA-2002 for spares. It is the cross needle meter that is needed. The ATU does NOT need to be working. Robert Coombes, G4ZEJ, 0773 473 4504, g4zej@btinternet.com (Horsham, West Sussex).

SILENT KEYS

We regret to record the passing of the following Members.

Name, callsign	Date
Mr G C Hulme, G0DLK	19/09/2018
Mr A S Pemberton, G0NGH	8/2018
Mr S J Cockshoot, G1WWR	20/10/2018
Mr A D Patterson OBE, GI3KYP	10/10/2018
Mr B M Johnson, G3LOX	04/07/218
Mr P J Groves, G3MWQ	10/2018
Mr I A Balloch, GM3UTQ	28/09/2018
Mr J Crabbe, G3WFM	18/10/2018
Mr J K Harding, G3XFL	9/2018
Mr R J Stacey, G4XQW	8/2018
M G P Parry, G7OSR	29/8/2018
Mr K Rothwell, G8EAP	07/09/2018
Mr G Stoddart, MM0GTG	10/2018
Mrs G H Wiles, M3GHJ	22/08/2018
Mr C J Dodd, VK6DV	03/10/2018

To notify us that a Member has passed away, 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.

Please note that Ofcom must be informed separately, on 0207 981 3131 – we are not permitted to pass on details on your behalf.

GELOSO VFO 4/104 with plastic dial, also high impedance microphone. Brendan, EI4BB, 00 353 87 250 8651, ei4bb@yahoo.ie (Dublin).

ICOM IC-2KL in clean working condition to complete vintage line up. Cash bank transfer or PayPal waiting. Can pick up or cover courier cost. Joe, MOAJO, axe.man@aol.co.uk (Watford, Herts).

QSL CARDS – silent key clear-out or just not wanted – please don't throw them away. I collect QSL cards for historic interest and research. Any date but prior to 1970 preferred. Can collect or arrange collection. Tony, G4UZN, AQuest1263@btinternet.com (Leeds).

RADIO MAST: wind-up, 30ft or more. Ted, G4MOV, 01621 853794, e.durey@sky.com (Essex).

SHELDON HANDS ELECTRONICS and Wood & Douglas – do you have any unbuilt, unfinished or even completed kits gathering dust in a cupboard or loft? If you do, please get in touch. Simon, M5POO, simon@m5poo.co.uk, 0786 089 2222 (Corbridge).

TEN-TEC ARGONAUT V transceiver in working condition. Will arrange courier if needed. Bob, MM0RKT, 0754 748 3232, mm0rkt@gmx.com (Hamilton, nr Glasgow).

TRANSMISSION LINE TRANSFORMER HANDBOOK by Amidon. Borrow or buy copy please. All costs met. W J Ricketts, G8LJO, 0785 445 5345 (Salisbury).

YAESU FRG-7 Rx in good condition; Drake TR4CW in v good order; Drake R4C Rx; JRC515 Rx; all from non-smoking home please. Ilan, G0UUT, elanpaim@icloud.com (Norfolk).

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.

HELPLINES

Seagulls and magpies are damaging my scaffold pole-mounted Cobwebb antenna. There are 'scarers' on the market based on a flying facsimile of a kestrel etc but all involve raising another pole, above roof height, contravening my local planning restrictions. If anybody has a similar problem how did you tackle it, without using a separate pole? Any help appreciated. Paul, G3SVZ, paul.laxton@blueyonder.co.uk (Plymouth).

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

1 DECEMBER 2018
SOUTH LANCASHIRE ARC WINTER RALLY
Bickershaw Village Community Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE.
Attractions include trade stands, a Bring & Buy, special interest groups, car parking, disabled facilities, catering and a licensed bar. Admission is £2.50, doors open at 9am (traders 7.30am). Jason, G0IZR, 01942 735 828.

