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Radio User REVIEW Radio User

FIRST TEST

ELAD FDM S-3

Detailed review of this keenly-awaited direct sampling wideband receiver

The role of radio

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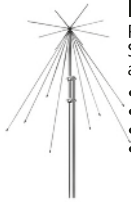
ICOM



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Optional Mains Power supply..... £25.95

AOR

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.....£22.95

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Latest Base Mobile Scanner with 'Close Call'

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£425

UBCD-3600XLT - NXDN
Same specs as above but with NXDN activated NXDN digital protocol is used by Kenwood & Icom

£479.95

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- Covers 25-960MHz (w/gaps)
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Whistler TRX-1
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Advanced unit suitable for all your batteries

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RadioUser

ISSN 1748-8117

April 2021 Vol. 16 No 4
On sale: 25th March 2021
Next issue on sale: 29th April 2021

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RadioUser Subscriptions Dept
Warners Group Publications plc
The Maltings, West Street
Bourne, Lincs PE10 9PH

This publication is printed by Warners 01778 395111

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Top-Flight SDR & Two-Way Comms

Hello and welcome to the April 2021 issue of *RadioUser*. As I write this, I am just hearing of the passing of Lou Ottens, the Dutch engineer credited with inventing the cassette tape and playing a major role in the evolution of the first CD. If you are about the same age as me, you will also have many memories spooling off when you think of those C60s, C90s, or C120s.

Talking about pioneers, you may wish to have a look at Scott Caldwell's column on Elisabeth Alexander. Contrast this with David Harris's reviews of a GCHQ book and a new biography of Kid Jensen, and you are well on your way to exploring the personality dimension in radio.

Our main feature this month is a review of the long-awaited ELAD FDM S-3 Software-Defined Radio. As Clint Gouveia finds out, this radio represents the very latest in high-end technology and adaptability. Take a look at what Clint found out about this classy piece of kit.

We begin a new column this month. From now on, Tim Kirby will alternate his *Signals from Space* series with a bi-monthly article on two-way communications, in a *wide* sense of the word. We have called it *Push-to-Talk*. The feature will encompass CB and Amateur Radio, Business and Network Radio, PMR446, and more.

Furthermore, in *Airband News* –having overflown a large number of civilian airports recently – David Smith now moves on to military airfields, looking at their communications profiles. Make sure you collect all.

Our other key features this month, we have news of radio geekery and a software tool for beacon hunters.

You will also find content on lifeboat transmitters, European private short wave stations, brain-enhancing international radio, loss measurement in coax, and safe radio-havens for migrants and refugees.

What is more, Keith Hamer and Garry Smith explore the role of graphic design in radio and TV and inaugurate a series of sporadic forays into the world of Amateur- and Satellite TV.

If you like projects, take a look at Roger Thomas's instructions for building a small receiver for BBC Radio 4 on long wave, 198kHz. I have also included Part Two of my mini-series on how Covid is affecting us; this time, I am looking at community and business radio, the hobby as a whole, and the industry.

If you are interested in all things digital, let Kevin Ryan introduce you to the ever-evolving, fascinating, world of digital radio, his column this month has all you need for a basic induction to this subject.

Last but not least, we have more news items than ever before in this issue; you will find them, not just at the beginning but distributed across the whole of the magazine. Enjoy.

However you prefer to enjoy radio – DX, Broadcast, KiwiSDR, Streams, Radio Garden, or in a plethora of other forms, I wish you happy listening.

Georg Wiessala
Editor, *Radio User* Magazine
www.radioenthusiast.co.uk

What's New

Have you got something new to tell our readers about? If so, then drop a line to **wiessala@hotmail.com**

Digital Handheld at Nevada

Nevada Radio has announced the release of the Alinco DM5X-GE Analogue/DMR Digital Handheld Transceiver. This is an upgrade on their earlier DJ-MD5 handheld. This X-Xtreme version includes both GPS with APRS support and an automatic repeater-roaming facility. The radio is full of features including a broadcast FM receiver with 100 memory channels, 4 selectable output powers from 0.2 to 5W, 4,000 channels, built-in vox, a digital recorder, and a large clear display. It is easy to import/export DMR contact databases and set parameters with CSV files from a computer. The built-in GPS sets date and time automatically. The radio will sell for £179.95 and is available from Nevada.

www.nevadaradio.co.uk

AOR Innovation at Waters & Stanton

RadioUser STOP PRESS!

AOR move deeper into Digital Decoding. AOR have announced a major firmware update for their AR-DV1 and AR-DV-10 receivers, (already implemented in their flagship AR-5700D). This provides the ability to import, bookmark, and name-tag, Tetra network's GSSI user group list, and to selectively decode voice communications. This adds yet another digital mode to these receivers that already are capable of decoding DMR, NXDN, D-STAR, DPMR APCO 25, FUSION, ALINCO, D-CR, as well as all the popular analogue signals including FM AM SSB CW. The firmware update requires a key, and these are available from this URL:

