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PRACTICAL WIRELESS
Incorporating RadioUser

March 2023 Vol. 99 No 3
On sale: 9th February 2023
Next issue on sale: 9th March 2023

ISSN 0141-0857

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This publication is printed by Warners Midlands PLC Telephone: 01778 391000

Keylines

I haven't done a lot of operating so far in 2023 but it's been good to see a few DXpeditions back on the air, as reported in our *HF Highlights* column. And, as I write this, the team planning to activate Bouvet Island have just set sail from the Falklands. I did operate in the CW leg of the RSGB AFS Contest (40 and 80m), on behalf of the Bristol Contest Group. I always enjoy this event and am happy to support the club. It's early in January and an opportunity to exchange a brief report with lots of friends and other familiar callsigns.

One of my other recent highlights was to attend the Yeovil Amateur Radio Rally, where the organisers had given me a table to promote *PW*. Attendance was lower than hoped for, partly because the weather was 'iffy', but I was pleased to meet a couple of recent contributors to the magazine and also a number of subscribers. And somewhere along the way I had my arm twisted to agree to give a talk to the mid-Somerset radio club. So, all in all it was worth being there. I look forward to attending further events as the year goes on.

Our Bands

As a hobby, we are very fortunate to have access to a great deal of radio spectrum, and have actually managed to gain new allocations in recent years, such as at 5MHz. And, as you will have read in these pages, experimental (not actually amateur radio) licences have been issued for 8m (40MHz). But, at the same time, the advent of the WSJT software, especially FT8, seems to have resulted in a concentration of activity on just a handful of spot frequencies, leaving much of our bands empty other than during contests. There are, of course, other reasons too for the lack of day-to-day activity, such as maintaining our everyday contact via the internet (WhatsApp and similar) rather than on the bands. But, as various correspondents have said recently, this lack of activity, day-to-day ragchewing and the like, is unhelpful and, in time, could lead to us losing our bands, especially as commercial and military interests are turning again to HF as a back-up given that they are increasingly realising satellite communications are vulnerable in this day and age and HF communications, with new digital capabilities, are proving reliable once again. 'Use or lose' has never been more apt.

Though on that very subject, I was fascinated to read about the use that the Ukrainians are making of **Elon Musk's** Starlink satellite system, launched and run by SpaceX. Unlike other satellite services, this one relies on a very large number of low earth orbit satellites, such that the loss of one or even more would have relatively impact on the overall level of service. I recall watching a number of these satellites pass overhead after a launch last year – quite remarkable!

Build Your Own Shack

I have long wanted to run a series on setting up your shack, from deciding what power outlets you need, type of operating table, etc. to the choice of equipment and test gear. I still hope to do that. But where is the shack going to be? A room indoors, an outbuilding or a shed (my son has kindly built me a secure and weatherproof shack inside an existing outbuilding). **Stuart Vanstone M0SGV** has written an article that takes readers blow by blow through his own experience of building an outdoor shack. It's a great story – my shack after I was first married was a standard garden shed and, I have to say, it left a lot to be desired! Building your own, while not necessarily any cheaper, can certainly result in something that's much more fit for purpose. I hope you enjoy the article, which is in this month's issue. I do hope to follow it up with further articles on, as I said, setting up other aspects of your shack.

As for other articles in this issue, I do hope you find plenty to educate and entertain you. We have no fewer than five reviews, two antenna articles and much else besides. Which leads me to mention that recent innovations have included the bi-monthly Face Behind the Call series and a monthly look back into the archives. I haven't had any specific reader feedback on either – I'd love to know if you find these of interest. **PW**

Don Field G3XTT
Editor, *Practical Wireless* Magazine

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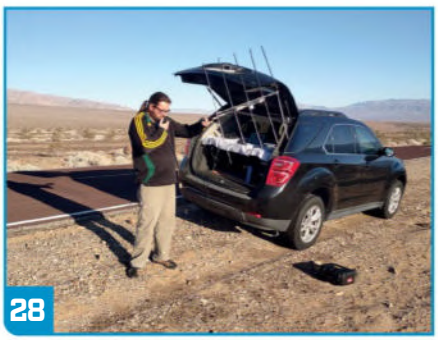
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Newsdesk

Have you got something to tell our readers about? If so, then email **practicalwireless@warnersgroup.co.uk**

A new Nevada Power PS-1335

The Nevada PS-1335 is a power supply with a difference! Not only does it provide a highly-efficient mains regulated supply with overvoltage protection, over-current protection and short protection, but by adding a battery becomes an uninterruptible supply.

The PS-1335 will continue to operate equipment via the battery even when the mains supply fails.

By adding a suitable 13.8V (nominal 12V) lead-acid or sealed gel battery, when the mains is on, the battery is kept charged with up to 1.8A charging current, keeping the battery ready for use. When the mains fails, a fast relay switches in the battery to keep everything going. The battery is fused with a 30A fuse.

The power supply has been designed to be exceptionally RF quiet, ideal for using with a transceiver it is also immune to RFI at close range.

Weighing just 1.52kg it's ideal for use both at home and on your travels. The unit sells for just £99.95 and is available from Nevada Radio:

www.nevadaradio.co.uk

Network Radio: The RFinder B1+

Network Radios report that the RFinder B1+ is the most advanced Dual Band (VHF/UHF) DMR Transceiver combined with an embedded, powerful smartphone. It delivers up to 4W of RF Power out of its very robust case. So, what is the difference between the RFinder B1 and the RFinder B1+? The RFinder B1+ comes with Android 9, instead of 8.1; It has a 2.3GHz processor instead of 2GHz and a USB quick charger 3.0 instead of 2.0. Running Android, you can install all the available Play Store apps. This means that you can install Zello, Team Speak, EchoLink and many others and use the built-in PTT button to key the transmission on such apps. If you don't reach an EchoLink node, just use your RFinder 3G, 4G or even Wi-Fi, and you are connected. Never miss a QSO again just because there isn't a nearby repeater. The Deluxe package includes a free extra battery, screen protector, DMRoIP and APRS-IS integration. DMRoIP allows connecting to DMR networks via 4G or Wi-Fi in case a local repeater or hotspot is not within reach. Is this 'real' radio? Remember **Chris Rolinson's** article in *RadioUser* here:

https://tinyurl.com/4zwc9b93
https://tinyurl.com/3576mzew
https://tinyurl.com/eu32s9ay

Demise of FT-818 and FTM-400

Yaesu have announced that both the FT-818 and FTM-400 will be discontinued. This appears to be the results of difficulty in securing components for rigs that have been around for a number of years.

Amateur Radio Licence Exam Fee Changes

The RSGB Board has reviewed the amateur radio licence exam fees and has decided that there needs to be an increase from 1 April. This is the first time in over ten years that the exam fees have risen and the new fees are still well below the cumulative rate of inflation since 2011.
The cost of each licence level exam will be:
Foundation £32.50
Intermediate £36.00
Full £42.00

Special Contest Calls

Ofcom has recently authorised an expansion of the list of Special Contest Call qualifying contests. It now includes the World Wide DIGI contest and the British Amateur Radio Teledata Group Sprint PSK63 contest. Full details of how to apply for a Special Contest Call can be found on the RSGB website at:
https://rsgb.org/scc

RSGB Convention Presentations

The RSGB has released four individual presentations from its 2022 Convention, which cover a wide and interesting range of topics. **Philip Lawson G4FCL** gives an introduction to test equipment while **Phil Catterall G4OBK** talks about adventure radio in Europe. Taking a look back into history, **Dr David Abrutat** provides a fascinating insight into Bletchley Park and the Y Services between 1939 and 1945. Finally, as a link with December's YOTA month, young radio amateurs **Dan McGraw M0WUT** and **Hamzah Shah 2E0HXS** share their experiences and learning from the 2022 YOTA summer camp in Croatia. Find these and other RSGB Convention presentations on its YouTube channel at:
youtube.com/theRSGB

Direct to Full Exam Booking & Mock Papers

Booking for the Direct to Full exam is now open. The exam can only be taken online but can be booked by individuals or clubs. Go to the RSGB exam booking page and follow the process for an individual or club booking:
https://tinyurl.com/nhdhwek4
The Society has also published a mock paper and answers for the Direct to Full exam:
https://tinyurl.com/4h6wn349

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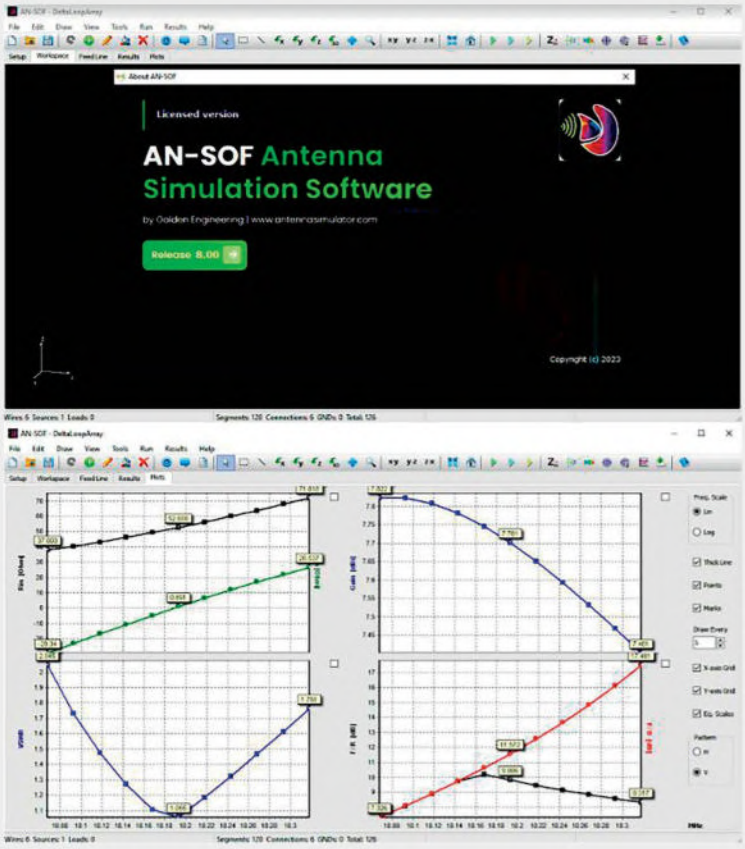

V8.0 of AN-SOF Antenna Simulator

The updated release (V8.0) of the AN-SOF Antenna Simulator software package was scheduled for mid-February 2023. The improvements are, in the main, related to the presentation of plots and shortcuts, which will enable the user to quickly display them. This is the preliminary description:

- New Plots tab where we can quickly see the input impedance, as a function of frequency, with various visualisation controls (grids, points, markers, etc.).
- The different parts of tapered wires are identified with alternating colours to better distinguish the wires of which they are composed.
- Click on a column header in the Results tab to display a plot immediately.
- New 3D Rotation button on the toolbar to easily rotate the view by moving the mouse.
- Combo-boxes now have 'memory'. Select the frequency or angles to display polar diagrams and the next time you do so the same values will be pre-loaded.
- The Resistivity can also be set when entering linear wires via the main menu > Edit > Tabular Input.
- Users who use the comma as the decimal symbol can now import NEC files that use the period as the decimal separator. Go to Tools > Preferences > Options and check the option 'The comma is set as the decimal symbol'.

The Results and Plots display appears as Tabs in the main design window. When the results tab is selected, clicking on the column header will display the relevant plot i.e. VSWR, Rin etc. without requiring access via menu items. The Plots tab displays VSWR, Gain, Front-to-Rear, and Front-to-Back ratios simultaneously. The user may then select any one of the four plots to display at full screen for better viewing. These last two features considerably reduce the time it takes to display a graph or plot while assessing simulations. The 3D Rotation feature now greatly enhances the viewing of 3D plots as the plot may be dragged to any viewing angle by the mouse. AN-SOF allows users to enter wires either individually via a single wire dialogue box or by the familiar tabular input used by other applications, now, wire Resistivity may be added while using tabular input.

Among these improvements, the developers have also fixed some bugs reported by users. For access to the 292-page user manual, knowledge base and pricing please visit:

https://antennasimulator.com

IN-CAR RADIO STREAMING: How is radio doing in the car today, given the growing competition from streaming services? What motivates people to choose radio over streaming while driving, and vice versa? And what role will voice control play in managing in-car entertainment systems? These points and others were covered by Diana Franganillo, Director of In-Vehicle UX Research at Strategy Analytics, during her pre-recorded presentation talk at the WorldDAB Summit 2022. It was organised by WorldDAB, the DAB global industry forum, on 17 November

https://tinyurl.com/4ykxtcn7

HAARP THANKS AMATEUR RADIO OPERATORS FOR HELP WITH LATEST EXPERIMENT: On 27 December 2022, the High-frequency Active Auroral Research Program (HAARP) conducted its latest ionospheric experiment of bouncing radio signals off an asteroid passing near Earth's orbit.

Amateur radio operators and radio astronomy enthusiasts were invited to monitor the test and send their results to HAARP for analysis. While the results of the experiment will take several weeks, Jessica Matthews, HAARP Program Manager, said the help was greatly appreciated. *"So far we have received over 300 reception reports from the amateur radio and radio astronomy communities from six continents who confirmed the HAARP transmission".*

HAARP officials say the results of the experiment could aid efforts to defend Earth from larger asteroids that could cause significant damage.

"We will be analyzing the data over the next few weeks and hope to publish the results in the coming months", said Mark Haynes, lead investigator on the project and a radar systems engineer at NASA's Jet Propulsion Laboratory in California. *"This experiment was the first time an asteroid observation was attempted at such low frequencies. This shows the value of HAARP as a potential future research tool for the study of near-Earth objects".*

The University of Alaska Fairbanks (UAF) operates HAARP under an agreement with the Air Force, which developed and owned HAARP but transferred the research instruments to UAF in August 2015.

JERSEY RAYNET ASSIST RNLI AND COASTGUARD: Jersey RAYNET were alerted when signals from a personal locator beacon – which warns the authorities of an emergency at sea – were picked up by a passing satellite at about 10am on 6 January.
Because the ageing beacon was not GPS enabled, the satellite could only give an approximate location within 20km of the device – in this case north-west of the Minquiers reef.
The Channel Islands Air Search plane and RNLI all-weather lifeboat were sent out to search the area and attempt to detect the device's 'homing beacon' transmitted on 121.5MHz, which would enable them to pinpoint its location.
At the same time, Jersey Coastguard contacted Jersey RAYNET and asked them to determine if a 121.5MHz signal could be detected on land in the area of La Collette recycling centre, as they had received information that the personal locator beacon had been discarded.
Two members of the group verified that a signal was coming from La Collette, and the Channel Islands Air Search plane also flew over and confirmed that the signal was coming from the site.
A member of staff from the recycling centre later told Jersey Coastguard that a pile of discarded electronics had been disturbed at around 9.30am, and it is believed this was the cause of the accidental activation.

INDONESIAN SATELLITE IS NATION'S FIRST BY STUDENTS: (from AMSAT News Service) Congratulations to the students of Surya University in Indonesia following the deployment of their first satellite from the International Space Station. Known as SS-1, for Surya Satellite 1, the CubeSat was sent into space on its own successfully on 6 January. SS-1 is also Indonesia's first student-built satellite.
The university undergraduates undertook the project with the support of the United Nations Office for Outer Space Affairs, which recognised it in a design competition in 2018. That achievement awarded it the chance to be deployed from the ISS.
The CubeSat's mission is to test communication between an Automatic Package Reporting System payload and the ground using the amateur radio frequency 145.825MHz. The university students were inspired to undertake the project after seeing a presentation on amateur radio by the Indonesian Radio Amateurs Organization, known as ORARI.

THE TEF6686 TUNING CHIP RADIO: *The SWLing Post* reports on an early test of the TEF6686 Tuning Chip Radio. The video is available on YouTube and the review was conducted by Ivan Cholakov NO2CW:
https://tinyurl.com/2bz6xt38

FRED G3SVK WINS TUNER: MFJ report that Fred Curtis G3SVK has won an MFJ-993B tuner for joining the EUDX Contest 2022 lottery. Congratulations to Fred.

SWISS AMATEURS GRANTED ACCESS TO 4M BAND: As of 1 January, amateurs in Switzerland have been allowed to operate on the 4m band using all commonplace simplex modes. The Swiss amateur radio association USKA reported recently that their communications authorities have granted approval to amateurs holding HB9 licences for a maximum operating power of 25 watts ERP.
Operation is allowed between 70 and 70.0375MHz and also between 70.1125 and 70.5000MHz. Relays and Echolink gateways will not be permitted on the band and any stations being operated via remote-control must get permission from the regulator, OFCOM-CH.

SWITCHING OFF FM IN NORWAY AND SWITZERLAND: The impact of these 'FM switch-offs' on domestic commercial radio was examined at the 2022 WorldDAB Summit in November
In 2017, Norway switched off its FM radio services, compelling Norwegians to tune in to DAB+. In 2024, Switzerland is set to switch off its FM services, forcing the Swiss to use DAB+ for over-the-air radio too. In a session entitled, Norway 5 Years on and Switzerland 2024, Digital Radio Norway CEO Ole Jørgen Torvmark asked Norway's Kenneth Andresen (VP/Head of Radio at Viaplay Group aka P4 Group) and Switzerland's Nicola Bomio (Head of Radio with CH Media Entertainment) for commercial radio's take on replacing FM/analogue radio with DAB+/digital radio.
The case for Switzerland's planned 2024 FM switch-off is supported for many reasons, some similar to those that drove Norway to make this move. For instance, the country's radio broadcast licences are set to expire by the end of 2024, said Bomio, so moving from FM to DAB+ by this date is *"common sense"*. It is also cheaper to only broadcast in DAB+ than to do so on FM and DAB+ simultaneously. *"So that's the first reason why we want to do it,"* she said.
https://tinyurl.com/2cyrrmuv

New Publications

Radioworld's 100th e-Book
Radioworld is proud to announce No. 100 in Radio, its series of free e-books, which they launched 10 years ago! This edition provides an update on trends in the design and use of consoles and mixers for radio stations. What is the definition of a console now? How has the evolution of consoles into control surfaces changed the way radio engineers view them and plan around their installation? What new features and capabilities do consoles offer – and which were not available until recently? How widely have radio broadcasters adopted 'glass' surfaces? What can be done now with scripting? How have the pandemic experience and the explosion in hybrid workflows influenced the design of broadcast consoles and related infrastructure? Radio engineers, consultants and manufacturers are asked to share their insights.

Radio Physics Explained: The Luxemburg-Gorky Effect (13DKA):
https://tinyurl.com/4bfv9854

M0RWX ACTIVATES ALL G SUMMITS IN ONE YEAR: Robert M0RWX from Wiltshire activated every SOTA summit in England, within the calendar year of 2022. This is an unprecedented achievement, but it doesn't end there. During 2022, Robert also activated extensively in France, Scotland and Wales and Benelux, recording a total of 326 activations, and a mammoth 1,476 activator points in the year—almost 1.5 Mountain Goats. Robert is now targeting an activator completion of Wales during 2023 and thereafter, spending longer on each summit, experimenting with more bands and modes.
http://sota.org.uk

Read more radio news and reviews at www.radioenthusiast.co.uk/news

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The Yaesu FT-710Aess

Richard Constantine G3UGF gets to grips with an exciting new radio from Yaesu.

When the FT-710Aess arrived on my desk, I was reminded of the 2010 RSGB Convention. In a packed to overflowing lecture room I learned that simple, single-band SDRs connected to resonant antennas, though a black-art, actually worked!

However, wideband reception had problems. Simple designs are subject to front-end overloading and lack selectivity. Result, broadcast and other interference can corrupt amateur band reception.

Back then, SDR designs were DIY projects linked to sound cards and PC Towers. It was prophesied that by now the conventional desktop radio would be a thing of the past. How wrong can you be?

Paper books still massively outsell e-books. Amateurs haven't abandoned their love of stand-alone radios, even if the inside has seen a complete makeover. Today, SDR has truly come of age. Advanced selectivity and digital filtering suggest that maybe the days of analogue superhet design are numbered.

You might well ask why has Yaesu released a true SDR transceiver, hot on the heels of its highly successful hybrid range… I'll try to explain.

To understand where the FT-710Aess sits in Yaesu's product range, you really have to first look at the hybrid technology of other models.

FTdx101D

(Take this slowly and read on…!)

The front-end attenuator includes ten precision, amateur band filters and five broadcast band filters, providing close-in signal rejection as a first stage.

Following these, the 101's secret weapon is a motor driven variable capacitor/pre-selector system. It auto-tracks across the band, as the main dial moves. After that comes the receiver's RF amplifier stage, the output of which follows two separate paths. The first, a conventional analogue/mixer /oscillator route that produces an Intermediate Frequency (IF), at 9MHz. Thereafter a selection of up to four switched, precision, conventional crystal filters can be used before signals pass through an analogue-to-digital converter (A/D) and enter the FGPA – Field Gate Processor Array (the clever stuff).

The second signal route from the RF amplifier passes directly from the front end into the same FGPA, via an A/D converter. Signals re-combine and processing takes place, hence the name hybrid design.

Note that the panoramic adapter is derived from the direct SDR route to give a wideband display.

FTdx10

(Stick with it …)

Gone is the clever auto tracking preselector while the attenuator and 15 bandpass filters remain, before a similar hybrid receiver chain. The conventional IF route following the mixer now has only two costly, precision crystal filters. The second route, a straight-through signal, A/D conversion connected to the FGPA remains.

FT-710Aess

(All is revealed)

Gone altogether is the conventional analogue superhet receiver and the related crystal filters in the IF. Everything becomes digitally processed to create a similar effect. The input attenuator and the bandpass filters remain in place for selectivity.

Following the RF amplifier, the signal now feeds directly into two separate A/D converters and the outputs feed into the FGPA. One is a digital version of a mixer/oscillator/IF completely replacing the traditional analogue. The other a direct line to the FGPA as before. Operating at high speed, field gate arrays have thousands of re-programmable gates, are long lived, reliable, ideal for smartphone and amateur radio designers alike.

Quantisation and Dithering

I left one bit out. That is, when A/D conversion takes place, signal distortion known as ***quantisation*** error, is inevitable. The system is constantly trying to select the nearest digital stepped value to the otherwise smooth curve of the original analogue signal.

There's bound to be a small difference. I find it helps if not strictly accurate, to imagine a sine

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Photo 1: Radio with menu screen display. Photo 2: Radio with Multi-screen display. Photo 3: Rear panel View. Photo 4: Top PCB shows LPF & ATU, double screening removed. Photo 5: Main menu screen. Photo 6: Main SDR PCB below cast alloy chassis and PA.

wave signal that's got a rough outline. Magnified, it verges on becoming a sort of lumpy square wave. Do away with the hybrid receiver section and clearly something has to be done. There are a couple of established things that help.

While I profess no detailed technical knowledge on how it's actually done, the technique used here is ***dithering***. Simply think in terms of a sort of random white noise type signal generated and fed back from the field gate array, into the incoming analogue signal lines. The FT-710 has a 'dithering' feedback loop to both A/D inputs to eliminate this problem. Safe to say, errors are minimised with further improved receiver performance.

Yaesu appears to have advanced their SDR designs in increments until they have been able to achieve a fully-fledged, clever SDR design. Don't just take my word for it when the highly respected Sherwood Engineering test house rates it at number four in their current listings. It's certainly no slouch, achieving in-band SSB/CW sensitivity in the order of 0.16µV with its low-noise pre-amp on and VHF FM at around 0.2 - 0.25µV.

Going fully digital means that QRM rejection using Shift, Width and Notch control, Noise blanker, Digital noise reduction Audio Peaking (APF) become flexible under software control.

The 32-bit, high speed floating decimal point Digital Signal Processor (DSP) makes many things possible. For example, filter edges can be shaped electronically for enhanced performance as and when required, while viewing everything on-screen.

Those familiar with the current generation of Yaesu's transceiver will already appreciate the way this radio looks and operates. With its additional speaker attached that we'll come to later, it's the same size as the FT-991a.

Curiously, with the outboard speaker removed it has exactly the same footprint as a certain other ubiquitous SDR black box, but with a lower profile. I know, I have one and I've checked.

Operation

For those less familiar with Yaesu's way of working, it has a colour touchscreen with an extensive palette of colour choices that operates in combination with some of the manual controls.

At times and despite the reasonable 11cm (4.3in) TFT colour screen, with so many menu options up on the screen, it was at first too easy for my fat fingers to select the wrong thing. I then had to backtrack, wind and press the Function knob to highlight the menu of my choice, from the long list. With more use and controlled enthusiasm, touchscreen became a quick way to change things and to cope with such issues as band noise and interference.

TFT Screen and Waterfall Options

Everyone expects a waterfall display these days and I wouldn't want to be without one. Touchscreen adds the convenience of seeing a signal first and jumping directly to it, without it disappearing before you've wound the VFO knob all the way across the band.

Yaesu like their on-screen 3D effect. You can see not only the signal in a standard X and Y, 2D waterfall, but also an additional Z axis, giving 3D depth to the display.

A spread graphic representation shows individual relative signal strengths and band conditions changing, over time. It's feels like looking at the near past. My mind remains open on this feature. I can see the point if you're hanging around waiting

your turn in a pile-up or monitoring band opening / closing conditions on say, 10, 6 or 4m. Yes, it does have 4m TX/RX, in the UK version.

Incidentally, the radio has internal, user programmable, software settings for different worldwide frequency allocations. Enabling 4m TX and 60m comes under C2UK. If not already activated by the supplier, it's a relatively straightforward button-pushing process to achieve. There's an SD card slot on the left-hand side of the box, to back up all settings.

Just a thought… This radio may a be a strong consideration for travellers and overseas call holders.

You can opt to have the display clean and simple with say, A & B VFOs, mode settings and waterfall etc, or other features, in a sort of pick and mix fashion, allowing you to have more visual control over things such as both received and transmitted audio scope. There is so much to see, do and change that the handbook devotes some ten pages to this topic alone.

The screen can seem a little cluttered at first if you display too much information simultaneously. There is an option on the rear panel to connect a larger remote display.

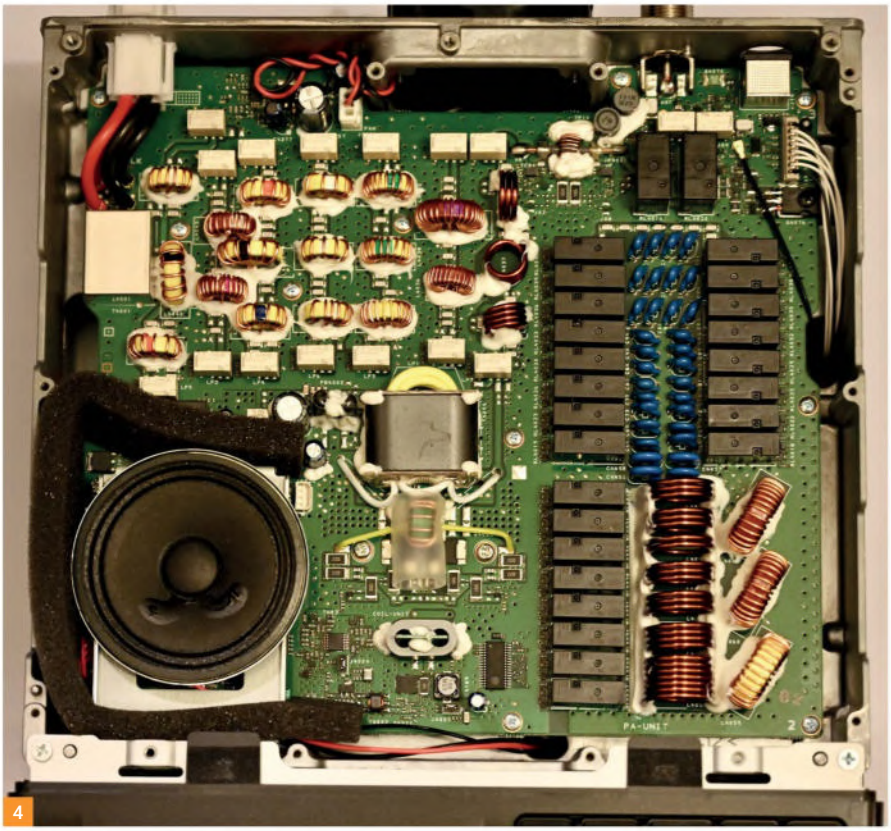
I wondered why manufacturers still specify DVI-D sockets for radios when this standard has been eclipsed by HDMI, on modern external monitors. Was I missing something? The answer is, Yes.

Primarily it's a licensing issue. Realistically, DVI-D has everything needed and adapter cables are available for all kinds of monitors. Here a strong word of caution. Folklore and fake news (the internet) says that some HDMI cables can damage your radio. What's actually critical is that there should be no potential difference between the chassis earth of the radio and the monitor. Use only 'earthed' external devices monitors/ computers, etc. Avoid like the plague anything with a two-pin AC connector! Double check with a meter that there is 0 volts AC between the grounding of separate equipment's before connecting anything!

Which brings me to the other connectors on the rear panel. There's the usual range, including connections for remote external tuner/linear amplifier band switching, two USBs and RTTY/ Data.

The radio can be remotely controlled by CAT commands. You can also plug in Yaesu's optional FH-2, desktop keypad, a great addition for contest calling from the memories.

It's a sign of the times that the handbook has three whole pages devoted to interface cables and presetting everything for FT8, RTTY and PSK. These options appear on the pop-up Mode screen display together with a *Pre-set* legend, allowing data settings to be selected and pre-stored to a memory card, for different operating modes. While FT8 is flavour of the moment with many, don't



4

ignore PSK, simple quick and easy to set up. The popularity of data also appears to be making more band space for SSB/CW these days.

For those of us brought up simply twiddling knobs and listening to the effect of, Shift, Width and Notch, a visual representation activated by pushing in the combined Step/Memory control just below the Function control, is a real bonus This control takes a little practice to follow as there are four initial choices, including the audio contour function. Turning the control moves across the options on the inset screen. First you have to turn off the last used of the four options using a virtual on-screen switch, before you can move to another choice. Took me a while to figure that one out.

Press the Step/Memory control a second time and you can begin making changes. Once set, touch nothing and after a short time the inset screen disappears. At first, I found this all a bit awkward and less than intuitive. It just takes time to become familiar with it.

In normal use, the Step/Memory rotary selects 99 memories in five banks plus the Programmable Memory Scan (PMS), all of which can be labelled from the on-screen keyboard display.

Menus and Controls

One look at the main on-screen menu list should be enough to tell you that it would take me a week to describe what everything does. I do like the curved, cursor LEDs either side of the two-speed, main tuning control. If you engage the *Clarifier* or

5

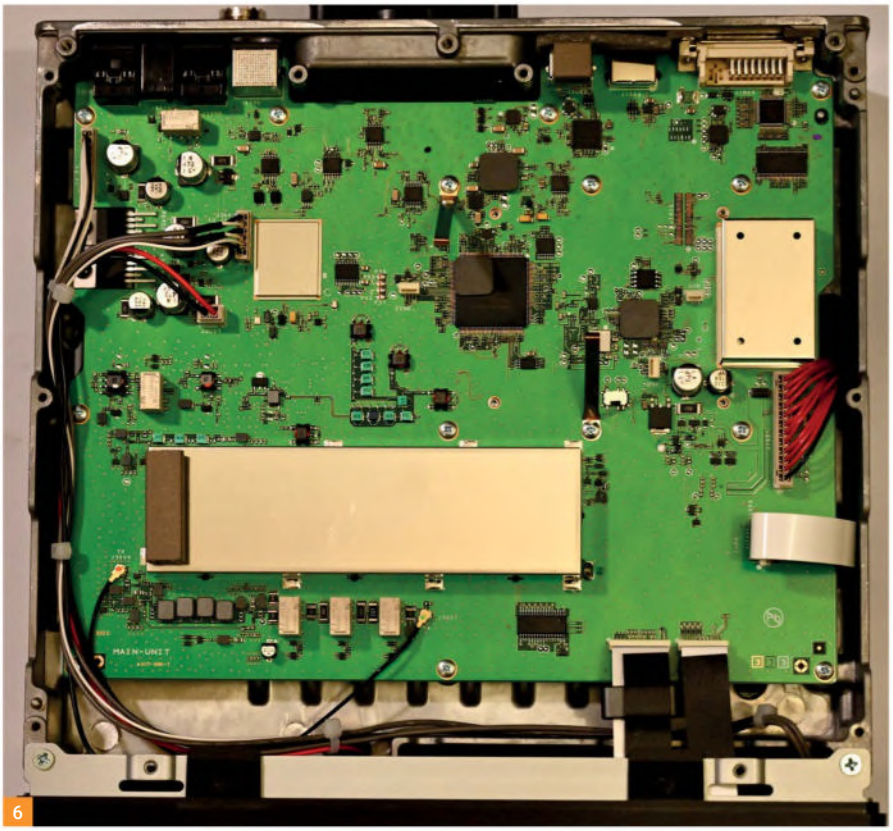
Split functions, they change from Blue to Red as a reminder.

Pushing the Function rotary control that's going to get a lot of use, reveals a very full screen of choices. 'Marmite' is how some describe Yaesu's menu system but stick with it, it works.

Rotating the Function control moves the cursor to the wanted area. Pressing the on-screen legend highlights the choice. Then it's a case of using the rotary part of the same control to switch something on or off while watching the pop-up centre screen-in-screen, or go into the next sub-menu again for a further set of choices.

Given time, you can customise the radio to your own personal preference and style. At first, I found this a little bewildering, rather like trying to pat your head while rubbing your tummy. I soon realised that some settings are likely to be once only and saved to set up. Others just needed more practice.

In short, if you're serious about this radio


6

and don't have experience of the other models mentioned, I definitely recommend first downloading the comprehensive 112-page manual from Yaesu's website, before committing. It's easy to follow, worth the study and it's free (print out double-sided and save the planet).

Aess—Acoustic Enhanced Speaker System

What's really different about the FT-710 Aess and why you get a second speaker is that it's all about audio profiling. If the old expression 'Armchair copy' means anything to you or spatial sound (not stereo), then you'll get a flavour of what Acoustic Enhanced Speaker System (Aess) means.

Before using it, I considered it a potential gimmick. However, the more I used it, the more I missed it when I didn't. You can adjust and balance the audio between the internal and external speakers. If you also adjust the bandwidth and digital filtering, the effect can be quite surprising.

I found it delightful to get rid of that awful and annoying bass rumbling noise you get from stations with over generous amounts of spreading EQ on their transmitted audio. Why do they do that?

The SP40 extension speaker has two wall hangar type slots, on each side, initially blanked by bungs.

Special, collared shank screws are provided that fit to pre-tapped holes on either side of the transceiver. The speaker slots on or detaches as required. Right hand gives better effect due to greater separation between the internal speaker and the extension. The on-screen menu system allows for adjustment of both balance and frequency cut-off.

A little disappointingly, the speaker has no feet. It has no tilt stand to line up with the radio, if separated. You can of course easily remove it to make the package smaller for travelling or /P.

On the good side. comparing apples with apples; for a proper comparison with other radios, you have to add around £150 for an extension speaker. This one's included in the price.

Now for the Transmitter

Power adjustable from 5 to 100 watts, carrier suppression in the order of –60db, 25 watts carrier AM/FM and excellent harmonic suppression at –50db, what's not to like?

The chunky SSM-75E, 600Ω electret hand microphone delivers crisp audio. It's nice to hold, has four function keys and that all important mic-mute button for those unexpected moments. It's only short of one thing, weight to give it that extra gravitas.

I'm sure that many readers will be conversant with variable speech processing and compression. This radio also has an internal 'Parametric Microphone Equaliser'. There's so much to consider that on-air adjustment isn't a great idea. Dummy load, headphones and a separate receiver is perhaps the way to go. Two independent sets of settings are possible, processor on or off. Bring up the on-screen scope display, engage the recording facility that covers both TX and RX audio and you can both see and playback changes. Operators can adjust centre frequency, enhancement and bandwidth. Don't overdo the width and the bass … please!

Automatic Tuner

Yaesu have a long history with automatic tuners and this one works well. It has a few more inductors and capacitors to choose from than some others I could name, all helping with selectivity and performance. It covers the usual impedance range of 16.5-150Ω on HF and 25-100Ω on VHF, for coaxially fed antennas.

VSWRs of 2:1 or less are stored in memory. Moving up and down a band it logs settings every 10kHz. Re-tuning as the operator goes up and down the band means there's rarely the need to press the Tune button repeatedly, in the same band. VSWRs of more than 3:1 are highlighted on-screen automatically.

Other Features

As you'd expect, there's a full range of options for CW, full and semi break-in, manual, bug or iambic keying and speed range of 4- 60 wpm.

In the menu there's a nice little option that brings up a tuning bar in the lower meter scale. It makes for easy matching of CW pitch to the received signal. Nothing worse than being slightly off frequency and fruitlessly calling, when you're not being heard.

Of course, there are no FM repeaters on 4m but there are some excellent and little used 6m repeaters in the UK, with amazing range, not forgetting 10m under the right conditions. Therefore, it's nice to see the FT-710 Aess has CTCSS tone capability and everything can be stored in memory for quick access.

What do I Think?

I'm so pleased that Yaesu UK gave me the privilege of an extended and longer than usual, loan of this new radio. My early impressions have definitely mellowed over time. I miss central VFO knobs. They are long gone and I'm left-handed.

I'm impressed with the performance of this all SDR transceiver, in a small package. Verging almost on feature and option overload for both RX and TX, you definitely get much for your money.

Due to its low profile, for me it worked best at shelf height rather than desk height. Its good looks match its performance and for me it scores 4.8 stars. If I was a serious contester, wanted that extra very weak signal performance or bragging rights, I might just be a bit tempted to spend more money.

That said, it's a great compact, transportable, high scoring, multi-function radio but, come on Yaesu, why charge me extra for a carrying handle? Not a fortune I know but, it just takes the edge of an otherwise really lovely radio. In the good old days, the original FT-101 had a carry handle as standard and weighed at least four times as much.

• UK price at time of press, circa £1,100.00.

Photo 1: What you get: antenna, SMA adapter and a small rubber ring to bridge any resulting gap.

The Rubberscopic Antenna

Don G3XTT takes a look at an intriguing antenna for handie-talkies.

Don Field G3XTT
practicalwireless@warnersgroup.co.uk

One of the products that caught my eye at Newark this year was the Rubberscopic Aerial by **Phil Williams G3YPQ**. This is, quite simply, a telescopic antenna for handie talkies that works on 2m and 70cm and, for good value, the marine too. It's a telescopic antenna in a rubber sleeve that, when retracted, acts as a 70cm quarter-wave and when fully extended as a quarter wave on 2m or a three-quarter wave antenna for 70cm. As such, its performance is supposed to be somewhat better than the short two-band whip that comes with the majority of sets (such as the Yaesu FT-4X that I used for testing). Telescope just the top section in, and the whip becomes resonant on the marine band. The antenna comes with an SMA adaptor (see Photo 1) in order to handle either male or female connectors on your radio.

I tried to measure the performance of the antenna but it's very difficult. Suffice to say it's certainly no worse than the supplied rubber duck antenna and may well be slightly better.

At £10 for one, £15 for two, what's not to like! The Rubberscopic can be ordered on eBay. Alternatively, you can contact G3YPQ at **philwill73@gmail.com.**

It's not new and you can find a review on YouTube (below) but it certainly caught my attention!

www.youtube.com/watch?v=FIR6UPnyPAE

Photo 2: The antenna retracted, for use on the 70cm band.

Photo 3: Antenna extended for 2m use or as three quarter-waves on 70cm.

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AT-600 Pro II General purpose Auto Tuner

Designed for mid sized amplifiers up to 600 Watts with a large easy to read bargraph that shows Forward/Reverse power and SWR. Switch between two antennas with 2,000 memories for each antenna, giving almost instantaneous recall.

£419.95

AT-100 Pro II 100W & QRP Auto Tuner

Requires just 1W for operation, so ideal for QRP, but will also handle up to 100W. Has two antenna outlets and 2,000 memories per antenna. The bargraph display provides both 12.5W and 125W scales for easy QRP or higher power readings.

£279.95

AT-1000 Pro II Flagship Auto Tuner

Handles 1,000 Watts with a large easy to read Bargraph display. Covers 1.8-54MHz with a choice of two antennas. Matches from 6 to 1,000 Ohms so easily handles Yagis, Dipoles, or virtually any coax fed antenna.

£539.95

Z-11 Pro II QRP Portable Auto Tuner

Ideal QRP tuner needing just 0.1W for tuning, but capable of 125W. Dedicated buttons for manually fine tuning the antenna once near match. Ideal for portable use with internal AA batteries requiring just 20 micro amp standby current.

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FTdx10	100W HF/50/70	£1399.95
FT891	100W HF/50	£679.95
FT818ND	6W QRP 160m-70cms	£624.95

ICOM IC-7300 100W HF/50/70 **£1299.95**

IC-9700	2/70/23cms	£1899.95
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PA5070-15-9BGP	6m 7el/4m 8 el	£475.95
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1

Practical Wireless Rating

★★★★☆

Good value as a starter rig on 12 and 10m.

Daimon Tilley G4USI
practicalwireless@warnersgroup.co.uk

Anytone 5555 Plus 10m Transceiver

With the improvement in high band conditions, **Daimon Tilley G4USI** looks at an inexpensive rig that gives you access to the 12 and 10m bands.

I have never operated a CB radio, but back in the early 80's when I was first licensed, I did buy a used Cobra AM CB from the Leicester Rally to convert for 10m FM. However, it was a project that never got started, let alone finished. Now that HF conditions are once again picking up with this new cycle, I have had a number of very successful forays on 10m in all modes, including a number of FM simplex and FM North American repeater contacts.

That got me thinking about what might be available today, to get on 10m on a budget, and I scrolled through this magazine's advertisement pages to see what might be available. I came across the Anytone 5555 Plus from Moonraker, priced at £169.95. This radio looks very much like a CB programmed for the 10m band, and Moonraker were kind enough to send me this radio for review.