28 DECEMBER 2018
YEOVIL ARC Table-top Rally
Sparkford village hall, Church Rd, Sparkford, Somerset BA22 7JN (on the A303 north of Yeovil). Off road parking, 10 tables, light refreshments, wheelchair friendly. £2 admission.10am till 3pm. Bob Harris, G8UED, 01963 440167, wjh069@gmail.com.

29-30 DECEMBER 2018
HAMFEST INDIA
In association with REVA University, Bangalore. The largest gathering and festival of amateur radio operators in India. [www.hamfestindia2018.com].

2019
24 Feb – **Rainham Radio Rally**
3 Mar – **Exeter Radio & Electronics Rally**
17 Mar – **Wythall Radio Club Hamfest**
24 Mar – **Hamzilla Radio Fest & Electronics Fair**
24 Mar – **Callington Radio Rally**
28 Apr – **NARSA exhibition (Blackpool Rally)**
9 Jun – **Junction 28 Radio Rally**
16 Jun – **West of England Radio Rally**
28 Jul – **Wiltshire Radio Rally & Electronics Fair**

NOW IS THE TIME TO TELL US ABOUT YOUR 2019 RALLY – email details to radcom@rsgb.org.uk TODAY

RSGB Convention 2018 continued from page 64

A few components were dropped onto the floor but none were lost in the carpet. One builder ran into difficulty and the problem was eventually traced to a faulty battery snap, a couple of solder joints had to be reworked and one builder managed to get one of the three integrated circuits in upside down; all fairly normal stuff for any Buildathon! The finished kits were set up using a frequency counter and an oscilloscope and demonstrated in use with a homebrew SSB transceiver. The newer licence holders were pleased to see the modulation patterns described in the training manuals actually happening in real life.

Once the build was under way an excellent buffet was served so the builders did not starve. Everyone left very happy, having learned something and having a great little kit to use afterwards. One of the builders said "This was just what I needed, someone to take me through the process and show me how to use SMD. I have been putting off for a long time but I now feel confident to give it a go."

Thanks to the RSGB Legacy Fund the workshop was filmed and the intention is to make a video available to clubs to encourage others to give SMD a try – it's not as scary as you think!

Raffle prizes

The three main raffle prizes were donated by Icom UK, Kenwood UK and Yaesu UK - an Icom IC-7300; Kenwood TH-D74E and Yaesu FT-818ND respectively. Two of the winners were at the Convention to receive their prizes – and were popular winners too. Victor Brand, G3JNB won the Yaesu radio and said, " I have been in the RSGB since 1953 and attended HF Conventions since the days of High Wycombe this is the first time I have come up with one of the major prizes in raffle. Everything comes to he who waits!" The Icom radio was won by Peter Day, G3PHO. The Kenwood radio prize was presented separately.

And the raffle was the final event of the weekend, a successful one at that. Thank you to all those who filled out the questionnaire, the points raised will be taken into consideration when planning next year's event.

An ISS contact was completed at the Convention.

RadCom

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HF F-Layer Propagation Predictions for December 2018

