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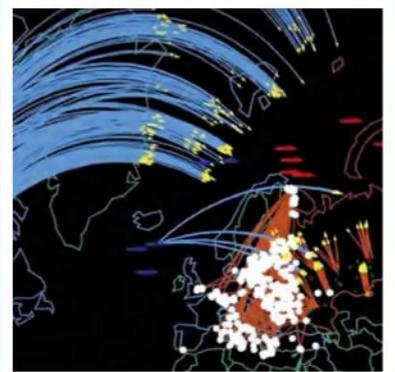
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# Keylines

**I**t's August and here I am preparing the October issue of *PW* and starting to think about what will feature in the November issue! Such is the life of a magazine editor – the year seems to fly by. My first issue as editor was October 2013, so that's 12 years under my belt – not only does the year fly by, but so do the years!

By the time this issue appears we should be starting to enjoy the usual enhanced HF propagation that comes with autumn. Unfortunately, it looks as though we have seen the best of this sunspot peak but let's keep our fingers crossed for a last gasp during the next six months or so.

## University radio clubs

I am shortly due to attend a 55 year reunion at my university (or Alma Mater as I guess our American friends would say). I was there from 1970 to 1973 and one of the first things I did on arriving was to join the radio club. It was a strong society, with over 70 members, if I recall correctly, most of them arriving with a Class A amateur radio licence (i.e. both theory exam and Morse in those days). Most would have gained their licence at the age of 16 or thereabouts. Probably the majority were embarked on a degree course in physics, engineering or maths, although that wasn't always the case. The club also had a permanent station (eventually with a quad antenna on a Versatower, with our own shack), paid for out of the Societies Fund, a fund dedicated to supporting university clubs and societies.

My experience was by no means unique. Back then, most universities offered similar experiences – a thriving radio club, often with its own shack (which was great, of course, as few students had access to a decent station at home, at their parents' house).

It was, of course, a time when many of us built our own gear (Japanese radios were only just beginning to appear, US equipment from the likes of Drake and Collins was too expensive, although there were a handful of UK manufacturers such as KW making kit that was affordable for the wealthier students). I also remember, in my final year at university, that the club acquired a lot of ex-Pye sets which we converted for the 2m band so that we could have a club net across the town.

Over the years the situation changed. Back in the 70s, if you had a scientific bent and were looking for a hobby, amateur radio was an obvious choice. But in just a few years we saw the advent of the home computer and that became the focus of attention. I recall a guy in



the room opposite me trying to build one from early TTL chips!

I suspect nowadays that most university radio clubs have disappeared or are but shadows of their former selves, much is the pity. Some have struggled on but most recruitment into our hobby nowadays comes from other sources and, in many cases, new amateurs are coming into the hobby quite a lot later in life. Not necessarily a bad thing but it's a shame that we aren't managing to recruit bright youngsters. The RSGB and others have tried hard and some programmes such as Youth on the Air are doing good work, but the numbers are small compared with how it was in the past. A pity in my view but I guess we have to accept that life and the world move on. The irony is that in some parts of the world, particularly in southeast Asia, there continue to be many young men and women coming into the hobby – is there anything we can learn from those countries?

## U3A and amateur radio

And while talking about universities, we featured a *News* item last month about the University of the Third Age and amateur radio. The item was submitted by **John McDonald G8PJC** and I'm delighted to say John and I subsequently had a successful QSO on 40m SSB. As I am a member of the Wells (Somerset) U3A, the QSO also gave John another contact towards his target of 35 that he is trying to achieve in recognition of the 35 years of his local U3A group. I have to say, it's now got me wondering what other organisations, if any, have an amateur radio arm!

**Don Field G3XTT**

Editor, *Practical Wireless Magazine*

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# Newsdesk

Have you got something to tell our readers about? If so, then email [practicalwireless@warnersgroup.co.uk](mailto:practicalwireless@warnersgroup.co.uk)

## New from Martin Lynch & Sons

**The DESHIBO WV-601, A Portable All-Band Listening Antenna:** The DESHIBO WV-601 is designed to help with today's urban jungle of electrical noise. Suitable for both permanent installation and portable use and covering an impressive range from 0.1 to 999MHz, the WV-601 opens up almost the entire radio spectrum. From longwave broadcasts and HF amateur bands to shortwave stations, VHF/UHF, and even the airband, it gives listeners access to signals that a conventional antenna might miss. Because it's a passive loop antenna, there's no need for power supplies or batteries. With no internal amplifiers, the WV-601 avoids the risk of adding distortion or extra noise – making it a true plug-and-play solution.

Constructed from lightweight aluminium, the WV-601 is both strong and easy to handle. The loop collapses neatly for transport, making it ideal for SOTA, POTA, or casual listening sessions in the park. It's also an excellent choice for temporary setups or travel, where space and convenience matter. Despite its compact size, it consistently delivers performance beyond expectations.

A major strength of the WV-601 lies in its ability to reduce the noise floor. Loop antennas are naturally effective at rejecting local interference, and this model is no exception – helping you hear more of the signals you want, and less of the noise you don't.

The WV-601 works seamlessly with most popular receivers. It's also suitable for use with transceivers, making it a flexible option for many types of operators. And in addition to being a high-performance receiving antenna, the WV-601 can also handle transmit power up to 10 watts on the 2m and 70cm amateur bands.

**RigExpert MATCH:** The RigExpert MATCH is a versatile antenna and coax analyser designed to evolve with your needs. With its modular design and user-friendly interface, the MATCH offers a future-proof solution for antenna analysis. The MATCH analyser begins with a robust base model covering frequencies from 0.1 to 70MHz. This range is ideal for HF band enthusiasts, providing essential measurements such as



SWR, return loss, and impedance. As your requirements expand, so can the MATCH:

- **Advanced Licence:** Extends frequency coverage up to 230MHz, unlocking advanced features suitable for VHF applications.
- **RFE Licence:** Further expands the range to 500 MHz, catering to professionals dealing with complex RF systems.

This upgradeable architecture ensures that you invest only in the capabilities you need when you need them.

**Key Features:** Display: 4.0in colour TFT LCD with 480x480 resolution for clear data visualisation. • **Measurement Modes:** • SWR (single/multiple frequencies) • Return loss • Impedance (R, X, Z) • Smith chart • Time Domain Reflectometry (TDR) • **Advanced Tools:** • Coax loss and characteristic impedance measurement • Stub tuner • Length & velocity factor calculation • OSL calibration with 10 user profiles • LC meter • **Connectivity:** USB Type-C for PC/mobile interfaces; integrates seamlessly with AntScope software. • **Battery:** Powered by a 2600mAh Li-Ion battery, offering up to 2 hours and 40 minutes of continuous operation. • **Portability:** Compact dimensions (93 × 207 × 37 mm) and lightweight (341g) design. • **Multilingual Support:** Available in English, French, German, Italian, Portuguese, Spanish, and Ukrainian.

The RigExpert MATCH is more than just an analyser, it's a comprehensive tool for various RF tasks with: Antenna Tuning: Achieve optimal

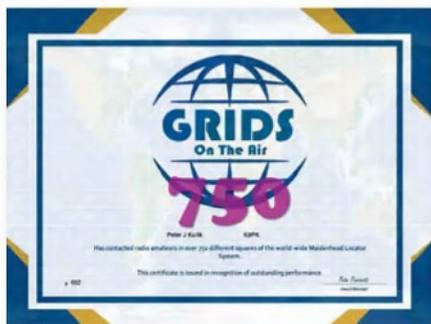
performance by precisely tuning antennas to resonance. • **Coax Diagnostics:** Identify faults, measure Coax loss, and determine characteristic impedance with advanced tools. • **Component Testing:** Measure capacitance and inductance of reactive loads, aiding in the design and troubleshooting of RF components. • **Stub Creation:** Design and measure coaxial stubs with ease, essential for various RF applications.

**KC4 4Band Vertical Antenna:** For radio amateurs seeking a high-performance yet space-efficient antenna solution, the KC4 4Band Vertical provides an outstanding combination of simplicity, durability, and multi-band operation. This antenna covers the 40, 20, 15 and 10m bands with up to 1kW PEP power – ideal for both casual QSOs and spirited contesting. Standing at 7.8m tall and weighing just 7kg, the KC4 has been designed for ease of installation and long-term reliability. Its robust build and wind rating up to 35m/s make it well-suited to withstand harsh weather. There is no need for ground radials - significantly simplifying setup for those with limited space. **Key Features:** Bands: 7 / 14 / 21 / 28 MHz (40–10m) • **Power Handling:** 1000W PEP (CW 500W, RTTY 300W) • **VSWR:** <1.5:1 across bands • **Bandwidth:** 150kHz (40m), 450kHz (20m), 800kHz (15m), 1000kHz (10m) • **Height:** 7.8m; **Weight:** ~6.8–7kg • **Feed:** UHF female SO239 connector; mounting clamps supplied

**TopBytes Morse trainer:** The TopBytes Morse Trainer (as featured in June's *RadCom*) is an innovative, pocket-sized device designed to help users master Morse code, whether you're a beginner or looking to polish your skills. Compact and battery-powered, it supports both straight keys and paddles via a standard 3.5mm jack, making it highly versatile. Its intuitive touchscreen interface offers four interactive training modes: 'Listen', 'Random Letter', 'Send Random String' and 'Send Letters'. These gamified exercises target both sending and receiving, with instant feedback to reinforce learning.

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**GRIDS ON THE AIR:** The Grids On The Air programme has recently started issuing awards to participants in the challenge. They now have two members who have achieved the milestone of over 750 Maidenhead Locator Grid Squares contacted on HF legacy modes, one of whom is a hairs breadth from the 1000 mark, and 12 who have reached the 500 grid level.

Grids On The Air is a scheme for uploading logs of contacts with locator squares or grids, using HF only and 'legacy' modes, ie SSB, CW mainly but also allowing AM and FM. The scheme offers award certificates at increments of 250 squares starting at 500. The website is in its early days so far, but in time will support uploading or entering of spots of rarer grid square activations, and notification of grid-focused DXpedition activity. [gridsontheair.com](http://gridsontheair.com)

#### RSGB NATIONAL RADIO CENTRE WINS

**TRIPADVISOR AWARD:** The RSGB is proud to announce that the RSGB National Radio Centre has been recognised in Tripadvisor's Travellers' Choice Awards for 2025. Winners of this award are among the top 10% of listings around the world on Tripadvisor. The award is based on genuine feedback from anyone in the community who has visited and left an authentic, first-hand review on Tripadvisor over a 12-month period. The award reflects the passion and dedication of the RSGB's volunteers, and the fantastic role they play in promoting amateur radio. Start planning your visit to the NRC by going to: [rsgb.org/nrc](http://rsgb.org/nrc)

#### ENSURE THAT OFCOM HAS YOUR CORRECT

**CONTACT DETAILS:** The RSGB is encouraging radio amateurs to check that their contact details registered with Ofcom are up to date. As well as confirming your home address and email address are correct, you can also select your communication preferences. Ofcom will use these details to contact radio amateurs about the implementation of phases two and three of its planned updates to the amateur radio licensing framework. This stage will include changes to new Intermediate callsigns and rules for Special Event Stations. Find out more about licensing in the UK via: [rsgb.org/licensing](http://rsgb.org/licensing)

[rsgb.org/licensing](http://rsgb.org/licensing)



## Icom IC-7300Mk2

At the August Japanese Ham Fair, ICOM unveiled the new IC-7300MK2 HF / 50 / (70) MHz transceiver. Pre-release information & Slideshow video available: Key features: HDMI port for external displays • Built-in CW decoder • USB Type-C with dual virtual COM ports • Enhanced RMDR and Phase Noise performance • Ideal for contesting & DX hunting • 70MHz band is included in the European Version.

The original IC-7300 was unveiled in 2015 and is reputed to have sold more than 100,000 units. This success is presumably what is behind Icom prolonging the life of the rig but adding additional features to match or improve on those of Yaesu's FTdx10. Initial shipments are expected by the end of 2025.

[www.icomjapan.com/news/4411](http://www.icomjapan.com/news/4411)

**TAUNTON & DISTRICT ARC:** TDARC do not normally have an official August meeting due to members being on holiday etc. This year however a group of us decided to have an unofficial get-together at Berron Beach on the Severn estuary. The original plan was to go portable on the beach itself just after high tide in order to check out the saltwater effect but the tail end of Storm Floris meant that there were still high winds. Undeterred, we set up at the beach car park with permission from the Beach Warden to use the adjacent grass verge for antennas. G1BED erected a Windom for 40m and had various contacts around the UK. M7UTX erected a quarter wave vertical for 20m and monitored the band with his G90. Other members attending included G4ELW, MOCIE, MOOAD, G6NIC, G4ETN, 2E0KJZ, 2E0KJY and G8PLL. All in all a good social event.



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Steve Macdonald G4AQB  
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**B**ack in the early 1980's I experimented with 23cm for the first time. I built a DF8QK transverter which came from the *VHF Communications* magazine. When the transverter was partially completed, I decided to make an antenna to use with it. As commercial 23cm antennas were expensive at the time, I chose to build a small 10-over-10 slot-fed Yagi that I saw in an *RSGB Radio Communication Handbook*. The antenna was quite easy to build and I used 15mm plumbing pipe for the booms along with 2mm brass rods for the elements. When it was finished, I mounted it on the top of my antenna stack on the chimney. The partially completed transverter gave an output of around 100mW and with my new 10-over-10 Yagi I was able to work a couple of local stations. Then, one Sunday afternoon we had an excellent tropo opening on the 2m and 70cm bands. I had just worked F1FHI on 70cm when he asked me if I had 23cm. I told him that I had, but only with 100mW. We moved to 23cm and completed a contact using just 100mW and the 10-over-10 Yagi, I was amazed! I used the Yagi for about ten years until storms finally saw its demise.

With all the recent increase in activity and experimentation on 23cm and the introduction of 1296 ALIVE, I have built another 10-over-10 Yagi to try out again. This time instead of soldering the elements directly to the copper boom, I have used brass nuts and bolts to mount the elements. The design is similar to one in an old copy of *Radio Communication Handbook* using the same dimensions for the element lengths and spacing, **Fig. 1**.

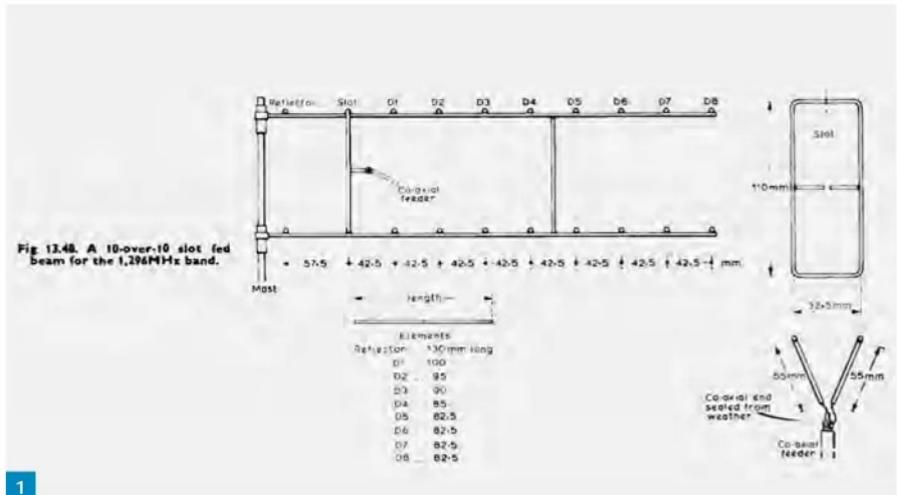
### Construction

First, you will need two 50cm lengths of 15mm copper plumbing pipe for the two booms. Each length then needs drilling to take the 4BA bolts used to hold each of the elements. The distances between the elements on the booms are shown on the diagram and should be drilled as accurately as possible. I used a small pillar drill to help with the drilling.

Next, you will need lengths of 2mm diam. brass rod and 20 x 4BA cheese head brass bolts **Fig. 2**. The slots on each bolt now need to be enlarged a little so that the brass rod will sit inside it. I used a small file for this.

At this stage you will now need to cut the brass rods for the elements. Cut the length of each rod according to the diagram, leave about 1cm longer for each element. These can be trimmed accurately after being mounted on the bolts. Leave the driven slot element until last, **Fig. 3**.

Carefully solder the centre of each brass element onto a 4BA bolt, taking care to centre the brass rod before soldering. A large soldering



1

# The 'Plumbers Delight'

With the increasing popularity of 23cm, **Steve Macdonald G4AQB** offers a homebrew solution for a suitable antenna.

iron or small blowlamp can be used for this, **Fig. 4**.

Match each of the elements with its associated hole on the upper and lower boom, mount each element with a 4BA brass nut and washer and make them finger tight. Using a ruler, measure and trim each of the elements to the correct size.

Now cut a 9.5cm piece of 15mm copper pipe and take two 15mm elbow couplers. These are used to fix together the upper and lower booms. Solder together using a blowlamp, **Fig. 5**.

It will now be necessary to drill a small hole between elements 6 and 7 on each boom so that a short piece of brass rod can be used to support the front of the booms. Solder together the elbow couplers to the booms and the brass rod between elements 6 and 7. Ensure that the elements are straight before soldering. A workmate or similar is very useful for this, **Fig. 6**.

Now make the slot driven element, I found it best to use two halves. Before bending the slot, remove the insulation from a couple of small choc-block connectors and slide it on each side of the brass rod. This can be used to connect the feed. Solder the bottom part of the slot to a 4BA brass bolt, mount this to the lower boom. Now put a 4BA bolt into the top boom hole and tighten. You can now line up the top of the slot into the bolt and solder.

Finally, cut the two pieces of brass rod 55mm long for the feedpoints. Remove one of the screws on each choc block connector and solder the feeds into each of the holes. The feed can now be moved up and down the slot; set this for half-way up the slot and tighten the screws. The coax is connected to the end of the feed. I used

a short SMA pigtail. As the feed is a Delta Match, the two rods need to slope inwards before connecting to the coax, **Fig. 7**.

### Testing

The antenna can be tested initially using a Nano VNA that works up to 1296MHz. This will display the SWR and show a graph of the resonant frequency and bandwidth of the antenna. As this is a slot-fed Yagi, it should be more wideband than a standard Yagi antenna. This also makes construction of the antenna less critical and allows for small errors or changes in boom size and element diameter.

Further tests were carried out using equipment developed by **Ross G6GVI**. At a recent meeting of the Bolton Wireless Club, Ross set up his Antenna Testing Range so that members could bring along different antennas for 23cm for testing and compare results. The tests were carried out on a field adjacent to the meeting QTH.

The test range consisted of a QRP transmitter tuned to 1297MHz, fed into a Helix antenna and mounted on a tripod pointing towards the receiver.

The receiver and test antenna were mounted on a computer-controlled astronomy telescope mount. The software controlled the measurement receiver and astronomy mount. This was rotated though 180° and plotted Polar Diagrams of the radiation pattern of the antenna being tested. Each measurement compares a pair of antennas, often using a WA5VJB 3 element PCB Yagi as a reference: this has a quoted gain of '6-7dBi', **Fig. 8**.

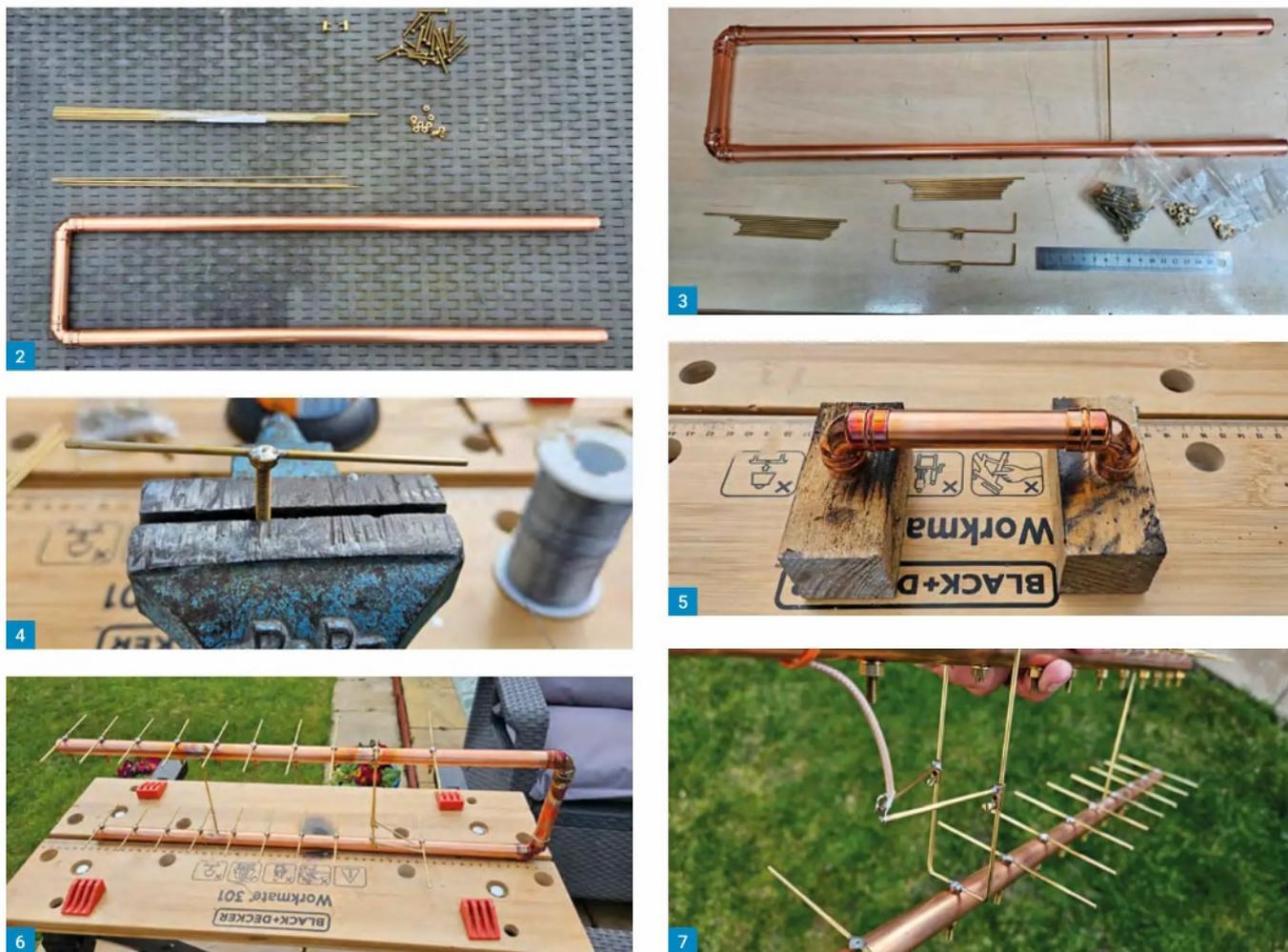
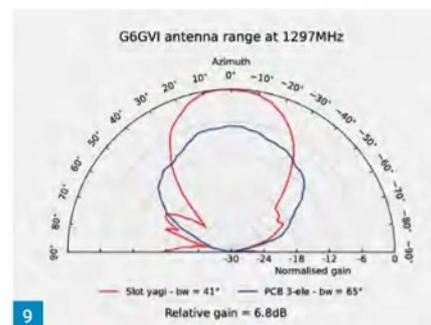


Fig. 1: Original design of the 10-over-10 slot-fed Yagi. Fig. 2: Materials needed for construction of the Yagi. Fig. 3: The booms and elements ready for soldering. Fig. 4: A completed element soldered to the bolt. Fig. 5: Soldering the elbow couplers for the two booms. Fig. 6: Completed 10-over-10 Yagi after soldering. Fig. 7: Close up of the slot with the delta match feed. Fig. 8: Testing the Yagi on the antenna testing range receiver. Fig. 9: Chart showing the azimuth and relative gain of the Yagi.



### Results

The results of my 10-over-10 slot-fed Yagi were admirable. The graph shows a relative gain of 6.8dB compared to the reference 3-element Yagi, giving an overall gain of around 13dBi. The beamwidth shows 41°, giving a wider beamwidth compared with a longer, straight Yagi, Fig. 9. The SWR measured on a VNA gave a result of about 1.5:1.

Although we were not using professional test equipment, the results give a guide to how the antenna performs. Other antennas tested included a couple of 23cm panel antennas, a 23cm biscuit tin bi-quad, a 23cm Moxon and several experimental 23cm mobile antennas!

### Conclusion

The 10-over-10 slot-fed Yagi is a small and compact antenna with a length of only 53cm. It has an overall gain of around 10 – 12dB with a wider beamwidth than that of a longer standard Yagi. The antenna can also be built as an 8-over-8 slot-fed Yagi by taking away the final two elements (D7, D8) on each boom. This would reduce the estimated gain to around 8 - 10dB, but also reduce the size of the antenna. It is very useful for portable and SOTA activities as well as for a fixed station. It is cheap and easy to build and ideal for anyone wishing to try 23cm for the first time without having to spend a lot of money on a commercial antenna.

### Reference

RSGB Radio Communications Handbook (Fifth Edition P13.25):

- <https://tinyurl.com/3yknsucm>
- WA5VJB 3 Element PCB Yagi:
- <https://tinyurl.com/ycxtb5d6>

### Parts List

- 15mm copper plumbing pipe
- 2 x 15mm elbow couplers
- 10 x 2mm diameter brass rods
- 20 x 4BA brass bolts, nuts and washers
- 2 x small choc bloc connectors
- SMA pigtail connector

Tim Kirby GW4VXE  
gw4vxe@icloud.com

As regular readers will know, I have been a big fan of the Quansheng UV5K and derivative handhelds. They've been available at bargain prices (my cheapest one was £8) and offer a very serviceable basic 2m/70cm FM handheld. In addition to that, though, with the 'hacked' firmware, you can do all sorts of things with them, including receiving CW/SSB, transmitting CW and DSB, receiving on HF and so on.

Quansheng have obviously been watching what has been happening with these developments and the outcome is the latest Quansheng handheld, the TK11. I was delighted when I had the opportunity to look at one of these units to see what it is capable of.

### Out of the box

Taking the rig out of the box, the first impression is of a similar looking radio to its predecessors, but in a more substantial form factor. It does feel a more solidly built unit. There are two versions of the radio available, one with a standard battery and one with a 'high capacity' battery. The review model was a standard battery.

The VHF/UHF aerial that comes with the radio is top loaded so looks a little unusual, compared to most rubber duck type aerials you probably already have. This is because the aerial is designed to cover 50, 144 and 430MHz. The rig has an SMA male connector, so you can easily compare it with other aerials that you may have. The rig also comes with a little T-bar ferrite aerial, which the manual suggests can be used for frequencies below 18MHz (don't expect too much of this aerial, but I could hear weak signals on 80 and 40m after dark). Because this aerial uses a 3.5mm jack plug, I've seen some suggestions of making up a jack plug connected to a piece of coax and an adapter for LF listening, although getting the jack plug to make good contact required a bit of shaving of plastic around the socket, to ensure a good fit! I didn't try that, for fairly obvious reasons.

### In use

Switching the rig on, the display looked very familiar to me, being used to the previous Quansheng models. The menu system worked a little bit differently, but I soon found my way around it, using the Menu, arrow and exit keys.

Something different to the earlier Quansheng models is that the TK11 has two PTT buttons, once for each 'side' of the radio. I am not a fan of rigs with two PTTs. Particularly with a radio like this which is capable of transmitting in all sorts of places, it could be easy to hit the wrong



# The Quansheng TK11 handheld transceiver

**Tim Kirby GW4VXE** takes a look at the latest offering from Quansheng.

PTT and transmit somewhere you shouldn't. I'd rather have a single PTT and manage where I'm transmitting using the VFO or Main key.

The TK11 is capable of dual-receive, so you can listen on 2m and 70cm at the same time, though the rig is not full duplex.

A quick first test on 70cm confirmed that I

could access my Allstar node on FM and could set the CTCSS and so on. At the same time, I had a look and could see how to set repeater offsets and so on. I used the Hubnet audio check to listen to my audio and it sounded good (the parrot said 'Your audio is perfect' – praise indeed!).

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Photo 1: A close up of the TK11.

Photo 2: The TK11 and aftermarket telescopic whip for 10/11m.

Something else that I quickly noticed is that the ability to receive CW/SSB/AM as well as the usual FM has been added as a default capability – no need to update the firmware to a non-Quansheng variant is required. Please note, this is receive only, you can't transmit on these modes and neither can you transmit a simulated DSB, as you can on the modified UV5 radios.

The rig claims receive coverage between 153kHz and 1160MHz (it's a shame it doesn't make it to 1296MHz!). There's also an FM radio included (isn't there always...).

Putting a CB telescopic whip on, instead of the rubber duck, and tuning to the 10m band, I could hear some signals. I used the 10m FT8 frequency, 28.074MHz, as a test using my phone to decode the FT8 signals. I compared the TK11 with a 'hacked' UV5K. The TK11 had a considerable amount more gain and received signals that I could not hear (with the same antenna) on the UV5K. That was an interesting comparison. I did feel the receiver gain on the TK11 was pretty much at maximum so I suspect it would overload quite easily! With very strong signals on AM and FM I noticed some overloading and loss of audio. I also compared the TK11 with a UV5K(8), which had the additional Si4732 board, running the CEC HF firmware. Once again, the TK11 was more sensitive and pulled out a couple of FT8 stations which the modified UV5K(8) did not hear.

I did similar receive tests on 6m (and 8m) receive and was pleased to find that the sensitivity was similar there.

AM reception is improved compared to modified UV5K units with clearer reception on airband as well. It was of similar quality to a much more expensive handheld, so if you're an airband enthusiast this will be good news.

### Does the TK11 work on bands other than 2m and 70cm?

But of course, I know what you really want to know is about the transmit side of the rig. Will it transmit on bands other than 2m and 70cm? I tried the rig on 10, 6, 4, 2m and 70cm.

The thing to be aware of, of course, when you transmit on bands other than 2m or 70cm is that some of the harmonics are not that far down. For example, on 10m, the second harmonic is about 30dB down as is the second harmonic of the 6m signal. These harmonics are fairly significant and certainly could cause problems, although use of inefficient handheld type aerials mitigates this to some extent. The 2m and 70cm signals were generally free of



Band	High	Medium	Low
28MHz	5W	3W	1.5W
50MHz	5W	3W	2W
70MHz	0.5W	0.5W	0.5W
144MHz	7W	4W	1.5W

Table 1: Measured power output.

significant harmonics, with 70cm being even better than 2m.

The rig is quoted to be a 10W unit. I measured power output as detailed in **Table 1**.

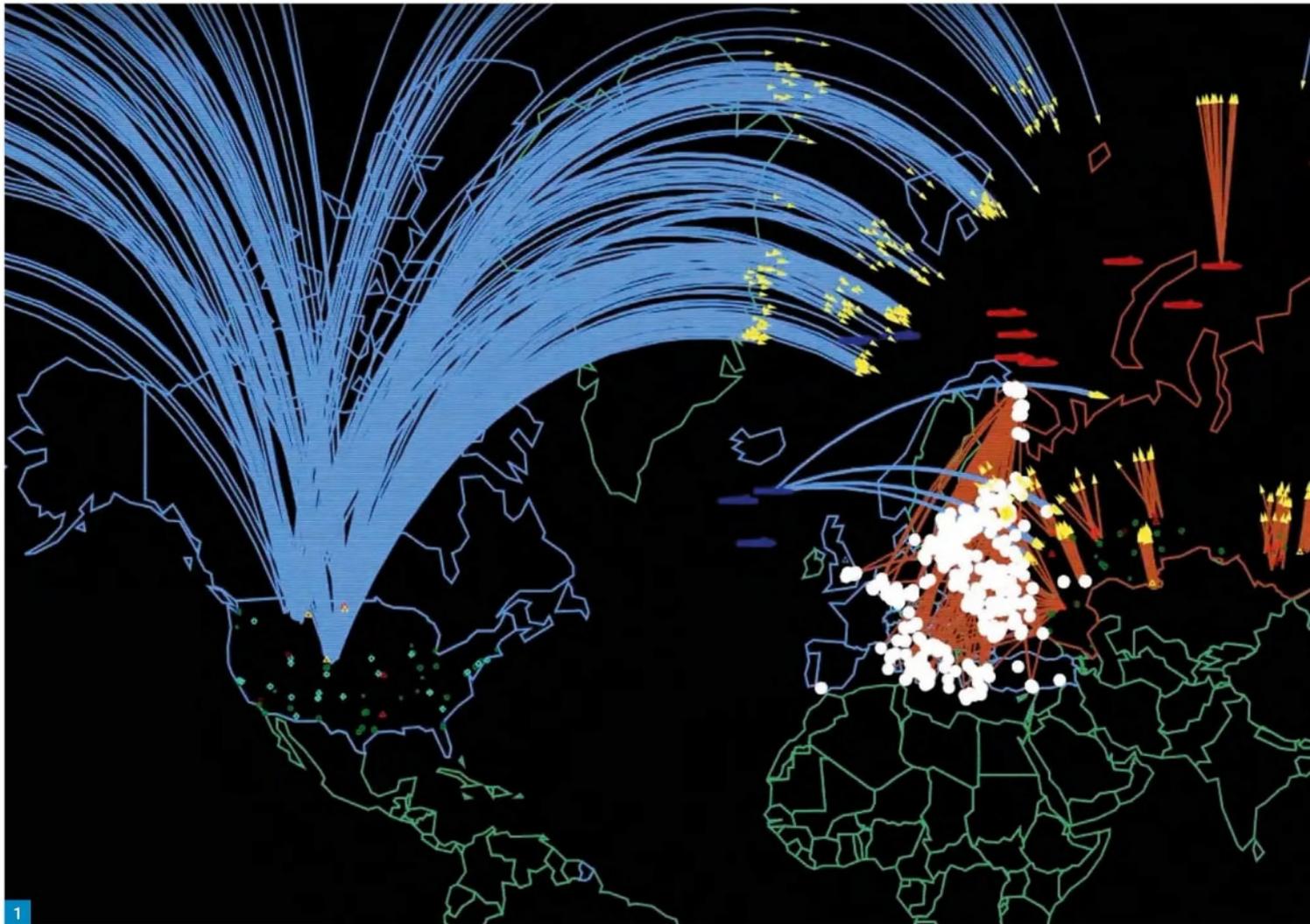
The power output results on 70MHz led me to believe that the rig really shouldn't be used there! Power is obviously being absorbed somewhere. The rig can be used on receive successfully on 70MHz though. I should add that nowhere in the documentation for

the TK11 does it suggest that the rig should transmit on 70MHz – I was just curious to see if it did.

Although the rig is quoted in places as having 10W output, as I have said in reviews before, I'm not keen in having RF at that level close to my face, so I prefer to see power output of closer to 5W. The rig produces most power on

Continued on page 14

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1

Joe Chester M1MWD  
m1mwd@gmx.com

**R**abbit warren anybody? Two DV dongles walk into a bar. Actually, two separate bars on opposite sides of the world. For clarity, a DV dongle is just a device to enable use of digital radio from a PC or other computer. Connecting to the local WiFi in the eponymous bars, they then call up a DMR Talk Group to establish a comms link with each other, using this server somewhere in digital radioland. People then use this comms link to talk to each other. The question is: what callsigns should they use? I have deliberately left out any location data to help you reach the correct conclusion.