Specifications

On the website, the specifications are shown as having a frequency range of 28 – 29.7MHz, with a stated maximum RF power of 12W on AM/CW, 40W FM and 40W SSB. I was particularly interested in the advertised CW function, as that is my main HF interest. Out of the box the radio comes with a microphone, power lead and mobile mounting bracket. First impressions were that the radio was larger than expected, measuring some 28 x 25 x 6cm, and weighing in at a little under three kilogrammes. This is surprising given the amount of empty unused space inside the rig (see photos.) The front panel has two displays, a numeric frequency display that also displays the status of selected menu items, and a channel number display, perhaps harking back to its CB roots. Functions such as Noise Blanker, Noise Limiter, Dual Watch and Scanning were readily available from the front panel, along with the ubiquitous CB 'Echo' function (why would you want to?). In addition are volume, squelch, RF gain and RF power controls.

Tuning is achieved by selecting one of six bands from a rotary knob, labelled A to F, and turning the channel selector. An irritating feature is a beep every time you turn a knob, but it is possible to turn off the beeping sounds in the menu and it makes for a much more pleasurable operating experience. The tuning control/channel selector has a detent, so is a positive switching action every turn and results in a loss of audio each time. This makes tuning across a band a bit slow and noisy as a result. Channels can also be changed from the supplied microphone.

Accepting this channelised nature of the rig, I noticed that every turn of the channel/tuning knob meant a 5kHz frequency change. At first this struck me as a severe limitation, but then I realised that in reality on HF SSB, the majority of the time operators tend to operate in 5kHz steps. When that is not the case, the Clarifier knob can be used. This knob, by default, alters both TX and RX frequencies at the 1kHz level, although repeatedly pressing it also allows you to change the clarifier increments to tune at 10 and 100Hz levels, as well as at the 5 and 1kHz steps. Using that facility I went on to readily have a number of SSB QSOs and managed the tuning quite easily. It should be noted that in software (see later) it is possible to alter how the Clarifier works and it can be set to just alter the TX frequency (like the XIT function on some rigs) but not just the RX (RIT) frequency.

In Use

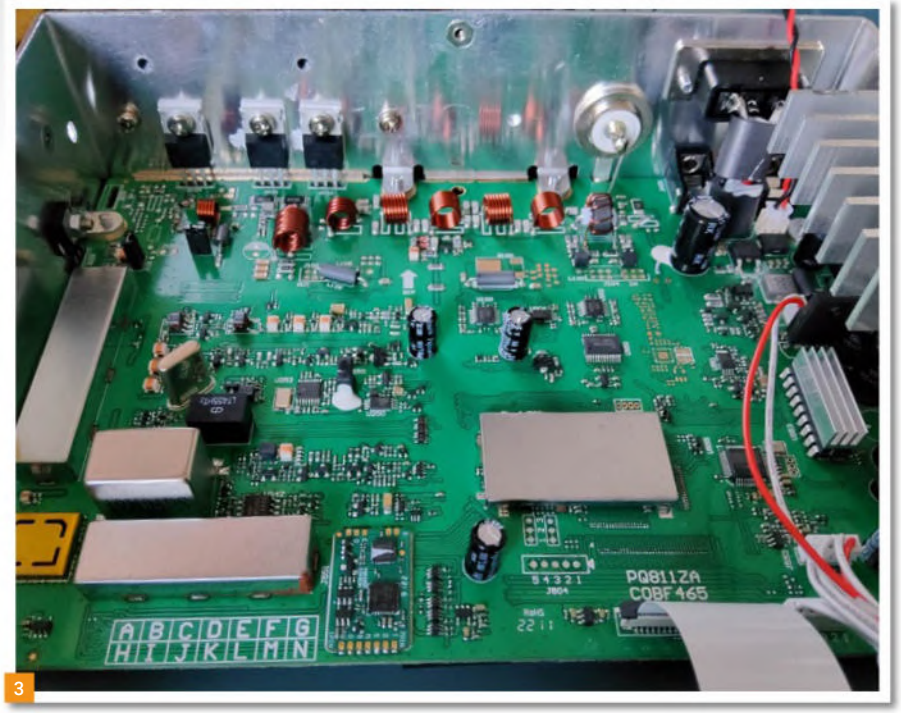
Connecting it up to my SpiderBeam Yagi gave me four elements on 10m and a number of QSOs on FM Simplex and through North American repeaters, by setting the appropriate CTCSS tone in the menu. The received audio was fine and there were no negative comments about my transmission.

Then my thoughts turned to CW. The mode button has a setting for this, but using CW with 5kHz tuning steps, even with the Clarifier, was going to be problematic. I plugged in a key and switched to CW just to see. A few things struck me. First there is no internal keyer, so it is a

2

Photo 1: Front view of the radio. Photo 2: Rear view. Photo 3: A look inside. Photo 4: The author's spreadsheet for programming the memories.

straight key only, or external keyer for a paddle. Next there is no CW specific filtering. The filter width is shown in the manual as 3kHz on AM/FM and 2.1kHz on SSB. This makes it quite a challenge to tune to the correct frequency for a QSO and separate out adjacent stations in the passband. Keying into a dummy load I then noticed another issue – there is no transmit or receive offset for CW. On a modern rig designed for CW, the transmit and receive frequencies are set a few hundred Hertz apart (around 700 – 800Hz and usually the same as your sidetone pitch). As an operator you don't notice this, but it is this difference that allows you transmit on the same frequency as the other station yet still hear them. If you were to listen on their exact indicated frequency, you would actually hear nothing! Finally, there is no QSK facility provided.



3

Progamming

It was at about this point that I noticed that a computer programming cable is available for the rig at £14.99 and Moonraker kindly provided one on request. I downloaded the software from their website and opened it up. The format is similar to many other radios and takes the spreadsheet format. Anytone advise that the very first thing you do is to read the existing programmed data from the radio and save it, in case you need to restore it later.

This is easily achieved. Simply plug in the radio and switch it on, use Device Manager (Windows) to determine the COM port, and then in the software, select 'Setup' and highlight the correct Communication Port number. Then select 'Program' and 'Read from Radio'. Once done, save this file as the original configuration.

Having done that I immediately noticed something interesting – in the channel information window there was an option to select from one of two frequency bands: 29 – 29.7MHz, as supplied, or 24.715 – 30.105MHz. Could I make this radio work on 12m too?

I began by choosing this wider frequency band and placing just a couple of 12m frequencies into the sheet for Band A, then adding some 10m (28MHz) frequencies into Band B. Using 'Program – Write to Radio' was not successful – the rig had not accepted the data. A little Googling around led to a solution. As well as selecting the wider frequency range in software, you also have to do this on the rig itself by:

1. Hold in the FN and EMG buttons, while turning the radio on
2. Use the Channel switch to change from Band 1 to Band 2
3. Then press and hold the FN button until the display changes
4. Switch the rig off and back on
5. Upload your file from software

I tried again and success!

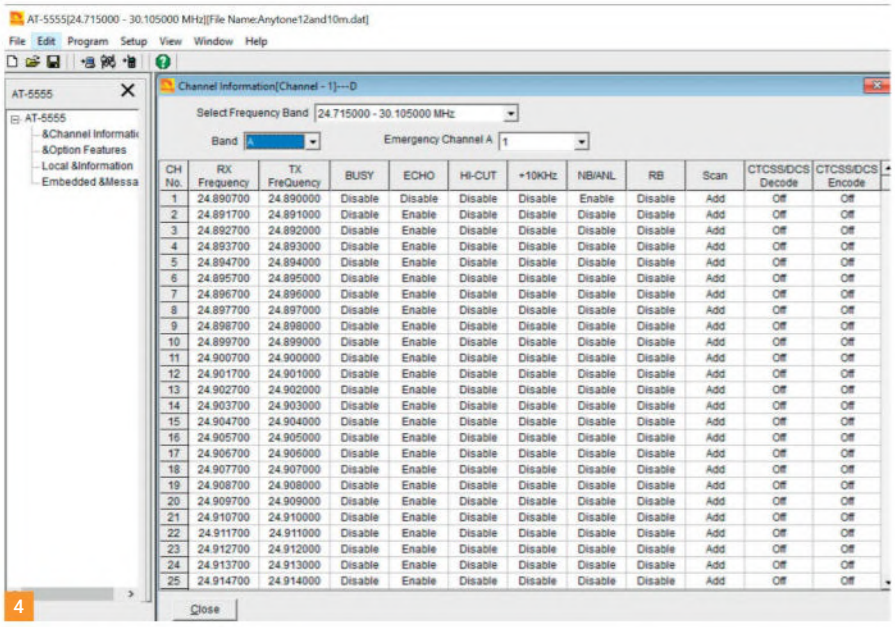
I then decided to spend some time programming the radio more fully and trying to resolve the CW offset issue. I decided to program the CW segments of 12m and 10m in 1kHz steps

with the RX frequency 700Hz higher than the TX frequency so that the rig emulated what modern CW transceivers do by default. It took me a good couple of hours as everything had to be entered manually, but I ended up with the following programmed bands:
Band A: 24.890 – 24.990 in 1kHz steps with RX frequency offset +700Hz for CW
Band B: 24.931 – 24.990 in 5kHz steps for SSB
Band C: 28.010 – 28.070 in 1kHz steps with RX frequency offset +700Hz for CW
Band D: 28.300 – 28.595 in 5kHz steps for SSB
Band E: 28.600 – 28.895 in 5kHz steps for SSB
Band F: 29.100 – 29.200 in 10kHz steps for FM Simplex
29.600 for FM Calling Channel
29.620 – 29.700 RX with corresponding
29.520 – 29.590 TX offset and CTCSS enabled for FM repeaters

As I said, this was a pretty painful process. I did find that if you enter the RX frequency and then hit TAB, it auto populates the TX frequency the same, but this is no use for setting CW offset or FM repeater offset. It was also a pain to enter 60 different frequencies per band. I had hoped that the spreadsheet format would allow me to enter a couple of values and then extrapolate them like a spreadsheet, but it would not. I then tried doing that in a normal spreadsheet, which is easy, and then copying and pasting into the Anytone software, but the software does not allow cut, copy or paste at all. Frustrated, I persisted by entering every frequency manually until everything was programmed, saved the data and then uploaded it to the rig., which was thankfully successful.

This procedure did indeed give me exactly what I had hoped for. Fairly comprehensive coverage of the CW, SSB and FM portions of both 12 and 10m. I did make a bit of a mistake here. By reserving Band A for 12m CW I used just 26 Channels, and on Band B for 12m SSB, only 12 channels. This meant that I was not able to get full coverage of the 10m band and had effectively 'wasted' 82 channels! I could have filled them in or added the CB channels but everything would have been out of a logical sequence. With hindsight I should have confined both CW and SSB 12m coverage to Band A, giving me 60 channels on Band B for better coverage of the 10m SSB allocation. I did go into the software and try to alter this, by moving band channel data between Band allocations, but the complete lack of a copy and paste function prevented this. I would have to start from scratch and enter all the data again to keep logical low to high coverage, so I left it alone. If I were planning on keeping the rig, I would go through that pain again to get the wider coverage.

Testing into a dummy load and a basic power meter (so not lab measurements by any means)



I recorded the following output power:
12m: SSB = 15W, CW = 10W.
10m: SSB = 20W, CW = 8W and FM = 30W.

These are somewhat below manufacturers claims, but I would not be concerned about it, being mostly a QRP operator in any event.

One consequence of programming the CW frequencies as I did, with a higher RX frequency than TX, is that the rig actually displays the RX frequency rather than TX. Therefore, on CW, my frequency display shows, for example, 24.89570 on RX and then changes to show 24.89500 on TX, but this is not a problem in practice.

So far so good, but what about on the air with these new frequencies. Well, I fairly immediately heard **Dan KB0EO,** in Minnesota, on 12m SSB calling CQ. The 15W and the two elements on this band from my Spiderbeam yielded a very enjoyable QSO across the pond over 15 minutes or so, until the band began to close.

I then decided to try CW and had a number of unsuccessful attempts at answering CQ calls before making contact successfully with **Willy LY2PX** with whom I have spoken many times. The filters are wide open on CW and if the band was crowded, it would make for tough operating, but it is possible.

Tuning around both bands, I of course stumbled across FT8. That got me wondering if digital modes could be worked with this radio. I did not try it but suspect it would be possible. There is an audio out jack and you could fashion an audio input using the four-pin mic socket, but there is no CAT control facility, so you would need to set the frequency manually and key the PTT with some form of relay or other manual switching. I suspect the filtering is wide enough to be successful, but not sure I would go to the trouble of doing it myself. I also noticed occasional broadcast station breakthrough on 10m from time to time, which surprised me a little.

The rig is sensitive enough for everyday use and there are also some useful features in the menus, including the ability to set SWR protection levels, voltage input minimum and maximum protection, microphone gain, noise reduction levels, CW sidetone pitch and volume, scanning mode (based on squelch or dwell time), and VOX settings.

In Summary

So, to sum up. This rig is good value for the money. With a little programming work and the cable, it is possible to get almost full coverage of the 12m and 10m bands. You could, if you wish, also program the CB channels. Performance on SSB and FM is more than adequate and good results are possible. I didn't try AM, but this mode is available. It is possible to use CW, but it is not a great experience and personally I would not purchase the rig for this mode. While a little on the large side, the price point of this rig would make it a good choice for, perhaps, permanent installation in a vehicle, where the relatively compact size of antennas for this band are an advantage, or a good station monitor where the scanning function could be useful for scanning the 10m FM repeaters perhaps. Overall, if you are on a budget, £170 plus the cost of a programming cable gives a reasonable quality dedicated 12 and 10m transceiver, with the ability to include 11m too. If you have one of these rigs, or decide to purchase one, I have kept the data file of the band and frequency allocations I made and would be happy to let you have a copy to save you the effort. You would still need the programming cable though.

My thanks to Moonraker for the loan of this rig. **PW**

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RustDesk and FT8 Comparisons

This month **Mike Richards G4WNC** is looking at some new remote access software and an FT8 performance comparison between the latest WSJT-X and JTDX.

Computerisation in the shack brings us many benefits, including the ability to operate our stations remotely. There are many ways to achieve this but, for data modes operators, the simplest is to use a remote access software program. These programs will usually provide access to your shack's computer screen and keyboard from anywhere with an internet connection. However, there is a problem, as most remote access software requires a payment to activate the full features. Those few that offer a free tier will occasionally withdraw access if you use the link excessively. I recently discovered a solution to this problem with the RustDesk remote access software. RustDesk is a fully open-source package written using the Rust programming language, hence the slightly odd name. The program is available for the following platforms: Windows, Linux (including Raspberry Pi), iMac, Android and iOS. This means you should be able to access your computer from a wide range of devices. However, screen size is important for data modes operation, so access from a phone, while possible, can be challenging.

Installing RustDesk

Installation is straightforward as RustDesk has binary executables available for free download. Here are the installation steps for a Windows PC:

1. Download the Windows zip file from:
http://rustdesk.com

There are three alternatives available, 64- bit, 32-bit and portable. In most cases, you'll need the 64-bit version, but older computers may need the 32-bit version. The portable version can be used to run RustDesk from a USB stick. This is mainly intended for service engineers to provide a temporary installation while repairing a device.

2. Unzip the file to a convenient temporary location
3. Double-click the extracted file and follow the prompts to install the software

For Linux, Raspberry Pi and iMac, RustDesk binaries are available from their Github site at:
https://github.com/rustdesk/rustdesk/release

For each release version, you will see a list of installation files you can download for your operating system, **Fig. 1**. For most systems, installation is simply a case of double-clicking on the downloaded file, and the appropriate package manager will open to guide you through the installation. For Raspberry Pi users, I have prepared the following more detailed installation guide:

1. Open the browser and navigate to:
https://github.com/rustdesk/rustdesk/release
2. Locate the latest release and double-click on the file with raspberry-armhf in the title. At the time of writing, the latest release was: rustdesk-1.1.9-raspberry-armhf.deb
3. Once the download is complete, check the browser option to keep the download
4. Use File Manager to navigate to the downloaded file (/home/pi/Downloads)
5. Double-click on the downloaded .deb file. This will start the installation and you will be prompted to enter the Pi password (the default is: raspberry).
6. The installation will then proceed.
7. Once the installation is complete, you will find RustDesk via the main menu under the sub-heading Other.

For mobile devices, the RustDesk app can be downloaded and installed from the Play Store for Android and App Store for Apple devices.

Using RustDesk

RustDesk is a powerful tool that facilitates remote access between any Windows, iMac, Linux, Android or iOS device. This means you can, for example, access your Windows PC desktop from your iPhone, control your Android phone from a Windows PC, etc. To access another device, you must first install RustDesk software on both devices. You also need the RustDesk ID and password for the remote device, as this is used to identify and create the secure link between the devices.

For the user, these steps are seamless and managed automatically by the RustDesk software.

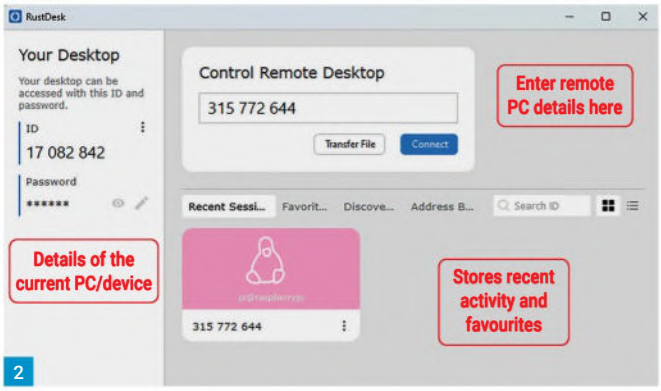
On Windows PCs, RustDesk runs as a background service so, providing you have the access ID and password for that machine, you can access the remote machine without having to start the software manually. This is an important feature when you want to access an unattended computer.

To access a remote computer, you begin by running the RustDesk application, which will display the main screen, as shown in **Fig. 2**. This screen is divided into three windows. The left-hand window contains the parameters for access to the current computer, while the top-right window is where you enter the details of the computer you want to control. The bottom-right window keeps track of computers you have recently accessed and provides an easy way to reconnect. You can also save these connections as favourites for easy access later.

To take control of a remote computer, you need to know the ID and password for that machine. These are the details shown in the left panel of the main screen on the remote machine. RustDesk allows you to create a custom password for each PC so you can set a more easily remembered password.

RustDesk Inner Workings

Under the bonnet, RustDesk uses two internal protocols to facilitate remote access, **Fig. 3**. The first is called the Rendezvous Protocol and is used to locate the remote computer, while the second is the appropriately named Hole Punching Protocol. The role of the Hole Punching Protocol is to set up a secure link between the two devices. When you access a remote device you are really just viewing the screen display and gaining access to the keyboard input. This is why you can seemingly do the impossible and control a Windows PC from an iPhone! The remote access is achieved with



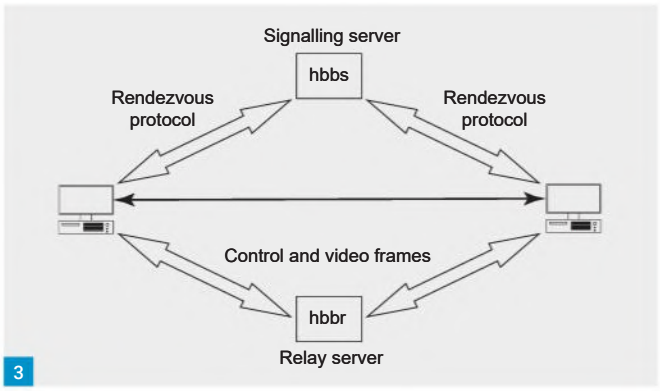


Fig. 1: RustDesk Github installation files. Fig. 2: RustDesk main screen. Fig. 3: RustDesk protocols. Fig. 4: FT8 test setup. Fig. 5: WSJT-X bandwidth setting. Fig. 6: JTDX bandwidth setting.

just two virtual connections, the first grabs screen frames from the distant device while the other is the control connection that carries keyboard commands and other data. Both of these connections are routed via an internet connected server which, in the default setup, is provided free of charge by the RustDesk team. However, if you need a faster or more secure link, the server software is freely available for download, so you can create your own RustDesk server. The computer requirements for the server are remarkably light and it will run successfully on a Raspberry Pi 4B. Full details for creating a RustDesk server are available in the RustDesk documentation:
https://rustdesk.com/docs/en

FT8 Performance Comparison

As it's been a few months since my last comparison, I thought it was appropriate to check the decoding performance of the latest versions of WSJT-X (version 2.6.0-rc5) and JTDX (version 2.2.159) to see how they compare. For the test session, I made a high-quality, five-minute duration, audio recording of 14.074MHz in the late afternoon of 31 December 2022. This was a busy period, but no contests were in progress, so it should be representative of typical busy weekend. I've described my measurement process here:

1. WSJT-X and JTDX are operated using their default settings

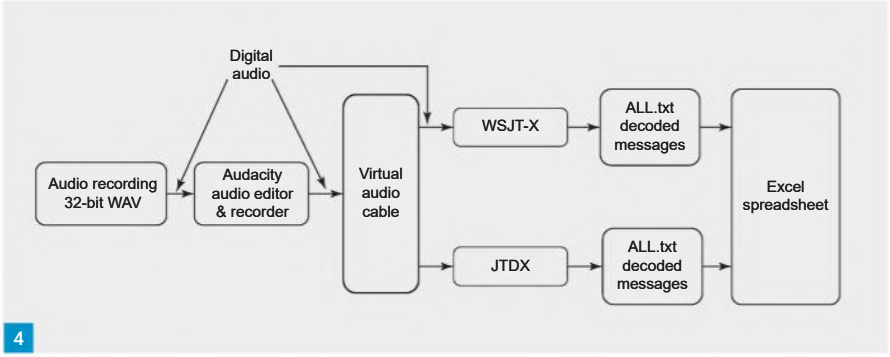
2. The ALL.txt file in both programs is cleared

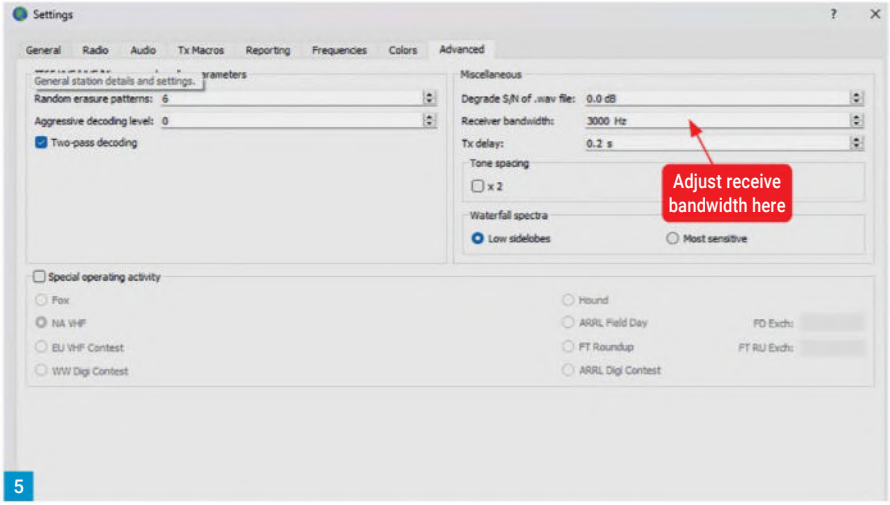
3. The recorded audio file (48ksps 32-bit) is replayed using Audacity and fed to WSJT-X and JTDX via a Virtual Audio Cable (**Eugine Muzychenko**), **Fig. 4**

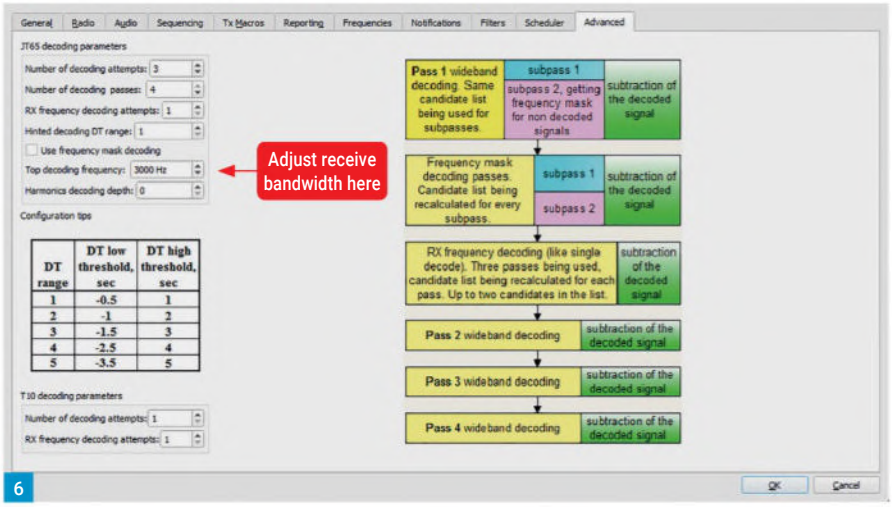
4. Time synchronisation is achieved manually by editing the audio clip and starting the audio replay at the beginning of a 15 second cycle

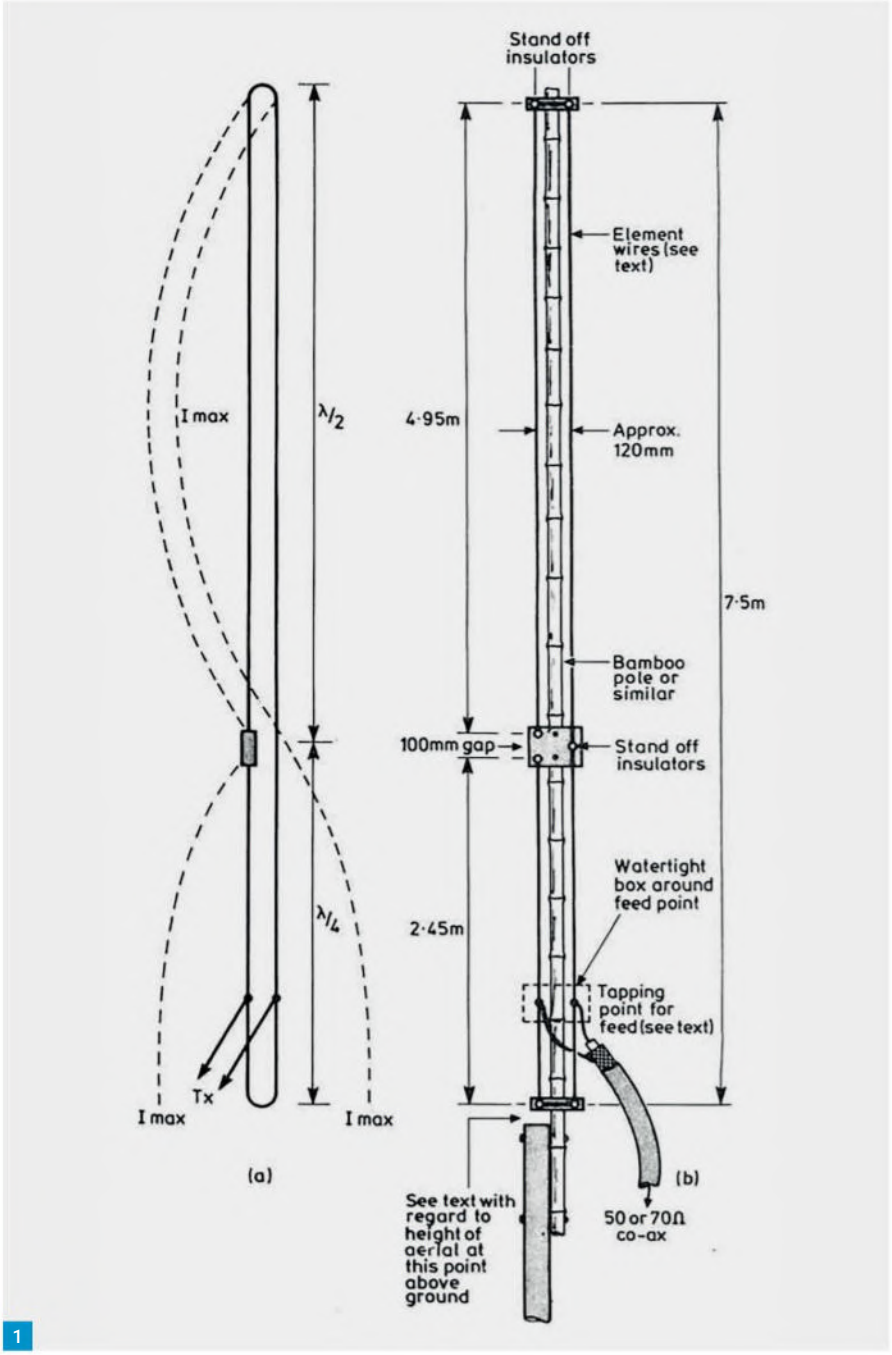
5. At the end of the test period, the ALL.txt files from JTDX and WSJT-X are imported into an Excel spreadsheet for processing.

Continued on page 23









1

Slim Jim for 28MHz

This article will interest all readers who for any reason cannot avail themselves of an outdoor aerial. The author describes many novel forms of the indoor type, some of which are not generally known.

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Since the publication of my article on the Slim Jim omni-directional aerial for 2 metres, many readers have written about its possible use for the 28MHz (10 metre) band. Indeed, quite a number have already tried it for themselves by scaling up the dimensions, and have discovered that excellent results are possible.

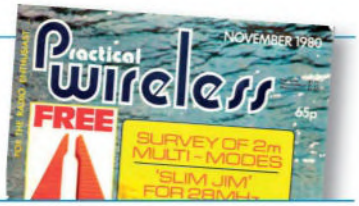
It is appreciated that a version for 10 metres cannot be constructed to exactly the same format as that for 2 metres. The general configuration is the same, however, and a suggested design is shown in **Fig. 1**. For the benefit of new readers, and as a reminder to others, Fig. 1(a) shows the electrical behaviour of the aerial. It consists simply of a half-wave folded radiator, fed at one end from a quarter-wave stub, which is used to obtain an impedance transfer from 50 or 70 ohm coaxial cable to the high impedance connection to the half-wave section of the aerial. Fig. 1(b) gives the required dimensions of the elements, which may be of heavy gauge copper wire (14 or 16 swg or multi-strand copper 'aerial' wire). Tinned or enamelled wire would be preferable.

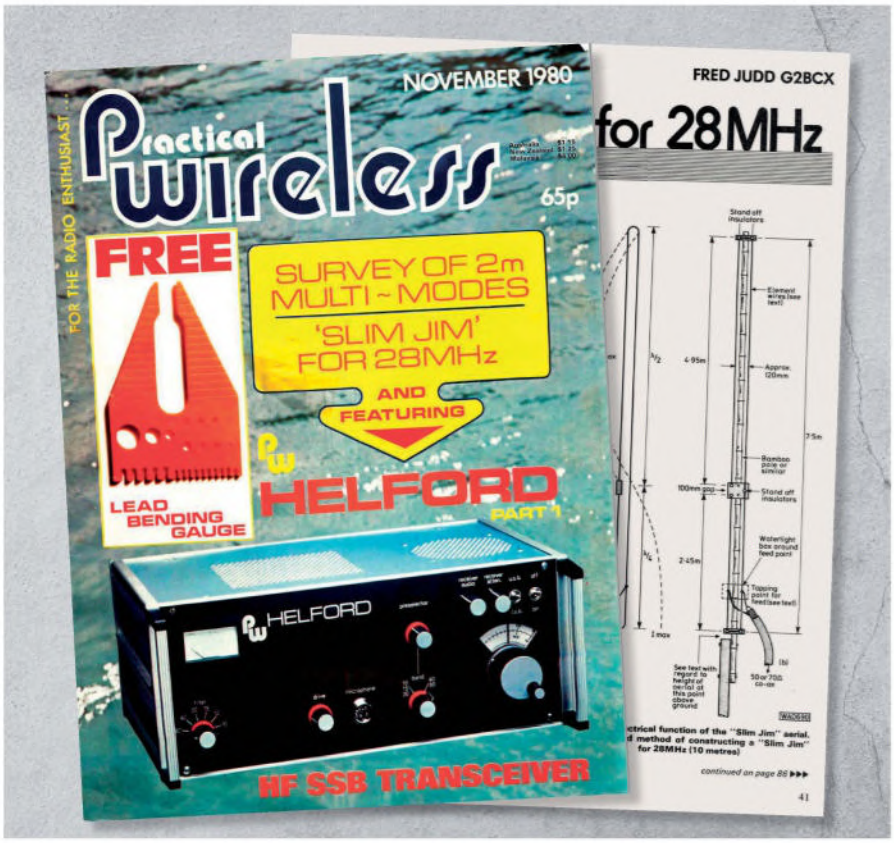
The main support could be a bamboo pole, which is quite light in weight and strong, although finding a single pole this long is not easy. It might be possible to acquire a couple of the 15ft canes used to roll carpets on and join them end-to-end. Whatever method is used to join them (wooden dowel glued down the centres, or plastic water pipe used as a sleeve, are two suggestions), it will then be necessary to stay the pole at top and centre. The stays (three at each level, spaced at approximately 120° intervals) should be either of non-conducting rope, or of wire rope broken up with 'egg' insulators. The lengths of the stay sections should be around one third of a wavelength (3.3m) and preferably not all exactly the same length.

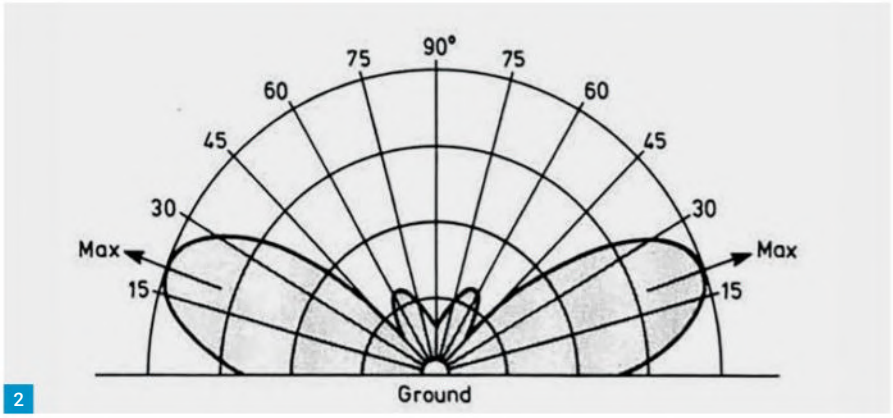
An alternative way of erecting the aerial, if you have a couple of support points at around 10m above ground level, would be to suspend the Slim Jim from a stay run between them.

Small wood spreaders fitted with miniature stand-off insulators are used to support the wire elements. The feed cable can be 50 or 70 ohms impedance, and the correct tapping points to the stub section, about 300mm up from the bottom, are found by temporarily connecting the cable with crocodile clips, and moving them up and down until minimum VSWR is obtained. This

This short article, by Fred Judd G2BCX, first appeared in the November 1980 issue of PW. A reader recommended that, given the recent improvement in conditions on the high bands, it was worth revisiting.







2

should be less than 1.5 to 1. This adjustment can be made with the bottom of the aerial a metre or so off the ground, but standing vertically of course.

In a situation where there are a lot of buildings around, the operational height should be such that the bottom of the aerial is 3 to 5 metres above ground. The theoretical optimum vertical angle of radiation of about 15° to 20°, as in Fig. 1, is obtained when the centre point of the radiating section is about a half wavelength above ground, but this applies only where the soil beneath has good conductivity and the aerial is situated in very clear surroundings. It would be worthwhile to experiment with height. Radiation is of course vertically polarised and omni-directional, but there is usually sufficient polarisation twist during long-range propagation to effect good transmission and reception to and from stations using horizontally polarised aerials.

Fig. 1: (a) Electrical function of the 'Slim Jim' aerial. (b) Suggested method of constructing a 'Slim Jim' for 28MHz (10 metres).
Fig. 2: Approximate vertical radiation pattern when the centre of the radiating section is a half wavelength above ground of good conductivity, and the aerial is situated in very clear surroundings.

One final note, make sure that the feedpoint is fully protected from rainwater. A small plastic box could be used for this, with the element wires passing right through from top to bottom. A couple of coats of paint or varnish should be applied to the support mast and element spreaders. **PW**

Continued from page 21

Performance Comparison

The stored message fields from both programs were compared to identify the total number of decodes and the number of unique decodes for each program. In this case, unique decodes represent messages that only one program decoded.

In my previous comparisons, I had simply been comparing the total number of successful decodes between the two programs. However, this time, I was taking a more detailed look at the difference in unique decodes between the two programs. Although it was a painstaking process, I think the result is a more accurate performance comparison.

During my first attempts, I found a significant difference between WSJT-X and JTDX with many more decodes from JTDX. However, the imbalance was traced to a difference in the decoder's receive bandwidth. While the WSJT-X default bandwidth is 2.5kHz, JTDX uses 2.7kHz. This is a significant handicap when the bands are busy because FT8 signals tend to expand to fill at least a 3kHz wide slot. The bandwidth can be adjusted in WSJT-X, via File – Settings – Advanced – Receiver Bandwidth, **Fig. 5**. In JTDX, it is in a similar location but titled Top decoding frequency, **Fig. 6**. For my comparisons I set both programs to 3kHz.

During the five-minute sample, WSJT-X managed 390 decoded messages, while JTDX decoded 430 messages. That's 10.2% more decodes for JTDX. I also tried the same audio sample with the Enable AP option set in WSJT-X. This evened-up the result with WSJT-X decoding 434 messages. However, that option is likely to include a higher proportion of false decodes.

The next step was to identify the number of unique messages decoded by each program. To do this, I first had to clean up the messages to remove additional characters and any trailing spaces. I then used the following Excel formula to compare the message fields and identify unique messages.

=IF(COUNTIF(JTDX!F$2:F$431,WSJTX!F2)=0, "Unique Msg", "")

This revealed that WSJT-X achieved 22 unique decodes, i.e. it received 22 messages that JTDX missed. However, JTDX managed 28 unique decodes that WSJT-X missed. Analysis of the unique decodes from both programs reveals that the majority were marginal signals, so it's not really a surprise that decoding success varied between software.

WSJT-X vs JTDX Summary

My tests have shown that matching the receive bandwidths of both programs is an important first step in any comparison. The results also show that JTDX produces approximately 10% more decodes than WSJT-X but this difference can be levelled by enabling the AP option in WSJT-X. Each program produced a good number of unique decodes. However, these were predominantly very weak stations that were probably unworkable. For those that want to investigate further or check my results, I've posted a copy of my Excel spreadsheet and the audio test file on the following link:

https://tinyurl.com/2dahwxnj

1

The Face behind the Call

Roger Dowling G3NKH invites readers to a studio engineer who has recorded the world's top artistes.

Roger Dowling G3NKH
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On 2 April 1982, Argentina invaded and occupied the Falkland Islands in the South Atlantic. The British government dispatched a naval task force to engage the Argentine Navy and Air Force before making an amphibious assault on the islands. The conflict lasted 74 days and ended with an Argentine surrender on 14 June, returning the islands to British control. It affected many of those involved in many different ways, some of which were tragic. But on a happier note, as we shall see, it was also the catalyst that finally encouraged **Alan Florence**, **Fig. 1**, to take up amateur radio and in due course become **G7CDK**.

Early interest in Sound Recording

A Londoner, now living in Cambridgeshire, Alan became very interested in sound recording as a result of joining a boys' club in his teens. There, he became intrigued by the Ferrograph tape recorder using which the owner, a keen amateur singer, would proudly play back his recordings. In due course, Alan's parents bought him his own Grundig tape recorder – and from that moment he was hooked and decided to make recording his career. While still at school he became aware of a nearby recording studio called Star Sound, which gave him the opportunity of joining the audience at recordings of such popular programmes in their day as **Hughie Green's** 'Opportunity Knocks' and **Michael Miles'** *Take your Pick*. He joined Star Sound on leaving school and it proved an ideal training ground for his future career. The company also had a film studio and stage nearby in Hampstead and Alan soon found himself putting out microphones and pushing dollies for programmes such as **Michael Bentine's** *It's a Square World*.

Tony Hancock: the 'Radio Ham'

It's perhaps a shame that Alan was not yet a licensed radio amateur as one memorable recording in 1961 was when he had the thrill of working with **Tony Hancock** and the cast on the album recording of the famous sketch, *The Radio Ham* written by **Ray Simpson** and **Alan Galton**, **Fig. 2**. Galton and Simpson later admitted that laughs were more important than strict accuracy in their scripts, which doubtless explains Hancock's memorable – if implausible – opening lines as he admires the glowing filament of his 'DF19/87B' valve: *"This is DLK London transmitting on the short wave band on 10.4 metres at a frequency of 250 megacycles per second!"*

Having cut his teeth at Star Sound, Alan moved to IBC Studios at 35 Portland Place. The company's location along the road from Broadcasting House was no coincidence: it had been set up back in 1930 as a commercial competitor to the BBC. In 1962 it was purchased from the original owners by the avuncular BBC conductor **Eric Robinson** and musician **George Clouston**. By this time IBC had become internationally famous, giving Alan the privilege of working with such famous names as **Peter Sellers**, **Billie J Kramer**, **Dickie Valentine**, the **Rolling Stones** and countless others. He particularly remembers the day his boss announced that the **Beatles** were coming in to record the soundtracks for a programme called *Around the Beatles* for Associated

2a


2


3

Fig. 1: Alan G7CDK at his QTH. Fig. 2: With 'The Radio Ham' writers Ray Galton and Alan Simpson.Fig. 2a: inset: Tony Hancock Fig. 3: 1965: Old technology at Pye Studios in 1965. Fig. 4: 1983: Falklands, an unexploded bomb from a Harrier jet. Fig. 5: 2012: With composer/record producer John Schroeder at Grange Farm Studios in 2012 (John Schroeder). Fig. 6: Flying a quadcopter under FPV rules.

Rediffusion. Alan admitted: *"When you have the biggest group in the world coming in the record, you do get a few nerves!"*

Still only 21, Alan moved to Pye Studios, just off Marble Arch, and in the following eight years developed further his reputation as a well-respected studio engineer, **Fig. 3**. There he worked with many more household names such as **Sammy Davis Jr**, the Rolling Stones, **Elton John**, **Morecambe & Wise** and dozens of others.

