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RadCom

21st August 2017

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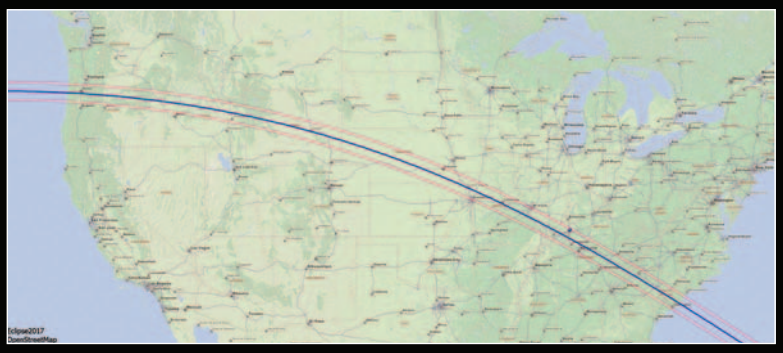

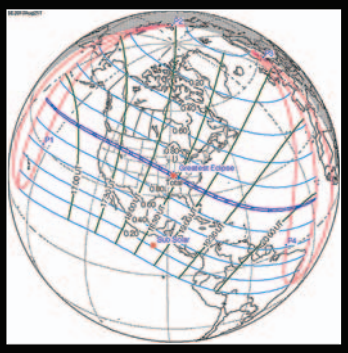

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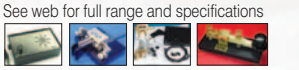

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Main cover image: Williams College Eclipse Expedition – Jay M Pasachoff, Muzhou Lu and Craig Malamut. US Map: Wolfgang Strickling (CC A-SA2.5G). Eclipse Predictions by Fred Espenak, NASA's GSFC.

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

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

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 Articles for *RadCom* are accepted on the strict understanding that they are previously unpublished and not currently on offer to any other publication.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

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

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A sense of scale and proportion

The new RSGB Strategy is reaching down to a lower level of detail now. The purpose, values, goals and priorities launched at the AGM in April are being used by all parts of the RSGB, staff and volunteers, to help shape our activities for the next five years.

There are just 11 full-time and 3 part-time, very busy staff employed at RSGB HQ, where we provide a wide range of services to approximately 21,000 Members, 500 affiliated societies and 850 volunteers. We offer Membership, publishing, sales, exam, insurance and licensing services and advice to many thousands of amateur radio enthusiasts.

We currently offer around 150 active titles through our bookshop, many of those are titles that we publish ourselves, and we send stock to and attend over 50 events each year. We administer almost 3,000 exams for the three levels of amateur radio licence each year.

We are very proud to operate the National Radio Centre at Bletchley Park, where we have demonstrated amateur radio to over 28,000 visitors in the last twelve months. We reach even further with our website, social media and videos, where we offer technical and promotional content that is used throughout the world to help promote amateur radio. Our annual Convention attracts expert technical speakers from around the world to share their knowledge with others.

Of course, the RSGB also provides a whole range of other services including EMC, Planning, Spectrum, Repeaters and Beacons, Contest, Propagation, Technical, Education, Youth, ARDF, Ofcom and IARU liaison – all provided through volunteer committees and groups, co-ordinated and supported by the RSGB Board, Regional Team and HQ staff.

You'll probably understand that it is quite an undertaking to review all of these activities against a new strategy and make sure we are focussing on and delivering the best possible service we can within our annual budget.

In future months, we'll let you know what some of the RSGB committees and groups are focussing on in their contribution to the strategy.

Steve Thomas, M1ACB
RSGB General Manager

Radio amateur honoured

Congratulations to Port Seton resident and RSGB Member Robert Glasgow who received the British Empire Medal (BEM) "in recognition of his work in amateur radio, the community and charity in South East Scotland".

Bob, GM4UYZ is the secretary of Cockenzie and Port Seton Amateur Radio Club. The club also won the 2016 Region 1 Club of the Year, see photograph. The trophy was presented at the Scottish Rally at Braehead by the RSGB President Nick Henwood, G3RWF.

RSGB Convention – have you seen our video?

Hundreds of radio amateurs have attended RSGB Conventions and had a great time. If you've never been, take a look at our new video (www.rsgb.org/convention) and find out why people come back year after year...

Ofcom publish misleading report on VDSL measurements

The RSGB, Ofcom and BT Openreach agreed to undertake tests at locations reported by amateurs as suffering from VDSL RF Interference (RFI). The RSGB screened 130 reports and selected twelve as representative of the problems reported. The RSGB had already visited and measured the levels at these sites to confirm VDSL RFI. Ofcom chose to visit only three of the suggested sites, all three suffered upstream RFI but not downstream. Openreach conducted line balance checks on the lines prior to measurements and corrected faults found at one of the locations.

Ofcom published a research report without prior notice to the RSGB of their intention to do so. In this report Ofcom came to the mistaken conclusion that no electromagnetic disturbance capable of causing harmful interference was found at these sites. They based this mainly on obtaining comparable levels for background noise at the three sites and at their monitoring station at Baldock, Herts. Asserting that levels in North London and at Baldock (a rural location especially selected for its quiet background noise) are comparable is clearly nonsense.

The RSGB EMC Committee has analysed in detail the results obtained by Ofcom and converted them to standard units for this type of measurement. Ofcom results were then found to be within a few dB of the RSGB's earlier measurements.

The RSGB have pointed out to Ofcom the reasons why Ofcom drew the incorrect conclusions. The antenna chosen by Ofcom for measurements was a 30cm diameter active antenna. The internal preamplifier has a noise floor which would be equivalent to an external source of 32dB(μV/m), that is nearly 40dB above the noise floor at quiet rural locations. Unsurprisingly the noise measured by this antenna was its own preamp noise (mistaken for background noise by Ofcom) which was the same at all locations.

Nevertheless, the VDSL2 noise was even higher at more than 35dB(μV/m) and the strongest amateur signal measured by Ofcom was 54dB(μV/m). This means that the bottom 43dB of the dynamic range was obstructed by VDSL noise, a clear indication of Harmful Interference. The RSGB has met with Ofcom and agreed to conduct further tests to correct the report's conclusions. More details of this work were published in March 2017 *RadCom*, page 56.

John Rogers, M0JAV, Chairman EMC Committee

50MHz in the Spotlight at IARU and CEPT

Talk of the 'magic' band often focusses on narrowband usage and Sporadic-E, although this often overlooks more conventional usage and opportunities in the 50.5-52MHz range. It also has unhelpfully led to too much being concentrated low in the band that has caused overlaps between beacons and amateurs. What is also forgotten is that 50MHz is not allocated to amateurs in ITU Region 1, so our tenure is far from secure and is now under intense scrutiny.

In 2011 with input from the 6m community, IARU Region 1 moved to restructure the 50.0-50.5MHz section of the band plan to accommodate planned growth. Recently that change has culminated in licence changes, hardware upgrades (and one closure) to UK beacons. Some will move up the band to 50.4-50.5 or in a few cases participate in the new Synchronised Beacon Programme (SBP) in the 50.0 – 50.010 sub-band (or even both!).

At IARU level, papers regarding 50MHz Beacons, narrowband MGM (that we need to drive usage at 50.3-50.4), innovative digital modes for 50.5-52 and wideband usage in the 52-54 range will be topics at the IARU Region 1 Conference. Indeed September sees CEPT consider whether amateurs can justify any allocation and share at 50MHz in the latest WRC-19 preparation meeting, which occurs just a few days before the IARU Region 1 Conference. Both the RSGB and the IARU are investing significant sums in that WRC process and need your support.

So with poor HF solar conditions, now is a good time to get on the air and innovate across the whole 50MHz band. Please also read and comment on our online IARU Consultation in the C5-VHF section that has these 50MHz papers, as well as many other key topics for the future of amateur radio at http://tinyurl.com/GB2RS-2105B

Examinations Standards Committee appointment

Professor Anthony (Tony) Kent, G8PBH has been appointed the chair of the RSGB's Examinations Standards Committee. Tony obtained his callsign, G8PBH, in 1978 and has been active on the bands continuously since. His interests in that time have included home construction, mobile and portable operation and, most recently, DX chasing. His favourite band is 6m and, in particular, the Sporadic-E mode of propagation on that band. He uses mostly SSB and data modes.

His early interest in amateur radio acted as a launching pad to a scientific career: He obtained his B.Sc. and Ph.D. degrees in physics from the University of London and in 1984 took up a lectureship in physics at the University of Nottingham. He was promoted to Professor of Physics in 2006. His research is in terahertz technology and he is currently working on acoustoelectric devices for THz communications and spectroscopy applications. Tony is currently the chair of the physics Examinations Group at Nottingham and has acted as external examiner at a number of Russell Group universities. Tony is a Fellow of the Institute of Physics.

Frequency Allocation Table

Ofcom has published the latest United Kingdom Frequency Allocation Table (UKFAT) that details the uses (referred to as 'allocations') to which various frequency bands are put to the UK. It also shows the internationally agreed spectrum allocations of the International Telecommunication Union (ITU). Visit www.ofcom.org.uk/spectrum/information/uk-fat for full details.

New Commonwealth Contest trophies

Peter Hobbs, G3LET has very generously donated ten silver copies of the Commonwealth Contest Senior Rose Bowl, which he won in 1963 under the callsign VP8GQ, to the Society. They will be awarded to the winners of the contest for the next ten years. Peter presented the trophies to the President, Nick Henwood, G3RWF. The Society is extremely grateful to Peter for his very generous gift.

QSL Matters

At the end of June the bureau passed its half-year target of processing 500,000 cards. Incoming cards from USA remain good, but Europe has temporarily slowed down, which is not uncommon at this time of year. A larger than usual consignment of cards from Finland containing many for OH activity in Z6 in 2015 will keep the bureau busy for a while.

If you are holidaying in another UK prefix area this summer, please remember to visit the QSL sub-managers listings on the website and deposit at least one collection envelope in the area you're visiting. It will avoid the need to give out 'via' information on the air and it will make our volunteers' job much more rewarding.

The photo here demonstrates the situation of uncollected cards. From left to right are 150+ cards for an active non-Member, then a similar number for a club that recently decided to not collect cards any longer. The next 350+ cards are for a serious G-call DXer who hasn't sent any collection envelopes recently (so his sub-manager has to keep reminding him). Finally, the largest stack of overdue for re-cycling cards is for an M0. He now only uses OQRS, according to his QRZ.com entry. The moral of this photo is check before you send, as we're sure this situation is repeated in bureaux across the world.

UKAC Workshop

The consultation on VHF-UHF UK Activity Contest future scoring schemes is now available. Online voting on this consultation will be available between 29 July and 20 August. RSGB Members who are active VHF/UHF contesters are encouraged to read the consultation document and vote. Take a look at www.rsgb.org/ukac-consult

NRC Co-ordinator

The RSGB is looking for someone to join their team and take the lead in co-ordinating activities at the National Radio Centre (NRC), Bletchley Park and support RSGB Members. Based at the NRC and at RSGB HQ in Bedford, the position requires an experienced and licensed radio amateur, with passion and enthusiasm for meeting and interacting with the public. The NRC demonstrated amateur radio to over 28,000 visitors in the last twelve months and the successful candidate will work with a dedicated team of experienced volunteers to develop the NRC further. The role also includes joining the small team of advisors at the RSGB, handling technical and licensing questions from our Members. Salary will be dependent on experience.

For more details or to arrange an informal discussion about the role, please contact Steve Thomas, RSGB General Manager via gm.dept@rsgb.org.uk

Club of the Year

Over 25 members of Loughton and Epping Forest ARS were in attendance on 9 June in order to receive the Region 12 2016 Large Club of the Year Award. Presenting the award (right) to Club Chairman Richard Clark was Regional Manager Keith Haynes, G3WRO, accompanied by District 123 DRM, Peter Onion, G0DZB and Jeff Stanton of Waters and Stanton (sponsors of the RSGB's National Club of the Year).

Bob Williams presented the Small club of the year 2016 trophy to the ladies' section of Staffordshire Portable Amateur Radio Club for Region 5.

Despite threatened heavy showers, Region 9 RM Tom, G0NSY attended the Radio Society of Harrow's monthly field day at a viewpoint looking towards Harrow on the Hill to present the certificate. Club members demonstrated 2m SSB to current Foundation students and made contacts with the Isle of Wight, Kent and Yorkshire. Left to right are Brian, G3YKB, Mike, Kate, Linda, G7RJL, Tom, G0NSY, David, G0CAG and Ian, 2E0PPM.

RSGB Journal Archive DVDs 1976-1980 & 1996-2000

NEW TITLE

Now available for the first time as single DVD versions, these two RSGB Journal Archives remain the best way to store and search *RadCom* over the years. These two new DVD versions contain five years of the magazine as either *radio communication* or *RadCom*. With over sixty magazines on each DVD that is over 5000 pages of material to look through.

The RSGB Journal Archives provide a unique insight into equipment construction, antennas, operating, the techniques used and, of course, what was happening across the hobby in the time covered. These DVDs are a fascinating resource for everyone interested in the history and progression of amateur radio in the UK and beyond.

Add these important records of amateur radio over the years to your collection.

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TX Factor summer edition

The summer edition of TX Factor is out on 14 July and includes a trip to Norwich where Pete Sipple, M0PSX spends a day with the Norfolk ARC at their recent annual Field Day 'Radio Active'. Pete discovers for himself why NARC won the coveted prize of RSGB Large Club of The Year 2015 and comes away with some excellent ideas for future Club activities. Pete also chats to RSGB President Nick Henwood, G3RWF about his Club Initiative.

TX Factor goes digital as Mike Marsh, G1IAR gives Bob McCreadie, G0FGX an introduction to operating on DMR, Yaesu Fusion and D-Star and how he uses the DV4Mini Dongle as part of his digital fun. They also visit a Devon amateur who has set up a Fusion Gateway to find out how he went about it.

For many, QSLs are an important part of our hobby, so the TX Factor team have been finding out about how the RSGB is educating amateurs as to what they can do to help speed up the sorting process at the QSL bureau.

Last episode's feature on the SOTA Beams WSPRLite stirred up a lot of interest judging from the number of entries to TX Factor's draw to win one of these amazing little devices. This episode reveals the DX destination the prize will be winging its way to.

The new episode of TX Factor, the only UK TV show dedicated to amateur radio, is available at www.txfactor.co.uk and on YouTube. It is professionally produced in HD and looks great on a full size TV but works equally well on a PC, Mac, tablet or smartphone.

TX Factor is sponsored by the Radio Society of Great Britain and ML&S.

Congratulations

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

Mr J L McHugh	EI8BR
Mr R Hills	G3HRH
Mr D John	G3WCB
Mr A S Hall	G3WOX
Mr M Holden	EA7JVZ
Mr T J Storeton-West	GW8BTX
Mr J Jenkinson	G8CVS
J A Hosking	G8DEX
Mr A Saunders	GM3VLB
Mr M G Toms	M0XBF
Mr M J Saywell	M6SSB

IARU World Championship Certificates

The 2016 IARU World Championship Certificates for UK participants are now available from RSGB HQ. If you would like the physical copy of your certificate for having participated in the contest please send a self-addressed and stamped envelope (C4/A4 sized) to RSGB Sales, 3 Abbey Court, Priory Business Park, Bedford MK44 3WH, who will return the certificate to you. If you need to check on your placement in the contest this can be done at www.arrl.org/results-database?event_id=80534.

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

Mr L Ross, 2E0KOR
Mr D Leyland, 2E0DWF
Mr H Butcher, 2E0EHS
Mr D Ferguson, 2E0FGN
Mr M Champion, 2E0FYA
Mr A J Pilkington, 2E0GAP
Mr G Parr, 2E0GLM
Mr J Tonkyn, 2E0GNT
Mr G Champion, 2E0MGP
Mr S Gale, 2E0STD
Mr B Randall, 2E1IKB
Mr W Stepka, AE4ER
Mr G Conduit, G0KZC
Mr A Chapman, G0NEF
Mr D Neeves, G1VNB
Mr P Forster, G3VWQ
Mr S Birt, G3ZNG
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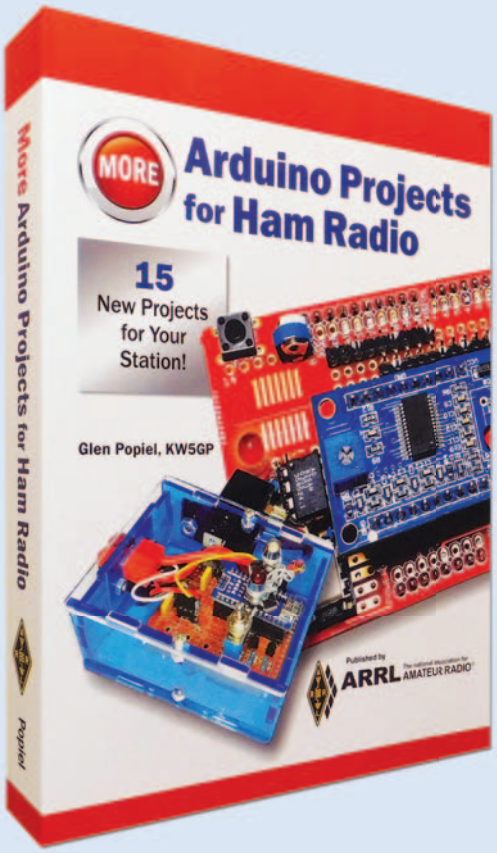
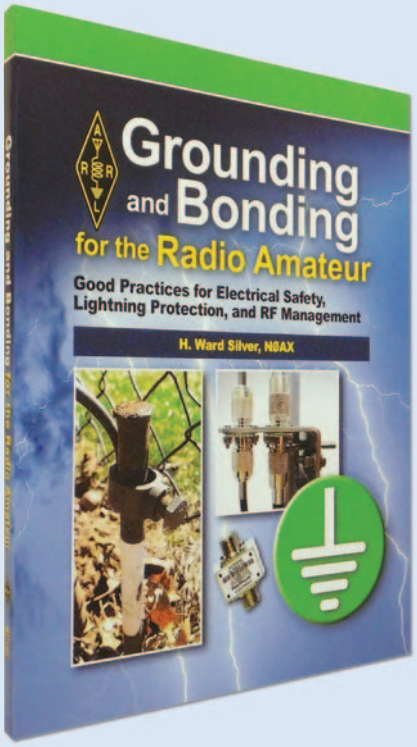
Mr R Harvey, M0RVV
Mr E Cooper, M6IKC
Mr L Barrett, M6IUF
Mr C Scouller, M6IZF
Mr A McCaffery, M6IZN
Dr M Bingham, M6JJY
Mr N Watling, M6JNA
Mr C Pryke, M6JNO
Mr T Wild, M6JNV
Mr S Jessup, M6JNZ
Mr I Smith, M6JQD
Mr D Start, M6JQG
Mr G Allison, M6JQP
Mr A Webb, M6JQR
Miss C Hodson, M6JQU
Mr M Tozer, M6MQM
Mr J Bramley, M6TPS
Mr T Wilson M6TZW
Mr S McCaffery, M6VPL
Mrs L Latimer, M6YMB
Mr A Newsome, MW0XDN
Master D Phillips, MW6SZL
Mr D Cooper, N7CNH
Mr H Lamprecht, OE1HLB
Mr D Robertson, RS304694
Mr B Williams, RS311890
Mr R Absalom, RS313089
Mr G Milton, RS313133
Mr A Herbert, RS313173
Mr B Kirby, RS313179
Mrs C Champion, RS313191
Mr P A McKie, RS313201
Mrs P McKie, RS313212
Ms A McKie, RS313213
Mr E Riddle, RS313227
Mr H Schwar, RS313244
Mr S Lamacq, RS313310
Mr M Richards, RS313313
Mr N Peppe, RS313323
Liverpool ARC, RS313324
Rev A Cook, RS313369
Mr M Young, RS313391
Mr P Gearing, RS313412
Mr C Bystrom, SM3ESX
Mr C Andersson, SM4LRA
Mr D Stewart, VE6DES
Mr A Stewart, VK2PSF
Mr M Kurylak, W3SPX
Mr P Foster, W5PD

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

Mr J T Stephenson, 2E0SCM
Mr P Craft, 2E0VII
Mr G Parsons, 2E0XDZ
Mr E Vacassoulis, F6FLQ
Mr V C Readhead, G0EGW
Mr G Potter, G0EOF
Mr W E S Davey,G0THI
Mr J W Joll, G0TQT
Mr M Procter, G1PIE
Mr S Roberts, G1YPG
Mr P Bolton, G3CVK
Mr A R Vickers, G3HFM
Mr V S Best, G3HGD
Mr S G Spencer, G3ILO
Mr G S Loveday, G3IUV
Mr M C Tate, G3MHX
Mr C Cook, G3OTH
Mr R E Bryant, G3WBC
Mr J D Broadley, G3WBP
Mr M B Graham, G3XMG
Mr T P Holroyd, G3YHD
Mr P Broughton, G3ZJF
Mr R S Pridham, G4BVB
Mr C S Manklow, G4CGV
Mr S J Whalley, G4DVN
Mr SJ Sinclair, G4EKF
Mr D Tanner, G4FLR
Mr M E Eckhoff, G4HLT
Mr D M Macgregor, G4IDJ
Mr B S Jones, G4ISQ
Mr L Norton, G4JNW
Mr D E Thrift, G4KSD
Mr G Reading, G4LZD
Mr R Boddy, G4MGQ
Mr J E Freeman, G4MGX
Mr P D Fawkes, G4MOC
Mr I R Watling, G4NYD
Mr C D Richardson, G4OCZ
Mr R P Tomlinson, G4TGJ
Mr I K Soaft, G4TGV
Mr G Porter, G4TXM
Mr G D Daisley, G4UMP
Mr K G Arrowsmith,G4VVL
Mr T B K White, G4YQS
Mr B C Tanner, G6HUI
Mr K Hailey G7EDU
Mr R Cammisola, G7ISO
Mr C Edwards, G7MJP
Mr N V Quest, G7VVL
Mr J Price, G8GCM
Mr W J M McKinney, GI3TZB
Mr W A McFaul, GI4FHB
Mr W J Turner, GI4LZR
Dr M S McKinney, GI4MAC
Mr G Chalmers, GM0ALW
Mrs M A Chalmers, GM0ALX
Dr W E Sleat, GM3FJA
Mr D Topham, GM3WKB
Mr A P Hamon, GU4WTN
Mr K Williams, GW4OKT
Mr R A Cleverley, GW4RKZ
Mr M D Saculla, K6MDS
Mr R Markham, M0AGT
Mr G Suter, M0GJS
Mr R M Fearn, M0ITC
Mr P White, M0PWZ
Mr D Griffin, M0ZDG
Mr B Reynolds, M3BJR
Mr W J Faulkner, M5WJF
Mr W N Sampson, M5WNS
Mr P Griffiths, M6PNC
Mr M Brady, MM6VEY
Mr T Cook, NZ8J
Mr T Ericson, SA5CCU

NEW TITLE





More Arduino Projects for Ham Radio

by Glen Popiel, KW5GP

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

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

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

Size: 208 x 276mm, 500 pages
ISBN: 9781 6259 5070 3
Non Members' Price: £39.99
RSGB Members' Price: £33.99

ARRL Grounding and Bonding for the Radio Amateur

By Ward Silver, N0AX

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

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

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

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

Size: 184 x 229mm, 176 pages
ISBN: 9781 6259 5065 9
Non Members' Price: £22.99
RSGB Members' Price: £19.54

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

Special event stations

Grey Point Fort ARS club station will be transmitting at the 204 NI Field Hospital Family Fun Day at Grey Point Fort on 12 and 13 August. All the museums will be open with other attractions such as a climbing wall, military displays, stalls and a band. Everyone is welcome.

Fareham & District ARC will be operating GB1GL from the *Mary Mouse 2*, an automated light vessel moored in Portsmouth Harbour as part of International Lighthouses and Lightships Weekend on 19 August. Two stations will be active on HF and VHF from 9am to 6pm. The Lightship is open to the general public for food and drink. The shack will be in the wardroom on the foredeck if you would like to visit in person.

Sheffield ARC, using the GB4HAM Communication Unit, will be operating GB0RFC at various times throughout August from Coal Aston celebrating the centenary of the airfield there. In 1917, the site was chosen as an Aeroplane Repair Depot, becoming No 2 (Northern) Aeroplane Repair Depot.

Colchester Radio Amateurs will be activating GB6NT at Naze Tower at Walton-on-the-Naze (all details and history of the tower are on QRZ.com) on 19 and 20 August for International Lighthouse and Lightship Weekend. Planned operation is 11am on the 19th to 5pm on the 20th using HF, VHF and UHF. All stations in the log will receive an eQSL card, paper cards will be QSLR only, details on QRZ.com

Martello Tower Group is operating GB5RC on the MV *Ross Revenge* from the evening of 3 August until the early hours of the 7th. The MV *Ross Revenge* will be anchored in the Blackwater estuary, close to Mersea Island and Bradwell-on-Sea, Essex. The group will be concentrating on 80m, 40m and 20m with the possibility to retune the 20m aerial to 17, 15, 12 or 10m if the need arises. The aerials will be a combination of verticals and dipoles. Reports from short wave listeners are welcome and encouraged and should ideally be sent direct. QSL details are published on both the Martello Tower Group website and qrz.com

Listen out for TF15MOOT from 25 July to 2 August. It's the amateur radio station at the 15th World Scout Moot in Iceland. An international team of Scout and Guide radio amateurs including three from the UK (Claire, G8ULQ, Liz, G0RJX and Richard, G0REL) will be waiting for your call, operating from the Scout Activity Centre at Úlfljótsvatn.

Torbay training

Torbay ARS training team has started running a series of practical sessions as a run up to the Intermediate licence weekend and exam due to be held at the end of October. Sessions run on Friday evenings as part of weekly club nights and will cover all the relevant practical elements of the course, with some repetition for those who can't make every week. The sessions will culminate in a weekend-long workshop and exams; cost will be approximately £70 per candidate (covering exam fees and room hire). Foundation licence holders who are interested should log onto www.tars.org.uk, complete the relevant application and make contact with the training team for more details. After the success of the Foundation course in May this year, the TARS training team are now looking for more prospective candidates to take part in the next Foundation course. Potential candidates should go to www.tars.org.uk. Cost of the course is £65 per candidate (covering exam fees & room hire). It requires a minimum of 6 candidates. Please direct any questions to the training team via email to training@tars.org.uk

Danish 90th anniversary

The Danish national society, EDR, celebrates its 90th anniversary in August. Danish radio amateurs will, throughout 2017, be active with OZ90EDR, OX90EDR and 5P90EDR. On 15 August from 0000UTC until 2359UTC there will be extensive activity with these callsigns as well as the special Head Quarters station, OZ90HQ, and also the Joker station, OV90EDR. On the 19th, OZ90HQ will be active again. After the 19th, the HQ station will go back to using OZ1HQ. All contacts on the 15th and 19th will be valid for the EDR 90 Anniversary Award. Read more about the award online at www.OZ90EDR.dk

ML&S Summer picnic

The ML&S summer picnic was well attended. Customers came from all over the UK, with several parked up in their motorhomes overnight! The lecture streams were a real success, with a good spread of topics. Andy from SDRPlay was demonstrating the latest features and benefits offered by the superb *SDRuno* software; there was a Q&A session on Panadapters, SDRPlay RSP receivers and more; Graham from bhi gave a hands-on demonstration of the latest ParaPro units he spent 2 years designing and the new Phonema speaker from Spain; Chris, 2E0UCW explained DMR basics and working with hotspots, such as the DV4mini and SharkRF and Tim Kirby was on site discussing satellite operation for the beginner and advanced techniques with a live QSO demonstration.

The RSGB took the opportunity to speak to Members and non-Members alike and *Practical Wireless* staff were also present. Videos of the lecture streams were broadcast live on ML&S FaceBook page and are now available on their MLandS.tv channel via YouTube. The day was kindly sponsored by Icom Kenwood and Yaesu, who were also on site during the day. The next event at ML&S is their Hog Roast & Open Day on Saturday 2 December.

Spalding Rally

The Spalding Rally took place on a lovely day in June. RSGB General Manager, Steve Thomas, M1ACB, visited the rally on his day off and met up with Ian, G4EVK, Graham, G4NWC and Andrew, G0FVI working hard on the RSGB bookstall.

6m array in USA

InnovAntennas has supplied Ray Higgins, W2RE 4 x 6-ele LFA Yagis (9.5m booms) for 50MHz that are stacked vertically on a 100' fully rotating tower. This 6m array is at Ray's remote ops installation in Eastport, Maine (shown right). When installing a new 6m Yagi, Neil G0GGG chose the new, urban, low noise LFA-3 third generation Yagi designed by G0KSC for city environments to ensure the noise levels were low enough that weak signals could be heard. In just 24 hours, Neil managed to work stations in Europe, North America and Japan with just 100 watts.

5MHz for Jamaica

Hot on the heels of being code-free, Jamaican amateurs also have access to 5MHz. In a recent update to their National Frequency Allocation Table, published by the Jamacian regulator, the WRC-15 60m Amateur Secondary Allocation of 5351.5 – 5366.5kHz has been granted under ITU Footnote 5.133B, at a maximum power of 25W EIRP. The Jamaican Amateur Radio Association is advocating use of the new IARU Region 2 60m band plan.

CHOTA

The annual Churches and Chapels On The Air (CHOTA) event takes place on 9 September, between 10am and 4pm. Most operation is on 40m SSB. If you are putting on a station please register your event with John, G3XYF by email to g3xyf@btconnect.com A list of CHOTA stations will be on www.wacral.org

144MHz Meteorscatter Sprint Contest

MMMonVHF, in cooperation with *DUBUS* and *Funk-Telegramm*, invites all radio amateurs to take part in the 10th anniversary 144MHz Meteorscatter Sprint Contest during the maximum of the Perseids meteor shower. Based on predictions from the International Meteor Organisation, this maximum will occur on 12 and 13 August between 1400UTC and 0230UTC. Full rules and conditions can be found at www.mmmonvhf.de/ctestinfo.php

Repeater update

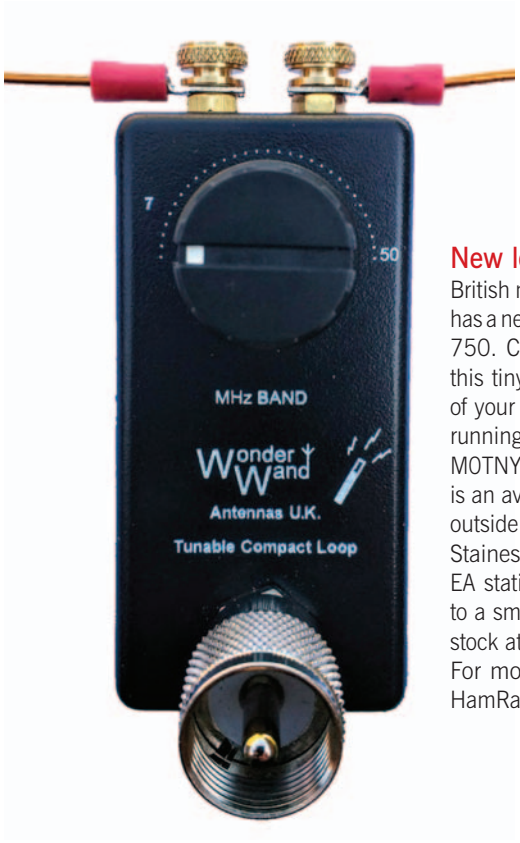
The callsign of the Perth City Internet Gateway on 145.2125MHz is now MB7APT-L. The station is part of the Echolink system, with a new node number of 866340. The gateway station is located on Kinnoull Hill, on the outskirts of Perth, and has good coverage both of the city and a swathe of its hinterland to the North and West. Access with a CTCSS tone of 94.8Hz.

Alpha Antenna distributor

Moonraker is pleased to announce that they have been appointed as UK dealer/ distributer for the Alpha Antenna range of products after the recent trip to the Dayton Hamvention. The antenna range features both verticals and loops for base and portable operation, they are directional, tuner-free HF antennas. There are multiband as well as monoband antennas and the verticals can be tripod mounted, as can the loops, making a portible antenna system. The range has been designed to be rugged and work with any radio with no tuner required for easy deployment. See the website http://alphaantenna.com for more information on the products available or the Moonraker website at www.moonraker.eu

radcom@rsgb.org.uk

New Products



New loop antenna

British manufacturer WonderWand has a new product, the WonderLoop 750. Covering 7MHz to 50MHz, this tiny antenna sits on the back of your FT-817ND or any QRP rig running a maximum of 10W. Tony M0TNY, Senior salesman at ML&S, is an avid QRP man and used one outside the premises at ML&S in Staines and instantly worked an EA station. Not bad for 2.5 watts to a small loop! It's available from stock at £109.95.

For more information see www.HamRadio.co.uk/wonderloop750

Moonraker HT-500D DMR/analogue handheld

The Moonraker HT-500D is a dual band DMR digital and analogue hand held radio that operates in analogue and digital modes from 400-480MHz on UHF and 136-174MHz at VHF. It is capable of up to 5 watts of power. It uses time-division multiple-access digital technology to double the number of users on a single 12.5kHz channel. Retailing at £199.99 and available for next day shipping, go to www.moonraker.eu for more information.

D-Star mobile

The Icom ID-4100E is a new D-Star mobile radio that will allow you to make digital voice and data calls through the worldwide D-Star network. Like the recently launched ID-51E PLUS2 handheld counterpart, the ID-4100E includes new Terminal Mode and Access Point Modes enabling an operator to make D-Star callsign routed calls through the internet, even from areas where no D-Star repeater is accessible.

Compact in size, the ID-4100E features an easy to read dot matrix display with a backlight selectable in three colours. The controller is also detachable from its main body, providing the possibility of different mounting positions. There are now apps for IOS and Android devices. The RS-MS1I App (for iOS devices) and the RS-MS1A App (for Android devices) enable you to wirelessly connect to the ID-4100E and remotely set the DR functions, link with a map application and send/receive messages over the DV mode. In addition, pictures taken by a smart device can be transmitted via the DV Fast Data mode or DV mode.

Other great features of this new radio include wireless operation with optional VS-3 Bluetooth Headset, integrated GPS receiver, wideband receiver and microSD card slot for voice and data storage.

The ID-4100E Dualband D-Star mobile will be available from the third week in June from all authorised Icom amateur radio dealers, with a suggested retail price of £499.99 including VAT. For further details about this new model visit www.icomuk.co.uk/ID-4100E-Dual-Band-D-Star-Digital-Mobile-Transceiver/D-Star_Digital_Amateur_Radio_Ham

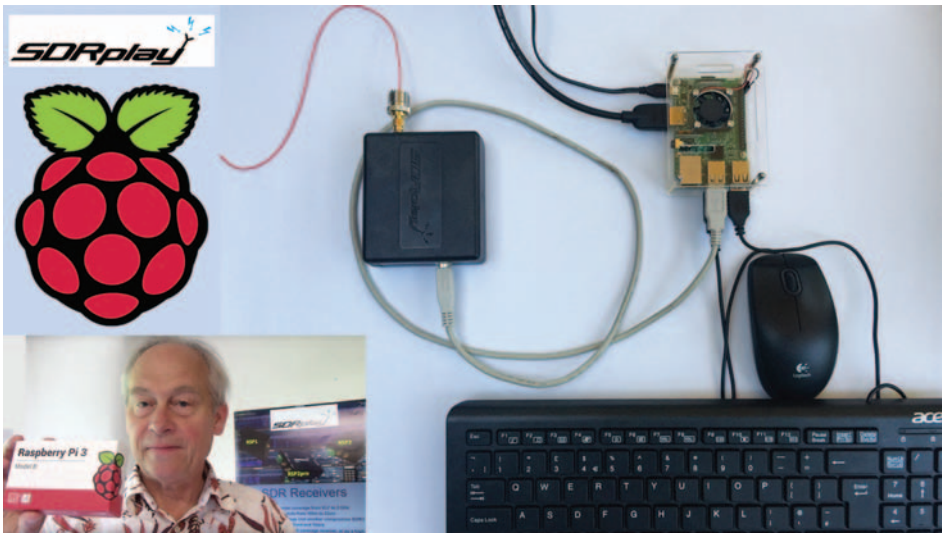
New linear amplifiers

The DX Shop has released two all new solid state linear amplifiers manufactured by themselves in the UK. The G2-1.2K is a 1200W linear for 144MHz and the G64-1.2K is a dual band linear giving 1200W on 50MHz and 900W on 70MHz. Both amplifiers share the same specifications, which includes commercial grade cooling allowing continuous data mode operation at full output, a universal power input from 100-260V 50/60Hz and a built in sequencer for preamplifiers. The drive requirements are from 2.5 to 25 watts. The new amplifiers are 315mm (w) x 180mm (h) x 360mm (d) and weigh 14.5kg. Available now, both are priced at £1,899. Visit www.thedxshop.com for more details.

SDRplay SD Card Image for Raspberry Pi

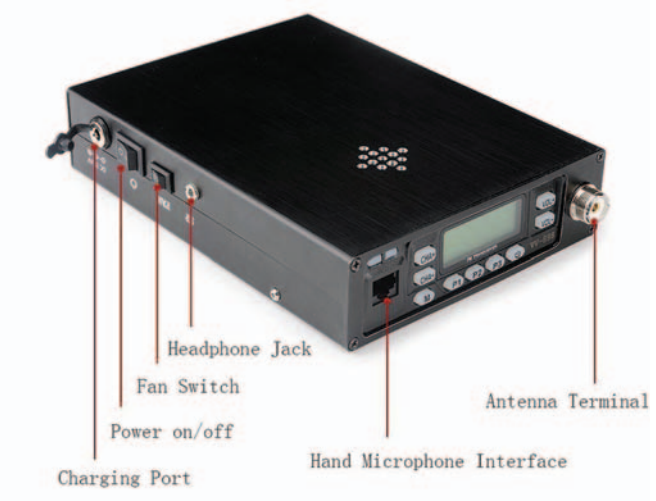
UK-based SDRplay Ltd has introduced a downloadable SD Card Image for Raspberry Pi3 users to be able to load all the software they need to run a complete SDR radio using any of the RSP family of SDRs. Full instructions on how to download the software are shown on their website under www.sdrplay.com/downloads – simply click on 'Raspberry Pi' and choose the 'Pre-Built Image' option where full instructions are given. At the time of going to press, SoapySDR/SoapySDRPlay, SoapyRemote, ADS-B (dump1090), CubicSDR and SDR-J DAB receiver were all included. Cubic SDR is an increasingly popular Linux SDR program and SoapyRemote is ideal for enabling the actual radio receiver to be located at a quieter monitoring location than inside a noise-ridden home or office.

To find out more about SDRplay, go to www.sdrplay.com or visit YouTube and search for SDRplay to find the SDRplay channel, where many video demos can be found, including how to run the Raspberry Pi SDR software.



New backpack transceiver

The Leixen VV-898SP is a mobile backpack transceiver you can take virtually anywhere you want. Leixen combined their micro-compact, 25 watt dual band UHF/VHF mobile radio with a powerful 12A Li-ion rechargeable battery and put it all in a sturdy chassis you can fit in your pack or emergency bag for use anytime, anywhere. It transmits and receives on both VHF (136-174MHz) and UHF (400-480MHz) and can receive on 400-520MHz and 200-260MHz, as well as commercial FM radio stations at 87.5-108MHz. It is equipped with a built-in 400mW speaker, backlit front panel display and two front panel LEDs. It also has a 13.8V AC adapter so you can recharge it as needed. The chassis includes a built-in radiator fan with an on/off switch to cool the unit as needed. Retailing for £149.95 and available for next day shipping, visit the Moonraker website at www.moonraker.eu for more information.



Keeping an ear on GB3EX

Repeater GB3EX, in the Exe Valley in Devon, became operational in March 2014. It is located in an agricultural building with no local mains electricity supply, making for an interesting challenge. The process of getting it on the air was described in the April 2015 *RadCom*.

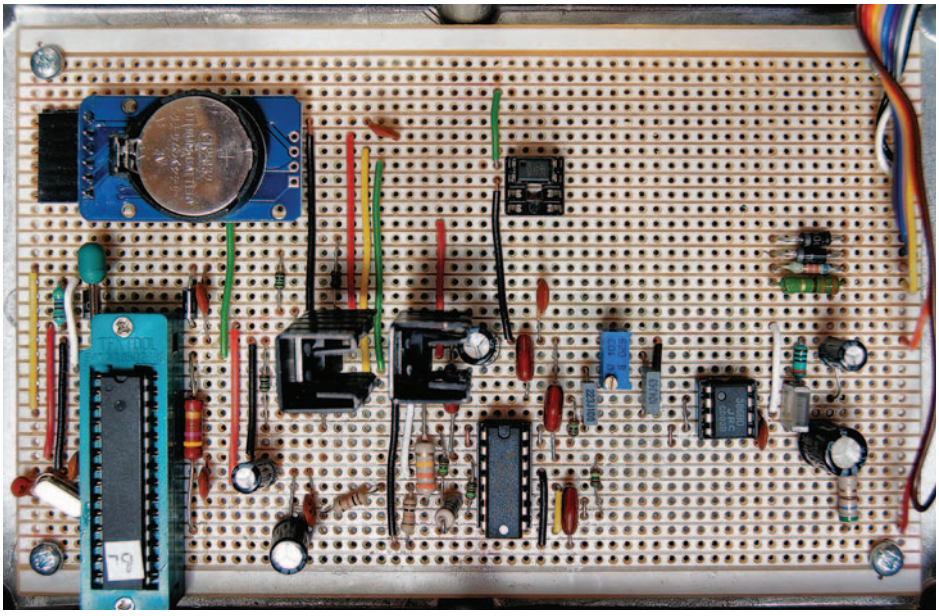


PHOTO 1: The GB3EX repeater controller as presently installed.