www.aorja.com

Radio News

LISTEN RIGHT NOW: This activity is the latest application of the wider *Radio's Digital Revolution* campaign, developed by *Digital Radio UK* to communicate the content and range of devices available. The social media activity launched in March and will run (on Facebook) over the next six weeks, targeting listeners interested in digital radio and podcasts, as well as young people who listen to music streaming services. The campaign messaging highlights there are over 50 national stations, hundreds of local stations, and thousands of podcasts, with creative assets including static and carousel ads for in-feed and stories, along with video ads; all are showcasing a host of UK radio and audio presenters, including Roman Kemp, Jamie Theakston, Amanda Holden, Ronan Keating, Harriet Scott, Angellica Bell, Greg James, and Zoe Ball. Other applications of the *Radio's Digital Revolution* campaign include a dedicated radio category microsite at johnlewis.com created for John Lewis & Partners; a digital radio e-learning platform developed for audio retail staff; and Digital Radio UK's *getdigitalradio*.com website. Ford Ennals, CEO, Digital Radio UK, said: *"Digital radio is booming with strong listening and new stations and podcasts launching all the time. With hundreds of digital stations and thousands of radio podcasts, there has never been a better time to celebrate the amazing digital radio content proposition. We believe that digital radio and audio content and distribution across digital platforms will help provide a vibrant and healthy future for UK radio."* The *Radio's Digital Revolution: Listen Right Now* social campaign has been developed and delivered by creative agency *Hearts and Minds*, digital marketing agency *Vertical Leap*, and website design agency *DSM*.

www.getdigitalradio.com

Compact CB Aerials at Moonraker

Moonraker has a new range of compact CB aerials available, the *Sharman Storm* series 100, 200, and 500 base CB aerials, ranging in price from £39.995 to £69.95. The image shown is of the *Sharman Storm 100* Base CB Antenna.

https://tinyurl.com/auhc5upu

Vibroplex Mini Morse Key at Nevada

Nevada is pleased to announce the release of a new miniature straight morse key from Vibroplex USA – the *Camelback*. The *Camelback* key is aimed at portable operations, weighing just 66 grams with an oval base measuring 50 by 25mm. With its lever arm, it is beautifully constructed to be balanced and a joy to use. Separate adjustments are provided for both spring tension and sending gap. It is an ideal key for the newcomer to Morse with its smooth action, enabling the code to be sent with ease. Send some nice CW then just pop it in your pocket when you are done! The Key is available for £109.95 from Vibroplex Exclusive UK distributor Nevada.

www.nevadaradio.co.uk

MyDEL IC-705 Carry Cage available from ML&S

The ultimate all-band QRP radio needs ultimate protection when out in the field. ML&S have introduced a new bespoke design for the IC-705, the MyDEL IC-705 Carry Cage. The all-alloy precision-engineered carrier wraps around the entire body of the radio, giving it strength and protection in one. Add to that a built-in carry handle and removable side protectors, all in a smooth hard black-satin anodised finish. Available from stock at £139.95 inc VAT.

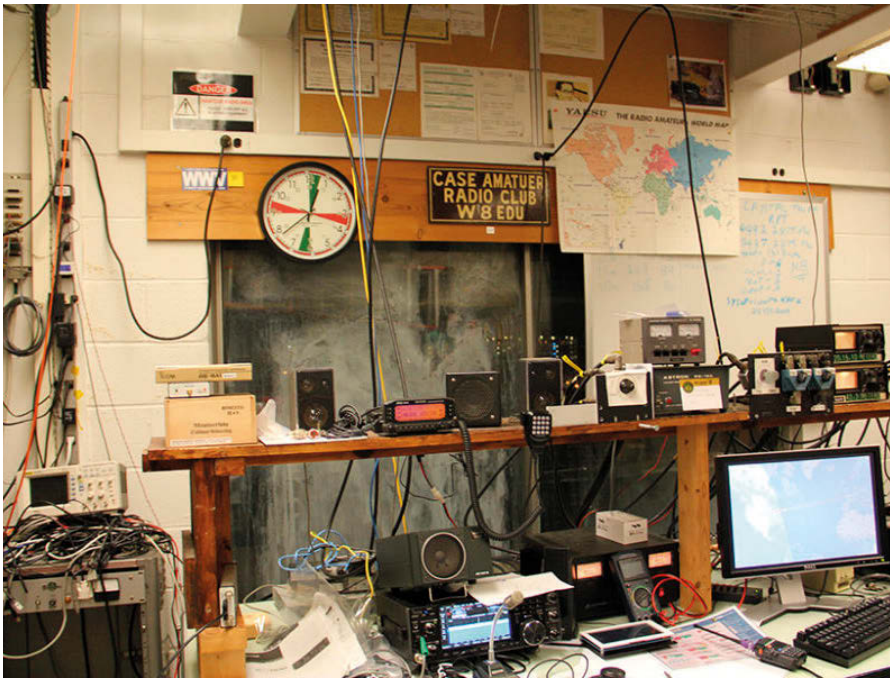
www.HamRadio.co.uk/Cage

Enter our competitions at www.radioenthusiast.co.uk/competitions

Radio News

E-MWN: The new electronic edition of the Medium Wave Circle's *e-Newsletter* is now out. (This is Volume 66 No. 10, of March 2021). This extra-large issue contains articles on *Carrier-Sleuth*, which we covered in *RadioUser*, March 2021: 11. Other features in this issue revolve around the following topics: *Choosing an SDR | MW Frequency Offsets | Catch an English County | Ultralight MW DXing | Be Your Own QRM Sleuth*, and *Direction-Finding Today*. Contact the Medium Wave Circle for further details and instructions on how to join.
mwneditor@mwcircle.org

