

OCTOBER 2021

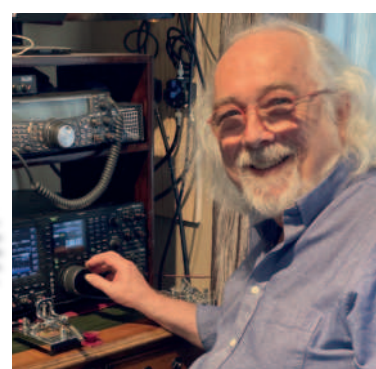
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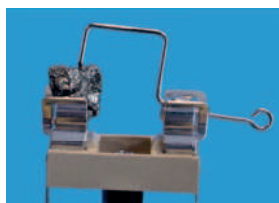


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12

3 Keylines

Don talks about the magazine's content and some readers' letters.

4 Subscriptions

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5 News

PW's monthly roundup of news from the UK and internationally, including new products, club news and recent events.

7 Radio Bookstore

Your one-stop shop for hobby-related titles, biographies, reference titles, historical accounts, technical advice and successful building projects.

8 The VK6LW BDB antenna

Want a wire antenna that has similar gain to a two-element Yagi but in two directions simultaneously and fits into a footprint a half-wavelength square? **Steve Ireland VK6VZ/G3ZZD** says try a compact Bi-Directional Beam!

12 The Xiegu HF Transceivers

Daimon Tilley G4USI takes a look at the range of HF transceivers from Chinese manufacturer Xiegu.

20 Kits & Modules

Geoff Theasby G8BML brings you his 'cabinet of curious capacitors' and some ideas about stepped attenuators.



48

21 Chasing the RSGB Awards

Lindsay Pennell G8PMA introduces award chasing and some of the awards available.

26 HF Highlights

Steve Telenius-Lowe PJ4DX reports conflicting forecasts for forthcoming HF propagation, and has all the latest HF news.

32 What Next

Colin Redwood G6MXL looks at JOTA and the role of local clubs and societies in the hobby.

38 Notes from a Small Station

Joe Chester M1MWD addresses the mysteries of the age by positing three rules of amateur radio.

42 The World of VHF

Tim Kirby GW4VXE reports on some remarkable VHF QSOs and also has the latest satellite news.

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Keylines



60

46 Valve & Vintage

Tony Smith G4FAI reflects on the life of Hiram Percy Maxim.

48 Comet HFJ-350M

Richard Constantine G3UGF gets hands-on with the Comet HFJ-350M 'Toy Box' antenna.

51 A Lab Tutorial

Jeff continues to coach Natalie in some basic circuit theory.

54 The Morse Mode

Roger Cooke G3LDI reports on CWops success, another interesting key and has a couple of NFD stories.

56 From the Ground Up

Eric Edwards GW8LJJ turns to semiconductors and, in this first instalment, diodes.

60 The RadioGeeks 'White Knight' 144/432MHz dual-band antenna

Tim Kirby GW4VXE looks at a low-profile antenna suitable for 2m, 70cm and a range of other frequencies.

61 Data Modes

Mike Richards G4WNC has more about the Raspberry Pi, checking SSD speeds and a neat Spectrum Analyser.

64 Rallies

Locate a rally or event near you; we have our usual comprehensive list.

66 Readers' Letters

Another wide selection, ranging from EMF issues to licensing and testing of baluns.

As we turn to autumn, I have taken down my 6m antenna after a reasonably successful season (over 100 countries worked, mainly on FT8) and am looking forward to the usual seasonal improvement in HF conditions, especially as I have been busy setting up a station at my son's new place, with lots of space for antennas. I plan some single-band contest entries in the major contests and will, as usual, be supporting my local contest group in the RSGB 80m events.

Letters

With another four and half pages of *Letters* this month, I've pretty much caught up with the backlog – my apologies if it's taken a while for your letter to appear. I do value our *Letters* pages, which always reflect the high level of enthusiasm and variety of interests (and views!) among our readers.

Content

I apologise that I have had to hold over the next instalment of *On a Budget*.

Daimon G4USI has put together an excellent feature on HF antennas but it was too long to squeeze in this time. It will, of course, feature next month. I should also take this opportunity to mention that *What Next* will, for now at least, reduce to being bi-monthly. It never ceases to amaze me how Colin G6MXL can turn his hand to a new topic every month but he has asked for a reprieve to research some topics that he is not necessarily experienced with. But he will, though, be back next month with the 144MHz Contest write-up. I plan to take the opportunity to fill the space with a new series on Microwaves that has been in preparation for a while – a side of the hobby often overlooked but becoming increasingly popular.

Incidentally, the content of *PW* is largely driven by the material I get sent which, thankfully, seems to cover most aspects of the hobby. But if you feel your particular speciality doesn't get fair treatment, do please let me know. For example, although we have covered amateur TV and low bands operation in the past, it may be that some of you would appreciate more on these or other topics.



Fort Bridgewoods

In our last issue, Alex VK4TE wrote looking for a source of the book about *Fort Bridgewoods*. I have been delighted at the number of readers who responded and we have left it with one who offered to buy a copy and ship it to Alex. It turns out that it is available on the RSGB website but the RSGB's shipping costs to Australia are, apparently, rather high. To my embarrassment, it seems the book is also available from our own (Warners) bookshop! I should obviously have checked before publishing Alex's letter.

TV DX Anyone?

The recent fire at the Bilsdale (Yorkshire) TV mast left a large number of viewers without terrestrial TV. This was a particular hardship to many old people who had no access to satellite or internet TV. I understand, though, that some folk reoriented their TV antennas to receive more distant transmitters – a case of chasing TV DX! It does make me wonder though, what percentage of viewers actually rely solely on terrestrial TV nowadays. Not a lot, I suspect.

Clarification

A reader has pointed out that in Fig. 15 of June's *From the Ground Up*, the 50 ohm resistors are there purely to represent the source and load impedances. They should not be understood to be actual resistors although the author, Eric GW8LJJ, assures me that including them would make little difference to the efficacy of the circuit.

Don Field

Editor, *Practical Wireless Magazine*

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Newsdesk

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



North Wales Radio Group

With Amateur Radio still being affected by certain lockdown legislation, the North Wales Amateur Radio Group (NWARG) fortunately managed to achieve a number of various activities and even Special Event Stations (SES) while still under Welsh Government restrictions.

On 26 March Chairman **Martin Moyse 2W0NKS** and Vice Chair **Tony Mottram MW6TMQ** joined more than 3,500 people throughout the country who had already signed up to the GREAT TOMMY SLEEPOUT.

These two ex-military veterans from North Wales gave up their home comforts for those that give up their lives, by walking a few miles before sleeping rough up a mountain high above Llandudno Bay. Both veterans braved the cold and very wet conditions complete with their portable HF radios and G5RV antenna, and managed to raise just under £1,000 for the Royal British Legion Industries using Special Event callsign GB2GTS.

On 18 April NWARG celebrated world Amateur Radio Day with SES callsign GB2WRD and members, especially the Club's new M7 licence holders, had a great day operating HF high on the slopes of the Great Orme overlooking Llandudno Bay.

Museums On The Air (19/20 June) was also commemorated at the Cae Hen Museum near Abergele, North Wales, which is the largest collection of



Photo 1: Phill Hughes MW7PWH & Kevin Jones MW0IBT operating GB1BER.

Photo 2: Stuart Armitage GW4EHZ with family members in the GB1CHM HF Operations Tent.

horse drawn vehicles, farming implements and bygones in Wales.

On a very warm day on Saturday 17 July **Kevin Jones MW0IBT**, along with **Ted Pierce MW6ADF** and **Phill Hughes MW7PWH**, set up an SES over 700m high above Llanfeirfechan, North Wales, using callsign GB1BER in memory of his late mother. This remote location was only accessible by their Land Rover, but after driving over difficult terrain the portable station was set up and the trio managed to make numerous contacts.

Event organiser Kevin Jones MW0IBT also completed the 3 Peaks Challenge between 19 and 25 July, raising funds for the NHS Awyr Las Gogledd Cymru (Blue Sky North Wales).

For the latest up-to-date information regarding the North Wales Radio Group, please visit:

www.nwarg.org

School for Deaf Children to Talk to an ISS Astronaut

A group of children at the Mary Hare School for deaf children in Newbury will be talking to an astronaut aboard the International Space Station (ISS) as it orbits above them at 11,000 miles per hour. In October 2021 the school will be using amateur radio equipment set up with the help of members of the Newbury and District Amateur Radio Society (NADARS). This will be a world first, where a group of deaf children will each ask a question to the astronaut who will answer the question live over amateur radio. The reply will then be interpreted into subtitles and sign language for the children to 'hear'. The event is made possible by the worldwide organisation ARISS (Amateur Radio International Space Station) that heads up the amateur radio contacts for space agencies NASA and ESA. As well as being able to listen on the ISS frequencies, there will be a live web feed available on the internet.

Radio amateur and contact co-ordinator **Lloyd Farrington** from NADARS states: "This is a truly exciting event for both the school and NADARS. It's a great privilege to be able to speak to an orbiting Astronaut and we'll have NASA and ESA watching and listening to us due to it being the first contact of this kind in the World!"

The 8m Band

WL2XUP is an experimental station operated by NI4Y, approved for operation on 40MHz (8m), with up to 400W ERP. WSPR and FT8 modes are currently being used to test propagation. One interesting tidbit from the linked EI7GL website is that 40MHz is used by automated devices measuring the snow pack in the US. Those devices use meteor scatter to transmit their measurements.

While the majority of UK amateurs will be unaware of the 40MHz allocation, it is available to amateurs in Ireland, South Africa and Slovenia and there is also a beacon in Denmark. The band has a long history, being made available during 1925 to 1928 to amateurs in the UK and Ireland and later, at different periods, to amateurs in a number of countries.

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



RAOTA NEWS: The autumn 2021 issue of OTNews is out and, in addition to all the annual reports from Committee, has an article by G4GQL showing his collection of Morse keys, and one by G3RZP titled '100 years of short waves across the pond'.

Then there is 'Radio at the roof of the world', which describes the trials and tribulations of taking wireless sets up Everest in 1933. There is also the latest in the series of member's articles about 'How I got started in Amateur Radio', which are always interesting, and for those with limited vision the magazine is always available as an audio version too.

www.raota.org

NRRL RECEIVES GRANTS TO SUPPORT ONLINE LEARNING, EMERGENCY PREPAREDNESS:

The Norwegian Radio Relay League (NRRL) has recently received two substantial grants that will further its education and emergency preparedness programs. NRRL was given the equivalent of nearly £59k from the Research Council of Norway for the development of teaching material for amateur radio. According to NRRL, the grant will fund measures that "strengthen children's and young people's digital competence through leisure activities". NRRL will develop online learning material for amateur radio and other activities over the course of the two-year project.

"Voluntary efforts from NRRL members will also be an important input factor in the project", NRRL said. "We hope that many will take an active part in this work, which will be important for the future of amateur radio in Norway".

NRRL has also received a grant of nearly £68k from the Gjensidige Foundation that will further support its emergency preparedness and response initiatives. The funds will specifically

enable NRRL to develop and produce new tracking units that NRRL will use in its rescue service to locate volunteer teams on a map and in real time. In addition, the funds will support much-needed equipment and joint exercises and skills development.

"Volunteer rescue crews have been a critical part of the Norwegian rescue service for more than 50 years", said NRRL's Liaison Service head, **Henrik Solhaug LA6ETA**. "In close cooperation with the police and the Main Rescue Centre, they have, over the years, searched for and found thousands of missing individuals and saved hundreds of lives. These are tasks that the public sector itself does not have the capacity to perform, and volunteers have largely covered the costs themselves". (Thanks to NRRL)

WSPR BEACON ON TRANSATLANTIC VOYAGE:

(from *Amateur Radio Newsline*) An experimental amateur radio beacon is making a 3,000-mile, 80-day journey across the Atlantic Ocean in a rowing boat, its second such trip this year, as the sole companion of French adventurer **Guirec Soudée**.

The 1W WSPR beacon, transmitting on the 30m band nine times an hour, is designed to help keep track of him if his satellite phone fails. Guirec and his rowing boat, *Romane*, left Cape Cod in New England bound for his hometown in Brittany, France on Tuesday 15 June. It was the second leg of his voyage which began in December when the young adventurer left the Canary Islands for St. Bart's in the Caribbean.

A veteran sailor at 29, Guirec, in 2013, became the youngest person to sail to Alaska. During the first part of this latest trip crossing the Atlantic, he capsized twice en route to the Caribbean.

SWISS RADIO AMATEURS FACE FEE TO USE QO-100:

(from *ICQ Podcast*) The Swiss communications regulator OFCOM charges £55 (CHF 70) to issue radio amateurs with special permits to use the QO-100 amateur satellite transponders. A post on the USKA website indicates OFCOM wishes to protect licence-exempt users in 2.4GHz and OFCOM reserves the right to withdraw the special permit if there are problems. The special permit entitles the holder to use a transmitter with a maximum output of 100W PEP for a satellite uplink in the 2400-2410MHz band.

NEW COMMUNITY WEBSITE:

Chris Lawton M7JEX tells us that he has spent the past four months designing a unique website for the amateur community. The site is 100% hosted by Chris on a secure server. He says, "I ask for no remuneration in running costs, I just wanted to give something back to the community".

The site is at:

<https://qrzbook.net>

AMATEUR RADIO RESPONDS TO FLOODING IN WESTERN EUROPE:

International Amateur Radio Union (IARU) Region 1 Emergency Communications Coordinator **Greg Mossop G0DUB** reported that amateur radio volunteers have responded in the wake of the recent widespread flooding in Germany, Belgium, and the Netherlands. The flooding, resulting from unprecedented heavy rainfall, has claimed more than 120 lives.

The Dutch Amateur Radio Emergency Service (DARES) was on standby from 14 July, as the first reports of flooding came in. An initial attempt to establish a point-to-point link from the provincial capital of Maastricht to the north of Limburg province was halted due to heavy traffic, as residents evacuated low-lying areas. DARES volunteers were in contact with members of the Belgian Emergency Amateur Radio Service (B-EARS) to coordinate their efforts.

The European Civil Protection Mechanism was activated, and emergency groups across the region reported that their governments were sending extra assistance and supplies to the areas where damage was worst. The floodwater surge continued to make its way north, leading to further evacuations, and amateur radio emergency groups focused on requests for assistance. B-EARS was asked to provide a backup VHF link between the emergency call centre in Brussels and the province of Hainaut, while DARES had four stations active in the Limburg area ready to respond if needed.

Marc Lerchs ON3IBZ, Information Director of the Walloon Brabant Crisis Centre, told *Crisis Response Journal* that the police building in Wavre, including its TETRA antenna and computers, was left completely underwater. Some 30 amateur radio volunteers deployed in the region to support communication for fire and ambulance stations, hospitals and emergency medical vehicles, the main command post in Wavre, and 112 (equivalent to 999) dispatch in Mons.

UKRAINE SPECIAL EVENT: The special event station EM30RUARL from Chernihivska will be active until 31 December. This is to celebrate the 30th anniversary of the Independence Day of Ukraine and the 30th anniversary of establishment of the Ukrainian Amateur Radio League. QSL via UX7UU (UARL Bureau is OK). EM30RUARL is good towards the UARL-30 award. Other callsigns to look for towards the award are: EM30UARL, EM30AUARL, EM30BUARL, EM30CUARL, EM30DUARL, EM30EUARL, EM30FUARL, EM30GUARL, EM30HUARL, EM30IUARL, EM30KUARL, EM30LUARL, EM30MUARL, EM30NUARL, EM30PUARL, EM30QUARL, EM30RUARL, EM30SUARL, EM30TUARL, EM30VUARL, EM30WUARL, EM30XUARL, EM30YUARL, EM30ZUARL and EM30LRU.

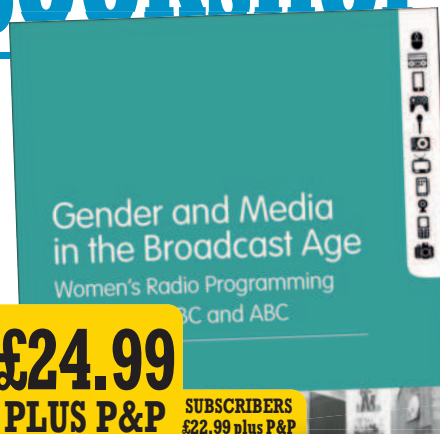
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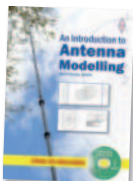
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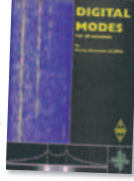
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Steve Ireland VK6VZ/G3ZZD

practicalwireless@warnersgroup.co.uk

The antenna experts will tell you there is 'no such a thing as a free lunch' when it comes to building an antenna that will give you gain over a simple half-wave dipole.

Either you have to make the antenna much longer – such as the Extended Double Zepp (EDZ), a Vee Beam or Rhombic – or add a reflector and/or a director to the dipole. However, my good friend and well-known contesteer **Kevin Smith VK6LW (G4EHF)**, Fig. 1, has come up with a new antenna design that retains the bi-directional properties of a dipole, has the same length, but also gives you the gain of a 2-element Yagi – about 5dBd – in two directions.

Another nice feature is a 14MHz version of the VK6LW BDB antenna will fit into a 10m by 10m square! But, as the advertisements say, 'there's more!'

In comparison to the currently fashionable EDZ, the BDB offers a decibel or two extra gain, a broader pattern, single coaxial feed (with no matching stub required) using cheap RG6 UHF TV-type coaxial cable feeder and is less than half the overall length.

To conclude my sales pitch, VK6LW's BDB comes as close to a free lunch (with dessert) in the antenna world as you're likely to get!

How the BDB was Designed

Kevin VK6LW is arguably the best CW contesteer in Australia, consistently finishing as the #1 Australian station in the CQ WW, WPX and the Commonwealth Contest for over 30 years. We have been friends for a similar length of time. His success comes not only from being a world-class operator but also being expert at antenna design, using computer simulation to produce practical, highly effective antennas.

As the world contest scene has evolved to embrace computer-controlled stations, in particular Single Operator Two Radio (SO2R) ones, and computer-designed antennas, Kevin has embraced the bleeding (oops, leading) edge of both technologies.

One of the keys to success in international contesting is to have antennas optimised for each HF band and able to be rapidly switched between the long and short paths to the main population centres (i.e. Europe, North America and Japan/SE Asia).

As a result, Kevin has built several low-cost monoband wire antennas, which were sited away from his house, located on the



The VK6LW BDB antenna

Want a wire antenna that has similar gain to a two-element Yagi but in two directions simultaneously and fits into a footprint a half-wavelength square? **Steve Ireland VK6VZ/G3ZZD** says try a compact Bi-Directional Beam!

top of a small hill but a major noise source.

Initially Kevin built Beverage-type antennas, which improved the signal-to-noise ratio markedly from his HF and 40m Yagi antennas mounted on two towers close by the house. However, as the signal levels on the HF bands continued to decline in line with solar activity, he switched to building remotely-sited wire antennas, which offered gain over a dipole and thus greater signal levels.

These were initially single-band EDZ antennas, superseded by two-element and then three-element wire Yagis.

With each change, an increase in signal and a relative drop in noise level occurred. But in order for the wire Yagis to be switched between long path and short path, both elements needed to be fed via 3/8th wavelength coaxial stubs and then relay-switched to change directions.

What started out as a cheap, simple ex-

ercise quickly became a costly, complex one, with 12V relay control lines, coaxial stubs and feeders running across a substantial portion of the VK6LW backyard. Simplification was urgently needed.

Kevin then went back to the EZNEC antenna modelling software and experimented with what would happen if a director is placed on either side of a driven element. Could he create a bi-directional Yagi with gain and a feed impedance suitable for RG6 coaxial cable? After several evenings of modelling, the BDB was the result.

How the BDB Works

In a conventional two-element Yagi (i.e. driven element plus reflector or director) the spacing between elements is in the order of 0.1 to 0.125 of a wavelength, which gives about 6.26dBi (or around 5dB over a dipole). This means the elements are relatively closely coupled, so the feed imped-

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Fig. 1: Kevin Smith VK6LW/G4EHF.

Fig. 2: Original VK6LW 20mBDB, designed for CW section of 14MHz band.

Fig. 3: VK6LW BDB azimuth pattern

ance is close enough to 50Ω for it to be fed with commonly used RG-213 or LMR-400 coaxial cable. However, when a third element (i.e. a director in front of the driven element) is added, the driven element impedance drops so low a gamma match or similar matching system is necessary, although the antenna gain increases to 7 to 8dBd.

Now if you increase the spacing between each element to a quarter wave (0.25λ), the gain of the Yagi falls but the impedance of the driven element rises, so coaxial feed again becomes possible.

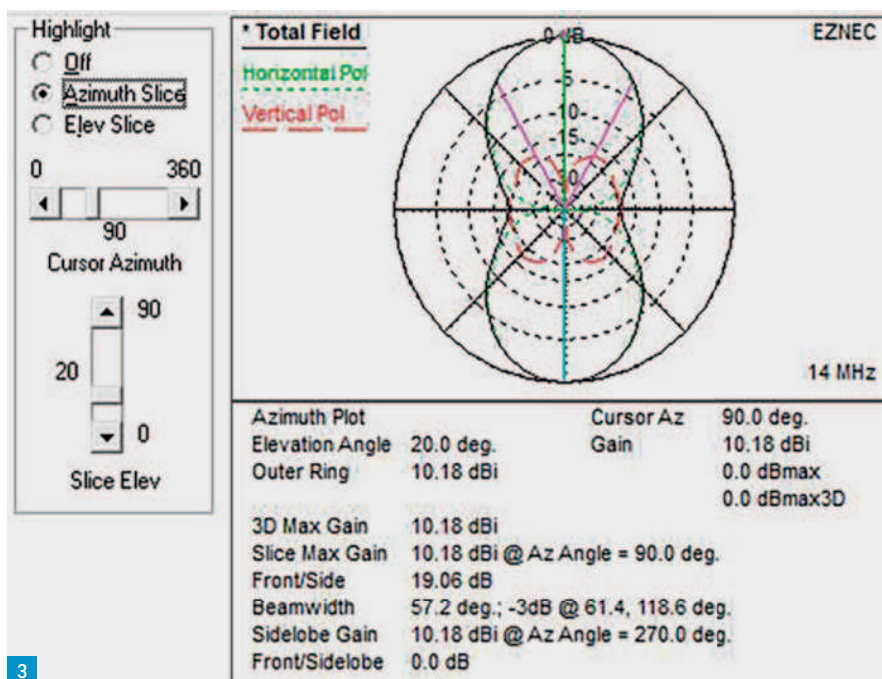
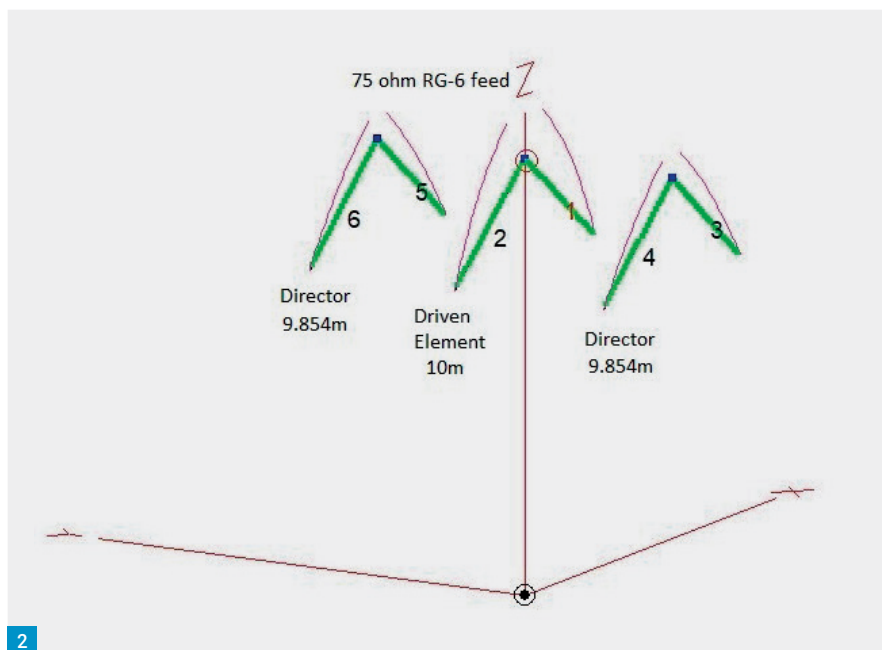
On this basis, VK6LW modelled adding two directors, spaced a quarter-wave, one on each side of the half-wave dipole driven element. This made the three-element antenna bi-directional. After varying the length of each director, Kevin found he could optimise the gain in two directions to almost 5dBd – the same as a conventional unidirectional two-element Yagi! Yes, Yagis don't have to be uni-directional!

What was equally pleasing was that the antenna displayed a feed impedance of around 75Ω – perfect for being fed with RG6 UHF TV quad-shield cable. You can buy crimping tools for RG6 relatively cheaply, which gets around of the issue of having an aluminium braid that can't be soldered.

Fig. 2 shows the configuration of 14MHz BDB in inverted-V configuration modelled by VK6VZ, with the apex of the elements at 12.8m and the ends at 11.3m. The antenna elements are made of 14SWG bare copper wire and hung from a polyester 'catenary' rope, which forms the boom of the BDB Yagi.

The beamwidth of the BDB antenna (before signals fall off by 3dB) is 57.2° , very similar to a conventional two-element Yagi, Fig. 3. Its front-to-side ratio (rejection off the sides of the antenna) is just over 19dB. As shown in Fig. 4, the maximum gain of the BDB at this height is at 20° to the horizon – great for working long distances. Fig. 5 shows the radiation pattern as a 3D image.

During the late Western Australian summer/autumn, we have long path propagation into the UK in the late afternoon and short path propagation during the evenings. In early March VK6LW quickly built up a prototype 14MHz BDB aimed at the UK/Western Europe and found he could easily work stations across Europe on



both short and long paths using the antenna running 100W. He even worked a few Europeans on the SP while only using 5W!

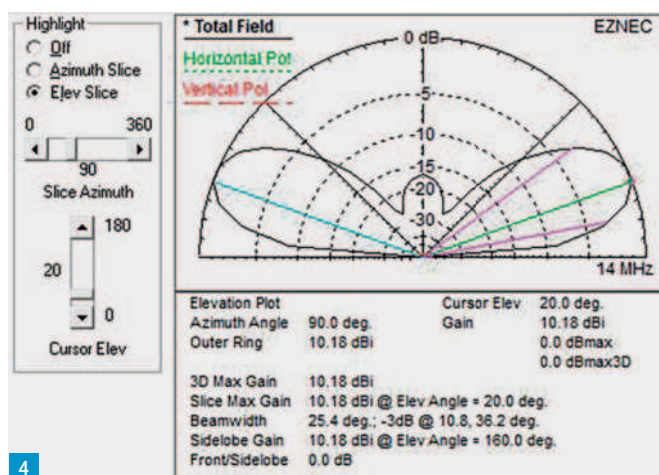
While the BDB produced lower signal levels and reports than his main, conventional Spiderbeam Yagi, the latter had three elements working in one direction, was over twice as high in the air and also on a tower on a much higher part of his property. On the other hand, the BDB was far quieter than the Spiderbeam, owing to being farther away from his house, and weak signals could be heard on it that were inaudible on the noisier Spiderbeam.

Another advantage of the BDB is being

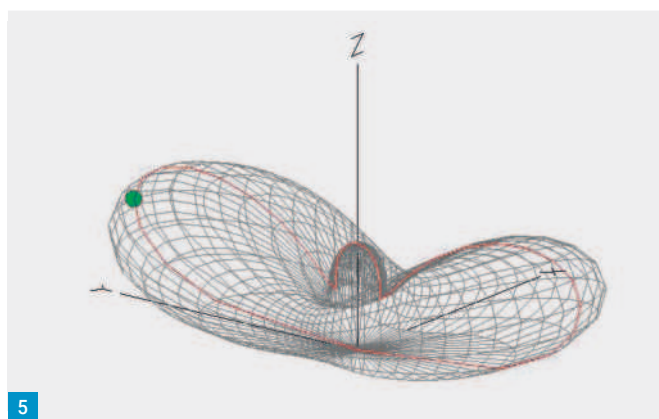
made of a 5mm diameter catenary rope and wire elements it is virtually invisible. This meant some 'outlining' was necessary in the photo, Fig. 6, so the antenna could be seen!

VK6LW fed the BDB using RG6 coaxial cable via a simple choke balun (five turns of the cable on a small piece of 100mm 'white' (non-ferrous) PVC pipe). 50Ω coaxial, such as RG-213 or LMR-400, could be used as a feeder, as long as an SWR of 1.5:1-plus is acceptable.

Table 1 shows suggested dimensions for a BDB antenna for the 14, 18, 12, 24 and 28MHz bands, based on VK6LW's work.



4



5



6

Fig. 4: VK6LW BDB elevation pattern

Fig. 5: VK6LW BDB three-dimensional pattern.

The green spot shows the angle/point of maximum radiation

Fig. 6: The layout of VK6LW's prototype BDB antenna. For clarity purposes, the antenna elements have been overdrawn/highlighted in green and the catenary rope and feeder in grey.

Kevin's original BDB was designed for the CW end of 14MHz, but the dimensions in the table are for the middle of each of band (except 28MHz, where the dimensions are centred on 28.5MHz).

Note the dimensions aren't critical, with the exception of the director lengths. A small variation will have a sharp effect on the symmetry of the bi-directional gain (i.e. there will not be equal gain/signal from both directions at 90° to the antenna).

Plastic egg insulators are used at the ends of each element, which are then supported/tensioned using fishing line or thin Dacron/polyester rope. While VK6LW's 14MHz BDB had an apex height of 12.8m, a BDB for any of the HF bands with its apex at 10m and ends at 7.5m is going to be almost as effective but easier to put up by the average radio amateur living in suburbia.

Band (MHz) (m)	Driven Element (m)	Directors (m)	Element Spacing
14	9.89	9.746	4.82
18	7.75	7.368	3.77
21	6.61	6.513	3.22
24	5.62	5.538	2.74
28.5	4.92	4.848	2.40

Table 1: Suggested BDB dimensions for each band between 14 and 28MHz.

Conclusions

The BDB is an excellent, non-critical and cheap bi-directional beam antenna, particularly for those with a tree or two in their backyard who are interested in making contacts with stations in one particular area on the far side of the world. No tower or rotator is required and it is going to give a performance noticeably superior in its principle direction(s) to a simple dipole or groundplane antenna at the same height.

It also has a definite advantage over the EDZ antenna as it can be configured in an inverted-vee format without loss in performance and has a wider beamwidth. Even at a lower height to that used by VK6LW, the BDB should be a very effective performer, owing to its inherent 5dB gain over a dipole.

If you want to use a long feeder, say

50 to 100m, Kevin suggests substituting RG11 75Ω coaxial, also used for digital TV installations. This has 1.5dB less loss than RG6 over a 100m run and about the same loss as RG-213 cable. A 100m roll of RG11 can be purchased from Farnell in the UK for under £100:

<https://tinyurl.com/wrwte25x>

He also points out there is an opportunity for experimentation by adding parallel driven elements for 21 and 28MHz on the same feeder and then interleaving parasitic elements (directors) for these bands with the 14MHz ones.

If you are interested in contesting, DXing and antennas, VK6LW has made a series of podcasts under the banner of 'Amateur Radio Topics', which has some excellent information, visit:

<https://tinyurl.com/8ua5fxpm>

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When you read various radio-related social media platforms, Chinese transceivers seem to be a bit like Marmite – there are those who love them and those who hate them! While no radio is perfect, wherever it comes from, my own experience has been quite positive overall, with only one notable exception, and this article is intended to be a follow-on from my recent *On a Budget* series where I covered HF transceivers.

I have owned a Xiegu X5105 for a little over two years now and when writing the aforementioned article I mentioned the three HF transceivers produced by this aspiring Chinese company, but have only had the opportunity to use the X5105.

I dropped Alan at Sinotel an email asking if he would be prepared to lend me a G90 and a G1M transceiver in order to write this review, and he kindly agreed. This article will describe the three rigs on offer from Xiegu, **Fig. 1**, along with my own extensive testing.

The Xiegu HF Transceivers

Daimon Tilley G4USI takes a look at the range of HF transceivers from Chinese manufacturer Xiegu.

