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September 2019 £4.50

The UK's Number One Amateur Radio Magazine

DXPEDITION TO THE SCILLIES
An adventure for Islands on the Air

LASERBEAM VARI TESTED
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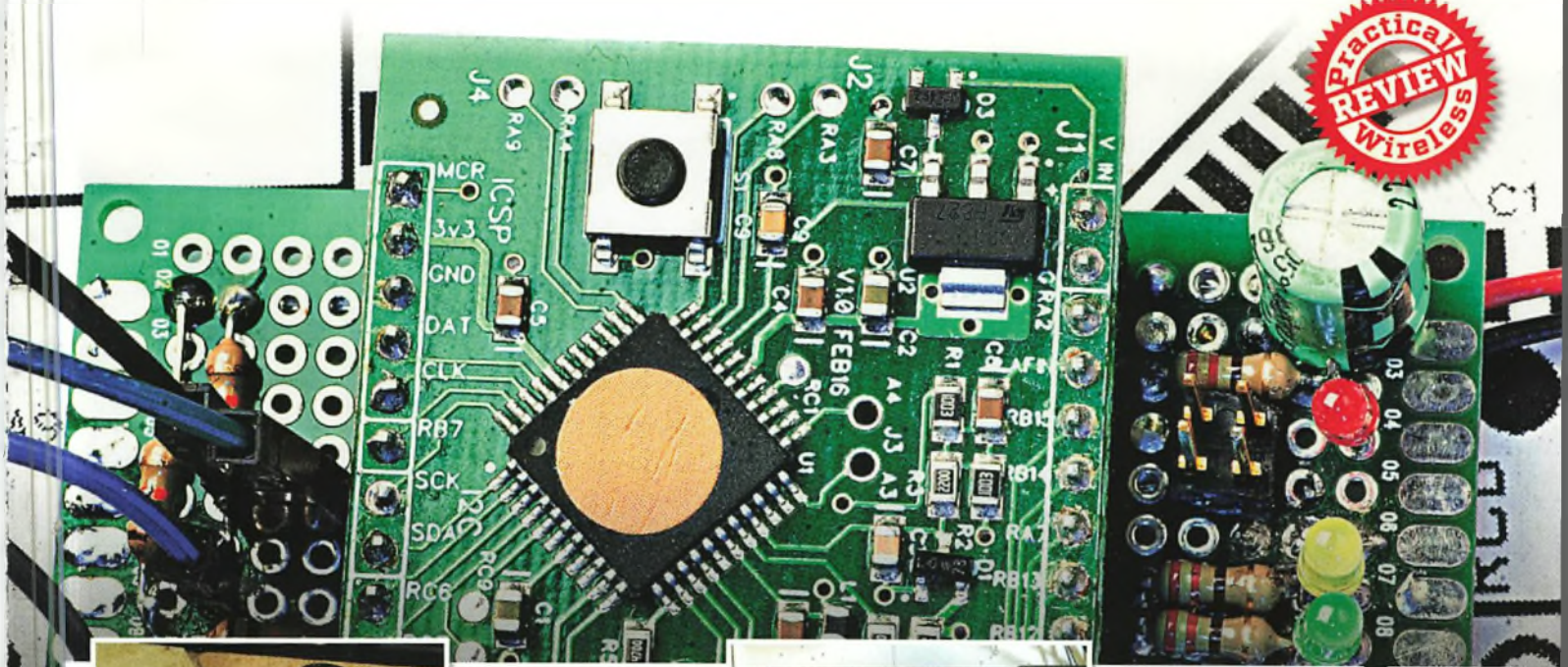

We review Pro Antenna
A detailed look at Pro Antennas' DMV-II

Setting up for 23cm
Getting started on 23cm, Part 3 of our series

Morse Mode | Antenna Gain | In the Footsteps of Marconi | HF Highlights
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One of the regular calls we get is about HF antennas for small gardens. I have been working on this and have concluded that the best option is the End Fed Half Wave. It has a very low VSWR and requires no external ATU or long coax feeder. The 40m- 10mm version is around 65ft long and can be bent to fit the garden. We now offer a kit to permit operation on 80m which adds around 9ft to the length. Call our Sales team who will be happy to help you.

Peter Waters G3OJV

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YAESU

FT-450D £599.95

FT-991A £1195.95

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Yaesu FT-DX101D

Now top of the Sherwood list for SDR HF Technology. When you buy from us you also get a 3-Year Yaesu UK warranty. The new Yaesu FT-DX101D embraces SDR in an interesting way. You have full SDR technology, but they have added a selectable superhet front end to provide optimum dynamic range and front end selectivity. The full colour touch screen offers variable bandwidth up to 1MHz, with clever screen presentation options and a rear panel HDMI output for an external display. **£3149.00**

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Peter Waters G3OJV, operates the first FT-DX101 to come into the UK.

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FT-991A	£90
FT-818ND	£45
FT-891	£45
FTM-7250	£15
FT-70DE	£15

ICOM

£50 Voucher ENDS 30/09/19

IC-7300 £1195.95

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IC-7610 £3499

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IC-7300	HF-6m 100W	£1,199.00
IC-7610	HF-6m 100W	£3,499.00
IC-7410	HF-6m 100W	£1,489.00
IC-7100	HF-70cms	£999.00
IC-9100	HF-70cms	£2,799.00
IC-7700	HF-6m	£4,789.00
IC-7851	HF-6m Flagship	£9,899.00
IC-9700	2m-23cms	£1,799.00
IC-V80E	2m Handy	£129.95
ID-51E	Dual Band D-Star	£378.00
IC-2730E	2m/90cms Mobile	£279.00
ID-4100E	Mobile D-Star	£299.00
ID-5100E	Mobile D-Star	£574.00

IC-9700

£50 Voucher ENDS 30/09/19

The new IC-9700 transceiver will be with us in the next few weeks. It offers 2m, 70cms and 23cms at an amazing price. SDR on 2m and 70cms with down convertion on 23cms. Great part exchange deals. Call Now. **£1795**

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Kit: £1059.95 Built: £1109.95

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- KXFL3 Filter £189.95
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- KXPD3 Key £159.95
- DC Lead £11.95
- 2m Transvert £309.95
- 4m Transvert £309.95
- MH3 Mic £79.95

KXPA100
100W PA for:
• KX3 • KX2
• FT-817

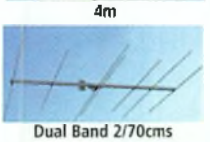
• FT-817/818 option £11.95

Kit: £899.95 Built: £949.95

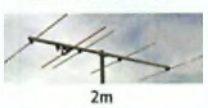
New!

2/70cms

4m



Dual Band 2/70cms



2m

70cms

23cms

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Dual Band 6/4

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PA5070-11-6	6m 5el 4m 6 element 6m boom	£259.95

4M Yagis

PA70-5-3	4m 5 element Yagi 3m boom	£139.95
PA70-6-4	4m 6 element Yagi 6m boom	£179.95

Dual Band 2/70cms

PA144-432-13-1.5	2m 5 element 70cms 9 element	£119.95
PA144-432-17-2	2m 6 element 70cms 12 element	£149.95
PA144-432-19-3-2C	2m 7 element 70cms 12 elements	£215.95
PA144-432-21-3	2m 7 element 70cms 14 element	£199.95

2M Yagis

PA144-5-1.5	2m 5 element Yagi 1.5m boom	£94.95
PA144-6-2	2m 6 element Yagi 2m boom	£119.95
PA144-8-3	2m 8 element Yagi 3m boom	£135.95
PA144-9-5A	2m 9 element portable 4.67m	£174.95
PA144-11-6BG	2m 11 element Guyed 5.72m	£199.95
PA144-12-7BGP	2m 12 element Yagi	£259.95

70cms Yagis

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PA432-23-6	70cms 23 element Yagi 6m boom	£199.95
PA432-30-8BG	70cms 30 element Yagi 8m boom	£269.95

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PA1296-13-1R	23cms 13 element 1m Rear mount	£99.95
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PA1296-36-3RG	23cms 36 element 3m RG Balun	£169.95
PA1296-36-3UT	23cms 36 element 3m Teflon Balun	£189.95
PA1296-70-6RG	23cms 70 element 6m RG Balun	£225.95
PA1296-70-6UT	23cms 70 element 6m Teflon Balun	£239.95

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For Fuller Detail of these Products please check our websits

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MFJ-207 Ant Analyser 160m - 10m Analogue dial - listen in on receiver for ultimate accuracy **£117.95**

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MFJ-418 Morse Tutor Pocket size to take anywhere **£96.95**

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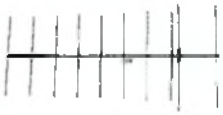
A great range of 6m, 2m and 70cms light weight Yagi antennas rated at 100W with Japanese engineering



A-502HBR ....6m 2 El. Phased 6.3dBi 400W.....**£81.95**
A144S10R....2m 10 Element 11.6dBi 2.13m boom..**£89.95**
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- 3W for FSD
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- SO-239

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- 3W for FSD
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- SO-239

£49.95

DIAMOND for IC-9700 Radio

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2m / 70cms / 23cms
A fibre glass vertical with N connection.
- Auto band select
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- 100W rated
- Gain: 4.5 / 8.3 / 11dB

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6BTV
This antenna is identical to the 5BTV above buthas the 30m band added. Again it handles full legal power and stands 7.3m high. **£289.95**

All antenna are rated at 1kW

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1kW End Fed Design
MyAntenna USA

No ATU Needed
EFHW-4010 66ft 40-20-15-10m
EFHW-8010 132ft 80-40-30-20-17 15-12-10m

Peter Waters G3OJV says, this has to be the perfect wire antenna solution for many. End fed makes installation easy. No ATU is a big plus. I use one myself and it beats the pants of the old G5RV.

MyAntenna EFHW-4010 .....£149.95
MyAntenna EFHW-8010 .....£159.95

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HF-16FX.....17m whip 1.2m long..**£49.95**
HF-20FX.....20m whip 1.2m long..**£49.95**
HF-30FX.....30m whip 1.4m long..**£49.95**
HF-40FXW..40m whip 1.4m long..**£49.95**
HF-80FX.....80m whip 1.4m long..**£49.95**

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- Attenuator
- Band Scoper
- MW Bar Antenna
- Signal Meter
- Lots More!

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Diamond CX-310A.....3 Way PL **£88.95**
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Watson CX-SW2PL.....2 Way PL **£34.95**
Watson CX-SW3N.....3 Way N.....**£59.95**
Watson CX-SW3PL.....3 Way PL **£54.95**
Watson CX-SW4N.....4 Way N.....**£79.95**
Watson CX-SW4PL.....4 Way PL **£69.95**

Ameritrons
Remote Switches

RCS-4LX.....4 Way with static protect..**£216.95**
RCS-4X.....4 Way standard.....**£179.95**
RCS-10LX...8 Way with static protect..**£237.95**
RCS-10L.....8 Way standard.....**£229.95**
RCS-8VX.....5 Way standard VHF.....**£183.95**
RCS-8VNX..5 Way standard VHF N.....**£193.95**
RCS-12X.....8 Way auto band sensor....**£334.95**
RCS-12LX...As above + static protect..**£377.95**

W-300S Magnetic Mount

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

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Taking place on Friday 27th and Saturday 28th September 2019 at Newark Showground, is the 11th National Hamfest. Packed with everything you need to set up and maintain an Amateur Radio Station and the ideal event to attend if you are interested in Ham Radio

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Offer expires on 13 September 2019. This is a UK direct debit offer only. Ticket will be posted in advance of the event. Telephone lines open Monday to Friday 8am-6pm and Saturday 9am-5pm.

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On Sale 8th August 2019

WARNERS GROUP PUBLICATIONS PLC

Keylines

Don looks forward to a house move, reflects on what's in this month's issue and comments on the apparent threat to our 2m band.

It's been quite a month here, mainly waiting for our house sale to go through. Having not moved house for over 34 years, this has been a traumatic process! Anyway, around the time this magazine hits the newsstands we will be settling in to our new home near Wells in Somerset. First priority is to get broadband internet up and running so that I can press on with my *PW* commitments. Next is the amateur radio station and, later, helping my wife with getting the house the way we want it (or maybe I've got the order of priorities mixed up?).

But I do intend to try and be on for the *PW* 70MHz contest in September. The announcement appears in this issue.

Apart from all that, I was helping at the McMichael Rally, organised by my local Reading club along with other local clubs, and met a number of readers. One asked that I tell his wife to desist from being first to open and read *PW* when it comes through the letterbox!

This Month

This month's contents are as varied as ever. We have something rather off the normal track by way of interpreting Chinese instructions but it makes sense. Most of the kits and modules recommended by regular contributor **Geoff Theasby G8BMI**, for example, hail from China and rarely come with clear instructions in English.

I'm also pleased to feature two very different island expedition stories, one from close to home on the Scillies and one from the Philippines. The latter story came to me by way of one of the Philippine amateurs I met on my visit last year. I find it interesting and reassuring to know there is such enthusiasm for the hobby on the other side of the world.

Sam Jewell G4DDK has the third part of his feature on getting started on 23cm. I feel sure the band will get more and more lively given the popularity of the new Icom IC-9700 – I saw several people happily walking away from the ML&S stand at the McMichael rally with these rigs.

Threat to the 2m Band

Tim Kirby G4VXE covers in his column this month the threat that has surfaced from France concerning the 2m band. It's not an immediate threat – nothing can happen for at least four years, given the way that the International Telecommunications Union (ITU) operates its decision-making process. Hopefully this will be plenty of time for those who support amateur radio (in particular, the International Amateur Radio Union, IARU) to get their national representatives to block the proposals. Indeed, **Tim Ellam VE6SH**, IARU President and a distinguished international lawyer, has already put some reassuring words on the IARU website. But any threat like this emphasises the need to make good use of our bands. I actually think the biggest downside of the new FT8 and FT4 digital modes is that they concentrate activity on just a couple of channels in each band, which leaves the amateur service at risk of being accused of having lots of spectrum that we are simply not making use of.

Radio-Related Museums

Recently I asked for suggestions for interesting museums and collections with a radio aspect. My colleague **Georg Wiessala**, editor of our sister magazine *RadioUser*, has kindly pointed out to me that he maintains a comprehensive list on the **radioenthusiast.co.uk** website. You can find it under 'Articles' or put 'museums' into the search box on the site.

As this is the September issue, I must close by saying that *PW* and *RadioUser* will, of course, be back at Newark for the National Hamfest, September 27/28th. Can I also give a plug for the RSGB Convention, October 11th to 13th in Milton Keynes, when I (and many far more distinguished speakers) will be giving a talk.

The Convention is sponsored by *PW* advertiser Martin Lynch & Sons. The programme has an HF, a VHF, an AMSAT and a General lecture stream, a Contest University session, club exhibits, Construction Competition, SMD Buildathon, Pi Workshop (I have a feeling our regular columnist **Mike Richards G4WNC** is behind that one), and more. I hope to meet many readers at one or both events.

Don Field
G3XTT

Practical Wireless

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Components for PW projects
In general, all components used in constructing *PW* projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified a supplier will be quoted in the article.

Photocopies & Back Issues
We can supply back issues, but we only keep them for one year. If you are looking for an article or review that you missed first time around, we can still help. If we don't have the actual issue we can always supply a photocopy or PDF file of the article. See the Book Store pages for details.

Technical Help
We regret that due to Editorial timescales, replies to technical queries cannot be given over the telephone. Any technical queries are unlikely to receive immediate attention so, if you require help with problems relating to topics covered in *PW*, please either contact the author of the article directly or write or send an email to the Editor and we'll do our best to reply as soon as we can.

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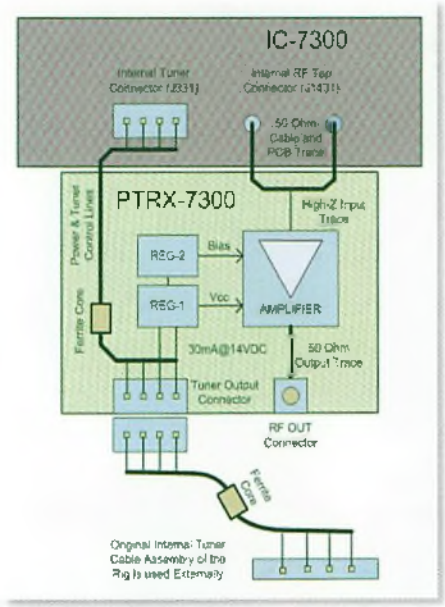


ML&S News

Martin Lynch & Sons tell us that they now stock the RadioAnalog PRTX-7300. With the Icom IC-7300 being the best-selling SDR Transceiver on the market today, it was only a matter of time before a manufacturer worked out how to get an RF output to enable connection of an external SDR device for full panoramic display. Because of cost restraints and getting too close to the specification of its bigger brother the IC-7610, Icom left out RF output capability, which is a major drawback for its users.

Located in Turkey and the USA, RadioAnalog have introduced the new PRTX-7300 for the Icom IC-7300. Very easy to fit internally with no soldering or alignment necessary, this high-performance module allows the user to obtain an RF output to drive any of the SDRs, including SDRplay, AirSpy etc. This allows the owner of an IC-7300 to interface through a low-cost SDR, full panoramic display, which the rig 'as standard' is unable to do.

Because of the unique design and internal fitting together with the high input impedance amplifier on the PRTX, the IC-7300 doesn't even know it's fitted and it doesn't degrade the performance on the transceiver in any way.

The RadioAnalog PTRX-7300 can be installed easily taking only 15 minutes and bar a Philips screwdriver, no other tools are required.

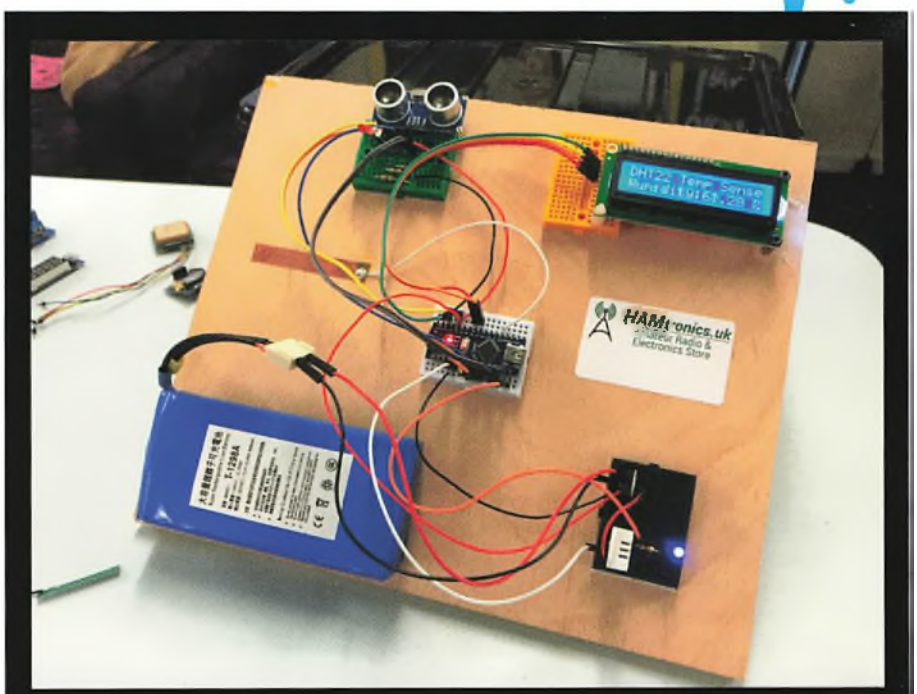
Available from ML&S, their sole distributor, the PRTX-7300 is available at an introductory offer of just £179.95 plus p&p. For more information see:
HamRadio.co.uk/PRTX7300

The Expert Electronics SunSDR2DX is a new direct sampling HF/6m/2m transceiver with 100W on HF, 50W on 6m and 8W on 2m. It is small and compact and based on the SunSDR Pro. Availability is this autumn with price to be announced. For further details see:
HamRadio.co.uk/SunSDR2DX

ML&S will be receiving their first delivery of the 200W version of the FTDX101, the FTDX101MP in August. There has been huge interest in the 200W variant, priced at £4199.95, including the additional VCT-101 VC-Tune unit.

Martin and his team will have a demonstrator at their London showroom and are taking orders. For more information see:
www.HamRadio.co.uk/ftdx101MP

A couple of Martin's 'lads' also visited the recent Ham Radio event in Friedrichshafen, Germany, and made a 12-minute video that can be found on the ML&S TV link:
www.MLandS.TV



South Essex News

It's been a busy few weeks for **Andrew M0ONH** as he has recently delivered his *All Things Micro* talk for the Thames Amateur Radio Group, South Essex ARS and Thurrock Acorns. The talk covered getting started with microcomputers and microcontrollers, the basics of coding small devices, and examples of how to use these devices in projects such as his new Arduino-controlled antenna rotator.

Andrew is the owner of Hamtronics.uk and is the designer of the popular Essex Ham-branded Repeater Timeout Kit. You can find a copy of his presentation and more information about his projects at: **onenewham.uk**

CAS-7B / BP-1B

(from AMSAT-UK website) CAS-7B (BP-1B) is an amateur radio Cubesat that will work with educational bodies in China. The Chinese Amateur Satellite Group (CAMSAT) has developed the project with Beijing Institute of Technology (BIT), one of the most famous aerospace universities in China. BIT provides launch support and there are many teachers and students from the university that are participating in the development and testing. With the help of CAMSAT, the university has established an amateur radio club (callsign BI1LG). Many students are members and are learning amateur radio satellite communication while having fun. At the time of writing, the launch had been delayed from its original June date and was expected on July 22nd. However, because of the orbital apogee and the size and mass of the satellite, its orbital life was expected to be only one week, up to a maximum of one month, which will also provide an opportunity for radio amateurs to track and monitor the satellite entering the atmosphere.

The reports says that, given that this is a new launch vehicle (developed by a small commercial organisation), there is a strong possibility of failure. However, if the launch fails, they will have another launch later this year.

The payload includes VHF and UHF monopole antennas, a CW telemetry beacon: on 435.715MHz, a V/U FM transponder downlink on 435.690MHz and uplink on 145.900MHz

Rescue in Wales

On June 30th, RAYNET member and WAB Committee Member **Esther GI0AZA** was engaged in a Worked All Britain activation of a rare square in Northern Ireland on 40m, when she picked up a 'Mayday' call from another RAYNET member **Richard MW6RBH/M**. Richard had been asked to help a motorcyclist with a serious leg injury in a remote area of the Cambrian Mountains in West Wales. There was no mobile coverage from any of the providers in that area, so Richard fired up the transceiver in his Land Rover and called for assistance.

Esther called 999 and asked for air ambulance Wales, which she says is a bit odd for their 999 in NI! They put her through and she gave them the grid reference. The operator said she had never had this before. Esther had to go back and get nearest town details from Richard and when the air ambulance control heard her talking to him, they realised that this was genuine. The air ambulance was dispatched, and the motorcyclist lifted out. The event has since received significant coverage in the press, on Facebook and elsewhere.

New Fusion Repeater

Moonraker are delighted to announce a networked 2m Fusion repeater, GB7CG, for Milton Keynes and surrounding area. Thanks are expressed to Yaesu UK and Panorama antennas for support with the project. The repeater should be up and running in August:
https://tinyurl.com/y6oku9ck

UK 2018 Amateur Radio Exam Statistics

The RSGB recently released the Examinations Standards Committee (ESC) report, which covers 2018 and has some limited data for the first three months of 2019

During 2018 they were a total of 2,592 candidates for all three levels of exam but only 234 were women, just 9%. The ESC make this comment on Foundation numbers: *"It is seen that over the past five years there has been a slow decline in the number of Foundation candidates, averaging about 2% per year"*.

Regarding the Intermediate exam the Examinations Standards Committee say: *"The Intermediate pass rate, which increased to 96% in 2018, suggests that the exam does not discriminate sufficiently well between candidates"*.

On the proposed new single exam to go straight to Full licence the Examinations Standards Committee say: *"The Examinations Group have prepared a draft syllabus, based on Syllabus 2019, for an exam that will provide direct entry to a Full licence, like the old RAE. The Examinations Standards Committee has agreed that the syllabus will be put out for consultation in the UK amateur radio community. This consultation will take place later in 2019."*

A table is provided giving candidates' average ages. It appears the exams mainly appeal to people in late-middle age. The Foundation exam attracts the 'youngest' people with an average age of 44.

Download the Examinations Standards Committee annual report issued May 2019:
https://tinyurl.com/y3ku93m2

News from Essex

Essex Ham member **Dorothy Stanley M0LMR** was recently asked to talk about her amateur radio journey at an event called *Women in Tech*. Dorothy talked about the hobby in general, how she got started, and how she progressed to running her popular Essex Ham YL net and making her first EME moonbounce contact. A full video of her inspirational talk can be found at:
sxham.uk/wit

Essex Ham members also supported the Basildon Street Science Festival 2019. This brought together scientists and ambassadors to Basildon town centre for a range of hands-on STEM (Science, Technology, Engineering and Maths) activities. Radio activities included demonstrations of Raspberry Pi SDRs and Arduino controllers, as well as the opportunity to send greetings messages. During the day, **David Burton-Sampson** (Mayor of Basildon) and local MP **Stephen Metcalfe** took up the challenge of making their first contact over amateur radio. There is a short video at:
sxham.uk/bss

New IOTA Groups

Following the decision to split the five-yearly review of the IOTA list into two parts, a second tranche of six groups was announced at Ham Radio Friedrichshafen in June. The review has now completed its work; the next one is scheduled for 2024.

These new groups have provisional numbers. This means that they will need to be confirmed by an operation taking place that meets the 1,000 QSO and other normal validation requirements. Only after confirmation of the group number will credit for past operations be considered.

The addition of these six groups takes the total of groups that have confirmed or provisional IOTA numbers to 1,172. Of these 1,131 have seen activity, the remaining 41 have not. The number of unnumbered groups remains at 33. A number of these will be withdrawn in due course to keep within the programme cap of 1,200 groups set long ago by the Management Team as a firm policy decision.

Further details are on the IOTA website:
www.iota-world.org/

Homebrew Heroes

The ICQ Podcast has announced a partnership in the founding of the Homebrew Heroes Award by three members of the podcast. This award is to recognise persons or organisations who help define the frontiers in amateur radio technology through the long-standing tradition of homebrew construction. It is housed at: **www.homebrewheroes.org**

"We felt that with all of the technical homebrew activity in amateur radio today that there should be a means by which to identify and highlight those whose technical creativity has made a clear impact on the hobby," said **Frank Howell K4FMH**.

"Commercial companies have begun signing on to donate prizes to the future recipient," said Howell. *"Digilent Inc, a National Instruments Company, immediately told us that they would contribute their highly successful Analog Discovery 2 test device"*. **Kaitlyn Franze**, Software and Hardware Product Manager with Digilent, said, *"When I learned that this was being planned, I immediately said that Digilent would like to be a corporate prize sponsor. Our market base has been significantly impacted by amateur radio operators who design and build equipment in this maker space. Digilent is proud to be on board with the Homebrew Heroes Award Program."*

Competition Winners

The winners of our July bhi headphone competition are **Mr D Hewitt** of Chester and **Mr M Stanbridge** from Somerset. Our thanks again to bhi for their generosity.

FT4 Latest

In mid-July the WSJT Development Group announced the 'general availability' release of WSJT-X version 2.1.0. This major upgrade formally introduces FT4 as a finished protocol for HF contesting. WSJT-X version 2.1.0 supplants any 'release candidate' (beta) versions and users should discontinue using any beta versions. This latest version also includes improvements and bug fixes in several areas, including FT8.

The WSJT-X Development Group is providing a separate WSJT-X version 2.1.0 installation package for 64-bit Windows that offers significant improvements in decoding speed. Installation packages for Windows, Linux, and Macintosh are available. Visit the FT8/FT4/JT9: WSJT 2-Way Narrow Modes for Amateur Radio Facebook page for additional information.

More D-Day Activities

GB2ORM from the Great Orme Country Park, organised by The North Wales Radio Society celebrating the 75th Anniversary of the D-Day Landings, was very successful. Conditions on the Friday night were terrible and high winds really put the pressure on club members but over the weekend well over 120+ contacts were made on HF/VHF/DMR and Morse.

On the Saturday club members joined the Royal British Legion Ceremony at the Llandudno Cenotaph where the club also had a stand promoting the RSGB and amateur radio in general. It was an honour then for the club to lay a special memorial wreath and parade with all the other dignitaries involved at the service of memorial.

Thanks are due to RAF Valley in Anglesey, who provided tents to accommodate the special event station. The photo shows the wreath laying ceremony on Llandudno promenade.

In support of the 75th anniversary of D-Day, the South of England was treated to a flyover by more than 25 World War II aircraft. In support of this, Essex Ham ran a three-county on-air event to cover the flight and to track the aircraft in real-time. Over 20 stations took part, including GB2IWM, from the flight's starting point in Duxford. The net was coordinated by **Dorothy M0LMR**, **Richard G7OED** and **Pete M0PSX** from Two Tree Island, near Southend-on-Sea, and the team was able to provide live updates to members of the public waiting for the historic flypast with their cameras at the ready.

Thanks to spotters in three counties, and live data from **Keith G6NHU's** ADS-B tracker, the coverage was more accurate than reports being relayed by the local BBC radio station, and an excellent demonstration of the immediacy of reports from a coordinated network of radio amateurs.

There is a short montage of photos and audio extracts from the event at: **sxham.uk/dday**

Friedrichshafen 2019

14,300 people attended this year's Ham Radio event in Friedrichshafen, down from 15,460 in 2018 and 17,400 in 2009.

However, this may be partly due to there being no associated Maker Faire this time round. The dates for the 45th Ham Radio and the 71st Lake Constance meeting have already been decided: June 26th-28th 2020, again at the Friedrichshafen Exhibition Centre. With that, Europe's biggest amateur radio show returns to its traditional last weekend in June.

'Happy 150!' Hiram Percy Maxim Birthday Celebration

This year marks the 150th anniversary of the birth of ARRL's first president and cofounder **Hiram Percy Maxim (HPM) W1AW**, born on September 2nd 1869. ARRL will hold an operating event to celebrate HPM's legacy, getting under way at 0000UTC on August 31st, and continuing until 2359UTC on September 8th. The event is open to all radio amateurs.

The goal is straightforward: Contact as many participating stations as possible. W1AW and all ARRL members will append /150 to their callsigns during this event (DX operators who are ARRL members may identify as <callsign>/150, if permitted by their country of licence.) Participating stations will exchange signal report and ARRL/RAC Section. DX stations will send signal report and 'DX'. Those taking part may use all amateur radio bands, excluding 60, 30, 17 and 12m.

Permitted modes: CW, phone (any voice modes), and digital. Submit Cabrillo log or .ADI files. ARRL will calculate all final scores based on participants' uploads to the ARRL event web app.

The 84 available multipliers only count once. These include the 83 ARRL/RAC Sections (RAC Sections include the Canadian Northern Territories, encompassing VE8, VY1, and VY0) and DX. The W1AW operating schedule during this period may be adjusted as necessary to accommodate on-air celebration operating activities. Contacts with W1AW/150 will earn 3 points each. Contacts with any ARRL member will earn 2 points each. These stations will also identify as <callsign>/150. Contacts with non-members will earn 1 point each.

Further details at:
https://tinyurl.com/y5pbgvfz

Exercise Blue Ham

Flt Lt David Webb RAFAC, Blue Ham Exercise Co-Ordinator, reports: *"Over the weekend of June 15/16th EXERCISE BLUE HAM 19-2 was run using the 5MHz (60m) shared band from 11 different locations around the UK, many of the stations being manned by RAF Air Cadets. We have not run a Blue Ham exercise during the summer months for a couple of years now but due to many requests from both the cadets and amateurs to have the opportunity to get out and work in the field or go portable, we managed to get a date when the weather was going to be on our side!*

"With this in mind we saw five portable amateur stations make the effort to get out and enjoy the fresh air, warm weather and try different antenna configurations that they normally would not use at their home location. Well done to these guys for trying something different and actively taking part. During the weekend most QSOs were by phone but we did have some exchanges using Olivia Signal 16/500, which proved to be good.

"Operating conditions proved difficult from time to time with heavy fading (QSB), static crashes from the thunderstorms (QRN) in Central France/Germany and the band going completely quiet did affect the number of QSOs but with patience and perseverance some 377 contacts were logged onto the Alphacharlie online log page and PDF certificates have been sent out to those that have requested them. Many thanks to the amateurs for taking the time to make contacts with our callsigns."

News from Lindars

Justin Lindars 2E0JVL, founder of Lindars Radios, reports, *"It all started back in June 2017 from home where I won a collection of amateur radio equipment from a local auction by mistake! Being a first-time user to the auction site I thought I was pressing the refresh button each time watching the bidding going up. It turns out this was the bidding button and not the refresh and the lucky winner was me to my surprise. I went to collect my winnings and it turned out there was a lot more than in the photos. This is where it all began; I sold the first radio from that job lot and made my money back instantly. This gave me the idea that perhaps I could do this a few more times. Amateur radio has been a hobby of mine for many years and I really enjoyed buying and testing the radios from auctions.*

"It wasn't long before the house started to fill up with interesting radios and accessories such that I started to realise I would need to take on a small premises. This led to a rather interesting stock system that utilised the children's wardrobes and various cupboards around the house.

"I built an ecommerce website to list all the items of stock, which was rapidly increasing on a daily basis:

www.amateurradiosales.co.uk

*"Due to the nature of rather unusual radio equipment I made contact with a local amateur radio club member, **Rob G3MYM**, who very kindly helps me identify various pieces of equipment. I joined the local Yeovil amateur radio club and they are always very supportive of any of my new ventures.*

*"Some time ago I was fortunate to find a unit on a local industrial estate that we share with another fellow amateur radio enthusiast **Lee G7OGG**, who runs PC Zone (Yeovil).*

*"In March 2019 due to the increased sales on the website and in the shop, I took on a new member of staff, **Rachel**, who photographs and inputs the stock to be sold on the website.*

"Within the shop we have a vintage wireless museum area, a good selection of vintage and collectable Morse keys, and a library of books and manuals on all things radio related. We have a popular Call Wall (callsigns) for every amateur who visits the shop and, of course, a great selection of new and used amateur radio equipment and accessories. We have an area available for customers to sit down and try out our equipment. We have an external HF antenna, which can be used for transmit and receive.

"On July 6th we had an open day with Yaesu demonstrating the latest FTDX101D transceiver. One of our customers kindly described the shop as an Aladdin's cave for amateur radio enthusiasts."

Visit our new Book Store at www.radioenthusiast.co.uk

TOP TITLES

Book of the Month

Hear my Voice

£9.99 plus p&p

This historical novel, set around the time of the German annexation of the Sudetenland, is written by former BBC Prague correspondent David Vaughan, who was also editor-in-chief of Czech Radio External Services. Reviewed in August 2019's RadioUser as "an interesting text on this crucial period of European history, prior to the outbreak of the Second World War", Vaughan "cleverly weaves contemporary radio broadcasts into his own account of events".

The Red Light Zone

For twenty-five years, Jeff Zycinski worked for BBC Radio and became the longest-serving boss of Radio Scotland. An affectionate, humorous account of inside life at the Beeb.

£8.99 plus p&p

Electrified Voices

Tracing the origins of the modern soundscape, showing how sound technology and the rise of a new auditory culture played an essential role in the formation of Japanese modernity. Electrified Voices looks at how radio shaped modern Japan between 1868 and 1945.

£24.00 plus p&p

Radio Caroline: The Pirate Years

Revised since its first publication in 2003, this title details a history of offshore radio from 1958 to 1980, providing accounts of ship – and fort-based radio stations and a history of Radio Caroline.

£18.95 plus p&p

Wartime Broadcasting

During the wartime years, the BBC was the sole radio broadcaster in Britain, boosting morale through programmes. Reviewed as "a fascinating read".

£7.99 plus p&p

Auntie's War

The BBC is an institution unlike any other, and this is its wartime story. A curated collection of articles gleaned from the BBC archives in this 422 page hardback book. Reviewed as "a good read".

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RSGB Yearbook 2019

528 pages of around 88,000 callsigns, the latest information about the RSGB, the committees and services, local information about regional representation, affiliated clubs, contest groups and repeater groups

£17.99 plus p&p

Broadcast Brothers

A true, autobiographical story about love and loyalties in families and family businesses the world over, risk, luck, laughter, hard work – and what happens when the little guys take on the big guys.

£14.99 plus p&p

Radio Listener's Guide 2019

The 31st edition of the annual guide for UK radio listeners is now available. Providing news and information for listener's, with coverage of all the key developments in analogue, digital and internet radio.

£6.95 plus p&p

World Radio TV Handbook 2019

This book continues to offer the most comprehensive guide to broadcasting. Itagain provide the most up-to-date information on mediumwave, shortwave and FM broadcasts

£35.00 plus p&p

The Voices – Spying and Radio Warfare during the Cold War

Based on the series of RadCom articles published in 2000-2001, this book has been edited from those articles and expanded with new pictures.

£9.99 plus p&p

Scanners 7

Includes details of an increasing number of "apps" for smartphones specifically for radio data decoding, including programs for digital scanner communications decoding for which a smartphone can be linked to an existing scanner radio to decode.

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Pro Antennas DMV-II

Don G3XTT tries out the new Pro Antennas DMV-II compact portable dipole for 80 and 60m

We carried an announcement of the Pro Antennas DMV-II in our July *News* pages. To recap, the DMV-II is a resonant V-antenna covering the 80m band with a 60m option. The antenna has a span of less than 8m but outperforms vertical antenna alternatives in respect to high angle radiation. It is designed to be used with a lightweight mast of 3 to 5m and can be permanently set up in a garden or quickly packed away when not in use. The poles compact to 1.2m, which makes it easy to transport.

Pro Antennas previously offered three antennas for the HF bands from 40m to 6m. The DMV-II was designed in response to many enquiries for 80m coverage and now complements this range.

Tony at Pro Antenna kindly loaned me one to review. I was particularly keen to do so because a full-size 80m dipole has a span of 130ft or thereabouts, more than many radio amateurs can find room for nowadays. An antenna with a 'wingspan' of around 25ft is much more manageable both for the home situation and for portable operations (especially as the DMV-II weighs around 2kg and can easily be picked up in one hand).