NEW TALENT: BBC Asian Network is welcoming 13 brand new presenters to the station following a search for new talent. Each of the new presenters will host their own Sunday shows each between March 2021 – and February 2022 as part of the station's *New Presenter Voices* initiative. BBC Asian Network launched the search for new presenter voices in December 2020, searching for talent who have a passion for British Asian culture and the latest in music and entertainment.
For several of them, hosting on the Asian Network will be their first-ever role in radio, including for Serena from Birmingham, who works as a model and content creator. Serena will be the first of the new DJs to take on the slot in March, before handing over to Bromley-born Jeevan, a full-time journalist and writer who'll take the reins in April 20021 […]. All 13 presenters – in the order of the dates of their respective shows – are: Serena, from Birmingham | Jeevan, from Bromley | Rambo, from Bradford | Virdi Mazaria, from Leicester | Renu Chopra, from Hertfordshire | Sufyan Jae, from Reading | Chunz & Makh, from Bradford | Omerah, from Uxbridge | Neha Navekar, from Preston | Mabby Alam, from Bristol | RJ, from London | Bhav Parma, from London.
(SOURCE: BBC Asian Network, *RadioToday*)
https://tinyurl.com/1mi32rcx



PLANET-SIZED SPACE WEATHER SENSOR NETWORK: For researchers who monitor the effects of solar activity on Earth's atmosphere, telecommunications, and electrical utilities, amateur radio signals a golden age of 'crowd-sourced science'.
Space weather events, triggered by solar emissions and their interactions with Earth's atmosphere, can have significant effects on communications and navigation technology and electric power systems.
As with terrestrial weather events, the economic impacts of space weather-related disruptions can be substantial, affecting satellite systems as well as systems on the ground. A severe geomagnetic storm (on the order of the *Carrington Event* of 1859) could have a catastrophic effect on modern infrastructure. Even solar storms of more ordinary size can induce currents in the power grid that drive up energy prices, affecting manufacturing and commerce.
Considerable interest exists in developing space weather forecasting technologies that use Earth's ionosphere as a sensor for events in its neighbouring atmospheric layers.
The ionosphere occupies a privileged niche in the overall geospace system, as it is coupled into both the terrestrial weather of the neutral atmosphere below and the space weather of the magnetosphere above.
Although we have a good understanding of ionospheric climate—diurnal and seasonal variations are well known, as are the rhythms of the sunspot cycle—there are new and vital areas of research to be explored. For example, it is known that the ionosphere—and near-Earth space—experiences variability (e.g., radio signals can fade in and out over periods of seconds, minutes, or hours due to changes in ionospheric electron densities along signal-propagation paths), but this variability has not been sampled or studied adequately on regional and global scales.
To fully understand variability on small spatial scales and short timescales, the scientific community will require vastly larger and denser sensing networks that collect data on continental and global scales.
With open-source instrumentation cheaper and more plentiful than ever before, the time is ripe for amateur scientists to take distributed measurements of the ionosphere—and the amateur radio community is up for the challenge. The *Ham Radio Science Citizen Investigation (HamSCI)* is a collective that unites amateur radio operators with the research community in the space and atmospheric sciences.
This confederation of scientists, engineers, and hobbyists holds annual workshops during which ham radio operators and space scientists share findings. A new *HamSCI* effort, the *Personal Space Weather Station Project*, aims to develop a robust, and scaleable, network of amateur stations that will allow amateurs to collect useful data for space science researchers.
The next *HamSCI Workshop* will be held virtually 19–21 March 2021, and it will focus on midlatitude ionospheric measurements.
SOURCES:
https://doi.org/10.1029/2018GL077324
https://tinyurl.com/y54eap97
https://tinyurl.com/329vaknv

News Extra

Have you got something to tell our readers about? If so, then drop a line to **wiessala@hotmail.com**

PskovNDB: A Visual Tool for NDB DXers

Andy Thomsett has news of an exciting analytical tool for NDB & Medium Wave enthusiasts and beacon hunters world-wide. With additional content by Robert Connolly and Nils Schiffhauer.

My initial thought when Georg tipped me off about *PskovNDB* was that it looked a bit complicated and might take some time to get to grips with. However, having perused Nils Schiffhauer DK8OK's *First Aid: PksovNB for Medium Wave* notes and watched a couple of *PskovNDB* related videos on *YouTube* – I was pleasantly surprised just how quickly I was able to use it as another method for identifying and logging weak NDBs.

Getting Started and Workflow

The first thing to do is to download the latest version of Ivan Monogarov's *PskovNDB* software, which is available via the following link (*Yandex Disk*).

https://yadi.sk/d/m8zZerRDCT272g

Once downloaded, you need to unzip it and save it to a directory of your choice. Using my Airspy HF+ SDR receiver and SDR#, I recorded a 768kHz-wide baseband file centred on 400kHz, with a duration of just over 9 minutes – this being the typical length of recording I use for most of my NDB surveys. In addition, I have also used chunked files recorded using my Elad FDM-DUO and the *FDM-SW2* software.

I then launched *SpectrumBuilder* to generate a spectrum based on my pre-recorded baseband file clicking on and selecting or deselecting the following options (Fig. 1).

Select file(s)
Read Headers
Check DX Viewing – good for near weak signals.
Uncheck Save only areas – purely because this worked best for me.
Save to: – select the directory you want the spectrum to be saved to.
Run – then sit back and wait for *SpectrumBuilder* to do its business...