Power is supplied by two 110 ampere hour batteries charged by solar panels. It is naturally important to know the state of the batteries and, since site access is difficult, some form of remote monitoring was necessary. The ubiquitous Arduino Uno [1] offered a solution: sample the battery voltages, convert the readings into Morse code and transmit at suitable intervals. We chose to transmit the values in Morse code every hour after the callsign and CTCSS code letter. The message output is typically:

```
GB3EX C A 12.9 B 12.7
```

The controller draws power from a switched 12V supply on the telemetry control unit. This means that a repeater owner can send a DTMF command and switch the repeater controller off, thereby disabling the repeater.

Development

A solderless prototyping breadboard was used to assemble an interface circuit (or 'shield') to an Arduino Uno. This is an 8-bit microcontroller IC with additional circuitry and sockets designed to allow the running of single-purpose computer programs indefinitely. With 32K of Flash ROM and 2K of static RAM, there is a limit to the size of program that can run. The Arduino's code was developed using the readily available free Integrated Development Environment (IDE) [2]. This allows program code to be compiled on a desktop computer, downloaded to the Arduino using its USB interface and tested – all within a few seconds. Rapid iterations of changes means that trying new code designs is quick and easy.

Reading voltage input

An accuracy of 0.1 volt was required, so on the face of it calculations would have required floating point (FP) arithmetic to produce exact readings. Unfortunately, the addition of a FP library to the Arduino code would have significantly added to the use of the microcontroller memory (as well as slowing performance). To avoid this happening, integer arithmetic was used and internal stored values were multiplied by 10. At the final output, when they were divided by 10.

Figure 1 shows the complete circuit diagram of the controller. The battery inputs BATTERY_A and BATTERY_B are near the middle and both use identical circuitry. The battery voltages range between 10 and 15 volts and must be reduced to less than the 5 volt limit of the Arduino's microcontroller inputs. For BATTERY_A, diode D2 prevents any possible unfortunate consequences from reverse polarity connection. R14, R16 and R17 form a simple potential divider that reduces the input voltage to one third. Taking into account the 0.65V nominal voltage drop of the diode, this results in the Arduino input on pin 24 seeing a voltage range of 3.11V to 4.78V.

Valid voltage inputs to the Arduino are 0 to 5V, which it digitises to 10 bits, resulting in a numerical value of 0 to 1023 proportional to the span of 0 to 5V. A battery input of 13.8V would therefore result in a value of (13.8 – 0.65) / 3 = 4.483V on the input pin, which is then digitised and rounded as (4.383 / 5) * 1023 = 917.

(Note: since Figure 1 was drawn, the potential divider was changed to 6k8 and 3k3, giving a maximum input to the Arduino of 4.36V when the battery is 14V. The software was changed accordingly so that it reads correctly with the revised input circuit. This article describes operation with the values shown in the diagram and the original software, which is functionally similar – Ed).

Generating voltage readings

How is this stored value of 917 converted back to the original voltage so that it can then be converted into Morse? In order to avoid FP maths it multiplies the result by 10 (=9170) and then divides by 1023/5 to scale it back to (10x) the original input voltage (= 44), then multiples it by 3 to reverse the effect of the potential divider (= 132) and finally adds 6 to make up for the diode drop (= 138). This is 10 times the BATTERY_A input voltage. (There are various rounding errors in this integer arithmetic but the effect is acceptable).

To achieve the final readout, the Morse character string was built using this value divided by 10. The quotient integer is 13 and the modulus integer is 8, so the final string generated is "A 13.8". This character sequence is translated into Morse code using a simple lookup table for each character. This table only needs letters, numbers, full stop and space. The box 'Making Morse' explains this in more detail.

Morse code timing durations were built from the 'dit' being defined as 64 milliseconds (ms) and a 'dah' is three times this value, 192ms. A 'dit' period is used between dits and dahs. A 600Hz audio output is generated

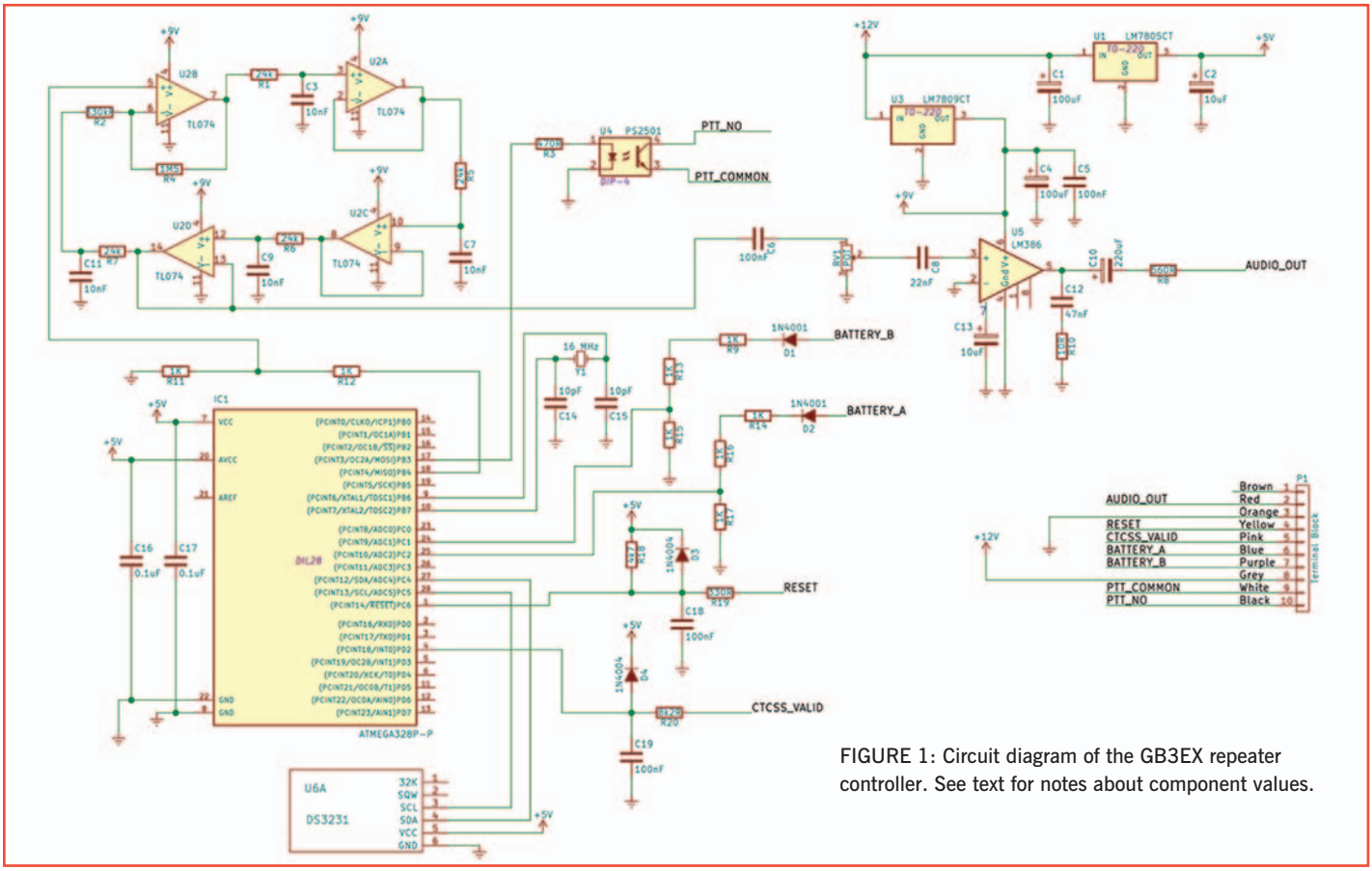


FIGURE 1: Circuit diagram of the GB3EX repeater controller. See text for notes about component values.

by switching an Arduino output pin on and off every 1,666 microseconds. The 5 volt peak-to-peak square wave was passed through a passive two pole RC filter and an emitter follower provided a low output impedance.

Resetting

The Arduino has six analogue inputs and 14 digital inputs. A digital input was used to reset the microcontroller after the associated DTMF telemetry decoder received the correct character sequence sent by the repeater keeper. The Arduino uses an internal clock oscillator of 128kHz that runs a counter from zero to 2^{32}, which was used for calculating time intervals. It rolls over to zero every 52 days, so care has to be taken in reading its value. As we don't really need the Arduino to act as a calendar, the easiest solution is to reset the counter to zero once per day. The actual frequency of the Arduino's internal 128kHz oscillator is not particularly well stabilised and drifts with temperature (and, to a lesser extent, supply voltage). This may alter timekeeping by many minutes per day. The result is that the 'hourly' transmission is 'about every hour', as the Arduino's sense of time drifts. It is, however, more than good enough and the application does not justify including anything more sophisticated such as a real-time clock.

DC current usage

With a breadboarded solution operating, DC supply current was measured and the repeater's RF team were told that 60mA was needed. They recoiled in shock at this constant drain on the batteries and asked if it could be reduced *fifteen-fold* to just 2mA. So the Arduino *Narcoleptic* library **[3]** was swung into use. This cleverly shuts down the Arduino to a sleep state for up to 8 seconds, but this began to delay the hourly transmission even more – and the current only went down to 30mA.

The Arduino board is built around an ATMega328P microcontroller **[4]**. It has a not-very-efficient 7805 power regulator, USB interface and LEDs. The power LED alone draws 20mA, continuously, and it cannot be disabled except by physically scratching it off the circuit board. We needed a change.

Enter the ATMEGA328P

The solution to the power consumption problem was to use only the ATMega328P with a crystal and two small capacitors for its internal oscillator. A 5 volt regulator produced the DC supply and the previously developed interface circuitry was added to the breadboard. Using a Zero Insertion Force (ZIF) socket, the ATMega328P could be lifted out quickly, placed into a standard Arduino Uno board, new code could be loaded into it, removed from the Arduino and dropped back into the ZIF socket. Using this design only 5.5mA was needed and the RF team were delighted. During short periods of Morse code transmission a relay closed a pair of isolated contacts and current drain rose to 55mA. The *Narcoleptic* library was no longer needed.

At this point the design team realised that the Arduino code could control all of the repeater logic. This meant generating courtesy pips, a full ident every 15 minutes, checking for excessively long 'key-down' transmissions and controlling the transmitter with pre-set time-outs. The repeater's receiver generated an open collector output when a valid CTCSS signal was being received. One of the ATMega328P inputs used this information and internal timing to generate a transmitter push-to-talk operation. The interface board became the main controller board and was installed in an Eddystone aluminium box to stop microcontroller oscillator harmonics from interfering with the repeater. **Photo 1** shows the completed device. All audio and control functions fitted to a single D15 connector.

Nick Johnson, M0NRJ
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The unit is connected to the other parts of the repeater as shown in **Figure 2**. It has the following inputs:

- Battery A
- Battery B
- 12 volt power from telemetry unit
- CTCSS valid signal received by telemetry unit
- Reset request from telemetry unit
- Ground

…and the following outputs:

- Isolated, normally open contacts to switch the TX on (PTT loop)
- Audio output to transmitter.

The GB3EX Repeater Controller has no external controls. To increase reliability in the harsh climatic conditions experienced on the exposed repeater site, adjustable components have been reduced to just one: the audio level control. The repeater controller was installed in December 2016 and already a list of new features are being compiled:

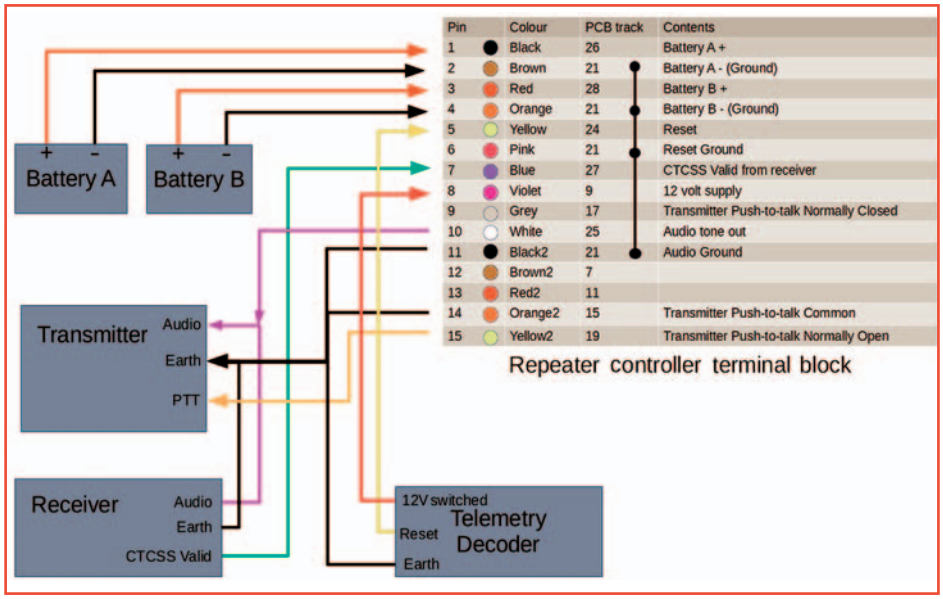

FIGURE 2: Repeater controller hookup diagram.

- Accurate time keeping using a DS3231 real time clock module
- *Bubba* oscillator for a pure sine wave audio
- Voltage calibration facility
- Optoisolated inputs

Photo 2 shows the new version on its development breadboard.

Acknowledgements

The author acknowledges the pioneering work of many engineers designing applications for using the Arduino for amateur radio projects. The developed code is covered by the GNU GPL v3 licence and can be downloaded from **[5]**. It was developed using the Arduino Integrated Design Environment (IDE), Fritzing Electronic Design Automation (EDA) **[6]** and the KiCad EDA Suite **[7]**. These are all free Linux tools.

Websearch

[1] www.arduino.cc
[2] https://www.arduino.cc/en/Guide/HomePage
[3] https://code.google.com/archive/p/narcoleptic/
[4] www.atmel.com/devices/ATMEGA328P.aspx
[5] www.exeterars.co.uk/repeatercontroller/RepeaterController4.ino
[6] http://fritzing.org/home/
[7] http://kicad-pcb.org/

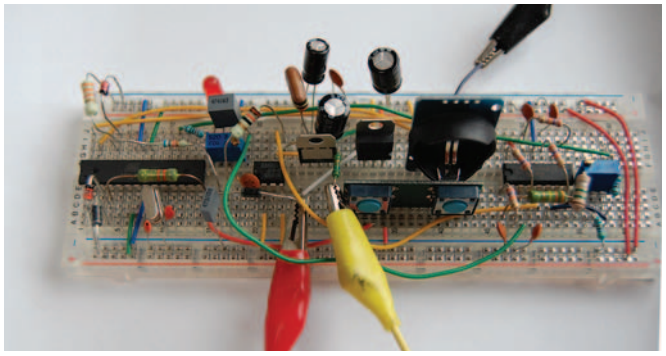

PHOTO 2: Next version being developed on prototyping board.

Making Morse

How is text converted into Morse code in the Arduino C++ code?

Firstly, a list of characters that are used is kept in a String constant:

```
String usedChars = " ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890:/.-";
```

When a "G" is to be transmitted, the characters are inspected one at a time. When a match is found, its position is noted. The first symbol is a space, used for creating a pause between characters. Later this is used to create a delay between generated tones. In this case "G" matches the seventh symbol. This offset is remembered.

Secondly, an array of Strings contains the Morse code symbols for matching the characters:

```
String morseTable[] = { "0",
  ".-", "-...", "-.-.", "-..", ".", "..-.",     // 'A' to 'F'
  "--.", "....", "..", ".---", "-.-", ".-..",   // 'G' to 'L'
  "--", "-.", "---", ".--.", "--.-", ".-.",     // 'M' to 'R'
  "...", "-", "..-", "...-", ".--", "-..-",     // 'S' to 'X'
  "-.--", "--..",                               // 'Y' to 'Z'
  ".----", "..---", "...--", "....-", ".....",  // '1' to '5'
  "-....", "--...", "---..", "----.", "-----",  // '6' to '0'
  "---...", "--.-.", ".-.-.-", "-....-"         // : / . -
 };
```

The final C++ code excerpt ensures all characters are converted to upper case before comparisons are made. Using variables 'i' and 'j' as counters, the position is determined and an offset looked up in the method makeMorse(). This is repeated along the whole string to be converted to Morse code.

```
String makeMorse(String input) {

input.toUpperCase();
  String output = "";
  for (int i = 0; i < (int)(input.length()) ; i++) {
    for (int j = 0; j < (int)(usedChars.length()); j++) {
      if (usedChars[j] == input[i]){
        output = output + morseTable[j] + '0';
      }
    }
  }
}
```

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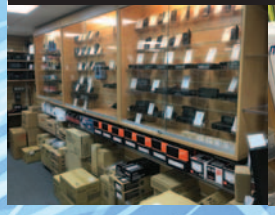

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The solar eclipse QSO party

A solar eclipse will be visible from Canada to Mexico on 21 August 2017.

You may have heard about the upcoming total solar eclipse on 21 August when the entire United States and much of Canada and Mexico will be able to see some portion of the Sun eclipsed by the Moon. The path of 'totality' (in which the Sun is completely behind the Moon) covers from Portland, Oregon to Charleston, South Carolina. This may be most-watched solar eclipse in history and amateur radio has a role to play.

Why Is the eclipse important?

As HF operators well know, solar radiation plays a major role in signal propagation. Daily, seasonal and longer-term cycles of solar activity have profound effects. Imagine then, a whole day's worth of changes taking place over a few hours. That's exactly what happens as the Moon's shadow temporarily blocks the Sun's rays from hitting the Earth during the eclipse. A propagation model's output in **Figure 1** shows what is expected to happen to the MUF along several paths as the eclipse occurs.

Another unique aspect of the eclipse is the abruptness with which the changes take place. During a normal day, the *terminator* (the line between dark and light areas) moves pretty fast – about 1100 miles per hour – to make it all the way around the Earth. The eclipse's deepest shadow or *umbra* where the Sun's disc is completely covered by the Moon moves even faster, crossing the North American continent in one hour and 33 minutes at a ground speed of 2240 miles per hour. The time during which the Sun is completely covered – *totality* – is a maximum of about two-and-a-half minutes if the viewer is positioned exactly in the middle of the Moon's shadow.

We're not doing all this work to observe the bands just during the short period of totality, though! The partial shadow or *penumbra* also has a dramatic effect that lasts for three hours or more as shown by Figure 1. This creates a perfect opportunity to measure how the ionosphere responds during the eclipse, as well as the hours before and after, but only if there are a lot of signals and receivers to do it. That's where radio amateurs come in.

Solar QSO party goals

Over the past few years, professional researchers have noticed the amateur's ability to generate good quality data about signals. At the same time, a combination of SDR technology and the internet have enabled amateurs to build sophisticated network of automated signal decoders such as the Reverse Beacon Network (RBN), PSKreporter and WSPRnet that listen to the bands 24 hours a day. The map in **Figure 2** shows a typical set of RBN data illustrating the effect of night and day on the amateur bands.

The upcoming eclipse presents a perfect opportunity to demonstrate the scientific value of amateur radio and the HamSCI team came up with the idea of a Solar Eclipse QSO Party, or SEQP. (There are other on-the-air events during the eclipse, too.) The object is to get amateurs on the bands from 160m through to 6m during the eclipse and collect as much information about their signals as possible. The references at the end of this article provide additional information on the eclipse. This may sound familiar to those who took part in the RSGB Eclipse QSO Party in 2015, which also generated valuable data.

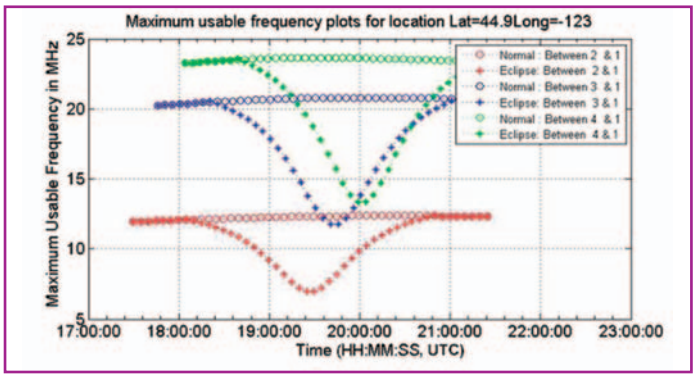

FIGURE 1: MUF along three paths between stations across the US. The model shows the sharp drop in MUF as the eclipse occurs. Station 1 is in Oregon, Station 2 is in Wyoming, Station 3 is in Kansas and Station 4 is in South Carolina. (Graphic courtesy of Magda Moses, KM4EGE).

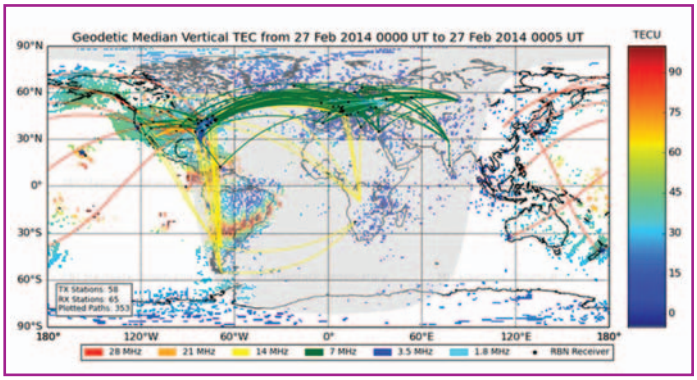

FIGURE 2: Map of RBN signal reports on several bands with the day/night terminator shown. The effect of solar radiation on the ionosphere and on received signals is clear. (Graphic courtesy of Magda Moses, KM4EGE).

How to participate

You don't have to be in the US, Canada or Mexico to join in, as those stations will be looking for contacts all around the world to collect data.

There are two basic ways to participate in the SEQP. The listen-only option is to set up an RBN receiver or *node* to make signal-to-noise ratio (SNR) measurements during the SEQP. The listen-and-transmit option is to get on the air during the eclipse and contact other stations so the RBN will receive and measure your signal's SNR. If your station has the capability, you can do both. This can be a great project for your club or a student project, as well.

The rules for participating as an active station are summarised later – see the HamSCI website **[1]** for detailed rules and updates. While scores will be calculated and published based on total QSOs and bonus points from submitted logs, this isn't a contest *per se* – it will be a true "let's all get on the air and make a lot of contacts" QSO party. There will be plenty of contest-style fun with rapid-fire contacts made over wide areas. That aligns well with the goal of making a large number of measurements before, during, and after the eclipse.

Preferred modes are CW or RTTY (those will be received and decoded by the *CW Skimmer* and *RTTY Skimmer*) along with PSK (captured by *PSKreporter*). Include "CQ" or "TEST" in your transmissions to be sure the automated decoders recognise and measure your signal. Phone QSOs and signal strength reports and observations are also welcome. WSPR fans are certainly encouraged to be active and their signal reports will be captured by the WSPRnet system separately from the SEQP. If you use CW, make it easy for the RBN nodes to capture your signal by using a consistent format and sending speed. JT9 and JT65 are also useful – turn on the logging feature of WSJT and record the SNR figures for all decoded transmissions. A how-to link will be provided on the HamSCI website about how to do this and how to submit data.

For active stations there are two traditional categories: Single-operator (SO) and Multi-Operator (MO). Participation is pretty much the same as in other contests – get on the air and make contacts.

Duplicate contacts on the same band as a previous QSO with a station are allowed after 10 minutes have elapsed since the previous QSO with that station. The same station may be worked on all SEQP bands and modes.

Another guideline applies to stations using rotatable antennas – leave them pointed toward or along the path of totality during the whole event so that the only thing affecting your signal strength is propagation. Note that the exchange requires your six-character grid locator, such as IO90CU. Watch the SEQP web page on the HamSCI website for updates, changes, and additional discussion **[2]**. Note that bonus points are given for being spotted in different four-character grid fields (IO90, EM48, etc). One bonus point will be awarded for each band and clock hour during which your signal was spotted in a grid square other than your own by the RBN, PSKReporter, or DX spotting network. There are eight clock hours and seven bands available for receiving bonus points. A spot of your signal on any mode will qualify for the bonus point.

You can use any logging software that supports the SEQP and software authors have been provided with the necessary details to modify their programs. What is important is for your log to comply with the Cabrillo 3.0 format standard. Sample logs are provided on the HamSCI website's SEQP page. Logs will be uploadable online. Paper logs will not be accepted, although you can use WA7BNM's Cabrillo converter web page to manually enter your QSOs and create a Cabrillo-formatted entry.

Following the eclipse, all of the collected logs and the data from RBN and other networks will be collected and combined into a database by professional researchers at Virginia Tech. The data will then be made available to the geophysics research community for study and further research.

Solar Eclipse QSO Party Rules Summary

See the HamSCI SEQP web page [2] for complete rules and FAQ.

Time and Date: Monday, 21 Aug 2017 from 1400-2200UTC
Bands: 160, 80, 40, 20, 15, 10 and 6m (60, 30, 17, and 12m will not be used)
Modes: CW, PSK31, RTTY (phone contacts may also be submitted)
Categories: Single-operator, Multi-operator, RBN Node
Exchange: Send the callsign of receiving station, signal report in RST format, six-character grid locator (eg IO90cu), and callsign of sending station
Scoring: Number of QSOs completed plus bonus points (see website)
Log Date, Time, Band or Frequency, Mode (CW, RY (for RTTY or PSK), or PH), both call signs, signal report sent and received, grid locator sent and received.
Logs should follow the Cabrillo 3.0 format standard and may be submitted via web log upload.
Details will be published on the HamSCI SEQP website [2].

Websearch

[1] www.hamsci.org/basic-project/2017-total-solar-eclipse
[2] HamSCI website – http://hamsci.org
[3] NASA Solar Eclipse website: eclipse.gsfc.nasa.gov/SEgoogle/SEgoogle2001/SE2017Aug21Tgoogle.html

Ward Silver, N0AX

Antennas

In response to feedback from several readers, this month we revisit some of the antenna techniques that lend themselves well to home construction in terms of dipole centres and antenna mast clamp arrangements. Several techniques that could be used as a basis to make up a dipole centre for either wire or beam antennas were described in a recent Antennas column and the subject this month is to continue with this theme.

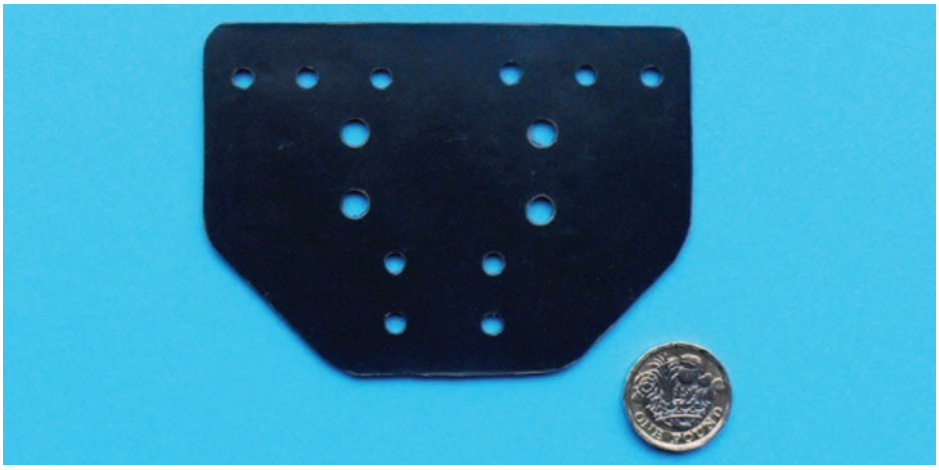

PHOTO 1: Layout of the dipole centre made from a section of uPVC sheet and used for an HF antenna.

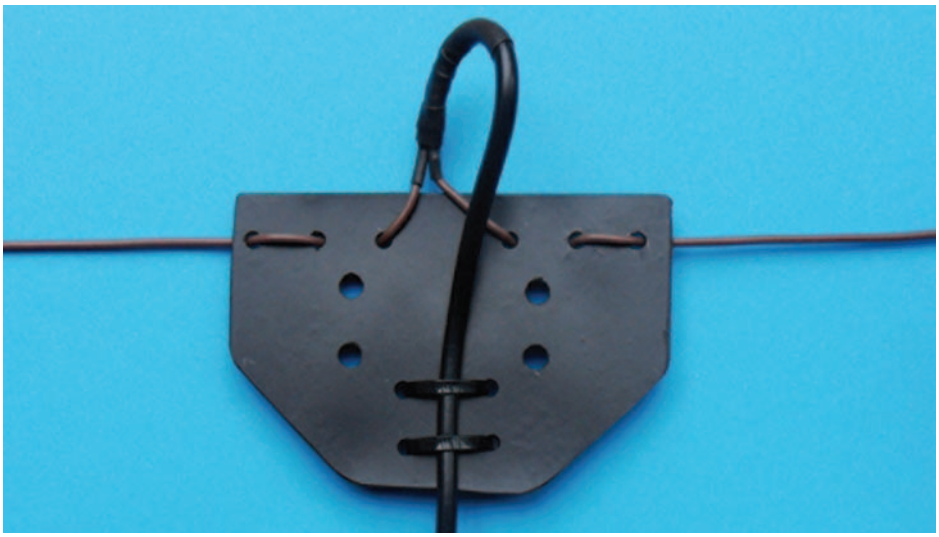

PHOTO 2: The HF antenna's dipole centre with 50Ω coaxial cable used to feed the antenna.

Dipole centres

The usual practice to install a dipole is to suspend the antenna between two high points with its feeder cable brought vertically straight downwards from the feed point. Keeping the arrangement as symmetrical as practical tends to maintain the balance of the antenna, improving its radiation pattern and helping to minimise undesirable common mode currents. The assembly used to connect the feeder cable to each leg of the dipole antenna is usually suspended within the antenna's wire span and necessitates a physically strong but lightweight design. Commercially, there are various dipole centre designs available that can be acquired from radio equipment stockists, online suppliers or at radio rallies.

However, a dipole centre can be made from a sheet of 3mm thick uPVC (unplasticised polyvinyl chloride) is shown in **Photo 1**. This design has three holes drilled along the upper section of the dipole centre either side of the middle, as shown. These holes are used to hold in place each wire leg of the dipole by lacing the wire through the holes. Four equally-spaced holes were drilled into the lower section of the dipole centre to hold the feeder cable in place using cable ties that were passed through the holes, over the feeder cable and then tightened. The two larger diameter holes, drilled symmetrically either side above where the feeder cable attaches, allow the antenna to be installed as an inverted-V if necessary. A short length of heatshrink was passed over each dipole leg and the leg soldered to one of the feeder cable's conductors. After soldering, the joint was protected by wrapping PTFE plumbers' tape around it. Then the heatshrink was slid over each joint and shrunk using a heat gun to help weatherproof the joint. A larger diameter length of heatshrink was then passed and shrunk over the assembly to project the joints.

An example of the use of this technique is shown in **Photo 2** for an HF antenna where the feeder was 50Ω coaxial cable. In this arrangement, the feeder cable was passed over the top of the dipole centre so that the end of the feeder cable pointed downwards to minimise entry of moisture into the joint. This antenna used a choke balun formed from several loops of the cable located just under the dipole centre to avoid the effects that arise from common mode currents [1]. This dipole centre design allowed the HF antenna's wire span to be suspended horizontally and run as straight as possible. Alternatively, the dipole centre could be fastened to the top of an insulated mast and the antenna installed in an inverted-V configuration with the feeder cable brought downwards. uPVC was chosen for the dipole centre because this material is designed for use outside in the wet, is fairly rugged and is able to generally withstand degradation from sunlight.

This design is very similar to the feed point assembly used for the off centre fed dipole (OCFD) described recently in the July Antennas column. However, the assembly for the OCFD had two rows of three holes drilled to allow the ladder line feeder to be secured using cable ties passed through the holes and the feeder cable in a 'figure-of-eight' configuration, crossing in the middle holes as shown in **Photo 3**.

Protecting cable connections

Often it is necessary to disconnect the antenna system from the feeder cable on a regular basis (eg when out operating portable). A common practice is to use a short length of feeder cable from the feed point, terminated in a connector, then using a longer run of feeder between this and the radio. However, this arrangement can present difficulties if the termination between the two cables has to be waterproofed each time the antenna is set up.

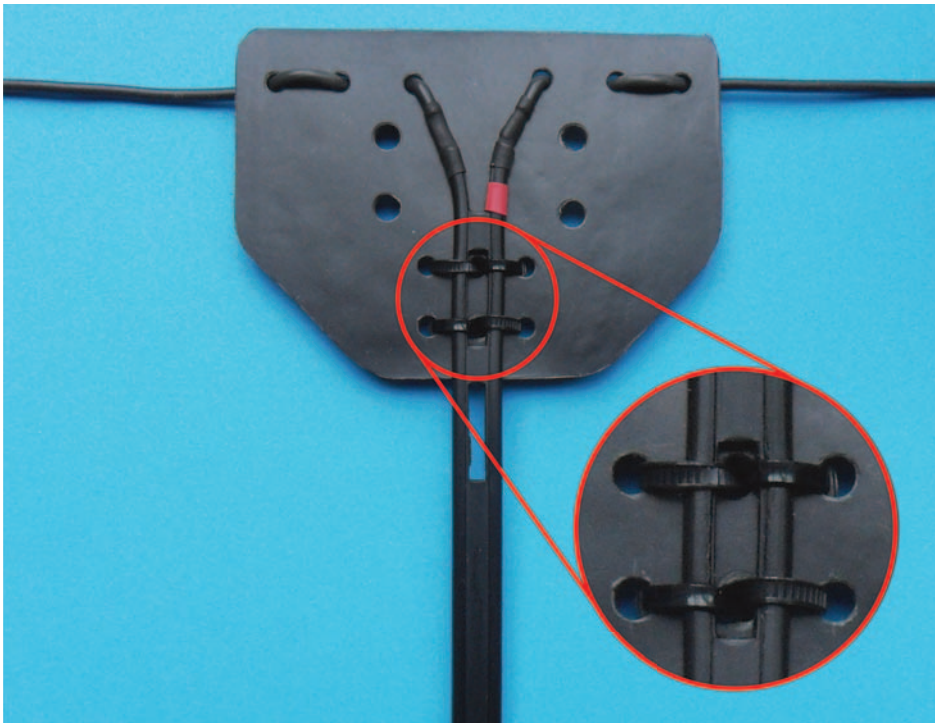

PHOTO 3: The dipole centre used for a doublet or OCFD antenna that used a similar construction to the arrangement shown in Photo 2.

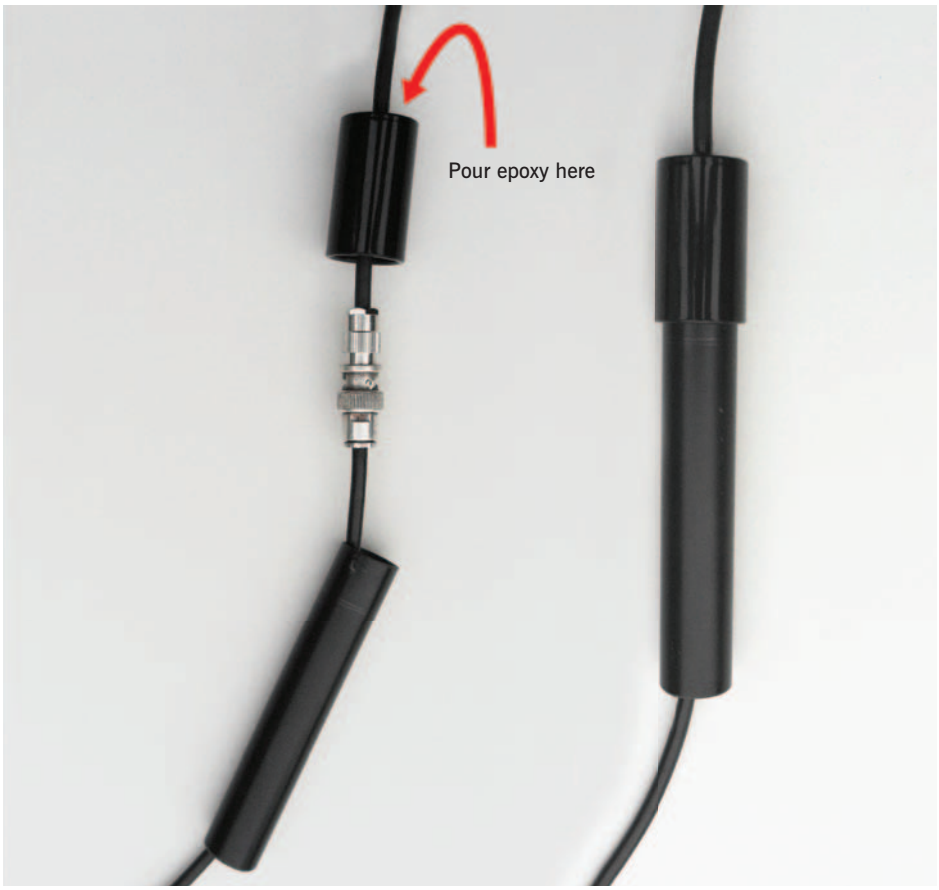

PHOTO 4: Technique used to protect a temporary coaxial cable joint from moisture using a length of conduit, a BNC coupling and self-amalgamating tape. Right: the assembled protector.

A technique that helps to overcome this problem is shown in **Photo 4** for a termination between male and female BNC connectors joining 50Ω RG58 coaxial cable. The cable run from the antenna had a large 'bung' made up just above the plug (upper section of the photo) by winding several layers of self-amalgamating tape together. The diameter of the 'bung' was made large enough to enable a PVC conduit coupling to slide over it making a snug fit. This assembly was then made waterproof by pouring epoxy resin glue to fill the space where the cable left the 'bung' towards the antenna. While pouring the glue into place, the coupling needed to be held upright and then left vertically to allow the glue to set, so sealing the assembly. A section of cable conduit was then cut that was a snug fit into the coupling. The length of the conduit was chosen to allow the coaxial cable connection to be completely covered once the conduit has been pushed into the coupling, as shown on the right of Photo 4. The conduit coupling needs to be hung vertically downwards from the antenna, with the section of conduit below it, to ensure that is difficult for moisture to reach the coaxial cable connectors inside.

This technique worked well and kept the coaxial connections dry when used during the winter months for both a 70cm Yagi beam and open sleeve dipole. However, its use is not recommended if the coaxial cable connections are subjected to prolonged external exposure because this is likely to cause the connectors to become corroded. Therefore, if the coaxial connectors are to be permanently situated outside, then a more protective arrangement should be used to weatherproof them.

A 20mm diameter conduit and coupling allows a BNC male and female connector to be accommodated, however a 25mm diameter conduit and coupling is required for SO239 (female) and PL259 (male) terminations.

Beam antenna mast mounts

Although there are a variety of brackets and clamps commercially available to enable a beam antenna to be attached to a mast, sometimes a custom made clamp is required

Mike Parkin, G0JMI
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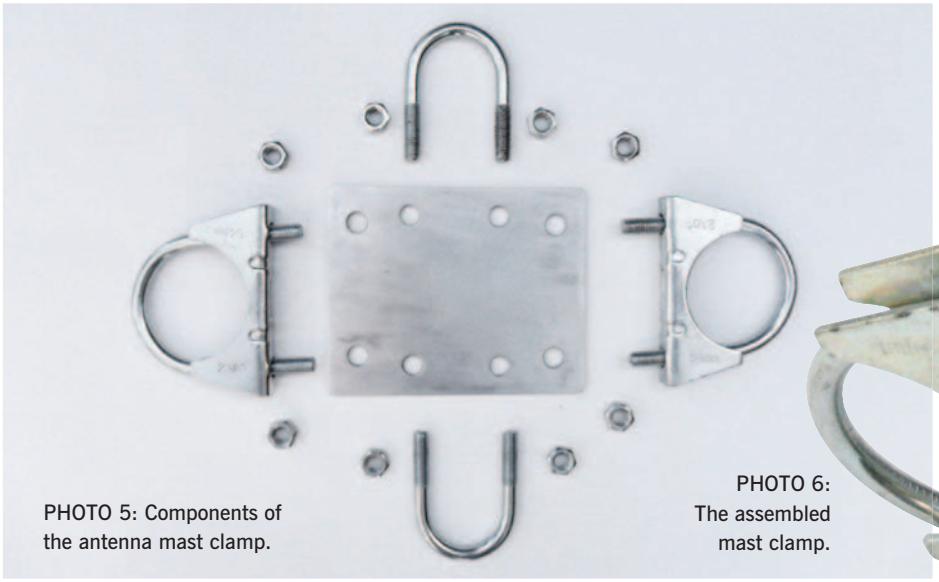


PHOTO 5: Components of the antenna mast clamp.

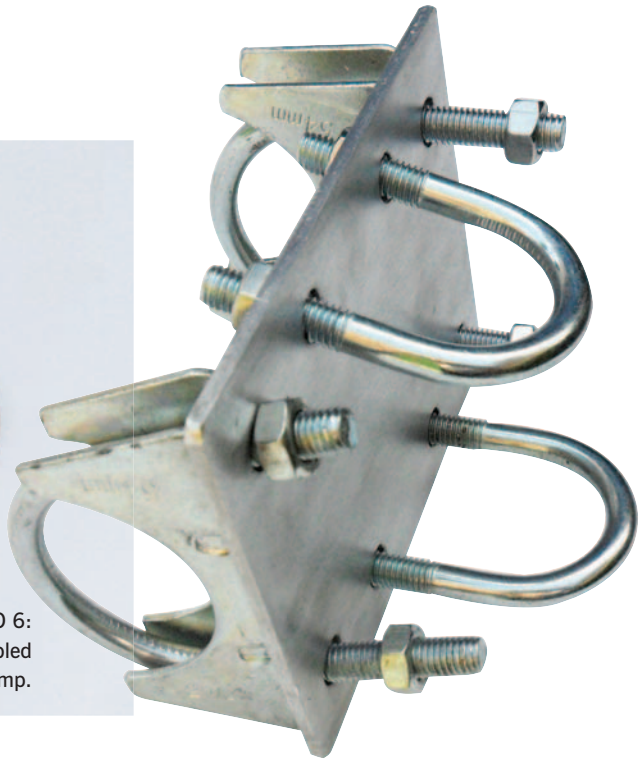


PHOTO 6: The assembled mast clamp.