1

First Impressions

The antenna arrived well packaged in a cardboard tube just 1.2m (47in) in length. It consists of a metal centrepiece, onto which two lightweight fibreglass fishing poles and a centre feedpoint slide. The feedpoint has an SO239 (UHF-style) connector and two wires that when unfurled form the inner part of the antenna. There is then a loading coil in each leg, and a further extension wire that goes to the end of the fibreglass pole and dangles vertically (not an issue given that the majority of radiation from a dipole is close to the feedpoint, where the current is highest).

The antenna is rated at 500W, unlike many portable antennas that are suitable only for QRP operation.

All the key parts are colour-coded so assembly is straightforward. It actually took me about an hour, making notes and taking photos as I went along. The Pro Antennas website suggests about 15 minutes to assemble at a portable site and this is probably realistic when you've done it a few times and are not in 'review mode' as I was. I found it easiest to assemble on my lawn and then mount on my mast, because I was using a Racal push-up mast, which puts the antenna feedpoint some 6ft above ground before extending the mast, just about doable but I found it easier to assemble the antenna and then mount it on the mast.

The only problem I had first time round was that I hadn't really allowed enough slack in the wires and they pulled out of the traps (it's a neat push-in connector at that point) as I was trying to manoeuvre the antenna onto the mast. Some plastic clips are provided with the antenna to stop of the wire hanging too loose from the fibreglass pole but I resorted, for simplicity, to my tried and tested method of using B&Q cable ties close to the traps to hold the antenna wire in place. These are cheap and disposable – simply cut them off after use. I had no problems after that.

The antenna wire is of such a length that, on the 80m band, it should resonate near the top of the band (80m is the widest of our HF bands in percentage terms – even a full-size dipole won't cover the whole band with a low SWR of, say 3:1 or less). A series of extension pieces are provided (two of each length so that a wide variety of extension lengths can be created by using them in different combinations) to extend the antenna for different parts of the band.

First Measurements

Without any extensions and with the antenna raised to about 5m at the centre, I measured the resonance at 3.77MHz with an SWR of 1.1:1 and a 2:1 SWR bandwidth from 3.739 to 3.809MHz, some 70kHz in total. This is probably about what I would expect from an antenna that is well short of a full half-wave. Adding all the extensions took the resonant point down to 3.455MHz so it was clear that, with a suitable combination of extensions, you can put the resonance pretty much

Photo 1: The parts after unpacking from the tube.
Photo 2: The antenna on a Racal ex-military mast.
Photo 3: SWR plot on 80m, measured on MFJ-226 analyser.
Photo 4: The loading coils are well made and weatherproofed, as well as being clearly colour coded (main colour indicates band, end colours are for placing and connections)

wherever you want it within the 80m band (centred, for example, on the WAB net frequency, a local club frequency or whatever). In my case, I planned to start by trying the antenna out in the CQ WPX CW Contest at the end of May, so I set about finding the right combination of extensions to resonate the antenna around 3530kHz, which, with a 60kHz or thereabouts 2:1 bandwidth would enable me to operate comfortably over much of the spectrum where contest activity would be taking place. I quickly arrived at a resonance of 3537kHz, with a measured 2:1 bandwidth of 3494 to 3566kHz. I expected these figures to increase in frequency as I raised the mast (in the contest I used it at full extension, about 35ft or so) and this proved to be the case. The resonance moved up to 3538kHz and the 2:1 figures moved to 3511 and 3572kHz, not a huge amount but worth being aware of if you plan to raise the antenna well above ground.

In Use

So how did it perform? I decided to enter the 80m high-power Assisted category, meaning that I could run the full 400W and use the Cluster network to find new stations. Even at 11m or so, this antenna would inevitably be a 'sky warmer' – an 80m dipole needs to be over 100ft high to have significant low-angle radiation – but that's fine in the WPX contest because it's not really a DX contest. Every new prefix counts as a multiplier so a DL4 (Germany) is as good a multiplier as a VK4 (Australia), for example. In the event, using my Elecraft K3, KPA500 amplifier and KAT500 tuner (which actually allowed me to move outside the 2:1 zone if I needed to because it copes with SWRs of up to 10:1), I made comfortably over 600 contacts, across five continents, including some nice DX in Asia, Africa and the Caribbean as well as plenty of East Coast US stations. Indeed, I beat the previous English record for that category and am placed World 10th in claimed scores, which goes to show that some fun operating is possible from even a limited garden if you are prepared to put up something like the DMV-II for the weekend. I had half expected that the SWR would vary as the wind moved the ends of the elements (the bits that hung down) but I saw no evidence of this. Yes, there were some stations that I failed to raise (VK6LW, for example, who I heard on both evenings of the contest) that I would probably (but not necessarily) have worked on my high dipole, but they were few in number and probably won't have affected my final position in the contest results. All in all, I was pleasantly surprised.

Then, a few days later, in the monthly Morse section of the RSGB 80m Club Championship contest, I managed 144 contacts in the 90 minutes, one of my better efforts in this event, so I certainly didn't feel I was compromised in any way by using an antenna significantly shorter than my usual full-size dipole.

60m

The next step was obviously to give 60m a try. With no extensions to the wire, the resonance was at 5.34MHz with an SWR of 1.69 on my MFJ meter. At the UK band edges, this rose to 2.4 at 5.258MHz and 2.15 at 5.406MHz. The exact figures would

Photo 5: One set of extension wires – various lengths that can be connected in a wide variety of combinations.

no doubt vary with antenna height. The good news was that my Yaesu FT-847 (which is boadbanded, so covers all parts of the 5MHz allocation) was quite happy to work into this anywhere across the band.

Although I had previously harboured an intention of trying out the 5MHz allocation, I had never done so from the UK although I did make some QSOs when I was visiting out HF columnist **Steve PJ4DX** in Bonaire. So, I looked forward to my first excursion onto the band. I had to wait until evening to hear anything other than FT8 signals but then was able to work several stations on CW around Europe, from Poland in the east to Norway in the north. I also had an excellent (59 both ways) chat on SSB with LB6BG, also in Norway. However, this was just a foretaste because I was blown away later the same evening to have LU7YS (Argentina) on CW come back to my call and to exchange 559 signal reports with him. With 100W and a low dipole, I was suitably impressed!

I should just remind readers at this point about the restrictions that apply to 60m operating, covered in our two-part feature in the May and June 2017 issues of *PW*. Full licensees only, maximum 100W and the bandplan is somewhat complex so it's worth having a printed copy in front of you, at least until you get the hang of things. The allocated channels are quite narrow and SSB is on upper sideband, while if you operate FT8, you may end up calling anywhere in a 3kHz bandwidth, so it's easy for your RF to be outside one of the channels even if the indicated carrier frequency appears to be within the allocation. It's just a matter of being careful.

Conclusions

This antenna is promoted as a lightweight compact dipole offering a means to get on the lower frequencies (80 and 60m) quickly and easily, for example for portable operation. It is recognised that a low LF dipole will not compare with a good vertical antenna for long-haul DX (although many home vertical antennas are anything but 'good', with limited ground systems, surrounded by trees and so on) but should give good service for NVIS (near vertical incidence skywave) contacts, in other words for working around the UK and near Europe.

In practice, I was very pleasantly surprised at its performance. Unlike many 'portable' antennas, it will handle up to the UK power limit. It is light enough to pick up with one hand (provided it's not too windy) and be used on a lightweight portable mast. The limitation, a function of it being short relative to a full-size dipole, is that the VSWR bandwidth is small (you can't beat physics!) but that isn't necessarily a problem if you enjoy a specific operating style (WAB, SOTA and similar). In a strong wind, the vertical wires would no doubt whip around too – I'm not sure this is an antenna for a permanent installation but it's not really intended for that. I like the overall concept and it's well put together. I gather a set of 40m coils will also be available by the time this appears in print, making the DMV-II even more useful. Yes, you could probably fashion something similar yourself, with a bit (a lot!) of trial and error but I doubt whether the construction, especially the loading coils, would be as robust or weatherproof and I do like the way the various wires and coils plug together with nice substantial connectors.

The basic antenna costs £238 with an extra £39 for the 60m option.

www.proantennas.co.uk

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5 DONCASTER ROAD, BARNSLEY, SOUTH YORKSHIRE S70 1TH

E&OE

• E-mail: practicalwireless@warnersgroup.co.uk

The 11th Practical Wireless 70MHz Contest

Colin Redwood G6MXL invites readers to participate in the Practical Wireless 70MHz Contest.

The 11th Annual *Practical Wireless* 70MHz Contest takes place on Sunday September 22nd 2019 from 1300 to 1600UTC.

The contest is split into two sections. The low power section with a power output limit of 10W enables Foundation Licence holders to compete on an equal basis with other low power stations. The high power section allows stations to run up to the full power permitted by their licence.

You may operate from a fixed location or portable – a good hilltop location can make a huge difference to your score.

For those new to the 4m band, the *PW* 70MHz contest is a great introduction to the friendly nature of contesting found on the band.

Equipment

The choice of equipment at 70MHz (4m) continues to improve. For SSB and CW operation, Kenwood's TS-890, Icom's IC-7100 and IC-7300 transceivers and the Yaesu FTdx101D all offer the 4m band in addition to the HF and 6m bands.

Less well known is the Noble NR-4SC, a dedicated 4m SSB/CW (but not FM) transceiver, which was reviewed in the March 2015 issue of *PW*. The UK version of the older Yaesu FT-847 also covers 4m and can often be found second-hand.

Transverters are still used by some 4m operators and are available from a number of sources. Most use an intermediate frequency (IF) of either 28MHz or 144MHz, taking the 28MHz output from an HF or 144MHz transceiver and mixing with a local oscillator to give 70MHz for transmit and vice versa on receive. Transverters usually require drive levels much lower than the full output power of most HF and VHF transceivers, sometimes as little as a few milliwatts. You may need an attenuator unless your main transceiver has a low-power output to suit your transverter.

A number of FM transceivers for 4m have come onto the market such as the Wouxuns's KG-UDV1P/L 4m and 2m dual-band and KG-699E 4m handhelds, the Wouxun KG-UV950PL mobile and the Mydel ML-5189 mobile.

Antennas

Many stations will perhaps be using nothing more than a simple dipole or quarter-wave vertical antenna. Stations with Yagi antennas are likely to have fewer than six elements. A number of suppliers offer commercial 4m Yagis.

Vertically polarised antennas are generally used for FM and AM operation. For SSB and CW, most stations use horizontally polarised antennas. For those who like building antennas, there are a number of designs for the 4m band on the *PW Antenna Collection Archive Disc*.

Operating

I'd suggest spending some time on FM and AM in addition to SSB and CW. If you are unfamiliar with the 4m band, you could be surprised at just how many stations are using these modes.

In recent years there has been increasing activity from the Continent in addition to activity from almost all parts of the British Isles, including a number of EI (Republic of Ireland) stations. It is easy to miss out on contacts simply by not rotating directional antennas in all directions. Don't forget that slow QSB (fading) is a common occurrence on the 4m band, so you may miss a station altogether if you don't rotate a directional antenna a number of times during the contest. The QSB (fading) can cause stations to disappear for a minute or two and then reappear.

Entries

Don't forget to submit your entry after the contest. Although electronic entries via e-mail are preferred and make the task of the adjudicator much easier, legible paper entries continue to be welcome. The e-mail address for logs is **entries@pwcontest.org.uk**

Do make a note in your diary now. The 11th *PW* 70MHz Contest takes place on **Sunday September 22nd 2019**. If you plan to use batteries, don't forget to charge them a day or two before and put a reminder in your diary to submit your entry to be received by **Tuesday October 15th**. Let's hope for some good weather and propagation on the day so that we can all have a really enjoyable time.

The 11th *Practical Wireless* 70MHz Contest Rules

www.pwcontest.org.uk

1. General: The contest is open to all licensed radio amateurs, fixed stations or portable, using SSB, CW, AM or FM in the 4m (70MHz) band. Entries may be from individuals or from groups, clubs and similar organisations. The duration will be from 1300 to 1600UTC on September 22nd 2019.

All stations must operate within the terms of their licence and only transmit within the 4m licensed allocation. Stations using transverters are reminded to be careful not to transmit out of band.

Subject to licence conditions, split frequency operation is permitted for the purpose of working stations in countries with different 4m allocations. Cross-band contacts where either station is not operating between 69.0 and 71.0MHz will not count for points.

Entrants must observe the bandplan for their country and keep clear of normal calling frequencies such as 70.200MHz. Entrants must avoid using any frequency that is obviously in use for non-contest purposes. **The 4m band is not an exclusive amateur band in many countries. Contest stations must allow all other**

users (including non-amateur users) of the band to carry out their activities without hindrance.
The station must use the same callsign throughout the contest and may not change its location. Entrants not operating as a fixed station must use the /P callsign suffix.

2. Contacts: Contacts will consist of the exchange of the following minimum information:
(i) callsigns of both stations **(including any /P suffix)**
(ii) signal report, standard RS(T) system
(iii) serial number: a 3-digit number incremented by one for each contact and starting at 001 for the first contact
(iv) locator (i.e. full 6-character IARU Universal Location for the location of the station).
Information must be sent to and received from each station individually and contacts may not be established with more than one station at a time. Simultaneous transmission on more than one frequency is not permitted.
If a non-competing station is worked and is unable to send his full universal locator, his location may be logged instead. However, for a square to count as a multiplier (see rule 4), a full 6-character locator must have been received in at least one contact with a station in the square.
Contacts via repeaters or satellites or using any digital voice modes (including D-STAR, Fusion and DMR) and data modes or machine generated modes, such as FT4, FT8, JT65, PSK31 and RTTY, are not permitted. The use of the DX Cluster, ON4KST chat or similar is limited to setting up contacts and not for requesting or passing reports, serial numbers or locators, which must only be exchanged on the 70MHz band.

3. Power: In the Low Power section, the output power of the **transmitter** or **transverter** final stage must not exceed 10W PEP. If the equipment in use is capable of a higher power, the power shall be reduced and measured by satisfactory means. Stations cannot rely on feeder loss to meet the 10W power limit. In the Open section, stations may use whatever power they are permitted to use by their licence conditions.

4. Scoring: Each contact will score one point. The total number of points gained during the contest will then be multiplied by the number of different locator squares in which contacts were made (a square here is the area defined by the first four characters of the universal locator).
Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 52 × 5 = 260.
Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log and clearly marked as a duplicate (not necessary in computer logs submitted by e-mail).

5. The Log: Logs may be submitted by e-mail or by post. In either case the log must contain the following information for each contact:
(i) time (**UTC – NOT BST**)
(ii) callsign of the station worked **(including any /P suffix)**
(iii) report sent
(iv) serial number sent
(v) report received
(vi) serial number received
(vii) locator received (or location).
The preferred form of a log is a computer file sent by e-mail. This may be generated by contest logging software such as MINOS or EI5DI's SDV, or a file in any other suitable format (plain text is fine) provided each of the items above is separated by a separating character such as a comma or tab (please don't mix separators). Give the file a name including the station callsign (e.g. g6mxl-p.log), and send as a standard e-mail attachment to entries@pwcontest.org.uk
The REG1TEST, .log, .edi and .adi formats or the spreadsheet available on the contest website are preferred. If there is any problem with your entry, you will be contacted by e-mail.
Log sheets and covering information sheets for paper-based entries are available for downloading from the contest website:
www.pwcontest.org.uk

6. Entries: The covering information listed below must be provided with each entry. The preferred method of submitting this is by the use of the online facility on the website. Alternatively, the information may be written in the e-mail message to which the log file is attached. For entries sent by post, it should be written on a separate sheet of A4-sized paper.
The information required for every entry is:
(i) name of the entrant (or of a club etc. in a group entry) as it is to appear in the results table and on the certificate
(ii) callsign used during the contest **including any /P suffix** (e.g. G6MXL/P)
(iii) name and address for correspondence
(iv) location of the station during the contest
(v) full 6-character locator as sent during the contest
(vi) whether single or multi-operator (a single-operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
(vii) a full description of the equipment used, including transmitted PEP output power
(viii) if you are entering the low power section and the transmitting equipment (including any transverter employed) is capable of more than 10W PEP output, a description of the methods used (a) to **reduce** and (b) **measure** the output power
(ix) antenna used and the approximate station height in metres above sea level (ASL)
(x) if you receive or send a report of poor-quality signals (e.g. wide/splattering), full details of the complaint, including time, callsign, nature of complaint and actions taken **during** the contest to investigate and resolve
(xi) the following declaration must be included in the e-mail text or written and signed by the entrant: *"I confirm that the station was operated within the rules and spirit of the event and that the information provided is correct".*
Failure to supply the required information may lead to loss of points or disqualification.

Entries & Other Information
Entries by e-mail must be sent to
entries@pwcontest.org.uk
Paper entries should be sent to:
Practical Wireless Contest,
c/o Colin Redwood G6MXL,
53 Woodpecker Drive, Poole BH17 7SB.
Entries must be received not later than Tuesday October 15th 2019. Late entries will be disallowed.
Any other general comments about the station, the contest and conditions during it are welcome. Photographs relating to the operation may also be sent by e-mail. They may be used for publication in *PW* or on the contest website. If these are not available by the time the entry is submitted, they may be sent later **to arrive by October 22nd 2019.**
You will be asked, with your entry, to agree to the holding and processing of your log and to the publication of the results. Warners Group Publications data policy can be seen at:
www.radioenthusiast.co.uk/privacy-policy

7. Miscellaneous: When operating portable, obtain permission from the owner of the land before using the site. In particular observe any restrictions on access. Always leave the site clean and tidy, removing all litter. Observe the Country Code.
Take reasonable precautions to avoid choosing a site that another group is also planning to use. It is wise to have an alternative site available in case this problem does arise.

8. Poor Signals: Make sure that your transmitting equipment is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving, excessive speech compression or low voltage supply. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the received input. The use of a high-gain RF preamplifier is likely to worsen strong-signal problems so if you do use one, it is best to be able to switch it off when necessary.
If after making the checks above, you are certain that another station participating in the *PW* 70MHz contest is radiating poor quality signals, please call the station, giving your callsign, and tell them about the problem. You cannot expect a station with a poor signal to do something about it if they are unaware!
If you receive or send a report of poor-quality signals (e.g. wide/splattering), you must record on the cover sheet full details of the complaint including time, callsigns of stations involved, nature of complaint and actions taken **during** the contest to investigate and resolve.

9. Adjudication: Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts in paper-based logs will carry a heavy points penalty. Failure to supply the complete information required in rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicator will be final.

E-mail: practical wireless@warnersgroup.co.uk

Laserbeam-Vari from Sotabeams

Tex Swann G1TEX makes a welcome return to PW with a look at a handy accessory from Sotabeams, a variable digital audio filter.

I've always been interested in new projects and items that can enhance my hobbies. Now along comes a small pre-assembled variable digital audio filter from SOTABEAMS that could improve the output from the receivers that I like creating. Although the filter is pre-assembled, that doesn't mean that there's no work to do in adding it to a project, or even a commercial rig. Unlike many projects in the past that used simple switches to control the various settings of their filter parameters, this one uses a rotary encoder and its in-built 'action' switch to set up either bandwidth or centre frequency.

On Arrival

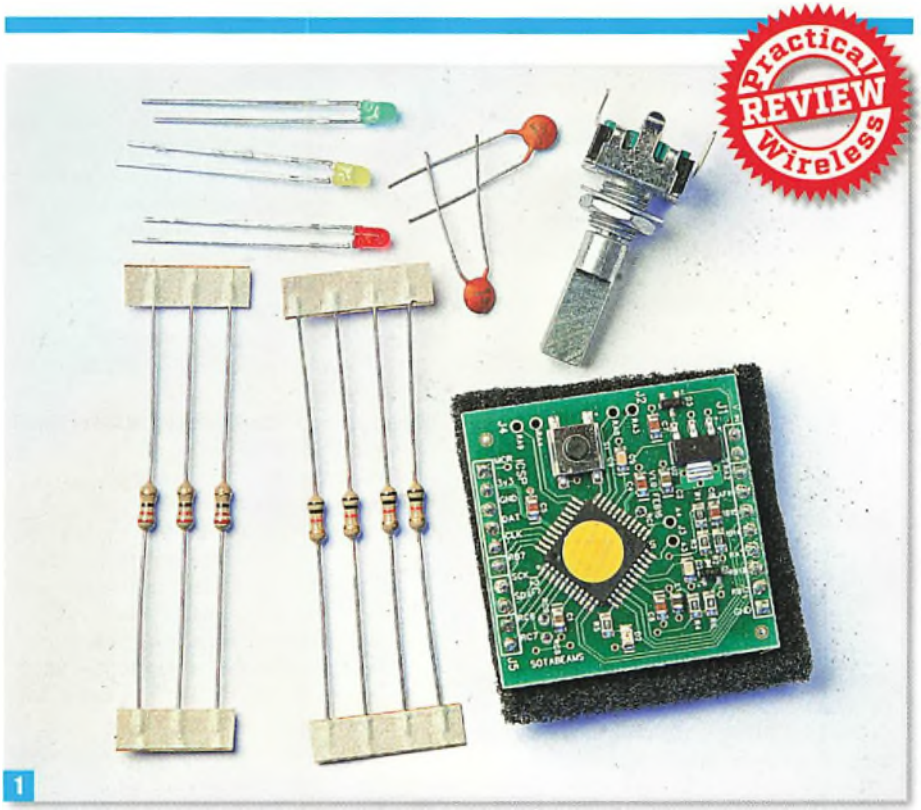
Dispatched as a 'part-kit', the envelope contained the small (35x35mm) board, four 10kΩ and three 220Ω resistors along with two 10nF disk ceramic capacitors, three LEDs (red, yellow and green) and an unmounted rotary encoder as shown in the photograph, **Fig. 1**. If you've not encountered a rotary encoder before, it uses two switches on a shaft that allow a system to sense which direction (and how fast) the shaft is being turned. The supplied items also include an inbuilt switch that is made by pressing in the shaft itself, meaning that there's just the one control for the unit.

Preparation

As I intended to try out various experiments with the unit, I didn't want to fix it into any one particular receiver or other project. So, I soldered two rows of ten pins into the pads at either side of the board as shown in Fig. 1. The second photograph, **Fig. 2**, shows the board plugged onto two rows of single-inline sockets on a project board. I've fitted two single-row sections of ten pins as can be seen in the picture. I rather allowed my enthusiasm to get going, to make me forget to photograph it as it came out of the package.

The board also contains the circuit made up from the layout that may be downloaded from the SOTABEAMS website. The only addition I've made to the supplied circuit is to add a supply filter capacitor. The input and output connections along with their 0V lines may not be too evident in the photograph but they are brought out on four pins just to the left of the red 'overload' LED.

The two other, yellow and green, LEDs indicate which mode the rotary encoder is currently controlling; yellow for centre frequency and green for bandwidth control. The four leads on the opposite edge of the board go to the encoder (0V, and the three switches connected to the shaft). For correct operation, the two rotary switches have to be correctly linked to the board to ensure that a clockwise rotation increases the parameter (and conversely anti-clockwise reduced it) so you may have to swap leads over.



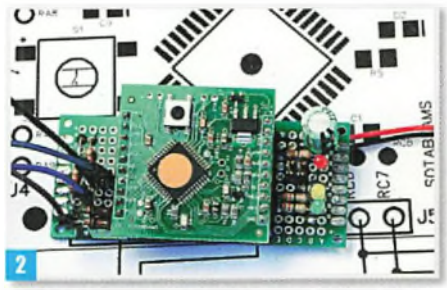
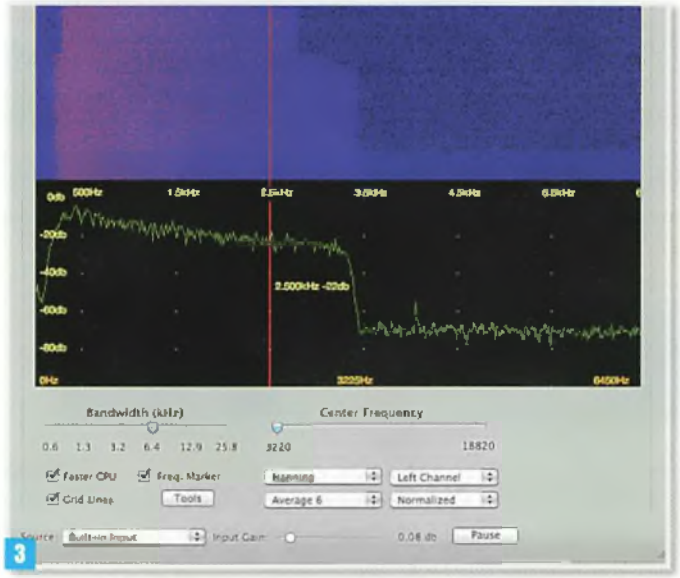


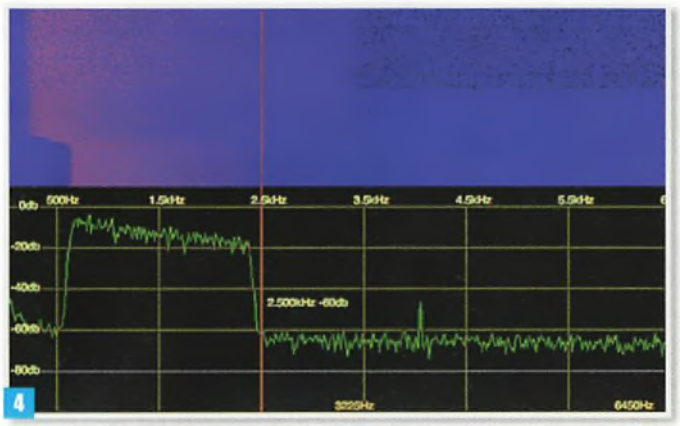
Fig. 1: The contents of the package, shown after the two 10-pin single inline pins have been soldered in place. Fig. 2: The filter mounted onto socket on a project board that has the other components fitted. See text for details.

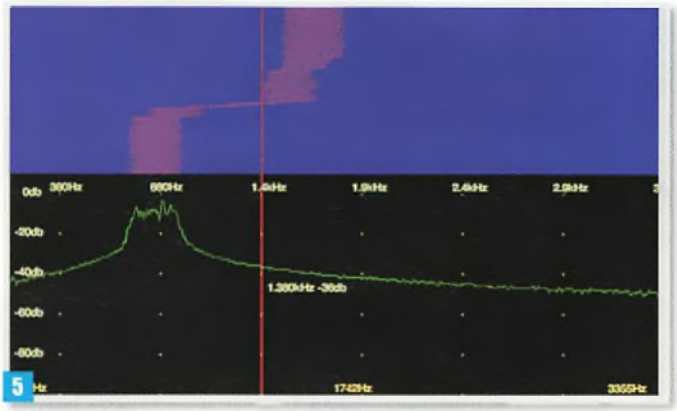
Characteristics

As delivered the LASERBEAM-VARI is set up for band edges of 200Hz and 3.5kHz. The overall effect of the filter being inline is seen in the screen-grab of **Fig 3**. The downward slope of the noise owes more to the limitation of the noise source rather than of the filter itself. As you may see, the flanks are quite steep. This would allow an interfering higher audio signal to be blocked with a minimal of wanted audio bandwidth being lost.

The bandwidth displayed in the screen-grab of **Fig 4** shows a reduced audio bandwidth signal (600-2500Hz), which, although sounding a bit 'thin', was perfectly understandable. For CW operation, the







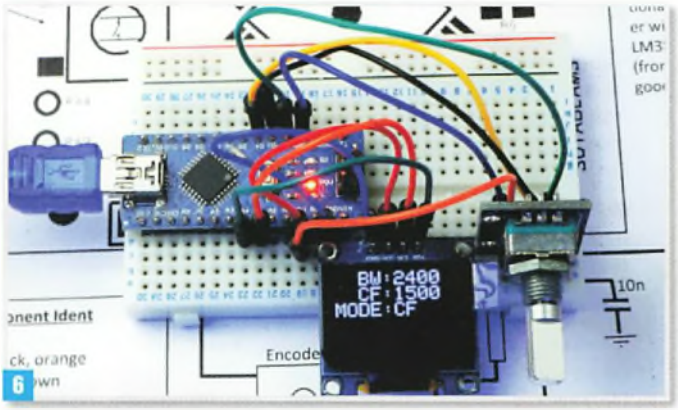


Fig. 3: Screengrab of the filter's output audio. The 'droop' in-band is due to the limitations of the source, rather than the filter. The limited bandwidth is 200-3300Hz. Fig. 4: Limiting the audio to around 600-2500Hz, gives a 'thin' but perfectly understandable sound. Fig. 5: A more severely limited bandwidth suitable for CW or some digital modes. See the text for more details. Fig. 6: Adding a programmed Arduino and a display makes it look good as well as sound good. Shown here in the development stage.

bandwidth may be reduced to as low as 200Hz and the band-centre varied over almost the whole range. The screen grab of **Fig. 5** shows the unit working with a bandwidth of some 600-900Hz.

The apparent 'softness' of the band edges in the lower part of the picture is a function of the program used. A truer representation is evident on the upper 'waterfall' part. When using the filter in its 'as-supplied' mode, there is little indication of the bandwidth and centre frequency. So, when using it with minimum bandwidth for CW or data modes operation, signals would 'pop up' out of near silence as you tune through a band.

In Use

The unit may be fitted into a rig of your choice, though keeping the full adaptability of the unit could mean extensive alterations to the rig. Not only would you need to insert the unit into the audio stream but you'd also need a hole for the rotary encoder and perhaps three smaller holes for the status LEDs. Certainly, it would be useful to have the overload LED visible because system overload can cause spurious signals to appear in band.

As the input level is capable of tolerating up to 2.4V peak-to-peak (pk-pk), with its recommended minim of 300mV pk-pk, the unit is perhaps more suitable for later in the audio chain, such as attached to a rig's headphone output. I intend to use the VARI external to the rig, using its own audio amplifier, which is suitable to drive a loudspeaker. A useful addition to it in this guise is to use a more 'informative' controller with a display of the parameters.

Arduino Sketch

On the SOTABEAMS website is a mention of a 'sketch' (source code file) for an Arduino, developed by **Dennis KG4RUL**. This sketch not only takes the signals from the rotary encoder but displays the mode of operation, centre frequency and bandwidth numerically on a small, neat one-inch OLED display as may be see in the photograph of **Fig. 6**. The addition of this controlling system adds only a few pounds to the setup, though it does depend on where you obtain the parts.

I found the sketch worked without modification so it would be suitable for someone with little experience of the Arduino system to program into the suggested Arduino type. If you've not met these before, all models are broadly interchangeable and require the minimum of changes to the system to program them. In essence, the changes are merely limited to telling the programming software which type of board you're using and the COM port that it's attached to. All in all, an extremely versatile project to make use of.

My thanks go to Richard at SOTABEAMS for the unit, which is priced at £44.95 + P&P.

www.sotabeams.co.uk

Specifications

Maximum bandwidth	200-3500Hz
Stepping rates	200-400Hz @ 20Hz
	400-700Hz @ 50Hz
	700-3500Hz @ 100Hz
Bandwidth adjustable	200-maximum (varies according to setting)
Centre frequency	200-3500Hz (band edges are limited to the maximum)
Stepping rates	200-2000Hz @ 25Hz
	2000-3500Hz @ 50Hz
Ultimate rejection	60dB
Passband ripple	<±0.2dB

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YAESU

Base

FT-DX101MP HF/50/70MHz 200W version transceiver £4139.95
FT-DX101D HF/50/70MHz 100W version transceiver £3149.95
FT-DX3000 HF/50MHz 100W Transceiver ..... ~~£1449.00~~ Now £1390.00
FT-DX1200 HF/50MHz 100W Transceiver £918.00
FT-991A HF/50/144/430 MHz All mode field transceiver £1199.00
FT-450D HF/50MHz entry level transceiver £599.99

Mobile/Portable

FT-857D HF/VHF/UHF 160-70cm 100W SSB/AM/CW/FM Transceiver £679.95
FT-891 HF/50MHz 160-6m 100W all mode transceiver £579.00
FT-818 HF/VHF/UHF 160-70cm 5W backpack transceiver £574.99
FTM-400XDE Dual band 2/70cm digital mobile transceiver. ~~£479.00~~ Now £369.00
FTM-100DE Dual band 2/70cm digital mobile transceiver £299.00
FT-8900 Quad band 10/6/2/70cm mobile transceiver £269.00
FTM-3200DE 2m digital mobile transceiver £179.00
FTM-3207DE 70cm 55w digital transceiver £189.95
FT-2980E 2m FM 80W mobile transceiver £149.00
FTM-3100DE 2m analogue transceiver ..... ~~£129.00~~ Now £124.99

Handheld

FT-3DE Digital dual band 2/70cm handheld transceiver £379.95
FT-2DE Digital dual band 2/70cm handheld transceiver ..... ~~£379.00~~ Now £299.00
FT-70DE Digital dual band 2/70cm handheld transceiver ..... ~~£189.00~~ Now £169.00
VX-8E Dual band 2/70cm handheld transceiver ..... ~~£199.00~~ Now £150.00
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FTM-7250DE £15.00 • FT-70DE £15.00

ICOM

Base

IC-7610 HF/50MHz SDR base transceiver £3499.95

Following on from the technology incorporated into the IC-7300, the IC-7610 adopts the same RF direct sampling system for signal processing. By converting the analogue signal directly to a digital signal and processing it within the FPGA (Field Programmable Gate Array) it provides improved transmission phase noise and excellent RMDR of 105 dB (at 1 kHz detuning).

IC-9700 2m/70/23cm 100W all mode transceiver £1795.00
IC-7300 HF/50/70MHz base transceiver £1199.00

The IC-7300 is a revolutionary compact radio that will excite HF operators from beginners to experts. This new model has a high-performance real-time spectrum scope and employs a new RF direct sampling system.

IC-7100 HF/VHF/UHF base/mobile transceiver ~~£1199.95~~ new low price £999.95

Mobile

ID-5100E Deluxe dual band D-STAR mobile transceiver £729.95
ID-5100E Dual band D-STAR mobile transceiver £574.95
IC-2730E Dual band mobile transceiver £289.00

This stunning new dual band mobile transceiver features a large high-contrast LCD screen with backlight, V/V and U/U simultaneous receive capability and optional Bluetooth® connectivity for hands-free and remote control communications.

Handheld

ID-51 PLUS 2 Dual Band D-STAR transceiver £379.00

KENWOOD

Base

TS-590SG All mode HF Transceiver £1299.00
TS-480SAT HF/50MHz 100W All mode transceiver £849.95
TS-480HX HF/50MHz 200W All mode transceiver £899.99

Mobile

TM-D710GE Dual band 2/70cm with APRS transceiver £549.95
TM-281E Single band 2m 65w transceiver £169.99

Handheld

TH-D74E Dual band 2/70cm with GPS £549.00

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New version of this ever popular handie - and now with a 4.5W on 2m . Comes complete with desktop charger, antenna, belt clip & high power 1800mAh battery and now with FREE earpiece all for less than £30!

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BL-5 Replacement 1800mAh battery £12.95
UV-5SM Fist speaker microphone £9.95
UV-5BE Battery eliminator £9.95
UV-5SC Soft case £9.95
UV-5PC Software cable £9.95

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AT-D878UV DMR & Analogue Handheld Transceiver ~~£199.99~~ **NOW £169.99**

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Includes: • Latest Moonraker Code Plug • Antenna • Charger • AC Adaptor • Li-ion Battery Pack (3100mAh) • Belt Clip • Instruction Manual • Programming Cable • Software (download)

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This radio is cellular so works like a walkie talkie but uses the cellular network as a repeater! This means hand held to hand held or handheld to mobile comms around the world. Companies like ID offer a suitable sim with EU roaming from £3.99 a month or if you are in the UK Freedompop is available otherwise you can use it on Wifi Using Apps like Zello & Teamspeak you can talk privately for just the cost of your sim!

Key Features: Intelligent Global Intercom ■ More than 80 Hours standby time ■ Dual chamber speaker to give Enhanced audio ■ GPS built in ■ Micro 5 pin data line ■ Supports MP3 & MP4 ■ 2.4 inch High Quality Screen ■ Extended memory up to 32GB ■ Waterproof IP54

INRICO T199 Network Handheld Radio ..... ~~£109.99~~ **£99.95**

The Inrico T199 network radio transceiver is a hand held portable 'screenless' network radio device with programmable rotary channel selection knob, side mounted PTT button, two programmable function buttons, 'dual port socket' for external speaker-mic or separate external headphone & mic. The external GSM/3G antenna works well but can be replaced with a high gain antenna to extend operating range.

INRICO TM-7PLUS 4G/WIFI Network Mobile Radio **£159.95**

The Inrico TM-7plus is the first 4G mobile network Radio. Great for amateur radio use with the new IRN platform, for Zello, Team Speak 3 and Echolink via 3G or WiFi. And it works as WiFi hotspot too!

SenHaiX

SenHaiX SPTT-N60 3G Network Mobile Radio **£249.95**

SenHaiX SPTT-N60 is a 3G network android mobile radio with wifi, bluetooth, zello, sos, phone function, gps function, with touch screen and large LCD.

Key Features: 100% Compatible with PTT4U and Zello ■ Palm Size Mini Mobile Radio ■ Support 3G:WCDMA 2G:GSM network ■ Support Group Call, Single Call, Intelligent selective call ■ 180 Degrees Rotatable Screen ■ LCD Display ■ GPS Built in ■ 50ohm 1W loudspeaker ■ Mobile Phone Call /SMS function ■ Requires a 13.8V Power Supply

4G Version **£299.95**

TYT

Now you can go digital on the road with the TYT MD-9600GPS Digital Mobile Two-Way Radio! The MD-9600 gives you crystal clear, noise-free audio of over-the-air digital communications in your vehicle, full analogue transceiver capabilities, and bundles it all together at a price you can afford!

