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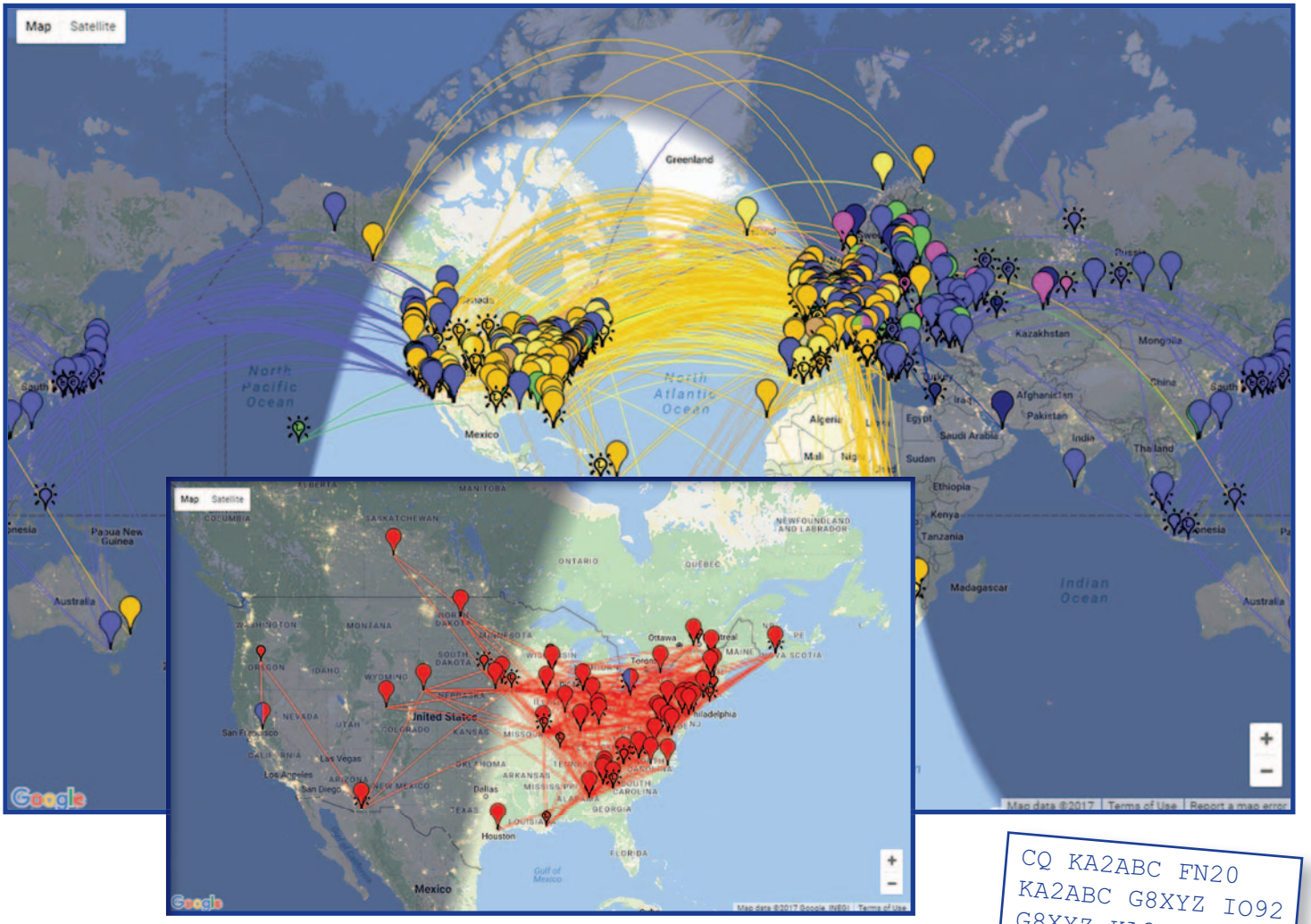
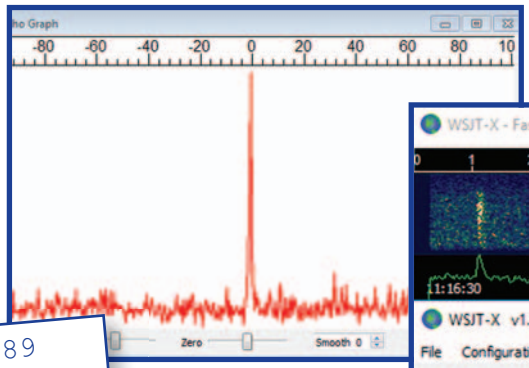
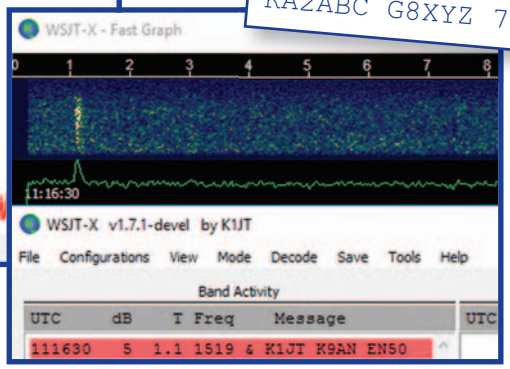
RadCom







CQ KA2ABC FN20
KA2ABC G8XYZ IO92
G8XYZ KA2ABC -17
KA2ABC G8XYZ R-21
G8XYZ KA2ABC RRR
KA2ABC G8XYZ 73

CQ UX1LW KN89
W3DJ LU2BN 73
PY4SM CP6UA -15
PY1ME PY6JB R-07
K7PWL K1NOX RRR

WSJT-X: Work the World

Joe, K1JT, Steve, K9AN and Bill, G4WJS explain

0717
July 2017 ◆ Volume 93 ◆ Number 07 ◆ £4.95

Jumped on a plane to Dayton HamFest in May, checking out the new venue at "Xenia". Got a lovely warm welcome from everyone we met and spotted some new products along the way. Talked to our existing (and soon to be) U.S. manufacturers to increase our product range as we all like new goodies, especially me. It's not a cheap trip, but I feel it's worth it to sniff out new products and see what our American friends find exciting in Ham Radio today.

Finally, don't forget our BIG SUMMER PICNIC at the store on Saturday the 24th. Did I mention that already?

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New! ELAD SP-1 Matching speaker
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FACTORY DIRECT DISTRIBUTOR

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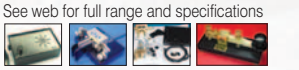

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RADIOSPORT

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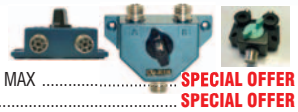
MyDEL COAX SWITCHES



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Also available LDG YT-100 as above but for FT857, FT897 and FT-100. **Only £199.95**
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Here's Why

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Why buy an LDG Tuner when my rig already has one fitted as standard?

Because most built-in Auto-Tuners have very narrow tuning capabilities, usually a max of 3:1SWR. LDG Auto-Tuners will tune typically 10:1SWR (6-600 Ohms) and contain 2000 memory locations allowing it to tune much faster. All tune 1.8-54MHz.

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Contents

July 2017

68

News and Reports

Regulars

Reviews

60

Technical Features

Features

Cover image: Working the world has never been easier with the development of WSJT-X. Design by Kevin Williams, M6CYB.

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 August edition of *RadCom* is expected to arrive with most Members by 24 July, although this can take up to a week longer in some cases; international deliveries can take longer still.**

The online *RadCom* is at www.rsgb.org/radcom/
RadCom Plus is available to RSGB Members online at www.rsgb.org/radcom-plus
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/

The RSGB is on Twitter @theRSGB

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Strategy

Why on earth does the RSGB need a Strategy? Why don't you just 'get on with it'?

This is a question that has been asked of Board members in the last few weeks since we published the Strategy. As the newly-elected Board Chair, let me try and answer the question.

Every organisation needs a Strategy to know where it should focus its efforts and resources. The world of amateur radio is constantly developing so it was time to review the previous Strategy, which was produced by the Interim Board in 2012.

The Society's focus affects both Members and non-members and the Strategy is more than just a 'tick box' exercise. It is there to ensure that the Society is moving with the times and listening to its Members.

What was the response to the Strategy consultation?

We had more than 500 responses to the draft Strategy consultation from both Members and non-members. The majority of the comments were very constructive and a few changes have been made as a result of that consultation process. One recurring theme of the feedback was 'representation'. We are a Membership-based Society that represents all UK radio amateurs at national and international level so it is appropriate that representation should feature in our Strategy.

- 91% agreed with the draft purpose
- 92% agreed with the values
- 94% agreed with the goals
- 86% agreed with the priorities
- 94% had confidence that the RSGB is heading in the right direction

So what happens next?

Simply publishing the Strategy is not enough. The Society now has to ensure that what it does fits with the goals, values and priorities outlined in the Strategy. All of the RSGB's Committees and Honorary Officers, as well as the Regional Team, have been asked to review their projects and priorities to check they are focusing on the right things. They may need to make a few changes to fit with the new Strategy, but that will only become clear when they reply to HQ by the end of June and the Board has a chance to look through their priorities. We'll highlight some of those projects in future *RadCom* issues and across all our communication channels so you can see what is happening.

The Strategy was launched in a presentation by Steve Hartley, G0FUW at the AGM in Cardiff and the next major update for Members will be at the RSGB Convention at Kents Hill in Milton Keynes in October. I am delighted that Steve has agreed to be co-opted to the Board for six months to ensure that we retain the right focus as we move to more detailed planning.

Why should RSGB Members be interested?

Amateur radio has many facets and the Society tries very hard to represent all of them. In fact, going back to the question at the very beginning, the 'it' in "get on with it" tends to refer to the aspect of amateur radio that the questioner is usually most interested in! However, the RSGB is the sum of its 21,000 Members and this is your strategy, not the Board's strategy. If you will support the Strategy, we can work together to ensure that amateur radio continues to develop and grow in the future.

Graham Murchie, G4FSG
Board Chairman

Region 7 Club of the Year

Sandpiper Antennas have sponsored the Region 7 Club of the Year (COTY) award with an MV10 antenna for the winning club – Barry ARS – to use at future club events. Glyn Jones, GW0ANA met with Marc Foster of Sandpiper Antennas to collect the antenna.

VHF Contesting

A briefing note from the UKAC workshop on 3 June is available on www.rsgb.org/vhf-contest-update. It describes the discussion and the workshop group's unanimous proposals for further development of these succcessful contests.

Regional COTY

National Club Of The Year
Principal Sponsors
WATERS & STANTON

Shack Manager for Barry ARS, Nigel, GW1CUQ, received the R7 Regional Club of the Year winner's certificate from Glyn, GW0ANA. Barry ARS now go forward to the National competition, sponsored by Waters & Stanton.

YOTA 2017

Another Club Supports YOTA 2017

We are pleased to announce that even more people have joined us as supporters of YOTA 2017. We now have over 30 clubs who have added their support alongside many businesses and individuals.

Norfolk Amateur Radio Club (NARC) has become the latest club to become a Supporter Plus of YOTA 2017. NARC is rightly proud of its activity that encourages and supports young people learn and experience radio and electronics in its regular 'Bright Sparks' evenings. It has now extended that support of young people by becoming with its membership's blessing a proud supporter of the YOTA International Summer Camp at Gilwell Park in August.

There is still time to help us with YOTA 2017 and If you haven't done so yet, don't forget you or your club can help by donating at www.rsgb.org/yotasupporter

Volunteers still needed

The event plan for YOTA 2017 contains lots of different activities and the RSGB is still in need of people from Affiliated clubs and groups to help with certain activities. In particular if you have experience of portable operation we are still looking for people to help support the SOTA activity every day.

However, no matter what your skills if you can spare some time during 5-12 August we would like to hear from you – please send an email to yota@rsgb.org.uk saying what you could do and when.

Activity plan

The YOTA team have now firmed up the week's activity plan and rather than try to manage around 100 young folk doing activities all at the same time, they have planned to have 5 activity streams running alongside each other with a rotation pattern that ensures all attendees will get to do all activities at some point during the week. The visitors can look forward to GB17YOTA operating throughout the week, an ISS contact, ARDF sessions, a visit to Bletchley Park and the National Radio Centre, a visit to the Science Museum alongside some London sightseeing, a Summits on the Air expedition and building a 17m QRP transceiver. A packed week! If you want to know more about this event, check out the RSGB website at http://rsgb.org/main/about-us/yota-2017/

Regional Activity

We want as many young people as possible to be involved in Regional youth activities as possible.

The Region 8 team have a BBQ on the air to kick start the week on the 4th. It will bring together young amateurs and give them the chance to meet and get on the air. Mid Ulster ARC is running SES during the week to make contact with camp participants but also to encourage other young amateurs to get on the air. A group of young amateurs may get to go on a SOTA experience day too.

On the 5th, Region 10 amateurs will be setting up their DF kits in the Scout camp at Beacon Hill, Faygate for a day of amateur radio including a direction finding competition, some Morse code lessons and of course use of a HF station.

Region 3 is hosting a Buildathon organised by R3 Youth Committee member Rebecca and the regional team. The Wirral ARC is hosting a SES and inviting young people in their area to get involved.

How could you get involved? Whether you are a club, a group of friends or an organisation, please get in contact with Sara McGarvey, 2I0SSW via email to 2I0SSW@rsgb.org.uk with your ideas, big or small and let's all work together to make YOTA 2017 a fantastic event for young people far and wide.

IARU General Conference 2017 papers are now online

Papers are now online for the International Amateur Radio Union (IARU) Region 1 2017 General Conference that will be held between 16 and 23 September. A record input of 25 submissions has been made by the RSGB – by far the largest from any national society. Overall there are nearly 120 papers on matters that include amateur radio development, policy, spectrum, band plans and contests. We are also the only member society that contributed to all five committees: Budget, General, HF, VHF/Microwave, EMC.

The papers can be downloaded under the heading 'Conference Papers' from the Region 1 website at http://tinyurl.com/GB2RS-2105A

The Society has a consultation to gather comments on the papers and their proposals on our IARU Forum at http://tinyurl.com/GB2RS-2105B

Callsign confusion

Due to finger trouble we printed the wrong callsign for Dave Redman, G4IDR alongside his article on small station EME last month. We apologise for any embarrassment this may have caused.

Regional Council

The RSGB Regional Council has elected Ian Douglas, G7MFN as Chairman and Mick Senior, G4EFO as Secretary for the coming year. The Regional Council comprises the elected Regional Managers and the President, and is responsible for the representation of Members' interests, promotion and co-ordination of the Society's activities in the Regions.

QSL Matters

Some news first for those of you who send their outgoing cards directly overseas. The USA area 5 is being handled by Oklahoma DX Association member Gene Lewis, W5LA (email w5buro@gmail.com). The bureau address has changed to W5 Incoming Bureau, PO Box 1060, Mounds, OK 74047, USA.

Please note that any Member with 1kg or more of cards for a single destination should always send them direct overseas and not via the UK bureau – see the RSGB Yearbook for full details.

- **Collecting cards:** If you decide that you are no longer going to collect QSL cards – as an active club recently announced – it would be a good idea to continue to supply the bureau with envelopes to care of the cards that are already in the system. By putting your QSL policy on QRZ.com, announcing it on the air and creating an OQRS presence you can greatly reduce the number of cards that come through the bureau. But it can sometimes take a few years for cards to work their way from the far flung parts of the world, so keeping envelopes with your QSL sub manager will help.
- **G4 Series:** The G4M-N manager Cliff, G4MAR is now handling callsigns in the G4M-S series. Eugene, M0HMS will shortly handle G4T-Z and we are currently in process of transferring all cards and envelopes.

Congratulations

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

70 years
Mr R A Bishop, G3GGG
Dr J C W Ickringill, G3HHU
Mr D A Pilley, VK2AYD

50 years
Mr B T Fallows, G3OWY
Mr Q G Collier, G3WRR
Mr D Ellacott, G3XOB
Mr S M Hutchison, GM3WPA

Training & Education vacancy

Following the co-option of the current Chair, Philip Willis, M0PHI to the RSGB Board, applications are invited for the role of Chair of TEC, the RSGB Training and Education Committee.

The Committee covers most aspects of radio-related training, other than those within the remit of the Examinations Standard Committee. Its interests range from encouraging new entrants into the amateur service, training trainers, syllabus review and roll-out, helping disabled amateurs and working with schools. Full details of the Committee, current projects and members may be found at http://rsgb.org/main/about-us/committees/training-and-education-committee/

Interested volunteers may contact the current Chair via email to philip.willis@rsgb.org.uk to arrange a confidential conversation if desired.

Applications by CV should arrive with the General Manager, Steve Thomas, M1ACB, via email to gm.dept@rsgb.org.uk by 1 July 2017.

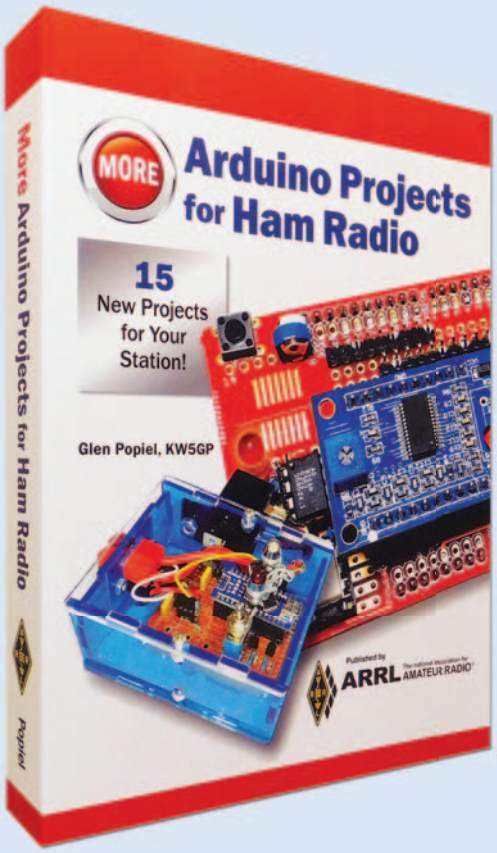
The RSGB would like to welcome to the RSGB family the following new Members who have joined their voice to ours and are helping to keep the RSGB strong.

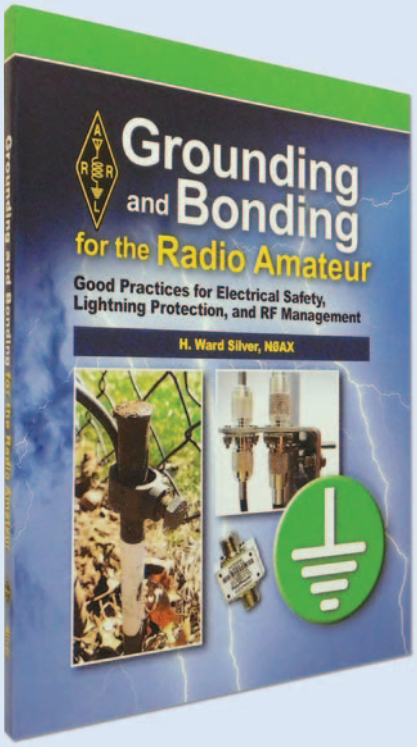
Mr B Smith, G4MHX
Mr D Lock, 2E0EDF
Mr A Cattell, 2E0ERO
Mr I Barnes, 2E0PPM
Dr S Pearce, 2E0SFQ
Mr S Kubecki, 2E0SQJ
Mr J P Keon, AB4PP
Mr P Bowman, AC9LR
Mr G Popp, AF8S
Dr S Seaford, AI4VV
Mr S McClain, AI6XB
Mr A McGonigle, G0KOM
Mr T Cooper G0RNT
Mr D Paine, G1CVR
Mr C Walker, G1TLY
Mr A Hemenway, G1VIZ
Mr J Peerless, G3JPJ
Mr C Bolt, G3NN
Mr M Kaye, G3WPQ
Mr M Meadows, G4GUG
Mr R Moore, G4KRF
Mr L Dymond, G4PEK
Mr M Kebbell, G4UWF
Mr S Kelly, G7SBU
Mr J Thompson, G8UCV
Mr S James, G8UDD
Mr J Beachey, GW1WTL
Mr G Nicholas, GW7EVG
Mr D Crawford, IR2DPC
Mr D Jarvinen, K0DAJ
Mr J Blinick, K1JB
Mr H Brown, K1WCC
Mr J O'Neal, K4XAR
Mr R M Litt, K5HM
Mr D Martin, K5YFO
Mr R Smith, K7OJL
Dr T Lougheed, K7TLI
Mr D Moriarty, K8AGB
Mr D Phelps JR, K9DLP
Mr J Wright, K9JDW
Mr T Dicesare, KB3YPN
Mr S Sabo, KB4KGB
Mr J Dahlager, KC0WCF
Mrs S L Oleniczak, KC9ZLS
Mr C Waldrup, KD4PBJ
Mr T Boyer, KD8KYK
Mr E Almasy, KE3HL
Mr M Postma, KE8DPO
Mr L Helton, KF4HNF
Mr M Brown, KF5PWF
Mr R Mix, KF6ABC
Mr B Comer KF6C
Mr J Stanford, KF6I
Mr K Smith, KG4YBH
Mr A Magnuson-Whyte, KI7ILS
Mr L Wolf, KJ4HY
Mr J Bilancio, KM4HI
Mr M Bridak, KM6HQI
Mr D Ruth, KV4WR
Mr A Cucchiara, M0ISI
Mr R Hunter, M0TLO
Mr A Gallop, M3RKV
Mr D Lean, M6BUZ
Dr D J Browning, M6DJB
Miss S Shor, M6HYX
Mr D Hall, M6IXP
Mr D Clempson, M6IYH
Mr A Bailey, M6IYN
Mr S Taylor, M6IYP
Mr D Drake, M6IZO
Mr K Knight, M6KRE
Mr M Slade, M6KYG
Miss L J Garrod, M6RVE
Mr C Jenkins, M6VCV
Mr K Minett, M6VKM
Mr C Smart, M6WGS
Mr M Forster, M6YCL
Mr D Dickson, MM0CDK
59° North ARG, MM0ORK
Mr R Stewart, MM6IXH
Mr A Sommerville, MM6IZH
Ms J Schaumbeffel, N2JLC
Mr T Betty, N3UKO
Mr J Shea, N4DSP
Mr L Bugeja, N5FAN
Mr L Nickles, N7MQ
Mr G Kelley, N9FQF
Mr M Reese, N9MR
Mr S Daffon, N9SWD
Mr F Horton, NA4P
Mr J Green Jnr, NF6O
Mr J Rush, NM0V
Mr F Martinez, NQ2T
Mr D DuBray, NS5G
Mr M Snijders, PA2MRK
Mr C Hoezen, PA3CAS
Mr M S Donadio, PY3MD
Mr J Harkins, RS312661
Mr S Baker, RS312719
Miss D Horn, RS312736
Mr P Sullivan, RS312770
Mr W Pickles, RS312771
Mr G Sewell, RS312796
Mr D Cooper, RS312815
Mrs J Sewell, RS312816
Mr S Sewell, RS312817
Mr A Sewell, RS312818
Mr A Watson, RS312832
Mr C Smith, RS312842
Mr S Becker, RS312843
Mr A Goode, RS312860
Mr R Vermeulen, RS312890
Mrs R Jariwala, RS312892
Mr J Kubecki, RS312893
Mr A Kubecki, RS312894
Mr G Hardman, RS312897
Mr D Wilkes, RS312903
Mr T Clark, RS312933
Mr R Moir, RS313067
Mr L Sutherland, RS313071
Mr J Hackett, RS313073
Mr T House, RS313091
Miss M Jolly, RS313103
Mr J Neal, RS313117
Mr S Gatley, RS313120
Mr G Milton, RS313133
Mr R Finn, VE3PNK
Mumbai ARI, VU2BPA
Mr J Brown, W0MPM
Mr L Wilbur, W2RTT
Mr W Kisse, W3MSH
Mr T Best, W3TMB
Mr L Schropp, W4LJS
Mr J M Henderson, W8EV
Mr S Lavinder, W8FG
Mr D Hudelson, W8HUD
Mr C Maccluer, W8MQW
Mr R Mercer, W9TAG
Mr R Vosatka, WA2I
Mr J D Edge, WA4KYI
Mr B Smith, WA5PSA
Mr M Hunton, WA5PSE
Mr D Riffey, WA5WD
Mr J Burke, WA8OGS
Mr R Petty, WA9RAD
Mr D Landes, WX4C
Mr N van Rensburg, ZS6QL

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

Mr R B Porter, G3VXK
Mr P H Trotter, AA4ZZ
Mr D Brennan, EI6IL
Mr G Gerard, F5BEG
Mr K Taylor, G0APQ
Mr A E King, G0DDJ
Mr P Hunter, G0GSZ
Mr A Etheridge, G0HXF
Mr M J Prendergast, G0RDD
Mr H Summers, G0UPL
Mr K Wall, G1ONY
Mr M S Clarke, G3CQL
Mr LW Sampson MBE, G3JSW
Mr D Hayter, G3OCI
Mr G Lawes, G3PLT
Mr D Ashwood, G3TVX
Mr W Wilkinson, G3XJI
Mr R Penberthy, G3ZFP
Mr J Loughlin, G4DKQ
Mr G M Rose, G4EDH
Mr K Scott-Green, G4GUK
Mr P Gillen, G4GVW
Mr D R Elwell, G4MUS
Mr G Ball, G4OJF
Mr R Potts, G4PEN
Mr M Spooner , G4PFG
Mr R White, G4PGY
Mr G C Mason, G4PTK
Mr D L Birks, G4SFD
Mr M Brooke, G4SKO
Mr D Meadows, G4TGB
Mr W Pope, G4TIG
Mr J W Oakley, G4VQZ
Mr V Packman, G4VYC
Mr G South, G4YAP
Mr N Banham, G4YFV
Mr C Pearson, G5VZ
Mr T N Smith, G6AQI
Mr S F Lord, G7PMJ
Mr V H Swanwick, G7TMU
Mr R Beauchamp, G8EYH
Mr J A Ferguson, GI4GPC
Mr R B McCartney, GM4BDJ
Mr C W Bridges, GM4NGJ
Mr IR Munro, GM4VXM
Mr T R Waters, GW4IMC
Mr T H Varney, GW4RLP
Mr I Hynes, GW4UCV
Mr G Bertos, GW4YVN
Mr M Lodico, K1EG
Mr R Gist, K4VU
Mr A Nellis, KA8IPO
Mr PRT Talbot, M0BHL
Mr R Astbury, M0EAF
Mr H Lillywhite, M0LHT
Mr D J Bown, M3JOS
Mr J Lindars, M3JVL
Mr N R Bardell, M3RZO
Mr M C Scott-Martin, M3YYO
Mr D Jones, M6OCO
Mr K J Hail, MM3XKH
Mr D Rumble, MW0JBX
Mr M D Paskeuric, N0ODK
Mr B K Moran, N9ADG
Uni of South Wales, RS154171
Mr D Cassar, RS215635
Mr D Jolly, RS94696
Mr F Fusari, W8KA
Mr B P Sidari, WA2TMC
Mr J McCown, WA5JM
Mr P Stoddard, WD9EWK

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.

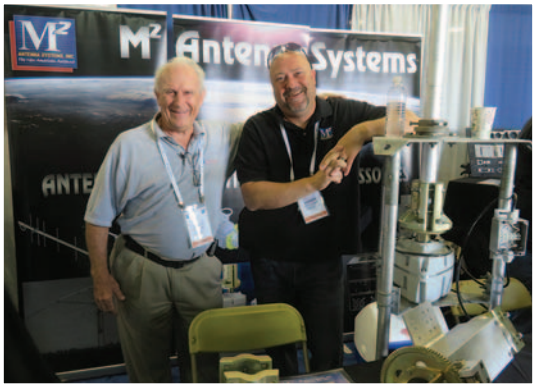
Caution: This book is not intended as a guide to setting up a station in the UK or Europe and some solutions are not compliant with UK/European electrical regulations and thereby may be illegal or deemed dangerous in these areas.

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)*

Hamvention® 2017

Some images from this year's event at the Greene County Fairgrounds, Xenia, Ohio.



The following Members and friends visited the RSGB stand at the Dayton Hamvention® in May.

A7IAM
AA1IP
AA3XV
AA8SU
AB1OC
AB1QB
AB4CT
AB4GE
AB9D
AI6TK
AK4WG (ex G1WWP)
AK4Z & KT4E
CF3GD
DK8OL
EI2WI
G0DWV
G0TSH
G2KQ
G3KEL
G3NID
G3RBP/VE3ZI
G4HPW
G4KGP
G4PEW
G4SPX
G6YIQ
G8EBM
HB9HVG
HB9HVW
JK3GAD/M0CFW
K1EG
K1JB
K3ZYK
K4MHM
K4SV
K5FLU
K7OJL
K8MCQ
K8MZ
K8RKS
K8VQC
KA0HMQ
KA4YBL
KB0P
KB2ERJ
KB3GXB
KB4KGB
KB8NT
KC0G
KC8QFF
KC9ZLS
KD2GUT
KD4D
KD8ATJ
KD8OUV
KD8ZZI
KE8DPN
KE8DPO
KE8ELR
KF4HNF
KF5BRB
KF5PWF
KF6C
KG4GZE
KG8G
KJ4UY
KK1K
KM4HI
KM6FZE
KO8SCA
KY4GPD
M0JCI
M0LJD
M0NKR
M1GRY
M1GWZ
N06Z
N0ULL
N1GB
N1RU
N1VU
N2JLC
N2MH
N2NT
N2SS
N3UKO
N4CWP
N4FWD
N4GIX
N4HAI
N4KEA
N4TZ
N5TN
N8HSO
N8VXQ
N9ADG
N9SWD
N9YZA/G8EDU
NC8Y
NF6O
NJ3T
NQ2T
NU8LL
PY2DM
PY3MD
PY3UA
S8UVC
VE1/K7SJ
VE1ZC
VE1ZX
VE3WY
VE6SH/G4HUA
VE9IM
VU2ISH
VU2IVV
VU2LOC
VU2MY
W0AO
W0MPM
W1AER
W1MG
W2APF
W2RTT
W2UDT
W3HTJ
W3IU
W4CHI
W4KMA
W4LVS
W4YN
W4ZST
W5QR
W8AAV
W8FG
W8HFJ
W8HUD
W8MOJ
W8MQW
W8TEE
W8WG
W8XCT
W9SWW
W9TOC
W9TRC
WA1ZMS
WA2I
WA2VYA
WA3OFY
WA4NLF
WA5PSA
WA5PSE
WA6LOS/DU3
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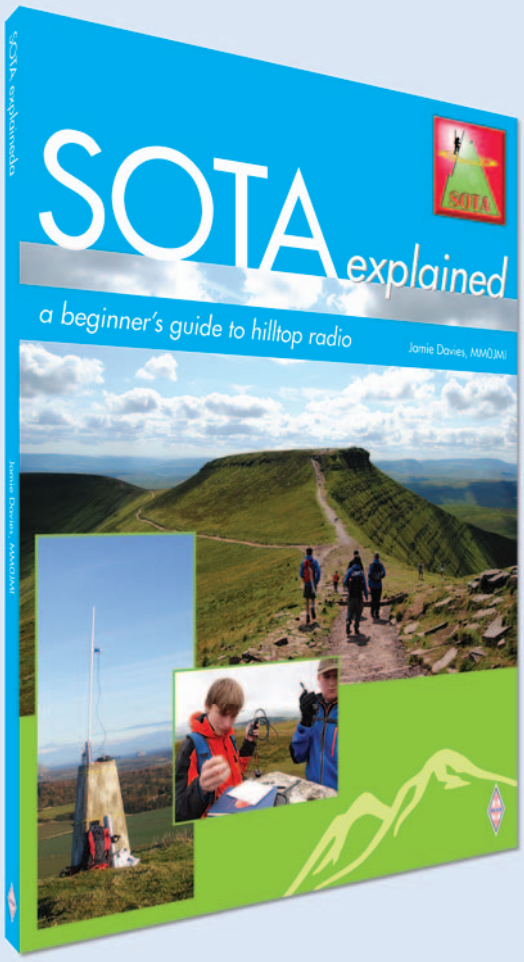
WA9FCN
WA9RAD
WB2KHO
WB8NUT
WB9DBD
WB9VHF
WD8ILI
XE2K



NEW TITLE

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 that have come into existence in recent years. For the active hillwalker and the home based chaser of summits alike 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 of amateur radio. SOTA activity is also inexpensive providing the opportunity to achieve a great deal in 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 available and on many days mountain-to-mountain conversations flow across the world.

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' from the 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.

The book is not just for those new to SOTA but the more experienced operator will find much of use too. *SOTA Explained* provides the ideal guide to the SOTA scheme and making hilltop operation easy, social, & fun.

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

Size: 174 x 240mm, 160 pages
ISBN: 9781 9101 9336 5
Non Members' Price: £12.99
RSGB Members' Price: £11.04

Also available on amazonkindle

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

SDRplay at Dayton

The British company SDRplay attended the Dayton Hamvention in the USA with their RSP SDR receivers. Invited by Ham Radio Outlet, who provided plenty of booth space, Mike and Andy from SDRplay performed demonstrations and answered technical questions about their RSPs and their own *SDRuno* software. The RSP1 and the more recent RSP2 (see the review in the April *RadCom*) are both manufactured in the UK and use chips from Mirics, which were also designed in the UK. To find out more go to www.sdrplay.com or go to YouTube and search for SDRplay to find the SDRplay channel where many video demos can be found.

Exercise Blue Ham 17

During March, the Cadet Forces took part in a radio communications exercise using the 5MHz (60m) band within the agreed nominated channels. Having two weekends of activity meant that more stations would have the opportunity to work each other and leave some of the channels available for the normal nets that operate over the weekends. Around the UK, Cadet stations were set up and operated on the band making contact with radio amateurs. Operating rules were slightly different from last year, which made making a contact easier to work. With the current HF working conditions, using the right equipment and antenna was key to getting good results. The special callsigns for this activity were allocated to stations that would be operating and were only usable during the period of operation; this provided some interesting callsigns in everyone's logbooks. Units from RAFAC, ACF and SCC made contact with 273 different amateur callsigns, with nearly 1300 calls being logged electronically during the period of operation. Some Cadet station to Cadet station contacts were also recorded in the logbook. Once a contact was logged into the system it showed up onto a map that could be accessed by going to http://alphacharlie.org.uk/blueham/showmap.php The top scoring callsigns for contacts racked up are G4DYA – 56, G0TNF/P – 49 and OZ7MHZ – 44. Any amateur with 10 or more contacts can email their callsign and contact details to blueham@alphacharlie.org.uk to claim a PDF certificate. Cadets and staff sometimes struggled with the exchange of information due to some non-standard phonetics used, but it did make sure Cadets had to listen carefully. Feedback again has been good and thanks go to those who have sent in their details. Thanks to those who took part, giving the Cadets plenty of air time that cements their radio training.

OE3XTR beacon sponsorship

InnovAntennas has supplied a 2-element 144MHz LFA-Q for the OE3XTR 2m beacon. Due to the height, many standard Yagis have failed and it is hoped the rigid, twin-boom quad will increase life and service of the antennas.

Advanced Distance Learning

The Bath-based team who run Advanced distance learning classes are recruiting candidates again. Their next course will run from July to December, with weekly study packages being circulated via a Virtual Learning Environment (like a private website). They provide additional notes to guide students through the RSGB textbook, some videos to watch and revision quizzes to check on progress. At the time of writing the team were awaiting news of their 500th successful candidate since they started in 2011. Throughout their history their average exam pass rate has been 85% or better. The team (and students) have also donated £9,000 to radio charities in the last five years. If you would like to know how to enrol, contact the course leader, Steve Hartley, G0FUW via email to g0fuw@tiscali.co.uk

Foundation Course

Lowestoft District & Pye ARC will be conducting a Foundation course at the beginning of July. The course will be held on Saturdays for around 4 hours over a 4 to 5 week period. For more information contact training at training@ldparc.co.uk or secretary@ldparc.co.uk. All are welcome, they say they are a friendly local club trying to promote the amateur radio hobby.

Dealer of the Year

Martin Lynch & his Sales Manager, Richard Radford, G1GRD are seen here receiving JVC-Kenwood Ham Radio Dealer of the Year Award for 2017. ML&S have held this prestigious position as the UK's No 1 official dealer for more years than any other retailer in the UK. The award is based on volume of Kenwood sales along with excellence in customer service and showroom experience. Left to right: Gary Hodgson (Communications Sales Manager JVC-Kenwood), Richard Radford, G1GRD (ML&S UK Sales Manager), Mark Haynes, M0DXR (Area Sales Manager (Amateur) JVC-Kenwood), Martin Lynch, G4HKS (Managing Director, Martin Lynch & Sons Ltd).

60m news

The Icelandic PTA decided on 12 May to extend the experimental licence privileges for radio amateurs in the 5MHz band until 31 December. The privileges are for 5260-5410kHz, with 100W EIRP. Mode of emission: CW, USB, PSK-31 and other digital modes. The permit is the same for N and G licensees. Currently, 25 TF licensees have an experimental licence on 5MHz (60m).

The Mexican telecomms regulator, IFT, has approved amateur operation on the new WRC-15 60m amateur secondary allocation of 5351.5 to 5366.5kHz. Maximum power permitted is 20W EIRP.

An entry (on p11) in the Uruguay national society's bulletin, CX511, has an FAQ section concerning the new Uruguay Amateur Radio Regulations and in particular about 60m operation. This indicates that currently access to the new Uruguay WRC-15 allocation is permitted only to Superior class licence holders.

The Radio Officers' Association

The Radio Officers' Association held their AGM and annual reunion in Chelmsford in April. As usual, members and guests gathered on the Friday and renewed old acquaintances and made new friendships well into the evening hours. The AGM was held on the Saturday morning and was preceded by a minutes silence for members who had become Silent Key during the previous year. Following the AGM and lunch, members and guests visited the Sandford Mill Museum, which was specially opened for the day. Members of CARS were also in attendance with a live radio rig and kindly allowed licenced members to demonstrate their CW skills on the bands. The next reunion is planned for Chatham, Kent in November. See www.radioofficers.com

Suffolk RED

Since Suffolk RED (Radio and Electronics Development) formed last year, it has gone from strength to strength, regularly attracting over forty attendees every other month. It is open to all who have an interest in radio and electronics on the last Wednesday of alternate months. Each event provides an opportunity to have a informal look at the many and varied aspects of the hobby and provide contacts if there is something you might be interested in further. The first RED Social is on 23 July at Suffolk Aviation Museum Foxhall Road, Ipswich IP10 0AH. www.suffolkred.co.uk.

5MHz newsletter

The latest edition (No 18) of *The 5MHz Newsletter* is now available for free pdf download from https://tinyurl.com/ln5f2p4 or alternatively from the RSGB 5MHz page http://rsgb.org/main/operating/band-plans/hf/5mhz/ This bumper edition includes 14 new allocations, 60m coverage of Europe, 5MHz from a 'postage-stamp' garden, a report on the Blue Ham 2 exercise and Beacon news.

Cornwall Hospice Care

Dennis, G7AGZ is raising funds for Cornwall Hospice Care using amateur radio to raise awareness. Starting on 8 July, he will operate GB6BEN on his hike to climb Ben Nevis. He plans to use FM on the 50, 145 and 433MHz bands. QSLs will go via the RSGB Bureau, eQSL and SWL reports are most welcome. He plans to try Echolink from the summit, subject to finding a link. More details on qrz.com

IARU HF World Championship

The 2017 IARU HF World Championship Contest takes place from 1200UTC on 8 July to 1200UTC on the 9th. Both Single and Multi operator stations may operate the entire 24-hour period. The objective of this contest is to contact as many other amateurs as possible, especially IARU member society HQ stations, using the 160, 80, 40, 20, 15 and 10m bands. Multipliers are the total number of ITU zones plus IARU member society HQ stations worked on each band (not mode). You can find the complete rules at www.arrl.org/iaru-hf-championship

CQ Hall of Fame

The CQ Amateur Radio Hall of Fame gained 18 new members for 2017. It honours those individuals, whether licensed amateurs or not, who have made significant contributions to amateur radio, to their professional careers or to some other aspect of life. Of interest to UK readers is the award to an UK amateur. David Honess, M6DNT was inducted for the Developed AstroPi project, which sent two Raspberry Pi computers to the International Space Station as platforms for students on Earth to write and run their own computer code in space; honored for this work with the Sir Arthur Clarke Award, presented by the Arthur C Clarke Foundation and the British Interplanetary Society. Many FlexRadio users will also be interested to read that Gerald Youngblood, K5SDR was inducted as a pioneer of software defined radio (SDR) and founder of FlexRadio.

World Wide Flora and Fauna

WWFF is an international and non-commercial programme run by the National coordinators of a large number of national Flora and Fauna programs. GxFF National Parks Week will be running from 24-30 July and operators are encouraged to take part in activating their local national park as a single operator or club field weekend. Awards will be offered to hunters and chasers for the amount of parks activated and Park to Park awards for operators during the event. Please contact m0pai@hotmail.co.uk for reference information, operating rules, or to register your station.

13 Colonies special event

Durham & District ARS is participating as one of the bonus stations in the 13 Colonies special event. GB13COL will run 24 hours a day from 1300UTC on 1 July to 0400UTC on the 7th. The primary focus of the event will be the HF bands, as well as VHF and UHF using SSB, CW and digital modes for contacts. The 13 Colonies event began in 2009 as a way of celebrating American Independence with the original 13 Colony States circa 1776. Since the UK was a major historical player in the Revolutionary War, a '13 Colonies Bonus Station' from England will take part. For further information regarding the 13 Colonies event and the available award and QSL please visit www.13colonies.info

Yasme Foundation Grants

The Yasme Foundation encourages amateurs to support activities that promote amateur radio and result in new licensees around the world. In furtherance of Yasme's goal of encouraging youth participation in amateur radio and operating activities, it has made a grant to Kevin, G0PEK, and his daughter Lauren, M6HLR, for the purchase of ARDF and HF, VHF and UHF portable radio equipment in support of their activities to encourage youth involvement in amateur radio in the UK.

Railways on the Air

Bishop Auckland RAC is organising Railways on the Air 2017 on 23 and 24 September. Registration for participating stations is open at http://rota.barac.org.uk/

Passing three exams in a day

Completely separately, Oliver Von Stein and Tony Maslin contacted Steve Hartley, G0FUW about the possibility of doing a day of exams and practical assessments. Oliver is a Brit who lives in Berlin and Tony spends most of the year at sea so only had a narrow window to fit in the radio exams. They agreed a date to work to and set about making it happen. Following some distance learning support, they travelled to Bath and were assessed by Steve, G0FUW, ably assisted by Russ, M0WYB. The next day they assembled at the Bath Exam Centre. Their efforts paid off with each receiving three pass certificates from RSGB HQ about a week later. Tony is now on the high seas, last heard of near Fiji, as M0IGZ/MM and Oliver has just been issued with the reciprocal callsign, DL5OVS, to add to his UK call, M0IHA. The photo shows Oliver and Tony seated in the exam room with Robin, G3TKF checking Tony's ID.

July special event stations

Mid Ulster ARC will operate a special event station at Coney Island from 8 to 30 July. Operation will be from 9am to 5pm and the address is Maghery Country Park, Co Armagh BT71 6NS.

South Essex ARS will put GB2BOX on the air from Boxted Airfield Museum, Langham Lane, Langham, Essex CO4 5NW for Airfields On The Air on 30 July. Admission to the museum is £3, children free. Light refreshments and airfield souvenirs are available from the shop. There is good disabled access with level ground from car park straight into the buildings and disabled toilet.

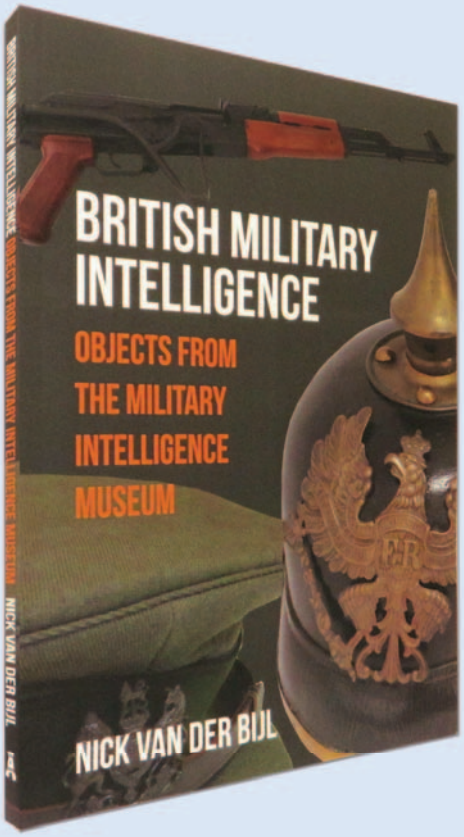
GB1AFV will be operated by Scunthorpe Steel ARC starting 30 July commemorating the first use of wireless in a British armoured fighting vehicle (AFV) at the 3rd Battle of Ypres on 31 July 1917. The Special Event Station will be based on the radio club's room at the App Frod Sports Club, Brumby Hall, Ashby Road, Scunthorpe, Lincolnshire DN16 1AA. A book entitled *The Life & Times of a Tankie from Lincolnshire in the Great War* has been recently published by club member John, MOJAE, about his great uncle, C S Allen, who was awarded the Distinguished Conduct Medal for "grit & determination under heavy fire". Lots of interesting information on this station can be found on QRZ.com

Chester & District RS will be running a Special Event Station from the Visitor Centre at Llyn Brenig Reservoir on 29 July to publicise amateur radio and the work of Welsh Water. The callsign of the station will be GB2DWR (DWR is Welsh for water). Please listen out for the station on the HF bands and give them plenty of amateurs to work.