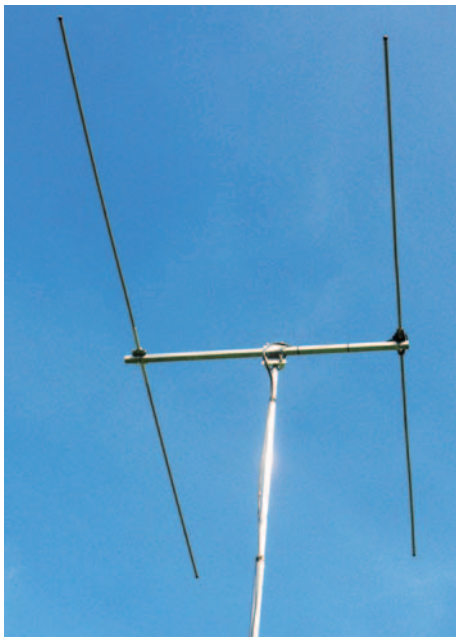


PHOTO 7: The mast clamp in use with a 2 element 6m beam.

PHOTO 8: The boom mount constructed for the 70cm Yagi beam, plus some typical bolts that can be used (see text).

to suit a specific arrangement of antenna.

An example of a simple clamp used to attach a 6m beam to a mast is shown in **Photo 5** and assembled in **Photo 6**. This clamp was mode from a section of 6mm thick aluminium plate, two 54mm exhaust clamps and two 35mm exhaust clamps. The aluminium plate measured 100mm by 125mm and was cut from scrap plate. The exhaust clamps were sourced from a local motor factor, although there are many online suppliers who stock these items. 9mm holes were drilled in the plate and arranged to take the clamps as shown in the photos. This arrangement allowed an antenna with a boom of up to 25mm in section to be attached to a mast of up to 50mm in diameter (as shown in **Photo 7**, where it was used to mount a 2 element 6m beam).

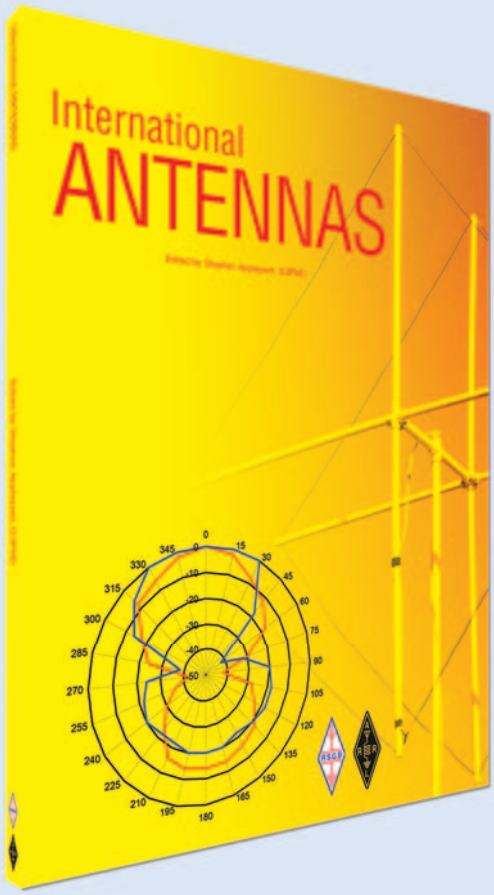
The May Antennas column described how the gamma match technique can be used to match an unbalanced coaxial cable to the driven element of an antenna. One reader expressed interest in the construction arrangements used for the boom-mount used to attach the 70cm Yagi beam to the mast in the article. **Photo 8** illustrates the boom-mount that was made up using two 120mm long coach bolts, two aluminium tubes of about 80mm in length and about 200mm of 12mm x 12mm square aluminium section. Essentially, two holes were drilled in the antenna's boom of a diameter to take the coach bolts, then matching holes were drilled in the aluminium square section. To secure the antenna to a mast, a 35mm exhaust clamp U-bolt was used and this was passed through two holes drilled in the square section, as shown. To assemble the boom mount, the coach bolts were passed through the boom, through the two lengths of tube, through the square section and secured with nuts. The photo makes the method of assembly fairly clear. Using the 35mm U-bolt, the antenna can then be secured to the mast.

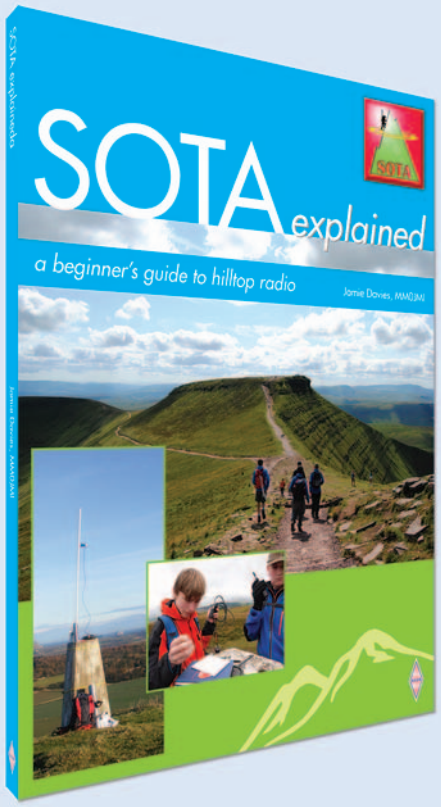
The aluminium square section was salvaged from a scrap TV antenna boom, the coach bolts were drum securing bolts that were saved when a new washing machine was delivered and the U-bolt was obtained from the local motor factor. However, if long enough coach bolts cannot be obtained, the long studs used to hold coaxial cable drums together (front left of the photo) work equally well and have been used for other antenna boom mounts.

Reference

[1] *RSGB Radio Communication Handbook* 13th edition, edited by Mike Browne, G3DIH, Section 14, Transmission Lines, pages 14.12 to 14.15

NEW TITLE





International Antennas

Edited by Stephen Appleyard, G3PND

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

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

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

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

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SOTA Explained

A beginner's guide to hilltop radio

By Jamie Davies, MM0JMI

Summits on the Air (SOTA), is one of fastest developing award schemes. For the active hillwalker and the home based chaser, this programme offers endless fascination. *SOTA Explained* sets out to provide the essential guide to this programme, hilltop radio and much more besides.

Taking a portable radio station into the hills and operating from a summit is a fascinating and rewarding way to combine the very best aspects of walking and amateur radio. Many appreciate the freedom this sort of operation offers and the benefits of having an elevated radio station far from urban electrical interference. At altitude, even modest sets can deliver astonishing performance: communication across the country and across the continent is routinely possible.

SOTA Explained provides advice for those who do not venture on to the hills but still want to participate in SOTA. There is a whole chapter dedicated to 'chasers', covering such topics as which bands to choose, how propagation affects your operation, chasing DX stations and rare SOTA activations. Not only does *SOTA Explained* detail how SOTA works but there is advice on safe hillwalking, setting up simple & cheap SOTA stations and modes of operation. There is technical advice on improving your first station, the antennas to choose and how to run SOTA stations on HF.

Be warned: after reading this book, you will never see a hilltop in the same way again.

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Design Notes

Transverter interfacing

In the December 2013 Design Notes we looked at an interface for driving transverters from low power transceivers such as the Yaesu FT-817. That used PIN diodes to switch an attenuator into the transmit path, reducing the typically 0.5 to 2W from the transceiver to a few milliwatts for the Tx mixer, whilst bypassing this attenuator on receive. I have two microwave transverters for 5.76GHz and 24GHz that have that interface built into them, and two others for the 1.3 and 10GHz bands with their own transceiver interface, all rated for the same 0.5W of drive at 144MHz.

The FT-817 is a great little rig for portable operation, but at home it is far more convenient to use the base station transceiver – in my case an Icom IC-746 – with its larger tuning knob, switchable IF filters and noise reduction. But herein lies a problem. The IC-746, typical of older transceivers, does not provide a low level output suitable for driving transverters. Its power output can only be adjusted over the range 5 to 100W from a small control on the front panel, this setting applying to both HF and 144MHz operation. Faced with such a situation, many amateurs just use a transverter interface rated for, say, 5 or 10 watts (containing a switchable attenuator rated to dissipate this power) and set the front panel control to minimum power output. This all works fine until someone forgets, in the heat of the moment, to adjust the power level to its lowest setting. The consequence of this should be self-explanatory! What we need is some way of automatically ensuring the transceiver is limited to no more than a few watts output, overriding the front panel setting.

Automatic level control

There is a solution. All transceivers have an automatic level control (ALC) input that can be used to control the output power. This can usually be found on a pin on the accessory socket on the back panel. The ALC input is mostly used in conjunction with external high power amplifiers that incorporate a detector on their output to feed back a voltage via the ALC line to automatically adjust the drive level from the transceiver to the PA. All manufacturers provide this facility on their rigs but for some unfathomable reason lost in time and history (but probably to do with driving valves), the ALC fed back is always a negative voltage. Typically, applying minus-a-few-volts to the transceiver's ALC pin reduces power output to nearly nothing. Power output on my IC-746 at 144MHz can be adjusted from the full 100W down to nothing with the ALC input varying from

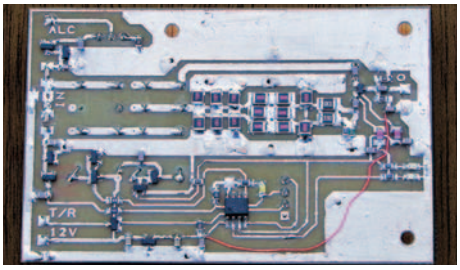

PHOTO 1: Transverter interface to make an IC-746 transceiver 'look like' an FT-817.

-0.8 to -1.7V. Other rigs will no doubt need slightly different voltage ranges and in fact the IC-746 manual says -3V is needed here. But all allow full power control over a relatively small change in ALC voltage.

So why not make use of this to control the power fed into a transverter's interface? A diode detector at the input to the interface's transmit attenuator feeds back a negative voltage. Component values are adjusted to ensure the resulting power is maintained at no more than 5W. A relay can switch the attenuator out during the Rx period. Whilst PIN diodes can be used as switches at this power level, they are more expensive and rarer than those for lower power. This simple approach does work and means the operator no longer has to worry about setting the transceiver front panel control to minimum. But what happens if the ALC connection isn't made, or the Tx/Rx switching control from transceiver to the interface unit fails? The 'magic smoke' **[1]** can still be released. Another mechanism for failure is that the ALC action cannot happen immediately: there will always be a short transient at high power before the ALC takes over to reduce it. On my IC-746 this short transient that comes out at a level of 50 to 100 watts and lasts for something like 100 to 300 microseconds, depending on the front panel power control setting. So although there is not much energy in the short pulse, the high voltage spike could damage delicate semiconductors in the transverter if it manages to reach them. There is always a delay, depending on modulation type, of several tens to hundreds of milliseconds between the Tx/Rx line changing and the first appearance of any RF, so some leeway is available for switches to operate.

FT-817 look-alike

I wanted to be able to make my IC-746 look like an FT-817, to enable it to drive any of the transverters that were set up for use with that rig. The IC-746 output has to be dropped to 0.5W (2W absolute maximum) in a standalone module. **Figure 1** shows the complete interface devised to do this job, with a number of belt-and-braces safety features built in to protect the transverter. Few component values are given, as each version will need to be customised to the user's requirements and the transceiver in use. Since potentially 100W could appear on the input, albeit only for a short time, the input capacitor to each of the two detectors needs to be rated appropriately. I used 250V rated ATC chip capacitors, but 'gimmick' capacitors made from twisted insulated wires would suffice. The capacitive potential divider formed from this and the lower capacitor ensure that standard switching diodes with only 50V rating can be used in the detector.

We'll now look at each section of the circuit in detail. Top left is the diode detector generating the negative ALC voltage to be fed back, described before. A preset resistor allows the level to be set to the 5W required. Another diode detector provides a positive voltage for the monitoring circuitry we'll look at shortly. Note the two sets of relay contacts on the RF input to the attenuator. The first set, A1, are normally held open and close only when the relay is activated by the protection circuitry. The power for the relay comes from the 13.8V supply on the transceiver's accessory socket, so if the link cable is not plugged in these can never close and RF cannot get any further. The second input relay B1 switches between Tx and Rx paths. A 10dB attenuator is made up of two cascaded pi-sections, 4dB and 6dB respectively. These values were chosen to share the dissipated power equally between series and shunt resistor paths. A parallel / series combination of resistors ensures the half-watt rated resistors are operated comfortably within their ratings. The RF path is completed by two PIN diodes, one selecting the direct through route used for Rx and the other the output of the attenuator.

Protection and control

The control circuitry monitors the state of the Tx/Rx line from the transceiver and the voltage from the input level detector, using these to control the relays and PIN diode drive signals. A 12F675 PIC microcontroller with an integral A/D converter and up to 6 I/O lines does the control and supervision. The A/D runs continuously, sampling the input drive at approximately 18kHz. This rate is fast enough to see the initial transient from the ALC action and to follow SSB speech peaks.

The PIC code runs in a loop looking at the Tx/Rx input line, all the while comparing the drive

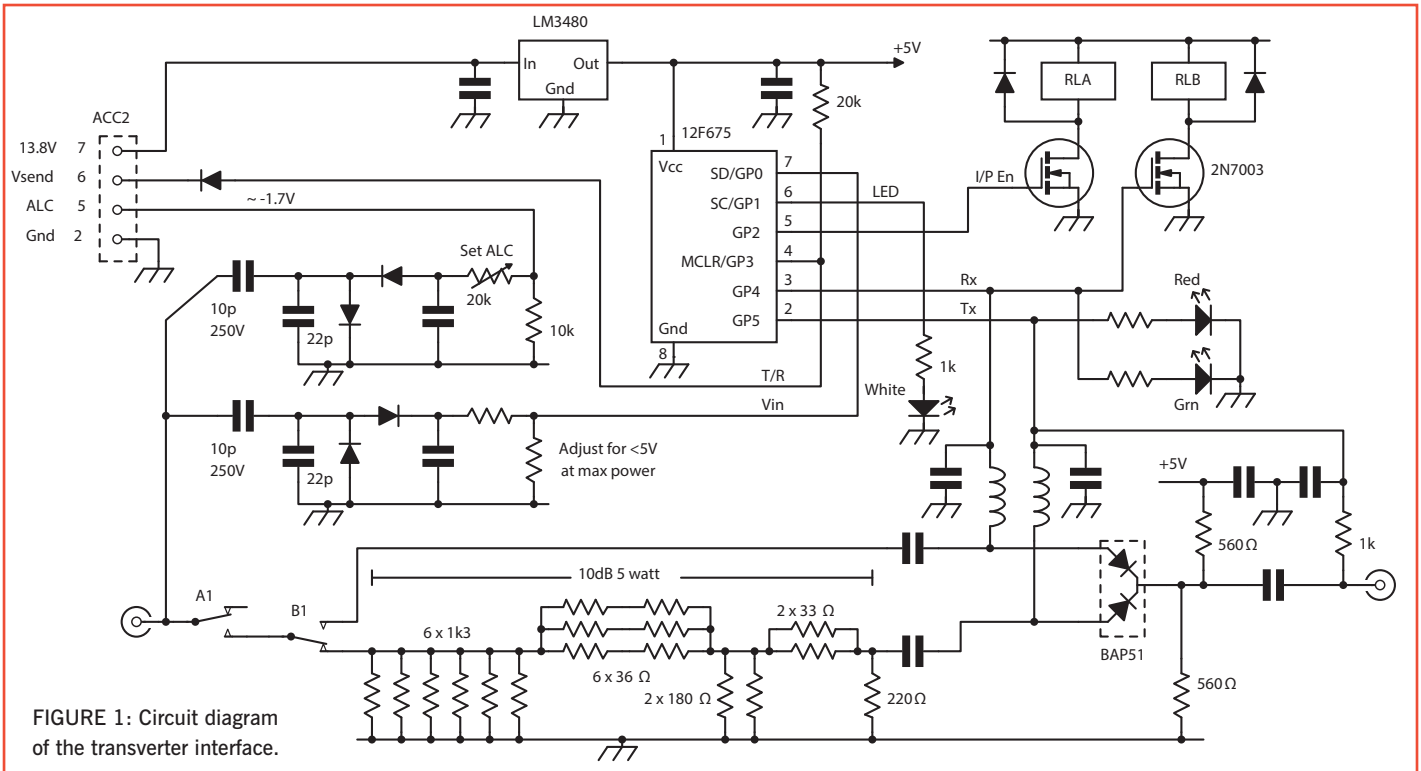

FIGURE 1: Circuit diagram of the transverter interface.

against three pre-stored thresholds. The algorithm is quite simple. During the Rx state there shouldn't be any RF drive at all. If a voltage is detected that exceeds the first (low) threshold there must be an error; possibly the Tx/Rx input line is broken. In this event the input relay is opened and the warning LED lights. If all is correct with no RF present, the second relay is pulled in, selecting the Rx path, which also switches on the Rx PIN diode.

When the transceiver goes to Tx, signalled by the Tx/Rx input line changing, things start to happen. We know there could be a short pulse of quite high RF power before the ALC takes over, so the first job is to protect against this. The Rx path PIN diode is (almost) immediately switched off, giving around 20dB of attenuation. This happens within a few microseconds of the Tx demand appearing. The transceiver itself doesn't output any RF until at least a few tens of milliseconds after this line changes, so we know the PIN switch is more than fast enough. The removal of the Rx PIN diode drive also drops the second relay to the Tx path, placing the power attenuator in circuit; this can absorb energy from the expected spike of up to 100W for a few tens or hundreds of milliseconds if a fault condition in the ALC circuitry were to allow this – such as the ALC feedback line broken. At this stage, the Tx path PIN diode has not yet been switched on, making sure the transverter won't see the, now 10dB attenuated, transient. After a delay of a few tens of milliseconds, the input drive level is monitored and if it is below a second threshold, equivalent to about 5W drive, the output PIN diode is activated for normal Tx operation. The loop is continually monitoring the drive level and if it exceeds the 5W threshold, the warning LED is flashed but no switching action is performed. The drive is also compared against a third threshold set at around 10W. If this is exceeded, the input relay is opened and the warning LED illuminates continuously. Whenever this safe isolated state appears, it can be reset by toggling the PTT: this allows transients and one-off pulses to be cleared and mentally noted. Should the error condition immediately reoccur, the operator knows there is a real error in the drive or interconnections that needs to be looked at.

Photo 1 shows a PCB carrying the circuitry of Figure 1. Surface Mount Technology (SMT) resistors were used for the power attenuator, employing 1210 sized components rated at 0.5W. The attenuator was designed so that no individual resistor dissipated more than 350mW. A continuous ground plane on the underside of the board serves as both RF ground and heatsink. Heat is conducted away from the resistors partly by copper tracks through tabs to the ground plane, but mainly by the thermal conductivity of the PCB material. Heat removal is greatly assisted by the use of 0.8mm substrate instead of the more popular 1.6mm material. PIC code, in assembler format only, can be found at **[2]**. If replicating this design, please remember the PIC code will have to be customised to your own thresholds and any other switching and timing needs for your own situation.

DG8SAQ network analyser

This PC-controlled two-port vector network analyser (VNWA) operates from near-DC to 500MHz at full specification, and up to 1.3GHz with gradually reducing capability. I have had the earlier Mark 2 for several years now and find it invaluable for setting up filters, antennas, cables and most RF measurements likely to be needed. Its most recent use was up a ladder at a local amateur's house, checking a fault in his 432MHz antenna system. Once you have purchased the hardware **[3]** the latest software and updates can be downloaded and used. A recent software upgrade makes setup and initial installation and calibration easier. Jan, G5BBL, of SDR Kits states: "From the feedback received to date, it appears that the upgrade to the new VNWA 36.7.0 release is quite straightforward, provided you install the VNWA 36.7.0 in a new empty directory! A big thank you to Kurt, OZ7OU for making three videos available with advice on how to install and start using the VNWA 36.7.0 release. These videos are essential viewing for first-time users but also useful for more experienced VNWA users." The videos can be found at **[4]**, **[5]** and **[6]**, and see also **[7]**.

Websearch

[1] https://en.wikipedia.org/wiki/Magic_smoke
[2] www.g4jnt.com/ 746TVTRIF_CTL.asm
[3] http://sdr-kits.net/VNWA3_Description.html
[4] https://youtu.be/TOMj4jaUSKs
[5] https://youtu.be/cuLjsJYpODc
[6] https://youtu.be/gATrqw4IKT8
[7] http://sdr-kits.net/VNWA/Amphenol-Connex_Universal_Cal_kit_Rev5.pdf

Andy Talbot, G4JNT
andy.g4jnt@gmail.com

www.rsgb.org/yota

YOTA 2017,
5 to 12 August at Gilwell Park

For Youngsters On The Air 2017 (YOTA), around 80 young people under the age of 26 from 28 countries – from all over IARU Region 1 as well as Japan — will be representing their national amateur radio societies at this event hosted by the RSGB.

Activities

The week will be packed with activities to appeal to the visiting young people, all with a basis in amateur radio.

Special Event Station: We have planned for a five band station to be operated from morning to night. Ofcom, the UK Regulator, has agreed for the station to use the call GB17YOTA. The station will operate on all HF bands from 10 to 80m, propagation allowing. Up to four bands will be on air at once covering SSB, CW and digimodes. Operation will also be on 6/4m SSB / CW and JT modes for meteor scatter, 2m SSB and JT modes, hopefully a little EME if we can. There will also be operation on 2m/70cm satellites - certainly the FM satellites (SO-50, AO-85) but hopefully also some of the SSB satellites as well. Look on the DX cluster or CW skimmer for the frequencies to find the stations and, for VHF, use the ON4KST chat rooms.

The RSGB has arranged for an award to be made available for stations working GB17YOTA, see the RSGB website for details.

Summits On The Air (SOTA): Kevin, G0PEK and Lauren, M6HLR will be briefing the YOTA teams on activating mountain summits. Lauren, who is just eleven years-old, has almost completed activating all the Wainwrights in the Lake District so has lots of experience to share. Following the briefing everyone will make a portable antenna and the teams will all be activating a summit during the week. Some may be able to use their YOTA kit transceivers and homebrew antennas. Activations will take place most afternoons from Sunday 6 August to Friday the 11th. Frequency details will be shared via social media.

Amateur Radio Direction Finding (ARDF): The Gilwell Park site is very large so we have lots of space to hide beacons to find with direction finding equipment. There will be a prize for the fastest time to find all of the hidden transmitters.

Radio Kit Building (Buildathon): Hans Summers, G0UPL of QRP Labs has designed a fantastic kit for YOTA 17. It is based around a digital synthesiser and includes a Morse decoder, simple but high performance receiver and a nicely filtered transmitter. The current thinking is that it will be set up for the 17m band, to link with YOTA 17, but it can also be configured for operation on 40m or 20m. Hans has been making daily contacts with his prototype and a simple wire antenna. With much experience from the Bath Buildathons, Steve Hartley, G0FUW will be leading the kit-building activity.

Bletchley Park & National Radio Centre: Bletchley Park was the home of the British code breakers and has an extremely informative museum. It is also the location of the RSGB's National Radio Centre, which has interactive displays and a very well equipped radio room.

London Day Trip: With most of the young people travelling from overseas, they will spend a full day in London with a visit to the Science Museum and time to see the sights, such as Trafalgar Square, Buckingham Palace and the Houses of Parliament.

ARISS: contacts with the International Space Station always attract much attention and Ciaran, M0XTD has been able to secure a contact for the YOTA camp. We will not know the date or time until the week before but the tried and tested approach used for the highly successful Principia schools contacts last year should ensure success. We will be inviting some of the Scouts who are on site at their own camp to see how amateur radio can reach out into space and link with STEM activities in schools. Further details will be notified as they are known.

Intercultural Evening: All teams bring food and drinks from their home country to share with the other teams. It's a great way to mix with the other team members and showcase their own countries.

Regional activities

To give lots of young amateurs in the UK the chance to take part in YOTA 2017, many Regions are hosting their own activities, often linking with the special event station on site. We are grateful that Ofcom have agreed that club stations participating in YOTA activities during the week can use the suffix /YOTA.

Region 1: The Regional team is planning to run experience days with the local Guides groups and the police Scotland youth club. This will include an introduction to amateur radio, giving the young people the experience of operating HF station and a CW demonstration.

Region 2: The Regional manager has been in contact with local clubs and will work with them to organise events to coincide with the activities in Gilwell Park, these include SES activation and a SOTA activation.

Region 3: The Regional team and Youth committee representatives have been busy planning for YOTA 2017 and hope to host a buildathon as well as supporting local clubs to run a SES.

Region 4: Local clubs in the area are planning a SES aimed at contacting the participants in Gilwell Park. DRMs have been working with local Scout groups and hope to host an amateur radio experience day.

Region 5: The Regional team are planning a BBQOTA event that will see experienced amateurs and young people come together to share their experiences of amateur radio. This will take place on the evening of 4 August.

Region 7: The team also hope to host a BBQOTA event, facilitate a SES and have made links with various Scouts and Cubs groups. The Regional manager has also organised a SE taking place from the Royal Mint, young people are being encouraged to get involved and the Youth committee representatives will be there to support them, this event takes place from 30 July to 4 August.

Region 8: This team is also planning a BBQOTA event. The Regional team have been making links with local clubs and it is hoped that there will be several SES activated throughout the week of the camp, there are also some very willing and experienced amateurs who plan to take a group of young people out on the hills for their first SOTA experience.

Region 9: The Regional team have identified several clubs who work hard to engage with young people in their area and hope to run SES to make contact with the participants at the camp as well as engaging with new young people in their area.

Region 10: The Regional team has made contact with the local Scout groups and hopes to run an amateur radio experience day to include HF activation, ARDF competition and CW demonstration.

Region 11: The Regional manager is planning a buildathon event and also to facilitate local Scout groups to achieve their Communications badge.

Region 12: There are a number of clubs in this area ready and willing to facilitate SES and other activities throughout the week aimed at getting young people involved and on the air.

Region 13: The Regional manager hopes to run a portable Special Event Station over the course of YOTA2017 week.

www.rsgb.org/yotasupporter

If you, your club or a group of friends would like to get involved in YOTA 2017 it is not too late. Contact Sara McGarvey via email to 2i0ssw@rsgb.org.uk.

If you are a young person who wants to attend any of these events or perhaps organise your own, please do not hesitate to get in touch with your Regional team. Contact details are in the Around Your Region section on pages 84-87.

Thank you

We're very grateful for the support of every individual, club and Super Supporter for their financial support of YOTA 2017. Two of our Super Supporters tell us this month why they chose to back this international youth event – read our interview with the Radio Communications Foundation (RCF) here and hear from GQRP Club in their vlog online (www.rsgb.org/yota-vlogs). We have published eleven vlogs so far that profile volunteers, UK YOTA team members and Super Supporters so do take the time to have a look.

YOTA 2017 Super Supporter - RCF

What is the RCF? The RCF is a charity registered in England and Wales (registration number 1100694), which was originally set up "to advance the education of the public in the science and practice of radio communication and electrical engineering and to promote the wider benefits to the public resulting from such education and training". A very ambitious statement! We've been in existence since 2002 and over that time have refined our objectives to four key groups:

- Those at school and those in uniformed groups such as Scouts and Guides etc
- University or higher education students whose studies major on radio communications
- Those planning on pursuing a career in radio communications
- The public in general.

Why has the RCF chosen to be a Super Supporter of YOTA 2017? The event can help people to see beyond amateur radio as a recreational interest to a route to a rewarding career in radio communications. We see encouraging young people into amateur radio and helping them develop as not only supporting the longer-term health of amateur radio itself, but directly underpinning the achievement of our objectives.

How does the RCF encourage young people to get involved in radio communications? Currently we are sponsoring Arkwright students (**www.arkwright.org.uk**) with a bursary over two years to help them with study projects prior to going on to further education. These are outstanding students and with the help of two of our trustees, Prof Sir Martin Sweeting and Trevor Gill, we are also able to provide them with work experience opportunities. Steve Hartley, another RCF Trustee, is currently acting as their mentor over their scholarship period.

We have also held two "Arkwright days" at the National Radio Centre where other Arkwright scholars who have not previously been involved in amateur radio have attended a day-long course culminating in taking the Foundation exam. The feedback has made this a very fulfilling experience for the volunteers who have helped out, as well as the students themselves, and led to some students taking their interest further by contacting their local club.

In a new partnership with the UK Electronics Skills Foundation (**www.ukesf.org**), the RCF provides two prizes for the best two university final-year projects that exploit radio communication technology in the most original or creative manner. The first prizes will be awarded in July. This is an important part of our strategy, providing us with an opportunity to make students aware of radio communications when they consider their career options.

Anything else you'd like to add? Remember we are here! We aim to introduce youngsters and, indeed, the public in general to a fascinating subject that touches all of our daily lives. Even if they don't go on to a career in radio communications we are confident they will have had many hours of enjoyment and learnt a lot in that time, that could be of use sometime in the future.

If you have a project that requires funding and you think it fulfils our objectives, our grant making policy is on our website. Why not take a look and see if you might qualify for funds? The website is **www.commsfoundation.org**

Professor Sir Martin Sweeting, G3YJO, RCF Chairman

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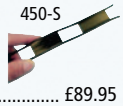

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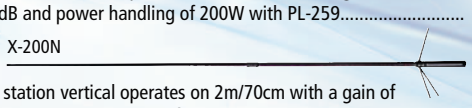

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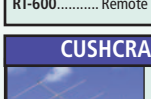

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NO ANTENNA TUNER REQUIRED!
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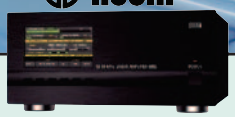

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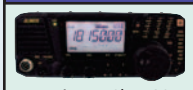

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EMC

Electricity meter change

I was recently notified that my electromechanical electricity meter was due to be changed. I asked if the new meter would be an electronic 'smart meter' and was told that it would be the same as the old one. When the engineer arrived to change the meter, the new one was a completely different, electronic type. The old and new meters are shown in **Photo 1** and **Photo 2**. I pointed out that they are not the same was told that the new one was the nearest available.

The conventional electromechanical electricity meter has a series coil that provides some filtering against mains-borne RF interference, both incoming and outgoing. In contrast, the electronic meter has a very low series resistance, of the order of milliohms, which provides no RF interference filtering. Does replacing electromechanical meters with electronic types increase the level of man-made interference coming into your house via the mains from neighbouring houses? Does the electronic meter itself generate any significant RFI? We did some tests to find out.

After purchasing some reconditioned electricity meters online, the first step was to measure the impedance at various frequencies, as shown in **Photo 3**. The results are shown in **Figure 1**. It can be seen that the electromechanical meter impedance is 22Ω at 10MHz. When the electromechanical meter is fitted between the electricity service cable and the consumer unit, both of these have a low RF impedance between live and neutral, typically 10Ω. If the meter 'tails' connecting the meter are very short then, at 10MHz, the electromechanical meter may introduce an additional 6dB of RF loss – whereas the new electronic type introduces no loss.

The electromechanical meter also introduces a similar loss to RF interference coming out of neighbouring premises, so if all the electricity meters nearby are changed then the level of RF interference coming in via the mains could rise. Not all the RFI that comes in via the mains is radiated and picked up by amateur radio antennas but, nevertheless, it appears that changing all meters in a street from electromechanical to electronic might increase the level of RFI picked up by amateur radio antennas by a few dB at 10MHz and above.

Electricity meter RFI?

Electronic electricity meters contain some digital electronics and a mains power supply. Either of these has the potential to feed some RF interference into the mains. Tests were performed to see if the meter *was* feeding any RF interference into the mains (see **Photo 4**).

PHOTO 1: Conventional electricity meter.

PHOTO 2: Electronic electricity meter.

There was *some* detectable conducted emission below 250kHz but it was a very low level and well below the EN 55022 Class B limit. It is unlikely that emissions from this model of electronic electricity meter into the mains would be significant in practice.

Electricity meter accuracy

A team led by Prof Leferink of the University of Twente in The Netherlands published a paper called 'Static Energy Meter Errors Caused by Conducted Electromagnetic Interference' in *IEEE Electromagnetic Compatibility Magazine* (volume 5, issue 4, fourth quarter 2016). A summary of the paper can be found on the University of Twente website **[1]** and the full text of the article can be purchased via the IEEE Xplore digital library.

'Static' energy meters means the electronic type with no moving parts. The study investigated whether electronic electricity meters give accurate readings with various non-sinusoidal current waveforms. The meters tested in question were manufactured between 2004 and 2014. The meters under test were connected via a switching board to various loads such as energy saving light bulbs, heaters, LED bulbs and dimmers. The researchers compared the readings on the electronic energy meter with the actual power consumption.

Five of the nine meters tested gave readings that were much higher than the actual amount of power consumed and in one case, it was up to 582 percent higher. Two of the meters gave readings that were lower by 30% than the actual amount of power used. The meters that gave inaccurate readings were not identified. The combination of energy saving light bulbs and LED bulbs operating on dimmers were reported to give the greatest inaccuracies.

The British Electrotechnical and Allied Manufacturers' Association (BEAMA) published a response to the IEEE article on accuracy of Dutch electricity meters (see websearch). The BEAMA response said, *"The* IEEE Electromagnetic Compatibility Magazine *recently published some research showing that under certain laboratory conditions with extreme levels of high-frequency interference, certain electricity meters displayed inaccurate measurements. Only meters equipped with Rogowski coils* **[3]** *or Hall Effect sensors were affected. These are specific metrology components that are not common to all meters.*

"There is currently no meter containing either Rogowski coils or Hall Effect sensors installed as part of the GB smart metering rollout. There are no meters containing these components currently under development for release as part of the smart metering rollout." (Reference [3] added – Ed).

Although BEAMA states that no UK smart metering products are affected, this does raise some interesting EMC issues. An electromechanical meter with a rotating disc responds to the average current and it is calibrated to read RMS if the current is a sine wave, for example with resistive loads such as heaters. Any load that rectifies the mains and charges a capacitor such as a switching power supply, a low energy light bulb or an LED lamp may take a current waveform that is a distorted sine wave, especially if a dimmer is used. For example a PC power supply without power factor correction typically takes current only on the peaks of the half cycles. The peak current may be three times higher than it would be for a resistive load of the same power. An electronic electricity meter that measures the true RMS value of the current waveform may give a different reading compared to an electromechanical meter that measures the average current and is calibrated to read RMS on a sine wave.

There are EMC standards such as EN 61000-3-2 and EN 61000-3-3 that include limits for mains harmonic currents at multiples of 50Hz but not all electronic products on the market meet the EMC standards that they should meet.

HVDC electricity transmission

Nearly all of the UK National Grid uses high voltage 50Hz AC transmission on overhead pylons but there are also some high voltage DC links where the cables run underground or under the sea. The connection from the AC power grid to/from a DC section requires a high voltage direct current (HVDC) converter station and these are normally

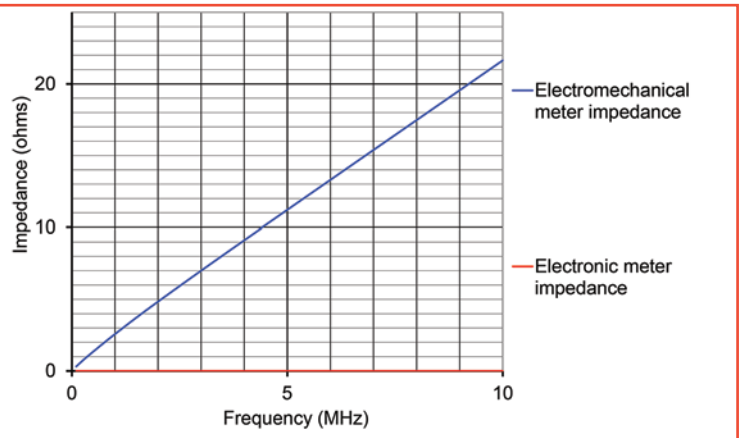


FIGURE 1: Series impedance of an electromechanical electricity meter at RF.

PHOTO 3: Testing the series impedance of the conventional electricity meter.

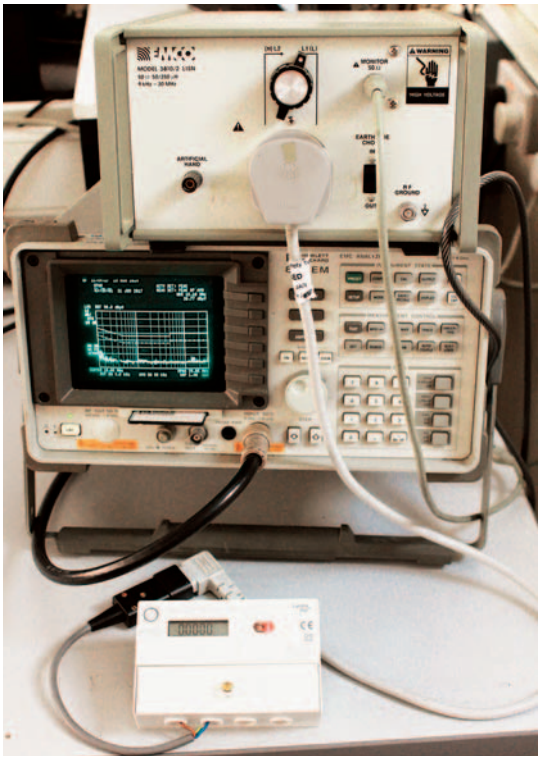


PHOTO 4: Conducted emissions from an electronic meter.

bi-directional so that they can convert AC to DC or DC to AC. For example the 1000MW IFA2 (Interconnexion France-Angleterre) France-UK Interconnector is currently under construction. This is a €350M project that will link the electricity grids of France and the UK. The cable under the English Channel carries DC and the current can flow in either direction depending on which country is exporting electricity. An onshore HVDC converter station to connect the DC cross-channel link to the AC National Grid is being constructed north east of the former RNAS Lee-on-Solent (HMS *Daedalus*) near Fareham in Hampshire.

Another project that uses HVDC transmission is the 400MW Rampion Offshore Wind Project in the English Channel with 116 wind turbines. An undersea HVDC cable from Rampion comes ashore near Worthing in Sussex and the cable goes underground across the South Downs National Park and north to Bolney Substation at Twineham near Hickstead in West Sussex. There the HVDC will be converted to AC and connected to the National Grid.

HVDC converter stations may be used elsewhere such as for some onshore wind farms, where the power output of the wind farm is via an HVDC underground cable. There are several types of HVDC converters. Early converters in the 1930s used rotary converters with motor-generator sets but all HVDC systems built since the 1940s have used static (electronic) converters.

There are two main types of electronic converters for HVDC. The first type is known as 'line-commutated' and these used devices such as mercury arc valves or, more recently, thyristors. In the past 20 years voltage-source converters have become available that use large high power banks of high voltage insulated-gate bipolar transistors (IGBT).

These converter stations with powers of hundreds of megawatts have some potential EMC issues especially at 1.8MHz. Special RF interference filters are used to reduce RFI radiated from overhead lines.

Wireless power transfer

High power wireless power transfer (HPWPT) is being developed for various charging applications from phones to electric vehicles but it needs to avoid harmful interference to radio communications services. The ITU-R World Radio Conference (WRC-19) will take place in Geneva in 2019. The ITU-R Radio Regulations may be amended and preparations are already underway.

Some frequency bands are already designated for Industrial Scientific and Medical (ISM) applications within the Radio Regulations and these can be used without causing interference to radiocommunications services. For example, there is an ISM band at 13.56MHz used for contactless card readers, etc. Only ITU-R can amend the Regulations and allocate new ISM bands if appropriate but others are proposing non-ISM bands for use by WPT and HPWPT. These are mostly below 100kHz for applications such as high power electric vehicle charging for buses, trams and also electric car charging.

Whatever happens with WPT or HPWPT, it will be necessary to keep a close watch on this.

EMP generators

EMP means Electromagnetic Pulse. It is a short burst of electromagnetic energy in the form of a pulse rather than an RF carrier used in radio communication. EMP can disturb the operation of electronic devices, especially digital devices. It can cause microprocessor software to crash, restart or otherwise malfunction. In extreme cases the electronic devices may be damaged.

Various designs have been published online using a high voltage generator a spark gap and a coil. These are in effect spark transmitters that contravene almost every EMC regulation. We have heard of interference on amateur bands that has the characteristics of an EMP generator being used nearby.

Websearch

[1] https://www.utwente.nl/en/news/!/2017/3/313543/electronic-energy-meters-false-readings-almost-six-times-higher-than-actual-energy-consumption

[2] www.beama.org.uk/news/beama-response-to-ieee-article-on-accuracy-of-dutch-electricity-meters.html

[3] https://en.wikipedia.org/wiki/Rogowski_coil

Dr David Lauder, G0SNO
emc.radcom@rsgb.org.uk

Mills on the Air (MOTA) 2017

In May each year, radio amateurs set up stations in windmills and watermills all over the country. The event promotes both the site itself and amateur radio since members of the public encounter the enthusiasts at work. The event is organised in conjunction with the Society for the Protection of Ancient Buildings.

Furness ARS operated GB2GW from Gleaston Watermill in Gleaston village, South Cumbria, owned by Mike, G8ALE.

Furness ARS operated GB2GW from Gleaston Watermill in Gleaston village, South Cumbria, owned by Mike, G8ALE. A large delta lop antenna is installed at the location and the club's recently purchased IC-7300 had its first official outing.

Unfortunately 40m band conditions on the 13th were so poor that only one QSO was made until 2pm when the band slowly started to improve, but remained unstable. Thanks to the persistence of Tom, M6NER, Jim, M0KYL and Mark, M6ZVD, the score reached the dizzy heights of 19 QSOs for day 1. All stations worked remarked on the poor conditions and the difficulty of making contacts.