£299.95

MOONRAKER

QRP Antennas

The Moonraker Whizz range are great for getting on HF in a neat compact and totally portable way

Whizz Whip HF/VHF/UHF portable antenna with telescopic whip - ideal for any situation where a long wire or vertical antenna is just not an option - get on air today for **just £99.95**

Whizz Loop 20-60m compact loop is ideal for QRP Transceivers when space is limited or using portable with a Yaesu FT-817ND or similar. Can be used indoors with surprising results and handy for travelling due to its "pocket" size antenna ideal for indoor or out and can be packed away and all for just **£89.95**

Whizz Loop V2 (right) same as above but with a frequency range from 40-10m..... **£79.95**

MOONRAKER

Base Antennas

Simple plug and play HF antennas radial free and at a great price

GP2500 All Band 80-6M Vertical TX 80-6M RX 2-90MHz, Power 250W Length 7.13M **£199.95**

GPA-80 budget version of GP2500 80-6M Length 6.0M **£99.95**

GPA-80F fibreglass version of GPA-80 ..... **£129.95**

MOONRAKER

HF Mobiles

Get great results with the Moonraker range of HF mobiles! From as little as £22.95!

AMPRO-10 Slim line design 28MHz 2m approx. 3/8th fitting **£22.95**

AMPRO-11 Slim line design 27MHz 2m approx. 3/8th fitting.... **£22.95**

AMPRO-12 Slim line design 24MHz 2m approx. 3/8th fitting.... **£22.95**

AMPRO-15 Slim line design 21MHz 2m approx. 3/8th fitting..... **£22.95**

AMPRO-17 Slim line design 18MHz 2m approx. 3/8th fitting **£22.95**

AMPRO-20 Slim line design 14MHz 2m approx. 3/8th fitting..... **£22.95**

AMPRO-30 Slim line design 10MHz 2m approx. 3/8th fitting..... **£22.95**

AMPRO-40 Slim line design 7MHz 2m approx. 3/8th fitting..... **£22.95**

AMPRO-60 Slim line design 5MHz 2m approx. 3/8th fitting **£24.95**

AMPRO-80 Slim line design 3.6MHz 2m approx. 3/8th fitting..... **£27.95**

AMPRO-160 Slim line design 1.8MHz 2m approx. 3/8th fitting... **£59.95**

Other frequencies available. Call or see online for more details.

Arrow Antenna

The Arrow II line of Antennas has been engineered to provide maximum gain and efficiency in the smallest practical size & weight

ARROW II 146/437-14WBP Portable satellite antenna (inc duplexer) 54" long **£189.99**

ARROW II 146/437-10WBP Portable satellite antenna (inc duplexer) 38" long **£149.99**

ARROW II 146/437-10WB Portable satellite antenna (without duplexer) 38" long **£89.99**

ARROW II Roll up bag to suit all above antennas..... **£59.99**

DIAMOND ANTENNA

Diamond Yagis

1st class Japanese quality antennas with simple plug and play assembly

A1430S7 Dual band 2/70cm, 7 ele, 7.5/9.3dB, 100W **£119.99**

A144S10R 2m, 10 ele, 11.6dB, 100W **£79.99**

A144S5R 2m, 5 ele, 9.1dB, 50W **£44.95**

A430S15R 70cm, 15 ele, 14.8dB, 50W **£64.99**

A430S10R 70cm, 10 ele, 13.1dB, 50W **£49.99**

A502HB 6m, 2 ele, 6.3dB, 130W **£79.99**

MOONRAKER

Mobile Antenna Mounts

TRIMAG-S Triple magnetic mount with SO239 antenna fitting with 4m RG58 and PL259 fitted – ideal for those larger antennas..... **just £39.95**

TURBO-S single 170mm magnetic mount with SO239 antenna fitting with 4m RG58 and PL259 fitted – will suit most antennas upto 5ft **£19.95**

HKITND-50 Heavy duty hatch back mount with SO239 antenna fitting with 4m RG58 and PL259 fitted **£32.95**

HKITM-S Min hatch back mount with SO239 antenna fitting with 4m RG58 and PL259 fitted **£32.95**

MOONRAKER

Multiband Mobile

Why buy loads of different antennas when Moonraker has one to cover all! SPX series has a unique fly lead and socket for quick band changing

SPX-100 9 Band plug n' go portable, 6/10/12/15/17/20/30/40/80m. Length 165cm retracted just 0.5m, Power 50W complete with 38th PL259 or BNC fitting to suit all applications, mobile portable or base - brilliant! **£44.95**

SPX-200S 6 Band plug n' go mobile, 6/10/15/20/40/80m. Length 130cm, Power 120W, PL259 fitting..... **£44.95**

SPX-300S 9 Band plug n' go mobile, 6/10/12/15/17/20/30/40/80m, Length 165cm, High Power 200W,PL259 fitting **£59.95**

MOONRAKER

VHF/UHF Mobiles

GF151 Glass Mount 2/70cm, Gain 2.9/4.3dBd, Length 78cm complete with 4m cable and PL259 ..... **£29.95**

MRM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd. Length 55cm, 1" magnetic base with 4m coax and BNC **£19.95**

MR700 2/70cm, Gain 0/3 0dBd, Length 50cm, 3/8 fitting..... **£9.95**

MR777 2/70cm, Gain 2.8/4.8dBd, Length 150cm, 3/8 fitting..... **£19.95**

MRQ525 2/70cm, Gain 0.5/3.2dBd. Length 43cm, PL259 fitting (high quality)..... **£19.95**

MRQ500 2/70cm, Gain 3.2/5.8dBd, Length 95cm, PL259 fitting (high quality)..... **£26.95**

MRQ750 2/70cm, Gain 5.5/8.0dBd, Length 150cm, PL259 fitting (high quality)..... **£36.95**

MRQ800 6/2/70cm Gain 3.0dBi/5.0/7.5dBdBd, Length 150cm, PL259 fitting (high quality)..... **£39.95**

MRQ273 2/70/23cm Gain 3.5/5.5/7.5dBdBd, Length 85cm, PL259 fitting (high quality)..... **£49.95**

MRQ900 10/6/2/70cm Gain 10m (2.15dB) 6m(2.5dB) 2m (2.8dB) 70cm (5.5dB) **Length:** 125cm PL259 fitting..... **£49.95**

MOONRAKER

GRP Fibreglass Base Antennas Diamond quality – Moonraker pricing

These high gain antennas have been pre-tuned for your convenience, easy to use, easy to install, and a choice of connection ... look no further

SQBM100P 2/70cm 3.00/6.00dBd, RX 25-2000MHz, Length 100cm SO239..... ~~£49.95~~ **SPECIAL OFFER £39.95**

SQBM200P 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, SO239..... ~~£54.95~~ **SPECIAL OFFER £44.95**

SQBM500P 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, SO239..... ~~£74.95~~ **SPECIAL OFFER £69.95**

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

SQBM223N 2/70/23cm, Gain 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type **£79.95**

SQBM3000N Triband 2/70/23cm, Gain 4.5/8.3/10.7dBd Length 1.55m **£79.99**

SQBM3500N Triband 2/70/23cm, Gain 6.8/9.2/11.8dBd Length 2.70m **£119.99**

MOONRAKER

HF Wire Antennas

Our HF wire antennas are made with complete waterproof potted baluns and high quality "original" flexweave antenna wire.

MQHF-80 3.5MHz balun matched mono dipole, length 40m **£59.95**

MQHF-40 7.0MHz balun matched mono dipole, length 20m **£44.95**

MQHF-20 14MHz balun matched mono dipole, length 10m **£39.95**

OSHF-80 3.5-30MHz balun matched off set dipole, length 40m **£59.95**

OSHF-40 7.0-30MHz balun matched off set dipole, length 22m **£44.95**

OSHF-20 14-30MHz balun matched off set dipole, length 11m **£39.95**

LWHF-160 1.8-50MHz unun match end fed antenna, length 42m **£49.95**

LWHF-80 3.5-50MHz unun match end fed antenna, length 20m **£44.95**

LWHF-40 7.0-50MHz unun match end fed antenna, length 10m **£39.95**

MOONRAKER

Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings!

YG27-35 Dual band 3/5 element 3.5/12.5 dBd gain with one feed **£79.95**

ALPHA ANTENNA

Base

PROMASTER complete 10-80M tuner free base antenna..... **£329.95**

Built for the harshest military and civilian environments, the Alpha ProMaster is a 43 foot tuner free 10-80 meter 500 Watt base & transportable antenna. Perfect for all HF modes including, but not limited to, CW, SSB (USB/LSB), AM, etc.

PROMASTER SR complete 10-160 antenna tuner free base antenna **£399.95**

The Alpha ProMaster Sr operates on 10-160 meters. This durable permanent base and transportable outdoor antenna brings you multi-band system base performance into an extremely small footprint.

Wire

J-POLE SR 6-160M 60ft wire antenna..... **£199.99**

The Alpha J-Pole Sr Antenna is only 60 feet in length. The unique design characteristics of this 6-160 Meter HF J-Pole antenna enables it to approach resonance on the major HF bands (10/12/15/17/20/40/80 Meters), all of which presents an SWR that is low enough for external tuners to achieve a perfect match, including 6 & 160 meters.

J-POLE JR 6-160M 34ft wire antenna..... **£179.99**

The Alpha J-Pole Jr Antenna is only 34 feet in length. The unique design characteristics of this 6-160 Meter HF J-Pole antenna enables it to approach resonance on the ma or HF bands

Portable

MILITARY 2.0 10-80M Multiband directional tuner free portable antenna **£369.95**

Unlike ANY other antenna, the multiband Military 2.0 is from the Multiband tuner free line of systems and fits in an included 16 inch Field Bag. When deployed, the Military 2.0 is a 10-80 meter directional antenna system, which can be configured to launch your signal at your target that has a maximum PEP SSB rating of 500 watts

Mobile

MOTO-SS 6-40M Multiband HF mobile..... **£199.99**

The Alpha MOTO-SS (Stainless Steel) provides you with the most Rugged and Compact HF mobile antenna system available that is rated at IP69K. It requires: -No extra whips -No adjustments required for band changes. - No moving parts - No power required -No control interface boxes Simply the Alpha MOTO-SS puts you on the air making contacts for an economical price! Placing the core components in the 316 Stainless Steel housing enables: -100% RFI rejection - Critical protection in a non-magnetic metal housing -The highest level of corrosion protection - Full RF bonding

Full Alpha Antenna range see www.moonraker.eu/alphaantenna

MOONRAKER

Radio Communication Manufacturer & Reseller

Sales line 01908 281705

E-mail sales@moonraker.eu PayPal VISA MasterCard

Postage (UK Mainland Only): Small Items just £2.99 Medium Items just £4.99 Maximum charge just £8.95

www.moonraker.eu

RM Amplifiers

The BLA 600 is a wideband compact linear amplifier for the HF bands and 6m, from 1.8 to 54 MHz Using Freescale MRFE6VP5600, Output 500W. Dual MCU Control. Fast PIN Diode RX-TX TX-RX switching enables QSK operation, 2x16 LCD Display for Amplifier Status. Separate LED displays for power and antenna VSWR. Input drive from 1W to maximum of 40W. 3 user configurable Antenna Output connectors. Dual large diameter MCU controlled, multispeed cooling fans for efficient cooling **£1999.95**

BLA350 1.5-30MHz 300w mains powered solid state amplifier **£699.95**

HLA305V 1.8-30MHz 250W professional amplifier with LCD. **£649.96**

HLA300V+ 1.8-30MHz 300W all mode amplifier with fans **£499.95**

HLA150V+ 1.8-30MHz 150W all mode amplifier with fans **£399.95**

LA250V 140-150MHz 200W professional amplifier with LCD **£549.95**

VLA100 420-440MHz 100W compact linear for 70cms..... **£449.95**

LDG Tuners

LDG Z-817 1.8-54MHz ideal for the Yaesu FT-817 ..... **£129.95**

LDG Z-100 Plus 1.8-54MHz the most popular LDG tuner..... **£159.95**

LDG IT-100 1.8-54MHz ideal for IC-7000..... **£159.95**

LDG Z-11 Pro 1.8-54MHz great portable tuner **£179.95**

LDG KT-100 1.8-54MHz ideal for most Kenwood radios **£199.95**

LDG AT-100 Pro II 1.8-54MHz..... **£239.95**

LDG AT-200 Pro II 1.8-54MHz..... **£269.95**

LDG AT-1000 Pro II 1.8-54MHz continuously **£519.95**

LDG AT-600 Pro II 1.8-54MHz with up to 600W SSB..... **£384.95**

LDG YT-1200 1.8-54MHz 100W for FT-450, FT-DX1200 & FT-DX3000. ..... **£244.95**

LDG YT-100 ideal for your Yaesu FT-857D..... **£199.95**

LDG RT-600 1.8-54MHz 5-600W external AUU **£439.95**

LDG RBA-1 Balun 1:1 high quality **£34.99**

LDG RBA-4 Balun 4:1 high quality **£34.99**

WHISTLER

Moonraker have worked with Whistler to customise a UK band plan for the scanners! This ensures the radios cover UK bands in the correct steps and the correct mode. When a user does a service scan it will search in the correct steps for the selected band ensuring maximum received stations. The radios will receive both amateur and commercial DMR transmissions, as (apart from the frequency) they are fundamentally the same mode. The radio is supplied with software and users can select mode when writing memories or select auto and it will work out the mode itself!

TRX-1 25-1300MHz Digital Handheld Scanner (left)..... **£419.95**

TRX-2 25-1300MHz Digital Base Scanner (above)..... **£479.95**

AVAIR SWR Meters

Quality meters at affordable prices – from HF to UHF

AV-20 1.8-200 MHz 30/150W **£49.99**

AV-40 144-470 MHz 30/0150W **£49.99**

AV-201 1.8-160 MHz 5/20/200/400/1000W **£59.99**

AV-400 140-525 MHz 5/20/200/400/1000W **£59.99**

AV-601 1.8-160/140-525 MHz 5/20/200/400/100W **£79.99**

AV-1000 1.8-160/430-450/800-930/1240-1300MHz up to 400W **£89.99**

Bhi Noise Cancelling Products

Bhi design and manufacture a range of DSP noise cancelling products that remove unwanted background noise and interference from noisy voice and radio communication channels to leave clear speech.

DESKTOP **£179.95**

10 watt DSP noise cancelling base station speaker will work with most radios, transceivers, receivers, and SDR radios, giving a new listening experience. The new rotary controls make it very easy to use and set up to your own operating conditions.

DSPKR ..... ~~£129.99~~ **ON OFFER £119.99**

This noise cancelling speaker incorporates unique DSP technology to remove unwanted background noise and interference from speech

DUAL IN-LINE **£199.99**

The Dual In-Line DSP noise eliminating module provides two channel/stereo noise cancellation, and is suitable for use on all radios and receivers including SDR, especially those with stereo or two channel output options.

COMPACT IN-LINE **£179.99**

This small compact battery operated handheld unit is ideal for portable use, and includes the latest bhi dual channel/stereo DSP noise cancelling technology. It is designed to be used with a pair of stereo headphones, but will also drive a mono loudspeaker or a pair of powered stereo speakers.

PARAPRO EQ20B **£199.99**

The EQ20 product range features a 20W modular audio power amplifier with a parametric equaliser plus the option of having bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth technology. The parametric equaliser allows any specific part of the frequency range to be selected and adjusted in strength enabling the user to shape the audio to suit their ears!

HP-1 Wired Stereo Headphones ..... **JUST £19.95**

The HP-1 stereo headphones are suitable for general purpose use and can be used for radio communications as well as listening to music.

Coax Cable Drums

Save money buying in bulk – 50m as well as 100m drums at discounted prices

RG58-DRUM-50 standard RG58 6mm 50m reel **£19.99**

RG58-DRUM-100 standard RG58 6mm 100m reel **£29.99**

RG58M-DRUM-50 military spec RG58 6mm 50m reel **£24.95**

RG58M-DRUM-100 military spec RG58 6mm 100m reel..... **£44.95**

MINI8-DRUM-50 military spec MINI-8 7mm 50m reel **£34.99**

MINI8-DRUM-100 military spec MINI-8 7mm 100m reel..... **£64.99**

RG213-DRUM-50 military spec RG213 9mm 50m reel..... **£64.99**

RG213-DRUM-100 military spec RG213 9mm 100m reel **£119.99**

WESTFLEX-DRUM-100 military spec Westflex 103 10mm 100m reel **£159.99**

RG174-DRUM-100 military spec RG174 2.8mm 100m reel..... **£59.95**

Masts – Push Up

Lightweight medium and heavy duty swaged masts sets from 1.25-2" diameter 5ft sections to create a lovely 20ft mast – choose the correct size needed for the antenna installation. Masts have a lovely push fit for easy of use and to give a strong connection

MSP-125 20ft Medium Duty (set of 4 poles) 32mm dia 1.6mm gauge . **£44.99**

MSP-150 20ft Medium Duty (set of 4 poles) 38mm dia 1.6mm gauge . **£49.99**

MSP-175 20ft Medium Duty (set of 4 poles) 44mm dia 1.6mm gauge . **£59.99**

MSP-200 20ft Medium Duty (set of 4 poles) 51mm dia 1.6mm gauge . **£69.95**

MSPX-150 20ft Heavy Duty (set of 4 poles) 38mm dia 2.65mm gauge..... **£69.95**

MSPX-200 20ft Heavy Duty (set of 4 poles) 51mm dia 2.65mm gauge..... **£89.95**

Masts GRP Fibreglass

Ideal heavy duty fibreglass masts for those antennas that need to be insulated from metal hardware or pole – convenient 2m lengths in a light grey

GRP-150 2m 37mm OD **£24.95**

GRP-200 2m 51.7mm OD **£34.99**

Masts Telescopic

We offer both aluminium and GRP fibreglass push up masts ranging from 20-50ft to suit your needs. The aluminium versions are for portable/occasional use and the fibreglass versions can also be used for fixed installation

LMA-M 26ft open 5.5ft closed 50-25mm aluminium mast **£109.99**

LMA-L 33ft open 7.2ft closed 50-25mm aluminium mast..... **£119.99**

TMF-1 20ft open 5.6ft closed 50-30mm high quality GRP mast **£199.99**

TMF-1.5 30ft open 7.5ft closed 57-30mm high quality GRP mast.. **£299.99**

TMF-2 40ft open 9ft closed 57-30mm high quality GRP mast **£349.99**

TMF-3 50ft open 8ft closed 65-23mm high quality GRP mast **£399.99**

Hardware

We offer all type of mounting hardware to help get you rigged up at home – if you can't see it listed chances are we have it. Check www.moonraker.eu or just give us a call

TRIPOD-HOA heavy duty collapsible tripod to suit base mats up to 67mm **£149.95**

TK-24 wall bracket offers 18" clearance **£29.95**

TK-12 wall bracket offers 12" clearance **£19.95**

BB2 mast base plate to suit up to 2" masts/pole **£22.99**

JOIN-200 clamp 2" poles back to back **£17.95**

PTP-20 2" to 2" mast clamp **£6.95**

Make Your Own? Wire, Insulators & bits

Have fun but making your own antenna system and see how it works against the commercial designs

SCW-50 Enamelled copper wire, 1.6mm, 50m length **£24.95**

HCW-50 Hard drawn copper wire, 1.6mm, 50m length **£29.95**

FWPVC-50 high quality flexweave with PVC coating 4mm, 50m ... **£44.95**

300-20 Ribbon feeder 300 ohm high quality slotted, 20m **£17.95**

450-20 Ribbon feeder 450 ohm high quality slotted, 20m **£19.95**

DPC-W Wire dipole centre with securing clamps **£5.95**

DPC-S Wire d pole centre with SO239 socket for PL259 ..... **£6.95**

DPC-38 Dipole centre for 2 x 3/8th whips antennas to make dipole ... **£8.95**

DOGBONE-S small plastic insulator **£1.00**

PULLEY-2

Lovely quality pulley wheel to suit up to a 2" mast and 6mm wire or nylon rope

ON OFFER THIS MONTH

~~£24.95~~ **£19.95**

Join our new loyalty programme

and start earning WATTS now!

All registered retail customers can now earn and redeem free product credits known as WATTS. It's simple the more you spend the more WATTS you receive. You will also receive bonus WATTS when you refer a 'New Customer', 'Write a Product Review', 'Share' a product' or 'Refer a Friend'

Don't miss out – Register now and start enjoying free WATTS

MFJ MFJ MFJ MFJ

UK Distributer – All MFJ 1500+ product lines available from stock or pre-order

Automatic Tuners

MFJ-926B remote Mobile ATU 1.8-30MHz 200W £349.95
MFJ-929 Compact with Random Wire Option 1.8-30MHz 200W £269.95
MFJ-991B 1.8-30MHz 150W SSB/100W CW ATU £269.95
MFJ-993B 1.8-30MHz 300W SSB/150W CW ATU £299.95
MFJ-994B 1.8-30MHz 600W SSB/300W CW ATU £399.95
MFJ-998 1.8-30MHz 1.5kW £799.95

Manual Tuner

We stock all the popular tuners to suit your needs and budget

MFJ-902B 3.5-30MHz 150W mini travel tuner £129.95
MFJ-901B 1.8-30MHz 200W Versa tuner £114.95
MFJ-945E 1.8-54MHz 300W tuner with meter £159.95
MFJ-941E 1.8-30MHz 300W Versa tuner 2 ..... £169.95
MFJ-949E 1.8-30MHz 300W deluxe Versa tuner with DL £199.95
MFJ-934 1.8-30MHz 300W tuner complete with artificial GND £219.95
MFJ-974B 3.6-54MHz 300W tuner with X-needle SWR/WATT £239.95
MFJ-969 1.8-54MHz 300W all band tuner £249.95
MFJ-976 1.8-30MHz 1500W balanced line tuner with X-Needle SWR/WATT £569.95

Analysers

MFJ offer the best range of analysers the most popular being the MFJ-259C

MFJ-207 HF 10-160M 1.6-30MHz in 5 bands £124.95
MFJ-208 VHF 138-156MHz + external jack for frequency counter £119.95
MFJ-223 HF/6M 1-60MHz with colour graphic display £329.95
MFJ-225 HF/VHF 1.8-170MHz, two ports, with graphic display £349.95
MFJ-226 HF/VHF/UHF 1-230MHz expect times analyser with graphic display £379.95
MFJ-227 VHF/UHF 88-226-330-500 MHz graphics VNA analyser £379.95
MFJ-249C HF/VHF/UHF 530kHz-230MHz with analogue meter £299.95
MFJ-259C HF/VHF/UHF 530kHz-230MHz with analogue and LCD screen £349.95
MFJ-269C HF/VHF/UHF 530kHz-230/415-470MHz with analogue and LCD screen £429.95
MFJ-269C PRO HF/VHF/UHF 530kHz-230/430-520MHz with analogue and LCD screen £449.95

SWR Meters

MFJ have every SWR/Wattmeter you could ever need including the world's largest with a 16cm+ screen

MFJ-869 HF 1.8-60MHz 20/200/2000W with massive 6.5 screen and fully automatic £258.95
MFJ-868B HF+6m 1.8-54MHz 20/200/2000W with massive 6.5" screen £169.95
MFJ-867 VHF/UHF 144/220/440MHz 20/200/400W with large screen £179.95
MFJ-826B HF 1.8-54MHz 1500W digital SWR/Wattmeter with built in frequency counter £209.95
MFJ-828 HF 1.8-60MHz 1500W digital SWR/Wattmeter with 3" cross needle screen £258.95
MFJ-864 Compact cross needle HF/VHF/UHF 1.8-60/144/430MHz 30/300W £114.95
MFJ-862 Compact cross needle VHF/UHF 144/220/430MHz 30/300W. £84.95
MFJ-860 Compact cross needle HF 1.8-60MHz 30/300W £69.95
MFJ-849 Digital HF/VHF 1.5-525MHz 200W with large 3.5" LCD display £199.95

Antenna Switches

MFJ Rhino antenna switches are tough and durable with gold plated flanges and connector contacts that provide low VSWR and low insertion loss. A rock-solid, sturdy, die-cast design gives up to an excellent 70 dB isolation.

These switches are built like a rhino, tough inside and out! A superior internal design lets them work for you for a long lifespan.

MFJ-2702 SO239 2-Way 0-1000MHz 2kW £37.95
MFJ-2702N N-Type 2-Way 0-1000MHz 2kW £54.95
MFJ-2703 SO239 3-Way 0-800MHz 2kW £74.95
MFJ-2703N N-Type 3-Way 0-1.5GHz 2kW £84.95
MFJ-2704 SO239 4-Way 0-900MHz 2kW £109.95
MFJ-2704N N-Type 4-Way 0-1.5GHz 2kW £119.95

Dummy Loads

Chose between dry and oil filled dummy loads between 15-2500W

MFJ-261 15W (100W peak) DC-500MHz with PL259 ..... £32.95
MFJ-261N 15W (100W peak) DC-500MHz with N-Type £47.95
MFJ-262B 35W (200W peak) DC-1000MHz with PL259 ..... £69.95
MFJ-262BN 35W (200W peak) DC-1000MHz with N-Type £79.95
MFJ-260C 25W (300W peak) 30-650MHz with PL259 ..... £49.95
MFJ-260CN 25W (300W peak) 30-650MHz with N-Type £49.95
MFJ-250X 1kW (2kW peak) DC-400MHz with SO239 (need transformer oil) £59.95
MFJ-250 1kW (2kW peak) DC-400MHz with SO239 (includes transformer oil) £89.95
MFJ-264 100W (1.5kW peak) DC-650MHz with SO239 ..... £84.95
MFJ-264N 100W (1.5kW peak) DC-650MHz with N-Type £94.95
MFJ-251 25W (300W peak) DC-60MHz 16.6/25/50/100/150 Ohm selectable £169.95

Dummy Loads

Analysers

SWR Meters

Antenna Switches

Tuners

Morse Keys

Headphones

Antennas

DC Multi Outlet Strips

These strips have 5-way binding posts for your transceivers and accessories to keep your power connected neat and tidy and organized.

MFJ-1118 Deluxe Multiple DC Power outlet lets you power two HF and/or VHF transceivers and six or more accessories from your transceivers main 12 VDC supply £99.95
MFJ-1117 Multiple DC Power outlet lets you power four HF/VHF radios -- two at 35 Amps each and two at 35 Amps combined -- from your transceivers main 12 VDC supply £79.95
MFJ-1116 Multiple DC Power outlet handles 15 Amps total. It has eight pairs of heavy duty, RF bypassed 5-way binding posts that lets you power your accessories. They are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator £69.95
MFJ-1112 15 Amp Multiple DC Power outlet lets you power up to six devices from your transceivers main 12 VDC supply £54.95

Morse

Morse keys, readers and tutors starting from just £19.95.

MFJ-550 Budget practice key for beginners £19.95
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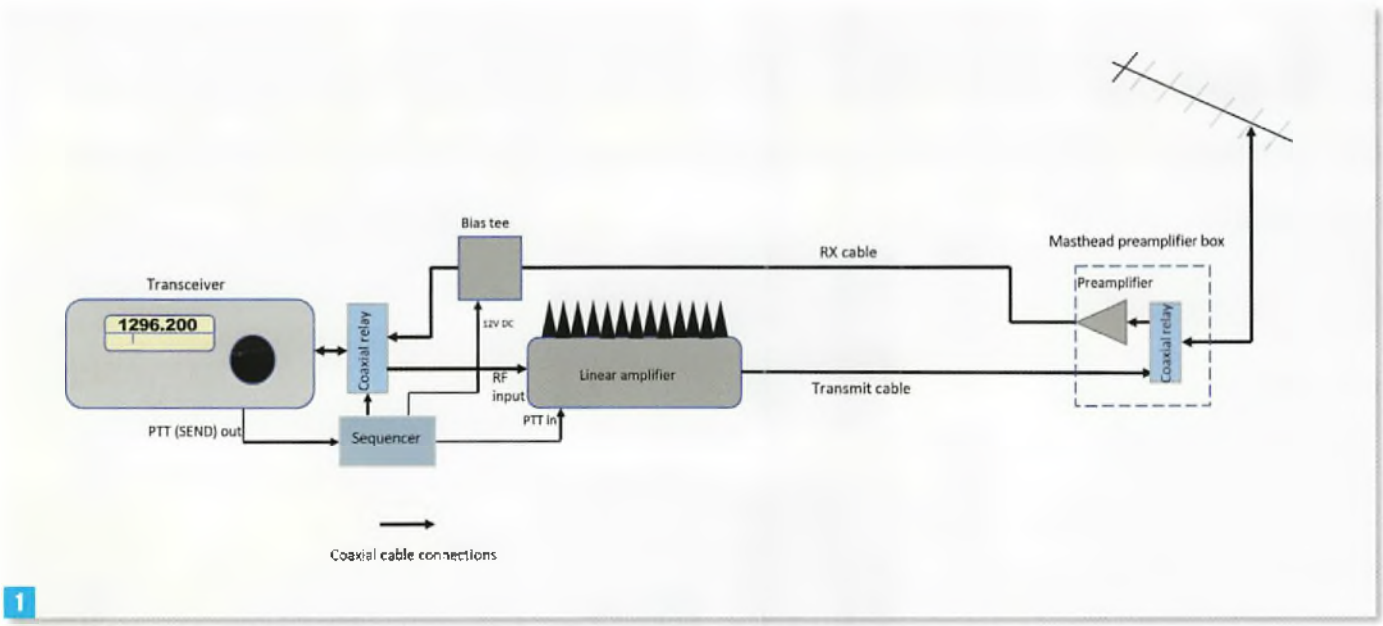

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Getting Going on 23cm

Sam Jewell G4DDK completes his look at 23cm by covering the practicalities of setting up your first station for the band.

Having read the first two parts of the *Next Band Up* article perhaps you are thinking of taking your first steps onto the 23cm band. Maybe you bought an IC-9700 after the July *PW* review and want to put the 23cm section to good use. What follows is intended to show how a 23cm system can be put together to give excellent performance in the DX part of the band. It may also prove to be suitable as the basis of a 23cm system for data or satellite (uplink) use with suitable changes. If you don't have an IC-9700 but perhaps do have one of the older multiband transceivers with 23cm amateur band coverage, or maybe a 144MHz transceiver and 1296MHz transverter, then the system described in this article, which is my current 23cm terrestrial system, may be equally applicable.

I have received lots of questions about antennas, coaxial cables, relays and masthead preamplifiers over the years from radio amateur friends. What is described here is not the only way to put together an effective system but it has been developed over an extended period, albeit with a recent change to using the IC-9700, to become the basis of my terrestrial and EME (moonbounce) 23cm station. **Fig. 1** shows my 23cm system in block diagram form.

The Radio

Almost certainly the starting point for most radio amateurs thinking about getting going on 23cm, is what radio to use. There is a reasonably wide choice of more recent and older equipment available. Many of these were mentioned in Part 2 so I will not be repeating them here other than to say that the basic choice is a transceiver with 23cm module or HF/VHF transceiver as an Intermediate Frequency (IF) driver to a 23cm transverter. The system described here uses an IC-9700. My previous system used a Kenwood TS2000X, which has a built-in 1240-1300MHz module. The photo, **Fig. 2**, shows my IC-9700 setup for use on 23cm.

Whether you choose to use a transceiver with 23cm capability or an IF transceiver with 23cm transverter, the power output will probably be no more than 10W. Some transverters provide just a few watts RF output. Unless you are only interested in working a few tens of kilometres or live on top of a mountain with a horizon 100km away, this is not going to be enough RF power to work a lot of DX and an add-on high power amplifier (HPA) is going to be required.

This would be good stage at which to decide whether you are going to use an LNA (low noise amplifier) on receive or rely on keeping coaxial cable losses between the antenna and transceiver (or transverter) as low as possible. Transceivers such as the IC-9700 or TS2000X have a 23cm band noise figure of around 4 to 6dB. While this may be reasonable, if the transceiver is connected directly to the antenna with an absolute minimal of coaxial cable, it is better to aim for a system noise figure of closer to 1dB to take advantage of lower antenna noise temperature above about 1GHz. Add the loss of the coaxial cable between the antenna and the transceiver to the transceiver noise figure and it is easy to end up with a system noise figure closer to 8 to 10dB. This really is not too acceptable.

One Cable or Two?

If you decide not to use a masthead mounted low noise amplifier (LNA), then you only need to use one coaxial cable to connect to the antenna. A second cable is required if the LNA is designed such that it has a single built-in coaxial changeover

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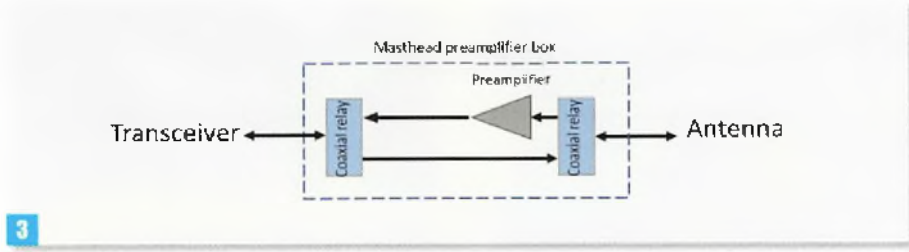

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Fig. 1: Block diagram of the author's 23cm system.
Fig. 2: The Icom IC-9700 in use on 23cm.
Fig. 3: Dual relay masthead arrangement.

relay. One cable is for transmit while the second is for the output of the LNA down to the transceiver. Since the cable carrying the LNA output already has a reasonable amount of gain and a low noise figure 'ahead' of it, it can have slightly higher loss than the cable carrying the transmit signal.

Some LNAs incorporate two coaxial relays so that the LNA output is switched back to the single cable as shown in **Fig. 3**. This may seem to be the most economic system at first sight until you accidently transmit high power into the back end of the LNA due to a sequencer fault (more on sequencing later). The tsunami of RF that passes into the LNA output will almost certainly destroy the active devices within the LNA and probably damage other components as well. Single cable systems are fine and used by many amateurs but for serious 23cm band operation a dual-cable system tends to be preferred. One further advantage of the two-cable system is that the preamp and relay can be powered over the receive coaxial cable. To do this with a single cable means that the bias tee (power inserter) that injects DC into the coax to power the masthead LNA and relay will need to be rated to stand the higher power transmit level. Similarly, at the masthead preamplifier end, where the DC will need to be extracted before the first relay. The second photo, **Fig. 4** shows my masthead LNA box arrangement. Modesty prevents me saying what preamplifier I use within the box. There are many to choose from. Choose one with a low noise figure and moderate gain. I make no apologies for the state of the masthead preamp. It has a had a long and hard life!

Coaxial Cables

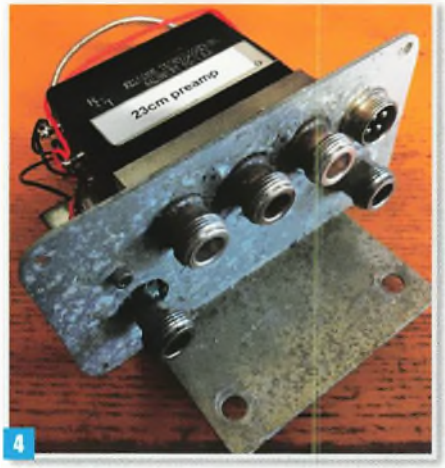
In my own system I use two cables from the shack to the masthead preamplifier. One is for receive and one for transmit. The transmit cable consists of a 15m length of FSJ4/50 from the shack, via ar underground duct, to close to the rotator level on the 10m-high Versatower. From here a length of Ecoflex 10 forms the rotor turning loop and then on to the masthead preamplifier box. From the masthead preamplifier to the antenna I use another short length of Ecoflex10.

For transmit there is another length of Ecoflex 10 from the masthead preamp changeover relay to just below rotator level where a further length of FSJ4/50 is used back to the shack. This could easily have been completely replaced by Ecoflex10 but the receive FSJ4/50 was already in place. Within the shack the two cables are terminated on N female bulkhead connectors. where I can disconnect the antennas during thunderstorms. Two further lengths of Ecoflex 10 connect to the rack-mounted power amplifier and relay.

You don't have to use Ecoflex coaxial cable and Messi and Paoloni Hyperflex 10 is equally suitable, although I do recommend professional Andrew Corp 'Heliax' if the cable is to run through a duct or be otherwise subject to unusual conditions other than general outside use. It is not advisable to rotate FSJ4/5 because even the multistrand flex version can end up with a cracked corrugated outer after quite a few rotations. I know this from experience!

Relays

I have mentioned using a relay within the masthead LNA box. This switches the antenna between the LNA and the transmit feeder. This relay must provide a high level of isolation between the transmit feeder connection and the input to the LNA, when switched to transmit. Low cost relays such as the Tohtsu CX600N are not really suitable above about 25W because their isolation can be rather poor. A much better relay is one of the Radiall, Relcomm, Narda, or Sivers Labs relays. These can easily handle the 200W transmit power and have excellent transmit-to-receive port isolation to protect the LNA. These feature



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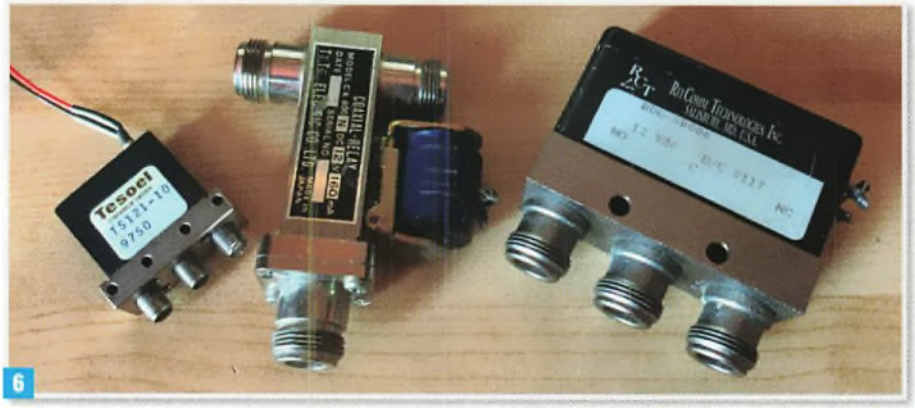

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Fig. 4: 'Homebrew' masthead LNA. Note the changeover relay is mounted with the three N connections through the box for easy access. Fig. 5: Replacement driven element on the author's Wimo 44-element Yagi. Fig. 6: Examples of three relays (see text).