The answer is of course none! The users may be radio amateurs, the server may have been set up by a radio amateur, but all this is irrelevant. There is no amateur radio RF used anywhere between these two access devices. Ergo, there is no legal or administrative need to use callsigns. This system is a purely amateur equivalent of Skype, or Facetime. In fact, the users of the dongles don't even have to be licensed radio operators (although

# Thoughts about Amateur Radio

Joe Chester M1MWD returns with some (controversial?) thoughts about the hobby and how it is developing.

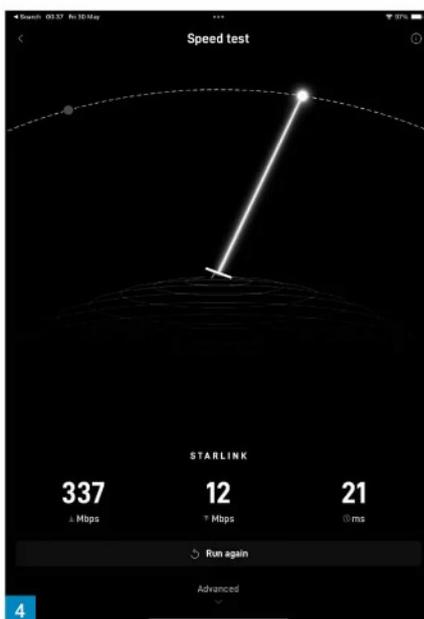
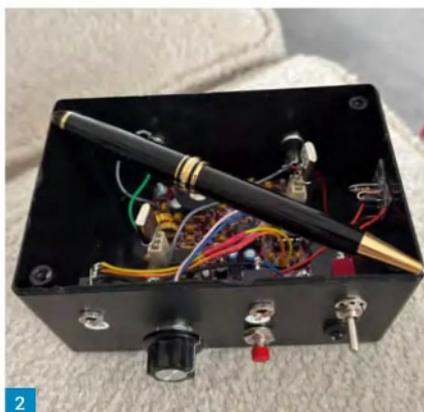
the FAQ at [www.dvdongle.com](http://www.dvdongle.com) says "users must be licensed and registered in the gateway system").

However, currently, there is an argument for the use of callsigns if any part of the journey of the digital voice bit stream uses any amateur radio frequency. And the two dongles can't know with any certainty if this is the case. And not wishing to fall foul of any administrative requirement, accordingly they use the callsigns of their owners, with any prescribed prefix or suffix. Am I asking here if this will always be the case? That digital radio voice bits will always use amateur radio RF? I don't really know, am I? And does any of this matter?

## It's always been so

There are lots of variants of this. Some, for example, have one operator using a M1KE, which doesn't use any RF (see Joe's article in the July issue – ed.). The man at the back has his hand up. "Stop! All you are doing is feeding the 'it's not real radio' trope". Granted. So, in answer to this remark, let me take you in this 'ere time machine, back to the birth of radio. First came CW. We all know that, chimes the chorus. Indeed, and it was useful, and many were pleased, and many more made lots of money. But there were cases where Morse keys interfered with more important operations - like flying a plane! (see my piece

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back in 2023 on early pre-1920's aviation use of radio). Additionally, people love to actually talk, and so Marconi catalysed the birth of broadcast radio - using AM technology. Which, of course, was rapidly adopted by the emerging generation of early radio amateurs. *PW* first appeared in 1932, and there in the letters page is one from a reader bemoaning the use of AM, because, all together now, it's not real radio! Well done!

My point? It has always been so. The current incumbents are always wedded to their ways of doing things. They have spent the time, passed the exams, called CQ for hours, they have done the hard work. But now that work starts all over again, as they try to understand this new AM stuff. And they will have to spend more hard-earned cash for a new radio as well. 'Flash in the pan, it'll not catch on, people will come rushing back to CW in time'. I wonder how **Frank Sinatra** would have sounded singing in Morse code? Silly, but maybe not. Try this - do you have to be using a genuine original Marconi Morse key to be doing real radio? Is the BBC not really the BBC now that its services have gone digital?

This is a nonsense discussion. In the more

**Photo 1: 'Nuclear war is not survivable', image from Princeton University at <https://sgs.princeton.edu/the-lab/plan-a>. Photo 2: Rockmite, new arrival, first tests. Photo 3: Testing a satellite dish for internet access and Photo 4: note the performance data! Photo 5: Go-box, based on KX3, with PAX3 panadapter, and FT5D using satellite internet.**

than 100 years since Marconi used a spark gap, the communications world has been reinvented time and time again. Those who wish to continue using the existing modes are quite welcome to do so. We won't name call or disparage. We might even join you on occasion. The new stuff, like SSB, or FT8, or digital radio is fun too.

I'm going to jump horses mid-stream now, and talk about EVs for a minute - cars powered by batteries rather than petrol or diesel engines. Or coal gas, which was used in the 1940s, during the last world war. The corresponding argument is 'I will never drive electric'. Which they steadfastly maintain until one of two things happens. They realise the huge savings in their fuel bill (eg from £200 a week down to £20). But the more interesting converts are the ones I have put in the driving seat of an EV on a empty road at a traffic light. I tell them to floor the

throttle when the green light appears. Not one, I repeat not even one, failed to scream in delight at the instant torque, or to quietly buy an EV some weeks later.

Coming back to radioland, I wonder if any of that EV argument has any relevance here? Day after day I hear stations saying on air that they are now digital-only stations, or that the HF equipment is up for sale. The local S9 noise is usually blamed. But I wonder if sitting in a comfortable armchair talking to the world of radio amateurs on crackle free channels might have something to say as well. And also I heard a couple of comments from those who are house or even bedbound. So there really is a use case for digital radio, be it sitting on the sofa talking with friends old and new, or building systems, or servers, or hosting nets about all sorts of topics, which anyone from wherever can join from their sofa, QRM, and QSB free.

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## Internet reliance and resilience

Yes, I know one of the issues here is the use of the internet. Which raises two problems. One is of capacity. We seem to think that because it's just there, that the internet has infinite ability to carry the rapidly increasing terabits of data we all throw at it. It's not infinite; it's a finite resource. Want an example? On D-STAR, REF01C and REF030C are very popular reflectors worldwide. But now **Robin AA4RC**, administrator of 01C, says that there are large numbers of hotspots connected almost permanently 24/7 to this server, and that its maximum capacity is frequently reached, and no further users can connect to it. Many, many operators link multiple hotspots in their homes to these reflectors. Consequently, today 01C, and soon 30C, now dynamically block multiple hotspots from the same IP addresses from linking. Furthermore, anyone who persists in linking multiple hotspots will be permanently blocked from REF01C (as reported by **Jim K6JM** on the forum). I experienced this blocking myself recently, while testing a new hotspot - I could not link in until I unlinked my other hotspot. With apologies to the admin for overloading the bandwidth.

And then, of course, what if the internet goes down? However, with satellite internet now available from an increasing number of suppliers, the risk of total internet meltdown is reducing. (I see Project Kuiper finally got 27 satellites into orbit recently - Amazon's latest venture into satellite internet, and another option). And there is a Prepper argument here as well. The power grid of two whole European countries collapsed recently, and repairs took several hours. Which, in turn, led to the collapse of internet services. Yes, some systems had backup generators, but many didn't. So, there is a real meltdown threat here. And if amateur radio were to become purely digital, then this threat would also be real. But this is not what is happening, or will happen in future. A century or more after Marconi first used Morse code over radio there is still a burgeoning use of Morse code over RF, and operators still prize well-made Morse keys. So, the use of RF is not going to die any time soon.

Building resilience in systems is a genuinely hot topic right now. Heathrow blackout anyone? And I am sure that there are many amateur radio operators thinking about this as well. For some, it's about backup generators, or at least a solar-charged battery bank to keep the station on air, even at a QRP level. I am sure that some may also be investing in satellite internet as a backup solution in case the current broadband solution goes down.

I end the resilience discussion with a quote from a resilience expert in a newspaper this morning, after the recent power failure on the continent.

*Charmalee Jayamaha, a senior manager at the*

*UK government-backed Energy Systems Catapult, said: "No system can be 100% resilient," so risks "need to be balanced with our willingness to pay to reduce them".*

## Lessons for radio amateurs

Turning this around, we as amateur radio operators need to continue to maintain our skills as operators of all types of radio equipment, digital and analogue, because, if and when there is a major infrastructure failure, we could be called on to provide emergency communications links in the immediate aftermath. My own Prepping? I'm glad you asked. Let's start with multiple hotspots, and several handhelds, as well as three HF transceivers, with several antenna choices. There are two large(ish) LiFePO4 batteries which would keep me on air for a while (at least two days I think, maybe more). They are used and recharged regularly. To this might be added some larger batteries shortly. I don't have solar panels yet, but there are plans for a couple of 95W solar panels and the necessary charge controller. And as to the internet, I was recently made an offer by a satellite internet provider of a 30-day trial, which I have accepted. One of the things I want to check during this trial is running digital radio through it. This is about the latency issue. What I have cancelled, however, is the daft idea of digging a subterranean bunker, War of the Worlds style, in the back garden! Despite the uncertainties of the world right now, I am not prepping for a nuclear war, as, in my view, a nuclear war is not survivable, **Photo 1**.

The cost factor? Lithium batteries and solar panels do cost, but prices have fallen quite dramatically from the early highs, and I have assembled my kit a piece at a time, over the last few years. Satellite internet is also expensive, but it's a backup system, for which I would pay only while using it (the contract is monthly, and can be switched to a lower cost, or a zero-cost option as required). And I also have my portable Go-box station, in case we are told to run to find shelter, rather than sheltering in place, eg if there was a major flood alert. So, I think that I am modestly prepared for any reasonable short to medium term failure of essential infrastructure. However, this is still a long way from being fully prepared for large-scale civil disorder - which is an altogether different issue.

And honestly, such a thing is too grim to contemplate, while the sun is beaming down from a cloudless sky in June. And I need to get my new Rockmite on air, **Photo 2**, and refresh my CW skills (more on this one later). My satellite internet, **Photos 3 and 4**, is working well on digital radio, with little or no latency issues, so I must work out how this will add to my Go-kit, **Photo 5**. And there's a call on XLX252B which I must answer. Now, should I use a callsign, and if so, which is the right one? 73. **PW**

Continued from page 11

so I opted to use the rig at medium power, 4W, on 2m.

I decided to test the rig on 10m FM and arranged a test with **Rob MW0RLJ** who lives about a mile away from me, over the fields. I used the TK11 set to 5W and a telescopic CB antenna which I had got from Ali Express. Slightly to my surprise, after adjusting the position of the antenna to maximise Rob's signal, Rob reported that I was 20dB over S9 with nice mellow audio. Certainly, then, that suggests that the rig would be good for local QSOs and perhaps some Es contacts in the summer. Just watch those harmonics though and don't be persuaded to put the rig on a decent aerial without using something like a low pass filter. Doubtless, the rig would work similarly on CB, although I did not try this (the TK11 not being type approved for CB, or 446MHz use).

The battery supplied is a 2500mAh and the radio comes with a drop-in charger. The charger comes with a UK 2-pin plug, so you'll need an adapter. The charger is the same as the UV5K models so you can swap them around if you need/want to. There's also a USB-C charging port built into the back of the battery.

Other accessories supplied included a programming lead, hand strap, belt clip and the T-bar receive antenna. There's a user manual too, which is basic but is enough to get you started and is worth a look through.

At the time of writing, I'm not aware of any alternative firmware for the TK11 in the same vein as for the UV5K. A quick read at:

<https://github.com/armel/tk11-firmware-custom>

suggests that producing alternative firmware is a significant challenge. It will be interesting to see what happens. Once again, at the time of writing, the latest firmware and programming software from Quansheng is available at:

<https://qsj.com/support/downloads/7073>

At around £70, the TK11 is not a trivial purchase like the UV5K. But, it has more sensitivity on HF receive in particular and SSB/CW receive comes as standard without having to change the radio's firmware. Transmit on 10 and 6m? Cautiously yes. If you're out in the middle of nowhere with few people around you, and you're using rubber duck/whip antennas, you're relatively unlikely to cause a problem with the harmonics. Or, if you treat it as a 2m/70cm handheld with HF receive capability as something to take to the beach or the country park you could get a lot of enjoyment out the TK11.

The TK11 is available from Sinotel in the UK (URL below) as well as through Ali Express. Many thanks to **Alan Clunnie** of Sinotel for providing the review model.

<https://tinyurl.com/2kmr7snz>

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Richard White G6NFE

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**F**irst things first. For anyone following this story of my naive forays into two metre operations, an apology. Due to balancing budgets, along with house repairs and garden maintenance, it has taken me a lot longer than I expected to continue with my endeavours into the VHF band. But! Progress has been made, and I can now continue.

After reading part two, readers probably won't be surprised to know that I decided to go down the 2m SSB path. I figured it gave the best chance for reliable future experimentation with various modes. That doesn't mean I won't try other ideas in the future, but I think this is a good starting point. Here is the story so far.

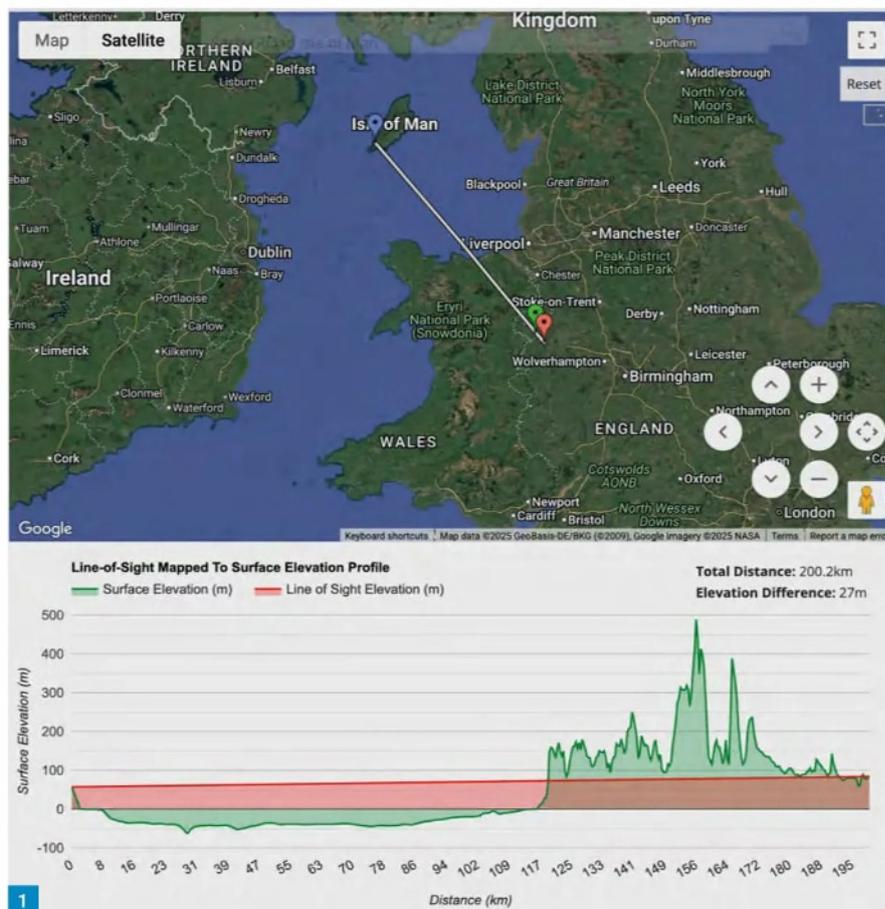
That famous quote from **Robert Burns** sums things up nicely for me right now. *'The best-laid plans of mice and men often go awry'*. Or in my case, planning things out in my head and naively thinking everything would work out just fine. As always, reality bites when one actually tries to move from theory to practice. I promised earlier that I would note the failures in my new VHF endeavours, so here is the first failure.

### Learning from failure

What did I mess up? Well, to save quite a lot of money I decided to purchase a lightweight AR500 rotator knowing perfectly well it was designed for small(ish) Yagi antennas, and was not designed to take extreme punishment. The manufacturer makes this crystal clear by the way. But the lesson that unfolded is probably about the pitfalls of random and casual/unplanned thinking, when it comes to putting together a radio system; from transceiver all the way to the antenna(s).

Back in 2021 I decided, thinking ahead, that one day I'd really like to try and make a serious attempt with VHF and above, at the new house. At the time I wasn't entirely sure when that day would come, but as it transpired it really crystallised when I looked at **Ken, G8DIR's** station and logbooks for VHF, in 2024. Anyway, back to 2021. I always had a hankering for a Log-Periodic antenna that would cover the 2m, 70cm and 23cm bands. My rationale was that it might be a lot less visually intrusive than separate Yagi antennas on a common mast. I thought this was a sound idea.

Knowing from previous experience how well designed and engineered InnovAntennas are, I bought a 100 to 1300MHz Log-Periodic antenna from them in 2021, only getting around to assembly in 2024. The antenna is very nicely engineered and I couldn't wait to fit it to a short stub mast on the AR500. However, it was after antenna assembly that my first doubts started to form. I am not a mechanical engineer, but common sense shouted that the length and weight of the antenna was too much for the AR500 to cope with. It looked



# Going back to my roots with the two-metre band (Pt III)

**Richard White G6NFE** reports on his early successes on 2m SSB, moving from a Halo to a Yagi.

as though I had a weight and balance problem staring me in the face. In addition, considering the ferocious wind speeds from recent storms, mounting the Log-Periodic on this particular rotator was simply asking for trouble. Damn.

With a sinking, mildly depressed feeling, I put the Log-Periodic into storage for future use, and decided to have a re-think. I took stock of what I actually had, and what I could spend. It looked something like this:

I had a new AR500 rotator that I'd tested, and was confident it would work if used within its mechanical limits.

I was not about to spend a lot more money on a stronger rotator along with multicore control cable and connectors and effectively write-off the AR500.

Recently I had acquired two used Tokyo HyPower linear amplifiers, one for 2m, the other for 70cm.

I had a Diplexer for taking the output from the FT-817 and splitting it for separate 2m and 70cm feeds into the amplifiers. I'd also acquired a Triplexer for 2/70 and 23cm, because I had originally intended to try the 23cm band with the Log-Periodic.

Looking at very low loss coaxial cable, and considering I didn't want the complexity of a masthead pre-amp, which coax should I choose? Some research indicated that M&P Hyperflex 13 would do the job without breaking the bank and because I was no longer using the 23cm band, the loss would be acceptable over the 20m long cable run.

Finally, I'd need to re-consider the antenna. Could I

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**Photo 1:** The author's path to the Isle of Man.  
**Photo 2:** Antenna array on the chimney.  
**Photo 3:** Path to Riccall, south of York.  
**Photo 4:** Path to Lisburn, N Ireland.  
**Photo 5:** Path to Amiens.

find a lightweight antenna that wouldn't over stress the AR500 or cost a fortune? Looking around I found the Dual PA144-432, a 2/70 Yagi with 8dB of gain on 2m and 9dB on 70cm. It was lightweight and compact with a minimal visual impact.

So now I had most of the component parts, but I'd have to sit tight and be patient, waiting for decent weather and some additional funds before going any further. For the time being I had no choice but to carry on using the Halo.

After getting over the serious disappointment of not using the Log-Periodic, the time had come for the first Tuesday of the month RSGB 2m SSB contest. The first one with the 2m Halo antenna and 50 watts. What could I expect given the surprising results I described in part 2?

Well, by now I'd come to 'expect the impossible' - and I wasn't disappointed. I managed ten contacts by the end of the evening, which I know isn't great but remember, I am still using the Halo. The best and most surprising was a contact with **Richard GD8EXI** on the Isle of Man, another obstructed path of 131 miles, **Photo 1**. Once again, the 2m band has proved it's not just for local chatter, even with a simple horizontal dipole.

At last the weather improved and so did my finances. Time to break out the credit card and order the coaxial cable, connectors, and the Yagi, and lastly not forgetting to book the aerial fitter. The Yagi, rotator, and mast were all fitted and a bonus was that I was able to retain the TV broadcast antenna below the rotator, **Photo 2**.

### Next steps

From previous tests, it was apparent that driving the Linear amplifier with 5 watts from the FT-817 was only ever going to produce a maximum peak



output of around 50 watts on SSB. Initially this didn't concern me too much, as rough calculations showed the ERP from the Yagi would be around 300 watts. A huge improvement on the Halo of course, and this time I had the ability to steer the antenna. The last connector was attached to the coax, checks were made for shorts, another SWR test performed and with no problems seen, the time had come; what results would I see with the Yagi?

Well, the difference was like night and day. This won't come as a surprise to readers who have already gone down this path, but for me being new to Yagi antennas (for communications), it was a revelation. For a start, GB3VHF which was just readable with the Halo, was now consistent and reliable. Where before on a good day it was received at S-0 and often below this, it was now fluctuating between S-0 to S-1 when received on the Icom IC-251. The Yagi was doing its job!

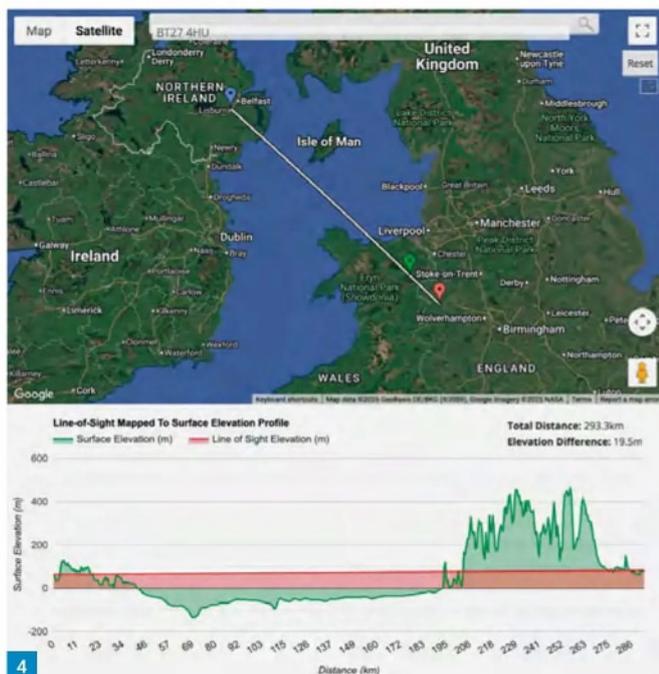
And so, armed with 50 watts, 8dB of gain and a rotator, what could I achieve this time? There were a couple of contacts I had previously managed using 50 watts and the Halo that stood out. The first was my contact with **Philip G4HOJ**, 111 miles away in Lincoln. That first QSO was workable but I remember it suffered slow QSB and was somewhat noisy. How would it work now with the Yagi?

I contacted Philip and we arranged another sked. The same non-line-of-sight path, the same QTH both ends, only this time the difference was obvious.

Back in December 2024 my log entry showed that I was receiving him at a maximum of S5 and he was receiving me at S6 to S7 with fading. There were moments when the link faded out completely but came back again just as quickly. This time I was seeing a more consistent S8 most of the time but the real difference was in link consistency; the contact didn't fade away to zero and was generally of a much higher quality - more like an occasionally slightly fading telephone call. The propagation mode? Originally I thought this was knife edge diffraction but now I'm having second thoughts. Could this be Troposcatter at work? With just 300 watts ERP from my station, I don't know if this is enough to support Troposcatter. Does anyone have any thoughts on this?

The next attempt with the Yagi was with another **Richard G4FBA**, at around 106 miles away in Riccall, just to the south of York, **Photo 3**. We'd made a brave/naive attempt with my Halo before being followed by an attempt with 50 watts into the Yagi, but the Pennines proved too much and no really discernible, good quality speech was detectable. However, when Richard sent a bit of CW, it was clearly audible. Although a bit of a disappointment at the time it did get me thinking about the feasibility of a keyboard-to-keyboard data mode at some stage. Surely if CW can make it, couldn't PSK31 work reliably? To be investigated later.

Anyway, back to the point. The second attempt



4

with the Yagi and G4FBA. This time, a bit of a brainwave had me reaching for my trusty Yaesu FT-221R. Although she's getting on a bit now I knew it would push around 12 watts out of the final amplifier. This was very handy as the Microset SR100 Linear Amplifier had an input rated at a maximum of 15 watts.

After testing proved that this approach produced a peak power output just under 100 watts, another sked was arranged with Richard. What improvement, if any would be seen jumping from 50 to 100 watts into the Yagi at my end?

The results were interesting. Although still noisy and with some deep fading, this time I heard Richard quite clearly around 70% of the time, and I guess it was similar for him; certainly enough for him to report that my FT-221R was producing 'good punchy audio'. This was a very different QSO compared to the first two attempts! Looking at the path profile now makes me suspect this is definitely Troposcatter at work. Once again, this test reinforces the idea that CW or another type of digital mode would likely be 100% reliable over this path.

And the final test for the month of July. Could I make a reliable contact with David G14SNA, Photo 4, in Lisburn, Northern Ireland? I had previously heard David much earlier in the year on my Halo antenna but didn't feel confident to bother calling him. After all he's around 187 miles away on a path that's obstructed by the Cambrian Mountains to the northwest of me in Shrewsbury.

Feeling bolder this time after witnessing the clear improvements in the link quality with Philip G4HOJ I arranged a sked with David using the FT-817 and 50 watts into the Yagi. The results were, for me, quite remarkable. We received each other at around 5+5 and with very little fading. The link

quality was very similar to the one I'd experienced talking with Philip G4HOJ earlier. In other words, to my ears, excellent!

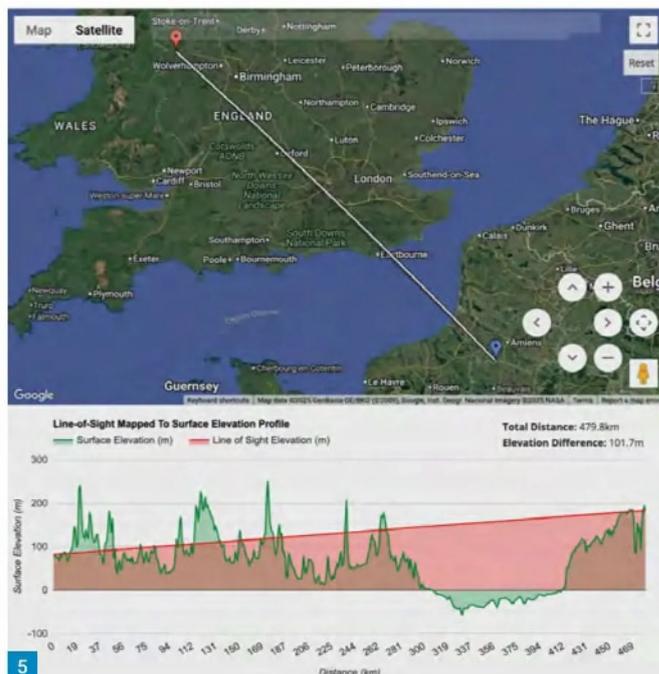
And now the 'pièce de résistance'. I just switched on the 2m SSB radio and heard **TM5R** in the noise with some QSB operating the club station in JN19BQ In Belleuse, just southwest of Amiens in France, **Photo 5**. Should I try working him with such a noisy signal at my end? I decided to give it a go. After a few attempts he heard me. We briefly exchanged reports and locations and it was done. Wow. Almost 300 miles on VHF. If I never exceed this distance I'll be a happy man. It's now easy to see why VHF SSB can become so addictive, so quickly. Now, let's think, could the AR500 cope with an 8-element Yagi?

Some of you will be reading this and thinking 'well, that's nothing new - I can manage twice that distance'. To me though, this is quite extraordinary. After years of reading the textbooks and magazines then going down the wrong path with VHF in 1982, I am finally starting to see the other aspects of our amazing hobby. It's an old cliché I know, but perhaps we take the privileges our licences give us, for granted. I think I did.

## Conclusion

I said at the start of these articles that I wondered if HF was too easy? Perhaps that wasn't fair. Comparing VHF communications with HF isn't really comparing apples with apples. What's fascinating about VHF and higher, is the realisation through experimentation, that the easy and lazy assumption that it's 'only good for across town natter nets' is completely wrong.

Perhaps making an effort with SSB on 2m looks too much like hard work with minimal reward, compared to installing an end fed HF antenna in a



5

back garden? For some of us though, something about VHF/UHF propagation is extraordinary. Looking at the blocked path profiles I have found, reinforces that feeling for me. It's science, but it almost feels like magic.

I would suggest it's time to take those unused 2m SSB radios out of the attic, fit a simple Halo antenna as high as you can, connect some decent coax (I'd recommend RG-213 as a bare minimum), and give this VHF mode another chance. The results will surprise you.

## Suggested reading

It's always a sobering thought when you realise you've forgotten things you thought you never would. In this case it took a read of *Understanding Ham Radio Propagation* from the RSGB (Also known as *The Fast Track to Understanding Ham Radio Propagation* in the US), by **Michael Burnette AF7KB**, to remind me about Fresnel Zones and Troposcatter. This is a small but excellent book, that covers off the principles of Tropospheric Ducting, Tropospheric Scatter, Knife Edge Diffraction, Fresnel Zones, Terrestrial Scatter, and then moves on to HF propagation principles.

## Acknowledgements

Thanks to Solwise (URL below) for permission to use their Surface Elevation Tool in these articles. <https://www.solwise.co.uk>

Lastly but not least, I have to say a big thank you to my local club, Salop Amateur Radio Society. Members of the club were pivotal in getting me as far as I have with my 2m SSB experiments. From initially firing my enthusiasm, to repairing equipment and supplying the roof mast for the Yagi. If you are considering joining your local club don't think too hard; just do it. **PW**

**Daimon Tilley G4USI**

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In this month's *On a Budget* we are going to take a look at the Chinese made Version 2 of a Si4732 Receiver, called the ATS-Mini, **Fig. 1**. At a cost of £23.49, is it worth the money?

Well, first, let us examine what we are buying. The Si 4732 is a 'Radio on a Chip' produced by Skyworks. According to the Datasheet, the Si4732-A10 is a "digital CMOS AM/FM/SW/LW/RDS radio receiver IC integrates the complete broadcast tuner and receiver function from antenna input to digital audio output." Think of it as the very latest, and enhanced version of the venerable old TRF Radio on a Chip, the ZN414, which was featured in my *Matchbox Receiver* construction article in the February 2024 *PW*.

## Features

The datasheet lists an impressive array of features:

- Worldwide FM band support (64–108MHz)
- Worldwide AM band support (520–1710kHz)
- SW band support (2.3–26.1MHz)
- LW band support (153–279kHz)
- Excellent real-world performance with integrated AM/FM/SW/LW/RDS
- Integrated VCO
- Advanced AM/FM seek tuning
- Automatic frequency control (AFC)
- Automatic gain control (AGC)
- Digital FM stereo decoder
- Programmable de-emphasis
- Advanced Audio Processing
- Seven selectable AM channel filters
- AM/FM/SW/LW digital tuning
- EN55020 compliant
- No manual alignment necessary
- Programmable reference clock
- Adjustable soft mute control
- RDS/RBDS processor
- Digital audio out
- 2-wire and 3-wire control interface
- Integrated LDO regulator
- Wide range of ferrite loop sticks and air loop antennas supported
- SOIC package

While the chip has been around for a little while in the guise of the ATS20 and ATS25 range of budget receivers, it is only fairly recently that it has been made into such a tiny self-contained package, and the Version 2 of this 'ATS – Mini' version is the one subject of review, costing the author just over £23, including postage, from AliExpress. A number of different people have contributed to the software development, including **Ricardo Caratti PU2CLR** and **Dave Stoney G8PTN**.

The radio came well boxed with a USB charging cable (a battery is fitted inside as



# The ATS-Mini Si4732 version 2 Receiver

**Daimon Tilley G4USI** recommends a cheap, small but surprisingly effective wideband receiver.

well as a loudspeaker!) and the briefest of instructions of how to access the menu. My version is in a good quality 3D-printed case, but an alloy version is available for extra cost.

The architecture of the chip is shown in **Fig. 2**, and it is a 16-pin SOIC package (Small Outline Integrated Circuit).

## Getting to grips

When the radio arrived, I was pleased to see it had a fully charged battery and was impressed by the clarity and layout of the small colour display. There are only two physical controls – an on/off switch and the rotary encoder. In my case I was provided with a choice of two knobs to fit myself by merely pushing on. Playing around in the menus revealed the following:

**Settings** allows control of brightness, calibration, sleep timer for the display, the colour theme of the display, and settings to do with the RDS display on the commercial FM bands. Long Wave is not explicitly included but I found that using MW1 I could tune down to 150kHz so it is indeed there, and MW coverage seems to go up beyond Top Band!

**Mode** allows choice of FM, AM, USB and LSB.

**Band** conveniently allows scrolling between a choice of all amateur bands, the CB band, all SW Broadcast bands, three MW bands and the commercial VHF bands (actually from 66 – 108MHz.)

**Volume** is good and can be turned up quite loud. Note the speaker is on the bottom surface so it helps to raise the radio off the desk a little – perhaps four tiny rubber feet would be useful for this.

**Step** allows tuning steps from 10Hz to 1MHz to be selected.

**Bandwidth** allows selection of between 500Hz and 4kHz on SSB, up to 6kHz AM, with FM having bandwidths from 40kHz to 110kHz, plus an 'Auto' function.