Compiled by Gwyn Williams, G4FKH

	3.5MHz	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	24.9MHz	28.0MHz
Time	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220
(UTC)	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020
*** Europe								
Moscow	998....58899	647654574457	...65543....	...5666.....	...2642.....	....32.....	....11.....	.....
*** Asia								
Yakutsk	55......6666	...5.....	.....	.....	.....	.....	.....	.....
Tokyo	.....	......4.....	.....	.....	.....	.....	.....	.....
Singapore	.....	......54...4	......4.....	.....3.....	.....	.....	.....	.....
Hyderabad	5.....	5......5..4.	.....	......3.....	.....	.....	.....	.....
Tel Aviv	88......7888	7763...57777	..553335....	...5445.....	...3332.....	....1.....	.....	.....
*** Oceania								
Wellington	.....	....6664....	....454.....	.....3.....	.....	.....	.....	.....
Well (ZL) (LP)	.....	.....	.....	.....	.....	.....	.....	.....
Perth	.....	.......5..4.	......4.....	.....23.....	.....2.....	.....	.....	.....
Sydney	.....	.....55.....	....454.....	....34.....	.....2.....	.....	.....	.....
Melbourne (LP)	.....	.....	....4.....	....3.....	.....	.....	.....	.....
Honolulu	.....	.......4....	.....	.....	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....	.....	.....	.....
W. Samoa	.....	.....55.....	.....4.....	.....	.....	.....	.....	.....
*** Africa								
Mauritius	.....	5.....	.....	.....	.....	.....	.....	.....
Johanesburg	55.....	55.......5.5	.....	.....	.....	.....	.....	.....
Ibadan	7775.....777	7.65....6766	4..53...5...	...543.4....	...2444.....	....322.....	.....	.....
Nairobi	66.....	554.....5556	.....	...3.....	.....23.....	.....	.....	.....
Canary Isles	8887.....889	78775...6877	45.65445.534	....5553....	.....	.....	.....	.....
*** S. America								
Buenos Aires	...5.....	.4.5.....	...4.....	.....	.....	.....	.....	.....
Rio de Janeiro	...6.....	.5.6.....	...5.....	.....	.....	.....	.....	.....
Lima	.....	.....	.....	.....	.....	.....	.....	.....
Caracas	...6.....	.5.54.....	....4.....	.....3.....	.....2.....	.....	.....	.....
*** N. America								
Guatemala	.....	....5.....	.....	.....	.....	.....	.....	.....
New Orleans	.....	.....	.....	.....3.....	.....	.....	.....	.....
Washington	67665.....56	...45.....	.....3..3...	.....3.....	.....	.....	.....	.....
Quebec	7766......56	.....	.....33.....	.....4.....	.....2.....	.....	.....	.....
Anchorage	.5......5...	.....	.....	.....	.....	.....	.....	.....
Vancouver	5555.....	.....	.....3....	.....	.....	.....	.....	.....
San Francisco	.....	....4.....	.....	.....	.....	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....	.....	.....	.....	.....

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 December, January 2019 & February 2019 are respectively (SIDC classical method – Waldmeier's standard) 3, 2 & 2 and (combined method) 2, 3 & 4. The provisional mean sunspot number for October was 4.9. The daily maximum / minimum numbers were 26 on 13 October and 0 on 5-10, 16, 18-20, 22-31 October.

THE VHF & UHF BANDS

David Taylor, GM8ARV

In reply to Colin Topping's suggestion for more VHF and UHF activity, I cannot see it being sensible for the RSGB to devote any resources to this when hand-held transceivers are already available for £20 (analogue) or £70 (digital). With digital, world-wide contacts are easily made, which might encourage an interest in HF activity too. If a kit is needed, why not something that either isn't available commercially, expensive commercially, or something that might be more educational – SWR bridge perhaps?

But please, don't re-invent the wheel, and no return to fixed crystal-controlled (and off-frequency) channels!

Robert West, GM4GUF

You asked for feedback on the letter from Colin, GM6HGW. The suggestion is that we have yet another 2m FM radio as a project when what we really need is an SSB/CW /FT8 capable one.

I think that clubs running courses generally are not introducing new blood to the VHF bands. There is an over obsession with HF, particularly contesting. VHF runs the risk of dying because if someone uses a poor handheld on VHF they are likely to get bored and give it up. There is so much more to VHF than just a couple of FM channels. How about a dedicated 2m portable small SSB/CW radio, with modern design it must be possible, I wish I had that knowledge to design one.

If we actively encourage those with capability to not just look for DX on VHF but come and work folk in the far corners of the UK, then the bands will stay alive. Look north for some of those contacts too, we are there. If we don't encourage VHF activity generally then those in the extremities of the UK will end up with no-one to work.