N connectors (No SO239 'UHF' connectors at 23cm, please.) These relays often appear for sale on eBay or other internet sales sites.

I prefer to use 12V 'fail safe' relays. Latching relays usually require some form of bi-directional coil activation and this adds a level of complication and might prove less reliable, especially in an LNA box that is remotely mounted at the top of a mast.

In my system the relay is powered in parallel with the LNA, so it is operated while the LNA is on and released when on transmit. This has several advantages, including the situation when you might have a relay powering failure due to the sequencer mis-operating. In this situation, with a little reconfiguring, you can continue to operate using just the transmit feeder. It also means that when you are not using the LNA its input is safely disconnected from the antenna. This might help when using high power on other bands and there is an ever-present risk of damage due to excessive RF coupling. It may also be useful in protecting the LNA if there are nearby thunderstorms.

Antenna

Probably the most important part of the 23cm station is the antenna. I use either one or two Wimo 44-element Yagis (SHF2344). My choice of one or two depends on the current mast loading due to the presence of antennas for other bands, such as the large 6m Yagi. I opted for the medium-length Wimo 44-element Yagi. I was unable to use a 67-element since it would overhang the lane adjacent to my QTH, when beaming east or west.

The 44-element Yagi has a claimed gain of 18.1dBd with a boom length of 3m. The 67-element is rather longer at 5m and has a claimed gain of 19.9dBd. My two 44-element Yagis would give a theoretical gain of 18.1 + 3dB = 21.1dBd, although in practice non-optimal spacing and combiner loss reduce the combined gain to closer to 20dBd.

The standard driven element is rated at about 500W, which is enough to handle the output from my 200W linear amplifier.

After some years of use I found that the match on my Yagi started to deteriorate. Close examination of the driven element balun encapsulation showed a small crack where I presume water had entered. Fortunately, spare driven elements are available and the photo, **Fig. 5**, shows my replacement driven element in place on the Yagi. While the Yagi was off the mast, I took the opportunity clean the aluminium boom and elements because these had become slightly corroded over the last ten years due to bird droppings. Closeness to the sea also implies a salty atmosphere, although I have never seen any corrosion I could attribute to salty air.

Two antennas require an antenna coupler and I use a Wimo-sourced two-way combiner (Wimo 18044). A similar four-way combiner is available (Wimo 18045).

I found that the match to the antenna was not especially good as supplied and I could improve it by slightly bending, outwards, the centre of the folded dipole of the driven element.

In my 'alternate antenna' system I bay the two antennas rather than stack them. This arrangement retains a good vertical beamwidth, which is important for slightly shorter distance aircraft reflection propagation than concentrating a main lobe entirely on the horizon. The narrower horizontal beamwidth may also help null interference from radar or other strong amateur stations.

Linear Amplifier

My usual linear amplifier is a Kuhne MKU 13200B, which is a 200W (240W saturated) output LDMOS amplifier using four MRF9060 devices. The amplifier requires 13W of drive for full output. A two-stage version of the amplifier (MKU 13200A) requires just 500mW for full output. Since the IC-9700 and my previous TS2000X produce just 10W output, the maximum output from the linear amplifier is 200W when driven directly at this level. This was a problem initially because my IC-9700 is located on my operating desk, while the linear amplifier is mounted in a rack at the other side of a doorway. This necessitates a 5m coaxial cable from the transceiver to the linear amplifier. The loss in the coaxial cable reduces the available 23cm drive to around 8W, even with Ecoflex 10. This, of course, further reduces the available output from the linear by around 1dB to 160W. I overcame this by adding a 'trunk' amplifier after the coaxial cable at the rack end. The amplifier consists of a pair of bipolar transistor Mitsubishi Semiconductor M57762 modules capable of over 30W output for around 1W of drive. A 10W, 10dB attenuator is connected at the input to this amplifier. With the IC-9700 23cm power output turned down to around 25%, the Mitsubishi module amplifier

(termed 'brick' amplifier) output is enough to drive the main MKU 13200B amplifier output to just over 200W. In Fig. 1 the two amplifiers are shown as a single PA, for simplicity.

The MKU 13200B is powered from my rack 28V/100A switch-mode power supply and takes around 25A at full output. The 'brick' amplifier is powered from the rack 12V linear power supply and take just a few amps at full output. Many alternative linear amplifiers would require the additional external sequencer.

In Part 1 of this article I showed a picture of a higher power solid-state amplifier due to W6PQL. This remains unbuilt as a complete amplifier but is on the to-do list.

Splitting the Transceiver Output

My two coaxial cable masthead LNA means that at some point I need to split the transceiver transmit and receive paths. I don't like doing this inside the transceiver so I use a coaxial relay, external to the transceiver, to switch the connection between the LNA receive path and the linear amplifier transmit path. Since the relay is now switching just the 10W output from the transceiver it can be a cheaper relay than would otherwise be required on the 'output' side of the LNA at the masthead.

If the relay were located at the masthead LNA output, in a one coaxial cable system, it would need to be capable of handling the full linear amplifier output power and provide enough isolation to protect the output of the LNA during transmit. In my own system I use a small, 12V, Tosoel relay with SMA connectors at the input to the 10dB attenuator located at the 'brick' amplifier input. The relay is shown in **Fig. 6**, together with a Totsu and a Relcomm Technologies Inc. relay.

Sequencer

The sequencer is a most important part of any system that runs any significant amount of power. I am fortunate in that the MKU13200B power amplifier includes a simple but effective two-stage sequencer. For this reason, I don't need the external sequencer shown in Fig. 1.

You will see adverts for multiple step sequencers, capable of switching each stage of the changeover sequence between receive and transmit, and back again. In most cases a two-stage sequence is enough.

The sequencer should first ensure that the antenna is disconnected from the LNA and then enable the PA. Most modern transceivers provide an adjustable delay before RF output appears. A delay of 30ms is usually enough to obviate the need to key the transceiver to transmit last and allow hand-mike keying of the transceiver.

Sequencing back to receive first involves disabling the PA and then reconnecting the antenna and LNA. Two stages and simple. The fewer the stages, the more reliable the sequencing will be. An embedded processor-controlled sequencer is not ideal. It will likely fail at the most inopportune time.

Results

With my 23cm system as described or with the previous TS2000X transceiver I have worked over 100 DXCC entities on terrestrial and a further 50 or so via the moon, although this required a 2.3m diameter dish reflector rather than the Yagi array. If there is enough interest, I will describe the EME system in a further article.

• E-mail: practical wireless@wamersgroup.co.uk

The Doublet Antenna

Tim Hier 2E0TWG recommends the simple doublet as an effective multiband homebrew antenna for a small garden or a newcomer to HF.

You have just passed your Foundation Exam and/or you live in a typical small British garden in an urban or semi-rural setting. You have no room for a full-sized 40m dipole (even in an inverted-vee configuration). Maybe you have tried a vertical antenna such as one fed with a 9:1 UNUN (unbalanced to unbalanced transformer) but found it noisy and not a great radiator of your much-prized RF? Or you are tempted to spend a few hundred pounds on that shiny new multiband (no radials) vertical that would surely become your solution?

Such all-band off-the-shelf verticals are easily obtainable and can work well. However, many newly qualified operators are faced with two major obstacles with these antennas:

• Price: typically ranges from around £200 to beyond £500.

• The need for radials: Many manufacturers and vendors will maintain that you can work these vertical antennas without radials. You can, of course, but just not very well. An extensive radial system is needed, requiring above all else, space.

If you also consider the tendency for verticals to be noisier on receive, you may be disappointed.

My QTH in West Sussex has a typical small UK plot. My semi-detached property has a garden measuring no more than 10x8m, thus representing a typical-sized British garden. I have tried the 9:1 UNUN approach using a 9.5m longwire but found it a noisy antenna, with the noise floor on the 40m band typically around S6 to S7. I have the space for a 20m dipole but these are monoband antennas and even when forced into another band via a tuner provide poor RF radiation. My attention then turned to the Doublet antenna.

Doublet Antennas

There is a plethora of information relating to doublets online. At first glance my quest to use 40m at home seemed to be thwarted because many observers maintain that you need to cut the doublet antenna to a full half-wave length at the lowest operating frequency – in this case a length of 20m (66ft), beyond the confines of my QTH. Further reading, however, revealed that it would be better for the doublet to be cut to a length that avoids a full or half-wave length, so that a tuner can does not have to try and deal with the high impedance that may be presented to them on certain bands. A total length of 0.4 wavelength of the lowest frequency is often quoted in online forums. Furthermore, thanks to the work of **L B Cebik W4RNL (SK)** (URL below) an alternative Doublet length came to light.

https://tinyurl.com/yxhrwz56

Cebik suggests that for 40-10m operation a total length of 44ft (13.37m) should offer reasonable performance on 40m, while increasing in gain as we rise in frequency. With this in mind I constructed my 44ft doublet. Cebik also states that an 88ft long (26.74m) doublet would provide coverage from 80-10m. Here is an outline of the parts and equipment I used at my QTH to construct the smaller of these two antennas:

• 2 × 6.7m (22ft) of wire

• 1 × dipole centre

• 300Ω ribbon lead – enough to reach your tuner. I needed 11m in length (450Ω ladder-line is also fine)

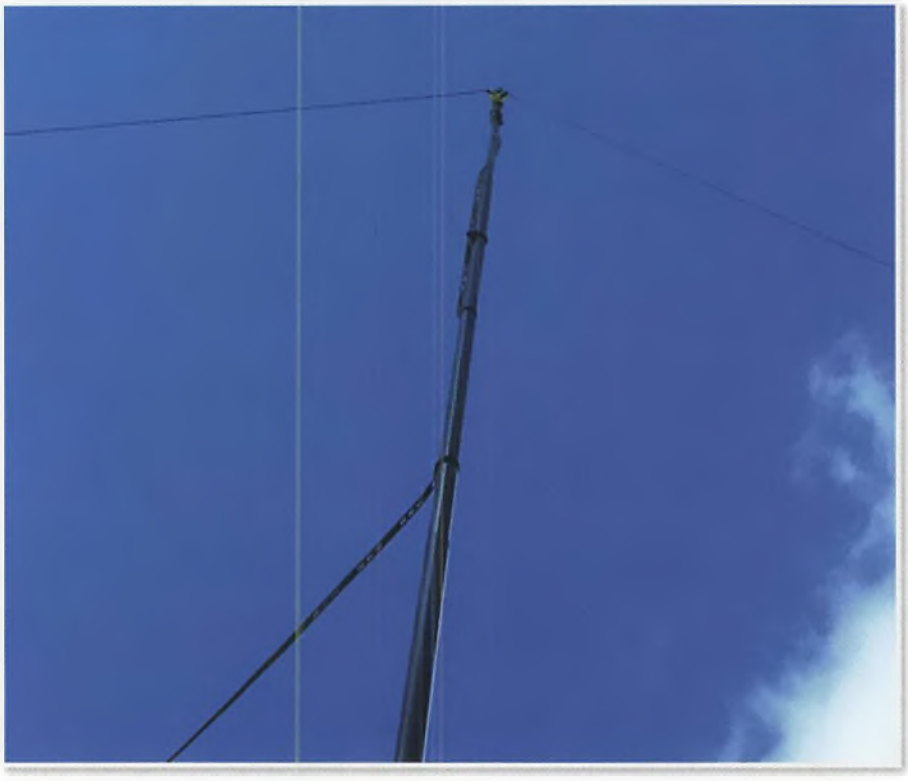
• 4:1 or 1:1 Current Balun

• Short RG 213 patch-lead (shorter the better – no more than 3m in length)

• Auto Tuner

• Antenna supports (in my case three fibreglass poles, but trees or other supports can work)

• Coax from tuner to Transceiver



The centre of the inverted-vee supported by an 8m fibreglass pole. Note the 300Ω ladder-line running down as straight as possible to avoid interaction with the doublet legs.

The 4:1 current balun. Simply hooked to the side of a low height shed. The 300Ω ladder-line feeding it from the antenna apex, with a short piece of RG213 running from the balun to the LDG tuner inside the shed itself.

Doublet Configurations

Strictly speaking, Doublets should be fed directly into a good balanced tuner in order to present a fully efficient system. This configuration minimises loss because there is no external balun or coax used. The (extremely low loss) ladder-line reaches the tuner itself. For many people, however, this presents an issue. Ladder line is sensitive to being close to objects, especially metallic, and it is not always possible to route it directly to the shack.

An alternative, which I used, was to feed the 300Ω ribbon to a good 4:1 current balun and use a short (1m long) piece of RG213 to feed an auto-tuner situated in a convenient shed positioned at the base of the central supporting pole. From here, I run a length of RG58 coax into the shack. While this configuration will see a little more loss in the balun and the short coax between the balun and tuner, it should still provide a very usable multi-band antenna system.

My Configuration

My doublet is constructed from 18AWG wire as an inverted-vee. The apex is supported by an 8m tall fibreglass pole and by two 4m tall end poles, again being made of fibreglass. The centre pole was originally a 10m pole but with the top two sections removed. The eighth section is still rigid enough to avoid any severe whipping around in 30MPH-plus winds. This centre pole is placed within a 50mm wide gutter pipe, which was sawn off to a length of just 3.5m. I then dug a square hole, which was around 1m in depth, and filled the hole and the bottom of the pipe itself with chippings to aid drainage, while having the pipe held in place. The fibreglass pole was then simply slotted down into the pipe and this has held firm throughout a UK winter.

The right-hand 4m fibreglass pole. Attached to the fence by tie-wraps! This has held securely throughout an English winter.

The end poles are also fibreglass and are each the bottom (thickest) four sections of two old 10m poles. To strengthen these, I simply removed each section from the base of the pole and put some Araldite/epoxy glue on the top of the inside of each pole section while slotting the next one back up inside. Adding insulating tape for good measure, I was able to provide further waterproofing. Both these poles have proved to be rock-solid and have provided good support to the end of each doublet leg. The added advantage of having an inverted-vee configuration, of course, is that the two end poles effectively become guying-points for the antenna.

The 300Ω ladder line is then taken down the centre pole and angled so as to meet the 4:1 current balun attached to a low shed just to the left of the centre pole. From there, a 1m length of RG213 coax feeds into an LDG Z11-Pro ATU, with a short 9m run of RG58 into the shack.

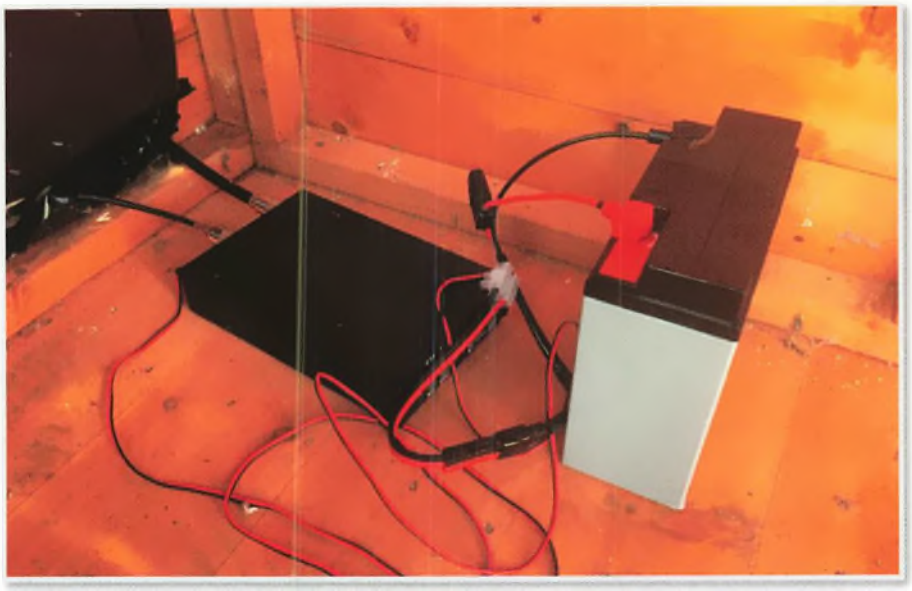
The final point to make about my configuration is that strictly speaking I did not have enough room for my doublet to run as a perfect inverted-vee. Dipoles/doublets are quite forgiving performance-wise if up to the final third of each leg is either angled directly downwards or zig-zagged to accommodate the length. In my case, the end of the left-hand leg is shaped down the pole for 0.5m, with the end of the right-hand leg shaped directly down the support pole for 1m. An important safety consideration, however, is to ensure that the end of each dipole leg is above the reach of humans or animals because high voltages are often present during transmission, even at low power. It is also important to note that to produce effective radiation, an inverted-vee should have an angle at the apex between the two legs and in any subsequent bend of the ends of each leg of no less than 90°. Any less and significant cancellation of RF radiation can occur.

Performance

Setting my Icom IC-7300 transceiver to the middle of the 20m band, I adjusted my power to 5W and selected FM mode. After a couple of seconds my external LDG ATU tuned a 1:1 SWR. This was the same for each band between 10 and 40m. Some installations may have difficulty not being able to tune a specific band. Adding a metre or two of length to your ladder-line feeder may well cure this (there's always a bit of trial and error somewhere!) but you may well get lucky like me.

The noise levels, when using a balanced antenna such as a dipole or doublet are often lower compared with an end-fed and this is the case for me, measuring S3 for 40m and hardly anything on the S-meter from 10-20m (I know I am lucky).

Having used this antenna now for seven months I can safely say it has been a winner. Working Europe is a breeze on 40m, often receiving strong S9-plus reports. I have also managed to work DX into North and Central America using 50W on 40m. I have enjoyed success on 20m, working North America without too much trouble, plus into South-East Asia. When open (rare I know), even 10 and 15m have seen me being able to reach into South America. All running the Intermediate legal power limit of 50W.



The LDG ATU fed from the balun and powered by a 22Ah lead acid battery. The battery has yet to require any charging following seven months of usage because the tuner requires less than an Amp to function.

The wire reaching an end support pole. Note how the wire runs directly downwards for a short distance.

Conclusion

We all have different environments to contend with. No one antenna provides a silver bullet for our HF challenges. However, if you want to try a multiband, low space option for HF try making your own multiband 44ft doublet. It may save you some pennies and gain you some highly satisfying and enjoyable radio time.

*(**Editor's note:** I am grateful to Tim for extolling the virtues of a simple doublet antenna as a good option for multiband working. The key aspect, and this can't be emphasised enough, is to use twin feeder – open-wire feeder is ideal but the commercial 300Ω and 450Ω types are easier to work with although they can be affected by rain (moisture tends to sit on them and can affect performance – the slotted types are to be preferred). As Tim says, an ideal solution is to tune the shack end of the feeder with a balanced tuner – see also the recent article by **Steve Ireland VK6VZ** about link-coupled tuners. However, most commercial tuners expect to see a coaxial feed (I have no idea why, because you should only use coax when the antenna itself presents a 50Ω resistive load at its feedpoint, in which case why do you need a tuner at all!). Coax from the tuner to the radio is fine, of course, as Tim suggests, because by then you have transformed whatever impedance is at the base of the twin feeder to a 50Ω unbalanced feed.)*

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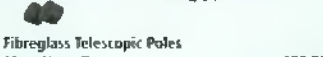

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TV Transmitting Antennas

Steve White G3ZVW discusses terrestrial television broadcasting and why the transmitting antennas are located on such tall towers.

The UK was the first country in the world to enjoy a regular television service. Until the 1960s it used a 405-line monochrome system.

Early Television

The world's first regular TV broadcasts were from a transmitter at Alexandra Palace in North London. The transmitter was directly above the TV studio and the antenna was on top of that. From its hilltop location it had a good takeoff across most of London. There was only one station to watch, the BBC, and it was broadcast on a frequency of 42MHz. The first regular broadcasts were in 1936 but the service was closed down as soon as Britain declared war on Germany in 1939 because bombers could have used the signal as a directional beacon to fly to London. The service resumed in 1946 but it wasn't until 1949 that any other part of Britain got television for the first time, the second transmitter being at Sutton Coldfield in the Midlands.

ITV (initially the Independent Television Authority, ITA) came along in 1955 and because it wasn't possible to broadcast two stations on the same frequency (and because the BBC had been allocated all the frequencies in Band 1 of the VHF spectrum), ITV needed to go higher in frequency. ITV in the London area was broadcast from a tower at Croydon in South London, on 192MHz. Because the coverage from South London was better, the BBC relocated their TV transmitter to nearby Crystal Palace in 1956. Even in those heady days the frequencies were given channel numbers. In the London area BBC TV was on Channel 1 and ITV was on Channel 9. Other Channel numbers were used in other parts of the country. See **Table 1**.

In terms of frequency, the channels in Band 3 are a very long way from the channels in Band 1. People needed separate antennas to receive each TV station and different antennas in each part of the country, although two antennas were sometimes combined and fed with one cable. The photo, **Fig. 1**, shows separate TV antennas of the day, along with a more modern UHF TV antenna. A testament to how well engineered some of these old antennas were is that a few still adorn peoples' rooftops today. The Band 1 (BBC) antenna is the largest, the Band 3 (ITV) antenna is smaller and the Band 4 (UHF TV) antenna is the smallest. Note that the Band 1 and Band 3 antennas are vertically polarised and the Band 4 antenna is horizontally polarised, which is the norm for receiving transmissions from main transmitters.

1

Band 1		
Channel	Frequency	Usage
1	42MHz	BBC
2	48MHz	BBC
3	53MHz	BBC
4	58MHz	BBC
5	63MHz	BBC
Band 2		
VHF FM	88-108MHz	
Band 3		
Channel	Frequency	Usage
6	177MHz	ITA
7	182MHz	ITA
8	187MHz	ITA
9	192MHz	ITA
10	197MHz	ITA
11	202MHz	ITA
12	207MHz	ITA/BBC
13	212MHz	ITA/BBC
DAB	~220-230MHz	Local and national ensembles

Table 1. Channels and nominal frequencies of VHF TV in the UK, along with VHF FM and DAB broadcasting.

The Colour Revolution

In the UK it was not until the 1960s that colour TV came along but before it could do so the engineers and scientists knew they had problems to solve. For any given number of lines in a TV picture, colour television contains more information than monochrome, the result of this being that more bandwidth is needed for each station's signal. Wider channels were needed.

The engineers and scientists knew there wasn't going to be enough bandwidth in the VHF part of the spectrum to broadcast good quality colour television, plus a third station (BBC2) was in the offing and they wanted a picture with more lines – and therefore more detail – in it. All the problems were solved together by deciding to migrate all television broadcasting in the UK to Ultra High Frequency (UHF), where a lot more bandwidth was available. Channels 21-68 (472-806MHz) came into being. The first transmissions from BBC2 took place in 1964 in monochrome. Colour was introduced in 1967 and by the end of the 1960s BBC1, BBC2 and ITV were all broadcasting 625-line colour programs at UHF. The 405-line monochrome TV service carried on for quite a while though. It was finally closed down in January 1985, the last transmitter to be switched off being in Scotland.

But there's another problem. As you move higher and higher in the frequency spectrum, signals from the hilltop transmit-

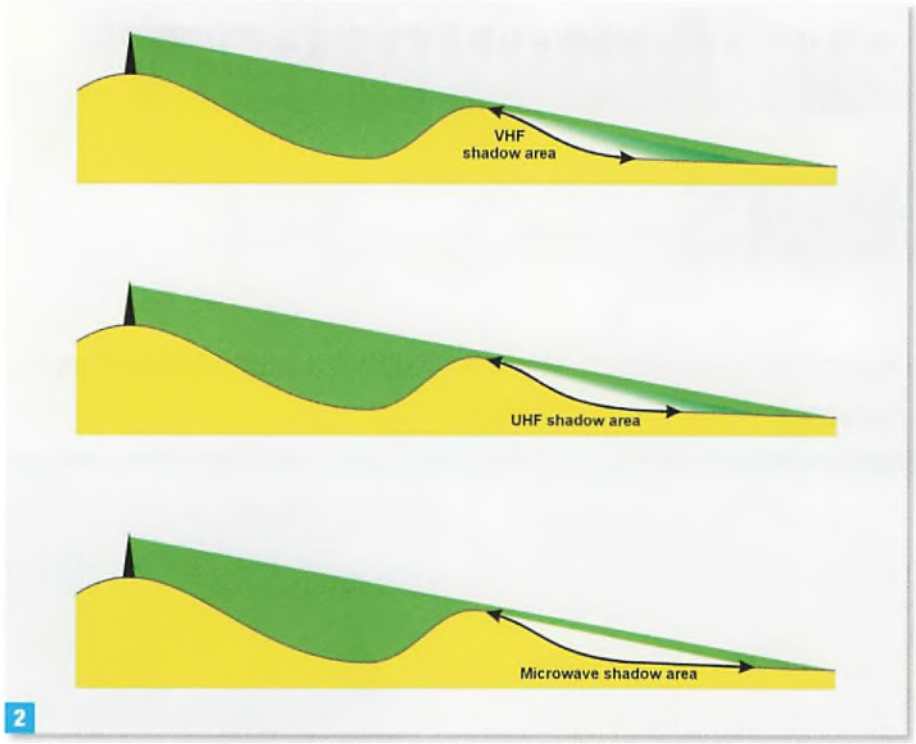

Fig. 1: Two VHF TV antennas of about 1960, still on a rooftop in 2019, along with a more modern UHF TV antenna. Fig. 2: (a) Shadow effect at VHF, 2(b) More extended shadow at VHF, 2(c), Shadow greater still at microwave frequencies. Fig. 3: The Stockland Hill UHF TV transmitter covers West Dorset, East Devon and the surrounding areas. Fig. 4: The main and reserve TV antennas on the Stockland Hill tower.

ters penetrate into valleys less and less. It is known as the shadow effect. See **Fig. 2** for details. In Fig. 2(a) a VHF signal penetrates reasonably well into a valley, so the shadow area where there is little or no signal is small. Moving up in frequency to UHF, Fig. 2(b), the shadow area lengthens. If you move up into the microwave part of the spectrum, where you really do need to be able to 'see' a transmitter to receive a signal from it, the shadow area is longer still, Fig. 2(c). The shape of any hilltops between the transmitter and receiver has an influence on the shadow effect but I'm keeping this simple.

The migration from VHF to UHF resulted in a greater number of huge transmitting masts being required, such the one at Stockland Hill in Devon, **Fig. 3**. The main TV transmitting antenna is contained in the white tube at the very top of the tower and the reserve antenna (in case of a fault with the main one) is built into a ring around the tower, a little way down from the top. The next photo, **Fig. 4**, shows this in better detail. Even though this tower is 750ft high and located on a 750ft high hilltop, you don't have to go more than about 20 miles away from it to find a town that needs a local relay station.

Now let's go back to the switching off of the VHF television transmitters. Why, you may ask, was one in Scotland the last to go? It comes straight back to the shadow effect. Scotland is mountainous, so there are lots of shadow areas. At UHF a lot more transmitters needed to be built to provide effective coverage.

As I mentioned earlier, in the days of 405-line monochrome television at VHF, only a small number of main transmitters were sufficient to cover most of the UK. There were a few hundred local relay stations but only about twelve main transmitters. I have seen it written that by the time the UHF TV network was completed across Britain about 1,000 transmitters (including local relay stations) were needed. Most transmitters were high power and covered large areas but many hundreds of local, low power relay transmitters were needed to fill in the gaps.

The Digital Revolution

Digital terrestrial television was launched in the UK in 1998, the same year that satellite television started switching from analogue to digital. Transmitting a TV signal digitally means that it can be transmitted more efficiently, so more stations can be transmitted in the bandwidth that one station used to need. This is known as multiplexing.

In the UK Digital Audio Broadcasting (DAB) takes place at a frequency of about 225MHz. This is more than double the frequency on which FM broadcasting takes place (88-108MHz), so the shadow effect has a greater influence on DAB than it does on FM. On a car radio an FM station gets noisy when you drive through a fringe area, while on DAB the signal chops in and out. If a substantially lower frequency had been chosen for DAB, there would have been less chopping of the signal but the bandwidth needed for the multiplexes wasn't available lower in the spectrum. The same also seems to be the case for other countries that use DAB.

Stations are also multiplexed on DAB, so the audio from several are combined into one transmission (called an ensemble). The receiver receives all the stations contained in an ensemble but only the data relating to the station that the user has selected makes it through to the loudspeaker.

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Contests, an Anniversary and Bugbears

As well as the usual roundup of news, Steve Telenius-Lowe PJ4DX introduces the autumn contest season, covers a 50th anniversary and shares another bugbear.

Although there are HF contests throughout the year, September marks the beginning of the main autumn/winter contest 'season', with several major events taking place during the month: the All Asian DX Contest (Phone) on September 7/8th; the Worked All Europe DX Contest (SSB) on September 14/15th; the Scandinavian Activity Contest (CW) on September 21st/22nd and the *CQ* World Wide DX Contest (RTTY) on September 28/29th, to name but four.

Even if you only intend to dabble in a contest, it's worth taking a look at the rules beforehand so that you know what details will be expected from you (the contest exchange – it could be a serial number, a zone number or even your age). WA7BNM's contest calendar lists all known events and clicking on the '+' sign at the left of each line brings up more information including a link to the rules for each contest.
https://tinyurl.com/yxseoxwn

Last September I took part in the Worked All Europe (WAEDC) SSB contest and recently received the smart silver metallic plaque shown in **Fig. 1** in the post from Germany. This contest is different from all others due to the exchange of 'QTCs': reports of previous contacts sent by DX stations to European stations. I plan to take part again this year so if you hear me on, please give a call. The rules, which include a full explanation of these unique QTCs, can be found at: www.waedc.de

OJ0 50th Anniversary

Market Reef became a separate DXCC entity in 1969. To celebrate its 50th anniversary a series of OJ0 mini-DXpeditions are on the air in July and August. The commemorations began on July 6th with OJ0A operated by, among others, **Martti Laine OH2BH** who was on the very first OJ0 DXpedition 50 years ago. The event concludes between August 17th and 24th with multi-operator activity as OJ0O.

Market Reef has a special place in my heart because it was the location of my first 'real' DXpedition back in July 1983. I enjoyed it so much I returned to the lighthouse (Märkets fyr in Swedish) three years later with **Drew GM3YOR**, **Kee OH0NA**, **Steve G4EDG** and **Hawk SM5AQD**, **Fig. 2**, to operate as OF0MA (OF was a special event prefix that year).

HF Bugbears, Part 2

In the second part of this occasional series of operating practices that annoy me I'll take a look at 'frequency fights'. Here's a real-life example: in May this year I worked **Brian GW4DVB**, who was active as **J88PI** while on holiday in St Vincent and the Grenadines (see *HFH*, June 2019). I continued listening to the frequency after our contact and was disappointed to hear what transpired. Brian was operating on 14245kHz and had a nice clear frequency until exactly at the top of the hour, when interference appeared from 2kHz higher. After a while – J88 stations being fairly rare – Brian had quite a pile-up of strong European stations calling him. But then another European station came on Brian's frequency and asked him to QSY (move frequency) down because he and the stations calling him were causing interference to the net that had started on 14247kHz. Brian politely pointed out that they had come up close to his frequency, rather than the other way around, and suggested that instead they might like to QSY a little higher in frequency. He was told they would not do that *"because it is a net"* so he ought to be the one to move. This strikes me as seriously poor operating: no one 'owns' a frequency and by starting a net within 2kHz of an existing contact it was they who were causing the interference, both to J88PI and to those trying to contact him.

Fig. 1: Worked All Europe DX Contest plaque.

Fig. 2: Drew GM3YOR, Kee OH0NA, Steve G4EDG, Steve G4JVG (now PJ4DX) and Hawk SM5AQD, all trying to look tough on Market Reef, summer of '87.

Readers' News

We start with news from **Steph Foster G4XKH**, the Secretary of the Riviera Amateur Radio Club based in Torbay, who sent a note to say the club will be marking National Battle of Britain Day on September 14th with a special event station. GB1BOB will be located near Babbacombe Downs just outside Torquay and will use an Icom IC-7300 to an off-centre fed dipole on HF SSB and FT8 (they will also have a VHF station).

We welcome yet another new contributor to the *HF Highlights* pages, **Erik de Mey**

ON4ANN, who wrote to say *"the NB DX Team is on the road again!"* Eleven Belgian operators will be active as MD/OP2D from the Isle of Man, **Fig. 3**, between September 21st and 27th on SSB, CW, RTTY and FT8. All bands from 160m to 6m will be used. If you work MD/OP2D and would like a QSL card, please QSL via **Tim Beaumont M0URX** using his Online QSL Request System (OQRS), or direct with US$2 and an SAE (no IRCs). Please do not send your QSL via the bureau as they are not wanted: bureau cards can be requested via OQRS at no cost to you. Details are on the M0URX website at:

m0urx.com

and see also:

users.telenet.be/on4ann/MD

A warm welcome back to **Carl Gorse 2E0HPI**, a regular contributor to this column but who has been absent for a few months. He wrote *"It's nice to be back as I have received quite a few messages from readers of PW asking if all is OK"*. Carl recently operated portable from Saltburn-by-the-Sea (WWFF GFF-0327, Redcar and Cleveland Coastal Sands, **Fig. 4**) using a new Yaesu FT-818 and an MFJ-1979 vertical. He says the Yaesu FT-818 *"is an excellent radio and is more robust for the weather elements we have here... I am planning on activating a new lighthouse this year (but not sure which one yet) for the ILLW* [International Lighthouse Lightship Weekend] *in August, which will soon be with us."*

illw.net

"The ubiquitous AM70 stations apart, lack of band occupancy seemed to be a problem in early June," **Victor Brand G3JNB** reported. Nevertheless, Victor worked 9G2HO on 30m CW, followed by 4X1EL *"who was a blockbusting signal in Bedfordshire on the 2nd. On 17m, S01WS Western Sahara, reliable as always, came back first call. Also on 30m, Asiatic Russians like RT0O (3200 miles) were available as medium DX late evenings. The mostly short-skip conditions and paucity of DX meant the moment that the 'Lazy DXers Team' station S9A from Sao Tome (AF-023) appeared on 17m, they were besieged! I joined the pile-up and eventually back they came with 'G3JN?'. Despite repeated requests for "G3JN? only" a look at the S9A online log on Club Log shows that unfortunately the contact was not completed"*.

Victor continues, *"On the morning of 11th OJ0AW Market Reef was thundering in, the only CW occupant of 30m. They were posted on the Cluster as far away as W and UA0 and heard me immediately... On 17th, TZ4AM in Mali was romping in at 2120UTC and* **Jeff** *responded to Victor's second call just before going QRT. The band was opening and OY1R was heard repeatedly calling 'CQ DX' and 'No EU' (without much success) while he struggled to copy the responding JAs."* Family celebrations and a holiday then kept Victor from his key until the 30th when he read both transmissions from the historic SAQ 200kW Alexanderson alternator on 17.2kHz with a length of wire hung out of his shack window. It loaded up nicely on 20m so he enjoyed a few QRP QSOs with his FT-818, including RT9T/3 and **Frank OV1CDX**.

Fig. 3: Look for MD/OP2D from the Isle of Man between September 21st and 27th.

Fig. 4: MFJ-1979 vertical antenna at the (WFF GFF-0327, Redcar and Cleveland Coastal Sands location of 2E0HPI/P at Saltburn-by-the-Sea.

Terry Martin M0CLH reckoned it was *"A mixed month with some nice openings on the higher bands. The Cricket World Cup stations are, as predicted, much more difficult to come by because of the skip distance involved but the Cyprus station (5B19CWC) has been very active and much easier to work. It is also good to see a strong station from Mauritania on the bands in the form of 5T5PA with prompt confirmation via LoTW* [Logbook of The World – PJ4DX]. *The unusual call of 4Y1A made an appearance this month and is the United Nations International Civil Aviation Organisation club station* [in Vienna – PJ4DX]. *Fifty years ago, having barely left university, I remember staying up to look at the live pictures of the moon landing – it was an amazing achievement and brought tears of joy to the eyes. It is good to see this seminal event marked with various special event stations."*

Tony Usher G4HZW found conditions on his favourite band, 10m, to be *"very encouraging"* this month with 174 contacts, mostly Europeans but some DX as well. *"For well-equipped stations the band has again been open to Japan but I had yet to even hear one. A couple of days ago in an effort to rectify the situation I moved the antenna up from its default 25ft to 45ft. From experiments conducted a couple of years ago using WSPR I know that this change in height would give an increase of 4dB. That doesn't sound much but in the world of FT8 it's quite substantial. It seemed to work and yesterday (July 8th) my signal was reported from UA0 and JA, although no full contact was achieved. Unfortunately, the band has dropped off today so no JA contacts to report. Apparently there are auroral signals currently being heard in Scandinavia so that's the cause of the poor conditions."* What Tony did work on 10m FT8 is shown in the band reports and we

hope he is lucky enough to make it to Japan in the coming month.

Owen Williams G0PHY had *"even less activity this month with only a handful of the Cricket World Cup special event stations worked (all UK-based). I did manage to work 4U1ITU, and OJ0Z celebrating 50 years of Market Reef being a DX entity... With the IARU and IOTA contests coming up this month there should be much more activity."*

Steve Emlyn-Jones GW4BKG says that he *"spent a fair bit of time during the preceding period chasing, like many others I suspect, the various GB19 stations and worked up to the Silver Award level as well as All Grounds and Teams and the various Half-Century modes awards. I also worked various Belarus (EV/EW) stations to qualify for their Games Awards. There is a Facebook page 'Radio Amateur Awards' where images of many awards are posted. As the GB19 stations are using the international version of HamLog I registered with it myself and am in the process of uploading all my old log entries so far back to 2013. I guess it is a cross between LoTW and Club Log but has features that the others do not include."*

Kevin Hewitt ZB2GI operated from his home and, as he often does, as ZB2GI/MM from the Bay of Gibraltar along with **John King ZB2JK**. However, this month he also operated from the top of the rock with both John and **Gordon MM0GOR** as ZB2BU/P, the club call of the Gibraltar Amateur Radio Society, **Fig. 5**. *"We put up the two-element 10m Yagi as and when required. If it was permanently installed the rock apes would promptly destroy it,"* Kevin says.