**Mute** mutes audio output until pressed a second time.

**AGC / ATTN** allows Automatic Gain Control as well as levels of attenuation to be set.

**SoftMute** is shown in the menu but apparently had no effect.

**AVC** Automatic volume control was also shown and available.

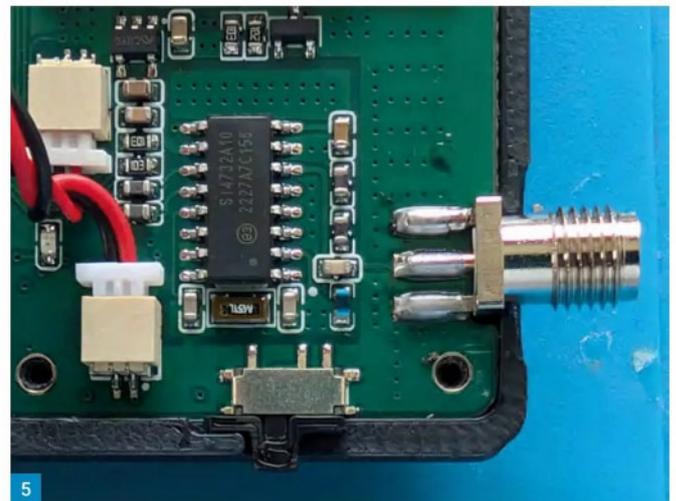
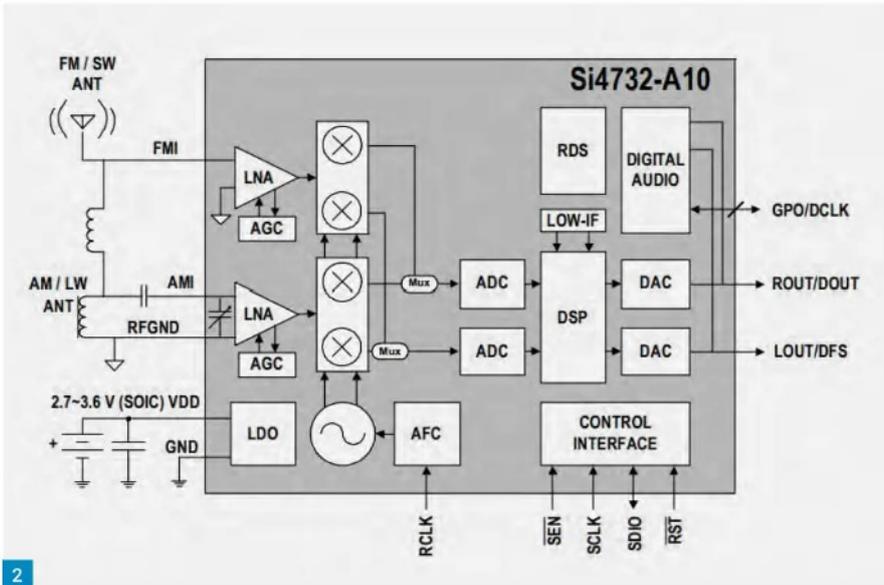


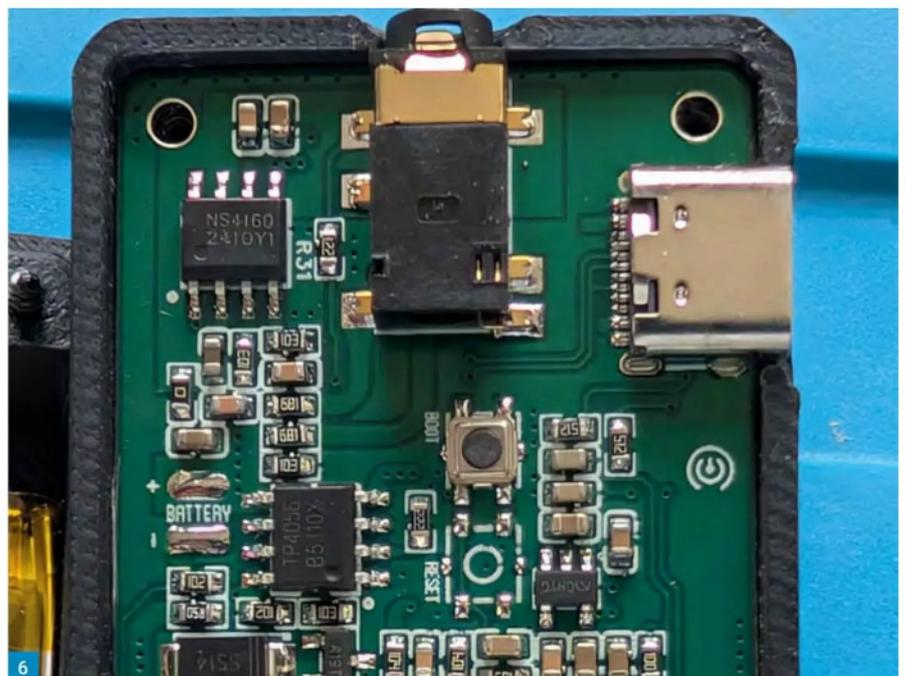
Fig. 1: The ATS-mini.  
 Fig. 2: Chip architecture.  
 Figs 3-7: Various internal views.  
 Fig. 8: Alongside the Belka DX for comparison.

### In use

This is a surprisingly capable tiny radio, with a few shortcomings. I found the display to be excellent and clear, if small, and although there is only one control for all functions, these were easily navigable and understandable.

I started on SW and found that reception of Broadcast (BC) stations and amateur SSB was really pretty good and understandable at good volume. Adding headphones to the provided jack obviously improved audio quality over the tiny internal speaker.

CW was, however, a little disappointing. Although the Bandwidth filters seemed to work reasonably well, for reasons I don't understand, decent CW can be received, but more often than not, the CW signal, regardless of strength, sounds a bit like a parrot being strangled under





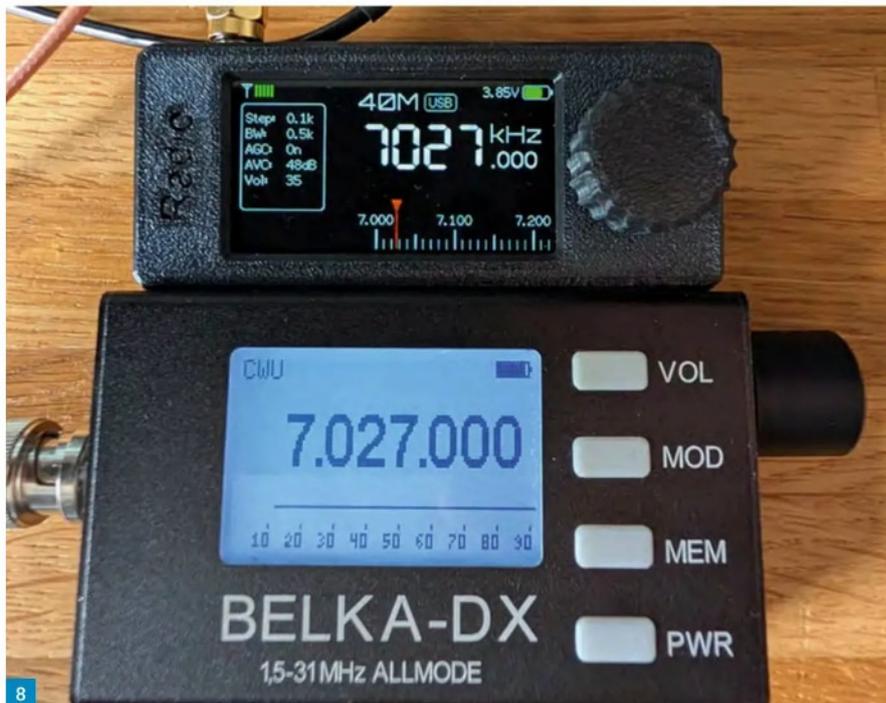
water (or at least how I *imagine* that would sound!). Thinking it was something to do with the frequency and the tiny speaker, I tried headphones, but with the same result. The CW remained copyable but was just not a pleasant sound to listen to and would soon get tiring.

VHF was really very good, the RDS worked very well and was quick to update. MW also seemed good, at least during daytime.

Having played around and been quite pleased, I reached for the screwdriver and took the back off to reveal the tiny battery and speaker in the back cover and the PCB in the front. Levering gently, I found the PCB was just a pressure fit in the case. Photographs of the inside are shown in **Figs 3 to 7**. Examination shows that the 'brains' of the radio is the ESP32 microcontroller (Fig. 4) with very few ancillary components associated with the Si4732 (Fig. 5.) The audio amplifier is the NS4160 IC and the TP4056 IC provides the charge controller for the battery. Charging is via the USB port and cable provided.

I decided that I would try the receiver alongside my favourite small portable receiver, the excellent Belka DX and these are shown together in **Fig. 8**, showing just how small this little radio is. I connected both radios to a coax switch and the station antennas to make a direct comparison between the two. This is, of course, not very fair – the Belka DX is superb and costs £90 plus import duty, taxes and delivery from Belarus.

But I was very surprised that the ATS-Mini receiver stood up very well in every case except for CW. It was *slightly* less sensitive and there were some very weak stations I could hear on the Belka but not on the ATS-Mini radio. The audio from the Belka was also more pleasant, probably due to the bigger internal speaker. Where the Belka really stood out was its superb CW reception and better bandwidth filtering.



It also has a number of user-programmable memories.

I have often used the Belka as a companion for homebrew CW transmitters, and there is no way I would do that with the ATS-Mini, except out of pure necessity sadly, but in all other respects, size, cost etc. it is a great little machine offering excellent value for money. It is perfect to throw in your pocket and take on holiday for example, without crying too much if it gets lost or damaged.

## Modifications

It does not stop there, of course. As an open-source project, software enhancements are very likely and there are mods published to assist sensitivity on a whip antenna by adding a Hi-Z transformer, as an example. That prompted me to switch from using my station resonant and full-size antennas to a short 60cm telescopic whip on each. Both radios performed well with moderate to strong signals, but with S1 – 2 CW signals on the Belka being resolved and copyable, they could not be heard on the ATS-Mini, indicating that if this is your preferred operating style, i.e. portable with compromised antennas, then the Hi-Z mod, which includes a preamplifier and uses just three SMD devices, a J-FET transistor and two resistors, would be worth doing. Details can be found at this link:

[www.youtube.com/watch?v=BzrOE9BFpyU](https://www.youtube.com/watch?v=BzrOE9BFpyU)

although in a subsequent video the same presenter shows a version he has just built which includes this feature, plus a separate headphone amplifier, built into the PCB design. This prompted me to check mine more

carefully, and despite being purchased in June, my version did not include these mods.

## Firmware

Those modifications prompted me to check firmware versions. My version 2 firmware is version 2.11 – a February 2025 release – but checking the website listed on the radio and found in 'Settings – About' revealed that 11 further upgraded versions had been released, and currently they sit at Version 2.30, released on 7 August (or perhaps 8 July, depending whether the UK or US date format is being used).

Nothing in the Change Logs indicated any improvements to CW reception quality, but it seemed prudent to update anyway and assess for myself. There is a good video on YouTube about how to actually go about this upgrade here:

[www.youtube.com/watch?v=C8vLWTCgQPU&t=78s](https://www.youtube.com/watch?v=C8vLWTCgQPU&t=78s)

But try as I might, I could not get the new firmware to flash, despite quite a number of tries. I tried every combination of using the Boot and Reset buttons on the PCB without any joy, using both the web firmware flasher and a downloadable one, so that seems a shame, but your mileage may vary. If you purchase the version in the YouTube link above, then at least you will know that that model can be flashed – mine was from a different supplier.

So, can I recommend it for casual listening? Yes – absolutely – it is excellent value for money, but if you are after a more polished small receiver, then the Belka DX outshines it! **PW**

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**Tony Jones G7ETW**  
charles.jones125@yahoo.co.uk

## The G63

**Tony Jones G7ETW** looks at the latest incarnation of the Talinfo G63 UHF handheld.

Looking for something on ML&S's website recently, I came across **Gary Spiers'** video showcasing the G63, a simple 16-channel UHF handheld made by Talinfo in China. In 2022 I bought two of these on eBay, for £58, and somehow I lost them. But while they were with me, I did some testing and started an article, which, I'm glad to report, I've found! On discovering that ML&S sell these, I made one of those one femto-second decisions and ordered two more G63s at a cost of £90 plus delivery.

**Fig. 1** is a photo showing a new ML&S-badged G63 and, inset, one of my originals. That's a cute radio; even smarter in black.

The top surface has a Baofeng-style SMA connector and an on/off/volume knob. The left side has PTT and channel up and down controls, and the right has sockets for external audio (and programming) and charging via USB-C.

### Modern antenna 'sockets'

If you are completely solid in your RF gender awareness, then by all means skip this section. But I think there is confusion here.

**Fig. 2** shows six 'normal polarity' RF connectors (Reverse ones do exist). Males are on the left, females on the right.

A male connector (a 'plug') has a pin in the centre and any threads, if present, are on the inside of the outside wall.

A female connector (a 'socket') has a barrel in the centre with a conductive inner cylinder to accept the male's pin. Any threads present are on the outside of the barrel.

**Fig. 3** is a photo showing two handheld radios. The Yaesu (right) is how things used to be, and this SMA lacks a pin. It's female, a socket in general parlance and as defined above. The G63 (left), in common with 99% of modern handhelds, clearly does possess a pin. This SMA, which anyone would call the radio's antenna 'socket', is a plug.

That may not sound right I know, but it's logical. I've put my tin hat on and I look forward to the *Letters* page next month.

### Initial set-up

ML&S's G63s come with everything you'd expect plus a Baofeng-type programming lead. I already have several of these, but I agree with ML&S for including one. It's so annoying to get a new radio and be unable to program it.

ML&S supply G63s pre-programmed with a mix of 70cm frequencies from 430.01 to 439.91MHz, as shown in **Fig. 4's** screenshot. Each channel is simplex, with matching Rx and Tx 'privacy codes', so these radios can legally be used straight out of the box by radio amateurs.

Er...make that, 'could probably'. 'Frequency Hopping' is switched on, and I don't know what that does. Can it really be FHSS, in such a cheap radio? If anyone knows, please drop me an email.

### Power

In the instructions A4 sheet, which, as Chinglish goes, isn't too bad, Talinfo have a specifications table but don't quote power figures. In 2022 they were less reticent, and those instructions claimed 3W and 1W for high and low power. In my (then) tests, using an AV600 analogue meter, I got the same 1W reading for high and low power settings.

My new G63s do rather better. High and low powers are still the same, but as the photo in **Fig. 5** shows, I now get 2.56W. This is a different type of meter, so all I can say with certainty is that the power has doubled.

### Audio

Receive audio from my original G63s was excellent, and the new ones are just as good. I do like a continuously variable proper volume knob.

I'm getting good transmitted audio reports, using the internal mic. I don't recommend using the supplied headsets. The switches in the jack sockets can and do fail, leaving the internal mic and speaker disconnected after something plugged in is removed. Sometimes 'working' the socket with something small, non-conductive and flake-free can restore switch functions, but this fault, in my experience, is usually fatal. Aside from programming, leave these sockets alone is my advice.

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Ch	In Freq	Tx Freq	QT/PTX Dev	QT/PTX Dev	Tx Power	N/B	Compressor	Scramble	Frequency log	CTCSS	CTCSS Code	Scan All
1	439.75000	439.75000	97.4	97.4	High	Wide	OFF	OFF	ON	OFF	9999999	All
2	439.12000	439.12000	103.5	103.5	High	Wide	OFF	OFF	ON	OFF	9999999	All
3	437.25000	437.25000	87.0	87.0	High	Wide	OFF	OFF	ON	OFF	9999999	All
4	435.54000	435.54000	30748	30748	High	Wide	OFF	OFF	ON	OFF	9999999	All
5	434.17000	434.17000	179.9	179.9	High	Wide	OFF	OFF	ON	OFF	9999999	All
6	432.39000	432.39000	136.5	136.5	High	Wide	OFF	OFF	ON	OFF	9999999	All
7	439.90250	439.90250	30238	30238	High	Wide	OFF	OFF	ON	OFF	9999999	All
8	438.76180	438.76180	30259	30259	High	Wide	OFF	OFF	ON	OFF	9999999	All
9	437.96000	437.96000	88.5	88.5	High	Wide	OFF	OFF	ON	OFF	9999999	All
10	432.30250	432.30250	97.4	97.4	High	Wide	OFF	OFF	ON	OFF	9999999	All
11	433.32000	433.32000	82.9	82.9	High	Wide	OFF	OFF	ON	OFF	9999999	All
12	434.17000	434.17000	100.0	100.0	High	Wide	OFF	OFF	ON	OFF	9999999	All
13	435.92500	435.92500	30748	30748	High	Wide	OFF	OFF	ON	OFF	9999999	All
14	439.91000	439.91000	20522	20522	High	Wide	OFF	OFF	ON	OFF	9999999	All
15	434.40500	434.40500	110.0	110.0	High	Wide	OFF	OFF	ON	OFF	9999999	All
16	439.91000	439.91000	74.4	74.4	High	Wide	OFF	OFF	ON	OFF	9999999	All

Ch	In Freq	Tx Freq	QT/PTX Dev	QT/PTX Dev	Tx Power	N/B	Compressor	Scramble	Frequency log	CTCSS	CTCSS Code	Scan All
1	433.17000	434.17000	102.5	102.5	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
2	432.00000	434.00000	110.0	110.0	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
3	432.37500	434.37500	102.5	102.5	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
4	432.30000	434.30000	102.5	102.5	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
5	432.20000	434.00000	75.0	75.0	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
6	432.40000	432.40000	OFF	OFF	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
7	433.47000	433.47000	OFF	OFF	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
8	432.50000	432.50000	OFF	OFF	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
9	433.92000	433.92000	OFF	OFF	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
10	432.55000	432.55000	OFF	OFF	Low	Wide	OFF	OFF	OFF	OFF	9999999	All
11												
12												
13												
14												
15												
16												



Fig. 1: A new ML&S-badged G63. Fig. 2: Six 'normal polarity' RF connectors. Males are on the left, females on the right. Fig. 3: Two handheld radios, G63 on left, Yaesu on right. Fig. 4: Pre-programmed frequencies. Fig. 5: Measured power output. Fig. 6: What the author currently has programmed.

### Programming

First time around, this was a nightmare. I quote from my unfinished 2022 article.

I was directed, by the eBay seller, to a utility downloadable from Talinfo's website. This program has a strange name composed of Chinese and Latin Script characters. The supplied rar archive unpacks, but the installer file does not work on my Windows 10 laptop.

Not entirely surprised, I tried Chirp (daily-20221109) which knows this radio as an Arbee AR-63. Problem solved! Er... no. I was able to load channels up the radio but CTCSS was not happening.

I rang Martyn Lynch and Sons, who had been advertising the G63 on their 'Something for the Weekend' emails. G63s had sold like hot cakes at the November Hog Roast, I learned. They were easy to program and customers had reported no issues. Clearly, I was missing something.

Within minutes I'd received an email from ML&S with a link to a download (TXQ G63 Software.zip) for a programming utility called JW-F59FSK-BC. This installed and worked first time, allowing me to set up the radio.

### Myset-up

ML&S have a link to the 2025 software on their website. I think it's the same software as above. It certainly looks the same, and the 'About' tag shows a date in 2022. It downloaded, unzipped, installed and ran without issues.

Fig. 6. shows what I currently have programmed.

With no screen, you do have to remember what channel is what. This is what works for me:

- Repeaters first, in callsign order, set to high power.
- Simplex next, an odd number in channel name

sequence, symmetrical about the calling channel if possible. Power set to low.

- No CTCSS on repeater receive. Idents indicate repeater life.
- All radios that look the same, programmed the same.
- No non-amateur radio frequencies to save potential embarrassment.

### Conclusion

Some reviewers, I've noticed, have a code. It's not cool to admit that a simple radio has won their hearts, so their justification for using one is their cheap and cheerful disposability.

'If it goes overboard when I'm next maritime mobile, I won't cry too much', such a reviewer might say.

Well, I won't do that. I liked my original G63s, and I'm delighted to have some more. And ML&S, by making the programming straightforward, have made these a better buy.

With care I think my G63s will last a good long time, and I intend to enjoy them. That is, if I don't lose them ... **PW**

Frank M. Howell, PhD, K4FMH  
practicalwireless@warnersgroup.co.uk

It is often said there is nothing like Paris in the Spring what with the Eiffel Tower as a backdrop to fine outdoor French cuisine. If you cannot make it to Paris, take along the EiffelTenna to get on the HF bands wherever you operate outdoors! This centre-loaded HF vertical is ideally suited for 'fine French dining' on a ground plane sheet that folds up nicely along with the antenna, coax, and other items into a small padded photography tripod bag. Here is how I designed it and built several to date.

The EiffelTenna concept I created was inspired by a YouTube video published by **Jim W6LG** and further work by **Jason VE5REV** illustrating the use of a metal tripod designed to hold photography lighting as an antenna. This specific design has a metal telescoping centre that is electrically isolated from the extendable legs on the bottom. It has the Eiffel Tower resemblance from this structure. These tripods come in various extendable heights. The one that I chose extends to about eight feet, which the reader may already guess is the height for a 10m vertical antenna. By adding a 17ft telescoping whip to the top, we can set the whip for desired total lengths, such as 16.5 feet for 20m. Using a centre-loaded design with the addition of an inductor coil between the tripod and whip, we can get 40m in tow easily. Continuing the 'fine dining' concept, I use a sheet of Faraday Cloth on the ground to place the tripod upon with a wire and clip to complete the ground plane for the vertical. This sets up and takes down quickly for the portable operator.

### Preparing the tripod base as a vertical

There are three major steps to ready the tripod base to serve as the main part of the radiating element. This includes preparing the sections of the shaft and the feedpoint at the bottom of the centre shaft as well as modifying the tripod tip for fitting an extendable whip.

### Getting the base ready

The annotated pictures in **Fig. 1** show the key steps to make the metal tripod base a vertical radiator. A standard SO-239 mobile antenna mount is used to connect the lowest tripod shaft section to the centre conductor of the coax. A hole the size of the hexagonal coupler nut is drilled through the shaft as shown. Since it is a tripod with extendable leg braces, take care to place the hole so that the coax can properly connect. Clean any paint or other coating from the immediate area around the hole to allow for a good electrical connection. I

# The EiffelTenna

**Frank Howell K4FMH** describes a Lightweight, Low Impact, Portable Multiband HF Antenna.



used a rotary hand tool by Dremel.

On the rear side a bolt is inserted into the coupler nut inside this shaft. Before the coupler nut can be put through the shaft, the edges on the hexagonal nut must be ground down sufficiently to fit the round hole. This may take some experimentation but it will produce a good solid mechanical and electrical connection.

### Preparing the shaft sections

A key is to ensure that each section of the tripod's shaft has a good low-resistance electrical connection to the others it touches. This process is shown in **Fig. 2**. The plastic retainer brackets are removed by unscrewing the bolt on each side of the shaft, freeing each shaft section. Clean the paint and other coatings off the shaft using a rotary tool with a metal sanding or grinding fitting. I also added very thin copper tape purchased at a hobby shop but Amazon or eBay are alternate sources. I also experimented with flowing a light coat of solder to bond the copper tape but it proved to increase the diameter of the shaft so it would not fit properly. Note that Fig. 2 contains pictures from different builds so one tripod is black while another is silver but they are the same model of tripod, manufactured by Neewer. I cannot stress enough to ensure that continuity



is present as you reassemble the shafts back into the base section.

### Modifying the tripod to mount a whip

Most tripods for this purpose have a fitting on the top section with a standard mount thread for camera lighting equipment (see **Fig. 3**). One could try to obtain a compatible adapter to a 17ft telescoping whip (either a  $\frac{3}{4}$  x 20in thread or a metric M10). However, I just used a rotary hand tool and removed this fitting as shown in **Fig. 3**. In my case, this resulted in a vertical shaft height of 7.5ft, which is close to the height for the top end of the 10m band.

**Fig. 1: Prepare the tripod base.**

a. Drill hole about the size of a 3/4"x20 coupler nut through base section of tripod shaft. This will become the feedpoint. Note the black plastic assembly: it insulates the vertical shaft from the metal legs.

b. Use common SO-239 insulated mount with ring terminal and bolt with washer, lock washer. The ring terminal will connect to counterpoise. Grind edges off of coupler nut so it fits through the shaft hole (left). (Hex-to-round shape.)

**Fig. 2: Prepare tripod shafts.**

Use copper adhesive tape at shaft joints to ensure good low-resistance, electrical connection. Then CHECK continuity!

**Fig. 3: Modifying the top section.**

a. NEEWER 8 ft Air Cushioned Photography Light Tripod. Tip of tripod needs removal OR an adapter procured. I removed it.

b. I took a common 3/4x20" coupler nut and modified it. A rotary tool removed enough of the nut edges on one end to fit into the metal tripod shaft. A hole was drilled and a nut-and-bolt added. This makes a good electrical connection between the trip and the telescoping whip (far right).

c. 17' stainless steel telescoping whip screws into coupler nut (left). The 7.5' tripod + 17' whip is about 24.5', but the vertical length of the whip can be reduced to 9' for 14 MHz resonance

After removing the top adapter, I scraped the inside of the shaft clean of any coatings. Then a coupler nut was adapted so it would fit partially into the shaft. Similar to the hex nut on the SO-239 mobile mount used for the feedpoint on the base, I ground off enough of the edges on the nut to fit into the shaft itself. A hole is drilled through both the shaft and the nut to allow a bolt, lock washer and nut to securely attach the coupler. Verify continuity on this section of the vertical radiating element before proceeding.

At this point, we have a tripod and 17ft whip resulting in a non-resonant 24.5ft vertical antenna. While this might be worth experimenting with as a random wire vertical, it is more effective to shorten the whip to about 9ft to yield the 16.5ft length for resonance on 20m. Do *not* shorten the tripod or the electrical connection at each extended shaft joint will likely be an open circuit. This length gives us the base configuration of the EiffelTenna.

### Creating a counterpoise for the tripod

The reader could use wires or any other sufficient counterpoise for this vertical. I have used a small rectangular sheet (42 x 35in) of Faraday Cloth very successfully. Set the table for fine French dining with the EiffelTenna by putting down some Faraday Cloth and placing



3a



3b



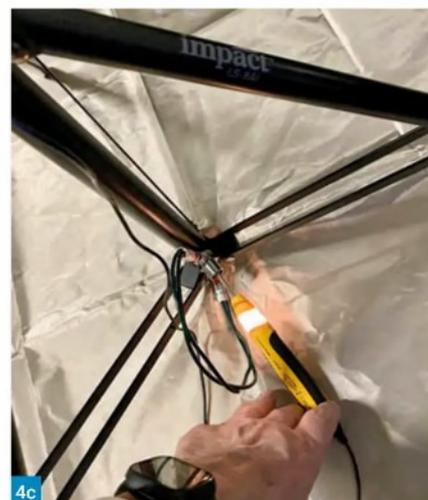
3c



4a



4b



4c

the tripod on top of it. This is illustrated in Fig. 4. To connect the counterpoise, put a ring terminal on the braid-side of the SO-239 feedpoint connector (see centre illustration). After building a two-wire cable with a banana plug to insert into the terminal end, I bolted it to the Faraday Cloth through a metal grommet in the centre. Later, I learned that a sturdy alligator-style clip will work just as well and is much easier. Repeating myself, *double-check continuity!*

### Multiband operation

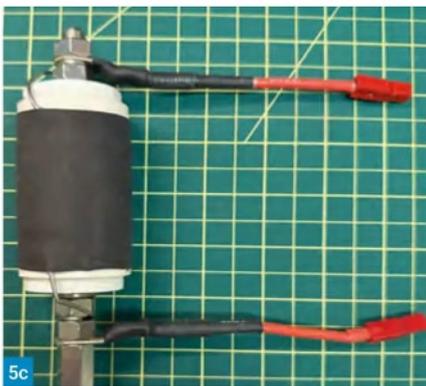
Using the tripod by itself, 10m works well. While I was merely testing the antenna, I accidentally worked a ham in Colorado, some 900 miles away (about 1500km), on FT8 with 5 watts into the EiffelTenna on the Faraday Cloth counterpoise. The antenna was *inside my garage with the doors closed*, next to an automobile and a wall of wire shelves holding a lot of my portable gear! While unintended, this accidental contact was a pleasant reminder that the tripod base by itself will indeed work on the 10m band.

**Fig. 4: Installing a counterpoise.**

a. I tested a small sized Faraday Cloth sheet as a counterpoise. Note ring terminal to nut-and-bolt attached to Cloth center. Later, I discovered that a simple wire clamp works just as well.

b. Illustration of SO-239 feedpoint on base of tripod. White resin washer insulates the counterpoise connection from the vertical shaft. c. Double-check continuity!

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**Fig. 5: Adding 40m using a centre-leaded inductor coil.**

- a. Here is the EiffelTenna on my sloping driveway using a Faraday cloth as a counterpoise. The whip is extended to 9' so that the antenna will work both 20M and 40M. Other bands are obtainable using adjusted whip and coil.
- b. JPC-7 adjustable coil can be set from little to no inductance to the desired 12  $\mu$ H to yield a desired 40M resonance. Use an analyzer or pre-mark the coil. Also, see right.
- c. Here's a trick to bypass or include an inductor coil developed by Michael KB9VBR. Connect to bypass, disconnect to include.



**Fig. 6: Packed down into a padded camera tripod bag.**

With the whip set so that the vertical length is about 16.5ft, the antenna tunes up on 20m very well. The impedance is 47 $\Omega$  with 1.15 $\Omega$  of inductive reactance in this instance outdoors on Yazoo Clay-type soil. The SWR at 14.154 MHz is 1.06. This is a very good match, easily working with transceivers without a tuner.

With the 20m length of 16.5ft (7.5ft tripod + 9ft whip) as a base, adding 40m can be accomplished by inserting an inductor coil between the tripod and the whip, resulting in a more efficient centre-loaded vertical as compared to a ground-mounted coil and whip. The issue is what inductor value should be used?

Several online calculators are available. I used one at the [66pacific.com](http://66pacific.com) website which suggested about 12 $\mu$ H for the total height of 16.5ft and the inductor inserted on top of the tripod at 7.5ft. I estimated that the radiating conductor averaged 0.6in as it varies from one inch at the feedpoint to 0.4in at the top of the whip when it is reduced to 9ft.

For this build, I chose an adjustable one from Chelegance. The JPC-7 coil measures a range of inductance on my calibrated HP 4275a LCR meter from 0.3 to 21.2 $\mu$ H, easily containing the suggested value of 12 $\mu$ H. I have shown the full EiffelTenna set up on my sloping driveway in Fig. 5. An inset picture shows the JPC-7 coil installed. I attached inexpensive ankle weights to the tripod legs for additional stability.

A very useful trick by Michael KB7VBR on his Youtube Channel is an easy way to bypass the coil if it is not needed. The illustration in Fig. 5 shows two short wire jumpers with Powerpole connectors installed on each end and ring terminals above and below the inductor (a fixed one from Wolf River Coils is

in the illustration). The coil can be inserted or bypassed in the radiator by simply connecting or disconnecting the jumper.

### The EiffelTenna as a portable multiband vertical

This homage to the Eiffel Tower is a lightweight, low impact, multiband vertical for HF. No stakes in the ground or wires hung from trees, something more parks and public spaces frown upon today. It is deployed and taken down quickly. Fig. 6 shows how I pack it down into an inexpensive padded camera tripod bag, along with coax and a small antenna analyser (hidden by the Faraday Cloth). Many adjustable inductor coils will work in this design. I just happen to use the Chameleon JPC-7 coil here. If there is modest wind, some ankle weights are attached around each leg using the Velcro built into each one. With only 20 watts SSB, I've worked all along the East Coast from Central Mississippi with very good signal reports, even with very poor band conditions.

This vertical can be easily adjusted for 40, 20 and 10m. Shortening the whip to 3.7ft with the tripod at 7.5ft and the coil bypassed will get the antenna into the 15m band. This is likely more efficient than using an ATU to match the 40m harmonic on 15m. The WARC bands can be tuned by adjusting the whip and using an analyser. I find that the Faraday Cloth sheet is far easier to lay out underneath the tripod and to fold up upon completion of the operation. All the parts in this antenna build are not very expensive for hams who are comfortable shopping the online resellers. Consider building one for your portable operating adventures. *Bon Appetit!* **PW**



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Keith Rawlings G4MIU

keith.g4miu@gmail.com

**H**ello and welcome once again to *Antennas*. After a break last month to catch up on some reader feedback I will return to discussing some of the tasks that can be carried out using a Vector Network Analyser or VNA. As before I will focus on using the NanoVNA family of analysers. There are various versions of Nano's available and in my case I use a VNA-3G. The techniques discussed, though, can be used with other VNA's.

### VNA as a dip meter

A Dip Meter (or Dipper) is a device that can be used in the measurement and testing of radio frequency circuits. Traditionally it will be enclosed in a metal case and is basically a tuned L/C oscillator that has an exposed coil, which determines the frequency range, and is used to couple to devices under test.

To adjust the frequency of the oscillator there will be a tuning knob on the case linked to a frequency scale and a means of reading the amplitude of the oscillator, usually a meter, the sensitivity of which can be set using a sensitivity control.

The exposed coil is used as a 'Coupling coil' and if it is presented to a resonant circuit, such as a trap, this circuit will absorb current from the coupling coil when the circuit under test is tuned to the same frequency as the oscillator thus producing a 'dip' on the panel meter.

To cover a wide range of frequencies the coupling coil can be unplugged and replaced with coils covering the appropriate frequency (a commercial dip meter will invariably have a set of coils provided with it).

The original dip meters were called GDO's, that is Grid Dip Oscillator, where the oscillators used a thermionic valve. In later years the meter was still a GDO but with the advent of the FET it became a Gate Dip Oscillator. However operation was the same, the coupling coil was placed near the tuned circuit, the oscillator was tuned over the appropriate frequency range and when resonance was found, the tuned circuit absorbed current from the GDO's oscillator, this was demonstrated as a 'dip' on the unit's meter, and the frequency was then read off of the tuning scale. Simple, but there are pitfalls to avoid.

The coupling between the two circuits needs to be 'loose' otherwise there could be interaction due to 'pulling', which will detune the circuit under test. Another factor is that although the GDO would have a frequency scale, the accuracy of this scale could vary greatly due to drift in the oscillator circuit and also to interaction just mentioned.

To accurately obtain the frequency of the GDO it is usually possible to monitor this on a receiver. Tune it to the 'ballpark' figure given by the GDO's scale while using a short piece of wire for the antenna. Then, fine tune the receiver to monitor the signal from the GDO. Alternatively, loosely couple the in-



## More on VNAs

Keith Rawlings G4MIU's suggests yet another use for VNAs before covering other antenna-related topics.

put of a frequency meter/counter (again to avoid pulling the meter off frequency) to the GDO after the measurement has taken place. Alternatively, something like the TinySA could be used to very accurately display the frequency of the dip meter.

Despite these limitations, when used with care the traditional GDO is a great tool for measuring things such as the resonance of tuned L/C circuits, resonance of antenna elements and crystals. It is also used to measure Capacitance and Inductance where a tuned circuit is made up of either an accurate known value capacitor or inductor. Also, they can usually be used as an Absorption Wave Meter, a relative Field Strength Meter (FSM) in addition to acting as a Heterodyne Frequency Meter and a Signal Source.

An introduction to using a dip meter can be found

here:

<https://tinyurl.com/2hcd84v7>

Incidentally there were Tunnel Dippers that used a tunnel diode in the oscillator circuit potentially offering higher frequency operation.

Fig. 1 shows a late 1970's vintage Grid Dipper.

### Enter the VNA

It is possible to use a VNA as a dip meter. To do this all that is required is to connect a suitable coupling loop to the S11 port of the device.

I suggest that it is best to mount the coupling loop on an SMA connector or on a short pigtail cable and mate that with the socket on the VNA. The size of the loop, its inductance and physical diameter, will generally be dictated by the desired frequency and/or size of device being tested.

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Fig. 1: Traper Gate Dip Oscillator Kit with a range of 440kHz to 280MHz. Fig. 2: Setup for measuring a trap. Fig. 3: Sense loops.

Fig. 4: Response of the trap on the NanoVNA using SWR selected. Fig. 5: AN-SOF box to select Sommerfeld-Norton model. Fig. 6: AN-SOF New Segments Display in the Models Tab.

I have seen it suggested that you don't need to perform a calibration to use the VNA as a dip meter but just set up the sweep to include the frequency you believe the resonant circuit will 'ring' on. However, I tend to calibrate so then I know that everything is set up properly.

To make a measurement you move a coupling loop connected to the S11 port close to and on the axis of the test circuit. At resonance you should see a dip in the response of the SWR or Return Loss plots and depending on the sweep width, possibly a few harmonics.

Making a coil for the VNA is relatively simple. With the GDO the coil has to be of a value that will match the capacitor to form a tuned circuit at the appropriate frequency (or more correctly frequency band).

With a VNA the frequency generation is all performed for us within the device and instead of a coil forming a tuned circuit, all we need is a 'sense coil' of some sort. A benefit of this is that there is very little 'oscillator pulling' as found with a traditional dip meter.

The example I have chosen for this discussion is a 7MHz trap from a G8KW/W3DZZ trap dipole. Fig. 2 shows the 7MHz trap under test. The traps have a dimension of 55 x 35mm and are potted, meaning there is no way to see inside without literally destroying them.

I made up a trio of sense coils for my VNA-3G from a reel of wire used for aircraft wiring. This has a cloth outer and the name Tefzel on the reel and was given to me years ago. As I've never used any of it before, I decided to put it to use to make some coils. Note that any stout insulated wire should be fine.

To check the traps, I formed up two loops of wire, one 65mm in diameter, another 100mm in diameter and a third was made 45mm in diameter to make up a set.