Finally you may ask what I am doing to help. Well, I am making and giving out free antennas to new licensees as long as they promise to try and work me. So far it's working, so that's a start. How about an amnesty for all the old antennas kicking about in the back of garages and unused equipment that will never be used – get it out there and ask some of your local operators if they would like to try VHF.

A BIG THANK YOU

Bill Jones, M0YAV

I would like to thank Yaesu UK for the fantastic prize that I was lucky enough to win at this year's National Hamfest. I would also like to extend my thanks to everyone concerned and for the generosity of everyone who donated the prizes.

I must apologise for not being there to accept the prize but my wife, Linda, 2E0YBL, has recently had a knee replacement and needed to get home after a long day.

Once again, thank you. The prizes will be a very welcome addition to the shack.

See page 11 of this edition of RadCom *to see more about the winners at the National Hamfest – Ed.*

UNDERSTANDING THE LICENCE TERMS

Alaric, RS319253

I am currently studying for my Foundation licence, and I note that section 11(4) of the licence terms as issued by Ofcom forbid the transmission of messages 'for general reception' other than CQ calls, discussion in nets, and 'Messages transmitted via a mailbox or bulletin board for reception by Amateurs'.

This leads me to wonder how WSPR and APRS transmissions are permitted.

According to https://aprs.fi/, the UK is teeming with APRS transmissions seemingly 'for general reception'. Does the existence of digipeaters mean that the 'mailbox or bulletin board' case applies here?

However, WSPR transmissions don't seem to fit any of those cases, even weakly!

From what I have seen so far, amateur radio is dominated by well-intentioned people, and cooperation on the bands seems to be mainly down to people simply being considerate. Would I be right in inferring that, in practice, some of Ofcom's regulations are overlooked as long as no harm is done?

WSPR can be considered to be a form of specific personal beacon transmission, so Schedule 2 of the Licence also has a bearing. A key issue is that to keep the right side of the line it should also be attended. We do occasionally receive proposals for full general unattended usage and GB3xxx Beacon NoVs can cover such requests if you are a Full License holder.

Whilst WSPR NoVs are rare, APRS, which has message relay and exchange, is a clearer area and ETCC regularly process NoVs for it (usually on 144.800MHz). See www.ukrepeater.net

Murray, G6JYB, Chair, Spectrum Forum

WORKSHOP WAS WORTH IT

Bob Whelan, G3PJT

I attended the GNU Radio (SDR) Workshop organised by John, G4BAO, Heather, M0HMO and Derek Kozel that took place before the RSGB Convention started in ernest. This was a truly outstanding workshop on how to use some of the latest radio design techniques typified by GNU Radio. It was one of the best and most interesting workshops I have ever attended. I understand that the RSGB Legacy Committee gave its financial support to ensure that this forward thinking, next generation event could go ahead. When my own-designed software GNU Radio received its first SSB signal yesterday morning it was a bit like the feeling I experienced when my first crystal set burst into life all those years ago. Thank you.

IN PRAISE OF THE FMACs

Helen Melhuish, M0TMD

The stated intention of the FM Activity Contests is to attract newcomers to 'get a feel for contesting'. This certainly worked for me. Starting out with my Foundation licence, these contests have actively driven me to work portable, to build and modify my own antennas, to improve my operating and to learn about the process of contesting. Now with a Full licence, I still enjoy working friendly regulars and newcomers alike, and each month there are usually new stations to speak to. I have often read comments from new participants, including Foundation and Intermediate licensees, saying how much they enjoyed the contest. I have had such enjoyment from these one hour challenges that I accepted the role of Contest Manager for BYLARA (bylara.org.uk) this year, and regularly share my portable contesting adventures with members through our newsletter.

I think the idea of organised FM activity is a good thing. 4m is often 'quiet', for example, but as new equipment becomes available, more stations are looking for opportunities to use the band. Whilst some people decry the lack of FMAC entrants, I feel that to have a core of experienced participants is essential to encourage new operators. To dive straight into the often fast and furious SSB contests can be daunting and sometimes discouraging, especially to the inexperienced operator. The FMACs are actually competitive, although some appear not to treat them seriously, just 'popping on before the proper UKAC' – the points are still appreciated.