Etienne Vrebos OS8D and ON8DN, who lives close to Brussels airport, wrote that he is *"waiting this month for the authorisation to elevate my Hexbeam,* **Fig. 6**. *I haven't seen anybody from the airport authorities till now. I could push the Hexbeam up another 4m, which would be probably better in the next months... I'm still not interested in data 'communication' and have made myself a member of the 'True Blue DX Club' (no. 970) as I think communication is mainly and only SSB (voice) or CW."* Etienne was once again taking advantage of the good summer weather in Europe in June by going on long motorcycle trips, resulting in *"very poor activities here – only 70 QSOs this month."*

Fig. 5: Gordon MM0GOR and John ZB2JK silhouetted against the setting sun at the ZB2BU/P operation from the top of the rock of Gibraltar. Fig. 6: The ON8DN / OS8D Hexbeam, waiting to be raised up a little higher?

Band Reports

Carl 2E0HPI/P reports 40m SSB: GB2CPM, SQ2LKY. 20m SSB: DK1MHWP/P (DL/CG-094), GB19SA, OT10WCA, PD10WCA/P (PAFF-0048).

As usual, Terry M0CLH used most of the available modes to work, on 40m SSB: GB19NZ, OR10WCA, PA10WCA/P. 40m CW: EV0MA. 40m FT8: GB19CNI. 30m FT8: 5B19CWC, HB0/DH3RD. 20m SSB: 4Y1A, AO50MOON, LZ815NI. 20m CW: GB19CS, GB19LL, LZ1809PNS. 20m RTTY: AO50MOON, 20m PSK31: LZ815NI. 20m FT8: 5B19CWC, 5T5PA, AP2AM, CS2019CWC, HF50MOON, VE1DBM. 17m SSB: OY1R. 17m CW: LZ1809PNS. 17m FT8: 5P19CWC, EA9AK, EV0CA. 15m SSB: AM70N. 15m CW: GB19SA. 15m FT8: GB19CGW, GB19CWC, K2A. 12m CW: 5B19CWC. 12m FT8: 5B19CWC, AA4VV, AA5DE, GB19LL, GB19PAK, N2CEP. 10m SSB: GB19BG, SM0XBI, YL2BM. 10m CW: AM70U. 10m RTTY: GB19BG. 10m FT8: 5B19CWC, A41ZZ, A45XR, CS7AKZ, GB19RB, HF9D, HS0ZIV, TK4LS, UA4FBG, WA3AFS.

Tony G4HZW used FT8 on 10m to work: 4X5MZ, 9Z4Y, A45XR, HK4EI, HS0ZIV, HZ1FI, PJ2DD, TF8V, VA2CZ, VO1NC, WP4PRD, ZD7BG, ZD7MY, many EUs and 37 Ws as far west as W0.

Owen G0PHY reports 20m SSB: 4U1ITU, GB19TB, GB19SG, GB19RG, J48GEO, OJ0Z. 17m SSB: GB19CGI.

Steve GW4BKG worked, on 40m CW: YP0H (EU-191). 30m CW: OJ0A, OJ0AW, RI1OM (EU-119). 30m FT8: 5T5PA, CO8LY. 20m SSB: PJ4DX. 20m CW: R205NEW (AS-205), SF2CW (EU-192). 20m FT8: A41CK.

Kevin ZG2GI operating from home, worked 17m FT8: 4X4MF, KP4ASG, LU3DW, LW2EIY, PT2VHF, ZW30BF. 15m FT8: AM70A, CT3MD, GB19BG, HK4GSO, PW50Y. 10m FT8: 4X4MF, PU1MHA, PY2HP. Also, as ZB2GI/MM, on 20m SSB: 9A1KDE, DB4RG, G4ZCW, EA1DBX, IU1LBL, OK3JTR, ON7AH, SQ8PEH/M, SY2CRK, UA4CVW. 15m SSB: IZ1XEE, M0PPF, YO3IPR.

The Gibraltar ARS club call, ZB2BU, was used /P from the Top of the Rock on 20m SSB: 9H5JO, AI1C, K2UQT, KC4YT, N3EON, PT2CSM, WP3ZN plus several other USA and PY stations. 10m SSB: 2I0BOW, DF2XE, EA8JK, F4EJW, G6UMS, HB3YCY/P, M0FAK, MI0AHI, ON4ANV.

Finally, Etienne OS8D and ON8DN reported only three stations this month: 20m SSB: OJ0AW, S9A. 17m SSB: S9A.

Signing Off

Thank you to all contributors. Please send all input for this column to **teleniuslowe@gmail.com** by the 11th of each month – photographs of your station or activity would be particularly welcome. For the November issue the deadline is September 11th. 73, Steve PJ4DX.

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Lavernock Point

Joe Chester MW1MWD has his first successes as GB9GGM, emulating what Marconi did all those years ago.

I finally got my DIY vertical up over a relatively low resistance ground – a wet sandy beach. Which means that my 10W input is probably delivering a good chunk of RF into the air. The sky is deep blue, and waves are crashing ashore less than 5m from our setup. Lovely spot. *"Your ten watts is really booming in here, +10 over"*, he said. Her and I, the entire *Footsteps* team, just looked at each other and laughed out loud.

In April 1897, **G G Marconi** set up his transmitting equipment on Flatholm Island in the Bristol Channel. His receiver was at Lavernock Point, on the Welsh coast, a few miles west of Cardiff. Here he reported reception of Morse code from the island – the first time a radio signal had crossed water, a whole 6km! For Marconi, this was the proof that his idea of sending messages to and from ships at sea was a viable business proposition.

My plans are more modest (I'm not trying to set up a business!). I want to repeat Marconi's experiment, which is why I planned to set up a station at Lavernock Point. Unfortunately, the land here is now privately owned. The adjacent bungalow park, with its Marconi Café, is also private property. So, I've moved along the Welsh coast a bit, to a beach called Oxwich Bay. It's normally quiet midweek but the weather is kind, so the strollers and dog walkers are out in numbers. Imagine the scene.

The people on the beach are staring bemused at a man sitting by a picnic table, beneath a pole held aloft with what looks like coloured bunting from a child's party. The coloured ribbons make the guy lines very visible, to help avoid trip risks for passers-by. The weather is kind, so there are plenty of these. Hence the quizzical audience! On the table sit two small boxes. The man is talking gibberish into his left hand. But we've all done this – haven't we?

A Real Challenge

I already know from my Pepperbox activities that 80m QRP with a short vertical is challenging. I made no contacts then. But I haven't given up just yet. My portable 80m station isn't very efficient. I think Marconi's early equipment was the same. And he used even lower frequencies, where the losses are even greater. So, I think my setup roughly matches Marconi's. I want to see if he really did hear what he said he heard. In a way, my lack of success last time was encouraging! Marconi said he heard something, even if I didn't. I have an even larger challenge for this one. Marconi was satisfied with 5km – but I'm 50km from the opposite shore of the Bristol Channel!

Photo 1: Setting up for 80m.

In the previous week, I spent time every day retesting my setup. I used the antenna analyser to find the resonant frequency of my antenna. On 40m I got 7120kHz, with an SWR of 1.1, with the j, C and L components all zero, bandwidth 240Hz. On 80m I got 3720kHz, SWR 1.09, and again all zeros, bandwidth 150Hz. I tried calling CQ for a while, but conditions that week were pretty poor, with almost no G, F or ON calls on the Cluster. I then switched to CW and tested the setup with the reverse beacon network (RBN). On 40m I got DJ9IE, at 14dB on the attic dipole and 10dB on the vertical, about half an S-point difference. So, the setup is working.

A Well-Oiled Machine

We're a well-oiled machine these days, setting up and taking down the portable station. My assistant understands the setting out of the counterpoise on the bamboo poles stuck in the soft sand. She carefully ties ribbons along this to increase visibility. I wind the ladder line around the SOTApole as I push it up, and then attach the RG58 from the antenna analyser to the coil. I connect the battery, select the band, and push scan. It's a bit too low, so I wind in a couple of turns of the counterpoise wire and scan again. Perfect – 3.720MHz, bandwidth (SWR<2) 100kHz, SWR 1.1, impedance 51Ω, and the j, C and L components are all zero. Time to get on the air. Just before 10.00UTC I start calling CQ.

Please recall that with this setup, I made no contacts last time out. My assistant is now sitting in a beach chair, cup of tea in hand, slightly bored. But the sun is out, so she's not unhappy. We're both a bit sceptical, as the CQ calls go unanswered for the next 10 minutes. Then suddenly we hear **Mike GW4GWH** answering my call. He's 59 with me and gives me a 55 report. He's in Llandrindod Wells, over 50km away, as the crow flies. We chat for nearly 15 minutes. I explain what I am doing and ask him to check the GB9GGM qrz.com page. He does this as we are speaking and says he recognises my home callsign. I asked if he reads *PW*. *"Yes"*, he said, *"that's it!"*. One of the things we talk about is the noise on 80m that morning. To me, it sounded like a buzz saw, and the noise level was worse than at home. It's clearly man-made but I'm on a beach, miles from any conurbation, so if anyone has any ideas about this, I would love to hear from you.

Before signing off, Mike tells me that one of his friends may have met me last weekend, at the CW Bootcamp near Hereford. We close at 1020 and I'm then called by another **Mike**, **G8ALS** in Coventry. He gives me a 56. Next comes EI6HSB, in Navan, 290km away. He's very weak, and just readable because of the noise, but he gives me a 57!

Move to 40m

After all this excitement, I remember that on the webpage, I promised to move to 7.119MHz at noon (UTC). I grab a cuppa

and change the configuration to the 40m one – this's easy, just shorten the counterpoise to a marked length, and move the tap on the coil. A quick check with the antenna analyser gives 7120kHz as the resonant frequency, close enough. The next hour is slightly disappointing, as no one answers my calls. I resort to the search and pounce (S&P) technique and in ten minutes log **Robbie MM0UDI** in Aberdeen, **Jan PA2JJB** on Texel, and **Mike F8VOU**, south of Poitiers.

At this point, the KX3 starts acting strangely, jumping 1kHz on transmit. Mike mentioned that he noticed this too. So, it's time for a break and to set up for 20m. I suspect it's the battery, although it was fully charged before I started, and the voltmeter in the KX3 is showing 13.1V. Very strange. I've sent an e-mail to Elecraft but if anyone else has seen this, please let me know what you think it is.

And then to 20m

In the afternoon, I continue on 20m. This uses the full Buddipole (BP) kit. For Lighthouse Weekend last year I tried it set up as a dipole. This year I'm trying a vertical configuration. I've also done some work on this configuration since the Pepperbox Hill disaster, when I couldn't get it to tune. I still don't know why this happened because in tests at home it worked perfectly. So, after a beautiful picnic lunch provided by my Catering Team, I make the change. I also change the battery. I start calling CQ – remember, my schedule and frequencies are on the GB9GGM QRZ page.

Operation on 20m is harder than on 80m earlier. It was difficult to find a free frequency on which to start calling. Instead, I search for strong signals, and in quick succession work **Marcus HB9GFM**, **Evo 9A2GF** and **Wolf DK2OO**. Then I call **Mike R9GM**. He's nearly 4000 km away and reports me 59+10. Incredible! With 10W? We have a brief chat. I tell him to check my qrz.com page. He tells me he wants to call the USA, so I sign off quickly.

Reflections

It's now early afternoon. The sun is shining. More tea has been organised, with some nice pastries. I sink into a beach chair and try to understand what has happened today. I don't really know where to begin. I think I'll leave the detailed analysis for a later article. But for now, the two highlights are working stations QRP on 80m SSB during daylight hours, and that incredible +10 report from 4000 km away in Russia. Now, tell me you're not just as amazed as she and I are!


2

Lessons Learned

So, what have I learned? Firstly, using CW on 80m QRP does work. But it's hard work! This is a huge improvement from my failure on Pepperbox Hill. I suspect that the close proximity to the trees there didn't do much for my effective radiated power (ERP). But I'm on a beach this time, with a take-off over water. The second lesson is about that elevated counterpoise. If you look at the ENZEC model of this, you will see that with one counterpoise it favours the direction the counterpoise is laid out and is relatively deaf in the opposite direction (you can see the large dent on one side of the plot). I knew this from tests carried at the home QTH. For example, amateurs a few kilometres north of me can't hear me calling but **Nigel G3TXF** over 60km south gave me a 57 report. This is essentially because of the orientation of the counterpoise. But conditions also play their part, as GB5WOR in Worthing didn't hear me calling either, even with 100W.

At Pepperbox Hill, conditions were such that I had to lay out the counterpoise in an unfavourable direction, more SW than I would have liked. On the beach, I've managed to stretch it out more S/SE. I can fix the null caused by the single counterpoise with a second counterpoise. However, because my setup is in a public place, I don't want to look as though I've created a police cordon around a huge chunk of the beach!


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Photo 2: First QSO for GB9GGM. Photo 3: Calling CQ on 20m.

Of course, the losses are not as great with the 20m setup. It's still a bit deaf in the direction opposite to the counterpoise but the antenna is just so much more efficient that this isn't really a problem. Hence, as I've reported, I had more success on 20m than on 80m.

So, I have successfully repeated one of Marconi's original experiments. Even though I was operating in daylight hours, I managed to get further than Marconi with my calls. I think I can therefore conclude that Marconi probably also got his signals across that 6km of water from Flatholm island. That's two down, and just one more to go. The big test is to cross the Channel with this setup. I will try this in the first week of July, from the Haven Hotel, where Marconi says he did it exactly 120 years ago. Details on the GB9GGM page on qrz.com.

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The British Bring Wireless to America

Michael Marinaro WN1M focuses on some significant 'firsts' in transatlantic wireless communications.

Signor Guglielmo Marconi (1874-1937) achieved many 'firsts' during his career as physicist and world esteemed inventor extraordinaire. The conduct of the first two-way wireless message exchange between the US and Europe was accomplished from the major Marconi station, CC, erected at South Wellfleet, Massachusetts. This particular achievement in early 1903 received great notoriety. But, contrary to common belief, this station at Cape Cod was not the very first Marconi wireless installation in the United States or on the North American continent.

In 1895 Marconi began to engage in serious experimentation to perfect his discoveries to generate and detect electromagnetic waves. Efforts to interest the Italian Government were unsuccessful and Marconi brought his concepts and models to Britain. A favourable reception led to the formation of The Wireless Telegraph and Signal Company Ltd in 1897, which organisation supported both Marconi's continuing experimentation and the initial objective of communication with ships at sea. The latter endeavour was eminently successful as wireless signals reached further and further around the British Isles and to France with excellent reliability. The enterprise was commercially successful as well, with the number of coastal shore and shipboard stations increasing and revenues growing. By the end of 1904, the period covered here, the Company had 69 land and 24 ship stations in operation. The value of wireless communication was widely accepted in Britain and the scope of activity widened.

With domestic acceptance ever-increasing Marconi's attention was drawn to bridging the Atlantic and, significantly, the ships that sailed thereon. Transatlantic communications was the evolving goal. A number of events were to contribute to the achievement of this aim and the introduction of wireless to the North American continent, some occurring simultaneously. The western sites selected were in Canada at Glace Bay, Cape Breton Island, Nova Scotia; and in the United States on the shores of Long Island, New York and the state of Massachusetts. But first it would be necessary to establish a base station in Britain to anchor the eastern end of the project.

Britain

The site for the world's first permanent great wireless station was selected for its westernmost location and nearness to the New World. The headlands overlooking Poldhu cove in south-western Cornwall were ideal and work began in 1900 there and at a complementary monitoring and domestic coastal service station at the Lizard, six miles distant. Initially, Polhdu was configured with a 25kW spark gap transmitter and an antenna of 60 wires strung fan-wise between two 170ft masts – unique and extraordinary for the time, **Figs. 1** and **2**.

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Canada

Three dots (the letter S) was the Morse code letter that Marconi used to preface and identify his experimentally transmitted signals. It was this letter, sent repeatedly from Poldhu, that Marconi monitored at Signal Hill, St John's, Newfoundland, **Fig. 3**, in 1901 even as the Poldhu works neared completion. Anxious to prove his theories Marconi had sailed to St John's with his team, receiving gear and a long antenna wire, which was to be lifted aloft by helium balloons or kites. He awed the world with the news that he had heard the signals, on a kite-supported 600ft antenna, from a distance of 2,200 miles over the Atlantic.

Marconi set out to prove that two-way commercial service could span the Atlantic reliably. Steps were taken to establish a permanent installation in Canada and with the cooperation and support of the Canadian government a site was selected. Not unlike at Poldhu, the site was atop a cliff-hung headland, Table Head, on Cape Breton Island, in the province of Nova Scotia. Similar in layout to Poldhu, the new station was more powerful and used a unique vertically-polarised antenna with 400 wires forming a cone The station was operational on December 14th 1902 when messages began to be exchanged with Poldhu to inaugurate the first regular transatlantic wireless service. In 1905 this facility was dismantled and moved to a larger site, five miles to the southwest. Known today as the Marconi Towers, the giant station involved an enormous horizontally-polarised antenna

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Fig. 1: The towers at Poldhu. Fig. 2: Marconi operating position at Poldhu, 1906. Fig. 3: Cabot Tower, Newfoundland. Fig. 4: Nantucket Shoals lightship. Fig. 5: The great station at Glace Bay. Fig. 6: Contestants in 1899 America's cup race – yachts Columbia and Shamrock. Fig. 7: Signage at Babylon on site of station, Long Island. Fig. 8: US National Park Service waymarker exhibit; original layout of Marconi station.

exhibiting highly directional radiation characteristics.

United States

While these various events were evolving, Marconi and his teams were concurrently establishing wireless on the US east coast. At first the effort, using their unique expertise, afforded sea-to-land communication. The *New York Herald* newspaper contracted with the Marconi entity to furnish news of shipping transiting the sea lanes off Nantucket Island. Two stations were equipped with current design two-way equipment and antennas. One station was located in the town of Sconset (Siasconset) at the east end of the island and the other was installed aboard the Nantucket Shoals' lightship, **Fig. 4**, 42 miles at sea southeast of the island. Service began in mid-1901. Reports received at the island station, call letters MSC, were relayed via undersea telegraph cable and the conventional land pole strung telegraph system to the newspaper's offices in New York. Approximately 250 vessels transited these sea lanes daily and the knowledge of vessels passing was of commercial and social value. As passing vessels became equipped with on-board stations, they were able to engage in two-way communication directly with the island station passing messages.

But, neither Nantucket nor Long Island was the absolute first US location of Marconi wireless activity. Both could be termed temporary stations because they were shortly superseded by major transatlantic stations at Glace Bay, **Fig. 5**, and Cape Cod. Another temporary station was the true first instance of wireless being generated in North America.

As mentioned previously, as the century was to close Marconi's short-range demonstration transmissions in Europe had begun to dispel scepticism. However, his 'space telegraph' was still considered a novelty and was not well recognised in North America. In the late summer of 1899 Marconi set out to gain publicity for his invention. He sailed to New York City and established a syndicate with the major newspapers there. He was to report the conduct of the America's Cup yacht race, to be held in September in lower New York harbour off New Jersey's Sandy Hook. His receiving station with linkage to telegraph and telephone lines was situated in a signal tower on the shore. The yacht *Ponce* was fitted out as the transmitting station with appropriate antenna. From this vessel Marconi, with yachtsman like precision, personally keyed in 1200 messages describing the sailing duel between the *Columbia* and *Shamrock*, moment by moment, **Fig. 6**. The reporting of the event was flawless and created a sensation. Wireless had come to the North American Continent and was received most positively.

The Marconi Company began immediately to scout for temporary and permanent station locations along the U.S. north-eastern beaches. The temporary stations were to serve as local, limited distance, shore-to-sea messaging facilities with integral operator training schools. Two such posts were in operation by 1902 at the towns at Sagaponack, and Babylon, **Fig. 7**, on the south shore of Long Island, New York.

While the two lesser Long Island locations were coming on the air a permanent US transatlantic-class station was sited on the desolate bluffs of Cape Cod, near the town of South Wellfleet, Massachusetts. Larger in design and scale CC was to complete the first transatlantic circuit linking with her sister stations at Poldhu and Glace Bay. And, consequently this was the station from which the first two- way wireless communication was accomplished between the US and Europe. This event was so broadly publicised that it became popularly known as the very first actual wireless activity within the USA.

The detailed drawing, **Fig. 8**, prepared by the US National Park Service illustrates the station arrangement upon completion in February 1902. The major components are the three buildings and the four 210ft wooden towers. The original pole antenna arrangement was destroyed in a storm before the station came on the air and Poldhu had suffered a similar antenna loss about the same time. It is worthy of note that the towers were set on square concrete slabs with the bases of the most easterly two towers set about 165ft from the edge of the bluff.

The station began transmitting on a wavelength of 1500m using the call letters CC. A spark of 20kV was created, a spark so powerful that it could be heard in the neighbouring village. The station was linked directly by telegraph line to the local main landline telegraph station in the

town of South Wellfleet and beyond that to the *New York Times* newspaper in New York City. Messages to be sent by radio transmission were received in this manner and likewise messages received by radio were so dispatched for delivery. Additionally, daily news stories, primarily from Boston and New York, were accumulated and condensed into a newspaper format, punched into a paper tape, and transmitted to ships at sea three times each night on 1500m. Ocean liners such as the Cunard Lines *RMS Lusitania* and *RMS Mauretania*, subscribing to the service, presented their passengers with a ship-published newspaper the following morning. This news service was a main activity of the station throughout its existence.

Shortly after the station was in full operation a momentous exchange of messages took place from the station. On January 18th 1903 a message was successfully sent by CC from **President Theodore Roosevelt** addressed to **King Edward VII**. The message was received by ZZ at Poldhu and a response from the King, then residing at Sandringham House, was received in turn at the Cape Cod station. It is purported that Marconi, who was in attendance at the station, actually keyed in the message. This was the first instance of a two-way US transatlantic communication and the first wireless telegram exchange between the US and Europe.

Advances in technology pointing to the use of short wavelengths and the demise of spark gap; and the forces of nature evident in the rapidly eroding cliffs, were beginning, to combine to doom the long term existence of the station. In 1908 the call letters were changed to MCC (Marconi Cape Cod) and in late 1912 or early 1913 they were changed again to the final WCC.

By 1910 operations had begun from two new Cape locations. A receiving site was situated at sheltered Chatham, Massachusetts at the 'elbow' of Cape Cod 34 miles south of Wellfleet To reduce the overloading of the then poorly selective receivers and permit simultaneous receiving and transmitting, the transmitters were located separately at a location 40 miles west in Marion, Massachusetts. The two sites were linked by telephone and telegraph.

American Marconi established two additional major stations in the US in 1913 and 1914. Both deployed in pairs to operate in duplex fashion. One was constructed on Cape Reyes, California with the transmitting station KPH at Bolinas and the receiving site at the town of Marshall.

Guglielmo Marconi posing in front of his early radio apparatus. (Smithsonian Institution Libraries)

The second, an enormous state-of-the-art facility, was situated in the state of New Jersey with the transmitting site in the town of New Brunswick and the receiving location at Belmar.

The last of the great facilities, New Brunswick, was the most technologically advanced. By 1918, after four years of experimentation and progressive improvements, it included a mile-long receiving antenna, a 5,000ft long transmitting array supported by eight 400ft masts and by mid-year an Alexanderson alternator transmitter with an output power of 200kW at 17kHz (17,500m).

World War One

With the advent of World War One, this, the best of the foreign commercial installations on the US mainland, was commandeered by the US Navy. The US entered the war in April 1917. After the partial failure of transatlantic telegraph cables, the New Brunswick facility was confiscated by the Navy in January 1918 to provide vital transatlantic communications. New Brunswick Naval Radio Station became the principal wartime communication link between the USA and Europe, using the call sign NFF.

After the war, ownership of the station, along with that of American Marconi's other US stations, was transferred from the Navy to the Radio Corporation of America (RCA). American Marconi disappeared as an entity as the US Government legislated that all commercial wireless be conducted by US companies.

Over a period of 18 years Marconi, his associates and colleagues, had built phenomenal transoceanic stations on both US coasts and in Hawaii. These stations maintained regular communications with Europe, Hawaii and Japan and were the initial links in the wireless chain that was envisioned to gird the globe.

A world circling chain was indeed subsequently created by the British parent firm Marconi Wireless and Telegraph Company. Promoted by the British government the system, completed by 1928, became known as the Imperial Wireless Chain and linked the countries of the British Empire. Concurrently, RCA, in competition, created their own worldwide network.

Marconi had brought the marvel of wireless to America and a grateful enhanced world. And, as he himself said, *"I too am but an amateur"*

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Transatlantic Contacts on Two Metres!

Tim Kirby G4VXE starts his column with both good and bad news regarding the 2m band.

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In exciting news, D41CV on Cape Verde worked FG8OJ in Guadeloupe on 2m FT8 on June 16th for a first transatlantic contact between Africa and North America. The distance was 3867km. D41CV was using 500W into stacked dipoles and FG8OJ was using 100W to a 14-element Yagi. Shortly afterwards, D41CV worked FG4ST who was even further away at 3911km. FG4ST was running 50W to a vertical antenna! Over the next day or two, D41CV completed with FM5AN in Martinique, who was running 50W to a 9-element Yagi and WP4G in Puerto Rico, over a distance of 4358km. WP4G was using a group of four Yagis. KP4EIT and NP4BM were also worked. Then, on June 20th, D41CV worked 9Y4D in Trinidad and Tobago, who was running 100W and a 7-element Yagi. On the same day, the D4 team put a Yagi up and worked FG8OJ on CW for a first transatlantic 144MHz QSO on that mode. Back on FT8, the team completed with J69DS in St Lucia. By June 22nd, the band was still open but signals had dropped. The PSK Reporter website was 'only' showing spots between D41CV, NP4BM, WP4G and FG5GH. Next day on the 23rd, the week-long historic opening had come to an end.

On the excellent blog of **EI7GL**, **John** notes that a dust plume had been blown across the Atlantic from the Sahara during the week of the propagation and wonders if they may be connected. It seems rather a coincidence, otherwise!

Congratulations to all the operators involved in making this exciting and fascinating series of contacts.

Two Metres Under Threat?

I imagine many readers will have heard through the grapevine about a threat to the amateur primary status on the 2m (144MHz) band. There has been lots of information around, some more accurate than others. One radio society official even used the words 'fake news' about some of the reporting!

So, what's actually happened? A proposal from Thales to put forward an agenda item for the World Radiocommunication Conference 2023 as a primary Aeronautical Mobile Service allocation drew little opposition at a preliminary meeting of the European Conference of Postal and Telecommuncations Administrations (CEPT) in June.

The International Amateur Radio Union (IARU) was present as an observer at the CEPT meeting and, it is reported, energetically opposed the French proposal. Among the delegates to the meeting, only Germany formally opposed the proposal, meaning that it will be discussed further at a higher level CEPT meeting in August. It is also reported that since the meeting, Belgium and Austria have joined Germany in opposition. Should the number of administrations opposing the French proposal reach eight, then the proposal will automatically fail to progress. The IARU are now actively seeking the support of other administrations to oppose the French proposal.

The Radio Society of Great Britain report that they have been 'deeply involved' with the joint IARU effort to oppose the proposal and are understood to be briefing OFCOM, our regulator, stressing the 'importance, innovation, investment and complexity present in the 144MHz band'.

It is important to note that *'As proposed, this is not an eviction or re-allocation of amateurs from the 2m band'*, but of course, it's not good news.

There was some criticism in RSGB and IRTS bulletins about the possibility of online petitions and other social media comment being unhelpful to the overall cause. However, it's fair to say that there seemed quite a delay in the reporting of the facts by those 'in the know', for no doubt genuine reasons, which understandably leads to speculation. News travels fast these days and it is wise, albeit extremely challenging for organisations to recognise this.

So, what can we do as individuals? Pragmatically, this is a good time to support your national radio society. If you are not a member, then consider why that is and whether it's time to change that. For all the faults that any society has, in the case of the RSGB, ARRL, IRTS and others, they are the only way that we can officially oppose proposals like this. What else? We can make our use of 2m very obvious!

In the words of the *Hitchhikers Guide of*

the Galaxy; *'Don't Panic!'* Whatever happens won't happen quickly. With luck, opposition will be mobilised and the proposal defeated. But it's a heads-up that there may be more challenges and we need to be smarter about opposing them, effectively.

QO-100. Do you need a receiver on 13cm?

If you've been paying attention to the items about the QO-100 satellite or E'Shail-2, you'll know that it has an uplink on 13cm and a downlink in the 3cm band. **Chris Wood G4CWS** wrote to **Don G3XTT** saying, *'There is, however, one point which I do not think I have seen addressed in any of the material published. This relates to compliance with clause 7(6) of the UK licence. As I read the licence document, to remain in compliance the amateur must be able to receive on the uplink frequency as well as transmit. Thus a station using, say, an FT-817 driving a 2.4GHz transverter would seem to comply, as it has the necessary receive and transmit capability, but a driver chain designed just for the purpose of producing a signal on 2.4GHz with no other provision for receiving on the band would not'.*

An interesting point for sure and I have certainly always worked on the basis that you should have a means of receiving on each band that you transmit on. However, the licence does not stipulate a number of things such as how sensitive should that receiver be? Where should that receiver be located? Should the reception capability be available in real time? Some have even suggested that a 'from time-to-time check' of your signals may be adequate to satisfy this clause. So, you might consider a Web-SDR one way of receiving your transmitted signals, for example.

An interesting question, Chris – thank you!

The 6m Band

David Smith M0OSA just missed the last deadline but says that he spent a couple of hours during the UK Six Metre Group Summer contest. Things were quite quiet, but David was delighted to work 5B4AAB (KM64), which was his most distant 6m contact to date. Other contacts made were IK7EOT (JN80), IZ8FFA (JM78), M0BEW (IO82) and G8ZRE (IO83). David was active again during the 50MHz Trophy contest and says it was the best opening he had seen in a while, making 27 contacts in 9 DXCC countries and 20 grid squares. David runs 50W to a Komunica HF-PRO-1 antenna on the car and was operating from a high location near Huddersfield.

Mark Forster M0YCL (Stoke on Trent) was delighted to work KO1DX and WU1ITU on June 24th while running 100W of FT8 from a Yaesu FTDX3000 to a V2000 vertical.

Abdel Mesbah M0NPT is deeply involved in the **7X2TT** club station and very often operates the station remotely from his home in Nottingham giving a much-needed country and grid square to many. On June 28th, Abdel was delighted to work the first Japanese station JH6VXP on 6m from 7X2TT.

Jef Van Raepenbusch ON8NT (Aalter) runs 10W from an IC-7300 to a V2000 vertical and worked 71 stations during June, with the following contacts outside Europe: June 7th 4Z5AV (KM71); June 16th EA9ACR (IM85), EA8JK (IL18); June 18th EA9ABC (IM75); June 20th KO1DX (FN54) and June 30th WU1ITU (FN65). All contacts were on FT8 apart from EA9ABC.

Kevin Hewitt ZB2GI has been active on FT8 using his FT-450 and a dipole. Highlights of the log include N1DG (FN42), CT3IQ (IM12), VE3VN (FN24), K1USA (EM37), EI4KP (IO52), TY2AC (JJ16) and 9G2HO (JJ06). Kev was also active on SSB from the top of the Rock with John King ZB2JK using an FT-690 and a 3-element Yagi, with the highlights being D4Z (HK76) and VO1FOG (GN37).

Fig. 1: Carl 2E0HPI's view from Eston Knab, during some VHF portable activity. His beam is just visible on the mast. Fig. 2: VHF NFD stations can be simple! Here's the fun entry of GC5BK/P with Simon G6AHX operating Fig. 3: John G3YQC received this DATV signal from BG0AUB in China via the QO-100 satellite

John Hemming G0UYT (Birmingham) says that he has worked some nice DX, including 5T5, 4X the USA and Japan. He has been experimenting with antennas and hopes to write up his results for *PW* in due course. John also paid tribute to **Mick Horsfall G7DMS** who passed away recently. Mick was the administrator of the Facebook FT8 UK group and was always very supportive and encouraging to newcomers in particular.

Nice to hear from **Paul Bowen M0PNN** (Newport) for the first time in a little while. Paul worked two new countries, 5T and PZ during the month as well as a few new squares in the USA. During a few openings, Paul says that conditions were good enough to work the USA on both CW and SSB.

John Wood G3YQC (Hereford) says the Es season now seems in full swing. John found one of the best openings on July 1st, when he worked N3MK, TF3JB and VO1HP.

Phil Oakley G0BVD (Great Torrington) has enjoyed some 6m Es contacts with highlights being OH0Z on SSB on July 11th and 7X2TT on FT8 on the same day.

The 4m Band

Derrick Dance GM4CXP (Kelso) has added two HB9CVs for 4m to his 'antenna farm'. One is outdoors and rotatable, although

only at around 12ft above ground and the other in the loft, which can also be rotated, by a quick visit via the loft hatch! Derrick also has a dipole in the loft. So far, using 50W to the dipole, Derrick has worked **Brian GM4DIJ** in Edinburgh.

The 2m Band

Derek Brown G8ECI (Louth) enjoyed the tropo opening around June 27th with the best contacts being SP2FH (KO02) to the east and EA2XR (IN83) to the south. South is a more challenging direction with the Wolds in that direction.

It was nice to hear from **Carl Gorse 2E0HPI** (Hartlepool) for the first time in a while. Carl has been using an FT-818 on some of his hilltop activities, **Fig. 1**, with some nice contacts being made on both FM and SSB at the 2.5W power level on 2m SSB. Carl was active during the late June tropo opening but found conditions patchy and thought it was perhaps better in the south of the country.

Jef ON8NT has received his new IC-9700 and is running 25W to a 5 element LPDA. During the month he made 152 contacts and listed only the contacts over 500km: G1BHM (IO70), F4EZJ (JN05), F4HER (JN06), GI6ATZ (IO74), OZ2ND (JO46), GI4SNA (IO64), DL4LAB (JO53), G4RRA (IO80), F6DBI (IN88); DL3TW (JO44), DK1FG (JN59), OZ1JMN (JO46), DL9LBH (JN59), OZ9PZ (JO46), DL5NEB (JN59), DL1SQH (JN58), HB9MFM (JN37), OV3T (JO46), OZ4VV (JO46), SK6QA (JO58), DG1VL (JO61), F4HEX (IN96), OZ1CCM (JO55), DL5AX (JO52), SM6CEN (JO67), OZ2ABI (JO46), LA3FV, JO59), OZ5AQJ (JO47), DL2AKT (JO50), OZ1CCY (JO45), LA0GE (JO59) and OZ6HQ (JO45).

Jef has also kindly donated his old FT-736 to the local technical school with some instruction about how to listen to contacts from the ISS. Great idea, Jef, and hopefully that will generate some new interest in amateur radio

Simon Evans G6AHX (Twyning) had an exciting start to the UK Activity Contest on July 2nd, working I7CSB (JN71) via Sporadic E. Just before the contest started, he completed with IZ8EVE (JN71) and IZ8WGU (JM88). During the tropo opening at the end of June, Simon worked ON4MPA, ON5NY and DL1KFS. During VHF NFD, Simon and **Adrian G0VLG** used the **Cheltenham Amateur Radio Association**'s call as GC5BK/P operating from near St Dogmaels in Pembrokeshire. Theirs was a 'fun' entry, **Fig. 2**, and they made 22 contacts on the band, with the best DX being G6IPU (JO02).

Roger Daniel G4RUW (Newbury) says it's not been the best of Es seasons, but nevertheless he has caught a couple of openings. On June 19th, Roger worked EU4AG (KO23) for a new country and then on July 2nd, he worked IQ0QU (JM88) for a new square. During the tropo at the end of June, Roger's best DX was DM5EL (JO61).

Derrick GM4CXP says that he plans to be active on 2m CW on 144.050MHz most Mondays to Thursdays between 2000 and 2020UTC. He's also open to sked requests (please e-mail **gm4cxp@gmail.com**) and hopes to enjoy some CW activity on the band, 'just like the good old days'! During the tropo opening at the end of July, Derrick worked three new countries – DL, OZ and PA – along with 11 new squares. He is running around 60W to his 7-element Yagi, using an FT-818 and a BNOS amplifier.

It's always good to hear from **Robert van der Zaal PA9RZ**. Robert has a new IC-9700 as well as an IC-7300 and has been enjoying putting them through their paces. He thanks **Dave G1XWX** for his help in getting the audio properly set up on the IC-9700. Robert enjoyed operating as PB100AU celebrating 100 years of the International Astronomical Union as well as some operation during the UK VHF Field Day. The best DX was F8KGU (JN19). Robert says *"no FT8 for me, I don't want to connect my radios to computers!"*

Jim Edgar GM4FVM (Eyemouth) was active during the RSGB MGM (machine-generated modes) contest on July 2nd and about halfway through, started to hear stations in Sicily and mainland Italy on FT8. Initially, Jim had no luck but then as propagation moved, worked five Italian stations in quick succession. The best DX was IT9PQO (JM78), the distances gradually getting shorter with the final contact being IZ5IOR (JN53). Jim apologises to the G stations who were calling him during the Es opening but says that he had to concentrate on the Italians – Es openings are few and far between, particularly in Scotland!

Paul M0PNN enjoyed the late June tropo too, picking up some welcome new squares in Poland and then the Es to Italy.

The 70cm Band

During the tropo opening at the end of June, Derek G8ECI worked DL1KDA (JO30) on 70cm FT8. Tantalisingly, Derek heard G4VXE briefly on 70cm too – although sadly we didn't manage to hook up. Next time!

Jef ON8NT has found that saying *"QSY 432.174"* following some contacts on 2m, seems to help. Contacts made on the band include GI6ATZ (IO74), MX0CNS (JO01), M1BXF (JO01), G4LPP (JO02), M1AEC (IO82), OZ1JMN (JO46), OZ1BP (JO55), DL8BFD (JO40), G8HQN (JO01), DH8BAO (JO43), DO1EJK (JO43) and DB9JH (JO31).

Simon G6AHX took part in the UK Activity Contest on July 9th, making 21 contacts. The best was F1BHP/P (IN99). During VHF NFD, Simon and **Adrian G0VLG** operating as GC5BK/P as a 'fun' entry, and made 15 QSOs on the band, with the best contact being G5LK/P (JO01).