With my aged PC (and my decisions to check D*X Viewing* and uncheck *Save only areas*) this took ca. 12 minutes. Have a look folder it creates – in my case, the process generated 10,922 files and 15.7GB of data.

After that, I viewed the generated spectrum using *PskovNDB*, which launched what initially appeared to be quite a complex multi-window GUI (Fig. 2). However, don't be put off!

Open – select the file ending .vvv2
Visible bandwidth, kHz: – use this to select the bandwidth (0.5 to 50kHz) you wish to view as a *greyscale spectrogram* – initially, I opted for 10kHz.
V.Zoom – the default is 64. However, using a lower number (my preference is '2') makes it much easier to pick out keyed NDB Morse idents.
Select range, kHz – when you click on this, you'll see the baseband spectrum has been split into chunks based on your choice of *Visible Bandwidth, kHz*.

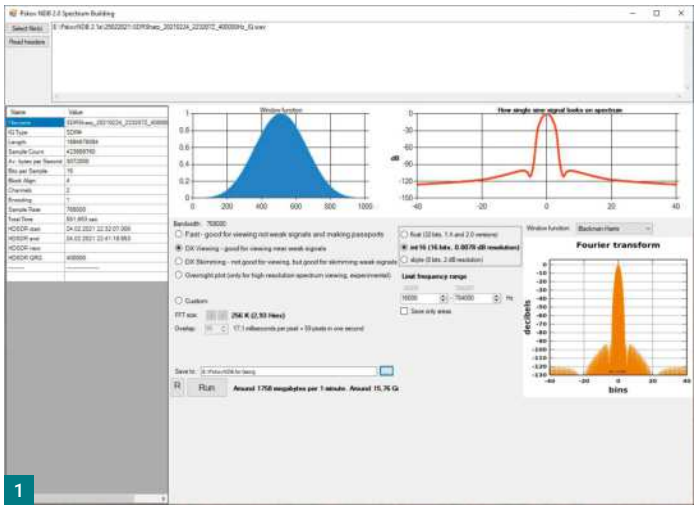
Initial Display and Signal Structure

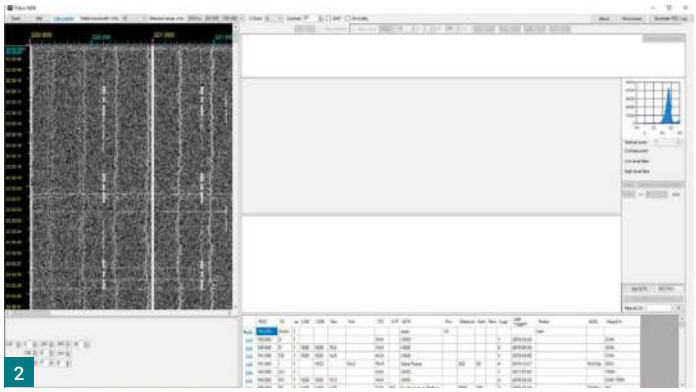
Once you have selected the chunk of spectrum you wish to view, *PskovNDB* processes it and, after a short delay, you should see a horizontally and vertically scrollable greyscale spectrogram, with time markers on the left-hand side of the GUI. Personally, if the option were available, I'd much prefer to see the spectrogram rotated by 90 degrees anticlockwise, so that time is represented on the horizontal axis.

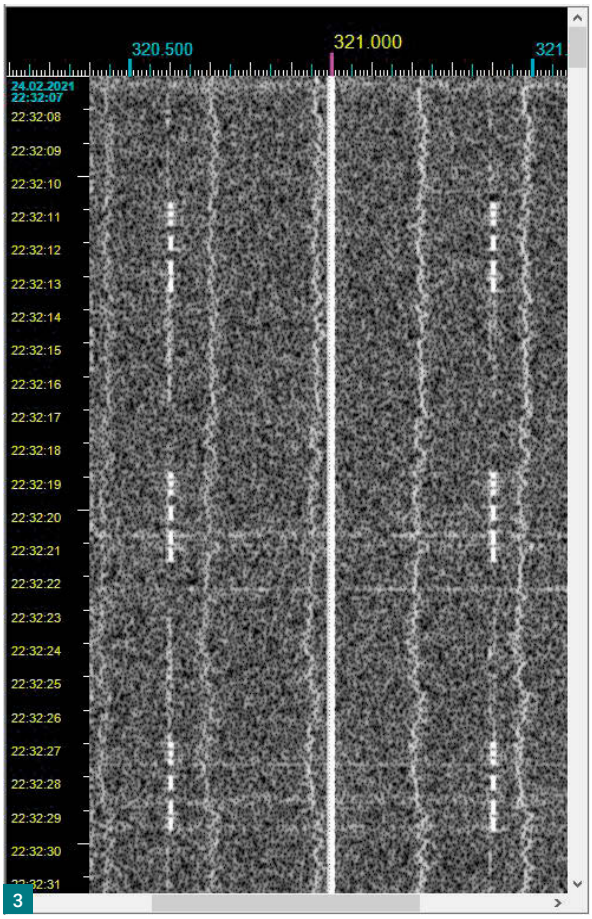
The next step is to take a moment to appreciate exactly what you are looking at. The majority of NDBs use modulated continuous wave (MCW) – double-sideband amplitude-modulated carriers, which are keyed using 400Hz or 1kHz sub-carriers. Visually, these are represented by on/off keyed side frequencies conveying the NDB Morse ident equally spaced on either of the (steady, unkeyed) carrier. For example, the screenshot of STM on 321kHz shows the keyed side frequencies clearly visible as vertical columns, approximately 400Hz above and below the carrier (Fig. 3). Be aware that some NDBs only employ a single side frequency. It is worth noting that some NDBs such as BST on 428kHz, radiate a continuous carrier that is interrupted while the Morse ident is transmitted (hence, there are no side frequencies, just the keyed carrier, Fig. 4).