Specifications

Table 1 gives an overview of the key features of the Xiegu offering. As well as hopefully giving you a good overview of the Xiegu offering, I think the table also demonstrates that the rigs offer good value for money and something for every budget.

First, let's talk a little about Xiegu themselves. Based in Shenzhen, China, ChongQingXiegu Tech (to give them their full name) have been established since 2010 and have produced a number of transceivers, some of which, such as the X1M and X108G, are no longer in production. Their website is not particularly great, but I feel it is not really aimed directly at the end-user in any event, with Xiegu selling

through resellers. The site (URL below) indicates that they employ 68 staff. Alan tells me that he has a good relationship with the factory and there is regular dialogue. This is a firm that is becoming increasingly experienced in the HF market and I feel sure will continue to produce new products.

www.cqxiegu.com/en

The G1M G-Core

The smallest, cheapest product is the G1M G-Core, **Fig. 2**. This is an SDR transceiver covering the 80, 40, 20 and 15m bands at about 5W output. Out of the box, it comes with a power lead, microphone, programming lead and basic instruction manual.

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Fig. 1: The three rigs ready for testing.

Fig. 2: The G1M G-Core. Fig. 3: The G90.

The first thing that struck me was its small size and just how light it felt in the hand. It is an updated model from the previous G1M and has a monochrome OLED display, volume control, tuning knob and a number of multi-function buttons on the front panel. These buttons are not labelled but are indicated by the OLED display. CAT and Data Modes are supported by means of 3.5mm jacks on the rear panel, along with a jack for the key or paddle, external speaker and a BNC antenna connector. Power is via a standard 5.5 x 2.5mm coaxial plug (centre positive.) There is also a knurled knob for a ground connection.

Powering up the rig I was pleased to see a clear and uncluttered display, which was easy to read. The menu buttons were easily identified from the screen and the rig was simple to use and operate. I found that the inbuilt panadapter functionality was limited, even though its scale could be easily altered by the user. I just found it difficult to pick out individual signals from the background. The display was readable in bright sunlight.

Tuning steps, mode, VFO selection, band change, keyer settings and display parameters are all changed from these menu buttons using either a short or long press. There are not layers and layers of buried menus, and once you have used it a few times, there is no need to refer to the manual.

In use, I found operation to be very easy and I made a good number of both CW and SSB QSOs while I had it. CW operation was good, with an 800Hz filter (a bit wider than I would personally prefer, but very usable) and I was able to choose from a straight or iambic keyer, including Mode A and Mode B, as well as keyer speed. Keying was quiet and while not full-break-in, response time was quite quick. Although I didn't make use of it, there is also a channel-setting function for memories.

I used the rig with my main HF antennas – a selection of quarter wave verticals, a multi-band EFHW and my Spiderbeam five-band Yagi – and quite enjoyed using it. I also tuned around the SW broadcast bands and enjoyed listening to stations there, too.

There were only a couple of things that I would change with this radio at this price point. The first was the quality of the received audio. Due to its small size and small speaker I found the received audio a little poor. The speaker would not drive



quite as loud as I would like and the sound was a little thin and tinny. Headphones didn't really improve matters, but an external speaker helped.

I also found the band coverage a little unusual. This rig, due to its size and weight, begs itself to be used portable, but 80, 40, 20 and 15m would not be my bands of choice for portable work. Not many of us work 80m portable really (he says, waiting for a stream of letters to the editor!). Maybe 40, 30, 20 and 15 (or 17m) would be better? As an SDR transceiver, you would think that this could be readily changed, although Low-Pass Filtering would also need to change with it. It surprises me that

Xiegu don't offer this rig with two or three band options to choose from. The form factor too, lends itself more readily to base station work, although I reckon it would make a great multi-band CW-portable platform.

On the air, I received good CW and SSB reports. When I specifically asked for comments on my SSB audio, I was told that this sounded fine. Overall, I liked this rig and it is really amazing value for money when you think about it – a four-band SSB/CW transceiver with 5W and general coverage receive for £239 is incredible. If this rig fits your budget and your operating needs, then I definitely recommend it. Just

be aware though, that in my experience 5W of SSB in current band conditions, while absolutely possible, can also be a challenge. A good antenna, especially a Yagi, helps enormously.

The G90

Well, wow! What a cracking little rig this is, although not entirely without issues. Out of the box it comes with the same accessories as the G1M but with a better microphone with a number of functions available from its keypad. The first thing that struck me though is its weight. It is quite a compact, but heavy beast at 1.7kg. I don't want to do it an injustice though, I am comparing its weight to the G1M and the X5105, both of which are substantially lighter. For its feature set and power output, it is still a relatively light piece of kit but remember that for portable use you will need a battery too.

The rig, **Fig. 3**, comes supplied with hand microphone, **Fig. 4**, with many features available from its keypad, power lead, programming/CAT cable and a cable for remote head operation, along with an Allen key to remove the head. The manual is more comprehensive than the G1M and covers all of the features nicely. This is the rig I had most fun using.

It looks more utilitarian than the other two of its stable mates, but in a rugged, rather than ugly, way.

Powering the rig on, the first thing you notice is the beautiful little full colour OLED display, **Fig. 5**. Although small, this really is incredibly clear. Good use is made of the colours and all critical information is available at one glance. It helps to raise the front of the rig a little to get the best from the display and there are plenty of DIY and commercial products to do this for you. I found the display readable in bright sunlight, but with some loss of clarity. Direct full sun on the screen was almost unusable though. However, the simple expedient of throwing your own shadow on the display soon resolves that. The panadapter and waterfall display is excellent, really usable and provides a 48kHz slice of band activity, scrolling nicely as you tune.

Necessarily, with the fuller features of the G90, the menu structure and button functionality is a little more complex, but readily learnt, and the manual neatly summarises the key features. The most regularly used features, such as power settings, tuner, keyer settings and SWR sweep, even filter settings, are quickly and simply accessed and amended. There is

	G1M G-Core	G90	X5105
Bands	80, 40, 20, 15m	160–10m, inc. 60m	160–10m inc. 60 & 6m
RX coverage	0.5-30MHz	0.5-30MHz	1-55MHz
Power Output	5W	20W (adjustable)	5W (adjustable)
Modes	SSB, CW, AM (Rx)	SSB, CW, AM	SSB, CW, AM, FM*
SDR functionality	Yes	Yes	No (double superhet)
CW keyer	Yes	Yes	Yes
CW memories	No	No	Yes
CAT Control	Yes	Yes	Yes
Twin VFOs	Yes	Yes	Yes
Inbuilt digimodes?	No	No	CW, RTTY, PSK31 (by memories only)
Input voltage	12-13.8V	10.5-16.5V	9 – 15V
Standby Current	0.5A	0.75A (I measured 0.6A)	0.66A
Max. current	2.5A	4.5A (manual says 8A!)	2.5A
Display	OLED monochrome	1.8in OLED Colour	3.6in dot matrix
Detachable Head Unit	No	Yes	No
Built-in battery	No	No	Yes, 3800mAh
Built-in ATU	No	Yes	Yes
Built-in SWR analyser	No	Yes	Yes
I/Q Output for panadapter etc.	No	Yes	Yes
Size (mm)	97 x 40 x 155	120 x 45 x 210	160 x 100 x 46
Weight	0.61kg	1.7kg	0.94kg
Price	£239	£390	£500

Table 1: Overview of Features

a multi-function key on the front panel, which you can define to one of a number of functions. It comes set to do 100kHz tuning steps but I changed it to alter keyer speed simply and quickly.

The audio output is excellent, with great volume and really nice audio with plenty of bass and treble – easily the best audio of all three rigs and a real pleasure to listen to for extended periods. Audio reports of my SSB signal on the bands were good. A few contacts commented on the positive impact made by the speech compressor. What was also most noticeable about this rig, though, was the relative ease of making SSB contacts compared to the either the G1M or X5105.

With 20W of output, you have four times the output of the two sister rigs. Now in theory, if you increase power by a factor of four, you should get a 6dB increase in received signal strength, or one S point, not a great deal. Testing and switching between the three rigs in an hour long QSO with **Tony IK6BXV** demonstrated this was indeed the case. Now if, as in my case with

Tony, you are receiving a 59 plus 20dB report on 20W (using a 3-element Yagi on 20m), then a 59 plus 15 report on 5W is an inconsequential change. However, in marginal conditions or with QSB, the 20W could make all the difference between being heard and not being heard, or having a comfortable QSO or a difficult one. That is also the experience of many G90 owners I have spoken to.

One of the great features of this rig is the ease of altering the filters. A quick push of the multi-function knob under the volume control allows you to shift the filter centre frequency to very effectively tune out adjacent QRM, while a second press allows you to alter the filter width just as easily. Standard CW filtering is 500Hz, but this is adjustable down to as low as 50Hz. Standard SSB filtering is 2400Hz. There is an LED zero-beat indicator built in, as well as a CW decoding function, although I don't find the CW decoder to be very effective with anything but really good machine-quality CW and relatively strong signals.

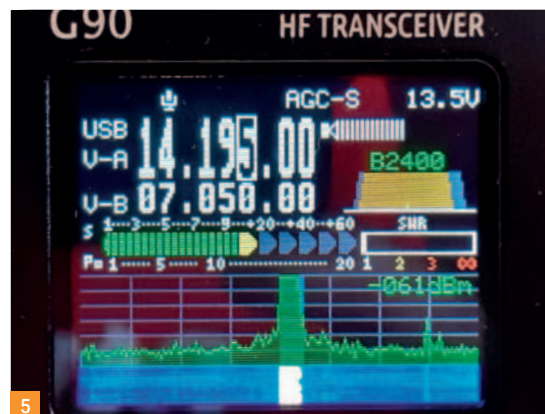
Fig. 4: Microphone supplied with G90 and X5105.
Fig. 5: G90 OLED display. Fig. 6: G90 head unit.

Band and mode switches on the top of the head unit make changing these very simple indeed, and you can cycle up and down through the options.

On the rear of the unit, the G90 differs a little from its sister rigs in that it alone uses an SO239 antenna connector and two-pin power plug, which I believe is known as a mini-Tamiya connector. I am not sure why this is really, because consistency between rigs in the Xiegu stable would be helpful if you owned more than one model. There are the usual 3.5mm jacks for key, CAT Control (labelled as Comm), I/Q output and an 8-pin accessory port. This port can be connected to the optional CE-19 port, enabling easy digital modes connections as well as connection to the Xiegu linear amplifier and the GSOC controller, more of which later.

During my tests, I did not use the G90 on digital modes, but when running for extended periods on 20W SSB I did notice the unit gets quite warm. There is no fan fitted so, for digital modes, with high duty cycles, many users fit a fan to a stand underneath the rig. Indeed, Sinotel offer such an accessory. In addition, I had the rig lying flat on my desk and it looks as though that is where the main heatsink is, so elevating the front of the rig would also assist by allowing airflow underneath.

It is a nice feature to be able to remove the Head Unit, **Fig. 6**, and this makes the G90 ideal for installation in a vehicle or in some form of bespoke go-box arrangement. To remove the head unit, you need to remove four Allen bolts with the supplied Allen key. In doing so, the front instrument panel guards are also removed and cannot be used. Neither the head unit nor body comes with any mounting hardware, although Sinotel do sell a multi-purpose bracket that will fit the body or head, but two would be required for both items to be mounted. If you are lucky enough, like me, to own a 3D printer, then a number of users have made designs available on Thingiverse.com to act as stands, brackets and legs. The connecting lead between the rig and head is a rather old-fashioned and bulky 9-pin D style connector with a 120cm lead. This would be too short to fit your radio under your vehicle's front seat and the head on the dashboard, but the good news is that such cables are widely and cheaply available in many lengths. Note that before you fit the extension lead, there is a warning sticker



on the rear of the head, giving instructions on fitting the cable. If you don't follow them, it is possible to lose the connector inside the head! The opportunity to separate the head is definitely useful, but it is not something that can be done quickly and easily, certainly not on a repeatable basis. It would be too easy to lose a screw or the Allen key. This is one of the areas of compromise really – the construction of the rig lacks a little finesse, but of course finesse in the engineering of an easier-to-remove head would certainly cost more. It is a compromise worth making I think.

The hand microphone is an Icom clone and quite useful. From it you can directly enter and change frequencies, change band, change mode, activate the ATU and tune, switch between memory or VFO mode and there are also three user-defined buttons. The up and down keys can be changed to tune one of either

frequency, band or volume, while the F1 and F2 buttons can each be programmed to toggle the preamp/attenuator, split operation, noise blanker, compression for SSB, or AGC (Fast, Slow, Auto and Off.) These functions are also each available via buttons on the Head Unit.

I have a tip here by the way. If the bands are noisy, turning the AGC off significantly reduces band background noise. Once you have found a station it can easily be turned on again.

The G90 supports VOX and you can make a number of adjustments, including sensitivity and anti-VOX, to personalise this, although you would need to play with the settings. The default ones were not very usable. The display also indicates the supply voltage, but usually this indicates a slightly lower voltage as the measurement is not made right at the entry of power but later in the rig architecture. This is not a

Fig. 7: The X5105. Fig. 8: Tuning the electric fence wire with the X5105. Fig. 9: SWR scanning on the X5105. Fig. 10: SWR scanning on the G90.

big issue. My display is currently reading 13.6V with a calibrated 13.8V DC shack supply.

An external speaker (powered only, not passive)/headphone outlet is available, and this can be selected by a short press of the volume control, muting the internal speaker, and the display changes to indicate this. My only desire for additional features on this rig would be for one or more CW memories, which are really helpful for CQ calls, SOTA references, etc. and backlit buttons for dusk/night-time use, although the illuminated microphone helps mitigate this, in part.

I will talk about SWR scanning and ATUs at the end of this article as these functions are common to both the G90 and X5105 and perform very well.

As my review time with the G90 was coming to an end, strange things started to happen. The SWR readings started fluctuating all over the place and the power would also be up, but mostly down. It was as if the radio was detecting high SWR and closing down power but not consistently – it was all over the place. I eliminated antenna and coax problems and was sure it was the rig. Contact with Sinotel suggested re-flashing the firmware. I did this and flashed the current firmware again, twice, and earlier firmware, but it didn't fix the problem. Sinotel arranged for the G90 and G1M to be collected and despatched me a new G90. At the time of writing I have been putting the G90 through its paces and that problem has not re-surfaced, which is good news.

On the last occasion I took the rig out of the shack to test, I went to nearby Dunkery Beacon on Exmoor, a two-point SOTA summit. I decided not to make the walk to activate the summit, but to operate from the car at the roadside not far away. I was at around 500m above sea level with cracking views of the Moor, the Bristol Channel and Wales.

I decided to keep it simple and used just a magmount with a 20m mobile whip antenna. I sat in the car and plugged the G90 into the cigarette lighter socket. My car is a petrol/electric hybrid and the cigarette lighter socket can deliver 10A from the engine starter battery, but the vehicle has to be switched to accessory mode. This is how you operate the car radio when parked. The only issue with this is that the accessory mode switches



itself off after 30 minutes, without any warning. I began operating on 20m CW and logged contacts into Russia, Italy, Germany, Belgium and Holland. After having exhausted answering the CQ calls I could hear, I decided to try SSB. At this point the car accessory mode switched off cutting power to the G90. I switched the accessory mode back on, but the G90 would not power up. It showed all sorts of weird behaviour. It took many (at least a dozen) attempts and much fiddling to get it back up. I began operating again, listening around on 20m SSB and working F4EAC just south of Paris with a 57 report. Then, it happened again, the vehicle cut power after 30 minutes and the same issue resurfaced, taking ages to fiddle around trying to revive it. **I should stress here, that after investigation, I do not think the rig was at fault.** I asked around in the G90 social media groups and no-one else has experienced this.

Following some ideas from group members I tested the G90 on the shack PSU. I 'pulled the plug' many times without switching off the rig, and every time I powered back on, the rig worked fine, although many settings reverted to factory default, but that is fair enough. I also reduced the supply voltage in increments of 1V, down to 10V. The rig continued to work perfectly and no sign of the issue reappeared. So, I am left believing that something about the way my vehicle powers down (or back up) the accessory socket is not to the liking of

the G90, perhaps a spike or something. It is an issue you should be aware of if this is the way you plan to operate from a modern vehicle. If I was to buy a G90, I would do more investigation of how my car powers down and either try to fix it or use a separate battery source, which is not really big deal if you plan to operate from your car, and it would prevent you accidentally flattening your vehicle battery too.

The X5105

As I said earlier, I have owned an X5105, Fig. 7, for two years, having bought it used for £300. I have used it quite extensively both in the shack and out and about portable. It was the rig I took with me on my extended train tour of Europe in 2019 when reviewing micro-portable QRP antennas for *PW* (Nov19) and the rig has been reviewed before in *PW* (August 2018).

I don't want to replicate that earlier review here, but I cannot review the Xiegu stable without talking about it. As you can see it is the most expensive of the three rigs, but is the only one without SDR architecture, instead using a double-superheterodyne receiver. It is compact, very rugged and has the biggest and easiest to read display of all three rigs, with a 3.6in dot-matrix monochrome display. The display is very good and easy to read. It is the only display that is still perfectly readable in 100% direct sunlight straight onto the screen. There are no protruding knobs on the radio, with

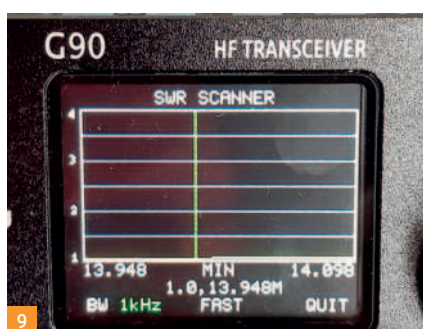


push buttons used for volume and other controls, and a thumb-wheel arrangement for tuning. This works well and means that the only protrusion on the radio is really the BNC antenna connector.

The X5105 is truly designed as a field radio and its form factor, with tilt-legs, makes it perfect to use on the ground or on a tabletop. Complete with built in ATU and large battery pack, it is a good package that will allow you to get on the air with the minimum of 'extra baggage'. All you need is an antenna, the rig, microphone and/or CW key and you are set. In fact, you could leave the microphone at home, as there is an internal microphone and a PTT button! I have to say, I like it a lot and it is perfect to give you a portable radio that can work all of HF.

I have had many QSOs on it. Mostly these have been CW as that is my preferred method of portable operating and I find that I get much more success with 5W CW than I do with 5W SSB.

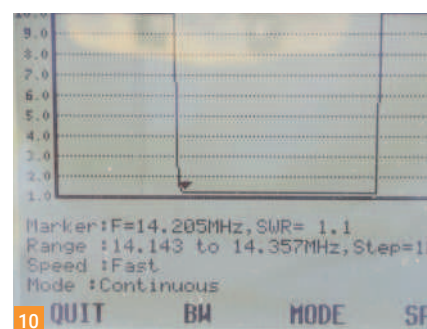
The rig offers many good features, but without SDR architecture there is no waterfall or panadapter. However, the I/Q output works well and I have successfully used the rig with Cubic SDR software on the Raspberry Pi, giving me a waterfall, panadapter and CAT control. I have also used it extensively for digimodes although



this was tricky to set up on the Raspberry Pi. Most have success with the G90 and X5105 on digimodes using Omni-Rig, only available for Windows.

The rig shares the same microphone and microphone functionality as the G90, as well as having VOX, AGC, speech compression and so on. There are multiple layered menus using four multi-function menu buttons providing quite a large degree of control once you get used to them. While I am used to it now, I do think that the G90 is a little more intuitive to use.

One feature the X5105 has that the others don't is the ability to decode PSK31 and RTTY. I believe (although I have never tried) that in the digimodes setting you can pre-program messages, which can also be sent in those modes, allowing a formulaic QSO without a computer. I do use these



memories as CW memories however.

The X5105 does have one or two extra features over the G90. First it covers 50MHz, although I rarely use this band, and second, and it's a small thing, but all the buttons are a little larger, with larger writing and are backlit. That makes it great for evening use either in a slightly dark room, or outside when camping perhaps. It really helps. Having said that, although the G90 does not have this benefit, the microphones on both rigs do light up when a button is pressed, which is also very helpful. However, if you are keen on the 50MHz function, I must sound a note of caution. The X5105 is marketed as having FM mode. I have never got this to work successfully despite the latest firmware. My friend in the nearby village also has the X5105 and when we tried 50MHz FM for a

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natter, we both found our modulation was unreadable. I asked around on the groups a year or so ago and I have never found anyone who has made FM work for them! Please feel free to prove me wrong.

I have been reasonably happy with the X5105 – until I listened to the G90! The G90's excellent audio output and filtering arrangements outshine the X5105 by a country mile. Comparing the two on transmit, both at 5W, there is nothing in it in terms of transmitted audio quality, but the X5105, with its smaller form factor and really tiny loudspeaker, sounds like a tinny transistor radio next to an old-fashioned Roberts – there is no comparison. While I found that headphones didn't seem to improve matters, a small bluetooth speaker with a short 3.5mm audio cable really did improve things and added some much-needed bass. Indeed, during my hour-long conversation with Tony in Italy, we did extensive switching between the three Xiegu rigs. The G1M and X5105 received audio were comparable. Transmitted audio quality across all three rigs was reported as 'good'. I spoke to Tony for a while on the X5105 before I asked him to pause while I returned to the G90 – the 5105 was, literally, hurting my ears in comparison.

On continuing on the G90, the QSO became a pleasure once more. But of course, received audio is just one part of the story and the X5105 with internal speaker is fine for a couple of hours in the field and a compromise that is acceptable. If you wished you could add a small external speaker and I would certainly consider that if using in the shack.

The ATU and SWR Functions.

Shared only by the G90 and X5105, the ATUs on these rigs are frankly remarkable. On the blog of my personal website (below) are two articles concerning this.

www.g4usi.wordpress.com

In the first part of my blog, I show how, for fun, my X5105 has successfully loaded the following items:

- over 0.6 mile of electric fence around my fields and orchard, **Fig. 8**.
- a metal gate on the cowshed
- the metal cowshed roof
- a metal poly-tunnel frame which is directly grounded, and
- a 12ft livestock trailer!

Not only did it load them, but CW CQs brought Reverse Beacon Spots on everything but the gate – truly impressive.

Now, before you write a letter to our erstwhile Editor, I must stress that this was just a fun exercise. None of these items is an efficient antenna, but it helped me assess the tuning range of the rig. Then, a few days later I was sat on the patio using a random wire connected to the Xiegu G90 and started considering that my favourite antenna for portable use is an end-fed half-wave. Normally these antennas are fed with a 49:1 or 64:1 matching transformer, as they have an impedance of over 2,500Ω.

Could a Xiegu ATU match one of these, without the matching transformer? There was only one way to find out, and to my utter astonishment, yes it could, and I proceeded to have a number of CW conversations on both 40m and 30m EFHWs without any interim matching device, using solely the Xiegu ATU. There aren't many auto-ATUs built into rigs that could do that!

Part two of the blog on my website covers this and this means for portable use you can reduce the amount of kit, space and weight you need to take with you.

In addition to an auto-ATU, both the G90 and X5105 have built in SWR scanning functions, providing a graphical display of SWR that varies according to whether or not you have the ATU in circuit. It is helpful when setting up antennas at home or in the field and a very useful function. I have included screenshots of this on the X5105 and the G90 here, **Figs. 9 and 10**.

Accessories

Also in production is the Xiegu XPA125B 100W linear amplifier, which can be used with the G90 and X5105. It includes the famous Xiegu ATU, retails at a little under £500 and has good reviews (see March 2021 *PW*). If you can only afford a single rig for shack and portable or mobile use, then this linear might be a good choice to get up to the 100W mark should you wish. Although it is worth noting that it costs more than the rig itself – linear amplifiers are not cheap. If you want a do-it-all rig but must have 100W as well, then I would consider something like the Yaesu FT-891 instead. At just over £600 it would be cheaper and fine for shack and mobile use. Note, though, that for portable use the FT-891 has a very high (comparably) RX current draw, so you would want a big battery even if using it at QRP levels!

Another recent accessory is the Xiegu GSOC controller. To quote from the Sinotel website, "the Xiegu GSOC is a stan-

dalone colour touchscreen panadapter/controller designed for external control of Xiegu G90 transceiver." It has not been released long and I have not seen one, but it looks an impressive piece of equipment, but at the same price as the G90 itself, I am not quite sure that it makes economic sense, to me at least.

The Future?

For more than a year now, there have been rumours and pictures of a replacement for the X5105. Radioddity, a retailer in the USA has just placed a picture of a new Xiegu on its website – the X6100. This appears to be very similar to the X5105 but using SDR architecture and providing 10W when connected to an external 13.8V supply, or 5W from the internal battery. It will be interesting to see it, if and when it appears. If it can combine the best of the G90 with the portability of the X5105, Xiegu will be onto another winner.

I asked Alan at Sinotel about it but he says that there is no official announcement from Xiegu about this yet, leaving some asking if it is just a concept and if it will ever see production.

Summary

I think Xiegu make some really good equipment at very good prices. They are not always without issue, however. In my experience, and that of some other users, this tends to be in relation to firmware. Firmware is the code that makes the transceiver function and is often responsible for many of the functions, such as ATU operation, CW decoding, etc. It seems that when Xiegu initially offer a new rig to market, users soon find faults and things that need improving. Often Xiegu respond positively with updated firmware, which the user needs to upload to the rig. The trouble is that while this might fix previously identified issues, thus far it has quite often brought unintended consequences, causing issues elsewhere with other features, that then also need fixing.

In the case of my X5105, when I bought it to use mainly as a CW transceiver for portable work, the firmware it came with did not work on CW! It 'clipped' the first few characters, making QSOs impossible. At the time I understood that previous versions of firmware did not have this problem, so I downgraded firmware to find it fixed, at the loss of other features. However, a few months later, new firmware was released, and all was fine in the world. This firmware version has now been in use for nearly 18 months with no

issues at all and no further updates, so it seems the X5105 is all good now, as far as firmware is concerned.

As far as the G1M is concerned, the firmware in this is dated 2020 and also seems stable with no issues. In relation to the G90, from what I have read in user groups it seems that version 1.75 was a stable release, but that following user feedback Xiegu issued a later release of software, and some people report the unintended consequence of tuning issues. I wonder if this is what happened to my original test G90? In any event the rig is so good that I think it is worth putting up with issues like this and updating firmware as new versions are released. Some users are frustrated that they feel like beta testers when they expect a rig to just work fine, but many in the community see this as a reasonable price to pay to get such a well performing rig at such a low price.

Is there a best Xiegu to purchase? Well, it is down to budget and use. I think the G1M is excellent value for money for what it does. Four bands, SSB and CW with general coverage receive for less than £240 is outstanding value. This rig could easily be used portable as well as in the shack.

The G90, in my view, is best suited to those deployments where space and weight are not too critical. For example, deployment from or near a vehicle, caravan or tent etc. or indeed as a base station. However, some users use it portable with just a 4S 18650 battery pack, which are small and lightweight. The rig is highly capable, and the 20W output is very helpful on SSB in marginal conditions. I also think it is the best of the three rigs to use and certainly the most pleasant to listen to.

The X5105 is a real field radio, well suited to a backpack. Compact, if a little on the heavy side, it gives you every mode on every HF band, plus 6m, along with a built-in battery, and is perfectly suited ergonomically for field use. Lengthy operating on SSB is however, like the G1M, tiring on the ear, unless you use an external speaker but I can live with this for field-type use of a couple of hours or so. If you are a CW-only operator, then the ten CW memories on this rig might help swing the decision.

There is little or nothing to choose between the rigs in terms of 'ears' and switching between them yielded indiscernible differences in receive sensitivity. There is no doubt you can hear a lot more

than your 5 or 20W can work, and that is all you need.

For me, the use-case differences are sufficient that I have decided to keep the X5105 for back-pack type deployment and invest in the G90 for mobile and caravan use. If you are looking for a cheap base station rig, perhaps with occasional portable use, then the G90 wins hands-down every time.

In the end, these are good quality, well performing rigs that offer remarkable value for money. If you are prepared to change firmware once or twice (in the case of the G90) until all issues are resolved and stable, the rewards are worth it. Changing the firmware is not difficult as long as you follow the instructions closely, and Sinotel do offer the service of doing this for you for just the cost of the return courier (£11.99) if you are not able to do it yourself.

Xiegu rigs punch well above their price-point and it is for this reason that many of us put up with the occasional issue and firmware update. I think Xiegu will continue to grow and improve, disrupting the 'big three' players as they go. I wish them every success. My thanks to Sinotel for the loan of the G1M and G90.

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Geoff's Capacity Box

Geoff Theasby G8BMI brings you his 'cabinet of curious capacitors' and some ideas about stepped attenuators.

Geoff Theasby G8BMI
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I'm sure most readers will have heard of, if not used, resistance or capacity boxes. Usually provided in 'decades'; or each range having ten times the previous range, selectable for the practical 'live' designing of circuits etc. I have never seen anything similar for variable capacitors. When at the workbench, requiring a variable to quickly check performance, a suitable item should be chosen, and wired in circuit with the risk of contacting other components, causing shorts, hand capacity effects, stray disturbances and so on.

This project avoids these problems. It is equipped with BNC sockets at the rear, switched into circuit (or not) to short out the item in use. Most connections are brought out to the front panel at 2mm sockets or binding posts for bare wire or test lead probes. As the capacitors are in a screened box, hand capacity is not a problem. Also, the capacitors are not linked so can be used independently. If required, they can be used with two or three linked together in parallel or series via the 2mm sockets.

It is built in a Data Switch box cheaply obtained at rallies for approx £2 each, with only a wafer switch and D connectors inside, which should be stripped out and consigned to the bin or spares box.

The rear panel will accept square flanged BNC sockets without further drilling of the steel case. A false rear panel made from aluminium or Plastikard will provide a superior appearance and give support to the sockets. A similar front panel overlay will improve its appearance.

If a capacitance meter is to hand (*K&M PW* Oct 2020 for a suggestion), the front can be roughly calibrated, and when the tests are concluded the value of the capacitor can be accurately measured, again using the small sockets.

The box is shown at **Fig. 1** with the circuit at **Fig. 2**.

Stepped Attenuators

I acquired an unusual radio receiver, an Eddystone 40A, **Fig. 3**, made for the Home Office in about 1980, for use in RF interference work. It was a wreck, barely functional,

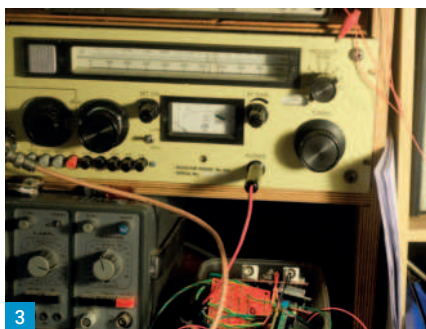
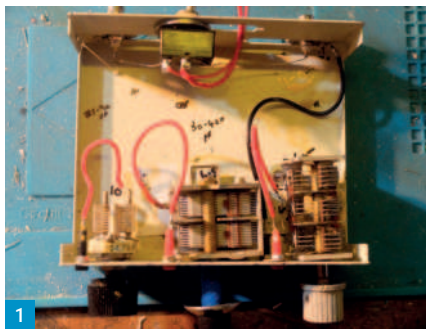


Fig. 1: Inside the capacious capacitance box.

Fig. 2: The circuit of the capacitance box.

Fig. 3: The Eddystone 40A.

Fig. 4: Resistor values and circuit of G3UVR attenuator.

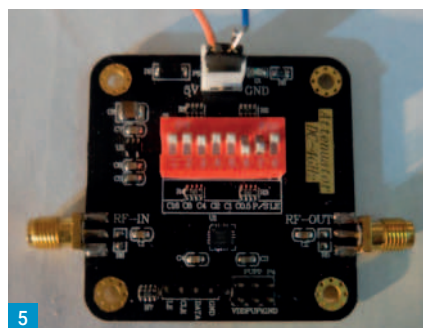
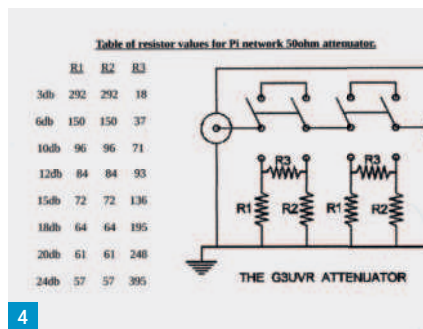
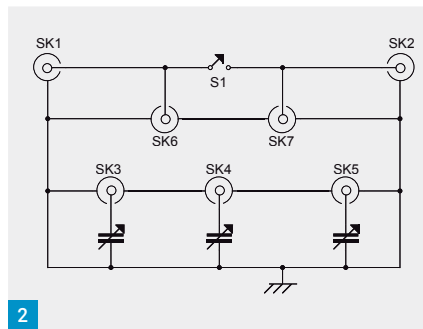
Fig. 5: PE4302/12 module DSCF 1815

and with parts missing and trailing wires, but those were not needed for my intended uses.