Future of G Whip

As some will know, Geoff, G4ICD of G Whip will be retiring in June. Andrew Rushton, GW0UZK has been a customer for some time and approached Geoff expressing an interest in taking over production of the G Whip range. Andrew will take over during June and says he will benefit from, and rely on, Geoff's designs, knowledge, expertise, reputation and goodwill that has taken years to achieve, for which he is extremely grateful. We all would like to wish Geoff a happy retirement.

NEW TITLE



British Military Intelligence

Objects from the Military Intelligence Museum

By Nick van Der Bijl

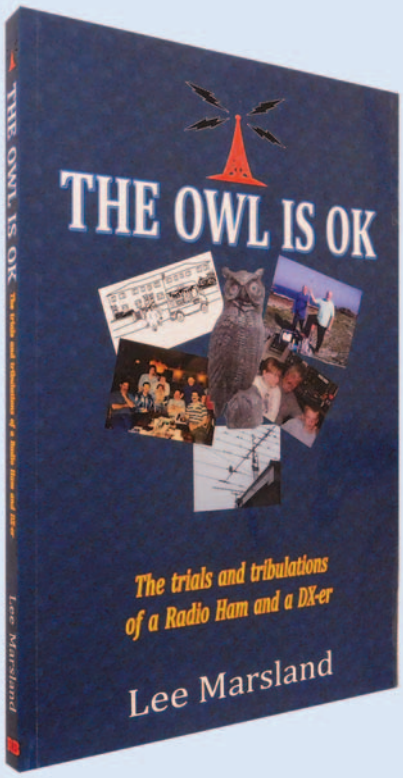
One of the little known museums of the UK is the Military Intelligence Museum at Chicksands in Bedfordshire. This museum provides a huge insight into British intelligence activity since Wellington's time and this new book provides a unique look at its fascinating collection.

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)*

radcom@rsgb.org.uk

New Products

Dual band D-Star transceiver

Icom's latest generation of D-Star hand portable is now available. The ID-51E PLUS2 allows you to make digital voice and data calls through the worldwide D-Star network. This new model incorporates popular features found in previous versions including integrated GPS, an independent AM/FM receiver and V/V, U/U, V/U Dualwatch. It also now 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.

The ID-51E PLUS2 dualband D-Star digital transceiver is now available from authorised Icom amateur radio dealers, initially in grey, with a suggested retail price of £449.99 inc VAT. Each radio comes supplied with the OPC-2350LU PC/Android data cable for use with the RS-MS1A Android Terminal Control Software. See www.icomuk.co.uk for details.

**These features will only work through an Icom D-Star repeater enabled with the latest G3 software: the ID-51E PLUS2 will function as a normal D-STAR radio until this implementation occurs.*

New IC-7300 accessory

Martin Lynch & Sons has announced a new accessory for Icom's IC-7300, the MyDEL-7300SPG, a pair of side panel guards with handles with integrated protection for the rear panel. With metal construction and anodised in satin black, the kit is supplied with a set of stainless steel mounting screws and can be fitted in a couple of minutes. The design protrudes out from the front panel of the transceiver with two integrated grab handles for transport. The MyDEL-7300PS also extends to the back of the IC-7300, offering a level of protection to the rear panel plugs etc. Supplied as a pair and available from stock at £59.95, see HamRadio.co.uk/grabhandles for more information.

Updates for the AOR receiver

Waters & Stanton has announced the most recent update to the capabilities of the AOR DV-1 analogue/digital receiver (reviewed in the May 2016 *RadCom*) to include NXDN descrambling and discriminator direct recording on SD.

For more details visit www.hamradiostore.co.uk

Digital power & SWR meters

Martin Lynch & Sons has introduced a pair of digital power/SWR meters covering 1.8-470MHz. The new RS-50 and RS-70 are compact in-line type meters that present power and SWR on a digital back-lit liquid crystal display. Easy to use and supplied with a micro-USB lead to power the devices, the RS-50 (HF at 200W) and the RS-70 (2/70 at 120W) are ideal for mobile or shack use. They both take AAA batteries (either rechargeable or dry). The introductory price is £69.95 each. Details at www.HamRadio.co.uk/nissei

New Flex radios

Waters & Stanton has announced the launch of the new Flex 6400 and 6600 series radios that will be available in August/September. Both radios offer the latest direct sampling SDR technology. The FLEX-6400 model is designed for those who want to operate the radio exclusively as a server from PC, laptop, Maestro, Mac, or iOS clients – whether local or remote. The FLEX-6400M places the most used controls right at your fingertips. Controls are labeled for intuitive operation and designed to minimise hand motion for the most common operations. Occasionally-used controls are easily accessible on the large touch screen display, bypassing the complexity of multi-function buttons and multi-level menus found on other transceivers. Like modern smartphones and tablets, capacitive touch control is provided on the large LCD display for intuitive pan, zoom, tune, and menu operation. The Flex-6600 has contest grade filters, ultra low spurious emissions and the ability to operate full duplex cross band on two antennas, which lets you transmit on one band while receiving on another – no external equipment is required. The FLEX-6600M controls are designed to provide maximum tempo in the most demanding applications including SO2R, Run, S&P, and Multi-op contesting. http://hamradiostore.co.uk has more information.

Educational videos

Ian Poole, G3YWX has launched several videos on his YouTube channel that radio amateurs may find really useful. *What is an Oscilloscope* can be found at https://youtu.be/iXvFw6KyAew It describes what an oscilloscope is and how it functions. The operation of the oscilloscope is explained in a way that anyone entering electronics and amateur radio can understand. The video details some of the measurements that can be made: voltage, current and the like by using different probes. It also takes a good look at the different controls on the scope, explaining what they do and how they work. All these explanations are backed up with interviews and explanations from industry experts. Companion video *What is a Spectrum Analyzer* is found at https://youtu.be/nLIKaszlaiw Spectrum analysers are really powerful instruments that are essential for many areas of RF design. But what exactly are they, and what is the difference between an analogue spectrum analyser and a digital or FFT analyser. All these questions are answered with descriptions about how these different analysers work. This is an ideal explanation for anyone who wants to know more about the basics of spectrum analysers. You can find out more on the Electronics Notes YouTube channel at https://youtube.com/ElectronicsNotes

Masts and trailers

Nevada has announced a new range of NEVADAMAST telescopic masts and trailer mounted masts, for both amateur and commercial use. The TM15-TM is the first in the series of trailer mounted heavy duty telescopic masts. The trailer supports a 3 section (100mm base box section) mast with head unit, that winds up to a full height of 15m. UK manufactured to the highest specifications, the heavy duty telescopic mast is constructed of high quality steel, hot dipped galvanised for long life and weathering. The trailer mast is supplied complete with manual winches, guy ropes and shackles sufficient to guy at the three guy points on the mast. A lockable box attached to the trailer stores all guying materials for easy erection on site. In addition the trailer has a tow hitch and lock, for security when towing and storing. The TM15-TM is priced at £4,495 and the 15m telescopic mast is also available as a separate item for home mounting and supplied with a slot in base section, guys and head unit with prices starting from £2,395. See www.nevadaradio.co.uk

bhi at Dayton 2017

bhi demonstrated the new ParaPro EQ20 range of audio DSP products at the recent Dayton Hamvention in the USA. All feature a 20W modular audio PA with a parametric equaliser plus the option of having bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth. The product will be available in the UK soon. Call bhi on 01444 870 333 for more information or go to www.bhi-ltd.com.

New dual band beam antennas

The first in this series of antennas is a compact dual band 6/4m Yagi on a 2.1m boom with 4 elements on each band. The DB-46M8EL is constructed using high strength T6061 aluminum with a 1¼ inch boom and Hy-Gain's traditional element mounting hardware. The antenna sells for £299.95. Also available are three 50MHz monoband LFA Yagis in the new Hy-Gain range with 4, 5 or 7 elements. All antennas are available through the International Ham Stores group members, including Nevada, see www.nevadaradio.co.uk

Homebrew

This month we concentrate on the receiver section of the 160m transceiver.

One of the key functions of a radio receiver is to provide power gain. A typical receiver will have very substantial gain of around 100-120 decibels (dB). This is sufficient to amplify microvolt signals from the aerial up to volts at the loudspeaker. In some applications, less gain may be adequate. A simple medium-wave 'crystal set' receiver will have no gain at all; on the other hand, a very high frequency (VHF) / ultra high frequency (UHF) receiver will probably have extremely high gain and a very low noise figure. Our low frequency (LF) / medium frequency (MF) receiver will fall somewhere between these two extremes.

There is no absolute rule regarding gain distribution. A direct conversion receiver may have most of or even all of its gain at audio frequencies. A complex superhet receiver may have gain at radio frequency (RF), intermediate frequency or frequencies (IF) and also in the audio frequency (AF) stages. The usual convention is to have most of the receiver gain and automatic gain control (AGC) in the IF stages. **Figure 1** shows the gain distribution of the receive section of the 160m transceiver. The combined gain of 123dB includes the optional RF amplifier stage. This is more than necessary for our particular application. In practice, AF gain will be substantially reduced by the manual AF gain (volume) control. IF gain may be reduced by anything up to 80dB by AGC and/or manual IF gain control.

I will be using a pair of Analog Devices AD603 ICs **[1]** to provide most of the IF gain in the 160m receiver. The traditional approach to gain control is to vary the IF amplifier gain: this is usually achieved by adjusting the amplifier DC bias conditions. This tends to cause increased distortion, variations in amplifier I/O impedance and variations in noise as amplifier gain is adjusted. The AD603 uses a different approach. The amplifier is a fixed gain design

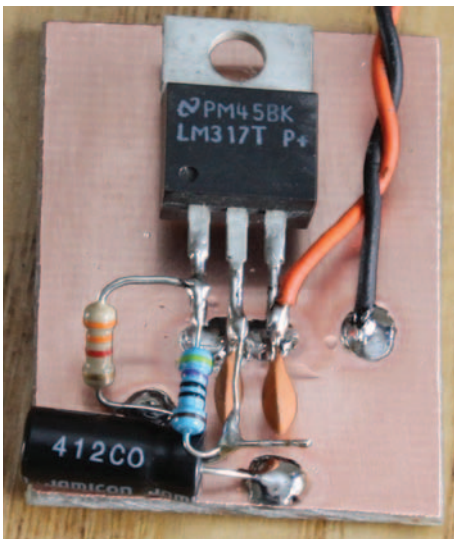


PHOTO 1: Prototype 10V power supply regulator.

that is preceded by a variable attenuator. Optimum amplifier bias conditions are maintained at all gain levels. The AD603 is almost ideal for use as a receiver IF amp. Gain is variable over a 40dB range for each stage. Gain is reduced by 1dB for every 25mV of control voltage applied (40dB/volt), giving a convenient 'linear-in-dB' response.

The configuration of the gain control inputs makes it easy to apply AGC sequentially (one stage before the other) or to both stages at the same time.

The AD603 is designed to operate from ±5V split power supply, or a single 10V supply. Unlike a typical opamp circuit, there isn't much tolerance for a different supply voltage. The datasheet specification for supply voltage range is ±4.75V (9.5V) to ±6.3V (12.6V). For single-ended supply applications, the AD603 will usually be powered by a standard 10V regulator (7810 or similar). As such a device was not available, I used an LM317T **[2]** variable voltage regulator to provide power for the IF amplifiers. The LM317 is a convenient choice for producing voltages other than the usual standard values (3.3, 5, 9, 12 etc). Output voltage is adjustable from 37V down to the IC's internal reference (Vref) of 1.25V. In most applications, the adjust pin current of around 50μA can be ignored, so the output voltage (Vout) is simply Vref × (1+(R2÷R1)). So, as a worked example using the values shown in **Figure 2**, Vout = 1.25 × (1+(3300÷470)) = 10.026V.

The completed unit is shown in **Photo 1**. Note that the LM317 pinout details are different from the popular 78xx devices. The LM317 heatsink tab is internally connected to the output, pin 2, so it should not be connected to ground. Although it isn't obvious from the photo, the prototype device hovers a few mm above the copper ground plane. No heatsink is needed for our low-current application.

This circuit is easily adapted for other output voltages. It can be used as a universal bench supply if R2 is adjustable. A heatsink and insulating kit will be required for higher current levels. Take care with this approach: a noisy or intermittent adjustment pot could cause unexpected voltage transients to appear at the regulator output. A small capacitor from pin 1 to ground might help stop the worst of it, and can actually improve ripple rejection as the output voltage is set higher, but see the datasheet for details.

AD603 IF amplifier

The IF amplifier stages are based on the standard applications from the AD603 datasheet. The basic amplifier is shown in **Figure 3**. The 10V DC supply is from the regulator described earlier. Maximum gain in this configuration is 31dB, minimum gain (max AGC) is -11dB. The noise figure (NF) is around 8-9dB at maximum gain and rises steadily as gain reduction is applied. Input impedance is well defined at 100Ω across the entire HF range and the output is capable of driving a 100Ω load with low distortion. The high impedance differential inputs for gain control are protected from voltage transients by a simple resistor-capacitor (RC) low pass filter (LPF) network.

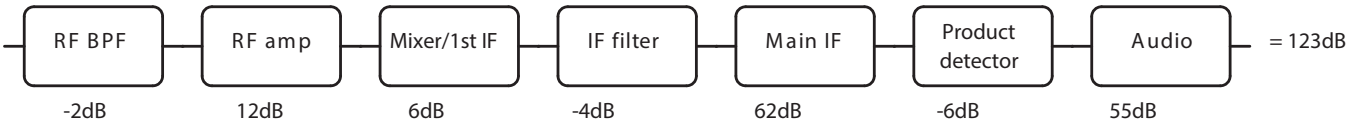


FIGURE 1: Gain distribution of the LF/MF receiver.

Construction

The circuit was built dead-bug style on a strip of PCB laminate. The negative supply pin (6) of the AD603 was bent backwards and soldered directly to the copper foil. I have built several AD603 amplifiers using this method and I haven't broken a pin off (yet). For extra mechanical stability, you can superglue the flat top of the IC to the copper.

Most capacitors are standard disc-ceramic types. Leads were trimmed short, to keep stray inductance to a minimum. I placed a small ferrite bead on the 10V DC supply lead. If a suitable bead isn't available, you can use a moulded inductor of 1-10μH or a few turns on a small ferrite toroid.

You will need thin solder (0.4mm) and an iron with small tip for soldering to the IC pins. The only tricky part is the bridge between pins 5 and 7. I bent the end of the output coupling capacitor (10nF) 90 degrees and used this to bridge between the pins. Use **Figure 4** for guidance. Take care with pin numbering. It is easy to lose track if you are more accustomed to looking at ICs from above, as is usually the case when working with PCB CAD software.

Resistors are all standard 0.25W types. I used a standard 22μF electrolytic for decoupling pin 4. The datasheet recommends a tantalum type in this location.

The assembled two-stage IF amplifier is shown **in Photo 2**. The two stages are absolutely identical, so there was no need to include both in the detailed schematic.

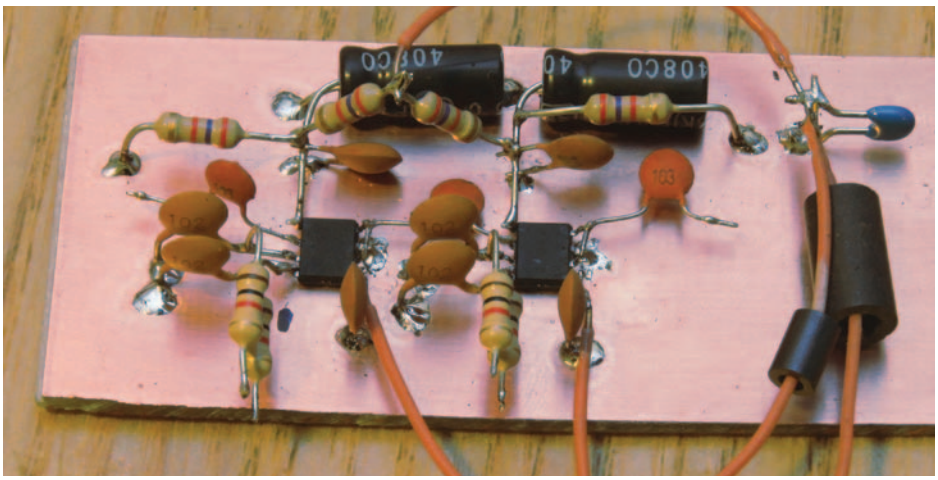


PHOTO 2: Assembled two-stage IF amplifier.

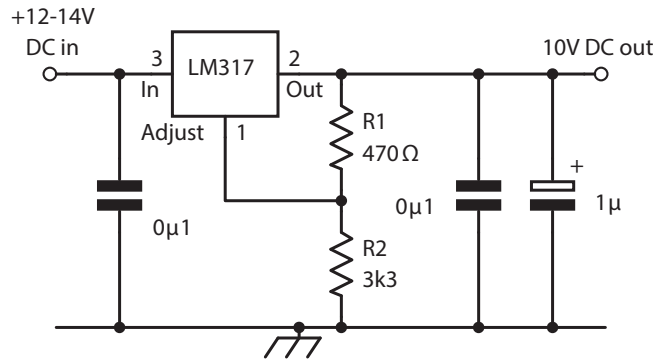


FIGURE 2: Circuit diagram of the voltage regulator.

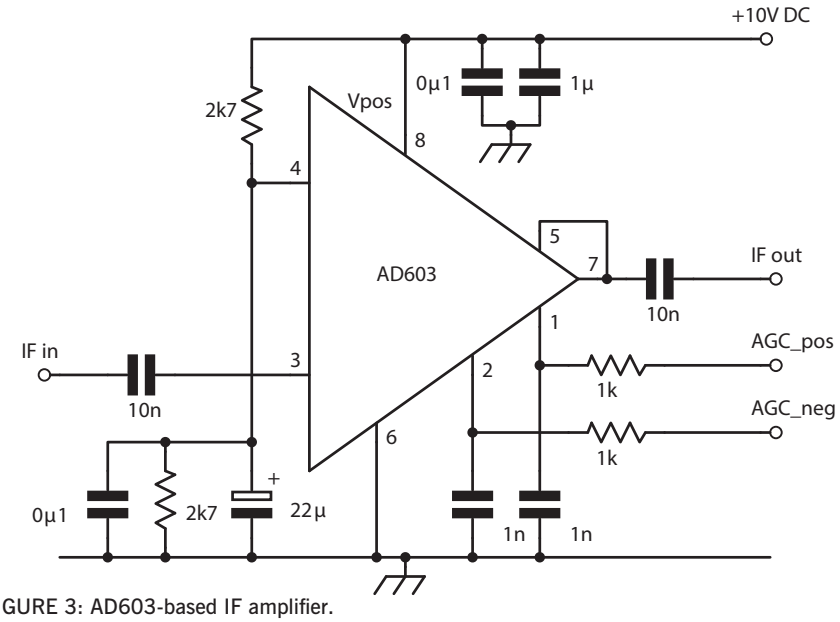


FIGURE 3: AD603-based IF amplifier.

Testing

The IF amplifiers were tested using a signal generator, step attenuators and an oscilloscope. Initial tests led to some confusion because there was a strong triangular waveform present at the output of the second stage. At first, I assumed this was evidence of instability. The problem was actually caused by the fluorescent tube in my bench lamp/magnifier! Once the lamp was turned off the amplifier performed as expected, showing low noise, the projected 60dB+ of gain and well-behaved gain control. As the AGC unit isn't ready yet, I used the simple circuit in **Figure 5** to provide the gain control voltages.

Product detector

The receive product detector (PD) is a standard diode double balanced mixer (DBM) as used for the main Rx/Tx mixer and the transmit balanced modulator. The IF amps and PD are shown in **Figure 6**. T1 and T2 are each 10T, trifilar wound on an FT37-43 ferrite toroid. The four Schottky diodes are 1N5711 or similar devices like the BAT43 (Maplin VR19V). You can use a moulded choke for the 100μH inductor. 15T on an FT50-43 toroid makes a good replacement for this item.

Eamon Skelton, EI9GQ
hbradio@eircom.net

Audio stages

The audio frequency (AF) output from the PD is fed to a common-base transistor amplifier. This low noise amplifier acts as a buffer between the 50Ω output of the PD and the high impedance input to the AF power amplifier. The schematic is shown in **Figure 7**. The choice of transistor isn't that critical. High gain, low noise NPN transistors like the BC107/8/9, BC547/8/9 or BC550 are an ideal choice.

The audio power amplifier (PA) is based on the TDA2050 (Maplin CP88V). Using such a high power device is probably overkill, but the IC is readily available, offers very low distortion and comes in a reasonably small 5-pin package. In its usual application as a 32W hi-fi power amplifier, the IC would need to be mounted on a large heatsink. With a 12 to 14V supply and output power limited to just a few watts, a small heatsink will suffice. It may be more convenient to bolt the heatsink tab directly to the metal case of your receiver. The heatsink tab is internally connected to pin 3 (-Vs), so there is no need for an insulating washer in single-ended supply applications. There isn't much to be said about the operation of the circuit: it is basically just a high-powered opamp with the usual inverting and non-inverting inputs.

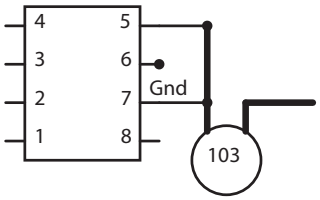


FIGURE 4: How I used the output coupling cap to bridge pins 5 and 7 of the AD603s.

Gain is set by external feedback resistors. The component values shown give gain of 30dB (20log (22000÷680)). The audio PA schematic is shown in **Figure 8**.

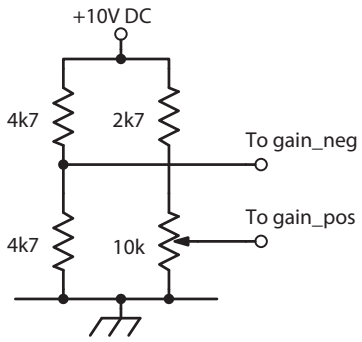


FIGURE 5: Temporary manual gain control voltage source used for testing.

Testing

The completed modules so far, the RF bandpass filter (BPF), mixer, IF/PD, carrier oscillator and AF stages were laid out on the bench and connected together for testing. I used my direct digital synthesis (DDS) signal generator as the local oscillator source. Several single sideband (SSB) stations were heard in the top half of 160m. Audio quality is particularly good. Listening to nets is hard work at the moment because of the frequent need to reduce IF gain manually while stronger stations are transmitting. I am currently testing two separate AGC systems, one IF-derived and the other AF-derived. One, or possibly both of these will be described in detail next month, along with the Rx/Tx switching.

References

[1] *AD603 Low Noise, 90MHz Variable Gain Amplifier datasheet,* Analog Devices, 2012
[2] *LM317 datasheet*, ST, 2014.

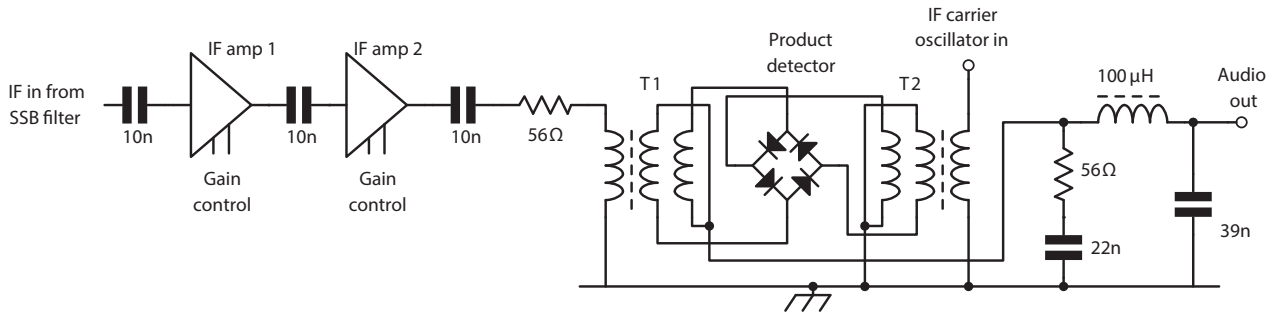


FIGURE 6: IF amplifiers (symbolically) and product detector circuit.

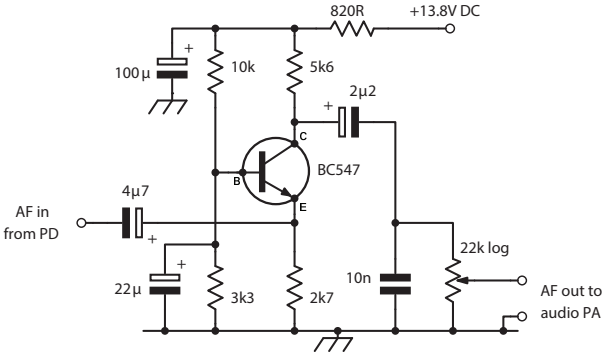


FIGURE 7: Audio buffer stage.

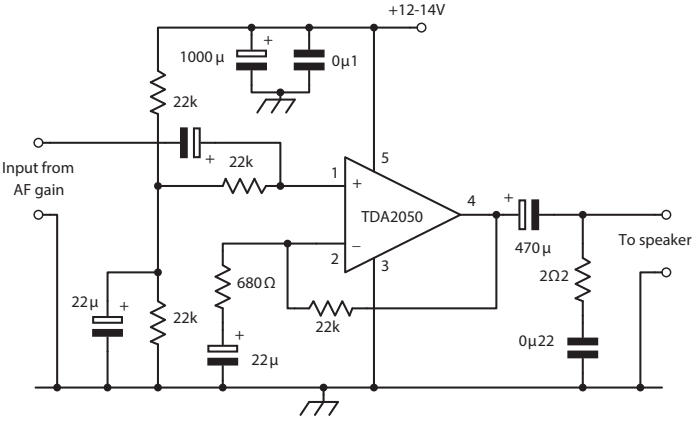


FIGURE 8: Audio power amplifier.

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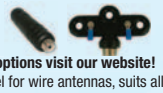

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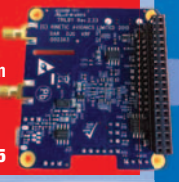

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Antennas

This month we examine how a span of wire can be used to concentrate RF energy into a beam-forming a directional antenna. This type of antenna tends to be for mono-band use, however this technique provides a useful antenna for portable use or where a Yagi beam may be difficult to install.

Overview of the asymmetric antenna

A centrally fed half wavelength dipole has a feed point that coincides where the voltage is at a minimum and the current is at a maximum. This relationship, between the voltage and current, results in a feed point impedance of around 50 to 70Ω [1]. When the length of the antenna's wire span is increased at one end by multiples of an electrical half wavelength, with the antenna continuing to be fed at the same point, then the feed point's impedance rises to around 110Ω. The concept of the asymmetrically fed antenna is illustrated as **Figure 1** [2]. As one side of the wire span is lengthened, then the radiation pattern is modified with more RF energy being radiated away off the longer side's end. This concept is illustrated in **Figure 2** for antennas of lengths of a half wavelength, five wavelengths and ten wavelengths for comparison using a *MMANA-GAL* antenna model [3]. This model used three antennas centred on 145MHz situated at 5m above the ground.

The length of the wire span can be calculated using the antenna equation:

$$\text{Length}(\text{m}) = 150 \times (n - 0.05) \div f \qquad (1)$$

where n is the number of complete half-waves in the antenna and f is the frequency in megahertz (MHz) [4]. The antenna's feed point is located an electrical quarter wavelength (λ/4) along the wire span from one end.

Matching arrangements

If a 50Ω feeder line is directly connected to a feed point, with an impedance around 110Ω then the SWR will be around 2.2:1. Therefore, good practice is to use a matching arrangement and one such method is to use a quarter wavelength (λ/4) of transmission line that acts as a matching transformer [5].

When an electrically λ/4 long transmission line is terminated by a load (ZL), then the impedance presented at the line's input is the reciprocal of ZL. This effect forms the basis to match the antenna's feed point to the feeder line when these impedances are different. However, for technique to work, the characteristic impedance (Zt) of the λ/4 section has to be different from both these impedances.

PHOTO 1: The antenna's feed point housing and connections.

The value of Zt (in Ω) for the λ/4 section can be calculated using:

$$Zt(\Omega) = \sqrt{Zo \times Za} \qquad (2)$$

where Zo is the feeder line's characteristic impedance and Za is the antenna's feed point impedance. Using a Zo of 50Ω and a Za of 110Ω, then:

$$Zt(\Omega) = \sqrt{50 \times 100} = 74.2\Omega \qquad (3)$$

Conveniently, RG59 coaxial cable has a characteristic impedance of 75Ω and can be used for the λ/4 line transformer. However, the length of the RG59 line is going to be slightly shorter than λ/4 because of the cable's velocity factor. For RG59, the velocity factor is around 0.66 to 0.8 depending on the insulation used between the shield and the inner conductor.

The concept of the asymmetric antenna and its matching arrangements are illustrated in **Figure 3**.

Example 6m asymmetric antenna

With the Sporadic-E (Es) season starting, it was decided to construct a 6m band asymmetric antenna, centred on 50.155MHz. Using equation (1), this gave an 11.8m wire span length able to support four half waves (ie n = 4). The wire span was made from 5A-rated insulated stranded copper wire with the feed point located 1.4m from one end.

The feed point was housed in a '20mm single-way' electrical termination box sourced from a local electrical supplier. Inside the box a connection-plate was added, made from single-sided PCB with a 20mm strip etched down the centre (as shown in **Photo 1**). Two brass connectors (from a 'chocolate block' terminal) were soldered to the PCB's copper strips to allow the coaxial cable to be connected. The wire span's ends were passed through holes drilled in the box,

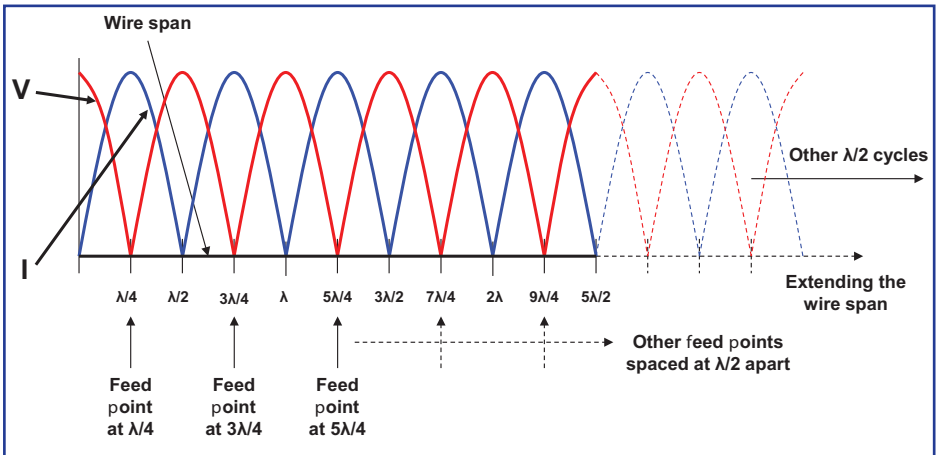

FIGURE 1: Asymmetrically fed antenna concept. Note: I (current) and V (voltage) represent standing wave patterns formed along the wire span.

soldered to the PCB and sealed using epoxy resin glue to waterproof the arrangement. A 20mm gland was glued to the box's access hole, the RG59 coaxial cable passed through, then connected to the feed point's terminals and sealed by tightening the gland nut. These boxes are usually supplied with a lid and compression gasket that, when screwed in place, seals the interior from the weather.

RG58 50Ω coaxial cable was used as the antenna's feeder and this was matched to the feed point using a length of RG59 75Ω coaxial cable as a λ/4 line transformer. Theoretically, the length of the RG59 λ/4 line transformer is 1.495m at 50.155MHz. However, its actual length was 1.2m; this was found by gradually trimming the cable until a very low SWR was obtained. (1.2m/1.495m indicates a velocity factor of about 0.8).

The RG59 and RG58 coaxial cables were connected together by splicing them. Guidance on how to splice cables can be found in the *Radio Communication Handbook* [6], however the main stages involved are shown in **Photo 2**. About 8m of RG58 cable was spliced to the RG59 cable and terminated with a PL259 plug. This length of cable was found sufficient to reach the transceiver ready for tuning the antenna.

Referring to Photo 2, the RG59 cable is to the right, the RG58 cable is to the left and spliced as follows:

- Equal amounts of the outer plastic sleeve were removed (about 30mm), exposing the woven outer shield. The outer shield was separated out to expose the inner insulation on both cables. Then about 5mm of the inner insulation was removed revealing the inner conductor on both cables and the cable centres were carefully soldered together (Photo 2A).
- A small length of the inner insulation was used to encapsulate the soldered joint. This was to retain the integrity of the inner insulation (Photo 2B). To hold the insulation in place, a single layer of plumbers' PTFE tape could be used.

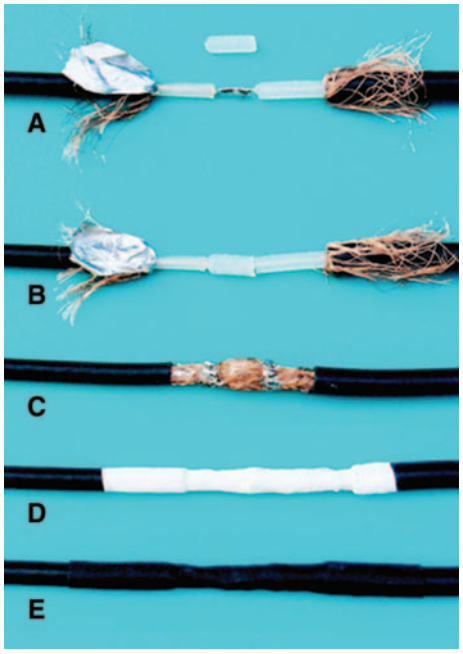

PHOTO 2: The main stages involved with splicing two coaxial cables together.

- The outer shield of one cable was carefully drawn over the inner insulation, the other cable's outer shield drawn over this and carefully rolled together. Spot solder joints were used to hold the outer shields in place (Photo 2C).
- Three layers of plumbers' PTFE tape were wound over the shields to protect the joint (Photo 2D).
- Heatshrink sleeving was passed over the joint and shrunk into place to seal the joint (Photo 2E).

The wire span was installed at around 8m above the ground, with dog-bone insulators at each end that were fastened to anchor points using nylon twine. Each end of the antenna was hoisted using a pulley system enabling the antenna to be raised/lowered during testing. The RG58 feeder was brought straight down from the antenna into the shack ready for testing (centred on 50.155MHz) using an SWR meter. Having signed on in CW using about 10W, the SWR was measured. Initially, the wire span was found to be too long and the ends were equally folded back on themselves until the lowest SWR was obtained. Then the length of the RG59 λ/4 line transformer was trimmed and the SWR monitored until the SWR had lowered to under 1.1:1.

Once the best match had been obtained, the ends of the wire span were trimmed, the wire ends soldered and weatherproofed using heatshrink sleeving. The wire ends were held in place through the insulators using cable ties tightly securing them. The antenna was then ready for use and was capable of handling transmit powers of up to 100W CW/SSB. **Table 1** summarises the dimensions used for the asymmetric antenna.

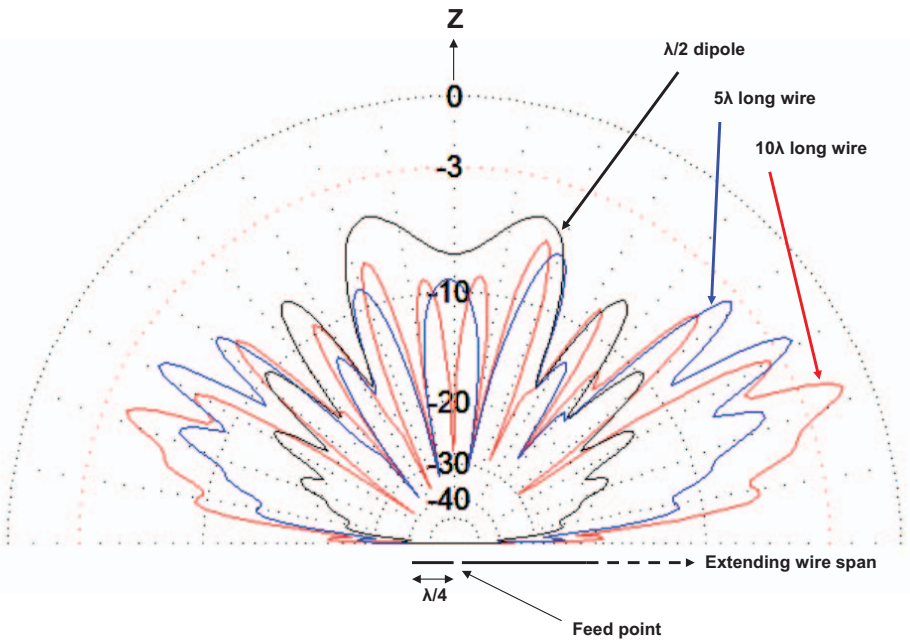

FIGURE 2: Predicted vertical plane radiation patterns for antenna lengths of λ/2, 5λ and 10λ modelled at 2.5λ above ground using *MMANA-GAL*.

Performance

A predicted radiation pattern for the 6m asymmetric antenna was made using *MMANA-GAL* and is shown in **Figure 4** (horizontal plane) and **Figure 5** (vertical plane, or side view), with the antenna modelled at 7m above ground level (AGL). The forward radiation is mainly directed about 45° either side of the wire span and the antenna's predicted free space gain was around 2.7dBd. This is comparable with a 2 element beam. The antenna has a predicted gain of around 10dBi and this corresponds with the larger forward lobe.

Mike Parkin, G0JMI
email2mikeparkin@gmail.com

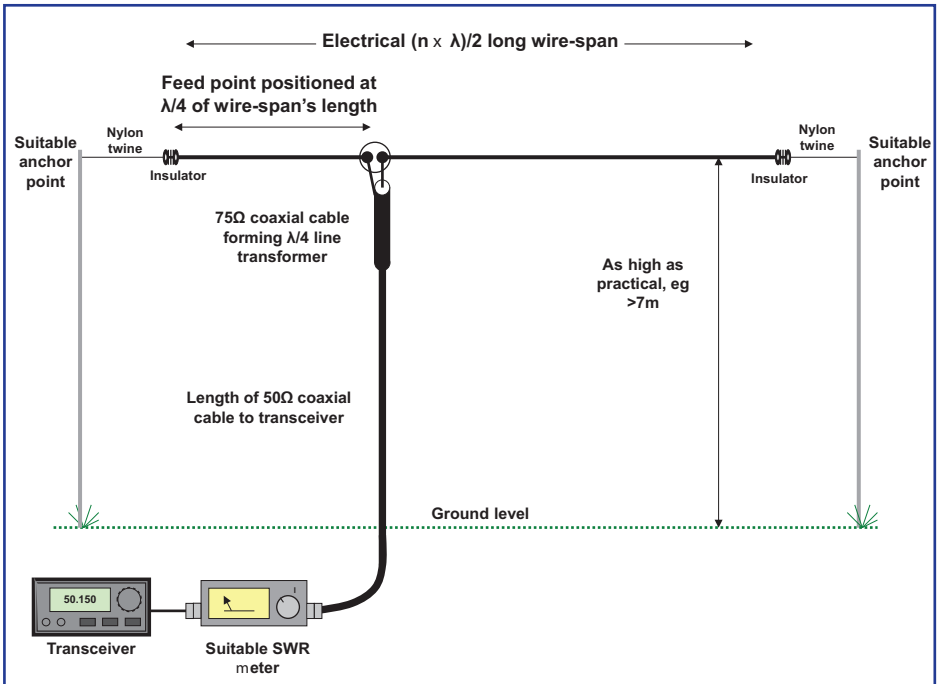

FIGURE 3: Asymmetric antenna concept and its matching arrangements.

However, this lobe is directed at about 40° to the horizon and does not favour working more distant stations. Tilting the asymmetric antenna downwards can help to improve the radiation angle, as shown in **Figure 6**. Here, the antenna's feed point end is at about 8m AGL while the longer span's end is at about 2.5m AGL. This has the effect of tilting the larger forward lobe towards the horizon to improve the performance of the antenna.

Within the confines of the back garden, it was possible to point the antenna southwards and eastwards by moving the lower end. This makes the antenna ideal for working into Europe (and possibly beyond) during the Sporadic-E season. The antenna's directivity was also tested by receiving a local beacon.

Conclusion

I hope the asymmetric antenna designed described here has provided something to think about, especially if you are considering working on 6m while out portable or have difficulties installing a full size 6m beam.

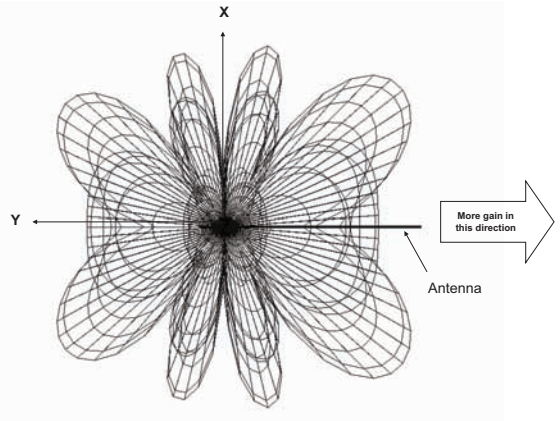

FIGURE 4: The antenna's predicted horizontal plane radiation pattern.

References

From the RSGB *Radio Communication Handbook,* 13th edition, edited by Mike Browne, G3DIH:

[1] Section 15, Practical HF Antennas, pages 15.3 to 15.5

[4] Section 13, Antenna Basics and Construction, page 13.2

[6] Section 14, Transmission Lines, pages 14.10 to 14.11

From the RSGB *Radio Communication Handbook,* 5th edition: Section 12, HF Antennas:

[2] Page 12.59

[5] pages 12.26 to 12.28

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

TABLE 1: 6m asymmetric antennas details.

Item	Length	Cable used
75Ω λ/4 line transformer	1.2m	RG59
λ/4 wire span leg	1.4m	5A-rated insulated stranded copper wire
Longer wire span leg	9.94m	5A-rated insulated stranded copper wire

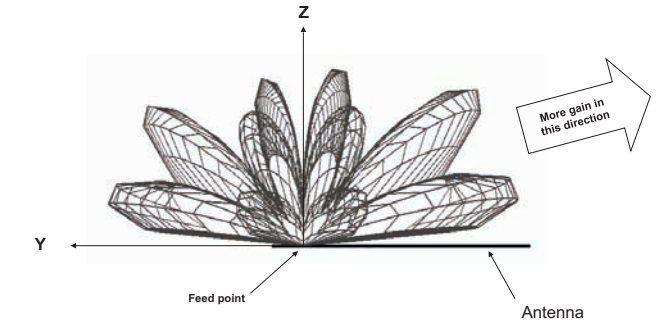

FIGURE 5: The antenna's predicted vertical plane (side view) radiation pattern.

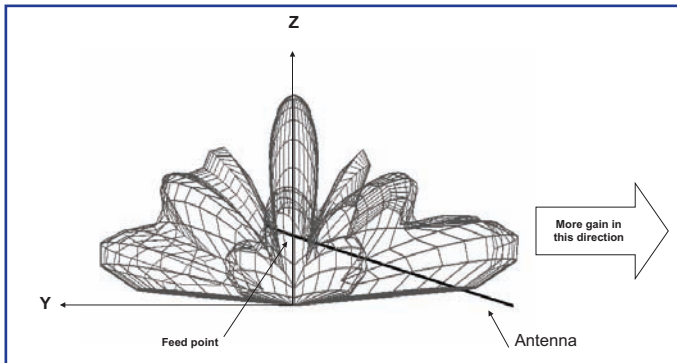

FIGURE 6: Predicted effect of tilting the asymmetric antenna downwards to direct the main lobe towards the horizon.

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Near real-time display of critical frequency, foF2

You can HEAR the conditions AND you can SEE the conditions on the bands by using the information collected on the convectiveweather website [1].

The way the amateur bands behave can seem like a mystery, or even a 'black art' to the uninitiated. We've all been caught out by band conditions changing mid QSO (contact), but over the last few months I've been using near real-time ionospheric data to unravel the mystery and almost make the band behaviour visible as it happens. A little time spent trying to understand the propagation basics will leave you in a much better position when it comes to selecting the right frequency to use, and whether to QSY (change frequency) to where conditions are still working in your favour.

The basics

Unless you are very close to the station being worked, in which case it's probably ground wave, your QSO will depend upon the main workhorse ionospheric layers, namely the F1 and F2 layers (other propagation modes are available, like Sporadic-E (Es) and Aurora etc, and we will consider Es later). The F1 is a daytime addition to the F region set and the two generally merge at night leaving just the F2. This implies that there are also height variations in the important F layers, so a given layer may not always mean the same skip distance. The state of the F2 layer is therefore a good 24 hour indicator of the band conditions, when your signals depend upon a refraction from the ionosphere.

In the professional world of ionospheric research, ionosondes are used to send a signal vertically upwards, whilst sweeping the transmitted frequency. The highest value of the frequency at which a signal is returned from the F2 layer is known as the Critical Frequency, or foF2. This is in effect a measure of the strength of the ionosphere's F2 layer and is related to the number of electrons that have been ionised by the solar radiation, principally U/V rays from the Sun. Therefore it is related to the season and time of day, but because of other processes, which can move this ionisation around, it does not suddenly switch on and off as the sun rises and sets.