We suffer/enjoy the challenges of location, propagation, station setup and weather, just like anybody else.

I am extremely disappointed to learn that, rather than promoting and encouraging participation in the FMACs, the RSGB Contest Committee plans to 'terminate' them for 2019 in favour of proposed MGM contests. For myself, as a very busy self-employed wife and mother I'm unlikely to be able to take part in 'proper', lengthy SSB contests on a regular basis, certainly not as often as the FMACs. MGMs don't interest me at the moment, and I don't think MGM contests would have attracted me as a new licensee, either.

So, thank you for the FMACs – I will miss taking part – and thanks especially to all the stations that have encouraged us newcomers. I'm sad that others wanting to get started in contesting won't have the same opportunity.

I'm really glad that you have found the FMACs an enjoyable introduction into contesting, and that they work for you. Our consultation exercise on rules for next year is the chance for the committee to test its ideas with the whole contesting community and to get feedback like yours. We also had a really good discussion about this topic in the forum at the RSGB Convention. As a result of that feedback and what we have seen in the written responses to the consultation, we are now looking to maintain the busiest FMACs, as well as running some MGM contests. I hope this provides the best of both worlds and that you'll be able to continue to enjoy the FMACs in 2019.

Andy Cook, G4PIQ
Chair VHF Contest Committee

PIRATING MY CALLSIGN

Steve Chapman, M6USB

My callsign, M6USB, is being used throughout

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Wiltshire by several people who are using it to chat to each other as well as other people. I have been on contact with Ofcom about this issue and they advised me to contact the RSGB to report this misuse of my callsign and have it monitored to avoid continued misuse. This misuse has been taking place on GB3WH only.

This kind of issue is best reported to our new Operating Advisory Service, via oas@rsgb.org.uk. I would welcome volunteers from around the country to help with this service. For more information, please contact me via Philip.Willis@rsgb.org.uk

Philip Willis, RSGB Board

AMATEUR RADIO SPECTRUM POLLUTION

Carl Langley, G3XGK

During the late 90s much research work was performed by BT Labs' Copper Access Group to design VDSL network systems for future UK deployment, including research on the effects of VDSL line transmissions (Egress) on amateur radio reception [1].

This, together with other international research, led to the formation of a specification by the European Telecommunications Standards Institute (ETSI) under TS101 270-2 [2] and in 2005 in the ITU-T G993.2 VDSL2 specification [3]. Both of these documents mention protecting the HF amateur radio bands from spectrum pollution by emissions from VDSL. The ITU-T G993 documents lists the international HF amateur bands to be protected as 160m to 10m; 60m is not shown.

The protection is by 'masking' or notching the VDSL Tx power by 20dB within the HF amateur bands. BT Labs even fought for this 20dB notching to be included in the ITU-T/ETSI specifications [4]. This level would reduce the Tx power of VDSL2 line signal in the HF amateur radio bands to 1% of that being used elsewhere in the VDSL2 HF line spectrum. For around 95% or more of those amateurs affected now, this would place the VDSL2 jamming noise below their current noise floor, ie they would not be aware of VDSL2 jamming any more.

In the ETSI TS101 270-2 spec page 27 it is stated that avoidance of emissions in the amateur radio bands is Mandatory. VDSL2 in the UK normally covers from 138kHz to 17.664MHz, shown in ITU-T Plan998 ADE17. So 'notching' would only be required in five amateur radio bands: 160, 80, 40, 30 and 20m.

Surly it cannot be asking too much for BT Openreach to comply with this Mandatory requirement, and in particular since it was BT itself who fought for VDSL2 protection notching in the first place?