There's just about room to mention an epic contact that I had at G4VXE with **Richard GW1JFV** (Haverfordwest) on FT8 during the late June tropo. We'd been trying to work for over a year, despite being able to work most days on 2m with ease. During a contact lasting an hour, we exchanged all the necessary information but shortly after we completed, signals came right up and we had another, back-and-forth-minimum-time exchange. Richard runs 20W to a vertical and I run 50W to a vertical.

Satellites

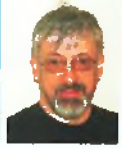
Jef ON8NT monitored the schools contact from the ISS to Rowan Preparatory School in Claygate on June 20th.

Kev ZB2GI has been active on AO-91 and AO-92 using an FT-817 and a 2m/70cm log periodic antenna. Highlights include 9G5AR (IJ95), GM4ZJI (IO86), G0PNM (IO70), G3PGA (IO71) and G0IIQ (IO93). Kev monitored a couple of schools contacts from the ISS, using a handheld scanner and its helical 'rubber duck' antenna.

John G3YQC writes, *"The wideband transponder on the QO-100 satellite has been very active with more DATV stations coming on as they complete their transmitters. The stations regularly on have been from all over Europe plus, of course, many from the UK. There are many stations known to be receiving and gathering transmit equipment"*, **Fig. 3**.

Patrick Stoddard WD9EWK (Phoenix) reports on his satellite operation in ARRL Field Day, when he operated from near Flagstaff in Northern Arizona. He writes, *"Despite the largest crowds we usually hear on the satellites during the year, I was able to make contacts on FM satellites (AO-91, AO-92, PO-101 and SO-50) and packet (FalconSat-3). As was the case last year, AO-92 was in the L/V mode as Field Day started. I logged a Field Day QSO from my station in northern Arizona with **Ryan AI6DO** near Los Angeles."*

Thanks to everyone for all your news. See you next month.



• E-mail: geofftheasby@gmail.com

A 20MHz Miniature Oscilloscope and an Undigital Filter

Geoff Theasby G8BMI has another oscilloscope suggestion, followed by a digital filter.

Most miniature oscilloscopes have a bandwidth of only a few hundred kilohertz, so aren't suitable for amateur radio purposes. (*Kits & Modules*, *PW* October 2018) This one (Google DSO 168 for suppliers), **Fig. 1**, however, claims 20 MHz! As I had recently been rethinking my station, and doing away with the Monitorscope, it occurred to me that this little device might just be a convenient replacement, while saving a square foot or so of bench space. Stick it onto the speaker grille or make it into a callsign plaque perhaps. The DSO168 doesn't meet its claimed 20MHz but is quite happy at 7MHz and below. It is also well above our normal limit of £10, at £35, but I thought it worth a try. It comes ready assembled, in a MP3 player-type, one-button case, which can be a challenge to navigate, and the probe is not compensated, but I made an adaptor to fit a better, compensated type, and found little difference.

There are other claimed specifications it fails to meet but for a station monitorscope we don't need the accuracy so much as the ability to observe the modulation waveforms to make sure the transmitter is working properly. We need some way of reducing the power to protect the 'scope and the 45dB sampling attenuator in *PW* March 2018 can do the job nicely.

The unit is accompanied by a glossy, colour leaflet but the manufacturers' printing skills exceed their English language skills. However, the instructions do make sense, unlike some others. It is powered by a Li-Ion battery, rechargeable in situ via a USB lead, although no other facilities are available through this connector so far as I could establish.

No doubt further progress will produce an oscilloscope capable of resolving a 30MHz signal at a similar price but for the moment, I am very pleased. If you want 'a better 'ole', said 'Old Bill', the DSO338 at twice the price claims 40MHz but I'll wait.

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Unidigital Filter

Lest readers think that everything goes swimmingly chez Theasby, I have spent too much time lately on a couple of items that did not succeed. A 45W HF linear increasingly diverged from the circuit, the parts list and the PCB, and a home-brew copy of the NESCAF filter just never worked as it should. (The official kits were out of stock.)

I wanted to revisit the add-on filters of years ago, in case they had improved, which led me to software like 'Spectran', and 'DSP Filter' for my smartphone. These are very good but no fun if you like using your soldering iron.

I have extensive experience of building and using Technical Associates and Datong products so, persisting with the audio filter theme, here is a kit by RV3YF, costing about £14. It claims to be a 'speech processor' but is really a cascaded three-stage op-amp filter, with variable bandwidth and adjustable top cut.

The PCB is well made but incorporates component locations on the copper foil side and not screened onto the component side, no doubt saving expense. This means that great care must be taken to ensure the correct location of each component before soldering, preferably one at a time.

Component designations are not

Fig. 1: The oscilloscope.

Fig. 2: Geoff's version of the finished filter.

quoted in the parts list, a major annoyance and so easy to do on such a low component count. In addition, two 180Ω resistors, R8 & R11, were supplied but the circuit diagram says 180kΩ, while R13, 360kΩ, was missing. These were fulfilled from my stock. Don't confuse R2 & R7, which are the large, 1W resistors, with R4 & R14 the normal, 1/8W resistors of the same value.

It works! Compared to my Technical Associates bandpass filter, it is slightly better. Checked with my smartphone audio spectrum analyser, Frequensee, and noise bridge (*PW* April 2019) 1st stage, 500Hz to 3kHz, little difference to 'straight through'; 2nd stage, 300Hz to 2kHz, –20 dB at 1kHz, cone shaped response curve varied to flat; 3rd stage, 400Hz to 1kHz, with a narrower shape factor. The centre frequency can be varied from 350Hz to 1kHz but the top-cut control has little effect (all figures approximate). It would be easy to ring the changes with component values (R5, C5, R6) but I leave that to my readers. This kit does not approach the filter shape factors achieved with DSP but it doesn't cost £200 either!

A comprehensive list of recently available filters can be found at:
www.eham.net/reviews/products/6

DSP filter software is available from:
www.hotamateurprograms.com
https://hamsoft.ca/pages/dsp-filter.php

While here is a DSP audio filter:
https://gi1mic.github.io

There is an Android DSP Audio Filter at £1.79 from Google Play. I have this on my Android phone, and it is good! Then a free DSP filter at:
https://tinyurl.com/y3qlnph6

Feature by Daimon Tilley G4USI

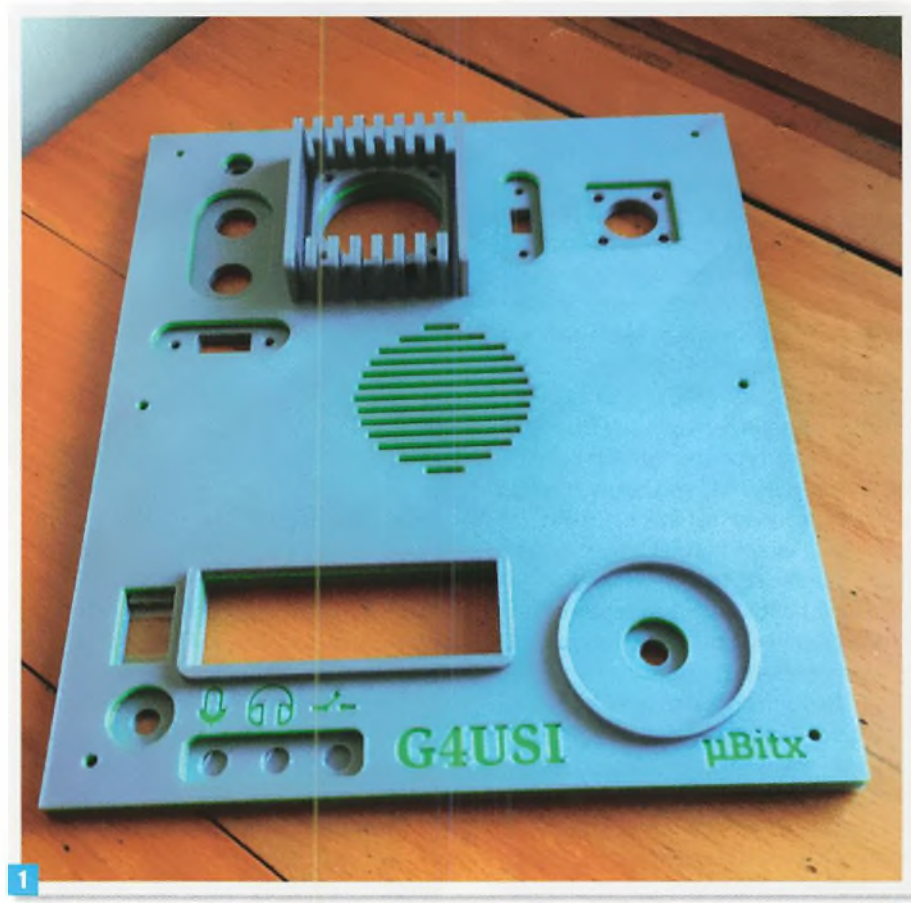
• E-mail: practicalwireless@warnersgroup.co.uk

Building a uBitx HF QRP 'Go-Box', Part Two

Daimon Tilley G4USI completes his build of the uBitx HF transceiver and reflects on lessons learned.

The only limitation with regard to enclosures is your own imagination. The websites and social media groups on this great rig are filled with pictures of individual builds. Some people have built theirs into the plastic box that the board and parts come in, some into biscuit tins and others into purchased enclosures that they have then drilled and cut for the rig and its components. Indeed, another enterprising Indian amateur, **Sunil Lakhani VU3SUA**, operates a small business producing a very nice bespoke metal case for the rig, available for $43 US and supplied with various hardware, knobs, connectors and so on. His website is: www.amateurradiokits.in

I decided to save my money and at the same time create a case specific to my needs. Regular readers may have seen my April 2019 article on 3D printing. I decided to print my own plastic case. My first stop was to the Thingiverse website to see what others had done. A number of cases were there but none really fitted my requirements. I needed to design my own, based on my own criteria.



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My Go-Box

As mentioned earlier, I wanted to build a 'Go-Box' or shack-in-a-box. I had already bought a small flight case in the Maplin closing-down sale, which measured roughly 13 x 9 x 5in – enough, I hoped, to fit in the rig, a power supply, microphone, key, earphones, antenna, ATU and some cord for raising the antenna. I also wanted to provide a separate 5V USB charging facility for phones and tablets and allow a USB port to upgrade firmware from the outside of the case, without having to connect to the Raduino.

With these considerations, I decided that I wanted a radio case that sat in the flight case, with every feature and connector available from the top panel. I would locate this centrally in the case and use the space on either side for storage.

What I came up with drew heavily on the work of others, who had built conventional cases. In particular, I drew on the design of DU2RK and used a number of his front and rear plate design features but on a single flat surface, to which I added additional features of my own, the labelling of a number of the items and some personalisation, such as my callsign. I also designed two ventilated side panels to support the top and the PCB and to provide separation from the two storage areas. This took me a number of hours to design in CAD software and about 24 hours in total to actually print.

Assembly was then pretty straightforward because all the wiring had been taken care of on the tea-tray. I included a 12V to 5V DC-to-DC converter, which cost just a few pounds and came with two USB female adapters for the 5V output. I fitted one to the top panel so that I could charge my phone or tablet (when using data modes, which I discuss later) and left the other one free for the time being, with a plan to build a Raspberry Pi into the case powered from this spare lead. The photos, **Figs. 1** through **5**, show the various elements.

Accessories

Once everything was assembled and verified as working, next was the job of completing the rest of the go-box kit and

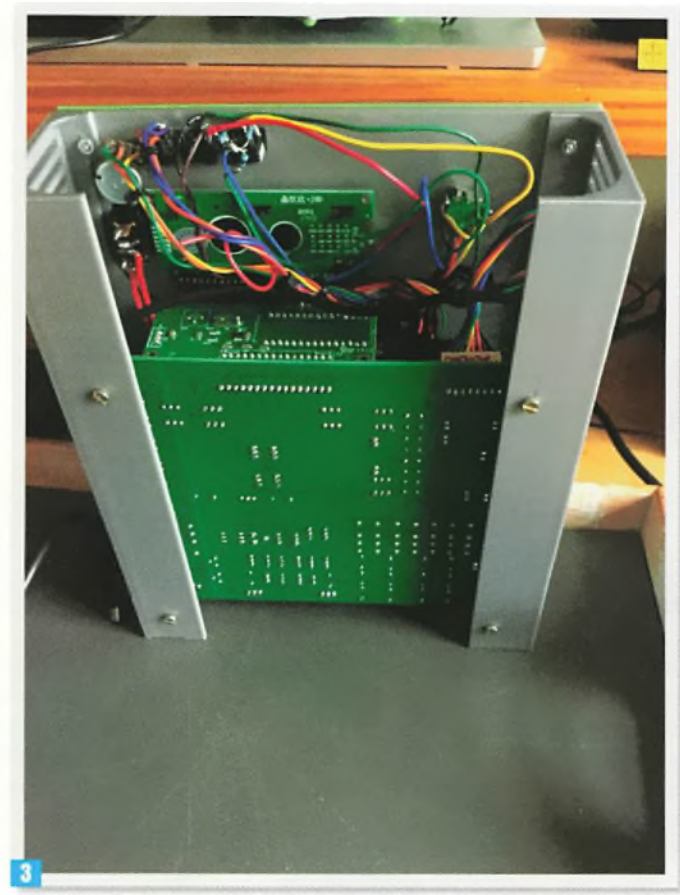

Fig. 1: 3D printed top fascia. Fig. 2: Addition of 3D printed sides. Fig. 3: Underside view.

ancillaries. I turned first to power. I wanted to provide for mains and battery power so I measured current draw on receive and transmit and chose a power supply that looked like a quality laptop unit, providing 12V at 5A, more than adequate for my needs. It appeared to work well for a while but then suddenly failed for no apparent reason, as did its warranty replacement. I eventually received a refund and had to think again. Then one day I discovered an old PSU in the garage. It's what is sometimes called a wall-wart, which don't have a great press. I believe they are often poorly regulated and not well smoothed. I plugged it in, though, and all appeared good. I carefully measured the PSU under differing loads and it appeared well regulated. I used the RTL-SDR again and looked and listened for any irregularities, comparing the results when driven from a 12V 7Ah SLAB (sealed lead acid battery). Again, I was reassured and this PSU now forms a permanent part of the kit.

I really would like to develop a bespoke LIFEPO4 battery solution, with balanced battery charging. Using 3.7V 18650 cells, I could achieve about four hours of intensive portable FT8 operation with a 4.5Ah supply, which would be nice and compact. I would also be able to supply 14.4V, which is within the supply voltage characteristics of the uBitx, and drive a little more RF output as a result. While I have done some research, I have yet to find the time to put this into practice so have settled for mains for now with an option of using my SLAB, which is heavy but fits in the case, or a vehicle supply via the cigarette lighter sockets.

Antennas

Next, I turned my attention to antennas. Again, I wanted something compact but versatile covering most bands but certainly 80 through 20m. After a lot of research on the QRP and social media websites, I opted for an End Fed Half Wave (EFHW) antenna. To achieve multi-band use I decided to cut it for 40m and place it on a spool with the half-wave points marked for each higher band by means of coloured heatshrink sleeving. I used the lightweight antenna wire from SOTABEAMS and also the kit version of their Mountain Topper EFHW tuner. The rig puts out a little more power than the tuner is rated for but, so far, no problems. So, how to deploy the antenna? I decided that some form of spool, at the far end of the antenna, would be effectively irrelevant in terms of matching. At 40m the whole antenna would be deployed and at higher frequencies, the wire left on the spool would effectively look like a 'blob' of thicker wire. I guess there may be some inductance added but given that I was using a tuner, I assumed this could be tuned in any event. I know others do it too and this type of QRP operation, especially in the field, is always going to be a compromise. Hey, it works!

I had read of people just using basic antenna winders and others had used portable clothesline spools from the camping world on which to store the antenna. I chose a fly-fishing reel as being neat, compact and easy to wind. The issue then was that I didn't own one so I decided I would use my 3D printer and print one instead! Off to the Thingiverse website and I found a nice design posted there that I used. I am really pleased with the result but only time will tell how robust it is.

Microphone and Key

I then revisited the microphone. I had printed a case for the original electret microphone unit supplied, but I wasn't


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really happy with it so I was rather pleased when at the Newark Hamfest I picked up a new speaker/microphone for the princely sum of £1. I had to replace the connector and I removed the speaker. It then took an hour or two to work out how to chop the circuit board around inside the microphone to wire it up suitably for the uBitx, but I got there and now have a nice professional looking microphone and lead.

I then set about what I was going to do for a CW key. I wanted something small and compact and chose to 3D print a published design for a single-lever paddle key. It consists of a printed base and a single mechanic's 'feeler gauge' as the lever or paddle. It works and is actually pretty accurate but I think it can be improved. As I am working on my CW I have been sticking to a straight key in the shack, but once I am more confident and have a number of additional CW QSOs under my belt, I will revisit a more permanent key for the uBitx. I have considered that a capacitive touch paddle built into the outside of the case might be neat.

I knew that the final stage of my build was to integrate data modes and for that I wanted CAT control. One of the uBitx developer community has done tremendous work here. **Ian Lee KD8CEC** has developed new firmware for the uBitx that makes a number of improvements on the original, and one of these is to emulate Yaesu FT-817 CAT control. I needed to download the firmware and then upload it to the Arduino Nano in the uBitx. Clear instructions were given for the Windows OS but I use a Mac in the office and a Pi in the shack. I tried software on both to upload the firmware to the uBitx and failed miserably. I must have spent a day and a half of frustration trying to sort it. In the end I had decided to give up, when my 13-year-old son (currently studying for his Foundation exam) came home from school with his Windows laptop. I reluctantly swallowed my pride, borrowed his machine and 15 minutes later I was done! One further point of interest is that Ian's revised software, and that of some other developers, allows you to replace the 16x2 digital display that is supplied with a full-colour Nextion touchscreen display, **Fig. 6**, in a variety of sizes, which gives the radio a really professional and high-end feel and puts a lot of the menu options at your fingertips. I like this but am struggling to justify the additional cost and effort of buying the screen and designing and printing a new top panel for a rig that will have only very occasional use.

The final stage of the build (so far) was the integration of a Raspberry Pi for data modes. I have been having a blast using FT8 on my main shack computer, another Raspberry Pi, and really enjoy the mode, particularly with propagation as it is. I wanted to be able to use FT8 and other data modes portable too. I bought another Raspberry Pi 3B+ just for this purpose and set up the necessary software (I used WSJT-X and FLDIGI) on the shack desk and using my monitor and keyboard first, integrating them with the uBitx with full CAT control.

User Interfaces

The next decision was how to display the Pi desktop and what form of input to use (keyboard, mouse or other). This could become expensive! You can buy touchscreen displays for the Pi and I could build that into the lid of my go-box very nicely, but it was around £60 on top of the £32 for the Pi itself. I would also need to buy a small Bluetooth keyboard, with integrated mouse or trackpad – another £30 or so. The reality is it is only going to get occasional use and having a screen and related hardware tied up permanently seemed a bit much. On the other hand, the Pi comes equipped with software called VNC. By installing an app on your tablet or smartphone, you can remotely access your Pi and have full touchscreen control of the desktop and its software.

I chose this route and got the Pi to recognise my smartphone mobile hotspot facility so that my smartphone, via VNC Viewer, could be used as a touchscreen desktop. Surprisingly for such a small device it is quite clear and easy to use WSJT-X for QSOs but a bigger screen would be more comfortable. To achieve that I use my 10in tablet and also connect this to the phone hotspot, using VNC Viewer from my tablet to access the Pi, via the phone's hotspot. Perhaps this is best explained by the diagram, **Fig. 7**.

Once I had proven that worked, I then set about installing the Pi inside the case, as there was plenty of room. In my design, I 3D printed a plastic tray that the Pi was bolted to on stand-off insulators. This plastic tray was then inserted in the front of the case in front of the main uBitx board and underneath the VFO and

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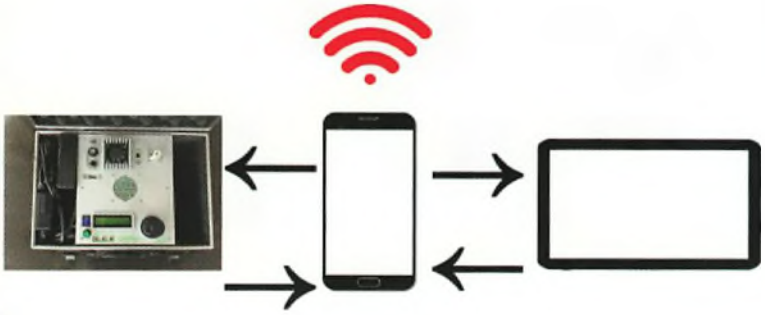
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Fig. 4: Raspberry Pi and USB sound card ready for installation. Fig. 5: Raspberry Pi installed and hard wired. Fig. 6: The Nextion touchscreen. Fig. 7: Using VNC Viewer for remote control. Left to right: uBitx with Raspberry Pi, Smartphone running Wi-Fi hotspot, Tablet with VNC Viewer. Fig. 8: First QSO, with F4FSY on 10MHz FT8. Fig. 9: First portable operations on a nearby hilltop with 3D printed CW paddle.

volume controls. I plugged a cheap USB sound card into the Pi and hardwired the microphone and loudspeaker ports directly to the microphone and headphone socket on the uBitx. Because the uBitx microphone carries a 5V DC supply, I used a series capacitor to block this DC from entering the sound card. The spare 5V supply from the 12V to 5V DC converter was chopped off and the supply connected to the relevant GPIO pins on the Pi.

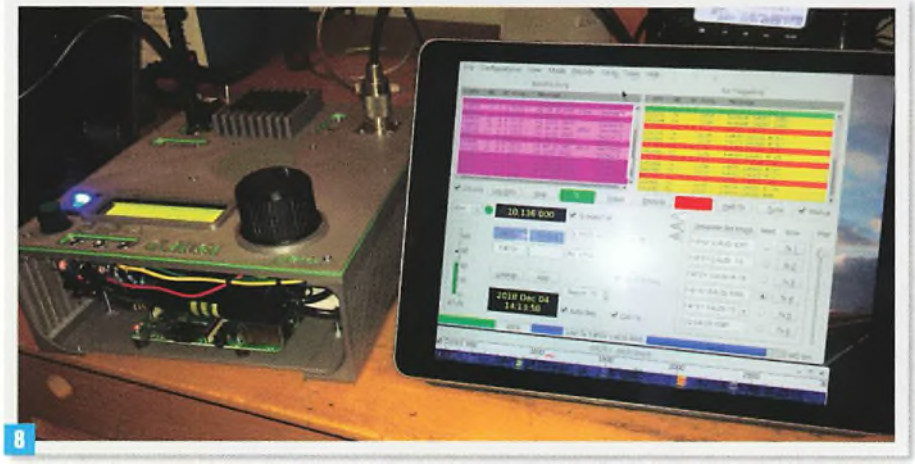
I put it all together, and to my joy, it worked first time and I soon had my first FT8 QSO in the log, **Figs. 8** and **9**.

After the Fact

So, what can I reflect back on and what might I have done differently? Well, first and foremost, I have really enjoyed the experience and I have enjoyed every aspect of the build, even after some of the frustrations. For about £150 (and a lot of effort) I now have a QRP shack-in-the-box, capable of SSB, CW and data modes on 80 through to 10m, with general coverage receive. I have also learned a lot along the way. If you enter into a build like this, you have to be prepared to put in the hours and to cope with the low points as well as the high.

As far as regrets are concerned, I have one main one. Do you remember all those modifications I told you about, adding an audio amplifier, an AGC and others to level up the power output? Well I had all the parts from the start but once I got the basic rig working I went ahead and built it all into the case. The problem is, now I'm not sure I can be motivated to take it all apart again to do the mods! Perhaps one day?

If you decide to give the uBitx a try, as long as you go into the project with your eyes open, you will have a lot of fun and put the 'amateur' back into 'amateur radio.' Good luck!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Further Resources

Manufacturer: www.hfsignals.com
Bespoke case: www.amateurradiokits.in
Independent website (all you need to know!): www.ubitx.net
Support group hosted by HF Signals: https://groups.io/g/bitx20

• E-mail: practicalwireless@warnersgroup.co.uk

Front to Back Ratio and a Visit to Cornwall

Colin Redwood G6MXL looks at front-to-back ratio of antennas and suggests some places in Cornwall of interest to radio amateurs.

Last month I briefly covered antenna gain. This month I am going to look at another antenna parameter – front-to-back ratio.

Front-to-Back Ratio

Directional antennas have less than 'ideal' radiation patterns. Apart from the main forward lobe (shown green in **Fig. 1**), there will be a number of side lobes (shown in yellow) and some radiation from the rear (shown in red).

The front-to-back ratio is actually the difference of two ratios – the power gain (in dBd or dBi) between the front and rear of a directional antenna. The ratio compares the antenna gain in the direction that the antenna is pointing with the gain (loss in some cases) in the direction 180° from the direction the antenna is pointing. The front-to-back ratio of an antenna is expressed in dB.

Taking the antenna in Fig. 1 again as an example, it has a forward gain of 15dBd and a rear (backward) gain (in some cases it could be a negative value) of 7dBd. So, the front-to-back ratio in this example is the difference between 15dB and 7dBd, which makes 8dB. **Table 1** shows the gain and front-to-back ratios for some very long loop Yagi antennas for the 9cm (3.4 GHz) band.

The higher the front-to-back ratio, the more directionally efficient the antenna is. However, it's important to remember that a directional antenna always radiates some signal out of the back of the antenna as well as a variety of other directions (often referred to as side lobes). Indeed, you often hear people on the air saying that the station they are working is off the back of the beam or off the side of the beam.

Given a choice, you might think that you'd always go for the highest front-to-back ratio. In many instances this is certainly true. However, if you want to be aware that stations are calling you from other directions to the one which your antenna is pointed, then there is a case for at least not maximising the front-to-back ratio. If you are participating in moonbounce (EME), then you'll want every scrap of signal you can muster to head off to the moon and not waste any off the rear of your antenna. You'll also want to maximise the weak signals you are receiving and minimise unwanted signals and sources of noise from other directions.

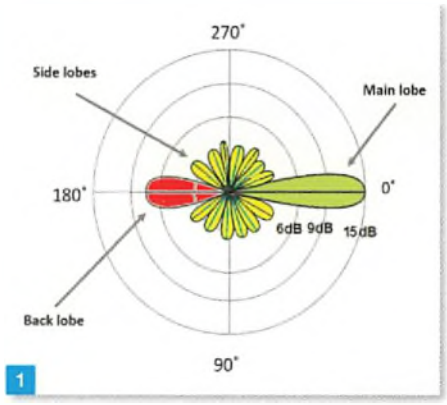
What this all means is that there is no 'optimum' antenna for all cases. For DX (weak signal) chasing (whether terrestrially or off the moon), you will want to focus the energy in a very precise way to maximise the signal at the far end and to get the best signal-to-noise ratio on the received signal. But for, say, contest operation, you may well prefer a broader pattern of radiation, at the expense of gain and front-to-back ratio, to avoid missing calls from other directions. Similarly, for VHF satellite operation (as reported regularly in **Tim Kirby G4VXE's** VHF column, for example), especially if you are tracking the satellite by hand, you'll want a wider beam because your pointing won't necessarily be all that accurate.

Cornwall

I've recently returned from a week's holiday in West Cornwall. Along the wonderful coastline, there are several sites of interest to radio amateurs, **Fig. 2**. I find it fascinating to see how three somewhat competing technologies developed and evolved over the years.

Porthcurno

Besides being a very attractive sandy beach not far from the outdoor Minack Theatre, Porthcurno Bay near Penzance has been the point where submarine



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cables have come ashore for nearly 150 years. The days of undersea copper cables have long gone and fibre-optic cables have taken their place. Nevertheless, Porthcurno continues to be one of the points where they come ashore.

Other locations are also used, no doubt to provide a degree of resilience among other reasons. Fibre-optic cables handle over 97% of international traffic (mainly in the form of data) because they have greater capacity than satellites and are also faster, not being burdened by the extra milliseconds delay of the uplink and downlink paths of satellites – something that is important to amateurs these days who need an accurate time for datamodes such as FT8 and JT65. Another advantage

Fig. 1: Radiation pattern of an antenna with main lobe (right) in green, the side lobes in yellow and the back lobe in red. Fig. 2: Outline map of Cornwall, showing the locations of the three places mentioned in the article. Fig. 3: Old teleprinter equipment in the Porthcurno museum.

of fibre-optic cables is that they are more secure than any radio system, including satellites – you can't easily 'listen-in' to a fibre optic cable.

Telegraph Museum

The Telegraph Museum at Porthcurno welcomes visitors. There is plenty to keep youngsters amused as well as adults. It's possible to see the history of underwater cables that linked much of the world in the days of the British Empire. Cable and Wireless (C&W) had their main training base here. The exhibition includes sections on the life of the trainees and operators, both in Porthcurno and overseas, shown in photographs, historical documents and filmed interviews. In addition to the operators in Porthcurno, over the years thousands of others were trained for work overseas. Largely because of its geographical isolation, in 1993 C&W moved their training college to Coventry – a more accessible location for many.

During the Second World War, a number of measures were taken against the possibility of bombing raids and attacks by sea, with huge tunnels being dug into the side of the valley. The tunnels now house a big part of the museum's exhibition.

During my visit I listened to an excellent talk and demonstration by a former C&W employee, which certainly engaged the young children in the audience as well as their parents. I particularly enjoyed seeing a mirror galvanometer demonstrated.

Of particular interest to radio amateurs of the older school will be a range of Morse keys, teleprinters and associated equipment, **Fig. 3**. It makes you appreciate how much easier we have it these days when we use computer-based RTTY rather than the old teleprinters. C&W operators, when sending and receiving Morse, were only permitted one mistake per thousand words!

The museum doesn't confine itself to exhibitions of historical interest. It also includes a room that introduces visitors to optical fibre cables. Many of the concepts that we encounter in the radio frequency spectrum are also to be found in this other part of the spectrum, albeit with different

technical solutions.

Many other buildings in the village, including the pub, were previously part of the huge C&W operation – the centre of communications and associated training for most of the British Empire.

There is plenty to see at Porthcurno. It's a particularly good choice for an inclement day, although the cable hut near the beach can't be opened if the weather isn't good. I'd suggest visiting the museum's website to check for current opening times and allowing several hours for your visit. https://telegraphmuseum.org

If you walk down to the beach, **Fig. 4**, you may see some to the old cables exposed, **Fig. 5**.

Marconi

Travel east from Porthcurno along the coast past Penzance and St Michaels Mount, and you come to Poldhu, near Mullion, on the west coast of the Lizard peninsular. The site was chosen by **Marconi** for much of his experimental work, including getting the first signal across the Atlantic from Poldhu to Newfoundland at 4pm on the December 12th 1901. The signal was heard by both Marconi and his assistant **Kemp**.

Antenna	Gain	Front to back
45 element loop Yagi	20dBi	20dB
76 element loop Yagi	23dBi	25dB
112 element loop Yagi	25dBi	25dB

Source: Directive Systems: https://directivesystems.com

Table 1 – Some examples of gains and front-to back-ratios of some 9cm loop Yagis.

There is a cliff-top memorial to Marconi. The Marconi Company gave six acres of the cliff-top site to the National Trust in 1937 after the research station closed in 1933. Subsequently the rest of the site (44 acres) was gifted in 1960. The site includes what remains of the foundations of some of the structures that were built for Marconi's use.

The National Trust, with assistance from Marconi PLC and European Union funding, built an excellent visitor centre which opened on December 12th 2001 – marking the centenary of Marconi's first transatlantic signal . The Marconi Centre is open to the public and manned by members of the Poldhu Amateur Radio Club, **Fig. 6**. There is no charge for entry, although a donation to club funds is welcomed, which is acknowledged with a visitor QSL card, **Fig. 7**.

I visited the cliff-top memorial on a rather inclement day and was glad to get inside the visitor centre. Once inside, along with other visitors, I watched a well-produced, short but informative video before looking around numerous displays and exhibits. The two friendly volunteers from the Poldhu club were kept very busy answering questions from a steady stream of visitors. I watched an interesting

Fig. 4: Porthcurno beach under which underwater old copper and modern fibre-optic cables reach land. Fig. 5: An old copper cable seen near the beach at Porthcurno. Fig. 6: The visitor centre and some of the Poldhu Club's antennas. Fig. 7: The visitor QSL card from the Poldhu Amateur Radio Club. Fig. 8: One of the dishes at Goonhilly.

demonstration of the effect on the radio frequency noise floor of switching off the lighting in the centre.

Visitors can walk to the Marconi memorial past the Poldhu club's impressive antennas and along the coastal footpath at any time. I'd suggest checking the Poldhu club's website for opening times of the exhibition centre:
www.marconi-centre-poldhu.org.uk
http://gb2gm.org

The Poldhu club together with their antennas have featured in *PW* on a number of occasions over the years. Their Doublet antenna was described in the December 2006 issue, while an extensive article on the club appeared in the May 2008 issue. Both these issues are available on archive CDs available from the Book Store at:
www.radioenthusiast.co.uk

Goonhilly Down

A few miles inland from Poldhu lies Goonhilly, a site rejected by Marconi in the early 20th century because the ground was too boggy. Here is a huge collection of satellite dishes, **Fig. 8**, some dating back to the earliest days of commercial satellite communications. One of the dishes, named Arthur (Goonhilly 1), dates from 1962 and is even Grade II listed!

Arthur carried the first transatlantic satellite TV pictures from the USA to Europe using the Telstar satellite. The dish is still in operation after 57 years with a capability to track to an accuracy of better than 1/100th of a degree! The entire 1100 tonne structure sits on a giant turntable and can track at speeds of up to 120° per minute. Typical dish gains are in the range of 50dB to 60dB (the Goonhilly website doesn't state whether this is dBd or dBi). Of course, well-designed microwave dishes have high front-to-back ratios – essential for a site with so much activity!
www.goonhilly.org

BT (formerly British Telecom) has moved most of its day-to-day satellite operations to Madley in Herefordshire. However, there is still much ongoing activity at Goonhilly, including supporting lunar and deep space missions and radio astronomy

while also providing international satellite internet access to remote locations and vessels at sea. The number of dishes has doubled since 2014.

While it is possible to see a number of the Goonhilly dishes from a distance, unfortunately the site doesn't currently provide facilities for visitors, the visitor exhibition having closed in 2010.

What Next

I am starting to plan the *What Next* column for the winter period. I'd really welcome suggestions from readers for topics that they would like to see covered. Please drop an e-mail to the editor marked for my attention. It can be to do with technical or operating matters – the purpose of the column, as the name suggests, is to go beyond what you learn during the licence training courses and introduce aspects of the hobby that will retain and develop your interest.

• E-Mail: practicalwireless@warnersgroup.co.uk

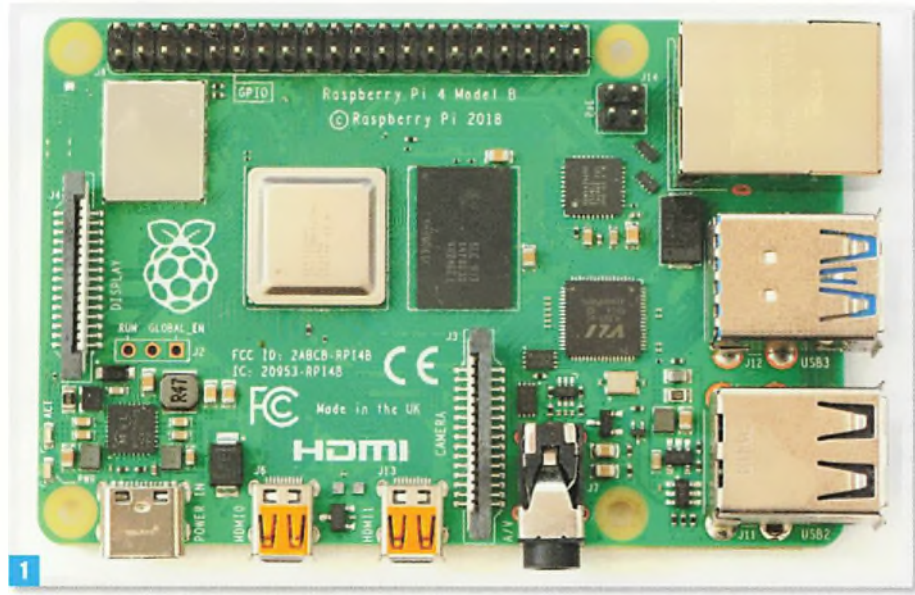
Using the Pi-4B

Mike Richards G4WNC gets excited by the latest incarnation of the Raspberry Pi.

The early release of the Raspberry Pi-4B has taken a lot of my time this month so I'll share my findings here, along with some ideas for measuring power at 2.4GHz for the QO100 satellite.

The launch of the Pi-4, **Fig. 1**, was something of a surprise because information from the Pi team suggested we wouldn't see the next model until 2020. This early release was triggered by its new SoC (System on a Chip) being ready for market much sooner than expected. The new chip is the BCM2711, which uses the 28nm silicon process and features a quad-core ARM Cortex A72 processor running at 1.5GHz. Although this is only a small clock increase from the 1.4GHz of the Pi3+, it gives about 50% performance boost over the Pi-3B+. This additional performance is due to the improved processing architecture of the Cortex A72. To avoid wasting time retrieving the next instruction or waiting for data to be returned from memory, modern processors employ an instruction pipeline. This pipeline is used to distribute work to idle processor cores thus enabling a degree of parallel processing to occur. The Pi-3 had an 8-stage pipeline but the new Pi-4 has a 15-stage pipeline that uses out-of-order processing so that it can minimise waiting time. The net result is speedier instruction throughput and a faster processor.