A Change of Career

Alan lived and worked in Spain for a few years in the 1970s before a major career move saw him return to the UK to join Independent Television News as a Sound Supervisor. It was a time of major change in news gathering technology. For years, news crews had used 16mm film cameras with sound recorded on separate synchronised recorders. However, the major drawback was the need to process the film before transmission, with all the attendant delays and costs. Both were eliminated by the introduction in the 1970s of portable electronic news gathering (ENG) cameras with integral sound recording.

Attracted by this new method of news gathering, Alan moved from the ITN news studios to become initially an ENG sound recordist and then an ENG cameraman. It was during this period that the war in the Falklands took place and Alan became a member of a 'pool crew' covering the scenes after the conclusion of hostilities early in 1983 for the BBC and ITN. *"It was an astonishing time to be there,"* Alan recalled. *"There were trenches and piles of ammunition everywhere"*, **Fig. 4**.

Alan becomes G7CDK, at Last

Alan had retained an interest in amateur radio since his schooldays when he was a regular visitor to the Science Museum in London to admire its amateur station GB2SM making contacts all over the world. In the years that followed, Alan was regularly encouraged to take out a licence by a friend, the late **Doug Burge G4ILV**, but with work pressures it remained an ambition for the future.

So why did a chance trip to the Falklands result in Alan's determination to become a licensed radio amateur?

The answer lies in the relative crudity of communications 40 years ago. On the Falklands, Alan's first thought was to ring home to confirm that all was well, but that was no straightforward matter. The communications company Cable & Wireless only had two operational satellite links. With a vast number of military personnel on the site, Alan was told that it would be eight days before he could make a satellite call back to the UK.

On day 3, Alan was surprised to receive a call from the owner of the house they were renting in Stanley who said that he had received a telephone call from a sheep farmer in the middle of the island who was anxious to speak to him. It transpired that the farmer was a licensed amateur who had just been worked by G4ILV who was asking if he knew anything of the TV crew there.

"In fact, the whole island knew all about the TV crew and where we were staying," said Alan. *"I was able to get the farmer to contact Doug and ask him to assure my wife that we had all arrived safely."*

Alan was so impressed by this demonstration of amateur radio in action that he resolved to get his licence without further delay. As it happened, a colleague at ITN was also keen to get a licence so they signed up for a twelve-week course at Southall College and in due course Alan became the proud owner of class B licence G7CDK. *"In*


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terms of callsigns, I was luckier than my colleague," said Alan. *"He was allocated G7BUM, which he found so embarrassing that I don't think he ever used it on air!"*

Alan threw himself into the hobby with enthusiasm. Back in the early 1990s he enjoyed using the Oscar 13 satellite, which covered half the earth. *"I used to hold Oscar 13 QSOs with a local station about 12 miles away using a multi-element Yagi for the uplink,"* Alan recalled. *"It was fun to think that our signals were travelling some 50,000 miles."* Alan's current gear includes an Optima AMSM transceiver, an RM KL400 linear, an Alinco DX-R8 receiver and a range of other ancillaries.

Other Interests

Since retiring in 2002 Alan has continued to undertake occasional freelance recording work, such as an album produced at Grange Farm Studios in Cambridgeshire for the re-launch of the 1970s funk group Cymande in 2012, **Fig. 5**. But Alan has always kept time for other hobbies, including amateur radio. Back in his days at Pye Studios he took out a pilot's licence, following training at London School of Flying at Elstree where he also met his wife **Lynne**. On one occasion in 1970 his flying proficiency came to his company's rescue. This was the year of the famous Isle of Wight Festival – the forerunner of today's Glastonbury and Woodstock – for which an American crew hired the Pye mobile unit to record the event for CBS. In those pre-Dolby days, the crew decided to record at 30ips to maximise sound quality and there was panic at Pye Studios when they received a message that the crew were about to run out of tape. Sensing an opportunity,


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Alan immediately offered to fly some tapes over and save the day. *"It was a great outing, and at the company's expense!"* he recalls.

Alan has retained an interest in flying and in model aircraft in particular. He has also been exploring the potential of drones with FPV (First Person View) technology, using an on-board forward-looking video camera to transmit live pictures to the operator's headset, giving a remarkably accurate simulation of the flying experience as viewed from the cockpit, **Fig. 6**.


6

A Full Life

Alan Florence has had a long and successful career in the media industry and continues to have a busy life in retirement. Does he have any regrets?

"Only one," he told me. *"We were so busy working that I never seemed to find time to take photographs with all the top artistes and groups coming into the studios. If only I had done so – what a great album it would be!"* **PW**

Tim Kirby GW4VXE
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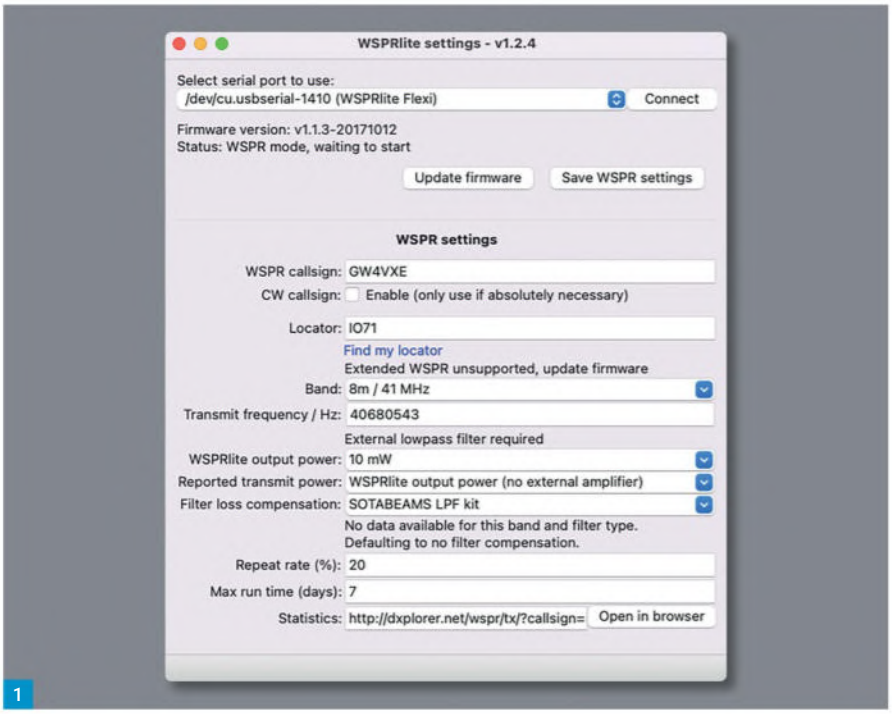

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Taking a look at the W0CHP-PiStar-Dashboard

Tim Kirby GW4VXE has another full column, including not only the W0CHP-PiStar-Dashboard but the latest news about the 40MHz (8m) allocation.

If you are a digital voice modes enthusiast, then the chances are high that you are running an MMDVM-based hotspot and if so, then it's very likely that you will be using the PiStar software to run it. Although the PiStar software is excellent and stable, there haven't been so many new releases in recent months – of course, that's probably why it is stable!

However, I recently became aware of an alternative to the PiStar software. It's a 'fork' of the PiStar software, developed by **Chip Cuccio W0CHP**. As Chip says on his website, *"This is my very highly modified and customized fork of MW0MWZ's Pi-Star software, and I call it 'W0CHP-PiStar-Dash'. There are so many large changes, divergences and new features, it merited my own fork/version"*.

You can either install it over the top of your existing Pi-Star installation – instructions for doing so are at Chip's website (URL below) or there's an image which runs on a Raspberry Pi, which you can flash to an SD-card. I opted to update my existing installation. The process is well documented but be prepared for it to take a little while, especially, if like me, you run it on an oldish Raspberry Pi 3, so just leave it to do its thing.

https://w0chp.net/w0chp-pistar-dash

Once the upgrade is complete, your first impression will be of a different looking dashboard. There's a lot more information available to you at first glance, particularly if you enable the Caller Details lookup. This means you will get name and location information for the people that your hotspot hears, which is quite nice. You can, if you wish, enable the Live Caller feature, which provides a large screen with the name and location information for the person that you are listening to, together with details about the Talkgroup that they are on. This might work well if you have several monitors and lots of screen space to play with. I ended up running two instances of the dashboard on separate computers – one to control things and one running the Live Caller screen, so there's a nice big display of who's active. Handy, if you've turned the volume down to concentrate on something, perhaps.

The W0CHP-Dashboard also updates to the latest versions of the MMDVM Host program, which means that some features that are not currently available on the original Pi-Star software, such as the M17 Gateway, can be used. Obviously, in this case, you'll need a radio capable of receiving and transmitting on M17, which you may not have – yet!

Updates to the dashboard are fairly frequent and a message displays on the dashboard that an update is available. You can either click on that to run the update manually, or by default, the system will check for availability of an update overnight and if one is present, run it automatically for you. I did discover that if you run a manual update, it's best to go into one of the configuration screens and hit 'Update Details', without making any changes. This doesn't seem to be necessary with the automatic overnight updates.

In general, Chip has enhanced many of the features of the original Pi-Star software to provide a little more functionality. The DMR Gateway feature, for example, has been made a little simpler to use, allowing you to connect to several DMR networks at the same time, eg Phoenix, Brandmeister and TGIF networks. It's not that you can't do the same thing on the original Pi-Star software – you can, but it's a little easier on the W0CHP variant.

I also enjoyed the way that the 'Expert' editor screens had been enhanced – just to make things a little simpler.

Perhaps because the software is a little more fully featured, I found that it was advantageous to reboot the Raspberry Pi overnight to free up memory. I used the crontab command to do this. You can easily Google 'reboot raspberry pi automatically' to see how to do this, if you need to do so.

Chip has clearly worked very hard to produce an excellent 'fork' of some already great software. He asks people not to make 'feature requests', but if you feel you'd like to see something in the software, that you roll up your sleeves and have a go at making it work yourself. A number of people have already done this!

In the unlikely event that you don't get on with the W0CHP version of the dashboard, then it is very easy to 'roll back' to the vanilla Pi-Star code and this is well documented on the W0CHP website.

If you are running a Pi-Star system and enjoy playing around with software, as I do, then I really recommend this to you, I think you will enjoy it. There's a Facebook group W0CHP-PiStar-Dash, which you may find useful for finding out more about the software.

AWSPRlite on 40MHz?

Readers who have been with us for a little while may remember that we have looked at the SOTAbeams WSPRlite device. This is a low power device that can transmit up to 200mW of WSPR. The later WSPRlite Flexi devices covered up to 50MHz. These were mostly marketed as antenna testing tools, but I enjoyed them as a simple WSPR beacon, which you could run and keep an eye on propagation. When the first WSPRlite Classic devices came out, I took

advantage of the fact that the source code for the WSPRlite-Config program was made open source and available on Github (link below) and I made some changes to allow the WSPRlite to transmit on both 472kHz and 5MHz. As it was, SOTAbeams later changed the WSPRlite-Config software, **Fig. 1**, so it would include these bands by default.

https://tinyurl.com/y5knnb9f

Roger Lapthorn G3XBM had determined from **OFCOM** that there was no impediment to using the Industrial, Scientific and Medical (ISM) allocation around 40MHz to radiate a 10mW eirp signal. You can read the OFCOM document about the ISM bands here:

https://tinyurl.com/43wu73nn

I wondered whether I could make the WSPRLite Flexi transmit WSPR on 40MHz. I was pretty sure I could. The first task, which was actually the most tricky, was setting up a development environment on my computer such that I could compile the existing source code, downloaded from Github. I did this under OS X on my Mac and it took a bit of fiddling to get all the appropriate libraries installed. It might well be easier on a Raspberry Pi or other Linux-based device, I just didn't have one readily available. As far as Windows is concerned, I'm not sure. I remember trying to get the code compiled in Windows before and struggling with it, but that may have just been incompetence on my part!

Once I had the libraries correctly installed, I was able to compile the existing code into a program that would successfully talk to my WSPRlite device. Next, I set about making the changes required to make the WSPRlite work on 40MHz (and in particular, on 40.680MHz). The changes are fairly simple and if anyone is interested, I'm happy to share them via email. If there's sufficient interest, I can put the changes on Github. To my surprise, the changes worked straightaway and I 'flashed' the 40MHz details into the WSPRlite. It worked and I was able to receive the signal across the shack.

In the WSPRlite config program, you can drop the power down to 10mW. Remember that the ISM spec only allows you 10mW eirp, so you may need to attenuate the signal level a little, depending on the antenna that you use. SOTAbeams also advise the use of an external filter on the output.

I've yet to make up a 40MHz dipole, but I plan to try this out in the Es season and see how far 10mW of 40MHz will go – it will be intriguing.

Unfortunately, the SOTAbeams website shows the WSPRlite devices as being out of stock and there's no indication if they will return, otherwise this could be an excellent way of staying within OFCOM rules but being able to make some limited experiments on a very interesting part of the RF spectrum.

Worked All States by Satellite

The Greencube satellite (IO-117) has enabled two UK satellite enthusiasts to complete their Worked All States (WAS) awards – all contacts, of course, being made by satellite. Many congratulations to

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Fig. 1: The WSPRlite-Config program, compiled to cover 40MHz. Fig. 2: Kevin ZB2GI received ZS6WAB using his FT-450 on 40.675MHz. Fig. 3: SSTV via the moon! PI9CAM sent this image, as received by Rob M0DTS. Fig. 4: Endaf N6UTC operating on AO-91 from the DM15/DM16 grid line.

Peter Goodhall 2M0SQL and to **Peter Green G0ABI** for earning these awards. Up until a couple of months ago, this prospect would have seemed very remote. Who's next?

The 8m Band

Kevin Hewitt ZB2GI received ZS6WAB on 40.675MHz on 26 December at 1246UTC, **Fig. 2**. Kev was using a homemade 10m Moxon. He monitored 40.662 and 40.680MHz for FT8, but heard no activity.

Steve Telenius Lowe PJ4DX reports that **Martin PJ4MM** received a special permit to allow him to operate on 40MHz between 40.66 and 40.7MHz at a maximum of 50W, on all modes. Martin has a 4-element Yagi and has already made a great start on the band. On Christmas Day, he worked **Paul Farley G7PUV** (JO00) who operates as G9PUV on 8m with his Innovation and Trials licence, as well as WM2XAN (EN74). On 27 December, Martin worked DL5WP (JO43), S50B (JN65), G9PUV and WM2XAN. Next day on the 28th, Martin worked ZS6WAB (KG46) on both FT8 and SSB. As well as these QSOs, Martin has been heard widely by stations such as FG8OJ, DK8NE, NL8992, EA8/DF4UE, VE1PLZ, KA9CFD, PJ4RF, VE3MMQ and WB0DBQ.

Roger G3XBM (Cambridge) reports that his 2.5W to a low dipole made it to the USA where he was spotted by two stations and over the Winter Es season, he has been spotted by three European stations. Roger says that he is still to reapply for his Innovation and Trials licence, which expires in April.

The 6m Band

Steve PJ4DX reports, "*the only stations worked by PJ4DX on 6m during the last month were ZL3s JT, RJ, NW and RC, all in the Christchurch area on the east coast of the South Island. This opening took place on Christmas Eve between about 2150 and 2210UTC, after which the band went 'dead' again*".

Roger Greengrass EI8KN (Co Waterford) worked F8ZW (JN38) on meteor scatter on 3 January during the Quadrantids meteor shower.

Here at **GW4VXE** (Goodwick) there was an intriguing series of Es openings in the evenings from 8 to 12 January, when I worked S5, I, SM, LA, EA, CT and F. The timing of the openings ranged from as early as 1745 to as late as 2100UTC.

The 4m Band

Jon Stow G4MCU wonders whether it may be possible for transequatorial QSOs to be made from the UK to South Africa and has been told that the geometry may be wrong to support such contacts. While that may be true, propagation fortunately seems to allow us a little wiggle room. While a 'classic' TEP path might not work from the UK to South Africa, it may be that a compound Sporadic E plus TEP might work. I definitely wouldn't rule it out and hopefully there will be sufficient interest to test the paths from Europe to Africa on 70MHz.

Mike Webb GD6ICR is looking for information on transatlantic 4m activity. Crossband contacts have been made to Canada in the past. It will be interesting to see what happens over the next few months.

Exciting news from Bonaire, via Steve PJ4DX, is that Martin PJ4MM also has a permit to use 70MHz at a maximum of 100W on all modes. Martin uses an 8-element LFA Yagi beamed at Europe. This is going to make the Es season very interesting indeed!

Another new country on 70MHz is Switzerland. During the Quadrantids meteor shower, Roger EI8KN heard a CQ from **Andre HB9HLM** (JN36) at 0944UTC on MSK144 and started to call. No further reflections were heard for 41 minutes and Roger was just about to give up, but there was a period of reflections and the QSO was completed. Roger thinks this is a 70MHz first from Eire to Switzerland. Roger says that HB9HLM provided a number of firsts to European operators during the Quadrantids shower. Roger also worked S52OR (JN76) by meteor scatter during the same shower.

The 2m Band

Jon G4MCU says that the tropo in October and November mostly missed him. On 13 November, Jon worked OZ6TY (JO55) and SM7GVF (JO77)

on SSB but there were no other Scandinavians. Jon says he belongs to a Facebook group that encourages voice and CW activity: **https://tinyurl.com/ysmk86fp**

It was great to hear from Mike GD6ICR (Peel). Mike worked 12 new squares and three new countries during the December Geminids meteor shower. The best distance was OH4MS (KP24) at just under 2000km. Most contacts were on MSK144, although Mike worked some on FT8, which is good going! Mike says he had regular reports from SWL **Anthonie NL8992**, which was very interesting. Some of the highlights of Mike's log from the Geminids are S52OR (JN76), DK2PH (JO41), DL1OBF (JO42), DL8BDU (JO43), DL5WP (JO43), DJ9YE (JO43), OZ2OE (JO45), OZ5KM (JO45VX), OZ1JXY (JO46), DL0HEL (JO50), DM2BHG (JO51), OZ8ZS (JO55), OZ1BNN (JO55), OZ2TG (JO65) and SM4KYN (JO69).

Kevin ZB2GI had planned to operate during the Geminids meteor shower from the top of the Rock during December, but unfortunately, it rained all week. Kev did make it to the top of the Rock on 27 December but unfortunately received no replies to his FT8, SSB and FM CQ calls.

Jef Van Raepenbusch ON8NT worked G0LTG (IO81) on SSB during the UK Activity Contest on 6 December. During the FT8 Activity Session on 7 December, Jef worked M0DSR (IO82) and G4EII (IO83).

Roger G3XBM takes part in the UK Activity Contest sessions using 10W SSB to his Big Wheel antenna. He feels that there are fewer SSB stations active compared to a couple of years ago but there are more on FT8.

Roger EI8KN worked F5DYD (JN03) during the Quadrantids.

Highlights of the 2m FT8 log here at GW4VXE include F5APQ (JO00), F4FET (JO00) and EI9JF (IO63) along with a good number of UK stations. During the Geminids meteor shower, I worked DL1SUZ (JO53), CT1HIX (IN52) and CT7ABA (IN60). Although I heard plenty during the Quadrantids, I missed the peak and there weren't any periods of sustained reflections to make some quick QSOs.

The 70cm Band

Jon G4MCU worked OZ6TY (O55) and SM7GVF (JO77) on SSB on 13 November.

Kev ZB2GI continues his interesting activity working maritime mobile stations through the ZB2BU repeater. He worked 4S7SL/MM on the *MV Nordloire* at a distance of 90 nautical miles from Gibraltar, off the coast of Africa, as well as working EA4/G4GEO on dry land in Malaga. Both stations called into the repeater using a handheld radio with the stock antenna.

Jef ON8NT worked G4CLA (IO92) and M0IEP (IO91) during the UK FT8 Activity Session on 14 December.

Roger G3XBM uses his 2m Big Wheel antenna on the band and heard many stations in the Netherlands and Eire during the FT8 Activity period and feels this must be some sort of troposcatter as the signals are always there.

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Phil Oakley G0BVD (Great Torrington) had a new Yaesu FTM-400XDE for Christmas and has been busy programming it up. Phil's looking forward to the new GB3ND, which will be Fusion capable from North Devon.

The 23cm Band

On 30 December, PI9CAM, based at the 25m dish at Dwingeloo in the Netherlands, carried out some SSTV tests via moonbounce! The team at PI9CAM used 100W. On Twitter, **Rob Swinbank M0DTS** (North Yorkshire) posted a video of the signal being received and the SSTV picture building up. It's incredible to watch (see also **Fig. 3**): **https://shorturl.at/ajGN2**

Satellites

Jef ON8NT continues using FT4 on the satellites and worked EB3FWC (JN11) and EA1GKZ (IN70) through FO-29 along with EB4ADC through FO-118. Jef also monitored two schools contacts from the International Space Station on 8 and 10 December.

Simon Evans G6AHX (Twyning) reports, *"Recently I have had my RF interests pulled back to FM broadcast DX and low symbol rate signals on Broadcast Satellites, eg the feeds to Irish stations on the 27.5W satellite. I have been using a program from the Amsat DL website:* **https://tinyurl.com/2ydnrk74**

"At the moment I use a laptop with my RTL-SDR and his latest version of his prog 2.1.1. I got into trouble trying to lock DVB-S signals and the creator immediately replied to me with a video of how to operate it in DVB-S mode. It does DVB-S2 rather better because the QO100 DATV group mostly use DVB-S2".

Good to hear, as always from **Patrick Stoddard** WD9EWK (Phoenix) who writes, *"In mid-December, I drove over to California and spent three days operating from five grids in central and southern California (DM13, DM14, DM15, DM16, DM24). Much of the weekend was spent working satellite passes with **Endaf N6UTC/MW1BQO**. I started my operating on 16 December from a location near Palm Springs in grid DM13. I worked a few passes from there, including an AO-27 pass where I made the first of three D-STAR QSOs via AO-27 with N6UTC during the weekend.*

"On 17 and 18 December, N6UTC and I first visited the DM15/DM16 grid line on the edge of the Mojave Desert north of Los Angeles [**Fig. 4**]. *We visited this spot in December 2021, and N6UTC had been up there one other time before that. For this trip, N6UTC worked most of the passes. I worked some, including an AO-27 pass where N6UTC and I made another D-STAR contact via AO-27, while both of us had stations on the DM15/DM16 grid line.*

"After DM15/DM16, we went to the DM14/DM15 line near the town of Boron, next to the large Edwards Air Force Base complex north of Los Angeles. Again, we both worked a few passes from this area, including another D-STAR contact via AO-27. After this stop, we split up and headed back to our homes.

"On my way home, I made a couple of stops to work an ISS repeater pass near the I-40 freeway on the eastern edge of grid DM14, followed a couple of hours later by an FO-118 (CAS-5A) FM pass near the Colorado River in grid DM24. I drove over 1100 miles during this three-day weekend in California, and await the issuance of a new satellite VUCC award covering my operating in and around Los Angeles over many years".

At GW4VXE, I've caught a couple of low Atlantic passes of AO-91 and worked VA3VGR (FN37), AA1XP (FN31), N1IPA (FN53), ND9M/MM (IN34), VE1CWJ (FN85) and N2FYA (FN31).

That's all for this month. See you next time. Thanks to everyone for their interesting contributions. **PW**

Read more radio news and reviews at www.radioenthusiast.co.uk/news

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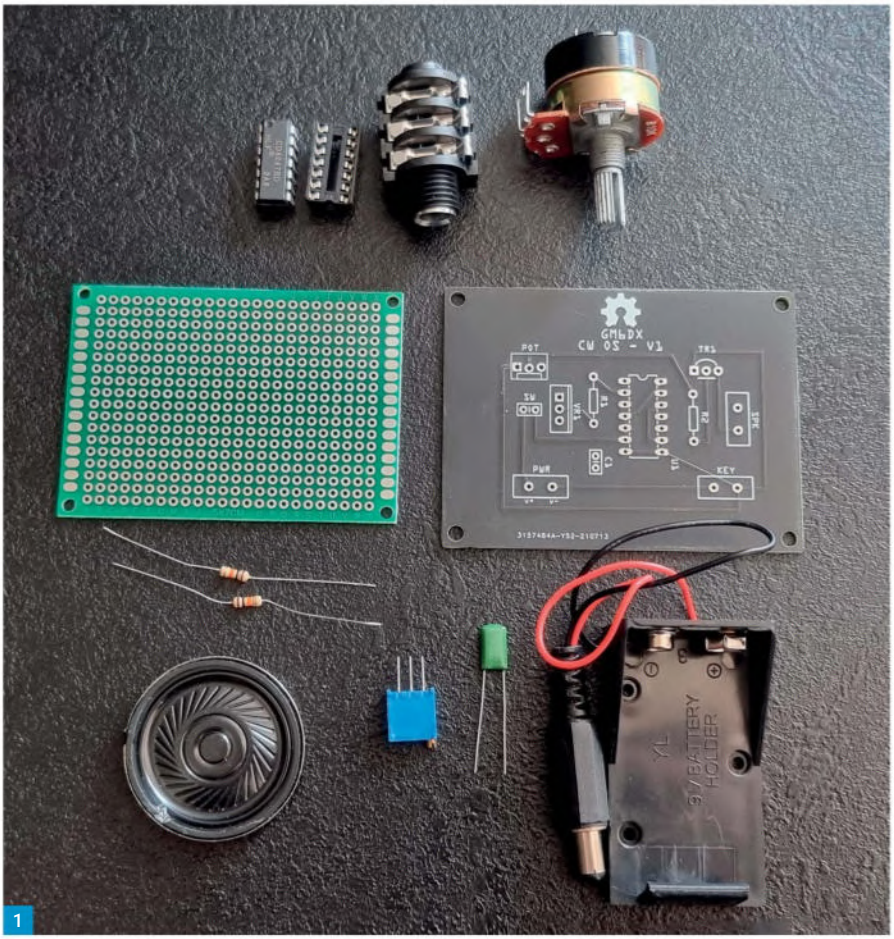

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Let's Get Practical

Billy McFarland GM6DX has an easy-to-build project to introduce beginners to construction.

For many newly licensed persons who have come into the hobby the chances of having been afforded the opportunity of hands-on practical exercises will be slim to none. One of the simplest methods to address this is to complete or construct a simple amateur radio project.

A traditional project, still constructed by many today, is a Morse code oscillator. This type of project might seem dated but it offers a few important learning points to the constructor. The first thing is the ability to see and use a variety of components that they may never have seen before and have only read about. The second is that it allows them to actually hear the product of their work. I have found that if people can see visually or hear the finished product of their work, they are more likely to continue learning and constructing. Finally, it offers the ability to practice Morse code without the need of a transceiver. Yes, straight keys are not as common as they once were due to the introduction of keyers. However, it offers the ability to understand the principle of Morse code, including the length of dots and dashes, as well as an appreciation of what many operators used to do regularly, some of which was at record high speeds.

With all this in mind let's get practical and build a simple but effective Morse code oscillator.

First you will need a few components listed as follows:

- 2N2222 Transistor
- CD4047 IC
- 2 x 10kΩ (1/4 watt) resistors
- 14 pin dip socket
- 1MΩ trimmer resistor (3296 1/2W)
- B10K Linear Potentiometer with ON-OFF Switch
- 1nF capacitor (Low Voltage Film Capacitor 102J2A)
- ¼ inch mono jack socket
- 8Ω 0.2W speaker
- 9V battery source
- Some wire
- Prototype board

These are the basic components, **Fig. 1**, to get it working. If you are wanting to power it from a wall plug, then other adapters will be needed. Likewise, a plastic enclosure will also be needed to house all the parts. First you will need to get your prototype board or download my PCB. Gerber file from here: **https://tinyurl.com/2d9ednnb**

As I have discussed in a previous *PW* article using the Gerber file type to create a few PCB orders online is a very efficient way to construct projects. With your prototype board in hand now look at **Fig. 2**. This is a sketch of the complete circuit. You will note that the speaker, potentiometer, 9V battery connection and Morse key jack are not physically installed on the prototype board. These components are connected with wires to the board.

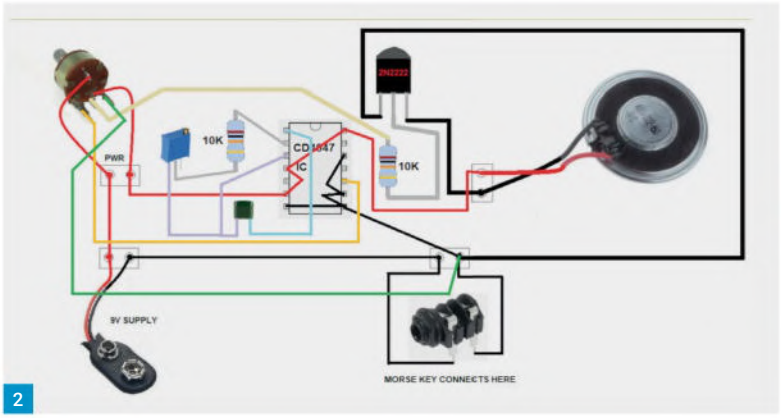
Making the Circuit

Take the prototype board and fit the IC (14 pin) socket and solder it onto the board. The reason that we use a socket is that it prevents us from melting the actual IC with excess heat from the soldering iron. Thereafter start to place the remaining components onto the board as shown in **Fig. 3**. By the end you should have the IC socket, green capacitor, blue trimmer resistor, black transistor and the two fixed resistors installed on the board. The finished positions of these components are seen in **Fig. 4**.

To get the circuit working we need to add a few more components and connect them together electrically by using short pieces of electrical (insulated) wire. It is helpful if you have various colours. An old CAT cable would do for the wire connections as there are various colours inside. If you find the sketch in Fig. 1 hard to follow for the actual electrical connections, then use **Fig. 5.** This shows the PCB board design stage and you can follow the yellow and orange connections between each component easily. Start by fitting the external components onto the board such as battery source, speaker and on/off volume control as seen in **Fig. 6**. The potentiometer has two connections on the back. These connections provide the +V switch to the circuit. The remaining three connections of the potentiometer control the volume of the CW tone. Once these external components are connected to the board then add the short wire jumpers to create the electrical connection between each component. Follow one connection line at a time and ensure they are soldered together at each point on the underside of the board. Once all the connection points are connected together fit the IC into the socket and you will then have a finished product as seen in **Fig. 7**.

Testing

Fit a 9V battery into the holder or supply the circuit with a 9V source if you have used an alternative connection such as DC jack from a wall plug. Connect a straight Morse key into the ¼ inch mono socket. If you don't have a key for testing, solder two wires to the ¼ mono jack and when these wires



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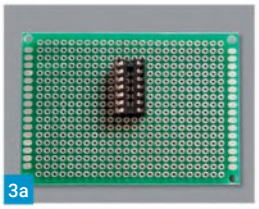
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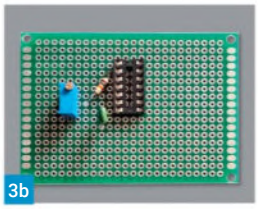
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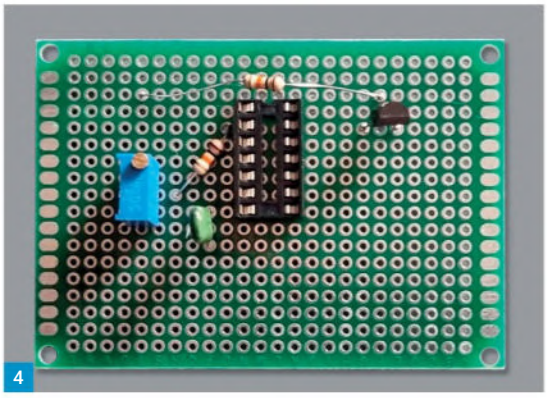
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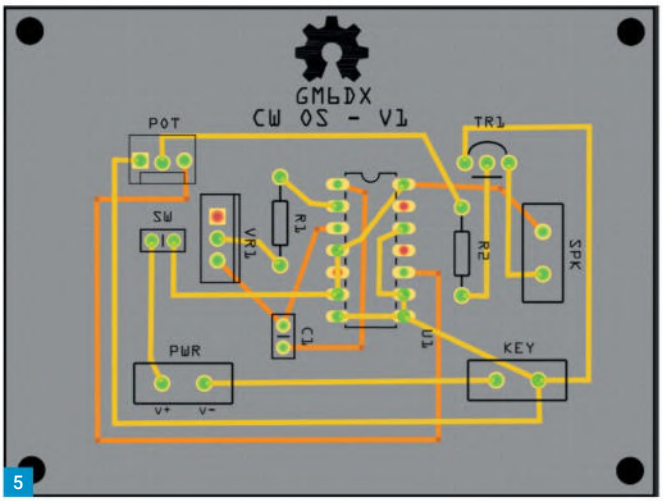

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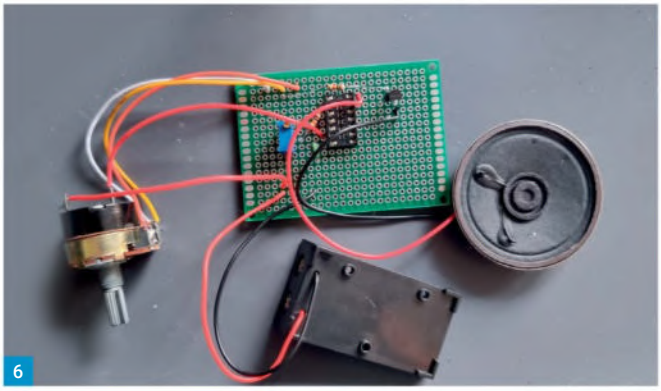
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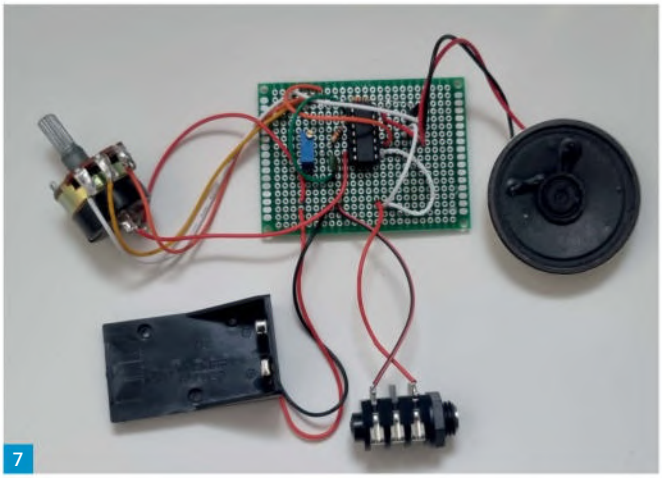
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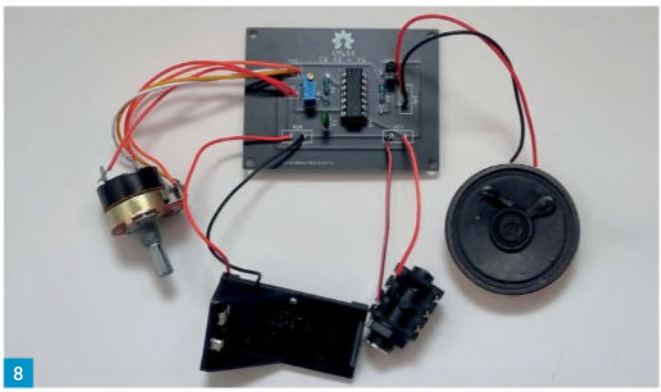
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Fig. 1: The parts needed for the project. Fig. 2: The circuit of the keyer. Fig. 3: Starting to place the components. Fig. 4: All components in place. Fig. 5: The layout when using a PCB. Fig. 6: The external components fitted: potentiometer, speaker and battery source. Fig. 7: The finished product, including IC and headphones jack. Fig. 8: The author's version on PCB.

touch they will complete the circuit, thereby making the tone. Turn the potentiometer, you will hear a click that is the switch engaging into the ON position. Continuing to turn will increase the volume level of the speakers. Now press the Morse key and you will hear a tone (hopefully). The tone pitch will be a very personal thing as people will hear tones differently. To set the oscillator tone pitch take a small slotted screwdriver (not a kitchen knife) and turn the brass screw on the trimmer resistor. This will vary the pitch of the CW tone. This completes the electric circuit. To finish it off place some hot glue across the connections and install it into your own plastic enclosure. **Fig. 8** shows the completed circuit using my PCB design. If you are unsure about using the prototype board, then get a PCB made up as it will be a simple case of soldering a few components and a few wires. The layout is the same on both boards no matter which option you choose.

If you are new to the hobby or to construction, then give this simple project a go. If you have any questions or are looking for a few parts to make this project then send me an email, **gm6dx@outlook.com** as I am happy to help and usually have parts about. **PW**

The essential guide to radio in the UK and Ireland

David Harris examines and recommends two essential, budget priced frequency guides.

David Harris
mydogisfinn@gmail.com

Radio Listener's Guide 2023 (RLG) is the 34th annual edition of this essential guide to broadcasting in the UK and Ireland. The book begins with a very useful summary of radio related news stories from 2022, many of which are about the trials and tribulations of the BBC as it struggles to maintain services against a background of financial cuts. There is also the welcome news that FM radio should be with us until at least 2030. MW is very definitely on the decline with BBC Radio 5 Live likely to end its MW services by 2027. There is also a question mark over the future of BBC Radio 4 transmissions on longwave 198kHz. Many European countries have already closed their MW and LW transmitters.

After the news we get a six-page guide to choosing a new domestic FM/DAB radio. There are also features on new technology, including Bluetooth, music streaming, multi-room sound systems, voice controls and smart speakers. Radio apps such as BBC Sounds, Spotify and Radio Player are reviewed. There is a detailed listing, with star ratings, of over 100 radios, with their features, currently available in the UK, which have been reviewed by *RLG* over the last few years. The FM/DAB radios range in price from £50 - £2,000+. The number of new domestic FM/DAB radios being launched each year is declining but *RLG* publishes detailed reviews of 18 new models, including some Bluetooth speakers. If you are looking at buying an FM/DAB radio, then this book is well worth the £10 as it can stop you making an expensive mistake in purchasing an underperforming radio.

The bulk of the book is taken up with very detailed maps and listings of all DAB, FM and MW stations in the UK together with transmitter locations and effective radiated power. Every DAB multiplex is listed with current stations. There are coverage maps for the BBC stations 1, 2, 3, 4 and 5 together with Absolute Radio, Classic FM and Talksport. There is a full listing of all commercial and community radio stations together with low power hospital, military and student stations. There is a four-page guide to all radios station in the Republic of Ireland. The FM frequency listing is the most comprehensive found in any publication.

All platforms are covered with a guide to radio stations found on Freeview, Sky and Freesat television. The book has contact details for major broadcasters, equipment suppliers and regulatory bodies. If you are at all interested in radio in the UK, then this is the guide to have in your shack or next to your radio. The editor also publishes two other very useful guides:

Radio Listener's Guide 2023
Edited and published by Clive Woodyear, 2022
£7 (+£3 postage) 162 pp. Pbk. ISBN 9781871611343
www.radioguide.co.uk

Global Radio Guide (19th ed.) Winter 2022-23.
Gayle van Horn. Teak Publishing, USA. 2022.
472 pp. (in pdf format)
E-book only. £7.46 (via Amazon.co.uk)
ASIN: BOBNSYN8PK
www.teakpublishing.com

Television Viewer's Guide 2023 and *Mobile Phone Users Guide 2023*. These books along with *RLG* are available from the publisher's website for £7 + £3 postage.

Something for everyone in Global Radio Guide

If you are not familiar with this publication, then you are in for a treat for it is a veritable encyclopaedia of all things radio. This is so much more than just another frequency guide. *Global Radio Guide (GRG)* had its origins in the US radio magazine *Monitoring Times* (1982 -2013) When *MT* closed **Gayle**, who had been a contributor, started up her own bi-annual radio guide. For the price of two or three cups of coffee you get almost 500 pages (pdf format) of radio news, receiver reviews, articles and a unique hour-by-hour frequency guide. It is only available as an E-book but can be viewed on a smartphone, Kindle, iPad or PC.

GRG 22/23 begins with a perceptive essay on the Taiwan Straits, the body of water that separates Taiwan from mainland China. Many observers feel that this area is a potential flashpoint for global conflict, especially if China fulfils its promise to reunite Taiwan with the mainland through military force. Gayle looks at the shortwave services of the state-run Radio Taiwan International and the American sponsored Sound of Hope station, which broadcasts to mainland China from Taiwan and other locations. She also discusses the various mainland Chinese radio stations that target Taiwan with Beijing's version of Chinese and world affairs. There are further articles on listening to shortwave radio stations from the Far East and the history of 2CM, the first radio station in Australia.

There is a short but useful article on what to look for when choosing an AM radio for medium wave DXing. Of great interest to many readers will be *GRG's* unique 25-page guide to Software Defined Radios (SDR), related SDR software and technology. With such devices costing between £40 - £8000+ one needs to carefully research the market. *GRG* lists over 15 manufacturers of SDRs with their specifications together with over 40 SDR software programs. This section alone is worth the price of the book.

The book is primarily aimed at DXers who enjoy monitoring the SW bands. There is an up-to-date chapter on the Tropical bands (60, 90 and 120 metres) together with a list of active frequencies. Something you won't find in many radio books is information about the 'Action Bands'. These are the areas of the radio spectrum reserved for maritime, aeronautical and military communications. There is much useful information on how to decode the data modes, which are now the main channels for maritime and military communications. There is also information on monitoring voice traffic.

The bulk of *GRG* is taken up with a 300-page hour-by-hour listening guide, which lists all SW (and a few MW) stations that you can hear, in any language, at any time of the day or night. *GRG* is published twice a year (May and December). It is so full of interest and so reasonably priced I really cannot recommend it highly enough. **PW**

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New Titles

Work the World with D-Star

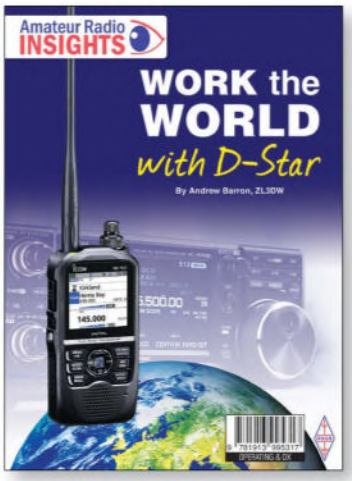
By Andrew Barron, ZL3DW

D-Star (Digital Smart Technology for Amateur Radio) is an established digital voice and data protocol, but for many the workings, and being able to take advantage of all it offers remains a mystery.