It is a 0-32 MHz AM receiver, with two precision rotary attenuators built in and a good meter. IF is 1.75MHz, but the inbuilt crystal filter is very wide at 16kHz, so is better used for broadcast reception rather than amateur radio purposes. The receiver has a fixed tuned BFO but is not very good on CW or SSB.

Apart from being a useful shortwave broadcast receiver, it may serve as a measuring instrument, as originally intended. That is, if the rotary attenuators could be relied upon. However, both were found to be damaged internally, possibly by being on the wrong end of a powerful RF amplifier. Their repair, if possible, is another story. This piece is about 'workarounds'.

The easiest to make is a simple switched attenuator. That by G3UVR, **Fig. 4**, at Wirral & District ARC is good, and inexpensive, costing less than £5. It uses easily obtainable



preferred values of resistors, yet it is fairly accurate, if built in a screened box:

www.wadarc.com

The error caused by using preferred value resistors is mostly less than 0.1dB at any point, but we are not making a laboratory instrument here, so these errors are insignificant for our purposes.

<https://tinyurl.com/4aretxxn>

Secondly, an 'active' attenuator module is available from the usual suspects for about £10. This can be manually set to between 0 and 31dB of loss, matched to 50Ω, using the inbuilt DIP switches, or by a PC via a three-line lead. Originally the PE4302, **Fig. 5**, it has been superseded by the pin-compatible PE4312, also known as HMC 324 (search for PE4312 on Google). Note: for low power use only.

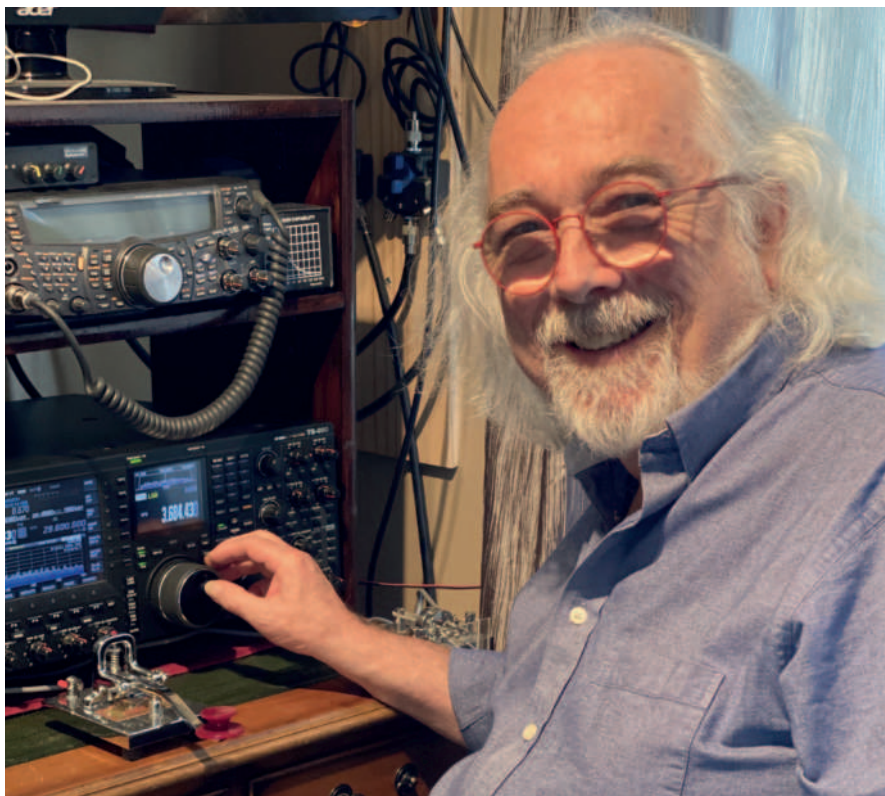
Lindsay Pennell G8PMA
awards@rsgb.org.uk

I became RSGB Awards Manager in December 2020, a role I had coveted (call me sad if you like) for some time, as I do enjoy working towards and obtaining operating awards myself. Since taking on the role and putting in place my own administration system, I have been trying to continue the revamping and improvement of the Society's awards that had been started by my recent predecessors. To this end, we have, this year, introduced two new awards, announced the discontinuation of one, and I can tell *PW* readers that there is more in the pipeline. It is my earnest desire to have an award offering that appeals to as many amateurs as possible, as well as to work with other organisations to promote awards-chasing as broadly as possible.

What's it About?

So, what is awards-chasing about? Well, obtaining certificates for achievements in life is something we have all come across in various ways during and since our school days. It might be for something that seems quite trivial later on, like winning the 10m egg-and-spoon race, or more significant like a degree. Certificates are used as a way of recognising achievement or participation in things. In amateur radio, we might start off with a printout of our licence from the Ofcom website, a kind of certificate of our having achieved the licence, maybe a certificate from a radio club for passing an exam or participating in an activity such as National Field Day or achieving a certain speed in Morse. Here, I'd like to offer an introduction to various awards for operating achievements, that might focus and energise our amateur radio operating.

Other columnists in *PW* have from time to time mentioned awards, whether from the RSGB or other groups, and readers will recall that they are generally focused on having a certain number of contacts with other stations, maybe within a set time period, or a target number of grid squares, countries or islands, etc. Some awards require QSLs – confirmations of those contacts using paper cards – or electronic confirmation via Logbook of the World, and in some cases eQSL. Some awards don't require confirmations though, and are given on trust that the applicant is genuine and really has had the said contacts. These awards often refer to a GCR List – a General Certification Rule List – which is a list of contacts that the applicant self-certifies having had, or in some cases gets other



Chasing the RSGB Awards

Lindsay Pennell G8PMA introduces award chasing and some of the awards available.

amateurs to countersign.

There are many different awards available; from national societies and from other radio organisations. The RSGB offers several HF awards for confirmed contacts with countries in different parts of the world, for example the IARU Region 1 Award (available for contacts on any HF band, and a version for contacts only on 28MHz as in Fig. 1).

The IARU R1 award at Class 1 is particularly hard to achieve, since a few of the countries have not been active for periods of time due to conflict or political 'difficulties'. There are also different versions of the Commonwealth Century Award, a challenging set of objectives usually taking more time, persistence and operating skill (and a good dose of luck with propagation and DXpeditions). Then there is the Worked ITU Zones Award, again available in different versions based on bands used for the contacts, which is another hard one requiring

contacts in some very sparsely-populated parts of the world. Finally, the RSGB validates and forwards approved applications for the Worked All Continents Award to the ARRL (acting on behalf of the IARU) in the USA for issue of that award.

Still on HF, there are awards specifically for Foundation and Intermediate licensees, not requiring confirmations for the contacts. The Foundation Award is progressive, available in Bronze, Silver and Gold levels for increasing numbers of contacts on three HF bands and one VHF band. The Intermediate 100 Award requires, fairly obviously, 100 contacts across four HF bands. I have recently coached a few new Foundation licensees through a sequence of awards in order to keep the momentum going, progressing from Foundation Bronze, through Silver, to Intermediate 100, and then to the IARU R1 Class 3 award. This was a good way for them to keep working towards something tangible while gaining

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Fig. 1: IARU Region 1 28MHz Award

Fig. 2: 50MHz Squares Award

Fig. 3: 50MHz Continents & Countries Award

Fig. 4: RSGB Youth Award

operating experience, and I thoroughly enjoyed mentoring them through the progression.

Then there are the VHF awards offered by the Society: a couple for 50MHz confirmed contacts, based on grid squares and countries, **Fig. 2**. These awards have progressive levels too, in terms of numbers of grid squares confirmed or countries, or combinations of both. They start at 25 squares and 10 countries respectively. The newest award, the 50MHz Continents & Countries Award, **Fig. 3**, takes this a step further by requiring a combination of country and continent scores (pretty obvious, I guess), starting at 30 countries in one continent. This then progresses upward through various levels to five continents and one hundred countries. I know of a few operators who have managed to get to that level using EME, but there aren't many.

Then we have awards for confirmed contacts on 70MHz, 144MHz and 432MHz:

the 4-2-70 awards, each with a variety of levels available for combinations of squares and countries confirmed. These are actually rather difficult to achieve nowadays, with reduced usage of those bands outside contests, but perseverance is the key, and determination gets its due reward in time. When gardens are getting smaller and neighbours less tolerant, VHF antennas become much easier to explain and for others to tolerate, so a plan to work towards these awards could be a good idea for some people. We will also soon be introducing new VHF and UHF awards, which might whet the appetite!

Youth Awards

In addition to these, there are awards for the younger participants in this hobby, and for those who may not yet be part of it but have some interest and enthusiasm to find out more. The recently introduced Radio Surfer Award is based on a person completing a series of tasks taken from a list on the RSGB website, each task having a points value; when the applicant has completed tasks valued at a number of points equal to or greater than their age in years, they can apply for the award.

The tasks range from the straightforward, e.g. designing a QSL card, to the more complex, e.g. getting the next level of amateur radio licence. The award scheme is targeted at groups such as the Scouts, ATC, radio clubs, but can equally be carried out by individuals with the supervision and guidance of a suitable mentor such as a Full licence holder (details and guidance for mentors are on the RSGB website).

The Youth Award, **Fig. 4**, is for young people under 26 who have obtained a licence, and is awarded at four progressive levels of achievement, Bronze through to Platinum. Applicants need to make certain numbers of radio contacts (QSOs) at each level, using a mix of operating modes and bands. While the Bronze level is not too hard, achieving the Platinum is a significant achievement and marks the holder as someone who is not only enthusiastic but also keen to get the most from the hobby by experimenting with the various modes and bands available.

Eligibility

All RSGB awards are available to any licensed amateur anywhere in the world (and typically, one third of applications

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come from outside the UK), except for the Foundation and Intermediate awards that are only available to UK licence-holders. It is not necessary to be a member of the RSGB to apply for these awards. Full details of all of the RSGB awards can be found at:

www.rsgb.org/awards

To talk about awards more widely, there are of course plenty of other operating awards out there, run by other amateur radio groups. I've mentioned the ARRL in the USA, and also *CQ Magazine*, who offer the DXCC, WPX and WAZ awards. Here in the UK there is the WAB (Worked All Britain) group, which offers many different awards for intra-G working, the UK Six Metre Group (UKSMG), BARTG and also SOTA, each of whom offers awards related to their respective areas of interest to all amateurs (and in some cases listeners too).

Many other national societies sponsor awards too, for example DARC in Germany and the Polish national society PZK, who both offer a really interesting range of awards. The Japanese society JARL has loads of different awards, some only appealing to locals but many of interest to the rest of us. Each of these societies offer quite a few awards based both on contacts

with their respective countries and wider operating.

It is also worth mentioning that many awards are available to Short Wave Listeners, mostly using GCR Lists or eQSL confirmations. These awards cover similar ground to all of the operating awards for licensed amateurs, and are available from a number of organisations, particularly eQSL itself and the International Short Wave League (ISWL). I recently noted that the German national society, DARC, have a full page of their website devoted to a series of Listener awards, although you need to be competent in German or the help of a translation tool to work out the details. I have actually noticed a number of licensed amateurs sending SWL reception cards for stations heard, not just unlicensed listeners. This may be because some people either can't transmit where they live, or are unable for other reasons to do so, but they can still get a great deal of enjoyment from the hobby not only by operating a receiving station well, but working towards Listener awards too.

Working towards amateur radio operating awards and certificates provides a useful focus for your operating, it

provides goals and objectives that can help to motivate you and direct your interest.

Awards are also a reward for achieving something through your development of operating skill and your station, perhaps in terms of understanding propagation or constructing band-specific antennas. To give a few examples:

IARU Region 1 Awards: download the award check sheet and start filling in details of confirmed countries already in the log, then look at the areas unconfirmed; that identifies the countries or parts of region 1 that need to be chased.

VHF 4-2-70 awards: I have been told by a number of lifelong HF devotees that they are keen to start exploring VHF operating and awards, due to noise floor issues or limited scope for antennas where they live. This set of awards provides a set of targets to work towards.

I recommend taking some time to look at the awards on offer, from the RSGB and elsewhere, to choose some areas that interest and challenge you. There are tracking spreadsheets or award checklists etc available, so download them and start filling them in, to see what you need to do to complete the award application.

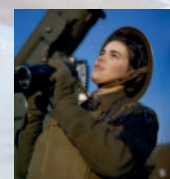
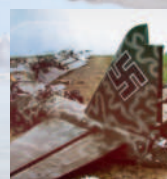
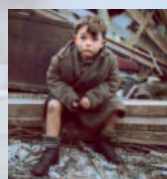
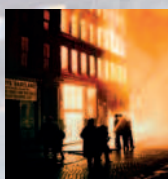
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Buy the Mat-10 for just

£179.95

179 WATTS

MAT-TUNER

mAT-40 Automatic Antenna Tuner



An outdoor weatherproof long wire and vertical wire tuner. A single wing nut antenna connector is on the tuner rear. Connection via control cables to ICOM, Kenwood, or Yaesu transceivers for control of the tuner from the radio front panel. 10 meter (32.8 ft) control cable included. Adapter cable to connect control cable to ICOM (mAT-40-M), Kenwood (mAT-40-K), Yaesu (mAT-40-Y) is required to use the tuner. Purchase one adapter along with the mAT-40 tuner.

Made for permanent external outdoor use. Uses 50 ohm coax for feedline. The tuner is used at the antenna feed point. The rear panel uses an insulated wingnut connector for attachment of a single wire antenna. A common recommended length is 40-43 feet, which should be tuneable on all HF bands with the mAT-40. Power is supplied to the tuner from the radio through the control cable. 16,000 memories, 1.8-54 MHz operation with built-in frequency sensor.

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£229.95

229 WATTS

MAT-TUNER

Mat Leads

All Mat leads just

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19 WATTS

MAT-TUNER

mAT-705 Automatic Tuner For the ICOM IC-705 Transceiver



Specifically built for the new ICOM IC-705, the mAT-705 Plus is the latest compact and fully portable Micro-ATU powered by an internal pair of Lithium batteries Charges by USB lead (Supplied) This new version eliminates the mechanical power switch. Its power supply is automatically controlled by the transmitter.

Buy the mat-705 for just

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MAT-TUNER

mAT-1500 Automatic Antenna Tuner



The mAT-1500 automatic antenna tuner is specially designed for modern high-power transmitters and power amplifiers. It can provide reliable high-performance tuned antenna solutions for land and marine deployments and allows a maximum of 1500W (PEP) RF signals to pass.

It is a universal tuner that does not require a control cable to be connected to the transmitter. Users can operate it through the multi-function buttons on the front panel.

The tuner's shell is made of aluminium plate, which is very strong and impact resistant. Its front panel and rear panel are made of a piece of aluminium through a milling process, and the surface is oxidized, and laser engraved, which is very beautiful and delicate.

The tuner has a PTT signal control function. When a tuning cycle is started, the transmitter's PTT signal is automatically interrupted to the power amplifier.

High Performance With 1500W(PEP) RF power handling capability, the Mat-1500 can be used for CW and SSB, over the full 3.5 to 54MHz HF band.

Sufficient Memory Capacity and Quick Tuning - With up to 16,000 data channels for storing LC configuration data, the tuner has an almost unlimited memory capacity. The tuner, using a highly optimised tuning algorithm, new frequencies are tuned in typically less than 5 seconds, previously tuned frequencies are tuned within 100 mS.

High Strength Alloy Housing The mAT-1500 has a high-strength alloy housing, strong and sturdy. The front and rear panels are machined from a complete piece of allow aluminium.

Simple Operation Panel There is only one square button on the front panel of the tuner. This button can complete the operation of starting tuning, offline and online functions.

Buy the mat-1500 for just

£449.99

449 WATTS

MAT-TUNER

mAT-180H Automatic Tuner For ICOM Transceivers



The mAT-180H is an automatic antenna tuner designed for modern Icom and Kenwood HF transceivers. It has two control cables to choose from, mAT-CI (Icom) and mAT-CK (Kenwood). mAT-CI for Icom is included standard with the tuner. mAT-CK is sold as an option.

Buy the mAT-180H for just

£139.99

139 WATTS

MAT-TUNER

mAT-K100 Automatic Tuner For Kenwood & Icom Transceivers



The mAT-K100 is an automatic antenna tuner specially designed for modern Kenwood and ICOM HF transceivers. It has two control cables to choose from: mAT-CI (Icom) and mAT-CK (Kenwood). mAT-CK for Kenwood is included standard with the tuner. mAT-CI is sold as an option.

Buy the mAT-K100 for just

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149 WATTS

MAT-TUNER

mAT-125E General Automatic Antenna Tuner



The mAT-125E is a general use external automatic antenna tuner for use with any HF transceiver. Automatic RF-sensed or manual tuning modes. RF-sensing means no external control cable is needed. As the unit uses internal rechargeable lithium batteries, it also eliminates the need for 12VDC from an external source.

Buy the mat-125E for just

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149 WATTS

MAT-TUNER

mAT-30 Automatic Tuner For Yaesu Transceivers



mAT-30 is engineered to integrate with Yaesu transceivers. The mAT-30 connects to one of CAT/LINEAR and LIN/TUN port on the back of the radio and is operated by the front panel of the radio through this interface. Connection cable to radio supplied with tuner. 12VDC to power tuner sent via transceiver connection cable.

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MFJ

MFJ-945E 1.8-60 MHz 300W Manual Tuner



Handles 300 Watts. Super Compact Size The small 8W x 2H x 6D inch black aluminium cabinet uses little room. The Cross-Needle meter shows SWR, forward and reflected power -- at a glance. It reads forward/reflected power in 300/60 and 30/6 Watt ranges.

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MFJ

MFJ-993B 1.8-30MHz 300W Deluxe Automatic Tuner



Dual power level 300/150 Watts SSB/CW Tuner. Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas. Select 150 Watt SSB/CW power level and match extra wide-range 6-3200 Ohms. The MFJ-993B IntelliTuner tune any antenna automatically.

Buy the MFJ-993B for just

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MFJ

MFJ-931 1.8-30MHz Artificial Ground Manual Tuner

Create an artificial ground with the MFJ-931! It effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible! It electrically places far away RF ground at your rig. This ground effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher. Also, the MFJ-931 electrically places a far away RF ground directly at your rig -- no matter how far away it is.

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MFJ-974HB 1.8-30MHz 300W Balanced Line manual Tuner

A fully balanced true balanced line antenna tuner. Superb current balance throughout its very wide matching and frequency range. Excellent current balance, very wide matching range (12-2000 Ohms) and covers 10-160M continuously including all WARC bands. Handles 300 Watts SSB PEP and 150 Watts CW. Tuning is fast and easy, just three tuning controls. You can even adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

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MFJ tiny Travel Tuner

Tiny 4.5 x 2.25 x 3 inch tuner handles full 150 Watts! Covers 80-6 Meters, has tuner bypass switch, tunes nearly anything! MFJ brings you the world's smallest full power 150 Watt 80-6 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna. It's no toy, it's got guts! Built with real air variable capacitors (600 Volt, 322 pF) and three stacked powder iron toroid's to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

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MFJ-949E - 1.8-30 MHz 300W Antenna Tuner with Dummy Load



Full 1.8-30MHz Operation Custom designed inductor switch, 1000 volt tuning capacitors, Teflon insulation washers and proper L/C ratio gives you arc-free no worries operation with up to 300 Watts 1.8 to 30 MHz.

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MFJ-969 - HF/6M 300W Roller Antenna Tuner



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MFJ-971 QRP 200W portable HF Antenna Tuner



This is a compact 200-Watt portable tuner ideal for QRP transceivers. The MFJ-971 is also a perfect mate for any of today's ultra-compact SSB radios. It provides a convenient cross-needle type SWR/Wattmeter, User-selectable 6-Watt range for QRP operation.

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MFJ

MFJ-994B - 600W Deluxe HF Automatic Antenna Tuner



MFJ-994B, 600 Watt Intelli-Tuner™ automatic antenna tuner with new 10,000 VirtualAntenna™ Memories. Like MFJ-993B but handles 600 Watts SSB/CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display.

Buy the MFJ-994B for just

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Whither Propagation?

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

Last year NASA physicists issued a paper in which they predicted that the new solar cycle, Cycle 25, could be as high as that of Cycle 21, which peaked at the end of 1979 with a Smoothed Sunspot Number (SSN) of 233 (see *HFH*, September 2020 *PW*). Now they have issued a revised, lower, prediction. On 4 August the *DX World* website carried a report that a paper from the NASA High Altitude Observatory based at the University of Colorado predicts that the new cycle's peak will have an SSN of 195, ± 17 .

<https://tinyurl.com/49b8ke5t>

It should be pointed out that other sources are still predicting that Cycle 25 will be of a similar size to that of Cycle 24, which was one of the lowest on record (see *HFH*, December 2020 *PW*). However, the new prediction, while lower than the NASA group's earlier one, would still be higher than either of the last two cycles – if it proves to be correct. If so, it should allow for some excellent F-layer propagation on 28MHz and perhaps even on 50MHz.

There was, in fact, a big rise in solar activity during the latter half of July, though only for a few days. The SFI peaked at 95 and the SN was 86 on 22 July, but activity then declined and by 1 August we were back once again to a spotless sun, **Fig. 1**.

Table 1 shows the SFI and SN on 'snap shot' days of the 11th of each month for the last six months.

Bouvet Island

In last month's *HFH* column we reported that the planned DXpedition to the Norwegian sub-Antarctic island of Bouvet, **Fig. 2**, in January 2023 had been cancelled following the sale of the expedition's vessel, *Braveheart*. While members of the Intrepid DX Group headed by N6PSE were looking at the possibility of developing a plan with the new owner of *Braveheart*, the Norwegian part of the team began the search for a different vessel to take them to Bouvet.

A new website was launched on 9 August, which carries a press release stating that a 12-man team headed by **Ken Opskar LA7GIA** had been formed and that the 101ft oceanic ketch *Marama* had been

Steve Telenius-Lowe PJ4DX reports conflicting forecasts for forthcoming HF propagation, and has all the latest HF news.



1

chartered to sail to Bouvet in November 2022, two months earlier than the initial plan.

While the *Braveheart* was equipped with a helicopter, the new team will attempt a beach landing, a much cheaper but potentially more difficult endeavour. Further details are on the 3Y0J website and Facebook pages at:

3y0j.no

<https://tinyurl.com/udxpkmzu>

More DXpedition News

Some news now from the Italian DXpedition Team: the team plans activity from Bubaque Island (IOTA AF-020) in Guinea-Bissau as J5T (on SSB, CW and RTTY) and as J5HKT (on FT8) from 7 to 19 October. Four stations will be active in the 1.8 – 28MHz bands. QSL information is via I2YSB (thanks *DX-World*).

Visitors to Bonaire

During the pandemic the number of visitors to Bonaire, including radio amateurs, naturally dropped significantly. As the island started to re-open in the summer, so the visitors started to return. We were particularly pleased to welcome **Etienne Chatlein P41E**, **Fig. 3**, to the island in July, because Etienne is (as far as we know) the only Bonaire-born radio amateur. He has been living on Aruba for many years but still has family on Bonaire and makes occasional visits. One of the most active



2

of the resident amateurs on Aruba, this was the first time that he had met up with the Bonaire Amateur Radio (BAR) group that meets for a social get-together every Wednesday evening.

Contest Season

October is an important month for HF contests, with 'the big one', CQ World Wide DX SSB, taking place over the weekend of 30/31 October. The bands will be full of contest activity, much to the delight of those who have been looking for a bit of 'DXcitement' on the bands (but equally to the annoyance of those who avoid contests like the plague!). There are, however, also several smaller events including the SSB Scandinavian Activity Contest taking place on 9/10 October and the Worked All Germany contest on 16/17 October that do not disrupt the bands for non-contesters but which still provide plenty of activity for those who enjoy contesting.

For those who prefer the new datamodes, another session of the 2021 series of RSGB FT4 contests takes place on Monday 27 September, from 1900 to 2030UTC, on the 80, 40 and 20m FT4 frequencies. There are separate sections for 10W and 100W entries. As relative newcomers to FT4, my wife **Eva PJ4EVA** and I have enjoyed taking part in this series of contests and were lucky enough to come in top place in the Non-UK 100W section in the July session, **Fig. 4**.

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Fig. 1: The spotless sun on 1 August. It was spotless again on 11 August. (Credit: SDO/HMI via Spaceweather.com website).

Fig. 2: The location of Bouvet Island (Credit: TUBS, CC, Wikimedia Commons).

Fig. 3: Etienne P41E (right) with Peter PJ4NX during Etienne's recent visit to Bonaire.

Fig. 4: Certificate for the Non-UK 100W section first-place finish in the July RSGB FT4 contest.

Fig. 5: The ZB2JK/ZB2GI Pedestrian Mobile backpack. In the background, Europa Point lighthouse.

Fig. 6: A new acquisition in the shack of Etienne OS9D: a Bencher CW paddle!



	Aug '21	July '21	June '21	May '21	Apr '21	Mar '21	Difference
SFI:	72	72	77	78	73	75	(±0)
SN:	0	24	29	36	0	11	(-24)

Table 1: Rolling six-month Solar Flux Index and Sunspot Numbers as of 11th of each month. The final column shows the difference between the August and July figures.

Readers'News

Kevin Hewitt ZB2GI once again operated portable from the top of the Rock of Gibraltar in July. Although he made over 150 QSOs on 28MHz FT8, Kevin said "my 10m SSB CQ calls went unanswered". It is a familiar complaint from many SSB and CW operators that everyone has moved to the new digital modes. During one of his operating sessions from the top of the rock Kevin observed *HMS Prince of Wales* (R09) entering the port of Gibraltar. Kevin also operated Pedestrian Mobile from Europa Point Lighthouse using a backpack put together by **John King ZB2JK**, Fig. 5. The backpack comprises an FT-817 powered by a 7Ah SLA battery and a LDG Z-100 ATU with a 5m wire wound on to a 4m telescopic fishing pole, connected via a 9:1 balun. Kevin added, "I operated on 20m SSB from the GARS station twice this month, the first time after 2000, when the log included Jamaica and Trinidad along with a good selection of European, NA, SA, and Asian stations. The second time after 1900 the

log included Thailand and Qatar along with a good selection of UK and European stations".

Victor Brand G3JNB reckons that the increase of the SFI to 95 by 3 July did little to enhance propagation for him. He reports: "However, I did receive weak signals on 17m from **E29TGW** Thailand and, on 30m, from **Didier FY5FY** French Guiana. But it was noticeable that both were struggling to work EU despite their many CQ calls. Nevertheless, it seemed to me that this might bode well for improved conditions in the days to follow. On the 4th, I gave it some 'welly' on 17m (my maximum 18W) and both **NY2PO** and **K2M** obliged, but with poor reports. So, I waited... and waited.

"The IARU Contest over 10/11th provided an interesting reflection upon the low power HF DXer's predicament at this early stage in the new cycle. There was good news and bad news. The good news was that the CW bands, devoid of operators for so long, were crowded with high-speed exchanges and unadulterated enthusiasm. The bad



news became apparent when I could receive some attractive DX but getting them to hear my QRP was impossible and so it also seemed for many of our more powerful operators. On the Saturday, I listened to **John P44W** Aruba calling his heart out on 40m but eventually realising that, apparently, nobody was listening. On the other hand, **Ricardo PY2PT** in Sao Paulo was doing a roaring trade on 15m.

"So, there was nothing for it but to concentrate on the EU 'HQ' callsigns [see Around the Bands – Ed]. Following the contest, I thought to check if the CW band occupancy had survived. Across 10, 12, 15, 17, and 20m there was absolute silence. No DX for days but on the 17th I was actually copy-

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ing a weak ZL4TT on 20m and, next day, a strong JH1HDT on 17m. No QSOs there but, as the SFI rose to 94 on 22nd, I slipped past the 30m pile-up to work JW0W on EU-063 Prins Karls Forland Island (Svalbard) who were limbering up for the IOTA Contest. Later, I was copying **TZ4AM** Mali on 12m but **Jeff** did not hear my low power calls."

Tony Usher G4HZW remained on 28MHz the whole month, stating that there was "still plenty of Sporadic E but little in the way of DX for me, although I did notice some propagation from the UK out to Japan from time to time. East coast stations from North America were copied frequently, with Arizona worked one evening. South America and the Caribbean were available most days. Sunspot numbers only appear to be rising slowly so perhaps we'll be waiting until next year for some F-layer propagation. Working conditions here in Mobberley: Yaesu FT-450 running 50W into a 4-element Sirio Yagi at 40ft." Tony commented that "We've endured a spell of hot weather recently with temperatures exceeding 30°C; much too warm for me. Today it's a much more manageable 15°C with heavy, slow-moving periods of rain – perfect!"

"I never in my entire life believed I would do this!" said **Etienne Vrebos OS8D**. What on earth could Etienne possibly have been referring to? Well, confirmed SSB operator Etienne writes: "I bought a Bencher CW paddle and an MFJ-418 pocket Morse code tutor. Connected it to my Icom IC-7300 and it works! (Fig. 6). I made some tests with 5W on 40m with a friend in the neighbourhood... This is a huge project for the next years. [I'm] not going digital, and not using a CW decoder, as I promised my friend **Jean 5T0JL** (SK), even if my friend told me my IC-7851 can do everything for me (I didn't even open those menus). So please have some years of patience with me, and we'll have QSOs on two modes: SSB and CW!" This month, though, Etienne stuck with SSB to make about 250 contacts, prioritising low power and portable stations. "It seems I do attract UK Foundation stations working with 10W, and some of them with inside antennas, when calling CQ on 40m every morning... I do like to spend a long time with them as they are that happy to catch somebody from ON country willing to speak with them and not only giving a 59." Etienne also highlighted a couple of other QSOs: on 7MHz SSB he worked KN6IPA/AM in a military refuelling plane flying over the North Sea. This is Justin, now based in England and signing M0JJ0 when he is on *terra firma*. Meanwhile on 14MHz SSB Etienne worked 4X100AI on IOTA AS-100



and commented: "I never saw any island in Israel, where I have been many, many times!"

Owen Williams G0PHY wrote to me saying: "Thanks for the contact in the IOTA contest; it was a difficult one as I had a high level of local QRM. All the DX worked this month was in the IOTA contest. I thought there was more island activity outside Europe in this year's contest. Apart from SA-006 [Bonaire – **Ed**] I managed to work 5T5PA/P on AF-050, TA0G on AS-099, AA4V on NA-110 as well as AF-014 (Madeira) and AS-004 (Cyprus). Outside the contest all contacts were with European stations including JW0W on EU-063 Prins Karls Forland Island. Although not DX it was nice to have a contact on 28MHz with EI3KM and with GM3RCV [on EU-111, the Monach Isles – **Ed**] on 24MHz."

Around the Bands

Kevin ZB2GI (operating from home, from the GARS club station, and portable from the top of the Rock as well as from Europa Point Lighthouse): **14MHz SSB**: 5B4AIX, 6Y5HM, 9Z4ZB, A71AM, AK1X, CN8AMA, CS9ABL, CX4RT, EA8CWA, HP6DJA, HS0ZEX, JA5AC, JH4IFF, KC1GTK, KD8EDN, KE0MAD, LU9FHF, N2QVY, N7VOX, N8XX, PJ7FM, PY1GV, PY5QW, PY9NT, TA2DE, VE2PU, VE3MJD, W4HRL. **21MHz FT8**: 4X1PF, CM2RSV, DS1JFY, EA8AUW, JA5DNJ, JA6YBK, JA9LSZ, JF1KMC, JG4AKL, JH3AIU, KB2ELA, N6LZ, NP4JF, PU0FDN, PV8AAS, PY2DPM, VE2TK, W8LRJ. **24MHz FT8**: CE1LEW, K0KX, K3LJ, K8VE, KC2LST, W1HNZ, W8VK. **28MHz FT8**: 4Z1DZ, AA7A, CQ750RSI, E20WXA, EA8TH, K0UA, K1CYQ,

K8ST, KA2D, N3CAN, PY7BC, TF3JB, TM66TDF, VE2MF, VE3FNT, VU3RGB, WA5TXY, ZV3Z2T.