NVIS

The last term to introduce is NVIS or Near Vertical Incidence Skywave. This is what most local 80m and 40m club nets depend upon, and makes the foF2 a fundamental ionospheric property to understand, and better still, visualise if you want to *see* what the bands are doing.

A near vertical incidence skywave signal is one that goes virtually straight up to the ionosphere and is then refracted straight back down, so giving you coverage over perhaps a 50 to 100 mile radius of your QTH. If your frequency is too high, that is above the foF2 or critical frequency, your signal will go straight up and keep going – straight out into space.

In other words, for a local club net, the signal path is nearly at vertical incidence or pretty much the foF2, which needs to be at least as high as the frequency the club net uses. Therefore, it's no good expecting a 40m (7MHz) club net to work if the foF2 is only 4.5MHz. Indeed, if the foF2 falls below the club net frequency during the net, then the band will appear to drop out and go long skip, since only those stations that use a shallower angle can be refracted by the F2 layer. That means that only signals from farther afield into Europe now satisfy the reduced foF2 because of their lower angle of take-off.

MUF

Another fundamental to understand is that instead of sending a signal vertically upwards, most amateurs will have QSOs with stations where there is a much shallower intersection with the F2 layer and this can greatly extend the upper frequency limit of the bands that might be open for traffic. This is the Maximum Useable Frequency or MUF and, although related to the strength of the F2 layer, it will be higher for longer skip distances.

In general, if you are considering inter-G nets we need to look at the longer skip MUF values too. The length scale of the British Isles is around 500 to 1000km for the more distant stations. There have been many of the RSGB 80m Club Championship evening contests where, as the foF2 declined, signals within 500km disappeared, leaving only the longer skip GM/GI stations audible, when everything closer-in had weakened or gone entirely. All of these quirky things can be explained by using the graphs described here. Remember that this form of analysis is for one location, at Fairford, in the centre of the UK and will not necessarily tell us how a multi hop path or indeed a single hop NVIS net centred within Europe will behave.

Sporadic-E

Before discussing the graph displays, it is also necessary to bring in the E layer, which can also affect the behaviour of a local club net. We tend to think of Sporadic-E as being a high HF and VHF propagation mode. However, there have been some evening nets when the foF2 has been very low, say around 2.3MHz, and yet the local Norfolk Amateur Radio Club net had great conditions on 80m (check 23 January 2017), which was a great surprise to me, see **Figure 1**. It turned out that there was some Sporadic-E and the foEs (critical frequency for the E layer) was almost 5MHz and sustained a good 3.5MHz 80m QSO! This was a change of ideas for me and it now seems that we should consider the behaviour of the E layer for low HF conditions as well as the traditional view that it's for HF and VHF only.

Near real-time foF2 display graphs

After a few weeks logging on to the various ionospheric data websites and plotting the data by hand, I decided to enlist the help of a programmer work colleague, Dan Holley, who is not an amateur, but should be considered an honorary one after this!

The website is very much an experiment and I hope it will provide you with the tools to better understand what the ionospheric conditions are doing to your QSOs. There are user instructions on the site, so here I will only briefly describe the main features

available and how to make the most of the information.

I cannot emphasise strongly enough how much insight can be gleaned from watching the behaviour of these foF2 measurements while listening to the bands. It really does show you why the band is fading or why it's only eastern European signals that you can hear. In fact, if you listen on 40m in the early evening during the winter, when the effect is very marked, you can see and hear the decay of the foF2 manifest itself as increasingly southern German stations remain. Look up the callsigns and note the distances increase as the band fades. It is even possible to predict the distance from the foF2 graph by interpolating between the MUF skip distances for the band you are using.

In order not to overburden the ionospheric database, I extract the observations for Fairford, which is the nearest ionosonde to the centre point of the British Isles, shortly after they are uploaded (every 15 minutes, about 10 minutes after the observation time). Opening the graph display will use the latest values of foF2 and foEs. Sometimes the site is unavailable, but is usually soon online again and this website will play catch-up to fill in the missing data. There is an update button to refresh to the latest measurement, since it does not automatically update once the page is open.

Display options

I will not repeat the detailed description of all the features; that information is available on the website itself. Looking at the **Live Data** first, see **Figure 2**, the main principle is that for a local club net on, say, 40m you need the foF2 to be above 7.0MHz. The amateur bands are shown as horizontal green dotted lines. If you are not interested in the 3,000km MUF, then it, and any of the plot lines, can be switched on and off by toggling the legend for that particular plot and the graph will rescale to make the wanted items stand out more clearly. Of course, if your net is more expansive, say WAB (Worked All Britain) or RAOTA (Radio Amateurs Old Timers Association) etc, then use the MUF for the appropriate skip distances needed to get everybody in the net, in both senses of the word!

On the other hand, if you are interested in DX the graph should give you an indication of the highest band that may be open to support contacts over 3,000km. Do bear in mind that this is only based on what is happening with the ionosphere above Fairford. On a DX contact it is all about how the ionosphere is behaving along the signal's path that is important and we can't tell that from one ionosonde.

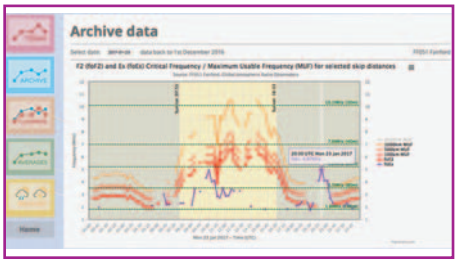


FIGURE 1: E layer foEs (4.97MHz) rescues a club net on 80m when the foF2 was down near 2MHz, producing strong local signals when the band had faded for F2 NVIS propagation.

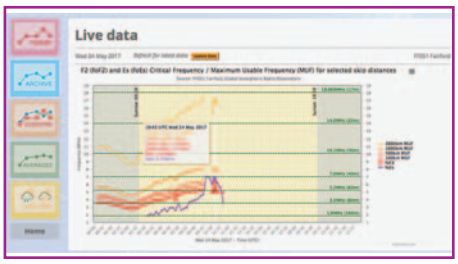


FIGURE 2: Live data plot of foF2, plus MUFs for various skip distances and foEs, shows how the graph builds during the day. Use mouse over to get the tool tip showing the actual vales plotted.

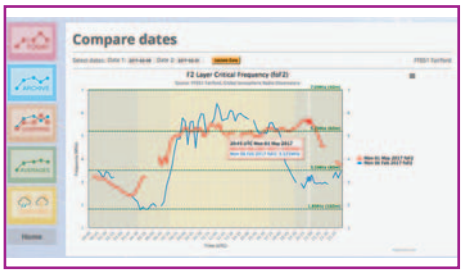


FIGURE 3: The compare function allows two dates to be compared. In this case, an RSGB 80m CC SSB contest in February (foF2 = 2.7MHz) and May (foF2 = 5.6MHz) shows how conditions dramatically improved during the evening period.

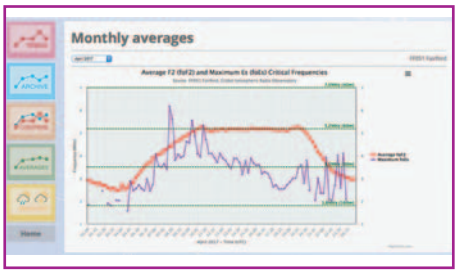


FIGURE 4: The *averaged* foF2 values recorded at each time step during the month of April 2017, shown in red. The purple line shows the *highest* value of the foEs at each time step during the month.

The **Archive** section allows you to examine the past conditions, for example for last week's club HF net that didn't quite make it. The features are the same as the Live Data display. Seeing a previous day's foF2 data in isolation is interesting, but often we are really thinking of how different this week's net is to last and you can now do exactly that. The **Compare** section shows the foF2 on two user selectable dates, which can go back to December 2016, see **Figure 3**. The final part of this display scheme is to be able see how the month looks overall, using the **Averages** section. This is produced by averaging each time step observation of foF2 over the whole month. The highest (not the average) of the foEs is also plotted, and this gives an idea of what those rare Sporadic-E events are capable of, in a given month, see **Figure 4**. I am planning to add a label for the smoothed sunspot number (SSN) on this monthly display, since they will look very different depending upon where we are in the solar cycle.

The final item on the website, **Weather**, shows the daily jet stream charts, which are very useful for predicting where there might be a chance of Sporadic-E. Again, see the website for full details of this feature. You may already be familiar with this information from the RSGB Forum website.

Data sources

Of course, this display depends upon the painstaking measurement of the ionosphere by the professional research teams and would not be possible without the wonderful resource of GIRO, the Global Ionospheric Research Organisation **[2]** and those who carry out the measurements. It is a superb tool for radio amateurs to use in developing a deeper knowledge and visualisation of the ionosphere in action. I am grateful to Weatherquest for server space during the development of the site and my colleagues in the RSGB's Propagation Studies Committee for advice and support.

I would be delighted to receive feedback about this website and happy to have any suggestions on how you think it might be improved. Propagation is the mechanism by which this hobby of ours is made possible and I hope this foF2 graph display will make your time on the bands more interesting, if not to say productive!

Websearch

[1] www.convectiveweather.co.uk/ionosphere/
[2] http://giro.uml.edu

Jim Bacon, G3YLA
g3yla@hotmail.co.uk

The TYT TH-8600 dual band mini mobile radio

In recent years I have had the opportunity to review some hand held radios from the TYT stable and have been impressed by the standard of construction and performance. This time it's a very compact mobile transceiver on review.

This new offering from the well-respected TYT communications equipment manufacturer (Tytera) on the surface provides an extremely neat and very compact mobile FM transceiver covering the 2m and 70cm amateur bands, providing 25W and 20W output respectively.

The TYT TH-8600 compact mobile mobile transceiver.

Out of the box

The first thing that is apparent when opening the box is that when TYT say 'mini mobile radio' they really mean it. Immediately obvious is the actual size of the radio compared to the chunky DTMF (dual tone multi frequency) microphone with keypad and PTT (push to talk) side button. Clearly the size indicates that miniaturisation of a microphone with keypad is somewhat problematic in the design area.

The radio comes complete with mounting bracket, screws, DC connector with an extra-long DC cable and also a USB lead and mini CD for DTMF/channel programming purposes.

One thing that is clearly evident from looking at the radio is that the TH-8600 could easily be used as a base station radio as well as the marketed mobile use.

General appearance and construction

The TYT method of construction with the heat sink integral to the structure visually doesn't disappoint, with good potential in the physical transmission test. The TH-8600 feels reasonably heavy, weighing in at 0.5kg for just the radio. My thoughts here are that it contains a decent amount of metal, which should aid cooling and potentially a long life, however there are some recommendations on this as described later.

The microphone is full of buttons controlling PTT, Increase/Decrease in volume, A/B VFO (variable frequency oscillator), screen change (ie band switching) and a transmit red LED (light emitting diode) plus a minute hole for the microphone. The keypad clearly takes up most of the structure. All buttons are positive in operation but one amusing side note is the button showing FUN – clearly this is the function key but perhaps it could mean have fun with this radio! For chunky fingers though, the frequency keypad buttons could be a little close together and on testing it was found easy to press two at once (or the wrong one altogether). After a little practice this didn't continue as a problem.

The TH-8600 front panel

As billed, the 'mini' radio must be at the limit of design to achieve a front panel with actual knobs that can be controlled well and a screen that is a reasonable size. In this case the TH-8600 is fine even for someone like me with fairly robust fingers. The on/off control is a simple push button at the top left, just above the main dial rotary switch that controls the change of frequency, memory channel and scanning direction.

Top right of the panel has a sizeable volume control that is positive and in operation relatively linear. In some previous TYT radios I have used, this has been an issue as the audio can be all off or nearly all on and not much in the middle.

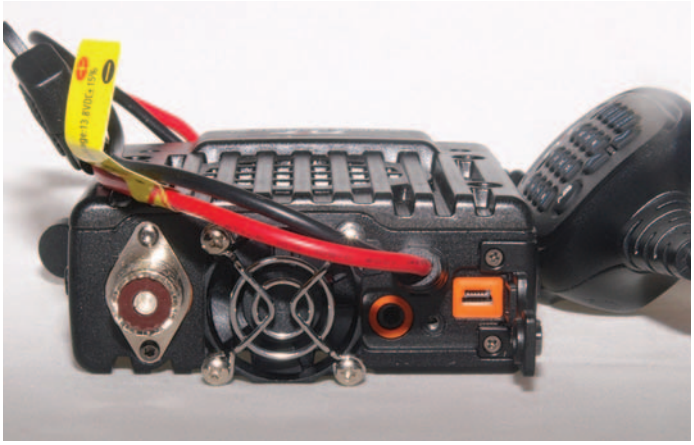
In the bottom right of the panel, the 6 pin microphone socket is conveniently covered with a rubber cap when not in use.

The microphone plug, while quite stout, could provide some leverage on the socket when in use if stretched too much, so I would be careful here to try and secure the conveniently lengthy microphone cable rather than strain the plug and socket combination.

All in all it's a good looking radio.

Rear panel

A simple rear panel contains the DC cable input directly wired inside the radio on a fused fly lead, the cooling fan, a screw cap covered audio/headphone output and also the USB data connection. The RF socket is an SO239. Purists might frown upon this as being lossy at 70cm, however the radio is not intended for ultimate weak signal operation and SO239s are commonly used on radios at these frequencies.



The rear of the TYT TH-8600 showing the USB data connection (orange).

With one RF socket it would be sensible to use a dual band antenna.

The manual

When purchasing a new radio there is always a strong temptation to plug it in and get on the air as soon as possible. As with many of these multi menu rigs, it really is worth reading the manual first. It can certainly reduce possible frustration when flipping through the setup and getting to grips with the radio. The TH-8600 is no different and although the terminologies used in the manual can be a little vague, after a couple of reads and then setting up the radio it becomes quite clear and saves time in the long run.

USB connection

Along with the USB cable to connect to a PC there is a driver disk that could be required (depending on the operating system of your computer). I tried it on two Windows XP Pro SP3 and Windows 7 Home 32 bit platforms. Windows XP required the driver installation, whereas Windows 7 did an online search and installed quickly so no disk needed. Once installed you can then program the radio with required DTMF coding etc. This operation is where reading the manual first comes in handy.

Connecting up for mobile operations

Over the years I haven't really done a lot of mobile work, mainly due to the size of some lumbering radios and the inability to position them in a useable position on many a curved dashboard – plus, of course, the need to keep the radio safe from prying eyes. Mounting radios in full view and in potential full sunlight could be problematic, so a convenient little nook or cranny has never been possible. This all changed when looking at the size of the TH-8600, which is clearly small enough to install in any convenient space under the dash. The U shaped mounting plate was easy to attach and has the ability to mount the radio at three angles. The mounting plate can also be oriented above and below the radio to deal with differing installation locations. With the fused DC lead fed to a cigar lighter plug/socket combination we were ready to attach the antenna.

As there is only one RF socket on the radio it is sensible to use a dual band (perhaps magnetically mounted) antenna. All my mobile tests were conducted with a simple antenna of this type.

Base station use

Although the TH-8600 is billed as a mobile transceiver, the radio fits well into the shack location too. I thought it would work well as a dedicated dual band FM radio for working local repeaters and club nets where changing over the settings on my main all mode transceiver used for SSB/MGM and CW is a bit of a hassle.

Power output

The TH-8600 has three power settings available to the operator: High, Medium and Low. Checks were made with a Bird 43 Thru Line power meter and suitable dummy load and all checked out to be within the specification.

At full power on both 2m and 70cm, as the main structure of the radio is also the heat sink, it did become rather warm and the fan was almost always in operation. In the manual there is a warning not to transmit at full power for extended periods or the unit may overheat.

On the air

Initially I used this radio as a fixed station and the TH-8600 worked fine, even into a horizontally polarised Yagi. My first contact was with a station on the North Yorkshire Moors at S9+ signals both ways. I was keen to ask the station how the audio was and they were very complimentary. With a strong signal through the internal loudspeaker there was a little distortion and this wasn't pleasant to the ear. This was resolved easily by adding a known good speaker into the 3.5mm audio socket. Having reviewed a few similar radios there is obviously a benefit to using a quality speaker. Close channel blocking performance of the receiver was good at 12.5kHz with very strong local stations on simplex both on 2m and 70cm on adjacent channels.

Final summary

All in all, it was a very pleasant experience using this radio. It is certainly small enough to be installed in a motor vehicle without being on show and out of direct sunlight. It is essential, however, that good ventilation is provided. Likewise in a home base situation the same conditions apply. It was a challenge to get used to the microphone control, which in the end proved easier than front panel controls. The sales literature also advises that the case is IP67 dust and waterproof and that the radio can be submerged in water up to one metre – I didn't try this at home! In practical terms that means it will certainly withstand the rigours of portable hill topping with a suitable power source and in a mobile situation. However it is real shame that the microphone doesn't have a built in speaker: this would aid operation enormously in a mobile situation. Finally, you did read the manual, didn't you?

Thanks go to Sinotel UK Limited, of Warwick (www.sinotel.co.uk) for the loan of the unit, which retails at £119.99.

Richard Staples, G4HGI
g4hgi@live.com

ATV

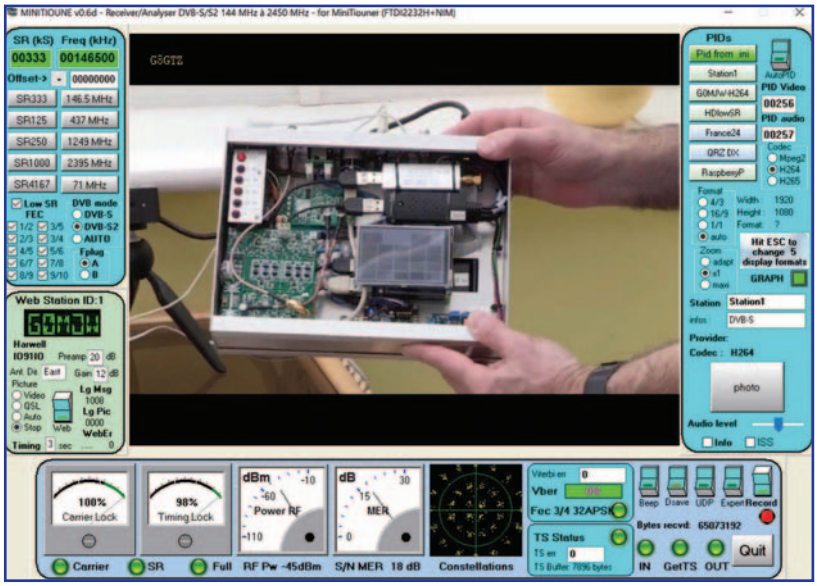


PHOTO 1: G8GTZ/P received in HD on 146MHz by G0MJW.

PHOTO 2: Pictures received by M0DTS/P during the Activity Weekend. Image courtesy of Rob, M0DTS.

High definition TV on 146MHz

The availability of 1MHz of spectrum at 146MHz continues to drive amateur TV (ATV) experimentation. During the May ATV activity weekend, Mike, G0MJW successfully received (and recorded) high definition television (HDTV) pictures of 1920 x 1080 resolution from Noel, G8GTZ/P. The distance in this case was only 5km, but there was enough margin on the signal to suggest that 20km or more should be achievable within the 50W ERP limit set for the band. The transmission bandwidth was less than 500kHz and a symbol rate of 333k symbols/s was used with 32 APSK (amplitude and phase shift keying) modulation and ¾ forward error correction (FEC). The 32 I/Q values available for each symbol can be seen on the constellation diagram at the bottom of **Photo 1**.

The HDTV signal source for this test was a pre-recorded video. The video was processed using the *vMix* Windows software and then fed to a DATV Express encoder/modulator then amplified to 5W output power. The receiver was a Serit tuner with the *MiniTioune* Windows software. Full home construction details for the tuner are on the BATC Wiki **[1]**.

ATV Activity Weekend success

At least 35 ATV stations were on the air during the May ATV Activity Weekend with activity as far north as Durham (G1LPS), as far west as North Wales (G3NWR/P) and as far south as Bournemouth (G4KLB). Highlights included:

- a 220km digital ATV contact on 146MHz between G3NWR/P in North Wales and M0DTS/P on the North York Moors
- a 50km contact between G1LPS (Durham) and M0DTS/P on 6cm.

At least four stations were using the new Raspberry Pi-based Portsdown transmitters as described in last month's *RadCom*.

The activity weekend was also remarkable for the number of bands in use. Contacts were established on 2m, 70cm, 23cm, 13cm, 9cm, 6cm and 3cm. Not all the activity was digital – there were quite a lot of analogue TV signals on 23cm and 3cm. **Photo 2** shows a mosaic of pictures from the event.

Following the IARU ATV Contest that took place on 10-11 June, the next ATV Activity Weekends are on 8/9 July and 12/13 August. For more details of planned activity see the BATC forum **[2]**.

AMSAT North America Phase 4B geostationary satellite

While we in the UK wait for the launch of the ATV-capable geostationary Es'hail-2 satellite **[3]**, AMSAT North America is preparing for the launch of their Phase 4B satellite that will accommodate ATV with a 6cm uplink and 3cm downlink **[4]**. The satellite transponder is not a linear transponder (as planned for Es'hail-2), but a space-qualified software defined radio and digital processor. The video uplinks will probably use some variant of the DVB-S2X digital TV standard, and the downlink video data stream will be multiplexed with all the other (voice and data) traffic. Ground station developers are experimenting with SDRs such as the LimeSDR **[5]** to generate and decode the uplink and downlink signals. There is an additional intention to make their equipment re-useable for terrestrial emergency communications, so they are also working on DVB-T2 capabilities for the uplink and downlink equipment. Some of this development is being supported by Charles, G4GUO, and all of the ground station work is open-source, so we should be able to use it on the air here soon.

Websearch

[1] https://wiki.batc.tv/BATC_Wiki
[2] http://batc.org.uk/forum/viewforum.php?f=75
[3] https://amsat-uk.org/satellites/geosynchronous/eshail-2/
[4] www.hume.vt.edu/geo/
[5] https://myriadrf.org/projects/limesdr/

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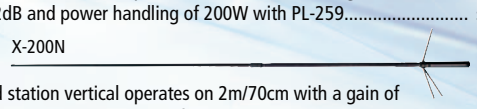

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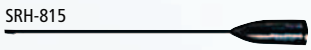

SRH-815 High gain 15cm antenna for 2m/70cm/23cm power handling of 6W with SMA plug..... **£27.95**
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This five-band (20, 17, 15, 12, 10 Meters) half-wave open-loop is perfect for restricted space or portable operation. **£209.95**

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Full 1.8-30MHz operation 300W antenna tuner with peak cross meter. **£199.95**

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HF/VHF/UHF antenna analyser with all RF-diagnostic functions you need. **£389.95**

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MFJ's tiny 36 inch diameter loop antenna lets you operate 10 through 40MHz continuously- including the WARC bands! Ideal for limited space. **£389.95**

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0.5MHz-30MHz receiving loop for massive reduction in receiving noise and those with limited space.
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MFJ-259C
HF/VHF/220MHz, 0.53-230MHz, SWR Analyser.
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300/150W Dual power ATU 1.8-30MHz.
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MFJ-991B
HF 300/150W Dual Power ATU.
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Yaesu Rotator Controller with USB port for remote control, Graphic LCD screen, userprogrammable callsign, 9/16" antenna direction display and more.
£369.95

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200W variable random wire antenna tune capable of matching almost any length wire from 160-10m.
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Linear Amplifier 160-10m 600W 3 x 811A.
£949.95

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

MFJ-998


ATU with full 1500 Watts SSB/CW Digital & Analog SWR/WattMeter. 1.8-30MHz.
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MFJ-269C
HF/VHF/UHF SWR Analyser.
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MFJ-226


VNA Antenna Analyzer covers 1-230MHz, 1Hz resolution.
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Pocket size morse code reader no cables or extras needed.
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Remote 200W ATU can cover the entire HF band.
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Heavy Duty remote 600W ATU 1.8-30MHz.
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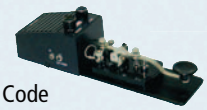
MFJ-557


Deluxe Morse Code Practice Oscillator with a straight key on a non-skid heavy steel base.
£54.95

INTERNATIONAL HAM STORES GROUP

Icom ID-51E Plus 2

NEW

- Dual Band Transceiver
- New Terminal Node and Access Point Modes

£449.95

Icom IC-7610

NEW

- HF/50MHz 100W SDR Transceiver

GENEROUS PART EXCHANGE on your old radio

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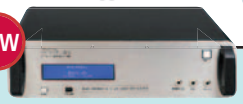
APACHE LABS



ANAN 8000DLE - In Stock!

Stunning HF+6m 200W SDR Transceiver

- Modes: CW, SSB, NFM, AM, Digital
- Probably the best performing SDR released to date!
- Generous Part X available

£4199.95

FLEX – SDR Transceivers

New Products released at Dayton 2017!

With improved receiver specs. and lots more!

We are taking DEPOSITS NOW!

Flex 6400M/6600M

Flex 6400/6600

Flex 6400	Now with pre-selectors..	£1999.95
Flex 6400M	Including front panel.....	£2999.95
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5 element
50MHz 10.5 dBi

£129.95

HF/VHF/UHF Beams		
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SY27-3	3 el (26-28)MHz 10.65 dBi.....	£84.95
SY27-4	3 el (26-28)MHz 13.15 dBi.....	£99.95
SY-400	6 el 70cms (wide band) 11.0 dBi....	£79.95
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M type Thinner higher performance with Dyneema

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Antennas, Telescopic Poles, Aluminium Masts

UL-404L Ultra-lite Dxpedition antenna
Dipole covers: 40, 20, 17, 15, 12, 10.6m..... £109.00

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12mtr Heavy Duty	£89.95
18mtr Standard	£199.95
22m 'Long John' **NEW**	£399.95
26mtr Standard	£499.95
Base Plate for Fibreglass Poles	£28.95
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10.metre Standard	£299.95
10 metre Heavy Duty	£325.00
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NEVADA Telescopic Masts

33 ft	Aluminium. 7 ft. retracted	£99.95
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20 ft	HD Fibreglass 5.5ft retracted	£179.95
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Also see our web for Spiderbeam masts and Mastrant guys and fittings

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Dual Band solid state amplifier

- Covers 50MHz & 70MHz
- Output 1kW for input from 1W to 25W

£2549.95

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1kW solid state amplifier
144MHz, Input: 10W max

£2495.00

HLV-770	770W 70cms	£2550
Amps below available to order (4 weeks delivery)		
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HLV-2000	2kW 2m	£4,299
HLV-1100	1kW 70cms	£3,699
HLV-350	350W 23cms	£2,595
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TA32JR	2 el. Beam (14,21,28MHz)..	£399.95
TA33JR	3 el. Beam (14,21,28MHz)...	£549.95
Mini 33AW	Compact 5 Band Beam.....	£699.95
RV-6C	6 band Vertical (40-10m).....	£499.95

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RCS-4LX	4 Way 2.5kW SO239 100MHz..	£219.95
RCS-8VX	5 Way 5 kW SO239 250MHz....	£189.95
RCS-8VNLX	5 Way 5kW N type 250MHz.....	£239.95
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2 Element Yagi	(20-6)m 3kW.....	£1549.95
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DB18 3El Yagi	(40-6)m 3kW.....	£3424.95
DB18E 3El Yagi	(40-6)m 3kW.....	£3924.95
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CREATE Japanese High Quality!

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Medium Duty

£509.95

Rotators		
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Log Periodic		
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QUALITY POWER SUPPLIES
2 YEAR WARRANTY!

PS-40M Linear

- 40A (max) with meter
- Voltage: 1.5-15V DC
- Cigar adaptor output

£129.95

PS-30M Linear

- 30A (max) with meter
- Voltage: 3.0-15V DC
- Cigar adaptor output

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PSW-07	Switch mode 7A (max) 13.8V DC....	£29.95
PSW-04	Switch mode 5A (max) 13.8V DC....	£24.95

ACOM

NEW ACOM A600S - Just Arrived!

- 600W solid state amplifier
- Covers 1.8-54MHz
- Ideal for portable or travel use
- Weighs just 12kg

~~£2399.95~~ **£2289**

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NEW Digital/Analogue Handhelds

Heavy Duty, feature rich, with outstanding audio clarity

DJ-AXD4: UHF Version
DJ-AXD1: VHF Version

- DMR Tier I and Tier II
- RF output 1W to 5W
- 1000 ch. in 16ch/zone
- Text messages
- IP67 dust & waterproof
- Key Lock, Talk around, TOT,
- Call Logs, DTMF tones,
- Scans and more!

£179.95

DJ-MD40: UHF

- RF output 1W to 5W
- 1000 ch. in 16ch/zone
- Text messages
- IP54 dust & waterproof
- Voice recorder

£179.95

ALINCO MOBILES

DR-735E
Twin Band Mobile
'Rainbow' display

Full featured VHF/UHF transceiver

- Extended RX 108-174MHz, 400-479MHz
- Power 50/20/5W output
- Computer programmable

£299.95

DR-138HE	VHF/FM mob TX 144-148MHz...	£169.95
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ALINCO POWER SUPPLIES

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30A Deluxe Supply variable voltage, low noise, extra filtering

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DM-330FXE
30A Standard Switch mode variable voltage standard filtering

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DM-30E
Lightweight 30A Switch Mode Digital Volt/Amp meter

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ALINCO HANDHELDS

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VHF/UHF Handy

- IPX7 waterproof
- Computer programmable
- Tough case
- Fully featured

£129.95

DJ-G7E
Tri-band Radio, die-cast chassis

- 2m/70cms/23cms
- 1000 memory channels
- Full duplex
- 39 CTCSS and 104 DCS encode/decode

£299.95

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ELECRAFT
Full range now available!

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The new version HF+6m transceiver with many improvements

K3S/100-F	100W (Assembled).....	£2999.95
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KX3

160-6m
All modes + DSP

KX3-K	(Kit).....	£999.95
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160-6m
500W Amplifier

KPA-500	(Kit).....	£2449.95
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KPA-1500 NEW - Arriving soon!

1500W HF+6M Amplifier with built-in ATU
Limited quantities - reserve yours now!!

Call for other Elecraft accessories

ALINCO

DX-SR9
HF Transceiver + SDR capability

- Receiver 150kHz-30MHz
- 3 Ceramic Filters
- Built-in CW Keyer

£599.95

DX-R8E
HF communications receiver - top seller!

- Frequency range: 150kHz-34.999MHz
- Modes: AM/FM/LW /MW/CW/LSB/USB
- Power: 11.7-15.8V DC (not supplied)

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Full range of INRAD filters for Elecraft and Yaesu - **NOW IN STOCK**

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LOTS MORE on our WEBSITE!

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Vibroplex Iambic Standard

Bencher BY-1		£189.95
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ICOM

IC-7300
100W HF+6m+4m
- RF direct sampling
- Touch screen control

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£1199.95

Purchase with the INRAD RX-7300 2nd RX antenna option at £49.95 and we will fit FREE OF CHARGE!

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New 2nd receiver socket option for the Icom IC-7300

Easy to install plug-in mod. requires no soldering, simple to install and easily reversible. Can be used for the insertion of accessory items into the receiver chain, like receive-only bandpass filters, low noise preamps, etc

Kit only..... £49.95
Fully Fitted by Nevada..... £99.95

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HF-Auto 1.5kW fully auto antenna tuner

Covers 6-160m
Output power: 2-1800W
Display: 4 line large print

£1599.95

AT-2K 2kW HF manual tuner

Covers 6-160m
Output: 2000W PEP
Metering: Active cross needle

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AT-500 600W PEP manual antenna tuner

SAVE £30

Covers 6-160m
Built in 4:1 balun

SPECIAL OFFER!
~~£529.95~~ **£499.95**

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(160-6m) 125W

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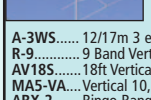

A50-5S
5 Element 50MHz Yagi

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FT-991A + SP10 Speaker
- Coverage: 160-6m, 145/433MHz
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- 100W HF/6m-50W 145/433MHz
- NEW colour waterfall display

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FT2DE..... C4FM/FM 144/430MHz digital H/H. £399.95
FTM400XDE.. Twinband digital/analogue mobile.... £499.95
FTM100DE.... New C4FM 50W Dual Band mobile... £299.99
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Yaesu FTDX5000 MP
200W HF/50MHz Premium Class Transceiver with 2 independent receivers, plus many options

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Professional grade with extra large display
- Freq: 1.8-200 MHz
- Power: 20/200/2kW

£129.99

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- Freq: 1.8-150MHz
- Power: 15/150/1.5kW

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CN-901HP3... 1.8-200MHz 30/300/3kW..... £139.95
CN-901VN..... 140-525MHz 20/200W N type..£119.95
CN-801VN..... 140-525MHz 20/200W N type..£119.95
CN-103LN..... 140-525MHz 20/200W N type.... £89.99
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CN-501H2..... 1.8-150MHz 20/200/2kW..... £89.99
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TYT - UHF DMR Radio!

MD-380
- 70cm UHF band
- 1W or 5W output
- 1,700 mAh Li-ion battery
- Easy to programme
- Includes **FREE** lead and software

~~£149.95~~ **£129.95**

SDRplay

RSP-2
Enhanced SDR receiver
- Covers: 1kHz (VLF)-2GHz
- Supports HF & VHF antennas simultaneously
- Includes SDRuno software
- Software upgradeable

£156

RSP-2 Pro As above but in a rugged steel case

£189.95

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Powerful wideband SDR
- Covers: 10kHz-2GHz
- Built-in filters
- Low noise floor
- USB interface
- Works with popular SDR software (HDSDR, SDR Console, Cubic SDR, SDRuno)

£119.95

KENWOOD

Kenwood TH-D74E
Dual Band Handheld with APRS and Digital (D-STAR) capability
- Built in GPS
- Wide band receive: HF, VHF, UHF
- IF filtering / DSP

Soft Case for D74E £29.95 **£599**

TS-2000X....Allbander classic includes 23cms.. £1469.00
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Kenwood TS-480SAT
HF + 6m 100W Mobile Transceiver

Still popular!
- Great performance
- Built in ATU

£659.95

TS-480HXE..... 200W version..... £719.95

Network Antenna Analysers

MetroVna DELUXE
with Bluetooth connectivity
- Covers up to 250 MHz
- Same spec as Pro below

FREE DELIVERY £299.95

MetroVna Pro Model
with Bluetooth connectivity

- Touch Screen - colour
- Freq coverage: 1-180MHz
- Measures: SWR, R, Z, X, phase, filters, Return Loss Transmission Loss
- Link by Bluetooth or USB

Phone not included

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MFJ

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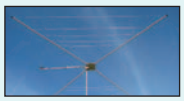

MFJ-1835
5 Band Cobweb Antenna

£239.95

225..... 1-180MHz graphic analyser..... £429.95
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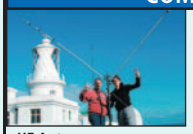

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Work the World with *WSJT-X*

Part 1: Operating capabilities

Weak-signal digital modes enable reliable two-way contacts with signals that may be too weak to hear, or perhaps last only a tenth of a second. Here's an overview of what the remarkable protocols in *WSJT-X* can do, from those who designed them and developed the software.

PHOTO 1: The 12-element Yagi antenna used by DL1VPL to complete DXCC on 144MHz.

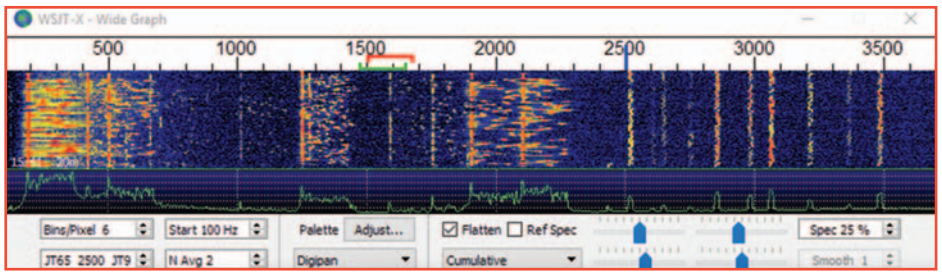


FIGURE 1: Waterfall spectrogram recorded by *WSJT-X* at 14.076MHz on 19 September 2015. The frequency scale gives audio frequencies in Hz above the transceiver dial frequency. Of the 23 decodable signals in this one-minute recording, 8 are so weak that they would be inaudible to a human – even if they were the only signal in the passband.

One of the greatest pleasures in amateur radio is the thrill of establishing two-way communication with like-minded hobbyists far away, using one's own equipment. We enjoy making such contacts on our own, without recourse to commercial carriers or infrastructure. Since the 1930s, amateurs have known that world-wide communication is possible on the HF bands (at least some of the time) with power levels no more than 100W and antennas as simple as half-wave dipoles.

Twenty-first century digital communication techniques based on information theory make these things possible at much lower power levels, even with compromise antennas. Optimised methods of coding and modulation enable these and many other surprising feats – for example, DXCC (DX Century Club award) using low power and an indoor antenna; two-way contacts on the 6 and 2 metre bands at any time over distances of 500-1300 miles (800-2100km) using reflections from ionised meteor trails; and Earth-Moon-Earth (EME, 'moonbounce') contacts over world-wide distances, whenever the moon is up and visible at both ends of a path.

Starting in 2001, the software program *WSJT* has facilitated making two-way contacts with extremely weak signals. The latest version of this open-source, multiple-author software package is called *WSJT-X*. It supports eight distinct protocols or modes, each optimised for a different frequency range or type of propagation. These modes are not designed for long conversations or 'rag chewing'; rather, they concentrate on efficient exchange of such basic information as callsigns, Maidenhead grid locators, signal reports, and acknowledgments at the lowest possible signal-to-noise ratios, in the space of a few minutes.

Short user messages are encoded into audio-frequency waveforms that can be transmitted and received with standard SSB transceivers. At the receiving end, recovered audio is converted back to digital samples and the software carries out a reverse transformation to decode the message. All transmissions are timed and synchronised with Coordinated Universal Time (UTC). Information required for a minimal valid QSO (contact) is typically exchanged and acknowledged after two or three successful transmissions from each station.

The first publicly available version of *WSJT* [1] was designed for meteor scatter on the VHF bands. The software has been in continual development since 2001, with improved performance, added user-convenience features, and new operating modes. The current program version supports four modes that use one-minute transmit/receive (T/R) sequences. Each of these

FIGURE 2: *PSK Reporter* world map showing open propagation paths for spotted JT65 and JT9 signals over a one-hour interval around 1630UTC on 13 February 2017. Different colours indicate signals on different bands: for example magenta is 80m, blue 40m, yellow 20m and brown 15m. Map data © 2017 Google.

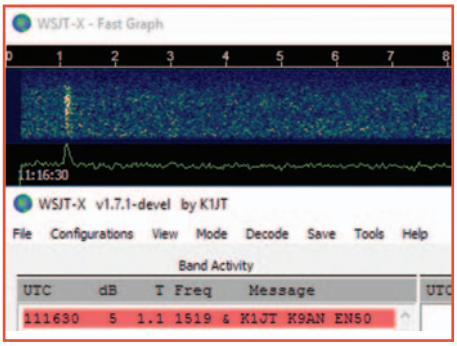


FIGURE 3: Screenshot showing small portions of the *WSJT-X* 'Fast Graph' window and main window when running in MSK144 mode. The bright vertical stripe at time t = 1.1s is a moderate strength meteor 'ping' lasting about 70ms. The decoded message (red highlight) shows that K9AN is calling K1JT.

'slow' modes, JT4, JT9, JT65 and QRA64, uses a distinct coding and modulation scheme designed to optimise weak-signal communication on a particular type of propagation path, with high reliability and good bandwidth efficiency. The program also supports three 'fast' modes, MSK144, JT9 (fast), and ISCAT (ionospheric scatttering), with selectable T/R sequence lengths of 5, 10, 15, or 30 seconds (s). The fast modes are optimised for meteor scatter, aircraft scatter, and other propagation types that yield short bursts of usable signal strength. Finally, *WSJT-X* supports a quasi-beacon mode known as WSPR **[2]** (for Weak Signal Propagation Reporter), used for probing worldwide propagation conditions, and Echo mode for measuring reflections of your own signals from the Moon.

Except for ISCAT, all protocols in *WSJT-X* include a strong form of forward error correction (FEC). This mathematically sophisticated method of encoding information ensures that, with very high probability, messages displayed by the decoding software will be exactly those that were originally encoded. Among many other obvious advantages, strong FEC means that in nearly all circumstances received callsigns, grid locators, signal reports, and other information are highly reliable.

This article is not a 'How To' guide for using *WSJT-X*; that purpose is best served by an extensive *WSJT-X User Guide* **[3]** and an active and user-friendly online support forum **[4]**. Instead, in Part 1 of this article we provide highlights illustrating the sort of things that can be done with *WSJT-X* and we briefly outline the station equipment required. In Part 2, 'Codes, Modes, and Cooperative Software Development', we explain how the various protocols work and offer some insight into how this all-volunteer software project has created an extremely capable, open-source, fun-to-use software package that is freely available **[5]** to all radio amateurs — including its internal source code **[6]**. We invite others with programming, documentation, testing, and related skills and interests to consider joining and participating in our ongoing development project.

Open sharing of our protocol specifications and source code has had the desirable and beneficial side effect of encouraging other programmers to create offshoot open-source programs such as *JT65-HF*, *JTDX*, and *MSHV*, which typically implement and support a small and targeted subset of the *WSJT-X* capabilities. At the time of writing we estimate there are roughly 5,000 users of *WSJT-X* active in a typical week, around the world. Almost as many more are using the *WSJT-X* modes and their encoding and decoding algorithms in one of the offshoot programs mentioned. This state of affairs is a fine example of good-ham-spirit cooperation in an age when state-of-the-art communication engineering usually involves software as well as hardware.

What *WSJT-X* can do

DXing with weak signals. The oldest of our slow modes, JT65, was designed for EME communication **[7]** and is widely used for that purpose today. However, even greater usage of JT65 (and the newer mode JT9) can be found in spectral slices less than 4kHz wide on bands from 160 to 10 metres. An example of the *WSJT-X* waterfall spectrogram for one such slice is shown in **Figure 1**, recorded on the 20m band about 18 months ago. *WSJT-X* decoded thirteen JT65 signals in this arbitrarily chosen one-minute time segment. All but three of these signals overlap in frequency with one or more others, but nevertheless they are decodable without errors. Ten JT9 signals appear at the right side of the spectrogram, above 2500Hz, and they are also decoded without errors. Evidently at least 23 error-free QSOs are taking place simultaneously in about 3.5kHz of spectrum. More recently we have sometimes seen almost twice this number of decodable JT65 and JT9 signals in a single minute, in one of the 4kHz slices.

JT65 and JT9 are the most widely used *WSJT-X* modes, and probably the most popular machine-generated modes of any kind in amateur radio today. Thousands of QSOs are made with them every day, on amateur bands from MF through to microwaves. Many amateurs have completed WAC, WAS, DXCC, and other awards using these modes, often with low power and simple antennas. Signals at least 10dB below the threshold of audibility are generally decodable in all the *WSJT-X* slow modes. For most humans the audible threshold for such signals (and for Morse-coded CW) occurs at signal-to-noise ratios around -15dB, measured in a reference bandwidth of 2500Hz.

Joe Taylor, K1JT, Steve Franke, K9AN and Bill Somerville, G4WJS
k1jt@arrl.net, k9an@arrl.net, g4wjs@classdesign.com

PHOTO 2: The portable EME-capable 10GHz station of VK7MO, set up at a roadside in the Australian outback.

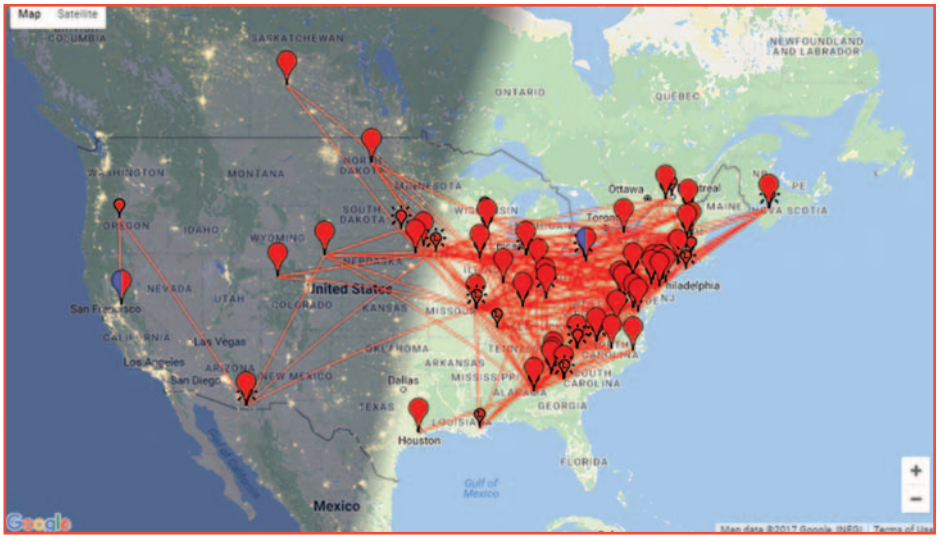


FIGURE 4: A map from PSK Reporter showing activity with MSK144 on a Saturday morning (Eastern US) in February. Map data © 2017 Google, INEGI.