Sunday wasn't much better, but there was an improvement. The first QSO was shortly before 10am, but progress was slow with deep QSB. During the morning an early afternoon the QSO count moved from 19 to a final of 54 (including 11 other Mill stations, considerably fewer than previous occasions).

As always, thanks to those who took part for all the effort over the weekend.

Chris, M0KPW

South Essex ARS (SEARS) were active using GB2RWM from Rayleigh Windmill. We had 26 contacts on CW, including a contact with Japan and one contact on SSB.

The 2m station was extremely busy with 62 contacts, partly due to SEARS linking with two other local windmill stations (Upminster and Meopham), allowing locals to make contact with three MOTA stations on the same frequency. There was lots of interest from the public, including training and membership. With plenty of support from members, a good time was had by all.

Pete, M0PSX

Harlow & District ARS operated GB0TWM from Thaxted windmill in Essex. The site is 300ft ASL and the mobile tower put the aerials up another 45 feet. We operated on 2, 80, 40 and 20m using a 2, 6 and 70 vertical and a G5RV and tri band beam and using FM SSB and some digital modes. The radios were Icom IC-746, Yaesu FT-857D and an Icom IC-7300.

Band conditions were reasonably good and the first contact was to break a pile up into Brazil on 20m with a 59 signal report. In total we made over 350 contacts over the 2 days, many with other Mills stations. HADARS would like to thank Thaxted Parish Council for their hospitality and allowing us to use their site.

Paul, M6PMX and Alistair of Braintree & District ARS, at Alderford Watermill, Sible Hedingham.

Paul, M6PMX, a new member at Braintree & District ARS, can be seen (right) with a prospective member, Alistair, having helped to install the Carolina Windom and VHF collinear at Alderford Watermill, Sible Hedingham. A total of 54 contacts, including 14 Mills, were made on the 80, 40 and 2m bands by six operators.

Geoff, G1WRH

Bangor & District ARS operated from Ballycopeland Windmill, Donaghadee and managed to make plenty of contacts on the HF bands over the weekend.

Blackwood & District ARS operated HF at a 19th century water mill. Propagation was good on the Saturday but poor on Sunday. Unfortunately, Mike, GW4JKV managed to bump and cut his head on a wooden beam in the attic space and had to go to hospital. Operators included Rob, MW0CVT, Andy, MW0MWZ, Andrew, MW0HYV, Mark, MW0MAU and Neil, GW7VQD.

Members of Stevenage & District ARS ran GB6CW from Cromer Windmill, Ardeley, near Stevenage. It was built in 1681 and is the last remaining post mill in Hertfordshire. It now belongs to Hertfordshire Building Preservation Trust Ltd.

Stevenage & District ARS ran GB6CW from Cromer Windmill, Ardeley, near Stevenage. It was built in 1681 and is the last remaining post mill in Hertfordshire.

On Friday afternoon, Ron, G4DDX; Martin, G0NJS; Paul, G8WWI; Adrian, M0ABY and Rob, G2BKZ, with the help of Robin Webb, one of the guides, erected an 80m inverted V on the sails of the windmill. With the 'Armstrong' method, Paul heaved the sails round until our aerial was top-wards.

Using a TS-570D, Adonis mic and a beefy analogue power supply, the best conditions were the morning and late afternoons on 40 and 80m both days. There were quite a few visitors to the windmill who were very inquisitive and asked questions. Paul was very willing to explain in layman's terms.

Due to the poor conditions, we only made 85 contacts. Thanks to all who took time out to call us and their patience as we tried to winkle them out of the high noise level at Cromer Windmill.

Rob, G2BKZ

South Bristol ARC took part at Saltford Brass Mill. The photo shows part of Sunday's operating team. Left to right are SWL SWL and Mark, M0SKV (photo by G7KNA).

Andy, G7KNA

Huntingdonshire ARS activated Duloe Tower Mill, Eaton Socon using GB2DWM. Operating from the grounds of the mill, by kind permission of the owners, we set up our dome tent that provides enough room for two stations to operate comfortably. We operated on HF and VHF, although due to the band conditions HF was somewhat of a challenge at times. We did log 200 calls with contacts from all over the UK, most of the European countries, Switzerland, Bavaria, Ukraine, Russia, Hungary, Slovenia and Bulgaria. Best DX on Saturday afternoon was Abu Dhabi with A61FK running 700 watts into his 6 element beam, not bad at 3,461 miles distance.

Part of South Bristol ARC's Sunday team at Saltford Brass Mill: SWL Ken (left) and Mark, M0SKV.

Sunday was a much quieter day with QSOs taking longer due to the fading and more interest in the exchange of the station information. We found that putting the operating frequency onto QRZ.com helped others locate us in the bands and regularly updating when we looked around the frequencies.

Thanks to the dedicated team who assisted during the weekend, even if it was only to make the refreshments! Putting up and de-rigging of the station only takes about an hour each time as we have got it down to a tee now.

David, 2E0DIP

With a weather report promising wind and rain, it did not bode well for Nunsfield House ARG (NHARG) wanting to transmit from a windmill on a hill in Derbyshire. NHARG has been transmitting from Heage Windmill since 2003 using GB5HW. This year they had a number of new members on the radios as well as the long time members.

The weather steadily improved and by 2.30pm on the Sunday, there had been 25 stations contacted on 2m. The group operated on 2m, 20m, 40m and 80m and although band conditions were not ideal, we did manage to contact 12 Mills. The best contact over the weekend was made by Connor, M6HZH, who managed to get all the way to Russia. The group

Elaine Richards, G4LFM
radcom@rsgb.org.uk

Nunsfield House ARG transmitting from Heage Windmill using GB5HW. 107 contacts were made over the weekend.

Norfolk Coast ARS participated next to a windmill in East Runton in North Norfolk.

would like to thank all of their 107 contacts over the weekend who all took the time to give full reports. It really was appreciated.

The station used an FT-736-R, TS-8870 with wire dipoles and R5 and tri-band collinear. The operators were Ken, G3OCA, Pete, G6KUI, Paul, G1SGZ Ken, G0JKC, Derry, 2E0RRF, Stefan, 2E0VKM, Nigel, M6ISK, Lyndsay, M6YMB and Connor, M6HZH. We would like to thank the Heage Windmill Society and the Friends of Heage Windmill for their years of hospitality. It was spectacular – see the photo at the top of the page.

Paul, G1SGZ

Norfolk Coast ARS participated at the QTH of Steve, G3PND, which conveniently adjoins a windmill in the village of East Runton in North Norfolk. The plan was to operate three stations under the GB2ERW call.

The main antenna was a 132' end fed half wave hoisted directly from the event shack to the top of the mill. The other two antennas were 20m and 40m dipoles. Initially there were problems with QRM between the stations, but ultimately it was found that the best combination was to operate SSB on 40m and CW on 20m and 30m.

Twelve other mill stations were worked – all on 40m SSB – and a large number of other QSO were made by the two CW stations. A highly successful radio day was rounded off with a barbecue. The photo overleaf shows Bob, G4XQW (closest), Arthur, M0VAW and Miles, G4FCZ.

Steve, G3PND

Peterborough & District ARC operated from Sacrewell Water Mill, about 5 miles west of Peterborough. The station was set up by the Visitors Centre entrance on the 11th. The HF station was an TS-590sg into an offset dipole at 26ft and the VHF station operated both FM and SSB, although SSB seemed fairly fruitless. The 13th was the best day, despite thundery outbreaks and changing propagation on 7MHz. The small band of willing operators/loggers managed a total of 78 contacts, 13 of which were Mills, in 14 other countries. Our thanks go to the management of Sacrewell Mill who made us so welcome and looked after us so well.

Tony, G0IAG

Andersons Mill is the first Australian Mill to join Mills on the Air. The full story of how Cheryl and Alan just moved to a house close to the mill many years ago and fell in love with it can be read at https://tinyurl.com/yahn8o3a

Cheryl and Alan, alongside the National Trust, Parks Victoria and many local organisations, organised an Andersons Mill Heritage Weekend where traditional crafts would be demonstrated and the mill would be open to the public. Being from England (G8HIM) and a Member of the RSGB, I knew something about Mills On The Air and via a roundabout route (Tony, GM0GFL and Peter, VK3CC) I was invited to join along with any other club members I could gather together.

It was an 8am start at the site on the 13th but as we are nine hours ahead of UK time we were not in a hurry. On-air conditions were poor and our operators were hard pressed to get contacts using VK3BI but they persevered all day and into the evening mainly on 40m and 20m.

We also had a lot of visits from members of the local radio clubs. By Sunday I had a WSPR setup going with an FT-817 and I was able to demonstrate my new KiwiSDR to the visiting public. By the end of the weekend I already had three email enquiries for more information. All this time the radio team were making contacts and demonstrating radio communication to a continuous stream of visitors.

Tony, VK3KKP & G8HIM

Full details on the radio side of National Mills Weekend (organised by Denby Dale ARC) are at www.mills-on-the-air.net

MyDEL SWR and power meters

PHOTO 1: The MyDEL SWR-001 and SWR-006.

PHOTO 2: Back panels of the the MyDEL SWR-001 and SWR-006.

If you are looking at budget SWR/power meters for the amateur market, what can you expect?

There are numerous SWR and power meters on the amateur market, with some models costing a great deal more then others. In this review I will be looking at two models from MyDEL – the SWR-001 and SWR-006 (**Photo 1**). They don't do exactly the same as one another, so when writing this review I did not set out to identify which is best.

Description

Both models are single meter units in similar housings, the front panel being plastic and the remainder steel. They are packaged in identical cartons, except for a stick-on dot to identify the model number. Inside the carton the packaging is good – a moulded polystyrene tray with a flat polystyrene topper. The meters themselves come in polythene bags and there's an instruction/specification leaflet that covers all the models in the range. A 30-inch long 12V DC power cable is also supplied, but a power supply is not. External power is not required to operate the instruments themselves but to light the meter and in the case of the SWR-006 to indicate which sensor is in use.

As **Photo 1** shows, the labelling on the units is clear and unambiguous. The SWR-001 is rated to work from 1.6MHz to 60MHz with a single sensor. The SWR-006 is rated to work from 1.8MHz to 512MHz, but to do this it uses two sensors. Either sensor can be used for the 2m band. At the back of each unit (**Photo 2**) there are 'UHF' sockets for connection to the transmitter(s) and antenna(s). On the SWR-006 there are four sockets (two for each sensor) and a slide switch to select which one is in use. There is also a socket for an external 12V DC supply. Each model can read a variety of maximum powers and display both average and peak power, a capacitor being used to provide a suitable time constant. Underneath the power meters are four feet. The front two are plastic, being part of the front panel moulding, while the back two are rubber and screwed on.

Although it is commonplace to find so-called UHF connectors in use at UHF, the original specification for them was for use up to only 300MHz. Officially, the socket is called the SO239, while the plug is the PL259. Personally I avoid using them at UHF, but I accept they are the coaxial connector of choice for innumerable equipment manufacturers. That said, there are different quality plugs and sockets. The best quality connectors contain PTFE as the insulating material, but that's expensive. Being budget instruments, the insulating material of the SWR-001 and SWR-006 sockets isn't PTFE.

Inside the SWR-001 (**Photo 3**) is a small PCB, which has the front panel switches and three calibration potentiometers soldered to it. Due to the construction of the unit the pickup module (**Photo 4**) can only be examined from one side.

There's more to see inside the SWR-006 (**Photo 5**). The main PCB is the same, but it has six preset potentiometers. There's also a second, small PCB at the back of the instrument, fixed to the slide switch that selects which sensor is in use. It has two preset potentiometers. In this model both pickup modules can be accessed more freely. The HF-VHF pickup is shown in **Photo 6** and **Photo 7**, while the VHF-UHF pickup is shown in **Photo 8** and **Photo 9**.

Tests

Operation of these instruments is the same as innumerable SWR / power meters and

doesn't warrant an explanation here. This review is not intended as a tutorial about how to use an SWR/power meter.

I tested the SWR-001 in conjunction with a 200 watt HF-6m transmitter plus 1kW amplifier with digital power meter into a Bendix 636C dummy load. The dummy load is rated from DC to 3GHz, so it is safe to assume it presents a uniform 50-ohm non-reactive load across the ranges of the instruments under test. Measurements into the dummy load without either of the test instruments in circuit certainly suggest that to be the case, with no appreciable returned power.

From 1.8MHz to 50MHz the test routine for the SWR-006 was basically the same, but without the amplifier. Additionally, a 2m/70cm FM transceiver was used.

SWR-001

As **Table 1** shows, the SWR performance on all bands from 80m up was pretty good, indeed on the HF/6m bands it was excellent. Only on 160m was it no-so-good. As regards power measurements, I don't have laboratory grade equipment, so the figures given in **Table 2** should be seen as a guide rather than absolute. What I would say is that this instrument read a bit high on the 30W range, but it was pretty good (ie within the 10% rated accuracy) on the 300W and 3kW ranges. The sensitivity declined as frequency increased above 14MHz, but only by a little.

SWR-006

As **Table 3** shows, the SWR performance was good. A little reverse power was observed on the upper HF bands, but really nothing to worry about. As I said previously I don't have laboratory grade power measuring equipment, so the figures given in **Table 4** should be seen as a guide rather than absolute. What I would say is that this instrument was generous in its readings on the 5W range, slightly high on the 20W range and excellent on the 200W range. When using the VHF-UHF sensor the SWR readings were excellent, but the power readings were low on 70cm.

Distinct similarities

The MyDEL SWR-001 and SWR-006 are badge engineered. For those unfamiliar with this term, it means similar or identical models are available from different companies, despite all of them having been (presumably) produced in the same factory.

The SWR-001 seems to be the same as the Avair AV-400 (which has two iterations for the same model number, with different switches), the Diamond SX-100 and the Sharman SWR-001. The Avair AV-200 and AV-201 are similar, but lower power. The Avair AV-200 and AV-201 are basically the same, but the model number was changed when the switches were changed.

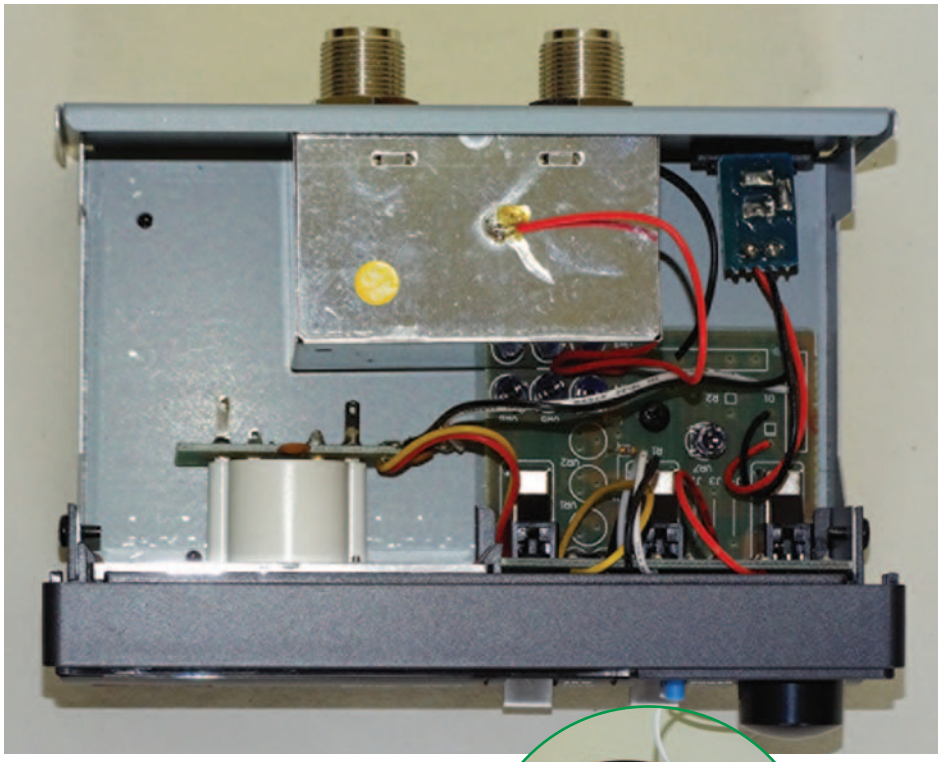


PHOTO 3: Inside view of the SWR-001.

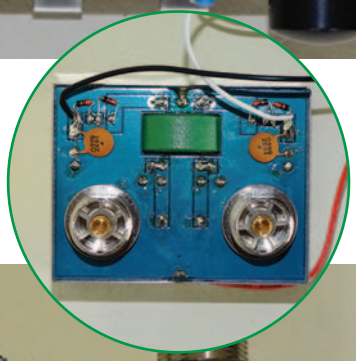


PHOTO 4: SWR-001 detector module.

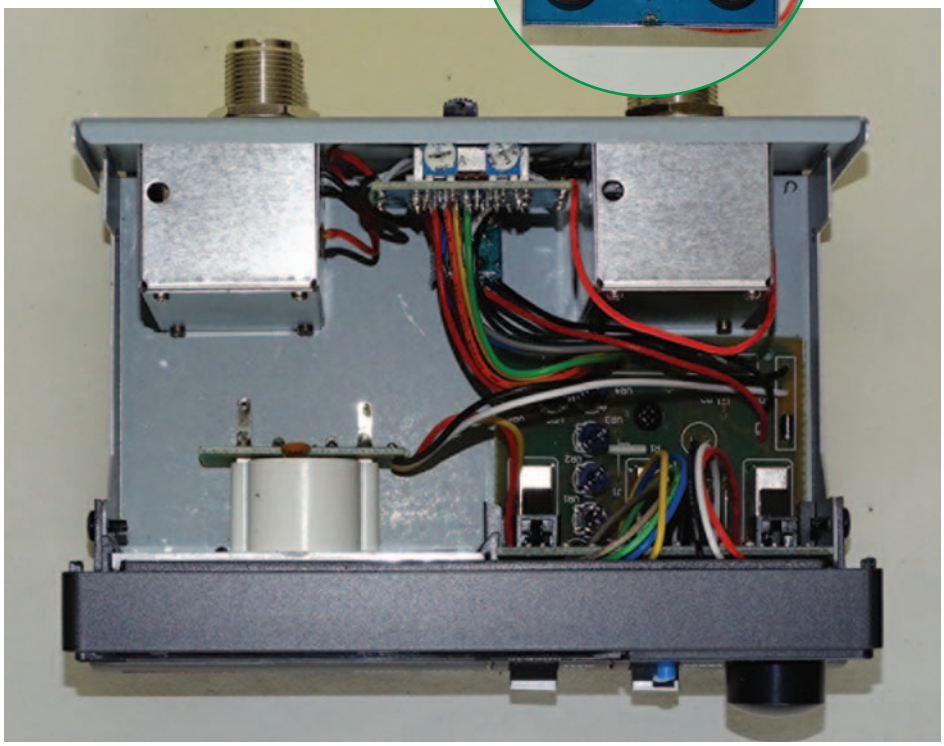


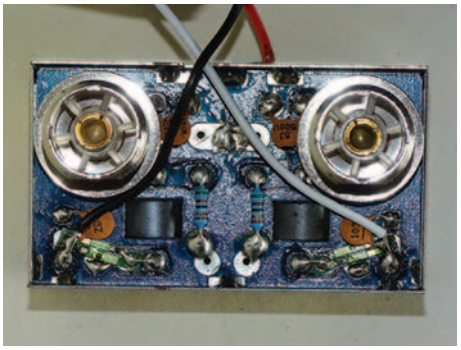
PHOTO 5: Inside view of the SWR-006.

Steve White, G3ZVW
steve.g3zvw@gmail.com

It's the same story when we come to the SWR-006, which to me looks to have exactly the same functionality and ratings as the Maas RS-600 (slide switches), Avair AV-600 and Midland Alan KW-520 (once again two different switch types on the same model).

The Sharman SWR-004, Diamond SX-400 and Avair AV-400 look to be single sensor versions of the SWR-006 (but intended only for VHF-UHF).

Martin tells me that the models with the flip switches are more reliable than the models with the slide switches.



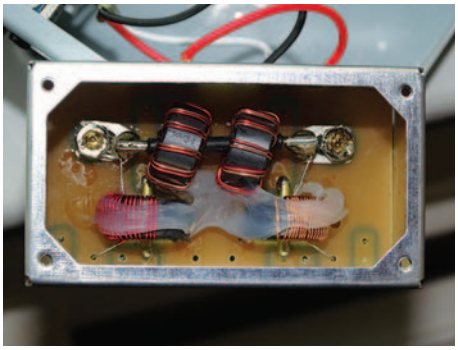
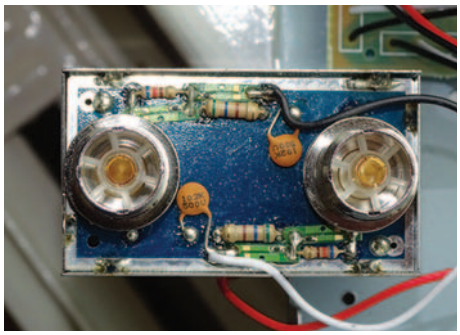


PHOTO 6 and PHOTO 7: SWR-006 HF-2m detector module front and back.

Conclusion

These everyday instruments each performed adequately. They aren't laboratory grade or promoted as such, so don't expect either to measure with absolute accuracy. As Martin himself said to me; "At the end of the day you get what you pay for. If you want better, pay more money." My only *real* criticism is of the power readings of the SWR-006 on 70cm. Each instrument provided an indication of output power and SWR that will be good enough for most people, ie if something is wrong with your transmitter or antenna these instruments will certainly show you. Personally I wouldn't ever try to put 3 kilowatts through the SWR-001 or any similar instrument.



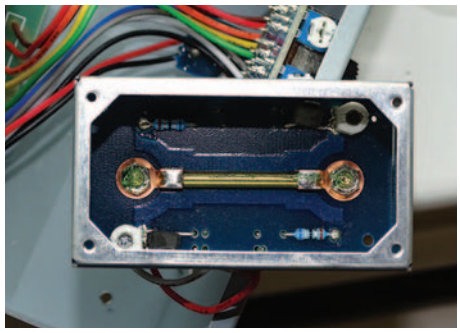


PHOTO 8 and PHOTO 9: SWR-006 2m-70cm detector module front and back.

I would like to thank Martin Lynch & Sons for the review samples and Martin for alerting me to the change in switch types in the various models.

The specifications are shown in **Table 5** and both models are available from stock from ML&S, with the price of the SWR-001 being £44.95 and the SWR-006 being £69.95.

TABLE 1: SWR-001 SWR readings, running 100W into a dummy load.

Band (m)	SWR
1.8	1.35
3.5	1.15
7	1.10
10	1.05
14	1.02
18	1.0
21	1.0
28	1.0
50	1.0

TABLE 2: Power readings of the SWR-001.

Band (m)	Tx Power	Indicated power (Range = 30/300/3kW)
1.8	20/200/1000	24/195/1000
3.5	20/200/1000	25/195/1000
7	20/200/1000	25/200/1000
10	20/200/1000	25/200/1000
14	20/200/1000	25/200/1000
18	20/200/1000	25/195/980
21	20/200/1000	24/190/950
28	20/200/1000	24/185/950
50	20/200/1000	23/185/940

TABLE 3: SWR-006 SWR readings.
Italics = VHF/UHF sensor.

Band (m)	SWR (Sensor = HF-VHF/VHF-UHF)
1.8	1.0/*
3.5	1.0/*
7	1.02/*
10	1.05/*
14	1.08/*
18	1.1/*
21	1.11/*
28	1.12/*
50	1.03/*
144	1.0/*1.0*
432	**/1.0*

* not rated

TABLE 4: Power readings of the SWR-006.
Italics = VHF/UHF sensor.

Band (m)	Tx power	Indicated power (Range = 5/20/200W)
1.8	5/20/200	7/22/205
3.5	5/20/200	7/22/200
7	5/20/200	7/22/200
10	5/20/200	7/22/200
14	5/20/200	6/22/200
18	5/20/200	6/22/200
21	5/20/200	6/22/192
28	5/20/200	6/22/190
50	5/20/200	6/21/190
144	5/20	5.5/20
144	*5/20*	*5/19*
432	*5/20*	*3/15*

TABLE 5: Specifications for the SWR-001 and SWR-006.

	SWR-001	SWR-006
Power ranges	30W/300W/3kW*	5W/20W/200W
Minimum power	3W	1W (HF-VHF) 4W (VHF-UHF)
Frequency range(s)	1.6-60MHz	1.8-160MHz, 140-512MHz
Average and peak?	Yes	Yes
Connectors	'UHF' (2)	'UHF' (4)
Accuracy	+/- 10%	+/- 10%
Insertion loss	0.1dB	0.2dB (HF-VHF) 0.3dB (VHF-UHF)
Dimensions	155 x 63 x 103mm	155 x 63 x 103mm
Weight	640g	720g

* Intermittent rating

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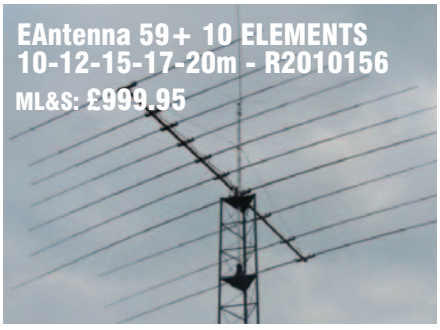

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R2010013	dbz40 double bazooka 7mhz wire antenna	£54.95
R2010048	ea1015204080dxs 5 band HF dipole	£119.95
R2010904	5 band cobweb 500W antenna	£284.95
R20109043	5 band cobweb 3kw antenna	£369.95
R2010050	ea101520dx dipole 3band HF dipole	£72.95

Feature

RSGB Convention 13-15 October

We're delighted to announce that the speaker for the Saturday night dinner will be Bob Beebe, GU4YOX. Bob is widely known in the HF contest community as the GU multiplier, particularly on 160m. Bob is a keen DXer and contester, holds all the GU Single Band High Power CQWW CW records and has been on several of the Five Star DX Association trips including D68C, 3B9C and T32C. He has also operated from several other locations as holiday style trips. He is a member of the Chiltern DX Club, FOC, Legacy Circle Member of ARRL and the RSGB.

Bob is always happy to tell some great anecdotal stories relating to the funnier side of radio. Indeed, on the Five Star trips, Bob is known as the unofficial 'entertainment king'! After hot footing it back from entertaining 700+ guests at the International DX Convention gala dinner in Visalia, California in April, we are delighted that you will be entertained by Bob and we all hope you enjoy Bob's talk and join in with the fun that is *... The Funny side of Radio! ...*

In addition to the talks listed in last month's *RadCom* we have confirmed the following presentations that cater for the beginner, the expert, and all those in between.

Getting started in Summits on the Air (SOTA) by Michael Sansom, G0POT. Michael will give an introduction to the Summits on the Air scheme looking at the tools, techniques and equipment for both Chasers and Activators. Whether you enjoy operating from a nice warm shack or relish the challenge of climbing mountains and operating portable, SOTA has something for you.

A Review of Antipodal Propagation. Carl, K9LA will review observations of antipodal propagation by amateur radio operators. He will follow this up with a review of papers in the scientific literature about antipodal propagation, and will take a general look at propagation to the antipode using *VOACAP*.

***FreeDV* – Digital Voice for HF and other low SNR channels.** Since the beginning of this year, the RSGB GB2RS News has been broadcast on 80m in *FreeDV* an experimental digital mode aimed to perform better than SSB voice in difficult radio environments. This talk by G6WPJ presents information on *FreeDV*; what it is, how and why is it being developed by a worldwide community of radio amateurs and how can amateurs can try it for themselves. An emphasis will be placed on practical ideas to become active.

As part of the AMSAT offering Kenneth Ransom, N5NVO (the International Space Station Ham Radio Project Co-ordinator at NASA Johnson Space Center) will tell you **"Everything you wanted to know about ARISS"** Kenneth will host a question and answer session on ARISS, the coordination that is required to manage the ARISS program and the complexities of operating in manned space projects.

Booking for the event is open and you can book everything from the whole weekend to a single day ticket, for details go to www.rsgb.org/convention.

National Hamfest

29 & 30 September

Arrangements for the UK's largest exhibition and gathering of amateur radio enthusiasts are well advanced. The planning for each year's event starts immediately following the previous event and work goes on all year. The team take account of comments to ensure that the show builds on the success of previous events.

Almost anything you could want for any aspect of the hobby will be on display. Many local amateur radio clubs will be present and can provide information on their meetings, training courses and other activities. The RSGB will be represented by many of the specialist committees who will be able to provide advice or information on many aspects including planning, training, licensing, interference, examinations and many others.

In addition to the exhibitors, you will find the café and licensed bar where there are plenty of tables and chairs to sit down and relax for a chat with a drink, a snack, or one of the diverse range of meals on offer.

The winners of the Club of the Year, sponsored by Waters and Stanton, will be announced and prizes awarded during the National Hamfest.

Following comments from last year, some changes to the layout of the flea market will be made this year to improve access. The outside area provides low cost table space for selling your personal excess equipment and junk. With 3000+ visitors expected, the flea market is always popular and early booking is recommended. Participants in the flea market can have up to three tables each, which will allow the maximum number of people the opportunity of clearing their shack or shed.

If you do not wish to sell items yourself then the large Bring & Buy stall will look after the sale for a small commission. It will be open from 9.30am each day and it is located in the marquee immediately outside the George Stephenson Hall.

Camping is available but *must* be pre-booked and paid for in advance using the downloadable form; there is *no* 'turn up and pay' facility.

Advance entrance tickets (ensuring fast track entry to the event), flea market bookings, camping passes are available online from early July. Details of club stand bookings are also provided online – please consult the Hamfest website: www.nationalhamfest.org.uk

We depend upon the help of many amateur radio clubs and societies to make the event a success. This year we are indebted to Camb-Hams, VMARS and the local radio clubs in Region 13: Lincoln Shortwave Club, Waddington RAF ARS, Grantham ARS, Spalding ARS and Thorpe Camp ARS for their help in the preparation and running of the event.

Finally, we are already planning to do it all again next year. Please let us have your comments and we shall do our best to satisfy your request for the next event.

Ian Shepherd, G4EVK
(Chair, National Hamfest)

National Hamfest

Friday 29th September & Saturday 30th September 2017

Britain's BIGGEST amateur radio event!

Show Highlights

- RSGB book stand
- RSGB committee stands
- Free parking
- Manufacturers stands
- International traders
- Club stands
- Special Interest Groups
- "Bring and Buy" stand
- Amateur radio car boot

Organised by

www.nationalhamfest.org.uk

George Stephenson Pavilion, Newark & Nottingham Showground, Lincoln Road, Winthorpe, Newark NG24 2NY

South Kesteven ARS goes portable

Inspired by some excellent talks by David, G6ENN (operating portable and taking part in Summits on the Air) and Dave, G4IAR (the popular Worked All Britain award scheme), members of the club have been busy during the past few months with many portable activations around the country.

Portable in Scotland

Andrew, M0NRD visited the Isles of Cumbrae and Arran, activating Worked All Britain squares on HF as well as hiking with a dual band 'flower-pot' antenna working several SOTA stations in Scotland. He also took part in the 144MHz UK Activity Contest using a Sandpiper Delta Quad Beam and was made very welcome on air by the local operators.

While on Arran, Andrew also met Joachim, DH5JBR who was operating as an IOTA activator station inside a bus shelter near the Lochranza Ferry Port as part of his 30 islands in 30 days challenge.

Portable in Lincolnshire

Mick, G7TGL, Darren, M0PYU and Adam, M6OLT took a trip up to the Lincolnshire Wolds activating Normanby Top (IO93UK at 500ft+) using FM and SSB on 2m plus SSB 10m alongside a G5RV mini antenna for 40 and 20m, resulting in some great contacts across Europe and into the Middle East with QSOs into Finland, Sardinia and The Lebanon amongst others. They all say it was a great learning experience setting up the tripod for use with the four antennas; (a) Diamond SE300 Collinear (b) Diamond 10 element 70cm beam (c) Moonraker 7 element ZL Special 2m beam (d) Homebrew 10m dipole along with a G5RV mini setup on a 10m SOTA pole.

Using the club call MX0SKR, Darren, M0PYU and Adam, M6OLT activated Holme Moss using the car park next to the antenna (IO93BM at 1700ft+) working 2m SSB and the 40m/20m/10m HF bands using the beams / tripod setup and a G5RV mini attached to a 10m SOTA pole bound to a fence post. The location was very open to the wind and proved challenging during both setup and operation. Lots of inter-G contacts resulted, ranging from Scotland and the Isles, Northern Ireland and across England to the South West.

Joachim, DH5JBR operating as an IOTA activator at the Lochranza bus stop.

Darren, M0PYU's tripod antenna setup.

SKARS

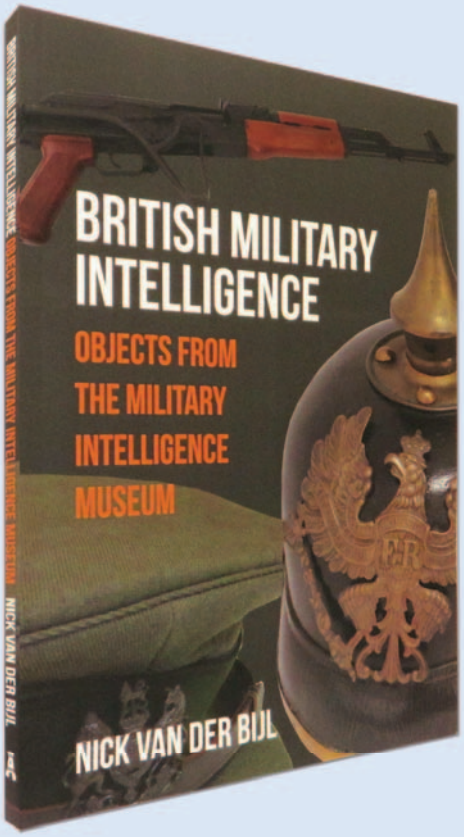
South Kesteven Amateur Radio Society meets the first and third Friday each month at the ATC Squadron, Triggs Yard, Watergate, Grantham. On Wednesday the club net is on the Grantham 70cm repeater, GB3GR, from 8pm. Please feel free to join in, all are welcome.

Andrew, M0NRD operating portable on Arran.

Holme Moss

Holme Moss transmitting station was built by British Insulated Callender's Construction Ltd on Holme Moss and became the BBC's third public television transmitter, launched on 12 October 1951. This operated on the 405 line VHF system, with black and white transmissions originally on British System A, Channel 2, with vision 51.75MHz, 45kW and sound 48.25MHz, 12kW. The mast survived until the end of the Band I TV broadcasts in 1985, with a replacement mast being constructed, adjacent, in 1984. The site is now owned and operated by Arqiva. The base of the station is 1719ft above sea level and the mast another 750ft on top of that.

NEW TITLE



British Military Intelligence

Objects from the Military Intelligence Museum

By Nick van Der Bijl

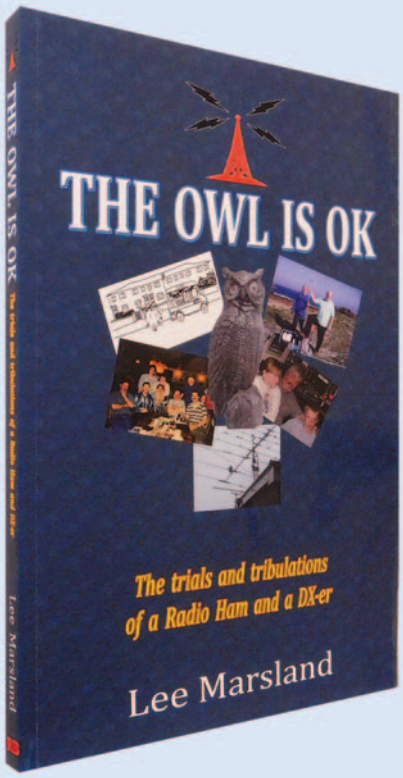
One of the little known museums of the UK is the Military Intelligence Museum at Chicksands in Bedfordshire. This museum provides a huge insight into British intelligence activity since Wellington's time and this new book provides a unique look at its fascinating collection.

Through a mix of medals, photographs and documents, the book tells the story of British military intelligence across the years. This collection includes a Boer War photographic stereoscope and uniforms worn by intelligence officers and other ranks during the First World War. Among the Second World War objects, are a highest gallantry medal awarded to a British officer by France, items that belonged to a founder of the Long Range Desert Group, an example of a pigeon coop used to deliver pigeons in Occupied Europe, a chess set used by captured Special Operations Executive operatives in Buchenwald concentration camp and copies of forged rations coupons dropped into Germany as part of Psychological Warfare Executive operations.

There are over 180 photographs and illustrations included and the varied nature of these objects illuminates a feature of British military operations that is rarely discussed, despite having been frequently proven to be crucial to their success. *British Military Intelligence* provides a great read and is thoroughly recommended to anyone interested in the UK's clandestine history.

Size: 165 x 234mm, 96 pages
ISBN: 9781 4456 6238 1
Non Members' Price: £14.99
RSGB Members' Price: £11.24

25% OFF



The Owl is OK

The trials and tribulations of a Radio Ham and a DX-er

By Lee Marsland, G0DBE

For over 30 years Lee Marsland has been a licensed radio amateur. In that time and in 'his own words', there have been plenty of 'trials and tribulations'. Lee brings to this book a light hearted look at how his hobby has become more of a way of life that defines him today.

Lee describes from his first experiences taking the Radio Amateurs Examination run by the City & Guilds through how he gained his Morse certificate, set up his stations, erected towers and even in more recent times encouraged his grandchildren to take and pass their own amateur radio examinations. The book is full of humorous anecdotes from Lee's life including the tale of the title that concerns RSPCA officer taking Lee to task about cruelty to his owl despite it being made of plastic. This book covers a great deal and there is even a chapter titled 'purple rain' that describes the advisability of putting a 57 foot antenna over the wife's washing line. There are the more usual descriptions of Lee's DX activity and the whole book is illustrated with cartoons and images.

Lee has written this book in an easy to read style that really brings over his Liverpool heritage. His tale of becoming a radio amateur and its challenges is a great read that provides many a chuckle.

Size: 150 x 229mm, 180 pages,
ISBN: 9781 9101 93372
Non Members' Price: £9.99,
RSGB Members' Price: £8.49

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

Work the World with *WSJT-X*

Part 2: Codes, modes and cooperative software development

Here's how the weak-signal digital protocols in *WSJT-X* work, together with an overview of how their software is developed.

Part 1 of this two-part article appeared last month [14], covering topics that highlight the capabilities of weak-signal communication program *WSJT-X*. This software package provides tools for a wide range of amateur radio activities including low-power DXing, meteor scatter, moonbounce and precise frequency measurement – all of them possible with relatively modest station equipment. Based on modern communication and information theory, the *WSJT-X* protocols and software boost your signal's effective reach by the rough equivalent of 10 to 15dB of added signal strength.

We begin this concluding second part by outlining some fundamentals of digital communication theory. We include examples that we hope will make the discussion accessible to most amateurs. We then describe and compare the seven weak-signal protocols in *WSJT-X* and explain how their impressive performance is achieved. Finally, we describe the tools and informal cooperative practices used for creating the *WSJT-X* software. In this era of rapidly advancing software defined radio (SDR) technology, in which good communication engineering generally involves both hardware and software, we think it's important to the health of amateur radio that some dedicated enthusiasts devote some of their algorithmic and programming skills and interests to the good of the hobby. We have found that many other radio amateurs – probably a majority of those using the tools we have created – would like to have a deeper understanding of how these weak-signal protocols work, and how they were developed. We hope this article will help to satisfy that desire.

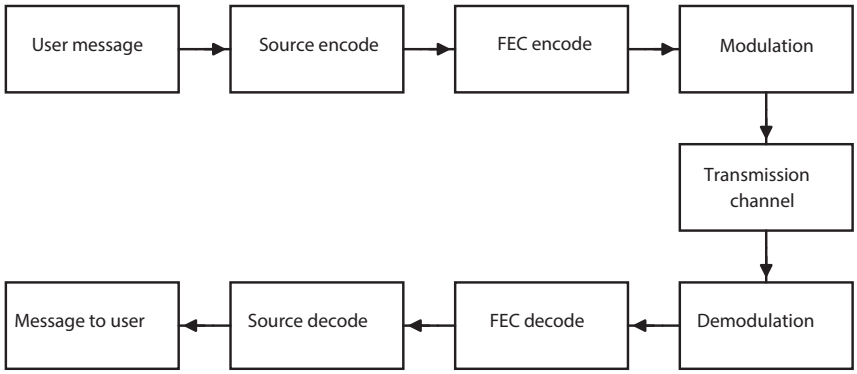


FIGURE 9: Block diagram showing steps in a typical digital communication process.

Digital communication fundamentals

Digital communication conveys information in digital form from an originating source to one or more destinations. In the case of interest here the digital information is modulated onto a carrier and the actual transfer takes place over a radio channel. The basic unit of transmitted data is called a *channel symbol*. The modulator may transmit m information bits in each symbol, using 2^m different waveforms to represent symbol values from 0 up to 2^m-1. The different waveforms might have distinct amplitudes, phases, frequencies, or even shapes. By design the *WSJT-X* waveforms all maintain constant amplitudes. The MSK144 protocol uses offset quadrature phase-shift keying (OQPSK) with waveforms shaped so as to maintain a constant envelope, while all other modes use a different tone frequency to represent each of the allowed symbol values. Binary modulation implies transmitting one bit at a time, ie, $m = 1$. As spelled out in more detail below, modulation schemes with larger m are used to advantage in all but one of the *WSJT-X* modes.