The 100mm loop has two turns as does the 45mm but for the 64mm loop I thought I would try three turns just to see how it compared.

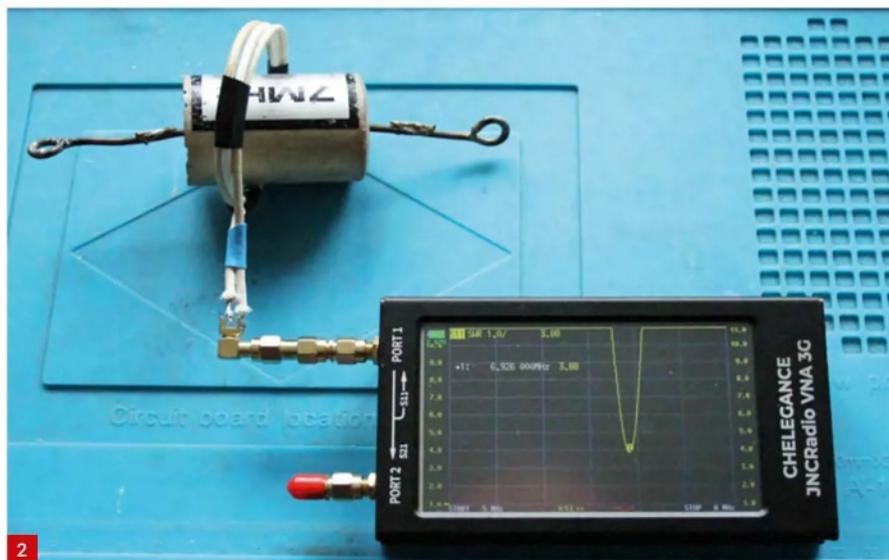
The length of wire needed is simply the coil's diameter and the number of turns multiplied by pi or  $\text{Length} = \pi \times \text{Average Diameter} \times \text{Number of Turns}$ .

The wire was then coiled up and held in place using insulation tape and shrink sleeving.

I then simply soldered the loops onto a female SMA socket which can also be mounted on a short cable if needed, Fig. 3.

If you do calibrate, do so where the loop connects to the cable.

It is then a simple matter of bringing the loop into the proximity of the trap as seen in Fig. 2.



I had the VNA-3G just set to read VSWR and as you can see from Fig. 4, there is a distinct response where the trap is resonant at 6.926MHz. Incidentally, I found no difference between the 65mm and 100mm loops in this case.

These traps cannot be adjusted but if you were designing your own then this method can be used to bring them to resonance.

As I knew these were 7MHz traps I used a sweep from 5MHz to 8MHz but if checking an unknown trap, a wider span may well be needed. However, bear in mind that if the number of sweep points used is too few, you may miss the response altogether.

If you are testing a tuned circuit using a toroid, then thanks to the self-shielding properties of the toroid you may have difficulty in getting a dip. In this case place a couple of turns of wire through the toroid and solder these to a connector. Disconnect the VNA first!

The elements of an antenna may be checked for resonance by connecting a suitable loop to the

NanoVNA and placing it near the element where a response should then be seen on the resonant frequency.

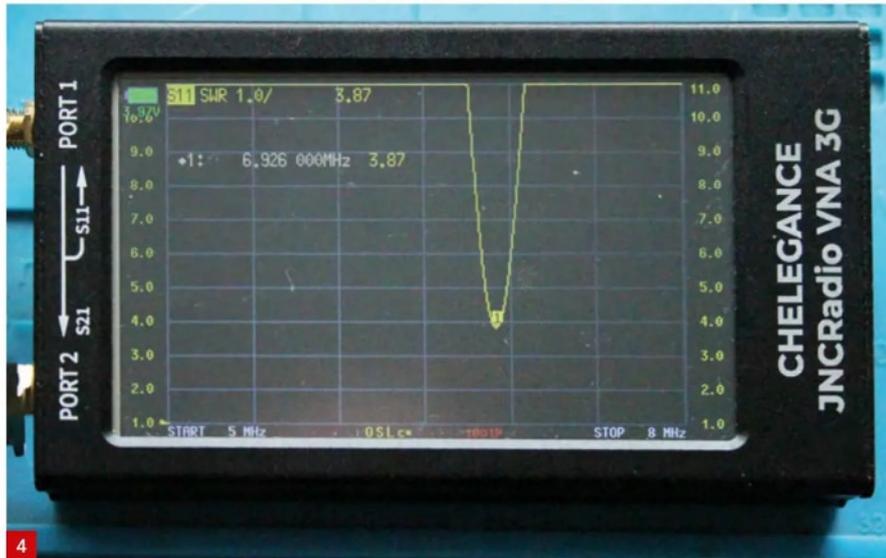
Always remember that devices being tested may well be affected by nearby objects which may detune them and as in the case with the GDO, keep coupling a loose as possible.

### A sad but cautionary story

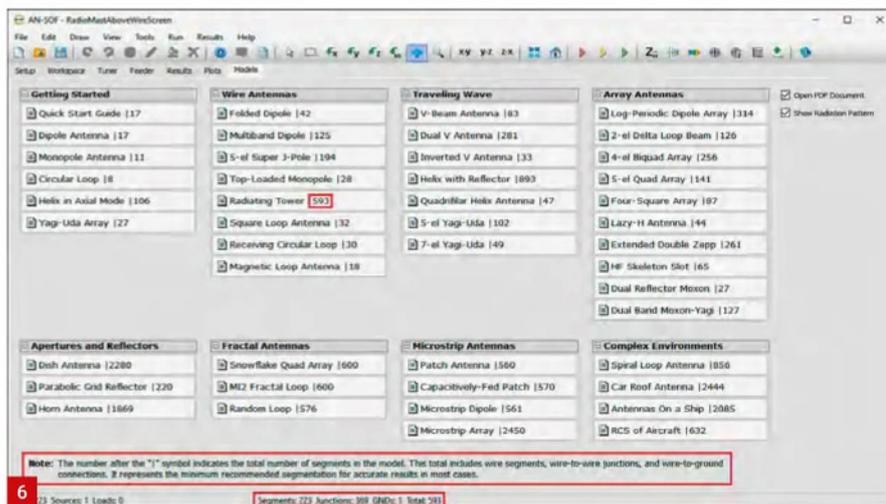
As I began writing this month's missive the August 25 issue of *PW* arrived on the doormat. In *Keylines* editor Don discusses the merits of portable operating, especially for those with limited operating opportunities due to antenna constraints and/or QRM issues. Indeed, Don is correct in saying that with today's modern equipment it is quite an easy task to take a radio and an antenna out into the wild.

Since writing *Aerials Now* in *RadioUser* and then the *Antennas* columns in *PW* I have been struck by how many readers 'go portable'.

A number of *RU* readers used 'world Band' radios such as those from Tecsun and Sangean to DX



4



6

shortwave broadcast stations using simple portable wire antennas. One reader took his Winradio Excalibur and laptop plus external hard drive out portable to DX utility stations, again using simple 'bits of wire strung from a tree' and from PW it is clear that the FT-817(nd) and Icom 705 are popular radios for the transmitting amateur. Antennas tend to be a bit less casual for the latter operators but again end-feds and dipoles strung from trees are popular and it seems that the small portable 'antenna kits' from China are becoming prominent too. Not to be left out are full size verticals using glass fibre poles, usually with a few radials or a counterpoise strung out along the ground.

Also, as I began writing this month, I read of the sad news of the death of **Tripp Owens N4NTO**. According to reports Tripp died after being electrocuted at a cemetery in Harnett County in North Carolina.

The report went on to say, "Emergency Units arrived on scene to find a male victim on the ground (with) his approx 20 foot Ham radio mast under a set of power lines.

"Fire and EMS could not access the victim as the

power in the immediate area had the possibility of being energized. Harnett County Sheriffs Deputies, NC Medical Examiner and both South River EMC and River City Construction arrived to assist. The person was pronounced deceased at the scene.

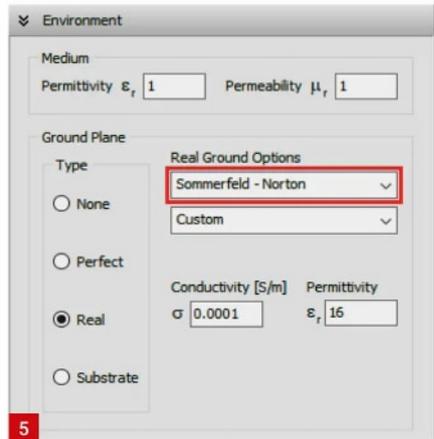
"This is still an active investigation."

The incident was thought to be at the Historic Averasboro Battlefield Site where it is believed that Tripp's vertical antenna came into contact with overhead power lines.

It appears the incident may not have occurred during setup, but rather while taking the antenna down after a POTA operating session. So, sad news indeed, and a reminder to be very careful when operating near power lines.

I have a location no more than 300m up the road from me that would be perfect for portable operation. It is almost the highest point in the village, away from the local QRM, it has a clear take off and is just off of a footpath so access is easy but there are two runs of 12kV overhead cables nearby, so apart from occasional hand portable operation I avoid for obvious reasons.

So, please be careful!



5

### AN-SOF Simulator V10.5 released.

Here are details of just some of the improvements.

In this version a new Sommerfeld-Norton ground plane model has been implemented. This useful addition improves accuracy on calculations for horizontal wires, including loops and linear wires, down to  $0.005\lambda$  above ground as well as with vertical wires raised by approximately one wire radius above ground. Wire-to-ground connections are supported although their interactions are modelled via specular reflection, so the ground must be a good conductor at the selected frequency.

It is recommended that for wires connected to poorly conductive grounds that the Sommerfeld-Wait / Asymptotic model is used instead.

The Sommerfeld-Norton model is particularly suitable for dielectric grounds with no direct wire connections, **Fig. 5**.

In addition the total number of segments per model is now shown: such as after the 'I' symbol on each button label in the Models tab and also in the Status Bar at the bottom of the AN-SOF window. The total of segments shown includes Wire segments, Wire-to-wire junctions and Wire-to-ground connections, which are labelled as 'GNDs', **Fig. 6**.

Calculation capabilities have been extended too. The simulation core has been improved with new options in the load impedance suite. Users can now define Series, Parallel and Trap RLC configurations, enabling accurate modelling of components such as traps and resonant circuits. Improved junction and stepped-radius algorithms will deliver up to two times' faster simulations, with no compromise in accuracy.

Gain, Directivity, Power Density, and Radiation Patterns may be plotted against frequency and users may instantly view Vertical-Polarisation, Horizontal-Polarisation, Right-Hand and Left Hand circular Polarisation components to analyse polarisation effects over a wide band.

Also, several bugs related to the rendering of metallic surfaces have been resolved which improve visual accuracy and model integrity.

For full details visit:

<https://tinyurl.com/yj3k4hnn>

That's it! See you all next month. **PW**

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## Topbytes Morse Trainer

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#### EXCLUSIVE TO ML&S!

#### Overview

The Topbytes Morse Trainer is a compact, self-contained CW practice unit with a feature set designed to make learning Morse code accessible, adaptable, and engaging. Housed in a durable enclosure with a colour touchscreen display, it enables easy navigation through practice modes, settings, and even built-in games. Its USB-C rechargeable battery, onboard speaker, and 3.5 mm key input mean it's ready to go right out of the box—whether you're practising at the desk, outdoors, or between QSOs at a club night.

**Touchscreen Display:** The full-colour, user-friendly interface makes mode selection and adjustment intuitive—ideal for those less keen on menu-diving or cryptic button sequences.

**Paddle and Straight Key Support:** The inclusion of a standard 3.5 mm jack allows users to plug in their own Morse keys, offering a more realistic feel than simple touchscreen-based alternatives.

**Customisable Practice Settings:** You can tailor WPM (words per minute), tone frequency, and character spacing to suit

your current skill level. This makes it useful both for slow learners and those training for high-speed contesting.

**Audio Output:** Useful for routing CW tones into a transceiver, amplified speaker, or external logger for added versatility.

**Games and Drills:** Onboard interactive games add an element of fun while helping reinforce reflexive recognition of characters and words.

**Wi-Fi Enabled:** Perhaps most impressively, the trainer includes Wi-Fi support for over-the-air firmware updates - a rare and forward-thinking addition for this class of device.

#### In Practice

Initial use of the Topbytes Morse Trainer is refreshingly straightforward. The unit powers up quickly, and the interface is immediately intuitive. Within minutes, you can select a practice mode, plug in your preferred key, and begin tapping away. The built-in battery easily handles extended sessions, and its compact form factor means it's well-suited to portable use, whether on a park bench or a field-day table.

The games and drills are a welcome touch. They go beyond simple tone reproduction, introducing pattern recognition and timing challenges that keep practice sessions both fun and productive.

#### Ideal For...

Foundation and Intermediate candidates preparing for their first taste of Morse Lapsed CW operators looking to rebuild



their speed and confidence. Contesters and QRPers refining timing and consistency. Clubs and trainers needing a portable, student-friendly practice tool.

The Topbytes Morse Trainer is a thoughtfully designed CW learning aid that blends traditional practice with modern convenience. Its feature set supports a wide range of users, from absolute beginners to those chasing 30+ WPM. The addition of Wi-Fi, games, and a vibrant touchscreen makes it stand out from many of the more spartan alternatives on the market. With its portability, ease of use, and real-world keying options, this is a trainer that doesn't just teach Morse—it encourages you to enjoy it.

Only **£99.95.**  
See: [www.HamRadio.co.uk/topbytes](http://www.HamRadio.co.uk/topbytes)



## Ham Radio Guide Book 2025

The Ham Radio Guide Book 2025 is a newly released, comprehensive printed guide aimed squarely at amateur radio enthusiasts. It consolidates essential information in a full-colour, magazine-style format—covering frequency allocations, band plans, licensing tips, operational best practices, and handy reference tables. It's your year-round companion, packed with clear diagrams, FAQs, and updates relevant to the 2025 amateur radio landscape.

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- Combines audio codec, serial CAT interface and PTT switch
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- Permanently available independently from CAT port an open-collector PTT switch controlled by RTS signal of the COM port to interface Handies/Mobiles etc.
- Auxiliary connection points to CM108 interface
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For more details see [HamRadio.co.uk/DigiRig](http://HamRadio.co.uk/DigiRig)



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See [HamRadio.co.uk/KiwiSDR2](http://HamRadio.co.uk/KiwiSDR2)

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5W - Multi use SDR Transceiver for only **£899.00**

The FDM-DUO is a game-changer - a top-end SDR with dials and knobs! This transceiver has a 5W output that can operate as a stand-alone unit, without a PC. Connected to a PC, FDM-DUO is a very modern SDR receiver and transmitter with capabilities which are usually available in very large large radios only.



### Elad TM-2

Console for SDR Radio for only **£269.95**

TMate2 allows the control of main functions of SDR software as FDM-SW2, PowerSDR and Perseus. Intended mainly to allow the use of SDR software without the need to watch the screen of the PC, or when the screen of the PC is crowded by various programs such as LOG or software for DIGITAL operations or CONTEST.



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**SDRplay Limited recently announced the imminent launch of the "nRSP-ST", an All-in-one, Plug-and-play Networked SDR Receiver.**  
This exciting new product addresses the needs of radio enthusiasts who want a 'plug-and-play' solution for remote reception.

We think the nRSP-ST will be ideal for anyone wanting a wideband remote receiver without needing computer skills hours of set-up time and ongoing maintenance at the remote location. We are very much looking forward to making the product available as soon as possible. We are aiming to launch the nRSP-ST in time for the holiday shopping season. **£459.00**



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- Combines audio codec and PTT switch
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- Supports VOX PTT by the tone on the unused right channel (experimental)
- Works with all major OS flavours: Windows, MacOS and Linux
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- Isolation can be easily added using a USB isolator dongle ..... **£47.95**

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**Shack Clock. Special Offer £19.99**

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- EFHW KIT** 200W 49:1 Unun for making your own end-fed half wave antenna. .... **£85.00**
- SDR Port Switch** 0-70MHz 100W RXin RXout ..... **£199.00**
- Aziloop DF-72** Antenna System ..... **£625.00**
- Triple base magnetic mag mount** SO 239 ..... **£45.95**

Steve Telenius-Lowe G4JVG  
teleniuslowe@gmail.com

The Sun was quiet during July, but that changed in August when there was a whole series of M-class solar flares. Although ten times smaller than the X-class flares reported in the August HF Highlights, even M-class flares can lead to Coronal Mass Ejections and HF blackouts on the daylight side of the world. The August flares started with an M2.9 event on the 3rd which was followed by more most days until at least the 10th. The largest was an M4.4 on 5 August. This activity led to a G2 (moderate) geomagnetic storm on 9 August.

According to the SolarHam website, Fig. 1, all this activity emanated from sunspot region AR 4168. SolarHam has been providing real-time space weather data and news for nearly two decades and is maintained solely by Kevin Gibeau VE3EN.

<https://solarham.com>

## New DXCC awards

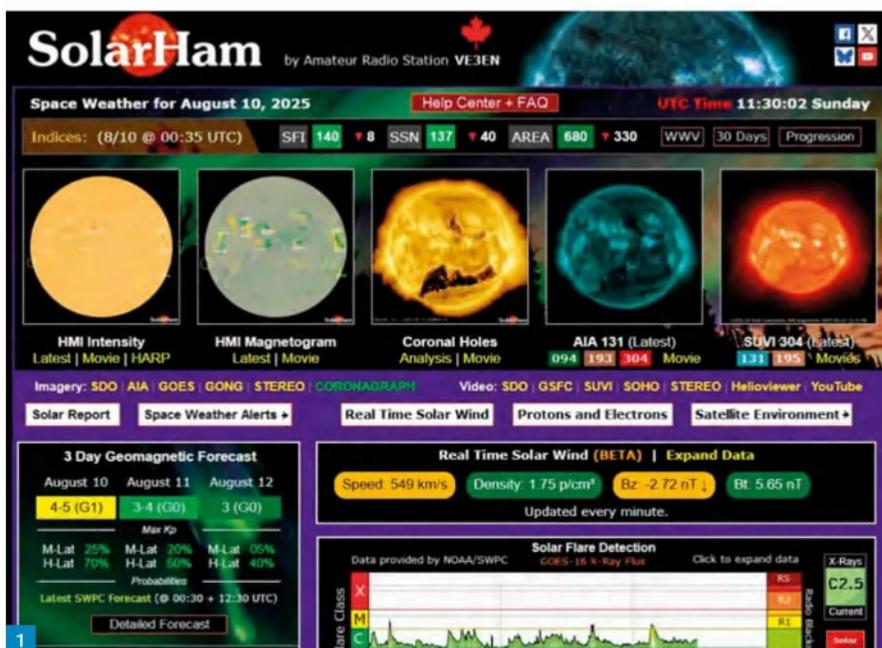
A new award, DXCC Trident (Fig. 2), was first mooted in January and was reported in April's HF Highlights, but full details of its implementation have only recently been released by the ARRL. Applicants should have confirmed a minimum of 100 DXCC entities using Logbook of The World (LoTW) on each of phone, CW and digital modes – physical QSL cards are not accepted for DXCC Trident. Full details are at:

[arrl.org/dxcc-trident-award](http://arrl.org/dxcc-trident-award)

Meanwhile, yet another new DXCC award, the 10-Band DXCC, is on the horizon. To qualify, applicants will need to show proof of working a minimum of 100 DXCC entities on each of the bands from 1.8 to 50MHz (excluding 5MHz). Endorsements will be available for confirming 200 and 300 entities plus the Honor Roll (surely the absolute pinnacle of DXing: achieving Honor Roll can be a lifetime's endeavour, but on all of the 10 bands...?!). At the time of writing (mid-August) full details of the 10-band DXCC are yet to be released, but the ARRL Member's Bulletin dated 22 July stated that its 'Programs and Services Committee' and HQ staff are working on creating the new award.

## QSL from yesteryear

This time, the first of two QSLs from yesteryear which are connected because they are both deleted DXCC entities and both were parts of South Africa. The first is ZS9Z (Fig. 3), which was an operation from Walvis Bay by Chris Burger ZS6BCR (now ZS6EZ) and Rad Handfield-Jones ZS6RAD from the QTH of John Smith ZS9Z. Walvis ('Whale') Bay was an enclave of the Cape Province of the Republic of South Africa but located on the west coast of Namibia and so it was separated from the rest of South



# A Mixed Bag

Steve Telenius-Lowe G4JVG reports that HF conditions have been variable but there is plenty to look forward to as autumn approaches.

Africa by hundreds of kilometres. Walvis Bay was therefore a separate DXCC entity from both South Africa and Namibia.

My QSO with ZS9Z took place on 19 December 1990 at 0852UTC on 28MHz SSB and the reverse of the QSL gives some interesting background. Walvis Bay, it states, "predates Namibia as an administrative entity, being annexed by the British in the 19th century. It is now a major port, supporting fishing, salt production and shipping activity... We erected an antenna farm for 11 bands (1.8 to 144MHz) and concentrated on unusual bands and modes."

After the end of apartheid, a treaty was signed between South Africa and Namibia and sovereignty of Walvis Bay was transferred to Namibia on 1 March 1994. Walvis Bay was therefore moved from the 'active' to the deleted DXCC list and from that date onwards any contacts with stations located in Walvis Bay count only as Namibia. The ZS9Z callsign has since been re-issued as a 'vanity call' to ZS10IN in Cape Town.

Next month, the second of the two former South African deleted DXCC entities.

## What to look for in September-October

As the autumn months come around, HF propagation conditions generally improve after the 'summer doldrums' and therefore

DXpeditioners tend to plan their operations for this time of year. This year is no exception and there is a plethora of expeditions planned for September and October.

YL2GM and EA5EL plan activity from the rare Annobon Island as 3COW for two weeks in September (exact dates TBC). Before and perhaps after the 3COW operation they hope also to be active from Equatorial Guinea as 3C3W.

[lral.lv/3c0w\\_3c3w\\_2025](http://lral.lv/3c0w_3c3w_2025)

A Czech team plans activity as PJ7K from Sint Maarten from 12 to 22 September. Their operation will be on all bands and modes: 1.8 to 50MHz and SSB, CW, FT8 and RTTY.

Look for SV5/HB90AU from Karpathos in the Dodecanese Islands between 13 and 26 September. Claudio will be operating 'holiday-style' on bands from 7 to 28MHz using SSB, CW and FT8.

A large international group from the F6KOP Radio Club de Provins will be active as FP5KE from the small island of Île aux Marins in Saint-Pierre and Miquelon from 15 to 26 September. Expect big signals and excellent operating from this experienced team.

<https://fp5ke.wordpress.com>

Janusz SP9FIH plans activity as VK9/SP9FIH from Christmas Island between 19 September and 3 October. Janusz travels to Christmas Island from Lord Howe Island, where he is VK2/SP9FIH between 27 August and 13 September.

Fig. 1: The SolarHam website run by VE3EN is an excellent source of real-time space weather news and data. Fig. 2: The new DXCC Trident award (photo: arrl.org/dxcc-trident-award website). Fig. 3: 35-year old QSL from ZS9Z in Walvis Bay, now a 'deleted' DXCC entity. Fig. 4: NASA satellite photo of Manihiki Atoll in the Northern Cooks. Fig. 5: Etienne OS8D operating from his motorbike deep in a Belgian forest.

Note that Lord Howe Island is a separate entity for DXCC: in the past it used the VK9L prefix but as the island is officially part of New South Wales the Australian Communications and Media Authority now uses VK2 instead.

<https://vk9.dxpeditions.org>

**Pista HA5AO** plans activity on CW, FT8 and SSB as 5X2I from Uganda between 29 September and 10 October. He will be using 500W to a vertical antenna.

**Eric GM5RDX** and **Graham 2M0IJU** plan activity as J38DX and J38LD respectively from Grenada between 8 and 15 October. Look for them on SSB with some FT8 operation. Eric was also active as J38DX in July.

Six operators from the Western Washington DX Club will be on the air as E51MWA from Manihiki Atoll, **Fig. 4**, in the North Cook Islands from 8 to 20 October. See:

[www.e51mwa.com](http://www.e51mwa.com)

PJ6Y is the callsign issued to the Pacific Island DX Group [although PJ6, Saba, is a Caribbean island! – Ed] for an October DXpedition being organised by **Gregg W6IZT**. According to its QRZ.com page: "The PJ6Y DXpedition will activate the island of Saba (IOTA NA-145) with a diverse international team of 12 – 14 operators, including nine first-time young DXpeditioners! Additionally, 30 – 40 young hams will join remotely using the innovative NexGen2 RiBs made possible through a grant from the Northern California DX Foundation. This is more than a DXpedition – it is an investment in the future of our hobby... The team will set up three local and two remote stations, operating CW, SSB, FT8, and satellite, from two separate operating locations."

<https://pj6y2025.com>

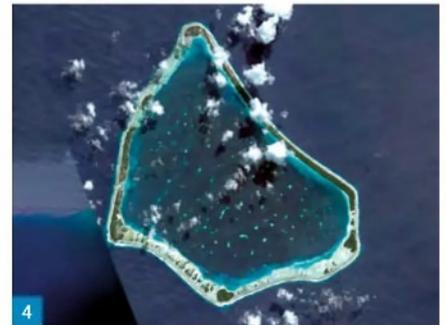
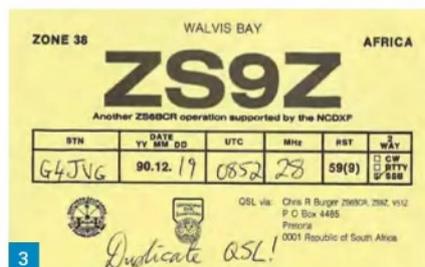
### The month on the air

Other than for the IARU and IOTA Contests in July, there were few DXpeditions this time round. However, **Dom 3Z9DX** remained active as T30TTT from Tarawa, Kiribati, during the month in review. He was worked by several UK stations on CW and FT modes on the higher HF bands.

Also, **Vlad OK2WX** and **Paula OK2YL** were active as JW0V and JW/OK2YL from Svalbard between 14 and 22 July, together making around 14,000 QSOs using FT8, CW and SSB.

### Readers' news

We start with **Etienne Vrebos OS8D**, who made



600 QSOs from home (see the 'Band highlights' section below) and a further 660 from his motorbike. This time, Etienne describes his 'motorcycle portable' station shown in **Fig. 5**: "I do like the FT-891, easy to use and to have with me on the bike but of course it needs an antenna tuner... I had somewhere an old manual MFJ-949e at home, it's lightweight and easy to take with you. It gives a perfect match on 40m where I usually work as activator... It takes 10 seconds to get a 1.2:1 SWR on the screen and it seems very broad to be used between 7060 and 7150kHz without tuning again..."

"About the antenna in use: Spiderbeam 404-UL asymmetrical inverted-V for all classical bands and as I'm always far away from home I bought a spare one I always have with me. The same for the microphone, always a spare one..."

"About the battery: a LiFePO4 of 20A gives me 200 QSOs (about 90 minutes at 70W output). I think my first battery gives some unexpected signs of being tired, as it sometimes stops giving enough power to the transceiver without any reason: 30 months activity with over 30,000 QSOs, charged nearly three times a week for 30 months... I bought a special battery controller for LiFePO4 batteries to check from time to time during my activation..."

"WWFF / POTA is more successful and the hunters are far more active than [for Belgian] castles. Usually now I get 100 QSOs/hour and that's a nice result even with some very bad

propagation the last weeks on 40m. My Belgian hunters have problems to get me in their logs. I'm a morning man and usually start my activation around 0700UTC. The best signals are coming from UK (but it's early for them!) and all East Europe countries. And my Italian friends are always 59+."

It was good to hear from another POTA activator, **Simon Davis-Crane G7WKX**, again after a long break. Simon wrote: "Highlights for me in July and August have been multiple POTA and SOTA activations, including many new POTA parks. I have been experimenting with my JPC-12 antenna, and so far the results are similar to my normal linked dipole setup, just a lot easier to set up on-site" (see **Fig. 6**). Simon will be visiting California from mid-September to early October, activating as many POTA and SOTA locations as he can. He will be active as W6/G7WKX and will be looking to work back to the UK and Europe.

**Carl Gorse 2E0HPI** wrote that he had not had much chance to get out with the radio. However, "we did have a holiday in Arrochar, Scotland; GMFF-0002 on Loch Long (**Fig. 7**), but the band conditions were terrible, with no DX. We did work around 100 QSOs UK / EU with the Yaesu FT-891 at 50W and the Mad Dog coil antenna. We are hoping the bands improve for September, with another visit to Blackpool and then Southport later in November."

Buy back issues and archive CDs at [www.mymagazinesub.co.uk/practical-wireless](http://www.mymagazinesub.co.uk/practical-wireless)

**Reg Williams G000F** also reckoned it was "not a good month for working DX stations. I was unsuccessful trying to work KH7AL/KH9, Wake Island, on any band FT8. He is away from the island until September. Hopefully by then HF conditions may start improving. Propagation did not seem suitable to work T30TTT, Western Kiribati, on FT8 although there was plenty of opportunity to try, the operation being around for three months, with the operator being active on a very regular basis." Reg said that "I enjoy chasing World Grid Squares and USA counties on FT8, so there are always stations to work. I have a fairly good return of confirmations for both of those. I can see roughly the overall pictures of those using GridTracker, which works alongside WSJT-X and other similar programs at the present time... [I have] a long way to go, so always something to do to fill in when HF conditions are not good."

**Tim Kirby GW4VXE**, operating on CW as **GW4MM**, also had a quiet month, although looking back through the log, he says it was perhaps a little better than he thought. An enjoyable QSO on 40m SSB was with the BBC Amateur Radio Group station GX8BBC/P operated by **Jon Kempster M5AEO**. When Tim was working in London, before moving to Pembrokeshire, Jon had kindly arranged a visit to the GX8BBC club station in Broadcasting House as well as a tour around the weather centre and newsroom. Tim writes, "It was a memorable lunchtime! It was nice to catch up with Jon again, for a quick chat. During the month, it was also nice to have a CW QSO on 20m with TM112TDF celebrating the Tour de France. JW0V was worked on 20m CW too, a country which is not so common these days."

Bucking the trend, **Jim Bovill PA3FDR** said it had been "quite a good, if not spectacular, month for DX. Most QSOs were in the 18MHz and 21MHz FT8 mode, with very little activity on FT4. There were good openings most evenings I was active, to South America, especially to Brazil, but also contacts with Argentina, Uruguay, Chile and Ecuador. I also made a new DXCC contact with El Salvador, although with a Brazilian operator (YS3/PY8WW). Interestingly, I had three contacts one evening with Indonesia between 1917 and 1925UTC, when most of my contacts with that country are morning or early afternoon local time."

**Martin Burch VK4CG** wrote all the way from southern Queensland where it has been snowing in the region! "HF down under has been a bit of a mixed bag over the last month with dead conditions on 15 and 10 metres with a lot of static," he wrote. "There seems more workable conditions on 20 and 40 metres... The next radio I would like get is a Clansman RT-320 HF man-pack radio, which have good reports as a solid radio. It was used by the British army from 1976 to 2010. Be good for potential SOTA / POTA activations. The Harris HF sets are hard to get



**Fig. 6: The JPC-12 antenna used by Simon G7WGX/P for his POTA and SOTA activations.**  
**Fig. 7: Carl, operating as 2M0HPI/P from Loch Long.**

SK5AE 28290 which was heard on the 22nd. Also from Sweden, SM6FMP 28280 was heard very occasionally. 5B4CY 28219 and YM7TEN 28225 were both heard on the morning of the 11th.

Now for beacons heard beyond Europe. On the 14th 4U1UN 28200 was heard during the afternoon and was the only beacon heard from North America all month. Staying with the world-wide beacon network on 28200, LU4AA was logged on 23 days while further north OA4B was heard just the once on the 3rd. 4X6TU was logged on 22 days. Nothing was heard from Russia, the Far East or the Pacific, although ZS6DN was logged on 4 days. LU2DT 28193 and PY4MAB 28270 were heard 25 and 18 days respectively. As always, beacon frequencies are quoted to the nearest kilohertz.

## Band highlights

**Key:** Q = <20W, M = 20 – 100W, H = >100W, S = Single-element antenna, B = Beam (see January HF Highlights for a more detailed explanation).

**Etienne OS8D (HB): 14MHz SSB:** 3V8CB, 4L1BB, 4M5K, 8P6NW, 9Z4BM, E51JD, FM4TI, FP/KV1J, FY5KE, HD1A, HK4RAU, OA4O, VK7ACE.  
**18MHz SSB:** BH7FFR. **21MHz SSB:** 3V8LL, 9Z4BM, EK/AB1F, LP1H, PJ2Y, S79VU, UP2L, YB5DDE, YB70NC, YE9BJM, YH7AA, YH8AJ, YS3/PY8WW. **28MHz SSB:** 5Z4VJ, PY7RP, XR7T, ZD7FT.

**Simon G7WGX/P (MS): 10MHz FT8:** HI8JCD. **14MHz FT8:** CN2DX. **18MHz FT8:** 7Z1AV, A71AH, XV9T. **24MHz FT8:** ZS4AW.

**Jim Bovill PA3FDR (MS): 7MHz FT8:** A61QQ. **10MHz FT8:** BH8BHJ, JI4POR, UA9SY. **14MHz FT8:** JG1IPZ, HC2GRC, V31MA, VK3DWS, WP3R. **18MHz FT8:** 9K2WA, HS0ZOY, JA4FDZ, JH2VVH, TF8KW, UA0SU, VE3NOO, VR2ZXP, WB4OSS, YH5NA, YH7OA, YS3/PY8WW. **21MHz FT4:** RX9WN, HI3A. **21MHz FT8:** 5Z4VJ, 7Q6UJ, 9K2WA, A61SD, A71AH, BG8GAM, CE2SV, D2UY, EK/RX3DPK, HL3KPJ, LW2EY, PQ2SI, PT7PT, PY1SX, PU5IKE, UN7ZZ, VE3EK, VR2VAZ, YH1AA, YH2BC. **28MHz FT8:** PY2FUI.

**Martin VK4CG (MS): 14MHz SSB:** 7MHz SSB: WA7LNH. **14MHz SSB:** AA4NC, CQ9A, FK8GM, W3PAW, WR5O. **21MHz SSB:** 8N8HQ, DA0HQ, DX3A, JL7GMN.

**Owen G0PHY (HS): 14MHz SSB:** PP5JR, PW7I, W4KJ. **21MHz SSB:** A60HQ, C4W, CQ9A, FY5KE, PY2MP, UN1HQ, V55HQ.

## Signing off

Thanks to all contributors. Please send all input for this column to [teleniuslowe@gmail.com](mailto:teleniuslowe@gmail.com) by the 11th of each month. For the December issue the deadline is 11 October. 73, Steve G4JVG. **PW**

over here but obtainable if you live in the US (albeit pricey!)."

**Owen Williams G0PHY** wrote that most of his operating this month "was during the IARU and the RSGB IOTA contests. I spent some time on 21MHz for the IARU contest and found conditions quite favourable with a lot of activity on that band. Most of the contacts in the IOTA contest were in Europe but there were some contacts with island stations in Brazil and east coast USA. Outside of the contests there was an interesting contact with EA8BW. This station appears to use AI to make contacts as the voice sounds robotic with no indication of any human element" [see also July 2025 HF Highlights – Ed].

## 28MHz beacons

**Neil Clarke G0CAS** brings us his 28MHz beacon report for 1 to 31 July, commenting that "July saw a welcome improvement in beacons heard via Sporadic E." Eleven beacons were heard on more than 20 days of the month. The top five were OE3XAC 28188, which was heard every day apart from the 3rd, followed by IZ8RVA 28240, heard on 28 days. Three beacons were heard on 27 days: DL0IGI 28205, IW3FZQ 28227 and IQ8BB 28260.