Also on the SoC is the graphics processor that uses the VideoCore VI 3D but this is now clocked at 500MHz. In addition to supporting all the common HD resolution modes, the new video core supports two 4k resolution monitors at 30fps or one monitor at 4k 60fps, all with hardware decoding. This is a major step forward on the graphics front and running two 4k monitors from a £35 computer is a very impressive achievement. To make room for the dual HDMI outputs, the single HDMI socket has been replaced by two micro-HDMI sockets, **Fig. 2**. I've been using a Pi-4B with 4k and HD monitors and have found that you need to connect the highest resolution monitor to the first HDMI port (the one closest to the power socket). Supporting the new video modes is a Screen Configuration tool that you'll find under the Preferences menu. This lets you set the desired resolution for each connected monitor, plus you can nominate either monitor as the primary display. There is also a graphical screen positioning tool where you can adjust the position and overlap of the second screen when using it to extend the main display. Be aware that this tool is only visible if you're using a Pi-4. Also worth noting is the missing pixel doubling feature with the Pi-4. This is because pixel doubling doesn't currently work properly with the latest OpenGL ES 3.0.



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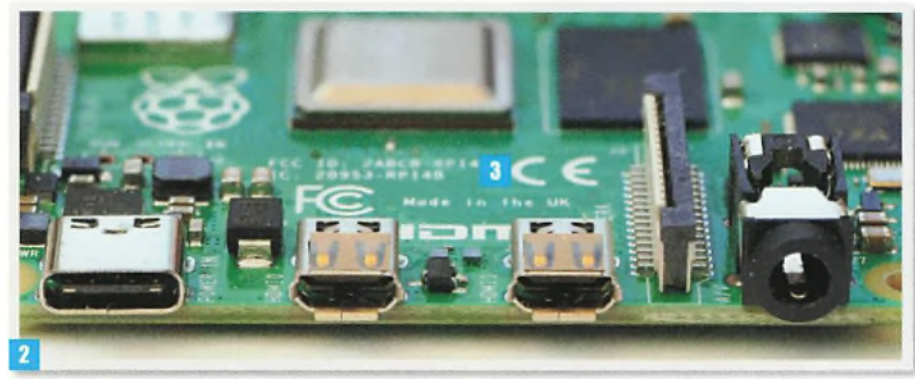

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Fig. 1: The new Pi-4B. Fig. 2: Revised HDMI and Power connector.

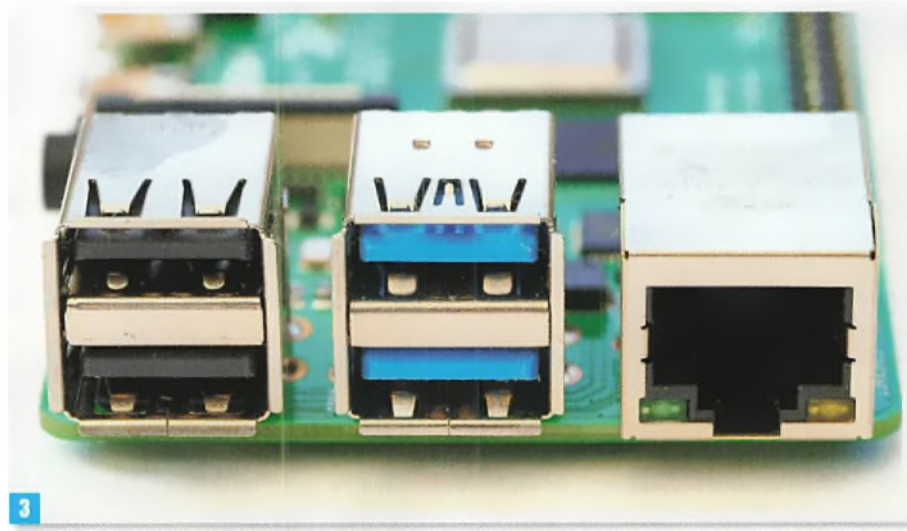
No More USB/Ethernet Bottlenecks

One of the design compromises of all the previous Pi models was the use of a single USB-2 OTG (On-The-Go) port to carry both the USB and Ethernet data. This gave a bandwidth limited solution that caused problems with applications that had a high data throughput on the Ethernet and USB ports. The Pi-4 uses a completely different approach. The new SoC has a PCIe lane that is used exclusively for the USB ports and supports two full-speed USB-3 and USB-2 ports, **Fig. 3**. The new SoC also has an integrated Ethernet gateway that can handle full Gigabit Ethernet speeds. Now we have full-speed USB-2, 3 and Gigabit Ethernet without bottlenecks!

More Memory and Faster Access

The new Pi is available in three flavours, each with a different size of LPDDR4 (Low Power Double Data Rate RAM) of 1GB,

Fig. 3: USB and Ethernet ports swapped.
Fig. 4: Pi-4 in a 'Official' Pi-3 case.



2GB and 4GB. Each RAM increment adds around £10 to the price. This will be very useful for memory-hungry applications. To speed the start-up time and general disk actions, the microSD card slot has been given a welcome speed boost to 50MB/s. The boot process for the new SoC has also changed and now uses a dedicated 4Mb EEPROM (Electrically Erasable Programmable Read Only Memory). Unlike the BIOS in an x86-based PC, the Pi had previously used a bootcode.bin file on the SD card combined with code that was permanently stored in ROM space on the SoC. The new Pi-4 changes the boot process by using a dedicated EEPROM to start the boot. This is necessary because additional boot code is required to configure the USB and Ethernet chips.

The use of dedicated boot memory enables the addition of a couple of new features. The first is USB boot, where the Pi will automatically boot from a connected USB drive if no SD card is detected. Although not available yet, this could work well with a USB-3 SSD (Solid State Drive) to give a fast boot as well as making the Pi-4 particularly attractive as a fast file or media server. The second new feature is what's known as PXE (Preboot eXecution Environment) booting and commonly called Pixie. This is particularly attractive for schools or teams of people working together. When set for PXE boot, the Pi will download its software environment from a network server. This ensures that all the connected Pi computers have the same software and configuration. This might be handy for Field Days or other competition work where you might be using several Pi computers to link the contributing stations. Although this is not currently available, it is in the pipeline and is likely to be available soon.

GPIO Improvements

The Pi-4 retains the same 40-pin layout as previous models but the SoC has many more inputs and outputs that can be assigned to the GPIO pins. The previous Pi models had a single hardware UART (Universal Asynchronous Receiver Transmitter) and a reduced performance software UART to handle serial communications. The inclusion of Bluetooth on the Pi-3 required use of the hardware UART that left us with a messy process to reassign serial ports if we needed the hardware port for a GPS, packet radio or similar. The new SoC adds a further four hardware UARTs so we no longer need to mess with the default allocation of the first two ports. To activate the new ports, you need to add the following line in the /boot/config.txt file:

dtoverlay=uart2 (NB: Change the number for subsequent UARTs)

If you want to use hardware flow control use:

dtoverlay=uart2,ctsrts

Once the Pi has rebooted, the new ports will be available as /dev/ttyAMA1. To see the pin allocations for the new UART, use the following:

dtoverlay -h uart2

In addition to the much-needed serial ports, the new Pi-4 has four extra SPI and I2C lines.

Physical Changes

Cramming all the extra functionality and power on to the same form factor was a challenge so there have been a few changes. Starting at the USB end of the board, these three sets of sockets stand proud by an extra 1mm and the Ethernet jack has swapped places with one of the USB banks. The central USB bank carries the USB-3 ports and has the familiar blue colouring, **Fig. 3**. The audio/composite jack is unchanged as is the camera socket, PoE pins and the GPIO pins. The single HDMI jack has been replaced by two micro-HDMI jacks and the power jack is now a USB-C type. This latter change was to increase the current handling capacity and support up to 1.2A for USB devices. Finally, the serial display connector is unchanged as are the four PCB mounting holes. The Pi team have

developed a new official case for the Pi-4 but you can use the current case with a couple of minor changes. Because the USB and Ethernet have swapped you need to cut back the small ridge in the top cover just above the Ethernet location. You also need to omit the side cover by the HDMI and power jacks, **Fig. 4**.

Power Supply and Heat Management

Although the Pi-4 is very efficient, more processing power inevitably means a higher current draw and more heat to dissipate. For the power, a 3A supply is recommended but this is mainly to support high current USB devices where the Pi can now deliver up to 1.2A. To cope with the potentially higher current draw, the micro-USB power jack has been replaced with a USB-C jack. To check the current draw in a demanding radio application, I set up a Pi-4 with Spy Server to stream an AirSpy with 10MHz sample rate. In this role, the current peaked at 1.5A. When running popular apps such as WSJT-X and FLDIGI the draw was around 1A.

To help manage the extra heat, the Pi-4 uses the same heat spreading technique that we saw introduced in the Pi-3B+ with a metal case for the SoC. As is common with most high-power processing units, the Pi is happy running at up to around

Fig. 5: Pimoroni Fan Shim.
Fig. 6: Fan Shim installed in the Pi-4.
Fig. 7: SV1AFN AD8318 module.

80°C. However, as the temperature approaches 85°C the processor throttles back to reduce the heat. If you're running software with a high processing demand or your Pi has limited airflow, you may find additional cooling is necessary. So far, I've tried a passive heatsink and a miniature fan. The fan won hands down and brought the temperature down by about 30°C! The fan I'm currently using is the Fan-Shim by Pimoroni (£9.60, see website below), **Fig. 5**. This is a tiny, 28mm fan that connects to a small PCB and slides over the GPIO pins, **Fig. 6**. The whole assembly is very thin, and the PCB is an interference fit on the GPIO so there's no soldering. Pimoroni has also developed a Python library and daemon so the fan can operate in response to the processor temperature. I have fan-shims for both of my Pi-4s and they are virtually silent. I leave them running continuously and, on a warm day, the fans reduce the processor idle temperature from 70°C to around 40°C.
https://shop.pimoroni.com

New Operating System

At the same time as the Pi-4, the Pi Foundation launched the Buster release of the Linux Raspbian operating system. This release is available for all Pi models and brings the new OpenGL video driver. Most of the other changes are security enhancements but they have taken the opportunity to tweak the desktop slightly to simplify the styling and give it a cleaner look. To upgrade to Buster, the recommended method is to start with a fresh download and reinstall your applications. You can try the update/upgrade route but you may run into conflicts with your existing software.

Updated SD Cards available

Those that want to short-circuit the upgrade process may be interested to hear that I've upgraded my range of pre-programmed Raspberry Pi microSD cards. All cards are now supplied as 16GB Class 10 units, built on Raspbian Buster and compatible with the Pi-4. You can get them here:
g4wnc.com/shop-2

2.4GHz Power Measurement

The launch of the QO100 (Es'Hail) geostationary amateur satellite has

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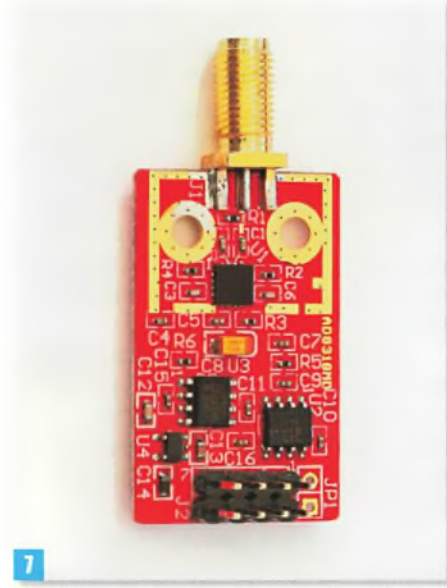
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tempted many amateurs to start exploring the wonderful world of microwaves, or the squeaky bands as my wife **Elaine G4LFM** calls them! As you will have seen from my recent columns, it is relatively easy to get started with this satellite. The use of a 10GHz downlink means that popular (i.e. cheap) consumer grade LNBs (Low Noise Blocks) and satellite TV antennas can be used to handle the downlink. You can also use standard satellite finders to help locate the satellite. The transmit link is a little more complex because you need to generate about 3-5W of RF at 2.4GHz. The use of 2.4GHz is a good choice because it gives us the opportunity to hack standard Wi-Fi equipment. For most of us, the transmit link will probably use multiple amplifiers to boost the transmit signal, with the final PA located on the dish. One of the problems with a multi-amplifier transmit chain is the requirement to measure the power levels at each stage to ensure the overall system operates within its linear range. Commercial test equipment for measuring power at 2.4GHz is expensive, so what else can we use?

One of the solutions is to look to the drone racing community because many of these drones use the 2.4GHz band. To avoid interference, there is a strictly observed RF power limit for all racing drones. As a result, there's a market for a power meter and the popular choice is the ImmersionRC Power Meter V2. This has an input range of –30dBm to +30dBm and handles frequencies up to 6GHz. I suspect this uses the AD8318 power detector chip but I can't be sure because the chip is located beneath a soldered screen. This meter was reviewed in the BATC journal a few issues ago and the reviewer found it to be remarkably accurate. However, it is quite expensive at just under £70.

If you don't mind some homebrew, there are some cheaper options. The first is to buy one of the many AD8318 modules that are available for around £10 from Chinese suppliers. The worry with the eBay versions is their accuracy. Genuine Analog Devices units give a linearity of 1dB through the mid-part of their measurement range. However, the eBay units are still useful as power indicators. An alternative is to go for one of the AD8318 modules from **Makis SV1AFN**, **Fig. 7**. Makis produces an excellent range of RF modules and his AD8318 module is supplied fully assembled. You only need to solder the SMA socket and connection pins. In addition to the AD8318 chip, the SV1AFN board has a low-noise voltage regulator and a 12-bit ADC with a stabilised reference voltage. The result is a complete RF head for power measurements up to 6GHz. Makis has also provided sample Arduino code that you can adapt to read the data from the AD8318 module and convert it to dBm. The cost is 49 Euros plus shipping and you can purchase from his website here:
www.sv1afn.com/ad8318.html

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Isles of Scilly Expedition 2019

Hot on the heels of last month's advice on undertaking an IOTA DXpedition, here's a story of one such trip.

It had been about four years since we did our last expedition to Flatholm Island in the Bristol Channel so we decided it was time for another mini adventure.

Our group consisted of **Steve G4EDG**, **Jeff G4ELZ** and myself **Pete G4GSA**. The aim was to have a lot of fun with radio and also to visit somewhere that was new to us. The Isles of Scilly fitted the bill so we booked a self-catering cottage (Mount Todden Cottage) on a farm with enough room for our antennas. We also booked trains to Penzance and the ferry *Scillonian 3*.

We travelled to Penzance on the Friday and met up at different stations on the way, Bristol, Exeter and Newton Abbot. Steve had already booked us into a backpackers hostel (EasyPZ Backpackers) for Friday night. This turned out to be an excellent place to stay for the night with cereals, toast and fruit along with tea and coffee available for breakfast. Highly recommended and we will stay there again next time we are in Penzance.

Saturday morning we got a taxi to the ferry and put most of our luggage in the container to be put onboard the ferry. We had a good crossing cruising along the Cornish coast before heading out to St Mary's island.

As we were self-catering it was time to stock up on provisions from the local Co-op and then another taxi to our cottage.

By the time we reached the cottage all our luggage had been delivered and was waiting outside for us.

We met our host, **Anna**, who explained all about the accommodation and then it was time to erect the antennas and alter the living accommodation to suit our operating positions. As it was a lovely day this wasn't a chore and all the antennas were tuned to resonance fairly quickly.

On Air

Our antennas consisted of a quarter-wave groundplane for 40m and half-wave vertical dipoles for 30m, 20m, 17m and 15m. Later in the week Jeff installed a half-wave dipole for 80m. For supports we used fibreglass fishing poles.

Operation started with the callsign GB6SM, which Steve had organised, and the equipment used was an Icom IC-7000, Yaesu FT-100 and Yaesu FT-891. Because we were well away from the town the lack of man-made noise was remarkable. This was a very relaxed style of operating with no operating schedules or band plans, the only requirement being that we had fun and enjoyed ourselves. If we felt like a walk, we went and explored different parts of the island.

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Photo 1: Arrival in Penzance. Photo 2: Antennas at the Farm. Photo 3: You're supposed to point it at the satellite! Photo 4: The Intrepid DXpeditioners. l to r: G4EDG, G4ELZ, G4GSA.

Sightseeing

We made a day trip to St Martin's island, which was interesting because we had to walk across the island from our drop-off point to where we were going to be picked up for the return trip to St Marys. This turned out to be quite a good move as we started by stopping at a café for homemade pasties and coffee. By the side of the café was another shop/workshop where they make handmade shoes. A history of shoe making on the island is on a display board outside the premises.

We then carried on walking and came to what I believe is the only pub on the island so we had to have another refreshment stop. Then it was on to the pickup point, which just happened to be by a hotel, so while we waited for the boat we had coffee and tea. Then it was back to St Mary's to stock up on provisions again before taking a taxi back to the cottage. With all the fresh air and walking it was quite a tiring day.

Results

Conditions on the HF bands were not good but plenty of contacts were made and we then tried using the satellites with a cheap 2m/70cm handheld that worked quite well. Jeff tried slow scan (SSTV) on 20m but was unable to complete a QSO.

Towards the end of the week the forecast was for a big downturn in the weather with gales, rain and the like. We decided

to leave the island as quickly as possible. It's amazing how quickly all the antennas and stations were dismantled and packed ready to catch the afternoon ferry.

We had another good crossing and spent the night in the backpackers hostel again before catching the morning train home to our various QTHs.

Our QSL card has been designed and printed by **Tony LZ1JZ** who does an exceptional job and if you are in the market for new QSL cards he is well worth contacting.

Thanks must also go to our lovely hosts at Mount Todden Cottage, **Arthur** and Anna, who graciously allowed us to take over the front lawns and fill them with antennas.

So, within a reasonable budget we went on an expedition to a new IOTA for us and although it might not have been to an exotic island halfway around the world, we had a great time and more importantly, a lot of fun. Now the question is, where are we going next?

73 de Steve G4EDG, Jeff G4ELZ and Pete G4GSA.

E-mail: practicalwireless@warnersgroup.co.uk

DXOS June 2019

Abet Villanueva DU1AV reports on an island DXpedition to Fort Drum (The Concrete Battleship), El Fraile Island, Philippines.

Sailing from the Pacific Ocean, you will not miss this unique structure while entering the Manila Bay. You will be spooked by its appearance but you will be amazed by the history behind it.

In 1909, the United States built the steel-reinforced concrete four-level 'battleship', named after **Brig. Gen. Richard C Drum**, on El Fraile Island situated at the mouth of Manila Bay in the Philippines. The sea fort, shaped like a battleship, which covered the entire island, was one of the harbour defences at the wider South Channel to the bay during the American colonial period. Fort Drum is the only one in world military history that was built as a sea fort. It was equipped with four 14-inch M1909 coastal artillery rifles in two armoured turrets and several anti-aircraft guns. During World War II, it was used by the American forces as a strong defence against the invading Japanese forces. The guns of this concrete battleship caused serious damage to the Japanese forces assaulting the island of Corregidor.

Fort Drum was captured and occupied by the Japanese and re-captured by the American Forces after igniting petroleum and gasoline in the fort, leaving it permanently out of commission.

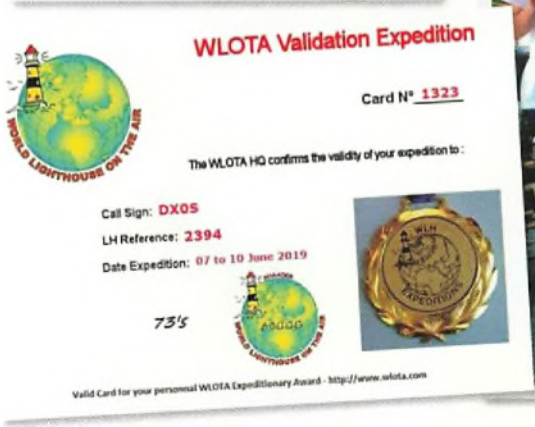
The Challenge

Because of the complexity of boarding Fort Drum, conducting a DXpedition to the island was just a dream of every DX group in the Philippine Ham community. Then the Ham Radio Emergency Communication Group (DX1HAM) DX Team dared to 'conquer' the island for the first time after it has been uninhabited since the end of World War II. Diligent liaison and coordination with the Philippine Military, the Philippine Coast Guard and the local government was carried out before the team was granted access to Fort Drum and to the Philippine Marine Camp. Other challenges expected to be met were transporting the team members and the equipment to the island, the power source, and the safety and security of the participants while on the island from wild creatures and the rumoured hostile spirits lingering there. (History said that 300 Japanese soldiers were burned to death when Fort Drum was re-captured by the American soldiers.)

Another concern was the integrity of the structure and the debris from the damaged walls and ceilings, since the Japanese Forces and their Kamikaze fighters heavily bombarded it in their attempts to capture it. The Philippine Military members who had jurisdiction over the island could not provide information as to whether anyone had spent the night in the island after it had been totally abandoned.

Logistics

The group was divided into two teams, one on night shift and one on day shift. It was part of the contingency plan that only one team would stay in the island at any given time while the other team would stay at the Philippine Marine Camp as a first responder if any untoward incidents occurred on the island. Since the signal of the cellular phones in the island is intermittent, an HF, VHF and UHF radio station was set up at the marine base for constant communication with the team at Fort Drum, which is more or less a 30 minute ride away on a wooden boat.



The chances of getting inside Fort Drum depend on the conditions of the sea and the level of the tide. During low tide, the sea is calm and boats can easily get near Fort Drum. However, you have to climb up from the sea into the island by rappelling or using an improvised bamboo ladder. On the other hand, during high tide, the entrance of Fort Drum is low enough that you can easily hop in, but the sea is rough and there is a risk of the wooden boat smashing on the concrete wall of the structure.

Excitement and Uncertainty

Excitement and uncertainty were experienced by the team, composed of **Ronald DU1SVZ, Brian DU1MS, Nes DU3NB, Willy DU1VCR, Russell DY1EBP** and **Jake DY3JIB**, who first boarded and spent the night at Fort Drum on June 7th. The team braved the high tide condition of the sea and they successfully got into Fort Drum. They brought all the required equipment, such as a portable generator, radios, batteries, solar panel, antennas, drinking water, snacks, tables, chairs, and most importantly, tissue paper and a portable toilet. Getting out of Fort Drum is equally as risky as getting in. You have to dance with the waves while balancing on the bamboo outrigger of the boat.

On Day 2, June 8th, the night shift team was relieved by the day shift team consisting of **Abet DU1AV, Darwin DU1DG, Nello DU1NLO** and **Don DW1DDZ**. The excitement was still felt by the team but in a more relaxed mode as the night shift team had already given the safety tips on how to board and get off from Fort Drum. The night shift team replaced the day shift team, and the former spent another night at the island until the following day. The participation of the rest of the members of the group, **Boyet DU1FIL, Boy DU1TDS, Lawrence DV1SVY, Nards DU1LC, Rhine DU1RB**, and **Renan DW1YZV**, are equally as important as the others in the success of the DXpedition.

The afternoon of Day 3, June 9th, was a 'happy hour' at the marine base wherein everybody excitedly shared their experiences. On Day 4, June 10th, the group packed up and travelled back to the metropolis. The activity was completed without any untoward incident happening.

Although the propagation was not so good during the entire DXpedition, the whole team cherished every contact made as it was done in a unique place that can only be found in the Philippines. The main purpose of the DX0S DXpedition was to let the world know about Fort Drum in the Philippines, and to share its historical value. Seasoned DXers, **Ed DU1EV, Clifford DU1CC, Audie DU1ZDR** and **Gazelle DU1ZDQ**, and other hams, **Beng DW1KVN** and **Misael DY1XIC**, who believed in the cause of this DXpedition, generously contributed to the financial resources of the group.

Another group achievement is the activation of the new World Lighthouse On The Air (WLOTA) number of the lighthouse installed at Fort Drum.

Thank you and 73!

***(Editor's note:** If you want to know more about Fort Drum, there is quite a lot on Wikipedia and other internet sources.)*

Rallies

Send all your rally info to Georg Wiessala at: wiessala@hotmail.com

Plan your visits with our wide-ranging list of forthcoming events. Warners (RadioUser & Practical Wireless) will be attending events marked with an asterisk (*). Club secretaries/ event organisers: Please send full and accurate details of your events, affiliations and clubs as early as possible if you would like to be mentioned here: wiessala@hotmail.com

AUGUST

August 24th and 25th (Saturday and Sunday)
MONTROSE AIR STATION OPED DAY AND RADIO RALLY
Montrose Air Station will hold an Open Day and Radio Rally on Saturday 24th and Sunday 25th August. Indoor event and tables will available to sell your own junk. Open to the public from 10 am; disabled access and minor catering available.
Ewan MM0BIX
Tel: 01674)676740
ewandcameron@yahoo.co.uk

August 25th (Sunday)
MILTON KEYNES ARS RALLY
The MK ARS Rally will take place at the MKARS, Irish Centre, Manor Fields, Watling Street, Bletchley, MK2 2HX. Entrance fee is £3 per person, and there are various trader options available. Free Parking, onsite catering, and extra indoor pitches available. Open to traders at 7am, and to the public from 9am.
Francis Hennigan M0UKF
Tel: 07563 498 156
rally@mkars.org.uk
http://www.mkars.org.uk/rally

August 25th (Sunday)
TORBAY ANNUAL COMMUNICATIONS FAIR
The Torbay Annual Communications Fair will be at the Newton Abbot Racecourse, Devon TQ12 3AF. Doors open at 10am, with disabled visitors gaining access from 9.30am. This is an indoor event, with free parking on site. There will be a bring-and-buy, and an RSGB bookstall. Catering will be available on site.
Pete G4VTO
Tel: 01803 864 528
Mike G1TUU
Tel: 01803 557 941
rally@tars.org.uk

August 26th (Bank Holiday Monday)
HUNTINGDON ARS ANNUAL RALLY
The Huntington ARS (HARS) Annual Rally will take place at the Ernulf Academy, St Neots PE19 2SH. Gates are open for Traders at 7am, and at 9am for the public. Entry is £3. There is free car parking, an RSGB bookstall, and a bring-and-buy, with indoor and outdoor stands. Catering provided on-site. Talk-in will be on 145.550MHz on GX0HSR.
Malcolm M0OLG
Tel: 01480 214 282
events@hunts-hams.co.uk

August 31st (Saturday)
G-QRP CLUB & TELFORD & DARS CONVENTION & BUILDATHON
The Buildathon is to be held in the evening of the 31st of August in Telford. More details on the website:
Martyn G3UKW
Tel: 01952 255 416
www.telfordhamfest.co.uk

SEPTEMBER

September 1st (Saturday)
TELFORD HAMFEST & G-QRP CONVENTION
The convention will take place at Harper Adams University (near Telford, Salop) TF10 8NB. Combined with the G-QRP Convention and Buildathon the previous evening (see previous entry). Usual trade and exhibition stands. B&B. SIGs. Midland clubs meet-up. Unlimited free parking, fresh food and more at this excellent venue.
Martyn G3UKV
Tel: 01952 255 416
www.telfordhamfest.org.uk

September 7th (Saturday)
CAISTER LIFEBOAT RALLY
The Caister Lifeboat Rally is taking place at the Caister Lifeboat station, Tan Lane, Caister-on-Sea, Norfolk, NR30 5DJ. Access via car park in Beach Rd. Doors open 9:30am to 2pm (8am for sellers); easy parking and disabled access, indoor spaces and outdoor pitches available, raffle, onsite café. The museum will be open, and there is a special event station.
Zane M1BFI
Tel: 07711 214 790
m1bfi@outlook.com
https://tinyurl.com/y55ntt8e

September 8th (Sunday)
PENCOED RC TABLETOP SALE
The Pencoed RC Table-top Sale is at the Rugby Club, The Verlands, Felindre Rd, Pencoed, Bridgend, CF35 5PD. Open 09:30. Refreshments are available.
Madeline Roberts
Tel: 07738-375775.

September 14th (Saturday)
FOG ON THE TYNE RALLY
This takes place at Whitehall Road Methodist Church Hall, Bensham, Gateshead NE8 4LH (corner of Whitehall Road and Coatsworth Road). Entrance is £1.50 and includes an entry for the raffle. There will be a bring-and-buy, junk stall, RSGB stand and traders. Car parking is now available. Enrolment for *Foundation*, *Intermediate* and *Advanced Examination* courses, and Morse code class.
Nancy Bone G7UUR
Tel: 07990 760920
nancybone2001@yahoo.co.uk

September 15th (Sunday)
WEST TYRONE ARC RALLY
The rally is at the Omagh Rugby Club, 7 Mellon Park Drive, Omagh BT78 5NE. Doors are open at 11am, and admittance is £3. There will be a talk-in station, trade stands, special interest groups, a bring-and-buy and an RSGB bookstall. Catering and a licensed bar are available on site. A prize draw/raffle will take place
Philip Hosey MI0MSO
Tel: 07849 025 760
info@wtarc.org.uk

September 21st to 23rd (Saturday to Monday)
ROTA – RAILWAYS ON THE AIR DAY
This annual event celebrates the anniversary of the first steam-powered passenger railway.
https://rota.barac.org.uk

September 22nd (Sunday)
WESTON-SUPER-MARE RADIO RALLY
The Weston-Super-Mare Rally is at The Campus, Highlands Lane, Weston super Mare BS24 7DX (Junction 21 M5). Doors open from 10am to 3pm. Ticket price is £3.00 There will be trade stands and a bring-and-buy area, catering and a large car park.
Dave Dyer
Tel: 07871 034206
G4CXQ@btinternet.com

September 27th and 28th (Friday and Saturday)
NATIONAL HAMFEST *
The National Hamfest will, once again, take place at the Newark & Nottinghamshire Showground, Lincoln Road, Winthorpe, Newark, Nottinghamshire NG24 2NY.
Check the website regarding onsite camping. *RadioUser* and *PW* will be present at the show. Meet the editors and grab a subscription bargain.
https://tinyurl.com/y3emp8a7

OCTOBER

October 6th (Sunday)
WELSH RADIO RALLY
The 46th Welsh Radio Rally is at Rougemont School, Llantarnam Hall, Malpas, Newport NP20 6QB. The doors are open from 10am to 4pm, with disabled visitors gaining access at 9.45am. Admittance is £2.50. There will be trade stands, a bring-and-buy, an RSGB bookstall. Lectures will take place during the day. Catering is available.
Rob Evans MW0CVT
Tel: 01495 220 455
mw0cvt@sky.com

October 11th to 13th (Friday to Sunday)
RSGB CONVENTION
The RSGB Convention will take place at Kent's Hill Park Training and Conference Centre, Swallow House, Timbold Drive, Kent's Hill Park, Milton Keynes, Buckinghamshire MK7 6BZ.
https://rsgb.org

October 13th (Sunday)
HOLSWORTHY RALLY
The Holsworthy Rally will take place at the Holsworthy Leisure Centre, Well Park, Western Road, Holsworthy, Devon EX22 6DH. There will be traders, a bring-and-buy and catering. The venue will have separate disabled access, via the traders' side-door entrance. A club steward will be on duty in the car park. The rally opens at 8am for traders, and at 10am for visitors.
Howard M0MYB
holsworthyarc@gmail.com
https://www.qsl.net/m0omc

October 13th (Sunday)
HORNSEA AMATEUR RADIO RALLY
The rally takes place at the Floral Hall, Hornsea HU18 1NQ. Doors open at 10am, admission is £2 (under 14s free). There will be trade stands exhibiting radio equipment, computers and so on. The bring-and-buy will be run by the Hornsea ARC. There will also be an RSGB bookstand. Hot and cold food will be available.
Les 2E0LBJ
Tel: 01377 252 393
lbjpinkney1@hotmail.co.uk
www.hornseaarc.co.uk

October 19th (Saturday)
CARRICKFERGUS AMATEUR RADIO GROUP RALLY
The Carrickfergus ARG rally will take place at the Downshire Secondary School, Downshire Road, Carrickfergus. Doors will be open to the public at 12 noon. All proceeds from the sale of beverages will be going to *Belfast Samaritans*, a very worthy charity. All visitors will be very welcome.
Liz Forde
elizabethforde64@yahoo.com

• E-mail: leeg4ejb@outlook.com

ESD and More

Lee Aldridge G4EJB is back with a tale of electrostatic discharge precautions, persistence and tree felling.

I mentioned last time about a tale of woe. I was trained over 30 years ago in anti-static precautions. Does time alone exonerate you from having to adhere to good working practices? In other words, does a blasé attitude help when handling MOSFETs from a bygone era? Embarrassingly the answer is no and having had a timely e-mail from **Ian Field** on the subject, I should have waited until I could do better (another school report cliché). So, when is an anti-static strap just not enough? Well, when you might be wearing clothing containing nylon, having a carpet as flooring (luxury), moving a component from an anti-static bag to another surface, using non anti-static tools, having a soldering iron with an earthed soldering bit.....anyway I hope this tale saves someone else from the disappointment of failure of more than one device.

An anti-static mat was overdue. In due course the mat arrived and although not large, it was sufficient for the work area. I strapped it to the same earth point as my wrist strap. I made a special adapter with mains socket for my Antex iron, though I'm not going into detail because I don't want to be responsible for anyone else getting up to some of my antics. Before any static sensitive work commenced, all the tools required were placed on the mat. The board was placed on the mat. Why? One fundamental is that objects probably have different charges on them and it's a very good idea to have everything at the same potential, particularly static-sensitive devices. So the mat is paramount. I sourced mine on eBay, although it is available from a number of stockists.

After discovering my less than successful implant of new MOSFETs, I had decided to build a clip-in dual-gate MOSFET amplifier test board. I thought this would at least tell me if the MOSFET was in good order prior to soldering it into the board under repair. Did it work? Well after finding a reliable method for strapping a dual-gate MOSFET onto the test board (see photo), yes it did.

I could monitor the output on my oscilloscope and see variation in the drain DC voltage when varying the gate voltage. Fantastic. Now to take a known working MOSFET and placing in the board, again keeping to the much improved precautions..... it worked! The 40m Howes Daventry receiver was fully working.

For further reading on ESD (electrostatic discharge), there's an excellent tutorial on **Ian Poole G3YWX's** *Electronics Notes* website at:
https://tinyurl.com/y38d7ny2

The MOSFET test board.

Why all the drama you may ask? Well, it doesn't matter if you did work in this field for years, there can come a time when you simply doubt what you're doing. Just don't give up, you are always closer than you think. It doesn't matter if you over-compensate trying to get the task right, what does matter is that you get there.

Anyway, with the Howes 40m Daventry receiver performing well, I added an audio filter board to improve the audio response on SSB and CW. The Howes A5 Linking Module had been refurbished and it was time to sort out the Howes 40m Rugby transmitter. Now, I've never really played with SSB transmitters – only operated them many years ago. So, I was a little intrepid to start with but just went about the task of refurbishing the board. There were parts missing but after a look around on old boards and my component collection, the board gradually took shape. It took a few weeks to get it ready for test and I did put it off until I saved an old metal Sky box from the scrap heap, which would house the whole 40m transceiver. Trying to work out the layout of boards, hack-sawing of spacers and hole drilling followed. Eventually the boards were placed in to their new home. Next for the testing, wiring and interconnection of boards.

And what of the tree felling? Well, the conifers in next door's garden were looming large and after a considerable amount of time a team of fellers and one lady turned up. I thought if I took down my one mast that would do. Upon my return later that day, I discovered the felling had been difficult, resulting in the rearrangement of my fencing and garden. Politely said, I wasn't too amused. But the mast and 20m dipole lying on the ground were still fine. Though I'd forgotten about my other low antenna further over in my garden. Most of you will know it as the W3EDP end-fed. Well, mine was a W2⅞EDP and another bit. The tree fellers had disappeared by this time. I thought, well it stretched and broke, I'll just put a terminal block where it broke. Now it's longer! Time to meter the wire end to end.

Next time, a race against time to get the 40m Howes transceiver working and a list as long as my W3EDP antenna of other jobs requiring my attention, including a dancing Father Christmas and a W1FB book appears.

Feature by Donard de Cogan MOKRK

• E-mail: practicalwireless@warnersgroup.co.uk

How to decipher the Instructions in Chinese Hobby Kits

Donard de Cogan MOKRK offers some advice on deciphering the instructions that often come with those Far Eastern kits.

Radio amateurs frequently benefit from the availability of reasonably priced construction kits from China. However, a major problem can be the fact that component details or key instructions are written in Chinese. That need not be the end of it. People say that Chinese is a very hard language to master. Well, it is and it isn't. It's really two languages, where the spoken grammar is simple but reading/writing is something else and can take a lifetime of practice to become a master.

Mind you, the situation used to be worse when traditional characters were used. In 1950s the Government of the Peoples' Republic of China introduced what is called the 'simplified' character set, which helped to raise literacy rates. Nevertheless, the acquisition of more than 5,000 characters still occupies approximately 70% of primary school class contact time.

Now that I have scared you, I will reassure you by saying that help is at hand in the form of electronic translating aids and by the end of this article you should have some idea about how to use these.

Written Chinese consists almost entirely of ideograms and there is a strict order for setting down the strokes, which were originally done with a brush. The younger generation of Chinese will be conversant with PinYin (using western characters to approximate a sound). With a mobile phone they will enter PinYin and a drop-down bar will then offer them a choice of Chinese characters.

This way they can send each other text messages at a reasonable speed. For older people who are not familiar with PinYin their telephone keyboards generally have special keys, each for a different stroke. They simply have to enter strokes in the correct order and a drop-down menu will offer them a range of characters from which they can choose the one they want for their message, **Fig. 1**.

So, I am going to give you the rules for stroke order and show you the Android app that I use to decipher characters and ultimately interpret entire sentences with the aid of *Google Translate*. My table, **Fig. 2**, lists the rules and gives some examples. The arrows show the direction in which strokes must be entered. As we progress through the rules I have included all the steps that are required to 'build' a character and I have also given typical characters that are obtained using the rule in question.

The first rule says that you must imagine that you are doing your strokes within a square box, as in Fig. 1, where you start at the top-left and then move right and down. This will become clearer in a minute. The second rule says that horizontal strokes are drawn from left to right. A single stroke represents the number '1'. The addition of a second stroke below gives us the Chinese character for the number '2'. The third rule shows how the character for '10' is constructed and if we combine rules 2 and 3, we can construct the characters for 11, 12, 13 as well as 20, 21, 22 and 23. Of course, if we extend this we could also construct the characters for the numbers 30 to 33.

Fig. 1: The characters which mean 'Chinese character'.