Cyclical Nature and PskovNDB in Practice

Another feature of NDBs is the cyclic nature of the keying of their Morse idents, something that is exploited by *PskovNDB*. In essence, if you split the spectrogram time-wise into chunks equal in length to the (possibly unique) duration







of an NDB Morse ident transmission cycle and then display them beneath each other, the beacon ident would appear as vertical columns. Click immediately above one of the vertical columns representing a Morse ident and see what happens. If you are lucky, the auto-correlation process generates a very clear spike in the blue vertical display and the NDB Morse ident can be seen as yellow vertical stripes on a black background, with white vertical stripes on a black background and a power spectrum beneath.

Thinking about the cyclic nature of the keying of an NDB Morse ident, note what has happened to the numbers in the boxes displaying S, mS and µS. Check out the effect of changing these numbers. Click on *Show cycles palette* and see the relationship between the chunk length and resultant pattern. The image in Fig. 5 shows what happened when I clicked on the column slightly higher in frequency than the carrier on 488kHz, which turned out to be the lower side frequency for NK on 490kHz. Just be aware that sometimes these displays 'wrap around', so it can be useful to use one of the multiplier options, for example, x2, at the top of the GUI.

Furthermore, if you prefer to read the Morse idents utilizing the power spectrum, then using the /2 option can also be useful.

It is worth pointing out that, on many occasions, the Morse ident might not be immediately apparent. Therefore, you might have to click in the yellow and black area and drag it from side to side until the stipes become vertical and you can display a readable Morse ident – I find it useful to do this slowly to get the best spectrum display, which is the one I find the easiest to read. Also, note the effect this has on the numbers in the boxes displaying S, mS and µS. Furthermore, on the right-hand side of the GUI, you will see that options are available for changing the *Vertical zoom, Contrast point, Low-level filter* and *High-level filter* – have a play with these and see what effect they have on the yellow & black, white & black and power spectrum displays.

Database, Logging, and Final Thoughts

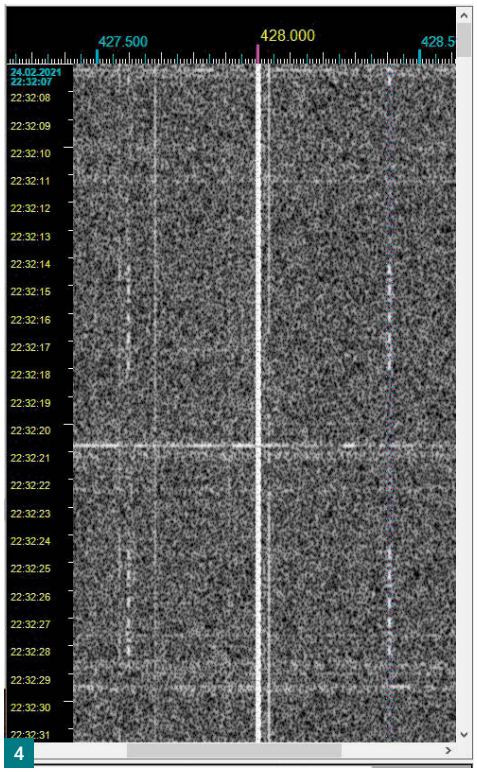
When you click on the greyscale spectrogram, you will see that, in the bottom right-hand-side of the GUI, there are database entries relevant to your chosen frequency chunk (Fig. 6.).

These are derived from the online *Signals Received in Europe (REU)* database which, in addition to NDBs, also has options for DGPS, DSC, Ham, Navtex, Time, Other and All. What's more, the database webpage also offers access to details of signals received in North America (RNA) and Worldwide (RWW).

https://rxx.classaxe.com/en/reu/signals

In the lower left-hand side, the *PskovNDB* GUI offers the option to log your catches and save them to the REU database.

Please be aware that this is just a first look, and that I have certainly not covered all of the facilities offered by *PskovNDB*. Nevertheless, I am impressed. The great thing is it allows one to 'dig out' NDB Morse idents visually that one well might struggle to pick out aurally. In particular, when multiple beacons are audible on the same frequency or their side frequencies are adjacent to a carrier frequency. Traditionally, digging these out – in addition to IF/AF filtering – might have involved having to monitor a frequency for some considerable time until the idents became out of phase, so each one could be received without mutual interference – with *PskovNDB*, this is very easy.