*Work the World with **D-Star*** is a practical guide explaining the steps to follow to make your D-Star radio work through your local repeater or hotspot. There are terms to discover, including dashboards, reflectors, gateways, hotspots, and Echo. Also, acronyms like AMBE+2, DR, DV, CS, and MMDVM.

Operating a D-Star radio may be a little more difficult than operating an FM radio, but *Work the World with **D-Star*** guides you, so, that with a D-Star radio and a repeater or a hotspot, you will soon be able to 'work' amateur radio stations all over the world.

Size 174x240mm, 176 Pages, ISBN: 9781 9139 9531 7, Non Members: £15.99



Work the World with System Fusion

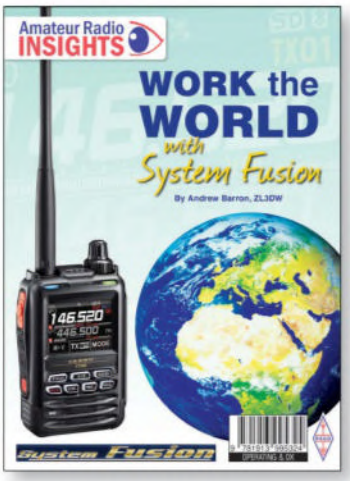
By Andrew Barron, ZL3DW

System Fusion is one of the three popular digital voice modes alongside DMR and D-Star. Andrew Barron, ZL3DW brings his no-nonsense approach to this Yaesu specific mode and gives you the usual 'what you need to know and how to do it' guide to this impressive mode.

System Fusion and Wires-X are exclusive to Yaesu. Although you have to use a Yaesu radio to access Yaesu Wires-X 'rooms' anyone can access thousands of YSF and FCS reflectors using a hotspot, a DV dongle, or a non-Yaesu repeater.

If you have a compatible Yaesu hand-held transceiver or a repeater in your area offers System Fusion then *Work the World with System Fusion* provides just what you need to make use of this mode.

Size 174x240mm, 144 Pages, ISBN: 9781 9139 9532 4, Non Members: £15.99



Work the World with DMR

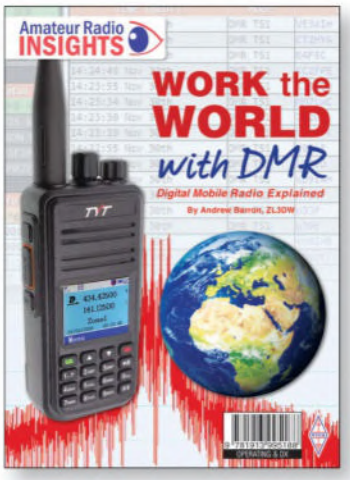
By Andrew Barron, ZL3DW

Getting started in Digital Mobile Radio (DMR) can be tricky. This book provides the information you need to get started with this exciting digital voice technology.

The *Work the World with DMR* practical approach explains the steps to follow to make your new DMR radio work on your local repeater or hotspot, and for worldwide contacts. Amateur Radio DMR is not as simple as entering a couple of frequencies and setting a CTCSS, so you can expect a steep learning curve, but of course, that's where this book will be the most helpful.

Work the World with DMR will help you to become familiar with complex terminology, purchase and program a DMR radio, and make your first few calls.

Size 176x240mm, 224 Pages, ISBN: 9781 9139 9518 8, Non Members: £16.99



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Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

A Good Start to the Year

Steve Telenius-Lowe PJ4DX has plenty of reports suggesting 2023 got off to a good start in terms of propagation and activity.

As this column is being 'put to bed' on 11 January, the sunspot number reached the dizzying height of 206, with the solar flux at 193 sfu. This is the highest level of solar activity recorded since the previous sunspot maximum.

While on the subject of propagation, here is the 28MHz beacon report for December 2022, compiled by **Neil Clarke G0CAS**. *"Several new or re-activated beacons were heard for the first time: 9A5ADI 28223, ZL3TEN 28228 and RC3XC 28261, which is located south-west of Moscow. In Cornwall, GB3MCB 28215 came on air and can just be heard via ground wave at my location. Paths to North America were very good with 4U1UN 28200 heard every day except the 10th, 11th and 30th. Beacons in the W4 call area were heard every day but only on seven days from the W0 call area. The first beacon in the W6 call area was logged on the 19th: K6FRC 28300. That now only leaves beacons in the W7 call area to be logged. DX paths around the globe were very good, with beacons heard in Australia, South Africa and South America on most days. Autumn normally sees very little Sporadic E propagation but 2022 was the best I've ever known in over 50 years of listening. Openings took place most days, some were short-lived and very localised while others lasted several hours. For example, IT9EJW 28225 was heard on 17 days. The most frequently heard beacons in Europe during 2022 were IZ8RVA 28240 on 128 days followed by ED4YBA 28263 with 107 days. On the worldwide beacon network on 28200, 4X6TU was logged on 249 days, followed by LU4AA on 168 days".*

A Personal Challenge

At the end of 2021 I set myself a challenge of working 100 DXCC entities on 1 January 2022, using any band or mode. I did not quite succeed, ending up with 97. So, on 1 January this year I tried again, and this time worked 109. One hundred is a good target: it is achievable, but it does require some effort. Unlike a contest, in which to be competitive you need to work as many stations as you can, for my personal challenge I only needed one QSO from each DXCC entity, making it possible also to celebrate the New Year and enjoy meals with the family. I now have a new target for 1/1/24!

The Month on the Air

The ARRL 10m Contest took place over the weekend of 10/11 December and although propagation was good, it was not really great. Nevertheless, it was good to see 28MHz alive with CW and SSB stations once again, not just FT8! From here in Bonaire I contacted all US States, including Hawaii and Alaska, on SSB. Conditions to Europe were not as good, with the band closing early on both days, although I was pleased to say hello to *HFH* regulars **Etienne OS8D** and **Owen G0PHY** during the contest.

A total of 161,834 QSOs were made during the month of December by the 11 historic UK callsigns commemorating the 100th anniversary of the first two-way transatlantic amateur contact. By 19 December I had qualified for the Silver award, **Fig. 1**, by making 100 different band-mode contacts, although it took me until 31 December to make a QSO with GJ5WS, to give me a 'clean sweep' of all 11 callsigns.

The flood of DXpeditions in October and November reduced to a trickle in December, but are well worthy of mention. One was S21DX on IOTA AS-140, Dhal Char island, in the Bay of Bengal. Several local Bangladeshi operators hand-carried their own equipment and antennas on a lengthy journey, camping on the island's beach under tarpaulins with little else in the way of shelter.

Thierry F6CUK, operating as **FT8WW** from Crozet Island, appeared on Christmas Eve. This proved to be a difficult one, both from the UK and here, although I was lucky enough to make contacts on 10 and 14MHz FT8 and on 14MHz CW. The difficulty was two-fold: firstly, being able to copy FT8WW as his signals were generally weak due to his location and the enforced use of simple wire antennas and, secondly, having to compete with enormous pile-ups when he was heard, Crozet being the third 'most-wanted' DXCC entity in the world.

On FT8, though, I have never before seen so many stations calling a DXpedition in the wrong Tx period (**Fig. 2**). For those unfamiliar with FT8 operation, the DX station – in this case FT8WW – would never be able to work those callers because they are always 'doubling', calling when the DX station is himself transmitting. This suggests that they were not actually receiving FT8WW but simply calling 'on spec'.

On 6 January the Czech TN8K DXpedition from the Republic of Congo started operating and by the 11th they had already made over 66,000 QSOs, with another 10 days of operating scheduled. Good signals and slick operating by the team made this an easy one for most people to work.

March DXpeditions

C5C, which was active from Gambia in May – June 2022, will be back on the air again from 14 February until 14 March this year.

A team from the Czech and Slovak Republics will operate as 3B7M from St Brandon, **Fig. 3**, from 24 February to 5 March. They will have four stations operating on CW, SSB, RTTY and FT8, with special attention to be paid to FT8 because it has never been used from 3B7 before.

http://3b7m.com

The CY0S Sable Island DXpedition has been postponed a couple of times but is now planned for 20 – 29 March. Sable is a Canadian island located in the North Atlantic, some 175km south-east of Nova Scotia.

https://t-rexsoftware.com/cy0s

Readers' News

As has often been the case since I started to compile this column in 2015, the first contribution to arrive this month was from **Victor Brand G3JNB**, **Fig. 4**. Having been a keen CW operator for an incredible 70 years, Victor recently also started to use the newest digital mode, VarAC (see *HFH* February 2023). He says that the time spent on VarAC caused him to neglect CW somewhat this month but, with his 90th birthday approaching and with 331 DXCC entities confirmed, Victor intends to spend a little less time chasing DX in the future. He will therefore also be contributing to this column less often now. I'm sure we all wish Victor all the best in his DXing 'semi-retirement' and we look forward to hearing from him from time to time when he has something in particular to report. Meanwhile, here is Victor's latest report:

"My opening DX contacts in December were with FR1GZ Reunion Island and KC2RGW New Hampshire on 20m VarAC, running 20 watts to a homebrew 'fishing rod' aerial... That period of extreme cold did interrupt my shack time despite the heating but, to my delight, it thawed on the 19th and I found ***Fred XQ3WD*** *Chile calling CQ on 10m after dark here in the UK. We worked on CW with him using his four-element monobander and just 10 watts powered by solar cells and a 220V inverter. Surely my best DX for December using that same vertical in the apple tree! Then, to close my year, Lapland's 'Santa Claus' station OF9X was logged on 20 and 30m. Always a pleasure to hear them and, clearly, this year my message was accurately QSPd as Christmas Day revealed that I had a full house from my 'Most Wanted List', including socks (thermal), black, aged relative for the use of!"*

I received a write-up and numerous photos of the JW0X Svalbard DXpedition from **Max van Rymenant ON5UR**. The DXpedition was back in April last year and although it is quite a difficult path from Bonaire due to the location, being only 12° south of the North Pole, I was able to work JW0X on 7, 14 and 18MHz, and on both SSB and FT8 (though not on CW). **Fig. 5** shows team members putting up a DX Commander vertical antenna in the Svalbard snow.

www.dx-adventure.com

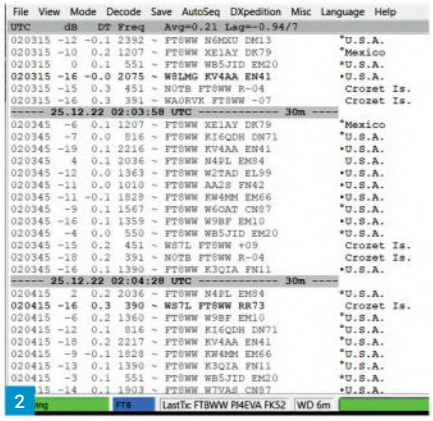

Fig. 1: The Transatlantic Centenary Tests Silver certificate. Fig. 2: Many stations calling rare FT8WW on Crozet Island at the same time that he is transmitting. Fig. 3: L'île du Sud in the St Brandon archipelago, 430km north-east of Mauritius. Fig. 4: *HF Highlights* regular Victor G3JNB. Fig. 5: JW0X team members putting up a DX Commander vertical. Fig. 6: 2E0HPI/P antenna above a cloud inversion in North Yorkshire. Fig. 7: EA6/G7WKX on the air from Majorca. Fig. 8: John HS0ZIQ is perhaps better known as ZB2JK.

Etienne Vrebos OS8D wrote that he has made some *"huge changes"* to his amateur radio operating. Firstly, he sold his Icom IC-7851 as he felt he was only ever using 10% of its possibilities – *"the same as being the owner of a Lamborghini Aventador and just driving around the church here at 30km/h"* as Etienne put it. He still uses an Icom IC-7300 and also bought a new Yaesu FT-710 for portable work. He is putting the new Yaesu to good use because, with 2600 castles in Belgium, Etienne has become a WCA/BCA castles activator. *"I really do enjoy 100% being outside and have a pile-up as I never knew before as I activated some royal castles (that aren't accessible to 'normal' people) and other difficult castles... Great activity, I love to be at the active side of the pile-up, it's a totally new sensation."* All this means that Etienne's priorities have changed a little, *"even at home, where I became a chaser for BCA and WCA. But meanwhile I worked a few DX stations from home of course with my Icom 7300, the Acom 1500 and my Hexbeam"* (see 'Band Highlights').

Jim Bovill PA3FDR reports that he *"managed QSOs with several new DXCC entities this month but the one that made the greatest impression on me was the one from Burkina Faso (XT2AW), for two reasons. The first was the pile-up that lasted at least 12 minutes. I had little expectation of making a contact, but during a pause in the pile-up I called and to my surprise got an immediate answer. The other reason was that the operator, **Harald Becker**, home callsign **DF2WO**, in his QRZ.COM biography included a photograph of school children… in the capital, Ouagadougou, some of whom had to walk 10 or more kilometres to school, proudly standing with new bicycles provided thanks to donations from fellow hams. Surely an excellent example of the spirit of friendship among radio hams. Other highlights of the month were the following new countries: Aruba (P40P), Bahamas (C6AGU), Bahrain (A92AA), Mexico (XE2FGC) which I had been trying to collect for over two years, Philippines (DU1IVY) and Sri Lanka (4S6NCH). I also managed a couple of interesting European contacts, the Isle of Man (MD0RTZ) and San Marino (T77BL), both contacts for only the second time in many years in the hobby... All together a very successful DX month."*

Carl Gorse 2E0HPI has been getting out portable quite a bit and sent in the photo (**Fig. 6**) of his antenna above a spectacular cloud inversion at Roseberry Topping in North Yorkshire. Despite the temperature being minus 7°C, with a wind chill of minus 10°C, he still managed to make 210 QSOs in four hours of operating on 7, 14 and 18MHz SSB.

Owen Williams G0PHY said *"There was a bit of a lull in activity at G0PHY in December. The second half of the ARRL 10 metre contest netted contacts in Asiatic Turkey, Canary Islands, Cyprus, East Coast USA and Bonaire. Comparing contacts made during the Canadian Winter contest in December 2022 with December 2021 certainly point to an improvement in conditions. In 2021 I made only five contacts with VE stations with the best DX being a VE6 in Alberta. In 2022 I made nine contacts, including two in British Columbia and two in Saskatchewan. The WRTC special event stations have provided an interesting diversion in January while waiting for possible SSB operations on HF from **FT8WW**. We can only hope that **Thierry** makes a good impression on the TAAF authorities and they look more favourably on future requests from DXpeditions... I had a go at RTTY at the weekend in the ARRL RTTY Roundup as SADARS* [the Shefford, Beds, club] *used the club call, G3B. Obviously it's a bit impersonal compared with SSB but more relaxed as you're not straining to hear weak signals and I found it easier to manage a run on RTTY."*

Operating as **GW4MM**, **Tim Kirby GW4VXE** spent most of his time on the higher bands. *"Despite some high solar flux figures, it's 193 at the time of writing, conditions have been quite variable. Most days it's been possible to have good 28MHz QSOs into the east coast of the USA on CW, which has been enjoyable, but it's been a little rarer to find the longer paths open... 15m has been quite interesting around sunset, with some longer paths into the USA being available. Listening during the ARRL RTTY Roundup, there were a good number of stations from California and Arizona audible just after sunset... The WRTC Award stations have been fun to chase too. I spent a few minutes during the RSGB AFS Contest on 40m and 80m which was fun – making a few QSOs, including **Don G3XTT**!"*

Simon Davis-Crane G7WKX visited Majorca around New Year and operated as EA6/G7WKX, **Fig. 7**: *"I made over 100 QSOs (mixed SSB / data)*


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and contacted 26 countries, using my Yaesu FT-818, amplifier and SotaBeams linked dipoles. Unfortunately, the BNC connection on the 15/17m dipole failed early on, so I was limited to 20/40m. In my limited free time between hiking up as many mountains as possible, I activated six POTA parks and one SOTA summit (twice, as it was near to the hotel). Best DX was ***David KM2O*** *in Glenmont, USA, at 6200km. I was using just 6W SSB on 20m. Also, on 20m 6W SSB, I worked Canada, USA, Azores, Wales, Canary Islands and Sweden. Having the option of the 20 - 40W amplifier helped when the 20m band was quieter later in the trip and having the option to use digital meant I could make contacts from the hotel room at night without disturbing our neighbours."*

During the month **Kevin Hewitt ZB2GI** made around 650 QSOs on SSB and FT8, including over 100 FT8 QSOs on 5MHz. Kevin's highlights were working **John HS0ZIQ**, **Fig. 8**, on Phuket, IOTA AS-053, on both 14 and 28MHz SSB. John is perhaps better known as Kevin's neighbour on Gibraltar, ZB2JK.

Band Highlights

Victor G3JNB: 7MHz CW: VK2GR. **14MHz VarAC:** FR1GZ. **28MHz CW:** XQ3WD.

Etienne OS8D: 14MHz SSB: 3V8CB. **18MHz SSB:** 6Y/W8YCM. **21MHz SSB:** 6W1QL, 6Y/N0GJW, SU9VB, TZ4AM, UK8FAI, UP7WRTC. **24MHz SSB:** CO8LY, S01WS, TZ4AM, XE1XR. **28MHz SSB:** 5X4E, 6Y8LV, 9N7AA, CB1A, CX5A, EK6TA, FY/F4GPK, HP9SAM, KP2B, KP4DZ, LS2D, P40P, PJ4SON, PU2MIW, S01WS, V51WH, VJ4T, VR2XAN, VU2DSI, XE1XR, YE9CDL.

Jim PA3FDR: 7MHz FT8: RJ8C. **10MHz FT8:** C6AGU, CO8LY, JE6DOI, P40P, T77BL. **14MHz FT4:** 7X2ET, HI3MM, JA3FQO, K7XB, RC0JD, VE2LOA. **14MHz FT8:** 4S6NCH, A722FWC, DU1IVT, JA8NRS, R0SCA. 18MHz FT4: KI6QDH. **18MHz FT8:** BD9AC, BG0BBB, DS5USH, JA3KVT, UB9OEC, VA7ZDX, ZS4WW. **21MHz FT4:** 7X3YOTA, AP22YOTA, N0UR, PY5QW, UN8PC, VK8NSB, XE2FGC, XT2AW. **21MHz FT8:** LU8EKC, N7QT, R8CFJ, UN7LEW, ZL3GAV. **24MHz FT8:** A92AA, CN22CWQ, JH6VXP, PY5BH, RZ9UO, ZZ4WTT. **28MHz FT4:** 7Z1IS.

Carl 2E0HPI/P: 7MHz FT8: JM1XCW. **14MHz SSB:** VK3EY, VK5PAS, YV5HJN. **14MHz FT8:** PY5QW, VE4MAR, WZ0C, VP8LP. **18MHz SSB:** VK5GR, YN2N.

Owen G0PHY: 14MHz SSB: K8Y, VA5DX, VE7AV. **21MHz SSB:** N1W. **28MHz SSB:** NN4TT, PJ4DX.

Tim GW4MM: 21MHz CW: S01WS, TZ4AM. **28MHz CW:** A75GC, CA4OMT, CX5FK, D44PM, FR8UA, FY5KE, HZ1WRTC, KW7Q (CO), NP2Z, OX3XR, S01WS, TI5/N3KS, TZ4AM, UN7TX, VA5DX, XE1CT, XQ3WD.

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Kevin ZB2GI: 5MHz FT8: K0KX, VE2JD. **14MHz SSB:** 4S7JL/MM (off Senegal), HS0ZIQ, KJ6YXI, PY1FJ. **21MHz SSB:** 6Y5HM, 9Z4ZB, CO2KR, HI3B, HK3X, K6NG, K7ACZ, PY2RE, TI2VAI, V31ZA. **24MHz SSB:** VE2CSI (Zone 2). **24MHz FT8:** 8P6ET, CO2QU, HC2EP, HK3DMV, K6MKF, KE7BMG, LU1BJW, XE1GLL. **28MHz SSB:** HS0ZIQ, PZ5RA, R9AB, V51WH, YI1WWA. **28MHz FT8:** HI3Y, K6PO, K7ISM, PY2RJ, VA3FU, XE2JA. **28MHz FT4:** VE9NC, W0GJ.

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. For the May issue the deadline is 11 March. 73, Steve PJ4DX. **PW**

Tony's TOP 10 Deals

1 MyDEL Deepace KC-901S+

4GHz Network Analyser. This is no ordinary Analyser, this is an Analyser from ML&S. Groan indeed.

KC901S+ is a multipurpose RF instrument integrating a VNA (vector network analyser), spectrum analyser, field strength meter, and an extra low-frequency signal source. It can do complete single port vector measurement and 2-ports simple vector network analysing.

Usually sold at £1349.99.

Tony's deal £1249.99

2 Icom IC-7610

HF+6M Base Transceiver. No more £10k IC-7851 Flagship, check out the IC-7610 instead.

With the demise of the extraordinary Icom IC-7800 series, if you want the best Icom Base Station on the market today then the IC-7610 is for you. Whether it's the superb "wide-screen" touch display though to the fantastic layout of the front panel design, it's hardly surprising that Icom are in no hurry to produce another mega-base station, aka IC-7851.

We offer the IC-7610 with the matching SP-41 Base Speaker (£192) free of charge, but Tony has sharpened his pencil so much we're even including the proper SM-30 Desk Microphone (worth £132) too!

Usually sold at £3623.99 with SP-41 Speaker & SM-30.

Tony's deal £3299.99

3 Yaesu SP-10

Compact High Quality Desk-top Base Speaker.

SP-10 is a High-Quality speaker that produces high quality audio-output sound from any receiver or transceiver providing clear and crisp audio for reliable communications on all HF and V/UHF bands.

Usually sold at £109.99.

Tony's deal £94.99

4 MFJ-1312dx

12V DC Power Adapter 500mA.

It's a small wall power supply, what can I tell you? It's not switch-mode so won't spray RF noise all over your receiver. That's worth £20 of anyone's money.

Usually sold at £21.95.

Tony's deal £19.99

5 Heil BM-10

Dynamic Super Lightweight Headset with boom microphone.

A lightweight version of the famous Heil Pro-4 and 5 range. The quality is still hard punching DX TX audio from the microphone & the twin earpieces are very sensitive and require low drive for maximum volume. Idea for that QRP radio you still haven't taken out of the shack yet.

Usually sold at £134.95.

Tony's deal £119.95

6 LDG MC-101

Dual Colour Analogue display meter for Yaesu FTdx101 series.

Dual analogue meters showing S-Meter, RF Output power, SWR. This nicely constructed sit-on-top unit is designed specifically for the Yaesu FTdx101D & MP and is so much more pleasing to the eye than just the TFT display of the radio itself.

Usually sold at £199.95.

Tony's deal £179.95

7 SUPER-MP1DXTR80

Super Antenna 80-10m Portable Antenna System.

Just bought your new portable HF transceiver and fancy taking it for walkies? Take along a Super Antenna MP1DX, add a MyDEL 5m patch lead and you can have your portable shack on air in literally minutes.

Usually sold at £349.95.

Tony's deal £299.99

8 Daiwa CN-901HP3

1.8-200MHz Huge Cross Needle 3kW Power SWR Meter.

There is still nothing to touch this "instrument" and year after year the CN-9xxx series find their way into Ham Shacks worldwide. If you don't want to squint at your power or SWR reading, then investing in a new Daiwa meter will probably be the best thing you put in your radio room today. A 2kW max version is also available, "CN-901HP"

Usually sold at £199.95.

Tony's deal £177.77

9 Bushcomm Highlander Bush-highlander-8

10-80m Mobile antenna.

For vehicle mounting, this Bushcomm Highlander cover all the bands including WARC from 80-10m. Don't forget a heavy-duty mount, (ATAS-Bracket) but specify 3/8th fitting, a cable assembly and you're ready to go!

Usually sold for £417.95.

Tony's deal £349.99

10 Astron AST-SS-30AP

30 Amp Bench Power Supply.

No frills on this PSU (no metering either) but if you want a good reference unit that has twin Anderson Powerpoles on the front panel & a large 30AMP cable screw set of terminals to the rear, then consider an Astron in your shack. Nothing to do with ***Aston*** (Martin) and it's not in your garage. Pity.

Usually sold at £249.95.

Tony's deal £179.95

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Yaesu FT-65E VHF/UHF 2m/70cm Dual Band FM Handie **£84.95**

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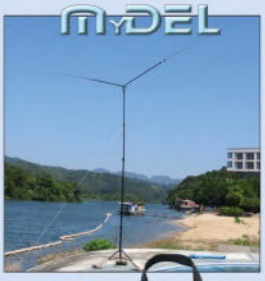

MyDEL JPC-7 (Dipole Version) covers 40-6m, 100W PEP. All contained in a small carry case for ideal portable use. Beautifully manufactured to a very high standard.

JPC-7: £339.95

See MLandS.tv for our full video review of this antenna.

See HamRadio.co.uk/JPC

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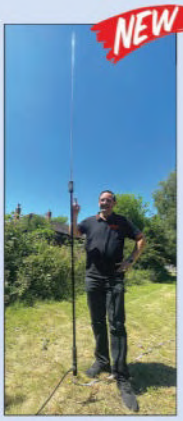

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See MLandS.tv for our full video review of this antenna.

See HamRadio.co.uk/JPC

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A compact but solid paddle capable of standing up to the rigors of portable operation as well as providing excellent service in the shack. Contact spacing is adjusted easily, without tools, via the large thumb-screws on either side of the paddle body. Spring tension is fixed for a light, precise action **£109.95**

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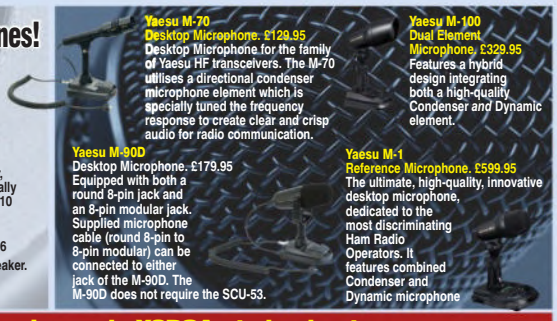

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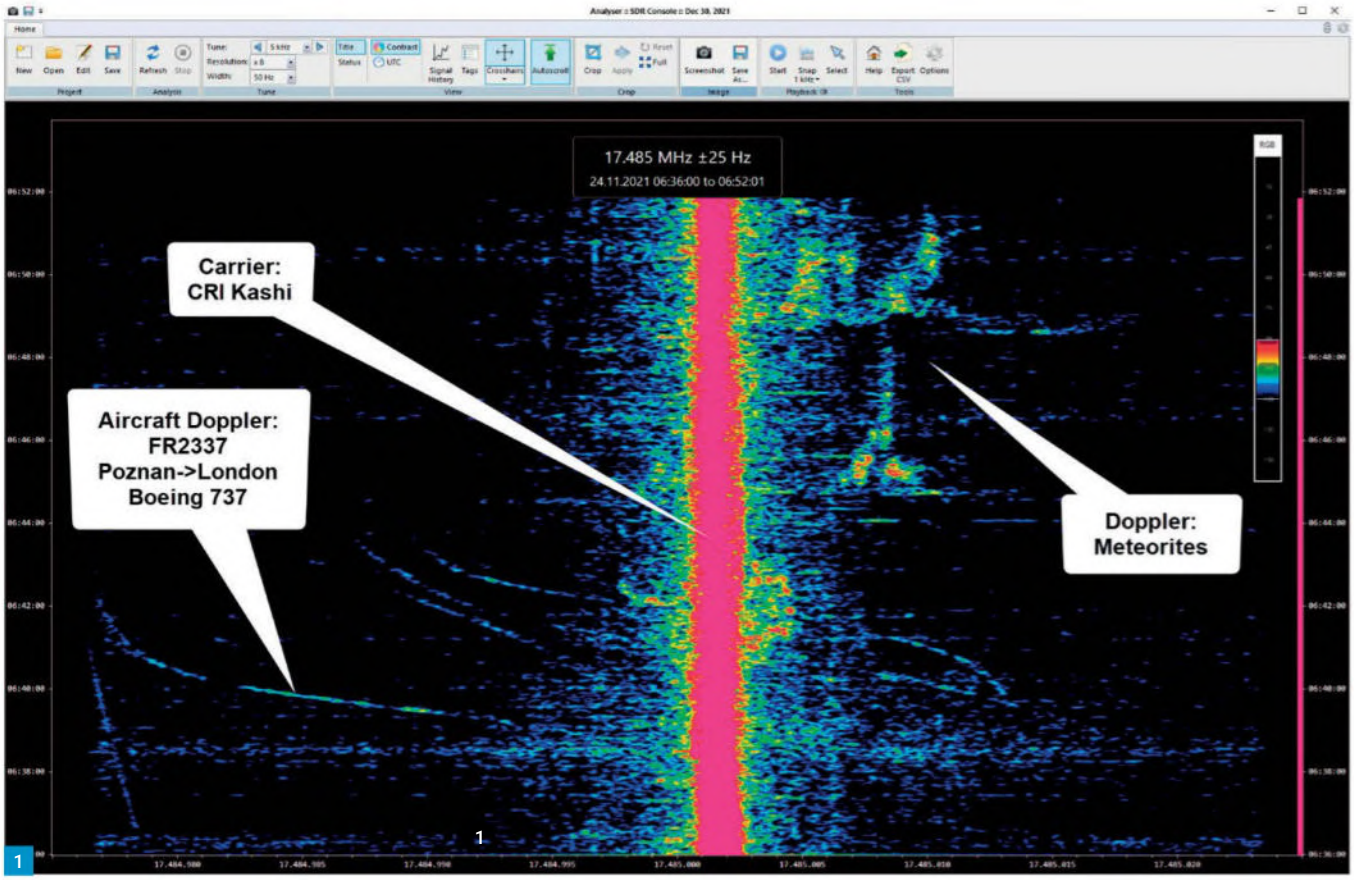


Aircraft Scatter on Short Wave

Radio waves are reflected, refracted and scattered by electrically conducting objects. Little attention has been paid to the scattering of shortwave signals by aircraft. SDRs and software allow insights into previously hidden areas. Fasten your seat belts with **Nils Schiffhauer DK8OK.**

Nils Schiffhauer DK8OK
dk8ok@gmx.net

Above 30MHz, scattering of radio waves by the metal hull of aircraft, but also by the electrically conducting plasma of meteorite tails, is nothing new. For a long time, these effects have been used by radio amateurs for over-the-horizon links. In the following I would like to show how the same effects can be detected also on shortwave (HF, 3 to 30MHz) with the simplest means, SDR and free software, what can be seen there and what limits physics sets to this project.

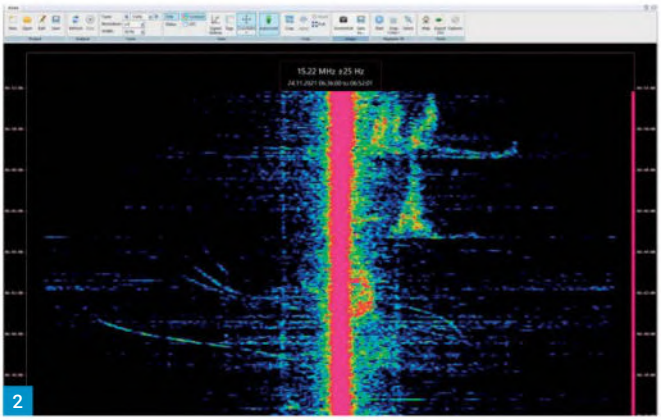
Aircraft scatter is caused by radio waves from a transmitter being scattered on the metallic outer shell of aircraft. The aircraft thus becomes a secondary transmitter/antenna whose signal mixes with that of the transmitter. Both then reach the receiver. The amount of backscattered energy depends on several factors. A major one depends on the mechanical dimensions of the aircraft and the frequency, i.e. the same as for conventional antennas' performance largely depending on their mechanical lengths versus received wavelengths. In addition, the direction in which the signal hits the aircraft is important. If it reaches electrically resonant parts, the backscatter is strong(er). Whereby 'strong(er)' is relative. In most cases, the signal is scattered in all directions, so that only a small portion reaches the receiver. Determining this so-called 'radar cross section' (RCS) is a science in itself. Although the RCS can be approximately calculated using complex modelling, reliable values that allow, for example, the type of aircraft to be determined from the backscatter can only be obtained by measurements on the actual model. For the HF range, it can be summarised that the backscatter is generally many tens of decibels below that of the original signal.

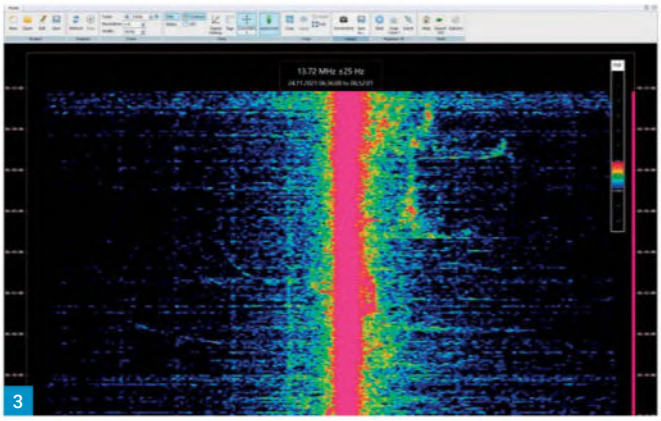
On higher frequencies this looks different. Especially if only the aircraft, due to its altitude, establishes a 'line of sight' (LOS) between transmitter and receiver, which otherwise does not exist between the two. This phenomenon is used by radio amateurs worldwide as aircraft scatter, and various software has been developed to predict such connections [**1**].

A Radar en Miniature

This technique is dubbed 'Bistatic radar' in which, unlike the familiar monostatic radar, transmitter and receiver are spatially separated from each other [**2**]. For professionals, a particular advantage is that this technique, also called 'passive radar', allows all kinds of already active transmitters to be used without disclosing the monitor by a (strong) radar signal, and thus being switched off. In the beginning, there were only bistatic radars anyway, ironically, except for the very first 'telemobiloscope' demonstrated by **Christian Hülsmeyer** in Cologne in 1904 [**3**], which, however, was not then understood by the Kaiserliche Marine (Imperial Navy).

If we associate radars primarily with frequencies well above 30MHz, this certainly covers over 99% of all radar applications. But as early as 1949, an over-the-horizon radar (OTHR) based on HF appeared in the then Soviet Union with 'Veyer' (fan). This technology experienced a considerable boom two decades later for defence against intercontinental missiles. Its





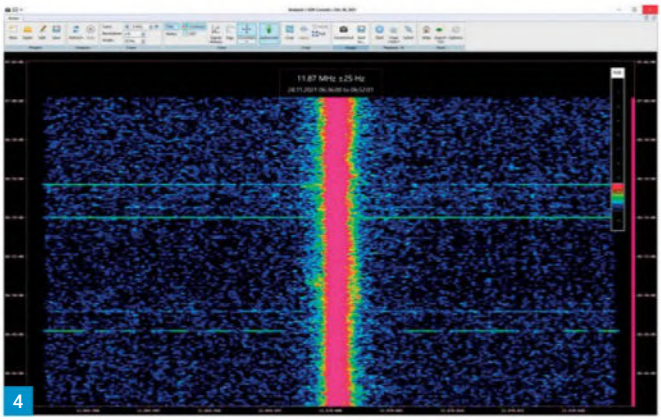


Fig. 1: The signal on 17.485kHz shows clear Doppler traces, both from aircraft and especially from meteors. Fig. 2: On 15.220kHz, the finding is just as similar, as ... Fig. 3: ... here, although scarcer, on 13,720kHz, while ... Fig. 4: ... the signal at 11,870kHz, which is about 30dB lighter, shows none of these effects at all. Fig. 5: The Kashi-Burgdorf track in the VOACAP online tool. Fig. 6: Distribution of levels on the four Kashi frequencies over 26 minutes. The mean values are, from left to right, –85dBm, –53dBm, –49dBm and –60dBm. Fig. 7: The Beijing-Burgdorf propagation path runs far more northerly than that from Kash, ... Fig. 8: ... but shows the same results. Fig. 9: Biblis illuminates the European airspace on 17,880kHz. Fig. 10: The peak values of the Doppler traces, viewed solo, are still relatively clearly to be seen ... Fig. 11: ... but then almost disappear in noise compared to the carrier signal.

signals, from the Russian 'Woodpecker' to the French 'Nostradamus' to the Australian JORN, are still being heard by everyone, since, for example, Australia still uses it to protect its northern coast over a wide area.

The Most Important Questions (and Answers)

If we combine the concepts 'Bistatic Radar' and 'OTHR', whose professional realisations are highly complex and contain solid knowledge of small-scale propagation phenomena for their compensation, then at least both concepts can be shown also with amateur means. Even more, with some luck one can even identify flight paths. Which leads to several questions and their succinct answers:

Which *signals* are best suited for this?

- Those from broadcasting transmitters, using their carrier as 'continuous wave radar'. Their transmitted signal quality is at least roughly known, they are on the air continuously for more than 30 minutes, but most importantly their effective transmission power is up to more than 100dBm while, for example, WSPR signals (see below) rate more than 70dB lower.

Which *frequencies* are suitable?

- All shortwave frequencies, although for reasons of proper scattering power due to RCS and propagation conditions, the broadcast bands above 11MHz seem particularly attractive, as confirmed by practical experience.

How do you *identify* aircraft scatter?

- By the Doppler effect. Since the backscattered signal comes from a moving object, it shows a Doppler deviation from the original broadcaster's carrier. This can be seen at a spectrogram of high resolution, and it often also shows a characteristic swinging pattern.

How *large* is this Doppler effect?

- The so-called Doppler shift depends on the cruising speed of the aircraft as well as on the frequency and the relative position to transmitter and receiver. At a relative aircraft speed of 1,000km/h, it is up to ±40Hz around 21.6MHz, dropping to around ±28Hz at 15.5MHz [**4**]. Since we observe *relative* speed, the Doppler frequency is almost always below that.

Are there *different* effects/objects causing Doppler other than just an aircraft?

- More than we would like! Most disturbing is the behaviour of the ionosphere, i.e. multipath propagation. It leads to likewise (smaller) Doppler effects by winds of several hundred km/h at great height, swirling refracting patches of the ionosphere and, hence, making them into moving objects. Magneto-ionic effects additionally split the carrier into ordinary and extraordinary rays taking different paths in the ionosphere and subsequently leading to slightly different frequencies at the receiver. Doppler from Meteor trails are also often found around a broadcasting carrier. Caveat: Only one transmitter should be on the channel in question at a time to clearly assign a reference for the Doppler trace.

How do we proceed?

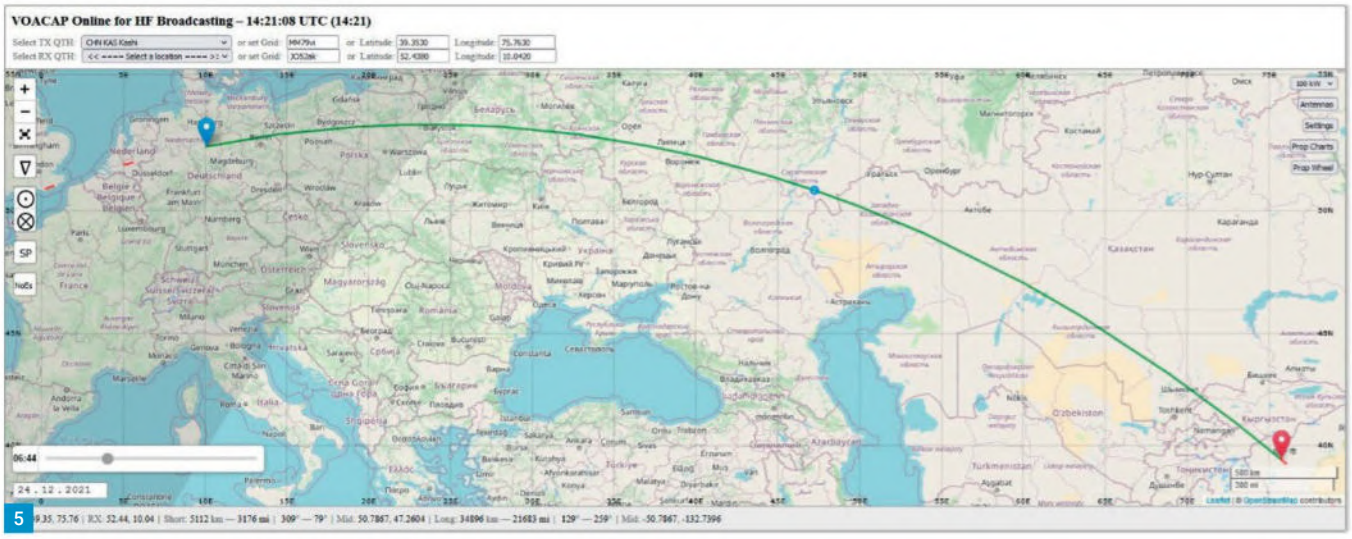
- By completely recording the frequency range of interest from, for example, 6MHz to 22MHz, and examining many signals for Doppler at a spectrogram under the 50Hz software magnifier with a resolution of 0.0977Hz. This process gain also gives us a good +10dB/Hz [**5**].