Victor G3JNB (during IARU contest):

7MHz CW: DA0HQ, E75HQ, EM5HQ, HG0HQ, LY0HQ, OF0HQ, OL1HQ, PA6HQ, S50HQ, SG0HQ, TM0HQ. **14MHz CW**: OL1HQ, OZ1HQ. **21MHz CW**: DA0HQ, EM5HQ, HG0HQ, LY0HQ, OL1HQ, S50HQ, YT0HQ, EF4HQ, EW5HQ, LY8HQ, OD4HQ, OE0HQ. **28MHz CW**: S50HQ.

Tony G4HZW: 28MHz FT8: 9Y4D, AD8GN, CE2EC, CE6TK, FS/W61ZT, HI8T, HI95RCD, K0IS, K2ENF, K6ND, KA1YQC, KA5OWI, KC0BRA, KC9WPS, KG8DH, KO4PQQ, L21RCA, N1ERA, N3QXC, N7WS (AZ), OA4DOS, PJ4EL, PU2DMA, PU5SZN, PU7SPK, PY1KS, TF1A, TF3VE, TG9ADQ, VA3AQB, YV1SW, YV7MAY, ZD7MY.

Etienne OS8D: 7MHz SSB: KN6IPA/AM (above the North Sea). **14MHz SSB**: 3V8MN, 4X100AI (AS-100), 5T5PA/P (AF-050), 9M8DEN, BD7MHZ, EK6ZA, JR2IRZ, JW0W (EU-063), JW/LB1RH, UN7QF, VU2XO, Y11WWA. **18MHz SSB**: JH3NGD, JR7TKG, ZD7FT. **21MHz SSB**: S79KW, VU3NPI, YB1TJ, YC3DOC. **28MHz SSB**: "Nice openings to UK some days."

Owen G0PHY: 14MHz SSB: 5B4KH, 5T5PA/P, AA4V, CR5DX, CT3HF, JW0W, PJ4DX, TA0G.

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. Photographs of your shack, antennas, or other activity would be particularly welcome. For the December issue the deadline is 11 October. 73, Steve PJ4DX.

DISCOVERY TX-500

Ultra Compact HF/50MHz Transceiver

A weatherproof radio with true desktop-radio features, like auto-notch, noise reduction, RX/TX EQ and built-in fast Panadaptor.

General Features

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- Current drain as low as 100 mA
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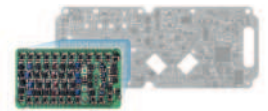


A liquid-protected housing, no through-holes, spatter resistant plugs with sealing rings and a special anodising layer on the case, ensures operation in extreme conditions.



Unique form-factor

Allows you to operate from anywhere. The transceiver is only 30mm thick, including knobs, weighing only 0.55kg. Fold out the kickstands at the rear for use on a desktop or picnic table.



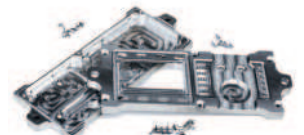
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Icom IC-705 Auto Tuner

Supplied with stereo interface cable and BNC to PL259 plug to work directly with the Icom IC-705. Features 2,000 memories that both store frequency and tuning parameters. The Auto tuner provides 125W power handling with super-fast 0.1 second tune (from memory).



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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.

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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.

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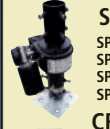
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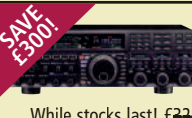
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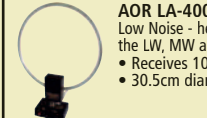
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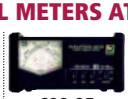


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In 2021, the Scout's Jamboree on the Air (JOTA) takes place over the weekend of 16/17 October. This is an annual event in which Scouts all over the world speak to each other by using amateur radio, **Fig. 1**, under the supervision of radio amateurs. JOTA is an excellent way of introducing young people to amateur radio and has been running for about 60 years. If your club is considering supporting a local cub or Scout group this year, then I'd suggest contacting the relevant group earlier than usual. You'll need to consider that most Cubs and Scouts won't have been vaccinated against Covid-19. You'll also need to consider ventilation, sanitising touch points, etc.

I am sure that the instant reaction of many readers will be concerns over child protection legislation and regulations and the like. The general guidance from the Scout Association is that the Scout leadership team are responsible for safeguarding and safety of young people. Whether or not members of amateur radio clubs have Disclosure and Barring Service (DBS) checks or not does not impact upon how a Scout event should be run. The Scouts, in common with other organisations that require these checks, will only recognise DBS checks that they have processed.

The Scout movement has numerous badges to recognise skills acquired and behaviours demonstrated. These are very popular with the Scouts. One of these is the Communicator Activity Badge, **Fig. 2**, which can be a good way of gaining interest in amateur radio as it leaves participants with something tangible afterwards. The requirements for amateur radio route to the badge are shown in **Table 1**. There are other routes to the badge, one of which includes building a Morse oscillator, which can be found at:

<https://tinyurl.com/fmu3387m>

For your club's first JOTA it is well worth putting plenty of effort into planning. This might involve several meetings with Scout leaders, to find out what they would like to get out of JOTA, and to explain what you can do to help. It is very tempting to be very ambitious, promising all sorts of wonderful things, but unless you are 100% sure that you can bring them off, it is probably better to keep expectations realistic, and perhaps exceed them rather than disappoint. Remember for many Cubs and Scouts this will be their first impression of amateur



JOTA & Clubs

This month **Colin Redwood G6MXL** looks at JOTA and the role of local clubs and societies in the hobby.

radio and they won't want to listen to a half-hour lecture on the history of radio!

Local Clubs

I am devoting the rest of this article to local amateur radio clubs. I think the greatest benefit of membership of a local club comes from being able to pick the brains of numerous local amateurs. Sometimes getting a range of ideas on a particular issue can be really helpful. This might be sourcing components or materials for a project, fault-finding a circuit, tackling an EMC issue or help in choosing antennas and installing them. Sometimes practical assistance is also needed. This might be programming a new VHF/UHF handheld with local repeaters

or putting up an antenna. With the gradual removal of restrictions on face-to-face meetings, many clubs will be beginning to restart their activities and meetings.

Training

If you are looking for training towards one of the amateur radio exams, now would be a good time to approach your local club to see if they are running training courses. Over the last year or so, many clubs have had to scale back their training, perhaps offering courses using Zoom or Skype rather than the usual classroom style face-to-face arrangements. Some will be planning to restart their classroom-style training programmes, **Fig. 3**, while others may continue with Zoom,

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Fig. 1: Sending a greetings message from a JOTA station. Fig. 2: The Scout Communicators badge. Fig. 3: Face-to-Face training enables hands-on demonstrations. Fig. 4: One-to-One coaching can be very effective. Fig. 5: Home Construction.

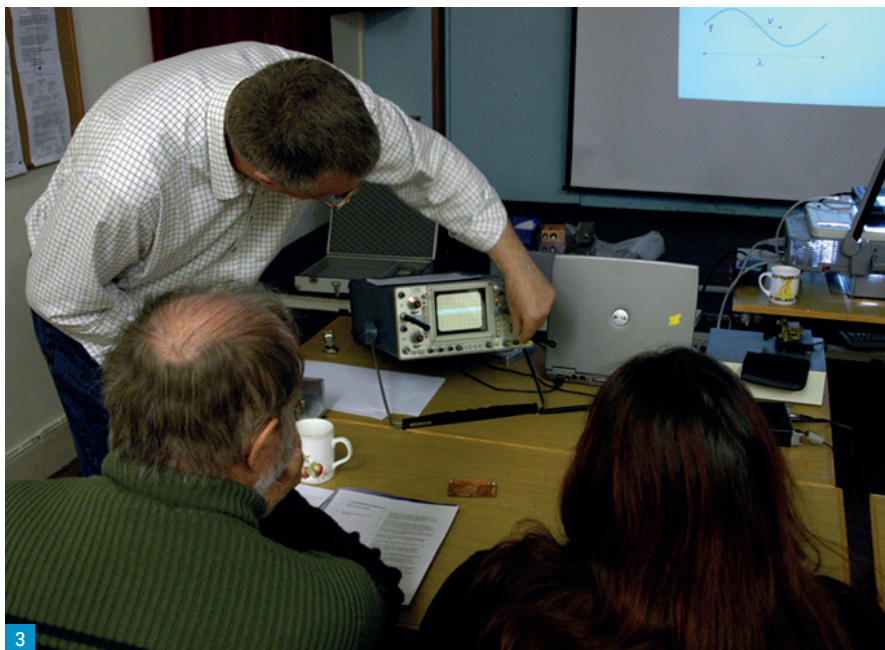
etc. Over the last year or so candidates have had little choice but to study remotely and sit remotely invigilated online exams. These don't suit everyone, so the option of local face-to-face training and locally invigilated exams online or on paper may be very welcome to potential candidates.

Make sure that your club trains according to the latest version of the syllabus. The individual syllabus for each exam and a combined version that includes relevant additional information (such as the diagrams and symbols used in the Foundation exam) can be found at: <https://tinyurl.com/4v3bta4h>

Just as you need to work from the most up-to-date version of the syllabus, candidates will also need to be working from the very latest editions of the relevant books. Any books pre-dating the major revision of September 2019 will certainly not provide candidates with all the material they need for the current syllabus. The very latest editions of each of the books also incorporate updates and corrections since September 2019. I'd suggest ordering books just before a course so that the most up-to-date edition is used both by candidates and tutors. The books can be obtained from the RSGB or the *PW* Bookstall.

Over the years, a few clubs have put training material on their websites. It would be a good idea for these clubs to review this, to make sure that it is up-to-date and reflects the latest version of the syllabus.

It may be a good opportunity to recruit a few additional trainers into the club's training team, so that face-to-face training can resume and the burden of preparing and delivering training material can be shared among members.



Coaching

Apart from the exams to get a licence, many clubs provide ad-hoc coaching to help members get used to operating or to explore various aspects of the hobby. These include setting up a station, operating practice, trying various digital modes, operating through satellites, operating in contests and learning Morse code or improving speed. There have been many newcomers to the hobby over the last 18 months. In addition, many have returned to the hobby after many years away. A few may be pleased to have the opportunity to have a little guidance on operating practices, and to see a variety of

different aspects of our hobby, **Fig. 4.**

In order to do this, clubs will need to reinstate their club stations. After 18 months with no use, it would make sense to check the whole installation over. If your club has external antennas, it would be a good idea to inspect then, checking for any damage or loosening of fixings, etc. It would also be a good opportunity to bring back on site club station equipment that may have been held at members' homes and check that it is still working as intended. The club will also need to make sure that it complies with the new

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Ofcom field strength regulations. There is plenty of guidance and an excellent spreadsheet on the RSGB website. If the calculations show that the field strength exceeds the Ofcom limits, the club may be able to put in measures to prevent members and others wandering around close to the antennas during high-power transmissions.

<https://tinyurl.com/rm9juv34>

Covid Safety

The regulations surrounding the Coronavirus pandemic have prevented local amateur radio clubs and societies from meeting face-to-face for well over a year. As the regulations are eased, many clubs are re-opening. No doubt many questions will need to be considered. A few members may be concerned about returning to face-to-face meetings indoors. If members don't feel safe, they won't attend!

Many clubs will choose to carry out a risk assessment, to make sure that they consider how they can minimise the risk of spreading the virus. It may be that a way of 'broadcasting' club meetings via Zoom or similar can be considered for members who are unwilling to physically attend meetings.

Getting basic things right, such as providing hand sanitiser at the entrance and ensuring good ventilation, are all important as is encouraging mask wearing. Those putting out chairs and tables at the beginning and packing up at the end should consider sanitising before and after each activity. Consideration should also be given to sanitising equipment before and after each person touches it.

Food and Drink

Many clubs offer members refreshments. It might be prudent to use disposable cups and so on to save the washer upper being exposed to an array of cups that have been used by members. Is the communal biscuit tin the safest way of providing biscuits?

Attendance Register

Many clubs keep an attendance/visitors book. I suspect completing this has not been of the highest priority for many. In present times, a complete and accurate record of who is attending meetings together with their contact details is important if track and trace is required. Not everyone has a mobile phone with the track and trace app installed and operational.

Junk Sale

Many members will have used the last 18



months to have had a bit of a clear-out and may have equipment and books that they wish to dispose of. A bring-and-buy or junk sale might be very popular with current and prospective members.

Website

With no face-to-face meetings and little activity away from the club, your club's website will almost certainly need updating to reflect the club's new programme of meetings and planned activities.

Show and Tell

Those club members who enjoy construction may well have used the periods of lockdown to tackle a number of homebrew projects. I suspect that several will be happy to show off their efforts, **Fig. 5**. This could take the form of a series of short talks spread over a few evenings. These types of talk can provoke discussion among members and motivate others to warm up their soldering irons.

Away from Home

If the weather permits, some outdoor activities might still be possible this year. These could include exhibition stations and contest stations.

Subscriptions & Publicity

Subscriptions from many members may not have been collected over the last year. It is probably time to make sure that overdue subscriptions are collected. Perhaps clubs will need to put a little effort into encouraging lapsed members to re-join. With all the newcomers to the hobby over the last 18 months or so, some publicity

Alternative A: Radio Communications

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- Demonstrate how to tune a simple communications receiver.
- Give an example of a typical greetings message.
- Explain in simple terms how radio waves travel around the world.
- Know the more commonly used HF and VHF amateur frequency bands.
- Know the phonetic alphabet and define at least eight international Q code signals.
- Demonstrate your ability to recognise callsigns from the UK and near continent.
- Visit an amateur radio station.
- Learn the regulations governing the use of amateur radio equipment.

Notes

A Scout who holds or gains the Radio Amateur Licence (Foundation, Intermediate or Full) or the Marine Radio Operator's Certificate of Competence and Authority to Operate or the Flight Radio Telephone Operator's Licence automatically qualifies for this Badge

Table 1: The requirements for the Scouts communicator badge (amateur radio route)

might attract some of them to join your club. Most towns now have local Facebook groups that could be used to promote the club. If club funds need topping up, then a raffle could be a good idea.

QSL Cards

Over the last year or so, clubs may have built up a backlog of QSL cards that have been received but perhaps not had access to the logs to check them and reply to the DX stations that have been worked. Before sending cards to the QSL bureau, sort them alphabetically by prefix, except USA cards, which should be sorted into call areas regardless of prefix. Keep countries with more than one prefix together, so in the case of Poland, for example, cards with an HF prefix are next to those with a SP prefix. It might also be worth making sure that the club has a supply of envelopes for incoming cards with the relevant QSL bureau sub-manager. An up-to-date list of QSL sub-managers can be found at:

<https://tinyurl.com/532rvt3m>



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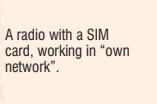
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Joe Chester M1MWD
m1mwd@gmx.com

Well, I guess you have all heard Rob Sherwood NC0B's (Fig. 1 and Fig. 2) brilliant RSGB Tonight@8 presentation the other week, Fig. 3. No? Then go immediately, find it on YouTube (URL below), and sit down with a notepad, and a large whiskey. Yep, it's one of those. I, a mere minion, an acolyte grovelling in the great man's footsteps, could not really add anything to what The Man said. Unless we reframe the conversation a bit. Really? Yep, I want to take a line from that presentation, and devote my *Notes* this month to truly understanding what Rob said – not just the words, but the implications. And from this, I propose to establish the Three Rules of Amateur Radio Success (TRARS); nice don't you think?

<https://tinyurl.com/3ub799em>

(Rob is, of course, best-known for his world-recognised receiver tests, the results of which appear on the website below.)

<http://sherweng.com/table.html>

Usually, at this point I tell you where this is going, so if you just want the highlights, then read the last paragraph. But I would rather you didn't for herein are some fundamental truths oft ignored in the rush to mega-stardom with mega-stations in mega-contesting or DX or whatever. Don't give up, this is a really good story – and not an unhappy one either!

Once upon a time in a galaxy far away [STOP; that's a movie! – Ed.]. Sorry, carried away. But as the story is told (in that presentation, and elsewhere), there is a ham on a hill working full legal power (1500W in that part of the world), all modes all day long. His neighbour in the valley is thinking of giving up. Because its only when kilo-man sleeps that he can get on the air. Valley-man says that he is experiencing wall-to-wall interference on every band and every mode, and believes it is being caused by kilo-man. Now let me say that in the UK I have never come across a similar case. If you have, then please let me or Don know. We are here to help. For this is what this *Notes* is about. So, I now pose an essentially simple, but in the end an existential question.

Whose fault is it that Kilo-Man is putting Valley Man off the Air?

Stop shouting – and think. Easy to throw assertions. But this is not social media, it's a respectable magazine, of international repute. So, you won't get away with that kind of thing here. Think. To help your thinking, I will offer you several alternatives, and then



The Three Rules: TRARS

Joe Chester M1MWD addresses the mysteries of the age by positing three rules of amateur radio.

debate each one for your entertainment and education. And please note that I have consulted widely about this. And Rob himself, in that presentation, made some comments too. So, I'm not short of constructive advice. Which I what I want to share with you.

Answer Number 1 is the obvious one. It's up to kilo-man to be sure his transmissions are not causing problems! Obviously. He's a fully qualified and licensed amateur radio operator. He's studied for the exam, he knows about watt meters, and antenna gain, and all the other technical subjects he has successfully studied. So, kilo-man is a bit annoyed by the suggestion that he is causing problems. He is running FCC approved equipment from a reputable manufacturer. He has no SWR problems, everything is properly earthed. He runs a good, clean station, an award-winning station. So, if valley-man has a problem it must be something to do with his, valley-man's station.

Now, let's leave kilo-man in his ivory tower for a minute, and ask a slightly provocative question. I am calling this answer 2. Does kilo-man actually know how to use his equipment? Does he know how to adjust his ALC, or his CW rise time, or any one of a thousand other possible settings on his equipment? Or does he just switch on, accept the manufacturer's default settings,

and start transmitting? If I'm absolutely honest, I would say that I'm not 100% sure how to do all of these things. RTFM really doesn't cut it (and I hear that in some circles, this is frowned upon – yes you lot over there!). And I have a friend, who after Rob's presentation, went immediately to his shack to adjust his CW rise time – and he is a licensed amateur for over 20 years (well done, Ed!). This raises an interesting point, doesn't it? Does every licensed operator in the UK, or the world even, understand in detail the impact on his transmissions of every possible setting of all the parameters on his transceiver? Be honest! That's what default settings are supposed to do, isn't it? I will return here in a moment.

For, of course, many would point the finger here at valley man, as being unable to adjust his receiver properly to null, attenuate, filter, or otherwise reduce the 'interference'. Answer 3. It's a bit like the days of the big broadcast stations, where we had to take steps to reduce the splatter from these monsters of the airwaves. Then again, it isn't. For here again, we have to ask if valley man understands how to adjust his equipment so that kilo-man's 'interference' is reduced or eliminated. Again, speaking just for myself, I'm not so sure. I do have operators nearby, but can honestly say that even when they are on-air I never see any 'interference'.

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Fig. 1: Rob Sherwood NC0B.

Fig. 2: Rob Sherwood's antenna farm in Colorado.

Fig. 3: The opening slide from Rob Sherwood's presentation – note the bottom line!

Maybe I'm just lucky, or the default settings on my receiver are doing the job for me. Who knows?

Rob Does

Well Rob does. He has led a one-man campaign for over 20 years to get the OEMs to address the sensitivity and selectivity of today's receivers, and with notable success. There will be an opportunity in another *Notes* to explain the cause of the intermodulation issues some transmitters create and transmit. But let's just leave it for now that modern receivers are, in general, very good at filtering out this type of interference.

It would therefore appear that I am pointing the finger of blame elsewhere. And yes, along with many others I am, at least for the purposes of this discussion. If both operators are doing nothing wrong, then where lies the blame for this type of incident? Could it be that the equipment is at fault, that the OEMs are not doing enough here, that transmitters are pushing out so many spurious intermodulation products, that no receiver in the world could hope to effectively deal with the problem? Call this answer 4, then. Rob seems to think that this is the case, and can now be heard on numerous video presentations (and written articles) saying just this. Having pushed better receiver performance into unheard of realms, he is now turning his attention, and testing programme, onto transmitters. I look forward to seeing where that goes. But this is for the future.

We are concerned with the here and now. That being so, a big Hi to **Ian G3WRT**. Thank you for your kind comments in *Letters*, (*PW* July). I share your confusion a bit, as I don't really know where all the former analysis is going. I thought I did. I even told my esteemed Editor what I was at but now I'm not so sure. I know that I was trying to work out how to improve my small station. I looked at antennas, and at transceivers, and T/R relays, and thought that the way forward was clear. Now I don't know. For out of the question posed in this month's *Notes* comes a glaring obvious result. And you will find this in Rob's presentation too.

So to the Three Rules

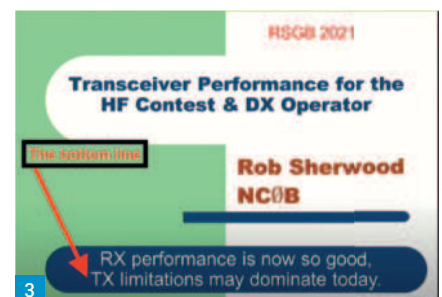
First up, (Rule 1), in practice for the average amateur radio station (and even many above average ones too) you will not be able to hear the difference in the receiver



performance among the top transceivers on the Sherwood table, certainly those with RMDR >100dB, or even 90dB, I suggest. We may have reached the performance limit of current receiver technologies, and cannot expect much more improvement, even in the longer term. So, dreaming about a major investment in a top-of-the-range transceiver may not be the way forward. It probably isn't for me. My IC-7300 and KX3 are both top performers, and an RMDR improvement of a few dB will be irrelevant to the performance of my small station. Why pick out RMDR? Because other measures, such as DR3, or noise floor, do not separate out the transceiver list enough. I need to look elsewhere for improvements.

Which brings me to Rule 2, antennas. I was told a very long time ago, and wrote this in a previous piece, to spend ten times as much on my antennas as on my transceiver. Literally this would suggest spending £10k plus. I would get a lot of antenna for that kind of money, if I could be certain it wouldn't topple the boat into the bottom of the river (work is in hand; but don't expect instant results!). Everyone knows this, and it came up in the Tonight@8 presentation. Yet we prefer to spend our time drooling over the latest and greatest black box, with or without knobs. For sure, with the transceivers I currently have, safe antenna switching is a bit of a struggle, but I'll get there.

And finally, to Rule 3. RTFM. And if this is not enough, then get help. For the single most useful feature of any transceiver is the ease of use – the ergonomics of the



function layout to give it its technical name. If you don't know where the button is to adjust the CW rise time, then first look in the manual, then ask other users of that rig where it is, after that the supplier, and even the manufacturer. And if the answer requires three button pushes simultaneously, followed by going down into the third sub-menu, then maybe the user interface is not quite what it should be. This does beg the question of whether you knew that this parameter (among many others) needs adjusting. H'mmmm!

So, there you have it – the revised programme for development at this station, and many others too I would suggest. I trust that Ian is satisfied with this as a full answer to the question in his email to Don. Any modern transceiver is good enough to get you on-air, your antenna is the key to better performance, and the function set on your transceiver, and your ability to use these functions easily are the three keys to success in this hobby of ours. And the answer to the blame question? OK, if I must. Add it all up. All of these are a bit to blame, in my opinion, kilo-man, valley-man, and the OEMs. Satisfied? If not, write to Don!



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Tim Kirby GW4VXE
longworthtim@gmail.com

Like the 'FT' modes or hate them, there's certainly no ignoring them. There is no question that the very much more intensive mode of operating that FT8 brings, as well as its weak signal capabilities, means that many fewer openings are missed. We are discovering marginal paths that we simply had no idea of before.

If you follow **John Redmond EI7GL's** blog (URL below) you will have seen John discussing some astonishing openings during the summer season. John started to write about a 6m path from Europe to Australia, feeling it was something quite exceptional, and then realised after writing about similar openings for a week or so that perhaps it wasn't as rare as he'd first thought. The openings continued, albeit not necessarily from the UK, until mid-July.

<http://ei7gl.blogspot.com>

It's not just the 6m band where we are discovering new paths, but 2m as well. John writes about an opening from Europe (IZ7AUH and LZ1KU) to A65BR in the United Arab Emirates which took place on 5 June. Although a contact was not completed, both sides copied each other.

John has also been championing monitoring Band II FM across the Atlantic and this is already showing some interesting results. FM stations from the Azores were heard in Newfoundland up to 93MHz on 23 July. The previous day, FM stations from Maine were heard in Ireland by **Paul Logan** in Co

The Changing Face of VHF DXing

Tim Kirby G4VXE reports on some remarkable VHF QSOs and also has the latest satellite news.

Fermanagh. Around 1400UTC Paul heard three stations WMED (89.7MHz), WEZQ (92.9MHz) and WHCF (88.5MHz), all from Maine. Paul says that this was only his ninth transatlantic Band II opening in about 20 years, so they're not common. Having said that, the advent of SDR receivers and the capability to record the whole band for later analysis means that we will miss fewer of the openings that occur.

What does all this mean for amateur band propagation? It certainly points to some interesting possibilities for crossband operation on 70MHz! Multi-hop Es across the Atlantic is a possibility at 144MHz, but perhaps tropospheric ducting or a combination of propagation modes will be more likely.

The 6m Band

Don G3XTT copied three different stations from California on 6m FT8 on the afternoon of 19 July. What was interesting about this was that no closer US stations were heard, perhaps supporting the idea of a chordal-hop method of propagation. After Don emailed me about the opening, I checked my .ALL file,

which logs everything that WSJT-X receives, and could see that I too had received several California stations as well as one from Arizona, but again, nothing closer. On the 25th, Don noted nothing all day until just after 1700UTC when he worked VE7SL (CN88) and then W7DUU (DM48) answered a CQ. On 2 August Don caught a late afternoon opening and worked W6TOD in California closely followed by K6FG, again with no other North American stations copied.

Jef Van Raepenbusch OS8NT really enjoyed the opening on 22 July, running about 30W to his V-2000 vertical. With this setup, the highlights of his log include XE2X (EL06), NS4C (EM84), K4PI (EM73), K8MFO (EN90), KD5M (EM60), W8FL (EM79) and K4IQJ (EM72). Jef was also delighted to work P43A (FK52) on 17 July.

Steve Lesson M1BJR (Plymouth) worked KP2/K0BZ (FK77) on 2 August. Steve says he is quite new to the band and uses an HB9CV antenna at gutter level. Steve found the band open most days during the month, with European and sometimes, East Coast USA stations.

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Fig. 1: Kevin ZB2GI's 50 and 70MHz station at the top of the Rock of Gibraltar. Fig. 2: ZB2GI's 6m beam mounted for his portable operation at the top of the Rock. Fig. 3: Digital video sent by Graham G3VKV on 437MHz as received by Steve G4NZV.

Kevin Hewitt ZB2GI (Gibraltar) says that he operated from the top of the Rock on FT8 during July, **Figs. 1 and 2**, and his log included over 1200 contacts in Japan, Taiwan, Qatar, Kuwait, Saudi Arabia as well as stations from North and South America. On SSB, the log was a bit smaller, working around 25 stations.

From home, Kev worked over 150 stations with his IC-7300 and whip antenna with highlights of his FT8 log being K5KC (EM16), VA2WA (FN36) and W0LGQ (EN21).

Steve Telenius-Lowe PJ4DX (Bonaire) writes, "The Sporadic E propagation on 6m seem to have almost ground to a halt now and in the last month I have only made a small number of QSOs on Six, all on FT8. HD1QRC90, celebrating the 90th anniversary of the Quito Radio Club in Ecuador, was an unusual call worked on 23 July, and the only new one on Six this month, HH2AA in Haiti, was worked on the same day. There was a brief opening to Europe on 25 July when I worked a few stations in France, Belgium and the Netherlands, but that was the last I have heard from Europe. There was a good opening from here to many parts of the USA on 31 July but I have not worked anything on 6m during the first 12 days of August.

"There is, however, some VHF news from Bonaire: we now have a 6m beacon, PJ4SIX, operating 24 hours a day from the QTH of **Martin PJ4MM**. The beacon, in FK52ve, is on 50.4355MHz and runs about 50W of FSK CW to a 4-element Yagi beaming towards Europe. PJ4SIX has been heard in parts of the USA including Maine and in Canada. Martin is planning to set up a 6m EME-capable station at his new QTH, hopefully later this year, at which time the beacon will be moved to a higher location on the island".

Phil Oakley G0BVD (Great Torrington) particularly enjoyed the opening on 3 August when he worked WX4G, K2IL, N4TB and WB2SNN, all in Florida.

Robert van der Zaal PA9RZ (Sassenheim) runs 10W SSB to a log periodic at 50ft ASL. Highlights of the month's log included EA6SA (JM19), IS0BSR (JN40), TC3EC (KM38) and SV6JHA (KM09).

Colin Fawcett G8YIG (Manchester) took part in the August 50MHz UK Activity Contest and worked G0CDA (IO83), G3RKF (IO83), G0XBU (IO83), G4BEE (IO83), G0VAX (IO83), GW4SHF (IO82), G8ZRE (IO83), G0CNN/P (IO94), GW4ZAR/P (IO83),



G3TDH (IO83), G8REQ (IO83), G4JLG (IO83) and G1PNP (IO83). It's clear that there's really good local activity on the band in Colin's area.

Tony Collett G4NBS (Cambridge) says that the vast majority of his QSOs have been data modes this month, reflecting the weaker Es. Tony says that at times there has appeared to be a pipeline to 5T5PA as well as strong short skip towards HB/DL.

Tony describes his best QSO of the month, "I have been looking for IO95 for a while as I'd never worked it and noticed M0EUK is active in UKAC. I requested if we could try a QSO when there was no Es around. Given I struggle to work IO94 I was thinking this might be a test for Q65 and certainly didn't think FT8 would work. On 19 July I noticed an Italian calling him on FT8 but as expected I couldn't see a signal. I sent a message on KST to let him know and he suggested a try – to my surprise there he was and a quick QSO followed. So much for avoiding when the band was full of Es. During the following periods he was not decodable so guess we caught a plane at the right time".

Tony caught an opening on 22 July to Florida and the Caribbean as well as southern and east coast USA. A new DXCC for Tony in this opening was P43A (FK52). He was pleased to catch SU1SK (KM50) on the 27th, with the Egyptian station just coming up for long enough for Tony to complete a QSO.

During the run up to the peak of the Perseids on the evening of 9 August, Tony worked CT1DIZ (IM58), EA3AKY (N11) and I6BQI (JN72) on MSK144 although he suspected it was more Es than meteors.

The 4m Band

Gordon Smith GW6TEO (Castlemartin) caught several Es openings in July. 3 July was a 'single station' event with only SQ8AQX (K000) being heard and worked. On 11 July there were two openings, one in the morning and the second in the afternoon. The morning gave Gordon contacts with DL, OK, OM, HA, S5 and 4O6AH (JN92) who was a new DXCC and square for Gordon. The afternoon opening was towards Spain with five stations, all worked before. On 18 July there was a brief opening to the north with LA3PU (JO49) and LA9DL (JO59) both being worked.

Gordon was delighted to catch DG7FEQ (JO31) for a new square just before the opening faded. Next day, Gordon caught an early opening around 0800UTC to SP5AOZ (K002) and DH2OAA (JO42). There was another opening to the south around 1500-1630UTC when Gordon worked CT1FOE (IM57) followed by ten EA stations in IN71, IN73, IM87, IM99 and JM19. During the Perseids, Gordon worked DK3RV (JO31), OZ6FH (JO47), OZ1MFP (JO65), SP2ERZ (JO94) via meteor scatter plus 9A2DI (JN95) and DH2UAK (JN59) via Es.

Kevin ZB2GI tried operating portable from the top of the Rock a couple of times using a Ranger RCI-2950, Spectrum transverter and a two-element Yagi, but unfortunately did not make any contacts. From home, on FT8, he did rather better with contacts with 5T5PA (IL10), 9A6R (JN83), EA7HCL (IM76), G0LFF (IO90), SP9HWY (JO90), G3MPN (JO02), G3SHK (IO90), G3YHM (IO90), G4FUF (JO01), G4PLZ (JO02), G8CVS (IO91), G8EFU (IO92), GW8ASA (IO81), M0UKR (JO02), M5RJC (IO82), PA4VHF (JO32) and G0ORG

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(JO02) with G0ORG (JO02) and EA8AVI (IL28) on SSB.