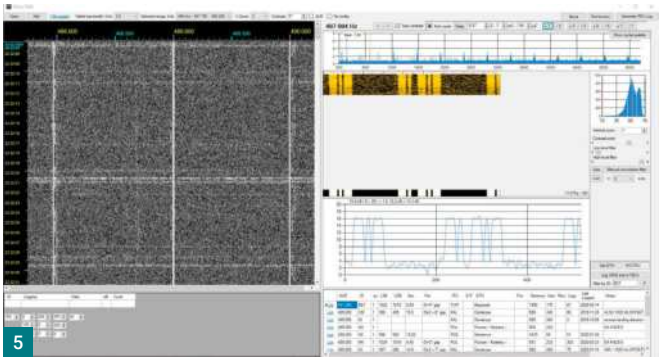


Fig. 1: The *SpectrumBuilder* GUI showing my chosen options. Fig. 2: The *PskovNDB* GUI might look a little daunting but don't be put off. Fig. 3: STM with its side frequencies clearly visible approximately 400Hz above and below its carrier frequency on 321kHz. Fig. 4: There are no side frequencies associated with BST (which slightly higher in frequency than the much stronger carrier for CTX on 428kHz), which radiates a carrier that is interrupted while the beacon ident is transmitted. Fig. 5: What happened when I clicked on the column on 487.921kHz - the lower side frequency for NK (490kHz). Fig. 6: Frequency-relevant data derived from the *Signals Received in Europe (REU)* database.

However, the one thing *PskovNDB* does *not* do for you is to decode the Morse characters. Hence, you still have to be able to recognise the *dits* and *dahs* and spaces between the letters as vertical stripes or changes in amplitude in the power spectrum, something that (as someone who's very much at home listening to Morse) I found a bit difficult to get used to. Nevertheless, once you have mastered the GUI, you have all the time in the world to decode the Morse – using a look-up-chart if required. Therefore, in addition to those of us who have already been bitten by the bug, *PskovNDB* might well be of interest to potential NDB DXers who struggle to receive beacon idents aurally. So go on, give it a try!

Additional Comments by Nils Schiffhauer:

"PskovNDB analyses HF WAV files. It builds up detailed spectrograms of high resolution from I/Q files and delivers precise data in time, frequency, and level . Furthermore, it allows you to assess the best chances for NDB DXing by showing noise and the signal strength of a station in a diagram – to name but a few features. It has been developed by Russian expert Ivan Monogarov who gratefully shared it for free. Initially written to dig out even the faintest NDB signals, Ivan built a major update in early 2021 to satisfy medium wave DXers' thirst for this excellent tool. *PskovNDB* software is working based on recorded HF files, in WAV format or WAV RF64 format. It is an alternative to *SDRC V3* – my old workhorse in this area – and it has some unique features. For example, it allows users to pack even exceptionally big recordings into just one file. I tried this up to 9TB (the entire HF Band for 24 hours). In my experience, *PskovNDB* deals best with smaller files – at least in the version 2.1a which I used, and on my PC configuration. On the one hand, your mileage may vary, but on the other hand, there is always the chance of an update. The software offers three different ways of working, displaying and over-night recording. Your workflow might be threefold: (1) *Recording* a file – or many consecutive files, 'chained' automatically (2) *Building a spectrum* from your WAV files with the Spectrum-Building option; and (3) *Viewing your spectra* with *PskovNDB* software. I have also used the ELAD FDM-S3 (OCXO & GNSS) and the software package *SDRC V3*. Ivan supplies the newest version of *PskovNDB* via *Yandex Disk* and publishes the link within the newsgroups *NDB* and *MWCIRCLE*."

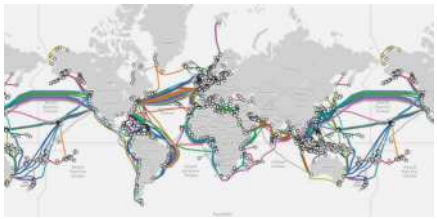
dk8ok@gmx.net

Additional Comments by Robert Connolly:

"When it comes to listening to the NDB band, I have always been a 'traditionalist': I preferred listening 'live', using my NRD525 receiver. However, during the past 12 months, I started using an SDR receiver to record the band for later analysis. I was fortunate in that I had a saved *WAV* file of the NDB band lasting approximately ten minutes from the previous night, which I had recorded using my SDRplay RSPdx and *SDRuno* software. Having extracted the *PskovNDB* software, I proceeded along the lines indicated by Andy Thomsett (see previous box). This made using the software much quicker and easier. After launching *SpectrumBuilder*, I selected the WAV file from the previous night and began to generate the spectrum. The first couple of attempts failed as I had omitted to select the *Read Headers* tab, resulting in *SpectrumBuilder* just shutting down when I clicked on the *Run* button. Selecting the *Read Headers* is vital to creating the spectrum to analyse in *PskovNDB*. It took a few minutes for *SpectrumBuilder* to do its thing and produce the *.vvv2* file for *PskovNDB*. I agree with Andy, in that using a much lower *V.Zoom* setting makes it easier to view the beacon Morse idents. In my case, I found that a level 2 or 4 *V.Zoom* setting produced acceptable results. *PskovNDB* would appear to be a useful asset for NDB DXing, especially for those who have hearing difficulties, for example, deafness or severe tinnitus. I would have liked to see an option for a horizontal waterfall rather than the vertical one, but that is a personal preference and does not affect the performance of the software."

gi7ivx@btinternet.com

Radio News



SUBMARINE CABLE MAP: Not exactly radio, but this interactive submarine cable map is, nevertheless, useful and beautiful to behold. It is a free and regularly updated resource from *TeleGeograph*.
https://www.submarinecablemap.com