[1] K T Foster and D L Standley, *A preliminary experimental study of the RF emissions from dropwires carrying pseudo-VDSL signals and the subjective effect on a nearby Amateur radio listener*, ANSI T1E1 4/96-165, April 1996
[2] ETSI TS101 270-2
[3] ITU-T G993.2 VDSL2 Specification
[4] VDSL and the Radio Spectrum workshop, K T Foster, BT Exact presentation, January 2001, DTI Conference centre, London, slide 3.

There is a mandatory requirement in the VDSL2 specification to support notching of up to 16 arbitrary bands. However it is up to the operator to specify the notches to be applied. The amateur radio bands are given in the standard as examples of frequencies to be notched. These vary by region and I think it's clear that the intent was that the operator is supposed to apply the correct notches for their region. However this is not explicitly stated in the standard.

The following extracts from the VDSL2 specification ***Rec. ITU-T G.993.2 (01/2015)*** *mention notches (which are otherwise referred to as stop bands). See https://www.itu.int/rec/T-REC-G.993.2* for the full 420 page text. The wording in previous *xDSL standards is very similar concerning notches.*

1 Scope

A requirement for downstream and upstream transmitters to notch, simultaneously, 16 arbitrary operator-defined RFI bands;

7.2.1.2 Egress control

VDSL2 transmitters shall be able to reduce the PSD of the transmitted signal to a level below −80dBm/Hz in 16 arbitrary frequency bands simultaneously. An example list of frequency bands (the amateur radio bands) is shown in Table 7-1. The value of −80dBm/Hz shall be accounted for in the determination of MREFMASK (see Tables 7-3 through 7-5).

Table 7-1 – Amateur radio bands

Band start (kHz)	*Band stop (kHz)*
1 800	*2 000*
3 500	*4 000*
7 000	*7 300*
10 100	*10 150*
14 000	*14 350*
18 068	*18 168*
21 000	*21 450*
24 890	*24 990*
28 000	*29 700*

The specific RFI bands to be notched are configured in the CO-MIB by the operator and set during the ITU-T G.994.1 handshake phase of initialization (see clause 12.3.2).

The egress control parameters specified in [ITU-T G.997.1] are the start and stop frequencies of each frequency band in which the transmit PSD shall be reduced to a level below −80 dBm/Hz. The PSD slopes forming the notch are vendor discretionary.

10.4.1 Data subcarriers

(Text describing the carriers omitted)

NOTE – The subcarriers used for data transmission depend on channel characteristics, such as loop attenuation and noise, and on the specific requirements on the PSD of the transmit signal, such as notching of amateur radio bands, PSD reduction at low frequencies to share the loop with POTS or ISDN, and others.

Dr Martin Sachs
EMC Committee Chair

KIRKWALL WIRELESS MUSEUM

Tony Skaife, G4XIV

Last month I was able to visit the Wireless Museum in Kirkwall when our cruise liner stopped for the day. The museum is small but packed with radios from a crystal set (working) to a wind up receiver. The photo shows me, G4XIV, with an R1155 receiver and above it the T1154 transmitter from an RAF Lancaster bomber of WW2 vintage. Other old radios, too many to mention, are on display also. When I mentioned I was an amateur, a QSL card was handed to me and, because the volunteer curator heard my Morse on their practice oscillator, an additional certificate was furnished. If you are in the area I would recommend you immerse yourself in radio nostalgia I don't think you'll be disappointed.

HEARING DOGS

Terry Roeves, G3RKF

Some readers may remember me mentioning Connie, the Hearing Dog my wife, Caroline, and I train. Part of the training means the dog has to get used to different situations and we try and provide a wide variety. One involves visiting the North Cheshire Radio Club to get Connie, the Hearing Dog, the opportunity to deal with different people and sounds. Connie arrived after an FT8 presentation by Terry, G3RKF, with a break for a drink and a slice of cake. Not exactly the Great Radio Club Bake Off, but we do bake a very good cake. The club has complete radio stations for HF, VHF and UHF for all modes. RAE tuition is available complemented, as appropriate, by hands-on station operation.

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