Jef OS8NT continued using his V-2000 vertical antenna (unmodified) with 10W from his IC-7300 and has logged some nice contacts. Jef caught Es openings on 8, 9, 17, 18 and 22 July. Highlights of his log include SX200JAO (KM18), YO9HP (KM35), YO9IE (KN34) and EA8BKF (IL38).

Robert PA9RZ worked G0VHF/P (JO01) on 17 July running 10W SSB to his log periodic and says that the path seems open all the time. Robert also worked DL6BF (JO32) running 5W of CW giving Robert a new country on the band.

Steve Macdonald G4AQB (Bolton) writes, "At the end of July we organised an outdoor meeting of the Bolton Wireless Club on our local contest spot on the side of Winter Hill in Bolton. I took my 4m Wouxun handheld with me to try to raise a couple of locals. When I arrived and switched on the handheld I was surprised to hear a very strong station in Croatia calling CQ on 4m FM. He seemed to be working stations mainly in 91 and 92 squares, but I kept calling him. He did eventually hear me but lost me again. This was around 8:00pm, quite amazing really".

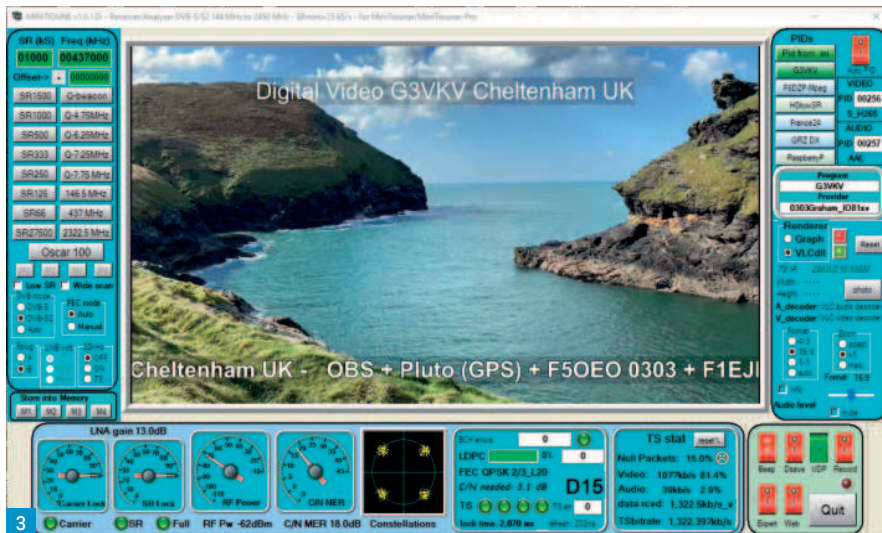
Here at **GW4VXE** (Goodwick) I decided to follow Jef OS8NT's lead and try my V-2000 vertical on the band. Using my FT-847, which is not at its best on 4m, I was pleased to be able to make my first FT8 QSOs on 4m from Wales. The FT-847 produces about 10W output and the receive sensitivity is not great. During the opening on 22 July I made 12 QSOs in OZ, EA, EA6, DL, OK and EI. On 30 July, I caught another opening to DL and OK and then on the 1 August, worked DK1MAX and DJ2QV both in JN58.

Roger Greengrass EI8KN made some meteor scatter QSOs on the band during the Perseids: OV3T (JO46), DG1VL (JO61), DJ5MN (JN58), DF5SF (JN39) on 12 and 13 August.

The 2m Band

Gordon GW6TEO caught an Es opening around 1650-1710UTC on 12 July, working YU7KB, YU7ON and YU7PAA, all in KN04, and YU2LSP and YU2LAM, both in KN05. On 14 July, Gordon worked S51AT (JN75) and IV3GTH (JN65) on meteor scatter using the MSK144 mode. On 21 July, there was some tropo and Gordon was able to work DK4ZZ and DL6YBF with OK1ADJ (JO80) appearing at 0707UTC. Initially, Gordon thought that OK1ADJ was an Es contact but now suspects it may have been a meteor burst as he was heard in SP, OM, OE and HA at the same time.

Gordon prefers FSK441/JTMS for meteor



scatter on 2m as opposed to MSK144 as he feels it performs better with shorter pings but notes that most of the activity is now using MSK144. Stations worked on meteor scatter during the Perseids shower include HA2NP (JN97), SM3RPQ (JP74), IK0BZY (JN61), SQ5GVY (KO02), S51AT (JN75), DK7OM (JO53), EA4I (IM68), IC8TEM (JN70), HB9BIN (JN37) and EA3CJ (JN01).

Jef OS8NT worked G3CKR/P (IO93) during VHF NFD and made an FT8 QSO with GW4FRX (IO82).

Simon Evans G6AHX (Twynning) took part in the 2m UK Activity Contest on 3 August, making 21 contacts in 17 squares with his best DX being G14SNA (IO64) at 381km. Simon mentions that there are minor new firmware updates for both the Icom IC-7300 and Icom IC-9700 radios, both issued in July.

Robert PA9RZ worked OZ1ALS (JO44) on 3 August, while running 100W to a 5-element Yagi.

Tony G4NBS found conditions in the UK Activity Contest on 3 August better than usual and says that he even found five stations to work on FM, including 2E0VCC/P (IO70) and MW1DDD/P (IO73). Tony worked 28 locators during the SSB contest although very little to the east. During the FT8 Activity Period, coinciding with the RSGB MGM Activity Contest on 4 August, Tony worked 28 stations before the RSGB session started, with the best DX being DK1FG (JN59). During the RSGB contest, Tony worked another 49 QSOs and says that activity is certainly increasing. During the following weekend's RSGB MGM contest Tony found activity poor on the Saturday evening, but worked EI9E (IO61) who was a good signal. On the Sunday morning, there was more activity with F6BQX and F0GIW both in IN96 being the best DX.

Roger EI8KN worked HB9BIN (JN37) on MSK144 meteor scatter on 11 August.

During the tropo opening on 14 August Roger worked EB1B (IN73), EA1U (IN83), EA1P (IN83) and CT3KN (IM12).

The 70cm Band

Jef OS8NT worked G5LK/P (JO01), G0VHF/P (JO01) and M0BAA/P (JO01) on 70cm during VHF NFD running 25W to his 5-element log periodic.

On 10 August Robert PA9RZ had a nice chat with **John G3XDY** (JO02) before the contest started and then went on to work G4LPP (JO02), G4ODA (IO92) and DL5DAW (JO31). Robert was running about 75W to a 12-element Yagi at 54ft ASL.

Tony G4NBS took part in the Low Power contest on 1 August and found conditions a little better than average. Tony was especially pleased to work MM0CEZ (IO75), GM4AFF (IO86), GD6ICR (IO74) and MW0OMB (IO81). During the UK Activity contest on 10 August, Tony made 117 QSOs with good conditions into IO83 and IO94 as well as M0AFJ/P (IO70), GD6ICR, G16ATZ, GM3SEK (IO74), MM0CEZ (IO75), GM4BYF (IO85), GM4AFF (IO86), GM4JTJ (IO86), OS8NT, PE1EWR (JO11), PA0WMX (JO21), PA0WMX, PI4HLM (JO22), DL5DAW (JO31), F1MKG (JN08), F1CBC (JN09), F1FPL (JN09) and F4HOG (JN09).

Roger EI8KN enjoys the EU FT8 Activity Contests which alternate between 2m and 70cm on a monthly basis. During the session on 11 August Roger worked nine stations in locators IO64, IO81, IO91, IO92 and JO01. On 70cm, Roger runs 40W to a 23-element Yagi.

The 23cm Band

Experimenting further with his WIMO flat panel antenna for the 23cm band, Jef OS8NT worked G3XDY (JO02) on SSB and regularly monitors the GB3MHZ beacon at Martlesham Heath.

Steve G4AQB says that there is still a Wednesday evening FM net in the Manchester area starting around 8:15pm on 1297.5MHz FM. Most stations are using horizontal polarisation. Anyone who hears the net is very welcome to join in.

Satellites

Kevin ZB2GI operated an AO-91 pass from the top of the Rock, using an FT-817 and manually tracked 2m/70cm log periodic. He worked EA1BYC (IM86), EA7IU (IM86), EI3FW (IO54) and G0ABI (IO80).

Phil G0BVD enjoyed the ARISS SSTV activity on 6/7 August, using a 5/8th-wave vertical on his chimney for reception.

Patrick Stoddard WD9EWK wrote, fresh from delivering some satellite talks at the QSO Today Online Expo, "Summertime means satellite activity from all over, operators going out and activating different locations. In the past week, it was fun to read about Greenland appearing on QO-100, which may be the first time North America was heard through that satellite. I'm still going out and activating the grids around me in Arizona and have had fun hearing a couple of Canadian satellite operators activating grids in Atlantic Canada.

"In the past few months, John VE1CWJ and

Dana VE1VOX, both from Nova Scotia, have been venturing around their province and other eastern Canadian provinces. Both of them have been putting many grids on the air, for operators on both sides of the Atlantic. These two guys have also helped with those who are working for the AMSAT GridMaster Award, working the 488 grids that make up the continental USA (and mirrors the ARRL's Fred Fish Memorial Award for 6m operators working the same 488 grids). Great to hear the roving activity from Canada!"

Here at GW4VXE I have been enjoying some RS-44 QSOs, mostly on low power CW with a fixed antenna, which is not ideal but I have been surprised with some of the contacts made, including A65BR (LL75), K8YSE (EN91), NA1ME (FN54), WA2FHJ (FN33), JU1WP (ON37), RW3XL (KO84) and UA3TJC (LO16). There have been some nice QSOs on AO-91 as well, including some very welcome new squares provided by an expedition to the west coast of Ireland by George M0ILE operating as EI/M0ILE/P. As Patrick mentioned, VE1VOX and VE1CWJ have both been busy providing some new squares in Nova Scotia and VE1XE has been on from Newfoundland! CU7AJ (HM58) provided another new country and square from the Azores.

DigitalTV

Graham Jones G3VKV (Cheltenham) writes, "I have been doing some digital TV tests with Steve G4NZV in Tewkesbury on 146.5MHz DVB-S2 using F1EJP FreeStreamCoder software to produce high compression H265 HEVC digital video instead of the usual H264 AVC. All seems to work fine, good quality, smoother movement and only three seconds' delay (Fig. 3).

"It was much better on 146.5MHz (NoV required from Ofcom) where bandwidth is restricted to 500kHz (333ks/s) and 50W ERP. I am now able to transmit and receive TV on all bands from 146MHz to 10GHz. I'm using the F50EO DATV firmware v0303 on a revision D Adalm Pluto SDR for transmit and a BATC Minitiuner receiver.

"The higher bands are reached by transverting up/down through my existing microwave systems.

"I received some video on 25 July from R0AU N066ka, Krasnoyarsk City, Siberia on the QO100 satellite who had only 3.9° elevation, including some good pictures from his drone camera".

Another busy column this month – thanks to everyone who has contributed! See you next time.



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A Name from the Past...

Tony Smith G4FAI reflects on the life of Hiram Percy Maxim.

In his time, **Hiram Percy Maxim W1AW** (1869-1936) was one of the most famous radio amateurs in the world; and his call can still be heard on the air from the Hiram Percy Maxim Memorial Station, located at ARRL HQ, Newington, Connecticut, USA. The station is known internationally for its Morse practice sessions and news broadcasts. Schedules and information about it can be found on:

www.arrl.org/w1aw

Many Talents

Although his contribution to amateur radio was massive, Maxim was a man of many other talents. He grew up in the world of ordnance. His father, **Hiram Stevens Maxim**, who became a British citizen and was knighted by **Queen Victoria**, invented the Maxim machine-gun.

His uncle, **Hudson Maxim**, invented the explosive Maximite and other ordnance devices. Hiram Percy himself was also a distinguished inventor, becoming famous in the field of armaments long before he became a champion of amateur radio.

He was also an automobile pioneer. His book *Horseless Carriage Days* is a fascinating account of his involvement in the industry and how the early cars were constructed and developed. He built an early petrol-powered tricycle; he designed the Columbia electric car and superintended the development of a complete range of road vehicles before the turn of the century. A Columbia car used by **Queen Alexandra** in the grounds of Sandringham House can be seen in the National Motor Museum at Beaulieu.

The Silencer

In 1902, while working on the problem of muffling motor exhausts, Maxim invented the 'Maxim Silencer', a device that virtually eliminated the sound of gunfire from sealed breech rifles.

Describing it later, he wrote: *"The silencer was developed to meet my personal desire to enjoy target practice without creating a disturbance... It occurred to me one day that there was no need for the noise. Why not do away with it and shoot quietly?"*

He formed his own company in 1908 to produce various versions of his invention, which caused a sensation. With the possibility of criminals using the silencers, press and public reaction judged them to be a menace to public safety and many states stopped their sale. Some countries banned their importation, and production finally ceased in 1930.



Maxim adapted the silencer to reduce noise in various industrial and marine applications, and in US fleet submarines. Another invention, the Maxim window silencer, ventilated rooms while keeping out noise; and his company was the first to develop a successful device to convert seawater to fresh water.

An enthusiastic film maker, he was organiser, and president, of the Amateur Cinema League. He was a pioneer in aviation, particularly gliding, and in 1910, with his son, he had an active amateur radio station with the callsign SNY.

He wrote a weekly 'science for the layman' feature for a newspaper syndicate, the scenario for a Pearl White film, and several books. He wrote and lectured about astronomy and was a keen yachtsman.

Co-founder of ARRL

In 1914, when unable to send a message direct to another station, he relayed it through another amateur halfway between the two stations. From this experience, he conceived the idea of a national organisation of amateur relay stations, handling third-party messages across America as a public service.

That year, with **Clarence Tuska**, its first secretary, he founded the American Radio Relay League (ARRL), becoming its first president. The following year, they started the League's famous magazine, *QST*, jointly funding its first issue.

When America entered the first world war,



in 1917, there were over 6000 amateurs in the country and, by then, the ARRL was their national representative body.

International Amateur Radio Union

The war curtailed all amateur activities, and the League closed down. After the war the US government was reluctant to allow amateur radio to start again. Maxim called together the old board of directors of ARRL, who raised funds to re-launch the League which, under his leadership, pressurised the government until amateur radio took to the air again on 1 October 1919.

In 1924, he came to Europe on behalf of ARRL, who believed there was a need for a body to represent the interests of radio amateurs at international conferences, and to encourage worldwide fraternisation. He met representatives of various organisations in France, who then invited all known national amateur radio societies to meet in Paris in March 1924.

As a direct result of this meeting, the

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Photo 1: Hiram Percy Maxim. Photo 2: W1AW Memorial station. Photo 3: Columbia electric car designed by Maxim. (The Horseless Age, 1903) Photo 4: Advertisement for Maxim Silencer. Photo 5: Horseless Carriage Days. An interesting book by Maxim. Photo 6: Logo of the International Amateur Radio Union. Photo 7: Maxim and Tuska jointly funded the first issue of QST.

International Amateur Radio Union (IARU) was formed. At its first Congress the following year, the IARU recommended that Esperanto be adopted as the standard international language for radiotelephony and for use at future Congresses. However, the Scandinavian representatives opposed this proposal, claiming that English was a much easier language to learn.

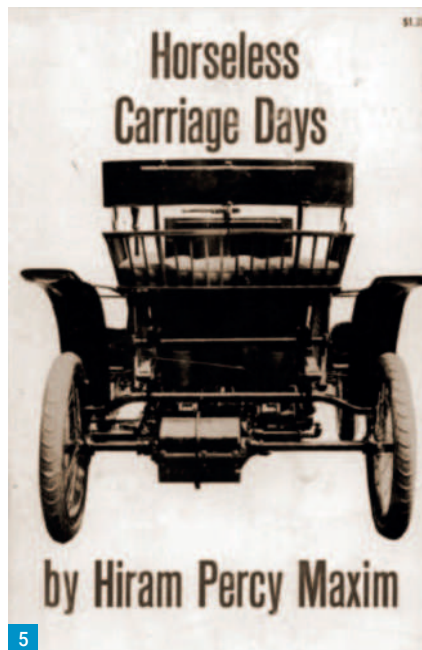
The Congress elected Maxim as its International President. The headquarters of IARU were located at West Hartford, HQ of ARRL, and he was now deeply involved in international, as well as national, amateur radio affairs.

Allocation of International Wavebands

In 1927, an International Radio Telegraphic Conference was held in Washington DC, but the official British delegation had no instructions to consider the interests of radio amateurs in their negotiations.

Maxim and **Kenneth Warner**, secretary of both the ARRL and the IARU, attended the conference and, by arrangement with the Radio Society of Great Britain, represented the interests of British amateurs.

They pressed hard for the allocation of wavebands on a worldwide basis, and



their efforts resulted in the adoption of the harmonically related frequencies for the main amateur bands as we know them today.

The IARU Today

Over the years since its foundation by Maxim and Warner, the IARU has become a federation of 160 national amateur radio organisations, promoting the interests of the hobby worldwide, while seeking to protect and enhance its spectrum privileges.

It is recognised by the United Nations as a Non-Governmental Organisation (NGO) due to its consultative status with other United Nations bodies, including the International Telecommunication Union (ITU). Its founders would have been proud of what it has become.

'The Old Man'

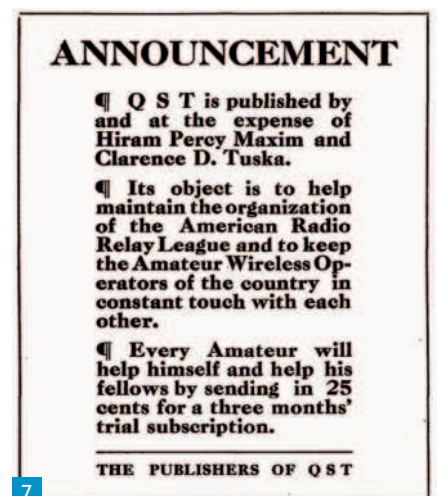
Apart from his involvement in the world of international negotiations and conferences, Maxim found time to get down to basics too. For many years he wrote a column in QST under the pseudonym *The Old Man*, with his identity only being revealed after his death.

The magazine's editor wrote of him: "With unerring aim and caustic wit he turns up to view the things that are 'rotten' in amateur radio, and his lessons go home because he entertains us at the same time."

It was a time when semi-automatic (bug) keys were widely used on the bands. The Old Man particularly disliked what he called "the speed maniacs" who he described as "Young Squirts". He wrote "Why doesn't some smart aleck (sic) start a sending school for Young Squirts? Teach them how to send. And why, for Pete's



6



7

sake, do they ... make I and E sound like S? "Extra dots on everything. Letters hatched (sic) clean in two, F becoming a clean IN, and so on. You simply can't read the stuff ... Did they never hear that a dot was supposed to be one-third the length of a dash? Do they find nothing incongruous in sending alleged Morse at 30 so far as concerns the dashes, while the dots are at the rate of 65?

"Good ops have clean fists. They don't hash everything up the way these modern Young Squirts do. They don't send a TH so it can't be told from a 6. They don't rip a lot of hash off at 40 and then have to

Continued on page 50

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Richard Constantine G3UGF

practicalwireless@warnersgroup.co.uk

I first encountered the Comet HFJ-350M compact antenna system while reviewing accessories for Icom's latest QRP transceiver and mentioned it in the article. It could be seen in photographs showing an aftermarket side-mount antenna bracket for the IC-705. It helped to shift the centre of gravity of this prone-to-tipping radio, before an OEM desk mount was released, and made the radio's screen easier to see.

I could only see part of the base coil but thought it looked rather robust and better than a similar one I had in my collection. I was unable to find a UK importer at that time to verify this. I could see the antenna in *QST* magazine and toyed (no pun intended) with asking my son to ship one from the USA.

The moment passed because, shortly after my review appeared, I noticed that the HFJ-350M was now being imported and so placed an order. Well then, what is it, what's in the 'Toy Box' and does it work?

On Arrival

It actually arrived in a reusable, roll-up and stowable plastic pouch. There's no box involved, maybe it got lost in translation?

The design follows a long line of traditional, base-loaded, tapped coil, mobile and portable antennas that have been around for almost as long as radio itself. In this case, scaled down for use with portable rigs. I obtained a similar one when Yaesu's FT-817 burst on to the scene, more than 20 years ago.

In general, base loading isn't the most efficient type of radiator but is the most practical. Additionally, the antenna is a mere fraction of the real thing. You simply can't expect, as the old pre-metric saying goes to, 'get a quart out of a pint pot!'

The small size, relative to frequency, is the biggest downside. That is to say, it becomes less efficient the lower in frequency you go. I wasn't expecting miracles unless the 10m band was wide open!

Construction aside, how well small antennas work relies on getting a number of things right. Effective earthing or counterpoise system, matching, location and of course the vagaries of band conditions. Nevertheless, this type of antenna can still surprise given half a chance. Mounting one on a biscuit tin in the back bedroom is most definitely not a good idea.

Mechanically, this version comprises a PL259 terminated, 20mm diameter, 47µH, tapped base coil. It provides coverage of



Comet HFJ-350M

Richard Constantine G3UGF gets hands-on with the Comet HFJ-350M 'Toy Box' antenna.

7-50MHz according to the position of the mini wander-plug lead, used to short circuit unwanted sections of the windings. The preferred tapping points are clearly marked, making life very easy with no guessing.

There are two fixed value, additional coils that can be mounted in series above, as and when required. All of the coils are covered by very attractive, heavy duty and durable looking shrink-wrap.

There's an add-on 15mm diameter, 210mm, 132µH coil for 80m and a further slightly larger diameter, 20mm x 250mm, 410µH inductor for the 160m band. The kit can be obtained without the optional 160m coil for a reduced price, if preferred.

The coil sections are topped off by a satin finish, 1.26m telescopic radiator, adjustable for best VSWR.

The telescopic radiator is also intended to provide coverage of 6m with the base section coil installed but shorted out.

Here a word to the wise and from bitter experience of my youth; never be tempted to close a telescopic whip by pushing it down from the top end. It's so tempting but, if a section jams, the whip bends irreversibly and you'll need a costly replacement.

Each additional coil section makes use of the now ubiquitous 3/8in UNF threaded

fittings for interconnection, something that could prove useful for further experimentation. I love to mix and match antenna parts from time to time.

The literature stated that the inductors are max power rated for 100W peak SSB. However, this information is modified by the following recommendation: 7-50MHz 100W; 3.5MHz 75W average; 160m 50W average. One to watch if you're not using a QRP rig.

As mentioned, the base coil is terminated with a fixed PL259 connector and there's a handy little earth tag affixed to it by means of a screw, nice touch. I considered using the earth tag to connect to a terminal block with multiple counterpoise wires attached. However, as the radio was bound to be close by, connect the earthing system directly to the radio itself seemed preferable.

The manufacturer's single page leaflet gives brief suggestions regarding counterpoise systems and made me smile. It recommends the following wire lengths in metres with the added rider that, 'depending on conditions, longer lines may be necessary': 1.8MHz: 40m; 3.5MHz: 20m; 7MHz: 12m; etc.

Ironically, if I had those quarter wavelengths of wire with me when /P, perhaps I would use them as antennas,

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Photo 1: The Toy Box kit. Photo 2: Antenna and mount system with, Elecraft KX3.

Photo 3: Close up of base coil and mount, with Elecraft KX3. Photo 4: Antenna clipped to backpack with Auto-ATU and Icom IC-705. Photo 5: Antenna directly mounted on MFJ manual ATU and FT-817.

rather than counterpoises? Realistically, that's not always possible or practical in holiday accommodation, on campsites or when backpacking plus not so easy for band hopping, if just listening, etc.

In Use

As any conscientious reviewer would, I decided to spend a day taking the manufacturers at their word, checking out every band with the appropriate counterpoise. Yes, this did include 40m of wire. Results were interesting but, in a nutshell, not as simple or RF docile as anticipated.

I did expect to find the antenna to be very narrow-band with a VSWR of a few kilohertz due to its size and so it proved. VSWRs of less than 2:1 became spot frequencies on the lowest bands. It became clear and very quickly that the VSWR changed to unacceptable levels, caused by proximity capacitive effects, when either I or the surroundings moved or changed.

Following some considerable experimentation, the solution was the most obvious, a genuine earth connection with a short wire lead.

I experimented further, adding counterpoise wires to the earth system. Small, and seemingly positive improvements in reception were noted on some lower bands. Comet recommends the use of an antenna analyser to set up the antenna for best match and, of course, the literature mentions their own model.

Being somewhat old school and for the benefit of the average radio amateur, I wanted to see if I could match the antenna by the traditional VSWR meter method. Result: it can be done but it takes time and patience. Move frequency, band, location, or a quick listen elsewhere and you have to start again. Therefore, using a modern pocket analyser is a great help and can be done without endangering the transmitter.

That said, the quick and easy solution is to use an antenna tuner, easily my preferred option. While the radiator might not just be spot-on resonant it's definitely the quickest and simplest way to use this antenna, while protecting your investment.

Once tuned manually or auto, the difference on receive is a striking improvement



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5

and bodes well for transmission. Elecraft's KX3 transceiver has its own internal auto tuner but other popular radios such as Icom's IC-705 and Yaesu's FT-817 don't.

Here a word about connecting this or any other compact antenna directly to the antenna socket on a radio. In my experience and having replaced a few sockets, not a good idea. Certainly not recommended if there is no internal tuner, for the reasons I've already described.

All of the above radios require an elbow connector for a vertical antenna. BNC adapters swivel and are a nuisance to keep aligned vertically without additional support. PL259s (FT-817 rear) have locking teeth but, importantly, all arrangements place unacceptable strain on the radio's output socket with a heavy HF vertical.

Which leads me to the next dilemma. The system doesn't come with any form of mount. A few frustrating hours were wasted trying to fabricate something and experimenting with mag-mounts. The simplest solutions are sometimes the most obvious. What I eventually came up with can be seen in the photographs. A flat alloy bar and a small hobby type G-clamp, both relatively light and compact to transport and for which I claim no originality.

With the addition of a car boot-lip mount it allows the antenna to be clipped to a wide variety of structures, such as picnic tables or seats, either horizontally or vertically. I really like the Q80 mount normally found on my backpack as it can be quickly unclipped and re-locked again with a spring-loaded lever. A simple alternative would be a drilled metal strip with its own SO239 mount and cable.

But Does it Work?

At the start of this review of my experiences I mentioned three criteria, earthing, matching and band conditions. Having shared with readers experiences of the first two, now under the heading of, band conditions, does the antenna work?

In general, the answer is, 'Yes,' with some qualification. While I'm personally no lover of the plethora of contests that overly dominate the bands and hasten the death of conversation, they are a useful tool for checking out antennas. Ignoring the irrelevant 59 sent from a logging computer, would my signals be heard and how weak a signal could I call and still get a report?

From a good clear location and presumably helped by the setup of the stations contacted and, of course, propagation, I was able to get some replies from S5 European signals, when in the clear, no pile-ups busted! Again, the higher bands were better and for now I'm guessing that using FT4 or FT8 data modes will produce some interesting results.

To summarise, this little antenna system has much 'play value'. It's ideal present material and definitely falls into the category of doing more with less. The inductors are built to last, making them ideal and improved replacements for my earlier version. The complete kit has found its way into my ever growing 'Toy Box'.

At time of press, the HFJ-350M is available from Nevada Radio. The 1.8 to 50MHz version retails at £149.95 while the 3.5 to 50MHz versions sells for £129.95.

www.Nevadaradio.co.uk

Continued from page 47

repeat it four times before it becomes evident that the message is 'Greetings by radio'... It's just plain rotten and getting worse by the hour".

He was commenting on a different, earlier world of amateur radio, but his remarks about high-speed sending could well have some relevance today!

Same Problems

In today's world of CW operating, the beginners, the improvers, and those with only moderate skill, still using manual Morse in one form or another, have the same reading problems that their forebears had.

Signals from high-speed stations are still sent at a gallop, the faster they go, the more mistakes are made, letters are sent incorrectly, and words are run together, requiring frequent repeats.

Contests using high speed are one thing, where everyone taking part knows what to expect in a limited exchange, or a computer sends and reads it for them. But actual communication? That's another thing altogether! It is supposed to be the convention that operators reduce speed to match that of the slowest station in a QSO but that doesn't always happen. The Old Man would still have a few things to say if he was around today!

Daily Tribute

As can be gathered, Maxim was a keen CW operator and his personal key, used when his call was 1AW, is now preserved in the Antique Wireless Association's museum at East Bloomfield, NY.

He died in 1936, still president of ARRL and IARU, and was mourned by amateurs everywhere, who had gained so much from his work on their behalf.

His Memorial Station can be heard on the air for approximately eight hours a day, five days a week, with code practice, code and teleprinter bulletins. Voice bulletins are also transmitted, at 9:45 PM eastern time with SSB on HF, 6m, and 2m FM. The story of the station and a description of its facilities can be found at:

<https://tinyurl.com/yb5jn7xn>

Its operation is a daily tribute to a man who, in the midst of an already full life, gave so much of his time and effort to advance and protect the interests of radio amateurs, not only in the United States but around the world as well.

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Chris Murphy MOHLS
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It was Thursday morning in the electronics lab and one of the senior engineers, Jeff, was sat looking at last night's football results in his paper when he was startled by a cheery voice behind him. "Morning Jeff". Looking round he saw the greeting was from the lab's apprentice Natalie. "Morning Natalie" he replied. "Good day at college?" "Yes thanks", said Natalie. "Can you go through the electronics stuff with me at lunchtime like you did last week please". "Yes of course, what is it this week". "Oh, more DC stuff", said Natalie. "Voltage dividers and Kirchhoff". "Right" said Jeff "I'll look forward to it".

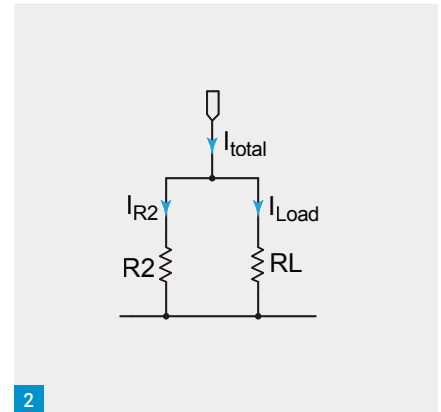
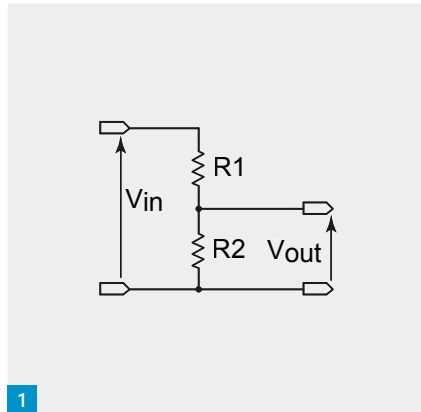
Lunchtime came and after they'd both eaten their lunches Jeff wandered over to Natalie's desk where she was already engrossed in her college work. "Hi", she said, "I was just looking at voltage dividers". "Well, they're normally fairly straightforward", said Jeff. "Just take Ohms Law a step further really. Have you got an example?" "Yes", said Natalie. "There's one here, look", Fig 1.

"OK then," said Jeff, "Explain to me how you find the output voltage". "Well", she said, "One way is to find the total resistance by adding the values of R1 and R2 together. Then you divide the voltage V_{in} by the total resistance to find the current flowing. You then use Ohms Law again to find the voltage across R2". "Fair enough", said Jeff, "but there is an easier way". "Do you mean by using this formula", said Natalie interrupting Jeff and wrote down an equation on her notepad:

$$V_{out} = V_{in} \times (R2 / (R1 + R2))$$

"Yes, that's right. It's a well-known formula for finding the output from a voltage divider that's fairly standard in textbooks. In fact, it is in the Radio Amateurs exam syllabus as well. You have to be careful though", Jeff warned, "That it only holds true if any load that you connect to the output has a high resistance compared to R2 and therefore draws a low current". "Why is that?" asked Natalie. "Because", Jeff explained, "Anything that you connect across R2 will be in parallel with it and the effective resistance will be the result of R2 and the load resistance in parallel. The best way to explain is by doing a few examples".