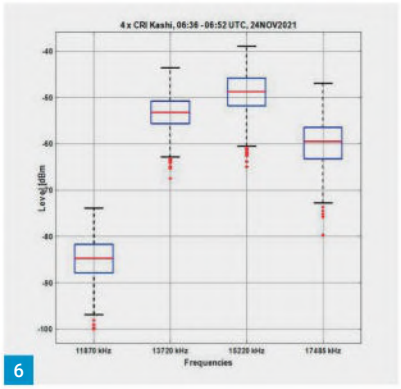
Three Scenarios

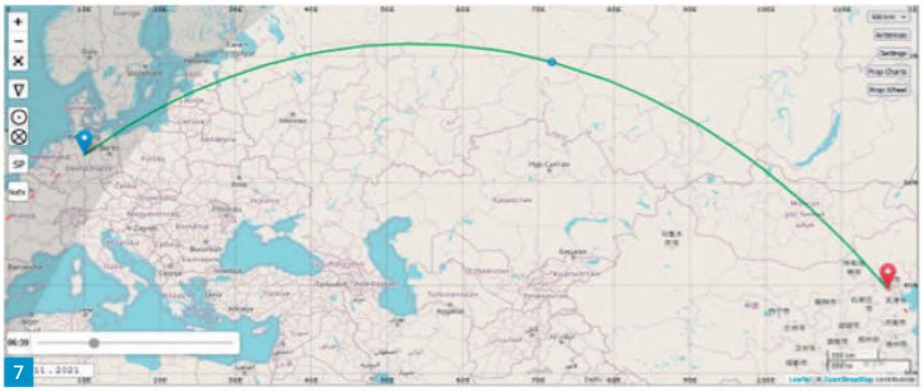
After sifting through hundreds of different signal traces on the spectrogram between 6MHz and 22MHz, the following groups emerge:

- Most radio carriers examined, especially in the DX range with two or more ionospheric hops (2000 ... 6000km), don't show any Doppler traces.
- However, if these broadcast signals are very strong, Doppler traces of aircraft but also of meteor trails can be found.
- A special case are such transmitters, which are in the dead zone, where aircraft at an altitude of about 10km see both the transmitter and the receiver thanks to their radio horizon of about 450km and thus establish a connection.

The first case – no Doppler traces – is only statistically interesting. Depending on the frequency range, reception level, time of day and distance, between only zero and 30% of the signals show any Doppler traces at all. Overall, even with this most sensitive method, aircraft Doppler is more the exception than the rule.







What can be Seen When and How

The second case is the most interesting. **Figs 1** to **4** show both meteor and aircraft Doppler using the China Radio International transmitter at Kashi (distance 5,112km, two hops, **Fig. 5**). On the three upper frequencies, transmitters of 250kW carrier power (amplitude modulation of a 500kW transmitter!) at curtain array antennas with about 21dBi gain are used, while on 11,870kHz it is only 50kW carrier power on a curtain array antenna with about 17dBi gain. 13,720kHz and 15,220kHz beam directly towards Europe (306°), while on 11,870kHz the beam points towards the Middle East (239°) and on 17,485kHz towards 269° (North Africa/Middle East). **Fig. 6** shows the statistical data of the respective 4 x 951 levels measured every second. The range around the averages is 36dB, which should answer the question, *"What power does a transmitter need to show scatter?"*

The unsurprising answer: a lot, an enormous amount! Because only those three transmitters with the highest effective transmit power of about 104dBm lead to these effects, which we therefore do not see at 11,870kHz with almost 10dB less effective transmit power. And this indeed seems to be primarily due to the transmit power, although the wavelength may also play a small role. But if the signal on 15,220kHz is intentionally and manually attenuated at the receiver by exactly that 36dB difference, even the strong backscatter of the meteor tail fades into the background almost beyond recognition, not to mention the already weak aircraft Doppler.

DX Stations illuminate their Own Region

Something else the spectrograms show, for instance in comparison with the ADS-B observations of FlightRadar24 [**7**]: Scatter is observable mostly when a *strong electromagnetic field* hits objects in *relative proximity* to the receiving site, 'illuminating' them, so to speak. This is also logical. Because already with the normal transmission the level is attenuated by the square to the distance, which is then again potentiated and, thus, further attenuated with backscatter, thanks to the property of the radar cross section. The observation of aircraft far away from transmitter and receiver is therefore unlikely. So, the clearly different and 7,573km long propagation path Beijing/Doudian->DK8OK (**Fig. 7**) on 15,120kHz (250kW with a good 21dBi gain, direction Central Asia, 322°) puts up the same signal as Kashi/17,485kHz with −60dBm. Consequently, this leads to an almost identical spectrogram (**Fig. 8**) with Doppler traces from our own immediate vicinity, without even one of the many other and somewhere along the way flying machines becoming visible!

Dead Zone: Doppler Revives

This just leaves the previously mentioned third case: observation of Doppler in relative transmitter proximity. Here I have taken the transmitter Biblis at 325km distance. The thesis: the signal of the 100kW propaganda station Radio Mashaal with sharply-focusing curtain array antenna (HR4/6/.5) on 17.880kHz between 1000 and 1300UTC should on the one hand be received at a modest level (dead zone, wrong direction ...), on the other hand however make objects visible in the *overlapping area* between its and my radio horizon. The average level was still about −60dBm, nevertheless an otherwise never seen round of many Doppler tracks of aircraft from the European airspace appeared, **Fig. 9**.

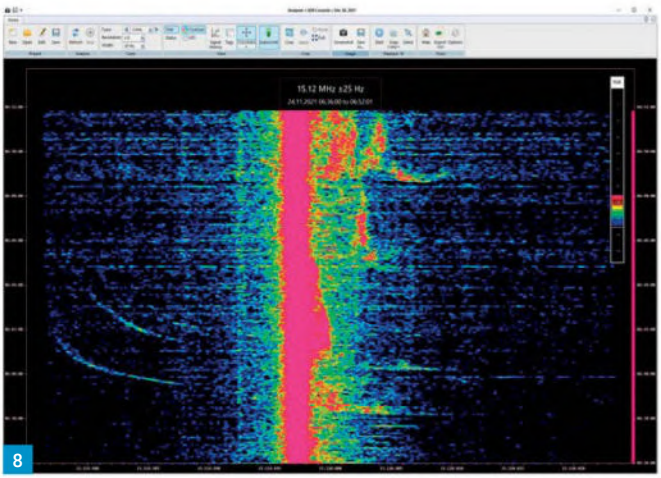
Thus, the questions at the beginning could be answered succinctly:

- To show aircraft Doppler on shortwave, *large field strengths* are needed to illuminate either the area around the receiver (for DX stations) or transmitters in the relatively close range.

The penultimate question that remains is:

- How strong are the Doppler signals actually? Absolutely and in relation to the carrier signal?

Asked, measured, because software SDRC offers an analyser module, which was already used for all spectrograms here, plus the saving of all numerical values for later evaluation. So, we can measure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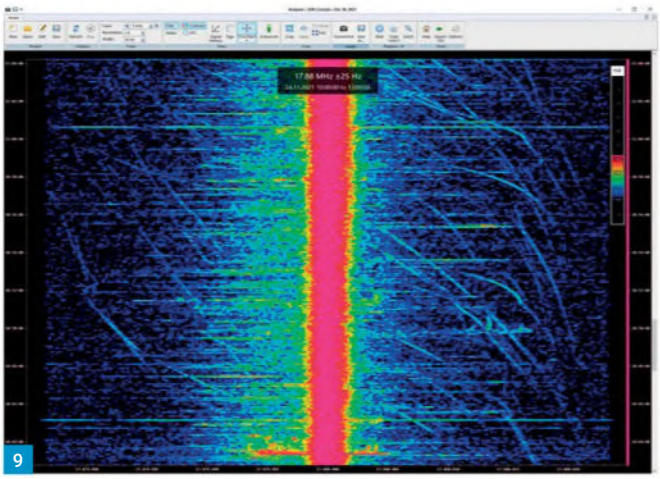
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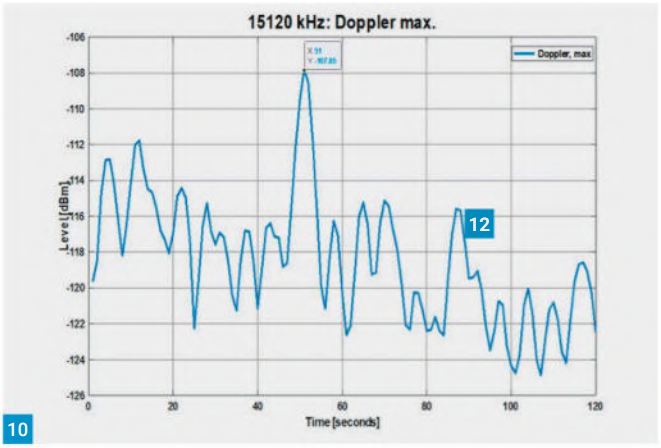

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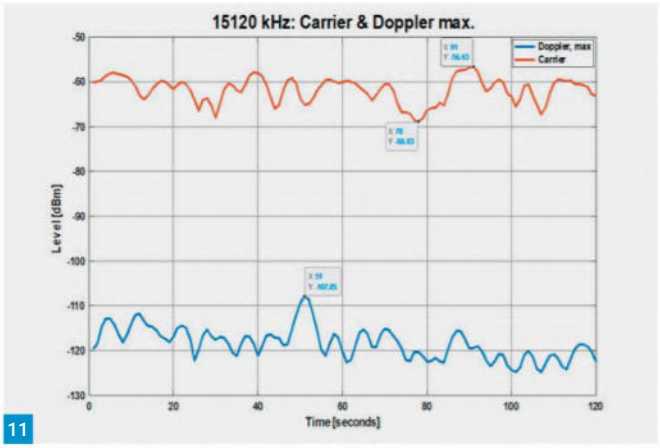

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and compare carrier and Doppler separately. For this purpose, I have taken the example from Fig. 7 (Beijing/Doudian) and compared the carrier signal with the respective maxima of the aircraft Doppler of the Boeing737, flight number FR2337, so that noise does not dilute the result [**8**]. **Fig. 10** prominently shows the trace of the second Doppler maxima *solo* over 120 seconds, with the typical sinusoidal trace. However, if this is combined (added) with the level curve of the pure carrier, the difference becomes clear: the Doppler *maximum* of -108dBm, reached anyway only during one second, reads 39dBm *below* the minimum of the carrier, and even a good 50dBm below its maximum, **Fig. 11**.

Aircraft Doppler needs High Field Strengths

What could be shown here with only one example continues through all experiments: typically, the Doppler level of aircraft in the immediate geographical vicinity of the receiver is 35 to 55dB below the signal of DX stations. And we had seen in Fig. 4 how quickly the Doppler signal thus falls below the threshold of even strong broadcast stations.

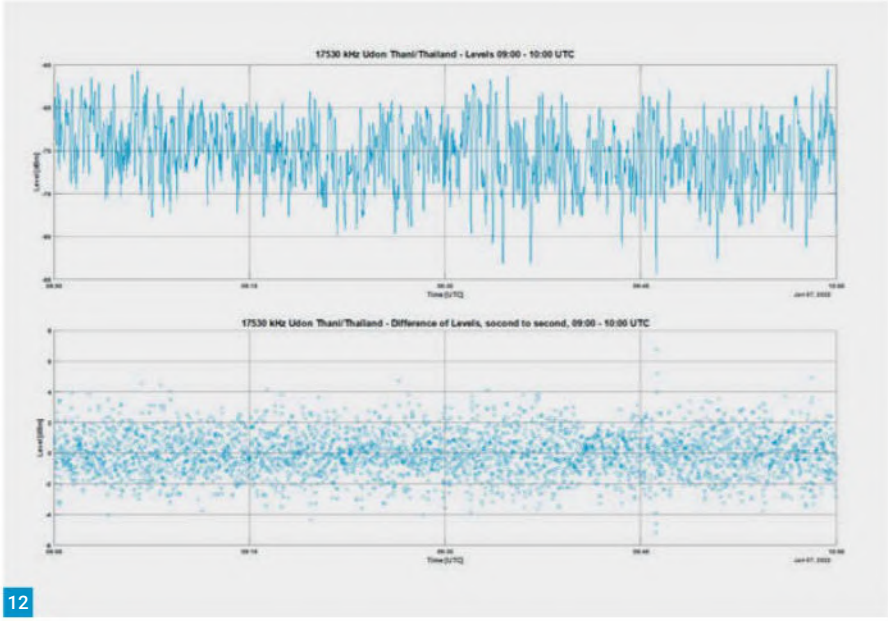
This brings us now to the last question, which takes up a discussion on the subject of 'level changes due to aircraft scatter on *WSPR* signals where, for example, a log between Switzerland and Australia is supposed to detect an aircraft somewhere in the middle of the Indian Ocean [**9**]. Already from the investigations made up to this point, this can be relegated to the realm of wishful thinking. On the one hand, WSPR signals are much too weak for this, and on the other hand, the detection is limited to objects in relative proximity well below an ionospheric jump. On the calculated total signal of carrier and Doppler from Fig. 11, the latter has almost no effect at all: adding the peak power of the Doppler signal to the average level of the carrier, this increases its total level by 0.001dBm in this best case.

Three other points complement this reasoning. The first point concerns HF's inherent fading, which swallows up all such weak influences without the separation made by 0.1Hz high-resolution FFT filters used with my experiments. A typical example may be a three-hop signal from the Udon Thani/Thailand transmitter on 17,530kHz, which offered stable reception between 0900 and 1000, with the 3,600 second level values largely within the normal distribution. Average and median levels were –70dBm, and the standard deviation was 3.9. These statistical values, as used in all climatic propagation prediction software models such as VOACAP and even PROPLAB-PRO3.2 [**10**], somewhat mask the dynamic changes that are experienced with Mother Nature from second to second. **Fig. 12** summarises the usual signal response and second-to-second differences. If one ignores a few outliers (impulse noise?), this alone leads to a largely randomly distributed dynamic range of about ±4dB from second to second.

The second point arises in the, as shown, stronger influences by, for example, influences of meteorites, which cannot be separated from possible aircraft scatter referring to log data only. In addition, the WSPR measurement envelops only the 6Hz narrow signal and thus does not capture a large part of the often much wider Doppler traces of the aircraft. If a 'drift' of one Hertz or two recorded in the log data is then taken as an indication of Doppler, this neglects several much more likely factors from transmitter instability to ionospheric Doppler due to multipath propagation.

The third point is that the WSPR log only provides a single average of the total signal over each 110 seconds and cannot separate individual components – neither over time within this span, nor over frequency.

Fig. 13 shows how much this smooths the actual level curves compared to a second-by-second resolution. It shows the level curve of the CRI Kashi 17,490kHz transmitter on 22 September 2021 over nearly five hours. In the background the nearly 18,000 measurement points every second (raw



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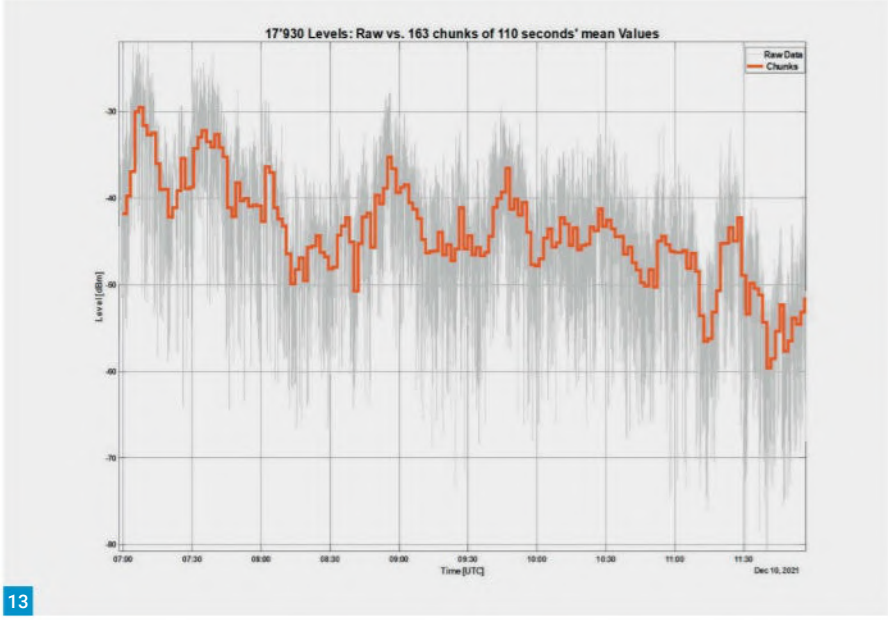

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Fig. 12: Dynamic ionosphere leads to typical shortwave fading (top), which oscillates from second to second in the range of about ±4dB [see text]. Fig. 13: The short-term dynamics and the information they contain are completely lost when the actual level curve is averaged at 110-second intervals – as it is done by logging WSPR signals.

data: 'raw'), in the foreground the values averaged over 110 seconds each (groups: 'chunks'). Here, too, the raw data were separated into carrier and Doppler, both values were mathematically combined into a total signal, and this in turn was separated into groups of 110 seconds. Even with this prior knowledge of where the Doppler traces were located, their identification was not even remotely possible. On the contrary, 'false positive' and 'false negative' markers completely dominate the result. **Prof. Joe Taylor K1JT**, Nobel Prize winner in physics (1993) and developer of WSPR, therefore also considers it *"crazy to believe that historical WSPR data could be used to track the course of the crashed flight MH370. Or, for that matter, that of any other aircraft .... I don't waste my time arguing with pseudoscientists who don't understand what they are doing."* [**11**]

What Radio Amateurs and SWLs can do

Clear words, which should at the same time, however, also encourage radio amateurs and SWLs to develop suitable waveforms, with which such phenomena can be proven clearly, and within the radio amateur's power limits. The pseudo-random numbers in STANAG4285 signals, have been used for many years by radio amateurs for exactly this purpose [**12**]. And with its 5MHz network, the RSGB had installed a smart system [**13**]. Also, the evaluation of the impulse-response diagrams of DRM broadcast transmitters by free software such as DREAM [**14**] and sodiraSDR [**15**] can provide valuable information about the structure of the ionosphere over the transmission path. Furthermore, the extensive data treasure trove of the Lowell Digisonde network spanning the globe has not yet been tapped at all [**16**].

The basis of a future beacon system that could replace the aging analogue and meritorious NCDXF beacons at today's possible State-of-the-Art is certainly GPS-based digital waveforms, for which those of digisondes could serve as a blueprint. For the technically-minded radio amateur and SWL, this opens up entirely new fields that coherently and innovatively combine RF propagation with radar technology, codes, and programming. The IARU would be the appropriate institution to take care of planning, coordination, financing, construction and operation within the framework of the implementation of its future concept [**17**]. There should be no lack of willingness to help financially and actively.

• Screenshots and diagrams are by the author.

References

[1] Among others:
https://w3sz.com/AircraftScatter.htm
www.airscout.eu
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all free of charge and discrimination-free access
[2] Bistatic Radar by **Nicholas J. Willis**, Raleigh/USA, 2005
[3] **https://tinyurl.com/bdzxj4ff**
alas, in German; DeepL will translate it:
www.deepl.com/translator
[4] Calculation tool:
https://tinyurl.com/5n9xnvcc
(multiply results by 2, because of double Doppler effect!)
[5] Best with software SDRC, free of charge and non-discriminatory: **https://www.sdr-radio.com/**
[6] **www.voacap.com/hfbc**
[7] **www.flightradar24.com**
This has proven to be the tool of choice among all related offers also because of its 'rewind function'.
[8] With Matlab. But also free programs like Python with its modules are suitable, which process extensive matrices and display them graphically.
[9] **https://tinyurl.com/mrycvwse**
[10] **https://tinyurl.com/4yrbmmj2**
[11] **https://tinyurl.com/4tuvpxm8**
[12] **https://tinyurl.com/3vzv7zjn**
[13] **https://tinyurl.com/5n6nzk28**
[14] **https://sourceforge.net/projects/drm**
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[17] **www.iaru-r1.org/stf**

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Avoiding Getting Loopy Over HF Loops: Measure the Feedpoint Impedance First

Frank Howell K4FMH looks in detail at building and measuring an HF loop antenna.

As a ham building a custom house a decade ago in an HOA-managed neighbourhood (*Home Owners Association, ie typically with severe antenna restrictions* – ***ed***.), I assessed my antenna options. There were no trees on a bare corner lot at the main entrance into the neighbourhood where everyone would view the house every day. I had designed a large attic space in the plans but I also had my builder add a wire around the roofline edge underneath the shingles, thinking that a horizontal loop might come of it. This paper outlines what works in my case, both in measured and in operational terms. It may be something that other HOA-bound hams can experiment with to allow a multiband HF antenna that is not visible to neighbours. The lesson of measuring rather than assuming the feedpoint impedance is reinforced. In doing so, a novel and practical approach to making these measurements is shared here. It uses a sweeping antenna analyser with a remote connection via Bluetooth. Let's begin by seeing how a ham can get 'loopy' over following the literature to put up a horizontal HF loop.

Getting Loopy Over HF Loops

When **Clarence Moore** designed and later patented one of the earliest HF loop antennas for the missionary shortwave station HCJB in Ecuador in 1947 (see article in January 2023 *PW* and the US patent application, URL below), he did it to combat arcing on the antenna ends from the high power of the transmitter. The HF loop though has long since become a niche antenna model for amateur radio. **https://tinyurl.com/37wtk6sa**

It became much more visible in the US with the publication of **Fischer's** article in 1985, which outlined a full-wave horizontal 'sky loop' for HF. **Dave W7FB** (then W0MHS) called it the *"best kept secret in the amateur circle"*. This article in *QST* served as an exemplar for many other articles, website pages, and presentations on HF horizontal loops. Many opted for the deployment traditions described by Dave Fischer. Most of the follow-up articles have tended to not stray very far from Fischer's article or general approach (**Carr** 1999; **DeMaw** 1990; **Kleinschmidt** 2002; **Harwood** 2006). One alternative exception is **Paul Carr N4PC** (Carr 1990a,b) who phased two half-wave loops. The *Rothammel's Antenna Book* (**Krischke** and **Rothammel** 2019, English translation) is an authoritative source on this literature.

Fischer's article in *QST* predated **L E Cebik's** presentation on *"Horizontally Oriented, Horizontally Polarized Large Wire Loop Antennas"*, where he provided formal modelling of the HF horizontal loop antenna in various forms (including vertically-oriented ones). This loop was later included in Cebik's top five backyard antennas (Cebik 2004). This presentation has generated many citations as the key 'traditional' approach to HF loops. Cebik suggested that one wavelength should be the standard for horizontal loops on HF (Although in Cebik (2004) he stated preferences for a loop at 2WL on the fundamental band). His antenna models showed that height above ground plays a strategic part in the take-off angle for frequencies above the loop's fundamental band. The long-time adage for antenna installation, as high as possible, does not reveal a complete or even accurate picture for HF loop antennas.

Cebik's models illustrated that this antenna at about 30ft above ground produces a pattern of higher take-off angles for the fundamental frequency (80m) and the first harmonic or so (40m) but increasingly lower take-off angles and relative gain for the higher frequency harmonics. While there is (modelled) gain on these higher frequencies with a desired lower take-off angle, the beamwidths are increasingly fragmented (or sporadically directional) with severe nulls. The loop is not omnidirectional at the higher frequencies. For a multiband antenna that is virtually immoveable once deployed in the air, these desirable characteristics come at a potential cost in specific spatial directions. The reader is reminded that these are antenna models, not empirical measurements from deployed loops themselves. The assumptions for many models, including the actual antenna segment geometry, may be far afield from those in actual operation at many ham operators' locations, especially in small spaces.

The practical installation of horizontal HF loops is more challenging than a conventional dipole or, perhaps, even a triband Yagi beam on a small mast or tower. Whether it is a rectangle, circle or delta triangle, multiple supporting points of attachment are required for this loop. For modern ham operators who increasingly live in urban locales, effective points of attachment at consistent desirable heights above ground can be scarce if not impossible.

This places pressure on the ham installing one to simply get it 'up in the air' and let that be that, hoping that a good guess at impedance matching and an antenna tuner will resolve how these guesses may miss the mark in reality. Raising, measuring, lowering to adjust wire length or change baluns, raising again for proper remeasurement is an imposing chore! The height at each point may not be the same as the availability of mounting points around the circle, square, or triangle are often a compromise vis-à-vis an antenna model's estimates. These practical considerations have understandably driven how hams have implemented the horizontal HF loop by just using traditions rather than measurement with modern instrumentation such as sweeping antenna analysers.

HF Loop Impedance Matching

These traditions may not work very well for all hams who install these loops, even with the forgiving nature of the loop design (Kleinschmidt 2002). This may be especially so when there are HOA restrictions. The *ARRL Antenna Handbook* (24th Ed.) says that most practical full wavelength loops have a feedpoint impedance between 50Ω and 150Ω. But this depends on the exact geometry and coupling to other objects (including nearby antennas) with the loop's shape and ground proximity affecting it. *Rothammel's Antenna Book* reports similar feedpoint impedance ranges, largely based on Cebik's popular model results. This source suggests that the complex impedances are *"easy to match"* with resistances between 95 to 415Ω of impedance. Reactance values tend to be in the 245 to 650Ω. The use of 450Ω ladder line is recommended for feeding the loop in combination with a balanced antenna tuner near the transmitter.

Consequently, the continued use of various transmission systems, such as 75Ω coax or 450Ω ladder line, with baluns ranging from 2:1 or 4:1, has been part of the recommended traditions for these sky loops. For most post-installation reports, they have worked, sometimes very well. However, we may not hear as much about failures. That is the luck of the draw if actual measurements at the feedpoint are not made, no matter how challenging in practice.

Kleinschmidt (2002) gives his own candid journey toward a 'blissful' horizontal HF loop with a continual eye toward improving antenna effectiveness. **Kirk NT0Z** focuses on the fundamentals, feeding it with ladder line but recognising the need for a tuner, either at the feedpoint or in the shack. He acknowledged that ladder line was mainly for bands below the fundamental frequency of the

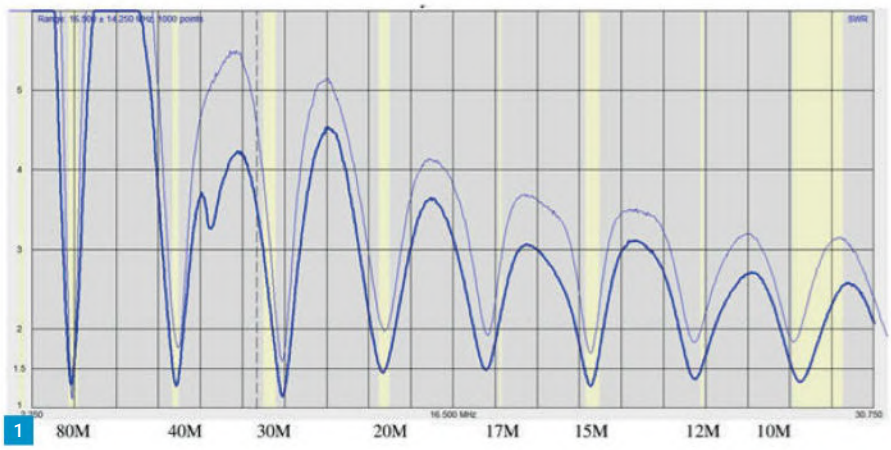


Fig. 1: RF Sweep of Horizontal HF Loop, 275 feet in length, 30 feet AGL, by Everett N4CY (Source: Everett Sharp N4CY, "Experimenting with different baluns on a 275' Horizontal Multi-Band Loop Antenna 80/40/30/20/17/15/12/10/6m," 7 June 2015 (personal communication)). Thin light blue line is 2:1 Balun with the thicker dark blue line is a 4:1 Balun. Measured at shack end of 50' RG-8X coax, not at the 'bare wire' feedpoint. Fig. 2: Author's house with #14 THHN wire loop run about 1in underneath the architectural shingles on top of plywood underpinning, feeding into the attic via soffit as noted. Note that the house roof has several peaks so the wire travels upward and downward following the path of the edge of the shingles. A TDR measurement found that the wire length is about 276 feet.

loop's design rather than above. RFI provided a significant challenge at NT0Z's installation, which many urban-based hams are likely to face, too. This was a significant detriment for feeding the loop by ladder line.

Kirk NT0Z concludes with this assessment: *"Horizontal loops are fabulous, if not the best, all-band non-resonant antennas. They noticeably outperform dipoles when used at frequencies above resonance and they're easier to match there as well (impedance wise). They're efficient, quiet and forgiving"*. NT0Z's journey lays bare how tradition does not replace measurement in building the HF loop antenna, although a workable solution can take many forms, including a guess that accidentally matches the unmeasured reality in the installation.

Most all of these conventions about HF loops were given life well before common use of modern antenna analysers, especially those with wireless connectivity, to facilitate the desirable measurement of impedance at the feedpoint ('bare wire'). This measurement at the feedpoint gives the ham operator the key information for designing the match and transmission line (see, for instance, **Caron** 1989). One can remove the coax from the measurement model but this largely defeats the practical issue of raising and lowering the antenna itself. **Ward AE6TY** illustrates some of these issues using a VNA and calibrating it to remove the coax from the measurement (see the YouTube video below).

https://youtu.be/HxhFUAxe0Jo

This discussion can get complex very quickly with strongly-held opinions. Applying many of these ideas in the field plays havoc on the assumptions of antenna system measurement. My emphasis on the direct empirical measurement in the field is on balancing the practical with the needed estimate of the feedpoint impedance at the 'bare wire' ends of the loop. This is to select an appropriate balun (or alternative) that does not depend on the folklore of HF loop literature prior to modern sweeping antenna analysers. The reader may wish to take an alternative approach. AE6TY's SimNEC software and tutorial is but one avenue to pursue.

For ham operators in an HOA or other community-restricted situation, these installations are typically far from textbook ones. They require the 'chess moves' that Caron's classic ARRL text advocates. This makes it even more important to begin with a good feedpoint impedance measurement.

One of the few sources that I found on horizontal HF loops that include measurement in the installation is **Everett N4CY** (Sharp 2015a,b). He built an 80m horizontal loop at 30ft above ground with 264ft of 14-gauge Flexweave wire, later expanding it to 275ft. He made use of a sweeping antenna analyser (Rig Expert AA-170) to obtain RF measurement data to export for analysis. N4CY made comparisons for two balun ratios, a 2:1 and a 4:1 wind, to compare the impedance match and SWR. Because of the practical limitation of raising and lowering the loop, all measurements were made at the end of a 50ft length of RG-8X coax in his shack.

(Although **Rick DJ0IP** has some information from Everett's loop project on his website (below), Everett N4CY sent me his two short papers on this design and deployment. They are now available by permission on my website (second URL below.))

https://tinyurl.com/59k6a77u
https://tinyurl.com/yw55cuy9

Fig. 1 illustrates N4CY's measurements for 80-10m. He concluded that the original design of a 2:1 balun assumed about 100Ω of impedance, based on traditional sources. Everett found that a 4:1 balun produced a wider bandwidth for SWRs of 2 or 3. It also produced lower absolute SWR measures than the 2:1 balun, less than 1.5 on the fundamental frequency of 80m. On the higher harmonic bands, the higher ratio balun also produced lower SWR values versus the 2:1 balun. N4CY concludes that it is a far superior match solution to his loop deployment. His impedance measurements from the coax end are between 29 and 89Ω, all in line with his conclusions. While we do not know the impedance at the 'bare wire' of the loop itself, N4CY delivers a more in-depth empirical evaluation of this horizontal HF loop than other sources. Everett was hampered by the practical constraint of having to connect his analyser to the bare wire some 50ft AGL, like most hams have faced until recently. He concluded that his horizontal loop was his first true multiband HF antenna.

N4CY faced the practicalities that most ham operators face with the horizontal loop: getting measurements of impedance directly at the feedpoint with the antenna up in the air at both the fundamental design frequency and other harmonics. Using an antenna analyser with Bluetooth connectivity, however, allows the antenna wire to be raised only twice: once with the analyser connected to the 'bare wire' (using a banana plug adapter) at the intended height above ground and again with the correct balun ratio for permanent installation. Alternatively, these measurements would ascertain whether the traditional approaches of 75Ω coax or 450Ω ladder line are indeed optimal transmission lines. This method of wireless connectivity to the sweeping antenna analyser greatly reduces the practical tasks, especially if used with a pulley system for raising and lowering each of the multiple points of attachment required by the loop antenna. Traditions can be fine. But if the specific loop, geometry and coupling to nearby objects doesn't fit them, they can be highly misleading (*ARRL Antenna Handbook* 2019).

(Another club presentation, available on YouTube at the URL below, is by **Ed N7PHY**. His field deployment of a horizontal HF loop was temporary,

Fig. 3: Feedpoint for horizontal HF loop measurement using Rig Expert Stick Pro antenna analyser: Bluetooth 'bare wire' (left) and with Palomar Engineers balun (right). Balun has built-in 1:1 current choke. Fig. 4: RF Sweep of 'Bare Wire' portion of Horizontal HF Loop. Note: see Fig. 3 (left panel) for hardware setup for making the 'bare wire' measurements. Results taken using Antscope 2 software for the Rig Expert Stick Pro via Bluetooth.

estimated to be 40 to 70ft above ground. He did provide SWR graphs over the HF bands, albeit as an after-the-fact measurement that was not used in the design of the loop's impedance match.)

https://youtu.be/ycwOTbTCpos

Avoid Getting Loopy

I present my own experience with an HF horizontal loop, installed originally when my house was constructed in a highly-controlled HOA neighbourhood. However, my loop is not up in the air as was N4CY's and others cited here. But the method I use is readily usable for that type of implementation.

My loop is mounted around the shingle edges of my roof. See **Fig. 2** where the antenna wire route is annotated in red. It is constructed of #14 THHN stranded copper wire. Electricians placed the wire about 1in beneath the shingle edge in the small trough where 1in x 1in wood supports the singles over the plywood sheathing. It follows the route of the roof line, moving upward and downward along the shingle edges. It is neither a pure rectangle or triangle but a necessarily bespoke geometry. There are a couple of places where copper flashing is very near the loop wire route. The opposing wire ends enter the second-floor attic above the soffit for the feedpoint as annotated in Fig. 2.

Initially following traditional sources for advice, I used 450Ω ladder line attached to a 1:1 current balun at the loop's wire ends. A 4:1 Sevick-style balun (Sevick 2003) connected to a short run of RG-213 coax was used at the point of entry above my shack on the second floor. This seemed to work adequately for a while as my first contact from Mississippi was on 40m with **Steve WB2WIK** in California. We were both using 100W SSB. But, alas, the nearby HVAC where the ladder line had to be routed in the attic picked up significant RFI when the AC compressor was running. This caused me to research the history and fundamentals of this sky wire for using 50Ω coax with ferrite chokes to reduce the RFI. Kirk NT0Z's experience with RFI and ladder line was not too different to mine: it worked but there were problems.

I later took direct measurements using a Rig Expert Stick Pro antenna analyser (with Bluetooth) to estimate both the actual length of the loop wire and the feedpoint impedance from 160 through 10m. The Time Domain Reflectometer (TDR) mode of the analyser attached to one end of the loop wire with the other end open showed that the length of wire was 276ft 5in (shown in **Fig. 3**). Using the formula for full-wave loops, L = 1005/f where L = length and f = frequency in MHz (**Carr** 1999), this length suggests that the wire loop would have a resonant design frequency of about 3.6MHz. Given the practicalities of the wire installation around the roof line, there was no shortening or lengthening of the wire that could be done. Following Kleinschmidt (2002), the question is: how can the loop wire in place be made more optimal? The answer is driven by taking the appropriate measurements and letting that be the guide.

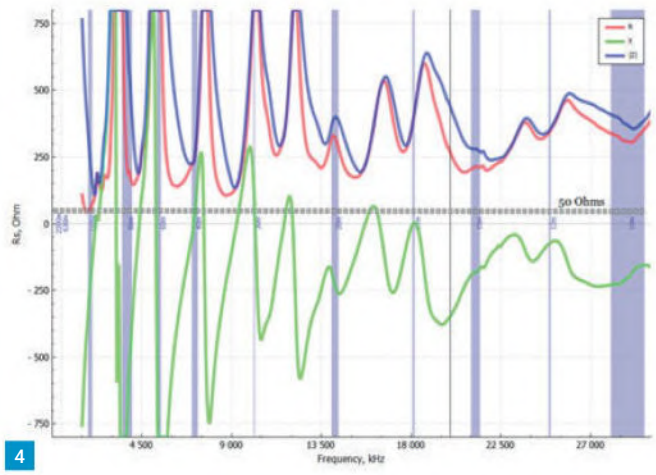
The RF sweep of the 'bare wire' loop over the 160 to 10m frequency range had the results summarized in **Table 1**. The table is complemented by **Fig. 4**, which visualises the impedance components of the loop's 'bare wire'. Examining both the table and figure, it is clear that this length of wire varies quite a bit from the expectations based upon Cebik's models. The impedance from the approximate band edges range from 49Ω at the bottom of 160m to 2,179Ω on the lower edge of 60m. Much of this can be better understood through the column, sign of j, in the impedance formula. The results are largely (negative) capacitive reactance on most frequencies. Only three of these measurements are positive or reflective inductive reactance. This should not be too surprising within the environment in which the wire is routed. One suspicion is that the two spots where copper flashing routes rainwater off the shingles contributes to this capacitive 'loading' on some bands but that is just a guess.

(Everett N4CY raised the question of the foil-backed radiator barrier on the underside of my plywood sheathing degrading the signal from the loop. That is a good question. But it is on the top side of the plywood so it does not need to actually penetrate the foil to reach the ionosphere. The foil may indeed be part of the systematic capacitive reactance measured on the bare wire (Table 1, Fig. 4). The WSPR results (see later) also provide some indications of radiation effectiveness. More on how one of my HF antennas works behind this foil-backed radiator barrier is available in Howell (2022). It surprisingly tunes up well and does penetrate this supposed Faraday Cage construction technique.)

On the fundamental 80m band, where the 276ft wire length falls squarely at an expected 3.6MHz of resonance, it does not measure out that way (again, see Table 1 and Fig. 4). There is a high spike in impedance at the lower edge of over 1,300Ω on 80m but this falls into the expected range of 157Ω on the higher edge. Both have between 400 and 650Ω of capacitive reactance, resulting in high SWR readings. These figures are actually in line with those reported in *Rothammel's Antenna Book* for these horizontal loops. The graph for reactance (Fig. 4, the green line X) illustrates the impact of the loop's wire installation environment throughout the frequency range. The capacitive reactance levels near the design frequency are high but taper off at the 20m band. The impedance (Z) ranges widely but tends to fall near or below 300Ω in the vicinity of each ham band. A low point is just above 80m and, surprisingly, 160m, which itself is below the fundamental band frequency.

These results suggest that the fundamental design frequency may be matched more optimally by a judicious choice of balun. Possibly, 160m may be brought into usability. Which winding design would achieve the best range of impedance match and SWR measurements?

Following Everett N4CY, I took RF measurement sweeps for separate balun wind ratios: 2:1, 4:1,



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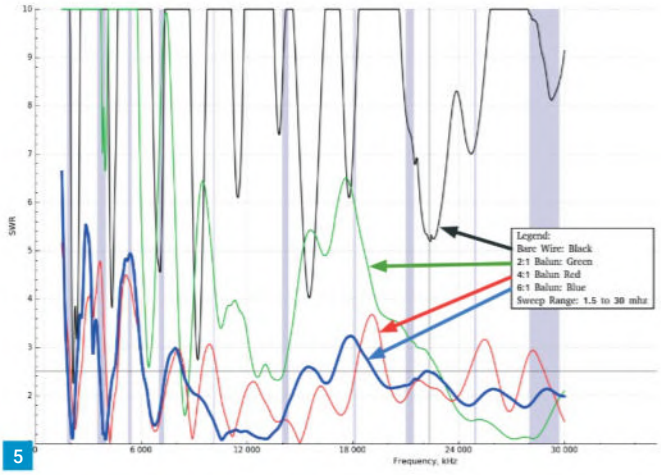

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Fig. 5: RF Sweep Results for Horizontal HF Loop: Bare Wire, Three Balun Ratios. Note: RF sweep by Rig Expert Stick Pro antenna analyser, 1.5-30MHz using 1,000 points of data over the range. Three separate Baluns respectively attached to bare wire for measurement by antenna analyser at the SO-239 coaxial connector. Fig. 6: WSPR Spots using Horizontal HF Loop. Note: Data collected via WSPR beacon, 0.2 watts, using horizontal HF loop over 24-hour period. A total of 667 unique spots across 8 HF bands were observed.

and 6:1 for comparison to the bare wire numbers (he used 2:1 and 4:1). These are shown graphically in **Fig. 5**. The bandwidth and lowest SWR figure for each is in **Table 2**.

The common tradition of using a 2:1 balun (green line), the initial approach used by N4CY, does not yield a very good result on the fundamental design band. The SWR numbers for 80m, at best, are about 7:1 for the 2:1 balun. It does have very good results on 10 and 12m but is not a good solution. (Impedance measurements to complement the SWR numbers are not shown due to space limitations. They are available from the author.)

The 4:1 balun (red line) makes a noted improvement. It does have high SWR in the lower band portion of 80m while the harmonics are reasonably low. It does not match well on 60 or 12m. Most of the bands are below an SWR of 2.5. This balun wind has been used frequently as I did previously on this same loop wire. But can the fundamental band and the higher harmonics be better optimised? That is the balancing act that the ham must face if the desire is multiband operation with the HF loop, especially if one wants the gain on higher frequencies (Cebik 1999).

The 6:1 balun arguably works the best across the HF bands. The SWR figures for both the fundamental 80m and, surprisingly, the lower 160m band are both quite good (SWR < 1.2). The higher harmonic frequency bands are all below 3 and some (20m) below 2. One exception is 60m as the SWR is about 5. The SWR on 17m is over 3.

The bandwidths at two SWR points and the lowest SWR by band are shown in Table 2. The fundamental 80m band SWR drops to 1.08 with 1.34 on 160m. The frequently used 40 and 20m, respectively, have 1.58 and 1.48. Corresponding to the graph in Fig. 5, there is no bandwidth at 2:1 or 3:1 minimum SWR for 60 or 17m. The 15m band has no bandwidth at 2:1 as the lowest SWR for that band is 2.22. At 12 and 10m, where Cebik's models suggest that gain may be realised have reasonable bandwidths at these two SWR minimums with lowest readings of 1.84 and 1.80.