By informal convention, the JT65/JT9 sub-band slices begin at the upper sideband dial frequencies listed in **Table 1**. If you're curious and have not previously used one of these modes, try downloading *WSJT-X* from the *WSJT* home page [5]. Install the program on your shack computer or laptop, set your transceiver to upper sideband mode at 7.076 or 14.076MHz, turn up the speaker audio and start monitoring in JT65 mode using the computer microphone for audio input to *WSJT-X*. Be sure that your computer clock is set to the correct time, within a second or so. On an open band you should hear the musical tones of JT65 signals, starting at the top of each UTC minute, and see the signals on the waterfall display. Near the end of each minute, decoded messages should appear in the *WSJT-X* Band Activity window. The messages will probably look something like these examples:

```
CQ UX1LW KN89
W3DJ LU2BN 73
PY4SM CP6UA -15
PY1ME PY6JB R-07
K7PWL K1NOX RRR
```

Two-way contacts in any of the *WSJT-X* modes usually start in the traditional way, with someone answering another operator's CQ. Messages exchanged in a minimal contact then proceed roughly as follows:

```
1   CQ KA2ABC FN20
2   KA2ABC G8XYZ IO92
3   G8XYZ KA2ABC -17
4   KA2ABC G8XYZ R-21
5   G8XYZ KA2ABC RRR
6   KA2ABC G8XYZ 73
```

Standard messages in *WSJT-X* usually consist of two callsigns followed by a grid locator, signal report, acknowledgment, or 73; CQ or QRZ may be substituted for the first callsign. Signal reports are expressed as signal-to-noise ratios (SNR) measured in a 2.5kHz bandwidth. You can also send any free-text message containing letters, numbers, basic punctuation, and spaces up to a maximum of 13 characters – one might say, roughly equivalent to a 'deci-Tweet' (we already mentioned that these weak-signal modes are not designed for rag-chewing!) Consult the *WSJT-X User Guide* for additional details and limitations concerning message structure – for example, how to accommodate compound callsigns like PJ7/KA2ABC.

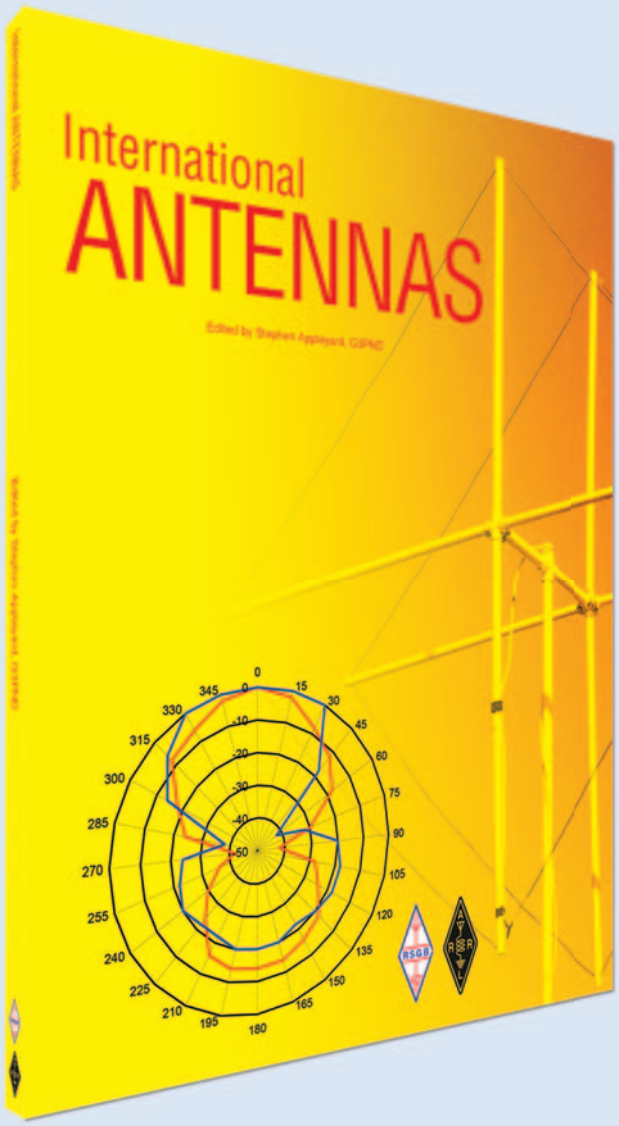
Monitor propagation conditions. About a decade ago it was realised that since callsigns and locators are decoded very reliably in FEC-enhanced modes like JT65, and since the computers in most amateur shacks are connected to the internet, it should be possible to create 'reverse beacon' networks that show where a signal is being copied and what world-wide propagation paths are open at the present time.

The central hub of one of the most successful such networks was developed by Philip Gladstone, N1DQ, and is called *PSK Reporter* **[8]**. *WSJT-X* optionally sends reception reports to its website, where you will find a world map showing open propagation paths color-coded by frequency band. *PSK Reporter* can also display reported callsigns, locators and other information, and can filter the displayed map by band, callsign, operating mode, and other criteria. In the background it carries out other tasks such as statistical analysis and limited archival storage of data.

More than a million reception reports are currently received by *PSK Reporter* every day, about 95% of which are for JT65 and JT9 signals. **Figure 2** is an example screenshot showing open world-wide signal paths on the HF bands at a time when it was mid-morning in the central United States.

WSPR mode provides another popular tool for probing propagation conditions. In this case the relevant signals are not part of two-way conversations between amateurs, but rather one-way, low-power quasi-beacon transmissions received at another location and reported automatically to the *WSPRnet*

NEW TITLE



International Antennas

Edited by Stephen Appleyard, G3PND

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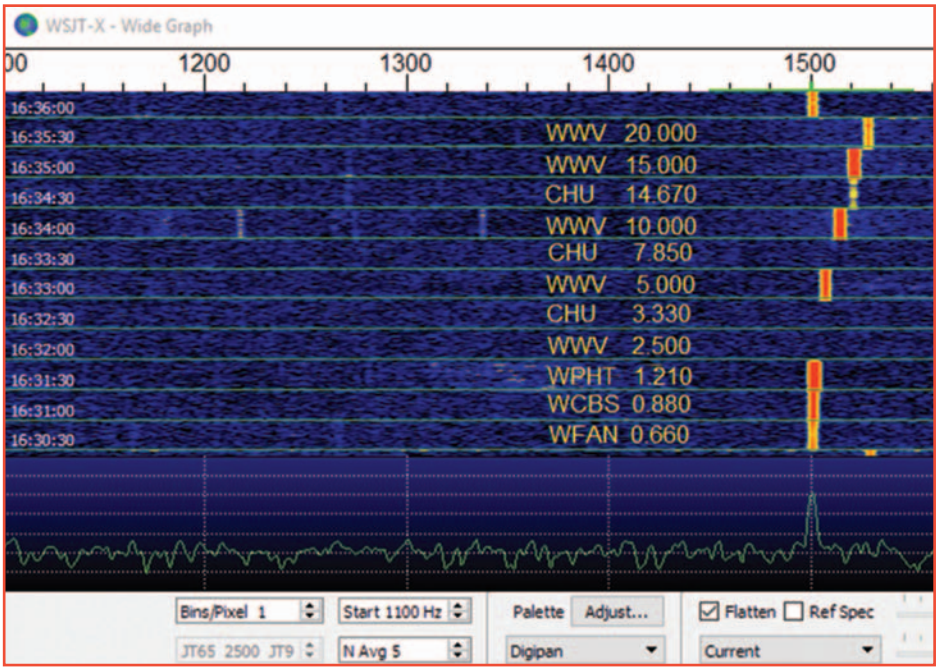

FIGURE 5: The *WSJT-X* frequency calibration procedure cycles through a list of AM signals with reliably known frequency, spending 30 seconds with the radio dial set 1500Hz below each frequency. Station callsigns and frequencies in MHz have been added to the figure (in yellow).

website **[9]**. All WSPR-mode capabilities including coordinated band-hopping have now been incorporated in *WSJT-X*. See the earlier article about WSPR [2] and the *WSJT-X User Guide* for further details.

Meteor scatter. About a year ago we started experimenting with MSK144, a new protocol designed explicitly for amateur meteor scatter (MS) communication. MSK144 has rapidly become the dominant mode for MS contacts, world-wide. On the 6 metre band, with 100W and a modest antenna (say a 3- or 4-ele Yagi, a 2-ele Moxon, or even a dipole or omnidirectional halo up 6m or more), you can make contacts out to beyond 1000 miles at essentially any time. More power and a better antenna will make for more (and quicker) QSOs. On 2m a good starter station for MS is 100W and a 10-ele Yagi. **Figure 3** shows what a short, moderate-strength meteor-induced 'ping' looks like on the *WSJT-X* horizontally scrolling spectrogram.

As an example of what can be done, we note that many hundreds of MSK144 QSOs were made during the January 2017 VHF Sweepstakes. Most of these contacts yielded additional contest multipliers for the participating stations. **Figure 4** provides another informative example: a pictorial summary of 50MHz MSK144 activity on a Saturday morning in February 2017, taken from the *PSK Reporter* website. February is generally a slow month for meteor-scatter activity, since it includes no major and few minor meteor-shower events. Sporadic meteors are present at nearly all times, and are sufficient for making MSK144 QSOs.

MSK144 is a 'fast' mode with selectable sequence lengths. In North America and Europe T/R sequences of 15 seconds have become the default standard. The MSK144 decoder operates in real time, so you see decoded messages immediately after each decodable ping. Pings as short as 0.1s are usually decodable if the signal-to-noise ratio is 0dB or higher. Weaker pings lasting half a second or longer can be decoded at SNRs as low as -8dB. Such pings are barely audible, if at all.

The MSK144 protocol uses strong FEC and the same structured messages as the *WSJT-X* slow modes. The resulting nearly error-free decoding makes it possible to use automatic message sequencing: the program can keep track of where you are in the standard QSO sequence and automatically select the appropriate message to send for each transmission.

Meteors are several times more frequent around sunrise, so MS QSOs are quicker in the morning than in afternoon or evening. The duration of 'pings' is inversely proportional to the square of frequency, so usable pings at 144MHz and higher bands are both shorter and less frequent than those at 50MHz. Nevertheless, MS QSOs are still fairly easy at 144MHz using MSK144, and with persistence they are possible at 222MHz (where the band is available) and 432MHz.

Moonbounce with modest equipment. The extremely high sensitivity of the slow modes in *WSJT-X* is particularly important on VHF and higher bands, especially on such difficult links as the EME path. Simply stated, EME

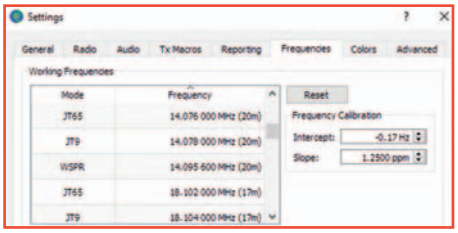

FIGURE 6: Upper portion of the Settings > Frequencies tab, showing the entry fields for frequency calibration of your radio.

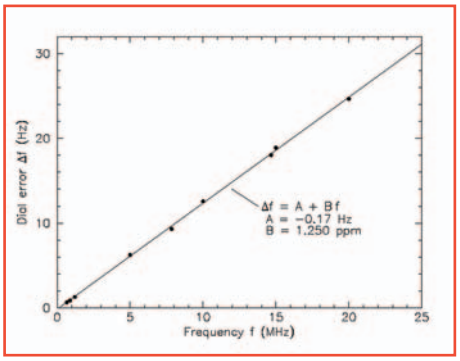

FIGURE 7: Dependence of dial error on frequency, measured for a Yaesu FT-2000. Parameters of the best-fit calibration line are indicated in the figure.

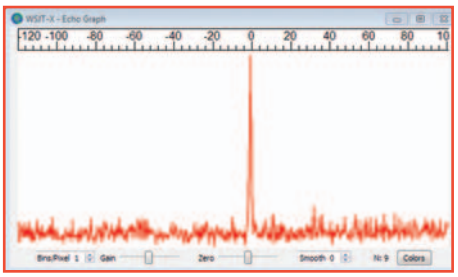

FIGURE 8: Lunar echo of the K1JT signal on 144MHz measured using Echo mode in *WSJT-X*.

communication is at least 10dB 'easier' with these modes than with CW or other traditional modes. The default mode for digital EME on the VHF and UHF bands is JT65. The new mode QRA64 is gaining popularity on these bands as well, and both JT4 and QRA64 are used for EME on the microwave bands 2.3GHz and higher.

As one example of what can be done, we know of at least three amateurs with modest single-Yagi stations who have worked 100 or more different countries on the 2 metre band. Of course, most of the necessary contacts were made over the EME path. **Photo 1** shows the 12 element Yagi used by Thomas Hartig, DL1VPL, to complete his 2m DXCC. Another example of 'doing the most with the least' is the 10GHz portable EME setup of Rex Moncur, VK7MO, shown in **Photo 2**. Rex's setup includes a 10GHz transverter, a 50W solid state power amplifier

and a 2.5-foot (75cm) dish mounted on a collapsible tripod. He has made hundreds of EME contacts with this equipment using the JT4 and QRA64 modes. Most of these contacts are with stations in Europe, close to his antipodes.

Rig control and frequency calibration. *WSJT-X* provides for optional computer-aided transceiver (CAT) control of nearly all modern radios. The necessary communication between radio and computer takes place over a USB or serial port. Relevant rig-control features include transmit/receive (Tx/Rx) switching, frequency and mode setting, and options such as split operation and automatic Doppler compensation for the EME path. The CAT-control portion of our software makes use of an open-source library known as hamlib **[10]**, to which many active amateurs have contributed.

Many capabilities of *WSJT-X* depend on the software's use of signal-detection bandwidths no more than a few Hz. This puts a special premium on frequency accuracy and stability. *WSJT-X* provides tools that enable accurate frequency calibration of your radio, as well as precise frequency measurement of on-the-air signals. The calibration procedure works by automatically cycling through a series of preset frequencies of carrier-based signals at reliably known frequencies. We find that major-city AM broadcast stations can serve as frequency calibrators at the low frequency end of the spectrum and in North America we use the standard time-and-frequency broadcasts of WWV and CHU at higher frequencies. Similar short wave signals are available in other parts of the world **[11]**. During the calibration procedure, the radio's USB dial frequency is offset 1500Hz below each frequency in the list. As shown in **Figure 5**, detected signal carriers therefore appear at about 1500Hz in the *WSJT-X* waterfall.

With modern synthesised radios, small measured offsets from 1500Hz will exhibit a straight-line dependence on frequency. You can approximate the calibration of your radio by simply dividing the measured frequency offset (in Hz) at the highest reliable frequency by the nominal frequency itself (in MHz). For example, the 20MHz measurement for WWV shown in Figure 5 produced a measured tone offset of 24.6Hz. The resulting calibration constant is 24.6/20=1.23 parts per million. This number may be entered on the Frequencies tab of the Settings window (see **Figure 6**). A more precise calibration can be effected by fitting the intercept and slope of a straight line to the whole sequence of calibration measurements, as shown for these measurements in **Figure 7**. Software tools for completing this task are included with the *WSJT-X* installation, and detailed instructions for their use are available online **[12]**. Using these tools and no specialised hardware beyond your CAT-interfaced radio, you can calibrate the radio to better than 1Hz and, for instance, compete very effectively in the ARRL's periodic Frequency Measuring Tests **[13]** if you choose.

TABLE 1: Conventional dial frequencies for JT65, JT9 and WSPR on the HF bands.

Band	Frequency (MHz)		
(m)	JT65	JT9	WSPR
160	1.838	1.840	1.8366
80	3.576	3.578	3.5926
40	7.076	7.078	7.0386
30	10.138	10.140	10.1387
20	14.076	14.078	14.0956
17	18.102	18.104	18.1046
15	21.076	21.078	21.0946
12	24.917	24.919	24.9246
10	28.076	28.078	28.1246

Aircraft scatter. The ISCAT mode is especially effective for microwave contacts using signals reflected from high-flying aircraft. ISCAT copes well with the rapid changes in Doppler shift and short bursts of signal lasting a second or so. VK3HZ, using a 60cm dish with 7 watts at 10GHz and working VK7MO as a rover, has increased his 10GHz grid locator total to over 80 using mainly this mode of propagation. Their longest contacts are over 900km (560 miles).

Echo mode allows you to make sensitive measurements of your own signal's echoes from the moon, even when they are too weak to be heard. In this mode *WSJT-X* transmits a 1500Hz fixed tone for 2.3s, waits about 0.2s for the leading edge of a return echo from the moon, records the received signal for 2.3s, and then analyses, averages, and displays the result. The whole cycle is repeated every 6s, and the program calculates and compensates automatically for continually changing Doppler shifts. As shown in the screen shot in **Figure 8**, return echoes should appear at frequency offset 0Hz, the centre of the Echo Graph window.

Station requirements and summary

Station requirements for using *WSJT-X* are essentially the same as those for other computer-assisted modes. You will need a SSB transceiver, an antenna, a computer preferably built in the past six or eight years, and a monitor with at least 1024 × 768 pixel resolution. Computer-to-radio interfacing usually requires a serial port or equivalent USB device for Tx/Rx switching; using your rig's VOX (voice operated changeover switch) is also possible. Tx/Rx switching uses CAT commands if your rig supports it, or serial port signals on either a CAT connection or a separate port. Output from the computer's sound card (or equivalent) should be patched to the radio's Data input, or Microphone if no Data input is available. Received audio goes to the computer's Line input or a combined Line input and Microphone connector. Auxiliary devices that handle these connections are widely available as homebrew projects or commercial products, and some recent radios have everything built in so that only a single USB cable is needed between computer and radio. You will also need a means for synchronising the computer clock to UTC within ±1 second. Further details and setup instructions can be found in the *WSJT-X User Guide* [3]. We recommend particularly its Basic Operating Tutorial and the downloadable sample files for each mode. You can get answers to specific setup questions from the online support forum [4].

Space requirements have limited us to a list of *WSJT-X* capabilities that is far from complete. Nevertheless, we hope to have given you a good feeling for the program's wide range of capabilities. Next month in Part 2 of this two-part article we outline some fundamentals of communication theory, describe the distinguishing features of each *WSJT-X* protocol, and explain how the program's seemingly all-but-magic tricks work. We then give a brief overview of the project's cooperative software development tools and procedures.

Websearch

[1] Joe Taylor, K1JT, "*WSJT*: New Software for VHF Meteor-Scatter Communication," *QST* December 2001, p 36

[2] Joe Taylor, K1JT, and Bruce Walker, W1BW, "WSPRing Around the World", *QST* November 2010, p 30

[3] www.physics.princeton.edu/pulsar/K1JT/wsjtx-doc/wsjtx-main-1.7.1-devel.html

[4] http://groups.yahoo.com/neo/groups/wsjtgroup/info; group email address wsjtgroup@yahoogroups.com

[5] http://physics.princeton.edu/pulsar/k1jt

[6] Source code for *WSJT-X* and its sister programs is publicly available at https://sourceforge.net/projects/wsjt

[7] Joe Taylor, K1JT, "The JT65 Communications Protocol," *QEX*, Sept-Oct 2005, p 3

[8] Philip Gladstone, N1DQ, https://pskreporter.info/pskmap

[9] http://wsprnet.org/drupal/node

[10] https://sourceforge.net/p/hamlib/wiki/Hamlib

[11] www.smeter.net/stations/hf-time-frequency.php

[12] https://physics.princeton.edu/pulsar/k1jt/FMT_User.pdf

[13] http://www.arrl.org/frequency-measuring-test

Design Notes

Serial interfacing

In a recent email exchange, Jonathan, G1EXG, said "I am thinking of playing with the BBC micro:bit to get it to talk to [an AD9850] DDS board. The chip's data sheet just talks about a serial input for loading up the frequency word but does not state what type. I know they are not talking about RS232… I assume an SPI (?) bus. I know it's a little outside of the remit of your regular *RadCom* column but am asking if you would consider writing a brief clear explanation of the various serial formats (RS232, SPI and I²C etc) that we might come across used 'on-a-PCB', rather than, say, communication from computer to a microcontroller circuit. For example,

1) when, generally, each type tends to be used
2) if you need to set the baud rate or not
3) how to know which ones are being talked about at any one time if just 'serial' is stated, etc.

"I think it would be really useful to a number of readers, like myself, who have some experience making circuits but less experience (although growing) with computer technology." So here goes.

Start-stop signalling

This format is one of the oldest digital communications around, dating back to the first teleprinters. It is often incorrectly referred to as RS232. Incorrectly, because RS232 is a complete signalling protocol involving voltage levels and interfacing as well as signal formats. However, the term is widely used, in spite of (real) RS232 itself being obsolete. If the term appears it often just refers to stop-start signalling. Ironically, other formats like RS422 and RS485, which also use start-stop, really *are* in widespread use.

This is how it works. Several bits of binary information ('1's and '0's) are first grouped together. For the purposes of this description we will assume groups of eight bits (which are referred to as a byte), but early teleprinter and digital communications used five or six or seven bits at a time. To send these 8 bits over a wire as on-off signalling we could just waggle the voltage and let the far end detect the change. But unless the receiving end knows exactly the timing of each and every bit period in order to sample it, things will quickly go very wrong. Timing must be absolutely spot on, and must not drift at all, ever. It's impossible to achieve this for independent Rx and Tx units.

The solution is to modify the byte by appending one extra bit that is always a '0' at the beginning, called the start bit, and one or two extra bits that are always '1' at the end; the stop bit(s). If the signal line idles, it does so in the '1' state, as if an extra-long stop bit had been sent. **Figure 1** illustrates a byte sent in start-stop mode. The bit pattern shown is sending the letter "E" in the ASCII (American Standard Code for Information Interchange) alphabet, which has a decimal value of 69 or a binary pattern of 01000101.

Traditional start-stop signalling sends the least significant bit first, so if you look at the waveform on a 'scope **[1]**, when the start and two stop bits are appended it will appear to show 01010001011 – a total of eleven symbols in all. (Here, I've underlined the eight data bits). The speed of sending, or the time duration of any one bit, is referred to as the baud rate; the number of symbols per second. A typical value might be 9600 baud, allowing 9600/11 or about 870 bytes (or characters) per second. The slowest commonly-used start-stop signalling speed is 45.5 baud (for teletypes) or 75 baud (for 'RS232'). Traditionally, 115200 baud was the upper limit on PCs, but modern USB serial interfaces now work up to the 3 million baud range.

The receiving end has a fair bit of leeway in its timing and for some confidence checking. It first looks for a negative going transition, the leading edge of the start bit, then waits half a symbol period and looks right in the middle of the start bit for optimum sampling. It checks this is still a '0', proving the edge was not just a transient or spike. If correct, it then delays by ten more successive baud periods, measuring the centre of each symbol and assembling the received byte. The final checks are that one or two '1's are present as the stop bits. If either the start or stop bit checks are wrong then there is a very good chance the data is wrong too and it indicates an error condition – the user has to decide how to cope with this.

Assuming the transmission medium is perfect (eg a short piece of wire) there is no need to sample *exactly* in the centre of each symbol, so the receiver timing can be allowed to drift relative to the transmitter. If the final stop bit is sampled 'roughly' in the correct place all will be well. We see that the sampling point can be allowed to drift by nearly half a symbol's period over the 10 symbols to get up that last one. Half a symbol in ten corresponds to 5% timing error and means RS232 **[2]** signalling is remarkably resilient to poor timing. This means calibrated RC timed oscillators in low cost microcontrollers are accurate enough for stop-start interfacing and is one reason this format is popular on modules designed to interface with microcontrollers. Using two stop bits instead of one adds just that extra bit of safety margin in timing at the expense of 10% lower throughput.

SPI bus

The Serial Peripheral Interface is used for on-board communication between chips and is by far the most common interface for storing or reading the register values in a chip.

SPI does not rely on timing, but instead uses three or four separate wires to carry data, clock and framing information from a master to a slave. **Figure 2** illustrates a typical SPI transmission. First, the Chip Enable (CE) line goes active then after a short setup delay, the first bit is placed on the Data line virtually simultaneously with the Clock line changing. After a short period, the clock line toggles, the slave using this edge to read the (now stable) state of the Data line. Then the process repeats for each bit of data to be transferred. When the requisite number of bits have been sent, the CE line returns to its quiescent state and the target uses this signal to save the data it has just received.

Reading an external slave is performed in a similar way, except that the direction of signal flow on the Data line is reversed and the clock edges sent from the master to the slave are used as instructions to '*place new data bit now*' and '*data is stable, now read it*'. Chips that need to both receive and send data, like multi channel A/D converters, either have separate Rx and Tx connections, making four in total, or use a bidirectional data line.

SPI is simple in concept, with Enable, Data and Clock wires carrying information synchronously, very fast, without any baud rate specification. If the logic at both ends can support it, clock speeds can be tens or hundreds of MHz, although hundreds of kHz or a few MHz are typical. But using SPI is absolutely fraught with unknowns – note the absence of any mention of 'high' or 'low' in the description above. There is no standard

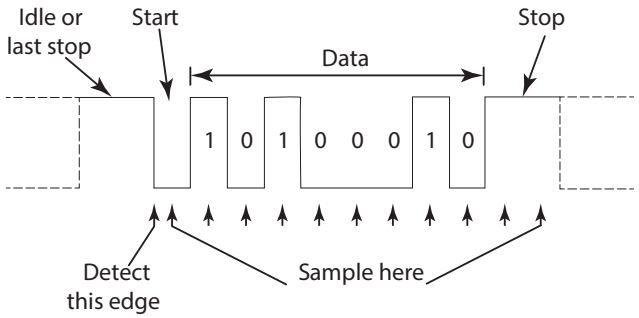

FIGURE 1: Start-Stop data transfer (popularly – and incorrectly – called RS232).

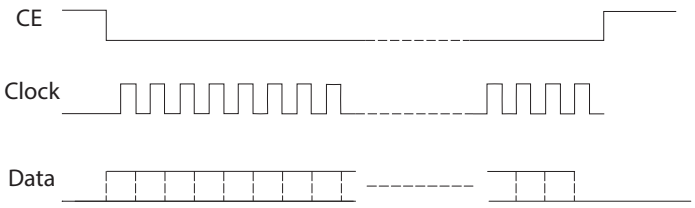

FIGURE 2: One of many variants of a typical SPI transfer – writing data to a slave.

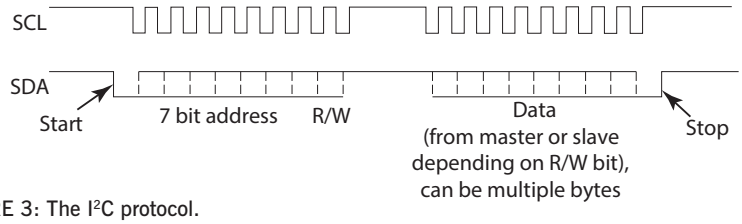

FIGURE 3: The I²C protocol.

as to whether CE goes high-to-low or low-to-high to initiate a transfer. Or it could just be a pulse at the end and the first toggling of the clock awakens the slave. The data can change on the negative or the positive clock edge; usually most significant bit first, but not always. And how many bits are in a transfer – 8, 16, 24, 32 or 40 or whatever? Sometimes it isn't a multiple of 8 or even a constant number **[3]**. The name of CE can change; sometimes it is called Load, sometimes Strobe. Every manufacturer or device can be different, so the only way to get an SPI interface working is to thoroughly study the data sheet, specifically the many pages on the serial interfacing.

I²C

I²C, or Inter-Integrated Circuit bus to give it its full name. This performs the same sort of task as SPI, but with just two wires and a rigidly defined protocol. The wires are Serial Clock, or SCL, which goes from master to slave, and a bidirectional Data wire, SDA. Resistive pullup is used, allowing several slaves to be paralleled on the same pair, which therefore are quiescent-high.

A transfer is initiated by sending a start condition from master to slave; a high-to-low transition of the SDA line while SCL is high. See **Figure 3**. This is followed by a byte containing a 7 bit address plus a Read/Write bit indicating whether data is to be sent or received. The address must match that internally stored in the target **[4]**. SCL is then toggled and, depending on the Rx or Tx bit sent as part of the first byte, data is clocked into or out of the slave on the SDA line.

Data is transferred as bytes and there is no limit to the number of these in any transfer. I²C communication is ended by a low to high transition of SDA while the SCL is held high. Start and stop conditions are prevented during data transfer because the SDA line only changes while SCL is low. Start and stop require SDA to change while SCL is held high.

I²C is a rigidly defined protocol that can simplify inter chip communication when many devices are controlled from a master. It is mainly used with domestic chips in consumer goods. Frequency synthesisers using I²C, for example, are those for cable and satellite TV tuners. 'Proper' synthesiser chips all use SPI. A/D and D/A converters can have SPI or I²C, occasionally both (selectable via a pin on the chip). Gain control chips are typically I²C, and so on.

Other serial protocols

There are many other serial interface standards that occasionally appear in amateur radio usage.

- *RS422 / RS485* is start-stop signalling using balanced twisted pair. The two numbers refer to uni-directional or bi-directional signalling on the same pair.
- *LVDS* is Low Voltage Differential Signalling. Also balanced twisted pair, but using current drive instead of voltage and with careful RF matching and termination of the cable for very high speed transfer. Gigabits per second are achievable. LVDS is used on some of the Silicon Labs Si-500 family frequency synthesiser chips. There is no protocol; it is just a connection standard.
- *CAN-bus* is a multi-user balanced twisted pair with addressing and a rigid hierarchical protocol and message structure with robust error detection, used in vehicles and for industrial automation.
- *Dallas One-Wire* – use a search engine on this one or see **[5]**. It's neat!

References

[1] This assumes a data polarity where logic '1' is high, say +5V and '0' is low, or 0V. Real RS232 interfaces, the 9 pin sockets on PCs, turn this on its head. A logic '1' is minus-a-few volts and logic '0' plus-a-few volts. 'A few' is anything from 3 to 12 according to the specification. To confuse matters even more, zero volts is perfectly acceptable for the negative level. No-one said RS232 was that simple!

[2] I did say the term 'RS232' gets misused all the time!

[3] The old MC145170 frequency synthesiser chip even varies the number of bits in the transfer to define which internal register is to receive the data.

[4] I²C addresses are agreed between manufacturers and can sometimes be selected from within a range using pins on the chip. If several identical chips with the same address are in use, separate SDA lines are required, although SCL can be shared.

[5] https://en.wikipedia.org/wiki/1-Wire

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Sport Radio

This month everyone can help support the RSGB HQ team by working GR2HQ.

July is the final month of this year's 80m Club Championship series and we start with the CW session on the 3rd. The SSB session is on the 12th. The Low Power Contest on Sunday 16th has four categories, a trophy being awarded to the winner of each. Traditionally this was an 80/40m contest, but as of last year 20m is included as well. The final session of this year's 80m Club Championship series is datamodes on the 27th. Please note that this is a week later than usual, to avoid a clash with 4m events. Finally, RSGB's flagship HF contest, IOTA, is on the weekend of 29-30th. Please note that this year there are changes to the rules.

VHF NFD runs for 24 hours over the weekend of 1st/2nd. As ever there are several sections to enter, giving all clubs the opportunity to choose a section appropriate to the equipment and operators they have. Lothians RS (see **Photo 1**) made the right choice last year and came first in the Restricted section. The final three hours of VHF NFD coincide with the first three hours of the 2m Backpackers contest. It continues for an hour after VHF NFD ends, in case there are any really weak signals that are masked by QRO activity in VHF NFD. We then move into the

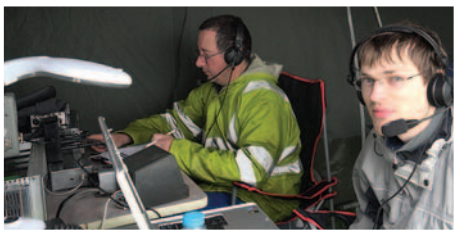

Photo 1: Danny Robson, GM6CMQ and Chris Thompson, MM0ZCT operating the Lothians Radio Society 2m station in VHF NFD 2016.

Activity Contests, with the 2m FMAC and UKAC on the 4th. The 70cm FMAC and UKAC on the 11th and the 6m UKAC on the 13th. The 4m Trophy Contest on the 16th is an event in which participation has been gradually increasing. This should come as no surprise, as more countries have access to the band and commercial equipment is more common. It has also enjoyed its fair share of enhanced propagation in the recent past. We return to the Activity Contests for the remainder of the month, with the 23cm UKAC on the 18th, the 4m FMAC and UKAC are on the 20th and the SHF UKAC on the 25th.

The UK Six Metre Group's Summer Marathon continues all month. The IARU HF Championship is on the 8-9th. As well as being a contest for individuals around the world there is a team element, with teams representing national societies. For the past few years the callsign used by the RSGB HQ team has been GR2HQ and it will be on the air again this year. GR2HQ stations will be spread across the country, at some of the best equipped contesters' QTHs – and those people open up their shacks to other top contesters, each forming a sub team. Each GR2HQ station concentrates on one band/mode, for example 80m SSB, but some of the bigger stations will be active on more than one band/mode. They are all linked live via the internet, so if you want to know what frequency any of them is on you can ask any of the others. So why might you want to do this? To make as many band/mode QSOs as you can, to qualify for one of the several free awards. Finally, the UK Microwave Group has a 5.7/10GHz contest on the 30th.

I am pleased to report that in the April 2017 session of the 2m UKACs the number of entries received reached 300 for the very first time. When the Activity Contests started they were held only on 2m and in 2001 the number of entries received was 26 – for the whole year! Who could have predicted back then what a success the UKACs would become?

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RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Mon 3 Jul	80m Club Championships	1900-2030	CW	3.5	RST + SN
Wed 12 Jul	80m Club Championships	1900-2030	SSB	3.5	RS + SN
Sun 16 Jul	Low Power Contest	0900-1600	CW	3.5-14	RST + SN + power
Thu 27 Jul	80m Club Championships	1900-2030	Data	3.5	RST + SN
Sat-Sun 29-30 Jul	IOTA	1200-1200	CW/SSB	3.5-28	RS(T) + SN + IOTA ref

RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Sat-Sun 1-2 Jul	VHF NFD	1400-1400	All	50-1296	RS(T) + SN + Locator
Sun 2 Jul	3rd 2m Backpackers	1100-1500	All	144	RS(T) + SN + Locator
Tue 4 Jul	144MHz FMAC	1800-1900	FM	144	RS(T) + SN + Locator
Tue 4 Jul	144MHz UKAC	1900-2130	All	144	RS(T) + SN + Locator
Tue 11 Jul	432MHz FMAC	1800-1900	FM	432	RS(T) + SN + Locator
Tue 11 Jul	432MHz UKAC	1900-2130	All	432	RS(T) + SN + Locator
Thu 13 Jul	50MHz UKAC	1900-2130	All	50	RS(T) + SN + Locator
Sun 16 Jul	70MHz Trophy +	1000-1600	All	70	RS(T) + SN + Locator + Postcode
Tue 18 Jul	1.3GHz UKAC	1900-2130	All	1.3	RS(T) + SN + Locator
Thu 20 Jul	70MHz FMAC	1800-1900	FM	70	RS(T) + SN + Locator
Thu 20 Jul	70MHz UKAC	1900-2130	All	70	RS(T) + SN + Locator
Tue 25 Jul	SHF UKAC	1900-2230 ~	All	2.3G & up	RS(T) + SN + Locator (see text)

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
6 May - 6 Aug	UKSMG Summer Marathon	All	All	50	4-character Locator
Sat-Sun 8-9 Jul	IARU HF Championship	1200-1200	CW, SSB	1.8-28	RS(T) + ITU zone (UK=27)
Sun 30 Jul	UKuG	0600-1800	All	5.7, 10G	RS(T) + SN + Locator

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

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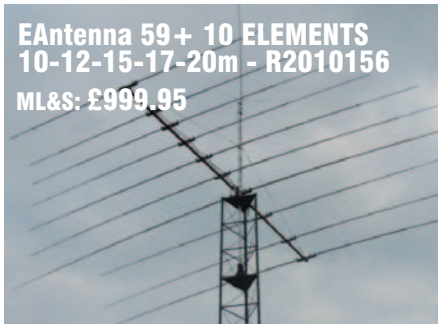

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AT-4K	2.5kW PEP Antenna Tuner	£1049.95
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ITURHFProp Prediction Tool usage

The *ITURHFProp* software came into existence during 2013, but it is only relatively recently that it has been utilised by radio amateurs for propagation predictions.

As part of the evaluation process its author, Christopher Behm of the Institute for Telecommunication Sciences (ITS) in Boulder, Colorado, ran a set of comparisons with three other programs against the ITU Data Bank D1, as reported in *RadCom* August 2016, page 62. Needless to say *ITURHFProp* was shown to be the most accurate.

One of the problems with this kind of HF Propagation Prediction software is that it is based upon monthly median data and what everyone seems to want is 'now-casting'. It is possible to coerce these programs into giving a smooth transition across the days of the month but this is a workaround that has little bearing on reality. However, it is possible to accurately compute the distribution of the variation such that we can say, for 10 days at this hour during the month that it will be this bad/good. Alas, we have no idea when these days will occur during a particular monthly period.

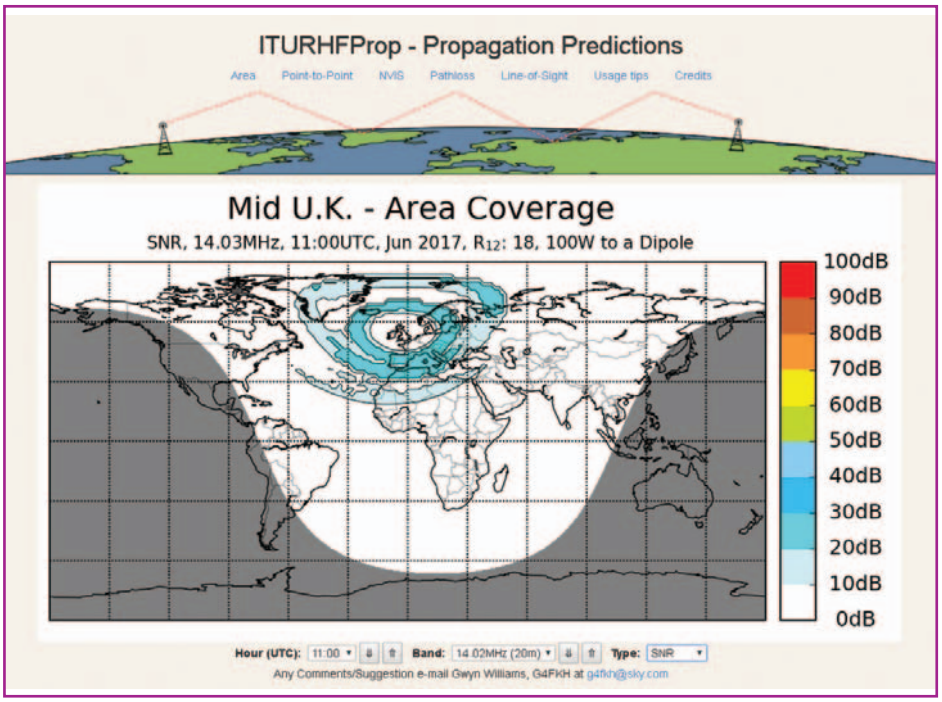

FIGURE 1: General view of the home page of www.predtest.uk.

Application

The basic application idea came out of an RSGB Propagation Studies Committee (PSC) meeting and was taken up and subsequently project managed by Gwyn Williams, G4FKH. The area predictions were compiled by James Watson, HZ1JW who did a sterling job. The Point-to-Point and subsequent programming work was done by Mark Lawrence, M0WMT. His wife assisted with the artwork and G4FKH supplied the background propagation information and parameter choices. Some very innovative ideas came out of the design team and the result is a very user friendly way of utilising the otherwise difficult to understand, yet very good, *ITURHFProp* propagation prediction engine.

Area coverage

The landing page of the site is the 'Area Coverage' map (www.predtest.uk) (**Figure 1**). Full information on utilising the site can be found on the 'Usage tips' page. This explains filling out the settings form, which is quite straightforward. The 'Area Coverage' page shows a world view with area coverage predictions for 14MHz at the current hour with SNR (signal-to-noise) as the output parameter, **Figure 2**. smoothed sunspot numbers (SSN) numbers are automatically downloaded monthly so there is no need to input this parameter. A table of SSN is retained so that predictions for future months are executed correctly.

Figures 3 and **4** show the area coverage view but for Reliability and Field Strength respectively. In order to gauge whether or not a particular area will be open for communications, it is necessary to study all three of the outputs mentioned, SNR, Reliability and Field Strength. For CW an SNR of above 10dB is necessary but for some equipment this may be as high as 20dB. SSB operators will require a much higher SNR, 10 to 20dB higher. The Reliability view is depicting the number of days a month that the area will be open, ie 50% says that the area will be workable about 15 days per month, 20% about 6 days, etc. The Field Strength view is calibrated into S-points, so if an area is predicting an S-point below the local noise then any arriving signal will be in the noise. As can be appreciated it is quite necessary to consider all three output types before anticipating particular areas to be available. One last caveat, these predictions are compiled with certain parameters, which cannot be manipulated; ie 100W, with a dipole aerial. Other station make-ups would yield different results!

Stepping through the hours on the Area Coverage page will show when particular areas come into communications range, or at this time of the sunspot cycle, when there is little possibility of much long distance communications. The restricted parameter set must be remembered whilst considering all this.

Point-to-point predictions

The Point-to-Point (P2P) predictions were compiled to aid the individual in visualising their own particular scenario. An example is given below to assist in the understanding of how the tool is used. Firstly fill out the form at the bottom of the page, it is possible to predict up to two or three years in advance. However, the issuing authority change the SSN monthly, whilst month by month the change is negligible, one or two years into the future the change may significantly alter predictions.

Figures 5, 6, 7 and 8 show a typical example of what can be expected following the clicking of the 'Generate Prediction' button. A full explanation of the output figures can be read on the 'Usage tips' page. One of our innovative ideas is to provide the user with a choice of colour scheme for the output; this is to assist those with a particular colour preference or need. The mauve line in the normal output depicts the MUF (maximum usable frequency), it is titled BMUF (Basic MUF) in the prediction engine, but MUF will suffice here. The field strength output has two plots, the top one shows the output in dB/μV whilst the bottom one converts these figures into an S-point graph. Hovering the mouse in any of the outputs shows detailed information showing hour, frequency etc. A recent change suggested by a user is to populate the URL with all the input data, copying and sending that URL to someone else will enable them to see exactly the same results as the original output.

The 'ITURHFProp output' tab shows the input and output to/from the prediction engine. The output as can be seen is in table format, changing that into human readable format is the whole reason for the tools.

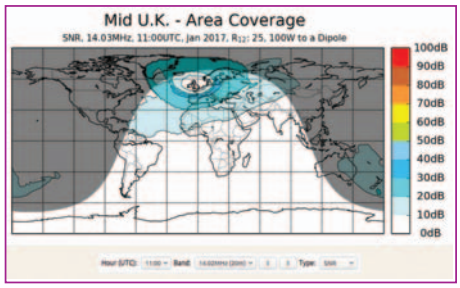

FIGURE 2: Area Coverage, SNR in dB plot.

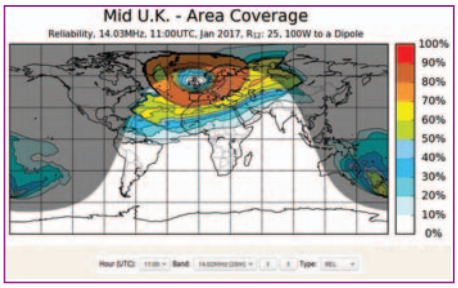

FIGURE 3: Area Coverage, Reliability in percentage plot.

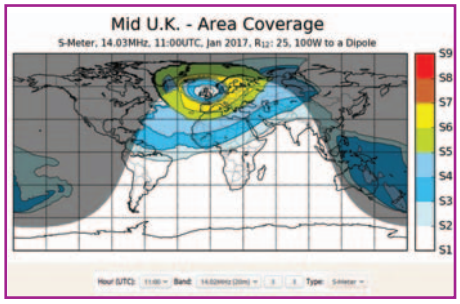

FIGURE 4: Area Coverage, Field Strength plot in S-units.

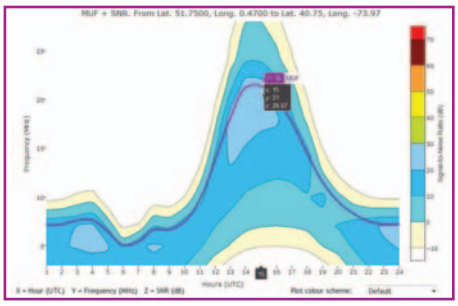

FIGURE 5: Point-to-Point, SNR in dB plot.

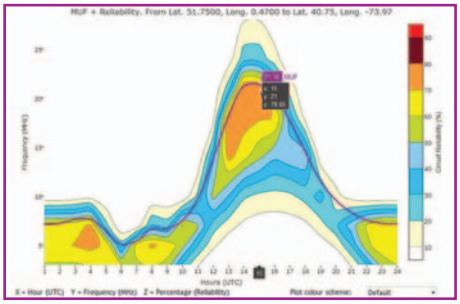

FIGURE 6: Point-to-Point, Reliability in % plot.

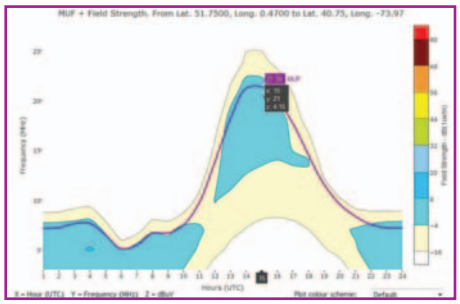

FIGURE 7: Point-to-Point, Field Strength plot in dBμV.