Both of the Polish beacons, SQ4HWI 28193 and SR5TDM 28216, were heard more frequently from around the middle of the month, on 9 and 14 days respectively. A very rare beacon to 'bag' was

Tim Kirby GW4VXE  
gw4vxe@icloud.com

Last month, I opened the column by speculating that it had been a poorer than normal Es season and perhaps there was some connection with the peak of the solar cycle. Within 24 hours of writing those words, there had been a 2m opening from the UK to Israel! Around 1200UTC on 13 July, 4X5CD (KM72) was worked by at least a couple of stations, **John G4SWX** (Suffolk) being one of them. What was interesting to me, at least, that this wasn't purely an east coast thing. Israel has been worked before on 2m from the east coast, but 4X5CD was heard further across the country, including in IO80 by **Paul Pasquet G4RRA** (Okehampton), which as far as I know is more unusual. Down in Cornwall, **Dave Edwards G7RAU** (The Lizard) was at work, but checked back on his PC and he'd copied 4X5CD despite beaming a good few degrees off the correct heading. Dave mentioned that some people had copied OD5KU on 2m as well.

Following up on my comments about whether poorer Es propagation in a sunspot maximum was an 'urban myth', I asked **Jim Bacon G3YLA** for his opinion. Jim kindly replied, "My instinct is that there probably is a loose relationship, in that mid-latitude Es depends upon movement of charged particles through the earth's magnetic field, and at solar maximum there will be more input to the ionosphere that could cause weak auroral events delivering a high Kp index. This implies a disturbed geomagnetic field, any movement because of the wind shear mechanism will be less organised and more variable, thus producing weaker Es convergence into thin layers as a result."

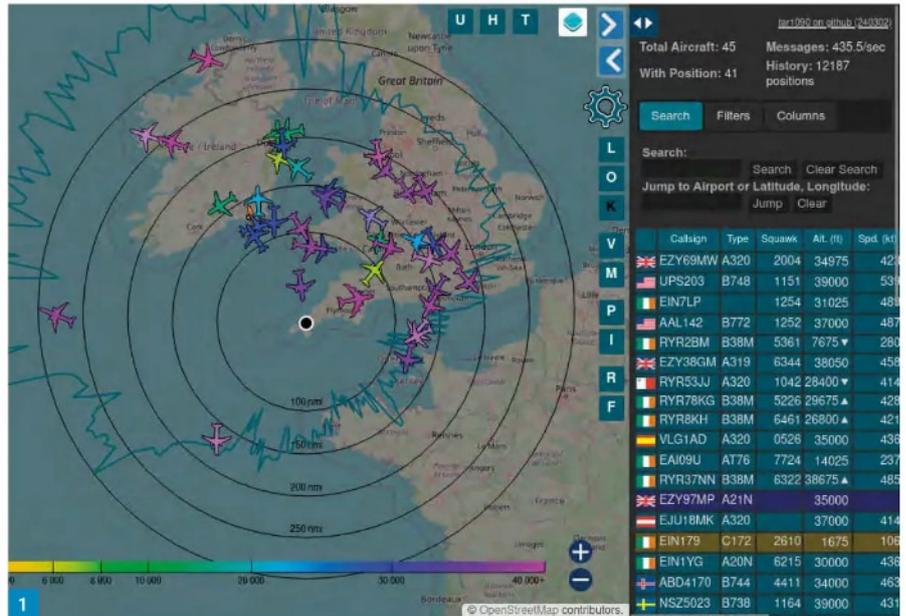
"The empirical relationship is not easy to define as a Kp value, since you can have pre-existing Es followed by a geomagnetic storm and high Kp but still with residual Es to decay. However, the overall feeling is that high K index is not a good thing for Es to form but may be present until pre-existing Es decays. My general feeling is that  $Kp > 3$  is not good".

### ADS-B as a propagation indicator

**Keith Watkins G8IXN** (Redruth) uses the 1090MHz ADS-B transmissions from aircraft as a propagation indicator and finds that it often shows spikes in particular directions, indicating possible tropo openings, **Fig. 1**. It's pretty straightforward to set up an ADS-B receiver using a Raspberry Pi, RTL-SDR dongle and a simple aerial.

### Skyroof

**Jef VanRaepenbusch ON8NT** is always on the lookout for new and interesting software. This month, he highlights Skyroof, from well-



## The unpredictability of propagation!

**Tim Kirby GW4VXE** has another packed column, starting with a discussion about recent propagation.

known software author **Alex VE3NEA**. The software combines satellite tracking and SDR functionality, **Fig. 2**. You can read more at: <https://ve3nea.github.io/SkyRoof/index.html>

### FT8 on Android

I've previously mentioned FT8CN, an app which runs on Android allowing you to decode FT8 on your Android phone or tablet. Jef ON8NT writes that there's an updated version written by **Dan Lee** which adds a GPS time correction feature (useful for portable operation) along with some other small improvements. You can find more information at:

<https://github.com/danleetw/FT8TW>

### A 2m CW beacon from space?

**Steve Macdonald G4AQB** writes, "The Bolton Wireless Club have recently embarked on a project that involves launching a High-Altitude Balloon into space (similar to the RSGB HAB) The plan is to launch a 144MHz CW Beacon running only 10mW into a dipole attached to the HAB. RTTY and LoRa modules are also fitted for telemetry and tracking."

"I have built the beacon, which consists of an Arduino Nano and an Si5351a Clock Module

**Fig. 1: Keith G8IXN uses ADS-B to give him an idea of tropo openings.**

along with suitable filtering (**Fig. 3**). It is currently being tested on 144.091MHz.

"While testing in July, it was received up to 20km away, but now we're planning to put it somewhere where it can be heard more widely: thanks to local private High-Altitude Balloon enthusiast (and new BWC member) **Nick McCloud**, we're aiming to send it up into the stratosphere. The beacon hardware weighs just a few tens of grams and will be powered from a 6V Lithium battery pack and carried in a polystyrene box under the balloon. Our provisional 'launch window' is Friday 29 Aug to Sunday 7 Sep.

"We have set up a reporting link so that anyone can send in a report and this is stored on Google Forms to be viewed on the Club Website": [www.boltonwireless.org.uk/2m-beacon](http://www.boltonwireless.org.uk/2m-beacon)

### The 8m band

It was a pleasure to hear from **Franz vanVelzen OE3FVU** (Kirchstetten) about his experiments on the 8m (40MHz) band, using ISM power levels of 10mW. Franz writes, "It is really fun to work with QRPPP on this band. The results are very, very impressive. I have completed 38 QSOs since June last year; I worked five continents: PJ4MM in South America (ODX 8571 km), VA2CYX in North America, EA8AIN and EA8DJR in Africa, 9K2YM in Asia and in Europe SV, EI, G, OZ, GM, I, S, IT, ON, LX, IS, EA and EA6. A total of

## 27 QTH grids.

"Usually, I won't be able to complete a QSO if I hear a station with less than +10. My report with stations I hear with +10 or more, is usually in the region of -20, although VA2CYX gave me a -03 report. Working S51ZO surprised me as he was not better than -01 and we have the Alps in between us. S51ZO must have very, very good ears".

Franz hopes that more stations will try 8m using the 10mW power level.

## The 6m band

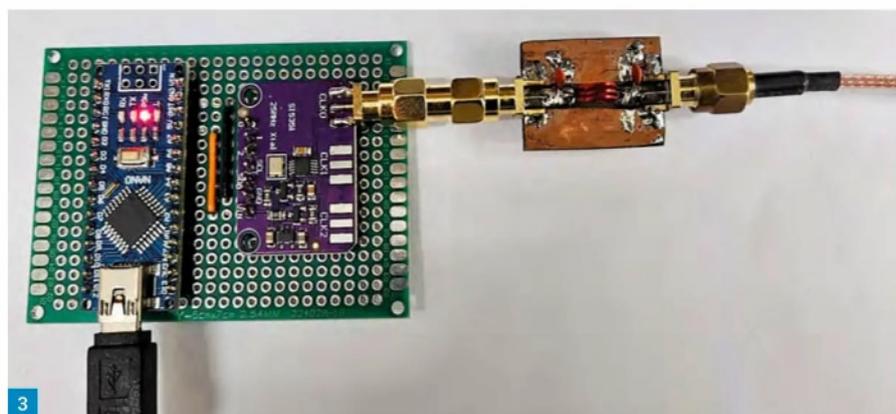
**Andy Green 2E0GYI** (Barnsley) reports, "A few years ago I made a slim Jim antenna for 6m FM from twin feeder. It has been lying unused in my shed but I decided to get it out for July's 6m activity contest and fasten it to a 6m fishing pole strapped to a fence post. I wasn't expecting much as I switched on my FT-991A, especially as the SWR was better at the FM part of the band. With this in mind, I reduced power to 30W. Imagine my surprise when Italian stations were booming in! I couldn't work them but I did manage F5JMI and F5SDD both in the South of France. I suppose that's why it's called the magic band!"

**Jef ON8NT** (Aalter) runs 10W from an IC-7300 to a V-2000 tribander and lists a few stations worked outside Europe, including 3 July CN2DX (IM64), CT3IQ (IM12), EA8TJ (IL18); 8 July 7X2RF (JM16); 13 July 9K2GR (LL49), CN2DX (IM64); 14 July VO1LQ (GN37); 16 July WP4G (FK68), K3UA (EN91); 19 July VE2XK (FN07), CN2JA (IM79); 20 July N0TB (EN34) and 21 July EA8BFK (IL38).

**Simon Davis-Crane G7WKX** wrote to say that he had been enjoying some Parks on the Air (POTA) activity on the band and had just got the 'Six Pack' certificate for activating six parks on 50MHz. Simon says that this included contacts with new countries such as Lithuania and Ukraine (it was also nice to work Simon as GW7WKX/P here at GW4VXE!).

**Roger Laphorn G3XBM** (Cambridge) says that he has been concentrating on 6m FT8 running 5W and has been heard in South America, the USA, South Africa and the Gulf. Roger continues that although FT8 is a magic mode, he wonders what it is doing to the long-term health of amateur radio. He says there is no chance of finding amateur radio accidentally as he did, with 160m AM from locals on a crystal set!

**Ian Dowse G0DYW** (Leighton Buzzard) lists his highlights as VO1NC (GN38) on 24 June, 9J2F1 (KH44) on 10 July, VO1CH (GN37) on 14 July, UN7AM (LN53) on 30 July and TF2CT (HP95) on 5 August. Ian says, "It is good to see the high number of EU stations and a few Stateside on the band and hopefully this will continue for the next month or so. However, it's interesting to note the



**Fig. 2:** A screenshot of the new Skyroof software from VE3NEA. **Fig. 3:** The Arduino 2m beacon, built by Steve G4AQB which is shortly to fly on a High Altitude balloon. **Fig. 4:** The DAB DX received by Simon Evans in July and August.

high number of mid-European stations working into North America when very quiet here?" Yes, it's always interesting to see what stations, even just a little bit south of us, can work when it's all quiet here!

It's good to hear from **Tony Collett G4NBS** (Cambridge) again. Tony's had building work going on, as well as other distractions, which have kept him away from the radio but says that he is now able to get to the shack and to wind the mast up to a reasonable height! Tony saw some glimpses of CE, LU and PY on the evening of 13 August although nothing solid enough to attempt a QSO. The August UKAC was a bit more interesting and Tony worked SV2DCD on FT8 just before the contest started. Tony caught a few Italians on SSB early on as well as 9A9R (JN85). Tony's noise problems weren't too bad towards the UK so he worked a few in IO83 as well as GI4SNA. Immediately after the contest, he looked back on FT8 and worked VE1PZ (FN85), VE1JBC (FN73) and AB4SF (FM17). A shame it's almost the end of the season, Tony says!

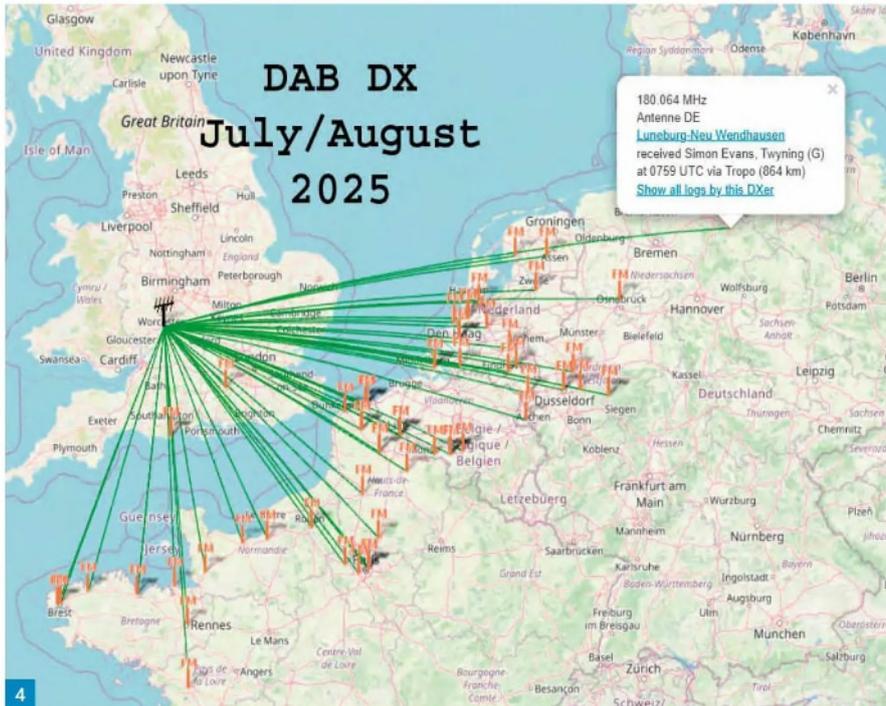
**Phil Oakley G0BVD** (Great Torrington) says he's missed most of the openings although he was pleased to work SM3JGG (JP81) for a new square.

Dave G7RAU had a good west coast USA opening on 20 July and was pleased to work XW4KV on 4 August for a new one, JA and BY were heard in the same opening. Dave says there have been almost daily openings to Africa (7Q/V5) and North America, although not for long and with fairly weak signals.

Highlights of the **GW4VXE** (Goodwick) log include 18 July TF8KW (HP84); 20 July KC1MMC (FN34), UA3TT (LO26), UN3M (LO61); 3 August CN2DX (IM64); 4 August UN3M (LO61), UA4HBW (LO53), RW4HD (LO53) and D2UY (JI64).

## The 4m band

Franz OE3FVU writes, "It is expected that 4m will become available for full licensed amateurs by the next issue of the frequency regulations. This has been said to be planned some time this autumn, although I personally don't think that it will be before year end. The frequency range will be 70.0 to 70.5MHz, with 25W max. I don't know if that is TRP or E(I)RP - until that time, it is possible to apply for a special licence which had been done by several VHF DXers, incl myself. At the moment, no licence has been issued yet. We



hope that the licences will be issued soon".

Jef ON8NT worked EA4T (IN70) and EA1YV (IN52) on 1 July.

### The 2m band

Jef ON8NT worked EA7/PG2M (IM76) via Es on 1 July while G0LTG/P (IO81) was worked on SSB via tropo the same day. On 2 July there was more tropo to F4HMV (IN88), DK0TR (JO40), GW4HDF (IO81) and 2E0YDG (IO93). 11 July saw more tropo to M0PNN (IO82), G8GXP (IO93), G4LOH (IO70), F6DBI (IN88), OV3T (JO46), GU6EFB (IN89), G16ATZ (IO74), G7RAU (IN79), G6DDN (IO93), F6EGD (IN88) and G4FBA (IO93), all on FT8, while G4VZV (IO93) was worked on SSB. Then on 13 July Jef worked G8BCG (IO70), G7RAU (IN79), DK1FG (JN59) and G4LOH (IO70) plus G0CUZ (IO82) and GW7SMW (IO81) on 16 July. On 20 July, Jef worked EA7E (IM66) via Es.

Ian Bontoft G4ELW (Bridgwater) says that other things have conspired to keep him off the radio, but he did manage to work EA2XR (IN83) at the end of July and again in early August. Ian has found plenty of French stations to work during the month, including F5LMG (IN88), F4JRI (IN98), F4EPP (IN97), F4GWG (IN77), F6HRE (IN93), F1VEO (IN77), F5DYD (IN86), F4FRG (IN98) and F5CBU (IN88). Ian says that on 12 August he was monitoring the band which seemed fairly quiet, so he tried a CQ and was called by EA8AQV with a good signal! Ian says that after their QSO, the EA8 was a good signal calling CQ for another 5 minutes, with no responses and then disappeared again. Ian runs 15W to a low 5-element on the Somerset Levels.

Tony G4NBS worked CT9ACF in the morning of 9 August on both FT8 and then CW for a new mode. There was deep fading but genuine 599 signals for a few minutes. Tony didn't participate in the MGM contest but did notice some 2m Es in the evening towards Romania and Serbia. Tony worked YT3N (KN04) and YO9AYN (KN24) and saw several others that he had worked before. Tony found the Perseids disappointing with lots of smaller reflections and no fireworks! He mentions it was a shame to see some stations calling CQ on 144.360 without using the QSY feature.

Peter Atkins G4DOL (Portland) worked IW9FRA (JM68) by Es on 5 August and HA1FV (JN87) on 9 August. Peter also found plenty of tropo, starting off with CT9ACF (IM12) on 30 June, followed by EA2XR (IN83), EA1NL (IN52) and EA1G (IN73). Next day on 1 July, Peter worked EA2BFM (IN83), EA1U (IN83), F6GPT (IN94), F4IVG (JN05) and F4EEJ (IN95). On 5 July, Peter worked F4EEJ/P (IN95) and F5GHP (IN96) on 14 July. Things started to improve again on 6 August when Peter worked EA2XR (IN83), then next day F5TMJ (JN03), EC2BBS (IN93) and EA8RS (IL18); 9 August CT9ACF (IM12), EA1UR (IN53); 10 August EA1FCH (IN63), F6ISJ (JN13), EA8FB (IL18), CT9ACF (IM12), EA8AIN (IL18), EA8CSB (IL18). Peter was particularly pleased to work EA8 on FT8 – he has done it on SSB over the years, but as he says, 'not too often!'

Dave G7RAU found an Es opening to SM/OH on 1 August and more Es to HA/9A on 9 August. Dave says that from late July into mid-August, the band was open to EA8, CT, CT3 and EA, more like a 'normal' summer with tropo to the

south and southwest daily.

Here at GW4VXE, I caught some Es on 4 August, working EA6SX (JM19), EA6VQ (JM19) and EA3EDU (JN01). On 6 August I worked EA8CSB (IL18) on tropo. The band has been good to the southwest and it seems to have been possible to see EA8s and CT9ACF every few days, even if they weren't that strong. Setup here is still 50W to a vertical.

### The 70cm band

Dave G7RAU is the only contributor to mention the band this month, with good tropo to the south and southwest including EA and EA8.

### The 23cm band

Simon G7WKX writes, "In July my Moonraker SQBM3000N antenna failed, so I was off-air for some time sorting a replacement. I now have a Comet GP-95N, which is noticeably longer than the Moonraker; hopefully the improved gain this brings will help me make more contacts from home, especially on 23cm. 23cm is gaining popularity here in the North West, especially among some of the SOTA community. I am working on a portable setup myself, and hope to be activate on 23cm soon. My current Icom IC-910 is not suited to mountain climbing!"

Dave G7RAU says that he was pleased to work a new call from EA8 on the band; EA8TJ (IL18)

### Satellites

Jef ON8NT enjoyed the ARISS SSTV event between 14 and 20 July and says that he received 68 SSTV pictures in total, of which 23 were of good quality. On 23 July, Jef copied APRS from NO-44 via the SONATE-2 satellite and the same day, worked N2YZH (FN22) and EA3DME (JN01) using FT4 through the RS-44 satellite. Jef is also enjoying his VGC VR-N76 handheld which, with the latest software release, can follow Doppler shift when tracking satellites.

Simon Evans G6AHX (Twynning) writes, "Very much encouraged by my friend in the BATC, Ian G8XZD, I have had a go at locking the DVB-S signal from the ISS using a small dish with a 13cm-23cm converter. I tried using my 80cm prime focus dish looking straight up on overhead passes. Initially I used the dish as the reflector of an RHC Yagi and failed. I then made an LHC feed for the same dish and did a bit better. The signal appears on the spectrum of my HD Ranger which I use for regular satellite reception. When time allows I may well put the 13cm feed on my main 1.8m dish and point that at a place on the geostationary arc that the ISS is expected to pass".

Patrick Stoddard WD9EWK (Phoenix) has an interesting report on satellite activities in

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Tony Jones G7ETW

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Many of us use analysers rather than VSWR meters these days. How did they become so *de rigueur*? (No pun intended.) The reason, of course is convenience. Using an analyser, I can connect direct to an antenna and instantly read off a complex impedance and a VSWR. Using a VSWR meter I need a radio, and all I can know is the VSWR.

But, when I see a number I like, can I simply believe it? I have three antenna analysers here and I'm going to do some comparisons.

### Analysers on test

As Louis (the policeman) says in Casablanca, "Bring in the usual suspects". See **Table 1** and **Photo 1**.

#### MFJ-269C (now superseded with 'D' model)

This, or the older MFJ-259B model, is for many amateurs, the 'hoover' of analysers. Big and heavy, in its diecast steel box, this undoubtedly feels old-fashioned – but in a good way! With an analogue VSWR meter and a digital display, this is easy to use and has an authoritative air about it.

#### Sark 100

This tops out at 60MHz, so for us it's effectively an HF-only device. It too is built into a black metal box, but it's half the size of an MFJ and lighter. This is a more obviously digital product – there are no knobs to turn, for example. There is room inside for a battery pack, but this is not supplied. See **Photo 2**.

#### MR100

An inexpensive Chinese product, this looks like an evaluation board which escaped from a lab. Judging by the layout, this is also marketed as the Mini 60. I bought an MR100 because my AW07A analyser packed up at the grand old age of six months. I was not prepared to spend another £200 and this looked like a good replacement.

#### Reactance sign determination

I checked the analyser manuals (see Useful Links) online. EA4FRB, the Sark 100 creator, says "the analyser is able to determine the sign of the impedance by a frequency shifting technique". Similarly, the MR100 SWR Analyser User Manual V2.0 tells us it shows "reactance sign '+' for inductive reactance and '-' for capacitive reactance."

In contrast, the MFJ-269C manual explains "the analyzer's processor can't determine if the reactance it measures is actually inductive (+jX)



1

# Analysers

Tony Jones G7ETW compares and contrasts three affordable analysers.

or capacitive (-jX)".

On paper, this is a significant weakness for the MFJ-269C, which is a much older design. An antenna clearly behaves quite differently depending on the sign of its reactive component.

Reactance sign makes no difference to VSWR however. As **Photo 3** shows, both (vectors)  $19 + j16$  Ohms and  $19 - j16$  ohms look like (scalar) 25Ω and would manifest as a 2:1 VSWR in a 50Ω system.

So, yes, it's incredibly useful to see reactance sign. But it isn't essential.

### Basic testing

The three standard calibration tests are: open circuit, 50Ω and closed circuit. I wanted each analyser to see identical test loads, but because the analysers have different RF sockets, that wasn't possible. I did my best though: I used the same adaptors, patch leads and dummy load.

To avoid any battery-related issues, I used a 12V 'Wallwart' switch-mode PSU. The results are shown in **Tables 2, 3** and **4**.

### Common antenna matches

For this testing I made up a test board with eight 100Ω 2W carbon resistors offering 50, 100, 150 and 200Ω loads, see **Photo 4**.

Stripboard is far from ideal for this (as you will clearly see!) but by good fortune I ended up with four loads giving VSWRs of roughly 1:1 to 4:1. The results appear as **Tables 5, 6** and **7**.

A lack of sign in the Sark's readings in italics is not a mistake – the manual says that when the analyser can't tell inductance from



2



3

capacitance, it indicates neither.

### Calibration procedures

After doing my tests, I discovered that the EA4FRB analysers have a software calibration procedure based on the user presenting three resistive loads: 50, 150 and 274Ω, **Photo 5**.

I tried this, using some more 100Ω resistors. I couldn't get to 274Ω and made do with 250Ω. This procedure certainly works: after doing this, my 50, 150 and 250Ω resistances were read as 50, 150 and 274Ω!

To make a resistor network to give these

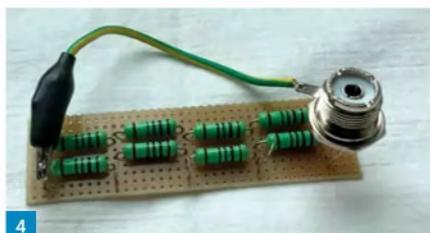


Photo 1: The three analysers.  
 Photo 2: The SARK (no batteries fitted).  
 Photo 3: Plus or minus jX but the same VSWR.  
 Photo 4: Stripboard loads.  
 Photo 5: Calibrating  
 Photo 6: Comparing the two Chinese analysers.  
 Photo 7: Capacitance read on the MFJ.

values would not be difficult but judging by my stripboard test, individual loads with no interconnecting wires would be better. I had always believed that this style of MFJ analysers had no calibration procedure, but I checked again and found a couple of possibly useful documents. (See Useful Links although one of the documents is no longer available.) These instructions are hardware-based, so I expect they are intended for workshop technicians.

### Interpreting the results

On the three standard calibration loads, each analyser does give the 'right answer'. The impedances and VSWRs vary, but what they mean is perfectly clear.

No analyser read my dummy load as precisely 50Ω but – as to be expected – all approached this as the frequency lowers. I was surprised at the MFJ being furthest out because I have used other dummy loads (fitted with N-types, now I think about it) with this actual analyser before and always seen 49Ω.

On the stripboard test, things are a little more interesting. One thing jumps off the page – the Sark 100 and my MR100 are very, very similar

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Analyser	Cost new	Bands	RF Connector
MFJ-269C	£499 (current 'D' model)	HF, VHF & UHF	N-type
Sark 100	£100	HF	SO-239
MR100	£65	HF	BNC

Table 1: The analysers compared in the article.

Frequency (MHz)	Short circuit	50Ω Dummy Load	Open circuit
7.1	1 + 4x, >31	46 + j0, 1.00	> 1500, >31
14.1	2 + 7x, >31	46 + j0, 1.00	> 1500, >31
21.1	2 + 9x, >31	46 + j0, 1.00	> 1500, >31

Table 2: MFJ-269C fitted with N-type to SO-239 adaptor.

Frequency (MHz)	Short circuit	50Ω Dummy Load	Open circuit
7.1	5 + j4, >10	49 + j0, 1.00	2419 + j0, 5.57
14.1	5 + j8, >10	49 + j0, 1.00	4828 + j0, 5.67
21.1	5 + j16, >10	49 + j0, 1.00	13876 + j0, 5.55

Table 3: MR100 fitted with BNC to SO239 adaptor. (On its default setting this analyser does not display complex impedance, but option 'IMP' (under 'Mode') allows this.)

Frequency (MHz)	Short circuit	50Ω Dummy Load	Open circuit
7.1	4 + j0, >10	51 + j0, 1.00	3812 + j0, > 10
14.1	5 + j0, >10	51 + j0, 1.00	1347 + j0, > 10
21.1	5 + j6, >10	49 + j0, 1.01	704 + j0, > 10

Table 4: Sark 100 (no adaptor needed). (Using 'IMP' mode.)

Frequency (MHz)	50Ω	100Ω	150Ω	200Ω
7.1	53 - j0, 1.15	87 - j40, 2.23	102 + j71, 3.22	106 + j92, 3.97
14.1	63 - j0, 1.37	68 + j44, 2.20	57 - j63, 3.14	49 - j71, 3.88
21.1	73 - j17, 1.63	45 + j9, 2.23	32 - j44, 3.15	26 - j45, 3.89

Table 5: MR100.

Frequency (MHz)	50Ω	100Ω	150Ω	200Ω
7.1	50 + j5, 1.1	81 + j25, 2.0	112 + j0, 3.0	128 + j19, 4.0
14.1	57 + j10, 1.2	63 + j29, 2.0	68 + j38, 3.0	129 + j19, 4.0
21.1	69 + j13, 1.4	48 + j28, 2.0	45 + j36, 3.0	36 + j43, 4.0

Table 6: MFJ-269C.

Frequency (MHz)	50Ω	100Ω	150Ω	200Ω
7.1	53 + j0, 1.09	89 + j30, 2.04	103 + j65, 3.03	105 - j95, 4.02
14.1	63 + j0, 1.25	68 j35, 2.03	54 - j60, 2.89	45 - j70, 3.9
21.1	142 + j7, 1.42	46 j25, 2.06	32 - j42, 2.91	85 - j44, 3.7

Table 7: Sark 100.

	MR100	Sark 100	MFJ269-C
100pF measured at 7.1MHz	94.8	79	113
10μH measured at 1.8MHz	9.0	9.7	9.2

Table 8: Capacitance & inductance measurements.

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**N**atalie was already sat at her desk in the lab office when Jeff arrived. "Blimey, you're early today", he said as he walked over to his desk. "Yes, I had to take my mum and dad to the airport and thought that I might as well come straight into work rather than going home for an hour or so". "Fair enough", Jeff replied. "It looks like you're catching up with college work". "Yes", Natalie replied. "Archie covered capacitive reactance with us yesterday. Can we have our usual tutorial at lunchtime?" "Yes, I don't see why not", said Jeff as he wandered off to make himself a cup of tea.

Lunchtime arrived and Natalie went over to sit at Jeff's desk with him. "Right, OK", said Jeff. "Let's just have a bit of a recap about what we talked about last time – inductive reactance". "OK", Natalie replied. "If you remember, we said that reactance is the property that resists the flow of current in alternating current circuits in a similar way to how resistance acts in direct current circuits". "Yes, remember that", Natalie said. "When we looked at inductive reactance", Jeff continued, "we said that we give reactance the symbol capital X and like resistance it is measured in Ohms. We also said that the reactance of a component is frequency dependant and for inductors the reactance is directly proportional to the frequency. In other words, for the same inductor if we double the frequency then its reactance will be doubled". "Yes, remember that", Natalie replied.

"So, let's have a look at capacitive reactance then. I'll point out the differences between inductive and capacitive reactance as we go along". "Fine", said Natalie.

"OK", said Jeff. "Let's start with a bit of revision about capacitors in direct current circuits. If we connect a capacitor to a DC supply [Fig 1], when the supply is connected to the capacitor, the capacitors plates will become charged – one will have a positive charge and the other a negative charge. We measure the charge in Coulombs and denote it by the letter q or Q. Both are used. We also denote Coulombs by the letter capital C so be careful as C is also used for capacitance." "How do we know how much charge there is?" Natalie asked. "The amount of charge is found by", Jeff wrote down the formula:

$$Q = CV$$

"Where C is the capacitance and V is the voltage. So, a capacitance of one Farad with a voltage of one volt across it will produce a charge of one Coulomb. But don't forget that one Farad is a huge capacitance, and

# Capacitive Reactance

Jeff discusses capacitive reactance with Natalie.

we usually use micro, nano or pico Farads in electronics. From the above equation you can see that for a given capacitor the amount of charge is proportional to the voltage applied to it". "Yes, get that", Natalie replied.

"So", said Jeff, "in order for the capacitor to charge up a current must flow but if you remember from our session on capacitors, the current won't be a steady current like you'd find in a resistive circuit. The initial current will be high and gradually fall in value until the capacitor is fully charged. After some juggling with maths, which we won't go into here, we can say that the current is given by the rate of change of voltage multiplied by the capacitance. That is:

$$i = C \, dv/dt$$

"And as we've discussed before, the d in dv/dt means a change in. So dv/dt means a change in voltage with time and the current is proportional to the rate of change of voltage".

"Yes, we've done that with Reggie in maths when we were doing calculus", Natalie put in. "Yes, it's used a lot in calculus", Jeff replied. "Anyway, when the capacitor is fully charged, no more current will flow." "OK, fine", said Natalie. "In a DC circuit", Jeff continued, "for a pure capacitance with no leakage, when we remove the supply, the capacitor will remain charged up for ever. But that is for direct current. Now let's have a look at what happens in an alternating current circuit." "OK", said Natalie. "When an alternating voltage is applied to a capacitor, the charges on the plates will be constantly changing between positive and negative at the same rate as the frequency of the supply. If you remember from when we looked at inductive reactance, we drew a series of graphs for voltage and current to show what was happening, and we can do the same again here". Jeff started to draw some graphs [Fig. 2]. "OK", said Jeff. "If you look at the first graph [Fig. 2a], here you can see the voltage that is applied to the capacitor, and I've also shown where the rate of change of voltage, dv/dt, is zero and when it is at its maximum. The rate of change of voltage is zero at the peaks, both positive and negative of the sine wave where it transitions between rising and falling slopes. The rate of change of voltage is at its maximum where the graph passes through zero". "That's similar to what we discussed when we talked about inductive reactance", said Natalie, "but for inductive

reactance we looked at current, not voltage". "Yes, that's right", Jeff replied. "And", Jeff continued, "for inductive reactance we drew a graph of the rate of change of current or di/dt, so here we can draw a similar graph for the rate of change of voltage or dv/dt [Fig. 2b)". "OK, so the rate of change of voltage is ninety degrees out of phase with the voltage itself then", Natalie observed. "Yes, that's correct", Jeff said, "And if you now look at the third graph [Fig. 2c], you can see that the current is also ninety degrees out of phase with the voltage. So, Natalie, can you describe the relationship between the voltage and current for me?" "I'll try", said Natalie looking at the graphs. "OK, so as I see it, the current leads the voltage by ninety degrees, or I could say that the voltage lags the current by ninety degrees. Either statement is right". "Correct", said Jeff. "So can you draw the phasor diagram for me?" Natalie picked up a pencil and drew the phasor diagram [Fig. 3].

"Yes, that's correct", said Jeff, "and there's an easy way of remembering the relationship between voltage and current in inductive and capacitive circuits. Just remember the word civil". "Civil?" said Natalie. "Yes", Jeff replied, "If we take the letters in the word civil, we can use the C to represent capacitance, I and V to represent current and voltage, and the L to represent inductance. So, taking the first three letters, C, I and V", Jeff wrote them down [Fig. 4a], "We can say that we have capacitance, current and voltage and that the current comes before, or leads the voltage. Which for a capacitive circuit we know is true. And taking the last three letters V, I, and L [Fig. 4b] we have voltage, current and inductance and we can say that if we have a circuit where the voltage leads the current, then it is an inductive circuit. So, there you are, CIVIL". "Oh, that's useful", said Natalie. "I'll pass that on to Isla, Poppy and Tommy. They'll like that".