In all, this loop fed with a 6:1 balun and 50 feet of RG-213 coax appears optimal among the choices I've measured. It is the one I've chosen for permanent installation (see Fig. 3, right panel). With a 1:1 choke built inside of the 6:1 balun by Palomar Engineering and another 1:1 choke on the coax exiting the remote attic antenna switch, very little RFI on any of the HF bands has been detected even with the HVAC's compressor engaged. This has made a substantial improvement in the loop's reliability as a multiband antenna.

Was This Loop Saved?

The next question is, of course, how effective does this HF loop, installed around the perimeter edge of my roof at heights of 10 to 30 or so feet with a bespoke loop geometry, radiate into the ionosphere on HF bands? WSPR beacon data for a 24-hour period at 200 milliwatts of power are summarised in **Fig. 6**.

Over the 80-10m bands, a total of 667 unique spots were heard all over the US (including Alaska and Hawaii) as well as Central or South America, Europe, West Africa and Australia. (A total of 4,707 spots were observed including repeated observations by the same receiving station.) While this is a weak-signal mode and not necessarily indicative of how CW or phone modes would fare, the combination of widespread spots around the US and DX spots on several continents suggests that the antenna has indeed become a workable part of my HF antennas. It is very quiet as compared to an 80/40 dipole inside the attic itself, although summer thunderstorms are indeed heard on the loop. My LDG AT-600 Pro II ATU has no issues reaching a minimum SWR match on 160-10m. Given that the fundamental design band was 80m, the inclusion of topband is a bonus.

Conclusions

The original installation used the accepted tradition of 450Ω ladder-line without the need for actual measurements to support the RF efficacy of this HF loop. It did 'work' in terms of making some HF contacts. It suffered from sporadic RFI making it unreliable, especially during the warm weather of the South where AC compressors are on most months of the year. But, as Kirk NT0Z advocates, continual assessments for optimisation can yield 'bliss' with this type of antenna design. I won't say that bliss has yet been attained compared to his outdoor loop. The measurements presented here do illustrate, however, that even in a harsh installation environment such as those many HOA communities present, the horizontal HF loop can be forgiving enough to work effectively on multiple bands. And be completely invisible to the community.

Your chances are greatly heightened if you don't get 'loopy' over just following traditions without making the impedance measurements that our fabled textbooks tell us are needed. Now, with wireless remote connectivity available in a small set of antenna analysers, the practical barriers that have restrained hams putting up similar loops from these measurements are now minimised. I have a walk-in attic where I could have used any sweeping antenna analyser. But it could have easily been a location where the multiple attachment points would have made the tendency to hang it and let the antenna tuner handle the rest be the road travelled.

Now, loop installers do not have to do that for putting a full-wave HF loop into the air. With this approach, they only face two steps: the original raising for remote wireless impedance measurement, determining the optimal balun wind, or perhaps, finding out that ladder line or 75Ω coax really is a good choice, and installing that before the final hoisting of the loop into place. At that point, the rest of the transmission line and tuner system can be the focus. But with both feet on the ground!

With regard to analysers, besides a few models from Rig Expert, the Sark Mini60s also advertises Bluetooth capability. There may be others but I have only used the Rig Stick 230 and Rig Expert Pro. The AA-55 Zoom BT is another one that I own but the Bluetooth implementation in that model is unreliable, even after several beta firmware versions by Rig Expert's support team. It works fine via USB connection or as a stand-alone device.

Thanks

Sincere thanks are expressed to Everett N4CY, Scott K0MD, Thomas K4SWL, and Kirk NT0Z for comments on a draft of this paper. Any faults or errors are my own. My contact information can be found on QRZ.com or via email at **k4fmh@arrl.net**

Band	Edge	Frequency (kHz)	Impedance (Ohms)	Sign of j	Reactance	SWR
160m	L	1,802	49	-	336	48.5
	U	1,997	71-	-	148	8.3
80m	L	3,498	1,322	-	630	67.1
	U	3,971	157-	-	409	24.7
60m	L	5,258	2,179	-	525	46.2
	U	5,448	1,051	-	476	62.9
40m	L	7,008	220	-	50	4.7
	U	7,300	362	-	171	8.9
30m	L	10,120	870	+	118	17.8
	U	10,158	909	+	39	18.2
20m	L	13,983	314	-	172	8.2
	U	14,346	287	-	261	10.6
17m	L	18,055	368	-	6	7.4
	U	18,162	417	+	2	8.3
15m	L	20,992	203	-	194	7.9
	U	21,454	211	-	168	7.0
12m	L	24,885	338	-	77	7.12
	U	24,975	348	-	72	7.25
10m	L	28,003	338	-	229	9.9
	U	29,703	354	-	156	8.5

Note: Rig Expert Stick Pro used with banana plug adapter to bare wire ends. A total of 1,000 measurement points (maximum) was used. A single end of the bare wire was used in TDR measurement of total wire length around shingle edges, resulting in 276ft 5in.

Table 1: RF Sweep Results of 'Bare Wire' Portion of Horizontal HF Loop.

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Bandwidth (kHz) at SWR:			Lowest SWR:
Band:	2:1	3:1	
160m	104	201	1.34
80m	284	439	1.08
60m	-0-	-0-	4.89
40m	203	300	1.58
30m	50	50	1.44
20m	350	362	1.48
17m	-0-	-0-	3.14
15m	-0-	457	2.22
12m	107	117	1.84
10m	57	1,670	1.80

Note: based on RF sweep with 1,000 points over 1.5-30MHz.

Table 2: Bandwidth of Horizontal HF Loop, 6:1 Balun.

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1

JPC-7 Compact Dipole Antenna (Part II)

Richard Constantine G3UGF continues his detailed look at this range of new portable antennas from China, with some nice surprises.

In last month's review of the JPC-12 vertical I indicated that there was more to come from this range of portable antennas from China, principally in the form of a compact dipole, the JPC-7.

Both antennas are available separately. The dipole package contains four 32cm arm extenders, two for each leg of the dipole, two telescopic whips and two resonating coils for 40-20m. Each version includes some dedicated custom parts unique to each kit variant. Here in the UK they are available as two separate packages.

Expecting to receive a complete antenna, what actually arrived from China was an upgrade kit for the vertical model, not currently available in the UK, and there was no tripod. Confused yet again I made some enquiries. It transpires that the 4m tripod mast is from another source and packaged with the JPC-7 here in the UK, by at least one provider.

The upgrade kit consisted of an additional coil, telescopic whip, two swing arms with thumb wheel screws and washers, the custom-made centre T-piece, screw-in alloy mast connector and a plug-in 1:1 balun with a Velcro type securing strap.

I had hoped that there would be two more of the black anodised alloy mast sections as per the full JPC-7 kit. My intention was to experiment with the original vertical by raising the coil position higher, thereby maximising the current distribution. It was not to be. Digging around I've recently discovered that additional mast sections can now be bought online.

On the upside, the additional coil likely makes it possible to resonate the vertical version on the 80m band, using two coils in series.

Back to the Dipole

While the custom centre piece is reasonably lightweight, each of the chrome steel swing arm connectors is heavy, weighing in at 90 grams each. Add the thumb wheel locking screws and washers, the little 1:1 ferrite balun plus the alloy mast connector and you have over half a kilogram of weight to support before attaching any arms.

Each of the swing arm connectors has two smalls spigots that locate in each end of the central T-piece. It's a cunning design with 360° matching sockets for the spigots, allowing the user to orientate the radiating elements in almost any direction.

The user can orientate the elements horizontally, vertically and just about anywhere in between. This is a useful feature if it's not practical to raise the system high enough to mitigate the effect of the ground on the radiation pattern.

Unless you're able to get the horizontal elements of a dipole half a wavelength above ground on the band of choice, it's bound to affect results. Closer to the ground you could easily end up with an NVIS (Near Vertical Incident Skywave) antenna. This is fine if you want to contact relatively close stations but pretty dire for low angle DX. Orientating the arms into a V shape or a slant dipole is worth trying, especially if you're not apparently getting anywhere.

As with the vertical, the loading coils are for 40m-(30m)-20m meaning that for higher bands they are removed. The antenna can then be configured as a full-sized dipole for one band at a time. Initial lengths for each band are similar to the single ended vertical (see last month).

I would recommend doing as I do. Invest in cheap tape measures to keep with each of your portable antenna kits so you never forget one. Also include a laminated tuning chart as a guide, just in case your little 'grey cells' temporarily desert you.

Tripods and Masts

Earlier I mentioned the alloy, screw-in mast adapter. As a photographer I instantly recognised that the custom fitting has been designed to fit a lighting stand. Conveniently I already had the same one to hand, allowing me to replicate the UK package. Currently, a typical 4m tripod photo/lighting stand costs around £90.00+ in the UK.

Alternatively, low cost 3m painters' poles are readily available from DIY stores. Many have the ubiquitous, coarse 'Acme' thread also found on floor mops and brushes. In many cases the fitting can be quite easily removed; something I've done in the past. Once removed, simply pack the tube and secure the JPC fitting with self-tapping screws. Add some guys and ground stakes and you're in business.

While not as convenient or as tall as tripods, it's one way to keep the cost down with a little ingenuity.

Tuning and Performance

The disadvantage of an antenna that requires to be re-set manually when band changing is that it's labour intensive. Easier done at ground level so a vertical has an advantage over a dipole that requires raising and lowering, possibly more than once for best match.

The manufacturers claim an average VSWR of 1.3:1 or better. I believe that this relates to 10m with the dipole arms in a V shape as I found it

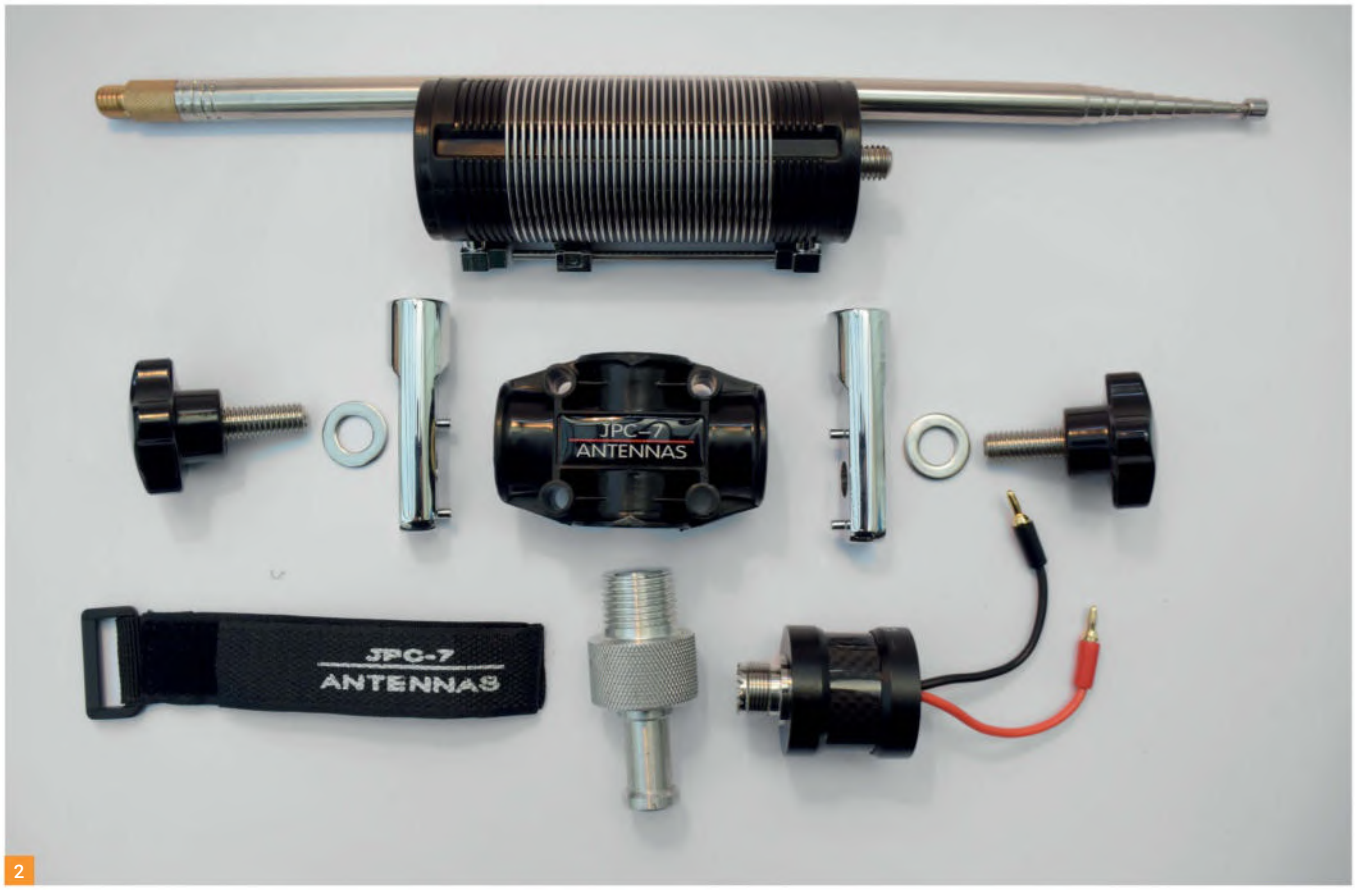

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Photo 1: JPC-7 complete kit.
Photo 2: JPC-12 to JPC-7 upgrade kit from China.
Photo 3: Set up as a Horizontal Dipole.
Photo 4: Unique Dipole Centre and balun.
Photo 5: Painters pole ready for modification.
Photo 6: Arranged as a V Dipole.
Photo 7: Dipole + 4m tripod 'Ready for take-off!'

varied with location and was sometimes fiddly to achieve as a horizontal dipole.

That said, a dipole has the benefit of being much less dependent on surrounding ground conditions and has no requirement for counterpoises or radials. While it's not technically correct to say that all of the dipole's RF is 'in the air', I'm sure you get my meaning.

A good place to site this kind of /P antenna is where the land parallel to the elements falls away sharply in the wanted direction. Using this technique where the antenna 'sees' more free space has, from time to time, produced some amazing QRP results on HF.


3

Final Thoughts

At present the UK offerings fall into two distinct choices, the vertical or the dipole.

Looking back on my experiences with this product over the months I now think that there is scope for UK providers to think more in terms of a mix and match system. That is, purchase the basic kit of your choice and choose additional bits and pieces, as required. Certainly, owners of the vertical would benefit from a cost-effective initial purchase and the option to purchase an upgrade kit as and when funds permit, which gives the best of both worlds.

For example, it was a revelation to discover that the ground stake supplied only with the JPC-12 vertical can be fitted to one end of the JPC-7 dipole T piece, thereby instantly creating a mount for a vertical.

There is a third socket on top of the T piece and provision to connect the balun or the vertical base unit. This makes an elevated ground plane practical and something else to explore. I'm looking forward to experimenting with 20-6m in this configuration and will be making up suitable radial kits.

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For JPC-12 users the option to purchase additional alloy tubes and raise the vertical's current point is another idea. An optional coil, added to the vertical kit would double the inductance to around 47**μ**H for lower bands such as 60m and 80m.

Choose to purchase the matching tripod or fabricate your own. The available professional grade tripod is impressive and definitely well worth the money on its own. It has a multitude of other uses, even if you never own either of the JPC antennas. It's reasonably light in weight to transport, one of the best around. It has wing nuts to lock the sections. The antenna can be rotated and the sections are air cushioned, so won't trap your hand when telescoping. Speaking from past and painful experience, an excellent safety feature.

Note: With the antenna generating a significant head load in a breeze I would not contemplate extending it without securing the tripod base and adding para cord guys. A guy kit maybe? Sometimes I also hang a weighted bag on the base for extra security.

As mentioned in Part 1, have a few reservations, principally longevity and weatherproofing. That said, these antennas cover a wide range of /P activity from lightweight QRP backpacking with the vertical, to country park style activity with either antenna from a car or caravan.

For me the two separate kits are a solid 4 stars for starters with the potential for more with a little ingenuity and imagination, as described.

UK pricing, at time of press taken from ML & S listing:

JPC-12 Stand-alone vertical, ***£199.96***.
JPC-7 Dipole + 4m tripod, ***£339.95.***

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Build Your Own Shack

Stuart Vanstone M0SGV offers a blow-by-blow account of how he built a new outdoor shack from scratch.

In the words of the late, great **Ernie Wise**, *"I have a long felt want"*. I have been interested in radio and electronics since the about the age of eight (1957) and since then I have been messing around with all sorts of projects, from crystal sets to hi-fi amps and lots in between. These projects all have one thing in common, they need somewhere to be worked on. In the past I have used the good old kitchen table, dining room table, bedroom floor, corner of the shed, a walk-in cupboard and my last shack was in the corner of a spare bedroom. What I really wanted was a space I could call my own.

Outdoors or Indoors?

I became aware of the existence of shacks in the late 1950s when introduced to *Practical Wireless* and initially I assumed they were all out of the house structures but I soon found out that they could be indoors as well. My journey to my home built outside shack began a few years back when I retired and joined the South Dorset Radio Society, my local radio club. I visited a couple of nice, well-appointed outdoor shacks but the killer blow came for me when I saw a double-glazed and uPVC summer house being used as a home for amateur radio. Now I really wanted my own outdoor shack.

I began the design process by selecting a suitable site in the garden, then I obtained planning permission from the XYL with the proviso I don't damage the two trees, which will be to the front and side when built. To decide on the measurements for the base I tied back the trees and measured as close as I thought I could get away with without causing any damage. There is a metal fence behind. I allowed a 25cm gap to this and it can be seen in **Fig. 1** as can one of the trees. I was also limited in length by the garage building at the far end of the base; I needed to preserve access to the shed at the far left for the lawnmower and other garden tools. Even with these restrictions I came up with a base size of 2.2 x 3.5 metres. This I estimated would give me an internal dimension of 3.4 x 2.1m. This was enough to give me two benches along the length made from 65cm wide kitchen worktop, with one shorter to allow for the door and a walkway between the two of about 80cm. The height was easy to work out. I measured the height of a standard double-glazed uPVC door available from the big DIY chains and added 10cm to it. This figure was the height at its lowest point. I also thought a pitch roof would be a nice feature so I worked out the pitch angle from photos of commercially available sheds and used that. Looking at it from the front, the door would have to go to the left, because of the plum tree, which I must not damage. I decided that I would have just one small window next to the door. It would have been nice to have lots of windows but I wanted to have as much wall space as possible for electrical sockets, trunking for antenna cables, component storage, bookshelves, test gear and of course radios. The other design considerations were that I wanted it to be made from timber with the exterior clad with shiplap. This was on the advice of the timber supplier who said that shiplap was more durable than tongue and groove planks. The floor joists were to be 2x4 inch and the wall framework 2x3 inch. These would all be treated for outdoor use. It should also have a wooden floor using 18mm tongue-and-groove OSB board, glass fibre roof, again using the 18mm OSB tongue-and-groove, fully insulated all around with 5cm polystyrene slabs and lined with 11mm thick OSB boards. Another design consideration was the length that the timber is available in. For instance the 2x4 inch joists for the base I could get in 2.4m lengths for the width and 3.8m lengths for the length. Doing this keeps the offcuts down to a minimum. Strange that it is still called 2x4 inch but the length is in metres? I also wanted it to be solidly built. Practically every commercially available shed I looked at moved and wobbled in some way when walked into. I did consider getting a shed custom made but they were very expensive for the size I wanted and I don't think the quality would be any better.

The Build

I realised that I would need some sort of footing for the base to stand on. Most shed footings on the internet showed the sheds just resting on blocks or bricks but I thought a proper foundation would be a good idea. I had some bricks and odd bits of Portland stone knocking around for the above ground work but I needed concrete for the foundation trench, which was about 15cm deep. Not being in the full flush of youth and always looking for an easy way out I tried a small section of the trench with some ready mixed post fixing cement that you water the hole first then pour in the dry mix and water over the top. It worked a


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Fig. 1: Squeezing a base into the available space. Fig. 2: The rear was built horizontally … Fig. 3: … and then braced in its final position. Fig. 4: The completed cladding with gaps for door and window. Fig. 5: Composite beam for roof support.

treat and within an hour it was as hard as nails. The rest of the foundation was treated in the same way and was soon ready for the bricks and stone to go on. This was achieved with ready-mix mortar by just adding water and mixing in a bucket while being careful to build level and to the correct size. The bricks were used to level the foundation as there is around a 20cm slope in the lawn along the length of the base. I laid a couple of joists across the bricks and stood on them and there was some bouncing so I decided to put two extra supports under the joists with blocks and cement so that every floor joist was supported every 70cm or so, making them resistant to bowing.

I found a local supplier on the internet for the timber needed. I did a rough calculation of what I would need for the first stages and ordered enough to do the base, the back wall and start the rest of the framework. The delivery time was only around three days and it was free so it was easy to get more when required. I asked the question whether to use nails or screws and the definite answer came back, screws. So, I ordered some 125mm for the base and for the framework and some 50mm ones for the shiplap and for the OSB boards. Your friend when using screws is the cordless drill and make sure you have a selection of replacement screwdriver bits and a bit holder that has a shroud that pulls down around the screw and keeps it upright, really handy when driving a screw with just one hand. Altogether I used around 350 x 125mm screws and 1500 x 50mm screws and if bought in bulk, they are not as expensive as you might expect.

A few days after the bricks were laid on the foundation the base joists were cut. I used an old bench mounting electric chop saw, which when clamped to a fold up portable work stand allowed quick and reasonably accurate cuts. I used a sawhorse to support the other end of the timber and this setup made short work of cutting the timber to length, not just the bigger timbers but the shiplap as well. With the base cut and screwed together the back wall was started. The problem was the metal fence restricted access to the back so it was built in the horizontal position, **Fig. 2**, then lifted into position and braced to hold it vertically, **Fig. 3**. It was easy then to build up the framework for the sides and front and clad with the shiplap in its final position, **Fig. 4** shows the completed cladding with the openings left for the door and the window. These openings are recommended to be 10mm bigger. For the shiplap on the front and sides I was careful to keep it all in line so the planks on the side line up with the planks on the front. This is not important for the back wall because it can't be seen easily. After I had built the back wall I was looking on the internet for building tips when I saw that it is recommended that a semi-permeable membrane, as used in roofing, is inserted between the framework and the shiplap. This is to stop any rain that may be forced past the shiplap getting into the internal structure. So, I included this in the other walls but I had to retrofit onto the back wall by just tacking it on inside before the insulation was fitted.

Now I could start on the roof. I made up a com-


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8


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posite beam for the ridge with 2x4 inch and 2x3 inch timbers as in **Fig. 5**, measured to the width of the shack, and these were glued and screwed together. It is important to measure the width along the side walls because there may be bowing in the timbers, meaning the centre measurement is different from the side measurement. I measured both sides and they were within 5mm of each other so I used this for the length of the roof centre beam. I cut two sheets of 18swg steel four inches wide by five inches long and drilled eight holes in each one to line up with the beam when offered up to the end. These were then screwed on the ends of the beam with 50mm long screws. Six holes were drilled in the steel either side of the 2x3 inch beam and the beam offered up to its position in the roof; the plate was then screwed to the wall framework at the peak. The two top corners were then hammered over, drilled and screwed to the top of the wall framework. Once fixed I swung my full weight on it and it showed no sign of movement whatsoever. I then cut five rafters for each side and set them equally spaced across the width. In **Fig. 6** they can be seen resting on a support on the side panel and then on the 2x4 inch part of the cross-composite beam. The roof boards were put in position and screwed down. Work had to stop then due to rain, which was on and off for around three weeks. At last the rain eased off and now I could get the roof sealed with fibreglass and resin. I found from the internet there were trims available to edge the roof with so I ordered what I thought I would need and with the help of my son (my XYL had banned me from climbing on top of the roof) we fitted the trims and with me mixing the resin and cutting the matting, my son laid the matting and applied the resin. When this was complete and the resin cured, a topcoat was mixed and applied and the finished roof looked perfect. It wasn't long before we had a deluge of rain and the roof was, I am pleased to report, totally watertight. There are plenty of tutorials for this type of roofing on the internet and the suppliers' websites for the glass and resin were also found to have a lot of advice. **Fig. 7** shows the end result and also the different trims used on the sides, ends and middle. The trims get incorporated under the matting and really finish off the look of the roof as well as the function.

The Finishing Touches

I fitted the door and window next. They were both standard sizes available from the big DIY stores. The window is quite small and has a top opener so I can still have a bit of ventilation if the door is shut. The door is outside opening but I didn't see any outside opening ones for sale so I got a standard inside opening one and fitted it the 'wrong way round' so it opens outward. Just be careful that you order the correct left or right opening for your situation. Remove the door from its frame before fitting. My door and window came with the glass but it was not fitted. They are a lot lighter this way and the glass is easily fitted after frames are in position. The frames are quite easily fitted by drilling the frame and screwing it to the opening with appropriate screws. Make sure there is an equal gap around the aperture. For the door I used four screws each side and a couple up the top, and for the window just three each side with one on the top and bottom. Then the gap is filled with expanding foam. Once cured and set it can trimmed flush to the frames with a Stanley knife. The glass is positioned in the frame with spacers to allow a gap all around, then held in place with the glazing bars supplied. The outside trim can now be fitted to the door and window. It is just a strip of uPVC about 25mm wide, and with the corner angles cut it was nailed in position. The inside trim is going to be wood strip so that will be done after the wall linings are complete.


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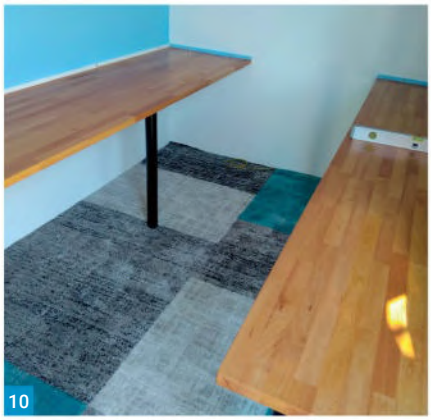
The Inside

Now the structure is totally watertight I could get to work on the inside. Firstly, I wanted to put some earth rods under the floor to give me a separate earth system for experimenting with later. I managed to get three quite hefty rods that were at sale price. So, these were driven in between the floor joists, linked together and a wire coming up into the shack. I don't know much about earth systems (yet) but it is there if I need it. The floor, wall and ceiling linings were then fitted. The floor went down first and this was 18mm tongue and groove OSB boarding. I wedged some 50mm polystyrene insulation between the joists first. I found



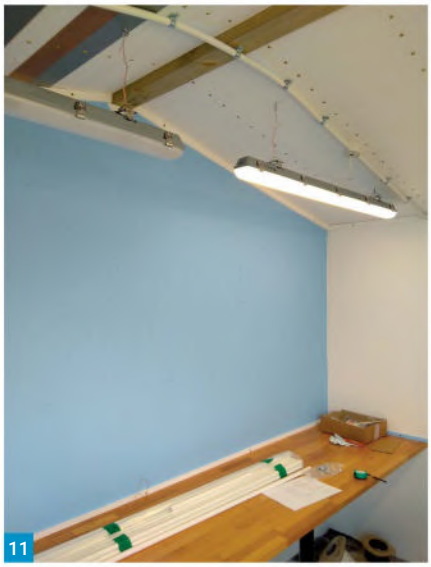


Fig. 6: Rafters in place.
Fig. 7: With the roof in place.
Fig. 8: The end wall half finished.
Fig. 9: The ceiling timbers screwed into place (and resistor colour-coded!).
Fig. 10: Carpeted and bench tops in place.
Fig. 11: An idea of the internal decor.
Fig. 12: Cable entry, seen above the trunking.
Fig. 13: Steps for access.
Fig. 14: The finished product.

if you cut it tight, it stays in position easily. I tried cutting the polystyrene with a hot knife, not very successful and I found the best way was with a hand saw even if it is a bit messy.

The 50mm polystyrene insulation was fitted in the walls and the 11mm OSB wall linings were cut and screwed in place. **Fig. 8** shows the end wall half done. I did have a problem with the insulation on the walls. The timber that made the wall frames was 3x2 inch but as with most timbers of this type the size is nominal and varied quite a bit, and it was about 7mm too shallow to accommodate the insulation. After a bit of head scratching I fitted a 10mm wood strip to all of the wall frame timbers, which gave enough depth for the polystyrene to fit in. The batons were around 20mm wide so they didn't cover the full width of the wall struts but I used 50mm screws for the lining so even if the screw missed the thin baton, it would hit the frame strut. I didn't have this problem with the ceiling because the timbers were mounted edge-on so the cavity produced was just under three inches deep, plenty of room for the insulation.

For the ceiling I used tongue-and-groove decorative wooden cladding to cover the polystyrene. This can be fitted one plank at a time. It is only about 125mm wide by 10mm thick so even a 2m length is very light, compared with a sheet of OSB board, which I know I wouldn't be able to lift into position without at least two helpers. To secure the ceiling I used screws with screw caps to leave a good finish. It did need drilling first to stop the screws from splitting the timber, **Fig. 9**. As I was fitting the ceiling I thought it would be nice to incorporate the resistor colour code. I have been playing with resistors since I was a boy so they have been a big part of my life, both at work and at home. It has surprised me that a lot of radio amateurs who have seen it don't recognise it. With the walls and ceiling complete the trims were fitted to the door and window. I used a timber trim rather than a plastic one. I also fitted a trim around where the wall met the ceiling to cover any gaps. To finish the interior I painted with sort of seaside colours of light blue for the longer walls and white for the ends and the rest of the ceiling. The internet was very unsure as to what paint to use with OSB boards so I went with a matt emulsion and I have to say it covers well and looks good. **Fig. 11** gives a good overall impression of the decor.

My next task was to make the space usable. I wanted to put down some sort of carpet and I managed to buy a rug that was about two inches too big in length and width. So, I laid it down in position and trimmed the surplus off with a pair of large scissors, and it now fits perfectly, with the trimmed edges the furthest away from the door and totally un-noticeable.

Bench tops were next on my list. I have used kitchen worktops for benches before and they seem ideal to me. A search online revealed that there were not that many at 3.5m or over that I would need to fit the longest wall. I plumped for some natural wood tops made with segments of beech wood glued together, one at 3m and one at 4m. When delivered the delivery men threw them around like balsa wood. I had prepared a spot outside to cover them until they could be installed. When the delivery men left, I foolishly tried to lift the shortest one and failed miserably. I had to get my son and the biggest grandson over to help with the installation. The top rests

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on a frame of 2x3 inch that was screwed to the wall. The worktop was cut to size with a handheld circular saw and the tops placed in position and screwed down. They were supported in the middle with legs made for kitchen installations. I did all of the cutting of the sheet material, worktop, roof and floorboards and the wall linings with a handheld circular saw and to get straight cuts I clamped a baton of wood to the sheet so that when the saw was pushed along it was guided straight by the baton. Worked a charm. All that was left to do was the finish of the work top. Danish Oil seems to be the favourite for this and it went on easily, while so far it seems impervious to hot cups of tea (I have not yet tried it with a soldering iron). **Fig. 10** shows the carpet with the bench tops supported at the front by the black legs. They are easily removable if I need to replace the carpet.

Power

A shack is no good without electricity. This was the next job on the list. I had thought about the problem of bringing in the cables, both power and antenna, and my solution was to cut an aperture into the wall and cover the hole on the outside with an aluminium shroud made so that it extends past the hole by a few inches giving protection from ingress of driving rain. The inside hole can be seen in **Fig. 12** just above the trunking on the end wall. The big black cable is the 240V mains input cable. I bought a garage mains box that has an input RCD with lighting and socket RCDs. I fitted the lights first, I have three LED-type strip lights, two 4ft ones over the long bench and one 5ft over the short bench. I have switched them individually so depending what I am doing I can just have the minimum number on. I decided I didn't want cables tacked all over the shack so I have used electrical conduit throughout, see Fig. 11 again. I also ran a wire and installed a switch for an outside light, essential for the impending winter months. Now for the sockets, again with conduit but I wanted to use the white plastic socket backs and they don't have any knockout holes for the conduit adaptors to screw into so I had to drill them all. There are a total of 29 double 13 amp switched sockets (probably all in the wrong place) and most of the backing boxes have two 20mm holes drilled with a step-type drill. The alternative would be to use the steel type boxes where you knock out the pre-punched holes but these are more expensive and don't look as good in my opinion. I wired the sockets in a ring main configuration and tested them all with a socket tester and they all seem to pass muster.

With the wiring done I decided to fit some trunking around to house the antenna cables. I managed get some 75mm trunking online and fitted it around where I thought I may need an antenna. I bought the wrong fittings for it but I modified the trunking with a 6mm hole for the fixing and the whole thing went up very fast. Fig. 12 is the now completed interior, although I do still have one more job to do and that is to make a cover for the cable aperture before the ice-cold winds of winter hit us. It is now waterproof but not draughtproof.

Last of all I need steps to be able to get in and out safely and easily. I have made one brick and paving slab step, and the rest made in wood, see **Fig. 13**. I made them fairly shallow so when I am even older than now I can still manage them OK.

At last the work is complete. **Fig. 14** is the finished product. It's warm and draught free, it's nice and bright inside and acoustically very pleasant. It took around eight months to complete, and all I have to do now is move in, but that's another story. **PW**

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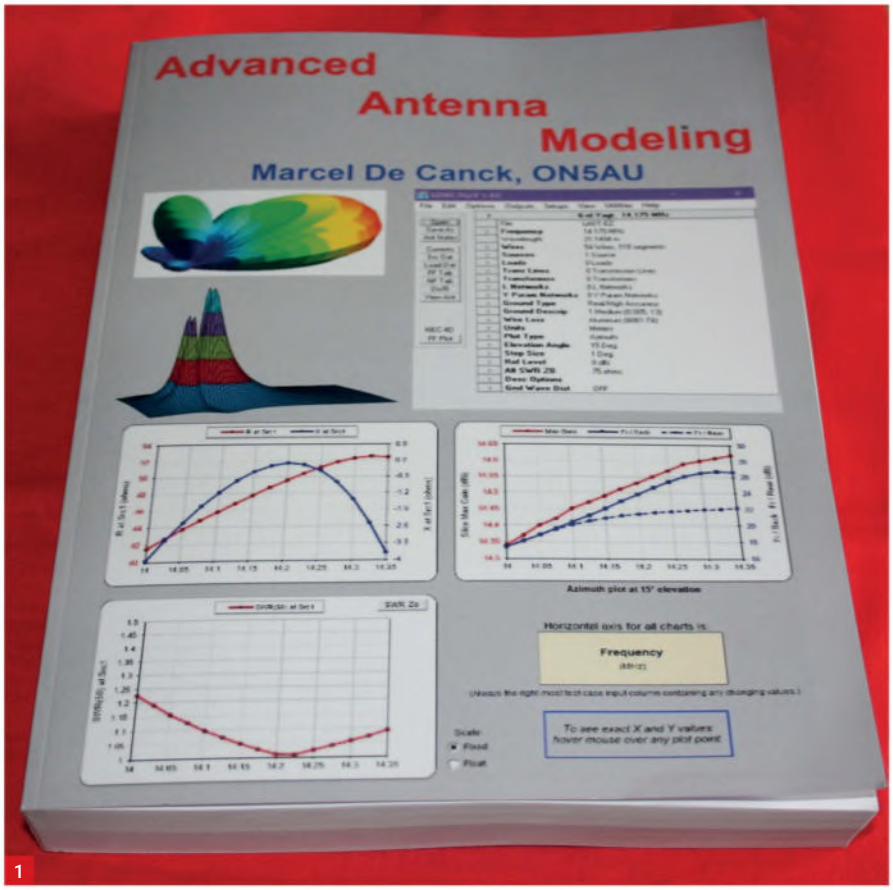

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Antenna Book, Feedback and News

Keith Rawlings G4MIU has a full column, starting with a look at a very useful antenna book.

Although I had not originally initially intended it, this month has an antenna modelling theme.

I wanted to review **Marcel ON5AU's** latest book *Practical Antenna Models Volume 3* in this issue and then cover some more VNA topics, but with some reader feedback and a news update, antenna modelling seems to have taken over!

Practical Antenna Models Volume 3

Readers may well recall that in previous issues of *PW* I have reported on the series of books written by Marcel ON5AU, which cover the fascinating subject of antenna modelling using the software applications EZNEC and AutoEZ.

Marcel has now released Volume 3 of '*Practical Antenna Models*', which covers the popular subject of Loop Antennas.

Firstly, though, I will briefly run over Marcel's previous antenna modelling books I have looked at.

The first that came to my attention was entitled '*Advanced Antenna Modelling*'. Despite its title I found that the book, **Fig. 1**, actually starts with the very basics of getting going with EZNEC, working up to some very advanced techniques, walking its reader through the various methods used in a series of detailed chapters.

EZNEC has a detailed and comprehensive 224-page user manual, which is free to download separately from the main EZNEC program. It methodically takes the reader from installing and running the software through building models, explaining how to use the many features of the software to build those models, and also using the inbuilt features to assess the design.

It also describes how the different calculating engines, NEC2-NEC4.2-NEC5, work and how they fit into EZNEC, explaining many of the differences between them.

Overall, the manual is well written and informative.

Advanced Antenna Modelling complements the manual with hundreds of practical examples and diagrams on 'how to do it' and what to look out for, and comes with dozens of downloadable files, including models applicable to the book and also many 'Extras' on antennas and modelling. Importantly it introduces the use of the powerful application AutoEZ used with EZNEC.

AutoEZ may then be used to program and automate EZNEC, enabling the user to run through many EZNEC tasks automatically and also introduces a number of features not available in EZNEC itself.

This book will give those new to EZNEC a good solid grounding (pun intended) into antenna modelling. The more experienced will also find many tips and techniques to get more out of the two applications and in my view is essential reading for anyone who wants to get the most out of EZNEC.

Following on from this book Marcel produced *Practical Antenna Models Volume 1*, which has chapters on Antenna Fundamentals and Dipoles.

Next came *Practical Antenna Models Volume 2* dealing, in the main, with modelling Verticals but also has details on modelling Towers and Matching Circuits.

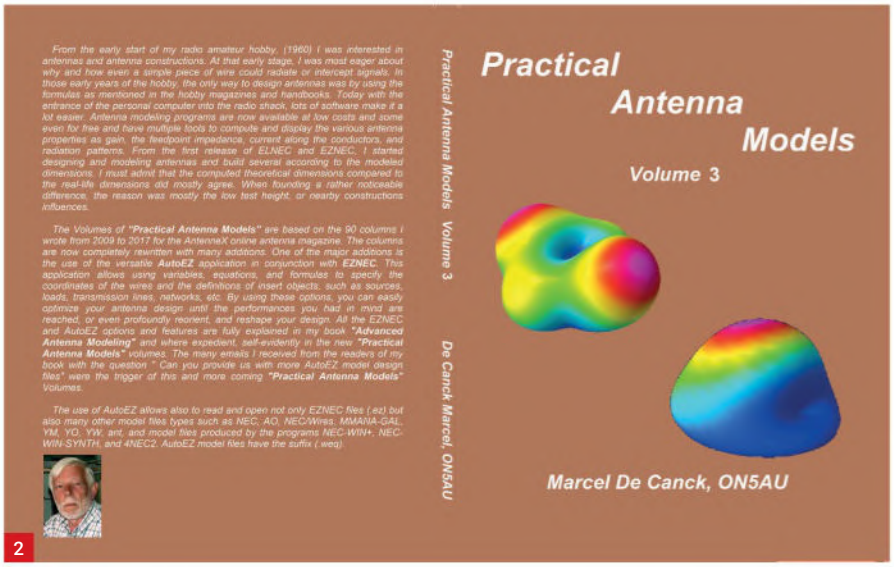
Marcel's latest book *Practical Antenna Models Volume 3*, **Fig. 2**, has now been published covering the ever-popular Loop Antenna and selected Matching Methods. Like the previous volumes, this book is full of information on how to correctly model antennas (in this case loops) using EZNEC and also programming AutoEZ to get the utmost out of EZNEC.

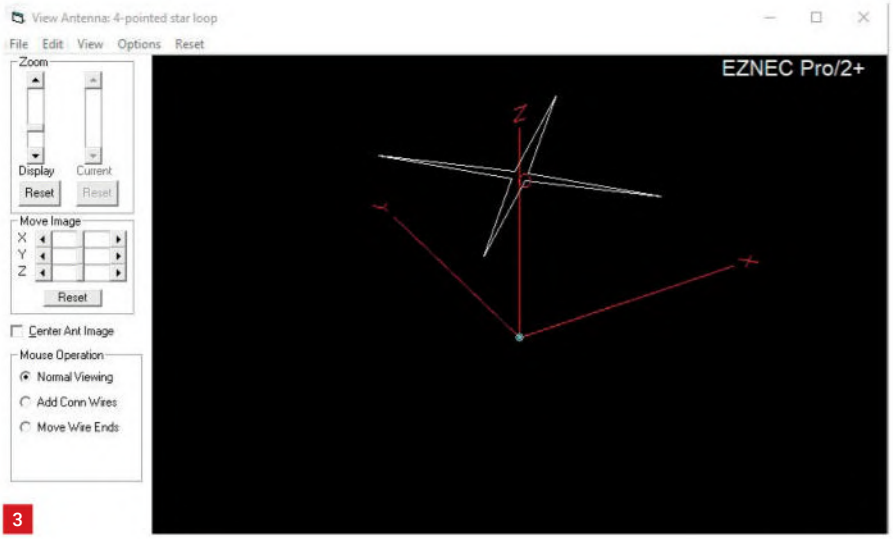
The previous volumes all have downloadable data to complement each chapter or 'Episode' and Vol 3 is no exception, having 410 EZNEC and AutoEZ model files ready to use. These ready built models allow the reader to get up and running straight away and also have the advantage that the model may be studied by the reader to see how it was built. Naturally these files may be edited and altered at will for experimentation or even adaptation for the reader's specific purposes.

Vol 3 starts off with a short preface and then introduction. In the introduction there is a useful comparison chart, courtesy of **Dan AC6LA**, which covers the features available in the different NEC versions.