"Let's say", said Jeff, "That the input voltage is 10V and R1 is 7kΩ and R2 3kΩ. Using the formula that you wrote the output voltage across R2 will be 3V. And since the



Voltage Dividers and Kirchhoff

Jeff continues to coach Natalie in some basic circuit theory.

total resistance of R1 and R2 is 10kΩ the current flowing through both resistors will be 1mA. "Yes, I follow that", said Natalie. "Now", said Jeff, "let's say that we connect a load with a resistance of 100kΩ across R2. Do you know how to calculate what the resulting resistance, let's call it $R_{parallel}$ will be?" "Yes", said Natalie and wrote down another equation (below). "And if we use the values of resistance in kilohms it works out as 2.91kΩ."

$$R_p = (R2 \times R_{load}) / (R2 + R_{load}) = (3 \times 100) / (3 + 100) = 2.91k\Omega$$

"So", said Jeff, "If we now use the voltage divider formula again but with R2 as being 2.9kΩ, we find that the output voltage is now 2.94V – not too much lower than the original 3V". "Now", said Jeff, "Let's see what happens if we connect a load resistance of, say, 500Ω across R2. Using your formula for resistors in parallel the resultant parallel resistance will be about 493Ω, and putting this value into the voltage divider formula we now find that the output voltage is only about 0.6V – much less than our original value". "Oh", mused Natalie, "Is there any way that you can keep the output voltage constant". "Yes, and you'll no doubt learn how to do that when you learn about power supplies", said Jeff.

"Incidentally, did you also learn about current dividers?" Jeff asked. "No", replied Natalie, "do they work in a similar way". "Sort of", said Jeff, "Except that whereas

a voltage divider consists of resistors in series, a current divider has resistors in parallel". "In fact", Jeff said, "what we've just looked at with adding a load to a voltage divider is a good starting point for explaining how a current divider works".

"If you remember we calculated the current through the voltage divider with no load to be 1mA", said Jeff. "The current with the 100kΩ load won't be much different, but let's look at what happens with the 500Ω load. We calculated the resistance of R2 and 500Ω in parallel to be about 430Ω, so the total resistance across the 10V supply will be 7.43kΩ". "Yes, I follow that", said Natalie, "R1 remains the same at 7kΩ". "Correct", said Jeff, "and if we now calculate the new current, we find it to be 10 divided by 7.43k, which is about 1.35mA".

"Now", said Jeff, "All of the current will flow through R1 but let's look at what happens with R2 and the load. Here, some of the current will flow through R2 and some through the 500Ω load", Jeff explained. "Let's call them I_{R2} and I_{load} and the total current I_{total} like this", said Jeff and sketched the circuit, Fig. 2. "So", said Jeff, "The total current will divide between R2 and the load and the currents in each will add up to the total current". "Hang on a minute", interrupted Natalie, "We did cover something like this. It was called Kirchhoff's current law". "Yes", said Jeff, "It's the same thing really but with the current divider we can work out the currents from the values

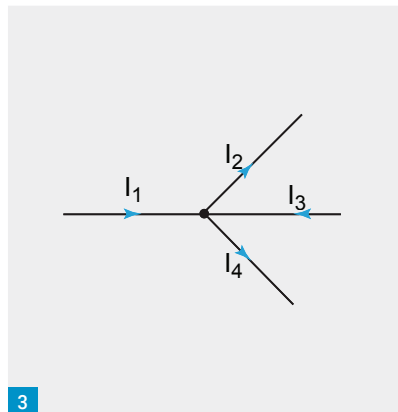


Fig. 1: Voltage divider circuit.
Fig. 2: Current divider circuit.
Fig. 3: An illustration of Kirchhoff's Law.
Fig. 4: Kirchhoff worked example.
Fig. 5: Second class example.

of the resistors. Going back to our example here we can write the equation total current equals the current through R2 plus the current through the load":

$$I_{\text{total}} = I_{R2} + I_{\text{load}}$$

"To find the current in each leg from the values of the resistors", Jeff explained, "We can use a formula similar to the one for voltage divider. I'll write it down for you":

$$I_{R2} = I_{\text{total}} \times (R_{\text{load}} / (R2 + R_{\text{load}}))$$

$$I_{\text{load}} = I_{\text{total}} \times (R2 / (R2 + R_{\text{load}}))$$

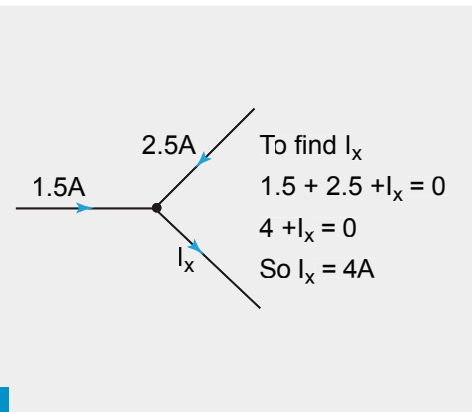
"So", said Jeff, "Let's work out the currents in R2 and R_{load}". We know the values of the resistors and that the total current is 1.35mA. Let's put the numbers into the formulas". "OK", said Natalie and wrote down the formulas with the numbers in them:

$$I_{R2} = 0.00135 \times 500 / (3000 + 500) = 0.000193\text{A} \text{ or } 193\mu\text{A} \text{ and}$$

$$I_{\text{load}} = 0.00135 \times 3000 / (3000 + 500) = 0.00116\text{A} \text{ or } 1.16\text{mA}$$

"They look good to me", said Jeff, "And if you add them together, you'll find that you have 1.35mA, which is of course the total current." "OK", said Natalie. "I notice that to find the current in one branch, the resistance of the other branch goes on the top line of the formula to work it out". "Yes, that's right", said Jeff. "Did you say that you'd done Kirchhoff as well?"

"Yes, sort of", said Natalie. "Archie said that there are two Kirchhoff laws, one to do with current and the other voltage. We covered the current law this week and we'll do the voltage law next week." "I see",



mused Jeff. "What do you know about the current law then?" "Well, it's similar to what we've just been talking about – currents in different parts of a circuit", said Natalie. "Kirchhoff's current law says that the algebraic sum of all the currents at a junction in a circuit (Archie calls a circuit a network by the way) add up to zero".

"Yes, that's right", said Jeff. "Actually, Kirchhoff talks about the conservation of charge. Current is the amount of charge in a given time – remember that problem Archie gave you last week. So, if no charge can escape, then it follows that what goes into a junction in a given time must also come out. A junction in a circuit, or network, by the way is called a node. Anyway, from the talk about charge we can deduce that any current that flows into a node must also come out." "Yes", said Natalie. "Archie used this example", and drew a network, Fig 3. As shown, $I1 + I3 = I2 + I4$ so $I1 + I2 + I3 + I4 = 0$.

"OK", said Jeff. "To solve the algebraic sum, we need to denote some currents as positive and some as negative. It doesn't really matter which as the calculations will show whether or not they've been given the right sign. If in the example that Archie gave you, we say that I1 and I3 are positive and that I2 and I4 are negative, then we can write the following", and Jeff wrote down another equation:

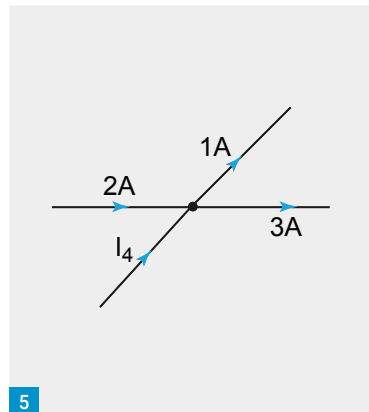
$$I1 + (-I2) + I3 + (-I4) = 0, \text{ then } I1 + I3 - I2 - I4 = 0$$

"Let's give them some values to show how it works. Let's say that I1 is 3A, I2 is 2A, I3 5A, and I4 6A, then we have"

$$3 + (-2) + 5 + (-6), \text{ which is } 3 + 5 - 2 - 6 = 0$$

"So, we have 8A flowing into the node and 8A flowing out", said Jeff. "Did Archie give you any examples where you had to find what a current flowing into or out of a node was?" asked Jeff. "Yes", said Natalie. "This one, for example", Fig. 4.

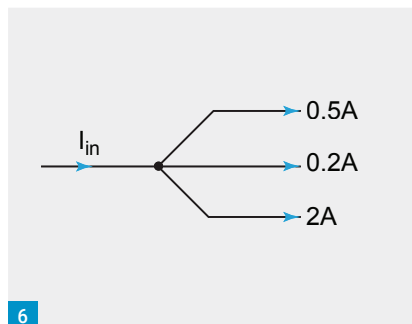
"Time's nearly up", said Natalie looking



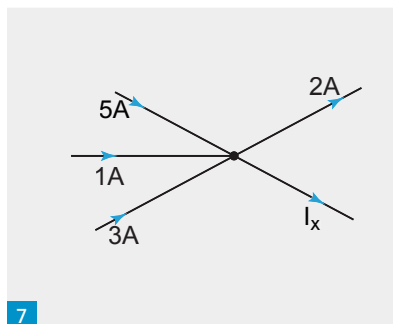
at her watch. "Can you write me a few questions about what we've talked about?" "Yes, of course I can", said Jeff. "Did Archie give you some as well?" "Yes, they're here, look", said Natalie handing Jeff a list. "Actually", said Jeff, "I thought that you'd ask me to write some questions for you and that you said that you'd be looking at voltage dividers and Kirchhoff this week so I dug out a couple of questions from my college days years ago". "Blimey", said Natalie, "Are they still valid?" "Electrical theory doesn't change with time", said Jeff with a laugh. "In the days before digital multimeters we had to use analogue meters and some, especially the cheaper ones, had fairly low internal resistances so the loading effect of the meter had to be taken into account when measuring voltages. If you look at an old circuit diagram, it will often tell you the resistance of the meter that any voltage measurements were made with. Putting the meter across the resistor just places a load across it the same as another resistor would".

"Hey Jeff", said Natalie looking at Jeff's questions. "Question 5, what are those squiggly lines?" "Those", said Jeff, "Are resistors. That was the old circuit symbol before we started using rectangular boxes". "Oh", replied Natalie, "But how am I supposed to find the current in them when I don't know their value or the voltage across them?" "The diagram tells you everything that you need to know", said Jeff. "Just use what you have learned over the past two weeks".

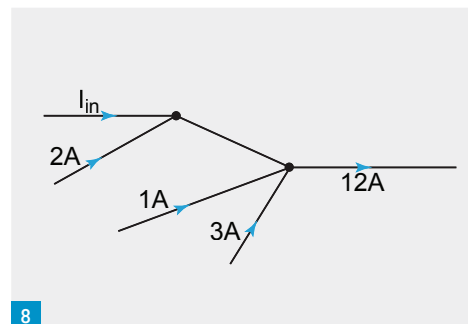
"Do these theories actually get used for anything", Natalie asked. "Archie said that next week we'd be looking at a couple of other network theorems as he calls them as well as Kirchhoff's voltage law". "Oh yes", Jeff replied, "The basic network theorems can be used to simplify quite complicated circuits or networks that contain a lot of resistors in series and parallel along with multiple voltage or current sources into a



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simple representation that often contains a single resistance and voltage or current source. Don't neglect them just because you can't see an obvious use for them at the moment". "OK", Natalie replied, "I'll look forward to them".

Class Examples

1. If in the voltage divider in Fig. 1, $R_1 = 20k\Omega$ and $R_2 = 3.3k\Omega$, what will V_{out} be if V_{in} is 30V? (4.25V)
2. If $R_1 = 100k\Omega$ and $R_2 = 56k\Omega$, what will V_{out} be if V_{in} is 230V? (82.56V)
3. If $R_1 = 820\Omega$ and $R_2 = 120\Omega$, what input voltage is required to produce an output voltage of 3V? (23.44)
4. In the network shown in Fig. 5, calculate I_4 . (2A)
5. What is the total current required to supply three circuits that require the currents as shown in Fig. 6? (2.7A)

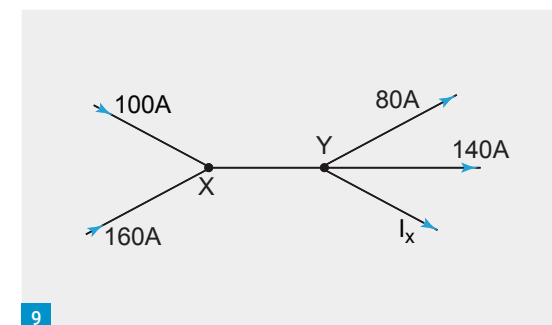
Further Examples

For voltage divider questions refer back once more to Fig. 1.

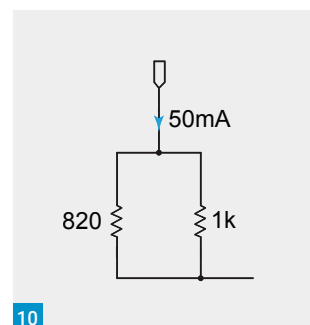
1. If $R_1 = 100k\Omega$ and $R_2 = 56k\Omega$, calculate the voltage across R_2 if $V_{in} = 18V$. (6.46V)
2. If $R_1 = 10M\Omega$ and $R_2 = 820k\Omega$, what is the voltage across R_2 if $V_{in} = 500V$? (37.9V)
3. If both R_1 and $R_2 = 470\Omega$, what is the voltage across R_2 if $V_{in} = 6mV$? (3mV)
4. Calculate I_x in the network shown in Fig. 7. (7A)
5. Calculate I_{in} in the network shown in Fig. 8. (6A)

Jeff's Questions

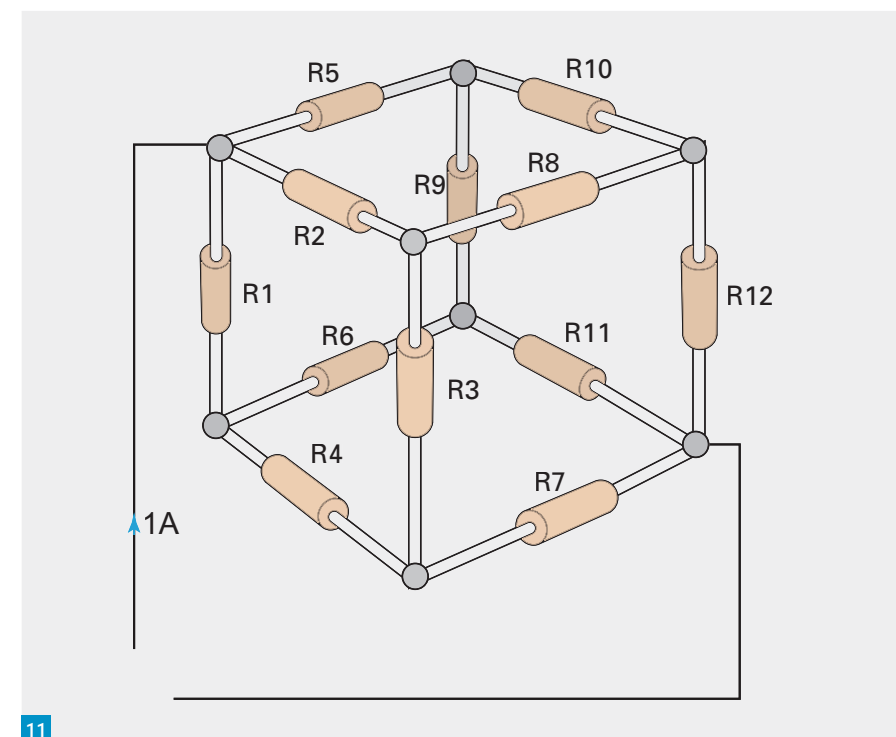
1. For the potential divider as shown in Fig. 1, if $R_1 = 200k\Omega$, $R_2 = 47k\Omega$ and V_{in} is 50V, calculate the voltage across R_2 with no load connected. If a meter with a resistance of $100k\Omega$ is used to measure the voltage across R_2 , what voltage will it indicate? (9.5V and 6.9V)
2. What voltage do you need to apply to a voltage divider consisting of a $56k\Omega$ resistor and a $3.3k\Omega$ resistor for a voltage of 6V across the $3.3k\Omega$ resistor? (108V)
3. An electrical distribution network for three marquees at an amateur radio



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event, Fig. 9, has two electrical supplies with currents of 100A and 160A flowing into it. The combined currents flow along a cable, X-Y, of resistance 0.4Ω . It then supplies three circuits as shown below. Find:

- A: The current flowing in the cable between X and Y. (260A)
 - B: The current I_x . (40A)
 - C: The voltage drop along the cable X-Y. (10.4V)
4. Find the current in each of the resistors in Fig. 10. (27.5mA and 22.5mA)

Fig. 6: Third class example.

Fig. 7: Fourth class example.

Fig. 8: Fifth class example.

Fig. 9: The first of Jeff's questions.

Fig. 10: The second of Jeff's questions.

Fig. 11: Jeff's final question.

5. In the network shown in Fig. 11, all resistors have the same value. Find the current flowing in each resistor. ($R_1, R_2, R_5 \frac{1}{3}A$, $R_3, R_4, R_6, R_8, R_9, R_{10} \frac{1}{6}A$, $R_7, R_{11}, R_{12} \frac{1}{3}A$)

Roger J. Cooke G3LDI
roger@g3ldi.co.uk

CWops Gold medallions for achieving 90 points in the weekly CWT events were plentiful in the Norfolk ARC this year! However, the rules are changing next year. A new session is being added, 0700 to 0800UTC. This will make it easier on the EU stations, a somewhat sobering hour to operate compared to the 0300 to 0400 slot! Having said that, we normally have at least three ops in NARC who regularly take part at 0300.

The 0700 sessions are live at the moment, but not for scoring purposes. That will commence on 1 January 2022. So, if you find it difficult to drag yourself out of bed at 0300, try the 0700 slot. The only problem there is that for the Gold awards, EU stations will, from 2022, need 120 points, so you might have to bite the bullet a few times!

Norfolk ARC also has another new CWops member. It's **Tony G00OR, Fig. 1**. Tony has been in our local classes for some time and is good at 25wpm plus now, but he now has to work during the day so can only get on for the evening sessions.

Another New Key

Well, it's new to me anyway! **Andy 2E0NDZ** emailed and asked if anybody has a drawing or information regarding the Hitchcox triple lever automorse key. It is an Australian-made triple-lever Morse paddle. Andy is a member of the British Vintage Wireless Society (BVWS):

www.bvws.org.uk

He bought this key from one of the members. As you see from the pristine one, **Fig. 2**, this is what it should look like. The other pictures are Andy's key after he cleaned it, **Figs. 3 to 5**. The small cut-out includes the maker's identification. It does look ancient and I don't suppose there are many in use today, but if anybody can help Andy, please email him:

andrewhumphriss@tinyworld.co.uk

HF NFD 2021

NFD was again this year a non-starter for me and also those in the Norfolk ARC. However, the RSGB decided to sanction it and there were a few clubs that took part. Despite the lack of DL portables, because they decided to cancel it this year again, some decent scores were made. I hope this does not have any significant effect on NFD itself. Personally, it is one of my favourite events in the year's operating calendar.



Heading for Gold!

Roger Cooke G3LDI reports on CWops success, another interesting key and has a couple of NFD stories.

I guess we have seen the better years however, harking back to the 1960s again.

Ian G3WVG was busy under the call MW5A/P and sent in a report, which would have been a great score under normal circumstances. Quite how he manages to operate alone for all that time beats me. His report makes interesting reading however: "A week before Field Day the weather forecast looked great, so I thought what could be better than a camping weekend in sunny South Wales playing radio. I was going to be operating on my own so I thought I'd make use of the RBN cluster to keep me company. That meant I would register in the Open section."

"Come the weekend the whole of the UK was sweltering in great weather, except where I was in South West Wales, it was rainy and cold all through the Saturday afternoon while setting up and didn't stop until after midnight!

"I'd got permission from a farmer I knew to set up in one of his fields. I'd loaded my trusty Russian push-up mast into my car however.....My absolute thanks must go to the local ham, **Ken GWORCH** (of the GW4CC Gower contest club) who I had contacted in advance. He most kindly suggested that he could loan me, deliver and erect his mobile

tower. On the Saturday morning I met up with him and his colleague **Paul GW4KTT** and they brilliantly helped with the antenna set-up. Nothing special, just simple dipoles. Neither of them have any great interest in CW so they left before the contest started but they most fortunately came back at the end to assist with the de-rig.

"So how was the contest? Well, it was tough on my own, it was the first time I'd done it solo and hadn't really realised that easily more than half the fun had been the competitive social aspect (I believe it's called 'banter'!).

"The lack of DL participation made what is normally a bit of a slow grind through the night into an even slower affair. That's why I fell asleep for a 'brief' nap and woke up a good four hours later. It's impossible to recover from that in competitive QSO terms so it was then just a question of continuing to play radio until the end.

"There was another contest running at the same time. Most entrants in that TC contest seemed opposed to having QSOs with FD stations so that didn't help.

"There were some short bursts of sporadic E for me, but it seemed to be highly geographically focused. And, oh yes, did I mention the QRN? Not unusually for FD in

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Fig. 1: Tony G00OR.

Fig. 2: The Hitchcox triple lever automorse key.

Figs. 3 through 5: Andy 2E0NDZ's key after cleaning up.

the summer there was loads of that too. No thunderstorms though. So, this year I was spared the sometime dashes to the Faraday cage of my car.

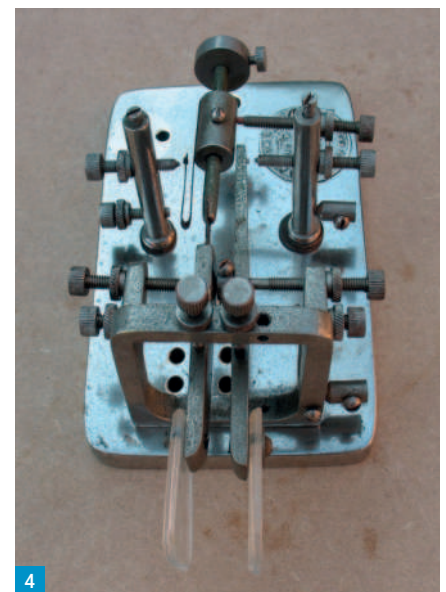
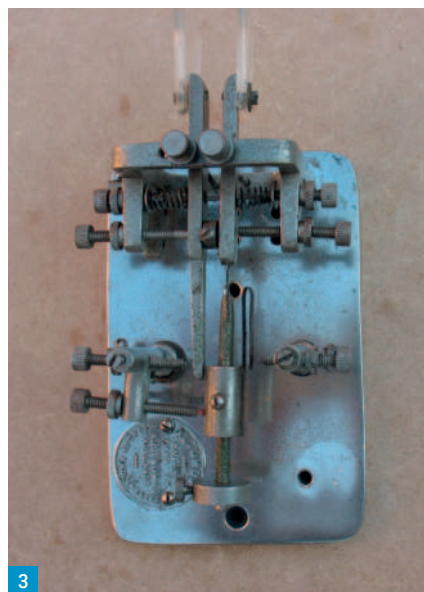
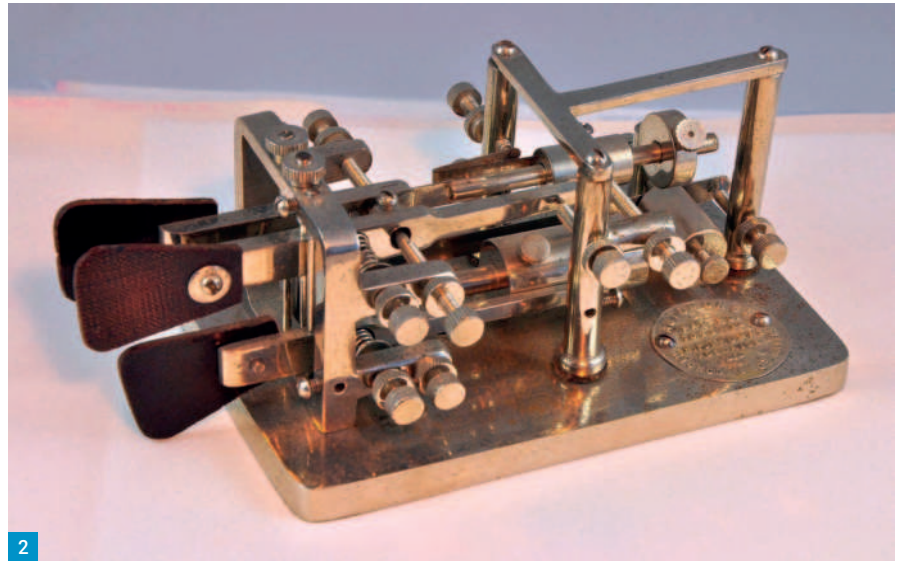
"Great that quite a few UK fixed stations called in to give points. Let's hope that next year we can get more intense (in tents) activity. Ended up with just about 700 QSOs and 150 mults.

"Verdict, it's tough on your own but can, should and must do better! 73 Ian G3WVG aka MW5A/P".

Peter G3LET also took part and put in a report: "Well, I didn't sign up for that! So many mults engaged exclusively in the TC contest and refusing to work any /P stations! That said, propagation was better than two years ago, if you could find anyone who would work you.

"Poor preparation meant that for most of the daylight hours the logger screen was all but invisible and entirely invisible during the long periods of full sun. Unlike in previous years, the local substation noise source in Twineham did not let up at any time, which meant that 160m QSOs were limited to those with S9+ signals. That said, my vertical antenna seemed to work well on that band and I was even able to edge in front of some 100W callers, giving me confidence to CQ in the face of an S9 noise wall when there was nothing left to call. Apologies to those who called without result but I really had no other option! Less than half the usual number of QSOs on 160 though.

"Along with the Elecraft K3 and P3, I was using a 20m vertical (supported with guys at 7.5 and 15m) with 50 radials varying from 5m to 20m in length, in the expectation that the centre of operation would be Russia and eastern EU and this turned out to be the case. However, its performance on 15 and 10 proved distinctly wanting – very frustrating. The strangest and ultimately most rewarding QSO came about on 15, when I was CQing in the hope of scaring up one of the few non-TC stations around. After several CQs I thought I could detect a very weak intermittent rough noise on my frequency, so I moved a few hundred Hertz on several occasions in order to avoid it. It seemed to follow me for several minutes. Eventually, it dawned on me that it might actually be somebody calling, in very slow hand-sent Morse and using some primitive rig. Once tuned in to this possibility I was able to catch the odd character on peaks. After sev-



eral more minutes OK1DZD was revealed, a mult! More minutes went by until I could decipher his serial – he must have been pretty desperate to get any QSO but I was also very happy with the result! Best DX was VR2 (Hong Kong) – he had some ears!

"Not being able to see the on-screen log (or P3 display) for long periods, it looks as though there are a large number of errors with missing received serials, where I had entered the next call without logging the previous QSO. To minimise losses I shall have to go through and mark these up as X-QSOs. Looks like I shall lose several mults as well, so no claimed score yet. Raw QSO total ended up at 472, well down on any previous outing in this event, so we shall have to wait and see . . ."

I still look at NFD with ancient eyes and memories, no keyers, no Clusters, 10W only, no computers, certainly no panafalls

or SO2R operations, plus of course there were no other contests on at the same time. So, with a nostalgic view, I think we had the best of times with NFD back then. I guess life changes, but change does not necessarily mean for the better. But, I suppose I should not look for a permanent solution to a temporary situation.

73 and May the Morse be with you!
Roger G3LDI.

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

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From Wikipedia

A **diode** is a two-terminal electronic component that conducts current primarily in one direction (asymmetric conductance); it has low (ideally zero) resistance in one direction, and high (ideally infinite) resistance in the other. A diode vacuum tube or **thermionic diode** is a vacuum tube with two electrodes, a heated cathode and a plate, in which electrons can flow in only one direction, from cathode to plate. A **semiconductor diode**, the most commonly used type today, is a crystalline piece of semiconductor material with a p-n junction connected to two electrical terminals. Semiconductor diodes were the first semiconductor electronic devices. The discovery of asymmetric electrical conduction across the contact between a crystalline mineral and a metal was made by German physicist **Ferdinand Braun** in 1874. Today, most diodes are made of silicon, but other semiconducting materials such as gallium arsenide and germanium are also used.

History

The first use of a diode was a 'crystal' semiconductor used in the early days of radio as a rectifier (detector). A crystal (crystalline material) was fixed in place and a flexible wire (cat's whisker) made light contact with the crystal, **Fig. 1**. The cat's whisker was carefully positioned for the received signal to be heard in a pair of high impedance headphones.

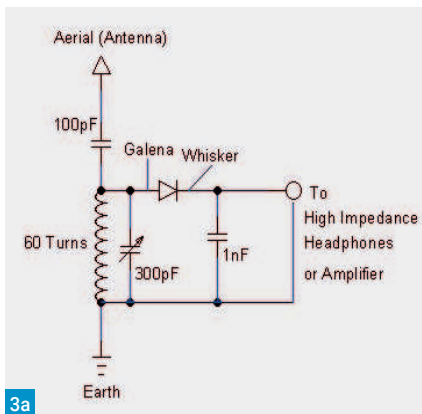
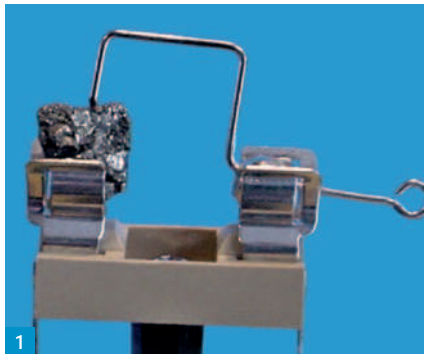
This was a delicate operation and many experiments were carried out by enthusiasts using various materials to use as the 'crystal', and Galena (Lead Sulphide) was commonly used. A razor blade with some corrosion (rust) and a light spring wire positioned in various spots to get the optimum sensitivity were also experimented with. Almost any combination of conducting material with 'poor' contacts would act as a detector.

It was common in the days of (vinyl) record players employing a crystal pickup (with poor connections to the 'pickup' leads) to receive off-air transmissions such as from taxis and even amateur radio operators, because the pickup was acting as a detector.

There are many different types of diodes made for various functions but they all share the same fundamental purpose of one-way conduction, **Fig. 2**.

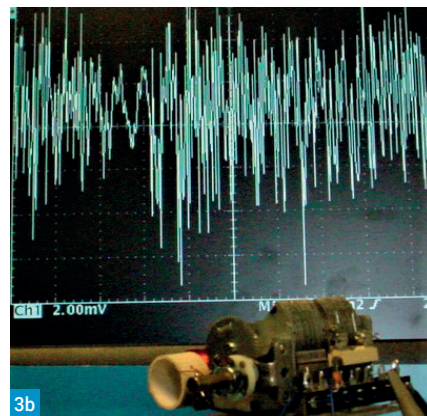
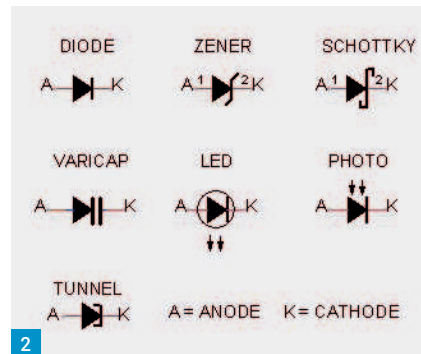
Semiconductors

Eric Edwards GW8LJJ turns to semiconductors and, in this first instalment, diodes.