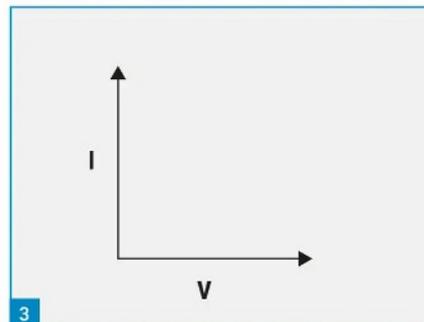
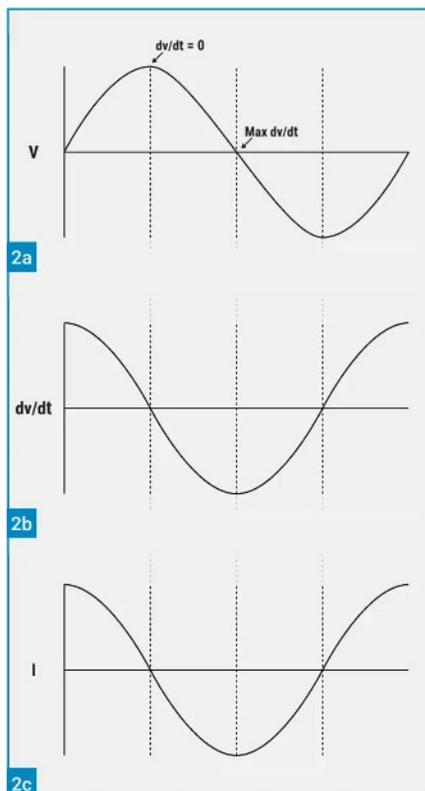
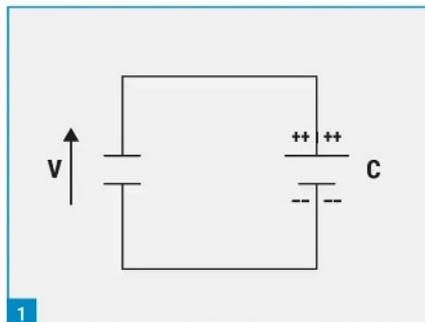
"OK", said Jeff. "We can also derive an expression for the current which involves a bit of maths juggling, which I'll show you how to do later, but what we end up with is this". Jeff wrote down the equation.

$$i = \omega CV_m \cos \omega t$$

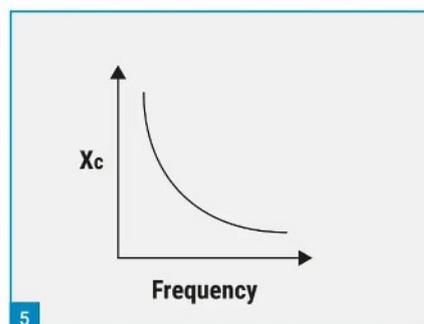
"Now", Jeff continued, "the maximum current,  $I_m$  will be when the cosine Omega time bit equals one". Jeff wrote down another equation.

$$\cos \omega t = 1$$

Fig. 1: Capacitor connected to a DC supply. Fig. 2a: Alternating voltage applied to the capacitor. Fig. 2b: Rate of change of voltage. Fig. 2c: Current, 90° out of phase with voltage. Fig. 3: Basic phasor diagram. Fig. 4: CIVIL - aide memoire. Fig. 5: Reactance vs. Frequency.



CIV VIL



"Which means that"

$$I_m = \omega CV_m$$

"From Ohms law we know that for both direct and alternating current circuits the resistance is given by the voltage divided by the current,  $R = V/I$ , and we can do a similar thing for reactive circuits. So, to find the reactance, we again divide the voltage by the current and so, for capacitive reactance we can say that"

$$I_m = \omega CV_m$$

$$V_m / I_m = 1 / \omega C$$

$$V_m / I_m = 1 / 2\pi f C$$

"And therefore, capacitive reactance,  $X_c$  is found by"

$$X_c = 1 / 2\pi f C$$

"Here we can see that capacitive reactance is given the symbol capital X followed by the subscript C. As with inductive reactance it is measured in Ohms." "OK, but capacitive reactance won't be directly proportional to frequency like inductive reactance is, will it?" Natalie asked. "No, it won't", Jeff replied. "The reactance of a capacitor is inversely proportional to frequency. The higher the frequency, the lower the reactance. Like this". Jeff drew a graph [Fig. 5]. "And, of course", Natalie said, "At a frequency of zero, in other words a direct current a capacitor will have a reactance that in theory at least will be infinity". "Correct", Jeff replied. "The fact that a capacitor can block a direct current whilst at the same time allow an alternating current to pass through is a useful property. We perhaps should have discussed this earlier, but it's important to understand that an alternating current can't actually flow through a capacitor because the dielectric which is an insulator won't allow it to. But, because the plates of the capacitor are constantly charging and discharging, it appears as though a current is flowing." "OK, I see", said Natalie. "Arthur had sort of explained that to us in engineering science". "As I said", Jeff continued, "it's a useful property that is often used between stages in an amplifier where we want to pass an alternating signal from one stage to another but don't want the direct current conditions of each stage messing with each other".

"Right, shall we do an example?" Jeff asked. "Yes please", Natalie replied. "OK, let's calculate the reactance of a capacitor that has a value of twenty nano Farads when operating at a frequency of ten megahertz. So, we have"

$$X_c = 1 / 2\pi f C$$

$$X_c = 1 / 2\pi \times 1.0 \times 10^7 \times 2.0 \times 10^{-8}$$

$$X_c = 1 / 1.257$$

$$X_c = 0.796\Omega$$

"Quite low then", said Natalie looking at the answer. "Yes, it is", Jeff replied. "I tell you what, let's see what happens if we use a lower frequency. Let's say ten kilohertz". "OK", Natalie replied.

$$X_c = 1 / 2\pi \times 1.0 \times 10^4 \times 2.0 \times 10^{-8}$$

$$X_c = 1 / 1.257 \times 10^{-3}$$

$$X_c = 795.774\Omega$$

"Which, as you can see is much higher and backs up what we said about for a given capacitor, the higher the frequency, the lower the reactance and vice versa". "I see", said Natalie. "When we looked at inductive reactance, you said that there was a reciprocal of reactance called susceptance. Does the same apply for capacitive reactance?" "Yes, it does", Jeff replied, "and as with inductive reactance we give it the symbol capital B, and it is measured in Siemens. Let's do an example. We'll use the two reactances that we have just calculated. So, at ten megahertz the susceptance will be"

$$B = 1 / X_c$$

$$B = 1 / 0.796$$

$$B = 1.256S$$

"And at ten kilohertz"

$$B = 1 / X_c$$

$$B = 1 / 795.774$$

$$B = 1.257 \times 10^{-3}S$$

"And if all you want to find is the susceptance of the capacitor, you can simplify things and say that the susceptance is equal to two pi times frequency times capacitance"

$$B = 2\pi f C$$

"No need to find the reactance and then take the reciprocal of it again to get you back where you started".

"OK", said Natalie. "For susceptance, the higher the frequency, the higher the susceptance will be". "Correct" Jeff replied. "And, of course, as with inductive reactance, we can juggle the formula for reactance about to find what frequency or capacitance will produce a certain reactance". Jeff wrote down two more equations

$$F = 1/X_c 2\pi C$$

$$C = 1/XC 2\pi F$$

"Let's do a couple of examples. Let's say that we want to know at what frequency a one hundred pico Farad capacitor will have a reactance of five kilo Ohms"

$$F = 1/XC 2\pi C$$

$$Xc 2\pi C = 5.0 \times 10^3 \times 2\pi \times 1.0 \times 10^{-10}$$

$$= 3.142 \times 10^{-6}$$

$$F = 1/3.142 \times 10^{-6}$$

$$F = 318.31 \text{ kHz}$$

"And what value of capacitor will have a reactance of twenty kilo Ohms at a frequency of five megahertz?"

$$C = 1/XC 2\pi F$$

$$C = 1/2.0 \times 10^4 \times 2\pi \times 5.0 \times 10^6$$

$$C = 1/6.283 \times 10^{11}$$

$$C = 1.59 \times 10^{-12}$$

$$C = 1.59\text{pF}$$

"So, there you are", said Jeff. "That's both inductive and capacitive reactance covered". "Yes, that's good", Natalie replied. "I'll photocopy the notes and pass them on to Isla, Poppy and Tommy as usual. Can you write us a few questions as well please like you normally do?" "Yes, no problem", Jeff replied.

## Jeffs questions

1. Calculate the reactance of a 1nF capacitor at a frequency of 5MHz. (31.83Ω)
2. What is the reactance of a 1000µF capacitor at a frequency of 10kHz? (15.92mΩ)
3. What is the reactance of a 1pF capacitor at a frequency of 200Hz? (795.77mΩ)
4. What value of capacitor is required to produce a reactance of 50kΩ at a frequency of 500kHz? (6.366pF)
5. What is the susceptance of a 20µF capacitor at 100Hz? (12.566mS)
6. What supply frequency is required to produce a reactance of 200Ω for a 0.1µF capacitor? (7.958kHz) **PW**

## Continued from page 41

same software (EA4JRB 11 V13), see **Photo 6**.

The MFJ stripboard results are astonishing. My resistors were supposed to give resistive 1:1 to 4:1 loads, but the complex impedances tell us otherwise. Yet above '50Ω', that is what I saw. I wish I could explain this, but I cannot. I tried several times and got the same results.

Bizarre! Again, overall, the VSWRs are remarkably consistent between pieces of equipment and any of the analysers, interpreted intelligently, would tell 'the truth'.

## Measuring inductance and capacitance

These analysers can also measure capacitance and inductance. They do this by measuring reactance with a user-set frequency and, knowing what kind of component is on test, working back from the usual reactance formulae. Each analyser has a maximum impedance it can process – for the MFJ-269C, this is 1500Ω. So, depending on the combination of frequency and capacitance or inductance, the reactance can be too high for a reactance reading – and hence component value – to be obtained.

I had never tried this before and did a couple of tests, see **Table 8**. See also **Photo 7** for the MFJ-269C's display. All the analysers gave some

difficulty getting readings, but the MFJ worked best. That said, I'm mindful that I came to this cold. I'd need to do much more testing to make judgements. Taking a positive from this, all the analysers gave the right answers, allowing for tolerance.

## Conclusion

There is a lot of information there, but summing it up, these analysers work well and report VSWR surprisingly consistently. Any antenna analysers I might afford will give me an indication at best. But, interpreted with an amateur's eye, they are accurate and can be relied on. Just as much to the point, they are useful, fun things. My MR100 will, I hope, add to my enjoyment of the hobby for a long time. **PW**

## Useful links

### Instruction manuals

- MR100:  
<http://115.28.16.44:81/file/3803.pdf>
- MFJ-269:  
[www.ad7fo.com/media/mfj269.pdf](http://www.ad7fo.com/media/mfj269.pdf)  
<https://tinyurl.com/ekfkpkac>
- Sark 100 (offline when checked recently):  
<https://tinyurl.com/yze6ks8a>
- MFJ-269 calibration document (doesn't look official so caveat emptor!):  
<https://tinyurl.com/3czep6hw>

## Continued from page 39

North America. "Jonathan N4AKV made a trip to Alaska, operating as N4AKV/KL7 from a couple of grid locators around the state capital Anchorage. N4AKV has been on from lots of locations in the continental USA and Atlantic Canada in recent months, and he made an effort to work stations in Asia while in Alaska.

"Philippe EA4NF is currently in south Florida, using his US call KE4NF before flying down to Curacao for a few days operating as PJ2/EA4NF.

"Alex VE3GOP popped up from eastern Nunavut, operating from the very rare grids FP77 and FP87 as VE3GOP/VY0 for a few days in late July. Alex is an air navigation systems technician for Canada's air traffic control provider NAV CANADA, and his job has taken him to other rare spots in northern Ontario where he has activated more rare grids. This follows Mark VO1ONE/N8TLV operating as VY0SAT from another part of Nunavut (grid EP28) earlier this year, and VY0ERC from above 80° North in grid ER60.

"Jerry W8LR continues traveling to grids throughout the eastern USA and always looks for opportunities to make transatlantic QSOs. And the British Virgin Islands made an appearance on satellites, thanks to Tony KD8RTT. VP2V/KD8RTT was on satellites, 6m and HF from Tortola. VP2V is rarely heard on satellites, so that was a nice treat.

"R.J. WY7AA has been on a long road trip to

Atlantic Canada, recently operating as WY7AA/VO1 in St. John's, Newfoundland, as well as WY7AA/VO2 from Labrador. He has been putting lots of rarely-heard grids on the satellites, as he has driven from his home in Wyoming.

"Johnny DK9JC, after making trips to the USA in recent years, went to Toronto and operated as VE3/DK9JC. Only on FM satellites, and from a not-so-rare grid FN03, but he made satellite operators in the USA and Canada happy with his appearance on many passes".

## FM and DAB DX

Simon Evans writes, "I would say that the Sporadic E season has been a bit later this year. I count the number of ITU countries received each year and since the last issue I've added two relatively difficult ones; Malta and Norway. Each year Malta usually appears at some stage but Norway and now Switzerland are a different matter. Both countries have closed their FM stations from their National broadcasters but I have received a couple of low power ones from Norway (one in Trondheim and another near Oslo)". On DAB, Simon has been seeing some good tropo in the mornings, out to the east and the best distance has been Antenna DE from Luneburg at a distance of 864km. The map, **Fig. 4**, shows Simon's recent loggings Another full column – thanks to everyone who has contributed and please keep your news coming, it's much appreciated. **PW**

Mike Richards G4WNC

practicalwireless@warnersgroup.co.uk

I've always enjoyed building my radio kit, as that's how I started in amateur radio as a boy; it was all we could afford! However, advances in modern technology, such as miniature surface-mount components and multilayer PCBs, have made home construction of high-performing equipment increasingly difficult. One area of our hobby that has always managed to find a way is the world of QRP. This is thanks to many ingenious designers who devote many hours to creating clever designs that they then share with the rest of us. One such prolific designer is Hans Summers G0UPL/AB7BF, of QRP-Labs. One of the best current examples of his work is the QMX+ transceiver, Fig. 1. I've been looking for a new QRP rig that I could use in remote locations, and the QMX+ seems to fit the bill perfectly. Although I've been aware of the transceiver for some time, I'd not taken a close look at its capabilities. When I did take the time to look, I was frankly amazed because it's packed with innovation and features to help the operator. Let me highlight a few of the features here, and you'll see what I mean.

- Frequency coverage: All amateur bands from 160m to 6m
- Power output: 5 watts
- Power supply: 9V or 12V versions
- Transmission Modes: CW, all data modes and SSB
- CW Operation: Very low latency full break-in with built-in keyer, memory and decoder
- Beacons: Includes a standalone WSPR beacon
- Frequency precision: TCXO, or external GPS with option for an internal GPS
- Current consumption (14MHz on my rig): Rx = 94mA 5W Tx = 1.01A (Uses Class D power amplifier)
- Computer Interface: Includes USB-C port providing a soundcard for digital audio and a virtual serial port for full rig control (emulates Kenwood TS440)

I could go on, but this list is pretty impressive. So how much does this sophisticated rig cost? Surely it must be heading towards £1000. No, it's just \$150 (£112) for the kit version, complete with the case or \$200 (£150) for the fully assembled, tested and boxed unit!

Next month, I'll run through a few tips for those building the kit version, but this time I'll take a closer look at some of the innovative features of the QMX+.

### Data modes FSK

I'll begin with the way the most popular data modes signals are transmitted. In most transceivers, Data Modes signals use the SSB modulator in the transmitter. However, many have a separate digital mode that usually determines the source of the SSB signal. For simple USB and LSB modes, the rig will normally take its input from the microphone socket. When you switch to Data, the rig usually



## The QRP Labs QMX+

This month, **Mike Richards G4WNC** takes an in-depth look at the innovative design of the QMX+.

takes its input from the data socket on the rear panel. However, in most cases, it will still use the standard SSB modulator. While this is generally the simplest way to add digital capabilities, for single tone modes like FT4/8, WSPR and other WSJT-X modes, it does add unnecessary complication to the signal path and potential distortion of the transmitted signal. The QMX+ uses an entirely different approach to create true Frequency Shift Keying (FSK). Most data modes software, such as WSJT-X, generates audio modulation tones that are applied to the rig's SSB modulator to create the data signal. In the case of QMX+ and other models in the QRP-Labs range, the rig's processor measures the frequency of the incoming audio tone from WSJT-X and makes a matching micro adjustment to the frequency of the Si5351 carrier generator, so that it follows the data mode's modulation using true frequency shift keying (FSK), Fig. 2. Using this technique completely avoids the transmitter's SSB modulation stages and the inevitable unwanted output products. The result is a much cleaner output signal where all the available power is used to carry the wanted signal.

A significant challenge for this approach is developing an audio frequency measurement system that's both fast enough and accurate enough to follow the data signal. In the case of the WSJT-X modes, there are usually tiny frequency shifts of just

a few Hz. If you've ever used a frequency counter to measure audio frequencies, you will know that you must monitor a lot of audio cycles to get an accurate measurement. For the QMX+, Hans uses the zero-crossing measurement technique. In this technique, you take a sample that's above 0 and one that's below zero and use a straight line between the two to calculate the zero-crossing point, Fig. 3. Once you've captured a few of these, you can calculate the time between consecutive zero-crossing points. This gives you the period of the signal, and the inverse gives you the frequency. Hans has found this to be a fast and accurate measurement system for typical data modes tones. In his tests, the measurement accuracy is of the order of 0.005Hz at 1.5kHz. He further improves this basic accuracy by averaging the measurement over 100 cycles. To create the modulation, the software retrieves the carrier frequency from the CAT link and adds the measured audio frequency. The result is sent to the Si5351 carrier oscillator to create a pure FSK signal.

### Efficient PA

With any QRP rig, power efficiency is critical because most operators are likely to be running with limited battery power. As the PA (Power Amplifier) is usually the heaviest consumer, its design is critical. For the QMX+, Hans uses a Class D design with four BS170 MOSFETs to produce 5 watts of RF output.

Buy back issues and archive CDs at [www.mymagazinesub.co.uk/practical-wireless](http://www.mymagazinesub.co.uk/practical-wireless)

Fig. 1: QRP-Labs QMX+ 160m to 6m Transceiver.

Fig. 2: Simplified block diagram of single-tone FSK modulation in the QMX+. Fig. 3: QMX+ zero crossing frequency measurement.

Fig. 4: QMX+ PA block diagram.

Fig. 5: Voltage doubler and rectifier used to derive PIN diode bias from RF.

Fig. 6: Switch-mode PSU block diagram.

Fig. 7: Raised cosine CW keying waveform.

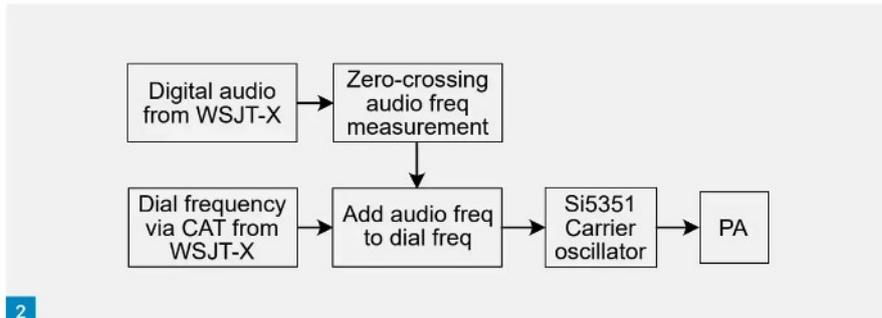
The class D design has many benefits, the first of which is its efficiency, as the PA transistors are either fully on or fully off. This also means there is very little heat generated, so the PCB can provide an adequate heatsink. The PA circuit itself is also very simple with just six logic gates and the PA transistors and no tuned circuits, Fig. 4. The other significant benefit is the natural cancellation of the second harmonic. In Hans' design, the second harmonic is approximately 70dB below the carrier. This significantly eases the design requirement for the subsequent low-pass filters.

## Neat low-pass switching

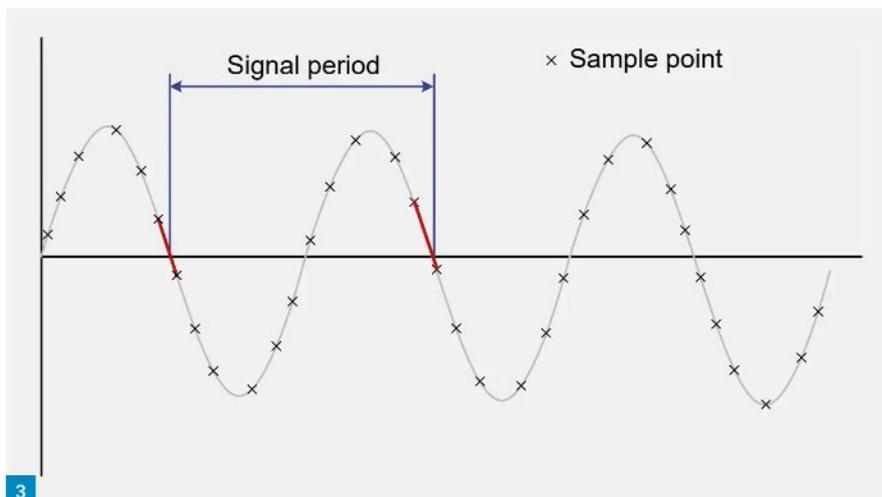
The QMX+ employs a bank of six low-pass filters to cover the amateur bands from 1.8MHz to 50MHz. The reduced number of filters is due to band sharing, which is possible thanks to the very low second harmonic output from the class D PA. While looking at the design, I was particularly impressed with the band switching technique. Hans uses solid-state PIN diode switching, which is not in itself unusual. The surprise was the use of common 1N4007 rectifier diodes in place of much more expensive PIN diodes. Hans has found that the 1N4007, with its 1000V reverse voltage tolerance, makes an excellent HF PIN diode. While PIN diode switching brings significant space saving, reliability and speed, in the off state the diode requires a DC reverse bias voltage that's greater than the peak RF voltage in the circuit. In the case of the QMX+ with its 5W PA, that's 45V of peak RF. That's potentially a problem when you're running a QRP rig on a 9V or 12V battery! Hans has developed a novel solution that uses a simple voltage doubler and rectifier that samples the rig's RF power, Fig. 5. The current requirement is very low, so the sample has minimal effect on the RF output. By taking the sample from the PA, you can be sure the bias voltage will always be greater than the applied RF.

## Switching regulators

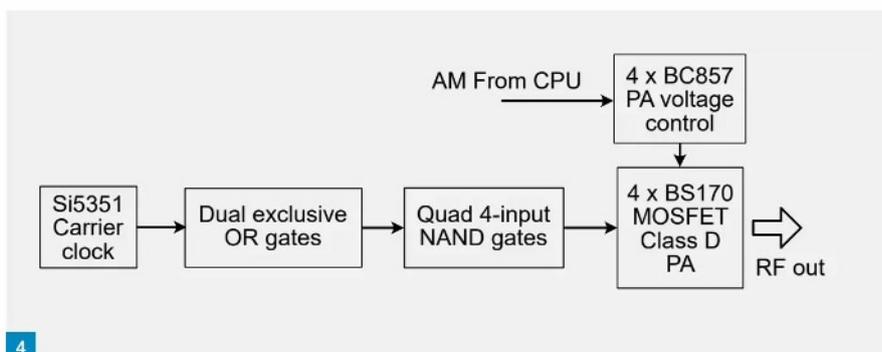
We all know that switching regulators and sensitive RF circuitry don't mix. However, there are times when they're unavoidable. In the case of the QMX+, efficient switching regulators are essential to keep the receive current down to an acceptable level. One of the primary sources of problems with most switching regulators is the free-running oscillator and its associated high phase noise. This creates a band of interference that drifts around



2



3



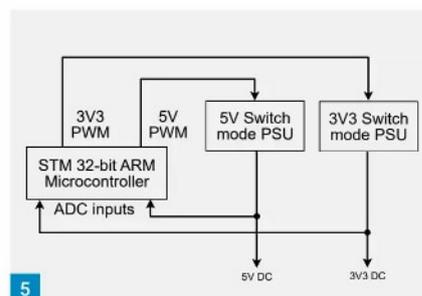
4

the band and is almost impossible to filter out. For the QMX+, Hans has used discrete component switching supplies, each of which derives its switching frequency from the processor, which, in turn, is locked to the low phase noise 25MHz TCXO, Fig. 6. As a result, any interfering signal generated by the regulators should be narrowband and stable, a significant improvement. As a further improvement, Hans uses the processor to automatically adjust the switch mode frequencies to avoid the current operating frequency.

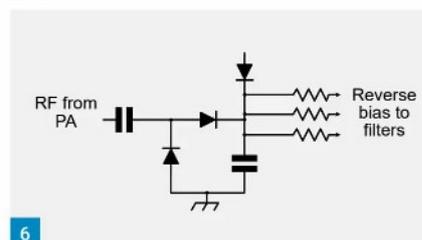
## SSB & CW shaping

While the QMX+ didn't initially include SSB, it was promised in a future firmware update. Given my explanation so far, you may be wondering how you can add SSB with a class D PA, which is certainly

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5



6

Colin Redwood G6MXL  
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### Assessing propagation

There are a number of techniques you can use to assess propagation. Some are as simple as listening on the bands. Others are web-based, which can be useful to help you decide whether to head for home or carry on with another activity. They all have a place in your propagation assessment tool kit.

### Assessing propagation—web based

The various 'banners' on Paul Herrman NONBH's website give a useful overview (an example is shown in Fig. 1). Paul's banners are extensively used on numerous amateur radio websites. In my experience they can often help understand why propagation is particularly poor during sunspot flares. Paul provides a basic interpretation. I've listed the main propagation parameters below to help interpret the data shown on Paul's banners, starting with three parameters that are generally linked to good propagation when they are higher. Remember these are generalisations! Paul's website can be found at:

[www.hamqsl.com/solar.html](http://www.hamqsl.com/solar.html)

### Solar Flux Index (SFI)

The SFI is a measure of the level of atmospheric radiation arriving on earth from the sun. It tends to fluctuate between about 60 and 300. The maximum usable frequency (MUF) is generally higher with higher SFI. For DX on HF the SFI needs to be above 110, ideally for several days. If it's 90 or less, then the upper HF bands will be closed and the mid-HF bands may be open to Europe. This isn't always the case, but generally so.

### SN—sunspot number

This is the current sunspot register and generally, it will link to the SFI number above. For good HF propagation ideally it will need to be greater than about 70 or 80. When it gets to 100+ then the bands will be open all day (and probably night). 200+ is unusual, but when and if we get it, worldwide DX will be possible.

### 304A

The 304A parameter refers to the specific wavelength (304 Ångstroms, equivalent to 30.4nm) of ultraviolet radiation that ionises the F1 and F2. High levels of 304A radiation are usually associated with good conditions for HF propagation.

The SFI, SN and 304A are all indicators of propagation assuming there's nothing adverse. Table 1 is a summary of the approximate values of SFI, SN and 304A that are needed to open the indicated bands for worldwide propagation on

# HF Propagation (Pt II)

Colin Redwood G6MXL concludes his look at HF propagation, this time looking at tools for assessing HF propagation. As before, there are a number of generalisations, but nevertheless it will hopefully help readers get a basic feel for a subject that can appear quite complex.

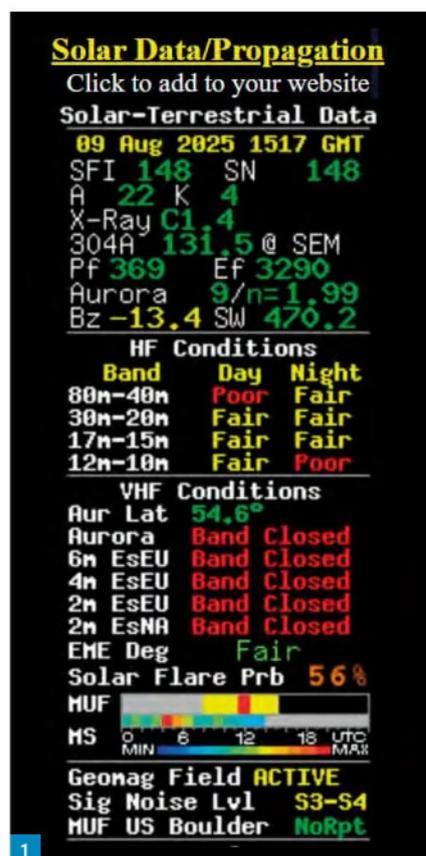


Fig. 1: One of Paul Herman's propagation banners. Fig. 2: The DXSummit DX cluster – there are many others available. Fig. 3: A map on DXView.

many days of the month (not just for a day or two). I'll now move on to consider some indicators of possible adverse conditions.

### K-Index

The K-Index is a three-hourly logarithmic measurement of the earth's magnetic field relative to what are considered quiet day conditions. A magnetometer is used to make the measurement. The higher the K-Index gets, the worse the propagation on the higher HF bands tends to be. A K-Index of 0 or 1 indicates quiet magnetic conditions. Values between 2 and 4 indicate somewhat unsettled magnetic conditions resulting in some degradation

on the HF bands. A K-Index of 5 indicates a minor storm (severity of magnetic fluctuations generally leading to an ionospheric storm), while higher values indicate progressively bigger storms. You may also see mention of the Kp-index, which is essentially the same as the K-Index except it is an average of K-Indices from measurements across the planet (earth).

### A-Index

The A-Index is the daily average of the previous eight three-hour K indices but on a linear scale giving values of between 0 and 400. A low value A-Index is best for good propagation on the upper HF bands. Between 1 to 6 is best, 7-10 is OK, and getting worse the higher the A-Index value. Above 15 is generally not good news, with 100 considered a storm and 400 an extremely violent storm! You may also see mention of the Ap-index, which is effectively the same as the A-Index except it is an average of A-Indices from measurements across the planet (earth).

### X-ray

This provides a measure of intensity of X-rays arriving at the atmosphere. High levels of X-rays can increase the absorption of the D-layer, thus preventing signals getting through to the higher E and F layers and preventing long distance contacts on the higher HF bands. B and C prefixes to the numbers indicate relatively low levels of X-rays. M and X readings are not good news as they are often associated with blackouts.

### Bz

This is the Interplanetary magnetic field measure in nano Tesla (T). The value indicates either a positive coupling with or a 'negative coupling' against the earth's magnetic field. Typical values range from -100 to +50nT. A positive or a small negative value is preferable to a large negative value.

### Solarwind (SW)

The solar wind is a stream of charged particles released from the Sun's corona, its outermost atmospheric layer. The solar wind speed is measured in km per second. When a big earth-bound coronal mass ejection (CME) or coronal hole (CH) stream occurs, they can increase the

The screenshot shows a web application for tracking DX spots. At the top left, there's a 'Filters' section with a '14MHz' filter applied. To the right, there are toggle switches for 'DX' and 'Inc', and a search bar. The main area is a table of spots:

Spotter	Freq.	DX	Time	Info	Country
JR6RRD	14074.0	S21IM	17:29 09 Aug	FT8 CQ	Bangladesh
YO3IWZ	14074.0	BA7LIP	17:28 09 Aug	Tnx for QSO_73!	China
K4TOO	14267.0	NM8GS	17:28 09 Aug	TY	United States
WQ6X	14045.5	WA2OTC	17:27 09 Aug	CW	United States
ES2IPA	14080.0	PA3GHJ	17:27 09 Aug	FT4	Netherlands
EA4IDN	14074.0	VK3VM	17:20 09 Aug	FT8 CONTACT BEST REGARDS	Australia
IB9M	14003.1	JE6RPM	17:20 09 Aug	wae test	Japan
IB9M	14004.9	H25A	17:19 09 Aug	wae test	Cyprus
IB9M	14009.0	YB9ELS	17:19 09 Aug	wae test	Indonesia
KJ9C	14044.5	N3QE	17:19 09 Aug		United States
PD8RW	14278.0	EI9GNB/P	17:18 09 Aug	pota ie0029	Ireland
IQ9SZ	14112.0	IT9ECY	17:18 09 Aug	17.19 CQ DX CQ DX	Sicily

On the right side, there's a clock showing '17:42:58 09 Aug', a location input field, and a 'Share a spot' form with fields for 'My call:', 'DX:', 'kHz:', and 'Info:', each with a 'Callsign' or 'Info' placeholder. A green 'Share' button is at the bottom of the form.

speed of the solar wind up to about 2,000km per second. Ideally, we want lower values of around 400km per second or lower.

## The Reverse Beacon Network (RBN)

The various parameters that I have covered so far are all aids to understanding the impact of the sun on propagation on earth. The theory and measurements are all very well, but another way is to use tools that show where signals are actually getting to. The Reverse Beacon Network (RBN) can be a useful guide to see where CW or datamode signals (including WSPR) are actually being received. In general, if signals from your country are consistently being received over a period of a few minutes or longer, then the band in question is open to the area where they are being received.

[www.reversebeacon.net](http://www.reversebeacon.net)  
[www.pskreporter.info](http://www.pskreporter.info)

As many of the RBN receivers are run unmanned 24 hours per day, you'll need to consider whether the amateur population is likely to be awake in the part of the world where your signals are being received. Don't forget that at 50MHz (6m) up to 144MHz (2m), there may be occasions where propagation is enhanced by meteor 'pings' for brief periods.

## DX Cluster

The DX Cluster can also be helpful, as this shows reports of DX stations actually worked by other amateurs. There are various nodes available which have varying filtering facilities. I use dxsummit.fi, which provides sufficient

filtering for my purposes (Fig. 2). The relative lack of filters in comparison with other Cluster nodes helps me see the 'big picture' of propagation. I know that others prefer the extra filtering capabilities provided by dxheat.com for example. There are many others.

[www.dxsummit.fi](http://www.dxsummit.fi)  
[www.dxheat.com](http://www.dxheat.com)

## FT8 signals

Even if you're not a fan of FT8, a quick listen on the main FT8 frequencies (Table 2) will give a rough indication of whether a band is open or not. I use this technique for quickly assessing whether a normally quiet band (e.g. 6m) is open or not.

## International Beacon Network

The international beacon system can also be useful (Table 3), as can listening for beacons in a particular part of the world that you want to contact. These transmit on five frequencies (14.100, 18.110, 21.150, 24.930 and 28.200MHz) in a three-minute cycle, so no two

Band	SFI for many weeks	Sn for many weeks	304A for many weeks
17m	80	30	105
15m	90	50	140
12m	105	75	195
10m	125	100	250
6m	190	215	400

Table 1: Summary of the rough values of SFI, SN and 304A that are needed to open the indicated bands for worldwide propagation on many days of the month (not just for a day or two). Taken from Space Weather Parameters and Propagation by Carl Luetzelschwab K9LA June 2021. <https://tinyurl.com/mr3affbc>

beacons transmit at the same time on the same frequency.

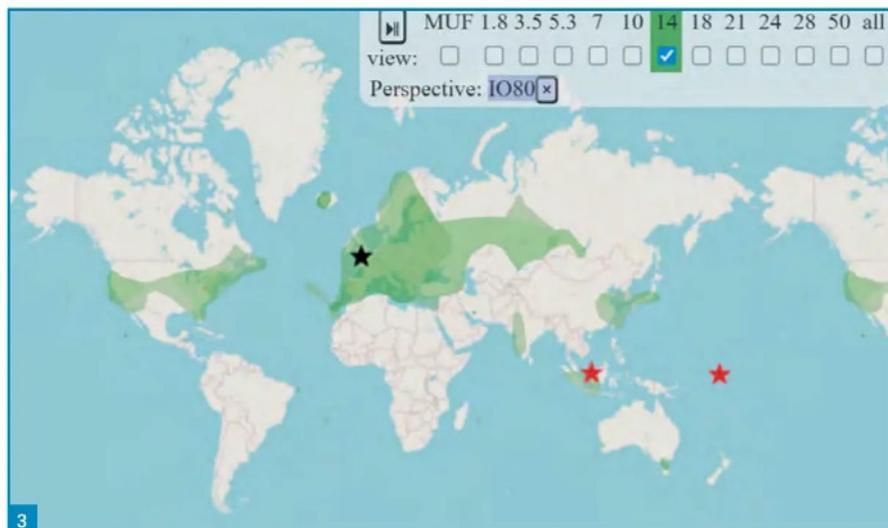
[www.ncdxf.org/beacon](http://www.ncdxf.org/beacon)

I find it helpful to put the FT8 and beacon frequencies into my transceiver's memories, so that I can quickly switch between them.