Marcel deals with the different designs under a series of 'Episodes' as follows:

Chapter 4: Loop antennas
Episode 1: Square Loops
Episode 2: Delta Loops
Episode 3: More Delta Loops
Episode 4: Half Loops
Episode 5: Multi-band Delta Loops
Episode 6: Horizontally Orientated Loops
Episode 7: Star Shaped Loop
Episode 8: The IL-ZX Loop





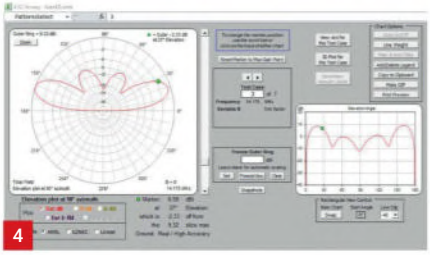


Fig. 1: Advanced Antenna Modelling cover (Marcel ON5AU). Fig. 2: Practical Antenna Models Volume 3 Cover (Marcel ON5AU). Fig. 3: EZNEC Antenna View of the Star Loop. Fig. 4: Combined AutoEZ View Showing Wires View Top Radiation Pattern Bottom. Fig. 5: AutoEZ Calculate Page for a Circular Magnetic Loop. Fig. 6: CocoaNEC Output views. Smith Left Impedance Right (Chen W7AY). Fig. 7: AN-SOF V8.0 Update Demonstrating Quick Access to Plots (AN-SOF).

Episode 9: The Hentenna
Episode 10: Magnetic Loops
Chapter 5, Episode 1: Some Matching Methods

There are also useful Tables, Conversions Data and an Index.

The book dives straight into the subject and in Episode 1 the two basic forms of loop are described, namely 'small loops' smaller than 0.2λ, which mainly respond to the Magnetic Field, and loops with a larger diameter that are often 1/2λ, 1λ, or 2λ in size.

In the first diagram of the Episode various loop shapes are displayed giving the reader an insight into the forms that loops may take and also the various feedpoints that are used to obtain either Horizontal or Vertical Polarisation. This gives the reader a good idea of the way loops may be implemented.

The first topic of discussion starts with Full-Wave loops, demonstrating the commonly used shapes and commonly used feedpoints. Further diagrams demonstrate the current distribution along the different shapes. This is useful towards understanding the operation of loops.

The book carries on in this vein throughout the differing loop types described and the information is backed up comprehensively with plots charts and diagrams.

What I have found interesting are the charts comparing loop types and their respective polar plots, gain and feedpoint impedances. For example, in Episode 7 'Star Shaped Loop' a standard square loop is compared to a loop formed into a star, **Fig. 3**. The star layout has the benefit of having a smaller footprint but, it would be imagined, with some adverse effect on the performance of the loop.

EZNEC runs indicate that on 7.1MHz at a height of 10m a star configuration is just 0.5dB down on a full-sized loop and with a slightly lower take off angle of 75° compared to 90° for the full loop and, with the possibility of better matching with figures of R±jX 60.8-0.15 compared to R±jX152-0.08 for the full loop and with a main pattern along its axis. In this case EZNEC would indicate that a star loop could be an efficient alternative to a square loop.

Fig. 4 demonstrates the 7.1MHz Star Loop being run in AutoEZ to display a polar plot on 14.175MHz.

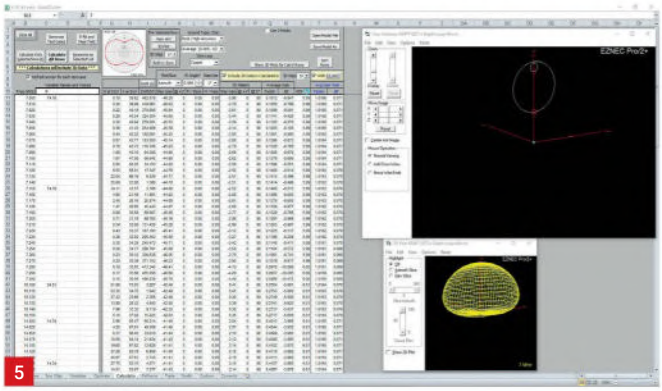
Episode 10 on Magnetic loops is of interest in that small loops can be a challenge to model in NEC-2, especially in circular form. Marcel describes how to build up a model and also describes the process using AutoEZ, which greatly eases the task. Indeed, throughout the book there are many examples on how AutoEZ is programmed to improve and enhance models simulated within EZNEC, **Fig. 5**.

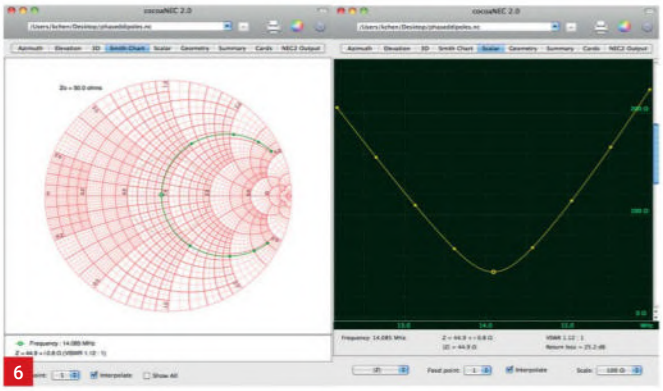
At 220 pages, packed with diagrams, tables and text this volume is another important book for the serious EZNEC user.

https://tinyurl.com/mrd6jpd5

Feedback

I received an email from **Elwood WB0OEW** who, after reading my introductory column in January, wanted to let me know how impressed he is with CocoaNEC, which is an antenna modelling program for the Mac operating system. Elwood describes it as a 'Front End' for the NEC-2 and NEC-4.2 calculating engines.





He adds that: *"In addition to everything all the other programs have, this one stands out because one creates models by writing C programs. There are functions to place wires, loads, sources etc. but since the coordinates are all C variables, their positions and properties can be computed using expressions, conditionals, trig calls, loops, arrays and all the other usual tools of a bona fide programming environment. Even executing the NEC engine itself is just a function call, so one can write arbitrary optimizations, generate tables of any parameters against any others and so on and on. I've used all the other modelling programs out there and nothing comes close to CocoaNEC."*

Not being a Mac user I have no way of evaluating CocoaNEC so I am grateful to Elwood for this description.

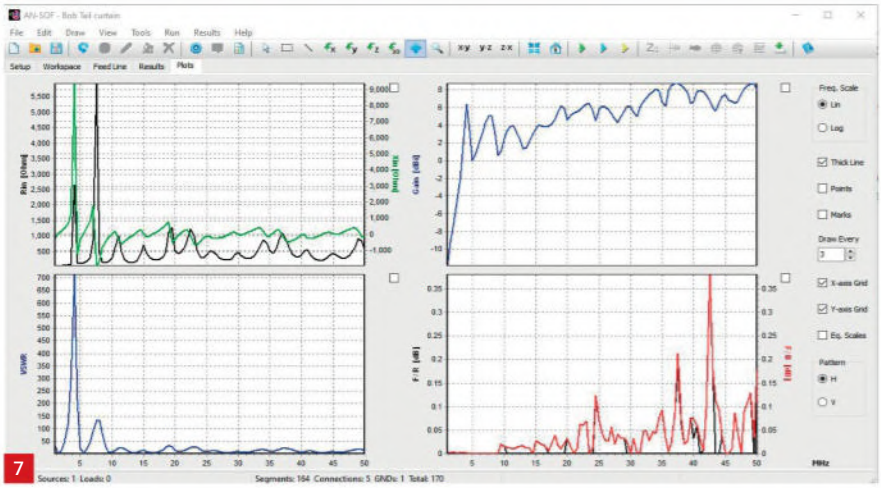
CocoaNEC is one of a number of Mac applications written by **Chen W7AY**, mainly because he was unable to find other alternatives to the software he needed to run on the Mac system. I understand Chen was a software engineer for Apple.

He explains: *"Not finding a native antenna design program for MacOS X, I had started the original CocoaNEC (1.0) project back in 2002 as a Cocoa GUI around the NEC-2 program. The FORTRAN code for NEC-2 was originally translated automatically into C with the f2c program. The old CocoaNEC had used an interpreter (an earlier version of NC) as the sole means of describing antenna geometry".*

Researching a bit more I found that CocoaNEC can accept data input via the familiar tabular/spreadsheet format very much in the same way as other applications or, as Elwood describes above, it can be 'programmed' using C.

W7AY describes this thus: *"If you are fluent with computer programming, you might find the programming method to be both a more natural way to describe an antenna and a faster way to generate the models. The 'programming' method also permits you to write automatic optimizers, whereas you'd have to manually manipulate the input data when using the 'spreadsheet' method".*

Using this method it is a powerful way to generate and asses models. The data output views from CocoaNEC are represented in a similar way to the well-known windows modelling applications used by many amateurs. There are graphical views for displaying predicted Polar Plots, SWR and Smith Chart, and antenna currents can be displayed in colour along the elements of a model in a similar way to what AN-SOF can do. There are options for generating radials and the user can select pre-set ground constants or enter their own Conductivity and Dielectric Constant values. Users may also optimise their designs.



CocoaNEC runs on the NEC2 engine and is completely free, **Fig. 6**. For the keen Mac antenna modeller it will also run NEC-4.2. There is no information I can find of it running NEC-5. Full details including manuals may be found on the website link below:

https://tinyurl.com/yeyrph8t

My thanks to Elwood for his email and if any other readers use CocoaNEC, please get in touch and let me know.

Staying with the January issue, in my description of EZNEC I should also have made it clear that the software will also run the external NEC-4.2 engine as well as NEC-5 and NEC-2. The previous Pro4 version ran the NEC-4 engine internally, making calculations faster. The NEC-4.2 licence is still available from LLNL but it is somewhat more expensive than NEC-5.

News

I have been informed that AN-SOF Antenna Simulation have released a major update to their software, which is now running at V8.0. Improvements are:

- The different parts of **tapered wires** are identified with **alternating colours** to better distinguish the wires of which they are composed.
- In the **Results** tab click on a **column header** to immediately display a plot.
- New **3D Rotation** button on the AN-3D pattern toolbar to easily rotate the view by moving the mouse.
- Combo-boxes now have 'memory'. Select the frequency or angles to display polar diagrams and the next time you do so the same values will remain.
- The **Resistivity** can also be set when entering linear wires via main menu > Edit > Tabular Input.
- Users who use the **comma** as the decimal symbol can now import NEC files that use the period as the decimal separator. Go to Tools > Preferences > Options and check the option 'The comma is set as the decimal symbol'.
- New **Preferences** window in **AN-Smith** to change the display of graphics in the Smith chart (line width, fonts, background, points).
- New **Plots** tab in the work area where we can quickly see the input impedance, VSWR, gain, Front-to-Rear, and Front-to-Back ratios as a function of frequency, with various visualisation controls (grids, points, markers, etc.), **Fig. 7**.

Among these improvements, some bugs reported by users have been fixed.

https://antennasimulator.com/

See you all next month! **PW**

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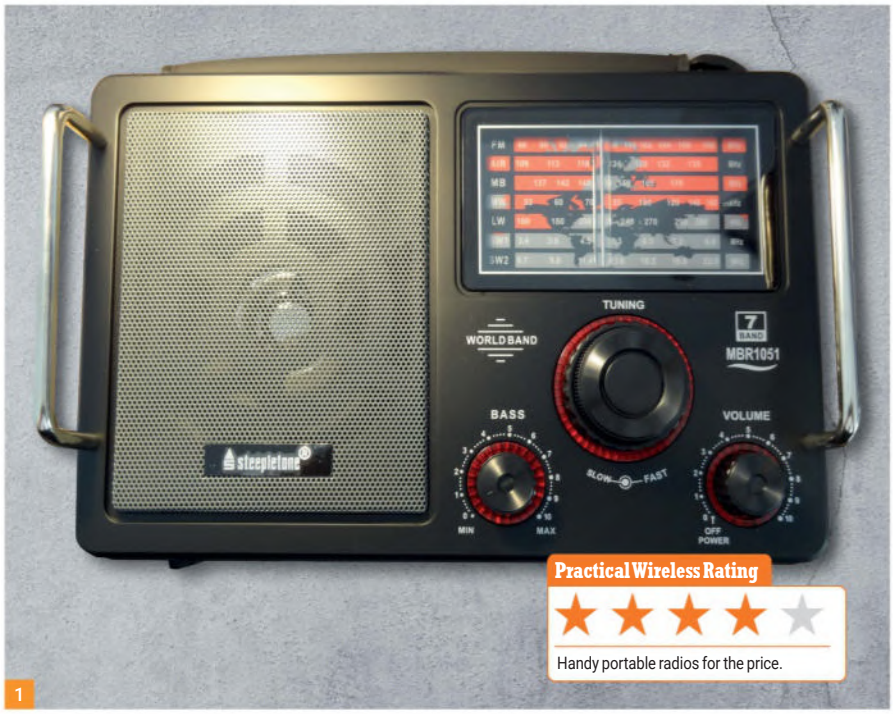

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The Steepletone MBR1051 & SAB2019

Georg Wiessala takes a closer look at two new beginner's level, low-cost, travel-friendly world band radios from the traditional makers Steepletone, which are now available on the UK market.

It was nice to be contacted by Moonraker recently, with the news that they were, once again, selling Steepletone world band radios, .
www.steepletone.co.uk/radios
https://tinyurl.com/bddhjb8t

Steepletone has a long and distinguished history as a manufacturer of world receivers. Our friends at Moonraker have worked with the firm since approximately the 1970s, and the brand is well-established – remember the Steepletone MBR7 from the 1980s? A Steepletone staple that one was.
www.youtube.com/watch?v=S_OOPJRy2E8

The compact and robust Steepletone radios are particularly popular, so I hear, with some DXers and travellers. Previous models have been well received, not least on account of their entry-level target market and correspondingly very reasonable price.
https://tinyurl.com/yr2uezdp

The Steepletone MBR1051

At just under £50, the MBR1051, **Fig. 1**, is an attractive proposition, in particular, if you are looking for a mobile radio, bedside radio or secondary rudimentary propagation checking and listening device.
https://tinyurl.com/yr2uezdp

The manual for this radio is available online, and this portable comes in a silver or black colour scheme.

The MBR1051 is a basic seven-band receiver covering Long Wave (LW: 160-300kHz), Medium Wave (MW: 530-1600kHz), FM (88-108MHz), and two SW bands (SW 1: 3400-8000kHz and SW 2: 8700-22000kHz; **Fig. 2**).

The unit also offers VHF coverage for Marine Band ('MB': 137-176MHz) and Air Band ('AIR': 109-135MHz).

It is powered by four 'D' (IEC R20; 1.5V) batteries or, alternatively, from the supplied power cable (DC in 6V, fused at 3A). There is a secondary 6V DC in, on the left-hand side of the chassis, as well as a headphones output. The battery compartment is found at the back of the radio, as would be expected.

This portable radio measures 20 x 27 x 9cm and sports two metal carry handles on the front, plus a padded carrier strap on top. In terms of overall form factor and design, the MBR1051 will look quite familiar to those of you who have Tecsun radios.

The operation could not be easier, and the basic controls are kept to a minimum. The instruction manual is in clear English (*Version / 19*). There are three large knobs at the front, for tuning (lower part for rough/fast, upper part for fine/slow), a bass control dial and a volume selector. The band you wish to listen to can be selected on the left-hand side of the radio, as shown in **Fig. 3**.

The antenna is a standard telescopic model, consisting of six sections, extending to 1.07m. There is no input for an external antenna (but see below).

In Use

The Steepletone MBR1051 has a large enough loudspeaker (4.4W) to sound fine, and room-filling, on FM. If required, you can boost the bass for a fuller sound. I found that I had to do this all the time, in order to avoid the radio sounding a bit 'tinny'. The bass-boost control makes an appreciable difference to how I perceived the sound, but everyone's hearing is different. On FM I found that when used outside, in a German-beer-tin-fuelled and noisy garden party environment, the radio was not drowned out by speech and background noise.

In terms of Airband and Marine Band coverage, the set offered a less-than-impressive selectivity and there was significant 'bleed-though' from large FM broadcast stations. There is no squelch and no scan function.

The same goes for Marine Band coverage; the review set I had been sent, at least, did not perform well on Airband or Marine. I'm afraid I did not resolve any transmissions.

But this is not what you would buy this for, anyway. Switching to MW, the in-built MWQ ferrite bar antenna brought in some of the stronger MW stations during the day, more outdoors and overnight. Tuning, even with the two-stage knob, is not fine enough to my taste, on account of the mechanics of the knobs.

For LW, the manual stresses that you can listen to the Cricket (on 198kHz) easily, and this is true. This makes a good takeaway sports radio for the weekend and it is robust enough to withstand the odd tackle, drop and shuffle in the queue to the stadium.

On Short Wave, with the inbuilt telescopic, I found some of the daytime SW broadcasters, such as Voice of Turkey and RRI, came in well but clearly, this is not a 'DX machine'. The situation was better naturally at night, when I could receive around a dozen or so stations easily, using the bass boost and moving the radio around a bit. The only way to connect an external antenna to the

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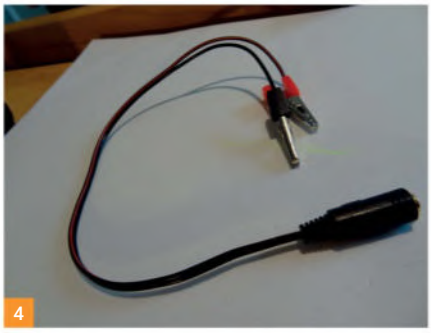

Fig. 1: The front of the (larger) Steepletone MBR1051. Fig. 2: The frequency coverage offered by the Steepletone MBR1051. Fig. 3: The simple band controls on the side of the Steepletone MBR1051. Fig. 4: A external adapter for a telescopic antenna. This may improve reception at times. Fig. 5: The Moonraker GA450 or a similar small loop can bring some signal gain. Fig. 6: The Steepletone SAB2019 and travel pouch. Fig. 7: The front of the Steepletone SAB2019. Fig. 8: Deploy a mobile phone stand to get the telescopic antenna into a vertical position and for additional stability. Fig. 9: A small active loudspeaker will improve the sound considerably. This is the Sony SRS-XB12.

MBR1051 was through a reception clamp, **Fig. 4**. This led to a marked improvement in the number of signals resolved, especially if you use this radio with an antenna such as the Moonraker GA450 – this would make for a rudimentary mobile setup, **Fig. 5**.

https://tinyurl.com/42jz2ses

Summary

The Steepletone MBR1051 Seven-Band (FM/AIR/MB/MW/LW/SW1-2) Receiver offers build quality and performance (just about) adequate to its below-£50 price point. Forget about the Air and Marine Band gimmicks and enjoy the good FM performance and satisfactory sound.

This would be reasonably adequate as a basic 'beginner's unit', secondary radio for out and about fishing or an introduction to HF listening, maybe also for younger hobbyists. However, I feel that you might soon wish to move up to something else once you catch the' HF bug'.

The main drawbacks for me were the sensitivity of the tuning knobs, the lack of light for the frequency scale and the missing external antenna input.

All in all, the MBR1051 can be recommended – if you are aware of the radio's limits – and, perhaps, with the use of some judiciously-chosen accessories.

The Steepletone SAB2019

The smaller radio reviewed here was the Steepletone SAB2019 model, **Figs. 6** and **7**. This set receives FM, MW, SW, and Airband (but not Long Wave). The small radio measures 140 x 88 x 26mm, and it is very lightweight, just 175g (246g with batteries).

Reception-wise, FM ranges from 76-108MHz, MW from 522-1620kHz, SW from 2300-22600kHz (in 5kHz steps), and Airband from 118 to 138MHz.

https://tinyurl.com/2p88d3bv

The set is powered by DC 4.5V/300mA or three 1.5V batteries (AA/R6) and can store, altogether, up to 120 stations, which is very useful. It has other convenient features, such as direct frequency entry, search, scan, lock, timer, sleep, store, and other functions. The bandswitch buttons are by band, or (on Short Wave) metre band, within its predetermined range (see above).

The design of the front will, for some, be a little reminiscent of the new Tecsun range of (slightly larger) world band receivers (e.g. the PL330). The receiver comes with its own travel pouch.

The telescopic antenna, at 540mm, is on the short side. It is not possible to get the telescopic rod into a fully vertical position when the radio is operated on its support frame. The set is prone to falling over easily when standing upright, due to the small surface area at the bottom and the metal antenna's weight. However, this can easily be compensated for by using it on a mobile phone stand or similar device, **Fig. 8**.

Most users will want to carry this radio around with them anyway, it fits easily in a jacket pocket or similar.

In my opinion, not everyone will easily get used to there being (possibly for reasons of stability) a kind of plastic cover over the top of the multi-function/tuning knob, as this restricts access to the flat side of the latter. But this is a minor design niggle. On the whole, this small set has all the features you might expect from a receiver in this price range (£39.95) and is very intuitive to use.

The SAB2019 in Practice

During my various travels, I found the SAB2019 easy and ergonomic to use. Volume levels are sufficiently spaced and stand up very well to significant background noise indoors and outdoors; the volume is definitely enough for inside your shack. Moreover, the SAB2019 portable provides a reasonable sound through its small loudspeaker – good enough for me to enjoy the *Neujahrskonzert* from Vienna on BBC Radio 3 as I write this. You can, naturally, plug in your ear- or headphones and listen in stereo.

For most users, this will be more than good enough. Alternatively, a small active speaker, wired to the headphones-out (**Fig. 9**; the Sony SRS-XB12) will make this a more enjoyable, more bass-driven, listening experience for both music and voice, at home or on your travels.

In terms of performance, I think that this radio will provide you with what you need for a nifty travel receiver with a small form factor. The Airband coverage offers some extra interest when you are at the airport, waiting for your plane. If you want more, though, you'll need a dedicated airband scanner.

On FM, I think most potential users will be happy with this receiver; consider some accessories if you want to. For HF, the same applies as above. There is no external antenna input, but you could try a modest long wire, the GA 450 (cf. above) or a similar device, in order to tease out some receive performance improvement.

Summary

Overall, this low-cost portable radio offers a range of features and functionalities that make it attractive to the mobile or holiday radio user. I liked the form factor, sound and direct frequency entry, and its performance was commensurate with its price. A few more thoughts might have gone into ergonomics and design, and LW and SSB might have been included but, in all, there is really very little to argue about here on this level.

I shall take it on my holidays with me soon, to check out local radio coverage on MW and FM and dip into a little airband while sipping my pre-flight pint at the airport. Pop it in your pocket and enjoy.

My warm thanks go to Moonraker, especially **Justin Godefroy**, for the kind loan of the review models. All photos are by the author. **PW**

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Eddystone 730/4 Receiver

Philip Moss M0PBM gets to grips with the Eddystone 730/4.

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I purchased this from an advert in *RadCom* (RSGB's member's magazine) for the outstanding sum of £20. I knew it was minus its case, but was said to work, which was true within limits.

On collection I found a set in a cardboard case. Well, it's better than nothing one may say, keeps out the dirt at least. The set was demonstrated and, yes, a sound came out. I would later have trouble at first repeating this.

The set in the photos isn't mine partly because I sold it for use as a prop on a film set, would you believe, and partly as an unmolested set is more informative. The set photographed here, **Fig. 1**, is the one in Comms Corner at the British Vintage Wireless and Television Museum, Dulwich. This set dates to 1959.

Initial State

No case and no sound. The front panel although properly lettered, was brown SRBP, and the BFO and phasing controls, which should be rotaries, were toggles. Some of the knobs were not original. There were many missing valve cans, as almost all should have covers, including the crystal calibrator crystal, which was missing. Looking underneath it was immediately clear an idiot had been at work, one of those idiots who though I doubt they could build a one-valve radio properly, think they are qualified to modify and 'improve' a fully developed professional product, and one which is rather tightly packed at that.

The main damage apart from the missing controls was around the PSU. The mains transformer did not seem to properly fit its hole, did not have the expected voltage selector on the top, was not grey as everything else was, and looked small, though it does not get very hot. I later confirmed it had been replaced. The last owner had bought it without a transformer. The mains connector and DC connector were not there, but an IEC connector had been substituted, not well done. Having seen a good version I know the mains transformer should be an unpotted C-core type of generous dimensions. This may have failed or been 'nicked' for another project. While the set normally ran off mains, provision was made for running off an external vibratory PSU, connection being by a Jones plug at the rear. Predictably this was mainly for the Military to use. Unusually it did not get a military designation as an R-something. As ever, I have found *Louise Meulstee's Wireless for the Warrior, Vol three Reception sets* very useful, though I do also have the manual.

The noise limiter silenced the set if turned on. The phasing switch did the same. The sound on its internal speaker (itself another modification) was very poor even at low level. I noted it was wired across outer and centre-tap of the 600Ω output. I moved it to the 2.5Ω output, but it wasn't much better.

A check of valves revealed some of my problems. The 6AL5 (EB91), V9 double diode for meter and noise limiter was replaced with a pentode. Surprisingly it proved a poor substitute! It also was probably responsible for doing the poor meter in. It had gone open circuit. The output valve V15 was a CV136, an EF91 look-alike. It should be a proper output pentode, a 7D9 (6AM5). I have

Photo 1: The Eddystone 730/4.
Photo 2: A view with the lid open.
Photo 3: The tuning gang.
Photo 4: The chassis bottom, note the RF section.


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one somewhere, but instead fitted a 6AQ5, of which I had five new ones. I say had. Due to my negligence, I didn't check the pin-out properly. It isn't quite compatible. It has two control grid connections, one on the screen pin of the proper valve. Bang went a brand new valve. I then moved the G2 connection and tried again. It draws considerably more current than the original, as expected. I am going from a 1.4W valve to a 4.5. I then added a 4.7kΩ screen resistor, which I expected to drop a lot of volts. The valve should draw 7mA, but it only dropped a couple of volts. I also had to fit a new cathode bypass capacitor. It had been 'changed' already and was hanging on wires as too big for the retaining clip. I found one which fitted. The output is still distorted though. It did receive many stations, and with its very high gearing, it is easy to separate stations.

The front panel apart from having a substitute legend panel also had the control for shifting the tuning scale missing, and although the button for the crystal calibrator was still there, the switch had gone along with its wiring. The crystal assembly itself had a wire loose. Another oddity, there is a cover over the tuning gang, but it is black. It has no spare holes in it, but it should carry a clip and trimming tool, and a clip with spare fuses. Someone has gone to the trouble of making up a new cover, and has even mounted the crystal assembly straight! However, another appalling botch was to twist off one of the terminals on the mode switch, for a function that wasn't needed.

Design

This set strikes me as being very conservative, or to put it another way, somewhat backward for the time it was designed. It was 1957 by the date on the manual. The line-up is like so many wartime sets: two RF pentodes, polygrid mixer, two IF amplifiers and a separate LO (local oscillator). It is single conversion with a typical low IF of 450kc/s. There is nothing new about the switched IF bandwidth, crystal filter or phasing control. It does have a voltage regulator for the oscillators. With 15 valves it could have been dual-conversion, and a higher IF would have improved the image performance, but with post-war higher *Q* coils they could still have kept the bandwidths, and the final reduction is achieved at AF anyway.

As in the CR 100, as an example of many, the mixer has too many electrodes: here a 6BE6 is used. This was intended as a self-oscillating mixer. A pentode would have reduced noise, cost and spares inventory. A double triode balanced mixer would have cost no more but reduced the noise much further. The use of two RF amplifiers seems excessive. There are two reasons for having pre-mixer gain: to drown the noise of the mixer, and to reduce image reception. Higher IF does the latter better, and the noise of this mixer would be far lower than the wartime 6K8/ECH35/X65. The cost of the tuned RF stage is high, so there would be a clear benefit here in only having one. I think they probably looked at war-time sets, especially the CRs, and simply came up with a newer version. Cut development cost and time. An oddity was the placing of the headphone socket on the left-hand side of the set. Not particularly convenient, and also if one wants to rack the set, it would be very difficult to use.

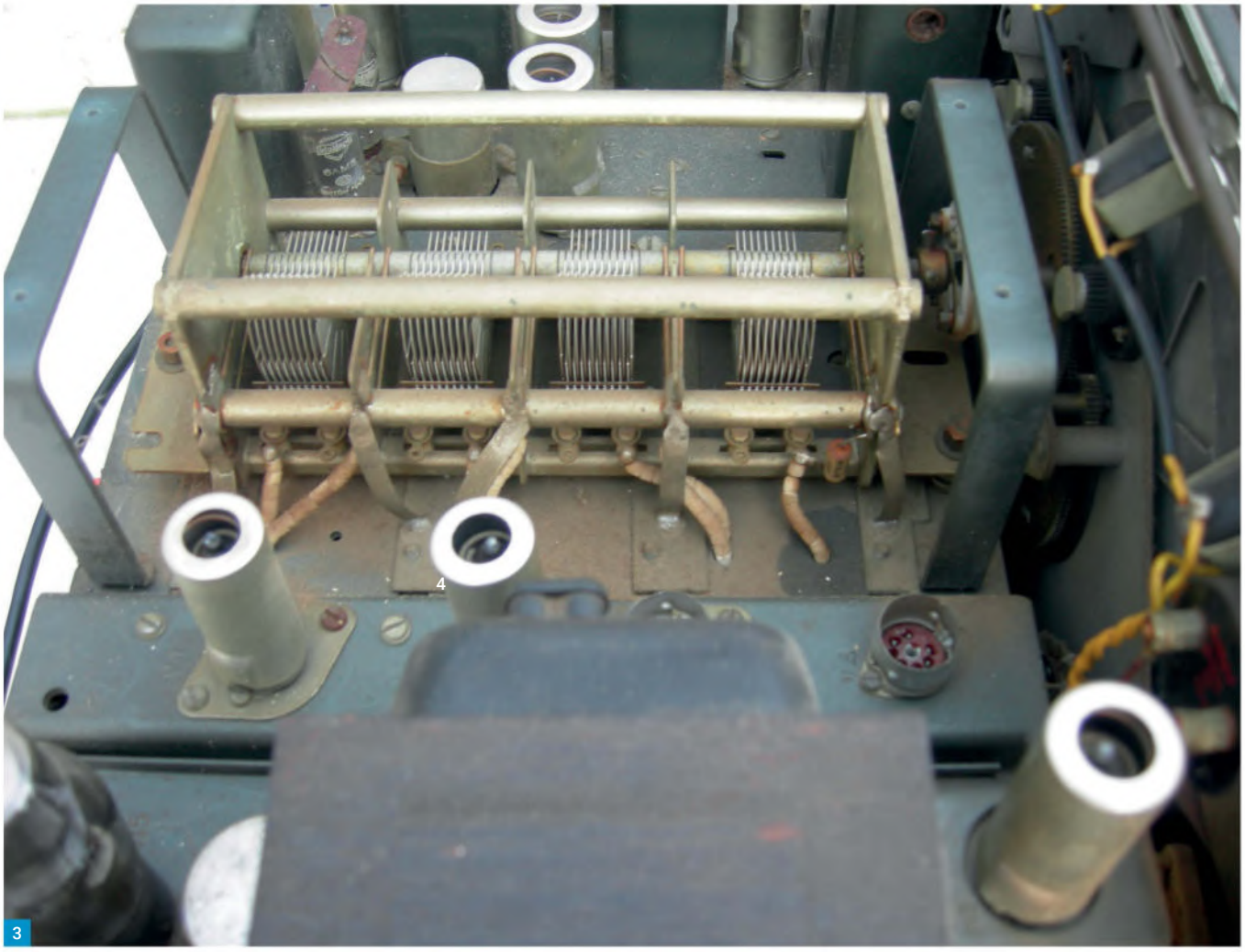
The valve line-up is as follows: the two RF amplifiers, the two IF amplifiers and the BFO are CV454 = 6BA6 (EF93). Mixer is CV453, 6BE6 (EK90), Detector and AGC, and in the other one, noise limiter and meter protection, CV140, 6AL5 (EB91). A triode connected CV2524, 6AU6 is used as cathode-follower to give a buffered IF output. AF pre-amp is CV491, 12AU7 (ECC82), there being switched inductive, narrow audio filters between the halves, then AF output is CV136, 6AM5 (EL91). The crystal calibrator is CV138, 6AM6, (EF91, Z77), rectifier CV1863, 5Z4G (R52), and finally CV216, VR150/30. As usual I have put the European types in brackets.

The original mains transformer was multi-tapped on the primary, and C-core, but the Museum's example, and it is the original fitted when made, is a conventional one, by Parmeko, and appearing adequate, but tapped only for 110 and 220/230V. These had a reputation for burning out, and with such a poor selection, no wonder. As my mains makes it to 250V on occasion, no surprise it ran hot, even when not on long, and not in the heat of summer. Manufacturers do have this nasty habit of trying to shave costs off products, with frankly predictable results. Any fool can quickly ruin a company's reputation, it takes a long time and effort to establish one in the first place.

The Museum's set came to me for checking. Seemed OK: needed very little attention except a spectacular design fault. On wide bandwidth it overloaded horribly on Medium Wave broadcast stations. Clearly the AGC was ineffective. I spent a long time trying to find a fault, until I looked at an alternative circuit. There should have been a resistor in the IF cathodes switched in for the widest bandwidth to reduce the gain, as the closer coupling means the wider the bandwidth the higher the gain. There is for the next lower bandwidth, but not the widest. They added one later, but how could they have made such a gross design error? Did they never try the set on air? Did they not measure the AGC effectiveness and overload point? How does a major professional manufacturer drop such a clanger? So, resistor added and all was well.

The IF Transformers

I think the IF transformers deserve their own paragraph. If you believe the circuit diagram, they are variably tuned. The use of symbols is incorrect. The tuning is fixed apart from the normal adjustment. What is variable as I found when I managed to prise the can off one, is that the coupling is mechanically variable. The lower coil slides up and down on rails! The two coils are mounted sideways on to each other, and the lower one can only be adjusted in the highest selectivity, ie lowest, position. This seems to me a very expensive way of doing things. Also, as there are flying



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leads that connect this coil to fixed connections, there is the chance of these joints failing due to being moved about too often. Surely the switched link winding is a much better way of varying the coupling. I have once seen mechanically variable coupling in a very old domestic radio, but I thought that an obsolete way of doing things, transmitters aside.

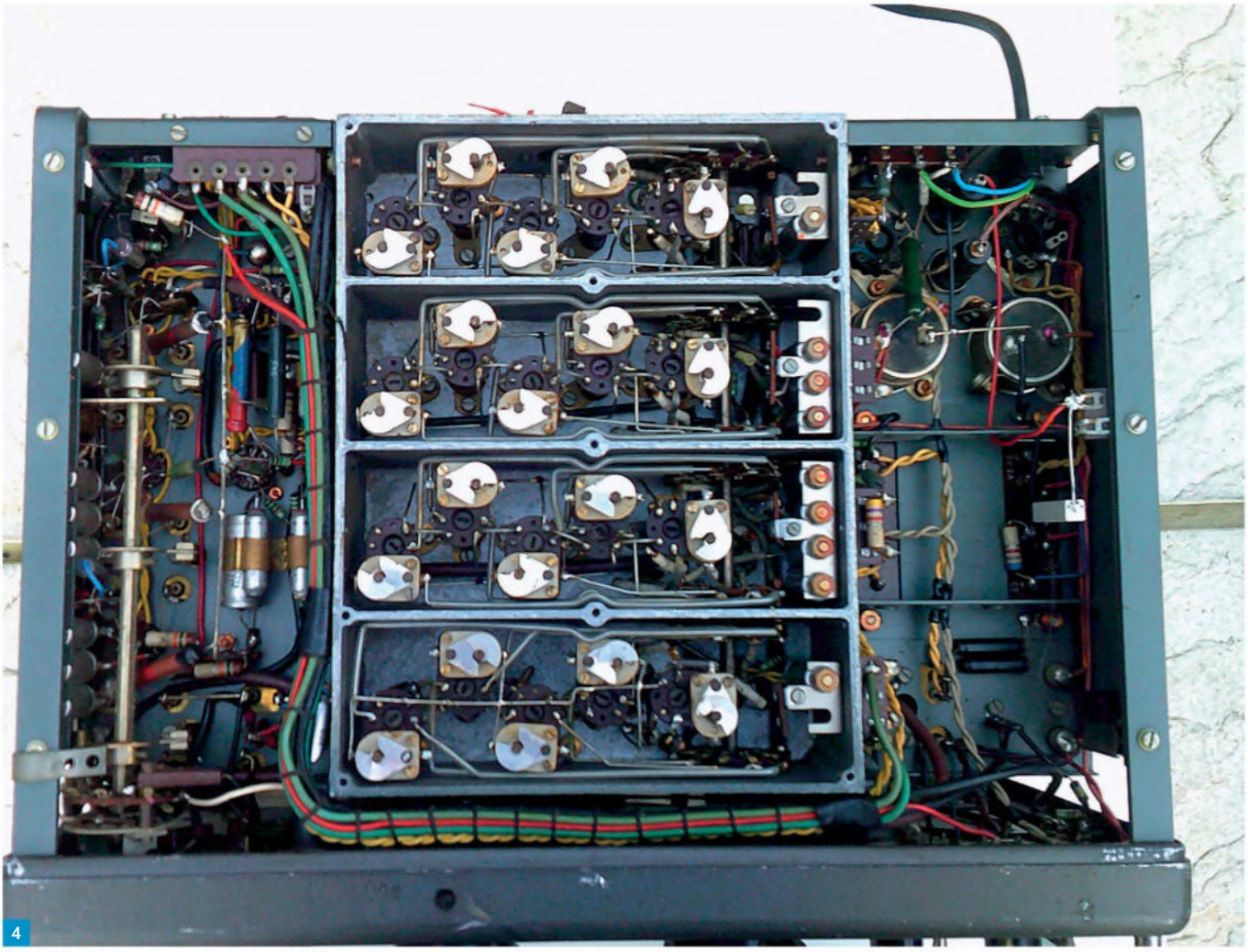
Build

Here the set scores well, and this is true of all Eddystones I have seen. It seems very solid. The centre of the set is a diecast aluminium four-section box, each section containing one of the tuneable stages, the RFs being at the rear, the oscillator at the front, **Fig. 2**. A raised channel in the casting carries all the valves, possibly to get their heat away from the tuned circuits. This does not seem an entirely convincing reason as the rise is only a few millimetres, but I cannot think of any other. The valves are on mounting plates, suggesting that the casting was for bigger valves such as Octal, and they avoided the cost of producing a new casting for the newer valves. The tuning capacitor has three mounting screws, all of which are adjustable for height, an unusual feature. Connections to the sections are by wires insulated by ceramic beads, not plastic, again very unusual, and again I am not sure why, **Fig. 3**. They are not more rigid than PVC wire would be, and the loss in PVC insulation is very low, so that is another reason gone. The earth connections are either on the same beaded wires, or on wide and very rigid strips, which in turn are not simply screwed to the aluminium box, but go to half-inch strips that go across the width of the capacitor and are screwed down in more than one place. There are a total of 12 connections to the capacitor, six being the earth strips, and two more being earths on beaded wires, with yet another brought through the chassis to join a wide strip, instead of being earthed under the chassis. They sure went to town on this! I do not know if they had severe instability problems with the prototype, or if this is all to maximise the *Q* of the circuits. At the front, there is a tubular ceramic capacitor to earth, which I suspect is thermal compensation for the LO. Access to all the top components is via the lid, **Fig. 4**.

Inside the sections, the wiring is very neat and looks very solid. The switch wafers are conventional. I thought they may have been ceramic in a set where so much cost has been lavished on it (later mains transformers excepted!).

Repairing these sections would be a nightmare: I think they may have worked on the idea it would last long enough that it would be thrown away instead! Based on an estimated five-year service life with the first, professional owner they would be right. To get at most components would require an extensive strip-down, either that or a bodge. The 470kΩ grid leaks are creeping high, but I have no intention of replacing them unless I am forced to.

The rest of the set is built on two 'L' sections, bolted to the central diecast box. These carry the PSU and BFO, itself a sub-assembly in a grey box, on the left-hand side as seen from the front, and the IF, demodulator and AF sections on the right-hand side. The two can electrolytics in the PSU, which are generously rated (450V for the reservoir and 350V for the smoothing) relative to an HT of 275 highest, are sunk through the chassis, so that they are not exposed to the heat of the rectifier and regulator. The choke is an unusual shape being tall and slim, and mounted in the same size can as the IF transformers. There



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is an unusual feature of an HT switch mounted over the tuning gang, which switches off the HT for the whole set. Its usefulness must be suspect given the poor accessibility and it does not leave the LO running, so it is not helpful in maintaining stability when used. You may just as well turn off the mains surely? OK, it comes on instantly, but surely would be liable to drift. On my set this is missing. Everything is grey, the chassis (not the casting) and all the boxed items above it. Front-panel controls are mounted directly on to the front panel. The front panel has the typical Eddystone vents down the sides, except they are false with no holes, just ribs. The handles were missing on my set.

All the many decoupling capacitors are metal tubular types, and are mounted onto brackets and then onto the chassis, in groups. Again, replacing these would be hard, though they probably won't need it for many years yet.

At each side there are steel 'U' loops secured to the front panel handle bolts, and the side chassis along top, bottom and rear. The set can be turned upside down or stood on either end using these. With the proper handles it will also stand face down.

Handbook

The set came with an incomplete photocopied handbook that covered other versions of the 730 as well. It had the circuits and test voltages but lacked detail. It occurred to me that **Michael O'Brien**, a fellow writer for the late *Radio Bygones* magazine, may have the full version, and we live not far apart. Yes, he did, and thanks to him for the loan. He also has the set but without the bodging mine has suffered.

The real thing is not impressive. 14 single sides of A4 plus the A3 circuit. It does not have the usual diagrams showing all component locations, and as mine has been got at I needed these. Its construction is also odd. The sheets are stapled at the top, not the margin. It doesn't look very authentic, but the cover is no copy.

Renovation

Voltages were checked and found low. It was obvious that there had been fiddling about with the resistors in the PSU. A 560Ω wirewound resistor had been added between rectifier and reservoir capacitor. This was removed. The main HT was now correct. The VR150/30 still didn't glow much and the 'regulated' voltage was not 150. R66, 2.7kΩ, had been replaced with 3kΩ, not very significant. R67, 4.7kΩ with 5kΩ, and R68, 22kΩ, with 2.7kΩ! It is very doubtful if any of these would have required replacing, and the reduction of R68 meant that the current drawn prevented the regulator striking, and the 100V needed for the screen grids of V3 was very much lower. All these were replaced with the correct values and the voltages were then spot on, with the regulator glowing fairly brightly.