Let's make a Cat's Whisker 'Crystal' Set

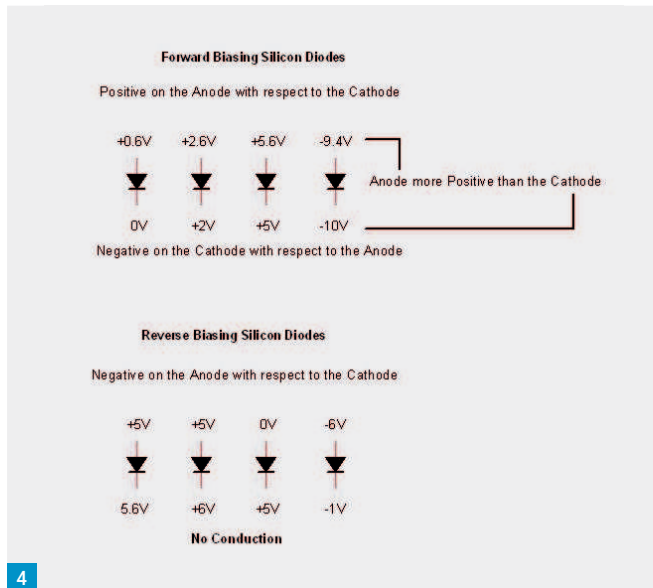
The circuit in **Fig. 3a** is as simple as it gets. For this example, I wound a coil on a 2in (50mm) long, 1in (25mm) diameter piece of white plastic conduit using 60 turns of 26SWG (not critical) enamelled copper wire (magnet wire) and soldered the ends across a 300pF dual-gang variable capacitor of which only one section of a gang was used. A 'fuse holder' contact housing the galena (Iron Pyrite, as supplied by **Trevor MOWDO**, see ref, is actually used and is an iron Sulphide normally called Fool's Gold) is soldered to the fixed (isolated) plates of the variable capacitor. The moving plates are connected to ground (earth connection). A 1nF (1000pF) capacitor is connected to the detector cathode (cat's whisker), which is the output of the receiver, and the other end is soldered to the earth connection to decouple the RF signal so that only audio is recovered from the diode. The antenna is connected via a 100pF to add to the selectivity of the receiver. A 100pF trimmer



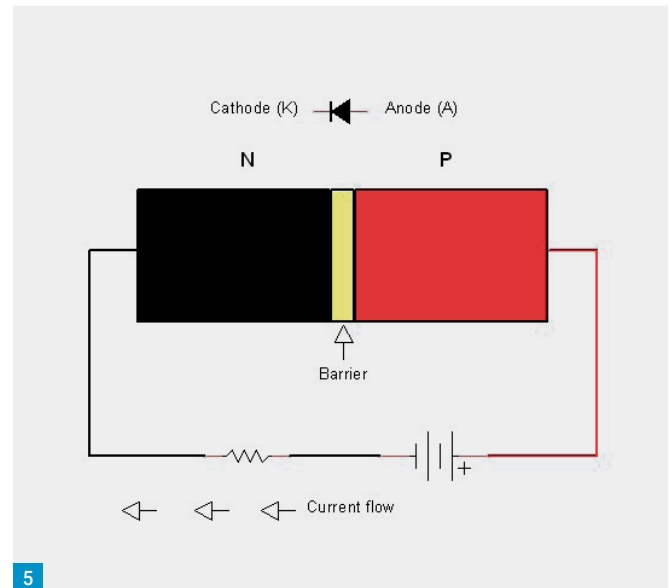
(variable capacitor) would be better for improved selectivity in place of the fixed capacitor. A pair of high impedance headphones must be used so as not to heavily load the output, which would be the case if a standard pair is used. The output can, of course, be connected to an audio amplifier. The performance of this is comparative to using an OA81 or similar Germanium diode. **Fig. 3b** shows the set receiving off-air displaying the audio on an oscilloscope.

Germanium

The first of this type was a point contact diode (similar to the cat's whisker) used in the Second World War for radar and other high frequency applications replacing thermionic (valve) diodes. Germanium is a common substance in raw form and can even be obtained from chimney soot! It has to be purified and this creates a crystalline construction like salt and sugar. Some common Germanium diodes are OA47, OA81, OA71, 1N34 and others that are not easily obtainable like a lot of electronic



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Fig. 1: Using a 'cat's whisker'.

Fig. 2: A selection of diode types.

Fig. 3a: Circuit of a basic crystal set.

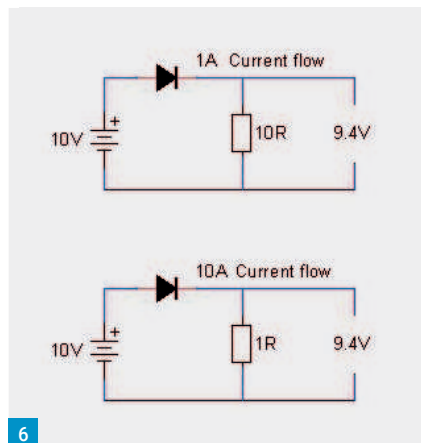
Fig. 3b: Off-air received signal displayed on oscilloscope. Fig. 4: Diodes under forward and reverse bias. Fig. 5: Diode construction, showing the barrier. Fig. 6: Regardless of the current flowing, the voltage drop will be the drop across the junction. Fig. 7: Current flow through a 'signal' diode and a 'rectifier' diode.

parts these days. These diodes were also used as video detectors and DC restorers in the days of CRT (Cathode Ray Tube) televisions. They also found their uses as FM detectors and in AGC circuits, speech clipping and noise limiters. They have lower losses than the Silicon types but they cannot handle the same power as silicon so they were primarily used for low current signal and fast switching circuits.

Silicon

Silicon can be obtained from sand on the beach but, as with germanium, it has to be purified. The atoms that make up the materials are rigidly locked together in a lattice, such that the electrons in the atom cannot be moved. The diode can be considered a good insulator. Well, an ideal diode is but, as with all things in life, nothing is perfect. After purification precise amounts of impurities are added and this is referred to as being 'DOPED'. The impurities fit into the lattice and have their own electrons, which are free to move around and produce an electric current flow. There is now a surplus of electrons so the material is called an 'N' type as it is negatively charged.

There are other types of impurities

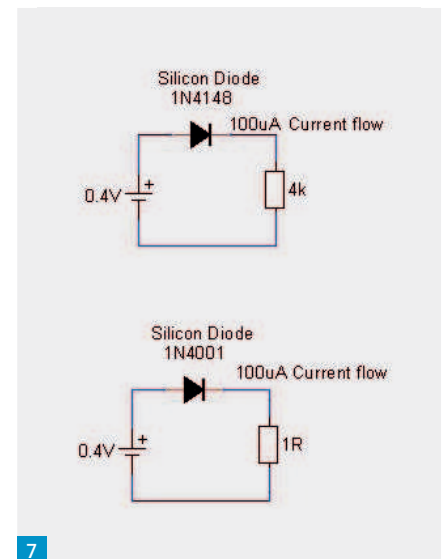


6

that can be added to pure silicon and germanium and these produce a shortage of electrons in the lattice. In this case there are 'HOLES' in the lattice. Electrons can jump into these holes, producing what can be thought of as a flow of holes. It's like sitting in a row of chairs and when someone gets up from the end, others move along, each leaving an empty chair (a hole) behind. People (electrons) move along nearer to the end of the row and a hole appears to travel in the opposite direction. Because there is a shortage of negative electrons there is a positive charge and the material is called 'P'-type semiconductor.

Conduction

Diodes conduct in one direction only. When there is a positive voltage on the anode with respect to its cathode, it will fully conduct when a barrier voltage has been reached, referred to as being forward biased. This is considered as 0.2V (average between 0.2 and 0.3V) for a germanium diode and



7

0.6V (average between 0.6 and 0.7V) for a silicon diode. However, if a positive voltage is applied to the cathode with respect to the anode, no current flows, referred to as being reversed biased. The diodes in Fig. 4 show the biasing. The top row is all forward biased, which means the voltage on the anode is more positive than the voltage at the cathode. It also indicates that the diodes are silicon and they show the 0.6V drop across the diode. You will notice that the top far right diode has a negative voltage (-9.4V) on its anode; however, it has -10V on the cathode so the diode is conducting because the anode is more positive than the cathode by 0.6V. The bottom row of diodes is reversed biased as the anode is more negative than the cathode, so no conduction can take place. The voltages on the cathodes are there as a reference to show reverse bias and are

not the result of any conduction. The 'arrow' on all semiconductors shows the direction of 'conventional' current flow, which was thought to be from positive to negative. We now know it flows from negative to positive because electrons are attracted to the protons, which are positive. The cathode of a diode is labelled as 'K', which is believed to be because 'C' is used for the collector in transistors, hence 'K' to avoid confusion.

The Junction Barrier

The diodes have a barrier, shown in **Fig. 5**, which is an insulator in the form of a space so that no electrons can pass from the anode to the cathode. This space can be narrowed when voltage is applied across the diode in the correct polarity (forward biased) so the barrier depletes (gets smaller or narrower). If it is a germanium diode, it will close at approximately 0.2V so allowing electrons to pass from one side to the other (cathode to anode) and if it is a silicon type, it will need 0.6V (0.7V). This depleting of the barrier will allow the maximum amount of current to flow through the diode depending on its rating, but the voltage across the diode will only drop by the 'barrier' voltage, **Fig. 6**. In the diagram the top diode has a 10Ω resistor as its load to allow current to flow through the diode. By Ohm's law it is drawing a current of 1A.

The voltage drop across the diode is 0.6V as it is a silicon diode. Providing the diode is capable of allowing a higher current to flow, with a 1Ω resistor connected as its load, the current passing through the diode and resistor is 10A. The voltage drop is, as with the lower current drawn, 0.6V (the silicon barrier voltage).

Contrary to the Rules

The accepted barrier voltages for germanium diodes and transistors are somewhere between 0.2V and 0.3V. Silicon diodes and transistors have a wider range and can be between 0.5V and 0.8V. For normal silicon diode calculations where it is used as a rectifier in a power supply, the level is taken as 0.7V. There are variations to the rules as explained and the barrier refers to full conduction through the diode. Where the load is very light, current will flow when a much lower voltage is applied and this is mainly because of leakage through the barrier. **Fig. 7** is showing two silicon diodes with an applied voltage below the silicon barrier value. The top drawing has a signal diode, 1N4148 with a 4kΩ resistor as its load. The current flowing through the diode and resistor is 100μA, which as

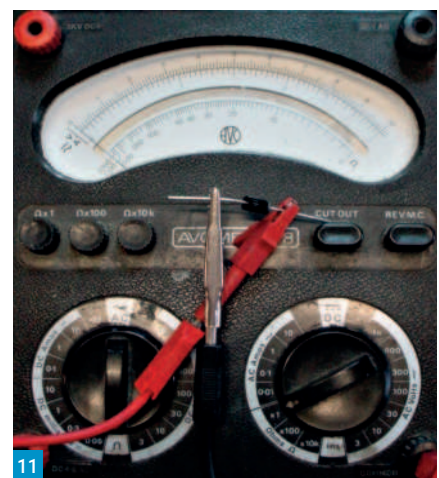
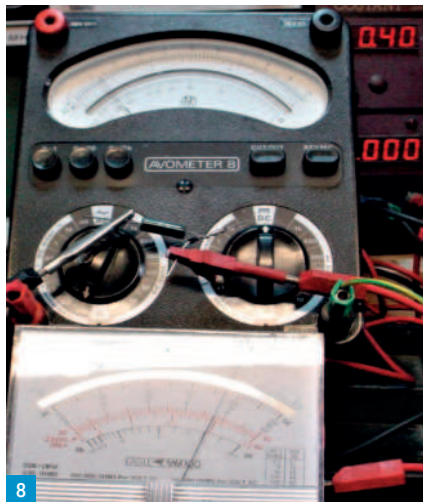


Fig. 8: Measuring current through the 'rectifier' diode. **Fig. 9:** A silicon diode under test with a digital meter. **Fig. 10:** Current flow under forward bias. **Fig. 11:** Current flowing under reverse bias.

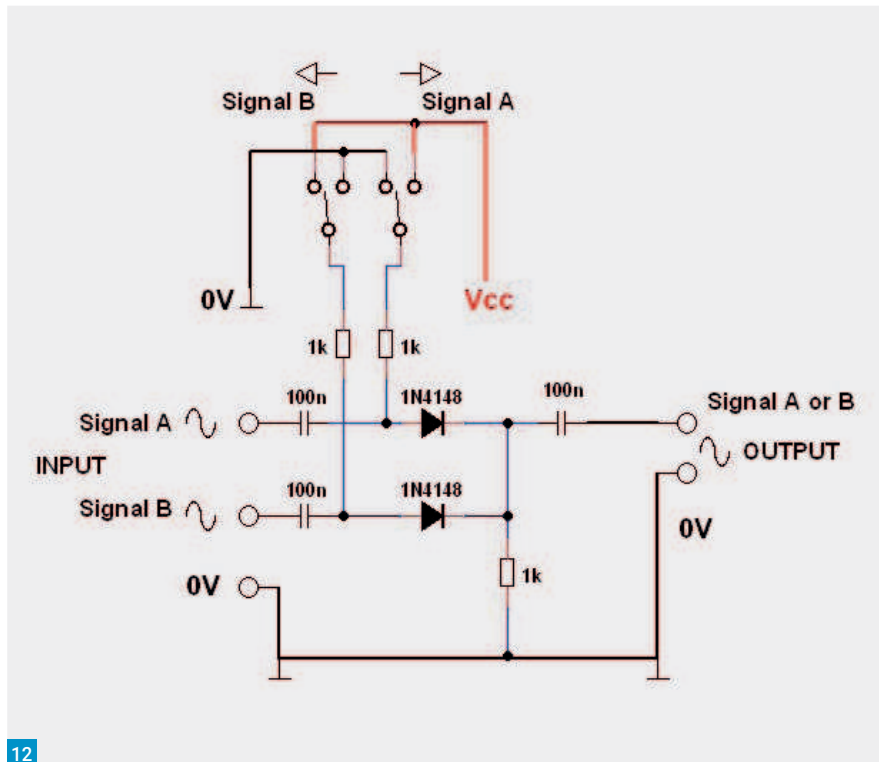
calculated with Ohm's law is $0.4/4000 = 0.0001A = 0.1mA = 100\mu A$. The bottom diagram with the 'rectifier' diode, 1N4001, has 1Ω as its load. Ohm's law will calculate the current flowing as $0.4/1 = 0.4A = 400mA$; however, the current is showing just over 100μA because, although the load is lower, it cannot draw the full current as the barrier voltage (0.7) has not been reached. It can be seen that if the load is light (high resistance), current will flow through the diode completing the circuit although the barrier voltage has not been reached.

The photo, **Fig. 8**, shows the signal silicon 'rectifier' diode, 1N4001, and 1Ω as the load resistor. The large meter in front of the AVO has a more sensitive movement (100kΩ/V) as opposed to 20kΩ/V of the AVO, so a better indication of current flow can be seen. Germanium and silicon have this property of conducting at a lower voltage providing the load is light enough.

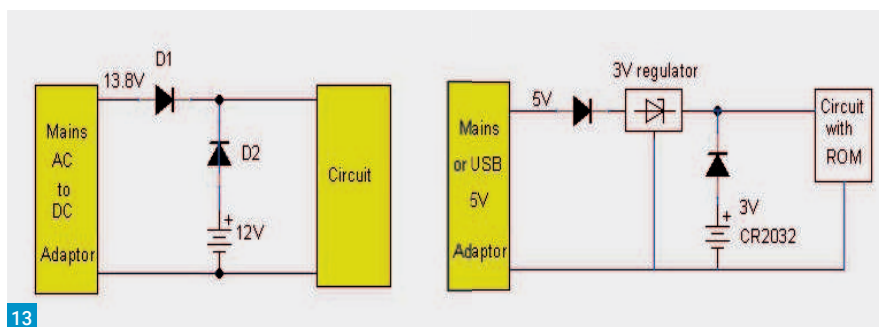
This is one reason why crystal receivers work with a germanium diode and will also work with a silicon diode albeit at lower signal output. The input signal to the antenna coil is very low and well below the barrier voltage but because a high impedance headphone is used as the load, it will detect the weak off-air signals. Also, the signal received at the anode of the crystal set diode can be very high if the load is light as it will be high impedance. If the load at the cathode of the diode is low (low impedance headphones), the signal will be reduced because it will be shunted by the low resistance load.

Testing a Diode

A digital multimeter can be used to test a diode and the photo, **Fig. 9**, shows a silicon diode being tested. The diode has its anode connected to the positive terminal and the cathode is connected to the negative terminal of the meter. The meter is set to



12



13

the 'diode' position, which places a test voltage of approximately 2.5V across the diode under test. The result is seen on the meter scale, which is reading 0.52V so it is indicating a silicon type. Measuring with an analogue meter will be different as most do not have a diode position.

They can be measured as a go-no-go device by setting the meter to Ohms ($\Omega \times 1$). The analogue meter will have a positive voltage on the negative terminal so the cathode of the diode is connected to the RED terminal and the anode connected to the BLACK terminal to apply forward bias to the diode.

This will indicate a low resistance reading when the diode is functional, **Fig. 10**, and when the leads to the diode are reversed there will be no, or very high resistance readings on the meter scale, **Fig. 11**. The meter connecting leads are connected to the opposite polarity terminals; the red lead to the negative

terminal and the black lead to the red terminal in the photo.

Diodes in Use

There are two main uses for the general-purpose diode. The smaller ones (1N4148 etc) are for small signal detecting and fast frequency switching, and the larger ones (1N4001 series) are used for power supply rectifications. There are other uses as we will see later but these are the most popular ones.

Switching Diodes

Signal diodes can make good switching between several circuits. The one shown in **Fig. 12** is using two 1N4148 general purpose small signal switching diodes to select signal 'A' or signal 'B'. Both signals, A and B, are AC (capacitor) coupled to the anode of a diode to isolate the DC from the circuit. The cathodes of both diodes are connected together, with a resistor to

Fig. 12: Using diodes to switch circuits.

Fig. 13: Using a diode to steer a backup supply.

ground (0V) as part of the biasing for the diodes and AC coupling is used to isolate the DC voltage appearing at the output. The circuit shows a Double Pole, Double Throw (DPDT) switch in the signal B position. This places a positive voltage on the anode of the Signal B diode (via a current limiting and isolation resistor), which makes it forward biased.

The Signal A diode has its anode connected to ground via a resistor, so is turned off (reverse biased). When the switch is thrown the other way, signal A diode is forward biased and signal B diode is reverse biased, so signal A flows through the diode to the output terminal. Both signals are completely isolated from each other and only the selected signal passes through.

Steering Diodes

Another use for diodes for switching is for directing (steering) a backup voltage when the main supply is removed or has failed. The top circuit in **Fig. 13** shows a mains adaptor as the main power supply source and the backup power supply is the 12V battery and the diode. When the main power supply is used there will be 13.2V at the cathode of D1 (using 0.6 as the Volts drop). The voltage cannot enter the battery because the diode (D2) is reversed biased; the cathode is more positive than the anode. When the main power supply is removed the battery voltage is now allowed to pass through D2 and supplies 12 (less 0.6) volts to the circuit as the anode is forward biased.

The bottom circuit is displaying 5V obtained from a USB or mains adaptor and supplies a 3V regulator that maintains the voltage for a 'ROM' (memory needing a back-up voltage). If this supply is removed, the 3V battery voltage takes over to maintain the memory of the circuit.

Next time we will look at different types of diodes and their uses.

References

- *Basic Theory and Applications of Tunnel Diodes* by **Sylvester P. Gentile** BSEE.
- *Radio Communications Handbook* 14th edition. RSGB.
- *ARRL Handbook* 1995.
- Galena and Cat's Whisker mounted on a holder: Sold on eBay by tgs1950 with the item number (at the time of ordering) 303872716343.

Tim Kirby GW4VXE

longworthtim@gmail.com

Regular readers of *PW* will be familiar with the 'RadioGeeks' brand of antennas and perhaps will remember the reviews of the innovative, inflatable antennas that they produce.

The antenna I'm looking at this time is not inflatable, but rigid, designed for base use. It's the RadioGeeks 'White Knight' antenna, described on their website as an 'All-in-one base antenna'. In reality, although it may receive over a wide range of frequencies, it's designed to transmit on the 2m and 70cm amateur bands. It's a half wave on 2m and two times 5/8th wave on 70cm.

RadioGeeks' publicity describes the antenna as

- New design 'All In One' Antenna, will Tx & Rx on 2m/70cm Ham Bands,
- Power 150 watts
- VSWR <1.3:1
- No ATU required
- 3dB gain on VHF, 5dB on UHF
- 3ft length
- Military grade solid stainless steel thick whip
- IP Rated, fully waterproof, multi band tuned coiled base unit with SO239 at base
- Supplied with wall fixing bracket
- Will superbly receive all Military & AirBand frequencies and will also cover Marine, TETRA, PMR & FM broadcast frequencies

Unpacking the antenna from the tube (slightly tricky because the plastic end pieces had been stapled into the cardboard), the first impression is of a nice piece of stainless-steel for the antenna whip, with a coil half-way down the whip. The base is slightly larger than an old 35mm film container, feels well made and appears waterproof, **Fig. 2**. The antenna is rated as IP67/IP68 and is also anti-corrosion proof. An SO-239 connector protrudes from the underside of the base, which can be secured into the supplied wall fixing bracket. Some people might like the option to have the antenna supplied with an N-socket, perhaps.

Testing

My first test of the antenna was to detach the wall fixing bracket, pop the base into the centre of a picnic table and try it as a 'portable' antenna, **Fig. 1**. Although 2m and 70cm conditions were noticeably above normal when I tried it, it was clear that the performance of the antenna was



The 'White Knight' 144/432MHz dual-band antenna

Tim Kirby GW4VXE looks at a low-profile antenna suitable for 2m, 70cm and a range of other frequencies.

very respectable on both 2m and 70cm, with signals 4 or 5 S-points better on both bands, compared to a rubber duck on the handheld at the same height. I was able to access the EI7MLR 70cm repeater at Mount Leinster using the 'White Knight' whereas I could not using the rubber duck, over a distance of around 85 miles. The GB7PD 2m repeater at Maenclochog, over a hilly path from me, was around S5 whereas it was inaudible on the rubber duck.

In the same configuration, I tried the 'White Knight' on the marine band, with my Standard Horizon HX370E marine handheld and it produced decidedly more traffic than when using the rubber duck supplied with the HX370E. Similarly, on the air band, using a Yaesu FT-2DE for receive, good results were achieved using the 'White Knight'. Curious about the resonance of the antenna, I popped it on the NanoVNA to

Continued on page 63

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Regular readers will know that I'm always tinkering with the Raspberry Pi and on the lookout for interesting new products. I know many amateurs make use of a Raspberry Pi as a data modes terminal because it works so well. The Raspberry Pi 4 or 400 has plenty of power and makes for a very compact data modes terminal. The other benefit of using the Pi is that you don't have to load yet more software on your already struggling PC. The Pi is also very flexible as you can completely change its operating system or load a completely new setup by replacing the MicroSD card.

While using an SD card is a great option for price and flexibility, when using the Pi as a data modes terminal, you should consider changing to a solid-state hard drive (SSD). There are a couple of benefits. The first is faster software loading, which means the Pi boots faster and programs open quickly. The other benefit is greater resilience. While I haven't encountered problems with microSD cards, they do have a shorter life, in terms of write cycles, than an SSD. Native external hard drive support is built into the current Pi models, and the Pi-4's full-speed USB 3 ports mean that the Pi can make good use of the greater transfer rate available from an SSD. SSD prices have also plummeted over the past year and there's plenty of choice below £30 from online sellers. I've been using a HikVision 128GB SSD for a while and it works well with the Pi, **Fig. 1**. A 120GB model has plenty of storage and is currently priced at £23. I've tested the data transfer speed on a PC with CrystalDiskMark software and it returns a healthy 443GB/s and the Pi delivers similar speeds.

There is, however, a new product around that makes SSD integration even better. One

Raspberry Pi Data Modes Improved Storage

Mike Richards G4WNC has more about the Raspberry Pi, checking SSD speeds and a neat Spectrum Analyser.

of my favourite enclosures for the Pi is the Argon ONE, **Fig. 2**, that's available from several of the Pi authorised dealers. The cast alloy case converts the Pi into a complete Mini-PC and routes all the connections to the rear panel. This is complemented with a proper power button (at last!) and an integrated cooling system that conducts heat from the hottest chips on the Pi to the main case. To complete the cooling, the case has an integrated variable speed fan. Argon have recently launched a second version of the case called the Argon ONE V2 that is very similar to the original, but now has full size HDMI ports and a built-in IR receiver for those that like to use remote control handsets.

What really caught my attention was the new Argon ONE M.2 add-on. This is an alternative base unit that fits the original Argon One as well as the V2. As you can guess from the name, the Argon ONE M.2 adds space and connections for an M.2 format SSD storage device, **Fig. 3**. While most SSDs have been supplied in a standard 2.5in package, the actual electronics are very much smaller. The M.2 format is a more appropriate standard for PC storage devices and is closer to the size of a memory stick, as you can see in **Fig. 4**. Prices for M.2 format SSDs have also been dropping rapidly and I recently pur-

chased a Kingston A-400 120GB M.2 drive for just £23 from a major online seller. This is an ideal size for use with a Pi data modes terminal because you get the speedier performance of an SSD plus 120GB is more than enough storage for amateur radio applications. The data and power connection between the Argon M.2 base unit and the main case is handled via a moulded USB 3-to-USB 3 connector.

Moving your existing Operating system and programs from your microSD card to the new SSD is simply a case of using the Pi SD card copier that you'll find via the Accessories menu. Your microSD card will show up as (/dev/mmcblk0) and your new SSD will probably be listed as (/dev/sda). You can leave the copier settings at their default values and start the copy. When it finishes you can remove the microSD card and the Pi will boot from the SSD. **NB:** make sure you connect your SSD to one of the blue USB 3 ports on the Pi.

Checking SSD Drive Speeds

While on the subject of hard drive storage, I ought to mention speed testing. I've got a few external SSDs that I often use to move data from my main PC to my laptop. I noticed that the transfer rate, when copying files,

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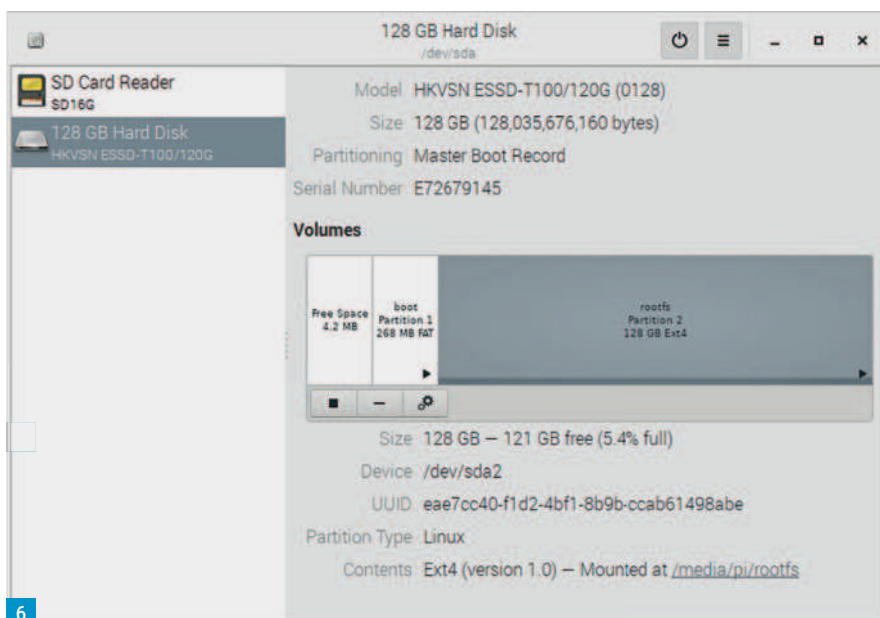
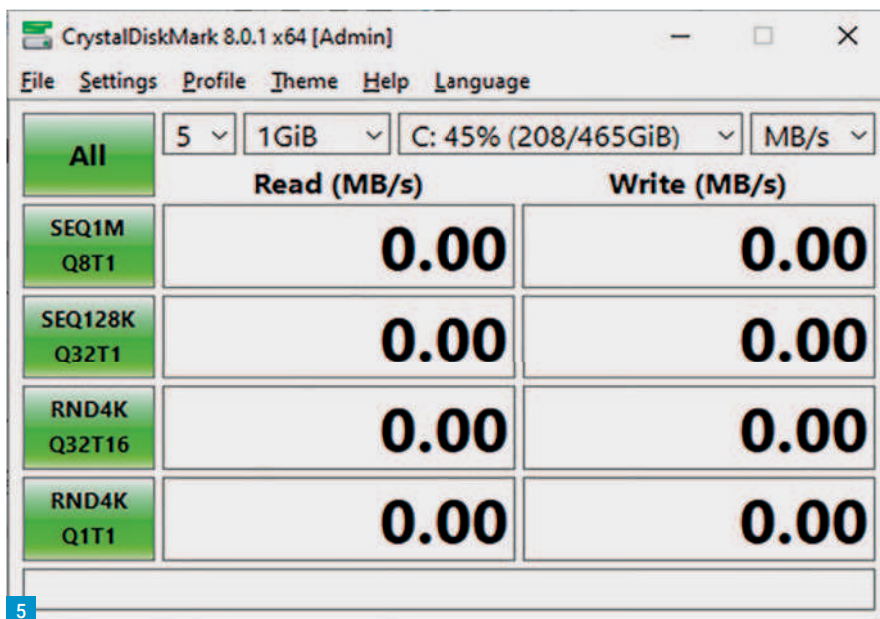
Fig. 1: The HIKVISION 120GB external SSD.
 Fig. 2: Argon One V2 Raspberry Pi case.
 Fig. 3: Argon M.2 SSD base unit.
 Fig. 4: M.2 SSD and memory stick.
 Fig. 5: CrystalDiskMark speed test software.
 Fig. 6: Pi Disks software disk benchmarking tool.
 Fig. 7: SATSAGEN spectrum analyser main screen.

seemed to be much lower than it should be. Having looked around for speed test software, it seems that CrystalDiskMark is one of the most popular. This is free software that's available from:

<https://tinyurl.com/mdwpad7a>

Once installed, it's very easy to run and the default settings are fine for most applications. You use the drop-down menu to select the desired drive and you can start a test by running the first check on the list (marked SQ1M Q8T1), Fig. 5. This provides a quick result and will tell you if you are achieving the expected rates. One point to note is that the results are shown in MB/s, that's mega-bytes per second, so the bit rate is eight times that result. For a standard internal SSD or an external SSD using a fast USB 3 port you should see around 400-500MB/s. This test quickly revealed that my problem SSD drive was returning a lowly 43MB/s. The problem turned out to be the USB cable. Although it was a new USB-C to USB-A cable it was wired to the USB 2 standard, hence the poor transfer rate. When I changed to a USB 3.1 standard cable, my speed was restored. If you want to run a disk speed test on the Raspberry Pi it's the Disks utility you need. This can be installed as follows:

- Open a terminal session (Ctl+Alt+T)



- Enter: `sudo apt install -y gnome-disk-utilities`
- When complete, you will find Disks has been added to the Accessories menu. Here are the steps to run a speed test:
- Open the program and you will see a panel that lists your connected disk drives, Fig. 6.
- Click on the drive you want to test, then select a partition.
- Just below the partition map in the right-hand panel you will see the gears icon. Click on that and choose the last item, Benchmark Partition.
- Start the benchmark and accept the default settings and provide your password.
- You will then see a performance graph being created that shows the achieved transfer speed and the average access time. An SSD connected via the USB 3 (blue) ports

should show a transfer speed of better than 300MB/s and a seek time of 0.25ms or less.

VHF-Microwave Spectrum Analyser

In one of my recent columns, I suggested that we, as radio amateurs, ought to be using our skills to develop radio networks that could help in times of crisis. The crisis could be anything from the increasing occurrence of flooding, through to a major internet service disruption. Whenever, a crisis situation occurs, the mobile network and the internet are put under considerable stress. Temporary data links would be a valuable resource to have available and make excellent learning projects. Developing these resources often requires access to test equipment that can



operate into the gigahertz bands, and these tend to be expensive. However, there are systems available that can fulfil the measurement needs at very reasonable prices. The one I'm going to suggest is a 70MHz to 6GHz spectrum analyser and tracking generator. This simple analyser makes use of the excellent Analog Devices ADALM-PLUTO SDR active learning module. This is available for under £200 and provides transceive capabilities from 325MHz to 3.8GHz using an AD9363 RF agile transceiver chip. While the AD9363 model is specified from 325MHz-3.8GHz, the device is performance selected from the same production line as the higher specified AD9361 and 64 devices. As it's essentially the same chip, the AD9363 can be coaxed to work to the extended frequency range, but the performance is not guaranteed. To convert the basic Pluto into a full featured spectrum analyser you, need to run control software on the PC and the best I've found is SATSAGEN, which is available from:

<https://tinyurl.com/2mm4fca2>

This is an excellent project that works with Windows 7 or later to provide the control and display facilities that convert the Pluto SDR into a 70MHz to 6GHz spectrum analyser with tracking generator. The program has been made available free of charge for non-commercial use, which is very generous of the author. With the addition of a directional coupler, the SATSAGEN can also be pressed into service as a VNA (Vector Network Analyser). Extending the frequency coverage of the Pluto to cover the full 70MHz to 6GHz can be done via the Pluto command line, but that is now done automatically the first time you run the SATSAGEN software. This is a great help for those with no command line experience. I've shown the main screen of SATSAGEN in Fig. 7. Here you can see the

main display area and the three instrument panels are shown on the right. These provide four basic instruments all with a range of 70MHz to 6GHz:

- Spectrum analyser with variable receive bandwidth, span and gain.
- Spectrum analyser with tracking generator and variable resolution, gain, offset and calibration facility.
- Sweep generator with variable Tx power.
- Signal generator with adjustable power and modulation systems.