Don't underestimate the value of listening and tuning around on the bands, using whatever modes you like. If you suspect a band may be open but you're not hearing signals, it can be a good time to call CQ and see if you get a reply - if we all just listen and nobody calls CQ, then no contacts will ensue!

## DXView

So far, most of the information on current propagation I've mentioned has been largely numeric / tabular. For those who like to be able to visualise the current situation without getting into load of numbers and multiple sources, the map available from DXView will be very welcome. The map shows real-time radio propagation from amateur stations operating on 11 bands between 1.8 and 54MHz. The



display shows worldwide activity from the last 15 minutes and is automatically updated about every minute. For the purposes of the map the MUF is effectively the maximum recently used frequency, since the display is based on real-time data (Fig. 3). Don't forget to enter your locator (grid) to get data relevant to your location! Data for the map is gathered from several online sources: WSPRnet, Reverse Beacon Network (CW, FT4, FT8), and DX Cluster. <https://hf.dxview.org>

### Sunspot cycle

Before leaving propagation, a reminder that we are somewhere close to the solar maximum of the current solar cycle (number 25). Some people are suggesting that we may have already passed the maximum in January 2025. It will take a few more months to establish whether this is indeed the case, as sometimes there can be a second peak. Either way, autumn 2025 could provide one of the best chances to work some DX stations on the HF bands before

the sunspot numbers decline and we wait for another ten years or so for the next solar maximum.

### RSGB Convention

Changing the subject, don't forget the RSGB Convention takes place in Milton Keynes on Friday, Saturday and Sunday 10,11, 12 October. I'm scheduled to give one of the talks, and look forward to meeting readers of this column. **PW**

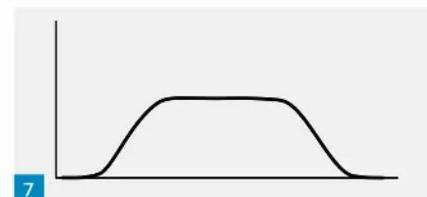
Band	Frequency (MHz)
160m	1.840
80m	3.573
40m	7.074
30m	10.136
20m	14.074
17m	18.100
15m	21.074
12m	24.915
10m	28.074
6m	50.313

Table 2: The main FT8 frequencies.

Slot	DX Entity	Call	Location	Grid Square
1	United Nations	4U1UN	New York City	FN30as
2	Canada	VE8AT	Inuvik, NT	CP38gh
3	United States	W6WX	Mt. Umunhum	CM97bd
4	Hawaii	KH6RS	Maui	BL10ts
5	New Zealand	ZL6B	Masterton	RE78tw
6	Australia	VK6RBP	Rolystone	OF87av
7	Japan	JA2IGY	Mt. Asama	PM84jk
8	Russia	RR90	Novosibirsk	NO14kx
9	Hong Kong	VR2B	Hong Kong	OL72bq
10	Sri Lanka	4S7B	Colombo	MJ96gw
11	South Africa	ZS6DN	Pretoria	KG33xi
12	Kenya	5Z4B	Kikuyu	KI88hr
13	Israel	4X6TU	Tel Aviv	KM72jb
14	Finland	OH2B	Lohja	KP20eh
15	Madeira	CS3B	São Jorge	IM12jt
16	Argentina	LU4AA	Buenos Aires	GF05tj
17	Peru	OA4B	Lima	FH17mw
18	Venezuela	YV5B	Caracas	FJ69cc

Table 3: The international beacons.

Continued from page 46



not linear. As you might expect, Hans has an interesting solution. One of the features I haven't mentioned yet is the CW envelope shaping. If we were to key the class D PA directly, the result would be lots of key click harmonics, which other band users would not appreciate. To overcome this problem, the QMX+ includes a power/gain control circuit in the power supply to the PA stage. This is effectively a discrete component power OpAmp that controls the PA voltage and has a very linear response. The input to the PA supply circuit is connected to a DAC output on the microprocessor. The software then uses this to generate a raised cosign keying shape with a rise time of 20ms, Fig. 7. This produces a very clean CW output.

To implement SSB with this non-linear PA, Hans used a modulation technique first suggested by Leonard Kahn, known as Envelope Elimination and Restoration (EER). This is more commonly known these days as Polar modulation. In this technique, the modulation audio (speech or data signal) is processed to produce the I & Q components. When done digitally, as in the QMX+, this is done with a Hilbert transform. With some simple maths, the I & Q components of the audio are split into their phase and amplitude components. The amplitude component is applied to the PA power supply circuit, and the phase component alters the phase of the Si5351 carrier oscillator. The result is combined in the PA to create a conventional SSB signal. Sounds easy! However, as Hans discovered, ensuring the amplitude and phase components reach the PA in synchronisation is not a trivial task. There are amplitude delays and a variable phase shift that's dependent on the operating frequency and power output. As with previous design problems, Hans is rarely beaten and has developed novel solutions for both measuring and correcting these limitations. Hans has also added the Controlled Envelope SSB technique to the QMX+. This deals with the overshoots that occur when you generate IQ SSB signals. The result is to increase the average power of the SSB output significantly, so the QMX+ 5-watts has similar punch to a 12-watt conventional SSB rig. This technique is only found in top end SDRs such as those from Flex Radio, Elecraft and Apache. The result is a very high-quality SSB transmitter.

That's all I have for this time, but next month I'll look at optimising a home-built QMX+ for data modes operation. **PW**

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**T**he first section this month is aimed at the Young Guns, those up-coming radio amateurs who may consider Morse Code an ancient art for ancient amateurs. Nothing is further from the truth so please don't flip the page to the FT8 section or use your PC or handheld to do what amounts to making a phone call. Where is the sense of achievement in that?

Give this section a read and give yourself a challenge. Become a Radio Operator and with an HF transceiver, a simple antenna and a Morse key; talk to the world!

Making Morse code irresistible: why young people should embrace the ultimate communication art

In an era of smart phones, social media, FT modes and instant everything, suggesting that young people learn Morse code might seem like recommending they take up blacksmithing or churning butter. But here's the thing: Morse code isn't a relic of the past – it's the ultimate communication superpower waiting to be rediscovered.

The secret language that actually works

Every generation discovers secret codes and hidden languages. Kids create pig Latin, teenagers develop text speak, and friend groups invent inside jokes that become their own dialect. But Morse code is different – it's a secret language that actually has superpowers attached to it. When you master Morse, you join an exclusive club of people who can communicate in ways that seem almost magical to outsiders.

Imagine tapping out a message on a table during a boring meeting, or flashing a light to communicate across a crowded room. Picture being able to send messages through sound, light, vibration, or even by keying a transmitter that can reach across continents. This isn't fantasy – it's what every Morse operator can do. In a world where young people are constantly seeking ways to stand out and develop unique skills, Morse code offers something genuinely distinctive.

### Digital minimalism

We live in an age of information overload, where the average person receives thousands of messages, notifications and data points every day. Young people, more than any generation before them, are beginning to recognise the mental toll of constant digital bombardment. Social media with all its trolls and assaults has a lot to answer for. If it upsets you, don't read it. You don't really need it.

Enter Morse code: the ultimate expression of digital minimalism. Think about it – every thought, every emotion, and every complex human idea can be reduced to just two elements: dots and dashes. It's binary communication in its most elegant form, predating computer binary by decades. There's something deeply satisfying about this

# Morse for the younger generation

**Roger Cooke G3LDI** makes the case for why Morse code is the mode for the young as well as the old.

radical simplification, like meditation through communication. When you're operating Morse, the noise of the modern world falls away, and you're left with pure, efficient connection. No trolls, no insults, just pure communication and enjoyment.

This isn't just philosophical – it's practical. Morse code forces you to think clearly and communicate concisely. In an age of rambling social media posts and endless text threads, the discipline of Morse teaches you to distil thoughts to their essence. It's like Twitter, but with actual substance and skill required.

### The ultimate backup system

Young people today are increasingly interested in preparedness, sustainability, and self-reliance. They've grown up witnessing natural disasters, infrastructure failures, and the fragility of our interconnected systems. When the power goes out, when cell towers fail, when the internet goes down – Morse code still works.

A simple key, a battery, and a basic transmitter can reach around the world when sophisticated networks fail. During Hurricane Katrina, when modern communication infrastructure collapsed, amateur radio operators using Morse code provided crucial emergency communications. After earthquakes, tsunamis, and other disasters, Morse consistently proves its worth when everything else fails.

But it's not just about catastrophic events. Morse code works in remote locations where cellphones are useless – in wilderness areas, on mountains, at sea. For young people who love adventure, outdoor activities, and exploration. You only have to see how popular POTA, SOTA and suchlike are. Morse code isn't just a hobby; it's a genuine survival skill that could save lives.

### The Maker Movement's perfect match

Today's young people are makers, hackers, and creators. They build Arduino projects, design 3D printed objects, and love understanding how things work at a fundamental level. Morse code fits perfectly into this mindset because it bridges the digital and analogue worlds in fascinating ways. In my youth, valves were involved, but I am not suggesting regression to those days!

Building Morse code projects is incredibly rewarding because the barrier to entry is so low, but the possibilities are endless. A simple LED can become a beacon. A buzzer can become a practice

oscillator. An Arduino can become a sophisticated Morse decoder. Young people can start with basic circuits and evolve into complex projects that combine modern microcontrollers with century-old communication principles.

The beauty is that these projects actually do something meaningful – they **communicate**. Unlike many maker projects that end up in a drawer, Morse code devices connect you to a worldwide community of operators who genuinely appreciate elegant, simple solutions to communication challenges.

### The Gaming Connection: flow states and progressive skill building

Modern young people understand flow states through gaming. They know the satisfaction of mastering complex control schemes, the joy of improving reaction times, and the meditative quality that comes from focusing intensely on a challenging but achievable task. Morse code operation offers all of this. Communication on CW with somebody in Europe or the USA, late evenings on 20m with your headphones on, chatting away for an hour or so, is irreplicable, almost unique and not appreciated until you do it!

Good Morse code operation has a rhythm and flow that's genuinely addictive. When you're copying fast code, your conscious mind steps back and lets your subconscious take over – exactly like in high-level gaming. The characters flow directly from your ear to your hand without passing through the verbal centres of your brain. It's a form of direct neural interface that predates computers by decades.

The skill progression is perfectly designed too. You start slowly, build muscle memory, increase speed gradually, and always have new challenges ahead. Like a well-designed game, there's always a next level to reach, whether it's handling faster speeds, copying through interference, or mastering different operating procedures.

### A worldwide community

But here's where Morse code becomes truly magical for young people: it connects you to a global community of like-minded enthusiasts who share your passion for elegant communication. This isn't a theoretical community – it's active, welcoming, and always available.

Turn on a shortwave receiver or fire up an online Morse decoder, and you'll hear operators from

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**Fig. 1: Team Belarus at the 2024 High Speed CW Test.**



every continent, every time zone, and every walk of life. The teenager in Tokyo practising their newly learned code connects with the retired engineer in Maine, the mountain climber in the Alps, and the sailor crossing the Pacific. Age, nationality, politics – none of it matters when you're sharing the common language of dots and dashes.

This community embodies the 'use it or lose it' principle perfectly. Unlike learning a spoken language where you might struggle to find practice partners, Morse code offers countless opportunities for real communication with real people every single day. Every contact you make helps maintain and improve your skills while contributing to a global network of communication enthusiasts.

The community is also incredibly supportive of newcomers. Experienced operators remember their own learning days and are eager to help new voices join the conversation. Special slow-speed nets welcome beginners, and there are always patient operators willing to adjust their speed to match yours.

### The historical adventure element

Young people love stories of adventure, resistance, and heroism – and Morse code has them in abundance. This isn't just about dusty historical facts; it's about real people in extraordinary circumstances using these exact skills that you can learn today.

Consider the *Titanic* disaster, where wireless operators stayed at their posts sending SOS calls in Morse as the ship sank. Think about resistance fighters in World War II using clandestine Morse transmissions to coordinate operations against occupying forces. Picture astronauts using Morse code to communicate when voice systems failed in the vacuum of space.

These stories aren't ancient history – they're proof that the skills you're learning have real-world importance and have shaped crucial moments in human history. When you learn Morse code, you're not just picking up a hobby; you're connecting with a tradition of communication that has saved lives, toppled governments, and explored new frontiers.

### The Zen of Efficiency

In our chaotic, always-on world, there's something deeply appealing about Morse code's enforced simplicity and focus. When you're operating CW, you can't multitask. You can't check social media while copying code. You can't let your mind wander during a conversation.

This forced focus is increasingly rare and increasingly valuable. Young people who've grown up in a multitasking world often discover that the single-minded concentration required for Morse code is refreshing, almost therapeutic. It's

mindfulness through communication, meditation through connection.

### The future is still analogue

Perhaps most importantly, learning Morse code teaches young people that not every communication problem needs a digital solution. In our rush toward ever-more-complex technologies, we sometimes forget that elegant, simple systems often work better than complicated ones.

Morse code represents the ultimate in sustainable communication technology. It requires minimal power, works with the simplest equipment, creates no electronic waste, and will function exactly the same way a hundred years from now as it does today. In an age when young people are increasingly concerned about environmental impact and technological sustainability, Morse offers a communication method that's genuinely future-proof.

### The challenge awaits

**So here's the challenge for young people:** while your peers are mastering the latest social media platform or video game, why not master something that connects you to history, community, adventure, and genuine skill? Why not learn the communication method that works when everything else fails, that connects you to like-minded people worldwide, and that offers a form of digital minimalism that's both practical and profound?

Morse code isn't a nostalgic hobby for old-timers – it's a communication superpower waiting for a new generation to discover its potential. The dots and dashes are calling. The worldwide community is waiting. The adventure is yours to begin.

**All you need is the willingness to start**, and the understanding that in our hyper-connected world, sometimes the most revolutionary thing you can do is learn to communicate with elegant simplicity. The skills you develop will last a lifetime, and the community you join will welcome you with the timeless greeting that bridges all languages: "CQ CQ CQ" – calling any station, this is you, ready to join the conversation that never ends.

### Learning Morse when disabled

I received quite a lot of feedback on this item in my last column. It seems that there are more disabled

amateurs, in all sorts of ways, who are using CW on the air quite regularly and easily. It does help with coping with disablement and an alternative therapy that is actually enjoyable!

I received this email from Bob, who helped with the medical side of things: "Hi Roger. Your article is brilliant! It will give hope to all with disabilities or illnesses that one can master Morse and help with good neurocognitive functioning.

"I am especially impressed with the story of the young Mother...and the lady who had no spoken language but could still tap out the Morse language to her family.

"Really like the 3 P's as that will work for mastery of any activity...need to apply to Golf :-)

"Best and hope to work you.

"If you readers have any questions, feel free to forward my way, if desired. 73 de **K4RLC Bob**"

As an FOC member I was chasing an award called the Nickel Trophy where it is necessary to have worked all current FOC members. One of the last I worked a relatively new member (2216), **Jenna N4JEH**, who is quite a unique individual, something that is common for FOC members. Blind, adopted from China, she has taken up Morse with vigour.

After a few short years, she can not only copy well, she is just plain having fun with it.

Jenna is 19 years old, and in her words, "I absolutely LOVE CW". She attends school at the Alabama Institute for the Deaf and Blind (AIDB) at their E. H. Gentry campus in Talladega, and she is a freshman at Central Alabama Community College, where she is beginning her pursuit in computer science.

Jenna doesn't have a station at her college, yet, but she is working on it with the help of **Dave W4CI**, **Gary NA6O** and others.

Meanwhile... Jenna has started a YouTube channel: QRQmaniacs. How's your copy? Check this out, Lap-slap CW:

[www.youtube.com/watch?v=yaPDbg6igIA](http://www.youtube.com/watch?v=yaPDbg6igIA)

How about this?

[www.youtube.com/shorts/KbwHzcPKjvA](http://www.youtube.com/shorts/KbwHzcPKjvA)

### High Speed CW Test 2024

I mentioned this in a previous Morse Mode with a young lad copying 200+ wpm. I should also have mentioned the fact that a lot of attendees, **Fig. 1**, were female! The YLs seem to dominate this competition which helps to prove that YLs do make good CW operators!

### G3NCNSK

Lastly some more sad news: Another GB2CW volunteer Silent Key. **John G3NCN** unfortunately passed away recently following a long illness. He had been a volunteer for a long time so the list is gradually diminishing. It's a pity we cannot seem to replace those that leave us. Please send all your comments, offerings, information and especially pictures to: [roger@g3ldi.co.uk](mailto:roger@g3ldi.co.uk). 73 and May the Morse be with you! **PW**

# Broadcasting history

**Keith** and **Garry** invite you to once again journey through the archives.

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## BBC Broadcasting House, London: Part II

By early 1931, the construction of *Broadcasting House* was progressing well, especially the areas below street-level, and the BBC were confident that the premises could be occupied by the autumn of that year.

Broadcasting House was built on the former site of *Foley House* which had been demolished some years earlier. There were some initial building difficulties. The foundations presented various interesting problems. An old brick conduit, which carried a stream from Hampstead, traversed practically the whole length of the site. The problem was not only to cover this with a casing of concrete sufficiently strong enough to resist the weight of the building, but also in laying bare the conduit during the excavation to avoid the possibility of it bursting under the inward pressure to which it was subjected after heavy rain.

As far as it was possible, British materials were used in the construction, furnishing and decoration of Broadcasting House. Initially, it seemed that it would be necessary to obtain most items from abroad, especially some of the special fabrics and materials required for decorating the studios. At an exhibition in London called *Why Not?* during October 1931, various items were on display, such as Swedish glass and foreign textiles, of qualities which could definitely not be obtained in the UK.

The designers knew that such materials would add significantly to the cost. Due to a financial emergency in the latter half of 1931, the BBC renewed their attempts to obtain satisfactory British substitutes. Eventually, the decorators managed to persuade two firms to undertake the manufacture of items of the same quality as the European products.

## Vintage 'Percolative Earth' advertisement

This month's stray through vintage copies of dusty newspapers and magazines has yielded a rather unusual advertisement by *Graham Farish Limited* for their *percolative earth* chemical called *Filt*, **Fig. 1**. The advertisement dates from 24 September 1932. The text has been left in its original format to reflect the spelling, grammar and punctuation of the time.

Perhaps a handy topped-up watering can would suffice instead? *Graham Farish Ltd.* was founded in 1919 to manufacture radio components. They capitalised on the growing popularity of radio in the 1920's by producing components for home radio constructors. The company expanded into other electrical products, including electric fires and water pumps. They also produced vacuum-sealing jar lids.

## Coronations & conference clangers!

PW reader, **David Pedley G8EMA**, has written from his location near Salisbury, Wiltshire, with memories of the 1953 Coronation and a slight technical problem during a political party's 'live' conference! David writes: "*Hi Keith and Garry, I have just been reading your column in May's PW. The BBC Coronations item brought back some memories. As a telecommunications engineer with the General Post Office, I was involved in the microwave network based at Telcomms HQ in London. Part of my job included visiting the link station at Tolsford Hill, near Dover, which connected to the Lille site in northern France. The circuit used by engineers utilised Pye radiotelephones and a Yagi antenna. The GPO staff had to converse in French to their counterparts as they refused to speak English!*"

"*We knew about fading on microwave links and later in my GPO career, I installed some equipment to record the duration of these fades. I was a Technical Officer working at Birmingham Tower in the mid- 1970's and thought I had the microwave circuit to London free for me to use. I removed a section of waveguide to insert our test gear. Unfortunately, the circuit was actually being used to transmit the Labour Party Conference 'live' from Birmingham. It went off the air for five minutes. Was I in deep trouble? Oh, well! 73 David G8EMA.*"

Never mind David, we all make little mistakes. One of the authors was a fellow Technical Officer with BT and managed to give subscribers on one Telephone Exchange (which shall remain nameless!) free calls all weekend! Several layers of senior *BT Executive Engineers* were not impressed!

## 100 years ago: October 1925

This series identifies some of the events, technical achievements and personalities associated with the world of broadcasting from exactly 100 years ago this month.

On 2 October 1925, at his workshop in Frith Street, London, **John Logie Baird** transmitted



"Graham Farish says :-  
**"DON'T WORRY!"**  
Your set's all right"

All these little troubles are due to a faulty earth. You've made the set carefully but neglected the vital point, the only direct connection to the station - the earth. Take my advice, fit a Filt to-day - the results will astonish you! Is your own set giving you the best? You don't know its possibilities until you try a Filt - spend half-a-crown on Filt and give your set a chance.

**GRAHAM FARISH**  
**FILT**  
**PERCOLATIVE EARTH**  
**2/6 COMPLETE**

Simply bury the copper receptacle containing the wonderful FILT chemical, which at once begins to spread through the earth, attracting moisture and making a PERMANENT highly conductive area to the depth of several feet. FILT keeps moist and highly conductive. It spreads like a tentacle, earthing your set perfectly and giving you every ounce of power, range and purity, no matter what set you use.

**FILT PERCOLATING EVER-DAMP EARTH**  
Get a Filt to-day from the nearest radio dealer or direct (post free) from the sole manufacturers  
**Graham Farish Ltd. 201, Masons Hill, Bromley, Kent"**

the world's first television image, a painted ventriloquist's dummy which he called *Stooky Bill*. The dummy's head was scanned vertically with a resolution of 30 lines.

Baird later enlisted the help of office boy, **William Taynton**, who stood in front of the camera. Consequently, his face was the first to be televised. However, the rate of only five images per second did not show realistic movement.

On 16 October, BBC engineers experimented with impedance equalisation techniques. The BBC also introduced moving-coil loudspeakers and microphone cueing lights into their studios.

## The rise and fall of 198kHz: Part XXIII

In addition to the transmitters at Droitwich and Westerglen, a third transmitting station was

installed at Burghead in Scotland for long-wave and medium-wave broadcasts.

The station was officially opened on 12 October 1936. The installation consisted of a lattice mast, insulated at the base, together with insulated stays capable of withstanding the high voltages which were encountered with aerial systems of this type. Radio-frequency power was passed from the output of the transmitter by means of a copper tube transmission line, or feeder, to the aerial coupling circuits housed in a small building at the base of the mast.

Power was supplied to the station from the *Grampian Electric Supply Company* at an incoming voltage of 33kV, 3-phase. Failure of supply was guarded against by the provision of a ring-main from two independent generating stations. A diesel engine and generator were available in case of a complete failure of incoming mains, **Fig. 2**. A sub-station was provided, housing transformers which reduced the high-tension supply voltage to 415V.

## 60 years of BBC-2: Part XIX

When BBC-2 eventually began on 21 April 1964, there was a shortage of ideas among executives as to what to actually broadcast. A *Seven Faces* format was adopted for each day of the week.

On Fridays, programmes began with *Story Parade*, which was a series of drama productions. The first transmitted production was a dramatisation of the novel *Condemned To Acquittal*.

Also on Fridays was the hit American film series called *Arrest And Trial*. The programmes were made in two parts. In the first section, a crime was committed and the suspect was arrested. In the second part, the story was resolved in the courtroom. The first programme in the series to be shown on BBC-2 was called *Call It A Lifetime*.

## Service information, Switzerland: Part XXXII

Between 1968 and 1970, further improvements were made to the colour television infrastructure. By the end of 1970, SRG-SSR broadcast 40% of their programme hours in colour.

For coverage of events outside the television studios, SRG-SSR purchased a number of large Outside Broadcast vehicles. Skiing competitions and football matches could now also be transmitted in colour. The latter presented engineers with several technical challenges. To cover certain football matches, all the cameras had to be aligned using a huge test card mounted on cardboard and positioned on the pitch. The pitch had to be displayed in the same shade of green from all the cameras. A



similar system was used for many years by BBC engineers during *Wimbledon*. All the cameras were aligned using a huge *Greyscale Chart*.

In Switzerland, there were also problems in the studio during colour productions. Performers with healthy-looking tanned faces often appeared on-screen with "an ugly shade of grey" complexion, according to an SRG-SSR announcer! By 1977, the switchover to colour television was virtually finalised, having taken almost ten years to complete.

Also in 1977, the *Radiotelevisione svizzera* (RSI) studios in Comano (Cantone Ticino) went on-air in colour. The authors visited the RSI television studios in August 2016, **Fig. 3**. Amid very tight security and rather stern-looking staff, they weren't initially allowed in but, as is so often the case, it's not *what* you know but *who* you know and, after some name-dropping,

**Fig. 1:** A rather unusual advertisement by *Graham Farish Limited* for their *percolative earth chemical* called *Filt*. The advertisement dates from 24 September 1932.

**Fig. 2:** The *Machine Room* at the BBC Burghead transmitting station in October 1936.

**Fig. 3:** The *Radiotelevisione svizzera (RSI)* studios in Comano (Cantone Ticino), photographed by the authors during a visit in August 2016.

it was all smiles and "Benvenuto, per favore entra"!

## Stay tuned!

The photos are once again from Keith and Garry's collection. Please send archive photographs, information or suggestions for future topics via the email addresses shown at the top of this column. **PW**

Georg Wiessala

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**A** former colleague of mine, **Jean-Pierre** from Belgium, once sought to compile a website about *100 Famous Belgians*, because he was constantly irritated by his friends asking him about people from that country who achieved international fame. **Adolphe Sax**, for example, **Eddy Merckx**, **Tintin & Snowy** and, naturally, **Hercule Poirot** (!) There is a parallel, I would argue, for the case of Denmark. How many renowned Danish personalities do you know? You are doing well if you can think of **Tycho Brahe** (1546-1601), **Hans Christian Andersen** (1805-1875), **Carl Nielsen** (1865-1931) or **Niels Bohr** (1885-1962).

If you are a radio enthusiast or science historian, you will also be familiar with the name **Hans Christian Ørsted** (1777-1851, **Fig. 1**), who, according to **Mitchell** (2018: 103), coined the word 'electromagnetic', and after whom the measurement unit for magnetic field strength (*Oe*) is now named. This value is used today to define a unit of magnetic field strength equal to 79.58 amperes per metre in the CGS (Centimetre-Gram-Second) system.

In 2020, the world celebrated the 200th Anniversary of Ørsted's discovery of electromagnetism. What is more, I am timing this article to be dispatched to our editor on 14 August 2025 – Ørsted's birthday. The Great Dane (no pun intended) was more than a pioneer of electromagnetism, paving the way for **Michael Faraday** (1791-1867), **Niels Bohr** (1885-1962) and others. With his brother, **Anders Sandøe Ørsted** (1778-1860), who became the third Prime Minister of Denmark, Hans Christian perhaps best epitomised what has been termed the 'Danish Golden Age' in European science during the 18th and 19th Centuries.

I would argue that no history of science can be complete without Ørsted. When thinking of the man and his time (**Fig. 2**), it is worth remembering, with **Roseanne Montillo** (2013: 9), that, "the distinction between a scientist, an artist, a political reformer and a man of letters was not as clear-cut as it later became. The disciplines intertwined; the interests overlapped." At the beginning of this period, Ørsted was viewed as modern and progressive – even "mildly revolutionary", near its end, as "hopelessly behind the times" (Mitchell, 2018: 119).

The bare outlines of Ørsted's life in this multi-disciplinary age are quickly stated (**Table 1**): Ørsted was born on 14 August 1777, the eldest son of an impecunious apothecary, in Rudkøbing (Rudkøbing), Langeland, Fyn, Denmark. When he was young, he was into chemistry and mixed up pharmaceuticals at the age of eleven. Later on, Ørsted's parents placed him and his brother in the care of a wigmaker and his wife in Germany.

This was because his parents lacked time and money. While living in Denmark's southern neighbour, the brothers learned German and the



## Famous Danes, Anyone?

**Georg Wiessala** delves into the life and times of Hans Christian Ørsted, one of the earliest electrical pioneers.

basics of Latin and French. They also assimilated some mathematics. When Hans Christian turned eleven, he went back to work at his father's pharmacy. It was here that he picked up more chemistry. He never went to school, but in 1794, both the Ørsted brothers passed the entrance exam at the University of Copenhagen with honours. Once there, Hans Christian studied for a career in 'natural philosophy'.

### From natural philosophy to science

In common with other epoch-making radio pioneers – perhaps a little more so – it would be difficult to understand who and what drove Ørsted, without recourse to the larger scientific and philosophical frameworks in which he operated. Many have argued that Ørsted was instrumental in promoting some of the early discoveries in the field of thermoelectricity, such as those made by

**Thomas Johann Seebeck** (1770-1831). It seems that Ørsted took as one of his premises the views on Nature of such philosophical giants as **Friedrich von Schelling** (1774-1854), **Johann Wilhelm Ritter** (1776-1810) and, particularly, **Immanuel Kant** (1724-1804). These contained a critical analysis of **Newton's** 'Laws of Motion' and of the then prevailing overall concept of a 'Clockwork Universe'.

By contrast to the Newtonian ideas of 'atomic' theories and 'push-pull-forces' – acting at a distance and in straight lines – Ørsted focused for most of his scientific career on more intangible phenomena, such as light, pressure and electricity. He closely followed the notions of Naturphilosophie (natural philosophy). According to these, the opposition between polarities was the guiding

**Fig. 1:** H.C. Ørsted, discoverer of the connection between the forces of electricity and magnetism.

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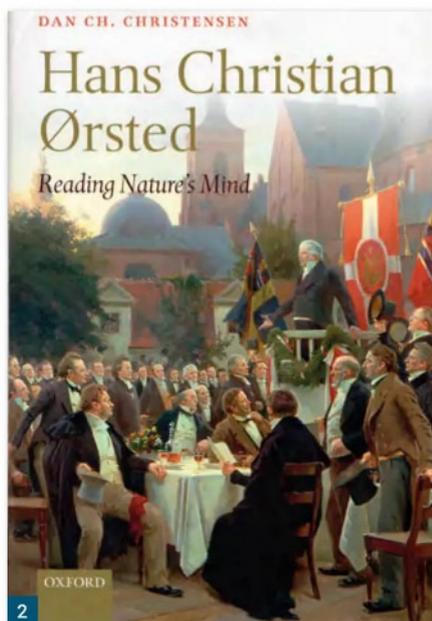


Fig. 2: 'Reading Nature's Mind': The key biography of Hans Christian Ørsted. Fig. 3: His text on 'Experimenta [...]' is often considered Ørsted's greatest published work.

principle of the cosmos, and all forms of matter were imbued with a kind of 'spiritual energy'. He was unique in this among his Danish contemporaries and peers, although, as his biographer claims (Christensen, 2013: 653), he always eschewed any wider categorisation.

In his 1786 book *Metaphysical Foundations of Natural Science*, Kant had laid the groundwork. Forbes and Mahon (2014: 49/50) clarify that Kant's *Dynamic Theory of Matter* was the point of departure: according to this, all matter - and all nature - was made up of the two fundamental forces of repulsion and attraction - and not of atoms or other particles (Shanahan, 1989: 303). This paved the way for a more unified concept of all the forces of nature - including heat, motion, air, electricity and magnetism.

This was an idea that Ørsted - and many of his contemporaries - subscribed to wholeheartedly because they were keen to promote the concept of a more 'dynamical' system of physics (Shanahan, 1989: 303; Mitchell, 2018: 119). Importantly, it followed that any force could be converted into any of the others. Here lie the first inklings of what we now know as *field theory*. With Kant, Ørsted conceived of electromagnetism as not a *phenomenon* but a *noumenon*, because it could not be sensed in time and space *per se*.

### Nature's mind readers and animal electricity

*Naturphilosophie* was a branch of *vitalism*, a key doctrine of the time. Its proponents held that life cannot be explained in, or reduced to, 'corpuscular', or 'atomic', theories, purely physical or chemical

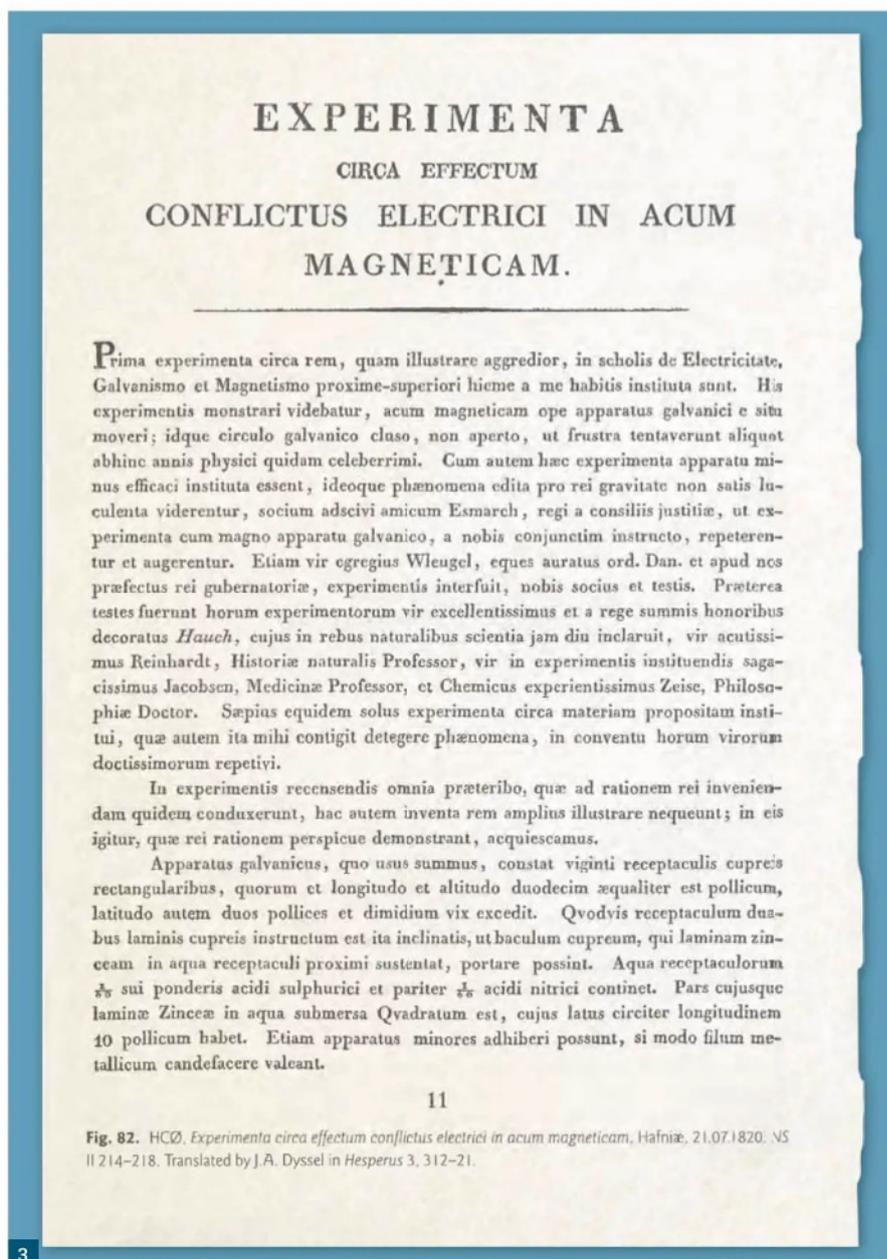


Fig. 82. HCO. *Experimenta circa effectum conflictus electrici in acum magneticam*, Hafniæ, 21.07.1820. NS II 214-218. Translated by J.A. Dyssel in *Hesperus* 3, 312-21.

terms, and that all living things possess some sort of special principle, whether it be called 'soul' or 'life force'. There were other, lesser-known, proponents of this kind of thinking; The Bengali polymath and radio pioneer Jagadish Chandra Bose (1858-1937), for example, thought along similar lines (*The Spectrum Monitor*, July 2025: 29-32). The opposite view espoused during the period was termed materialism, or 'physicalism' (Levy, 2018: 62).