A P2P prediction example

Let's take as an example a communication path with the New York area. What time and band would give the best chance of success? Our station details are; a transceiver with 100W output into a dipole aerial, our local noise level is classified as rural and we are considering a CW contact. To give a better chance of success the receiving station has a 3-element Yagi aerial.

Click the 'Point-to-Point' tab and complete the form at the bottom of the map display with the above details and click the 'Generate Prediction' button. After a second or so a plot display will appear, this will be the SNR in dB plot as shown in Figure 5. Most importantly, the other plots should be scrutinised, Figures 6, 7 and 8. Together they will answer the example question. So for the best chance of a successful QSO, 1500UTC on 21MHz or 18MHz gives a decent SNR for CW (for SSB a higher value would be necessary, say another 10 to 15dB). The reliability plot is suggesting this level will be available for about 79% of days in this particular month. Lastly, the field strength plots are suggesting an S-point level of around 4.

Taken all together it is quite possible to make a QSO at the suggested time with the example station and the stated background noise level. Signals will be low but not in the noise so for CW it is a viable prospect.

To increase the chances of success it would be necessary to use a more efficient aerial or increase the output power. For example a 3-element Yagi transmit aerial and 200W would yield higher SNR (even enough for SSB), better reliability and louder signals. Other times and frequencies may also be suggested in the plots.

Wrapping up

At present we are in the doldrums as far as propagation is concerned, ie the sunspot numbers are low. Because of this the tool outputs are rather sparse; during times of higher sunspot numbers the output will be brighter and more suggestive. It should always be remembered that the three output types should be studied for a complete picture of what is expected to happen. A credits page is available that gives references for those studying propagation. For the technically interested, the server is Linux and the OS is Ubuntu, the 'Area Coverage' predictions and the 'P2P' predictions utilise the newer Linux version of *ITURHFProp*. (Both the Windows executable and the Linux program produce exactly the same results.) Any comments or suggestions should be forwarded to the author of this article.

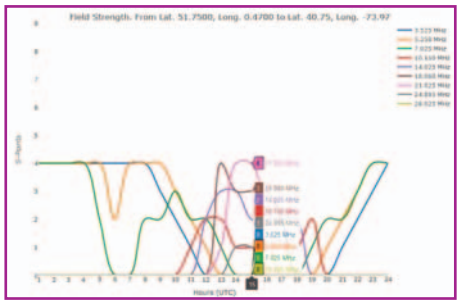

FIGURE 8: Field Strength plot in dBμV, converted into S-Points.

References

George Lane, *Review of the High Frequency Ionospheric Communications Enhanced Profile Analysis & Circuit Prediction Program*

ITU – Radiocommunications Sector (ITU-R) – P533() and ITURHFProp(), procedure.

Christopher Behm, A description of *ITURHFProp* software, and author of the software.

Gwyn Williams, G4FKH
g4fkh@sky.com

HF

Becalmed in the doldrums... We are now well into the summer doldrums caused by the anomalous drop in F layer electron density every June/July. With the Sun high in the sky, one would expect correspondingly high electron densities but subtle changes in atmospheric chemistry mean this doesn't happen. In partial compensation these are good months for Sporadic-E that can produce some excellent European signals on the higher bands that would otherwise be dead.

In the last few months there have been a number of bad propagation days caused by coronal holes on the Sun. These are areas where the Sun's magnetic field extends outward into space and act a little like a rotating water sprinkler showering the planets with charged particles. For a hole to be 'geo-effective' it needs to be roughly equatorial and off to the right of centre as seen from the earth. I hope I don't need to remind people not to look directly at the Sun – and coronal holes are invisible to the naked eye anyway – but the current images on the solarham website can be very helpful. The satellite pictures taken at a wavelength of 193 ångström (19.3nm) are particularly good at showing coronal holes as dark areas and can be found at http://solarham.net/latest_imagery/193.htm. The inbound charged particles disturb the geomagnetic field and cause the A and K indexes to go high.

Earlier this year, the ARRL announced the deletion of Midway and Kure Islands from the DXCC list but it seems the move was not in fact justified by the small administrative changes made by the US government. I believe there was some confusion over whether the changes applied to the islands or just the surrounding sea areas. So these two islands are back on the list – though I'm not aware of any imminent DXpeditions and the growing influence of the wildlife people means there may be a long wait. It is very disappointing to see wildlife bureaucrats close off more and more parts of our planet to visitors. Amateur radio operators have shown time and time again that their activities are harmless and yet all around the world visits continue to be denied.

The 2017 inductees to the *CQ* DX Hall of Fame are: Bill Moore, NC1L (now a Silent Key) – the ARRL's DXCC Manager for over 20 years; and Jerry Rosalius, WB9Z, an accomplished DXer and DXpeditioner, who has participated in multiple major DXpeditions, is a frequent speaker at club meetings and hamfests, and regularly makes his home station available for training new contesters.

Last month I reported on the latest winner of the Cass Award (in memory of Hugh Cassidy WA6AUD, founder and editor of the West Coast DX Bulletin that ran from around 1968 to 1979). This award has traditionally gone to the single-operator DXpedition working the most unique callsigns in a two week period. It will now be joined by the Unlimited Cass Award that goes to the DXpedition working the most unique calls irrespective of duration or number of ops.

The CDXC LF Challenge results have now been ratified and the winning score – from a 7MHz 4-square vertical array - was 168 total DXCCs on 40 or 80 or 160m during March. Conditions were quite good with significant openings into the Pacific and the maximum possible score would have been 219 if anyone had worked everything. One of the biggest problem areas was the Caribbean where there are dozens of DXCC entities but many are only on the LF bands infrequently even though there are nightly openings. Bolivia, Paraguay and Uruguay and many African countries also have relatively few operators and were hard to find. Some operators worked on 20m expressed doubts about whether their antenna on 40 would be good enough for a DX QSO but in almost all cases it worked out well when they were finally persuaded to try it. The next CDXC Challenge is HF, during September, and involves the 15-6m bands. Why not give it a go?

The A25UK team and one of the aerial arrays in use in Botswana.

DXpeditions

The A25UK DXpedition made 44,438 QSOs with over 14,000 'uniques' according to Club Log and was worked from the UK on every band from 160-10. The clear winner on the British Isles Leaderboard was G4CCZ with 22 band/mode slots. G0FUV was second with 18 and G0DWV third with 17.

Alan, KE4TA expects to be QRV from Rwanda for two years but does not yet have a 9X call. He will be mainly using 20/17 SSB and digital. Check www.rwandadx.com

IOTA

Jean-Pierre, F6CTF should be active as TX5X from the Leeward and Windward Islands in French Polynesia until early August.

Cezar, VE3LYC was QRV for about 10 days last month from Pukapuka in the North Cook Islands but he only had a simple antenna so was very difficult to work. Nevertheless, I understand that there were a few days of above average conditions when UK contacts were made – mostly on 20m. T2R in Tuvalu was also QRV and Club Log shows about 20 UK QSOs on 20m only around 08-0900UTC.

Four German ops will be active as P40X from Aruba (SA-036) from 22 July to 5 August.

Vlad, UA0LCZ, will be active as R66IOTA from Popov Island (AS-066) from 25-30 July. Look for him on 3507, 7007, 10107, 14017, 18077, 21017, 24897 and 28017kHz. He will do some SSB during the IOTA Contest.

The Italian DXpedition Team have announced that they will be active from Sherbro Island (AF-056), Sierra Leone in mid-March 2018 as 9L1T.

A Japanese team will be active as V6J from Mwokil Island (OC-226), Micronesia. Their ship is due to depart Pohnpei in late June, so I imagine operations will start a few days later.

A French team will be active as TX5EG between early June and early September as follows: until 19 June, King George Islands (OC-131); 29 June-17 July, Huahine (OC-067); 29 July-6 August, Marquesas Islands (OC-027); 15 August-5 September, Moorea (OC-046).

Alex, F4GHS, will be QRV as E51GHS on Aitutaki Island (OC-083) from 7-16 August and

Dave, G4BUO running an A25 pileup.

The shack for the A25UK DXpedition to Botswana.

from Rarotonga (OC-013) from 16-25 August.

The D2 expedition to AF-108 has been postponed to early 2018 due to licensing delays in Angola. But the organiser, Col, MM0NDX has announced a separate new IOTA activation of Baiyah Island in Liberia (AF-111) that is likely to take place around 1-4 November. See af111new.com for more details. Both these islands are south of the UK so should be fairly easy to work even at sunspot minimum – subject to breaking through the wall of southern EU signals.

Correspondence

Tom, G4IDL failed to contact E51LYC but did find: 12m – 5R8UI; 15m – A92GE, 8P5A; 17m – A25UK, HP3SS, A61Q, 9K2NO, 8Q7EJ, TZ4AM, FS/K9EL, E31A, VP8NO; 20m – WH7W, 9Q6BB, VK3FY/DU8, E51DWC (CW and RTTY), JD1BMH, OX3XR, VU4YC, XV9NPS, A61Q, 9V1XX, 5Z4/DL2RMC, 6Y5WJ, AD8J/HR9, E31A, T2R, HD2RRC, A92GE, TN5E; 40m – TZ4AM, VP2V/K6TOP; 80m – A45XR, 5Z4/DL2RMC.

Peter, G4XEX was QRT for much of the last month to re-work his shack and his antenna was still mounted on the ground due to planning problems. But it worked OK and allowed him to contact: 15m – 4M1K; 17m – E44WE; 20m – E31A, XO1X, JT5DX, Z25DX, JAs, V51WH, XE3ARV, ZP6ARO.

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.

G4PTJ	191	90	0	239
M0NKR	167	188	23	238
M0IKW	142	75	39	237
G3SVD	134	136	37	207
G3PXT	84	104	142	179
G4IDL	172	0	33	179
GI4DOH	175	8	59	177
G3HQT	162	0	0	162
G4XEX	87	91	99	161
CT7AGZ	158	0	1	158
G3SVK	134	0	0	134

Ken, CT7AGZ commented that he could not remember conditions as bad as last month – and his more southerly location gives him an advantage over the UK on most bands. He found: 10m – T77C, TZ4AM, FY5KE, ZD7BG, 4U1ITU, E31A; 12m – FS/K9EL, TZ4AM, E31A; 15m – PS7DX, 5R8UI, KP2M, PJ2/WI9WI; 17m – FY5KE, CE2AWW, E31A, SU9JG; 20m – A25UK, PY1IT, C31US, ZP6CW, LX/ON4WRC, 6Y5WJ, A61Q, 5Z4/DL2RMC, ZS1/R3HD, 4U1ITU, V53DX, YV5DRN, HD2RRC, Z25DX; 30m – A25UK, TF/F5CWU, ZL2AP, ZP6CW, HK1MW; 40m – 9M2/JE1SCJ.

Fred, G3SVK was away for half the month but still kept busy with: 20m – VU4YC, YV5DRN, ZP6CW, 9Q6BB, P4/DJ4MZ, AD8J/HR9, V85TL, 4J5R, OA1F, 5T5DX, FM5FJ, VU2TMP, P4/DL5RMH, LU8DRM, E31A, XV9NPS, TR8CR; 30m – 5A1AL, A65BX; 40m – FM1II, 5A5A, TF/F6CWU, PJ2ND, CO8ZZ, VU4YC, CO8LY, VP9/CX3AN, 8P5A, FS/K9EL, AD8J/HR9, E31A, FY5KE, ED9T, V53DX, 4U1ITU, P4/DJ4MZ, 9K2NO, TZ4AM, HR2RRC. Unfortunately he missed the E51s, T2 and KH0.

Peter, G3HQT didn't hear a whisper from the Pacific DXpeditions last month but he did catch E31A even though they were usually working JA, or North America, or going QRT when he could copy them! DX included: 12m – E31A; 17m – HP3SS; 20m – BG7BDB, VU4YC, AD8J/HR9; 30m – D44TWO.

Chris, G8APB had to balance gardening duties with DXing but found: 17m – CE2AWW, VU4YC, XW1IC, E44WE, E31A; 20m – T2R, 5R8AL, E31A, XW1IC, VR2XMT.

John, G3HTA has an excellent QTH with a beam on top of a hill but struggled to copy E51LYC. He finally bagged him on 17 May when Cezar had a signal of 549 – which would put him in the noise for most people. John also had a play on the Saturday of the WPX CW contest and worked: 40m – KP2M, P40W, EP8CID, VP5M, XE2X, ZF2DO, VK3JA, ZL4YL; 20m – 8P5A, HK1R, E29AU, JAs, JT5DX, KL2R, VP5M, EP8CID; 15m – A65CA, ET3AA, HS0ZLM, 7Z1SJ, WP3C, PP5KR, VP2M, YE2R, 4M1K. Sadly the K index hit 7 late on Saturday night so conditions worsened dramatically. John observes that although we have new sources of band noise today, things weren't perfect in the past and the locals in Exeter used to have to wait for the electric trams to stop running at 2300 before they could copy anything!

Gordon, G3PXT spent most of his time on 6m but also made a lot of contacts on 20m using a variety of data modes. His 20m QSOs included: 4K6N, D44TWO, TR8CA, VU2EEI, 8J1ITU, JA1PJS, E44WE, DS3EXX. 20m SSB included: A25UK, YI0MTU.

TABLE 2: Forthcoming DX activity.

29 June – 17 July	TX5EG (OC-067)
End June	V6J (OC-226)
1-7 July	OJ0V (EU-053)
4-18 July	FP/KV1J (NA-032)
5-14 July	RI0Z (AS-039)
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)
15 Aug – 5 Sept	TX5EG (OC-046)
16-25 Aug	TX5EG (OC-013)
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)
November	Mellish Reef? (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)

Fnally

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

Martin Atherton, G3ZAY
g3zay@btinternet.com

VHF/UHF

Good Sporadic-E, tropo, aurora and EME conditions have all caused an increase in activity this month.

The now traditional VHF Muster at the Norbreck Blackpool Rally held in April. The photo includes Mike, GM3PPE, Pete, GM4BYF, Barry, G4KCT, Sue, G8SFI, Frank, G8REQ, Tony, G8ONK, Nick, G4KUX, Philip, GM0LIR, Gordon, G8PNN, David, G4RQI, David, G4JLG, Gordon, MM0GPZ, Peter, MM0CEZ, Gerry, G1SWH, Ian, GM0OQV, Richard, G4HGI, Dave, GW4ZAR, Dennis, G3UVR, Dick, GM4PPT. Isabel took the photo. Sadly, Roger, G4HBA who was also in the photo passed away suddenly whilst on a visit to Spain just after this was taken. He was a very keen VHF operator and enthusiastic member of the Ossett ARO Group and will be a sad loss to the VHF community.

The keenly awaited Sporadic-E season arrived on cue with May having numerous good openings on 6 and 4m. Meteor reflections also improved after a lacklustre April with the Eta Aquarids shower providing some excellent reflections and good DX. Tropo and aurora QSOs were completed as there was a variety of propagation modes available. There were two EME expeditions active also with 403EME QRV from rare Montenegro (JN91) and Chris, IK/PA2CHR working 'rover' around Italy operating from locator squares JN81/JM87/JM79 and JM89. Thanks to *MMM On VHF*; it is interesting to read expedition updates etc that, in some cases, are only achieved when data is available by mobile phone [1].

QRN/ Noise

With new reports in this month, one overriding feature that seems to be an ever increasing problem is noise, QRN or electro smog as I like to call it. Since becoming active on 6 and 4m again at this QTH (location), it's clear that both bands (and in some directions, 2m too) suffer from this ever present annoyance that could be leading to a drop in activity. The simplest of things can cause severe issues. Within my own house a supposedly 'genuine' CE marked laptop charger caused havoc on 4m when left on – particularly with no load on it. This proved to be worse than charging the laptop itself as did another 'quality' phone charger. Clearly internet cabling is also an issue also when using cheap unshielded CAT 5 cables which can also cause severe problems.

RSGB VHF Manager, John, G4SWX explains further and reports on noise and testing. "In most European countries, VHF Managers are observing a drop in the number of amateurs operating on 50 and 70MHz – and to a lesser extent on 144MHz. Some of this might be due to the sunspot cycle being on its way down but activity in the first Sporadic-E events this year has not looked promising. 50MHz is a key band where IARU Region 1 is aiming to get primary status for 50-54MHz similar to Regions 2 and 3 at the next WARC in 2019. If the regulators also notice the activity drop it undermines the amateur case. In the UK, I have a slightly different position as Ofcom are prepared to let us 'play' where there are no other users for bits of the spectrum. Hence 70.5-71.5 and 146-147MHz. As I have said a number of times it is business radio users that are pushing Ofcom concerning the low-band noise floor not amateur radio. I am particularly concerned about the noise pollution levels at 50 and 70MHz where there is commercial pressure on Ofcom and amateur activity levels are dropping quite significantly. Commercial pressure has not surfaced at mid-band, which is adjacent to 144MHz, so probably, despite observations, things are not quite as dire!"

Noise testing

John has some tips on how to check your noise. "Number 1, for absolute beginners; is to record the S-meter reading increase between a 50 ohm resistor and the antenna. This will produce a personal reference that is difficult to relate to others although there is a danger that many will try to compare answers! Number 2, for those with a moderate competence with the hobby; to use a simple piece of PC software on the audio output, say WSJT-X, switch off the receiver AGC and record the increase in dB in a 2.7kHz bandwidth, between a 50 ohm resistor and the antenna. Measurements performed according to 2, despite significant error bars, from enough amateur stations, would probably (because of the huge levels of noise) provide meaningful data for the RSGB (G4SWX in this case) to make representation to Ofcom. Whilst many might comment on the errors involved we are often dealing with 10-30dB increase in the noise floor!"

70MHz band developments

During the Sporadic-E (Es) season 2017, German stations with Class A licences are able to operate on 4m for experimentation purposes with 25 watt ERP and horizontally polarised antennas. This seems to be a welcome surprise since there was an announcement last year that there would be no permit in 2017. The Federal Network Agency agreed to temporary access to the frequency range 70.150MHz to 70.180MHz continuing until 31 August [2].

Czech Republic stations were granted licences to transmit on 4m during 2017

(similar to permits in 2015/16) with a range of 70,100 – 70,300MHz with 10W ERP. Once again a special permit is required for all OK station to operate on the band.

Paul, G4MWO also confirmed that Polish amateurs are allowed to use up to 70.300MHz, a significant increase in allocation.

Band reports

Lyn, GW8JLY (IO81) reports on his May meteor scatter activities. "After many months of really poor meteor scatter (MS) reflections, conditions picked up with a bang from the start of May. This follows the pattern of previous years as random meteor activity is at its lowest from mid January through to late April. At the end of April, we usually experience the April Lyrids meteor shower but as it was last year, this shower made little or no impact to meteor activity. This was not the case however during the Eta Aquarids, peaking around 5 May. As usual this shower produced very long reflections and I understand enabled some G stations to complete contest exchanges using SSB MS. I focussed though on working stations using FSK441 and really enjoyed the massive bursts. Some of the more interesting QSOs were with SM6CEN (JO67AJ) who only used 50W because his main PA (power amplifier) was out of service. During this QSO we both saw bursts of very long duration, with the final one lasting a full minute and a half. Hakan's signal was peaking to S9++ for a full period, really amazing considering the comparative QRP being used from SM. During this shower I also worked LY5G (KO05OQ) and SP7THR (KO10AN) who both used just 50W. SP7THR doesn't have a large antenna either; he uses just a 9 element DK7ZB Yagi. Again this proves that although high power and a big antenna system helps greatly with working DX, using relatively low power and small antennas can make successful MS QSOs too if the conditions are right. Switching to 6m for some Sporadic-E possibilities, the opening at the beginning of the month were missed however some OH (Finland) stations were copied. These Es openings should become far more intense and should occur more frequently as this month progresses."

Stuart, G8CYW comments, "I have not written before, but I had to tell you about this. On 20 May, just after 12 o'clock, I was putting my rig back in the shack after the Thursday evening 4m contest and I switched it on (FT-847 with all of 6W output on 4m). A quick tune for the beacon to check all was OK then across the SSB part of the band revealed a strong signal from DK2EA in JO50uf, who I then worked at 5/7, 5/5 at 12.17. Under him I heard HA6ZB in KN07bv, who I called giving 5/7 both ways at 12.20. A minute later I worked OK1TEH in JO70fd just north of Prague at 5/9 both ways at 12.21. Extended listening revealed no more signals so I can only conclude this must have been the shortest Sporadic-E occurrence I have ever heard. A check on beam headings and the map reveals very similar beam headings for all three contacts and these were the only signals heard, it must have been only a small patch of Es of a very short duration. With 6 watts and a 2 element beam at 6m high I had no competition and made contacts immediately so there can't have been any other stations on, if there were, they were not audible to me."

Rich, GD3YEO (IO74) reports his first 4m Es contacts in the log for this season on 14 May just after 1700UTC, 9A2SB (JN95GM) and 9A1Z (JN86FJ) were worked and beacons 9A0BFH (JN85JO) 70.023 and HG1BVC (JN87FI) 70.060 were heard with good signals. Also worked on 50MHz earlier in the day (1212UTC) was EA4MR, IV3SKB, 9A7Y and IZ3GNG (around 1630).

I like to keep an eye on G0LFP's website **[3]** and the ionograph plots for prior warning of possible activity. I noted that German amateurs now have the chance to operate on 70MHz this year so will have to remember not to just sit on 70.200MHz waiting for things to happen.

Dale, 2M0WDG (IO850) has only been licensed for 18 months but after a slow start seems to have the 6m 'Magic Band' bug. He was advised to wait for the Spring by some experienced operators and, although he had a few MSK144 QSOs during the winter months, the good conditions were eagerly awaited. Spring has sprung it seems and the weekend of 14 May was the first time Dale experienced Sporadic-E while he was monitoring EA and GM stations making QSOs to and fro on MSK144 and JT65. Dale was also very interested in plotting the Es cloud movement through the internet DX Cluster spots. After a few initial QSOs and increasing confidence, the next opening on 30 May favoured Scotland and Dale worked new 10 countries. As a newbie to the hobby, and a first time experience of Sporadic-E on 6m, he confirms that it is indeed quite the magic band! Hungry for more, Dale will be monitoring band intently over the next few months!

Gordon, G3PXT's tree-mounted 2 element quad antenna continues to work well. Followers of this amazing antenna will be pleased to know that more DX has been logged particularly during the first part of the UK Six Metre Group Summer Challenge working 185 QSOs during May. 9K2GS was a real highlight, however TR8CA was missed. As the tree has come into leaf Gordon reports the SWR has gone down slightly if anything so hopefully more DXCCs will follow.

Beacon news

The beginning of May brought another 70cm beacon on the air. GB3FNY is hosted by Finningley ARS and the beacon keeper is Kevin Avery, G3AAF. The beacon has been under construction and testing and came on the air over the May Day weekend. Finningley ARS also host a microwave beacon on 10GHz and are well known for their Microwave Roundtable and Rally activities **[4].** GB3FNY is transmitting on 432.4450MHz from locator LO93NN in mode A1A. The original posting on the website and cluster reports shows a big wheel as the antenna and 2 watts output from the transmitter giving a horizontally polarised omnidirectional pattern. Spots have already been posted on the DX Cluster and then relayed through to Beaconspot **[5]**. This shows spots up to 373km with G4RRA in IO80BS. Interesting to note that having listened to GB3FNY for some days how there is considerable multi path and aircraft scatter of the signal over a relatively short distance of 122km. As the summer comes there will hopefully be good conditions and more DX spots. Please spot this and other beacons as there is more excellent propagation study work continues and this is an excellent source of data. The operation of the GB3FNY beacon nearly completes the 'full house' of 70cm beacons with GB3ANG, GB3NGI, GB3MCB and GB3UHF that are now in operation. GB3LEU was QRV but is currently receiving some attention. The planning and construction of these beacons is an onerous task involving time, commitment and certainly cash to bring on the air so congratulations and thanks from all in the amateur community.

Sign Off

Thanks once again for all the reports particularly from new contributors Stuart, G8CYW and Dale, 2M0WDG and let's hope for more DX as the summer develops.

Websearch

[1] www.mmmonvhf.de/latest.php
[2] www.70mhz.de
[3] ww.sixaddict.co.uk
[4] www.g0ghk.com
[5] www.beaconspot.eu/home.php

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GHz Bands

Boosting DX activity

Steve, G4TRA is active on the VHF bands and responded to my May column about DX activity. He said, and I paraphrase, that "everyone will tell you, and to 99% of casual observers, the band is 'dead', with sporadic activity once a month on the UKAC. The real challenge is to use the tools available to work out when the propagation will support DX. These tools are propagation websites, DX spotting and others (albeit some based upon activity). The issue is getting ops to come on the band and test with you." His strategy to get new squares is:

- identify the potential operators in the squares/DXCCs you would like to work
- understand their equipment, locations, detrimental influences and life styles
- build relationships with them using email, social media and chat rooms
- enthuse them to try new modes and when the going gets tough how to achieve some motivating quick wins.

He asks, "Why should a newly licensed M6 go onto VHF/UHF/SHF with all the technical and operating work needed when he can work around Europe with ten watts and a dipole on 40m?" This is valid, but the answer is to generate a culture of experimentation. Steve made some good suggestions for generating GHz bands interest. Would you like to see a regular 'back to basics' paragraph in GHz Bands? A beginner's (new to the GHz bands) DX table based upon distance worked/squares or something similar? A common interest group on the internet linked digital repeater network? More articles on using surplus equipment to get on the GHz bands like the recent 5GHz article? A beginners' 10GHz contest, like the FM section of the UKACs? How about articles on how to program the Lime SDR and its like to get you on the GHz bands? More to the point, *are you seasoned GHz bands activists prepared to provide some of this?* One columnist can't do it all.

Life on the edge

Those of us fortunate enough to be close to centres of activity tend to be a bit blasé about 1296MHz and 2.3GHz. In the 1296 May contest, Phil, G3YPQ reported just eight QSOs in seven different squares, but none adjacent to his own, IO70. Keith, GU6EFB is even more out on a limb as far as the UK is concerned and his comment was "try it from IN89RK!" From there he made five QSOs, all to IO91 apart from one in JO20, so there *was* some propagation if stations turned their beams. Ralph, G4ALY (IO70), who is always workable here on the Fen Edge, reports that he has replaced his preamplifier on the mast to deal with higher power, and should be running around 180W now. Good to hear that there will be a few more signals on the 2.3GHz band from GM over the coming months. Andy, MM0FMF emailed to say that he's ordered seven 13cm transverters from SG-Lab in Bulgaria [1]. Five of them are going to SOTA operators and two to long-time microwavers. Apart from the SOTA ops chasing each other for QSOs, I hope that a few signals from the tops of some real mountains may be heard over a large part of the UK. Jim, GM3UAG continues to be QRV on 13cm, reporting "a wee bit of DX" with PI7ALK copied on the band earlier in the year. Further south, in England, G3YJR has also been experimenting with an SG Lab 13cm transverter. Several other Sheffield & District Wireless Society members are intending to try them, so I'm hoping for a mini-explosion of activity on this band! You can read G3YJR's blog at [2].

PHOTO 1: One end of the EA 47GHz record QSO. Photo: EB3FRN.

New 47GHz EA record

On 18 April a group of Spanish operators travelled to the Ebro valley to try new contacts on 10, 24 and 47GHz. EA5JF, EA5DOM and EA5CV were in EA2 (IN91KE70) and EA3HMJ and EB3FRN in EA3 (JN02SD52). From these sites, they set a new 47GHz EA distance record of 245.5km. On the EA2 side the equipment was a 90cm offset dish and in EA3 a 60cm offset dish. Both were using Kuhne PCB systems and powers were just over 1mW. A video of the QSO is at [3].

1st South American 10GHz EME contact

On 6 May Juan, LU8EN and Bruce, PY2BS made the first 3cm EME QSO between two South American stations. LU8ENU used a 2.3m solid dish with a VE4MA linear feed and 25W. PY2BS used a 3.7m Andrew dish with a linear rotary feed and 40W. The mode used was JT4F and signals were -17dB at LU8ENU and -18dB at PY2BS. Apparently, Juan did a great job with manual moon tracking. Not easy at 10GHz! Full details and photos were in a recent *Scatterpoint* [4].

Beacon News

Progress continues with the move of the GB3RPE 10GHz beacon to Carmarthen. Chris, GW4DGU reports that the group there have managed to recover the old beacon and Chris has offered to give it a check-over. If it's usable it will be reprogrammed and will initially make an appearance from its proposed site on the Trinity Saint David University campus as an unlocked, FSK only, personal attended beacon when the keeper is at work.

Finally

Keep reports and technical info coming in to me by email. Join the conversation on Twitter @g4bao and @ukghz using the hashtag #GHz_bands.

Websearch

[1] *RadCom* Jan 2017 page 70
[2] https://g3yjr.wordpress.com
[3] www.youtube.com/watch?v=_dlOAeXg6Dg
[4] www.microwavers.org/scatterpoint.htm

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Airfields on the air

All amateur radio stations around the world are welcome to take part in Airfields On The Air (AOTA), in particular RAFARS members and ATC. The main event is the first weekend in April but stations can be put on any other times of the year.

To take part as an activating station you need to operate from a current or an old RAF military establishment that was used during the wars or perhaps may still be in current use. The usual amateur radio licensing regulations apply. You can either use a special event station callsign, a club callsign or even an individual callsign /P. All activating stations must register with the RAFARS AOTA Manager to have their contacts count towards the award programme.

GB2LAF

Norfolk Coast ARS is spoilt for choice when it comes to choosing a venue for the Airfields on the Air event, given the proliferation of WW2 airfields in East Anglia and specifically in North Norfolk. Langham Airfield was part of Coastal Command's 16 Group, providing protection for friendly shipping and the destruction of the enemy's vessels. Langham Airfield is now a turkey farm although some infrastructure can still be seen.

The reason that NCARS chose RAF Langham for its AOTA activity was primarily because of the recently restored Langham Dome. Built in 1942, Langham Dome was a state-of-the-art anti-aircraft gunnery training facility for AA gunners. Gunners were schooled in accuracy using ground-breaking stop-frame film technology developed in 1940 and air attacks were simulated by projecting images of enemy aircraft onto the interior walls of the Dome. Some forty of these training Domes – which are 25' high and 40' wide – were built in WW2, but only a few are still standing. Langham Dome has been superbly restored with the help of Heritage Lottery and other funding and the dedication of the Friends of Langham Dome.

For the AOTA event, NCARS set up two stations, one within the Dome and the other outside on one of the picnic tables. Within the Dome is a 1154/55 that is depicted in an situ setting – with a Morse key and oscillator for visitors to try their hand. The AOTA station was set up alongside, using the club's compact FT-100D – showing visitors how the developing technology over the past 75 years has allowed the size and weight of an HF transmitter/receiver to reduce so dramatically. This station was operated mainly by Arthur, M0VAW, who himself had a long career in the RAF.

Arthur, M0VAW operating GB2LAF inside Langham Dome.

Steve, G3PND and Phil, G4PQP operating GB2LAF outside the Dome.

The antennas for the two stations were simply supported by the Dome's wooden perimeter fencing – a half wave 20m vertical for the internal station and an end fed 132' that covered all bands from 80m to 10m. Both antennas performed well, given the open ground and the proximity to the sea.

The outdoor station mainly operated on SSB as did the inside station. Both drew a good deal of interest from the visitors to the Dome.

For opening times and other information on the Dome see www.langhamdome.org

Steve Appleyard, G3PND

GB0HAF

Over the weekend of 8 and 9 April, Harlow and District Amateur Radio Society operated under the call of GB0HAF from ex RAF Hunsdon for Airfields on the Air.

Activity was on HF and VHF using an inverted G5RV, tri bander beam for 20, 15 and 10m and a 3 band vertical for 6m, 2m and 70cm. All were mounted on a forty foot mobile mast.

The weather was excellent and the event was well supported by members of the club.

VHF conditions were pretty good with over 110 2m FM contacts with the best contacts into France and Belgium. HF conditions wre variable with contacts around Europe and the Middle East but the best contact was into Australia. In total over 200 HF contacts were made.

The club would like to thank Hunsdon Microlight Club for their hospitality and allowing them to use the site.

Jackie, 2E0SIJ

The antenna system used at GB0HAF.

Harlow and District ARS operated under the call of GB0HAF.

GB4AOA

Riviera Amateur Radio Club from Torquay ran a special event station on 8 April celebrating the Royal Air Force special event Airfields on the Air. They activated the site of the former WW2 airfield RAF Haldon and ran both VHF and HF stations into an inverted Vee antenna at 30 feet up on the club's trailer mast.

The weather was beautiful, extremely sunny with blue skies and no clouds and they managed to work Eire, Northern Ireland and Scotland to the North and Italy, Switzerland to the East amongst other European countries.

As well as playing radio, the event also helped to get newly licensed M6s to get on the HF bands and to learn the ropes of setting up and operating a big portable station. It also served as a social event where they all had an opportunity to get together and have fun.

Per Ardua Ad Astra

Steph Foster, G4XKH

Riviera ARC from Torquay ran GB4AOA.

GB0WY

A team from Huntingdonshire ARS assembled recently to set up and operate GB0WY at RAF Wyton in Cambridgeshire. The booking in process ran smoothly and passes were assigned to all the team so that they could proceed to the Air Cadet Central & East Region Aerospace Centre that is located on the side of one of the hangars adjacent to the main runway. Once they were on the airfield, the team soon got the station set up reasonably quickly, there wae the occasional cry of 'In Coming' from Mervyn, G4KLE as he attempted to break some of the hanger windows with his catapult and golf ball. He was trying to get a line over the huge hangar door framing so that we could tie off one end of the antenna at a reasonable height: he eventually succeeded with the correct amount of twanging on his catapult.

After testing the equipment they operated a shift system that worked well with the usual operators and loggers 'duty cycling' from time to time. Due to the current poor HF conditions they decided to utilised some 'free media' with the use of QRZ.com, Facebook and DX Summit to advertise the operating frequency and callsign. They felt that this aided to amount of contacts captured during the day, this gave food for thought as this may be a way forward for future events... you do need someone with the laptop in front of them so that you can keep a keen eye on the frequency readout and update accordingly otherwise you have to play catch-up!

They operated the station on the 80, 60, 40 and the 20m bands chasing the propagation and openings where thy could to get the maximum number contacts out of the day. A round up of the 53 contacts ended with a total of 8 on CW – thanks to Clive, G3HKQ. There was 45 contacts on phone, from a team effort, with local stations from Cambridgeshire and other stations including Finland, Russia, Turkey, Serbia, Germany, Poland, America, France, Ireland and Wales, so all in all good spread for the HF conditions. Notable was Rob, G3FXA his QTH is in Kettering but he remotely operated from Las Vegas via his iPhone!

This year sadly only two other Airfields were contacted; RAF North Weald and RAF Stoke Holy Cross so unfortunately no certificate this year for GB0WY!

The setup was the club's IC-7200, LDG ATU, full-sized G5RV mounted onto a 40ft mast running 100 watts straight out. The setup worked well and behaved itself all day.

Thanks go to M0VTG, G4KLE, G3HKQ, G1KWF, G6LSB and M0JWS for their company and time during the enjoyable day, HARS for the loan of the equipment for the event and to 2E0DIP for organising and arranging access to the station for all.

David Webb, 2E0DIP

The antennas in use operating GB0WY.

Operators G3NKQ, G1KWF and M0JWS.

Elaine Richards, G4LFM
radcom@rsgb.org.uk

RSGB Convention & the National Hamfest

Two dates for the diary with something to interest every radio amateur whatever your interests within the hobby.

RSGB Convention 2017

Taking place on 13 to 15 October at Kents Hill Conference Centre in Milton Keynes, the RSGB Convention lecture programme is, once more, catering for all aspects of amateur radio. We have confirmed talks from the *A25UK DXpedition to Botswana* and the *ZL7G DXpedition to Chatham Island*. Professor Hugh Griffiths, who many of you will know as G4CNV, will talk on *Reflections on the History of Radar* making use of recently declassified material from the Public Records Office at Kew.

The Elecraft K3 transceiver is extremely popular and James Patterson, M1DST will be talking about *M1N-the-Middle, a flexible hardware control add-on for your K3*. James has been working on an open source hardware/software project to allow him to take control of his K3 / external add-ons in an interesting and inexpensive way. It is small enough to take to a contest site or DXpedition where you can take your workflow with you.

Remote operation of stations is becoming more popular especially as the level of RFI increases in the urban environment. John Regnault, G4SWX will be talking on *Remote Amateur Stations: the next generation*. The talk will look at how technology might support a remote club amateur radio station. It will review both the regulatory and today's technical issues highlighting some of the pitfalls. On the technical side it will highlight the importance of maintaining full control of the station and also the ergonomic issues. John is the RSGB's VHF Manager, but his talk will be equally relevant to operation of LF, HF, VHF or microwave amateur stations.

This year, the AMSAT-UK Colloquium is combined with the RSGB Convention and, amongst other space and satellite talks, we are delighted that Professor Monica Grady, who many of you will have seen on television talking about the Rosetta mission, has agreed to come and speak. Monica is Professor of Planetary and Space Sciences at the Open University and has previously presented the prestigious Royal Institution Christmas Lectures on the subject of A Voyage in Space and Time.

As usual there will be an opportunity to sit both the UK and FCC exams. In addition, this year, you will be able to try the new online examination system that was launched earlier this year. This demo was run at the AGM in Cardiff and proved 'interesting' for many of those who have held licences for a long time – come along and try it!

The Construction Competition proved very popular last year and will be open to all again this year. The rules are very simple and will be published on the RSGB website during July.

There will be a strong presence from various Special Interest Groups (SIG) affiliated to the RSGB – if you want to participate as a SIG then please email convention@rsgb.org.uk to tell us.

Booking for the event is now open and you can book everything from the whole weekend to a single day ticket, for details go to https://secure.niceltd.co.uk/rsgb/

Convention visitors enjoy the social area where radios are on show.

National Hamfest, everything from components to radios and more.

National Hamfest

The National Hamfest is the biggest amateur radio show in the UK and takes place on Friday 29 and Saturday 30 September at the Newark Showground, Winthorpe, Coddington, Newark NG24 2NY.

The show attracts manufacturers, dealers, majors suppliers and small traders of everything amateur radio related from many UK and international companies. The event is in association with and supported by the Radio Society of Great Britain with a large book stall and representatives of the many RSGB Services available. There are also many of the special interest groups and clubs from around the UK in attendance.

This is the 9th National Hamfest event run in this venue and every year the hall is packed with everything you need to set up and maintain an amateur radio station, whether your interest is CW, SSB or data modes, QRP, QRO, just for rag chewing or a serious contest station, you'll find it here. With over 3000 people attending over the two day show, there is nothing bigger or better in the UK. If you're interested in amateur radio this is a 'must visit' experience.

www.rsgb.org/convention
www.nationalhamfest.org.uk

RSGB 2017 Convention

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- Construction Competition

LECTURES FOR 2017

- Botswana, A25UK 2017
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- AMSAT - Current status of FUNcube satellites
- Remote Amateur Stations: - the next generation
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A low cost, CS-mount HD video camera

The cost of making the transition from standard definition 4:3 to high definition 16:9 (1920x1080 pixel) images has, up until now, been more of a huge leap than a jump. However, as with most technology related products, if you wait long enough and apply a lateral view, a means can sometimes be found.

This article describes the disassembly of one of the newer webcam products and the steps required to install its innards into a custom CNC-machined aluminium housing that has an integrated 'CS' lens holder. I found the case on eBay but the supplier has since opened a website [1]. CS lenses are widely used in the CCTV industry, inexpensive, interchangeable, and offer advantages such as different fields of view, manual focus and aperture control.

This project is not for the faint of heart – and it goes without saying that any warranty will be lost the moment that you take your angle-grinder within centimetres of the poor unsuspecting webcam.

Finally, I found the modified camera needs reasonably good lighting before it will perform well. With lower light levels, resolution drops and white balance is more difficult to achieve. I was initially disappointed with a red-cast image and resolution barely higher than SD, using poor indoor lighting. The camera jumped into life as soon as the target was illuminated using a few tens of watts of 6500k LED light.

WebCam, the next generation

Sometime in late 2011, Logitech introduced the C920 webcam [2]. This was a significant technology leap in that the product had integrated H.264 video encoder, audio encoder, runs on 5V at just under 300mA so can be USB powered. At the time of writing (late May 2017) it has a list price of about £70. It is capable of streaming full HD (1080p) at 30fps (frames per second).

Soon after this new product was introduced, an enterprising engineer in Lithuania created a wonderful custom enclosure, milled out from aluminium stock and finished with hard, black anodisation. As well as making the webcam considerably more rugged, this enclosure also adds a standard CS lens mount, a standard ¼" tripod mount hole, and a USB socket (in preference to the standard integrated USB 'A' cable).

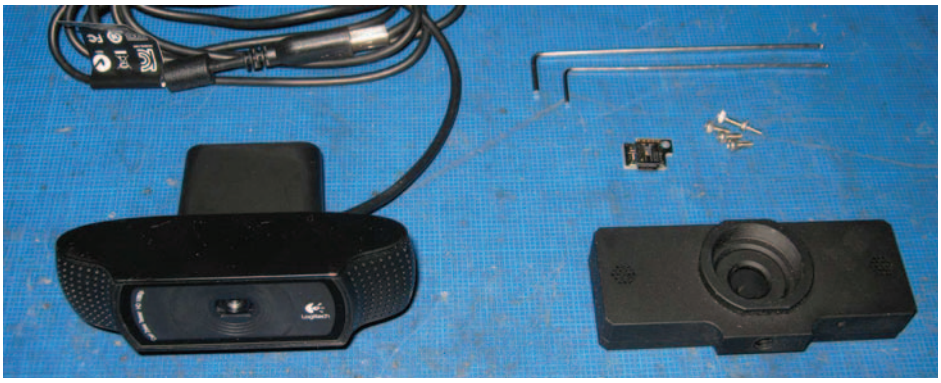

PHOTO 1: Unmodified C920 camera (left) and aluminium case.

PHOTO 2: Removing the rubber bumpers.

PHOTO 3: Removing the front moulding.

The author saw several possible applications for this modified product. Firstly, an HD video source for digital amateur TV (DATV) applications. Secondly, given the high frame rate and very low encoder latency, an inspection camera for SMD assembly work. And last, but by no means least, as a telescope, given the relatively small sensor size (and the associated optical gain when used with a standard CS mount lens).

Photo 1 shows the Logitech C920 webcam and the sauliakasas custom, milled enclosure [2] as supplied. Before proceeding with this project, it is worth fully evaluating the performance of the webcam, since this modification will invalidate any applicable warranty.

It is also worth noting that the lens assembly supplied with the webcam includes an electro-mechanical auto-focus mechanism and an infrared filter. Neither of these features will be available without additional work in the modified unit.

Disassembling the webcam

The underside of the webcam has a pair of thin, rounded triangular bumpers. These must be fully peeled back to expose the first set of screws. See **Photo 2**. Use a snug-fitting cross-head screwdriver, as one slip later in the process could cause considerable damage. Remove these two screws from each side, and insert a thin, flat bladed screwdriver in the slot. The mic covers will then easily pop off.

Remove the four screws either side of the lens assembly (**Photo 3**) and keep all parts. Some of the screws will be required later.

As seen in **Photo 4**, the exposed screws attach the main body to the webcam base; unscrew and save them. The main board will be free of the enclosure after this step. The cable to the left of the lens carries USB back to the computer. This attaches to a small five pin connector that will need to be unplugged from the main PCB.

Observing proper anti-static handling, the main assembly can be pulled free of the enclosure (**Photo 5**). Remove the final pair of screws that attach the lens assembly to the PCB. Do not attempt to remove the lens yet.

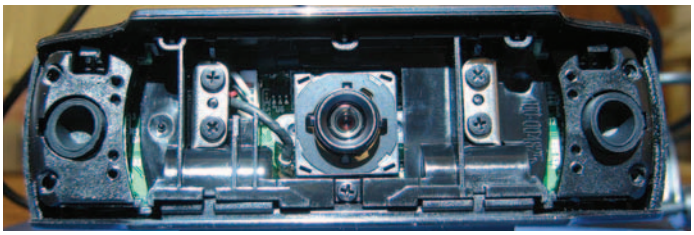

PHOTO 4: Exposing the base screws.

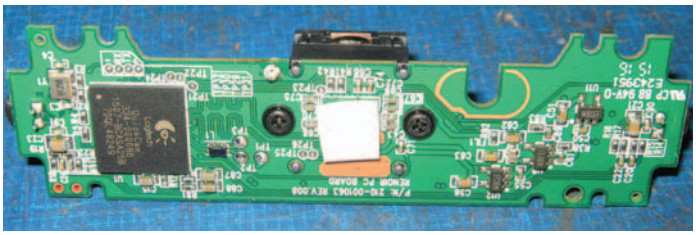

PHOTO 5: Rear of the main electronics.

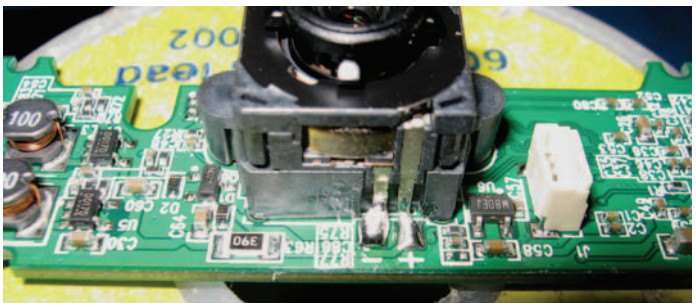

PHOTO 6: Lens connections.