Software Aids for Translation

There is a wide range of aids for learning about Chinese and I will share my experiences of three of these, one which is available for Mac/PC and two that I use extensively on an Android tablet. The *Yellowbridge* site (URL below) has input from English to PinYin, and also has strokes translated into PinYin and English. It has an excellent facility for displaying the sequential construction of strokes, so perhaps an early exercise might be to enter English words such as electricity, lightning or weather and then check the consistency of the rules given above.

On the downside I find it cumbersome to use and it has quite a steep learning curve. I have never paid for any of the extra features. *HanPing Pro* is an app that I use all the time on my Samsung tablet and I am sufficiently happy with it to pay for the full version. Once you download this app and fire it up you should go to the paintbrush on the top right-hand side, **Fig. 3**.

https://yellowbridge.com

As you enter your strokes the software will attempt to guess what you want and when you see the character you want on the top then you can click on it before going to the bottom right of the screen to click on the green 'correct' button. A series of translations will then appear on the screen. The screenshot, **Fig. 4**, shows the construction of the character for the number '4' where I am about to close the outer box (rule 10).

Some Examples

I have a DEGEN 31 active-loop antenna where the diagram and the instructions are entirely in Chinese characters. I will take a few of these to demonstrate the steps required in decipherment.

Let's start with 电池

This is in fact two characters and if we start with the first on the left and enter the strokes (in the correct order) into *HanPing Pro*, we get both a PinYin and an English translation:

diàn = electricity.

Note the accent in the PinYin. We may need it later.

When we enter the next character into *HanPing Pro* we get:

chí = pool/enclosed space

Again, note the accent.

Whatever does this mean? Well, Chinese can often allocate a different meaning when two characters are together. So how about entering the PinYin for the two words together into *HanPing Pro*, observing the accents (which are the tones in the spoken language). We get:

diàn chí = battery

And now we have a translation. However,

Fig. 2: Basic rules for creating characters.

Fig. 3: Starting to create a character with *HanPing Pro*.

Fig. 4: About to close the box after constructing the character for the number 4.

Parameter	PinYin	Character/s
V	Fú	伏
A	ĀnPéi	安培
Ω	Ōu Mū	欧
kΩ	QiānOū	千欧
MΩ	ZhàoOū	兆欧
H	HēngLī	亨利
mH	HáoHēng	毫亨
F	FāLā	法拉
µF	WéiFā	微法
nF	NàFā	纳法
pF	PíFā	皮法

Table 1: Electrical Parameters that may be found in a circuit diagram.

the app has a fairly limited dictionary and we are not always so lucky. This is where I frequently use *Google Translate*. Let's take another example from the loop antenna connection diagram:

连接电揽

As we enter each of these four characters into *HanPing Pro* translator we get the following:

Lián | Jiē | Diàn | Lān

The translations for each of these in turn are:

connect | come into contact | electricity | cable

Google Translate is not too fussy about the accents and manages to give us a translation, but it still doesn't have anything for this assembly of words in its dictionary but if we take a guess and enter 'electrical connector' into *Google Translate*, we get characters and PinYin as follows:

电连接器

Diàn | Liánjiē | Qì

Most of the characters are there, so ours was not a bad guess, but it highlights another problem in translating via PinYin and that is running text together. You may have noticed that I have written PinYin, because it is two different characters, but most times you will see it written as 'pinyin' because the meaning as two separate characters may be different to the two characters run together. An example of this can be seen in the three characters:

收音机

Each can be put into *HanPing Pro* as strokes and will give you:

Shōu | Yīn | Jī

receive | sound | machine

If the Pinyin is entered into *Google Translate*, you won't do any better but if you were to join the two of these together as 'Shōu Yīnjī', you would immediately get 'radio' as a translation. Things like this make it all a fascinating piece of detective work and give some idea about the reasons why some translations from Chinese into English can appear so strange. A particularly strange one is the pair of characters:

小心

Taken singly they translate as 'little' and 'heart' respectively but taken together it means 'be careful'. Such a warning might well appear in circuit diagrams or instruction sheets.

Finally, I am going to close with a useful table, **Table 1**, of electrical parameters that you might encounter in a circuit diagram.

Note that my font has nothing to represent the third tone as in the Pinyin for the capacitance examples, so I have used ā as a substitute.

In conclusion, it should be clear that you don't have to be an expert in Chinese. Software aids are a great help but getting maximum benefit from a translation still needs detective work. Nevertheless, it can be great fun and if your efforts to get a partial translation help you towards a successful outcome of a project, then it will have been worth it.

E-mail: ericgw8ljj@outlook.com

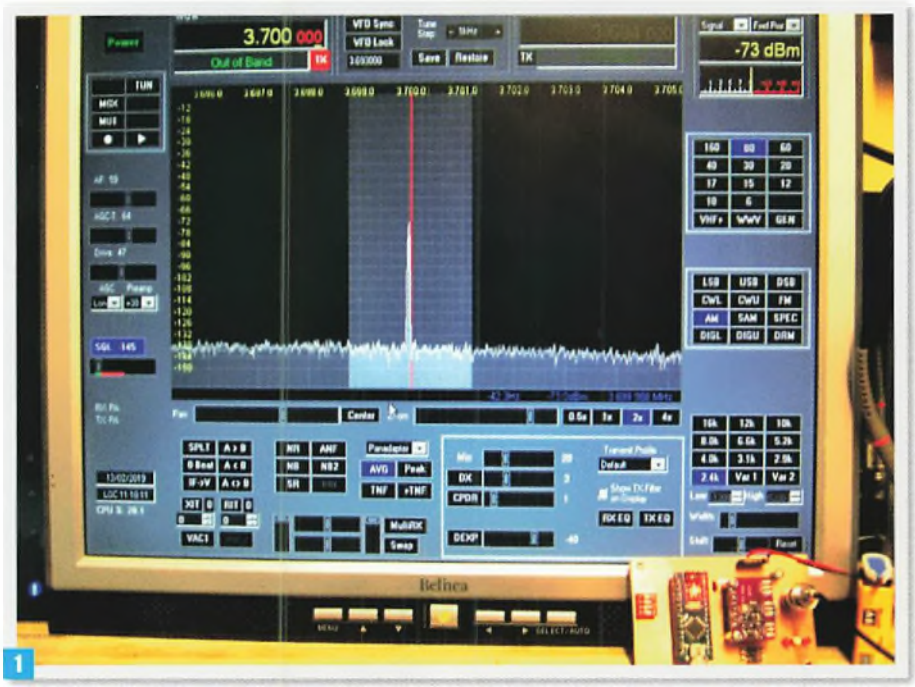
An S9 Calibrator with Sidebands

Eric Edwards GW8LJJ describes an accurate calibrator for your S meter.

All radio amateurs are familiar with the RST (Readability, Signal Strength, Tone) code and that S9 as the signal strength is the highest number used in amateur radio with any signals stronger than S9 being represented by an additional dB (decibel) rating. Thus, S9 plus 10 would mean a received signal strength of 10dB over S9, which is 160µV and is also represented as –63dBm. There are two representations as can be seen, one as the voltage (µV) and the other as power (pW=picowatts) and if you were to represent S9 with the shack signal generator, you will have to set the generator output to 34dB above 1µV. This is where this project comes into its own. There is no need for a signal generator with an accurate attenuator because this is an 80m S9 generator.

The S-meter (signal strength meter) is a moving coil, or solid-state type to show the incoming received signal strength. The RST reporting system uses S1 to S9 with S9 representing an incoming received signal at the antenna input of the receiver of 50µV at 50Ω. This can also be shown as –73dBm, which is 50pW and is the usual standard for frequencies below 50MHz whereas 5µV is the generally accepted signal level for an S9 signal at frequencies above 50MHz.

This calibrator provides 50µV at 3.700MHz as the centre frequency carrier along with switchable LSB and USB carriers at 1kHz away from the centre frequency, **Fig. 1**. Normally, receiver S-meters are calibrated (if they are calibrated at all) for an S9 signal and every S point below S9 is 6dB lower. This is where not all transceivers display accurate S points. The main reason why the lower signal strengths are not accurate is because the reading is derived from the receiver AGC (automatic gain control) and the AGC holds the audio output fairly constant during changes of the input signal strength. Software Defined Radios (SDRs) have accurate S-meter readings, which are the direct measurement of the input signal amplitude and not derived from an AGC system. It must be remembered, however, that the S-meter readings are only accurate with a receiver input impedance of 50Ω. See the chart, **Table 1**, for the S-meter values. Most will be familiar with µW and mW but the others may need clarifying and are simply: One fW (Femtowatt) = 0.001pW (Picowatt); one pW = 0.001nW (Nanowatt); one nW = 0.001µW (microwatt); one µW = 0.001mW (milliwatt) and one mW = 0.001W (Watt).



1

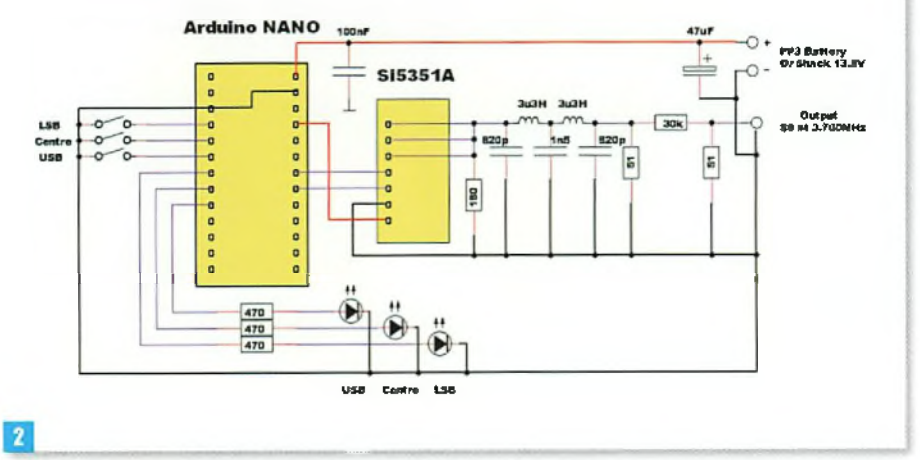
The Circuit

The circuit, **Fig. 2**, consists of an Arduino where the program is stored and supplies the data required for a Si5351A clock oscillator. The Arduino is a small board based on the ATmega328P and has the same pin-out and specification as the UNO board but is smaller. It is programmed using the Arduino software IDE and given that this project uses a pre-programmed Arduino, no information is provided here for the programming of the device. The programming and use of the Arduino came from **Ray Koster G7BHQ**.

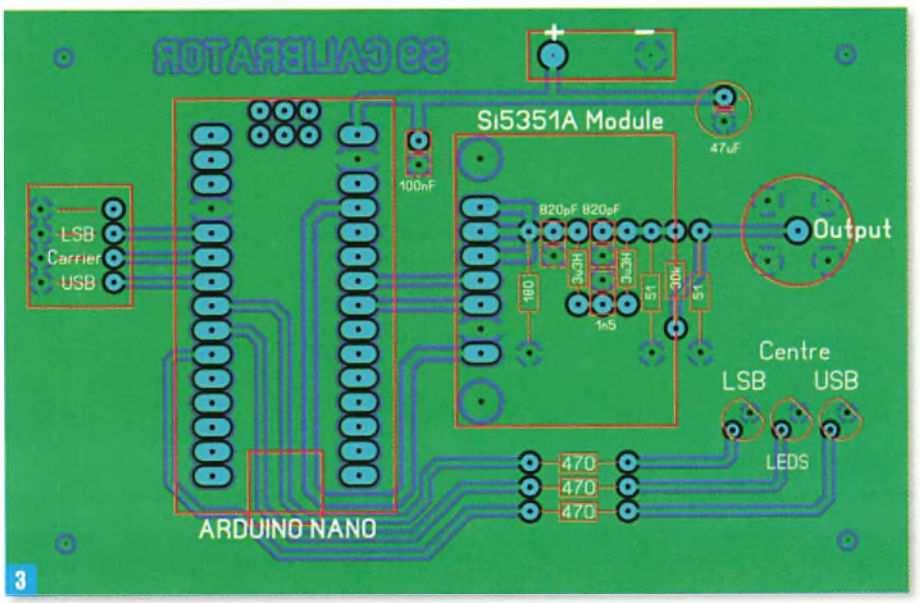
Oscillator

The oscillator used is an Si5351A, which is a chip that has a very accurate 25MHz crystal reference and internal PLL (Phase Locked Loop) and dividers so it can generate any frequency from 80kHz to 160MHz and is an I²C controlled clock generator providing three independent outputs of 3V pk-pk. The three clock outputs are used in this project to supply the main carrier and SSB offsets for mid-way in the 80m amateur band (3.700MHz). The main (centre) carrier along with the sideband carriers are selected with the DIP switch as shown on the PCB layout (there are LEDs to indicate which of the carriers are selected). This DIP switch can, however, be replaced with a three-position (wafer) switch because it is switching DC levels.

The outputs from the Si5351A are paralleled and each output is controlled by the switches at the input to the Arduino. As these outputs are separate oscillators, only one should be selected when making the S9 measurement. If all three switches were on, the three carriers will be seen and the output voltage will increase because there are now three signals at the output.



2



3

Fig. 1: The 3.7MHz carrier.
Fig. 2: Circuit diagram.
Fig. 3: The PCB (not to scale).

There will be the centre carrier and the other two will be represented as LSB and USB placed 1kHz from the centre carrier.

The outputs from the clock oscillators are square waves and a lowpass filter (LPF) is made to follow to provide a clean sinewave output at 400mV when terminated with a 180Ω resistor, which is the output impedance of the Si5351A. An attenuator is needed for reducing this output to 50µV to provide an S9 signal across 50Ω at the output. I chose a Marconi industrial attenuator to achieve the attenuation needed. This came to 62dB and looking at M0UKD's calculator online calculator (URL below) will show panels with a Pi resistor network on the left and panels on the right-hand side for placement of the required dB attenuation and the impedance of the input and output. I entered in the dedicated panels, 62dB, 50Ω input and output impedance. Pressing the 'calculate' button produced the resistor values needed for the Pi attenuator. There are several tables ranging from perfect values to resistor values of E12 to E192. I chose E24 values and that suggested values of 51Ω for the drop-down resistors, with 30kΩ for the top (series) resistor. All the resistors chosen are 1% type. The power supply can be the shack 13.8V or to make it portable a PP3 battery can be used.

https://tinyurl.com/yyzagj5k

The PCB

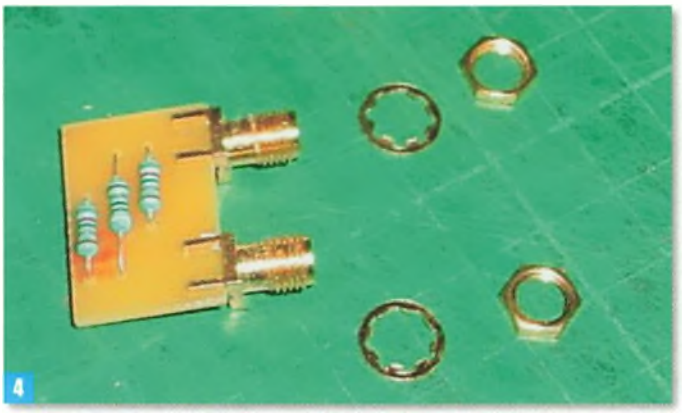
The PCB, **Fig. 3**, is double-sided. The top is a ground-plane and the underside (print side) also has a ground-plane, which is common for all RF circuitry. It contains one attenuator and is set for 50µV output across 50Ω (S9). The DIP switch on the far left of the board selects centre frequency (main carrier), LSB or USB. Selecting the centre carrier would be the best choice and the receiver set to AM or CW. One of the others can be selected instead with the receiver set to the appropriate sideband. The Arduino and Si5351A modules have been mounted onto sockets to allow easy replacement if needed. The Si5351A module has small pillars for the support and to be able to fit the LPF underneath the board so saving a little space. The output is with a PCB BNC socket for convenience. The length of the cable from this socket to the receiver under test is not critical but it would be prudent to keep it reasonably short.

To reduce the signal further, other S points below the S9 attenuator can be fitted between the output of this unit and the receiver under test. Using the information in Table 1 and with the aid of the online calculator (see earlier reference), any attenuation level can be made, remembering that every S point is referenced at 6dB to the adjacent one so the attenuators need to be made in, or multiples of, 6dB.

To check the performance of a receiver it may be required to set the input to a much lower level, perhaps S5 (3.2µV, –97dBm) or even as low as S1 (0.20µV, –121dBm). The signal strength recorded as S9 as we have stated in terms of power, is –73dBm, and because each S point below is lower by 6dB, then S8 is –79dBm with S7 at –85dBm. It will be an easy matter to produce other S-meter readings once the S9 signal has been established and we can take this as a 0dB reference. Then, because all S points below are 6dB lower, it just needs a set of 6dB attenuators to select the other levels. A 12dB attenuator will produce a signal two S points lower (S7) and a 24dB attenuator will be four S points lower (S5). These attenuators can be made up with 6dB attenuators in cascade or dedicated values can be used. As an example, if it is required to monitor the S-meter for an S7 signal, a 12dB attenuator will be used. This will supply 13µV, which will be seen on the S meter as –85dBm.

The Attenuator Modules

I have made PCBs for these attenuator pads, **Fig. 4**, and selected the resistor values with a small range of attenuation that will be useful for many low voltage levels. They can be used individually or cascaded (placed in series). They are



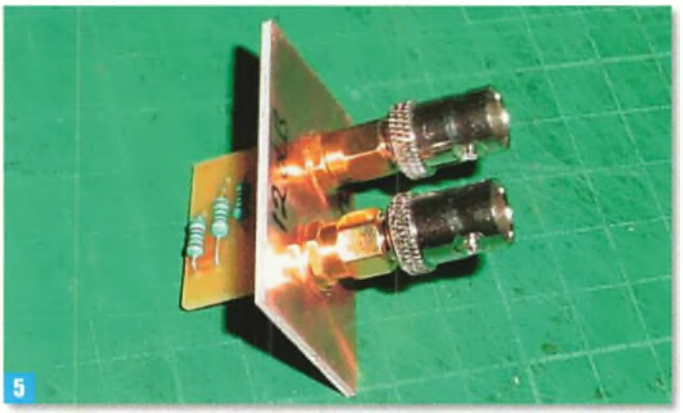


Fig. 4: Attenuator pad PCB. Fig. 5: Attenuator pad with BNC connectors.

made to be mounted onto a small panel or even into metal boxes. The input and output SMA sockets are both on the same side, being easy to daisy chain a set of them. There is sufficient spacing between the SMA connectors to allow the use of SMA (male) to BNC (either male or female types) adaptors if SMA male-to-male leads are not available or BNC connections are preferred, **Fig. 5**.

Is there a Kit?

I am not offering a complete kit as in 'plug and play' but can offer the PCBs and any parts on a picking list supplied on request by sending me an e-mail. The attenuator pads can be supplied as separate PCBs and any of the other parts needed or as ready built attenuators.

Signal Strength	Relative dB	Voltage Received	Power Received
S1	–48	0.20µV –14dBµV	790aW –121dBm
S2	–42	0.40µV –8dBµV	3.2fW –115dBm
S3	–36	0.79µV –2dBµV	13fW –109dBm
S4	–30	1.6µV 4dBµV	50fW –103dBm
S5	–24	3.2µV 10dBµV	200fW –97dBm
S6	–18	6.3µV 16dBµV	790fW –91dBm
S7	–12	13µV 22dBµV	3.2pW –85dBm
S8	–6	25µV 28dBµV	13pW –79dBm
S9	**0**	**50µV 34dBµV**	**50pW –73dBm**
S9 + 10dB	10	160µV 44dBµV	500pW –63dBm
S9 + 20	20	500µV 54dBµV	5.0nW –53dBm
S9 + 30	30	1.6mV 64dBµV	50nW –43dBm
S9 + 40	40	5.0mV 74dBµV	500nW –33dBm
S9 + 50	50	16mV 84dBµV	5.0µW –23dBm
S9 + 60	60	50mV 94dBµV	50µW –13dBm

Table1: S-meter chart

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£20 STAR LETTER

Basic Electronics

Dear Don,

In response to the letter that you published in the August 2019 issue of *PW* from **Will Brooks** about where he can find books that will give him the theory behind the electronics that go into radio equipment, may I offer the following based upon my personal experience as both a radio amateur and professional electronics engineer.

Many, by the sheer nature of electronics, can look quite daunting when you first look through them due to the number of equations and so on but as long as you know what the various terms mean (I_C for collector current, for example) the maths isn't usually too gruelling.

Many are quite old but cover the design of amplifiers, oscillators and other building blocks quite well. An advantage here is that they can be picked up as ex-library books fairly cheaply – often less than £1.

There are also some training manuals that were produced by Heathkit many years ago and these can still be obtained on eBay and the like. For completeness I've included valve circuits and also a few websites where useful information may be found.

In my opinion an excellent book to start with for someone with little knowledge of electronics would be *Electronic Circuits: Fundamentals and Applications* by **Mike Tooley**. As well as circuit theory this book also includes sections on test equipment, fault finding, and circuit simulation.

Here are some of my other recommendations, both books and websites:

• *The Art of Electronics* by **Horowitz** and **Hill**. Covers almost every aspect of electronics.

• *The RSGB Handbook*. RSGB Shop. Covers almost every aspect of radio equipment circuitry, feeders and antennas although not always in great depth. New copies of the latest issue are fairly expensive but previous issues can be obtained at reasonable prices.

• *Electronics, Theory and Practice* by **Gerardo Mesias**. Mainly mathematical but not overbearing. Shows how to calculate almost anything in analogue electronics with many worked examples.

• *Principles of Transistor Circuits*. **S W Amos**. Very good book about designing circuits using transistors. Covers amplifiers at all frequencies, oscillators, etc.

• *Operational Amplifiers*. **Clayton** and **Winder**. Good broad range of circuits and applications using op-amps.

• *Industrial Electronics* and *Advanced Industrial Electronics*. **Noel Morris**. Fairly old books but still obtainable second-hand. Don't be put off by the titles. They both cover the design of general electronic circuits – amplifiers, oscillators, etc.

• *Valves Revisited*, **Bengt Grahn**. RSGB

For RF design:

• *RF Design Basics* by **John Fielding ZS5JF**. A good comprehensive guide to RF design. Available from RSGB.

• *The Electronics of Radio*. **David B Rutledge**. Covers most aspects of electronics at radio frequencies. Can be a bit mathematical in places but readers should be able to follow once they are acquainted with the basics of electronics.

Websites:

www.allaboutcircuits.com
www.electronics-tutorials.ws

Chris Murphy M0HLS
Derby

A Heathkit training manual.

***(Editor 's comment:** Thanks Chris and to those others in these* Letters *pages who have responded to the request. There have been some great suggestions, which I'm sure will be of interest to many readers. I have, over the years, acquired several volumes of the* Services Textbook of Radio *series, now very collectable. It's worth recollecting that an earlier owner of* PW *did very well during the war years out of producing electronics textbooks, selling many thousands to the MOD, most ostensibly written by* **FJ Camm** *although I suspect he became something of a 'brand' in the end, leaving others to do the early drafts. Those old books don't cover modern devices, of course. I've actually been enjoying working my way through a* 100+ Circuit Science Kit *with my nine-year old granddaughter, which takes the experimenter from basic circuits through to AM and FM receivers and more. At her age she simply builds them and enjoys the results but for older users, there's plenty of learning to be had.)*

The Star Letter will receive a **voucher worth £20** to spend on items from our **Book Store** or other services offered by ***Practical Wireless***.

Learning Basic Electronics

Dear Don,

This is a problem that has vexed generations. There are many books that deal with the analysis of circuits but precious few that deal with actual design. In my 70+ years of active tinkering one or two books are memorable but, of course, they date from the days when strange creatures walked the earth. *Foundations of Wireless*: **Scroggie**, the *GE Transistor Handbook*, *Reference Data for Radio Engineers*: ITT, *Radio Designer 's Handbook*: **Langford-Smith**, many editions of the *RSGB Handbook* and *Radio Engineering* (volumes 1 and 2): **E K Sandeman** all come to mind as representative examples.

The best hunting ground for interesting books has to be the second-hand market. You will

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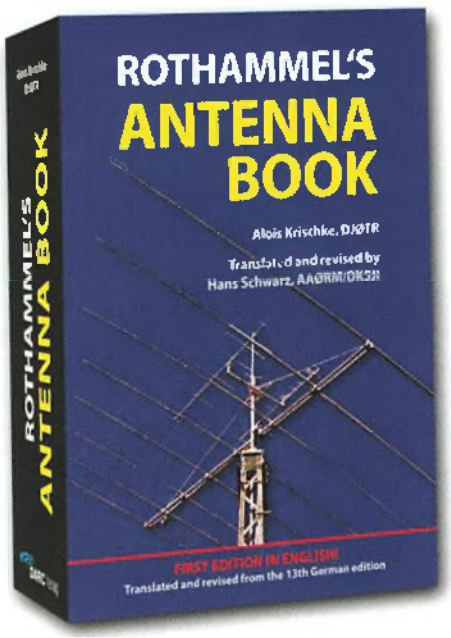

probably have to haunt rallies and second-hand bookshops where it is possible to browse. Just sometimes a book will 'lick your hand' when you pick it up.

You are quite correct that there are many writings on how to do it but very few as to why.

The 'why' is often dictated by physical constraints. For instance, a conventional tuning capacitor has to be a reasonable physical size and that has turned out to be 600pF per gang, at the most. Another requirement is that it helps to be able to 'do the numbers' with some facility. Electronics can be numerically intensive and 'the numbers' point one towards the possible and save a lot of components. However, note that I have wrecked more 'kit' than is good for me and expect that anyone with a serious interest in the hobby will do the same.

A hobby is, by definition, not 'hard work'. However, you will have to apply yourself considerably to catch up a little with those of us who have been 'at it for years'.

You should enjoy this!

William R Blankley G8CMK
St Leonards on Sea

Rothammel's Antenna Book

Dear Don,

I spotted an advert in the latest ARRL *QST* for an English first edition translation of the German 13th edition *Rothammel's Antenna Book*. Seeing it advertised at 59.00 Euros plus 6.90 p&p my curiosity overcame the 'How Much' effect and I ordered a copy. The total cost was 65.90 Euros (one mustn't forget the German 7.00% VAT).

I am still working my way through the volume and I have to say it's a great reference book that will have space on my shack shelves for many years to come.

https://tinyurl.com/y5wx8weu

Ken Thompson G1PJO
Peterborough

***(Editor 's comment:** Thanks for the tip Ken. I took the plunge and bought a copy. I then had my arm twisted by my editorial colleague **Georg Wiessala** to review the book for our sister magazine* RadioUser *– look out for that in the September issue! Or go to the URL above)*

High-Speed Morse

Dear Don,

Further to recent letters on the topic of achieved Morse speeds for copying groups of five digits or letters, it may be interesting for *PW* readers to look at records in this discipline achieved at HST (High Speed Telegraphy) competition events recognised by the IARU Region 1 HST working group (see [1] for the table of records). The 'real speeds' given there indicate how many letters or figures fit into exactly one minute. The current records stand at 300 letters and 320 figures. Rules for these events stipulate that the messages of a length of one minute each must be copied down. Methods of choice are usually either a laptop with or without external keyboard for typing, or pencil and paper. Typewriters went out of fashion for some reason, hi. Most of the first-rate competitors use elaborate shorthand systems for taking down and then copy their result out again in legible form for the adjudicators. It's also noteworthy to point out that the top female competitors are just as fast as male ones.

YO3FCA provides a table for converting the 'real marks' seen in the records listing into WPM speeds that most amateurs are familiar with (see table in [2]). Converting the IARU records with the help of YO3FCA's table shows that current competitors from Eastern Europe are not far off **Ted McElroy's** legendary 75.2WPM (300 letters per minute translate into 72 WPM). As a participant in IARU HST championships and first-hand witness to their extraordinary Morse abilities, I have little doubt that McElroy's result will be surpassed eventually.

[1] https://tinyurl.com/y3uuzsln
[2] https://tinyurl.com/y69bsqx9

Dr Oliver Bock DJ9AO/M0TAO
Jena, Germany

In the Footsteps of Marconi and LCT Tuners

Dear Don,

I'm mostly indifferent about **Marconi** but in recent months I've been starting to feel the presentation of his story is getting a bit too much slant. He may not have invented radio but very few designers create something entirely new without drawing on the work of others. Any that do are probably hidden from our prying eyes or maybe even bumped off to stop them falling into the wrong hands (That's what conspiracy theorists think happened to **Tesla**). There were brilliant researchers, experimenters and dabblers all over the world achieving great things and then not doing much with them. Marconi was the guy who got all the 'magnetic dipoles' pointing the same way so something could stick to the magnet. The presentation taking form in my mind's eye is of someone who probably spends £3k on a rig and complains about one of the easy target entrepreneurs who started the ball rolling that eventually made that freedom of choice available.

On a different topic, can I pick up on **Steve Ireland VK6VZ** and LCT tuners, talking about reducing noise in the shack. His adventures with ferrites are pretty much what I usually end up doing with IT kit, so I'm guessing he's done his homework.

In the home environment, it's worth a little attention to detail when buying LED bulbs. Many of the cheaper brands use wattless droppers instead of SMPSU topology. I hate it when technical authors just assume everyone knows what they're talking about, so I'll risk boring you with the detail: The X_C of a capacitor in series with the AC feed is high relative to R_L, so it

vaguely resembles a constant current supply, which is what the LED needs.

Wattless droppers actually soak up a small amount of the mush on the mains line instead of adding to it.

A possible cheeky bonus of that type of dropper is that current leads voltage. The old electromechanical electricity meters can't see how much electricity you're getting away with if V & I don't both happen at the same time, and they might even be weighted in favour of charging you for inductive loads anyway.

With prices edging downward, it's not all that drastic to break one open to see what's in there, then buy more if you like what you see. Determination by electrical test isn't straightforward. The series chain LEDs have a high total V_f, so you probably won't see the charge/discharge kick with a continuity tester. The SMPSU type should kick as the reservoir capacitor charges. It probably has a bleed resistor so you should be able to repeat the test after a pause. Putting the mains through a bridge rectifier only doubles up circuitry that's in a SMPSU type anyway, so it should just work while a series capacitor type won't.

As far as I know there aren't any series capacitor CFLs, and the folded or spiral tubes look an awful lot like antennas to me. The very early ones had iron-cored ballast like regular fittings, or autotransformer ballast for countries with lower mains voltage.

Co-operation with neighbours is worth consideration, but unfortunately this world has a lot of difficult people who think you're trying to be funny if you try to help them. Neighbours could be encouraged towards low-noise LED bulbs, and maybe something in it for them if they loop various mains leads a few times through a ferrite ring.

Ian Field
Letchworth, Herts.

*(**Editor 's comment**: Thanks for your feedback Ian. No one invented radio, of course – it was always there! It just needed to be discovered and several people were involved in that, from **Maxwell** and others predicting the existence of radio waves to various early experimenters. But, of course, what **Marconi** did so effectively, as you point out, was to make it the tool that we all benefit from today. See also this month's V&V column! Meanwhile, of course, our contributor **Joe Chester MW1MWD** has been using his quest to have a bit of light-hearted portable fun. As for dealing with electrical noise, sadly this is an ongoing problem nowadays and, as you say, neighbours are not always prepared to be co-operative. That said, a friend of mine bravely knocked on his neighbour's door a few years ago when trying to track down a 'sproggy' that was affecting his 160m reception. He discovered a wallwart PSU trapped behind a desk and running very hot indeed. The neighbour was suitably thankful that a potential fire risk had been averted so you never know!)*

Learning Basics and TinyURLs

Dear Don,

Regarding the August 2019 *PW* letter *Learning basic electronics* from **Will Brooks**, two online books that I think might help are:

Crystal Sets to Sideband by **Frank W Harris K0IYE** at:
https://tinyurl.com/yy3on43v

There is an HTML version of each chapter at:
www.qsl.net/k0iye

and if you change the .html in the URLs you find there to .pdf, the PDF version is available. A PDF of the full book, albeit of an older revision, is available at:
https://tinyurl.com/y2urnfj5

Lessons In Electric Circuits by **Tony R Kuphaldt** is available at:
https://tinyurl.com/y4btbbbc

Hope this helps. On another topic, while I agree that shortened URLs (your July *Keylines*) are easier to work with as an end-user, and take up less print, I have two concerns:

There's a long-standing principle of the web that 'Cool URLs don't change' [**Tim Berners-Lee**, 1998 **https://tinyurl.com/2pcyf**]. When TinyURL (or the company running any link-shortener) goes out of business, all your printed links to relevant websites will be useless. Google recently terminated its link-shortening service and they're not exactly a cash-starved start-up. How is TinyURL funded? Running such a service is not cheap. [**https://zapier.com/blog/best-url-shorteners** discusses the Google shutdown and alternatives, including Zapier's own.]. Would a middle ground be to use a link-shortener but also print the full URL, perhaps in a footnote? This would permit quick entry via the shortener but keep your references usable if the shortener goes away, and also usable via the Internet Archive 's Wayback Machine, if the original URL goes away and has been captured in the archive.

Could a slightly different typeface be used for URLs, shortened or full, that more clearly distinguishes I and 1, 0 and O?

Kind regards and thank you for an excellent magazine.

Matt Gumbley M0CUV
Tonbridge

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REVIEW - ELECRAFT AX1 PORTABLE WHIP ANTENNA Joe Chester MW1MWD takes a look at the AX1 triple band portable whip antenna.

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OPERATING 101 Tony Jones G7ETW takes new licensees step by step through repeater operating.

STARTING OVER Lee Aldridge G4EJB completes his return to the hobby!

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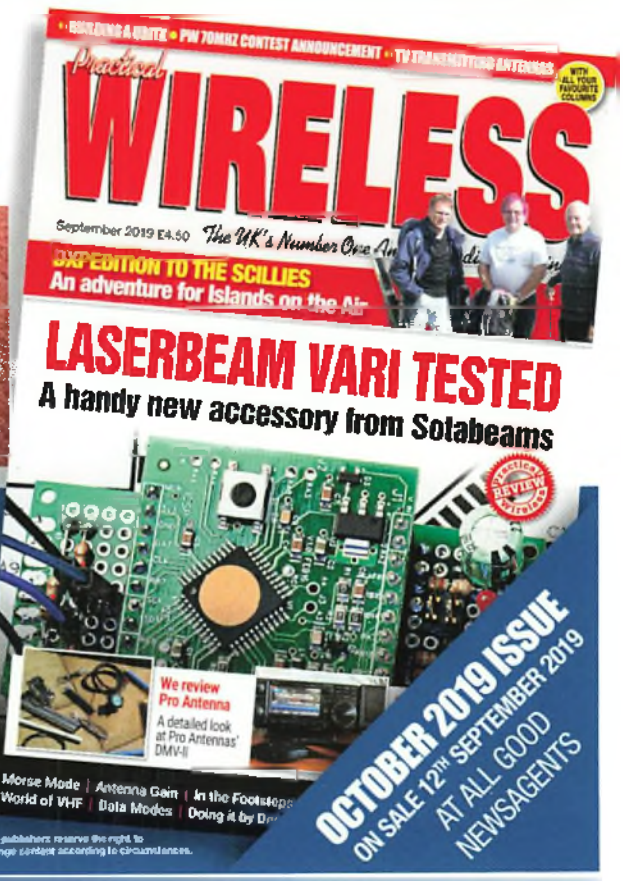

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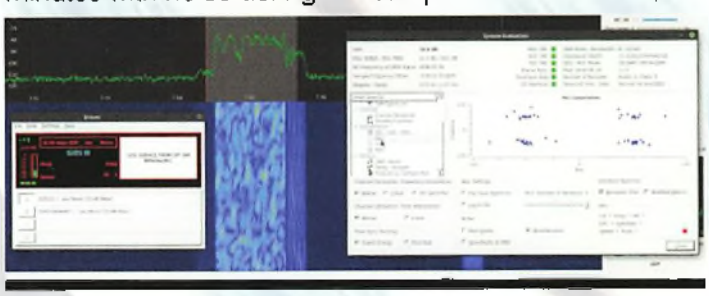

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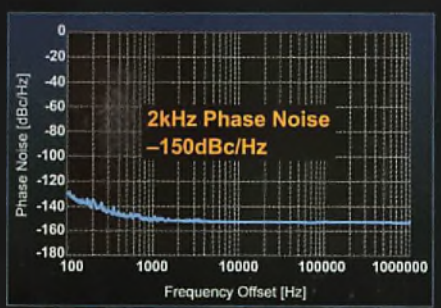
Transmit Signal Purity

High-Quality Transmission with Outstanding Phase noise characteristics

The excellent C/N characteristics provided by 400MHz HRDDS (High Resolution Direct Digital Synthesizer) used in the FTDX101 local oscillator circuit contribute significantly to the superb performance of both the receive and the transmitter sections. Yaesu conducted a thorough examination of each element in the transmission final stage such as clock distributor that divides/distributes the local signal from the 400MHz HRDDS circuit as a clock signal to each block, as well as FPGA, D/A converter, final power amplifier etc., and then carefully selected the latest circuit configuration to improve the C/N characteristics of the entire transmitter block. The transmission signal of the FTDX101 is generated directly from a 16-bit D/A converter without passing through the mixer circuit, therefore distortion and noise are significantly suppressed.

As a result, high-quality local signal characteristics are maintained without degradation to the final stage, and the transmission phase noise characteristics achieve an extraordinary –150 dBc/Hz at 2kHz separation. FTDX101 transceiver users will enjoy the outstanding performance as well as confidence and pride in the high-purity of their transmission signal.



TX Phase Noise (14MHz Band, Mode:CW)


TX Final Stage (MP Version)

In Homage to the Founder of Yaesu – Sako Hasegawa JA1MP

FTDX101MP 200W

HF/50MHz TRANSCEIVER

The Ultimate

FTDX101D 100W

HF/50MHz TRANSCEIVER

YAESU
The radio

YAESU UK Ltd
Unit 12 Sun Valley Business Park, Winnall Close
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Specifications subject to change without notice. Some accessories and/or options may only be standard in some areas. Check with your local Yaesu Dealer for specific details.