The debate about which one of these alternatives was true was influenced by one of the key electrical discourses of the era: the controversy over 'native' or 'animal' electricity between the Italian geniuses Alessandro Volta (1745-1827) and Luigi Galvani (1737-1798); this was a Europe-wide electrical dispute, which the German polymath Alexander von Humboldt (1769-1859) later tried to reconcile and resolve. The argument was at its most intense, you

might not be surprised to hear, by the time Mary Godwin Shelley (1797-1851) began creating her novel, *Frankenstein, or the Modern Prometheus*.

More generally, adherents of 'natural philosophy' felt that science ought to be pursued for its *aesthetic and cognitive benefits* in the first place, not for any specific *utilitarian or technological* ends to be gained. Thus, understanding itself was more interesting than the utility of anything studied. Knowledge of nature's phenomena derived in this way would help people to differentiate between 'true' and 'false'. Perhaps today's Universities would do well to return to these principles. But I digress.

One of Ørsted's key biographers, Dan Ch. Christensen (2013: 4), summarises this view succinctly: "For some people, miracles serve as proofs for the existence of God. For Ørsted,

however, the absence of miracles reflected divine intelligence". He saw electromagnetism as a reflection of nature's mind; God, in this view, could reasonably be perceived by human beings to be the creator of nature. This concept proved an unusual – and unusually fruitful one – for Ørsted to espouse, but it did earn him the label of 'nature's mind reader'.

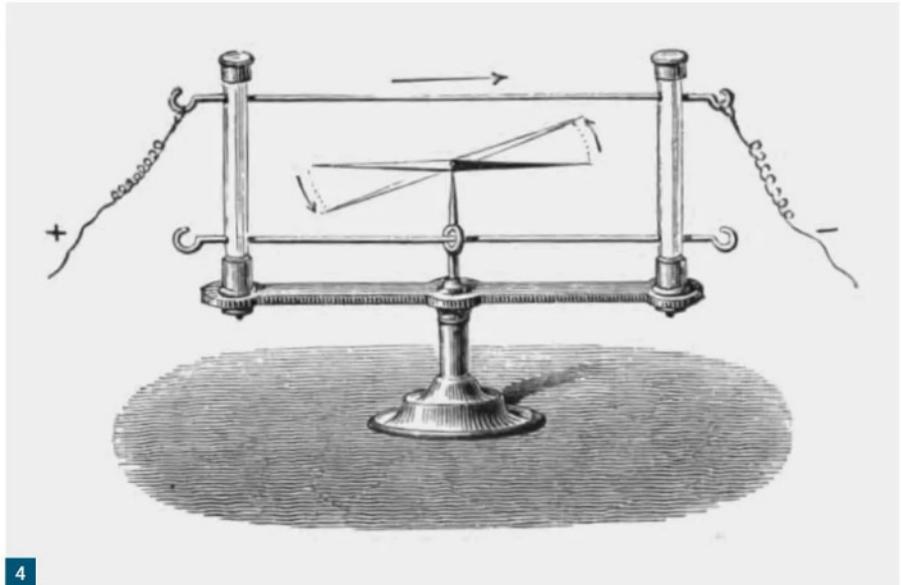
### Chance favours the prepared mind

Against the backdrop sketched out by those intellectual currents, and mindful of this description of Ørsted, which has often been attributed to **Louis Pasteur** (1822-1895), Hans Christian Ørsted built on earlier work on 'galvanic currents', electrolysis and magnetic needles, by researchers like **Paracelsus** (1493-1541), **Daniel Schwenter** (1585-1636), **Giovanni Aldini** (1762-1834), **Giuseppe Mojon** (1772-1837), **Gian Domenico Romagnosi** (1761-1835), **Johann Wilhelm Ritter** (1776-1810), and many others.

More so than many of them, however, Ørsted was also an academic founder, a political campaigner, a physicist, a chemist, and a prolific, multi-lingual lecturer and organiser of scientific exchange, who spent more than ten per cent of his life abroad. He undertook countless, very successful, European tours to Germany, France, Britain and Scandinavia. In the course of those, he encountered many of the luminaries of the day from both Science and the Arts and Humanities, such as **Johann Wolfgang von Goethe** (1749-1832) and **Humphrey Davy** (1778-1829).

The Dane became known as a "modern Prometheus" (Christensen, 2013: 360, 365). Above all, it appears that he emerged as a genuine 'popularizer of science' (Verschuur 1993: 56), not least because he held a prestigious Professorship at the University of Copenhagen from 1806. The great man was fascinated by some of the (sound) pictures of waves, produced by his German colleague **E.F.F. Chladni** (1756-1826), because they showed him that nature consisted of 'forces', not Newton's 'atoms', a theory he considered as pure speculation (Christensen, 2013: 378). However, Hans Christian Ørsted is, arguably, best known for his discovery in 1820 of electromagnetism and for establishing the science behind how an electric force can produce a magnetic effect.

The prevailing scientific view at the time was that electricity and magnetism were two separate and distinct forces, unable to affect one another. This was worked out based on the work of researchers such as **Charles Augustin de Coulomb** (1736-1806) and others. 'Natural philosophers' like Ørsted, by contrast, held that magnetism existed in *all* bodies and that electricity and magnetism were not two different 'species' of matter, or two divergent 'fluids'. Ørsted had always known that there had to be a unifying *link* between all fundamental forces, such as electricity and magnetism; in the end, it was he who persisted in looking for it and who eventually found it. He discovered that, when a magnetised needle



4

was brought near a wire carrying an electric current, the needle was deflected.

### A serendipitous lecture

Received wisdom says that this momentous event happened altogether inadvertently, when Ørsted offered a demonstration using his magnetic needle (Fig. 4) to a group of his students, during a lecture at his home in Copenhagen. **Gillian Turner** (2011: 80) offers some great detail: "[...] when Ørsted held a wire carrying a current over a compass, the compass needle swung around until it was at right angles to the wire. When the current was northward, the compass swung to point west. When the current was reversed, the compass needle also reversed: a southward current made it point east."

However, the historiographical notion that it was simply a matter of 'accident', or 'chance', or his adherence to *Naturphilosophie*, that enabled the great man to stumble upon his perplexing discovery, has recently been questioned by **Shanahan** (1989: 287) and others, who have homed in more on the influence of Kant as a causal factor in the preparation of Ørsted's experiments (see URL below), leading to the eventual discovery of electromagnetism.

[www.youtube.com/watch?v=2yawV5ekyNO](https://www.youtube.com/watch?v=2yawV5ekyNO)

But philosophical foundations notwithstanding, and in the wider context of his well-known lecture, Ørsted found that, for a straight wire, when carrying a DC current:

- The magnetic field lines encircle the current-carrying wire.
- The magnetic field lines lie in a plane perpendicular to the wire.
- When the direction of the current is reversed, the direction of the magnetic field also reverses.
- The strength of the field is directly proportional to the magnitude of the current.
- The strength of the field at any point is inversely proportional to the distance of the point from the wire - see also the explanation by **Karen Tamayo** at:



5

Fig. 4: Ørsted's magnetic needle experiment.

Fig. 5: Denmark remembers one of her proudest sons through radio-philately.

<https://tinyurl.com/ydhhbke7>

Historian **P. F. Mottelay** (1922: 453) highlights this celebrated finding as a key moment of international scientific discovery: "[...] he [Ørsted] found that the needle turned at right angles to the wire, thus proving the existence of electromagnetism, i.e. the relation of electricity and magnetism as mutually productive of one another, and as evidence of a common source of power".

### Revolutions in magnetism and electricity

Before this time, the identity (and inter-connectivity) of magnetism and electricity was only suspected. However, in the famous experiment, when the current was reversed, the compass needle did so too: a southward current made it point East. This was an unexplained, unimagined and inexplicable find-

ing: the magnetic 'force' appeared to be *circular* (Mitchell, 2018: 128; Cheung, 2020: 16). This was 'revolutionary' stuff indeed, in more ways than one.

Ørsted later wrote up what he found in Latin, the *lingua franca* of the day, as a four-page tract entitled *Experimenta circa effectum conflictus electrici in acum magneticam* ('Experiments on the Effect of the Electric Conflict on the Magnetic Needle'; Verschuur, 1993: 60, Fn. 13; Mitchell, 2018: 128). This text is often abbreviated, understandably, to just *Experimenta* (Fig. 3). Numerous other publications, in German and French, followed, as well as global fame.

**Motteley** (1922: 454) states that, "The desideratum of a clear expression of the manifold alliance between electricity and magnetism has been so long and so universally felt, that the discovery placed its author in the first rank of scientific men". As an aside, the very compass that Ørsted used during his famous experiment – and during the many others that followed – is now at the Danish Museum of Science and Technology (website below) in Elsinore – the very castle that forms the setting of Shakespeare's *Hamlet*. But that's another story. <https://tekniskmuseum.dk>

In terms of electromagnetic theory, Ørsted's *magnum opus* was *The Soul in Nature*, written over four decades and published in 1850. In the book, he reaffirmed his 'dynamical' view of all science, including electromagnetism. The text is a testament to his belief that such 'invisible polar forces are, "not susceptible to being measured and weighed, and hence comparable to the noumenal forces of the human soul" (Christensen, 2013: 622). The upshot of such ideas was that human reason is capable of discovering the laws of nature as an expression of a superior cause. We can all, in other words, decipher the greater *Mind of Nature*, as Christensen's phrase has it in the title of the most comprehensive Ørsted biography I could find.

## The legacy of a Scandi genius

In the European arena of savants and scientific geniuses of the time, Ørsted's findings were outstanding. The historian **P.F. Mottelay**, in his landmark bibliographical survey of electricity, would still quote **Jacques Babinet** (1794-1872), who once called Ørsted "the Christopher Columbus of Magnetism". And in our own time, it seems that Ørsted's work still reaches whole new audiences of all ages in new formats.

What is more, the great man's findings strongly influenced other scientists, such as **Dominique François Jean Arago** (1786-1853), and especially **André-Marie Ampère** (1775-1836). **Verschuur** (1993: 70) succinctly clarifies the key contrast between the findings of Ørsted and Ampère: "In review, Ørsted discovered that an electric current influenced a magnet, and Ampère showed that a current could actually produce magnetism."

In fact, it was only seven days after Ørsted's famous lecture that Ampère promulgated his new

law governing electromagnetism, and within a few months, Ampère had published on the subject and found out how to use magnetism to measure currents. By the following year, Faraday worked on the opposite phenomenon (induction) and discovered the reverse of Ørsted's findings: a magnetic field can produce an electric current (Faraday's Law).

As we all know, Faraday and his successors went on to build a simple electric motor and a generator, and he is reported to have commented on Ørsted's work as follows: "His constancy in the pursuit of his subject, both by reasoning and experiment, was well rewarded [...] by the discovery of a fact of which not a single person beside himself had the slightest suspicion; but which, when once known, instantly drew the attention of all who were able to appreciate its importance and value." (Verschuur, 1993: 62).

## Prefiguring Maxwell's equations

Some also credit the US radio pioneer **Joseph Henry** (1797-1878) with (co-) discovering induction. Much later still, in 1864, **James Clark Maxwell** (1831-1879) would enshrine this work in his famous equations. Maxwell's equations, at last, defined electromagnetic waves much more precisely, in terms of oscillating electric and magnetic fields. It may not be strictly appropriate to try and somehow recruit Ørsted as one of the 'fathers' of communications or of radio. In fact, the first initiative to deploy Ørsted's discovery for the purpose of (telegraphic) communications came from Ampère. It came to nothing, though, on that occasion.

Five years after discovering electromagnetism, Ørsted made another colossal find in the field of chemistry when he became the first person to capture the element aluminium. Although aluminium is one of the most plentiful elements on earth, it is always combined with other elements. Many chemists who came before Ørsted believed that it existed but failed in their attempts to uncover it. However, it was Ørsted who successfully distinguished it from other chemical compounds and positively identified and extracted it as a unique element.

By way of a brief conclusion, the debates about what kind of theoretical framework Ørsted might have been informed by, and which philosophical concepts of the phenomena he studied he might have preferred, will go on for a while, I am sure. Today, it is not just the Danes who are celebrating this amazing pioneer (Fig. 5).

From the point of view of radio enthusiasts today, the life and work of Hans Christian Ørsted were not, I would argue, the direct precursors of radio communications. Inventing radio was not, I feel, on the mind of the great scientist. However, he can be seen as an important pathbreaker for others who followed in his footsteps, took new directions and arrived at different destinations, many of them leading towards communications and radio. **Table 2** offers some suggestions for further study of the life and work of Hans Christian Ørsted. **PW**

<b>1777</b>	Born on 14 August in Rudkøbing, Denmark
<b>1793</b>	Travels to Copenhagen with his brother Anders Ørsted
<b>1794</b>	Student time and University exams
<b>1797</b>	Pharmaceutical exam
<b>1799</b>	Viva Voce for his doctoral dissertation
<b>1801-4</b>	First trip outside Denmark
<b>1804</b>	Recruited as a lecturer at the University of Copenhagen
<b>1806</b>	Became a Professor
<b>1814</b>	Married to Inger Birgitte Ballum. They have seven children
<b>1817</b>	Appointed Professor at the University
<b>1820</b>	Discovers electromagnetism
<b>1824</b>	Founder of the (Danish) Society for the Dissemination of Natural Science
<b>1825</b>	Isolated Aluminium for the first time, using Potassium and Aluminium Chloride
<b>1829</b>	Established the Polytechnic College (Technical University) of Denmark
<b>1850</b>	Publishes his key philosophical work, <i>The Spirit in Nature</i>
<b>1851</b>	Dies of pneumonia, 9 March

**Table 1: Ørsted's electrifying life.**

- American Association of Physics Teachers: Ørsted-Medal: [www.aapt.org/programs/awards/oersted.cfm](http://www.aapt.org/programs/awards/oersted.cfm)
- American Experience: <https://tinyurl.com/3dt6ymhe>
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- Christensen, Dan Ch. (2013) *Hans Christian Ørsted. Reading Nature's Mind* (Oxford: OUP)
- (Danish Original. 2 vols.; *Naturens tankelæser: En biografi om Hans Christian Ørsted*) ISBN 978-87-635-2524-4
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- Forbes, N. & Mahon, B. (2014) *Faraday, Maxwell and the Electromagnetic Field* (NY: Prometheus Books)
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- Hans Christian Ørsted (Famous Scientists): <https://tinyurl.com/2zdc88> <https://academic.oup.com/book/35358>
- Levy, J. (2018) *Frankenstein and the Birth of Science* (London: André Deutsch)
- Magcraft: [www.magcraft.com/hans-christian-oersted](http://www.magcraft.com/hans-christian-oersted)
- Mitchell, A. (2018) *The Spinning Magnet* (London: Oneworld Publications)

**Table 2: Further Reading & Resources.**

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### HAYTOR VALE REPEATER GROUP INSTALLS GB7HV - FM ANALOGUE AND C4FM REPEATER:

The newly-formed Haytor Vale Repeater Group (HVRG) is proud to announce the installation of a new VHF repeater at Haytor Vale, in close proximity to the famous Haytor rock on Dartmoor, Devon.

The repeater, call sign GB7HV, is situated just south of the famous granite outcrop and tourist site Haytor, which was formed over 280 million years ago!

The group was granted permission to set up the repeater in May 2025. Key members of the team completed the installation on 9 August and GB7HV commenced broadcasts later that day. GB7HV is now fully operational with coverage tests showing excellent results, especially across the south coast of Devon and Dorset and onwards towards Bournemouth. Wires-X connectivity will follow in due course.

The group has benefited from some very generous donations of equipment to enable the team to set up the repeater in record time, in particular **Darren Harris 2E0MVT** who donated the Yaesu repeater box itself. TX Films Ltd, the production company that produces TX Factor films, has given financial assistance to the group along with other amateurs who have kindly offered items of equipment, their time and practical advice.

Further details and information can be obtained from the Repeater Keeper, **Bob McCreadie G0FGX**, via email:

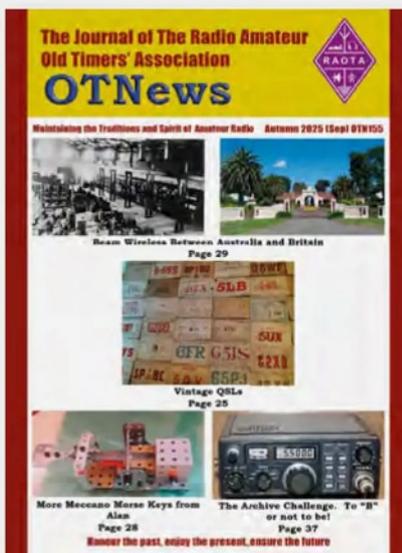
[bobmccreadie@sky.com](mailto:bobmccreadie@sky.com)

**LIVINGSTON & DISTRICT ARS NEWS:** On 27 September, Livingston & District ARS will be operating at the Almondell Model Engineering Centre, Drumshoreland Road, Broxburn EH52 5PF as part of Railways on the Air. They will be using the club call sign MSOLIV.

On 18 October, the club will be assisting their landlord, 6th West Lothian Scouts, for Jamboree on the Air and Jamboree on the Internet at the Scout Hall, Station Road, Broxburn, EH52 5QU.

<https://ladars.org.uk>

**RAOTA NEWS:** (from **David G3ZPF**, RAOTA President) The latest issue of our quarterly magazine, *OTNews*, has been delivered to members, along with the audio version for those with limited vision. As usual the magazine opens with the Presidents Piece, followed by the editor's comments. Next up are the News pages, and an obituary for **Alan G4GQL**, our QSL manager who has provided a series of articles over the years about making a variety of CW keys using Meccano. The issue even includes one he sent shortly before his SK. The annual reports are in there too, which indicate



that RAOTA is in good shape, but as with most clubs we would like to see more submissions to the magazine from members.

Our editor has 'article swap' agreements with the Australian equivalent of RAOTA and this issue includes an interesting piece of history about 'Beam Wireless between Australia & Britain' by VK3YBP.

An article entitled 'our nearest companion' is about the NASA moon missions and the technical difficulties which were not really covered by mainstream media.

'Cheese, Lumber, Breakfast & a Discone' details a stateside visit by **Ray G40WY**.

The content of the article 'Vintage QSLs' by **Anthony 2E1BDU** will be evident from the title.

This is the first issue of *OTNews* where the Committee agreed the use of colour everywhere

the content required it, rather than just selected pages, as we felt we could absorb the cost. We felt we were in a sufficiently good position to absorb the spiralling postage cost of the magazine too, so membership subs will not be increasing.

**THE DX MARATHON SPRINT:** The DX Marathon continues to grow, and Cycle 25 has brought even more excitement to DXing. Participation has nearly doubled in the past few years, and the organisers would like to see it grow even further. This year, they are introducing something special – the DX Marathon Sprint, a 10-day mini-Marathon running 18 to 27 October. Any DX worked during the Sprint counts toward both the Sprint and your full-year DX Marathon score. No sign up will be required for the Sprint as is the case for the full year DX Marathon.

Submissions will be made through the streamlined submission system. All that is required is to: Generate an ADIF file • Upload it directly at

[entry.dxmarathon.com](https://entry.dxmarathon.com) •

The program remains simple: No fees and no confirmations are required. Participation options: single mode, single band. Visit:

<https://dxmarathon.com/rules/2025-sprint>

Every participant will receive a certificate, acknowledging your score, your placement, and how you compare against peers in at least three categories.

With the CQ WW Phone contest (25/26 Oct) falling inside the Sprint, the bands will be full of DX. It is the perfect opportunity to have some fun, get reacquainted, and fuel your year-long DX Marathon score.

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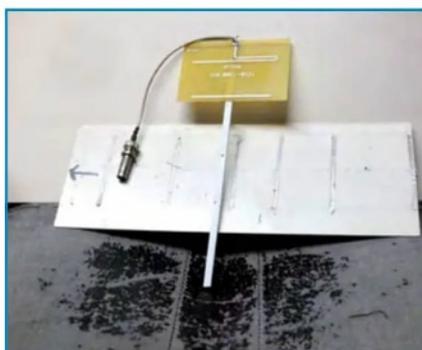
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## Cardboard antennas?

Dear Don,

The M7GET item in *PW* August about a DIY microwave aerial was very interesting, as I made a similar one using a 2-element printed circuit type beam from WA5VJB. G3PHO drew my attention to the WA5VJB offering (and others). It is constructed on 1.5 mm polystyrene sheet (Modellers call this 'Plastikard'. Strips of aluminium self-adhesive tape made the elements according to the published dimensions for such a beam. The matched feed is mounted on a 4mm square section plastic rod sliding in a slightly larger hollow square tube forming the boom. This prevents it turning. To calibrate, tune in a 1296MHz signal, adjust the boom length for maximum signal, then drill the square tube so as to fix its position with a miniature screw, yet remain dismantle-able for transit. See photos. I am assuming good RF performance of the Plastikard as it is made from polystyrene, and not lossy.

**Geoff Theasby G8BM1**  
(Club News Editor,  
Model Engineer magazine)  
Sheffield



## Vintage transceivers/receivers

Dear Don,

There seem to be quite a few vintage/veteran radios coming on to the second-hand market here in Australia from different sources. However, a constant issue is they need recapping, especially models like the AR88's which have the old paper capacitors which blow. These radios were built to a very high standard back in the day but are beginning to show their age. My first HF receiver was a Trio 9R59D but this was a lot newer and had a transformer that had to be replaced and a capacitor pop. I remember going to pick it up from a country area miles from the bus route (no car in 1981) and having an 11-mile bus ride from Bognor Regis to Southbourne near Chichester. Getting off then walking nearly three miles inland to pick it up from a private address where the seller had used it briefly in the late 1960's then it had sat in the garage not being used. I finally got over there, picked

up my pride and joy and carried it back the same way getting home at 9.45pm at night after leaving home on the outward journey at around 3.45pm. The seller sold it for £20 and said to me the phone had not stopped ringing since I had rung asking him to hold onto it for me. The moral of the story is if radios sit for a while, even if they haven't had a lot of use, things can degrade. Luckily with these types of radio there is good access space when you take the lid off whereas many of the new generation of amateur radios are in a lot of circumstances too complex to user service and have to be sent off to a service tech as opposed to the older valve radios, which if you have the patience, can be diagnosed and worked on (with due consideration to the voltages present).

The radio that was recommended to me at the time was the Trio/Kenwood JR310, which was the Rolls Royce of HF receivers, but people held onto these like gold dust,

hence the reason as a 17 year old young bloke starting in radio I got acquainted with the 9R59D. I often wondered why it was not marketed as Kenwood in the UK whereas it used the name Trio. I found out that the trademark apparently clashed with Kenwood kitchen appliances and wasn't supposed to be used for Ham radios in the British Isles.

Kenwood Radio gear is still quality equipment but no longer available in Australia due to JVC Kenwood pulling out of this market. Just thought I would share this musing with you.

**Martin Burch VK4CG**  
Brisbane, Australia

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## Radio in Old Age

Dear Don,

Interesting to read the letter, in the September issue, from **Dave Blencowe 2E0INJ** supporting getting your licence in old age (whatever that is?). I was interested in Short Wave Listening in the early 1960's as a young teenager and then life took over. Finally got back to it in 2021, passed my M7 in 2021 and then the full licence in 2023 - two days after my 74th birthday. Absolutely loving it all.

**Dave Garner M0FQZ**  
Hull

## Station Manager', antenna "myths & new versus old.."

Dear Don,

Skipping merrily through this month's (September 2025) issue of *PW*, there was an abrupt halt on page 16. The 'Friedrichshafen 2025' extravaganza. My eye had caught sight of the '403A Station Manager'. I don't mean to be facetious, but my immediate thought was, I already had a 'station manager' - my partner. Who, over a decade or so, has been managing my station activities with an iron fist inside a velvet glove. Sometimes in my best interests, other times not. So maybe, 403A's product could be the answer to my prayers? Seriously though, given my ham-radio predilections, it would be akin to buying a Hilberling rig purely for a decorative purpose. However, a Hans Summers QRP Labs Kit, is no doubt a better proposition.

**Martin Lynch's** comment regarding the "fledgling internet of the mid-nineties", was indeed an alarm call for ham-radio and communications in general. Witnessing its birth first-hand, it was then a novelty. But novelties come and go. This one has kept going, although now no longer a novelty, an ingrained commercial necessity. At the time, I couldn't understand what all the fuss was about. It was just something new. Like a new type of coffee at Starbucks - everyone wants to try it. Knowing that once the joy and newness of it had died down, internet talk would revert to a whisper. In fairness, it didn't happen overnight, but it did rekindle a much-needed change to our hobby.

G4MIU's Reader Feedback (*Antennas* column) was enlightening. Especially relating to 'antenna myths'. Well, I wouldn't really know where to begin on that subject. Suffice to say, that theories are just that, a theory. They do not purport to be a practical happening. Essentially, a theory is a mathematical or guess-work assertion, or as is sometimes the case with cosmology for example, simply a patch-up job. Nowadays, most of theoretical physics is a by-the-seat-of-your-

# Rallies & Events

All information published here reflects the situation up to and including **21st August 2025**. Readers are advised to always check with the organisers of any rally or event before setting out for a visit. To get your event on this list, email the full details, as early as possible, to: [practicalwireless@warnersgroup.co.uk](mailto:practicalwireless@warnersgroup.co.uk)



The Newark Hamfest (above) is always worth a visit and we will feature photos from this year's show in next month's *PW*. But do make a point of supporting your local rallies too! Our usual listing below.

### 20 September

#### EAST MIDLANDS HAM AND ELECTRONICS

**RALLY:** Beckingham Village Hall, Southfield Lane, Beckingham (nr. Gainsborough), DN10 4FX. Doors open 9.30am - 3pm. Hot food and refreshments available. Free car parking behind the hall, disabled parking near entrance. Traders setup from 7am. Well-behaved dogs on a lead at all times please. More information and trader booking at:

[www.emerg.uk/rally](http://www.emerg.uk/rally)

### 5 October

**50TH WELSH RADIO RALLY:** Run by: Blackwood and District Amateur Radio Society (GW6GW), at Llanern High School, Hartridge Farm Road, Newport, NP18 2YE. South Wales. Entry: Traders at 7:00am Public at 09:30am, Raffle 12:30, Admission £3.00. Trader, RSGB Books, Talks/Lectures, Bring and Buy, Refreshments, Contact: Michael Rackham GW4JKV:

Tel: 07976368250, 01495 226149  
[welshradiorally@gmail.com](mailto:welshradiorally@gmail.com)

### 10 to 12 October

**RSGB CONVENTION:** Kents Hill Park, Milton Keynes.

<https://rsgb.org>

### 12 October

**DARTMOOR RADIO CLUB RALLY:** The Autumn Dartmoor Radio Club Rally will be held at The Yelverton War Memorial Hall, Meavy Lane,

Yelverton. Devon, PL20 6AL on Sunday 12 October 2025. Free on-site Parking. There will be the usual Bring and Buy, Trader Stands and Refreshments available. Doors open at 10:00hrs. Admission is £3.00. Contact Roger: Tel: 07854 088882, 2e0rph@gmail.com. Always check the Club website before setting out:

[www.dartmoorradioclub.uk](http://www.dartmoorradioclub.uk)

### 7 December

#### MID DEVON AMATEUR RADIO & ELECTRONICS

**FAIR:** The 2025 Mid Devon Amateur Radio & Computer Fair will be held on Sunday 7 December at Winkleigh Sports & Recreation Centre from 09:00 - 13:00. Entry £3 per person, no charge for partners & under 16s. Easy access from the A3124, free parking, free WiFi, hot food and refreshments available. A chance to pick up hard-to-find electronic components, two-way radio and computer hardware. Traders please book ASAP, NOTE - this year a maximum 4 tables per booking, we may remove the 4 table pre trader restriction after 1 October if the rally is not fully booked. Tables are 6 foot frontage (tables supplied), Mains electricity available on request. Please pre-book ASAP with Phil G6DLJ 07990 563147

Email [wrg2024@hotmail.com](mailto:wrg2024@hotmail.com)  
What3Words ///focal.fountain.laminated

#### GENERAL RALLIES INFORMATION

<http://www.arri.org/hamfests-and-conventions-calendar>  
<http://www.g4rga.org.uk/All.html>  
<https://hfdxarc.com/calendar-3/radio-rally-calender>  
<https://rsgb.org/main/news/rallies>

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pants exercise (an educated guess). The traditional practical scientific method has been cast aside in favour of notebook equations (Classical physics deals with everyday type stuff. Radio and magnetism etc). Where those who are engaged in the art of mathematical theories sit at their desks whilst in mindful imaginations - and then wander off without constraint into the realm of fantasy. Besides, most of it will never be proven. Never be of any practical use. As **Mr Tesla** remarked long ago, "scientists have substituted mathematics for experiments". And of course, when the atomic theory of quantum mechanics popped up, that really put the cat amongst the pigeons. A field day beckoned for more theoretical thinking. That's another story.

G8UUG's comment about home repairs was a welcome excursion. If only to point out that test-gear is cheap. If you care to make use of it, that is. Andrew's suggestion of writing an article on fault finding might well find an eager audience. So perhaps he'd better do exactly that. And no, you don't need a tower, a beam and a very large linear (it helps) to work DX. That's a causal effect of prominent marketing. I've worked the world countless times with bamboo poles and wire. I once worked Antarctica with a bamboo Yagi. I was surprised too!

Oh, nearly forgot. I suspect that Martin Lynch won't remember me, but I once bumped into him at **Brenda & Bernie's ARE**

gaff in West London. I don't recall whether I parted with any cash.

**Ray Howes G4OWY/G6AUW**  
Weymouth

### Martin Lynch and Leicester Shows

**Dear Don,**  
September's *PW* arrived a few minutes ago. I am envious of the interview with **Martin G4HKS**. I've been wanting to have a chat with Martin and his team so I can write an article about his businesses and premises for the Radio Amateur Old Timers' Association (RAOTA) magazine (*OTNews*).

My first major amateur radio event was the first (1972) or second (1973) Leicester show at the Granby Halls. In those days this show was organised by the Amateur Radio Retailers Association. It was later run by the Leicester Radio Society which has an item about the Show on its website:

<https://tinyurl.com/mtctkr3>

The closure of the Granby Halls saw the Show move to Donington Park and finally to the University of Loughborough for the final Show in 2009.

I was too late to visit the RSGB's shows at the Royal Horticultural Halls. I did visit them for an event unrelated to amateur radio and thought they were a delightful venue. I have friends who considered holding an event at the National Exhibition Centre (NEC). The basic



prices were acceptable; the problem was that the gangways had to be rather wide which reduced the number of stands that could be accommodated which in turn pushed up the price for a stand such that my friends dropped the idea of holding their event at the NEC.

I looked at the photo of Broadcasting House being constructed (Contents page and page 45) and I wondered "what would that lot load up on?" It reminded me of a site on the A1 which stored mobile cranes. You've guessed? One crane was extended at the top there was an HF beam.

**Ian Brothwell G4EAN**  
Nottingham

# Next Month

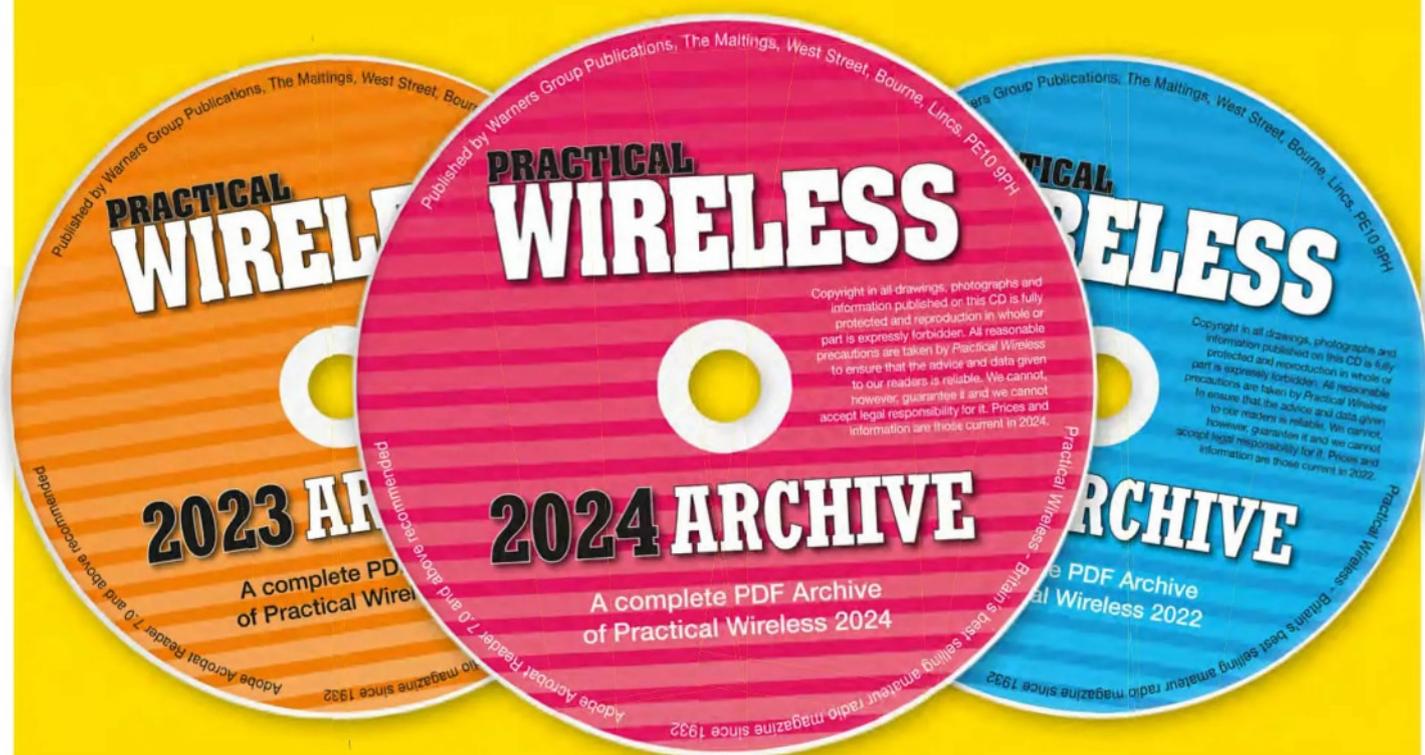
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**FTX1 REVIEW:** Richard Constantine G3UGF has the first part of a review of this exciting new rig from Yaesu.  
**REVIEW OF THE OmniRF ON-THE-GROUND ANTENNA:** Georg Wiessala takes a look.  
**SUDDEN FREQUENCY DEVIATION OBSERVATIONS:** Whitham Reeve, an RF engineer working in Alaska, looks at the phenomenon of sudden frequency deviations caused by solar storms.  
**FAKE PLUGS:** Chris Murphy M0HLS offers advice on avoiding fakes.  
**CLUB SALES:** Tony Jones G7ETW finds some treasures from radio club sales.  
**VINTAGE TV & RADIO:** Another cornucopia of cracking stories from the collections of Keith and Garry.

There are all your other regular columns too, including HF Highlights, World of VHF, Antennas and Data Modes as well as your Letters, Rallies, the latest News and more.

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