Important benefits can be gained by adding controlled redundancy to a digital message so that transmission errors can be recognised and corrected. A trivial form of redundancy might involve the simple repetition of each symbol, say three or more times. But much more powerful redundancy can be arranged by mapping each sequence of k message symbols in a controlled way into a unique and longer sequence of n symbols called a *codeword*. This technique is called Forward Error Correction (FEC). The *WSJT-X* protocols use *block codes* in which the values of n and k are fixed; the codes are conventionally labelled as (n, k) codes. An integer parameter q can be used to define the range of available symbol values for a code, analogous to the m we used for modulation schemes. Parameter $Q = 2^q$ is then referred to as the *alphabet size* of the code. The code's symbol values range from 0 up to $Q - 1$, and each codeword conveys kq message bits. The amount of redundancy is characterised by the ratio n/k, and its reciprocal k/n is referred to as the *code rate*. We note that the mathematics underlying the design of such k-to-n mapping schemes and their corresponding n-to-k reverse transformations forms a major branch of modern communication theory.

Reception of transmitted symbols requires accurate synchronisation of time and frequency between transmitting and receiving stations. To make this possible with typical amateur station equipment, each *WSJT-X* protocol includes a unique synchronising pattern: a sequence of known information interspersed with the message-carrying symbols. The software demodulation algorithm starts by looking for the known pattern, thereby determining any frequency and time offset as well as the locations of boundaries between received symbols.

As a specific example, the JT65 mode uses a (63, 12) code with $q = 6$ and thus $Q = 2^q = 64$; its code rate is $k/n = 0.19$, and its modulation uses $m = 6$ and thus $2^m = 64$-tone frequency-shift keying, with one additional tone used for synchronisation.

As an aid to understanding we divide the overall process of transmission and reception into a sequence of independent steps, as shown in **Figure 9**. The steps correspond roughly to

identifiable blocks of the *WSJT-X* source code. In the list below steps 1 – 5 are at the transmitting station, steps 6 – 9 take place at the receiving end:

1 Generate a message
2 Compress message to *k* symbols of *q* bits per symbol
3 Add error-correcting redundancy to produce codeword of *n* symbols
4 Add synchronising pattern and modulate onto a carrier
5 Transmit modulated waveform over a radio channel
6 Receive, synchronise, and demodulate to yield *n* symbols, some of which might be in error
7 Decode *n* received symbols to recover *k* error-free message symbols
8 Decompress *k* symbols to recover original message in human-readable form
9 Deliver message to receiving user.

Every step in the sequence is important, but arguably the most crucial parts are those in steps 3 and 7. Step 7 is likely to be the one requiring the most computational resources, and is discussed in more detail below.

When developing a protocol we want to choose an efficient code that maximises the probability of recovering transmitted messages even when the received codeword is corrupted. It's also important to consider likely types of fading, Doppler spread, and interference that may occur on the targeted propagation paths. We need an efficient decoding algorithm that can be executed in reasonable computing time and will ensure that false decodes are rare.

The *WSJT-X* protocols

Message Structure. Steps 2 and 8 in our sequential list involve lossless compression and decompression of data. This process is called *source encoding* the message. *WSJT-X* protocols JT4, JT9, JT65, QRA64 and MSK144 all use structured messages that source-encode human-readable information for basic QSOs into packets of exactly $kq=72$ bits. The packets contain two 28-bit fields normally used for callsigns and a 15-bit field for a grid locator, signal report, acknowledgment, or 73. One additional bit is used to flag packets encoding arbitrary alphanumeric text, up to 13 characters. Special cases allow other information such as add-on callsign prefixes (for example, ZA/KA2ABC) or suffixes (G9XYZ/P) to be encoded efficiently. The essential aim is to compress the most common messages used for minimal QSOs into fixed-length 72-bit packets.

Why 28 bits for a callsign, and 15 for a grid locator? A standard amateur callsign consists of a one- or two-character prefix, at least one of which must be a letter, followed by a digit and a suffix of one to three letters. Within these rules, the number of possible callsigns is equal to $37\times36\times10\times27\times27\times27$, or somewhat over 262 million. (The numbers 27 and 37 arise because in the first and last three positions a character may be absent, or a letter, or perhaps a digit). Since 2^{28} is greater than 268 million, 28 bits are enough to encode any standard amateur callsign uniquely. Similarly, the number of 4-digit Maidenhead grid locators on earth is $180\times180 = 32{,}400$, which is less than $2^{15} = 32{,}768$; so a grid locator can be encoded uniquely with 15 bits.

More than six million of the possible 28-bit values are not needed for standard callsigns. A few of these slots have been assigned to special message components such as CQ, DE and QRZ. CQ may be followed by three digits to indicate a desired callback frequency. In the meteor scatter mode MSK144, if KA2ABC transmits on a conventional US calling frequency, say 50.280, and sends the message "CQ 290 KA2ABC FN20", it means that s/he will listen on 50.290 and respond there to any replies. *[Please see the box on page 63 about frequencies – Ed].* A numerical signal report of the form ±xx or R±xx can be sent in place of a grid locator. As originally defined in JT65 mode, the numerical signal report values 'xx' were constrained to lie in the range –30 to –01dB. Recent program versions accommodate reports between –50 and +49dB for all modes except JT65. A country prefix or portable suffix may be attached to one of the callsigns. When this compound-callsign feature is used the additional information is sent in place of the grid locator, or by using some of the six million available slots mentioned earlier.

Finally, our compression algorithm supports messages starting with CQ AA through CQ ZZ. Such messages are encoded by sending the pseudo-callsigns E9AA through E9ZZ in place of the first callsign of a standard message. Upon reception these calls are converted back to the form CQ AA through CQ ZZ. This feature allows users to send directed CQ messages of various easily understood forms such as CQ DX, CQ EU, or CQ VT.

Coding, Modulation, and Synchronisation. Different codes, modulation schemes, and synchronising patterns have been adopted for each protocol in *WSJT-X*; the basic goal has been to optimise each mode's effectiveness for a particular type of propagation. To some extent the final code choices also reflect our own incomplete-but-growing familiarity with historical developments in communication theory. JT65 uses a *Reed Solomon* code, and JT4, JT9, and WSPR all use a robust *convolutional* code **[15]** first implemented for ham radio use by Phil Karn, KA9Q **[16]**. These are among the best known types of error-correcting codes, and they have been studied thoroughly for over half a century. In contrast, our latest modes MSK144 and QRA64 use state-of-the-art codes that are close to the forefront of this research field. MSK144 uses a *Low Density Parity Check* (LDPC) code, and QRA64 a *Q-ary Repeat-Accumulate* (QRA) code, a particular type of non-binary LDPC code. Full technical specifications for each mode can be found in the *WSJT-X User Guide* **[17]** and our openly available source code **[18]**.

Protocol details for slow modes

Figure 10 shows an example of each of the slow modes on the *WSJT-X* waterfall display. For comparison, this collection of simulated signals also includes an unmodulated carrier and a 25 word-per-minute CW signal. The signals have been degraded to a key-down signal-to-noise ratio –10dB in a 2500Hz reference bandwidth, to simulate typical on air reception. Among the *WSJT-X* modes JT9 has the narrowest occupied bandwidth, 15.6Hz, and JT65 the widest at 177.6Hz.

Bandwidths and other design parameters of the slow modes are summarised in **Table 2**. In column 2 the type of forward error-correcting code (FEC) is denoted by C for convolutional, RS for Reed Solomon, and QRA for Q-ary Repeat-Accumulate. The keying rates have values chosen to make the length of a transmission about 48 seconds – thereby leaving enough time for a message to be decoded and the receiving operator to decide how to reply, before the start of the next minute. The exact values were chosen so that the number of digital samples per channel symbol is an integer with no prime factor greater than 7. This choice is advantageous because it makes some of the digital signal processing algorithms more efficient.

The following paragraphs give a few additional details for each of the slow modes and a brief statement about their typical use.

JT4. Each channel symbol carries one information bit (the most significant bit) and one synchronising bit. Thus 50% of the transmitted energy is devoted to synchronisation. Submodes JT4A through JT4G have tone spacings at increasing multiples 1, 2, 4, 9, 18, 36, and 72 times the keying rate. The wider submodes are useful on propagation paths with large Doppler spread: for example, JT4F is frequently used for Earth-Moon-Earth (EME) communication on the 10GHz band.

JT9. Eight tone frequencies are used for data, one for synchronisation. Sixteen symbol intervals are used for synchronising. The slow submodes JT9A-H have tone spacings at multiples 1, 2, 4, 8, 16, 32, and 64 times the keying rate. JT9A (often called simply JT9) uses less than 10% the bandwidth of JT65, and for this reason is becoming increasingly popular for low-power DXing on crowded HF bands.

JT65. A detailed description of the JT65 protocol was published more than twelve years ago in *QEX* **[19]**. Half of its channel symbols are used for synchronisation, using a pseudo-random pattern at the lowest tone frequency. The other symbols carry encoded information using $2^m = 64$ different

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g4wjs@classdesign.com

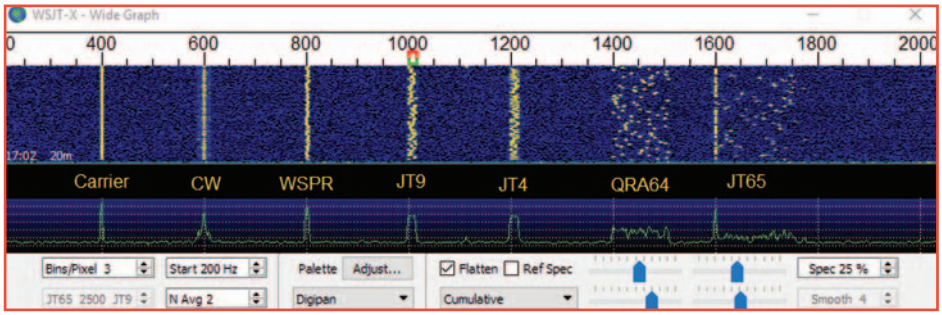

FIGURE 10: Simulated signals for an unmodulated carrier, a 25 WPM CW signal, and the *WSJT-X* slow modes WSPR, JT9, JT4, QRA64A and JT65. The slow modes are shown in their 'A' submode, in increasing order of occupied bandwidth. All signals have S/N = –10dB in a 2500Hz reference bandwidth.

tones. Special features (used only for EME) can convey the EME-style 'OOO' signal report and short messages interpreted as RO, RRR, and 73. Submodes JT65B and JT65C, also used only for EME, use tone spacings 2 and 4 times larger than JT65A. JT65 has become very popular for low-power DXing at MF and HF, as well as for EME on VHF and higher bands.

QRA64 is an experimental mode intended for EME and other extreme weak-signal paths. Its internal code **[20]** was designed by Nico Palermo, IV3NWV,and we expect to publish a full description in *QEX*. Synchronisation is accomplished by using three 7 × 7 Costas arrays **[21].** Submodes QRA64A-E use tone spacings 1, 2, 4, 8, and 16 times the baud rate. Early tests have shown QRA64A to be very effective for weak signal work at MF and HF, and for EME on the VHF and UHF bands. The wider submodes QRA64C-E work extremely well for EME on microwave bands up to 24GHz.

WSPR differs from other *WSJT-X* slow modes by using message lengths $k = 50$ bits and two-minute T/R sequences. Message packets normally include a 28-bit callsign, a 15-bit grid locator, and 7 bits to convey transmitter power in dBm. Alternative formats can convey a compound callsign and/or a 6-digit grid locator, using a two-transmission sequence. WSPR usage was described in *QST* several years ago **[22]**.

Protocol details for fast modes

The fast modes in *WSJT-X* aim to take advantage of brief propagation enhancements that bring a signal up to useful levels for a very short time. Keying rates and occupied bandwidths are much larger than for the slow modes, because we want the full message to be conveyed in a very short time. **Table 3** lists the essential parameter values for these modes. The last column gives the time required to transmit the message once; of course, in these modes the transmitted information is repeated for the full duration of a T/R sequence.

ISCAT messages are free-form, up to 28 characters in length; the protocol uses no forward error correction other than repetition. ISCAT has proven especially useful for making aircraft-scatter QSOs on the microwave bands.

JT9 Fast submodes JT9E-H differ from their slow counterparts by using much faster keying rates. Otherwise the coding, modulation, and synchronisation schemes are the same as for the slow JT9 modes. JT9 fast modes have proven useful for propagation types like ionospheric scatter and weak double-hop Sporadic-E on the 6m band.

MSK144. Forward error correction is implemented by augmenting the 72 message bits with an 8-bit cyclic redundancy check (CRC) calculated from the message bits. The resulting 80-bit augmented message is mapped to a 128-bit codeword using a (128, 80) binary low-density-parity-check (LDPC) code designed by K9AN specifically for this purpose. Two 8-bit synchronising sequences are added to make a message frame 144 bits long. Modulation is Offset Quadrature Phase-Shift Keying (OQPSK) at 2000 baud, so the frame duration is 72ms. Compared to FSK441, the mode widely used for digital meteor scatter since its introduction **[23]** in 2001, MSK144 has the advantages strong error correction, an effective character transmission rate about 1.7 times faster, and significantly better sensitivity. MSK144 has rapidly become the dominant mode for amateur meteor scatter contacts, at least in North America and Europe.

Decoders and sensitivities

Together with additional details published in the *WSJT-X User Guide* and the open source code, Tables 2 and 3 and the preceding paragraphs define the various protocols supported in *WSJT-X*. For these protocols to be useful for transferring information, each one also needs a decoder. The mathematical underpinnings of suitable decoders are complex and widely discussed in the professional literature, and we will not go into those details here. The algorithms we have implemented all use *soft-decision* decoding, and to the best of our knowledge they are the most sensitive practical algorithm for each code. For JT4, JT9, and WSPR we use the *Fano* algorithm, as implemented [16] by KA9Q, and for JT65 we use the Franke-Taylor algorithm, details of which were recently published **[24]** in *QEX*. A full description of the QRA64 decoder written by IV3NWV is available online [20] and we expect to publish details of the MSK144 decoder soon.

A few special features of the decoders are worth mentioning. The current usage patterns of JT9, JT65, and WSPR make it advantageous for the decoders to focus not just on a single frequency, but on a frequency range covering at least several kilohertz. Our decoders for these modes are organised to scan a range of frequencies up to 5kHz, if the receiving hardware supports it, finding all signals in the specified mode and decoding and displaying the results. For JT65 and WSPR the present decoders go one step further, taking advantage of the fact that when a signal with strong FEC has been decoded we know its transmitted waveform exactly. An amplitude-scaled version of that waveform can be subtracted from the received data and the decoder executed on the remainder to decode weaker, previously hidden signals. This approach has proved very effective: it frequently decodes weak signals lying within 1 or 2Hz of much stronger ones.

The various *WSJT-X* modes have better sensitivity than traditional modes such as CW for three main reasons. They use efficient modulation schemes tailored to the targeted types of propagation; they use detection bandwidths matched to the protocol's baud rate; and they benefit from *coding gain* provided by each specific error-correcting code. As shown in Table 2, detection bandwidths for the slow modes range from about 1.5Hz to 4.4Hz. Noise power is proportional to bandwidth, so each of the slow modes has an advantage of more than 10dB when compared to the typical 50Hz 'ear-and-brain' bandwidth of a skilled CW operator.

The MSK144 decoder cannot use such narrow bandwidths because the signal is roughly 2.4kHz wide. However, it can use another trick, namely *coherent* detection. Meteor scatter signals generally maintain signal coherence over the duration of a ping. Our MSK144 decoder measures a received signal's frequency and phase with enough accuracy to maintain coherence over half a dozen or more of the protocol's 72ms frames. As a consequence, the out-of-phase noise power can be rejected and we gain 3dB over non-coherent detection for single-frame decodes, and up to 7dB for seven-frame averages.

Software development

Software engineering involves repeated cycles of designing, writing and testing *source code:* the human-readable instructions that will be converted to patterns of zeros and ones that tell a digital computer what to do. For all but the most trivial applications it is normal practice to build also on existing software. Such existing software might include tools and utilities for simplifying and organising the development process, libraries or 'frameworks' that can be directly included into the application, and services that cooperate with the application or with the developers themselves. It might also include services used for distribution and support of the software.

WSJT-X is a complex program that operates in a complex environment. As a result, many

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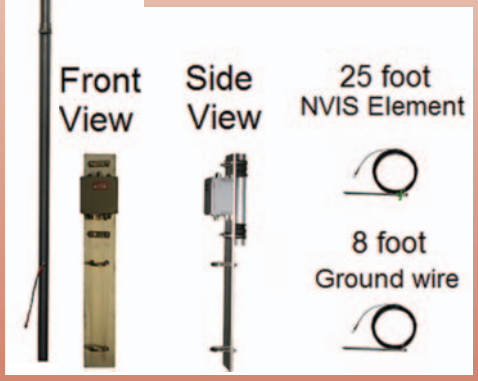

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of the techniques used to design, write, test, deploy, and support it are the same as those used by large corporations marketing computer software. Working practices and disciplines from this corporate world generally require many people and significant capital investment. Here we explain how the same goals can be met when the application is provided free of charge by a small team. We also try to explain why individuals capable of doing this would even *consider* doing it without financial compensation.

Free open-source software (FOSS). In the present context the word *free* does not necessarily mean without cost to the user, it means *free as in freedom*. Many successful FOSS products are paid for by users in some way, most often in return for technical support or consultancy. Free-of-cost is also common, but not ubiquitous. A key element of FOSS is that the rights of software authors are protected: no one can legally make profit by stealing or otherwise passing off as their own a product they did not create themselves. This principle is fundamental to how FOSS works; it allows those who wish to share ideas and skills with a community, in a philanthropic manner, while not being taken advantage of by those with less honourable intentions. It should be clear that FOSS fits well into amateur radio because some of its principles are the same: in particular, the idea that sharing knowledge with a community of like-minded hobbyists is a Good Thing To Do.

Hierarchy of Components of WSJT-X. We developed the novel data communication protocols in *WSJT-X* to enable amateur radio operators to experiment and use them for over-the-air communication. Obviously the underlying software must handle such tasks as encoding and decoding user messages, which involve a number of mathematically complex algorithms. These essential tasks account for roughly 37,000 lines of code in *WSJT-X*. Significantly more code is needed to enable effective communication between computer and radio, and to allow user control of the encoding/decoding algorithms and display features in a convenient and intuitive way. Current revisions of *WSJT-X* are built from a total of about 103,000 lines of our own code. We use FOSS compilers `gcc` and `gfortran`, available from the GNU Free Software Foundation, and `clang` from the University of Illinois, to convert our source code to machine language. We also use the FOSS libraries *Qt Framework* (from the Qt Company), *FFTW* (Massachusetts Institute of Technology), *SLALIB* (East Asian Observatory), and the *JPL Solar System Ephemeris*.

Inter-operation with other software. A large proportion of amateur radio operators keep a computer log, and many use web services to enhance their hobby. *WSJT-X* is a source of both log records and 'spots' – reports of the reception of someone else's signal – so one can imagine many possible interfaces to other software and internet services. In Part 1, we mentioned the support of *WSJT-X* for *PSK Reporter* and *WSPRnet*; these services turn a *WSJT-X* station into 'reverse beacon' source with virtually no input from the operator.

There are many other possibilities. Rather than trying to communicate directly with all logging software, *WSJT-X* implements only basic features – enough for an occasional user who does not mind a bit of manual data transfer to update their station log. The program appends basic amateur data interchange format (ADIF) QSO records to a text file that can be imported into other logging software or to QSL matching services such as *Logbook of the World* and *eQSL*. We have chosen not to duplicate what other specialist logging applications already do so well. Instead, *WSJT-X* publishes decoded messages, logged QSO details, and some program status information to a network port. This allows other software authors to receive the data directly or write a bridging application that communicates with logging or other services on behalf of *WSJT-X*. A notable example is the program *JTAlert* [25] by Laurie Cowcher, VK3AMA. *JTAlert* handles logging to most major logging applications and spotting to an associated web service Hamspots.net **[26]**. It also manages a wanted continent, zone, DXCC, US state and grid locator database that allows it to alert the user when a decode from one of them is seen. Other application authors are also using this source of data and we expect that many novel uses of it are yet to be discovered and implemented.

WSJT-X requires computer assisted transceiver (CAT) control for several of its advanced operating features. This requirement can create conflicts with logging software that, like *WSJT-X*, wants to grab exclusive control of the radio. Fortunately the most popular logging applications provide a proxy rig-control facility and *WSJT-X* is able to control a transceiver that way, without conflict. Other possibilities are available such as the `rigctld` server that is part of the *Hamlib* package, and the *OmniRig* control server – both of which are designed to allow multiple compatible applications to share a rig's CAT connection.

Implementation languages. Programming languages are many and diverse. Some are best for quick-and-dirty development of small programs, while others are best for large complex systems. Some are targeted for pure number crunching, others come with rich libraries for programming applications that need a user-friendly graphical interface; some are operating system or hardware specific, others try to work everywhere.

A project like *WSJT-X* needs computational performance, a rich graphical user interface, native look-and-feel on several platforms and an implementation language suitable for use in a large complex application. One might hope that a single near-perfect language could be chosen, but it's never that simple. In our case, an important factor is that most of the team are not professional software engineers – so any language they are comfortable and familiar with is a prime candidate. The democratic necessities of FOSS collaboration often mean that programmers tend to join projects where their experience counts. Another constraint may be that some essential software component requires a particular programming language. These are perennial problems in software development and fortunately the tools to build software usually allow a single project to be implemented in more than one language with at least basic inter-operation between them.

We use this approach in *WSJT-X* for all of the above reasons. We use Fortran and C for the computational heavy lifting, and C++ for access to the platform and operating system abstraction layer and the *Qt* user interface library. These three languages inter-operate reasonably well, so the mix-and-match approach can be very effective.

Collaborative tools. FOSS project teams often collaborate over worldwide distances. It is common for team members never to meet face-to-face, or to communicate other than by email. Well-defined

TABLE 2: Parameters of the slow WSJT-X protocols. Bandwidths (BW) are specified for the narrowest submodes. Mod stands for modulation type, and Sync Energy is the fraction of transmitted energy devoted to synchronisation.

Mode	FEC type (n, k)	q	m	Mod	Keying rate	BW	Sync energy	TX duration
JT4	C (206, 72)	1	2	4-FSK	4.375 baud	17.5Hz	0.50	47.1s
JT9	C (206, 72)	1	3*	9-FSK	1.736 baud	15.6Hz	0.19	49.0s
JT65	RS (63, 12)	6	6*	65-FSK	2.692 baud	177.6Hz	0.50	46.8s
QRA64	QRA (63, 12)	6	6	64-FSK	1.736 baud	111.1Hz	0.25	48.4s
WSPR	C (162, 50)	1	2	4-FSK	1.465 baud	5.9Hz	0.50	110.6s

* Modulation includes one additional tone for synchronisation.

TABLE 3: Parameters of the fast *WSJT-X* protocols. MSK144-Sh is the optional short-message format in the MSK144 protocol.

Mode	FEC type (n, k)	q	m	Mod	Keying rate	BW	Sync energy	Message duration
ISCAT-A				42-FSK	21.5 baud	905Hz	0.17	1.176s
ISCAT-B				42-FSK	43.1 baud	1809Hz	0.17	0.588s
JT9E	C (206, 72)	1	3*	9-FSK	25 baud	225Hz	0.19	3.400s
JT9F	C (206, 72)	1	3*	9-FSK	50 baud	450Hz	0.19	1.700s
JT9G	C (206, 72)	1	3*	9-FSK	100 baud	900Hz	0.19	0.850s
JT9H	C (206, 72)	1	3*	9-FSK	200 baud	1800Hz	0.19	0.425s
MSK144	LDPC (128, 80)	1	1	OQPSK	2000 baud	2400Hz	0.11	0.072s
MSK144-Sh	LDPC (32, 16)	1	1	OQPSK	2000 baud	2400Hz	0.20	0.020s

* Modulation includes one additional tone for synchronisation.

processes for collaboration are therefore essential. The FOSS community has solved most of these problems so effectively that even commercial teams working and sitting next to each other often use their mature collaboration tools.

Several large projects offer internet-hosted platforms to support collaborative software development. Such platforms include a *version control system* that allows many programmers to work on a common set of source code files, resolving potential editing conflicts and recording a full history of changes. They may also include a forum or mailing list for team discussions and application support; file storage for package deployment; a bug- or issue-tracking system; a wiki-style collaborative knowledge base; secure backup of all project data and so on. We currently use the *SourceForge* project and web site as our collaborative service. Like many others, this one is free of cost for FOSS projects. It offers extensive services with excellent availability – services that would cost a considerable amount for a project like ours, if we had to purchase the necessary hardware and network bandwidth.

Computing hardware and platforms

Our software is developed on desktop PCs, and the majority of our users run *WSJT-X* on a modern PC running Microsoft *Windows*. However, the platform abstraction layer in the *Qt Framework* enables us to provide *WSJT-X* also as a native application on several other platforms. We support Microsoft *Windows* (currently all versions since *XP*), Apple Mac *OS X* (versions 10.7-10.11) and *macOS* (version 10.12 onward), and *Linux* (a recent desktop distribution is best). The capability to run on *Linux* opens up many possibilities for computer hardware including low cost single-board systems like the Raspberry Pi (model 2 and 3) and also older PCs like PowerPC Macs. A *Linux* desktop distribution on Raspberry Pi allows users to run *WSJT-X* just as they would on full-size PC or laptop, with connection to a transceiver through a cheap external USB soundcard. Another alternative is a basic SDR system like the FUNcube Dongle or SoftRock, making a very capable, low cost digital receiving station; or, using later devices like the SoftRock Ensemble RXTX a fully functional QRP digital station. To do these things you must invest some time in learning about *Linux*, and perhaps construct a basic SDR kit. Add a resonant antenna and your reward can be an ability to work the world with ease – and with equipment you made and assembled yourself.

Like most successful *Linux* development projects, the *WSJT-X* development team has collaborators who package the program for various flavours or distributions of the operating system. The package maintainers ensure that all required dependencies are correctly installed and referenced when *WSJT-X* is installed – no small task, as *Linux* comes in many quite different distributions.

The world of *Unix*-like operating systems extends to more than just *Linux*: some users prefer others, such as *FreeBSD*. For those with some programming experience almost any platform is possible as long as recent versions of the packages *Qt* and *FFTW* are available.

It's possible to generate signals for the *WSJT-X* modes on much smaller systems. Encoding is computationally much simpler than decoding. Enterprising individuals and project teams have implemented beacon generators in small embedded systems using a microcontroller and a DDS chip. These can be used in 24/7 beacon sites or even in high-altitude flights with a few grams of payload hanging from a hydrogen- or helium-filled party balloon. David Beverstein, VE3KCL has outfitted balloon-borne systems **[27]** that include a solar power source, GPS receiver, transmitter for WSPR and JT9 and an antenna, the full payload weighing less than 40 grams. These balloons can broadcast their location, altitude, and other information whenever they have sunlight – and at least one of them has been tracked over a full circumnavigation of the globe! *[Note that aeronautical operation is expressly prohibited in the UK Amateur Licence – Ed].*

Summary

We hope that our description of the capabilities of *WSJT-X* and its development process will inspire others to join in and contribute to future developments in digital communication techniques for amateur radio. We ourselves have many ideas that have not yet reached fruition: for example, an even narrower-bandwidth mode, probably using 30s T/R sequences, intended for low-power DXing on crowded MF and HF bands.

Many people have contributed to the development and success of *WSJT-X*. We particularly wish to thank Greg Beam, KI7MT, whose *JTSDK* software development kit has helped many *WSJT-X* users to build the program for themselves, from the source code; and G3WDG, VE1SKY, VK7MO, and W3SZ for comments that helped us to improve earlier drafts of this article.

Please stay legal and within the band plans

Modern amateur radio features an increasing number of innovative communications modes such as those contained in *WSJT-X* software. Members are encouraged to try these out, but are reminded that all transmissions within UK jurisdiction must comply with the UK Amateur Licence and should follow the guidance of the relevant band plan. Take note that some of the default 'working frequencies' currently included in *WSJT-X* and some other software packages do not comply with the IARU Region 1 band plans (which, in some countries, have statutory backing).

It is important to note that the UK Amateur Licence, in common with all ITU frequency allocations, specifies the actual frequency limits of emissions and not the 'dial' frequency selected on an amateur SSB transceiver. These limits are included in the current RSGB band plans **[28]**.

One notable problem has been in 5MHz where the UK-specific and new WRC-15 ITU allocations are quite narrow – and differ from the USA. Upper sideband transmissions on the 'working frequencies' currently included in *WSJT-X* software of 5287.2kHz (WSPR) and 5357.0kHz (JT65) are likely to cause emissions outside the frequencies licensed for UK amateur use and this has also prompted action by the Amateur Radio Observation Service (AROS). Detailed advice on this for modes such as WSPR and JT65 are provided at **[29]**.

Members are also reminded that on 50MHz, the RSGB band plan recommends that transmissions using MGM (machine generated modes) such as JT65, WSPR or MSK144 should be made in the 50.300-50.400MHz section of the band and not the 'working frequencies' included in *WSJT-X* and other software packages, which are all below 50.300MHz.

The *WSJT-X* user guide contains guidance on changing the 'working frequencies' that are included in the software [17]. UK amateurs are recommended to change these to comply with the RSGB band plans. User of WSPR in particular are also reminded that power levels should be modest and operation should not be unattended.

John Regnault, G4SWX, RSGB VHF Manager

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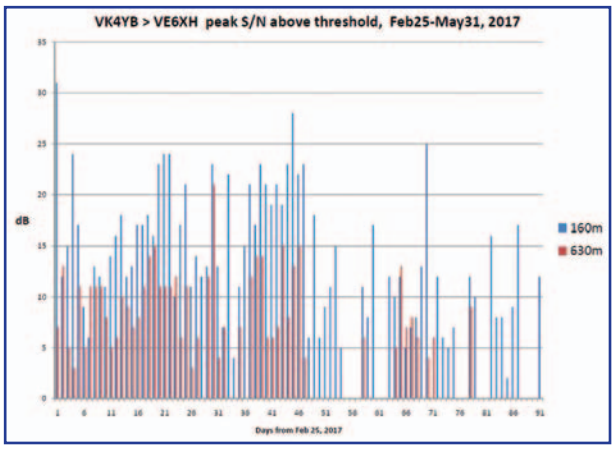

On 28 February, Dix, DJ6CB, Ottar, LA1TN, Giulio, IK2DED and Ian, G4GIR sustained a four-way CW contact on 472.4kHz. As far as they can tell this is the first time that a CW contact between Germany, Norway, Italy and Great Britain has been carried out. Despite unfavourable conditions, through deep QSB phases, reports of 549 to 579 were exchanged and confirmed.

The next goal is to make a QSO between five countries. As we approach the autumn season, when conditions will start to pick up, they are looking for participants in other countries to join in. I think that they should be able to get it up to eight if all goes well and a big effort is made.

If you are interested in joining in or know someone who should do so then call in one evening on 472.4 or contact one of the group via QRZ.com.

Monitoring propagation

Roger, VK4YB (G3UPK in a former life) has some very interesting aerials for 472kHz. One is a 900ft end-fed wire that rises from the shack over a 90ft tree, then to the top of a 120ft tree where it drops vertically and continues at around 10ft above ground and downhill for another 450ft. The idea of this is to place the high current carrying part of the aerial into the vertical section and maximise the low-angle propagation without the need for an extensive earth system.

To test the performance of this configuration he has been running *WSPR* tests with Dan, VE6XH in Northern Alberta some 12,592km away across the Pacific Ocean. The tests took place over the equinox, starting on 25 February and running for 90 days. Roger transmitted *WSPR* on both 160m, using a dipole, and 472kHz using the long wire. He tried to equalise the ERP (effective radiated power) of the two aerials and plotted the signal-to-noise readings received by Dan on the two bands.

As might be expected 160m proved to be more reliable, as you can see in blue on the chart (top right), but on some occasions 472kHz (in red) out-performed Top Band.

Roger now has two 900ft aerials using the same idea, one pointing North-West and one pointing North-East. *WSPR* tests show that there is a 9dB difference between them in the desired direction, not a bad front-to-back ratio. He has had a two-way JT9 QSO on the North-East aerial with VE7SL at a distance of 11,822km, which is the record for 472kHz.

VLF and ULF

As promised last time Joe, VO1NA continued his tests on 8.27kHz and, despite many problems with ice, burned-out loading coils etc they finally bore fruit in early May. Paul Nicholson in Todmorden, UK, at a distance of 3,575km, made a positive identification of Joe's carrier, right down to a slight frequency error of a few parts-per-billion. Paul reported a s/n ratio of 13.9dB in a 46.296µHz bandwidth. Joe's ERP was about 10µW and Paul calculated that the received signal strength equated to about 2.6 electrons on his E-field probe!

The tests are continuing and latest reports indicate a small amount of night time enhancement. Unfortunately there is a short hiatus as I write: Joe is having to rewind part of his huge loading coil again due to a flash-over damaging it. The total inductance is almost half a henry.

Another record was broken when Stefan, DK7FC's 6.47kHz EBNaut transmission was successfully received at 1,990km distance by Alex, RN3AUS. Alex had failed to decode the EBNaut message from his recorded .wav file so he sent it to Paul Nicholson to analyse. He eventually succeeded but the decoder needed 47GB of RAM to handle the complex process. Some have noted that the tiny ERP used to transmit the signal may be impressive but so is the massive computer power required to decode the signals!

Later, Stefan went even further LF and transmitted for 90 hours on 970Hz, a wavelength of 309km. He used his usual 30m high, 70m long inverted L fed via a modified mains transformer from a homebrew amplifier. 5kV at the feed point gave an aerial current of 15mA, which works out at 3nW ERP. So far he has decoded EBNaut messages received at a distance of 27.2km, a small proportion of a wavelength at that frequency. He is looking to extend this into the 'far field' soon.

VLF in space

The US Air Force Research Laboratory hopes to launch the DSX satellite into an orbit carrying it through the outer region of the inner Van Allen radiation belt. One of its tasks will be to perform 'Wave Particle Interaction Experiments' that research the physics of VLF electromagnetic wave transmissions through the ionosphere and magnetosphere, and to characterise the feasibility of natural and man-made VLF waves to reduce and precipitate space radiation. It will have two LF dipole aerials, one will be 16m from end to end, which will act as a receive aerial at right-angles to the transmit aerial that is 80m from end to end. This 'Top Band dipole in space' will be excited by a special 800W peak-power TX at frequencies below 50kHz.

More information at the EO Portal website at https://tinyurl.com/y9wzttvb

DX report

Firstly, one I missed from 1 March this year was Ian, G4GIR working Fortunato, 9H1ES on 472.4kHz. Ian describes the 10 minute QSO as very hard with deep QSB. Reports of 559 were sent and 339 received. His set up is a TS-990S driving a PA3BCA design amplifier delivering 360W into an inverted L with 12m vertical and 27m horizontal.

As the summer rolls in DX reports get fewer, but in Alaska the 136kHz band tends to stay open and in early June KL7L was still copying WH2XND in WSPR2 from Phoenix, Arizona at a distance of 4,059km.

Summer idea

Many LF operators do aerial work in the summer when hours of darkness are short and Dennis, M0JXM has sent some information on his multi-band system that may give you some ideas. His aerial is basically a 40m dipole fed with 10m of twin feeder that is wound round the fiberglass supporting pole about 30 times. This helical winding gives a loading effect when the aerial is strapped as a Tee for use on 80, 160 and 630m.

Dave Pick, G3YXM
daveyxm@gmail.com

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HF

The end of July sees the annual Islands On The Air (IOTA) contest, which is a great opportunity to collect new IOTAs. If the stations you work submit logs for the contest you can gain credits for your IOTA score without needing the QSLs. You can also gain QSL-free credits more generally if people upload their logs to Club Log but these can take a while to be ratified and appear on the system.

The HB0 team in Liechtenstein L-R, John, MM0JZB, Ross, MM0OBT, Hugh, GM4UYE, Myles, MM0MYL, Duncan, 2M0BYS, Rab, 2M0DRO, Jonathan, MM0OKG and Billy, GM0OBX.

The latest edition of the ARRL journal for experimenters – *QEX* – has a short article referring to an old US study comparing atmospheric noise picked up by horizontal and vertical antennas. *RadCom* readers can find the full work at www.dtic.mil/dtic/tr/fulltext/u2/681879.pdf The main conclusion seems to be that horizontal antennas can have up to 30dB less atmospheric noise around 2MHz but that there is little difference at 10MHz. I'm not sure what this means for amateur radio operations as we are more concerned with signal to noise ratios and the radiation patterns of our antennas rather than absolute noise levels, but the study is worth a read.

Another interesting snippet from the ARRL was that the CASSIOPE satellite would again be listening for amateur CW signals during the North American Field Day. Apparently it listened on 3.5 and 7MHz last year – heard nothing on 3.5 (where the ionosphere probably blocked signals from the ground) but heard a number of stations on 7MHz. An advantage of this sort of research is that there are many transmitters and they can all be identified by their callsigns to assist in ray-tracing through the ionosphere. I hope the results will be published eventually.

The US Fish and Wildlife Service recently issued a finding that amateur radio will have no significant impact on the Nature Reserve of Baker Island in the Pacific – though the conditions for a DXpedition are rather stringent. They include 'flagging' all guys, antennas and masts every two feet and inspecting all equipment every four hours for bird strikes. There will only be one DXpedition permitted every 5 years and the DXpeditioners must pay in excess of $20,000 for a member of the Fish and Wildlife staff to participate and monitor the activity. In the 'justification' section the FWS note that this way they get to send a staff member to a spot that would otherwise cost them $250,000 to reach – so you'd think they might waive the $13,000 salary costs they want to charge the DXpedition. I am still puzzled by the apparently widespread concern about birds striking antennas – and I took the opportunity of a short visit to the RSPB centre at Sumburgh Head in Shetland last month to ask about birds killed by the large LF wire antenna on the clifftop. The staff member I spoke to wasn't aware of any issue!

It is very pleasing that the Chiltern DX Club (CDXC) will be sponsoring a tent at the 2018 World Radiosport Team Championship in Germany, thus putting its name and logo alongside other worldwide DX and contest clubs. This great result was achieved with a combination of club funds and donations from individual members. Don't forget the next CDXC Challenge for DXCC entities worked on 21-50MHz in September. You may be surprised what you can find…

Iceland's 60m privileges will remain unchanged until the end of the year. TF3JB reports that the Icelandic Post and Telecom Administration has decided to extend the experimental licence privileges. Twenty five Icelanders have an experimental licence for 60 and are on 5260-5410kHz with 100 watts EIRP on CW, USB, PSK-31 and other digital modes.

If you are interested in knowing more about some of the non-amateur signals in our HF bands then check out the IARU Monitoring System website at www.iarums-r1.org You can download the monthly bulletins via the links on the left side of the home page.

In the 'early warning' department, please mark your diaries for the GMDX Convention in Stirling on 14 April 2018.

Joe, G3MRC became a Silent Key in early May 2017 and Phil, G3SWH has obtained from Joe's widow copies of the logs and some blank cards for each of the following callsigns: 5X1P, 7Q7BP, 7Q7FOC, 9Q5MRC, 9U5MRC, C91MR, C93MR, C96MR, C97MR, G3MRC, VK8CP and Z38/G3MRC. The logs had all been uploaded to Logbook of The World (LoTW) by Joe, but have now also been uploaded to www.g3swh.org.uk, where there are log search facilities for each call. Joe's RSGB Membership lapsed at the time of his passing so Phil is unable to process or respond to any bureau QSL requests as the RSGB QSL bureau does not forward outgoing cards for non-Members. Paper QSLs for these stations are only available direct with adequate return postage or via the OQRS on Phil's website above.

Roger, G3LDI was recently presented with a special award by the CW Operators Club for his persistence at encouraging people to learn Morse. The award was collected for him by Chris, G0DWV in Dayton.

This month we have some great pictures from the GM expedition to Liechtenstein that was worked on many bands from the UK.

TZ4PR is in northern Mali and will continue there until October. The equipment is basic – a Yaesu FT-857, an LDG tuner and some wire. He often operates split and asks that you not work him more than once to give everyone else a chance.

IOTA

The Russian Robinson DXpedition to Iony Island (AS-069) is still expecting to start activity around 18 July. Check www.iony2017.com for news.

Masa, JA0RQV is planning to activate Niuatoputapu Island (OC-191) as A35JP/P from 17 to 22 August 2017.

Jeremy, EI5GM and Col, MM0NDX will be active from Bere Island (EU-121) as EJ3HB during the IOTA contest.

Colin, CT7ACG, Cliff, CT7ANG, David, G3UNA, Charlie, GI4FUE and Rob, M0KPD will participate in the IOTA Contest as CR5CW from

The HB0 view past the Hexbeam to the South.

Ilha da Culatra (EU-145). They will be using CW and SSB with two stations. If the band is open they will also be on 6 metres.

Antonio, CU8AS, Hermann, CU8FN, Siggi, DL2HYH and Lutz, DL8MLD will participate in the IOTA Contest as CR2V from Ilha das Flores (EU-089).

Keith, G3TTC plans to operate holiday style as GM3TTC/P from various islands in IOTA groups EU-123 and EU-008 until 1 August. Do not send or request paper QSLs as IOTA credit will be given through Club Log matching. A large team from Cockenzie and Port Seton ARC will be active from the Isle of Tiree (EU-008) on 28-30 July. They will participate in the IOTA Contest as GM2T and might also be transmitting as MM0CPS before the contest. Iain, G4SGX will be active as GM4U/P from the Isle of Jura (EU-008) from 28 July to 1 August.

The Czech DXpedition Team (OK1BOA, OK1CRM, OK1FCJ, OK1GK, OK2ZA, OK2ZI and OK6DJ) and guest operators 5T0JL and 5T2AI will be active as 5T5OK from Mauritania between 16 and 28 September. They will operate CW, SSB and digital modes on 160-10 metres. See www.cdxp.cz/ for further information.

Mikhail, VE7ACN will be active as AL3/VE7ACN from Hinchinbrook Island (NA-042) on 9-15 August, and as NL6/VE7ACN from Kayak Island (NA-157) on 18-28 August. He will be using the 10-40m bands. See www.ve7acn.com for more information.

Keen IOTA supporters might also like to take a look at page 81 this month.