PHOTO 7: Main board and aluminium case front with new USB socket and carrier board in place.

Removing the lens assembly

Using de-solder wick, unsolder the electrical connection between lens and main assembly, to the right of **Photo 6**, marked + and – on the silkscreen. Gently pull the lens assembly away to expose the CCD sensor, which can be seen in the middle of the PCB in **Photo 7** (surrounded by the thin black square). Be very careful not to touch or dirty the CCD. It can be damaged very easily and fingerprints, dust etc are very difficult to remove.

Starting reassembly

It is worth taking some time to lay out the parts on an anti-static mat and figuring out how the assembly is going to proceed. In Photo 7 the new USB socket has been dropped roughly into location. The electronics assembly will be flipped over so the CCD is visible through the central aperture of the case.

The new USB socket

Now for the fiddly bits. Despite the clarity of **Photo 8**, the USB breakout board is a tiny assembly. I recommend you use the same colour wires as shown in the photo because this makes it much easier to go along with the following description.

Carefully tin the five holes on the board. Harvest four wires from the old USB cable and tin and trim the ends carefully. I made each connection carefully by dipping each tinned wire-end in gel flux then touching it to the PCB and applying *just enough* heat.

It is inadvisable to have wires poking through to the USB connector side of the assembly.

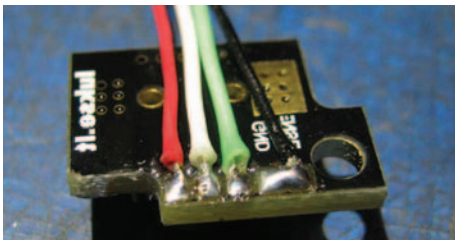

PHOTO 8: Rear of the new USB socket board.

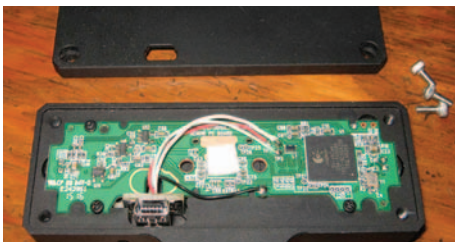

PHOTO 9: Main assembly and new USB socket.

Hooking it all up

Five screws and two Allen keys are supplied with the metal case. The smallest of the screws is used to attach the USB board to the inside of the aluminium case. The main PCB assembly drops into the case and is held using the four previously-removed tiny black screws seen in Photo 3.

Connections

Assuming you used the same colours as me, the black wire attaches to the ground tab, below the sensor. Red is attached to TP1 (5V); white attaches to TP2 (USB D-) and Green attaches to TP3 (USB D+). **Photo 9** gives a good idea of how it should look. The instructions supplied with the case will also help and include such information as how long the wires should be.

Finally

It is worth noting that a CS lens needs to be provided by the user. Please also note that I have no connection with kurokesu.com: I am merely an admirer of their work.

PHOTO 10: Finished camera with a CS-mount manual lens.

Websearch

[1] www.kurokesu.com

Mark Atherton, ZL3JVX
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Tecsun PL-880

all mode portable receiver

Seldom do I covet a portable receiver but this one is a bit special. It calls itself a "PLL multi-band radio with excellent performance" – and it's not wrong.

First impressions

This is a very nicely-made radio with a real sense of quality to it. The supplied accessories – particularly the carrying case – are all top-notch and, best of all, it works and sounds very nice indeed.

Briefly, the Tecsun PL-880 is a fully synthesised all mode receiver that's about the size of a paperback book. It covers 100kHz to 29.99999kHz in AM, LSB and USB, plus 87-108MHz WBFM (in stereo with the supplied headphones, or via the LINE OUT socket). Demodulation is via digital signal processing (DSP) and a range of fairly 'brick wall' filters are implemented, down to 500Hz bandwidth. It runs from a user-replaceable lithium-ion battery and comes with a range of useful accessories (see **Photo 1**).

What's in the box

Opening the protective cardboard box reveals a bundle of documents, a natty mid-brown soft case with carrying strap and a wealth of accessories. There's a pair of earbuds, a long-wire short wave aerial on a handy bobbin that can supplement the telescopic rod aerial, a USB to mini-USB charging lead and, crucially, an 18650-size rechargeable lithium-ion battery that contains as much power as *twelve* 1.2V 500mAh AA NiCads!

Documentation

There's a shirt-pocket size yet comprehensive 32-page proper English manual that covers everything from basic operation to handling the 3050 memories. There's also a poster-size quick-start guide; once you've mastered the radio you can reverse the poster, revealing an amateur radio world callsign map.

User interface

The Tecsun PL-880 has a straightforward user interface with well-labelled, sensible controls. Frequencies can be entered from the keypad (more on this later), recalled from memory, or tuned manually using the Tuning and Fine Tuning knobs. Step sizes depend on the receive mode (see **Table 1**). Both have 20 steps per revolution. The Fine Tuning control can be used to set up an offset, for example 230Hz, so that the main tuning would go (say) 3356.230, 3357.230, 2258.230kHz etc. If you turn the Fine Tuning past zero it increments or decrements the next digit, so you *could* tune from 1.8MHz to 29.9MHz in 10Hz steps if you had plenty of time on your hands.

Keys on the keypad are positive and have a comforting click as you press them. Although the radio can receive from 100kHz to (nearly) 30MHz in AM or SSB, it treats the 100kHz-1711kHz range as separate from short wave, largely because that range uses an internal antenna. There are two 'AM' ranges (basically LW and MW), plus short wave 'bands' that are selected via up/down buttons. The radio knows the difference between amateur and short wave broadcast bands and assumes you do, too, so it changes between bands of the same type. If, for instance, you're listening on the 40m amateur band and step up it takes you to 30m, but if you're on the 22m broadcast band it will step to 19m. The top right corner of the display identifies the metre band (eg "20mb") as you step up or down. You can freely tune between amateur, broadcast and other frequencies.

Frequencies can be assigned to and recalled from memories. There are useful scan and auto-store functions. Memories are divided into 25 'pages' to make access easier. Page '0' has 650 memories, with 250 for SW and 100 each for FM, MW, LW and SSB; the other 2400 memories can be freely divided into 24 pages and any modulation type. The 'fine tuning' part of the frequency isn't stored, so you can only recall (say) 14,239.00kHz rather than 14,239.22kHz.

TABLE 1: Tuning step sizes.

Mode	Tuning	Fine tuning
LW/MW (AM)	9kHz§	1kHz
SW (AM)	5kHz	1kHz
LW/MW/SW (SSB)	1kHz	10Hz
WBFM (64-108MHz)	100kHz	10kHz

§ MW tuning steps are selectable as 9kHz or 10kHz to suit your region.

PHOTO 1: The Tecsun PL-880 all mode receiver comes with a range of valuable accessories.

Display

A large, clear, backlit liquid crystal display (LCD) provides all the operating information. The main section shows the frequency (or the time, if the radio is off) plus the operating mode. On SSB, frequencies are displayed to 10Hz; MW and LW are to the nearest 1kHz and on FM to the nearest 10kHz.

The backlight comes on automatically or, thanks to a switch on the side, can be left permanently illuminated.

Additional sections on the display show status, mode, signal strength and quality, time of day and battery charge state. It's all very well thought out and easy to read.

Broadcast sound quality

My first action was to tune the radio to an FM station. Classic FM was the first I happened upon, and I listened in amazement at the clarity of the reception. The built-in speaker had rich, deep bass that sounded like it was coming from a *much* larger enclosure; the treble was crisp and pleasant too. Turning the volume up resulted in a big, effortless, room-filling sound. FM stereo reception through headphones was exemplary. I'm impressed.

Turning to medium wave AM, the quality was also very good. On AM you can choose bandwidths of 2.3, 3.5, 5 or 9kHz to suit listening conditions. The filters sounded very efficient and had typically DSP-sharp cutoff characteristics. 3.5 or 5kHz worked well

PHOTO 2: Controls and connections on the left side include a mini-USB 5V charger input, stereo line out, stereo headphones out, the local / normal / DX short wave antenna gain switch and the short wave antenna socket.

for less than brilliant stations, whilst 2.3kHz bandwidth could chisel a listenable signal out of quite a lot of mush (at the expense of losing the treble). On a clean signal, switching to the 9kHz bandwidth setting showed just how *nice* AM can sound.

Short wave and SSB

Performance on short wave is excellent. AM, SSB and CW are all catered for and the sensitivity is astonishing. I was able to listen to 20m and 40m quite happily using the built-in telescopic aerial, although the supplied plug-in wire extension aerial can help in difficult circumstances. There is a three-position attenuator to cope with DX, normal or local signals (**see Photo 2**). The manual doesn't give specs but the steps seem to be about 10dB (local to normal) and a further 16-20dB on the DX setting.

Demodulation on SSB and CW is superb. The triple conversion superhet architecture uses a low 45kHz final intermediate frequency (IF) for the digital signal processing (DSP) core (128kHz for WBFM) and it works really well. The DSP filtering is very useful in crowded band conditions. SSB/CW bandwidth are selectable between 0.5, 1.2, 2.3, 3.0 and 4.0kHz.

Tuning is smooth, sharp and precise. There are no clicks, mutes or other unpleasant noises that bedevil some other portable all-mode receivers I've used. The separate normal and fine tune controls soon become very natural to use. If I tried tuning *too* quickly the radio didn't keep up, but it was perfectly fine with normal tuning speeds. Keypad frequency entry is simple and direct, eg pressing 7-1-8-0 takes you straight to that frequency (in kHz) and zeroes the fine tune.

I didn't check the absolute frequency accuracy, drift, sensitivity or intermodulation etc but everything seemed stable and 'right'. It is great for normal AM, SSB or CW listening and probably also good for many digimodes.

Miscellaneous

There are full alarm clock radio functions. You will need to have your own 5V USB power source, such as the ubiquitous phone charger or computer USB socket. When the radio is on charge the display shows an elapsed time meter plus a simple 'fuel gauge'. Charging stops automatically when the battery is full.

You can increase the WBFM coverage to 64-108MHz using details in the manual (though the manual only promises 76-108MHz). The radio firmware was revision 8220.

Conclusion

This is a fabulous portable radio that is nice to use, covers all modes on HF and beyond and includes useful accessories. Its performance is excellent, making it a superb personal radio. A club could even lend one to newcomers so they can listen round the bands.

Whether it's the cricket on Radio 4 LW, a hot HF contest or smooth music on Aardvark FM, this one radio does it all. I want one.

Our thanks to Nevada Radio for the loan of the review sample.

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01922 414796 sales@radioworld.co.uk

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Icom IC-718 HF All Band Transceiver £499.00
Kenwood TS-570DG/E HF Transceiver £539.00
Yaesu FT-897D Multiband Portable Transceiver £599.00
Icom IC-781 Multimode HF Transceiver £2,499.00

Kenwood TS-430S HF Transceiver £399.00
Kenwood TS-870SAT DSP HF Transceiver £799.00
Kenwood TS-570DG/E HF Transceiver £500.00
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From Spark to Speech – the birth of wireless telephony

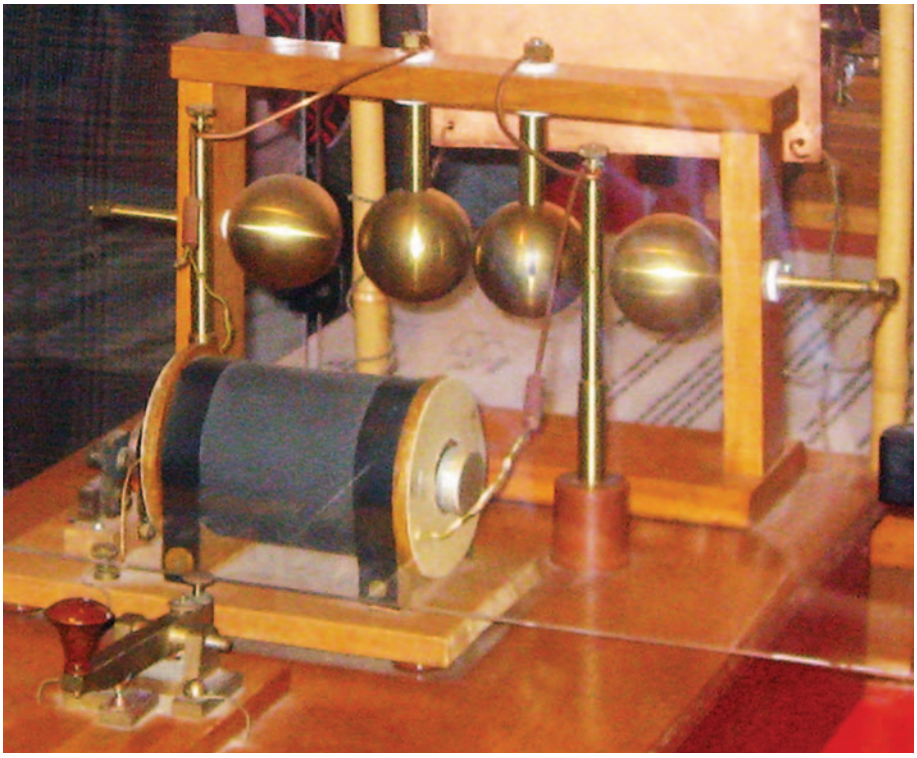
The history of voice before valves is one of the most fascinating adventures that unfolded during the embryonic years of our hobby.

As we tune across the crowded HF amateur bands with a sensitive modern communications receiver, it's difficult to imagine the eerie hush that the set would have captured if we were magically transported back some 120 years. In parts of the spectrum, it would have picked up the cosmic noise that has pervaded space since the beginning of time; and crashes of distant lightning strikes and local precipitation static would have punctuated that constant hiss. But near centres of population the electrical noise from arc lamps, switches, leaking insulators and the first electric streetcars would have revealed that man was beginning to harness the new form of energy that would change the world.

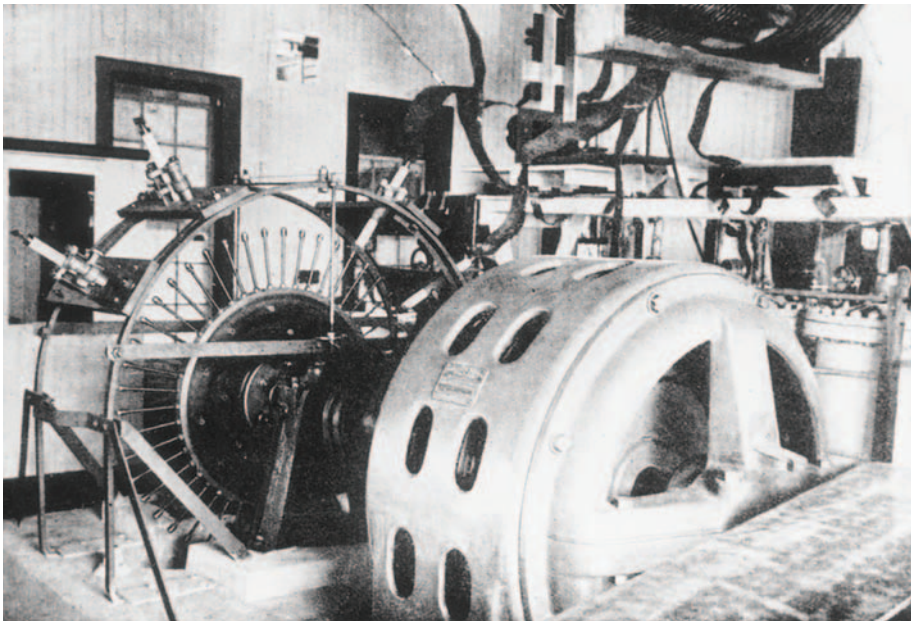
In 1865, Clerk Maxwell had formulated the classical theoretical foundation for the understanding of electromagnetic waves, and by 1888 Heinrich Hertz had confirmed the existence of such waves and measured their properties, using spark gap transmitters with frequencies between about 50 and 500MHz. But Hertz thought that his work had no practical use, and it was left to Guglielmo Marconi, Oliver Lodge, William Preece, Reginald Fessenden, Lee de Forest, Karl Braun and others to pursue the application of these discoveries to the first practical systems of long distance radio communication. Enthusiastic amateur experimenters soon began to explore the wonder of wireless, and the first official radio amateur licences in the world were issued by the British Postmaster General (PMG) in June 1905.

The vital spark

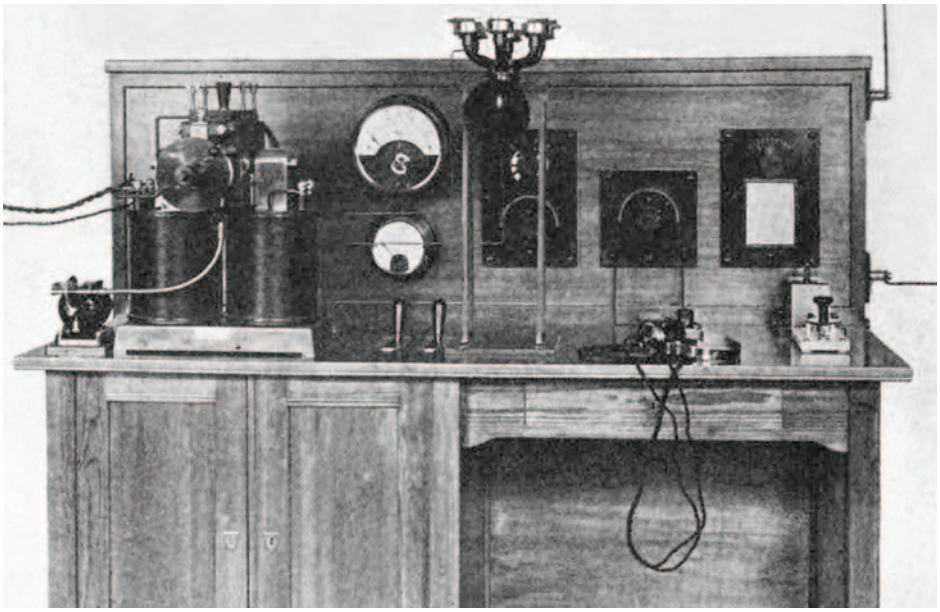
Although he had many formidable rivals and competent supporters, and used the discoveries of several other inventors, the enterprising young Marconi is acknowledged as the outstanding initial driving force behind the widespread use of wireless telegraphy. The ambition, foresight and determination of the experimenter who once declared himself a radio amateur laid the foundations of the connected world in which we live today.



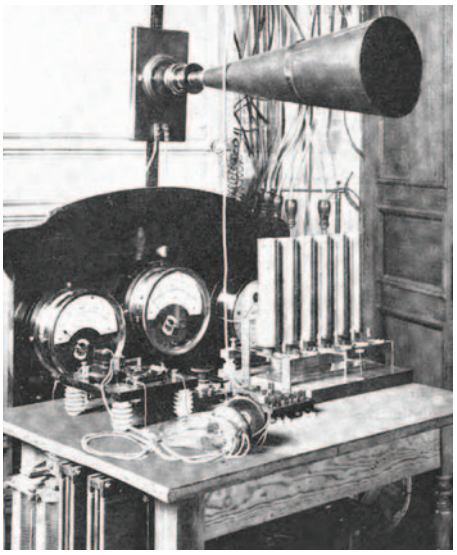
A simple Righi-style spark transmitter at Salvan in Switzerland, where Marconi carried out successful tests at a range of 1.5km in 1895. In 1897, Rodolfo Lonardi proposed to send speech by modulating the positions of the spark spheres.



Fessenden's synchronous rotary spark gap transmitter was powered by a 35kVA alternator driven by a steam engine. The 1.5m diameter spark gap rotor had 48 electrodes.



A small Poulsen arc AM phone rig. Note the arc chamber on the left and the six-head carbon microphone (rated for a maximum antenna current of 4A) on the central stand. The crystal receiver is behind the headphones on the desk.



This 1906 AM phone transmitter has a battery of six water-cooled arcs in series. The microphone with the large horn shunts the antenna coupler, and the electrolytic detector receiver board is behind the headphones on the table.

But, as with Hertz's experimental apparatus, Marconi's early transmitters were unable to generate continuous pure sinusoidal signals, since they relied on sparks to excite oscillatory currents in the antenna. They produced a train of damped waves with a typical spark repetition rate of a few hundred Hz. Indeed, Marconi's first high power transmitter at Poldhu is believed to have had a second-stage spark rate of less than 5Hz. With such a low frequency spark train it was difficult to send the dots and dashes of Morse code at a useful speed, far less the nuances of human speech.

Despite Maxwell's seminal work, the radiation of electromagnetic waves wasn't well understood by many early experimenters. Even reputable scientists such as Ambrose Fleming (of diode valve fame), who was retained as scientific advisor by Marconi, postulated in his authoritative 1906 book that the impulse produced by a spark discharge (the so-called 'whip-crack effect') was essential to cause radiation, whereas a continuous high frequency alternating current could not. This erroneous argument became progressively muted in later editions.

Continuous waves

However, on the other side of the Atlantic, the Canadian-born radio pioneer Reginald Fessenden appreciated much earlier the importance of developing ways of generating CW **[1]**. Although ultimately his commercial ventures were unsuccessful, Fessenden was a prolific inventor of extraordinary calibre. In 1891, he experimented with multiplexed line telegraphy by sending sinusoidal signals of different frequencies generated by 'dynamos'. This inspired his ideas about using CW at radio frequencies to support voice communication.

There was a second important reason why Fessenden believed that CW would prove superior to spark. Before radio amateurs were relegated to the 'useless' wavelengths below 200m, and in 1921 discovered short wave communication by multihop ionospheric reflection, reliable long distance communication was thought to require the use of frequencies between about 20kHz and 1MHz. (At lower frequencies antenna efficiency was poor, whereas at higher frequencies daytime absorption was found to severely limit the possible range). With their unstable frequencies and broad spectra, spark transmitters made poor use of this very limited bandwidth, and it was realised that many more stations would be able to operate without mutual interference if CW could be generated.

Some early wireless professionals were very supportive of radio amateurs. Fessenden, who later held the callsigns 1XS and VP9F, was a founding member of the NY Junior Wireless Club, which succeeded in averting implementation of the very restrictive Depew Wireless Bill in 1910. In Britain, Marconi and Fleming wholeheartedly backed the amateurs in their struggle to regain transmitting rights in the period immediately following WWI. Their efforts were fully justified just a few years later, when amateurs led the way in exploring short wave propagation.

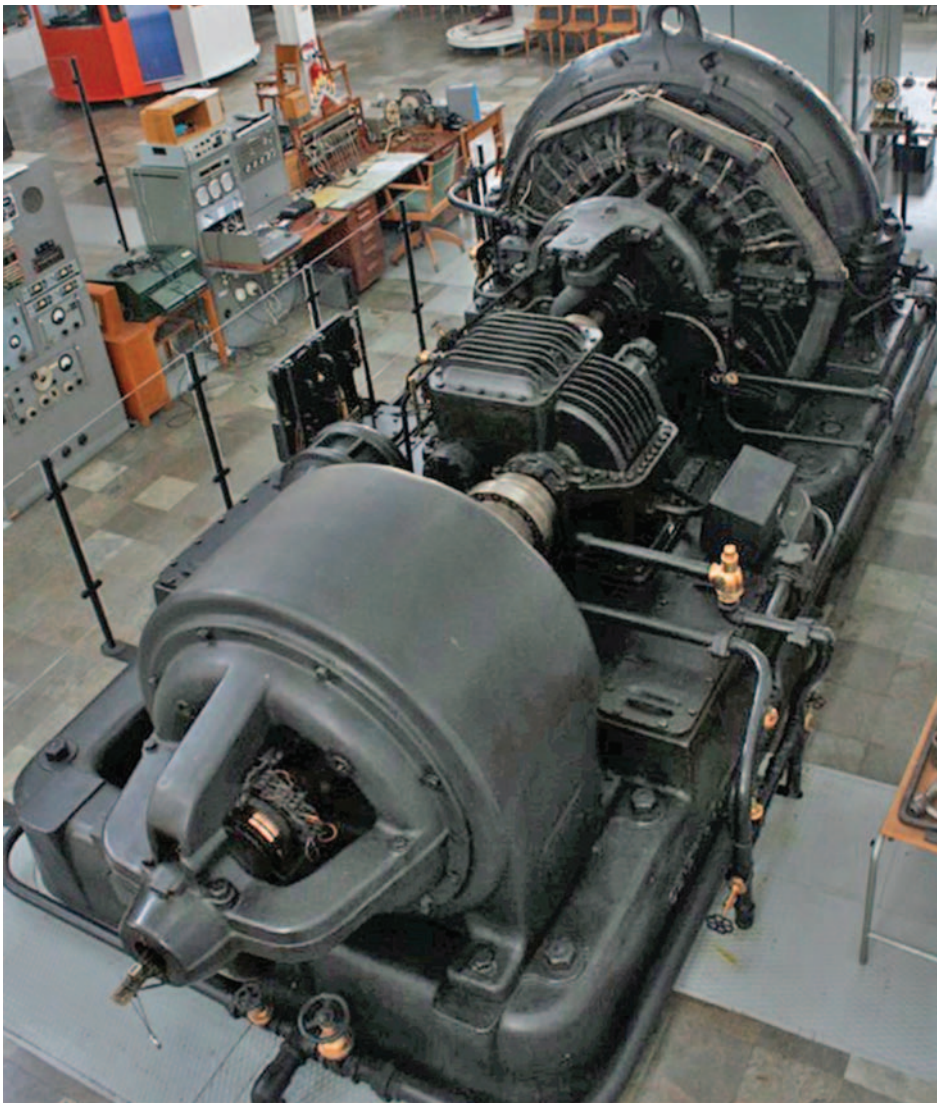
High-speed spark gap transmitters

For his first voice experiments, Fessenden used a spark transmitter in which the Ruhmkorff induction coil was driven by a special interrupter that could operate at up to 10kHz. The interrupter was driven by microscopic incisions cut in a phonograph cylinder, and modulation was achieved by connecting a carbon microphone in series with the antenna lead. With this setup, he was able to transmit speech over a distance of 1.5km in December 1900. What may have been the first intelligible voice message ever transmitted by radio was, "Is it snowing where you are, Mr Thiessen? If it is, telegraph back and let me know".

No spark transmitter could generate true CW, but Fessenden obtained a cleaner narrower-band signal by coupling a 3-phase alternator to a rotary spark gap with 48 electrodes, synchronised to fire in sequence on the positive and negative peaks of the output waveform. His station at Brant Rock, a small village near Boston, initially employed a steam engine driving a 35kVA alternator with a 1.5m diameter synchronous rotary spark gap. Unlike that of her elder sister ship *Olympic*, the 5kW Marconi transmitter of *Titanic* was also equipped with a synchronous rotary spark gap. This produced a distinctive musical tone, unlike the rougher sound of the asynchronous rotary spark gaps that were used at the time by many radio amateurs and most other Marconi stations.

In January 1906 Fessenden briefly established the first two-way transatlantic radiotelegraphy link, between Brant Rock and his station near Machrihanish on the

Dr Bruce Taylor, HB9ANY
bgtaylor@iee.org



The QRO Alexanderson alternator VLF transmitter at Varberg radio station in Sweden is still regularly on the air. (Photo courtesy SK6SAC).

Kintyre peninsula in western Scotland, but communication was sporadic and couldn't be maintained during daylight hours or the summer months. (At that time, Marconi was also still struggling to establish a reliable LF transatlantic radiotelegraphy service. He only succeeded after the huge 300kW disc discharger stations at Clifden and Glace Bay became operational in October 1907).

As in today's smartphone world, fierce legal battles over patent rights were commonplace in these early years, but many rivals also considered that intentional jamming was fair game. During one important demonstration of the Brant Rock system, competitor Lee de Forest hired an individual to operate a powerful arc in a building next to the station, blotting out reception. The individual was eventually located and bought off with liquor and food.

The Poulsen arc transmitter

The first successful CW transmitter was developed in 1903 by the Danish engineer Valdemar Poulsen, who is also credited with inventing magnetic sound recording. In his design the negative resistance of a burning arc maintained continuous RF oscillation in a tuned circuit that was connected directly across it. By applying a strong magnetic field perpendicular to the arc, frequencies up to 1MHz could be achieved, although the technique was most successful up to a few tens of kHz. For Morse telegraphy, FSK or absorption switching was used instead of on-off keying of the arc, precluding break-in operation. In 1905 Poulsen set up an AM phone station at his laboratory in Lyngby, from which Lorenz successfully transmitted speech over 370km to Berlin in 1909, using 12 carbon microphones in series to modulate the 5kW RF output.

The Poulsen arc system was introduced to Britain by Nevil Maskelyne, who founded a rival company to Marconi's and sparred with him frequently. History tells us that hacking did not begin with the internet: During Fleming's 1903 demonstration to the Royal Institution of the interference rejection afforded by Marconi's tuning system (the practical embodiment of his famous four-sevens patent of 1900), Maskelyne broke into his receiver from a transmitter on the roof of the nearby Egyptian Hall. Being quite deaf, Fleming carried on with his lecture, oblivious to the derisive interfering messages from Maskelyne that were amusing his audience.

In 1907, a UK radio amateur called Anthony Hankey demonstrated wireless telephony to the War Office with a portable Poulsen arc transmitter powered by a dynamo driven by a petrol engine. He successfully transmitted voice (and song) over 29km from Aldershot to Midhurst; but in the years prior to WWI, and unlike the Admiralty, the Army was reluctant to adopt wireless. In 1910, Leonard Fuller, who had become a radio amateur at the age of 16, built a Poulsen arc to replace the synchronous rotary spark transmitter at Cornell Radio Club, making what may have been the first CW amateur radio station anywhere in the USA.

Although the Poulsen arc transmitter generated CW, its output waveform was not sinusoidal, so that it had a large harmonic content that was difficult to filter out. To encourage rapid de-ionisation the arc operated in an atmosphere of hydrogen gas or alcohol vapour. It has been said that in some British ships equipped with these transmitters, the alcohol had to be adulterated to discourage any of the seamen from consuming it!

The Alexanderson alternator

While Marconi, Cross and others initially refuted the idea that significant radiation could be produced by a continuous sinusoidal alternating current, Fessenden pursued his concept energetically, and from 1903 he financed the development of RF alternators by General Electric (GE). Although the theory of alternators was well established, this was a challenging task in view of the high speed at which the machines had to be run, and the hysteresis losses at high frequency. This contrasted with Poulsen arc transmitters, which were straightforward to build, but difficult to scale and optimise because the physics of the arc plasma was not well understood.

Using a hybrid alternator/quenched spark configuration, Fessenden achieved radio telephony communication over 40km in 1904. Then in 1906, the Swedish-American engineer Ernst Alexanderson at GE succeeded in supplying him with an improved 50W 75kHz alternator with a rotor of unique design. This prototype machine was eventually upgraded to achieve an output of 500W, and after 1917 much larger versions achieved 200kW at 100kHz.

After the interruption for war work, Marconi negotiated the purchase of 24 Alexanderson alternators from GE. But just

History, Satellites, Microwaves, VH

The Cray Valley Years 1946-2016

A history of the Cray Valley Radio Society

by Bob Treacher
M0MCV

As the Cray Valley Radio Society celebrates its 70th anniversary this lavishly illustrated book captures the highs and lows of one of the United Kingdom's most well-known, and successful, amateur radio societies. From its modest beginning in 1946 to the highs of the wonderfully successful special event station for the London 2012 Olympic and Paralympic Games this book covers the history of this famous club. Learn why the Society took the unusual step of becoming a company limited by guarantee in the 1970s; share in the success and disappointment of field days and national and international contests; and obtain first hand appreciation of the Society's expertise in organising special event stations, not only on a local scale, but in the national and international arena. This fascinating read provides real insight into a club that also had prestigious and highly successful celebrations of the Millennium, HM Queen Elizabeth II Golden Jubilee, the bi-centenary of the Battle of Trafalgar, and more.

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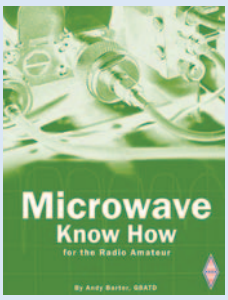

Microwave Know How

Edited by: Andy Barter, G8ATD

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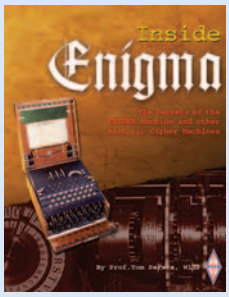

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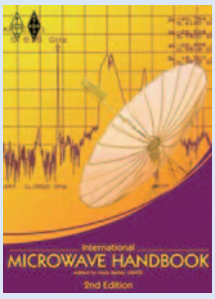

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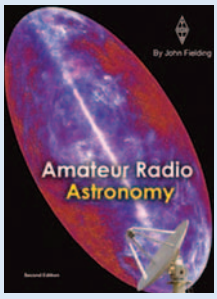

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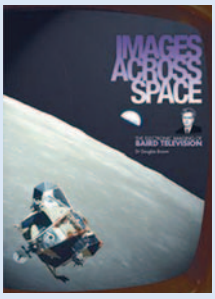

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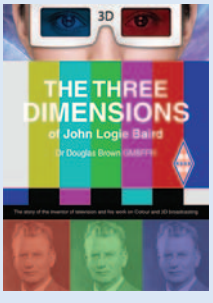

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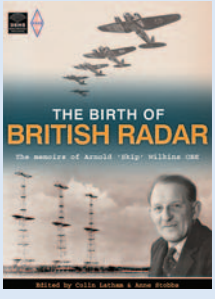

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By Philip Lawson, G4FCL

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Restoring Old Radio Sets is a practical guide that explains what you need to do and how to do it. You will find topics that include cleaning methods for electrical and mechanical parts, making typical electrical repairs and the process for performing live tests. There are sections on fault-finding methods and alignment & calibration of the working set. There are even useful guides to one of the major keys to completing a successful restoration - knowing how to treat the cabinet, be that - wood, Bakelite, or plastic. The tools, materials and techniques needed for your restoration are all discussed along with the care and maintenance of the finished item. Safety issues are not forgotten and the hazards inherent in such a restoration are discussed and what can be done minimise them.

Restoring Old Radio Sets provides a fascinating insight into the world of the radio set restoration. This book is one of the few available on this topic that is aimed at someone with a basic knowledge of electronics but wishes to restore an old set. Philip Lawson, G4FCL gives you the benefit of his knowledge, skills, and experience to help you undertake the job within a safe environment. Armed with this book, the reader should be able to tackle an old set, get it working safely and finish-up with a really attractive piece of domestic furniture.

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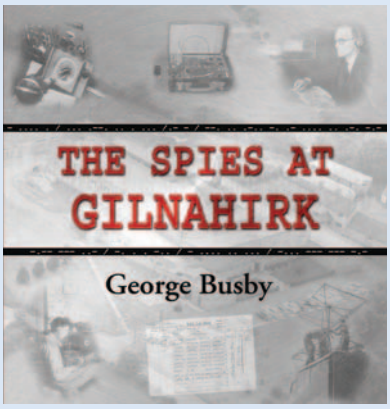

The Spies at Gilnahirk

By George Busby

Whilst many know about Bletchley Park's role in WWII breaking the Enigma codes, fewer know the hugely important role of the Y service and the many radio amateurs involved in the collection of signals in WWII. This book focuses on the Y service station in Gilnahirk in Northern Ireland and sets out the story of those radio amateurs involved and why Gilnahirk was such an important centre in the Y service operations.

Many who know about the Y Service will know that in WWII many RSGB Members became 'Voluntary Interceptors' who collected German signals at home and posted these logs to the mysterious PO Box 25, Barnet, London. For those in Northern Ireland, Gilnahirk was the final destination of PO Box 25 that collated the amateur logs along with the logs from the larger military 'Y' listening station, before they were telexed to the codebreakers at Bletchley Park. Operations carried out here were of the upmost secrecy and its work carried on well beyond WWII, despite the closure of Bletchley Park. The unpretentious buildings largely attracted little attention despite a burst of press attention in 1951 when the Ministry of Finance tendered for the construction of a radio station but refused to comment on who it was for. Working in utter secrecy until its eventual closure in 1978, the Gilanhirk site was heavily involved in collecting signals during the Cold War.

The Spies at Gilnahirk provides a fascinating insight into the activities of the Radio Security Service and this little known site at the core of the Enigma story. Recommended reading for anyone interested in WWII codebreaking and the Enigma story.

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HAMSAT

Amateur Radio Satellites Explained

By Pierluigi Poggi, IW4BLG

Since 1957 Radio Amateurs have been listening to artificial satellites. A mere four years after the launch of Sputnik, Radio Amateurs put their own satellite into orbit, thus beginning a series of amateur satellite launches that continues today with the CubeSat operations. *Hamsat - Amateur Radio Satellites Explained* sets out to give you details of what you need to know about Amateur Radio Satellite operation.

This book explains what is needed in an amateur radio ground station from the antenna through to the receiver. You will find rotator information for tracking the satellite, designs for pre-amplifiers and all manner of technical detail. There is a chapter dedicated to the ground station antennas, giving details of the performance of many commercially available systems.

For anyone interested in operating Amateur Radio satellites *Hamsat - Amateur Radio Satellites Explained* is the book to have. It provides a guide to the history through to what is possible.

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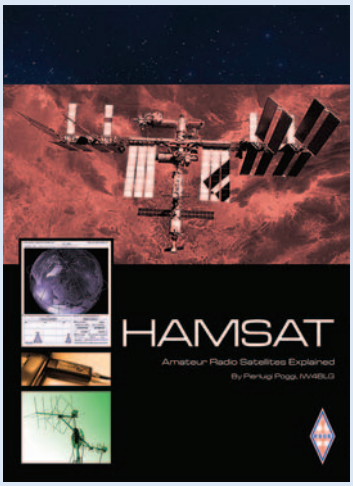
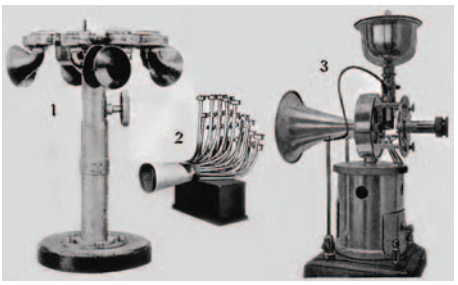




Ingenious high power microphones were devised for the direct modulation of antenna current: 1) Rotating turret type. 2) 20 microphone cluster. 3) Continuous carbon granules stream type.

Brant Rock shack in 1906. Adam Stein is on the left of the photo. The RF alternator is lower right, in front of the compressed air tuning capacitor. The receiver is on the left, the loudspeaker on the wall, and the high current telephone relay under the glass dome on the table.

before the contract was signed in April 1919, Stanford Hooper of the US Navy intervened to block the sale, because he feared possible domination of worldwide communications by the British company. Instead, he orchestrated the establishment of the Radio Corporation of America which, under David Sarnoff from American Marconi, was to become effectively the corporate instrument of US communications policy. Nevertheless, in 1920 GE did supply two 200kW alternators (out of a total of 20 manufactured) to upgrade the timed spark discharger transmitters at the Marconi station near Caernarfon in North West Wales. In the same year British manufacturers started the production of high power transmitting valves, and no more alternators were purchased by Marconi.

Initially there was such fear that the fast spinning rotors of Alexanderson alternators (up to 20,000rpm for 100kHz output) would fly apart that they were tested in a sandbagged bunker. But the alternators proved as reliable as a Swiss watch, and several continued to be used until well after WWII. The last transmitter at Grimeton in Sweden, which was in service until 1996, is still operated for special demonstrations, and on Christmas Eve every year, with callsign SAQ.

Amplitude modulation (AM)

In the days before AF (audio frequency) amplification by thermionic valves became possible, ingenious high power carbon microphone configurations were devised to directly modulate antenna currents of 20A or more. Fessenden is also known to have used a special high current telephone relay to modulate his alternator transmitter with local and remote telephones; and a condenser microphone to produce AM by detuning the antenna circuit. Water, oil, and forced-air cooled microphones were developed, as well as assemblies containing up to 20 carbon microphone cells with asbestos packing. Telefunken even attempted without success to use a cluster of 72 microphones to modulate directly 7kW of RF (radio frequency) power.

One design had a turret of four pairs of microphones that rotated 90° every two minutes to avoid any of them overheating, while another model continuously fed a stream of carbon granules from a hopper through the microphone cell into a collection cup. (At regular intervals, the contents of the cup had to be emptied back into the hopper). Later, ferromagnetic amplifiers were used to modulate RF outputs of over 50kW, as well as to regulate the speed of Alexanderson alternators to control the carrier frequency.

Transatlantic telephony

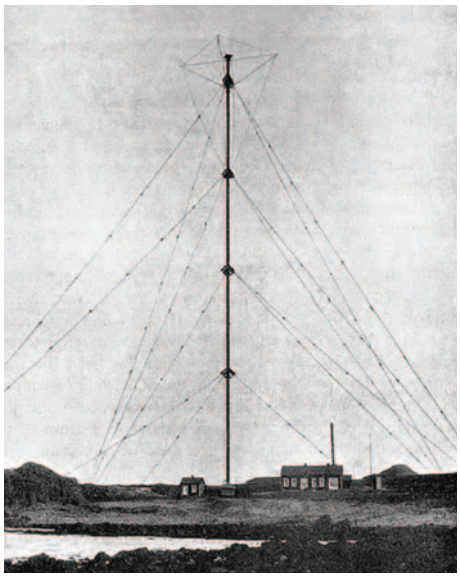
With their alternator running at about 60kHz, operators at Brant Rock regularly used AM phone to communicate with a testing station at Plymouth, some 16km away. In the autumn of 1906, Adam Stein at Brant Rock was instructing an operator at Plymouth how to run his alternator. He was astonished to learn some time later that his audio transmission had been heard so clearly across the Atlantic at Machrihanish that his voice could easily be recognised. To avoid premature disclosure of this achievement to the cable companies, what might be termed a 'direct QSL' reporting the reception was sent to the USA from Scotland by registered post.

This was nine years before AT&T claimed the first successful transatlantic telephony with highly publicised test transmissions from Arlington to the Eiffel Tower. But on 5 December 1906, due to faulty guy-wire jointing, the 126m hollow tubular mast at Machrihanish collapsed in a severe gale, and it was never re-erected.

AM broadcasting

In January 1932, Fessenden belatedly claimed that he and his associates had made the world's first public wireless broadcast of speech and music from Brant Rock on Christmas Eve 1906. A phonograph recording was transmitted, and Fessenden made a speech and played the violin. The programme, which was repeated on New Year's Eve, was said to have been received by the operators of Fessenden stations on several ships along the Atlantic seaboard and in the Caribbean. From 1907 de Forest promoted the idea of broadcasting, and in order to boost sales of his radio apparatus, he made regular broadcasts of speech and music from 1915. But Fessenden, Marconi, GE, Telefunken, the GPO, the private telephone and telegraph corporations, and later major players such as RCA, all failed to foresee that public broadcasting would in due course become a huge activity compared with the narrower field of point-to-point radio communications.

Instead, it was the Pittsburgh radio amateur Frank Conrad who started the broadcasting revolution, when in April 1920 he began playing phonograph records on a regular basis from his garage station 8XK. Westinghouse soon saw the commercial possibilities, set up transmitter KDKA with a PA (power amplifier) of six 50W valves, and gave birth to what would rapidly grow to become a vast new industry. In Britain, many radio amateurs were broadcasting entertainment by 1921, although this was outside the terms of their GPO licences. In January 1922 official permission was finally granted for 2MT to broadcast regular concerts from Writtle, and this paved the way for the start of national broadcasting by the BBC later that year.

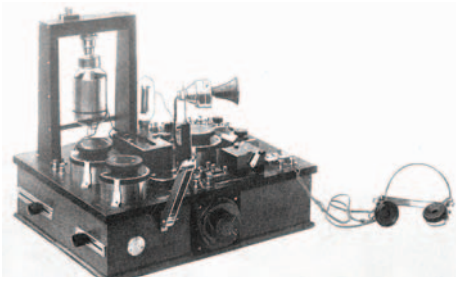


The first transatlantic AM phone signals were received at this station near Machrihanish in November 1906. It was possible to climb to the top of the 126m hollow mast by an internal ladder.

Detectors

During the early years of wireless, inventors developed a wide range of detector technologies, such as different versions of Branly's coherer, the magnetic detector, and the hot-wire barretter. Many of these devices were designed to detect Morse signals from spark transmitters; so they had bistable characteristics and were not suited to the demodulation of speech. Fessenden's electrolytic detector was one of the most sensitive of these early instruments, although Marconi continued to use the more rugged magnetic detectors until he began to adopt valves from 1912. *Titanic* was equipped with a Fleming diode valve receiver as well as the standard Marconi 'Maggie' and multiple tuner.

The simplest demodulator for AM phone signals is an envelope detector comprising an HF (high frequency) rectifier followed by a low pass filter and DC block. Karl Braun (who also invented the CRT (cathode ray tube) oscilloscope and phased array antennas) had observed the rectifying properties of a point-contact diode as early as 1874. Semiconductor physics wasn't understood at that time, and experimenters such as Greenleaf Pickard tried thousands of crystal and metal materials to find the best 'cat's whisker' detectors by trial and error. Had Pickard stumbled upon the point-contact transistor configuration during this work, the entire course of electronics during the first half of the 20th century would have taken a profoundly different course. In view of the cost, unreliability and high frequency limitations of early diode valves, it was crystal and carborundum detectors that initially drove the democratisation of wireless.