As you would expect in this price range, there are a few compromises. The first is the input and output impedance, which are not constant across the range. The simple solution to this is to fit a 10dB masking attenuator to the input and output SMA sockets. The other issue is the Pluto's uneven frequency response over the 70MHz to 6GHz bandwidth. This is no surprise, especially as we're operating the AD9363 beyond its advertised specification. However, the SATSAGEN software has this covered with a built-in calibration function. This can be used to correct both the frequency response of the Pluto, the 10dB input and output attenuators and the test leads. This means that the plotted result shows closer to the real performance of the device you're testing. One shortfall, that cannot be calibrated out, is the crosstalk between the transmit and receive channels of the Pluto. This becomes more of a problem at the top end of the frequency range and is primarily due to the lack of screening from the Pluto's plastic case. This can be improved by mounting the Pluto in a metal case and the internet will reveal plenty of examples of modifications to re-box and generally improve the performance of the Pluto.

That's all I have space for this time, but I'll give some more operating tips another time.

Continued from page 60



Fig. 1: Under test. Fig. 2: The base.

sweep it. The VSWR on 2m is very good, a little bit higher on 70cm, but still usable. Civil and military airbands look just fine (there is a peak of high SWR around 320-350MHz) but it will be entirely adequate for reception on these bands and indeed, **Tom Morris** tells me that the antenna is already widely used by airband listeners around 220-240MHz.

The antenna comes with a simple mounting bracket made of stainless steel, so that you could easily mount it to a wall. You'll need to supply your own screws/plugs as needed. Because the whip is relatively flexible, try and mount it so that if the whip antenna moves around in the wind, it won't touch anything as it does – which wouldn't help your SWR and an annoying tapping from outside on the wall might not be welcome either.

The White Knight won't work as well on 2m/70cm as one of the larger white stick verticals. However, it is decidedly lower profile, which in some instances could be very useful. Because the stainless-steel whip is quite thin, it will not be very visible if mounted at roof level, so could prove a useful antenna where a more stealthy installation is needed. The antenna is rated at 150W (I did not test this) so should cope fine with a 50W FM mobile rig or you could try using it for vertically polarised FT8 on both 2m/70cm. It's a simple design, but well executed.

Many thanks to Tom GM3HNN for letting me try out the White Knight antenna, which is available, priced £59, from the RadioGeeks website:

www.radiogeeks.co.uk

Rallies & Events

Due to the ongoing Coronavirus situation, the Rallies calendar remains dynamic at the moment, and there will be more cancellations and postponements. All information published here reflects the situation up to and including 24th August 2021. Readers are advised to check carefully with the organisers of any rally or event, before setting out for a visit. The Radio Enthusiast website will have updates, please check here regularly: www.radioenthusiast.co.uk To get your rally or event onto this list, please, e-mail full details as early as possible to wiessala@hotmail.com

4-12 September INTERNATIONAL AIR AMBULANCE WEEK

<https://tinyurl.com/4zvetj4w>

11 September
CHURCHES AND CHAPELS ON THE AIR 2021: Most activity will take place on the 80 and 40m bands, SSB, between 10 am to 4 pm. If you intend to put a station on at their local church or chapel, please ensure permission has been obtained. Please send details of your CHOTA station to John, G3XYF by e-mail to jhwresdell@gmail.com

12 September
CAISTER LIFEBOAT RALLY: Caister Lifeboat Station, Tan Lane, Caister-on-Sea, Norfolk NR30 5DJ. 9.30 am (8 am for sellers); easy parking; access via car park in Beach Road. Raffle. The museum will be open. (CR | TI | 22)
Tel: 0771 121 4790
<https://tinyurl.com/xt7v2rkw>

12 September
EXETER RADIO AND ELECTRONICS RALLY: America Hall, De la Rue Way, Pinhoe, Exeter EX4 8PW.
Tel: 07714 198 374
<https://www.exeterars.co.uk>
g3zvi@yahoo.co.uk

19 September
CAMBRIDGE REPEATER GROUP RALLY: Foxton Village Hall, Harman Road, Foxton, Cambridge CB22 6RN. Open 9.30 am (7.30 traders) Admission £3. (BB | CR | RSGB)
Tel: 07994 197 2724
rally2021@cambridgerepeaters.net
www.cambridgerepeaters.net

25 and 26 September
RAILWAYS ON THE AIR (BARAC): As an additional activity, we propose to camp on DMR talk group 23560 for the duration so that stations can talk with BARAC and other special event stations to check on activity on the bands. That Talk Group is the one for North East England, which is appropriate given the history of our railways.
<https://rota.barac.org.uk>

26 September
BRITISH VINTAGE WIRELESS SOCIETY (BVWS). RETROTECHUK 2021: RetrotechUK 2021 will take place at the Warwickshire Event Centre. RetrotechUK is the new name and image for the National Vintage Communications Fair, (NVCF) established in 1992. Since then, the event has evolved and outgrown its previous title!
<https://www.retrotechuk.com>

26 September
WESTON SUPER MARE RADIO SOCIETY 6TH RADIO & ELECTRONICS RALLY: The Campus Community Centre, Worle, Weston-super-Mare BS24 7DX. Opens 10 am (visitors [D: 9.30]) and 7 am (traders).
Tel: 07871 034 206.
g4cxq@btinternet.com

9 October
RSGB ONLINE CONVENTION: The event will be streamed live on the Society's YouTube channel. You can find more information at this URL:
www.rsgb.org/convention

16 October
BATC CONVENTION FOR AMATEUR TV 2021 (CAT 21) PART 2: CAT 21 Part 2 will be a day of free online talks about Amateur Television, using a similar format to the very successful CAT 20 (Online Zoom event). More details will be available nearer the event, but we would like to hear from anyone who would like to present to an audience of nearly 500 'ATVers' from around the world.
<https://batc.org.uk/events>
<https://tinyurl.com/4v55p35r>

16 October
ESSEX CW BOOT CAMP: 3rd Witham Scout & Guide HQ, at the rear of Spring Lodge Community Centre, Powers Hall End, Witham, Essex CM8 2HE. Open 8.30 am (registration). 9 am (public). Finishes at 4.30 pm. Admission is £10, with free soup/ drinks/ cakes. (CR | FP)
Tel: 0745 342 6087.
g0ibn1@yahoo.com



17 October
HORNSEA AMATEUR RADIO RALLY: Driffeld Show Ground, Driffeld YO25 3AE. Open 10 am. Admission: £2 (under 14s free). Raffle. (BB | CR | CBS | FP)
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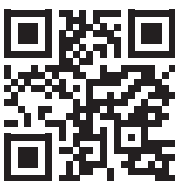
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Time Saver for Digimodes Setup

Dear Don,

Love the magazine. Keep up the good work. I always have some new idea/project etc. after reading each issue.

I don't know if the following has been discussed in the pages of *PW* before but some readers might find the method useful.

Anyway, I like to work digital modes (mainly FT8) so I need to get several computer programs running before I can start. As you are well aware, they also need to be brought up in the correct order. I've tried just leaving everything open and 'sleeping' the computer but things tend to stop communicating with each other after 'waking' when I try this (probably the antiquated equipment I'm using). I recently got pretty fed up with having to do all this manually so I sought out a better way. After a bit of internet searching, I came across this method.

All you need to do is to produce what is known as a batch file in a text editor such as 'Notepad' (I'm no computer expert by any means). In this batch file you can start up any programs you like and leave time for each to start before the next in the list is started. My startup batch file looks like this:

```
@ECHO OFF
START "" "C:\Program Files (x86)\DXShell\
JTSync\JTSync.exe"
START "" "C:\Program Files (x86)\HRD
Software, LLC\Ham Radio Deluxe\
HamRadioDeluxe.exe"
TIMEOUT/T 20
START "" C:\WSJT\wsjtx\bin\wsjtx.exe
TIMEOUT/T 10
START "" "C:\Program Files (x86)\
HamApps\JTAAlert\JTAAlert.exe" /wsjtx
EXIT
```

As you can probably work out, this starts JTSync and HRD together and then waits for 20 seconds (that's what the TIMEOUT/T 20 does). The batch file then starts WSJT, then waits 10 seconds before starting JTAAlert.

To get the path of the program you want to start it's easiest to right-click the program icon, select 'properties' then the 'shortcut' tab (if it's not already selected) then cut and paste the contents of the 'target' field.

Obviously, you can add any programs you

require and vary the timing to see what works for you.

Save the file to your desktop with the extension .bat and then all you need to do is double click and all the required programs start up in order. To alter the batch file you need to right-click the icon and select 'Edit'. When finished editing don't forget to 'Save'.

Implementing this has sped up my startup procedure massively. I can double-click the batch file and let it play out with no further intervention. I also have a simple batch file to close all of the programs:

```
@ECHO OFF
Taskkill /IM wsjtx.exe /F
Taskkill /IM HRDLogbook.exe /F
Taskkill /IM JTSync.exe /F
Taskkill /IM JTAAlert.exe /F
Taskkill /IM JTAAlertV2.Manager.exe /F
Taskkill /IM HamRadioDeluxe.exe /F
Exit
```

Again, I saved this to my desktop (calling it 'close.bat') so I can just double-click when I'm done and all of the programs listed close. Notice that the two parts of JTAAlert both need to be 'killed'.

You might also notice that the startup batch file has quotes around the program path while the close batch file (using 'taskkill') does not. Don't ask me why. Also, the 'taskkill' command does not need the full path of the program (presumably because it's already open). As I said, I'm no computer expert!

Maybe these ideas could reduce other readers' setup time and save them some effort too.

Ian Bell M0VRP
Sittingbourne, Kent

EMF calculation

Dear Don,

Looking at the calculation chart for the EMF new regulations I see most is power output, band, type of coaxial cable, type or antenna etc. But they give a safe distance after you put your details in. Why not just say a simple distance for each band and height above ground to mount your antenna? Everybody knows there is a safe distance then for each band without bothering to do a calculation in the first place. It is all about safe distance

from the antenna. Also, I should like to mention ground-mounted HF vertical antennas. Are they compliant being just a couple of feet off the ground as most are mounted that way and what about rooftop antennas? Are they in some way a concern in the future? Seems things are taken as read, by filling in the right boxes on a calculation chart. All well and good but as time goes on will complication of compliance and new perhaps data comes out make things more difficult to comply?

Mike Kerry GW1SXT
Pontypool

(Editor's comment: Thanks Mike. Well, the safe distance presumably varies according to the data you input. As for ground-mounted verticals, I see no problem provided no one is able to get too close when you are operating. I can envisage a number of possible ways to ensure that this is the case.)

OFCOM EMF Rules

Dear Don,

The threats to the continuation of amateur radio by the current communications Quango, OFCOM, are transparent. And as M1BNH (May 2021) rightly points out, the abolition of paying a licence fee together with not having to keep a log of all contacts, did, in effect, signal the future intentions of where those that administer and licence private citizens who wish to use various parts of the frequency spectrum – in our particular case, the amateur radio allocations – are heading.

However, whether the RSGB has been misled by what might be a hidden agenda of OFCOM, is open to question. I suspect that the RSGB finds itself between a rock and hard place. At least they did get an invite to sit in on the proceedings, whatever they were. And yes, it would have been a good idea if the RSGB had blown the whistle on what was about to hit the fan. After all, they do act as our mouthpiece for all things communications wise. Well, maybe someone fell asleep at the wheel?

Again, as Patrick points out, radio amateurs have been aware of the hazards of radio emissions for many decades. They've been aware of other things too, such as keeping

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OFCOM EMF Exposure Consultation

Dear Don,

I had been only an occasional purchaser and reader of *PW* for many years until my good lady bought me a subscription for a present, and I have to confess that I have been missing a lot! The May 2021 edition has so much practical and useful content and I look forward to more of the same.

Your star letter from **M1BNH** (*Letters*, May) was thoughtful, covered a number of areas, and will strike a chord with many readers. He certainly raised pertinent issues for discussion. I would like to comment on **Patrick's** views about the RSGB and the new licence conditions concerning EMF.

Criticism of the RSGB has been going on in different ways for years and I am not sure this is constructive. I hasten to add that although I am an RSGB member I am by no means an uncritical supporter. Like many membership and professional organisations, it is the best that the membership (and, where the RSGB is concerned, the entire amateur radio community in the UK) has to advocate for us in interfacing with the Government, OFCOM and internationally. In many ways the RSGB do an excellent job; it is the contentious matters that are problematic among those willingly or unwillingly represented by the organisation. This situation is not limited to the RSGB.

To build up a new organisation from scratch that will attract the influence and

respect the RSGB has developed at home and abroad – well, rather you than me! I suggest the best way forward if real change is wanted would be change from within, and that takes becoming a Board Member, Director, or even the President of the RSGB. Not everyone is willing or able to take this on for many reasons, remembering that this level of commitment is voluntary, but if there is appetite for change, then there may be enough people out there to join the Board and have the votes needed to redirect policy if that is what is wanted. It may also be possible to pursue issues as members at the AGM.

M1BNH has highlighted important areas of disquiet. OFCOM appears to be primarily a business. The last but one Chief Executive of OFCOM is described on Wikipedia as a Businesswoman. She was a career civil servant with no apparent experience in OFCOM's areas of operation and stayed only four years before becoming Chairman of the John Lewis Partnership at a tripling of an already substantial salary. Not exactly someone who could have significant interest in us. The current Chief Exec of OFCOM is also a career civil servant with no discernible experience of OFCOM's core areas.

We must protect our bands and I am afraid that means not relying on narrow band small signal digital modes such as FT8. Although I am not opposed to these and really do consider them to be part of amateur radio, they

neither utilise the full allocations we have nor make arguments to retain and increase them. I am not at present convinced by M1BNH's suggested OFCOM hidden agenda, though it is far from impossible. It is the RSGB relationship with OFCOM that causes me concern. Given the need for a positive working partnership with OFCOM, the RSGB seems to be hampered in vigorously and fully pursuing matters where OFCOM clearly fails in its legal duties. Examples are OFCOM's lack of interest in exercising their statutory powers and duties under the International Radio Regulations to protect the Amateur Radio Service from harmful interference, and their imposition of disproportionate EMF requirements.

The RSGB did, in my view, put in a strong submission during the first EMF consultation to show that OFCOM was not acting within the law and was making disproportionate proposals. However, OFCOM largely ignored that and we are where we are, with the RSGB having secured some special rules for us. It is a pity that OFCOM is not so insistent where EMC is concerned.

What is also a pity is that none of the candidates for RSGB President or Board Members mentions any of these situations in their election CVs.

There are likely problems in taking a firmer line with OFCOM and this cannot be a single issue campaign or it will be doomed to failure. I agree with M1BNH that the RSGB should adopt a stronger stance, but very serious thought should be given to where that ends up.

Finally, although I object to the way the EMF requirements have been imposed, seeing as we have it I am personally treating it as a learning opportunity – just what the licence is for!

John Fellows G3YRZ
Diss, Norfolk

their next door neighbours happy. And also keeping an eye on their RF output etc.

As for the comments regarding cellular phones, that it had been 'established', that using them 'caused no measurable harm to humans' is akin to stretching the actual truth from here to eternity. Besides, cellular phones (Smart Phones) are a highly organised and lucrative commercial activity, so their use on a mass scale was never going to be restricted even with the advent of 5G. Licensed users of the communications spectrum is another matter altogether. Hence, where the RSGB finds itself in the same arena with multi-national corporations who have

much more influence and cash than you can imagine, wanting to get their hands on as much frequency allocation as possible and why, therefore, the RSGB is emasculated on our behalf.

Yes, the threat to UK amateur radio allocations is a real one. Particularly, that nowadays, a large majority of the populace considers amateur radio an irrelevance or a nuisance. Trouble is, the general public are so enamoured with social media and with what their friends are doing every minute of the day. Those corporations that provide these services, are constantly seeking ways to expand their opportunities to garner yet more

and more tracts of frequency bandwidth to fulfil their customers' expectations.

As for the issues concerning LED streetlights causing interference and so on, let's face it, amateur radio is a hobby pursued by a tiny proportion of the populace. Once upon a time long ago, when LEDs had not yet been invented, nor 3G or its successors, or where the technology we take for granted today was a staple of science fiction magazines, amateur radio was, in some respects, viewed as a leader rather than a follower of technology. And the irony is, it was the amateur radio community who first championed the use of repeaters for

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communication, which would eventually bring forth cellular phone use everywhere. Did we shoot ourselves in both feet?

Lastly, as for extending the RAE to cover more technologies, how long is a piece of string? Isn't the prime directive of the Radio Amateurs' Examination about self-discovery and embracing new technologies as and when they appear? If the syllabus were to be altered each time something new pops up, such as SDR, for example, it might be the case that every radio amateur who holds a transmitting licence to talk about the weather, or chew the rag about the CW rig kit they've just bought from a factory in China, might be asked to sit the RAE once every six months. Wow!

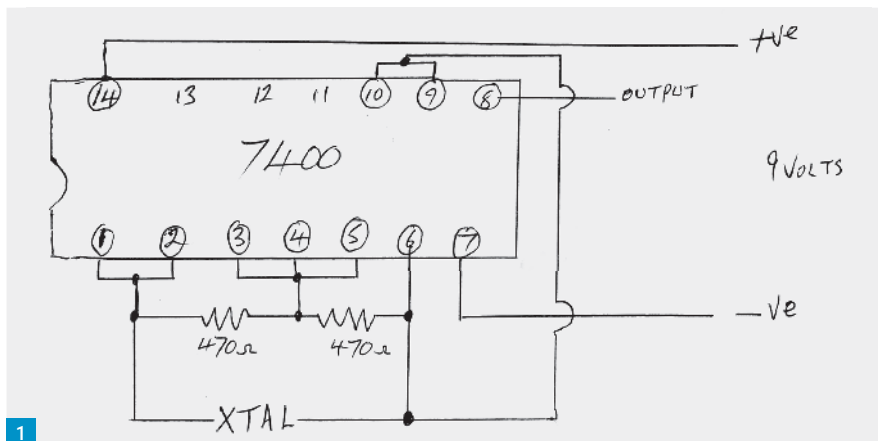
Ray Howes G4OWY/G6AUW
Weymouth

(Editor's comment: Thanks for another of your provocative emails Ray! A couple of comments if I may. Probably the best defence we have against losing our allocations is that they are, for the most part, international, so it would really take an international agreement to remove them – doing so in a single country would be pointless because radio waves don't respect boundaries. I would certainly agree that there is little we can do about encroaching sources of interference – when we moved to our last QTH some 36 years or so back, I could 'hear a pin drop' on the 160m band it was so quiet. By the time we moved away, a couple of years ago, the ambient noise level was far higher but not down to any single-identifiable source. Rather, it was the combined effect of LED lighting, wallwart power supplies, VDSL, dodgy TVs and PCs, etc. The good old days are, I'm afraid, just that. But there remain many aspects of the hobby we can pursue, both from home and by going out portable.)

The Licence

Dear Don,

I am responding to two letters in the April PW, which I feel have the common theme of making the hobby fit for purpose in the 21st Century. The first was from **Daniel Keely M7EAU** *Starting in the Hobby* and in it he queries the current examination syllabi. Without repeating his very thorough and detailed reasoning, I agree with his conclusion that the content needs to be reviewed to make it more relevant to today to attract new entrants. Also, having read the three licence manuals out of interest, I am not alone from comments on our local nets to feel that the Full Licence requires a very high standard, in my view too high. This I think is demonstrated by



the number of new entrants that stop once they become a '2E'. Apparently there is also a current problem as heard only last night that a candidate failed his Intermediate and commented that the format bore no resemblance to the available practice papers.

The second letter was from **Colin Hall GM4JPZ** entitled *Jargon* and queried whether some of the phrases in current use were appropriate for today. While not against using recognised abbreviations such as QTH as I think it helps to distinguish our hobby from the likes of CB and Zello, some other phrases do I feel need modernising. For example, OM (Old Man), what image does it conjure up to someone who is listening/observing? Is it how we want the hobby to be portrayed? Also, a look on the internet says that XYL has come to mean any female spouse of an amateur radio operator, licensed or not. How then does a male or female operator refer to their partner or a female refer to her unlicensed husband? I am not trying to be politically correct here but merely be respectful and inclusive to everyone licensed or not.

Finally in case any reader thinks I am a relative newcomer, I was first licensed in the 1970s as G8JBK so could be termed an Old Timer!

On another topic, catching up with my reading of the April edition, in the article by **Daimon Tilley G4USI** he writes in the first column on page 25 that CTCSS modules are readily available for the FT290R. I wonder where he gets this from as it has not been so in my experience? I could only find one advertised and having tried and failed to fit this fixed frequency board in mine due to both my less nimble large fingers and a lack of accurate instructions, after a lot of searching I am in contact with someone who makes a variable frequency board but does not advertise.

John Sones M0AAO
Ipswich

Well Done

Dear Don,

I was really pleased to receive this month's PW. I have to say it is one of the most enjoyable radio magazines I have seen in recent years.

It contains a very good balance of topics from digital modes (*Absolute Beginners' Guide to FT8*, *Top 10 FT8 Operating Tips*, *Data Modes Q65* etc.) to achievable construction projects (*QCX mini*, *Quartz Crystal Oscillator*, *Doing it by Design* Transistor receiver), a simple but effective antenna (*What Next* – linked dipole – I made one and it is light and effective) plus a fascinating and clear article on Passive Radar and also very helpful information on the NanoVNA. A good star letter too.

Well done to you and all the contributors.

BTW, a couple of weeks ago I had a dabble into HF (the dark arts as one of my DX chasing club members called it) and was delighted to work PJ4DX on 20m SSB in the ARRL contest using my IC-7300 plus end-fed wire.

Charlie Mitchell G0SKA
Lacey Green, near Slough

Crystal Oscillator/Checker

Dear Don,

Saw that article in the May PW. Here is a circuit (see **Fig. 1**) that I use, which consists of just one IC and two resistors. I use mine with my Mark 123. Plug the crystal used to transmit into the checker and zero beat the receiver to the tone. Very simple.

Ross Bradshaw G4DTD
Cornwall

Salvaging a Mast

Dear Don,

I bought an aluminium telescopic mast a few years ago from one of the suppliers in PW, which had plastic collars round the aluminium tubing with brass inserts and a screw to lock them in place when the mast was



extended. It worked well for a while but the brass inserts very quickly pulled out of the plastic and the bottom sections would not fit together because there was a gap between them that had previously been filled by the plastic collar. I removed the other plastic collars as well. For a few years they were stored in my house extension.

I looked at them again the other day and decided I could do something to use them. I had some thin aluminium sheet which I cut into 6in lengths. The width had to be determined by experiment. This was rolled round the smaller aluminium tube and the next larger tube slid over that so the gap was now filled by this aluminium collar and held in place by Jubilee clips. Get the real Jubilee clips as there are some cheap ones that don't tighten and the thread gets mangled.

The two photographs (Figs. 2 and 3) show the idea. It may be of use if somebody has the same problem.

Bill Kitchen G4GHB
Ashton under Lyne

The B40

Dear Don,
I just received September *PW*, all very good as usual.

My father **Jim Linton** worked for Murphy Radio in the 50s, assembling the B40s. He told me he used to scribble his initials inside the sets he'd finished assembling and testing.

I'd really love to acquire a set with his initials inside, but sadly I've never found one, despite inspecting a few. A long shot I know, but

if anyone has a B40 with JL or JHL inscribed inside I'd love to know, see a photo and ideally, if possible, acquire!

Andy Linton EI2HH
(On air as EA/EI2HH until I get my EA call!)

Dear Don,
Your excellent article on the B40 Receiver (May 2021) and the letter from **Ted G3WBB** (August 2021) has prompted me to write this.

I served in *HMS Protector GXVN* 1965-67 and well remember how the audio signals from the B40s rose and fell with the roll of the ship, very soporific at 3am. I put it down to Doppler effect and I experienced this in all the ships I sailed in, with various receivers, in the 32 years as an RO RN and MN. They did indeed roll on a 'wet blanket' and I well remember the tortuous route Ted would have taken from the Radio Room to his workshop 'carrying a B40'.

Bruce Keeling G4EUW
Colchester

Log4OM

Dear Don,
It was nice to read **Colin Redwood G6MXL's** article about our Free Log4OM software in the September issue and his kind words are appreciated.

There were however a couple of small misconceptions that we would like to point out to your readers as follows:

Regarding modes and bands, the user can add any mode and band he wishes to the drop-down lists; the program is designed for user personalisation. Providing the mode/band added is a recognised ADIF standard mode there should be no problem uploading QSOs to the online logs such as LoTW, eQSL and QRZ.

Loading contacts from an ADIF file, providing the file being imported included the user's 'Station callsign', Log4OM can differentiate between QSOs due to its powerful filtering.

I have QSOs from both of my calls and some special event callsigns that I activated all in one logbook datafile and Log4OM works with either individual or all calls according to my needs.

Transverter operation is possible with Log4OM by using the transverter offset facility to ensure the correct frequency is logged.

Historic contacts can be uploaded to QRZ and the other online logbooks using our QSL Manager. However, other than Clublog, which provides a method of flushing an existing online log while uploading a current log, QRZ, LoTW and others do not provide a method for deletion or editing of existing online QSOs via their API systems. When they do we will in-

clude the facility.

Once again thank you for the coverage in my favourite magazine.

Terry Genes G4POP
and **Lele Pistollato IW3HMH**
(Founders and developers of Log4OM)

In Your Shop?

Dear Don,
When I married **Brenda** nearly 60 years ago, there were no computers, but I found that as part of the deal I had attained a spell and grammar checker, together with a typist! I was trying to build up the Hi-Fi side of my father-in-law's photographic business, and with Brenda's help, started writing for *Hi-Fi News*.

This proved to be a very good move, the Hi-Fi business did well with the help of the free publicity, and eventually when I started selling amateur radio equipment, I took the same approach, and once again got paid for effectively advertising!

It is now over 20 years since I retired, I am no longer in touch with what goes on 'In the Shop' and no doubt soon will be in the ultimate DX location. I can't help wondering, however, as to why some other member of the amateur radio trade has not taken over the baton, of *In the Shop* to dish out help with operating and repairing the latest equipment. I can assure them that they will get plenty of encouragement from readers.

Could this be you?

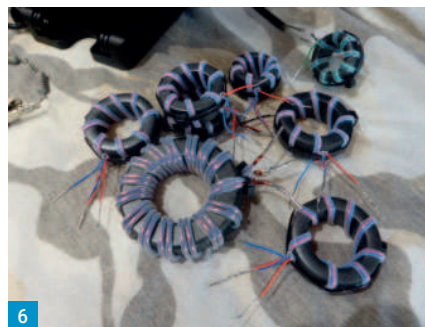
Harry Leeming G3LLL
Morecambe

(Editor's comment: I'd love someone to come forward and carry on the excellent work you did for so many years Harry, perhaps covering some of the radios that have come and gone in the meantime. As Harry says, any offers?)

Testing Your Balun/Un-Un

Dear Don,
There's some really poorly made baluns and unun units appearing on the market, usually due to cheap imported cores. Would you know how to spot them, check them, test them?. Some of the 4:1 unun units that I have seen recently are really disgraceful and sellers are charging massive amounts of money for them.

Firstly, stay away from anything that is painted RED. This is 99% sure to be an Iron Powder core and for impedance matching is a poor and inefficient core to use, so a code of practice is "if it is RED put it to bed". Many people copy other people's mistakes, we have seen this for many years, so here is



some help in testing and checking your unun or balun.

In real terms you need test equipment to measure what is going on in the matching network. Many people have an antenna analyser, some are lucky enough to have a spectrum analyser with inbuilt sweep generator and VSWR bridge but what if you don't have either of those items?

Maybe you have the IC-705? If you do, then here's a pleasant surprise as you have a superb piece of HF/VHF/UHF test gear.

Many years ago Icom brought out the Icom IC-7100. I am pretty sure it was the first mass-produced amateur radio unit that incorporated a VSWR/Antenna Analyser. Then came the IC-7300, which also houses a fast wider bandwidth analyser, and last but not least the IC-705, which has the same internal analyser.

So, how do you go about checking your unun or balun? All you need are a few 1W

carbon resistors equal to the output value of your matching unit, ie: 100Ω (2:1), 200Ω (4:1), 300Ω (6:1), 450Ω (9:1) etc. Connect the test balun/unun to a piece of coax with a BNC plug on the other end, connect up the BNC to the IC-705, set the BAND you want and reduce the power level of the radio to 0.5W and then activate the SWR menu from the 'MENU' button. Make sure you terminate the balun/unun under test with the correct value of resistor eg: 4:1 is a 50:200Ω, so terminate the transformer with 200Ω. You are now ready to go. Press the 'small white square' in the bottom left of the display and then press the PTT and you will see the VSWR results in steps across the display. That's it. In practice you are looking for under 1.5:1 across the bandwidth. If it is any higher than 1.5:1, then the transformer is not very good.

The example in the picture, **Fig. 4**, shows the IC-705 on 14MHz TX with the first portion on the VSWR display at the bottom of the dis-

play (not the one at the top) showing a perfect match of 1.1:1 and just a 'small yellow dot' to show where the reading is taken. On the right under the tuning knob is the 4:1 unun under test with 2 x 100Ω resistors in series = 200Ω. Keep pressing the PTT until you reach the end of the scale on the right-hand side, then the VSWR resets to normal RX.

The test was also carried out on 50MHz, which again produces a near perfect match. The little blue bars in the second photo, **Fig. 5**, are the VSWR reading, which is about 1.15:1 on 50MHz and zero on 14MHz on the previous picture, quality at its best.

All the cores used above and shown in the third photo, **Fig. 6**, are made of Ni/Zn (Nickel/Zinc), some of them are also made of Ni/Zn with a special addition of ferrite called F14. PTFE wire and PTFE sleeving is used.

Geoff Brown G4ICD
Southampton
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RESULTS OF THE PW 144MHZ QRP CONTEST Colin Redwood G6MXL has the results of this year's summer contest.

VALVE & VINTAGE Philip Moss takes a look at the classic HRO receiver.

COAXIAL CABLE Tony Jones G7ETW unravels some of the complexities around this ubiquitous but often misunderstood aspect of our stations.

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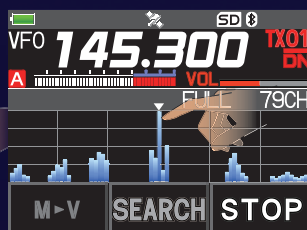
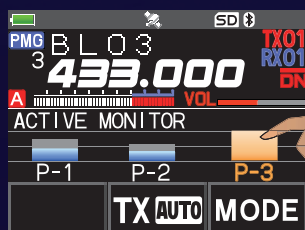
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The Battle of Britain was one of the most iconic battles of the Second World War, embedding itself indelibly into the nation's consciousness. Earlier, the Battle of France could easily have spelled defeat before the air battles got underway in July 1940.

As for the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. It was clear that large-scale fighting would ultimately follow, and a British Expeditionary Force was sent to France before the end of that year. As part of the BEF, a large Air Component was supplemented by an Advanced Air Brigade. In total, there are forces amounted to six squadrons, six of which were Hawker Hurricane fighters, and four were Spitfires. The remainder of the RAF force in France comprised largely light bombers and Army Co-operation squadrons. Eventually, however, the 'sitting' became the 'fighting'.

On 10 May 1940, German forces launched their all-out assault on France and the Low Countries and what followed in Belgium, the Netherlands etc, was the complete collapse of those countries under the overwhelming might of German military power. Across France, German forces moved inexorably towards the English Channel and while the French and British tried desperately to stem the advance, the situation became ever more desperate.

Predicted Catastrophe
When the fighting had broken out in France, the BEF's Air Component was in almost certain trouble, and it was not to be long before it was to be completely

BACKGROUND TO BATTLE

Left: A Hurricane of 501 Squadron, sent to France for an operational sortie at Bethune, France, May 1940. An RAF Hurricane High Dive bomber, sent to France for an operational sortie, was shot down by German fighters. Right: As the anticipated German offensive against France unfolded, the RAF's Hurricane fighters were sent to France to bolster a faltering defence.



THE RAF FIGHTER PILOT



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