TABLE 1: 2017 Worked DXCC entities (ranked by All) showing Top 3 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
M0IKW	150	84	41	243
G4TUK	163	135	147	241
G4PTJ	193	97	0	241
G3SVD	148	149	42	221
G4IDL	181	0	34	188
GI4DOH	180	8	60	183
G3PXT	92	105	142	181
G4XEX	112	98	102	174
G3HQT	166	0	0	166
CT7AGZ	-	-	-	166
G3SVK	146	0	0	146

Correspondence

Tom, G4IDL spent quite a bit of time on 6m but also found: 10m – 9K2HN, 4Z5LU, UN7AB, ZB2TT, HV0A; 15m – Z25DX, TR8CA, 5X2B, 4J5A, ZP6CW; 17m – TY2AC, D44TWO, J68GD, HH2A; 20m – KH6U, JT5DX, BV1EK, 7Z1SJ, HI9/F5PLR.

Fred, G3SVK, found: 10m – OH0Z, plus a host of EUs; 20m – AD8J/HR9, V85TL, 5T5DX, OA1F, FM5FJ, E31A, TR8CR, ZL4TT, 9V1VV, P4/DJ4MZ, LU8DPM, HB0/GM4UYE, HI8RD, TY5AC, ZP6CW, CP4BT, VK2KM, HK4CZE, 5A1AL, J5UAP, KH7XS, VK3CWB, LU8PW, 9J2BO; 30m – A65BX, OJ0W, HK1X, HI3A, VU2GSM, A71EM, 9Q6BB, 9V1YC; 40m – FY5KE, V53DX, P4/DJ4MZ, 9K2NO, 8P5A, HR2RRC, P4/DL5RMH, LU8DPM, HI3K, DU1IST, YV5DRN, PJ7/KK9N, TY5AC, VP2/K6TOP, 6Y1M, J68GD, VK9MAV, VK6LW. Fred points out that the VK9 on 40 was an extremely rare Australian IOTA but many callers thought it was Mellish Reef and will be disappointed when they get the card. I was listening to this station on a simple dipole and noted that he was audible from at least 1700UTC though probably not workable for another hour or two. Fred's new dipole on 15m failed to produce many signals but hopefully things will improve in the autumn.

Richard, GI4DOH wrote in to update his score and say he was pleased eventually to break the pileup for HV0A on 12m.

Peter, G4XEX is now in the planning appeal stage for his modest antenna system but with the antenna very near the ground he worked: 10m CW – TY2AC, TZ4AM, BA8BA, OD5PY; 15m – 5Z4/DL2RMC, 4M1K; 18m CW – TN5E; 20m data – VU2NKS, YI3WHR, E21YDP, 5Z4/DL2RMC; 20m SSB – V51WW, HC7AE , FP5AC, A25TVB, 8P9K; 20m CW – VP2MDG, HS0ZIA, HK1R, KP2M, B7Q, HP3SS, P44X, 8P5A, ZP6CW, HI8RD, ZD7BG, 5Z4/DL2RMC, TE8DX.

Peter, G3HQT spent most of his time gardening but found: 15m – Z25DX; 20m – E51DWC, 5Z4/DL2RMC, BD4WN; 30m – V31MA.

Gordon, G3PXT was also mostly on 6m but ventured on to 17m for OJ0JR, E44WE and 4Z5LA.

Andy, G3SVD found conditions dire and noted that more and more DX stations have been moving to JT65 even when more traditional modes might have worked. He contacted TN5E on 20/17/15/12, KH7XS, BVs, W1NDE/KH0, B7CRA, KH0/KW2X all on 20m, and DS3EXX and VK9AA on 17m.

Ken, CT7AGZ was driven by the poor conditions to try WSPR, WSJT-X and JT65 and was amazed by the results. On an apparently dead 30m band his 10MHz WSPR signals were heard from VK/ZL to the mid-west of the USA and northern Canada. He found: 10m – TN5E, 5R8UI, NP3YL; 12m – TN5E; 15m – Z25DX, J68GD, Z37CEF; 17m – TN5E, HK4DEI, KP4IS, OA1F, HI/SP5Y, LU3AHY; 20m – ZA1E, OJ0W, 9J2BO, JR3IIR, CO2II, TF2MSN, J68GD, OH0Z, CE2MVF, LU4AT, CP4BT, OA1F, KH0/KW2X; 30m – VK2KJO; 40m – C31US, V31PS, VK3LDB.

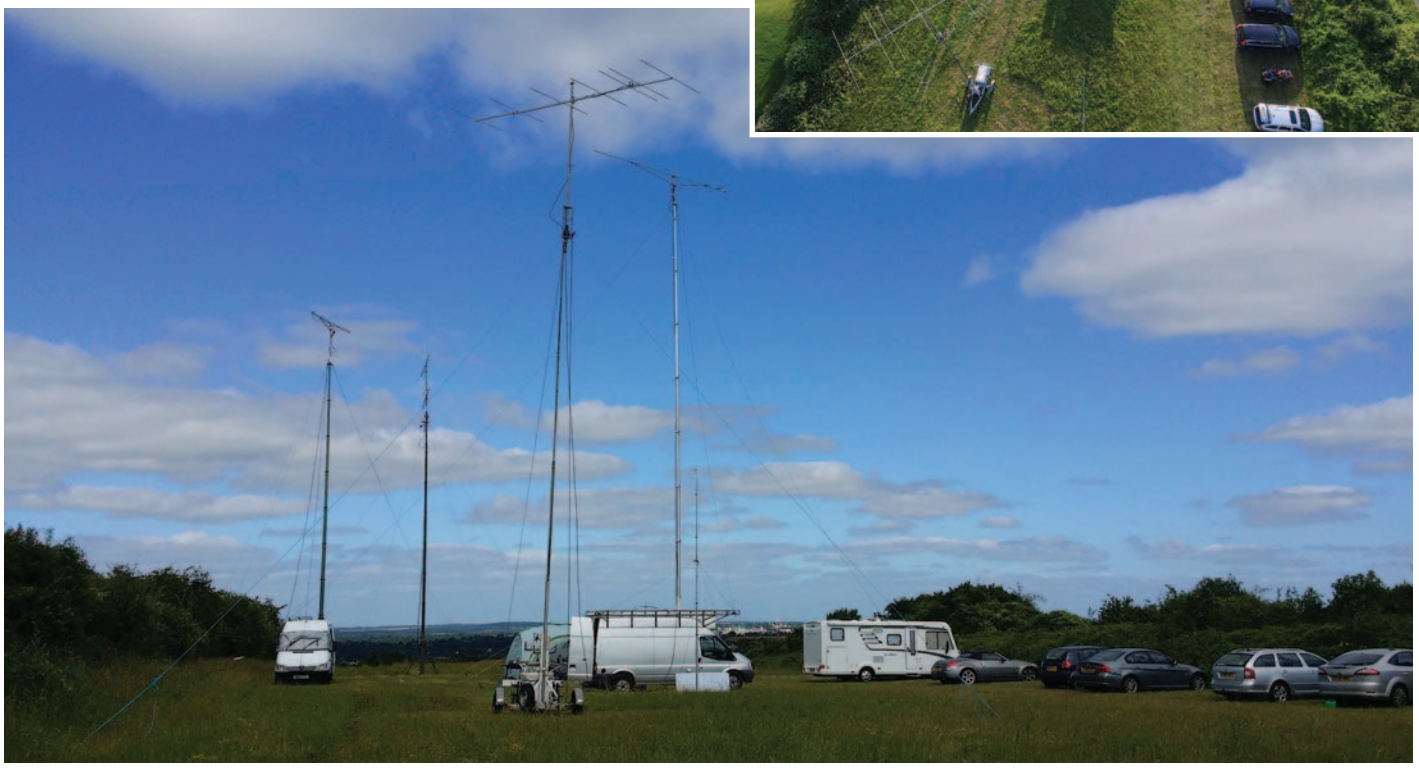
Finally – thanks as always to my correspondents, to DX-World, 425 DX News and Daily DX.

TABLE 2: Forthcoming DX activity.

Until 18 July	FP/KV1J (NA-032)
18-22 July	RI0C (AS-069)
22 July – 5 Aug	P40X (SA-036)
25-30 July	R66IOTA (AS-066)
28-30 July	VA2NDX/VY0 (NA-173)
29 July – 6 Aug	TX5EG (OC-027)
End July	RI0LI (AS-022)
End July	RA70AA (AS-070)
1 Aug – 31 Nov	HC8/G8OFQ
7-16 Aug	E51GHS (OC-083)
9-15 Aug	AL3/VE7ACN (NA-042)
15 Aug – 5 Sept	TX5EG (OC-046)
16-25 Aug	TX5EG (OC-013)
17-22 Aug	A35JP/P (OC-191)
18-28 Aug	AL6/VE7ACN (NA-157)
16-28 Sept	5T5OK
18-22 Sept	FP by CUWS ops (NA-032)
26-30 Sept?	RI1F (EU-190)
12-16 October	VK5CE/8 (OC-198)
23 Oct – 6 Nov	VK9CZ (OC-003)
1-4 Nov?	Baiyah Island (AF-111)
3-16 Nov	VK9MA (OC-072)
6-12 Nov	OC-216 by VK5CE
Early 2018?	D2 IOTA (AF-108)
Early 2018?	3Y0Z Bouvet (AN-002)
Mid March 2018	9L1T Sherbro (AF-056)
10-20 March 2018	9M0W Spratly (AS-051)
April 2018	St Brandon by F ops

Martin Atherton, G3ZAY
g3zay@btinternet.com

VHF/UHF



Camb-Hams G3PYE/P VHF NFD station near Cambridge from ground level (courtesy Geoff, G0DDX) and above (inset courtesy Dave, M0TAZ).

"Some of the best Sporadic-E conditions not seen for many years" is the message from our VHF and UHF correspondents.

Despite a slow build up in May, from the first week of June continuing through the month, Sporadic-E (Es) conditions were excellent on 6, 4 and 2m. Reports have many comments of 'the best for years'. A helpful jet stream and persistent hotspots over central Germany gave the chance to work well over the single hop target distance of 1,800-2,000km. There were also instances of chordal and double hop where reflections from the initial hotspot, connects directly to another without ground intervention. On 6m openings to the Caribbean during the RSGB 6m Trophy contest and also over to Japan were also available to operators in the right place at the right time! Quite annoying when you are not!

Band reports

Bob, G8HGN (JO01) says, "It's been a lively month at G8HGN with the opportunity to change bands and modes from 6m to 4m and 2m using SSB and JT65b. There were a surprising number of 4m openings, also being helped by increased countries band availability using a temporary garden furniture mast arrangement for the 4 element Yagi! The 2m openings have been, so far, characterised by short bursts of signals at weak (S2) to medium (S6) strengths with nothing really S9+. Highlights included 6m: new squares OH8EJX (KP23), UR7QM (KN76), F1EBN (JN18), LA/DK2BJ/P (JP44), TY2AC (JJ16), Benin on JT65A on the 22nd, for DXCC #94, OH7JJT (KP52), LA9DSA (JP43) and 9K2BM in LL49. The RSGB 6m Trophy/IARU contest on 18 June produced great DX yielding European Es contacts with Z68PM Kosovo logged, which doesn't seem to be a valid prefix? Tropo QSOs with GJ8P (IN89), and G8T in (IN79).500 squares now worked on 6m. On 4m, there were 3 new squares on the 16 June with LA1UW (JP52), DK2EA (JO50), DD3SP (JO72), plus LA0BY/P JP44 on the 19th." Bob's 4m square tally is now 117 squares. On 2m, 16 June brought more DX with UT3UX (KN28) and UW8SM (KO50) worked for squares #286 & 287, plus UX2SB (KN28), UT3BW (KN29) and YO8TNB in KN37. An opening to Spain on 26 June brought EA3EVL (JN00) worked and EA3BR (JN01) heard.

Lyn, GW8JLY (IO81) says that "Compared to previous years, 6m Sporadic-E got off to a slow start with only a few short openings in the middle of May. Into June and the band was open every day and in some cases very extended periods, for European Es for those with decent stations. I noted QSOs being completed between Europe and Japan from as far west as Southern Ireland and also QSOs into the USA, Canada and the Caribbean. I have a small station on 6m here (100W into a very low down 2-element HB9CV beam) and I don't usually bother to chase DX on 6m unless the opening is very intense. On the 2m band – there have been at least five Es openings that reached into the Cardiff area and one that came very close. The one that didn't reached as close as Newport, just 12 miles to the east of my QTH. On 7 June, during a very spotty 2m Es event, I worked SO3Z (JO82) , SP7TEE (JO91) and UT5ST in KN28 all at S9+. I also heard EW8W in KO42 but couldn't complete a QSO as he disappeared in the noise before reports were exchanged. On 9 June while stations

on the east coast of England were working stations in EA8 (the Canary Islands) that were completely inaudible here, Joe, CT1HZE in IM57NH came out of the noise. I completed a QSO with Joe at 59 both ways. I work Joe at least once each year in 2m Es events and I was pleased to work him again in 2017, keeping my record of working him every year in 2m Es events intact."

Bob, G3NSM told me, "I wanted to report that I experienced a most unusual opening to JA on 50MHz on 8 June when I worked 52 JA stations on CW in all call areas 0-9 in just over an hour starting at 0816. There was a huge pile-up and I could have worked many more had I been better practised at handling it. My antenna was only 50' AGL at the time. Otherwise, it has been an unremarkable month for me on 6m. I have experienced the customary frustration of being unable to hear DX stations that someone 30 miles away can easily work. This is despite the fact that I have a 7/7-ele that can be raised on a tower to 120' AGL when there is little breeze."

Darrell, G0HVQ (IO81) remarked "What an incredible Es season so far! As a seasoned VHF DXer since the early 80s, it's one of the best I've experienced and we're not even half way through yet. I managed to catch 4 Es openings so far and missed a few others. 2m seems to have been open nearly every day in June to some part of Europe. 7 June – YO8TK (KN27), SP4XYD (KO12), SP3UCA (JO92) 14 June – IK7UXU (JN81) 18 June – EW8W (KO42), EU3AI (KO22), UR5RCW (KO51), UA3WN (KO72, 2540km, the furthest I've ever worked into Russia) and 26 June EA3BR (JN01). On 6m I was away for the first week of June, but on returning on 6th I found S01WS (IL46) in the clear on SSB for DXCC #141. Until this season, I've only ever copied JA via F2, never via multi-hops Es. I had 3 separate openings to JA culminating in a huge opening on the 16th lasting about an hour. The whole JT65 band was full of JA signals, and 4 JAs copied me JA0MRW (PM96), JA5EXW (PM63), JH4ALY (PM54), and JA6CRP (PM53) but due to all the noise I was unable to complete a QSO – very frustrating, because I have been chasing JA on 6m for so many years, and was copied on CW way back in 2001. We wouldn't do VHF if it was easy and the quest for JA on 6m continues. However, I'm not too upset, as BA4SI (PM01) popped up on my JT65 screen calling CQ and we managed to complete for 6m DXCC #142: I've never received China before in my 30 years on 6m so that was a very nice surprise."

Gordon, G3PXT's prolific operation on 6m continues. With the addition to the already successful tree mounted 2 element quad, Gordon has added two slopers, one south and one to the north east direction. In summary, Gordon's incredible QSO tally continues to increase, with a current standing (25 June) of 1,113 QSOs in 2017, 62 DXCCs and 300 grids worked using a variety of modes and propagation. These are real standout statistics that show the effectiveness of his antenna in the excellent conditions we have seen over the past couple of months. TY2, S01, HV0, ZB2, HB0, JY, 9K2, R7 (European Russia) 5B4, A45, CT3, 4X, EA9, OH0 plus many more European QSOs including an outstanding 187 QSOs with Italy.

Alan, G0HEL (IO81) reports that "On 2 June I was preparing my LFA for the next 50MHz UKAC having put it on the mast and checked the SWR with my VNWA; with everything as it should be I connected the IC-7300 to see what I could hear; to my surprise there was an opening to Italy. With the rig set for 10 watts output I made contact with 2 Italian stations, then on a clear frequency a CQ was answered by 4Z5LA in KM72NC. Over a 3 hour period I managed to work 93 stations in 50 different locator squares from Italy to Greece and Israel right up through Europe, Ukraine, Scandinavia, to Iceland and the UK with a total of 20 DXCCs. I have no antennas as a permanent fixture so they were mounted on the van I use for UKACs. This is a pain but has to be done if I want to operate from home. Another highlight was working KP4EIT in KP58 all with the kit used for the UKACs."

John, G4SWX (JO02) says that "May started with a lot of good EME including: S79H (LI75), BX4AP (PL04), 4O3EME (JN91), BA4SI (PM01) and I/PA2CHR who provided a number of EME and MS QSOs from several locations, JM79 and JM87 being new ones for me. All QSOs were random with most MS QSOs being completed in 'straight sets'." It was unfortunate that Chris' location was blocked towards the UK in JM87 so MS at that range (1,952km) was not possibly even using an offset path. However he was a very good signal via EME in this square and all of the others. To date there have been five Es openings in JO02 the most remarkable being tropo combined with Es down to EA8 on the 9th. This opening was quite predictable. "Both Hepburn and F5LEN predictions showed a strong tropo possibility from EA8 to CT1. This was backed up by a report from Fernando, EA8TX of strong CT signals on 144MHz. When the MUF maps produced from the FM Band 2 spots showed that the MUF was over 120MHz down to CT all that was left was to call CQ. I worked the two stations transmitting at that time from the Canaries, EA8TX and EA8AVI. As you can see from the repeat QSOs with EA8TX in my log the path was open for over 30 minutes. I also worked CT1HZE (IM57) and was heard by EA1YV (IN52) who were probably on the Western extent of the Sporadic-E part of the propagation. There have also been a number of strong 144MHz ionoscatter days in early June with stations from OH and Italy workable on CW as well as JT65. UA4ALY LN29LA at 3,050km was heard at S2 for 5 minutes. Other best DX included UT4UEP (KN49), UT3UX (KO50), UR3CTB, UR5UI (KN59), UT4UEP (KN49), YU1EV (KN04), YT1T (KN94), UT7EW (KN78), UR5VFJ, UR3VKE (KN69), UR5VFJ (KN69), YO8TNB (KN37), YO8TK (KN27), UW8SM, UX2SB, US7SB (KN28), YO8MI KN36 and UR3EE (KN88). I listened to UA4ALY (LN29LA) at 3,050km working DL stations for over 5 minutes but despite everything I could run – he did not hear me! Looking at the maps I am convinced this was chordal rather than any other combination of Es. After that a great time – the PA/DL wall was rather hard to break but I managed a few times. I do wonder if the two YU stations were FAI – I guess it just depends where they were beaming and whether another path opened at that time.

Dale, 2M0WDG (IO85) says he had a good month on the higher bands. "The RSGB 6m Trophy contest threw up some pleasant surprises and being new to this 'VHF stuff' everything is a first! I have managed about 60 QSOs on 6m, from TF3ARI to the north, SV9CVY south and east to UR0MC. During the 6m contest I wandered up my local big hill (Traprain Law, IO85PX) with my FT-690 and stock telescopic whip, and much to my surprise I managed three QSO, only GM of course, but with 2.5W it was hard going to be copied. Z3A was booming in for a few minutes just on the FT-690 whip antenna. Moving over to 4m my first QSO was with DK5EW on the 16th, so many thanks to Erwin for that. Given that my base station antenna is a G5RV, I can't help but wonder what I could do with a proper antenna at home and also when QRP/P."

After reading the VHF column last month and the report from Stuart G8CYW, Iain's, MM1DVC (IO87) first excursion on 4m produced good DX working DK5EW (JN48), OK1DIG (JO60) and OK1TEH on JO70 all with a Moonraker BM158 and IC-7100 running 10 watts. 4m FM was also productive working a SOTA activation station GM7PKT/P also in IO87 who was using handy with 4 watts output.

Signoff

Excellent conditions in June so let's hope for more DX during the rest of the summer. Thanks also to Alan, G4GNX with an excellent description of the all too familiar subject of noise around his QTH. After a previous mention in earlier editions of *RadCom* seems to have stirred quite a number of comments.

Richard Staples, G4HGI
g4hgi@live.com

GHz Bands

UK 122 and 241GHz records

On Sunday 21 May, G8KQW and G8ACE extended the UK two-way record on 122 and 241GHz, claiming 6.8km on both bands. There is a video online **[1]** and details of G8ACE's equipment **[2]**. Initial paths of 3.9km were first worked, then G8KQW moved to another location 6.8km away. G8ACE was operating from his home QTH.

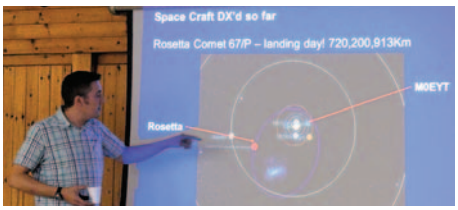


PHOTO 1: Paul, M0EYT speaking about amateur DSN at the Chilton Round Table. Photo: G4BAO.

Amateur deep space reception

At the Chilton (RAL) Microwave Round Table in June, Paul Marsh, M0EYT **[3]** gave a fascinating talk on his work receiving space probes in the DSN (Deep Space Network) bands at 2.2, 8.4, 26.5 and 32GHz. Paul was inspired to look at these bands by a demonstration by Freddy, ON6UG and James, G3RUH at the 2005 Martlesham Round Table, where they received the *Venus Express* spacecraft on a 1m dish.

This little-publicised aspect of the GHz bands is a great opportunity for learning, experimentation and technical self-improvement. It covers spacecraft and solar system orbital dynamics, GHz hardware, receiver and dish optimisation, opportunities for SDR experimentation and, as Paul says, "to have lots of fun and hear some cool signals!"

Paul's 10-year journey, from barely receiving X band signals from geostationary earth orbit, to his recent reception of the Cassini probe at Saturn, made an inspirational and fascinating subject. Just three weeks after the 2005 meeting with James and Freddy, Paul copied the *Venus Express* probe at almost 6.5 million km. Over the years he has gone from a manual dish rotation system involving look up tables, arithmetic, protractors and dashing out to the dish every 3-4 minutes to reset it, to a fully automated tracking system. His system automatically downloads the space probe ephemeris data from JPL Horizons Solar System Dynamics, computes the Doppler shift and interfaces to the F1EHN **[4]** software to drive a Radamec 409 ex electronic warfare antenna tracker turning his 1.8m dish with 0.04° accuracy.

Paul presented several interesting slides of SDR waterfall displays showing, amongst others, the loss of 8.4GHz signal from the Rosetta probe as it crash-landed on comet 67/P and his best DX of the Cassini Saturn probe at 1.36 billion km!

Have a look at Paul's website **[5]**, which covers from UHF satellite reception with a Yagi in the loft to details of his 32GHz downconverter. I think you'll be inspired to have a go at this ultra-DX! New missions are being launched all the time so there are new spacecraft to receive. As the probes go out to the planets and beyond, the continually-weakening signals provide a great opportunity for system optimisation and some exceptional DX at microwave frequencies. Amateur DSN provides an excellent learning environment to prepare for missions such as the AMSAT Mars mission **[6]** and for software geeks. Paul has shown that data demodulation and decoding is possible. In fact, amateur stations are currently taking STEREO-A/B satellite data for NASA! Googling 'amateur DSN' gets lots of information on the subject.

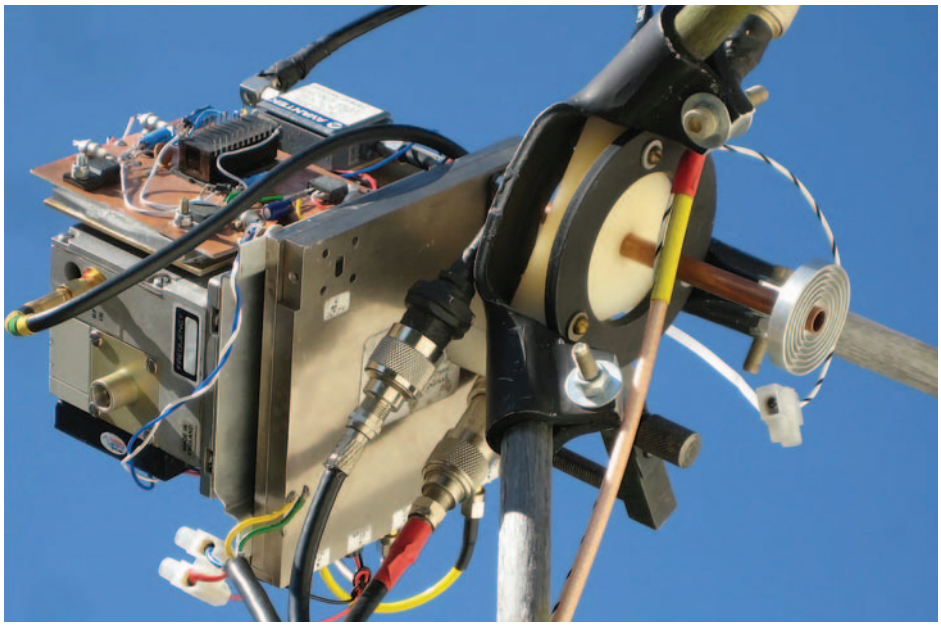


PHOTO 2: M0EYT's 32GHz downconverter for amateur DSN. Photo: UHF-Satcom.com.

Swedish EME meeting, 20-21 May

Peter, G3LTF sent me a report on the 5th Swedish EME (moonbounce) conference at Orebro. There were 32 attendees from 11 countries, with G3LTF, G4NNS, G4RGK and me from the UK. These meetings are mainly about microwave EME, how to build stuff, what works and what doesn't. Among other talks, Sergei, RW3BP described cryogenically cooling a 76GHz LNA and getting 12dB system improvement, meaning it may be feasible to use a 5W SSPA for EME on 76GHz rather than the 'monster' 60W TWT he used for his first successful echo tests. Hannes, OE5JFL spoke on pulsar reception with EME equipment and Zdenek, OK1DFC, reported plans for an EME DXpedition to Morocco in October with gear for 23-3cm **[7]**. All the presentations are available at **[8]**.

Finally

Please keep reports and technical snippets coming in by email. Join the conversation on Twitter @g4bao and @ukghz using #GHz_bands.

Websearch

[1] https://youtu.be/k6ZkNyYJb_Q
[2] www.microwaves.dsl.pipex.com/
[3] http://twitter.com/UHF_Satcom
[4] www.f1ehn.org/
[5] www.uhf-satcom.com/ and https://groups.yahoo.com/neo/groups/amateur-DSN/
[6] www.amsat-dl.org/p5a/p5a-to-mars.pdf
[7] http://bit.ly/2rVe42W
[8] www.moonbouncers.org

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Online amateur radio exams

Rob Harvey (was 2E0RVE) siting the new online Advanced exam.

Dave Wilson, M0OBW looking over Andy Hawksworth (was 2E0ECO).

Administration of the Amateur Radio Examinations (ARE) passed from the Radio Communications Foundation (RCF) to the RSGB in 2015. With this transfer came a new agreement between RSGB and Ofcom prescribing the examinations system and the supporting management structure.

Many amateurs have asked why we could not develop an online system for taking examinations. During 2016 we studied how other organisations are approaching this area. Many larger organisations offer online examinations to meet Qualifications and Credit Frameworks (QCF) that standardises both academic (from GCSE to Doctorates) and vocational qualifications such as hairdressing and first aid. Research showed that such systems were both expensive and significantly over specified for our needs. We settled on a more streamlined system produced by TestReach that more closely matched to our requirements and with features that could enhance our system in the future, should we so wish.

The RSGB signed an agreement with TestReach in the Summer of 2016 and since then we have embarked upon a project to deliver online all three levels of examination. At the time of writing the Advanced exam is the only one available online.

We are now in the final phase of testing the basic system before any of the planned enhancements are added. The expected enhancements include online applications (including payments) for both candidates and/or Examination Secretaries. It is hoped that candidates will be able to request an examination from a published list of already registered exam venues, dates and times. Subject to confirmation by the relevant examinations secretary that the session can accommodate the candidate (space considerations etc) then the booking goes ahead.

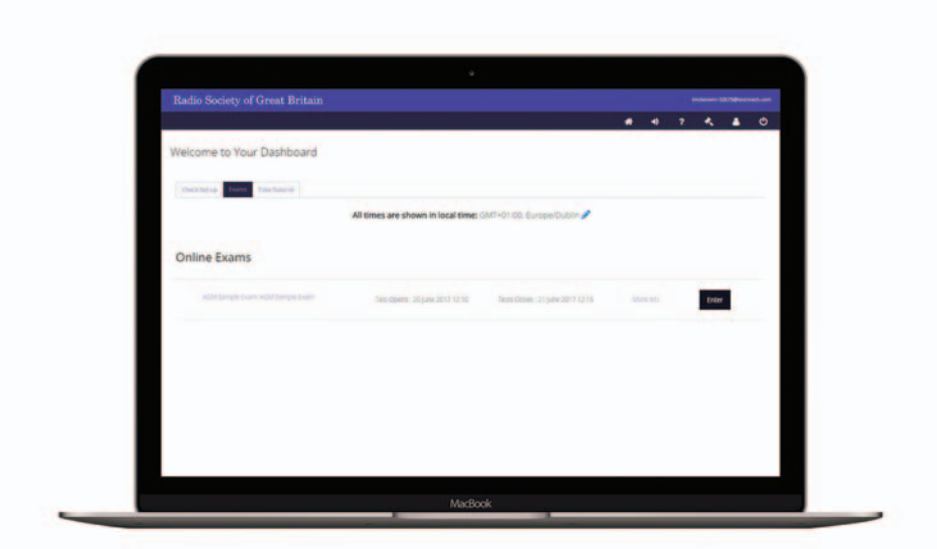
We have also been testing various solutions to situations where Wi-Fi is not installed within an exam centre. We have had success with several of 3G and 4G hotspot devices. The basic versions of these are quite affordable and the required data-only SIM card can be obtained on a 'pay as you go' basis, avoiding the need for contracts with a mobile phone provider. Some of you may have seen such devices in use at the recent AGM. A similar demonstration will be available at the forthcoming RSGB Convention (14-15 October, Kents Hill, Milton Keynes). Of course, mobile phone signals are not universal across all parts of the UK and some providers have better coverage than others in some areas. Therefore local research and testing is advisable before purchasing.

The examinations system itself sits happily on a laptop and there are recommended choices of browser and operating system

(OS). Details of these and other information will in due course be available from the examinations office and the RSGB website. Candidates may use their own laptop; clubs may also make computers available for those who do not own a laptop. Note that whilst the examinations program is running candidates will not have access to external resources such as the internet. The arrangements for invigilation will not change although the job of local marking will not be required except in unusual circumstances such as where a paper-based examination has been used.

Online examinations offer definite benefits for candidates. As a candidate answers a question the question button running along the bottom of the screen changes from black to green. If for some reason a candidate isn't completely happy that they've marked the correct answer (eg is it 15MHz or 150MHz?) the system has a built-in feature that allows them to highlight that question so that they can come back and have another later look at that question – it does this by changing the question button to orange rather than green. With facilities like this there should be no instances of a) candidates not answering a question and b) not being happy with their answers. Another significant benefit is there can be no instances of candidates making errors when transposing their answers from the question paper to the Optical Mark sheet (OMS). At the end of the examination they are presented with a 'submit' screen button. Once pressed, the candidate will receive a gentle reminder that they have still got a question highlighted for checking or if they've not answered a particular question. Candidates can choose to go back and deselect the highlighted question(s), answer any they've missed altogether or confirm that they are happy to submit their answers.

The examination is marked and within a few seconds a result displayed together with access to a feedback sheet, which may be either saved or printed. Unless irregularities have been reported during the examinations, the result as displayed will be sent to Ofcom. The candidate will be notified by letter of the result together with, if appropriate, the HAREC certificate. Simultaneously, Ofcom is also informed making the relevant level of licence available from the Ofcom web portal.



The candidate dashboard from where the candidate enters the exam.

A multiple choice screen with four possible choices.

New syllabus consultation

A new syllabus for all three levels of examination is in the final stage of development and is now available for consultation (rsgb.org/syllabus_review).

At the Intermediate level, there have been some additions. Some Advanced level material will now be found at Intermediate level to allow room for expansion of the scope at Full (the new name for Advanced level). Some of the older material such as valves and semiconductor technology has been removed or reduced in scope. New digital technologies and software defined transceivers are now included but care has been taken not to increase the level of maths above that already included. A detailed check of the number of learning points is in progress to ensure that the extent of the learning and teaching required has not increased the overall scope of the syllabus. At the same time, the balance of questions across the whole syllabus is studied. We expect the times for the examinations will remain broadly unchanged.

Your comments are invited during the consultation after which the Examination Group together with the Training and Education Committee syllabus review team will consider any necessary changes before publishing the syllabus in October for implementation in late 2018.

The three training books are also being updated and are expected to be available in time for training in the 1st quarter of 2018.

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Ian Shepherd, G4EVK
g4evk@rsgb.org.uk

Best Books from ARRL

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The race to stop Hitler's A-Bomb

By Colin Brown

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Operation Big guides us through a world of espionage and scientific discovery revealing, the truth surrounding Hitler's atomic bomb.

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Launch Pad UK

Britain and Cuban Missile Crisis

By Jim Wilson OBE

For most British people the weekend of 27/28 October 1962 could have been their last weekend on earth. Yet, astonishingly, the fact that Britain's nuclear deterrent forces were set to such an unprecedented level of readiness was kept secret from the public. Thor nuclear-tipped ballistic missiles stood on a round-the-clock wartime state of alert ready to be fired; the 'other' missiles of the Cuban Missile Crisis, which made Britain, in effect, America's launch pad.

Launch Pad UK throws light on the crisis, and the period that Britain had land based nuclear missiles. Covering the reasoning behind basing Thor missiles in the UK, through their installation and deployment, to their withdrawal only 5 years later, this book provides real insight into this crisis and the UK's involvement.

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RAF Tempsford

By Bernard O'Connor

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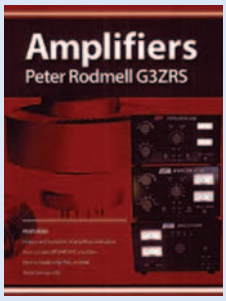

Operation Big

The race to stop Hitler's A-Bomb

By Peter Rodmell, G3ZRS

This book dispels amplifier myths and provides an insight into HF, VHF and UHF amplifiers. Written and produced by Peter Rodmell, G3ZRS the founder of Linear Amp UK, *Amplifiers* is a personal guide to this topic.

Amplifiers provides the context of RF amplifiers with a history and evolution of amplifiers and valves. It also describes how valves work and the reasons for continuing to use them in amplifiers. Valve types are explored in depth along with classic designs from a wide range of manufacturers. There are sections on fault finding and details of Linear Amp UK amplifiers describing the evolution of the Challenger and Discovery models.

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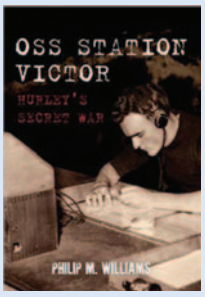

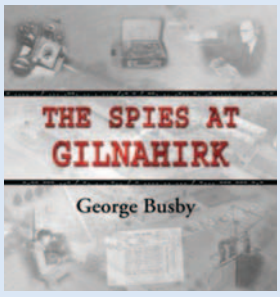

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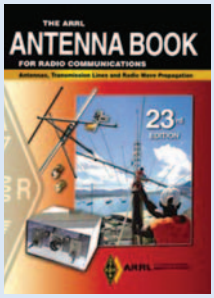

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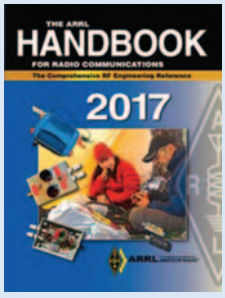

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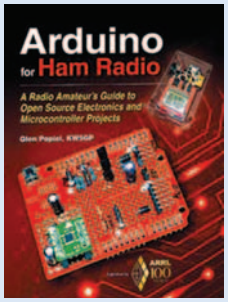

ARRL Arduino for Ham Radio

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By Glen Popiel, KW5GP

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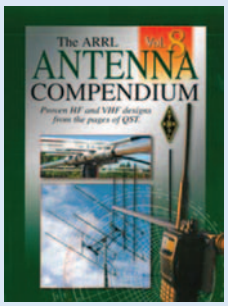

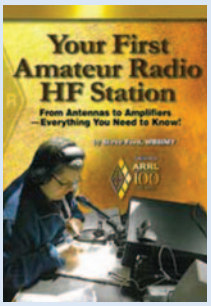

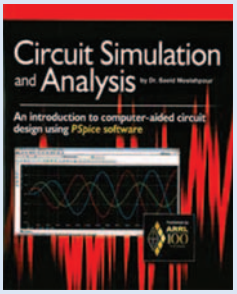

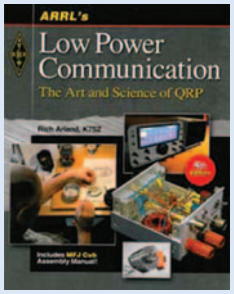

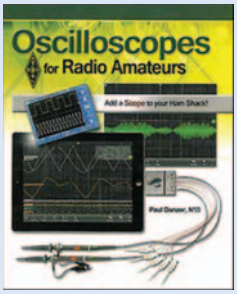

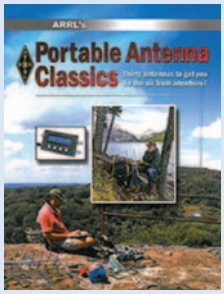

Digital radio: what's it all about?

A glimpse into the world of digital radio

I think it's safe to assume that most amateurs are aware of the various modulation modes that we have at our disposal such as AM, FM, SSB, CW, SSTV etc, just to name a few.

Back in the day, many amateurs in the UK first got onto 2m and, later, 70cm by modifying surplus professional mobile radio (PMR) [1] equipment, which has been around in the UK since 1947. As time went on, radio amateurs took advantage of surplus PMR radios when they came on to the market. Many were converted for the VHF and UHF amateur bands, and several articles appeared in amateur radio magazines showing how this could be done.

Digital radio communication has been around for a while. On the amateur bands, text-based data communications became popular in the 1980s using terminal node controllers (TNC) with their characteristic sounds. Lists of nodes seemed to be published everywhere. Broadcasters, particularly for satellite TV, have used digital signals for many years.

The introduction of digital voice PMR products has brought great benefits to the users of professional radio. Digital modulation provides a wide range of advantages by enabling the exchange of more complex information, resistance to radio interference and arguably better audio quality. It wasn't long before encryption was added to provide a secure and safe way of converting speech to transmissions. The UK emergency services largely transferred over to digital around the turn of the century, having previously migrated from just above Band 2 (88-108MHz) to 'high band' (~140-180MHz) VHF, as well as UHF.

Digital radio is, however, bringing a degree of complexity in that there are many different types of protocols now on offer – DMR [2], dPMR [3], NXDN [4], TETRA [5], P25 [6] to name but a few – some of which are standardised and some proprietary. D-Star (Digital Smart Technologies for Amateur Radio) [7] was developed by amateurs in collaboration with the Japan Amateur Radio League (JARL); it offers digital voice and data comms either direct or via an internet backbone for longer distances (potentially world-wide, or at least anywhere close to an internet connection). The most recently launched system, Yaesu's System Fusion [8], offers functions that are broadly comparable to D-Star and DMR.

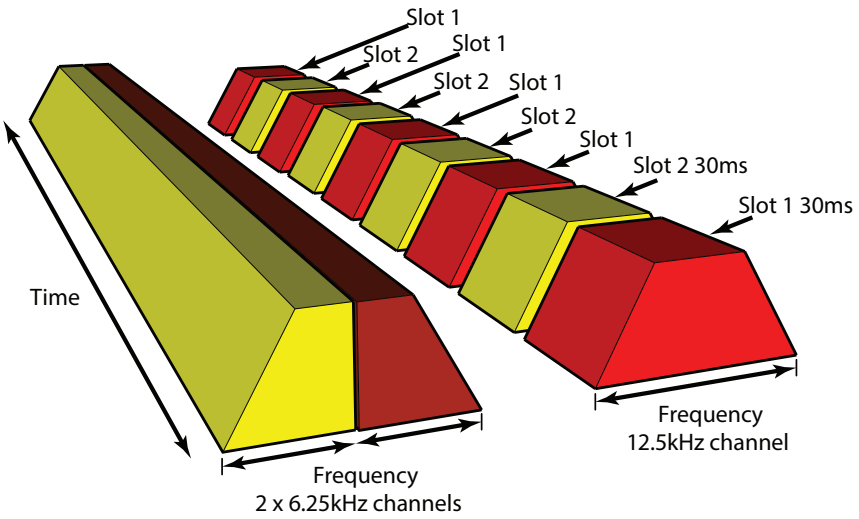

FIGURE 1: Left – frequency division multiplexing (conventional channels); right – time division multiplexing (channel divided into time slots).

None of these protocols are compatible with each other and all bring different attributes to the table. All, however, are more efficient than analogue in terms of use of spectrum. They can also improve coverage and fringe area voice quality, due to the efficiencies of digital processing and error correction. But as a digital system reaches the limit of its range it tends to stop working quite suddenly when errors can no longer be corrected – this is sometimes known as the 'digital cliff' [9].

The DMR standard was first published in 2005 and has been widely adopted by radio manufacturers and users worldwide. Research by the Digital Mobile Radio Association has concluded that DMR has become the leading digital PMR technology in operations-critical sectors such as the transport and industrial sectors. They claim to have more terminals (handhelds, vehicle-mounted, base station etc) in use than any other digital technology. Major manufacturers of DMR equipment include Motorola, Kenwood, Vertex, Tait, Simoco, Hytera and others; 'copies' are being made by a number of Chinese manufacturers. D-Star has been driven largely by Icom, until recently the only major manufacturer making suitable equipment, however Kenwood has now started making D-Star compatible radios. Only Yaesu makes System Fusion.

Largely thanks to the availability of ex-PMR equipment and the lower cost of new equipment thanks to economies of scale, many amateurs worldwide have taken up DMR. One of the principal benefits of DMR is that it enables a single 12.5kHz channel to support two simultaneous and independent calls, achieved using a system called 'time division multiple access', described next.