RTÉ TO CEASE RADIO TRANSMISSION ON DAB NETWORK: RTÉ is to cease transmission of its radio services on the Digital Audio Broadcast (DAB) network on 31 March 2021. However, its digital radio services, RTÉ Gold, RTÉ 2XM, RTÉ Radio 1 Extra, RTÉ Pulse, and RTÉjr Radio, will remain available on other platforms.
(SOURCE: *RTÉ, ICQ/ Ham Radio Podcast*)
https://tinyurl.com/vzr6z4n8

SIX NAZI ENIGMA MACHINES DISCOVERED IN THE BALTIC SEA: Archaeology and marine enthusiasts scanning the Baltic Sea for lost treasures have stumbled upon six *Enigma* machines that were used by Nazi Germany during World War II and were likely thrown overboard in a panic. *Enigma* machines were devices used by the German navy during the Second World War (1939-1945) to send encoded messages which, the hope was, could not be read by the Allies. The machines had three interchangeable rotors that scrambled messages; these were then sent via Morse code to a receiver machine with the same settings.
(SOURCE: *Radio Kurier 3/2021: 9; ICQ | Ham Radio Podcast*)
www.tinyurl.com/3gzk7tpm

SOFIA IS AIRBORNE: *RadioUser Maritime Matters* contributor Robert Connolly wrote in to report the following, "Last night just before midnight I was outside checking everything was secured before going to bed. The wind and rain of the day had gone with the sky now fairly clear and spotted an overflight heading north-bound that seemed higher than normal. Ongoing back into the house and taking my night time tablets I had a look at *Flightradar24* on my mobile phone. The aircraft I had seen was a NASA Boeing 747 that had tracked up along the Irish coast at 43,000 feet to just north of Glasgow where it began an orbit over the west coast of Scotland. Curious as to what the NASA aircraft may be doing I searched the aircraft registration (N747NA). It then transpired that this was the flying observatory for NASA's project SOFIA (Stratospheric Observatory for Infrared Astronomy). SOFIA is currently being run in conjunction with the world-renowned *German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt)* during February and March 2021." The link below provides more details.
https://tinyurl.com/2smtj2na

European Private Shortwave Stations

Stand: March 1st 2021

Only legal stations are included. Most stations use 100 to 3,000W of power.
D = Germany, DNK = Denmark, FIN = Finland, NL = Netherlands, NOR = Norway, Irr. = irregular, F.pl.: future plan, min. = minutes, Mo = Monday, Tu = Tuesday, We = Wednesday, Th = Thursday, Fr = Friday, Sa = Saturday, Su = Sunday.

kHz	Country	Name	Transmittersite	Schedule(UTC)
3920	NL	Radio Piepzender	Zwolle	Mainly weekends
3955	D	Radio Channel292	Rohrbach Waal	24/7
3975	D	AM Shortwave Radio	Winsen	Daily 0700-2300
3985	D	Shortwaveservice	Kall-Krekel	Daily 1500-2300
3995	D	HCJB	Weenermoor	24/7
5810	NL	Mike Radio	Heerde	Irr.
5895	NOR	The C/ Radio Northern Star	Bergen	Daily 0429-1358/1359-2310
5920	D	HCJB	Weenermoor	Daily0600-1700
5930	DNK	World Music Radio	Bramming	Daily 0700-1745
5970	DNK	Radio208	Hvidovre	Daily0700-1600
5980	DNK	Radio OZ-Viola	Hillerød	We 2200-2300, Sa-Su 1200-1400
5980	FIN	Scandinavien Weekend Radio	Virrat	1st Saturday of the month
6005	D	Short wave service	Kall-Krekel	Daily 0900-1700
6005	NL	Radio Delta International	Elburg	Irr. Saturdays 2100-0200
6020	NL	Radio Delta International	Elburg	Sa-Su 0900-1300
6070	D	Radio Channel 292	Rohrbach Waal	Mo-Fr 0600-2200, Sa-Su 0500-0300
6085	D	Shortwaveservice	Kall-Krekel	Daily 0800-1700 (Radio MiAmigo)
6115	D	Radio SE-TA2	Hartenstein	Irr. Sa-Su 1000-1200
6140	NL	Radio Onda, Belgium	Borculo, NL	Weekends only
6150	D	Europa24	Datteln	Daily 0700-1600
6160	D	AM Shortwave Radio	Winsen	Daily 0800-1600
6170	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
6200	S	Radio Nord Revival	Ringvalla, Sala	March 7th 0500 *to March 8th 2300
7365	D	HCJB	Weenermoor	Daily 0900-1400
9670	D	Radio Channel 292	Rohrbach Waal	24/7
11690	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
11720	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
15790	DNK	World Music Radio	Randers	Sa-Su 0700-2000
15880	NL	Radio Piepzender	Zwolle	F.pl.
25770	DNK	World Music Radio	Maarslet	F.pl. in A21

This list is compiled by Stig Hartvig Nielsen (**shn@wmr.dk**) each first day of the month – and is based on details supplied by the various radio stations, the stations websites and HFCC registrations. The list is not copyrighted and may be published everywhere.

David Harris
mydogisfinn@gmail.com

David Harris has chosen two very different books for his review this month – a comprehensive account of signals intelligence at GCHQ, and a refreshingly different radio presenter biography.