Conclusion

If not built with love, then the set was certainly built with fine components and considerable care. An old and unadventurous design, but very well implemented. This must be its main feature. As I neither read CW, nor is this set now capable of normal operation for CW and narrow bandwidths, it is hard to determine how good a performer it would have been. Its low IF is not conducive to sparkling image performance, and the amount of gain before the main selectivity is not conducive to fine adjacent channel rejection, but I suspect it was a competent performer, and that it was reliable. It was also reasonably light and compact for its time. The serious AGC design fault though does cast a signifcant shadow. **PW**

1

Studio Acoustics

Keith Hamer and **Garry Smith** continue looking at the early days of the BBC, in particular the requirements necessary for suitable studio acoustics. Also featured are early short-wave transmissions to the British Empire, a new series about European radio and television services, the Blattnerphone, and television pioneer, Vladimir Zworykin. There is also a vintage equipment advertisement from 1927.

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It should be remembered that in the 1920s, virtually every aspect of broadcasting was totally new and a lot of testing was done by 'trial and error'.

When BBC engineers were tasked with designing suitable acoustics for radio studios, all they had to rely on for making tests were their ears while listening to music, rather than speech, due to the range of frequencies involved. In the early days of broadcasting, there was no other way of evaluating the quality of the sound produced in the studio. It was soon realised that some types of music sounded better in specific environments. For example, certain types of chanting were ideal when performed in a cathedral whereas chamber music sounded better in a medium-sized room. The spoken word, especially in drama productions, was heard to best advantage in the somewhat deadened conditions of a small theatre. For broadcasting purposes, however, the environment had to be chosen to give the best results to suit the microphone. In general, the conditions suitable for microphones were quite different from those necessary for the human ear, and much more difficult to satisfy. Furthermore, the two ears of the listener in a theatre or concert hall could, with the additional aid of sight, assist to make up for any deficiencies in the audio quality. Unfortunately for the engineers, this attribute was not available to overcome the somewhat rigid conditions of the microphone and loudspeaker system. Great care had to be taken at the microphone end in order that the reproduction on the loudspeaker gave the most satisfaction, from an acoustic point of view, to the person sitting in front of it.

BBC engineers summarised (from a male perspective in the 1920s) acoustics as follows: *"Acoustic effect can, in general, be expressed scientifically in terms of the length of time an impulse of sound takes to die away. Fire a revolver in the open air and it sounds like a sharp crack. Fire it in a hall and the sound reflects backwards and forwards between the walls and lasts for several seconds. This latter effect is called the 'reverberation', and the length of time that it lasts gives an approximate criterion of the acoustic effect of a hall. In the case of a lecture room or theatre, this length of time should not be greater than a second when the audience is present, or the speech will be difficult to understand.*

"But in a concert hall it should be much greater, say up to two or three seconds, to give the best musical result for a symphony orchestra. In this case, the wise concertgoer will find for himself

Fig. 1: A 1927 advertisement for the *Gambrell Mains Receiver* which would give trouble-free wireless. Fig. 2: The original transmitter used at the Blécherette Aerodrome on 14 October 1922. Fig. 3: The original receiver used for the first unofficial radio broadcast in Switzerland. Fig. 4: Roland Pièce, the engineer in charge of the transmitter at the Blécherette Aerodrome, near Lausanne. Fig. 5: The Radio Bern studio in 1931. Fig. 6: The first Blattnerphone sound recording system used by the BBC.

various positions where he may hear the best musical tone. In these places, the reverberation time may be actually the same as elsewhere, but the way in which the sound dies away, due to a certain combination of reflections at those spots, gives a warmth of tone which makes all the difference in the appreciation of the music.

"In the same way, as far as broadcasting is concerned, the correct acoustic effect, as a result of proper choice of studio or hall and of correct microphone placing, can be found to give the most agreeable result at the loudspeaker. And this result may, if it is just right, be so striking as almost to compel people to listen to it; at any rate it will satisfy fully those listeners who have any idea of musical appreciation."

BBC Empire Service

While planning the *Empire Service*, the BBC insisted that reception should be on a 'continuous' basis. This meant programme planning required that, as far as possible, good reception should be guaranteed for the entire broadcast. As far as the listeners were concerned, this meant a whole evening of entertainment, not just a few minutes!

An Australian newspaper, commenting on the reception of a relayed programme from London via Australian stations, expressed disappointment in the artistic quality and interest of the items broadcast as compared with the fare provided by local radio outlets. The commentator's opinion was a significant indication to executives back in London that programmes intended for listeners overseas could not expect to enjoy a privileged status as far as overall quality was concerned just because the broadcasts were from the BBC.

The process of establishing a regular BBC Empire Service, as distinct from occasional test transmissions and special broadcasts, involved many questions regarding the quality of programmes and reception. The prestige of having such a worldwide service could not necessarily justify the capital and maintenance expenses involved in having a station of this type. The BBC recognised that daily broadcasts would be subjected to the risk of its programmes either not being received at all, or the quality of reception experienced in distant countries making them less acceptable than the standard output of local stations.

Another question which had to be faced was programme control. A continuous service of programmes designed specifically for listeners in one particular country would not necessarily be acceptable to listeners in another. Also, an intermittent service of selected items would not justify the expense of the station. A decision would then have to be made as to whether the Empire station in England would have to fill in time by broadcasting from a studio of its own in the UK. This would result in broadcasts being audible to an English-only audience with additional operating costs.

Vintage Wireless Equipment

This month's rummage through vintage copies of forlorn newspapers and magazines has unearthed the *Gambrell Mains Receiver,* which would, according to the advertisement, give *trouble-free wireless*, **Fig. 1**.

The text has been left in its original format to reflect the spelling, grammar and punctuation of the time.

This is the full description of the equipment originally featured in an advertisement, dated 1927: *"At Last! Trouble free wireless. Here is the receiver that is always ready to bring radio entertainment to you – it has no batteries or accumulators to run down and you do not need any knowledge of wireless to use it.*

"Gambrell Mains Receivers work off your electric light – you just switch-on or plug-in to the electric light mains like one does for a standard lamp.

"The highest degree of musical excellence is

obtained as everything comes through as though you were hearing the actual performance.

"Demonstrations without obligation gladly arranged through your local Dealer. If desired our own staff will demonstrate within a radius of 50 miles from London.

"Write for our Illustrated Folder No. 12
GAMBRELL BROS. LTD.
76 VICTORIA STREET, LONDON, S.W.1"

Although reception may have been trouble-free in 1927, plugging the wireless into an electric light fitting may have caused 'trouble' regarding safety issues! Having said that, it was quite common during the Fifties to plug an electric iron into a light socket if there wasn't a convenient wall-mounted power point available.

Service Information: Switzerland - Part 1

In this new series, we'll be exploring the history of various European radio and television services. We begin with a detailed look at the extremely complex Swiss broadcasting system.

During the First World War, the operation of radio transmitters and receivers was reserved solely for the Swiss military. Private individuals

were forbidden to listen to any radio broadcasts. The first licences to be issued allowing reception of foreign radio broadcasts within Switzerland were granted to watchmakers in La Chaux-de-Fonds and Zürich. Due to a time signal being transmitted from the Eiffel Tower in Paris, Swiss manufacturers of watches and clocks were able to precisely set mechanical timepieces and check their movements for accuracy.

Even after the war, radio operations remained heavily regulated. The *Obertelegraphendirektion* (the *Upper Telegraph Directorate*) was authorised to approve installations in the civil sector. However, they saw little reason to issue such licences for the transmission and reception of radio broadcasts, believing that radio waves would interfere with wired systems. The Swiss military wanted to completely ban radio reception in the event of war for reasons of national security. The Obertelegraphendirektion only issued reception permits with clear conditions stipulating that the secrecy of telecommunications could not be contravened.

Following the establishment in 1925 of the *League of Nations*, based in Geneva, Switzerland was responsible for the installation of communications equipment for the international organisation. The main aerodrome near Lausanne was equipped with both telephony and telegraphy radio facilities.

The transmitter for the aerodrome was set up by the French company, *SIF* (*Société Indépendante de Téléphonie sans Fil*), on behalf of the municipality of Lausanne. The installation became operational on 22 August 1922. The original transmitter and receiver are shown in **Figs 2** and **3** respectively. It was originally only intended to serve the needs of aviation, such as the broadcast of weather reports and air traffic control for the infrequent flights. The adjacent *Service météorologique vaudois* provided relevant weather data and forecasts for the Paris-Lausanne route.

The wavelengths used were 1400m for the telegraphy mode and 900m for telephony. Communication with the aircraft (known as *Goliath*) using telegraphy, which had a greater range than the telephony mode, was not possible because the plane's on-board mechanic, who also served as the in-flight radio operator, did not understand Morse Code. Communication via telephony was only possible at a distance of less than 100km. Due to telephony radio being used extensively, the authorities in Bern issued instructions that transmissions had to be restricted for only essential official purposes.

The first unofficial radio broadcast in Switzerland is reputed to have been on 14 October 1922. The engineer in charge of the transmitter at the *Blécherette Aerodrome* near Lausanne, **Roland Pièce**, together with **Paul Louis Mercanton**, decided to broadcast music

4

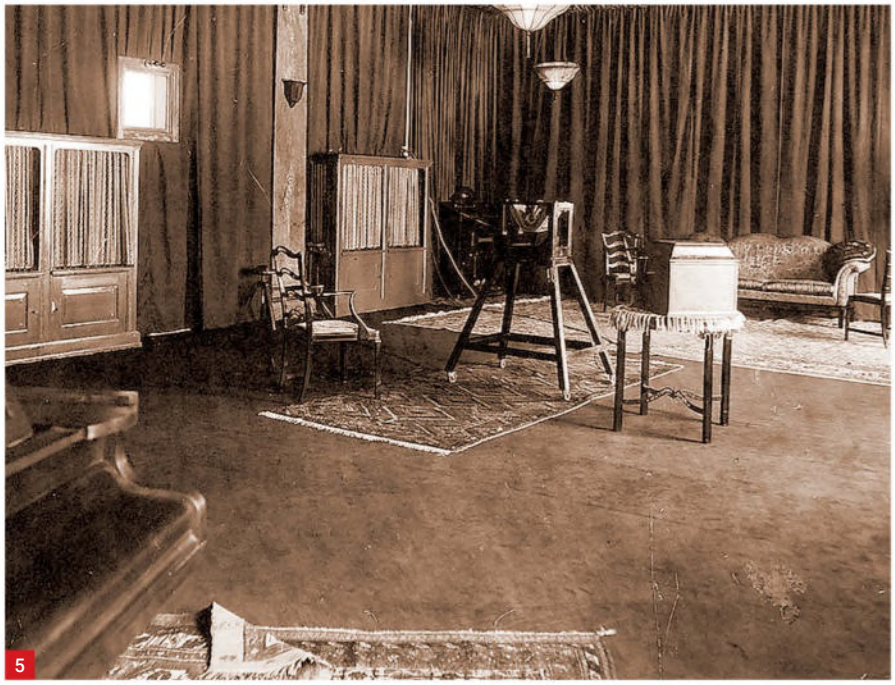
to passengers on an inbound flight from Paris, **Fig. 4**. He used a wax cylinder phonograph to play Classical pieces via his microphone using the telephony mode. The *Overture to William Tell* by **Rossini** was one of the pieces that went out over the air waves in this historic first broadcast. Inspired by their success, the staff at the airfield organised a radio broadcast to the *Hotel Beau Rivage* on the shores of Lac Léman in Lausanne's Ouchy district. An ensemble sang in the studio and a Federal Councillor, senior +PTT officials (the '+' denoting the Swiss PTT, based on the country's national flag), the French ambassador and representatives of the City of Lausanne and Kanton Vaud, had their first experience with the new medium. Incidentally, *Lac Léman* is the official Swiss name for what is usually referred to outside the country as *Lake Geneva*. The station was known as *Champ-de-l'Air*. From that time, Lausanne became the focal point for Swiss radio activity.

The idea of broadcasting music via telephony wasn't entirely new. Music had been transmitted 'live' via telegraphy and telephony since the late 19th Century. In Paris, affluent people were able to take out a *Théâtrophone* subscription and listen to opera performances in stereo at home on their telephone equipment.

The first official test transmissions for public radio took place on 26 October 1922, on 900m with an output power of 400W. Following approval by the Obertelegraphendirektion for broadcasts from transmitters using existing aeronautical radio systems on 10 January 1923, regular programmes began on 26 February. News, general information and weather reports were radiated, interspersed with music played from records. A newly established company, *Utilitas*, took over the programming. Since the airfield transmitter could not operate simultaneously on both wavelengths (1400m and 900m as previously mentioned), programmes had to be interrupted when telegraph traffic was pending. Equipment to enable reception of LW and MW broadcasts was installed.

By the following year, 980 licences had been issued. Over successive years, a number of other radio stations opened throughout the country, each supported by money raised from licence fees. The *Société Romande de Radiodiffusion*, also in Lausanne, followed in July 1923. A studio in Zürich opened in February 1924, broadcasting from a transmitter located at Höngg. This was followed by a station in Geneva at the beginning of 1925. On 15 August 1925, the *Radiogenossenschaft Bern* (Radio Association of Bern) was formed. Within a very short time, the organisation changed its name to *Radio Bern*, **Fig. 5**. In 1931, Radio Bern moved from the *Kursaal Schänzli* (a casino and congress centre established inside the *Hotel Bernerhof*) to the radio studio in Bern's Schwarztorstrasse, which is still in use today. A station in Basel went on air in 1926, followed by one in Lugano during 1930.

Many listeners tuned in to the multitude of stations using crystal radio receivers, which were very popular in the 1920s. The main component was a small piece of pyrite crystal, an iron sulphide mineral. The listener used a thin wire in conjunction with the crystal to search for a signal. The pyrite acted as a demodulator, rectifying the high-frequency vibrations of the radio waves. The most basic equipment converted the radio waves into audible sound. The signal was not amplified. This meant that



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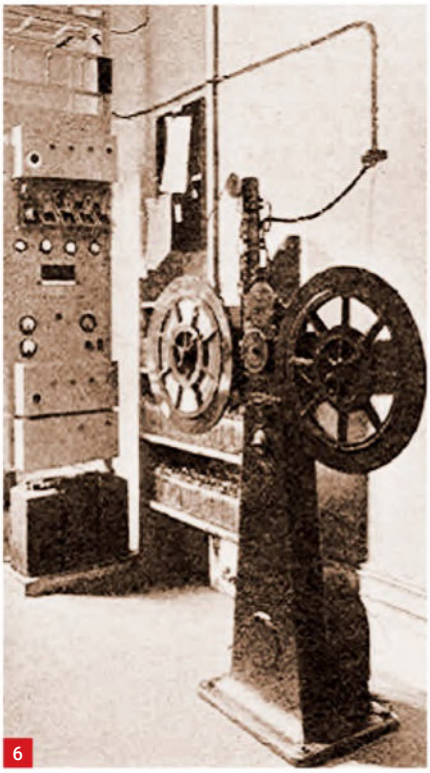

6

only relatively powerful transmitters could be received. Users listened via headphones, the power for which was generated by the radio waves themselves. Radio kits became very popular with a typical price tag of around SFr. 50 (today's equivalent of approximately SFr. 300), including headphones.

The Blattnerphone – Part 1

The *Blattnerphone* wasn't a device used by Batman to contact Robin, or even for the BBC Director-General, **John Reith**, to summon his executives. It was, in fact, a sound recording device, **Fig. 6**.

For many years, BBC's programme producers dreamed of having a machine that would record outside events such as commentaries and speeches. Such apparatus would also prove to be very useful for recording rehearsals and, in particular, to enable certain broadcasters to hear themselves as listeners at home heard them. The equipment would also have been a valuable tool for convincing unwilling artists that the microphone would not distort their voices. In the early days of radio, suitable recording apparatus simply didn't exist – everything was broadcast 'live'.

Fortunately, the long-awaited equipment eventually became a reality with a professional format that the BBC could use, thanks to technology developed by **Ludwig Blattner** (also known as Louis) who was a pioneer of early magnetic sound recording techniques. He licensed a steel wire-based design from German inventor, **Dr Kurt Stille**. Blattner modified the design to use steel tape instead of wire. The device was marketed as the *Blattnerphone*. In 1928, while on a promotional tour to demonstrate his latest sound recording equipment, he would dance with ladies chosen from the audience with music being played from his Blattnerphone.

Ludwig Blattner was a German inventor, born in 1881. He was also a film producer, director and studio owner in the United Kingdom. His device recorded sound on 3mm-wide, 0.08mm-thick, steel tape. The first version of his machine appeared in 1924, but was not of a high enough standard to be used by the BBC. A much-improved version enabled the tape to run at a speed of 1.5m per second. The BBC found that the quality was suitable for broadcasting recorded speech programmes, but not music.

Early Television Pioneers: Vladimir Zworykin – Part 3

In 1930, Westinghouse's television research department was transferred to RCA and **Vladimir Zworykin** became Director of RCA's *Electronic Research Laboratories* at Camden in New Jersey. In April of that year, he visited the San Francisco laboratory of inventor **Philo Taylor Farnsworth** at the request of Farnsworth's financial supporters who wanted to make a deal with RCA. Three years earlier, Farnsworth had given the first successful demonstration of an electronic television system. Zworykin was particularly impressed by Farnsworth's transmission system, the *Image Dissector*, and was inspired to develop an improved version, which he called the *Iconoscope Television Camera Tube* and for which he filed a patent in 1931. The new camera tube vastly reduced the amount of light required to capture a viable image. It was later superseded by the *Image Orthicon Tube*, developed by **Dr Albert Rose**. RCA kept Zworykin's developments a secret and he wasn't able to announce the existence of his improved camera system until 1933. In 1939, RCA introduced their first regular, public, all-electronic television broadcasts at the *World's Fair* in New York City. The Fair's opening ceremonies were carried by the newly-formed *National Broadcasting Company* (*NBC*) with **President Franklin Delano Roosevelt** presiding. So far, so good, except for the fact that the *new* iconoscope invention claimed by Zworykin and RCA came to the attention of Philo Farnsworth. He registered a counter-claim, dating back to his association with Zworykin in 1930, which ended up in court. A bitter legal battle ensued resulting in RCA being found guilty of violating Farnsworth's original patent. RCA had to pay $1m in licensing fees.

With the iconoscope, the scene to be televised was focused on a light-sensitive mosaic made from tiny beads of treated silver, which produced an electrical charge proportional to the strength of the illumination. A narrow scanning beam, ejected from an electron gun and diverted across the mosaic by magnetic deflection coils, caused a succession of voltages to pass to a signal plate. The picture signal then passed to an amplifier for transmission to a television receiver.

Stay Tuned!

Please send archive photographs, information or suggestions for future topics via the email addresses shown at the top of this column. All photos this month are from the **Keith Hamer** and **Garry Smith** Archive Collection. **PW**

Rallies & Events

All information published here reflects the situation up to and including **13th January 2022**. Readers are advised to check with the organisers of any rally or event before setting out for a visit. The Radio Enthusiast website **www.radioenthusiast.co.uk** has the latest updates, please check it regularly. To get your event on this list, e-mail the full details as early as possible: **wiessala@hotmail.com**

5 February
SOUTH ESSEX AMATEUR RADIO SOCIETY: Cornelius Vermuyden School, Dinant Avenue, Canvey, Essex, SS8 9QS. The rally is expected to be the usual hive of activity (CBS [Indoors] | CR | TS).
sears.enquiries@gmail.com
07748 432026

12 February
RADIOACTIVE FAIR 2023 (MID CHESHIRE ARS [MIDCARS]): Nantwich Civic Hall, Market Street, Nantwich, Cheshire, CW5 5DG. 100 Traders and Exhibitors Stands. Public transport is onsite, Doors open at 10 am, and admission is £5. A wide variety of trader stalls covering every aspect of the radio hobby, new and old radios, computers and electronics.
(CR | BB | D | FP | RF | RSGB)
http://radioactivefair.co.uk
https://midcars.org

26 February
RED ROSE RALLY: St. Joseph's Hall, Leigh WN7 2PJ (CR | FP | RF).
www.wmrc.co.uk/rally.htm

4 March
LAGAN VALLEY ARS RALLY: Hillsborough Village Centre, 7 Ballynahinch Road, BT26 6AR. Doors open at 10.30 am.
www.lvars.uk

5 March
EXETER RADIO & ELECTRONICS RALLY: The 2023 Exeter Radio & Electronic Rally will be held at *America Hall*, De la Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30 am (10.15 for disabled visitors). Admission is £3.00 (under 16's free).
(BB *[book in from 10.15 am]* | TS).
Pete G3ZVI
07714 198374
g3zvi@yahoo.co.uk

11 March
SOUTH KESTEVEN ARS, JUNK SALE: Railway Club, Grantham, NG31 7AU. Doors are open for traders at 8 am (bring your own table), and to the public between 9.30 am and 1 pm. Admission for traders is £5 and for the public £1. The maximum table length is 2m.
Please book in advance to avoid disappointment (CR).
s.mason@skars.co.uk
https://tinyurl.com/zp8873h2

12 March
HAMZILLA RADIO FEST (DOVER ARC): At the *Julie Rose Stadium* in Ashford, Kent TN24 9QX. Early bird tickets are available; open from 9:30 am; general admission from 10 am. Local and national traders are welcome. Join *SDR Play, Ceecom Antennas, Icom*, and *ICQ Podcast*. Book your ticket and/or table online (BA | BB | CR | FP | D). TBC: (RSGB | L | RF | Wi-Fi).
www.Hamzilla.uk
club@darconline
T: @HamzillaRally
F: https://tinyurl.com/yc78ucr8

26 – 28 March
RADIODAYS EUROPE 2023: In the Finale of *Radiodays Europe 2022*, it was announced that Prague would be the host city for this now three-day event, in 2023, 26 – 28 March.
https://www.radiodayseurope.com

23 April
NORTHERN AMATEUR RADIO SOCIETIES ASSOCIATION (NARSA): BLACKPOOL RALLY, Norbreck Castle Hotel; Queen's Promenade, Norbreck, Blackpool FY2 9AA.
https://narsa.org.uk

11 June
JUNCTION 28 RALLY: Alfreton Leisure Centre Bowls Hall, Church St. Alfreton, DE55 7BD. From January 2023, trader booking forms for the J28 Radio Rally, hosted by South Normanton, Alfreton & Dist. ARC, will be available on the club website, or by contacting the club secretary.
www.snadarc.com
secretary@snadarc.com

18 June
EAST SUFFOLK WIRELESS REVIVAL (IPSWICH RADIO RALLY): Kirton Recreation Ground, Back Road, Kirton IP10 0PW (just off the A14). Doors open at 9.30 am, and the entry fee for visitors is £3. Trade tables are from £10. B4SWR HF station. Contact Kevin G8MXV:
(BB| CBS | CR | FP | RSGB | SIG | TS)
07710 046 846
www.eswr.org.uk

23-25 June
HAMRADIO FRIEDRICHSHAFEN
www.hamradio-friedrichshafen.com

30 July
NEW BLACK COUNTRY RADIO RALLY: *Bloxwich Active Living Centre*, High Street, Bloxwich, Walsall, WS3 2DA; Doors will be open from 10 am to 4 pm. There is a large car park available and catering on site. Entry is £3 each or £5 for two. See the website below for details of the traders and clubs attending.
www.theradioclub.co.uk

30 July
WILTSHIRE RADIO AND CAR BOOT SALE: Kington Langley Village Hall and Playing Field, Kington Langley, Wilts. SN15 5NJ. Starts at 9 am and finishes at 1 pm. Entry is £2. Traders Welcome. Indoor tables £10, Car booters £10, Vans £15.
Chairman@Chippenhamradio.club

15 October
HORNSEA ARC RALLY: Driffield Showground, YO25 9DW. Organiser: Les, 2E0LBJ.
01377 252 393
lbjpinkney1@hotmail.co.uk

25 November
WILTSHIRE WINTER RADIO RALLY [SATURDAY]: Kington Langley Village Hall and Playing Field, Kington Langley, Wilts. SN15 5NJ. Open 9 am to 3 pm. Traders Welcome. Entry is £2, indoor tables £10. Depending on the weather, there may be a small car boot section. Further information (see also: 30 July).
Chairman@Chippenhamradio.club

Looking Ahead

- **February** International Radio Playwriting Competition (BBC World Service & British Council) Deadline: 12th February 2023 **https://tinyurl.com/8ut556p9**
- **March** Radiodays Europe: Prague https://**www.radiotechcon.com**
- **April** International DX Convention: Visalia, CA, USA **http://www.dxconvention.com**
- **April** NAB Show Broadcast Engineering and IT Conference: Las Vegas **https://tinyurl.com/y783mzb8**
- **May** NDB 2023 **https://nrbconvention.org**
- **May** AES Europe 2023 Convention
- **May** ARIAS 2023 (Radio Academy)
- **May** Critical Communications World 2023 **https://tinyurl.com/mr4xcjkj**
- **May** International Broadcasting Convention (IBC): Amsterdam **https://tinyurl.com/2n8cruj6**
- **July** International Conference on Journalism and Mass Communication: Austria **https://tinyurl.com/9zknsmfu**
- **August** IEEE International Symposium: Radio Frequency Integration: Cairns **https://tinyurl.com/mrxk6695**
- **September** European DX Council Conference **https://edxcnews.wordpress.com**
- **November** Radio Tech Con 2023: London **https://www.radiotechcon.com**
- **November** World Radio Communication Conference: Dubai **https://www.itu.int/wrc-23**
- **2023** Podcast Conferences 2022/2023 **https://tinyurl.com/t8fxypv7**

Web Updates

www.radioenthusiast.co.uk
https://tinyurl.com/5xs5k9uz
http://www.g4rga.org.uk/All.html
https://tinyurl.com/yc7ysmf4
https://rsgb.org/main/news/rallies
www.radioenthusiast.co.uk

BA Buildathon **BB** Bring-and-Buy **CBS** Car Boot Sale **CR** Catering /Refreshments **D** Disabled visitors **FM** Flea Market **FP** Free Parking **LB** Licensed Bar **L** Lectures **MS** Meeting Spaces **RF** Raffle **RSGB** (RSGB) Book Stall **RU/PW** RadioUser/ PW in attendance **SIG** Special-Interest Groups **TI** Talk-In (Channel) **TS** Trade Stalls **Wi-Fi** (Free) Wi-Fi

Specialist Dealers

Electronics

Kit Suppliers

Scotland

Somerset

South Yorkshire

Classified Adverts

Wanted

VINTAGE FIREWORK COLLECTOR. Do not light the blue touch paper and burn British Heritage, private collector will pay cash and collect from anywhere, licensed explosive storage. **Call Tony on 07956 506300**

Valves

VALVES AND ALLIED COMPONENTS? For free stock list and/or advice, Please contact me: **Geoffdavies337@Gmail.com Telephone 01788 574774**

TO ADVERTISE IN CLASSIFIED ADVERTS
Contact Kristina Green Tel: 01778 392096
Email: kristina.green@warnersgroup.co.uk

Repairs

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

For Sale

CTCSS ENCODER AND DECODER KITS. DTMF kits and modules. Pic development kits. **https://cstech.co.uk**

DISCLAIMER Some of the products offered for sale in advertisements in this magazine may have been obtained from abroad or from unauthorised sources. Practical Wireless advises readers contemplating mail order to enquire whether the products are suitable for use in the UK and have full after-sales back-up available. The publishers of Practical Wireless wish to point out that it is the responsibility of readers to ascertain the legality or otherwise of items offered for sale by advertisers in this magazine.

Bargain Basement

Wanted

OLD HALF INCH FERRITE RODS. Must be half inch 12.7mm in diameter and be six inches long or more will pay good money for the old rods. **Call Peter Tankard on 0114 2316321 or email peter.tankard@gmail.com**
SHEFFIELD

THE ORIGINAL TECHNICAL MANUAL FOR THE EDDYSTONE E.C.R RECEIVER and its mains transformer can be re wound and the die cast box containing the crystal phasing / selectivity controls for the same receiver. **Contact Andy 2E0NDZ by email on andrewhumphriss@tinyworld.co.uk**

For Sale

2022 SECOND GENERATION QRM ELIMINATOR. X Phase. One week old, QRM disappeared so not needed. Check tests on YouTube. £36 including p&p. **Contact Paul on 07748 948685**

Up For Grabs

HEADPHONES, MINISTRY TYPE 10AH1536. Working. Nominal impedance 90 ohms. Fitted 1/4" mono 90 degree jack. First to give me postal address gets them. **Contact Godfrey G4GLM. (020) 8958 5113 after 10:00am, not Sunday mornings. cgmm2@btinternet.com**

Bargain Basement adverts cost just £5.00

BY EMAIL Firstly email your advert's wording to **kristina.green@warnersgroup.co.uk** and then call **01778 392096** to make your payment. **BY POST** Send your advert to: **Bargain Basement, Practical Wireless, Warners Group Publications plc, West Street, Bourne, Lincs. PE10 9PH** Please write your advert in BLOCK CAPITALS up to 30 words, plus 12 words for your contact details and send it together with your payment of £5 (subscribers can place their advert free of charge as long as they provide their subs number or mailing label). Cheques should be made payable to Warners Group Publications plc, credit card payments also accepted. Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. No responsibility will be taken for errors and no correspondence will be entered into on any decision taken on any of these conditions. The Publishers of Practical Wireless also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

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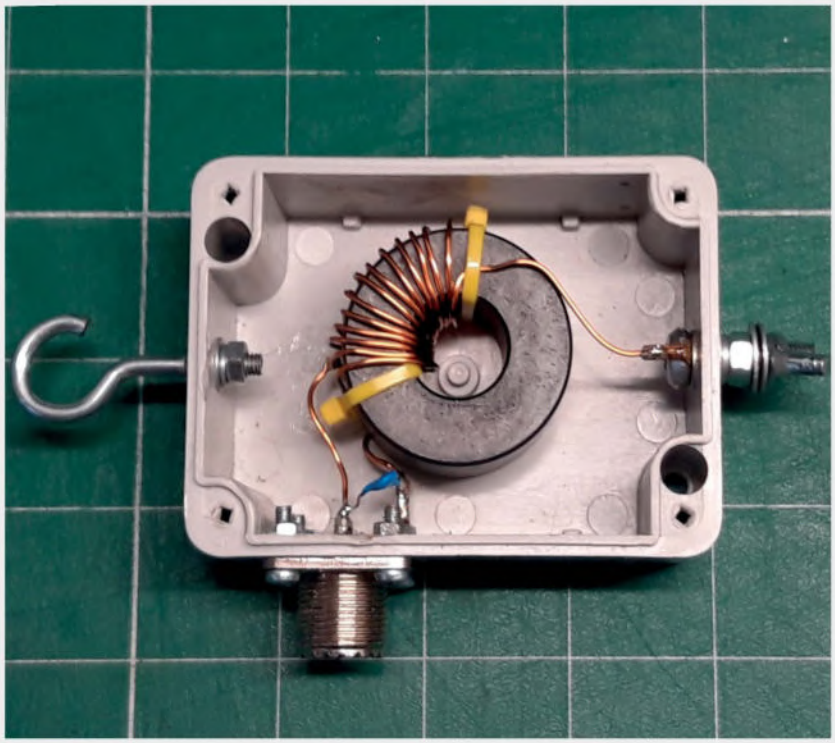
E-mail: practicalwireless@warnersgroup.co.uk

★Star Letter★

The Star Letter will receive a voucher worth £20 to spend on items from our Book Store, or other services offered by Practical Wireless



EFHW Antenna Article

Dear Don,
I enjoyed reading the article on the EFHW antenna in the February issue of *PW*. I have been using one of these at home for several years now and it has given excellent results, with 100W SSB QSOs as far afield as Costa Rica, Texas and Jakarta.

The design of the 49:1 unun followed traditional practice but I'd like to propose a couple of suggestions for improvement.

While the FT240-43 toroid is a popular choice, for operation up to 100W there is a better one: the Fair-Rite 2643251002. It is often overlooked because it is marketed as a cable core, but it uses the same type 43 material and due to its form factor has a better efficiency (and hence lower loss). I measured 91% as opposed to 77% for the FT240-43.

Also, the unun can be wired as a conventional autotransformer (i.e. a single winding tapped 2 turns up from ground) and gives the same performance as the traditional method with twisted primary and crossover turn. Mine is shown in the photo.

The hook is tied to paracord that runs over a pulley at the top of an 11m pole and the antenna wire is bent into a horizontal L to fit my garden. The first 2m of coax feeder below the unun acts as the counterpoise and a common mode choke at that point ensures no RFI is conducted into the shack.

Mike Dunstan G8GYW
Woodley, Reading

Vintage Television and Radio & RadioUser

Dear Don,
Having just read the January issue I was a little dismayed to see that *RadioUser* had stopped being a separate publication. Being a short-wave listener for many years I had taken the former *Short Wave Magazine* and then *RadioUser* for a long time. However, after passing my Foundation exam in 2020 and sadly finding fewer articles of interest to me in *RadioUser* I switched my subscription to *PW*. Therefore, I wasn 't extremely surprised to see its demise.

I am glad you have incorporated it into *PW* and that you have included the excellent writing duo of **Keith Hamer** and **Garry Smith**. I really enjoyed their first column and I'm sure this will be a great addition to *PW*.

Andrew Green 2E0GYI
Barnsley

Dear Don,
As a long time reader of *RadioUser* and now with the amalgamation with *PW*, in the January and now February issues I'm saddened to see no airband user articles. Are there any plans in the future for a monthly article for airband users?

Paul Handley
Worcestershire

*(**Editor's comment**: Thank you Andrew and Paul. I'm pleased, Andrew, that you enjoy the* Vintage Radio and TV *pieces – I'm hoping they will be of interest to many* PW *readers. And, Paul, as for airband, I appear to have 'lost' the airband authors from* RadioUser *but have discussed this with* **Georg**, *previously the editor of* RU, *and we are working on bringing back some airband items, probably not on a monthly basis but maybe bi-monthly to start with.)*

Learning Morse

Dear Don,
Further to **Dr Tim G4EOA**, during my 22 years in Royal Engineers as a radio operator as both FSC and CVRT driver, I can concur with the training method we were trained on in our sigs wing for Morse.

Learning not to count dash/dots but listening to tapes of single CW then multiple letters

was same system, then using Morse buzzer keys in pairs to each other, writing (transcribing) to paper or message pads, the norm being 12wpm increased with speed practice. We started as B3 proficiency to B2, B1 and then an A trade qualification as NCOs training others. Since as of now, I have had a stroke with memory loss, but relearning it with my good friend and old tutor who has progressed to be an active amateur operator still today, helping me to buy my 'Listening radio set', with hopefully my Foundation Licence.

James Spencer
PW reader

Dear Don,
I refer to **Dr Tim G4EOA's** letter re methods of learning morse. I joined the Royal Navy in February 1960 and we were taught to write it down from the beginning. By the end of our first eight weeks of 36 we were expected to know the alphabet, figures, tiddly letters etc. Then the learning progressed by a word per minute each week. Some days we had five short sharp sessions. At 12 reading Morse was combined with typing, which we were learning in parallel. We also got our Sparkers Badge, the wings of Mercury with a lightning flash through. We were not shown a Morse key until about 30 weeks. Our instructor had the firm belief that either you could or couldn't send. By then we were well above the pass speed of manuscript at 18wpm and onto a sit up and beg Imperial Typewriter with blank keys at 25wpm. We had to pass at 18wpm on a straight key, anything that went sideways was a no no, too much room to make errors. The rhythms by then were firmly imprinted in the brain so sending came easily. On leaving the RN I gained an MRGC and the requirements were slightly different: 20wpm send and receive, written down.

After 62 years of reading Morse I still can't retain it in my head apart from procedural exchanges. Good luck to those who can.

If I meet you on the air, I have a condition called Cervical Mylopathy, which now makes sending consistent coherent Morse difficult. Don't knock those of us who use a computer to assist sending. The old old adage applies, 'practice makes perfect', there is no easy way, but maybe having a strict Petty Officer looking over ones shoulder helped.

Don't let CW die. After all its two humans communicating not two computers.

Bruce Keeling G4EUW
NE Essex

Dear Don,
The learning Morse debate continues (February 2023). Whether to write it down first or last. Or to partly quote the Bard: to be or not to be.

I've no wish to be seen as (although, doth **Tim G4EOA** protest too much?) over-egging the proverbial pudding, but as **Don**, the editor, seems to make clear, professional Morse operators are not amateurs and nor are amateurs professional Morse operators. But, of course, that there are many amateur Morse operators out there who would give professionals doing exactly the same thing a damn good run for their money. Whether the message is written down on not.

But it's really no surprise that Tim (as a one-time merchant navy professional radio officer) defends his opposition to *"writing it down comes last"*. After all, not only would such an inculcated process be a given within his employment environment – training would-be professional radio officers (it's always been done this way, so why change it or moderate it?), there was a time, as I've mentioned before, where the high priests of teaching Morse code within the amateur radio community thought it a marvellous idea to start out at 5wpm and slowly move on up to 12wpm and so on. Instead of starting out at 12wpm straight away. No wonder so many people gave up, chucked the Morse key in the drawer and forgot about it.

Yes, it is about practice, practice, practice. Always has been. As Tim noted, *"competency increased until eventually, with no copying of traffic onto paper"*. No writing it down. That came last.

No one method is sacrosanct, it's about seeking out a method that bring results for those who want to put their feet in the water from an amateur point of view rather than future aspirations of the professional kind. And without being tied or coerced into something that is set in stone. Or maybe because someone pops up to say this is what professional Morse operators are taught to do. Besides, they have a completely different agenda when copying Morse than someone sat in a shack having a CW QSO with a fellow amateur on the other side of the world. The former is paid to copy down every single word, the latter, probably couldn't care less.

Personally, I wouldn't risk stepping inside a Tesla, be it in self-driving mode or not.

Ray Howes G4OWY/G6AUW
Weymouth

*(**Editor's comment**: Thanks James and Bruce for your insights into learning Morse as professionals, and Ray for your alternative 'take'. Bruce's letter reminds me of an incident when I was training Sea Cadets in Morse code at a weekend camp. I took along my twin-paddle Morse key and a sounder, only to be confronted by a grizzled ex-Navy officer who said that was definitely not a 'proper Morse key'. But, interestingly, one teenage girl on the course started sending good Morse almost immediately on it. When I asked her how come, it turned out she was a flautist in her school orchestra – I suspect there's a lesson there!)*

The 8m Allocation

Dear Don,
It seems clear that both OFCOM and the FCC are dead against giving radio amateurs access to 8m. I suspect the military in both countries is vetoing this and people are too afraid to say so in case they break the Official Secrets Act or equivalent and risk prosecution.

However, it would be really great if many more people could come on 8m transmit in 2023. What would be helpful would be if many asked for limited access, i.e. for a fixed time with lim-

its. The reason is radio science research around solar maximum.

Please ask your local body responsible for permits for limited 8m access. The following would be what I would suggest you ask for:

- 40.680-40.685 MHz (just 5kHz within the ISM band limits)
- 100W ERP
- Narrow digital only, e.g. CW, QRSS, FT8 or WSPR
- April 2023 to September 2023
- Strictly non-interference, i.e. if any harmful interference the station can be told to immediately go QRT.

This would give access during the Es season in the northern hemisphere. Ideally the permit should be for 12 months, covering the F2 DX season in the expected sunspot maximum (November 2023).

Roger Lapthorn G3XBM
Burwell, Cambridgeshire

Dear Don,

PW, Feb 2023, 8m band. Why? Why is it that despite having khz and even Mhz of unused bands, 6, 4, 2, 70, all dead as a dodo, there are those who feel the desperate need to go off to some remote corner and 'experiment' in secret? The statement that *"only serious experimenters"* would play with a 5khz band is a bit much. The rest of us then, the normal band experimenters, the QRPers, the microwavers, even those who just whisper their callsigns, we are not 'serious' experimenters by implication?

I can certainly confirm that despite having numerous radios that will happily transmit on 40MHz, I shall not be partaking and will continue to hope for QSOs on our poor forgotten standard wastelands.

Bernard Nock G4BXD
Kidderminster

The Ragchew?

Dear Don,

I have had my amateur radio licence since 1973, and have been active on and off ever since.

But today it all seems so different from when I first started out on two metres and seventy centimetres. Yes, times move on, new modes of transmission arrive, once data transmission was RTTY, not forgetting the first data transmission, Morse.

Now I can send my signal (callsign) all over the world, and get confirmation, even on a map. I don't even have to pick up a microphone and speak. Wonderful some might say, as in the January 2023 Star Letter. OK, some people may be an introvert and not want to speak to a stranger a few or a thousand miles away, but I am sure they speak to strangers when out shopping, or do they use a pencil and paper to communicate – I don't think so. In the words of **Tony Hancock** (modified) *"I did not spend £500 on a piece of high-grade radio equipment to be told my signal is 59"*. It appears nowadays that is almost all you will get from a distant station. Try to engage in conversation and in most cases you get shut out. If you are very lucky, the other station may tell you what equipment they are using and also the antenna. I like a ragchew, it is social, you don't have to tell your life story. I thought amateur radio was about communicating with other, like-minded people, telling them or you what type of antenna is being used, testing antennas and radio settings. I am sorry, *"Your signal is 59"* (why is it always 59?) or to see my signal on a world map just does not cut it for me.

I want long distant games of snakes and ladders (explain your station to me) and would like to know *"it is raining in Tokyo also"*. I say bring back the ragchew and may it go on forever. Most certainly find a copy of Tony Hancock's *The Radio Ham* and have a good laugh at our hobby. Now, did I tell you about my life story? Maybe you should look me up on QRZ.com. And get a surprise, until next time, it's 73 or 88, whatever the case maybe, from Len G8LXI. Oh, by the way, "it is raining here in Cornwall also" – no change there then.

Len Baddeley G8LXI
Kelly Bray, Cornwall

*(**Editor's comment**: Thanks Len. Many years ago I did a spell in the Royal Signals Reserve and I recall that the Signals guys were renowned for being the worst communicators in the Army. Most were more interested in playing with the technology. I suspect many radio amateurs are the same! But, yes, I am all for seeing more two-way communication on our bands too!)*

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