The production of Henry Round valves by Ediswan allowed compact AM phone rigs to be made. This elegant British 1914 set had a 10W T.N. valve oscillator (in the frame), and the receiver had a C valve regenerative RF amplifier followed by a carborundum detector.

Heterodyning

Several methods were used to render CW Morse signals audible in early receivers, such as the crossed gold-wire 'tikker' interrupter devised by Peder Pedersen, a colleague of Poulsen. Fessenden invented the heterodyne method, patented in 1902, and that remains ubiquitous in amateur radio to this day. But he was initially without a signal source to implement a stable HF BFO (beat frequency oscillator). (Although de Forest invented the triode in 1906, the principle of positive feedback that led to the electronic oscillator and Autodyne receiver wasn't discovered until 1912). Despite the rather broad spectrum of the Poulsen arc, Fessenden used it as the local oscillator in a direct conversion receiver that was adopted by the US Navy.

Of course, the heterodyning principle came into widespread use after the invention by Edwin Armstrong, Lucien Lévy and others of the superhet, and the rapid expansion of radio broadcasting during the 1920s and 30s. As a result, Fessenden's heterodyne patent, then controlled by Westinghouse and cross-licensed with RCA, became very important indeed, and it was the object of a storm of litigation, but it withstood repeated challenges in the courts.

The electronic age

Spark gap phone transmitters were of mediocre quality, while arc transmitters and RF alternators were restricted to the lower part of the spectrum. The key innovation that eventually made short wave phone operation readily accessible to radio amateurs was the invention by de Forest of the 'Audion' triode valve, which he patented in 1907, although it became apparent during the lengthy court battles with Armstrong over regeneration that he had only a rudimentary understanding of how it worked.

The early gas ionisation Audions were fragile, erratic in performance, and had a short filament life. It was not until Irving Langmuir developed the 'Pliotron' high-vacuum triode in 1913 that thermionic valves became really useful for CW oscillation, signal amplification and modulation. In that year, the first edition of *Wireless World* was published, and the London Wireless Club, forerunner of the RSGB, was founded with a Membership of four people. (By 1924 the RSGB had over 1,000 Members, and today there are around 22,000).

The hiatus for WWI was initially followed by a period of restrictive regulation in Britain. In October 1919 receiving was authorised again, but special permission from the PMG was required to use thermionic valves, which Ediswan had been manufacturing near Enfield since before 1916. Valves were hand-built and expensive, and some amateurs procured them from pirate manufacturers such as Elmer Cunningham, who initially made counterfeit triodes without a licence. But in 1920, Stanley Mullard started the production of transmitting and 'R' valves in Britain, prices began to fall, and the electronic age of amateur radio began.

When the first comprehensive post-war amateur station listing was published by *Wireless World* in August 1921, it showed that almost half of the stations were already equipped for phone operation, allowing more natural social contacts. Spark transmissions soon disappeared from the amateur bands, and were prohibited in Britain from 1924; while in the same year UK and US amateurs made the first transatlantic telephony contacts on a wavelength of 100 metres. The extraordinary journey from spark to speech had taken just 20 years of exciting invention, experiment and discovery.

Recommended reading

M Raboy, *Marconi,* Oxford University Press, 2016, ISBN 9780199313587

F Seitz, *The cosmic inventor: Reginald Aubrey Fessenden (1866-1932),* American Philosophical Society, 1999, ISBN 9780871698964

H G J Aitken, *The continuous wave: Technology and American radio, 1900-1932,* Princeton University Press, 1985, ISBN 9780691023908

V J Phillips, *Early radio wave detectors,* IEE, 1980, ISBN 9780906048245

E Richards, *Centenary: 100 years of working for amateur radio,* RSGB, ISBN 9781905086894

Notes

[1] For brevity, I have used the abbreviation CW for continuous wave in its original literal sense, not its present-day signification of Morse code signalling as against phone operation.

All the photos are author's own or in the public domain, with the exception of that which is credited to SK6SAC in its caption.

Gilnahirk revealed

Saturday 6 May saw the activation of a special event station, GB0GLS, to commemorate the role played by the Gilnahirk Listening Station from WWII onwards.

The Gilnahirk Listening Station, as it was known locally, was a Y Station that was in operation from 1940 to the end of the Second World War. Afterwards it continued to 1978 as part of GCHQ. The station played a vital role in intelligence gathering for Bletchley Park.

The inspiration for initiating the event was a combination of childhood memories of the station and reading George Busby's fascinating book, *Spies at Gilnahirk* [1].The role played by local Voluntary Interceptors serving King and Country during wartime should be remembered, many of whom worked at the station during the Cold War period, details of which are still classified to this day.

Today the site of the radio station is occupied by 14 luxury apartments within a gated enclosure, but the present building looks surprisingly like the original station building. Building planners insisted that the new building occupied the same footprint and followed the same style and appearance. The residents are aware of the site's heritage and were keen to invite amateur radio enthusiasts in to relive the site's secret history. A local landowner also cooperated and helped to make the event a tremendous success.

Roger Bradley, George Busby, author of *Spies at Gilnahirk* and two former employees.

GB0GLS

The event involved two of Northern Ireland's amateur radio clubs, Antrim & District ARS and Mid Ulster ARC. They provided operating teams to cover SSB, FM and CW operation, antenna towers, power supplies and radios and, not least, catering for the day.

We were blessed with good weather and everyone enjoyed a very successful day of operation with some 165 contacts being made, of which 35 contacts were in CW. Some twenty five countries were reached including Canada and America. The general public was also reached via the services of BBC Radio Ulster, who interviewed George Busby and William Bradley of Antrim & District ARS the previous day.

Two operating sites were used, one of which was within the grounds of the original station that added to the poignancy of the occasion. Both clubs demonstrated just what can be achieved through cooperation and planning. Friendships were renewed and new friends made in the course of developing and building working relationships for a common purpose, the promotion of amateur radio, while at the same time enjoying time spent in sunny rural County Down.

The replacement building seen here appears not dissimilar to the original listening station.

The amateur radio station at the National Radio Centre in Bletchley Park, GB3RS, did try to make contact and while they believed that they heard our station, unfortunately conditions did not permit a successful QSO. The station did however make contact with a G0 amateur who worked in Gilnahirk during the 1960s. He has been put in contact with George Busby, who still researches the site's secret past.

It is hoped that this could become an annual event to mark the role played by Gilnahirk and amateur radio enthusiasts throughout Northern Ireland who volunteered as voluntary interceptors during the Second World War. Gilnahirk was Northern Ireland's best kept secret!

Roger Bradley, MI0WWB operating GB0GLS at the Gilnahirk site.

Reference

[1] Available from the RSGB via www.rsgbshop.org

Roger Bradley, MI0WWB
w.r.bradley@btinternet.com

Book Review

More Arduino Projects for Ham Radio

by Glen Popiel, KW5GP

What is an Arduino? There are many answers, but most boil down to 'different sizes of programmable little boards and accessories that you can do all sorts of magic with'. But just as magic requires specific incantations and potions, so does an Arduino board in order to make it do something useful. That's where this book comes in.

Once you get your head around the terminology, such as not all Arduinos are called Arduino, programs are called 'sketches' and expansion boards are 'shields', it all starts to make sense. I was amazed at the number of shields the book mentions – from simple current shunts to colour LCDs to full-on direct digital synthesisers and even a couple of complete multi-band amateur transceivers. I learned that there are huge libraries of sketches out there, meaning that as often as not you can simply pick up someone else's code and glue it together, Lego-block style, to make the incantations you require. And if it doesn't work, it's all re-programmable and easy enough to try again.

What this book does is show you how you can use bits chosen from the Arduino ecosystem and put them together in a range of ways to make projects useful for the average amateur – and hopefully learn some new things along the way. There are 15 well described, practical projects, including a voice memory keyer, 1-30MHz direct digital synthesis variable frequency oscillator, antenna SWR analyser and a 40m QRP JT65 transceiver, to name but a few.

It's nice to see that each project is presented in a fully functional manner, yet leaves you with options open to add your own personalising finishing touches. I'm not talking about simply deciding what colour the LEDs should be, but real, functional changes that can make a difference to how the projects work and integrate them into your specific environment. Much of the thickness of the book comes from the fully documented incantations, sorry, sketches, that make the various items work. Whilst really useful for understanding what's going on, it's also refreshing to see that to save typing the code the sketches can all be downloaded, free, from the ARRL website.

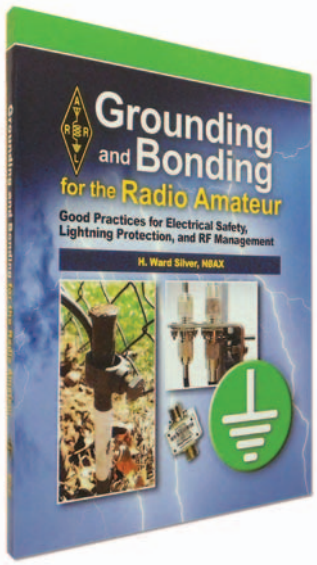
A couple of the wireless projects use ready-made RF modules on the US 915MHz band; it would be wise to adapt these to their 433MHz-band equivalents because frequency allocations differ here. The text does cover this and even uses modules that have 433MHz equivalents.

This book is the second in a series and yet an excellent introduction to the world of Arduino: it spells everything out as it goes along and teaches you without you even realising you're leaning. Although this is a big book at 500 pages, which makes it a little pricey, I think it's well worth it for a volume that offers so much.

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

Grounding and Bonding for the Radio Amateur

by Ward Silver, N0AX



This book prompted a discussion in the office. On the one hand, it is interesting to see how grounding and bonding is handled on the other side of the Atlantic. On the other hand, many of the practices are very different from those suitable for UK electricity supply conditions (and may be dangerous and/or illegal here). But on the third hand, there is much other interesting information – for example about lightning protection – that is mostly universally applicable. What to do? It's understandably selling like hot cakes in the States and we have had numerous enquiries about it here, too.

This book gives an intriguing insight into how a rather different electrical distribution system works and many parts are useful regardless of supply differences. The chapter on RF Management is excellent even if some diagrams are a little US specific. The Good Practice Guidelines chapter also contains a wealth of information that is applicable internationally. I was astonished to learn from an appendix that the US has at least 13 types of standard 240V socket configurations ranging from 15A to 50A – and that's in addition to the familiar two flat blade type for 120V.

Overall, the book contains some very interesting material, a good proportion of which 'travels'. There is no doubt that this is an excellent book about electrical practices in the USA, however the book should *not* be used as a how-to guide for British electrical conditions because it is not intended for that. We are therefore pleased to say that John Woodhouse, G6GPF has kindly put together some UK-specific notes on the book, which are well worth reading. You can find his notes on the Books Extra page on the RSGB website at www.rsgb.org/booksextra

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

Giles Read, G1MFG
giles.read@rsgb.org.uk

Passive I/Q for HF – twisted wire revisited

Back in 2002 Leif, SM5BSZ described a simple test unit for a VHF software defined radio (SDR). It was just a pair of SBL-1 mixers and a few resistors and capacitors. A quarter wave stub in the RF path achieved a near 90 degree phase split. Audio processing was left entirely to the computer. It was a step towards what Rick Campbell, KK7B once described as an "I/Q crystal set". Rick and others often used a similar approach to the initial mixer circuit, which would be followed by analogue audio phase shift networks.

Since the SoftRock receivers appeared in 2005, the standard low cost approach to SDR has involved an oscillator at four times the reception frequency followed by digital dividers to produce an accurate phase shift. Once direct digital synthesisers (DDS) became cheap and plentiful the need for a variable high frequency signal source ceased to be a problem.

So why dig up an old idea?

Two reasons: first, that it can be convenient to use a single master oscillator for a QRP transmitter and its companion receiver. That is easier if all signals are managed at baseband. Secondly, in a digital age it is stimulating to look back at some classical analogue circuits.

Joe Taylor's *WSPR 2.1* program has an 'I/Q mode' that takes quadrature audio signals and applies automatic phasing and gain adjustment. This means that if a simple SDR receiver shares the same oscillator as a WSPR transmitter (such as the QRP labs Ultimate 3), it is possible to receive and report WSPR signals as well as sending them out. An added bonus of the U3 series [1] is that frequency and timing can be stabilised with GPS.

Leif's unit was designed for 144MHz, where the use of a quarter wave line (~50cm) was an option for phase shift. For lower frequencies something else was clearly required to avoid unmanageable cable lengths. The choice was the Reed Fisher [2] LC hybrid branch coupler, shown in **Figure 1**. It is well discussed in [3]. There are numerous references to variants on the web, including useful descriptions in several US patents. Two in-phase windings

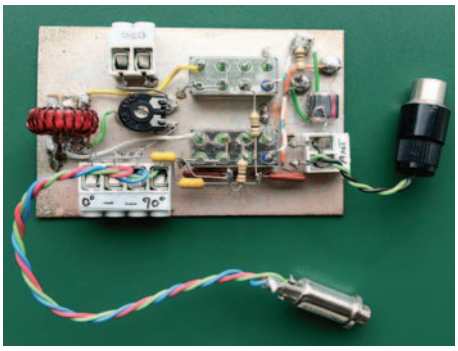


PHOTO 1: A prototype board (see text).

are made on a ferrite core so that at the centre frequency each has an inductive reactance of 50Ω. The two capacitors have a reactance of 100Ω each and the actual values are chosen to allow for inter-winding capacitance of the bifilar inductor. The circuit is spare but elegant and a full understanding of how it works is a useful refresher course in phasing theory. For now we just need to know that at the centre frequency (*f0*), when there is a matched 50Ω load at each port, a signal applied to port 1 will be transferred equally to port 2 and port 4, where the phase difference between the resulting two signals will be 90 degrees. This phase difference will be maintained over a wide range of frequency, but the proportion (and hence the amplitude of the signal appearing at the two outputs) will vary as the applied signal deviates from *f0*.

So, would it be possible to use this hybrid as part of a useful 'front end' for a simple minimalist SDR covering 3.8 – 7.2MHz, feeding I/Q audio to a computer sound card?

Paul Chominski, WA6PY – who has done pioneering work on these – kindly responded to an enquiry by suggesting that if coverage of an octave was required, then a 3 section wide band LC coupler would be best. This should be placed at the LO inputs rather than the RF ports, as they are less sensitive to amplitude ripple and mismatch. An in-phase splitter would be needed at the RF input. In the interest of extreme simplicity Paul accepted, apparently without a wince, that a single branch splitter might be tried.

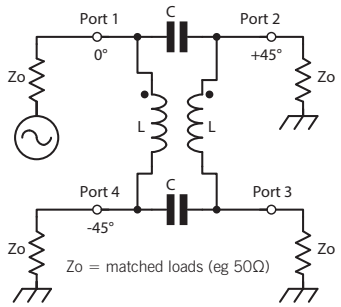


FIGURE 1: Four port twisted wire quadrature hybrid.

The test circuit

Figure 2 shows the circuit diagram and **Photo 1** a prototype board. As mentioned earlier, the RF and LO ports should see, as near as possible, a 50Ω load.

A doublet antenna and matching unit feed RF to the in-phase splitter, T1. The oscillator

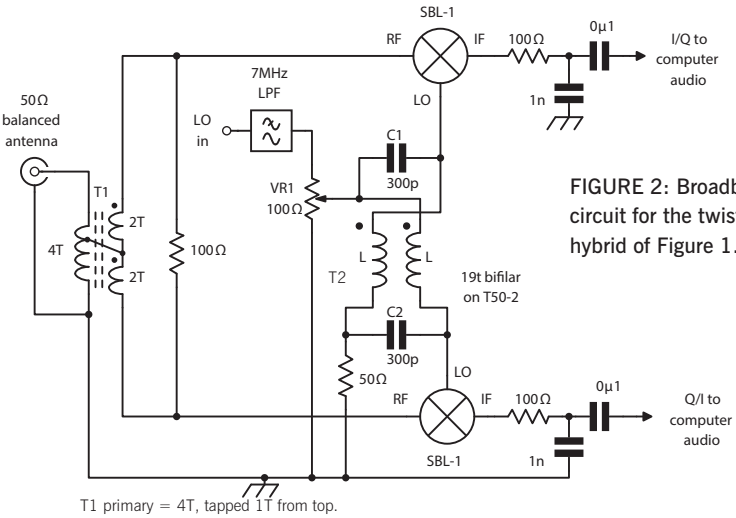


FIGURE 2: Broadband test circuit for the twisted wire hybrid of Figure 1.

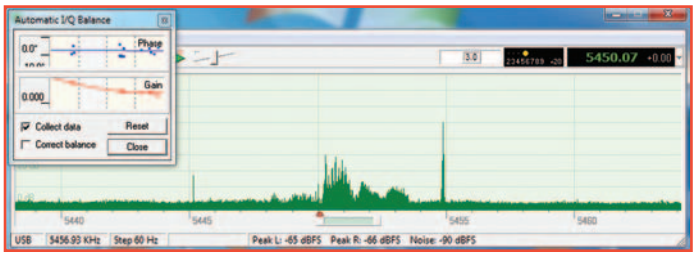


FIGURE 3: USB signal just to the right of the central spike. The LSB is barely visible. An image of the 50dB signal near 5455kHz is seen about 10kHz below, showing just over 30dB suppression.

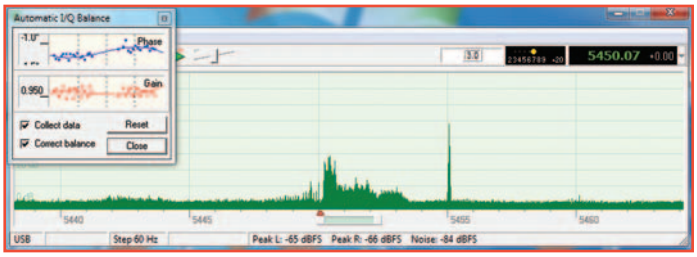


FIGURE 4: Apart from a little noise around the central spike there is no sign of the LSB. The image of the 50dB signal has disappeared. Suppression of at least 50dB with the automatic I/Q balance.

is more of a problem and the usual square wave DDS will need a filter. A 7MHz low pass filter (LPF) was used, based on the values given in the technical pages of the G QRP Club website. Wire gauge and pitch of the bifilar windings is not critical. I used 28 SWG and about 6 twists per cm.

As in Leif's original circuit the IF ports are not terminated in 50Ω loads but with matched low pass filters to cut down LO and RF leakage to the audio board. The RF in-phase power splitter shown is not ideal for the LF bands but causes less loss than a resistive divider. Values for C1, C2 and L are the ones used in the broad band tests. The original intention in using a 100Ω trimmer (VR1) was to allow adjustment of the resistive load presented by the local oscillator, however it will also affect the amplitude of the LO signal and probably also skew the hybrid phase shift. The extent to which each of these occurs will vary with the frequency of operation. In practice VR1 is simply adjusted for best suppression of the unwanted image on 40, 60 and 80 metres.

Construction

One prototype was built on copper scrap and another on perf board. SBL-1 mixers were used simply because I had several to hand; this governed the overall size. A far smaller unit could be made if surface mount ADE-1 mixers were used. These are only 8mm long, plus they have lower conversion loss and better LO – RF isolation. Building could hardly be simpler and of course no PSU is needed!

Testing and initial results

Assessment was made with a desktop PC with a Delta 44 soundcard and an Acer Aspire laptop that has stereo input and 2GB of RAM. Both used Windows 7. Each machine supported *WSPR 2.12*, *Rocky*, *HDSDR* and *KGKSDR*.

DDS oscillators tried included the K5BCQ / K5JHF kit (Si570-based) and Hans Summers' U3 kits (AD9850 and Si3551), all with similar results. An output of 3V peak to peak is adequate.

The first test looked at the audio signal on the *Rocky* screen with the software phase adjuster switched off. In the UK a reliable USB weather station can be found in the 5.0 to 5.5MHz range at virtually any time of day, so the oscillator was set to the precise frequency of one of these. With no sideband suppression, symmetrical audio patterns would be seen on either side of the screen centre. By adjusting VR1 it was generally possible to lose the lower sideband (LSB) completely. A signal generator was then used to make a more precise measurement of how much suppression could be achieved, shown in **Figure 3**. The effect of adding the software I/Q and phase balance is seen in **Figure 4**. The unaided sideband suppression measured at 7.15MHz, 5.5MHz and 3.5MHz was 45dB, 35dB, and 25dB respectively. With software balance, levels of 70dB were measured.

At this stage it is easy and instructive to substitute different RF splitters and to experiment with other values of inductance and capacitance. The standard formulae for reactance are straightforward but care is needed with the units. Suitable values for the three individual bands would be as shown in **Table 1**.

Without making elaborate claims, this setup with just a variable frequency oscillator (VFO) and a laptop can make for an interesting general coverage receiver for checking what is around on the lower HF bands. It works fine for WSPR (see **Figure 3**) and, presumably, other data modes. Used with the Eden DSP receiver from Cumbria Designs **[4]** it gave a satisfying attenuation of the unwanted sideband on each band.

Finally, this circuit is bi-directional, which raises the possibility of a flea-power transmitter. On WSPR, microwatts can go round the world so perhaps an entirely passive mixer unit would be worth thinking about. It would certainly need more sophisticated RF filters, but is another project entirely.

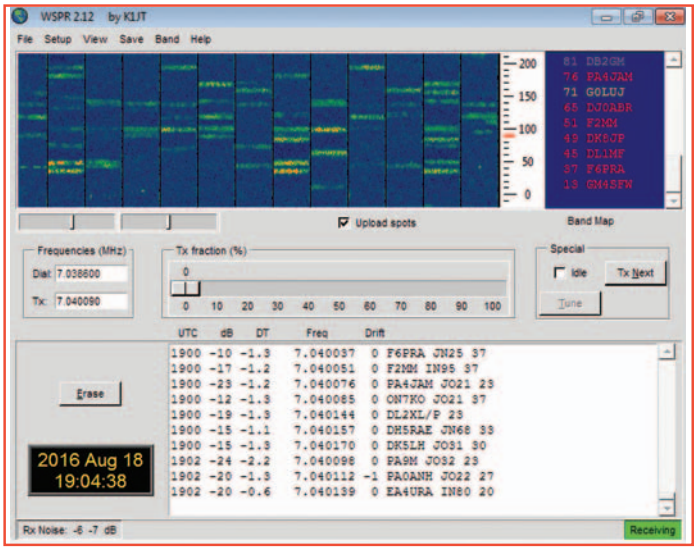


FIGURE 5: *WSPR* signals recorded on my Acer laptop using the passive I/Q demodulator.

TABLE 1: Suitable component details.

Band	C1 & C2	L	Bifilar turns on T50-2
80m	390pF	2.18μH	21
60m	300pF	1.5μH	17
40m	220pF	1.1μH	15

Websearch

[1] http://qrp-labs.com/vfo
[2] Twisted-Wire Quadrature Hybrid Directional Couplers, Fisher, R; *QST*, January 1978, p 21-23
[3] *Experimental Methods in Radio Frequency Design*, ARRL, 2003 (reprinted as a 'Classic Reprinted Edition', 2016)
[4] www.cumbriadesigns.co.uk/DSP.htm

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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 details of meeting. Example: Fraser Road Radio Club, Region 9, Steve, M1ACB, 01234 832 700, 29 Oct, On the Air. We normally acknowledge all submissions 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 August issue is 22 June and for September it's 27 July. 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
Caravan Rallies July: Llandrinio

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

British Railways Amateur Radio Society m0zaa@brars.info, www.brars.info
Net Friday 1600 on 3.685MHz

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

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

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

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

Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723
1-2 VHF Field Day
7 Normal club night
29-30 RSGB IOTA Contest from Tiree

Livingston & District ARS
Cathie, 2M0DIB, 01506 433 846
4, 11, 18, 25 Operating

Lothians RS
Mike, MM0MLB, secretary@lothiansradiosociety.com
1-2 RSGB VHF NFD, Gatehouse of Fleet
12, 26 Informal Pub Night, 'wee' Bennet's Bar

Stirling & District ARS
Lyndsay, MM6KEO, 0778 688 5566
6, 13, 20, 27 General amateur radio shenanigans

Wigtownshire ARC
Lance, 2M0HEO, lancedavisedmonds@gmail.com
6, 13, 27 Club night
20 Talk on SOTA

The next three deadlines are 22 June, 27 July & 24 August

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

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

Dundee ARC
Martin, 2M0KAU, 0776 370 8933
2, 11, 18 VHF /Practical hands-on/activity
25 Talk

Glenrothes & District RC
Tam, MM0TGB, 0775 3526 498
5 Caravan and generator checks
12-26 Club closed for summer break

Perth & District ARG
Ron, mm3ygi@gmail.com
24 Normal club night, all welcome

REGION 3: NORTH WEST

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

Bolton Wireless Club
boltonwireless@gmail.com
10 DMR, Robert, M0NVQ

Chester & District RS
Bruce, M0CVP, 01244 343 825
1-2 RSGB VHF NFD at Cheshire View
4 Dayton Hamfest update
18 Bring and tell evening
25 Pie & pint night, The Plough, Waverton

Isle of Man ARS
iomars@manx.net
11 Antenna workshop

Macclesfield & District RS
Greg, M0TXX, info@gx4mws.com
3 Shack on the air
10 Film night
17 National Park Week by M0PAI
24 How to build a 20m trap
31 Equipment maintenance night

Mid-Cheshire ARS
Peter, G8HAV, 0791 931 5547
1-2 VHF NFD

South Manchester R&CC
Ron, G3SVW, 01619 693 999
6 Using your AVR, G8RSI
9, 16, 23, 30 HF net 3,636kHz, 10.15am
13 Panadapter update, G0BHP
20 Shack night
27 Spectrum analysers and their use, G4MVU

Stockport Radio Society
Heather, M6HNS, 0750 690 4422
4 Society meeting
9-10, 16-17, 23-24 Foundation class weekend
11 Club net, 51.550MHz FM at 7.30pm then QSY
13 Club net, 7.30pm, 145.375MHz
18, 25 Radio/Skills night

Thornton Cleveleys ARS
John, G4FRK, 01253 862 810
1-2 VHF NFD
10 Natter night/practical club on air
17 Fox hunt
24 Ships of the Royal Navy, Ken, G3RFH
31 Video: HK0NA, Malpelo Island

REGION 4: NORTH EAST

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

Angel of the North ARC
Nancy, G7UUR, 01914 770 036
3, 10, 17, 24 On the air; Advanced course
31 On the air; Advanced exam

Colburn & Richmondshire District ARS
Colin, 01748 876 391
13 50MHz contest and/or club radio
27 Richmond School Radio Club

Denby Dale RC
Darran, G0BWB, 0797 442 3227
2, 9, 16, 23, 30 Net via GB3HD, 10.30am
5 Amateur astronomy across the spectrum, Robert Williams
19, 26 Club night / night on the air
29-30 IOTA Contest from Lindisfarne

Durham & District ARS
Michael, G7TWX, dadars@dmx.com
1-6 GB13COL: 13 Colonies SES
5, 12, 19, 26 Club night
6, 13, 20, 27 Net, 145.475MHz, 7.30pm

East Cleveland ARC
Alistair, G4OLK, 01642 475 671
2 Technical forum
9 General discussion evening
16 Radio magazines evening
23 Want it or fling it night
30 Social pint and chat

Ripon & District ARS
David, G3UNA, 01423 860 778
6, 13, 20, 27 Club night

Sheffield & District Wireless Society
Krystyna, 2E0KSH, 0788 406 5375
5 RSGB VHF Propagation video
12, 26 Training, social and technical
19 UHF fox hunt

Sheffield ARC
David, G6DCT, littlewood20@btinternet.com
3, 17, 31 Club night
10, 24 Shack night

Spen Valley ARS
Russell, G0FOI, 01274 875 038
6 Testing newly donated equipment
20 On the air

REGION 5: WEST MIDLANDS

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

Bromsgrove & District ARC
John, G4OJS, 0788 9678 7303
28 Demo: WSPRlite and *DXplorer*

Burton ARC
Mike, 2E0EZG, info@Burton-ARC.co.uk
2, 9, 16, 23, 30 net, 10am, around 145.575MHz
5, 12, 19, 26 Club night
6, 13, 20, 27 Net, 8pm, around 145.575MHz

Cheltenham ARA
Derek, G3NKS, 01242 241 099
1-2 FD & BBQ celebrating club's 40 years
2, 9, 16, 23, 30 Net 8.30am 50.220MHz USB

4, 11, 18, 25 QRS CW net, 3540-3550Hz, 8pm
18 Lunch
20 Two short talks

Coventry ARS
John, G8SEQ, 0795 877 7363
3, 10, 17, 24, 31 Open net, 145.375MHz FM and/or 7.16MHz ± QRM SSB, 8pm
6, 13, 20, 27 Open net, 50.175MHz SSB, 8pm
7 K4ERO antenna
14 Castles on the Air from Kenilworth Castle
21 Chernobyl video
23 GB4BLC at 30th Signals Gamecock Barracks
28 G2FDC DF Trophy 3rd round

Dudley & District ARS
Graham 2E0GIJ, 0783 120 1407
29-30 Seven Valley Railway

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595 daytime
3 Contesting for beginners, Dave Tunnicliffe
5, 12, 19, 26 Net, 7.30pm, 145.475MHz FM
6, 13, 20, 27 Net, 7.30pm, 145.475MHz FM, then 80m SSB
7, 14, 21, 28 Net, 7.30pm, 432.220MHz USB
9 Visit G1EDP at Coleford
10, 17 DF hunt and informal at the school
24 No meeting

Malvern Hills RAC
Dave, G4IDF, 01905 351 568
11 VNA workshop
25 Informal meeting

Midland ARS
Norman, G8BHE, 0780 807 8003
5 Open meeting, training classes
12 Committee meeting and training classes
19 Ragchew; open forum; training classes
26 Shack on the air, open meeting, training

Mid-Warwickshire ARS
Don, G4CYG, 01926 424 465
11 RF measurements, M0OAE
25 Anything goes

Nuneaton & District ARC
Neil, M0NKE, info@ndarc.co.uk
1-2 RSGB VHF Field Day
6, 13, 20, 27 Club net, 9.30pm, 145.475MHz
7 Pint & chat, The Harvester, 7.30pm
21 VHF NFD recap & on the air night

Rugby ATS
Steve, G8LYB, 01788 578 940
1-2, 8 VHF NFD/Review
4, 11,18 UKAC
15, 25 Shack on air, HF/VHF
22 Committee and open meeting
29 Using IC-7300 and FT-101ZD for IOTA

Salop ARS
salopamateurradio@gmail.com
1-2 VHF NFD
4, 11, 18, 25 CW net, 4.30pm, 144.070MHz
5, 12, 19, 26 Club net, 8.30pm, GB3LH
6, 13 Committee meeting/natter night
20 Foxhunt #3 (mobile)
27 Shack night with G3SRT on the air

Solihull ARS
SolihullRadioClub@gmail.com
6, 13, 27 Club net, 145.450MHz, 8pm
20 Club night

South Birmingham RS
Gemma, M6GKG, gemmagordon.m6gkg@gmail.com
3, 10 Work in the shack
4, 11, 18, 25 Coffee morning in the shack, 11am to 1pm, visitors welcome
6, 13, 20 Training classes with G8OWL
7, 21 Sorting rally stock for Telford Hamfest
14, 28 Aerial and equipment checks
31 Open meeting and rag chew

Staffordshire Portable ARC
Lynn, M6LIN, 01922 449 668
1-2 NFD, Donative Farm
8 Pelsall Carnival
11, 25 Club meeting
15 Bolehall Manor
22-23 Chasewater
29 Portable

Sutton Coldfield ARS
Robert Bird, rob2e0zap@gmail.com
1-2 VHF NFD
3, 17, 31 Open net, 7.30pm, ±145.250MHz
10, 24 Club meeting
11 Open net, 7.30pm, 70.475MHz FM
15 Middleton Village Fete, 1pm
25 DMR open net, 7.30pm, GB7FW slot/local2

Telford & District ARS
John, M0JZH, 0782 473 7716
1-2 VHF Field Day
5 Committee meeting & GX3ZME OTA
12 2nd fox hunt
19 Marconi/50MHz Trophy & Field Day debrief
26 Richard Wilkinson talk

Wythall Radio Club
Chris, G0EYO, 0771 041 2819
1 RSGB VHF NFD, club BBQ and social evening
2, 9, 16, 23, 30 Club net, 8pm, 145.225MHz or GB3WL
4, 11, 18, 25 Morse class and club night
7, 14, 21, 28 Nibbles night in the shack, 7.30pm
9 Plug and play day (Wx permitting), 10am
11 Committee meeting
31 Curry night

REGION 6: NORTH WALES

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

Dragon ARC
John, MW0JWP, 0751 503 1025
3 Radio quiz, John, GW3GUX
17 RF historic dates, Simon, MW0NWM

North Wales Radio Society
Liz, GW0ETU, 0776 019 0355
6 General meeting
13 Technical topic
20 Visit to Police Control Centre in St Asaph
27 Night on the air

REGION 7: SOUTH WALES

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

Aberkenfig Radio Club
Ian, 2W0ITT, 01639 617 439
6, 13, 20 Club meeting
19 Western Valleys RAYNET meeting
27 Club raffle

Aberystwyth & District ARS
Ray, GW7AGG, 01970 611 853
13 HF on the air and barbecue
27 Net on 145.500 then 145.550MHz

REGION 9: LONDON & THAMES VALLEY

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

Aylesbury Vale RS
vic@rakewell.com
12 How I got into flying, Vic, G6GDI

Bracknell ARC
David, M0XDF, M0XDF@Alphadene.co.uk
5, 19, 26 Open net, 8pm, 145.375MHz
12 BBQ, David Ferrington, M0XDF

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

Edgware & District RS
Mike, G4RNW, 02089 500 658
13 RAOTA explained, G0PQB; Up the Amazon, G4RNW
27 Reform Club lecture, Steve, G0PQB

Newbury & District ARS
Rob, G4LMW, 0797 088 5614
22 Summer barbecue

Shefford & District ARS
John Burnett, john@hobart-europe.co.uk
6 2m pedestrian DF hunt
13 USA photo-recon satellites, Brian, G2KQ

Southgate ARC
Keith, G8RPA, g8rpa@arrl.net
12 Spinney on the Air

Verulam ARC
Greg, M0PPG, 01582 413 345
13 Social with GB3VH Repeater Group
18 Martin Lynch, measurement tools and dongles

REGION 10: SOUTH & SOUTH EAST

REGIONAL MANAGER: MICHAEL SENIOR, G4EFO
RM10@rsgb.org.uk

Bromley & District ARS
Andy, G4WGZ, 01689 878 089
5, 12, 29, 26 Net, 9pm, 145.500MHz (and QSY)
18 Morse Code, Graham, G4NPD

Coulsdon ATS
Andy, G0KZT, secretary@catsradio.org
2, 9, 16, 23, 30 Nets: 11am, 145.4MHz ± QRM; 5pm, 3.7MHz ± QRM
5, 12, 19, 26 Net, 9pm, 70.425MHz

Crawley ARC
Richard, G3ZIY, 01342 843 545
26 PCB production, Matt, M0NJX

Cray Valley RS
Dave, G8ZZK, 0773 954 9822
6 BERU from East Africa, Nick, G3RWK
20 DXing without the luxuries

Crystal Palace R&EC
Bob, G3OOU, 01737 552 170
5, 12, 19, 26 Net, 8pm, 145.525MHz ± QRM
7 GPS, Nick Stapley

Dorking & District RS
David, M6DJB, djb.abraxas@btinternet.com
25 South Downs evening

Dover RC
Aaron, 2E0FQR, 0771 465 4267
6 DJI Phantom 3 Pro drone demo, M0IER
13 Table top sale
20 How to design a common emitter amp
27 How to do the 2m fox hunt + quiz night

Hastings E&RC
Gordon, 01424 431 909
26 On air operating and chat

Hilderstone R&EC
Ian, 2E0DUE, secretary@g0hrs.org
13, 27 Club night

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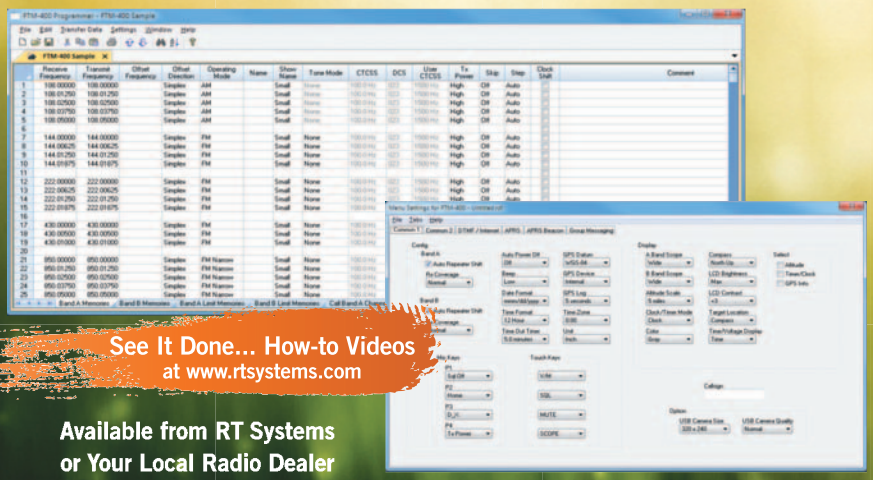

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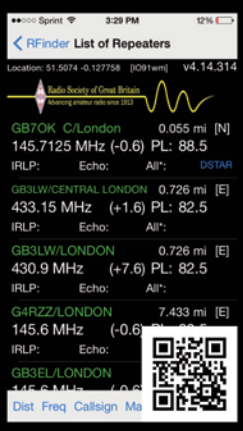

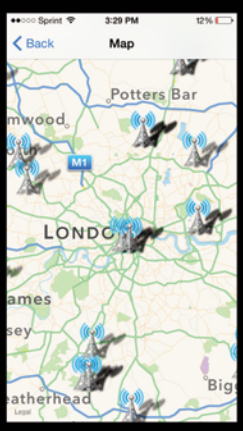

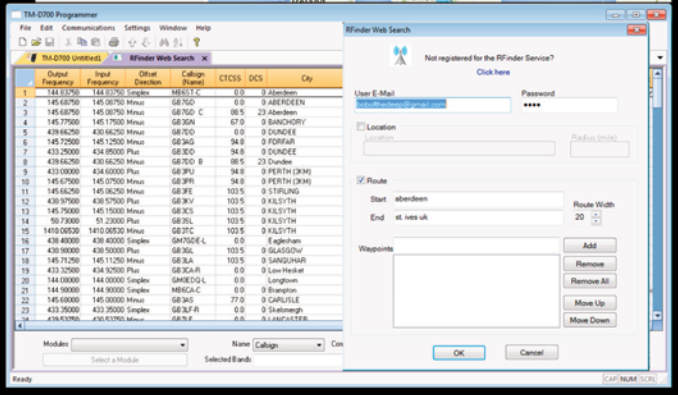

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Horndean & DARC
Stuart, G0FYX, 02392 472 846
7 Natter night/social evening
21 The History of Navigation, Prof Mike Whittle

Horsham ARC
Alistair, G3ZBU, 0785 526 8666
6 Pirate radio, Mick Senior, G4EFO
20 Social at The Sportsman, Amberley

Mid-Sussex ARS
Dennis, M0YDC, 0747 630 1044
1-2 VHF NFD
7 Chairman's barbecue
14, 21 Radio night / table top sale
28 Walking fox hunt from Cyprus Rd car park

Southdown ARS
John, G3DQY 01424 424 319
1 Beachy Head 50th anniversary summer BBQ
5 Hailsham shack meeting, 10.30am
5, 12, 19, 26 Net, 8.30am, 145.275MHz FM; cafe 12.30pm, net, 7pm, 144.060MHz CW

Surrey Radio Contact Club
John, G3MCX, 020 8688 3322
2, 9, 16, 23, 30 Net, 1905kHz, 9.30am
3 No meeting
6, 13, 20, 27 Net, 70.300MHz, 8pm
7, 14, 21, 28 Net, 145.350MHz, 8pm
10 Annual BBQ, G4CCY/DDY QTH
17 Construction project, chat & fix-it

Sutton & Cheam RS
Martin, M0SGL, info@scrs.org.uk
20 Icom IC-7300, Mike, G0KAD

Worthing & District ARC
Al, M0OAL, information@wadarc.org.uk
2 Sunday breakfast
8 Club tea and chat night
12 Lecture
19 Outside on the air event
26 Practical evening or workshop demo

REGION 11: SOUTH WEST & CHANNEL ISLES

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

Appledore & District ARC
Alan, M6CCH, 01237 422 833
17 Heritage Day Special Event debriefing

Bristol RSGB Group
Shaun, G8VPG, 01225 873 098
31 Annual dinner

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

Cornish Radio Amateur Club
Steve, G7VOH, 01209 844 939
5 Committee meeting
6, 20 Main /social meeting
8 Setup for club rally at Penair School
9 Cornish Radio Amateur Club Rally

Exeter ARS
Nick, M0NRJ, 01363 775 756
4 Club net, 7.45pm, GB3EX
11, 18, 25 Club net, 7.45pm, GB3EW
12 Workshop on VLF radio plus Morse practice
26 Software Defined Radio

Flight Refuelling ARS
John, G4POF, 0758 250 6336
1-2 VHF NFD at Cerne Abbas
8-9 Foundation course and exam
12, 19 On the air activity evening
16 Hamfest preparations
23 Social evening and prep for Hamfest on 13 Aug
29-30 Multi-op in the IOTA contest

Mid-Somerset ARC
David, G8BFV, 01749 670085
10 Antennas at new venue

North Bristol ARC
Mat, G7FBD, g7fbd@gb3bs.com
7 Relax and chat + operating & training
14 Video evening + relax and chat
21, 28 Relax and chat, prep for Filton Festival

Poole Radio Society
secretary@g4prs.org.uk
1 VHF NFD, 2-11pm, Worth Matravers
7, 21, 28 Activity night
8 Hamworthy Park Fete, 11am-4pm
14 Arduino and other microcontrollers, G1TEX, G0HEH and M0TGY

Saltash & District ARC
Mark, M0WMB, 0781 054 8445
6, 20 Club night, all welcome

Thornbury & South Gloucestershire ARC
Mark, 2E0RKM, 0777 629 2813
1-2 RSGB VHF Field Day, Thornbury Carnival

Torbay ARS
John, G4VUD@TARS.ORG.UK
7 Operating night
14 Business meeting
21 VHF/UHF propagation basics, DL7AYD
28 Tales from the Underground, G7JHE
29 Torbay Hobbies Fair SES

Yeovil ARC
Rodney, M0RGE, 01935 825 791
6 Trans-equatorial propagation, G3MYM
13 Field day and BBQ at Ham Hill
20 Morse practice, G3MYM
27 Station on the air and problem solving

REGION 12: EAST & EAST ANGLIA

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

Braintree & District ARS
Edwin, G0LPO, 01376 324 031
4, 18, 31 Club net, 8pm, 145.375MHz
11 Construction contest
25 Aerial clinic

Chelmsford ARS
secretary@g0mwt.org.uk
4 Three short talks
9 Science Discovery Day at Sandford Mill
17 Skills night at Danbury Village Hall

Colchester Radio Amateurs
Tony, 2E0FTQ, 0783 177 4669
20 A look at JT65
22-23 Club field weekend

Essex Ham
Pete, M0PSX, news@essexham.co.uk
1 Essex YL net, GB3DA, 8pm
2 Online Foundation course
3, 10, 17, 24, 31 Net, 8pm, GB3DA; chatroom and audio feed at www.essexham.net

Felixstowe & District ARS
Paul, G4YQC, pjw@btinternet.com
2 GB2FX Darrell Day SES, Landguard Museum
8-9 MH100 SES Martlesham Heath Green
17 Felixstowe Beach operation
22-23 Military Heritage SES
31 Club net, 145.400MHz, 8pm

Huntingdonshire ARS
David, M0VTG, secretary@hunts-hams.co.uk
1 Buckden Village Festival
13 RAYNET, Rob Chipperfield, M0VFC
27 MF operations, Dave Humphries, G4ETG

Leiston ARC
John, G4XVE, secretary@larc.org.uk
16 Barbecue
25 VHF/UHF activity contest

Norfolk Coast ARS
Steve, G3PND, info@norfolkcoastamateurs.co.uk
6 EMC

Peterborough & District ARC
Alan Ralph, secretary@padarc.co.uk
3 Club net, 1.908MHz
10, 17, 24, 31 Club net
26 Events update; CW by other means, G0IAG

South Essex ARS
Terry, G1FBW, 0798 607 0040
11 GX4RSE, White House, Benfleet SS7 1BU
30 GB2BOX at RAF Boxted

Thurrock Acorns ARC
Gordon, 2E0ELI, acorns@taarc.co.uk
4 2m SSTV open net, 7.30pm
6, 13 2m FM open net, 7.30pm

REGION 13: EAST MIDLANDS

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

Derby & District ARS
Richard Buckby, radio@dadars.org.uk
4 Junk sale

Leicester RS
Sandra, G0MCV, 0793 027 4044
3, 24 Morse class then night on the air
10 Committee and open meeting
17 Rise and fall of Emley Moor mast, G3HRH
27 Cuppa and chat, 12pm
31 Morse class then project night

Lincoln Short-Wave Club
Pam, G4STO, 01427 788 356
1, 12, Open shack & G5FZ on the air
5 Sausage & burger night
6 Club net via GB3LM
8 Open shack, G6COL OTA, Boulthham Park SES
13, 27 Club net, 145.375MHz
15, 24, 28 Open shack & G6COL on the air
20, 26 Formal meeting/talk
22 Club net via GB3LS

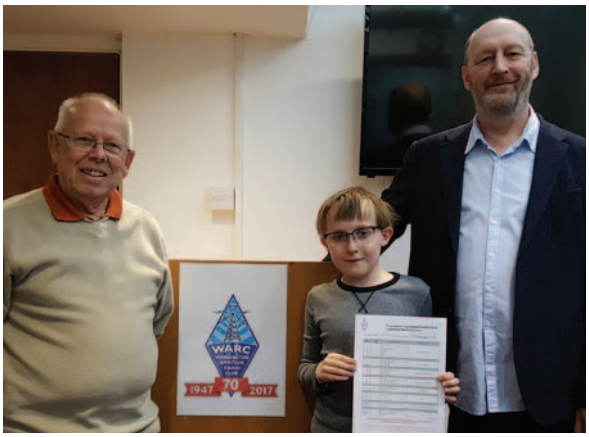
Loughborough & District ARC
Chris, G1ETZ, 01509 504 319
4, 18 Portable 2m/23cm from Wymeswold
11 BBQ at Phillip, G4DCI's, Hathern
25 Practical evening
30 Club field day, Greenhill Lodge Farm, subject to WX

Spalding & District ARS
Graham, G8NWC, 0775 461 9701
7 Building a flower pot antenna, G6OHM
21 Show and tell, open evening
26 Visit to Spalding Gentlemen's Society

Welland Valley ARS
Peter, G4XEX, 01858 432 105
3 Club net, 8pm, 10.142150MHz PSK31
17 DF Hunt in the Welland Valley, G0SFJ

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

Dundee ARC has enjoyed more talks by members – George, MM0KGS and Rolfe, MM0RJJ spoke on the types of digi modes. Also last month, club member Garry, MM6KYW passed his Foundation exam and got his callsign in time for the RSGB Backpackers contest. The club will continue to hold meetings at the /A shack (Monikie Scout Hall DD5 3QA) until September.