Time and frequency division multiplexing

Broadly speaking there are two underlying technologies to all of the various digital radio protocols that allow multiple users in a given chunk of spectrum:

- Frequency Division Multiple Access (FDMA) – used by systems including NXDN and dPMR
- Time Division Multiple Access (TDMA) – used by DMR, TETRA, P25 Phase 2 and others.

Figure 1 shows how FDMA and TDMA compare. In FDMA (left), a channel corresponds to a frequency band and channels are assigned to individual users. So, in FDMA the entire bandwidth is divided in different frequency bands or channels that (perhaps on request) are allowed to each user. No user can share the same frequency band at the same time. Small 'guard bands' are maintained between adjacent signals to minimise cross-talk between channels. User A has 100% use of a small slice of spectrum (here shown as 6.25kHz) and user B has 100% use of another similar small slice of spectrum. They thus share a total of 12.5kHz.

On the other hand, TDMA (right) divides up spectrum using time slots; user A gets a few

milliseconds of access to the 'full' bandwidth (30ms of 12.5kHz in this example), then its user B's turn. Because both user A and user B can both get access to the same 12.5kHz channel using TDMA techniques, the channel usage is the same as the FDMA example where 12.5kHz is shared between user A and user B each in 6.25kHz chunks

Different users can transmit or receive messages, one after the other in the same bandwidth but at different time slots. Each user occupies a cyclically repeating time slot and a TDMA channel may be thought of as a particular time slot that recurs regularly.

A very simple example to illustrate this principle can be two users each speaking a rhyme. Take one saying "Mary had a little lamb" in slot 1 and the other reciting "Hickory dickory dock" in slot 2. Each sender's information (speech) is cut into small packets of data and transmitted one after the other. So it might sound something like Mary Hickory had dickory a dock little the lamb mouse. In reality the time slots are very short (eg 30ms) but this does illustrate the principle.

Once the packets are received at the other end, the digital processing reassembles them into normal speech.

- FDMA isn't limited to two channels: for example, you can think of all the 2m repeater outputs side by side as a form of FDMA that divides 145.600MHz to 145.7875MHz into 16 separate 12.5kHz channels (RV48-RV63).
- Similarly, TDMA is not limited to two time slots – the TDMA-based GSM mobile phone system uses eight time slots per 'frame' (group of slots) so that it can support multiple users on the same frequency, or offer more bandwidth to certain users by giving them more slots.
- FDMA and TDMA essentially provide the same amount of capacity (channels) in the same amount of frequency spectrum, they just divide the spectrum in different ways.

Which system?

It is important to understand some basic differences in the systems' technology in order to make the right choice for an application. Some differences in specific products are the result of the way different vendors have implemented features. Others are due to fundamental differences in the underlying technology used by the protocol. These underlying differences impact system scalability, power efficiency, feature possibilities and both access to and use of spectrum. DMR uses TDMA and many of its advantages come from this choice.

D-Star has the ability to call a station by simply entering their callsign in a field in the radio. Repeaters can be connected to each other or to 'conference rooms' by the user.

Yaesu System Fusion can connect to other Fusion systems using Wires-X. In a way it is similar in use to Echolink, as the radio display updates as you navigate connections, so you can easily see what you are connecting to. Most Fusion radios also come with Group Monitor (GM), which sends out a request to see which radios are monitoring.

DMR does have a limitation whereby connections are limited to what the sysop (system operator) has configured, and usually requires the radio to be reprogrammed when new connections are needed or added.

I've had a few surprises at the number of RNARS members who are on DMR and had some interesting contacts elsewhere.

Getting started

With most common amateur digital radio systems there are a number of things you have to do before you can get involved (Yaesu System Fusion is a notable exception). D-Star and DMR both require one-time registration before use. I'll explore DMR here; D-Star is *broadly* similar although the details are different.

To get started on DMR you first have to obtain an ID number. This can be obtained free from DMR-MARC **[10]**. A DMR ID is similar to a phone number. You program it into your radio then, a bit like a phone's Caller ID, others will see you show up on their displays. If the radio is programmed in a certain way, then the call sign and/or name belonging to the transmitted ID appears in the display. One of my radios has over 800 active DMR UK calls in the memory. Live logs are available online so that you can see if you are really accessing the repeater(s) as well as who else was on the air at the time.

DMR has a capability to have Talk Groups that can be local, regional, national or world-wide – and even language specific. With the scanning facilities it is possible to hear activity on the channels such that you shouldn't miss your friends when they call you.

Setting up a digital radio can be complex, but there are now numerous guides on the internet and various downloadable files to help you with the process. Unfortunately there is some division into various 'camps' even within fraternities using a single system (eg DMR), with the practical upshot that if you side with one group you may not be able to talk to others who use the same system. This is quite separate from the fundamental incompatibilities between the different systems (D-Star, DMR, Fusion…).

One of the greatest joys of the new digital radios is the way that the repeaters can be linked to the internet and provide contacts with excellent voice quality over vast distances. There is something very special about sitting in your back garden with a little handheld, chatting away to a fellow amateur on another continent! Some digital systems also support data and picture transfer – even with a camera built into a hand mic – making it possible to send photos effortlessly, either locally or over a wider area.

Conclusion

As the title suggested, this is only a glimpse into the world of digital two-way radio. You can discover a completely new side to amateur radio that was never before possible with conventional CW, AM, SSB or FM systems. Gone are the days of stupid signal reports like "you are 5 and 1". How can anybody be perfectly readable when signals are barely perceptible? DMR, for example, has just three states of signals: perfectly clear and very good quality; broken up digital; and no signal at all.

If only Marconi knew what he started! What's it all about? The answer is the efficient use of the spectrum.

Acknowledgements

A version of this article was previously published in the *RNARS Newsletter* [11] and is used here with their kind permission. Thanks also to Gavin Nesbitt, M1BXF, for some additional information used in this text.

Websearch

[1] also known as private mobile radio
[2] Digital Mobile Radio, an open standard, see https://en.wikipedia.org/wiki/Digital_mobile_radio
[3] Digital private mobile radio, see https://en.wikipedia.org/wiki/Digital_private_mobile_radio
[4] NXDN is an open standard 'common air interface' developed by Icom and Kenwood, see https://en.wikipedia.org/wiki/NXDN
[5] Terrestrial Trunked Radio, see https://en.wikipedia.org/wiki/Terrestrial_Trunked_Radio
[6] Project 25, or APCO-25, digital comms standards widely used in North America, see https://en.wikipedia.org/wiki/Project_25
[7] see www.d-staruk.co.uk/
[8] see https://systemfusion.yaesu.com/what-is-system-fusion/
[9] https://en.wikipedia.org/wiki/Cliff_effect
[10] www.dmr-marc.net/
[11] Royal Naval Amateur Radio Society: www.RNARS.org.uk

There are many dedicated websites, Facebook groups and other online resources for DMR, D-Star, Yaesu System Fusion and other systems – a web search will help you find them.

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Data

Russian data activity

The Russian Digital Radioamateur Club, RDRc serves to increase awareness and operation using digital modes, running various activity events and contests. Gordon, G3PXT took part in one such event and he wrote about his experiences.

"I received an invitation to take part in the RDRc digital activity days contest. As you can see from their website [1], the aim is to operate any five digital modes and have at least ten QSOs on each mode. In the end I worked 18 different modes and had 360 QSOs: 36 Domino, 10 Contestia, 12 Feld-Hell, 14 JT10, 11 JT65, 24 JT9, 48 MSK16, 26 Olivia, 10 PSK125, 11 PSK31, 13 PSK125, 18 ROS, 20 RTTY, 28 SIM31, 12 SSTV, 24 THOR, 18 THROB and 12 MT63. Many of these modes I had never worked before and had to download the software from the RDRc site. This proved trouble free and all worked first time.

"Calling CQ got me pileups as many Russian stations were after DXCC for silverware. There is an award for the station that works the most modes; I may be in with a chance." A couple of week later, Gordon added "Results out, I came 12th. Look up the results table on the RDRc website." So if you want an intensive training session with a wide variety of data modes and welcome pileups, give the RDRC events a try.

WSPR opened up new horizons

And… a tongue-in-cheek comment from Ed, G8BQR, about his WSPR experiences: "Great mode for gardeners! I can work the world without tuning or logging whilst planting beans, etc and see the outcome when back indoors for a nice cup of tea. [It] got me back to radio again after 30-plus years, along with other more conventional immediate 2-way digital modes. For 'no tuning around', PSK, JT etc and RTTY are ideal. I have also discovered and managed to install meteor scatter software and reception is possible sometimes on a loft dipole (no fast CW with an old G8 2m+ licence!) – I just love these types of innovations."

JT9 and JT9-Fast

JT9, one of the newer modes within *WSJT-X*, started out primarily for use at HF, being narrower and slightly more sensitive than JT65A. The two are often used together with a dual mode simultaneous decoding option being possible within *WSJT-X*. JT9 uses nine tones, 8 for data giving three bits per symbol, with the 9th tone for sync. More details of JT9 can be found in the *WSJT-X* documentation with the message coding details at [2]. The original sub-mode JT9A adopted 1.736Hz-spaced tones at the same symbol rate for HF working, giving an occupied bandwidth of around 16Hz. At this symbol rate and with the same type of error correction as WSPR, it offers about the same sensitivity but allows QSOs using the usual one minute cycle-time protocol.

FIGURE 1: The *WSJT-X* user screen. JT9 Fast modes are selected by selecting a tone spacing from JT9E through JT9H, then clicking the Fast tick box just to the right of the black date and time box at the bottom.

As with JT4 and JT65, wider-spaced options can be selected to suit the higher frequency bands where spreading and scattering distort the signal. The widest is JT9H, with 222.2Hz tone spacing. This is comparable to JT4G's 315Hz and suggests JT9H could have possibilities on the higher microwave bands like 10GHz where JT4G currently rules. Its lower symbol rate could offer something like 4dB extra sensitivity.

But apart from just widening the tone spacing, there is an almost hidden option that really opens up possibilities with JT9: the 'fast' options, *JT9-Fast*. Fast mode can be selected by clicking the 'Fast' tab that appears at the bottom of the screen – see **Figure 1** – when any wider spaced mode from JT9E through to JT9H is selected. For the narrower JT9 modes the button is visible, but greyed-out. When Fast mode is selected, the symbol rate is adjusted to suit the tone spacing, as per **Table 1**.

When *Fast* is selected, Tx/Rx timing can be selected down to as fast as 5-second cycles. The message repeats continuously during a Tx cycle and there is no rigid timing structure to be maintained like the slower modes with their on-the-minute start times. All this means that JT9-Fast has become a strong contender for fleeting propagation paths like aircraft scatter and short Sporadic-E (Es) openings. ISCAT, with its two modes A and B, was designed for these sort of propagation paths, but JT9-Fast now offers a more robust error corrected option. Try it and see. With the arrival of the Es season, George, KF2T made this comment on the WSJT-Yahoo Group:

"While JT65 is a great mode for EME, it probably is about the worst for spotty Es. While a great gateway for low band operators to get started with on 6m, the thrill rapidly turns to frustration for everyone. May I suggest we push for greater use of JT9 fast modes for Es contacts? Just as MSK144 is 'the' mode for meteors, JT9E-H seems ideally suited for Es. My personal opinion is that JT9F with 10 second cycles is pretty close to the sweet spot, based on how long fades during weak openings seem to last. A good mix of sensitivity and speed. What say? Comments?"

TABLE 1: Summary of JT9 fast modes.

Mode	Tone spacing	Symbol rate	Message duration
JT9E-Fast	27.78	25	3.4s
JT9F-Fast	55.56	50	1.7s
JT9G-Fast	111.1	100	850ms
JT9H-Fast	222.2	200	425ms

Dual mode beacon possibility

With the same message encoding for slow and fast modes, the only difference being in timing, a JT9 beacon could be switched continuously between normal slow and fast modes to exploit all propagation possibilities. As the mode uses convolutional coding, generating the message in real time is straightforward too. Just a thought…

Websearch

[1] The Russian Digital Radio Amateur Club – https://www.rdrclub.ru/dni-aktivnosti-rtsrk/ (in Russian but many online translators work). There are links to downloads for all the data modes.
[2] The JT9 coding process – www.g4jnt.com/JT9_Coding_Process.pdf

Andy Talbot, G4JNT
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Book Review

RadCom DVDs 1976-1980 and 1996-2000

RadCom's digital archive has been available on CD for some time as one year per disc, but we are now starting to release five-year sets on a single DVD, taking advantage of that newer medium's enhanced capacity.

The DVDs contain the full editorial text of the year and the accompanying photographs and diagrams. (Some editions do not include the advertisements, but most do). Where possible, the files are reproduced as searchable PDFs, making it easier to find archive material. (*RadComs* before about the 1990s were produced by the traditional method of manual galleys and no searchable version is available, although of course the annual indexes included within the magazines provide a method of finding the material you want).

The DVDs are available now, priced at just:

- £16.99 for Members
- £19.99 for non-Members

and join the other sets of back issues available via the RSGB Shop.

Help support the IOTA Programme

IOTA Mug

The IOTA mug is a fine drinking vessel that adds panache to any amateur radio shack. Its warm colours evoke a gorgeous sunset seen from a tropical beach – exactly the sort of thing that an IOTA island activator is likely to see (assuming they're not clinging on for dear life to somewhere inhospitable like Rockall). Extensive testing in the *RadCom* office suggests that tea tastes nearly 15% better when drunk from an IOTA mug. At the time of writing, results were not yet available for coffee or other beverages, but we can confirm that it's dishwasher-safe. Show your support for IOTA with an official, limited-edition mug – and why not get a set? They make an excellent conversation-opener when you serve your guests, and may even be a way to persuade people to sample the delights of amateur radio.

"A mug anybody would be proud to have on their desk"
– Elaine Richards, G4LFM, RadCom *Managing Editor*

£5.99 +P&P

IOTA polo shirt

Perhaps the last word in sartorial elegance is the IOTA polo shirt. Available in a range of sizes to suit almost any amateur's figure, the shirt features a finely-embroidered IOTA logo on a white background, contrasting nicely with the tasteful background colour.

Made from fine cotton and featuring three buttons for temperature and smartness adjustments, this short-sleeved shirt is perfect for all casual occasions, whether amateur radio-related or not. It is suitable for machine washing and, while it will benefit from ironing, will still look good if it is simply hung up straight out of the tumble dryer.

£12.99 +P&P

For both these products, all proceeds go to the funding of the IOTA programme

Giles Read, G1MFG
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Sport Radio

Looking forward to a new series of Autumn HF contests.

There are no RSGB HF contests this month, but this seems an opportune moment to remind readers that a new Autumn Series of 80m contests will be starting next month. The new series replaces the 80m Sprints, which never gained widespread popularity in its 10-year history. The Sprints used to begin in August, but the new series will begin in September and last for three months. Unlike the Sprints, datamodes will be included in the Autumn Series. Sessions will follow the familiar Monday-Wednesday-Thursday pattern, but instead of starting on the first Monday of each month they will start on the second Monday. Starting the sessions a week later every month will avoid clashes with the 4m FMACs and UKACs, without ever having to juggle the dates. The distance limit for Local Clubs will be a 50 mile radius from their Virtual Meeting Place and there will be significant encouragement for clubs to get their Foundation and Intermediate licensees to take part, with Foundation licensees having their score boosted by a factor of three and Intermediate licensees having their score boosted by a factor of two. Perhaps the most radical rule is that the Autumn Series will feature a Le Mans style start, with two minutes of radio silence before each session. The full rules are available on the Contest Committee website.

PHOTO 1: Antennas at G7LRQ's home in Watford.

VHF contesting starts with the FMAC and UKAC on Tuesday 1st. Then we have what I call Low Power Weekend. On Saturday 5th the fourth session of the 144MHz Backpacker Contest is overlapped by the 144MHz Low Power Contest. Remember that the power limits for the Backpacker series are now 5 watts (Backpacker section) and 25 watts (Hilltopper section). The power limit for everyone in the Low Power Contest is 25 watts. Some people who operate portable in the 144MHz Low Power camp overnight and change their equipment the following morning, to take part in the 432MHz Low Power Contest. Last year Anthony Coldman, G7LRQ won the Single-op Fixed section of both Low Power contests (see **Photo 1**). Activity on the same band resumes on Tuesday 8th, with the 432MHz FMAC and UKAC. The 50MHz UKAC is on Thursday 10th. The final session of this year's series of 70MHz Cumulatives is on Sunday 13th. It's back to the Activity Contests for the remainder of the month, with the 1.3GHz UKAC on Tuesday 15th, the 70MHz FMAC and UKAC on Thursday 17th and the SHF UKAC on Tuesday 22nd.

The Worked All Britain 144MHz Low Power Phone contest is on Saturday 5th. Conveniently it coincides with two RSGB Low Power contests, but bear in mind you need to exchange WAB area (the first, second, third and sixth digits of your National Grid Reference) in this one. The Worked All Europe (WAE) DX CW Contest takes place for the entire 48 hours of the weekend 12/13th. Europe works non-Europe only in the CW and SSB legs of this German-run series. In WAE exchanging QTCs (reports of previously held QSOs) can significantly boost your score, but not everybody does it. There really is no substitute for reading the rules to learn how this works. The UK Microwave Group has another in its series of 5.7/10GHz contests on Sunday 27th. The IRTS (Irish) 2m Counties Contest takes place the same day. In this one there are awards in each section for the leading station inside and outside of EI. Last year only one log was submitted from outside of EI, which to me means you might not have to make a lot of QSOs to come first. Those in GI have an obvious geographic advantage in this contest, but if you live in G/GW/GD/GM and have a decent 2m station and a good takeoff to Ireland you stand a chance.

Steve White, G3ZVW
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RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Tue 1 Aug	144MHz FMAC	1800-1900	FM	144	RS(T) + SN + Locator
Tue 1 Aug	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
Sat 5 Aug	144MHz Backpacker #4	1300-1700	All	144	RS(T) + SN + Locator + Postcode
Sat 5 Aug	144MHz Low Power +	1400-2000	All	144	RS(T) + SN + Locator + Postcode
Sun 6 Aug	432MHz Low Power +	0800-1200	All	432	RS(T) + SN + Locator + Postcode
Tue 8 Aug	432MHz FMAC	1800-1900	FM	432	RS(T) + SN + Locator
Tue 8 Aug	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
Thu 10 Aug	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
Sun 13 Aug	70MHz Cumulative #5	1400-1600	All	70	RS(T) + SN + Locator
Tue 15 Aug	1.3GHz UKAC	1900-2130	All	1.3G	RS(T) + SN + Locator
Thu 17 Aug	70MHz FMAC	1900-2130	FM	70	RS(T) + SN + Locator
Thu 17 Aug	70MHz UKAC	1900-2130	All	70	RS(T) + SN + Locator
Tue 22 Aug	SHF UKAC	1900-2130 ~	All	2.3-10G	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
Sat 5 Aug	WAB 144MHz Low Power Phone	1400-1800	Phone	144	RS(T) + SN + WAB square
Sat-Sun 12-13 Aug	WAE DX CW	0000-2359	CW	3.5-28	RST + SN (Eu works non-Eu only)
Sun 27 Aug	UKuG	0600-1800	All	5.7/10G	RS(T) + SN + Locator
Sun 27 Aug	IRTS 2m Counties	1300-1500	SSB/FM	144	RS(T) + SN (EIs & GIs also give county)

+ VHF Championship event. ~ Different bands at different times. For all the latest RSGB contest information and results, visit www.rsgbcc.org

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A Great New Compact User-friendly Dual-bander

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Please send news reports to radcom@rsgb.org.uk. To get future events listed here and put on GB2RS, email details of your meetings as early as possible to radcom@RSGB.org.uk Include your club name, RSGB Region number, contact name, callsign & phone number, date and meeting details. Example: Fraser Road Radio Club, Region 9, Steve, M1ACB, 01234 832 700, 29 Oct, Aardvarks on the Air special event station. We usually acknowledge everything within 3 working days: if you don't hear from us, please phone. We don't normally include 'closed', 'TBA' or 'every Tuesday'-type entries. The deadline for the September issue is 27 July and for October it's 24 August. For GB2RS, the deadline is 10am on the Thursday of the week of broadcast.

CLUB EVENTS CALENDAR

INTERNATIONAL

Pafos Radio Club, Cyprus
Richard, 5B4AJG, 00 357 97 857 891, 5b4ajg@gmail.com www.cyhams.org
Meets 3rd Thursday at DT's Bar. Visitors and holidaymakers welcome.

International Federation of Railway Radio Amateurs (FIRAC), www.firac.org.uk
Nets Sun 14.320MHz at 0830UTC Wed 1430UTC 21.3MHz g4gnq@hotmail.co.uk

NATIONAL

Amateur Radio Caravan and Camping Club membership@arcc.org.uk, www.arcc.org.uk
Rallies August: Winster, Matlock and Copt Oak

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

British Railways Amateur Radio Society g4gnq@brars.info, www.brars.info
Net Tues 1900 3.680MHz, Fri 1600 7.155MHz

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

Radio Amateur Old Timers' Association MemSec@RAOTA.org, www.RAOTA.org
Nets: Wed 3.763MHz 1000, 1.963MHz 2100, Thurs 7.163MHz, 1100, 3.763MHz 1930 Sun 3.763MHz 1000.

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

Regional Manager: Marcus Hazel-Mcgown, MM0ZIF
RM1@rsgb.org.uk

Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723
4 Normal club night
11 24th annual mini-rally night
19-20 GB2LBN, Barns Ness, ILLW

Livingston & District ARS
Cathie, 2M0DIB, 01506 433 846
1 Feedback from Field Day/operating
8 Talk
15, 22, 29 Training and operating

Lothians RS
Mike, MM0MLB, secretary@lothiansradiosociety.com
9, 23 Informal pub night, 'wee' Bennet's Bar

Mid Lanarkshire ARS
Kevin, 2M0KVM, 0772 509 6279
4, 11, 18, 25 Club night

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Regional Manager: Andrew Burns, MM0CXA
RM2@rsgb.org.uk

Dundee ARC
Martin, 2M0KAU, 0776 370 8933
1 VHF radio hands on
8 YOTA activity
15, 22 Practical hands on/ tuition
19-20 ILLW, GS4AAF/P lighthouse
29 Talk

Glenrothes & District RC
Tam, MM0TGB, 0775 3526 498
2, 9, 23 ILLW prep / Check HF kit / ILLW debrief
16 2m homebrew Yagi
30 Club meeting

REGION 3: NORTH WEST

Regional Manager: Kath Wilson, M1CNY
RM3@rsgb.org.uk

Macclesfield & District RS
Greg, M0TXX, info@gx4mws.com
7 14 Equipment / construction maintenance
10-13 Field Day at Brandside Village Hall
21,28 Film night / on the air

South Manchester R&CC
Ron, G3SVW, 01619 693 999
3 Demonstration of QRP
10 Crib Sheets by G8RSI
17 Review of shack test equipment
24 Mini lectures
31 Communications in W Africa by 5N0/G3SVW

Stockport Radio Society
Heather, M6HNS, 0750 690 4422
1 Society meeting
8 Club net, 51.550MHz FM, 7.30pm, then 50.270MHz SSB at 8.15pm
10 Club net from 7.30pm on 145.375MHz
15, 22 Radio / Skills night

Thornton Cleveleys ARS
John E Rodway, G4FRK, 01253 862 810
7 Natter night and on air
14 SSB NFD / 2m Trophy discussion
21 Beach BBQ – on air

REGION 4: NORTH EAST

Regional Manager: Ian Douglas, G7MFN
RM4@rsgb.org.uk

Denby Dale RC
Darran, G0BWB, 0797 442 3227
2 Direction finding, G3SDY & G1DEN
5 WAB 144MHz QRP contest
6, 13, 20, 27 Club net via GB3HD, 10.30am
9, 23, 16 Night on the air / club night
19-20 Lighthouses on the Air
30 DF fox hunt

Durham & District ARS
Michael, G7TWX, dadars@gmx.com
2, 9, 16, 23 Club night
3, 10, 17, 24 Net, 7.30pm, 145.475MHz

Hull & District ARS
Julian, 0775 957 7118
3, 10, 17, 24, 31 Club night / on the air

Ripon & District ARS
David, G3UNA, 01423 860 778
3, 10, 17, 24, 31 Club night

Sheffield & District Wireless Society
Krystyna, 2E0KSH, 0788 406 5375
2 Portable night, moors above Sheffield
9, 23 Training & social / technical & training
30 Meal out

Sheffield ARC
David, G6DCT, littlewood20@btinternet.com
14 Remote lock, John, 2E0WLJ
21 Club night

Spen Valley ARS
Russell, G0FOI, 01274 875 038
3 Shack improvements discussion
17 On the air

REGION 5: WEST MIDLANDS

Regional Manager: Martyn Vincent, G3UKV
RM5@rsgb.org.uk

Cheltenham ARA
Derek, G3NKS, 01242 241 099
1, 8, 15, 22, 29 QRS CW, 3540-3550kHz, 8pm
6, 13, 20, 27 Net, 8.30am, 50.220MHz USB
15 Lunch
20 Auction of SK gear

Coventry ARS
John, G8SEQ, 0795 877 7363
3, 10, 17, 24, 31 Net, 8pm, 50.175MHz SSB
7, 14, 21, 28 Open net, 8pm, 145.375MHz FM and/or 7.16MHz ± QRM SSB
11 BBQ & portable night, Newbold Comyn,
18 G4ZMC portable competition trophy
25 Radio workshop

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595 daytime
2, 9, 16, 23, 30 Net, 7.30pm, 145.475MHz
3, 10, 17, 24, 31 Net, 7.30pm, 145.475MHz FM then 80m SSB
4, 11, 18, 25 Net, 7.30pm, 432.220MHz USB
14 Outdoor OTA & picnic, Crickley Hill, members only
28 Outdoor operating at Crickley Hill

Malvern Hills RAC
Dave, G4IDF, 01905 351 568
8 The story of GB3NW, G4IDF and G6CMV
22 Informal meeting

Midland ARS
Norman, G8BHE, 0780 807 8003
2 Open meeting, ragchew and training classes
9, 30 On the air/general meeting with training
16 Holiday experiences and open meeting
23 Review of rallies to visit

Mid-Warwickshire ARS
Don, G4CYG, 01926 424 465,
5 Club Field Day
15 Barbecue at Fred's with M6ENC

Salop ARS
salopamateurradio@gmail.com
3 Natter night / committee meeting
10, 31 Calibration night / shack night
17 Tabletop sale
24 Fox hunt #4 (pedestrian)

Solihull ARS
SolihullRadioClub@gmail.com
3, 10, 24, 31 Club net, 8pm, 145.450MHz
17 Club night

South Birmingham RS
Gemma, M6GKG, gemmagordon.m6gkg@gmail.com
1, 8, 15, 22, 29 Coffee morning from 11am

4, 11, 25, 31 Preparing for Telford Rally
7 Checking rigs in shack
17, 24 Training classes with Dave, G8OWL

Sutton Coldfield ARS
Robert Bird, rob2e0zap@gmail.com
7, 21, 28 Open net, 7.30pm, 145.250MHz
14 Club meeting
15 Open net, 7.30pm, 70.475MHz FM
29 DMR open net, 7.30pm, GB7FW slot/local2

Telford & District ARS
John, M0JZH, 0782 473 7716
2 Committee meeting and GX3ZME OTA
9 The 160m / 80m dipole
16, 30 Hamfest prep, incorporating gQRP club
23 3rd fox hunt

Wythall Radio Club
Chris, G0EYO, 0771 041 2819
1, 8, 15, 22, 29 Morse class and club night
6, 13, 20, 27 Net, 8pm, 145.225MHz or GB3WL
8 Committee meeting
13 Wythall Carnival
28 Curry night

REGION 6: NORTH WALES

Regional Manager: Ceri Lloyd Jones, 2W0LJC
RM6@rsgb.org.uk

North Wales Radio Society
Liz Cabban, GW0ETU, 0776 019 0355
3 17 General meeting / discussion night
10,3 31 Technical topic / night on the air
24 Club visit to Wireless in Wales in Denbigh

Wrexham ARS
Eifion Parry, mw6eyu@gmail.com
1 Heart and stroke talk, Dave Lockyer

REGION 7: SOUTH WALES

Regional Manager: Glyn Jones, GW0ANA,
RM7@rsgb.org.uk

Aberystwyth & District ARS
Ray, GW7AGG, 01970 611 853
24 Net on 145.500MHz then 145.550MHz

REGION 8: NORTHERN IRELAND

Regional Manager: Philip Hosey, MI0MSO
RM8@rsgb.org.uk

Carrickfergus ARG
Elizabeth Forde, elizabethforde64@yahoo.com
18-20 Lighthouses on the air

REGION 9: LONDON & THAMES VALLEY

Regional Manager: Tom O'Reilly, G0NSY
RM9@rsgb.org.uk

Aylesbury Vale RS
vic@rakewell.com
9 Discussion evening

Bracknell ARC
David, M0XDF, M0XDF@Alphadene.co.uk
2, 16, 23, 30 Open net, 8pm, 145.375MHz
9 Treasure hunt, Richard May, G8IBP

Chertsey Radio Club
James, M6FLT,
chertseyradioclub@hotmail.com
1 Social online gathering

Reading & District ARC
Laurence, G2DD, 0758 470 6625
10 Night on the air
24 Social evening

Southgate ARC
Keith, G8RPA, g8rpa@arrl.net
9 Barbecue in the Spinney

Verulam ARC
Greg, M0PPG, 01582 413 345
15 Fox hunt

REGION 10: SOUTH & SOUTH EAST

Regional Manager: Michael Senior, G4EFO
RM10@rsgb.org.uk

Bromley & District ARS
Andy, G4WGZ, 01689 878 089
2, 9, 16, 23, 30 Net, 9pm, 145.500MHz (and QSY)
15 Club meeting

Coulsdon ATS
Andy, G0KZT, secretary@catsradio.org
2, 9, 16, 23, 30 Net, 9pm, 70.425MHz
6, 13, 20, 27 Net, 11am, 145.4MHz ± QRM; 5pm, 3.7MHz ± QRM
14 Annual BBQ at home of G4CDY

Cray Valley RS
Dave, G8ZZK, 0773 954 9822
3 A perspective on Guernsey, Bob, M0MCV
17 Non radio talk

Crystal Palace R&EC
Bob, G3OOU, 01737 552 170
2, 9, 13, 16, 20, 27 Net, 8pm, 145.525MHz (S21) ± QRM
4 Summer social

Dorking & District RS
David, M6DJB, djb.abraxas@btinternet.com
31 Social evening

Dover RC
Aaron, 2E0FQR, 0771 465 4267
3 2m fox hunt, 7pm
17 Operating at Dover Patrol monument

Echelford ARS
John, G4GSC, 01784 451 898
10 RAYNET, Colin, M0NLP
24 CW practice, on air operating and social

Hastings E&RC
Gordon, 01424 431 909
23 Construction contest

Hilderstone R&EC
Ian, 2E0DUE, secretary@g0hrs.org
3, 10, 17, 24, 31 Informal meet at Joss Bay
19-20 GB1NFL, ILLW

Horndean & Disrict ARC
Stuart, G0FYX, 02392 472 846
4 Natter night/social evening

Horsham ARC
Alistair, G3ZBU, 0785 526 8666,
info@harc.org.uk
3 Club night
17 Social at The Bricklayers Arms

Mid-Sussex ARS
Dennis, M0YDC, 0747 630 1044
4 On Air Night
11, 18 Radio Night / Table Top Sale(11th)
25 The RNLI (Penny)

Southdown ARS
John, G3DQY, 01424 424 319
2 Hailsham Shack meeting 10.30am
2, 9, 16, 23, 30 Club net, 8.30am,145.275MHz; cafe meeting 12.30pm; CW net, 7pm, 144.060MHz
5 Beachy Head 50th Anniversary BBQ
26-28 Festival of Transport, Hellingly

Surrey Radio Contact Club
John, G3MCX, 020 8688 3322
3, 10, 17, 24, 31 Net, 8pm, 70.300MHz
4, 11, 18, 25 Net, 8pm, 145.350MHz
6, 13, 20, 27 Net, 9.30am, 1905kHz
7 Video, Peter, G3ZPB
21 Chat and fix-it, John, G8MNY

Sutton & Cheam RS
Martin, M0SGL, info@scrs.org.uk
17 ICQ PodCasts, Martin Butler, M1MRB

Worthing & Disrict ARC
Al, M0OAL, information@wadarc.org.uk
2, 9 Tea and chat night/BBQ
6 Sunday breakfast
9, 23 lecture/Practical evening or workshop
30 2m fox hunt, 8pm

REGION 11: SOUTH WEST & CHANNEL ISLES

Regional Manager: Pam Helliwell, G7SME
RM11@rsgb.org.uk

Appledore & District ARC
Alan, M6CCH, 01237 422 833,
fisheralan@btinternet.com
21 Natter night

Bristol RSGB Group
Shaun, G8VPG, 01225 873 098
21 Magnetic loop aerials, Dave, G3ZXX

Cornish Radio Amateur Club
Steve, G7VOH, 01209 844 939
2, 17 Committee/Social meeting
3 Main meeting

Exeter ARS
Nick, M0NRJ, 01363 775 756
1 Net, 7.45pm, GB3EX
8, 15, 22, 25, 29 GB3EW Repeater Net, 7.45pm
9 Workshop on AREDN and Hamnet
23 HF propagation prediction

Flight Refuelling ARS
John, G4POF, 0758 250 6336
13 Flight Refuelling Hamfest Rally

Mid-Somerset ARC
David, G8BFV, 01749 670 085
14 Summer picnic and /P operation

Newquay Radio Club
Terry, 2E0XTM, 01841 540 142
3, 31 Chill and chat – all welcome
17 What's your poison? All welcome

North Bristol ARC
Mat, G7FBD, g7fbd@gb3bs.com
4, 18, 25 Relax, chat, operating and training (4th)
11 Summer quiz night

Plymouth Radio Club
David, 2E0DTC, d.beck123@btinternet.com
8 Club night

Riviera ARC
rivieraarc@gmail.com
3, 17 Club night

Saltash & District ARC
Mark, M0WMB, 0781 054 8445
3, 17 Club night, all welcome

South Bristol ARC
Andrew, G7KNA, 0783 869 5471
3 Darts tournament
10 2m collaborative fox hunt
17, 19-20 ILLW briefing/ILLW
24 DX Challenge, shack manager
31 Open house and on air night

Torbay ARS
John, g4vud@tars.org.uk
4, 18 Operating night
11 Business meeting
19 70th Anniversary BBQ, Chudleigh
25 Basic First Aid for radio amateurs, M0TCF

The next three deadlines are 27 July, 24 August and 21 September. Send your event info to radcom@rsgb.org.uk and *clearly* include your full club name, RSGB Region number, contact name, callsign, phone number, date and meeting details.

Weston Super Mare RS
Martin, G7UWI, 01934 613 094
7, 14, 28 Construction, operating and natter night
20 DF hunt
21 Main meeting

REGION 12: EAST & EAST ANGLIA

Regional Manager: Keith Haynes, G3WRO RM12@rsgb.org.uk

Braintree & District ARS
Edwin, G0LPO, 01376 324 031
1, 15, 29 Net, 8pm, 145.375MHz
8 TX14
22 Natter night/summer camp prep

Chelmsford ARS
secretary@g0mwt.org.uk
1 Construction competition
21 Skills night

Colchester Radio Amateurs
Tony, 2E0FTQ, 0783 177 4669
17 Visit to Wakes Colne Observatory
19-20 Naze Tower, GB6NT

Essex Ham
Pete, M0PSX, news@essexham.co.uk
5 Essex YL net on GB3DA, 8pm
6 Online Foundation course
7, 14, 21, 28 Net, 8pm, GB3DA, www.essexham.net

Felixstowe & District ARS
Paul, G4YQC, pjw@btinternet.com
14, 28 Net, 8pm, 145.400MHz

Huntingdonshire ARS
David, M0VTG, secretary@hunts-hams.co.uk
10 Natter night
24 SSTV, G6OHM
28 Rally

Loughton & Epping Forest ARS
Dave, M0MBD, 0798 016 5172
3, 10, 17, 24, 31 Net, 144.725MHz, 8pm
4, 18 Natter night
19-20 GB0TBW ILLW

Norfolk Coast ARS
Steve, G3PND, info@norfolkcoastamateurs.co.uk
3 Mag loop construction
10 Computer logging
17 EME testing
24 Contesting
31 JT Modes

Peterborough & District ARC
Alan, secretary@padarc.co.uk
1, 15 M1 PRC, 145.400MHz
1-2 Foundation course
7, 14, 21, 29 Club net, 1.908MHz
23 Digital mode demonstration on air

South Essex ARS
Terry, G1FBW, 0798 607 0040
8 35th Anniversary evening
20 35th Anniversary Field Day at Island Yacht Club

Thurrock Acorns ARC
Gordon, M0WJL, acorns@taarc.co.uk
1 2m SSTV open net, 7.30pm
3, 10, 17, 24, 31 Open net, 7.30pm
15 Broadcast radio, pt 2, M0PSX
26 SES, Thurrock Thameside

REGION 13: EAST MIDLANDS

Regional Manager: Jim Stevenson, G0EJQ RM13@rsgb.org.uk

Leicester RS
Sandra, G0MCV, 0793 027 4044
7 Bring and buy
14 Morse class, night on the air
21 Morse class followed by a quiz
24 Drop in for a cuppa 12-5pm

Loughborough & District ARC
Chris, G1ETZ, 01509 504 319
1 Aerial testing, ZL special, G7SEG
8 On air from the allotment, Whitwick
15 Open forum – ATUs and baluns
22 SWR, Andrew, G7SEG
29 Practical evening

Nunsfield House ARG
Paul, G1SGZ, pr@nharg.org.uk
4 Surplus sale
7, 14, 21, 28 Shack Night
10, 17, 24, 26, 31 Club net, 8pm, 145.325MHz
11, 18 TX Factor 15 /16 video
25 Sawley Marina prep & club night

RAF Waddington ARC
Bob, G3VCA, 0797 116 6250
4, 11, 18, 25 Cake night
7, 14, 21, 28 Net, 8pm, 145.325MHz

South Kesteven ARS
Andrew, M0NRD, 0796 906 2859
2, 9, 16 Club net via GB3GR
4, 18 Club meeting

Welland Valley ARS
Peter, G4XEX, 01858 432 105
7 Club net, 8pm, 145.275MHz FM
21 HF Portable from Clipston, 7pm

Worksop ARS
Sue, M6XAK, 01777 707 992
1, 8, 15, 22, 29 Social night
3, 10, 17, 24, 31 Technical night

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Members of Orkney RC enjoyed a social evening at the station of GB4SRO on South Ronaldsay organised by Val, G6MML, Elaine, 2E1BVS, Glenn, G6HFF and John, G3WFK. The station was activated for two weeks in April/May. Operators and supporters included Glenn G6HFF, Brenda, Colin, GM0IFM, Elaine 2E1BVS, Dave GM0KTA, Val G6MML, Donna, MM3WJD, Dave, MM5DWW, Ed, GM0WED and Glenn, 2M0DES.

REGION 3: NORTH WEST

Members of Stockport RS recently embarked on a 300 mile round trip to Bletchley Park to take in all the historic site has to offer. Organised by Kieron, M5KJM with assistance from Heather, M6HNS, 29 club members and three guests spent a pleasant four hours viewing the many and varied offerings Bletchley has on show for visitors. Eats and treats for the trip were supplied by Neil, M6NAE, and the luxury coach was provided by local company, Bullocks.

REGION 4: NORTH EAST

Durham & District ARS held their first radio rally in May. They would like to thank all the visitors, traders, clubs and staff of Bowburn Community Centre.

Hull & District ARS has a new meeting location: Humber Social Club, 36 New Bridge Road, Hull, HU9 2RG.

Grimsby ARS now has a new website and domain, Grimsbyars.uk New members are welcome. The D-Star UHF repeater, GB7GC, has new antennas and a UHF preamp on receive that will help with better coverage. The UHF FM repeater, GB3GY, which is now based in Cleethorpes, will also be upgraded soon.

Bishop Auckland RAC committee and members would like to congratulate Paul, M0TZR, David, 2E0FTD and Michael, 2E0FTT in successfully passing their Full and Intermediate exams. Well done.

Denby Dale ARS had a presentation on electrostatics given by Richard, G4RCX. This was both a 'shocking' and informative night with some light hearted humour. The 'Braggers Night' saw Gerald G3SDY with his Codar ATS mobile transceiver, Howard, M0HRE with his Clansman patrol transceiver with clockwork burst transmitter and David, M0RIU brought a homemade HF antenna analyser utilising Arduino, a DDS and a SWR bridge.

REGION 5: WEST MIDLANDS

Geremy Ali passed his Intermediate exam at **Midland ARS** with thanks to tutor Ron, M0WSN.

REGION 7: SOUTH WALES

Blackwood and District ARS has enjoyed over 45 year at Oakdale Comprehensive school, but the school building has now reached the end of its projected life. So the club is moving to the new school, Islwyn High School at Waterloo Road, Oakdale, Blackwood, Caerphilly NP12 0NU. The school authorities have offered generous facilities in the new building, so the club can continue its weekly Friday evening meetings and provide Foundation, Intermediate and Advance tuition. The site is also registered as an RSGB examination centre.

REGION 10: SOUTH & SOUTH EAST

An Intermediate course will start in November at **Dover Radio Club.** Register your interest at the club by Mid-September by following the details online at www.darc.org.uk
Advanced exam support nights will also start in November.

Hilderstone R&EC members used the prize of a bhi Dual In Line Noise Eliminating module at GB1MSM for Museums on the Air at the Spitfire Museum (kindly supplied by W&S). Here you see Kadriye, M6WFY operating and Christopher logging.