REGION 3: NORTH WEST

Warrington ARC welcomed its youngest licence holder, Robin Middlehurst, M6XXF, aged 11. He gained his Foundation licence after attending the club's training weekend in April. From the left is Jeff, G1DYN, club training manager, Robin, M6XXF and club president Mike, G4VSS.

Wigan-Douglas Valley ARS has moved and now hold meetings at 13 Walthew Green, Roby Mill, Upholland WN8 0QT.

REGION 4: NORTH EAST

Bishop Auckland RAC has a membership ranging from 14 to 70+ years and include both male and female operators and prospective operators. The club repeater GB3CD is a Yaesu DR-1 C4FM/FM digital repeater running full Fusion: RV55 output 145.6875 input 145.0875MHz, CTCSS J/118.8Hz. The repeater is connected to the Echolink internet linking system (node number 412936), and Wires X is also available on the repeater now in digital mode. Thanks go to Brian, G7OCK for supporting this facility.

Denby Dale ARS nets have moved to Sunday mornings at 10.30 and, due to the wide location of the membership and the local terrain, it has been decided to move the nets onto the GB3HD repeater. The repeater has excellent coverage locally and can be reached even with a hand held radio from indoors. GB3HD transmits on 433.225 and receives on 434.825, sub tone 82.5Hz. The club is grateful for the use of this repeater and thanks go to Malcolm, G0ISX and Kevin, G1FYS for enabling this. The repeater is not exclusively for club use, however during our planed nets the Wires X component will be switched off to limit its use to local stations.

REGION 5: WEST MIDLANDS

Congratulations to Roger, M0ORG and Mark, M0KPN who recently passed their Advanced exam at **Dudley & District ARS**.

Midland ARS has had a series of exam successes. Gary Parr passed his Intermediate and, both with full marks, Alan and Andrew passed their Foundation exam. Thanks to tutors Ron, M0WSN and Steve, M0SSV.

REGION 6: NORTH WALES

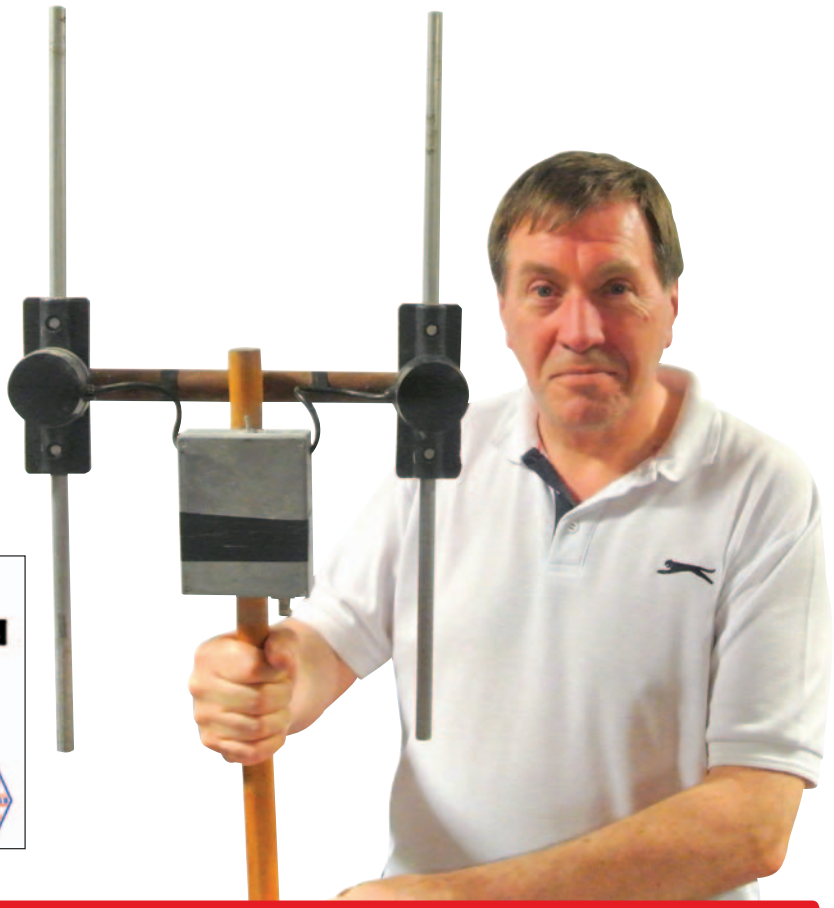
Congratulations to Tom, MW6OGT, Chris, MW6IXU, Clive, MW6IXZ and Jason, MW6IXS on passing their exams.

REGION 8: NORTHERN IRELAND

Bangor & District ARS enjoyed a demonstration of the assembly of the club's new hexbeam. Stephen, GI0HHV can be seen working out how to get it onto its mast. The club's rally is on 1 July, the club's 50th anniversary. To celebrate this, rally admission is free to all. *[See page 94 for details of the rally – Ed]*

REGION 9: LONDON & THAMES VALLEY

At **Verulam ARC's** meeting in May, David, G4HHJ gave an illustrated talk on direction finding. He covered the early history and subsequent development of its professional use with a range of different types of antennas and techniques. David also demonstrated different designs of antennas. The picture shows him with his 'whistling dipole'. The club expects to hold a fox hunt in August.



REGION 10: SOUTH & SOUTH EAST

Since 2004, Maidstone ARS have been maintaining the fleet of radios used by Hope and Aid Direct on their regular humanitarian aid convoys to Kosovo, Serbia, Montenegro and Greece. The Charity first started using CB radios, but changed over to PMR. They currently use low band Tait 2000 series radios on the trucks and Philips/Simoco PRP series handhelds. As well as maintaining the sets, the club often meet the convoy on route to Dover to install a radio on a hire truck for the duration of a convoy. Additional help has come from Medway RAYNET and to Matt, MOLMK. Special thanks to Sam at Radioworld and Lucy at ETPS who have helped with spares at good rates too.

REGION 12: EAST & EAST ANGLIA

South Essex ARS club night saw a presentation by Pete, MOPSX about his time in the hobby, the formation of the online club Essex Ham and his passion for training, which led to the creation of the online Foundation training course.

Thames ARG has just completed an Intermediate course. In May, Tony G4WIF gave an enthusiastic explanation of QRP and the benefits of home-made kit.

Five amateurs, Dave, Sarah, Alex, Vaughn & Nick, came together in October when they met on their 2E0 course, lead by Dave, G4HUP (SK) of Leiston Club. Instantly hitting it off as friends, they formed their own study group, meeting fortnightly to go through the work. In January they signed up to the Bath Distance Learning Course. Long distance learning takes discipline and often a lonely thing, so having a group around you certainly helps, Melvin and Paul who also passed 2E0's first time, have since joined the revision group. L-R Terry, G3MXH, Dave, 2E0EDF, Sarah, 2E0ISJ, Alex, 2E0UKF, Vaughn, 2E0EDN, Nick, 2E0NCX, Melvin, 2E0FHT, Paul, 2E0MIY.

Andy Cook passed his Foundation exam recently. He is a specialist heavy lift driver and came across some colleagues at work who were talking on a radio and decided to find out what was going on. He soon found out his colleagues were talking on the amateur radio bands and it did not take Andy long to get the bug. He wanted to get a licence so he could talk over the airwaves and installing a radio in the truck is his next challenge. Thanks go to Nicholas, G4HCK from the local radio club for all his help. The picture shows (L – R) Steve, G4HXY, Andy with pass slip in his hand and Lt Cmd Robert James RNR who acted as the senior invigilator.

Following on from their work on baluns and chokes, **Norfolk Coast ARS** carried out an experiment to measure their effectiveness. A 20m dipole was set up with the feed point accessible. RF current meters were inserted in each leg and a meter to detect common mode current in the coax screen. The initial test was to measure the imbalance in the current and to detect the level of common mode current. A balun was then inserted and the currents in the two legs – which were previously at different levels – became balanced. The balun was replaced by a common mode choke, which had the same effect. This was an effective demonstration to members and is the start of a wider investigation.

Under senior invigilator Lt Cmdr. Robert James (RNR) two air cadets from the 106 (Orsett Hundred) Squadron based in Grays attempted their amateur radio exam. The Cadets had been attending a training course at the Air Cadets HQ and complemented this training with studying at home. The two Cadets, Smith and Crafter, passed both sections and are now waiting for their certificate to arrive. Everyone involved was really pleased to see the two Cadets achieve their goal. (L – R) Miles M0LHA, Cadets Smith and Crafter show off their pass certificates with Lt Cmdr Robert James.

During the Camb-Hams trip to Islay EU-008 at the start of May, along with the 8,177 or so contacts from the main station GS3PYE/P, some of the group activated SOTA summits and WAB squares, including WAB NR33, which is right on the tip of the island and only accessible when there isn't a high tide.

Around 60 amateurs met for another busy Essex Skills Night in May, There were live demos of RTTY, EchoLink via the MB7IDA repeater and the N1MM logging app. The **Essex CW Club** were operating live, and Essex Ham was demonstrating balloon tracking using *FL-Digi* and a cheap SDR dongle. Mike, G4NVT brought along his new software-defined spectrum analyser, and for the first time at the Skills Night, there was a junk auction held by Mike, G4NVT and David, M1ECC.

Getting youngsters interested in radio and electronics is a challenge, and well done to **Essex Ham** member Ed, G8FAX for finding a novel way of demonstrating basic principles. As part of an electronics talk at the Southend Raspberry Jam (a maker's event for users of Raspberry Pi computers), Ed recruited some young volunteers to play the part of various components to demonstrate series and parallel in a simple circuit – each youngster was labelled with the component name, placed in the right order, and connected by wire.

April's meeting for Peterborough & District ARC was the annual PAT (portable appliance testing) night. With the special event season looming it is time to check all mains extension leads power supplies and any thing with a mains power plug that is used in the public domain, even the club's many soldering irons were checked as they are used by exam candidates. Scott, G8HQY supplied the test equipment and carried out the tests ably supported by Peter, G6AYU.

REGION 13: EAST MIDLANDS

Eagle Radio Group MB7AMP is now active in the Mablethorpe/Sutton on Sea area. It is an ALLSTAR Gateway operating on 430.0375MHz with a CTCSS access of 71.9Hz.

South Kesteven ARS is thrilled to have been announced as the Region 13 winner of the RSGB small Club of the Year 2016. For the second year running, SKARS have won the regional section, coming third nationally last year. SKARS club chairman, Andrew, M0NRD would like to pass his thanks to all of the members who have worked so hard over the last year to make the club a success. In May they hosted a presentation for Worked all Britain that was informative and of great interest. Thanks to Dave, G4IAR and Judith, G4IAQ for this. Members enjoyed a visit by Chris, M0PZC who was in the area. Finally, congratulations to Steve, M6TTZ who passed his Foundation exam with flying colours.

Lincoln Short Wave Club enjoyed the fox hunt that followed a talk on the subject about a homebrew steel tape Yagi by Joe, WB2HOL that could easily by built for the event. The event was won by Stephen, M6TSJ who came round the corner pointing his newly made steel tape Yagi, followed by his partner Kat. The event finished at the Willingham Woods picnic area with a lovely hot chicken casserole prepared by Pam, G4STO. Stephen was presented with a bottle of wine for winning. A very successful and enjoyable event for all concerned.

RAF Waddington ARC ran a special event station at the former RAF Binbrook using GB5BK on 1 and 2 April. Members include left to right, Barry, G4DBS, Tom, G4OSB, Baz, 2E0DKY & Andrew, M0OOO.

For Sale

FIBREGLASS TUBE
High strength tube, square box, rod, and other sections stocked in 6m lengths, can be cut. Engineered Compositions, Chester. Tel: 01244 676000 e. info@engineered-composites.co.uk www.engineered-composites.co.uk

SINOTEL UK - AUTHORISED UK
importers of Baofeng & TYT handhelds, Xiegu X108G HF transceivers. Accessories, antennas and more. www.sinotel.co.uk, 01926-460203, sales@sinotel.co.uk

CTCSS ENCODER AND DECODER KITS, DTMF Kits and Modules, PIC Microcontroller Development Kits. www.cstech.co.uk

USB CAT, CI-V & PROGRAMMING CABLES.
Control & programme your rig from your PC – logging, satellite tracking etc. SiLabs CP2102 or FTDI chipset for guaranteed reliability. For these and more great items go to www.technofix.co.uk or technofix.uk

Vacancies

FULL TIME & PART TIME RF ENGINEERS
required for our busy Service department at Nevada Radio in Portsmouth. The ability to repair to component level and be a licensed Radio Amateur is essential. Would suit retired or semi-retired person wishing to keep their hand in! Full job specs on our web site, email to mike@nevada.co.uk

FULL TIME & PART TIME SALES PERSON
wanted to join our team, preferably living within commuting distance of our showrooms in Portsmouth. Must be a fully licensed Radio Amateur with a wide ranging experience of the hobby. Full specs on our web site www.nevadaradio.co.uk email CV to mike@nevada.co.uk

WEB & MARKETING ASSISTANT
for uploading products & pictures to our web sites. We are looking for a radio amateur with a knowledge of Photoshop, Magento and basic HTML experience. We would consider a remote part time worker if they have the necessary experience. Nevada email mike@nevada.co.uk

Aerials

M0CVO ANTENNAS
For quality HF Wire antennas, BALUNs, UNUNs, VHF/UHF base or mobile antennas, all made in England, for QRP to QRO.
Also available accessories and kits for home builders. At a price to suit your pocket.
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67ft wire dipole 160-6m, full details lookup m0bzi at: www.qrz.com buy direct: m0bzi@outlook.com or 07748331458 reviews at: http://g0kya.blogspot.com/2010_08_01_archive.html **or** http://www.eham.net/reviews/detail/9424

G4TPH MAGLOOPS BACK IN PRODUCTION.
Remote tune and manual tune models for 40m through 10m. Details at www.g4tph.com

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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 £109.95, 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

QSLers
It is with saddness that we have been imformed that the proprietor of QSLers, Chris Darlington, M0DOL has become Silent Key., RIP OM

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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

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Equipment

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

Wanted

VINTAGE RADIO & VALVES WANTED national cash settlement for silent key, shack clearouts 07552 678725, vintageradio@btinternet.com

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

18m TILT OVER TOWER with beam antennas for HF, 6m and VHF, complete with 3-bed Lockwood 2 storey house on 1.5 acres of land in a QRM free country location near Nelson, New Zealand. Interested? Dave Stenning, ZL2CX, 0064 3 543 2182, dave@stenning.co.nz (New Zealand).

FL-2100Z amp, £475, FT990 AC + SP6 speaker, £650. KW2000A with PSU, £220, Eddystone EA12, £425. Heathkit DX100U AM/CW Tx, £300. Heathkit SB220 amp, £450. Icom IC-8500 Rx with PSU, no manual, £750. Some items very heavy, prefer buyer collects. Keith, G4AAH, 01623 642 719, kandmlaw@btinternet.com (Mansfield).

FORCE 12 EF-415 4-element 15m beam, £150. Trident TA10M3L 3-element 10m beam, £100. These have been on a few DXpeditions, but have been stored in a dry warehouse in between. Collect only. Chris, G3SVL, 07946 386 392, Chris@G3SVL.com (Portsmouth area).

FT-450D, with mod, £475. MFJ 901B Versa Tuner, £75. Welz SP-220, £50. MV HF Vertical (MK 5), £100. Dave Price, G3LYU, 0785 075 7330 (Oswestry).

HIGH POWER 1.3kW AMPLIFIER, two 813s. 400W all day. Built by John Sagar, GW3ARS, used for IOTA & Honour Roll. £350 ONO. Top cover removed for inspection. 8x813 valves, untested but all are well wrapped so should be good, £30/pair. Collect. Stuart Morton, ssm14@hotmail.co.uk (Bridgend, South Wales).

ICOM IC-7410, property of the late G3UST, £700. 4 years old, little used, good condition, non smoking household. Complete with power lead and microphone. Watson W-25AM PSU available if needed (£60). No original packing, so prefer buyer collect and inspect. john@g3zjg.co.uk (Leicester).

KENWOOD TH-74E dual band 144/430MHz. Complete and in box as supplied. All info can be found on Kenwood website. Unused and still with Kenwood warranty. Cost £595, will accept £495, saving VAT. Buyer collect or post at cost. Don Bennett, G4GLH, 01539 720 654, donald.lakes@icloud.com (Windermere).

KENWOOD TS-570D, £475 OVNO. Includes voice synthesiser unit, power leads, original mic and all manuals. Good clean condition and works perfectly well. Also, Trio TR-9000, full setup, £200 OVNO, including the radio, matching base unit, speaker and PSU, all leads, original mic and manuals. It has been fitted with a CTCSS board. It is well used and shows marks of its age but works OK last time switched on. Pictures available if you genuinely require them. Silent Key sale. Geoff, G7GJU, 0797 126 2988, g7gju@raynet-uk.net (Co Durham).

KENWOOD TS-570D, VGC, £400 ono. Kenwood desk mic MC60, £80 OVNO, hardly used. Also Signalink USB, £80 OVNO. I Barber, M6IBC, 01502 567199, ibarber1@yahoo.com (Lowestoft).

KENWOOD TS-570DG, mint condition, brand new unused o/p transistors, 3 language instruction manuals, original box, power supply lead, £400 ono or £450 with newish Palstar PS30M PSU. Buyer collects. G1RFI, 01527 526 041 (Redditch).

MFJ-945E mobile ATU, 160-6m, 300W, SWR/PWR meter. Cost £140. Sell £95. Delivery £5. Also NISSEI 25A switch mode power supply. Cost £75. Sell £50. Delivery £8. Both items in near new condition and in original boxes. John, G3EGC, 01204 301 502, jvhoban@gmail.com (Bolton).

MOONRAKER MT-270 dual band 25W mobile transceiver, still boxed, £50+£5 postage. Frank, G8FPW, 01406 330 883, frank.brown24@btinternet.com (Spalding, Lincs).

NRD-545 DSP RECEIVER. Wideband converter unit CHE-199. In mint condition. Handbook. Inspect and collect £2,100. Geoff, G4AYH, 07989 606 376, mintymm8@icloud.com (Leeds).

STAR MASTERKEY MK II, £60. Kent keyer, £60. Daiwa DK-210 keyer, £60. Shure 526T desk mic, £50. Icom IC-2e, leather case, speaker mic, boxed, cct diag, exc condx, £120. Hi-Mound EK-1032 electronic keyer, £80. DL-60 £60, DL-1000 (oil filled), £80. G4KZZ, 01723 890 786, nipro@btinternet.com (Scarborough)

YAESU FT-857D, boxed, £450. Matching ATAS 120A, £150. Anytone 4m, AT5189, £50. Woxun KG-UVDIP, 2 & 70 full kit, costing £150, £40. Realistic Pro-2025, 16ch scanner £20. Realistic 200 ch H/H £40. All mint condition. Bill, G7AKJ, 01395 568 503 (Exeter).

YAESU FT-920, excellent condition, £500. ME750-V 2m PA, single GU74B, 750W, £420. ME750-F 6m PA, GU74B, 750W, £420. Amps built by HA1YA. Spare GU74B valves, £100 each. Create ERC51 elevation rotor, £300. Create RC5-3 azimuth rotor, £250. Inspect / collect, shipping extra. Niels, G8RWG, 01737 554 493, nielsm@btinternet.com (Coulsdon).

WANTED

AR88D RF (front end) coils RANGE 1, L13/L14 & L23/L24, part no M-95520-501. Bruce, G3WCE, 01692 538 794, g3wce@grimblepoos.co.uk (North Walsham).

FL-50B transmitter in working order, appearance not too important. Also HC6U crystal sockets. Ross Bradshaw, G4DTD, 01726 891 320 (Cornwall).

KENWOOD AT-50. Need 2 x relays JY12H-1C for Kenwood antenna tuner AT-50. New or used OK or non working PCB also OK. Larry, G3LWF/9J2LF, +26 096 678 4543, larryfranklin@hotmail.co.uk (Bristol).

YAESU CPU2500 2m FM transceiver with keyboard mic if possible. Must be in working order and clean condition. Ray, G6AUW, 0790 938 3475, g4owy6@gmail.com (Weymouth).

EXCHANGE

FT-450D HF rig, only 1 year old, only used for 6 months, still in new condition. Want any D-Star handie, in good condition and set up and running. Reason for exchange: unreasonable neighbours. Roy Moss, GW7UVO, 01244 811 311 (North Wales).

UP FOR GRABS

FREE TO A GOOD HOME Marconi Instruments TF1370 wide range oscillator, Universal Bridges TF868/1, TF1313A, BSR L050B oscillator. All modified for blind operator, operable, but need attention. Also miscellaneous components. See www.radio-lists.org.uk/rsgb. Collection only. Andrew Slater, G0BDN, 01663 732 896, g0bdn@radio-lists.org.uk (High Peak, Derbyshire).

HELPLINES

I am visiting the Lincoln area in the week of the National Hamfest to stay with my daughter. Can anyone help by allowing me to operate on HF in the week running up to the National Hamfest? Thanking you in advance, Tom Morgan, ZS1AFS/ZT1T/G0CAJ, info@onboardpublications.co.za

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**

1 JULY
BANGOR & DISTRICT ARS ANNUAL RALLY
Donaghadee Community Centre, Parade, Donaghadee BT21 0HB
Doors open at 11.30am, with free admission. RSGB President Nick Henwood, G3RWF will be in attendance. There will be trade stands, a Bring & Buy and an RSGB bookstall. Catering is available on site. A raffle will be held on the day. Contact Harry Squance, GI4JTF on 0777 594 2174 or email gi4jtf@gmail.com.

1 JULY
1st HOUGHTON LE SPRING ARC RALLY
The Dubmire Royal British Legion Club, Britannia Terrace, Fencehouses DH4 6LJ
Doors open 10.30am until 3pm. Entry is free. There will be traders, club and private stands. Table space is limited (and free) and will be allocated on a first come first served basis. Tea & coffee will be available and a licensed bar from 11am. Details from Ken, M6ELL by email m6ellken@aol.com or on 0795 146 0290.

2 JULY
BARFORD NORFOLK RADIO RALLY
Barford Village Hall & Green, Barford, NR9 4AB
Doors open 9am (traders from 8am) with talk-in

SILENT KEYS

We regret to record the passing of the following Members:

Name, Call sign	Date
Mr W F Ardley, G0BOF	13/04/2017
Mr D J Roberts, G0JBT	21/04/2017
Mr D M Wordsworth, G0MYP	19/05/2017
Mr C E Read, G0SGM	1/2017
Mr L V Pinto, G1LRR	28/07/16
Mr S Fenwick, G3AIO	04/04/2017
Mr P C Hayward, G3JMX	06/05/2017
Mr N Penketh, G3RYY	18/03/2017
Mr W T Guilfoyle, G3UBC	09/05/2017
Mr J A Rollason, G3WCO	05/04/2017
Mr E J Margetts, GM4BOA	4/2017
Mr P Honour, G4IHX	5/2017
Mr A Thomson, G4OLF	5/2017
Mr F Atkin, G4VHH	09/04/2017
Mr J Reeve, G8ATS	11/04/2017
Mr D C Barber, G8STE	22/05/2017
Mr J A Butt, G8VXH	04/04/2017
Mr D J Bishop, M0VNK	20/03/2017

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 22/5/17.

Start Date	Callsign	Event Phonetics	Main Station City
01/07	GB13COL	Golf Bravo Thirteen Charlie Oscar Lima	Bowburn
	GB0PSW	ASE	Glasgow
	GB5GHT	Great Haldon Telegraph	Exeter
	GB6BEN	Ben Nevis	Ben Nevis
	GB13COL	Golf Bravo Thirteen Charlie Oscar Lima	Durham
	GB4RR	Rolls Royce 30th Anniversary	Nottingham
07/07	GB8ASP	All Saints Church	Peterborough
08/07	GB0ST	ASE	Plymouth
	GB4MH	Martlesham Heath	Ipswich
	GB2MH	Martlesham Heath	Ipswich
14/07	GB1AVR	Alpha Victor Romeo	Ackworth
15/07	GB6MMR	Mc Michael Rally	Sonning on Thames
	GB2NCW	ASE	Torquay
	GB5TVS	Trunch Village Society	Norfolk
18/07	GB4RFR	Flight Refuelling Amateur Radio Society Hamfest	Wimborne
21/07	GB1PF	Golf Bravo One Palmerston Forts	Portsmouth
	GB4WP	War and Peace Show	Kent
22/07	GB0ELR	East Lancashire Railway	Bury
	GB2FX	FeliXstowe	Ipswich
	GB1BPC	Golf Bravo One Basildon Pitsea Carnival	Basildon
	GB4BLC	Bedworth Lions Club	Bramcote Nuneaton
24/07	GB2FN	Mike Oscar Tango Alpha	Portsmouth
	GB0TOF	Two One Four	Wasdale Head
28/07	GB2LBR	Llyn Brenig Reservoir	Conwy
	GB9IOW	IOTA	Sandford
	GB2DWR	DRW	Conwy
29/07	GB4SVR	ASE	Highley
	GB0KHF	Kingsteignton Hobbies Fayre	Kingsteignton
30/07	GB1AFV	Armoured Fighting Vehicles	Scunthorpe
	GB4RME	Golf Bravo Four Radio Mike Echo	Llantrisant

on S22. There will be trade stands, car boot sales, a Bring & Buy, raffle, repeater groups, catering and free car parking. Entry £2 per person / under 16s free. Pitches £8, indoor tables £10. Contact radio@dcpmicro.com [www.norfolkamateurradio.org]

8 JULY

LAMFEST – in aid of Yorkshire Air Ambulance

Elsecar Heritage Centre, Wath Road, Elsecar, Barnsley S74 8HJ

Doors open from 10am to 4.30pm and admission is £2. Tables are free. Contact Clair Marsh on 226 361 700.

8 JULY

STOCKPORT RADIO SOCIETY RALLY

Walthew House, 112 Shaw Heath, Stockport, Cheshire SK2 6QS

Doors open from 10am to 3pm. Admission is £2 and there will be catering on site. There will be trade stands, special interest groups and an RSGB bookstall. There will be a raffle held on the day. Contact: Heather Stanley, M6HNS on 0750 690 4422 or by email to info@g8srs.co.uk.

9 JULY

CORNISH RADIO AMATEUR CLUB RALLY

Penair School, Truro, Cornwall TR1 1TN

Car parking is available on site. Doors open 10.30am and admission £2. There will be traders, Bring & Buy and club stalls. Catering is available. Contact Ken, G0FIC, on 01209 821 073.

8/9 JULY

2017 uWAVE ROUND TABLE

Finningley ARS, The Hurst Communications Centre, Belton Road, Sandtoft, Doncaster DN8 5SX

A 2 day event with presentations, demos, test lab, and Buildathon of a nanowave optical transceiver. Updates are on www.g0ghk.com and www.facebook.com/g0ghk

14-16 JULY

HAM RADIO SHOW, FRIEDRICHSHAFEN

Messe, Friedrichshafen, Germany

Trade stands, special interest groups and IARU Member Societies all have stands in the main hall. Large flea market. Lectures take place each day, some in English. There will be a large RSGB book stall. [www.hamradio-friedrichshafen.de].

16 JULY

MCMICHAEL RALLY

Reading Rugby Football Club, Holme Park Farm Lane, Sonning Lane, Sonning on Thames, RG4 6ST

Talk in will be on S22. Parking is free. Doors open at 9.30am and entry is £3. Tables and car boot spaces are £10. There will be trade stands and special interest groups. Catering and a licensed bar will be available on site. Due to venue rules, no dogs are allowed other than assistance dogs. Details from Andy on 0777 594 0016. [www.mcmichaelrally.org.uk/]

23 JULY

FINNINGLEY AMATEUR RADIO SOCIETY RALLY

The Hurst Communications Centre, Belton Road, Sandtoft, Doncaster DN8 5SX

Doors open 10:30am. Free parking. Massive indoor / outdoor trader's area. Hot food and drinks all day. Major traders and club stalls – microwave components to QRP kits. All on one level. Admission £3. Contact Kevin, G3AAF, 0783 161 4640 or Kevin@avery03.fsnet.co.uk.

30 JULY

CHIPPENHAM AND DISTRICT ARC RALLY

Kington Langley Village Hall, Church Road, Kington Langley SN15 5NJ.

Talk in on S22. There are disabled facilities and on site parking. Doors open 10am to 1pm. Entry is only £2, under 16s are free. Car boot pitches are £6 for cars/vans payable on entry, tables inside £8 each. Access available from 7am for set up. Hot food and drinks are available on site. Details from Brian by email to g6huim3hui@gmail.com. [www.G3VRE.org.uk].

6 AUG – **KING'S LYNN ARC GREAT EASTERN RALLY**

6 AUG – **LORN RADIO RALLY**

11 AUG – **24th ANNUAL MINI RALLY NIGHT**

13 AUG – **FLIGHT REFUELLING ARS HAMFEST**

20 AUG – **RUGBY ATS ANNUAL RADIO RALLY**

27 AUG – **MILTON KEYNES ARS RALLY**

28 AUG – **HUNTINGDONSHIRE ARS RALLY**

2-3 SEP – **TELFORD HAMFEST & 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 to 24 SEP – **WACRAL CONFERENCE AND FELLOWSHIP 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**

13-16 OCT – **RSGB CONVENTION**

15 OCT – **HOLSWORTHY ARC RALLY**

15 OCT – **HORNSEA AMATEUR RADIO RALLY**

21 OCT – **CARRICKFERGUS ARC RALLY**

22 OCT – **GALASHIELS RALLY**

5 NOV – **WEST LONDON RADIO & ELECTRONICS SHOW**

11 NOV – **NEW DATE** – **FOG ON THE TYNE RALLY**

12 NOV – **29th GREAT NORTHERN HAMFEST**

18 NOV – **RADARS TRADITIONAL RADIO RALLY**

19 NOV – **PLYMOUTH RC RADIO RALLY**

26 NOV – **BISHOP AUCKLAND RAC RALLY**

PHOTOS FROM THE PAST

Steve Nicholls, G0JFM / EA5FJF

During this special 60th anniversary of WACRAL (World Association of Christian Radio Amateurs and Listeners), we have discovered some fascinating pictures of the original founder – Rev Arthur Shepherd, G3NGF who started WACRAL's predecessor – WAMRAC – in 1957.

The first photograph was Arthur when he worked on the railways before he joined the Salvation Army. The second is when he was Minister at Crewe in the mid 1960s and the third is in his Salvation Army uniform around 1939, shown here.

If any readers have other pictures or memories of Rev Arthur Shepherd, we would love to hear from them!

COST OF RIGS

Ray J Howes, G4OWY/G6AUW

The idea from Dr M Foreman, SA6BUD/G7LSZ that contest competition be decided upon via a points system related to the actual cost of a rig (June *RadCom*) is, on the face of it, a theory that appears to hold water.

However, in practice I don't think it will have legs. Yes, I agree that there are lots of stations out there where money appears to be no object when deciding which transceiver (be it HF, VHF or UHF) or other equipment to purchase. But of course, even if you decide to spend a king's ransom on a rig, it doesn't necessary follow that it will bring you the contest rewards you so desire. On the contrary, it might be sat there at your operating position doing not a great deal more than a rig costing much, much less.

No, on the surface, it does seem to be a beguiling idea. But it'll never work. Besides, many amateurs just love to be on the cutting edge of technology. That usually translates into buying the newest all-dancing all-singing rig.

Lastly, Dr M Foreman may like to know that I have operated a £100 rig (with a decent antenna on an appropriate tower of course) in an HF contest where I was getting just as many contacts as lots of other stations running very expensive rigs. Cash is not the always the key to success in contests. Being smart is. And sometimes, spending less.

Ray hits the nail on the head: the world's best transceiver is useless without a good aerial system and, ideally, a low noise location.

Giles Read, G1MFG
RadCom *Technical Editor*

CQ TRAINING

Bob Houlston, G4PVB

In response to Dave Parkinson, 2I0SJV ('CQ Training', *RadCom* June 2017) all my GB2CW lessons are freely available via my website (g4pvb.eu.pn). I was inspired by the teaching methods of Jack Ritter, W0UCE & Hilary Claytonsmith, G4JKS.

Stewart Rolfe, GW0ETF

In response to 'CQ Training' from 2I0SJV can I point out that in addition to the excellent work of GB2CW, CWops (cwops.org) run 8 week structured training courses 3 times a year for Beginner, Intermediate and Advanced levels. Based on a maximum of 5 students to one trainer it includes weekly face to face Skype sessions in a virtual classroom and the interactions make for an enjoyable and self motivating experience. So if you wish to (re)learn or improve Morse, have a key (paddle recommended), a computer/internet, and the time to commit to 45 minutes practice per day and 2 Skype sessions each week, please go to the CW Academy page on the website and sign up for a course.

Since its inception in 2012 CW Academy has generally been oversubscribed due to a shortage of trainers. Roger Cooke, G3LDI of GB2CW (and his book *Morse Code for Radio Amateurs*) fame will confirm the unfortunate lack of established CW operators in the UK willing to give up some time to help the growing numbers wishing to enjoy the art of CW. CwOps would also be delighted to hear from anyone willing to become a trainer if only for the occasional course; it is after all the very future of amateur Morse that is at stake. You can sign up as a trainer ('advisor') on the website or contact me direct via QRZ.com.

Ray J Howes, G4OWY/G6AUW

Dave Parkinson, 2I0SJV, asks about the best way to "master the art of dits and dahs".

Well, there was a time, when some people recommended starting off at 5wpm and then up to 10wpm and so on. In hindsight, this is probably why so many people found it so difficult to learn Morse code. No, the most efficient way, is to start at 20 wpm straight off, but at first leave bigger gaps between words. And don't try to guess what the characters are. And never try to think it out (in passing this is an excellent way to learn a foreign language). The object of the exercise is to translate subconsciously. All things being equal, it will ensure success. But the downside is, you have to stick to it. Perhaps leaving the rigs switched off more often might help. Just a respectful suggestion.

CARE HOME VISIT

Glyn, GW0ANA

As Region 7 Regional Manager, I have the opportunity to visit both clubs and individuals around Region 7. Recently I had the pleasure of visiting John Segar, GW3ARS in his care home. It was a very enjoyable visit – for both of us – and we had a great time talking radio and discussing his DX exploits. In particular the 5BDXCC plaque provided us with plenty to talk about. A great moment for both.

PLEASE STOP SPELLING OUT *ALL* ABBREVIATIONS

Andy Talbot, G4JNT

All right, I think you've made your point. Things have really gone from extreme to worse now. I was already getting irritated by the number of trivial abbreviations that we should all know by now. But when I read the WSPRLite review by Steve Nichols in the June *RadCom*, that carried things to a new high. Or low.

Isn't the standard amateur, even newly licensed, going to know what SWR stands for without it being spelled out in full in an article? And ATU, and certainly LED? Yet those are all spelled out. And as for "mean (average)"; that is not even an abbreviation.

Can we go back to a bit of sanity and common sense, please. Spell out less used abbreviations by all means, but don't keep patronising the vast majority of readers by doing everything, every time.

This is a difficult matter to gauge. Whilst I personally agree wholeheartedly with Andy and think that previously we got it about right, recent correspondence in RadCom *suggests some Members believe otherwise.*

Letters published in 'The Last Word' do not necessarily reflect RSGB policy. 'Last Word' letters may be emailed to radcom@rsgb.org.uk Please note that letters submitted for 'The Last Word' may not be acknowledged. The RSGB reserves the right not to publish any letter, with no reason being given. It is a condition of publication that all letters may be edited for grammar, length and / or clarity. Due to the limited space available, please keep letters as short as possible.

We have put a fairly comprehensive list of abbreviations and acronyms on the RSGB website, for which the short link is http://tinyurl.com/RC-acronyms – at the time of writing the list contains well over 500 entries and is growing daily.

I think we really need to make a decision on this subject and therefore strongly invite Members' feedback. Should we

- *continue to spell* everything *out, in* every *article, or*
- *go back to our previous practice of assuming that most people know something about amateur radio and use our own judgement about what needs spelling out in full?*

Remember, if you don't know a particular acronym, you can readily look it up on the RSGB website and be confident that what you see is the appropriate answer.

Please let us know what you think – email radcom@rsgb.org.uk with Acronyms *as the subject line.*

Giles Read, G1MFG
RadCom *Technical Editor*

MORSE KEYS

Iain Kelly, M0PCB
(also 9G5X / C5X / VP2MXI / VP8DNA plus many others)

My thanks to Giles, G1MFG for pointing out the Morse key in the photograph of the 9G5X expedition. The furthest operator in that picture is in fact me, and I can assure Donald – and other concerned readers – that I most certainly was making good use of the actual paddle during the 9G5X trip.

The practicalities of running a dense pile-up at 30wpm mean that keyboard sending is convenient, that's for sure, but when I greet friends by name in the pile I use the paddles. For corrections I use the paddles. If the keyboard goes wrong and I halt it, I use the paddles.

At home I use a mixture of paddles, bugs and cootie keys interchangeably. All hand sent. I have spent many months applying myself to sending decent Morse with a bug key, and then a cootie before going on air with them. More importantly I only ever receive by ear.

Not for the first time I find my Morse operating under question. Perhaps I am 'doing it wrong' and perhaps my 17 years of CW isn't enough, but every Morse QSO I have makes fills me with joy. Whether that be DXing (or being the DX), Contesting or rag-chewing. We all draw our own lines with how we operate, but in my opinion anything that gets CW on the air is a good thing.

John Tuke, GM3BST

I was fascinated to see the person operating the rare DX station C6APY was not using a Morse key – but a laptop instead. But then I am 97 years old.

The Morse paddle is right next to the radio in the picture that shows C6APY in action on the front cover of the June RadCom.

As one of the three C6APY operators, I can assure you that Rob (pictured on the June cover) used the paddle many times and to good effect during the trip. Computers are however great for some station tasks such as logging. (We used voice keyers to help take the strain when calling CQ on SSB too).

Steve Thomas, M1ACB
C6APY Team Member
(and RSGB General Manager)

NOT DATA?

Peter, G4YUP

I feel I should respond to the article in June *RadCom* by Andy in his Data column, "Morse is NOT Data", as the person responsible for the title Team Digi.

After 20 plus years away from amateur radio I joined Itchen Valley ARC and was taken aback by the way technology had changed. Brian, G0UKB, introduced me to 80m CC, I realised my CW was at best extremely rusty. I then started using *CWget* and *N1MM*, later I told my mentor, Brian, that I was treating CW as a data mode, that is, not using my ears! At that time he thought it was a novel approach. Later, IVARC entered the Commonwealth Contest. In order to let those who weren't CW operators, but wanted to have a go, we formed a group using software (as I still do in 80m CC). Andy is always very precise in his articles and should allow us a little leeway in a title! Yes, Morse isn't data, but, I believe it is ones and zeros in the computer, so I suggested Team Digi to indicate a different way of operating. I'm pleased Andy has shown an interest in our efforts.

Team Digi came 17th out of 17, our team Captain had problems with his, expensive, it covers all bands, sir, aerial and had to pull out, leaving just two of us to enter. I'm sure Brian's approach was the same as mine, we'll never win but we'll enjoy ourselves. The other IVARC team, with four experienced operators came 14th, only a few places away, so I reckon we didn't do too bad. They say *it's all in the taking part*. On Field Day an experienced member will be paired with an inexperienced CW operator, using *CWget*, go give them some training.

I certainly wasn't bemoaning the inability of software to perfectly decode Morse, and I'm sure G0UKB wasn't. We're aware of the timing problems (including poor sending), and the effects of QSB and QRM that our ears can cope with much better than machines. In this computer age anything that encourages CW operation is a good thing. It would be interesting to know what percentage of contesters are using a key only. I'm sure these operators, are happy to receive the points given them and aren't interested in knowing you're using a computer to send and receive!

A spin off from our entry, or more accurately from the aerial problems the Team Digi Captain had, our new Chairman and aerial guru, Duncan, G3RQF, is working on a technique to check how our aerials are radiating – but you'll have to come to Itchen Valley Amateur Radio Club to find out more!

HOMEBREW IS BEST

Mike Nicholas, G3TOI

As I am always banging on about the ever increasing erosion of the 'amateur' aspect of our hobby, I thought you may like to see the latest pics of my *amateur* shack (below). It includes 23cm ATV, 70cm ATV and SDR added on to the FT-101 – and all of it is homebrew except the D to A and A to D video converters.

RadCom

HF F-Layer Propagation Predictions for July 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	52.....255	553211113466	355433224566	123544355531	..112111221.	....1...11..	.....	.....
*** Asia								
Yakutsk	.....	11.11.111112	211211121122	.....	.....	.....	.....	.....
Tokyo	.....	.....	.....111..	.....11.1..	.....	.....	.....	.....
Singapore	.....22.	3321	.....121.1	.....1....	.....	.....	.....	.....
Hyderabad	233	2.....3444	1.....23333	.....21...	.....	.....	.....	.....
Tel Aviv	53.....155	552.....3455	25421.124553	..333312452.	.....21..	.....	.....	.....
*** Oceania								
Wellington	.....	.....	.....	.....	.....	.....	.....	.....
Well (ZL) (LP)	.1.....	242.....132	331.....43	1.....32	.....1.	.....	.....	.....
Perth	.....11.	2313	.....11.2	.....	.....	.....	.....	.....
Sydney	.....1..	.....23..	.....1221.	.....1.	.....	.....	.....	.....
Melbourne (LP)	.....	.23.....	122.....1	..1.....1	.....	.....	.....	.....
Honolulu	.....	.....	.....	.....	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....1...	.....	.....	.....
W. Samoa	.....	.....	.....	....1.....	.....	.....	.....	.....
*** Africa								
Mauritius	1.....222	3332	.....1221.	.....1....	.....	.....	.....	.....
Johanesburg	22.....122	.1.....2321	.....31..	.....12...	.....	.....	.....	.....
Ibadan	553.....345	5542....2455	51531..13555	..3321124521	...2....35..	.....12..	.....	.....
Nairobi	33.....233	441.....1344	.42.....3442	..3.11.134..	.....1..1...	.....	.....	.....
Canary Isles	664.....156	66531...2466	655432224566	213532225564	..1332224531	...22111232.	...11...12..	.....1..
*** S. America								
Buenos Aires	221.....	433.....24	222.....33	122	.....11.	.....	.....	.....
Rio de Janeiro	33.....2	442.....34	32.....244	332	.....22.	.....1..	.....	.....
Lima	221.....	333.....13	2121.....23	21	.....	.....	.....	.....
Caracas	332.....3	4432.....14	21321.....24	121	.....	.....	.....	.....
*** N. America								
Guatemala	122.....	333.....2	222.....3	11	.....	.....	.....	.....
New Orleans	232.....	332.....1	11.....2	.....	.....	.....	.....	.....
Washington	4431.....1	44321.....12	42..211..123	.....2.1..21	.....	.....	.....	.....
Quebec	3421.....	4432.....12	21..11..1122	.....2.	.....	.....	.....	.....
Anchorage	.....	.....	.....111...	.....	.....	.....	.....	.....
Vancouver	.....	..1.....	..1.....	.....	.....	.....	.....	.....
San Francisco	.....	122.....	112.....	.....	.....	.....	.....	.....
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 July, August & September are respectively (SIDC classical method – Waldmeier's standard) 20, 19 & 18 and (combined method) 25, 26 & 27. The provisional mean sunspot number for May was 18.8. The daily maximum / minimum numbers were 55 on 23 May and 0 on 9, 10, 13-15 and 30 May.

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