REGION 11: SOUTH WEST & CHANNEL ISLES

Torbay ARS enjoyed a presentation on aircraft carriers by Don, G4NNP. His detailed talk started at the 1900s when armaments had improved enough require an airborne spotter through the addition on a runway on the stern of the ships, to finally arriving at a look at the new 65,000 ton HMS *Queen Elizabeth* that has just been launched.

After many years tirelessly leading Plymouth Radio Club, the existing board decided it was time to hand over the reins. The new incumbents are Dave, 2E0DTC (Chair); Martin, M0MLZ (Secretary) and Chris, M0ZCP (Treasurer). Other committee members include Shelia, 2E0YSM, SWL Steven and Robert Goodall, 2E0ITN, who remains as the Publicity Officer.

Callington CARS recently held a Raspberry Pi evening. Members displayed and talked about their projects. Most of the projects were SDR based whilst one involved remote monitoring of temperatures. The evening proved to be a useful forum for problem solving and exchange of ideas.

In June, Thornbury & South Gloucestershire ARC took part in a roadshow to bring amateur radio to the public. The event was a huge success and there was plenty of interest. Rex, G4REA was very popular with parents and children who wanted to see what Morse was all about.

REGION 12: EAST & EAST ANGLIA

Over 40 local amateurs attend the June Essex Skills Night in Danbury. This month, handset programming, test equipment, an auction, a challenging quiz and callsign badges were all on display. The evening included a live link-up to Essex Ham's Monday Night Net. See www.sxham.uk/skills for details.

Thames ARG operated GB2HBT from Hadleigh Country Park to remember the aircrew killed in a mid-air collision near this location during World War 2. Despite a herd of cattle who decided to leave their mark at the spot set aside for the operation, the club still managed a display of radios and antennas that fascinated passers-by ranging from lapsed licence holders to those asking the usual questions about CB radio or our relevance in the age of mobile phones. At the June meeting, Tony, G4YTG spoke about his Life in Radio. He has spent most of his working life engaged in radio, from working with the LF transmissions from Rugby, to HF communications for *Concorde*. An enjoyable evening.

Peterborough & District ARC hosted a fascinating talk by David, M0VTG, an ex RAF cryptographer, about the LORENZ coding machine. He also talked briefly about the Enigma machine. Eventually Colussus at Bletchley Park broke the code for both machines. The talk was enjoyed by all present. Thanks David.

Roger, G4ROJ visited Norfolk ARC to give a talk and demonstration of how he uses kites to support HF antennas. His talk showed that he uses a variety of kites, including multiple models at once to support a host of different antennas, from long wires, collinears, loops and even a 2m mobile whip on a biscuit tin! This latter antenna allowed 2m contacts over large distances using just two watts. A kite demonstration on the evening was not so successful due to a lack of wind. Roger did, however, use a helium balloon to hold up the end of a vertical wire for 40m, which brought stations romping in from all over Europe.

Norfolk Coast ARS operated two stations at the recent Langham Dome 40s / Fun Day, generating a lot of interest with the many visitors. Phil, G4PQP an be seen operating the SSB station with Arthur, M0VAW and the Morse demonstration. This was particularly popular with children, who were given a certificate after they had sent their name in Morse code

The longest day of the year was celebrated by Essex Ham operating GB1JSS. Operating for three days, at the event's peak, seven stations were active using multiple bands and modes.

RSGB President Nick Henwood, G3RWF visited Chelmsford ARS. He presented the M1FDE Shield to Alan, M0IWZ, the winner of the CARS Construction Competition. Nick then went on to describe his fascinating experiences over the years operating from countries across Africa, starting with Sierra Leone in 1963. He also spoke about the new strategic direction the RSGB would like to take for the next five years with a question and answer session. Nick also accepted a £100 donation for YOTA 2017.

The East Suffolk Wireless revival Rally, at its new venue at the Kirton Recreation ground, was deemed a success by traders and visitors alike. Putting on events like this is a big team event with the combined help from Felixstowe & District ARS, Ipswich RC, Martlesham RS and Leiston ARC. Thanks to all who helped, see you next year.

REGION 13: EAST MIDLANDS

Nunsfield House ARG is pleased to announce that Connor Reeve, Harry Hutchinson, Nigel Butler, Terry Baker and David Horner have all been successful in passing their Intermediate exams. Adrian Lawrence, who sat the Advance exam on the same night, also passed. His new callsign is M0OJR. Thanks to David, G6XOR, Ken, G3OCA, Tony, G6MWS and Ken, G0JKC.

Lincoln Short Wave Club operated GB5WW at Fir Park Free Show. Thanks to Andy, M0KED, Pam, G4STO, Les, G1LQB, Peter, G1FLL, Stephen, M6TSJ, Jason, G7KPM, Tom, G4OSB and Ian, G4XFC. Additional help came from Andy, G0OOO, Terry, G7JFI and Regional Manager Jim, G0EJQ. The photo (left) shows Andy, M0KED on the club's FT-1000.

In April Worksop ARS took part in a sponsored narrow boat pull along a 3 mile, 3 lock section of the Chesterfield canal, raising funds for a local hospice and the Chesterfield Canal Trust. Other recent activities include the annual ARDF Foxhunt and the Ranskill and Torworth Scarecrow Festival promoting amateur radio as a hobby for all. There were lots of visitors and the Morse code demonstrations were popular with adults and children alike. Another hit was the mini ARDF demonstrations, thanks to Bob, G3ORY (Chair, ARDF Committee) for his help in providing two loan transmitters at short notice. Two recent training courses have resulted in nine successful Intermediate and five Foundation passes, three of these candidates being 15 years of age.

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10/6/2/70 Quad band 2.5/2.5/3.5/5.5 dbi gain only 1.2m length £59.95 ea 6/4/2/70 Quad band yes Includes 4m, 2.5/2.5/3.5/5.5 dbi gain 1.2m length £59.95 ea 2/70 Dual band 3.5/5.5 dbi gain 1.1m length only £37.95 ea. UK post £7.95.
Website: mirfield-electronics.co.uk
Email: martin.stokes@hotmail.com or
Tel: 07825549430

NEW. QYT KT8900D 2/70 25/20w base/mobile, 200 memories, CTCSS etc only £89.95. TYT MD380 DMR £99.95, MD380 spare Li battery £12.95, MD380 speaker mic £12.95. Free next day delivery. Mirfield Electronics, 07825549430 www.mirfield-Electronics.co.uk

HAMTENNA UK
Manufacturers of Antennas, Baluns, Ununs and suppliers of antenna wire and accessories. Checkout Hamtenna.co.uk

Cards & Design

LOW COST AND HIGH QUALITY QSL CARDS
By LZ1JZ QSL PRINT www.LZ1JZ.com

Miscellaneous

ALL UK STATIONS – CALL IN ON OUR 'M1CRA' CHRISTIAN NETS!
WACRAL welcomes all amateurs & listeners to our Sunday morning 'GOOD NEWS' nets, now at 07300-0830 on 3.747 MHz +/- QRM and, again, at 14.00-15.00 on 7.147 MHz. Our 2m SSB net at 15.00 is held on 144.205 MHz. Or, do join us on Wednesdays 07.30 3.747 MHz +/- QRM, 10.00 on 7.147 MHz (if no contact established after 5 mins QSY to 3.747 MHz and 21.30 on 3.751 MHz, for nationwide Christian fellowship and relaxed chat. All times UTC. See www.wacral.org for more net info and WACRAL details or just call Ian G4OPP on 01622 746650 or g4opp@wacral.org

VINTAGE FIREWORK COLLECTOR
will pay cash and collect from anywhere call Tony - 07956 506300 Licensed explosive storage

Equipment

REPAIRS TO RECEIVERS, TRANSMITTERS
New/Old, valve/transistor. Call 07903 023437 for details: www.kent-rigs.co.uk

RADIO REPAIRS BY M0NKL
Icom, Yaesu, Kenwood etc, plus linear amplifiers, please contact Nick on 07770 397668 or email np262@yahoo.com

Classified advertisements 58p per word (VAT inc.) with a minimum of 14 words £8.12.
All classified advertisements must be prepaid. Please write clearly. No responsibility accepted for errors. Latest date for acceptance is 1st of the month prior to publication
Payment to: RSGB, 3 Abbey Court, Priory Business Park, Bedford, MK44 3WH

Advertising. All display and classified advertising enquiries (except Members' Ads, which go to memads@rsgb.org.uk) should be sent to: Chris Danby, G0DWV, Danby Advertising, Fir Trees, Hall Rd, Hainford, Norwich, Norfolk NR10 3LX
Tel/Fax 01603 898 678
e-mail adsales@rsgb.org.uk

Business Cards

Advertisers Index

FREE MEMBERS' ADS OF UP TO 40 WORDS

Email your Members' Ad to memads@rsgb.org.uk. You must include your name, callsign, phone number, email address and location (not counted in the 40 word limit). Optionally, attach your own photo of the item (min res 800 x 600, must be in focus and well lit). Max 1 ad per Member per month; other terms & conditions also apply (see tinyurl.com/MemAdsInfo).

FOR SALE

30ft WIND UP TILT OVER MAST. Comprising 2 off 15ft galvanised sections, 1 inner, 1 outer, plus galvanised ground post with tilt over unit & winch. £250. Buyer collects. G6HIQ, Chris, 0794 480 1540 (Glastonbury, Somerset).

80cm ALUMINIUM SATELLITE DISH, PCI TV card (Sky2PC) + DVB-TV s/w cd. Buyer to collect dish. £25 ono. Peter Carey, G3UXH, 0114 245 9081, g3uxh@stanage-edge.com (Sheffield).

ACOM 1000 1kW LINEAR AMPLIFIER plus unused spare GU74B valve. Bought from Ron Vine. Mint condition, dummy load tested every 6 months but never put in to service. All original material plus vinyl cover. Offers in excess of £1,500. Paul, M0CVX, 0743 226 4458, paulbradbeer@paulbradbeer.plus.com (Lincoln).

B-SQUARE 10-80m TERMINATED FOLDED DIPOLE, American-designed transmitting antenna, 66ft overall, excellent antenna for all HF bands. Does not require tuner. Details on eHam.net. Cost over £250 with duty, unfortunately too large for my small garden. £60 ono, must be collected. E Hayden, G4LZU, 01823 442 477, edward.hayden2@btinternet.com (Taunton).

CFD400 COAX CABLE. 50Ω, 10.3mm OD. Unused length. Weighs about 7kg. £60, buyer collects. Nick, G3VNC, g3vnc@uk6.net (Cheddar).

FT-857D, boxed, complete with leads, manuals, external meter, PSK interface, separation kit and in-car boom mic. Rig has been wide banded. £450 ONO, willing to post in UK only for £20. Warren Mitchell, M1EBU, 0786 468 1483, m1ebu@sky.com (Burgess Hill).

HOUSE FOR SALE with mast planning permission and a great site for DX on the Isle of Wight (IO90IR). Mast left on request. Family reasons forcing sale. Full details at www.rightmove.co.uk/property-for-sale/property-59575285.html. Dave, G7RAU, 01983 290 338, dave@g7rau.co.uk (IOW).

ICOM IC-7100 in mint condition, c/w box, manual, head mount for mobile use, never used mobile. Very little use. £700, includes UK delivery. Dave, G1LNA, 01209 717 261 (Cornwall).

KENWOOD TL-922 linear amplifier. 1.8, 3.5, 7, 14, 21, 28MHz, power 2000W PEP SSB, 1000W DC CW/RTTY, input drive power 80W or more. Bought from Martin Lynch, I have only used it a handful of times, in very good working order, £750 ONO. Postage extra. G0CAM, 01209 820 967 (Cornwall).

KENWOOD TS-850, one owner, mic, handbook, CW filter, box, £350. Doug, G3MUI, 01284 760 229, dougd.g3mui@btinternet.com (Suffolk).

MOONRAKER GP2500 all band 80-6m HF vertical, 4 months old, £100. Ken Pye, M0CFT, 01852 251 478 (Wellington, Shropshire).

MOONRAKER MLP-62 log periodic beam, 50-1300MHz. Only 4 months old and was used for Rx project which is now complete. Removed from the rotator mast and packed down ready for collection. £120 ono. Collect only. Lee, M0DDU, 07506 870 733, l.shep66@googlemail.com (Portsmouth).

QTH SALE complete with 10.7m Tennamast, medium rotator and controller, Cushcraft MA5B beam, Cushcraft R8 vertical, full size G5RV, with planning permission. 300ft asl, modern 4 bed detached bungalow, ¼ acre plot, 1 mile Farnham town centre. Offers on £945,000. Roger M Williams, M0RMW, 01252 724 497, m0rmw.roger@btinternet.com (Farnham, Surrey).

R390A/URR: £575. ITT3020A: £125. WJ8716: £375. RA1772: £375. RA1792: £375. RA117: £125. RA63H: £75. MA1101A: £275. RA6790: £275. PRS2282: £550. Skanti R5000: £175. WJ8618B10: £525. All working, all OVNO. Buyers inspect and collect. Rod Sparrow, RS33299, 01692 630 067, rodneysparrow@btinternet.com (N Norfolk).

SIGMA SE 1300 discone scanner base station with long piece of coax, BNC plug and fixing brackets, £25. 10-ele 2m beam, £25. M0CVS, 01629 823 025 (Matlock, Derbyshire).

SK SALE. AR88D, clean, working on LF band, spare valves, manual, unused long time, requires service. Sensible offers. Levell Oscillator to 150kHz, Evershed & Vignoles megger, Telequipment D1015 'scope, working, Manor Supplies UHF TV crosshatch generator, AVO Model 40 multimeter, offers. Roger, G4NVV, 01275 842 925, roger.english@tiscali.co.uk (Portishead).

SK SALE. Yaesu FT-DX5000MP/SM5000, boxed, instructions, £2350. FT-101E, YO100, matching speaker, Magnum Two transverter, instructions but no mic, £295. Trio TS-120S plus MB100 mobile bracket, boxed, instructions, no mic, £175. LDG AT1000-Pro auto ATU, boxed, instructions, £295. MFJ-886 1MHz-3GHz frequency counter, boxed, £80. Yaesu SP2000, boxed, £90. Oskerblock SWR-2500B 50/75 ohm SWR power meter, boxed, instructions, £30. juliet.brough@googlemail.com (NE Cheshire).

TENNADYNE 6-ELE LOG YAGI, t6 10/20m, £200 ONO. K Ginder, GW3NAS, 01545 581 108, keithgw3nas@gmail.com (Ceridigion, Wales).

YAESU FT-2000 serial no 8I340057, boxed, £900. FT-897D serial no 6E690573, c/w 2 batteries and charger (ideal field/holiday use), boxed, £500. FT-1802M/E, boxed, used once, serial no 5N030659, £50. All in very good working condition. Buyer collect or pay p&p. Bruce, G8BGI, 01420 475 698, g8bgi@tiscali.co.uk. (Bordon, Hants).

YAESU FT-450D, 12 months old, as new, boxed, clean manual, perfect working order, new full length DC power lead. Too big for air travel. Being replaced with an FT-891. Available for trial before purchase, £450. David Bedford, G3ZVH, 01244 349 657, djbedford@btinternet.com (Chester).

YAESU G5500 azimuth / elevation rotator, ideal for satellite operation. It has been up for less than one year and shows no signs of corrosion. Also have the LVB Tracker for computer control. £400 ONO. Collection preferable due to weight. Peter, G8KEK, 0778 837 1745 (Hertfordshire).

WANTED

3rd WINDOW DECAL FOR AR88D. I wish to remove the meter fitted at a later date and get it back to its original condition. Barry, G1NPN, 07900 123 495, ukbaz1@yahoo.co.uk (Wirral).

4004 AND 8008 microprocessor integrated circuits. Need not work (for static display). Godfrey, G4GLM, 020 8958 5113, cgmm2@btinternet.com (Edgware, Middlesex).

78H12 REGULATOR, 12V 5A for my homebrew PSU. John, G0PIA, 01708 477 493, johng8bua@yahoo.co.uk (Hornchurch, Essex).

ALINCO DX-77T transceiver, EDX-1 manual ATU 180-10m, EDX-2 automatic ATU, E… microphone, EDS-5 microphone extension cable 5 foot, ERW-4C PC interface serial RS232C Cable (DB-9F), ERW-7 PC interface USB cable, any other accessories etc. I will also pay P&P costs. Brian, G8NHN, 0779 285 9886 (Manchester).

CMF-144 MONITOR UNIT board for JRC JST-245, with fitting instructions etc. Terry, GW4RLP, 01286 675 264, terencehv@outlook.com (Gwynedd).

DOES ANYONE HAVE a Cap-Co Antenna Tuner for sale? Will pay a reasonable price if in good working order plus P&P. William Rabbitt, G0PZP, william.rabbitt@btinternet.com (Cheshire).

EARLY G-WHIP mobile antenna coils and telescopic whip with 3/8 inch BSF threads and ¼ inch coupler. NOT 3/8 inch UNF threads and 6mm diameter coupler as on later units. Please e-mail with details. Bob White, G8SPC, 01275 874 001, g8spc@blueyonder.co.uk (Clevedon, Somerset).

HEATHKIT RA1 RECEIVER. Complete unit, preferably working. Hugh, RS205789, 01684 893 594 (Malvern).

KW1000 LINEAR AMP for spares or repair. Vic Waddington, G4JSS, 0781 010 2479, g4jss@tiscali.co.uk (Wakefield).

MOUNTING BRACKET for High Sierra antenna type HS-1800/PRO, bracket type no HS-201C - Universal Mounting Bracket. If you have a defective antenna I will consider buying it to get this type of bracket. Richard, G0WKL, 01730 825 360 (Petersfield, Hants).

SD1441 AND SRF1397 (SD1447) power transistors. Time to look in your junk boxes for these old 1980s devices, so I can repair my VHF amplifiers. Fair price paid. Steve, G4TRA, 0793 342 9710, g4tra@aol.com (Malmesbury, Wiltshire).

VERSATOWER (OR SIMILAR) TRAILER MAST in good condition with rotator cage. Minimum height 40' erected. For sale: 10.5m Invisible Green 3-section Tennamast, ground socket mounted, VGC, c/w cage, 12VDC Goodwinch. Requires new ground sleeve. £795. Dismantled, buyer collects (nr Bude). Duncan Fisken, G3WZD, 0751 586 9977, duncan.fisken@blueyonder.co.uk (Frome).

UP FOR GRABS

COLLECTION OF OLD CIRCUIT DIAGRAMS/ SERVICE MANUALS for electronic music equipment/group gear, amplifiers, mixers, keyboards, synthesisers, effects etc and some specific spares. 12 boxes approx 19x13x14 inches. Collection only. Richard Straker, G8ELW, 01424 480 279, tamtec@tesco.net (Hastings).

FREE TO GOOD HOME, dormant for many years AR88 suitable for restoration or as parts for another project, Cossor 464 Bakelite MW/LW vintage radio, needs TLC. *For sale:* MM 144/28MHz transverter £20, 432/28MHz Rx converter £10. Collection or delivery negotiable. John, G8EWG, 0785 403 9612, jlearwig@googlemail.com (East Sussex).

TRIO TS-830S. Low audio on receive. Full re-cap done, problem persists. With mic, power lead, manual. Yaesu FT-290R. No Rx, no Tx. With mic, helical, power lead, manual. Collection only. Steve Kell, G4KEL, 0791 903 3880, steveandjoankell@gmail.com (Taunton area).

HELPLINES

I will be in Lincoln for the week of the National Hamfest. Is there anyone within a 20-mile radius who will be kind enough to allow me to operate their station? I will supply a copy of my G0CAJ licence to fulfil any regulatory requirements. I am offering reciprocal facilities at my own station in ZS for any operator who is so kind. Tom, G0CAJ / ZS1AFS / ZT1T, zt1tzs1afs@gmail.com.

The World Radio Propagation Study Association (WRPSA) sponsored DXpeditions in the 1960s. Does anyone have information on this organisation? People running the organisation? Where it was located? Its aims and objectives? When it ceased to function? Any information please to Tony Cobb, G0WJK, tony.cobb.email@gmail.com.

RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond.

If *your* rally or event is not listed here,
PLEASE SEND US FULL INFORMATION
by email to radcom@rsgb.org.uk

6 AUGUST
28th KING'S LYNN ARC GT EASTERN RALLY
Gaywood Community Centre, Gayton Road, King's Lynn, Norfolk PE30 4DZ.
Free car parking on site. Talk in on 145.550MHz. Doors open at 9am, entry £2. There will be trade stands and a Bring & Buy, on-site catering. There are amateur radio pitches outside as well as tables inside. Ted, G4OZG, 01553 768 701, or email g4ozg@raynet-uk.net [www.klarc.org.uk].

6 AUGUST
LORN RADIO RALLY
Crianlarich Village Hall, Main Street, Crianlarich, Perthshire FK20 8QN
Doors open at 10.30am, entry £2. Trade stands (tables free but a raffle prize appreciated), Bring & Buy. Raffle, drawn at 1.30pm. On-site catering. Details from lornradioclub@gmail.com.

11 AUGUST
24th ANNUAL MINI RALLY NIGHT
Port Seton Resource Community Centre, South Seton Park, Port Seton, East Lothian EH32 0BQ
Doors open 6 to 9pm, entry £2. Refreshments available. A raffle will be held. Bring along your own 'junk' and sell it yourself. Tables free but first come first served. gm4uyz@csparc.com.

SPECIAL EVENT STATIONS

These callsigns are valid for use from the date given, but the period of operation may vary from 1-28 days before or after the event date. Details published here were kindly provided by Ofcom on 21/6/17.

Start Date	Callsign	Event Phonetics	Main Station City
01/08	GB0PL	Golf Bravo 0 Papa Lima	Paul
	GB2HLH	Hunstanton Light House	Old Hunstanton
	GB8NCI	National Coastwatch Institution	Exmouth
	GB1OL	Orkney Lighthouses	Kirkwall
03/08	GB5RC	Radio Caroline	Bradwell Marina, Bradwell-on-Sea
04/08	GB0BIB	Baston in the Blitz	Baston
10/08	GB2SHC	Starting Handle Club	Marsham
	GB2TD	Trwyn Du	Anglesey
12/08	GB2ALE	Alpha Lima Echo	Burton upon Trent
18/08	GB0CCC	Cabin Cruising Club	Bristol
	GB2BHL	Golf Bravo Two Bidston Hill Lighthouse	Wirral
	GB1HA	Headcorn Aerodrome	Kent
	GB2BML	Blakeney Marines Light	Norfolk
	GB1DLH	Dungeness Light Houses	Dungeness, Romney Marsh
	GB1BPL	Burry Port Lighthouse	Carmarthenshire
	GB4WL	Whitgift Lighthouse	Goole
19/08	GB1GL	Gosport Lightship	Gosport
	GB0LXX	Golf Bravo Zero Lima Xray Xray	Devon
	GB0NFL	North Foreland Lighthouse	Broadstairs
	GB2AL	Ardnamurchan Lighthouse	Acharacle
	GB5AC	Abergele Castle	Abergele
	GB5BL	Blackhead Lighthouse on the air w'end	Blackhead
21/08	GB2KAA	Kent Air Ambulance	Kent
	GB2GFW	Gressenhall Farm & Workhouse	Dereham
	GB4MO	Military Odyssey Show	Kent
25/08	GB0SMD	St Margaret's Durham	Durham
	GB0DS	Denbigh Show	Denbigh
26/08	GB0RRS	ASE	Rugby
	GB0RRS	Rugby Radio Station	Rugby

SILENT KEYS

For administrative reasons we have had to delay publication of this month's Silent Keys until next month. We apologise for any inconvenience or distress this might cause.

Only former RSGB Members appear in this list. Please note that Ofcom must be informed separately, on 0207 981 3131 – we are not permitted to pass on details on your behalf.

Silent Key column entries
To notify the RSGB that a Member has passed away, please email details to sales@rsgb.org.uk or telephone 01234 832 700 then select option 1. This will ensure that their Membership will be ended properly and that they appear in the Silent Keys list (unless you specify otherwise). We need to know their name, callsign and date of death.

Obituaries
Obituaries are published at www.rsgb.org/sk. Please send details by email to sk@rsgb.org.uk and include everything that you would like to appear. All submissions are moderated and may be edited. Obituaries are welcome for any former amateur, irrespective of whether they were ever a Member of the RSGB.

13 AUGUST
FLIGHT REFUELLING ARS HAMFEST
Cobham Sports and Social Club Ground, Merley, near Wimborne, Dorset BH21 3DA
Taslk-in on S22, free car parking. Doors open at 10am, entry £3.50. There will be trade stands, a car boot areas, indoor and field pitches for traders. Lectures will take place during the day. Catering and licensed bar on site. Camping is available on Saturday night only in an adjacent field. Details from hamfest@frars.org.uk.

20 AUGUST
RUGBY ATS ANNUAL RADIO RALLY
Princethorpe College, Princethorpe, Rugby, CV23 9PY
Doors open 10am-4pm, (sellers 8am), entry £3. Car boot area. On-site catering. Tony, G0OLS, 0775 968 4411 [www.rugbyats.co.uk].

27 AUGUST
MILTON KEYNES ARS RALLY.
The Irish Centre, Fenny Stratford, Bletchley MK2 2HX (opposite Dobbies)
Doors open 10am. Contact Tim Cowell, G6GEI, 07976 262 497, renegade62@hotmail.co.uk.

28 AUGUST
HUNTINGDONSHIRE ARS RALLY
Ernulf Academy, Barford Rd, St Neots PE19 2SH
Free parking. Doors open 7am for traders, 9am for public. Entry £3. Hot meals & drinks on site. RSGB bookstall. More from Malcolm, MOOLG on 01480 214 282 or events@hunts-hams.co.uk.

2-3 SEP – TELFORD H'FEST & G-QRP CONVENTION
9 SEP – CAISTER LIFEBOAT RADIO RALLY
9-10 SEP – BATC CONVENTION (CAT 17)
10 SEP – TORBAY ANNUAL COMMS FAIR
17 SEP – WESTON-SUPER-MARE RALLY
22–24 SEP – WACRAL CONFERENCE WEEKEND
24 SEP – PENCOED ARC TABLE TOP SALE
29-30 SEP – NATIONAL HAMFEST
1 OCT – HACK GREEN HANGAR SALE
8 OCT (NEW DATE) – 44th BLACKWOOD ARS RALLY
13-15 OCT – RSGB CONVENTION
15 OCT – HOLSWORTHY ARC RALLY
15 OCT – HORNSEA AMATEUR RADIO RALLY
21 OCT – CARRICKFERGUS ARC RALLY
22 OCT – GALASHIELS RALLY

WE'RE MARKETING THIS HOBBY WRONG

Ed Durant, DD5LP/G8GLM

… Good, I have your attention. Now let me tell you what I mean.

I hear these days in broadcasts, podcasts, social and print media, that to get into amateur radio, you first have to get licence. This approach sells the hobby very short.

To be clear, I am not suggesting operating without a licence, rather that there are so many parts of our hobby where the licence is not mandatory. There are more of these parts of the hobby than you might at first think. Of course, you will all have thought of short wave listening, whether listening to broadcast or amateur stations but also think of the following;

- electronic education, design & construction
- software development
- contest logging
- Field Day tasks like erecting the tents and antennas and generally having fun with others outdoors
- antenna design, construction and testing
- equipment restoration or repair
- fox hunting
- supporting special events and sporting events (in non-operating roles)
- satellite and high altitude balloon tracking

I'm *sure* there's many more!

Historically, when there was a minimum age to take a licence, youngsters would join a radio club, become part of it and learn a lot about the hobby before studying for the exam. I would suggest such youngsters would know exactly what they were going to do once they got their ticket, unlike today when those who start with the exam are lost as to what to do after passing it and quietly leave the hobby. This is a real shame.

Even for non-teenagers who may be interested in the hobby, I believe clubs and the amateur radio press should promote the parts of the hobby that don't require a licence a lot more than they do. There is an obvious interest in electronic construction at the moment, proof is the number of expanding Maker movement groups. Maker groups are not everywhere and someone seeking them may live near to an amateur radio club without knowing that electronic construction is part of our hobby because we don't publicise the wide field that amateur radio covers. Most clubs are fairly well equipped with construction tools and test equipment, for general needs, not only for RF related tasks. These are assets that clubs can use to attract new members.

There's no reason we can't have amateur radio clubs with members who are not licensed – they may become interested and get a licence later or they may stay non-licensed and have fun with, and support, the club or group.

Please *think* about this. When was the last time your club or group promoted all the 'non-operating' things that you do?

Bring some more variety into your club meetings: how about a club construction competition? Take a look around at all the equipment assets you have in the club or group that prospective new members could be shown how to use to build a small device of some kind or a simple antenna, or whatever you like…

And then PROMOTE, PROMOTE, PROMOTE!

Radio clubs and groups are more than just operators, they are much, much more.

The Society is currently beginning a marketing strategy and plan; constructive ideas like these are very welcome indeed. They chime with Strategy 2022 and are an excellent example of the thinking needed – not 'more of the same' but something different.

We will shortly be arranging facilities for marketing suggestions and asking for volunteers for help in formulating RSGB plans in this area. Meanwhile, please send your ideas either through Have Your Say or to marketing@rsgb.org.uk

Alan Messenger, G0TLK, Director

HOMEBREW IS BEST

Ray J Howes, G4OWY/G6AUW

G3TOI's photo (July 2017) of his shack, celebrating the virtues of homebrew equipment is, on the face of it, a revealing insight on what could be the norm in thousands of shacks. Of course, it once was.

However, just imagine if it actually was the norm. On second thoughts, maybe we shouldn't, advertisers wouldn't be happy. Besides, notwithstanding having to go back to plugging in the soldering iron again on a regular basis, it's not something that I could personally come to terms with nowadays. Even if the thought of it is wonderfully tempting and strangely seductive.

Yes, 'homebrew is best' to a degree. But just as once upon a time, a few brave souls built their own cars and televisions etc, today, without the commercial enterprise in electronic R&D departments worldwide, we'd be spending more time sat in our shacks building and testing than communicating. And no SDR either!

I would love to think the reason the bands are sometimes 'dead' is that everyone *is in their shack homebrewing stuff, but I doubt that's actually the case.*

Giles Read, G1MFG, RadCom *Technical Editor*

LEARNING CW

David Perry, M6GYU

Regarding CW, I hear a wide range of operator skill on the air varying from those who would have surpassed many military and commercial operators, to those who have a long way to go to achieve any fluency and ability at CW. I've looked at countless CW learning resources on the web and elsewhere, and they are often highly imaginative and/or largely useless for learning CW. All the commercial and military operators I knew, including many from other countries, all seem to have been taught by the same method, which worked for 99% of them.

Learn the characters first. In our case on our first Friday we were all given flashcards with CW on one side of a card and the letter on the other side. "You'll be starting doing this on Monday – so you won't be going anywhere, lads!". Of course, on Monday (and probably the next couple of sessions) the instructor made sure we could all recognise all the letters by sound. Then the letters were sent at a speed we could all recognise the individual dits and dahs. Extra punctuation etc was added as we went along. We listened to English and foreign language text and random 5 letter groups of characters, which were deliberately introduced to prevent guessing. Our basic training lasted around 27 weeks including a period of leave, and weekends. We probably spent around an hour listening to CW each day. Each week or so, just as you were getting used to the speed, the instructor increased the speed and reduced the gap – and this continued until all 20 or 30 of us could read Morse at 20wpm. No one failed to learn. There are no short cuts.

Regular practice is important whilst you are learning, otherwise a break of a couple of weeks will easily see you back at a slower speed than where you left off. If there are, or were shortcuts then I'm sure these would have been used by the military and commercial trainers.

Rod, G3PPR

Three excellent websites on CW training deserve a mention for enabling the *daily* practice essential for progress and the development of fluency. All can be used flexibly as the tyro telegrapher progresses. All offer a wide range of speeds.

For learning letters and numbers there's AA9PW's fine site http://aa9pw.com/morsecode/. You can choose up to five groups of letters or numbers or punctuation, or a mixture of all of these. There is also a CW RSS news feed for some plain text.

The website Just Learn Morse Code, www.justlearnmorsecode.com/ has free downloadable software where you can select characters, words, or – and this is its real strength – any plaintext file that you provide. You can, if you wish, encode long documents or extracts from web pages to build up your CW stamina.

The excellent ARRL CW site www.arrl.org/Code-Practice-Files has a large archive of MP3 CW files with text taken from past issues of *QST* so that you can learn some radio words.

For help on CW learning techniques (or for fun if you already use the code), have a look at Carlo Consoli's wonderful 'Zen and the Art of Radiotelegraphy' at www.qsl.net/ik0ygj/enu/.

Enjoy your CW.

Francis Donovan, G4ALD

I have been reading, with a somewhat furrowed brow, the various recommendations for learning CW, voiced in the recent letters.

Time was when newcomers began with a comprehensive and relaxed 'apprenticeship' to amateur radio. This included many hours of listening and consequently a building knowledge of operating procedures, official abbreviations, Q Code, prefix areas, propagation trends, etc,

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possibly extending over a few years! For the CW orientated enthusiast (one is usually aware at the beginning!), this period of learning also encompassed listening to CW QSOs, live on air. This was traditionally supplemented by regular lessons given by a local operator and many amateurs have learned their trade this way. I, for one, will always be grateful to such amateurs as G6BQ, for his dedication in securing my passing the CW test. In fact, he insisted on myself, (and other pupils), attaining 18 wpm solid on receive, before sitting the test, to allow a generous margin to account for nerves on the day! It has to be said, it was the RAE that held more terrors for me – the CW, admittedly tackled in my teens, seemed just a matter of time and practice. By the time I sat the RAE, I was ready to sit the CW test. I would therefore ask the question – are people in too much of a hurry these days? The modern world seems to expect immediate results and gratification, in many fields. This impatient attitude seems to have invaded amateur radio. Take your time – you will surely get there!

Adrian, K6KY/G4FRZ

My local club, CVARC (Conejo Valley ARC) runs Morse classes from time by time. The MC is Norm, AB6ET, and he runs the classes mainly as self study, with a couple of classroom practice sessions. Norm recommends using the 11 lessons prepared by the 'Ham Whisperer', Andy, KE4GKP. It should take about 4 to 6 weeks.

The course can be found at www.hamwhisperer.com/p/morse-code-course.html with videos at www.youtube.com/playlist?list=PLE29501CA11B567E8

The course seems to follow the same technique as in the old RSGB Morse training book from many years ago, which I used to get my licence in 1977. I found it took about 3 months requiring 15 to 30 minutes study and listening to slow Morse every evening, together with a daily train commute hissing fellow passengers' newspaper headlines back at them.

The RSGB actively encourages CW via, among other methods, GB2CW broadcasts – see http://thersgb.org/search/index.php?q=gb2cw for more information.

Giles Read, G1MFG, RadCom *Technical Editor*

WSPRLITE REVIEW

Neil Thackrey, EA7VPG/GM0VPG

It is frustrating reading the June WSPRlite review when no credit is given to the stations across the world having invested and running digital interfaces like the SignaLink USB and WSJT-X software then uploading their HEARD spots from WSPRlite users. If everyone bought WSPRlites they would be rendered useless as no one would be out there to HEAR them to upload their spots. WSPRlite is a one way street, transmitting with no reception facility. Whilst one can view information from their HEARD list at wsprnet.org, which is free, or from their subscriptions after the first year with DXplorer extrapolating the data from the HEARD / HEARING list and maps at wsprnet.org can be far more productive, after all, what do we always say "if you can't hear them you can't work them". This aspect of WSPRlite users seems to get overlooked having only seen one credit given in other reviews for the HEARD station spotters. Something to take on board if WSPRlites proliferate.

INNOVATIONS

W L Cooper, G7FDD

I must applaud the RSGB for setting up an Innovation Group. I feel it goes to the heart of amateur radio, with support of 'out of the box' ideas. Innovation I feel is the heart of experimental amateur radio, enabling a humble shed approach that may make a big difference!

I love this idea that in so many respects gives credence to inventors in amateur radio and the many different ideas that emerge from the world of amateur radio. Personally this is what I live for, in my spare time getting out in the shed and just thinking, experimenting and trying out crazy ideas, just to see if the idea matches the theory or leads to something different.

The recognition that the RSGB has given to people like me is, in my opinion, truly inspirational!

ACRONYMNS

This subject has created one of the largest 'postbags' in recent years! Here is a summary of the comments and sentiments expressed as well as details of a project we'll be working on over the next few months – Ed.

Commonsense needs to prevail. You shouldn't have to spell everything, only new terms. Acronyms are supposed to save space and repetition after all.

Bob, G3PJT, Bob, G4PVB, Len, G0OOS, John, G4KLA, Robert, G3JRD, Adrian, G4AZS, Mike, G3TOI, David, M0XDF, Alan, G3XAQ, Ian, 2E0IGJ, John, G4RDC, Rod, G3PPR, Gary, M0SOA, Steve, G4TRA, Ralph, GM4MHE/S55CX, Clive, G8POC, Alan, G3XAQ, Brian, G0GSF

One of the most important aspects that separates our hobby from others is that it's about self training and experimentation, it's beholden upon ourselves as amateurs to educate ourselves. The usual convention of typing it out in full with the new acronym next to it in in parenthesis should be followed, after that the acronym should be used.

Gary, GM7USC, Peter, G4URT

Write the item out in full followed by the acronym in parentheses. Surely it is not too much to ask that readers who are fully aware of all possible acronyms in the world of amateur radio allow for the more inexperienced of us to have the benefit of the explanation.

Mike, G6ONV

Stick to English in articles wherever possible. There is no reason to use QSO or QSY in a magazine. Just substitute 'contact' or 'change frequency' where appropriate. Where abbreviations and acronyms cannot be avoided, explain it in brackets immediately after the first use; *or* include a glossary at the end of the article.

Philip, M1GWZ

Why not list the acronyms, with definitions, at the end of each article?

Harry, G7KNK

Yes, always define Acronyms, even the easy ones like SWR. *RadCom* should be accessible to all levels of amateurs especially those who are still learning. A reader can always 'stop reading' to lookup a meaning but human nature is that we try to press on, which weakens an article. I would rather help new readers even if it is a little irksome for some more knowledgeable fellow enthusiasts.

Nigel, M0ICH, Sean, G4BVS

I would suggest that abbreviations are expanded when, and only when, doing so is likely to aid comprehension of the article in which they appear. As a newcomer to radio, I'm less bothered about abbreviations than I am about jargon terms in general. There are several terms the term regularly in your pages that I don't know what they mean. Whenever I see it, I make a mental note to find out what it means, and then I forget until next time. Since there seems to be a general consensus that there aren't enough newcomers to radio, I think it would help for *RadCom* to have more introductory, explanatory articles. Not about electronics and technology, necessarily – there are heaps of textbooks on those things – but about the practicalities of radio operation and associated matters.

Kevin Boone

This is an interesting idea and something we will be working on over the next few months. Kevin has given us a few suggestions on the jargon he would like to see explained, if you have something about the hobby that puzzles you, drop a note to radcom@rsgb.org.uk

A fairly comprehensive list of acronyms and abbreviations used in RadCom *is online at http://tinyurl.com/RC-acronyms*

HF F-Layer Propagation Predictions for August 2017

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	63.......366	654211123566	245433335562	.1355445552.	..12221232..	...111.121..	.....	.....
*** Asia								
Yakutsk	.....	11.11.....22	..122.....2.	....2.....	.....	.....	.....	.....
Tokyo	.....2..	.....24..	.....11131.	.....1.....	.....	.....	.....	.....
Singapore	.....22.	13422	.....232.1	.....121...	.....	.....	.....	.....
Hyderabad	1333	2.....13444	23331	.....2....	.....	.....	.....	.....
Tel Aviv	54.....355	553.....3555	1421.135552	..543324551.	...1...21..	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	..1.....1..	234.....311	223.....232	..1.....31	.....1.	.....	.....	.....
Perth	.....11.	13312	.....121.1	.....	.....	.....	.....	.....
Sydney	.....1..	.....233..	.....2221.	.....	.....	.....	.....	.....
Melbourne (LP)	.....	.121.....	..22.....	.....	.....	.....	.....	.....
Honolulu	.....	..2.....	..111.....	.....	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....1...	.....1...	.....1...	.....	.....
W. Samoa	.....	.....	..111.....	....11.....	.....	.....	.....	.....
*** Africa								
Mauritius	2.....222	3432	.....1331.	.....111..	.....	.....	.....	.....
Johanesburg	22.....122	.1.....3432	.....331.	.....13...	.....11...	.....	.....	.....
Ibadan	554.....355	5552....2555	3.5311113555	..232112453.	...21...45..	.....22..	.....	.....
Nairobi	33.....333	441.....2444	.22.....3444	..11...2441.	.....21..	.....	.....	.....
Canary Isles	6641.....256	66541...2466	636532224566	1.2532225662	..1432225521	...22111341.	...11...12..	.....11..
*** S. America								
Buenos Aires	222.....1	333.....23	1.2.....133	.....22.	.....2..	.....1..	.....	.....
Rio de Janeiro	332.....13	433.....244	211.....443	431	.....31.	.....2..	.....	.....
Lima	222.....	323.....23	..11.....22	.....1.	.....	.....	.....	.....
Caracas	333.....3	3332.....24	..1.1.....33	.....12.	.....	.....	.....	.....
*** N. America								
Guatemala	222.....	3231.....2	1.1.....12	.....1.	.....	.....	.....	.....
New Orleans	333.....	333.....1	2	.....	.....	.....	.....	.....
Washington	4442.....2	44412.....13	....211.1123	.....211.22.	.....	.....	.....	.....
Quebec		4432.....1	44221.....13	21111123	.....1.	.....	.....	.....
Anchorage	.....	.....	.....	.....	.....	.....	.....	.....
Vancouver	.....	.12.....	.....	.....	.....	.....	.....	.....
San Francisco	.12.....	1231.....	..1.....	.....	.....	.....	.....	.....
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 August, September & October are respectively (SIDC classical method – Waldmeier's standard) 19, 19 & 18 and (combined method) 24, 25 & 26. The provisional mean sunspot number for June was 19.4. The daily maximum / minimum numbers were 36 on 5 June and 0 on 9-12 June.

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