Secret Signals and a Radio Career Without Debauchery

The Pedantry of Grammarians

This is the first official history of GCHQ and it is written by Canadian academic Prof. John Ferris who was given unprecedented access to GCHQ archives. This book deserves a place on the shelves of any major library or academic institution. For the general reader, the book might be quite a challenge, as it is not a linear history of GCHQ. Instead, the author adopts, at times, a thematic approach. Quite a lot of the title is devoted to the personnel of GCHQ. It is part corporate history, and part political record, of signals intelligence (SIGINT).

SIGINT began in earnest during World War I, when Britain intercepted 70 million cables, 20 million W/T messages and a billion letters. The origins of GCHQ lie in September 1914, when *MIi(b)* and *Room 40* were secret departments formed to tackle the issue of cryptanalysis (code-breaking).

Wireless interception of German traffic began on the Western Front along with the use of field telephones that could intercept leaking German transmissions. SIGINT was a new industry and welcomed women into its ranks, as there were no previous traditions or barriers to overcome. Consequently, many women with language or maths degrees worked on code-breaking.

In 1919 the *Government Code and Cypher School (GC&CS)* was founded out of *MIi(b)* and *Room 40*, with the threefold aim of collecting and deciphering foreign government communication, constructing codes for British use, and training others in the use of codes. In the interwar period, it was quite a small body with around 300 staff, including those involved in radio interception. Cryptographic staff were recruited mainly from Oxbridge, with a preference for those with First-Class degrees. There was no specific 'person specification for a code breaker, but it was suggested that they need the 'pedantry of grammarians, the logic of philosophers and the flair of a chess grandmaster'.

The author contends that World War II 'started by accident' rather than 'by intention', but that Britain responded quickly to the challenge of cracking many Axis codes. The most interesting chapter in the book is Chapter 5 (Bletchley). In its 50 pages, it takes us through some of the ground covered by *Bletchley Park and D-Day* by David Kenyon (*RadioUser,* September 2020: 11).

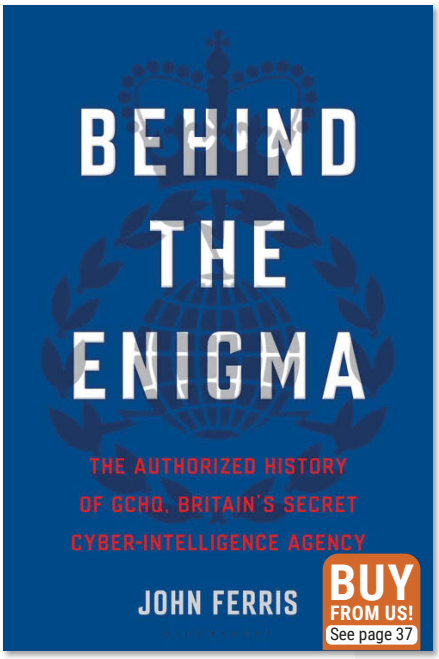
Ferris contends – as does Kenyon by the way – that it was the 'industrialisation' of code-breaking that enabled Bletchley to produce ULTRA SIGINT, rather than the work of a few eccentrics and mavericks. Ferris observes that the job profile of a 'computer scientist was *created* at Bletchley with the building of the *Bombes* (tabulating machines), which were the precursor of the modern computer. He argues that the success in breaking codes was due to several factors, such as mathematical skills, codebreaking, the design of cryptanalysis machines, and the manufacture of the devices. He also makes the point that Bletchley staff were poorly paid, housed in very basic conditions and that much of their work was extremely boring. Ferris contends that, for sure, the Allied victory was aided by SIGINT, but was not dependent upon it.

The post-war chapters are of great interest, as they show how GCHQ rapidly adapted to changing SIGINT technology. Mechanical cryptanalysis, which began at Bletchley in 1940, now gave way to computerised code-breaking from 1955 onwards. Moreover, from the 1970s, satellite interception was a priority, while, from 1992, priorities shifted to the internet.

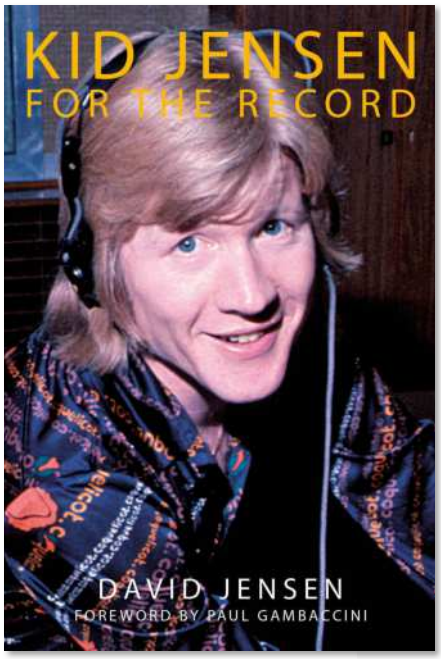
The book also follows the changing political landscape with GCHQ concentrating upon monitoring the USSR, from 1946 up until the end of the Cold War. GCHQ moved to its current headquarters in Cheltenham in the early 1950s and, since the 1960s, has had a purely civilian staff.

The chapter on GCHQ and the Falklands War (1982) is one of the most fascinating, as this was Britain's last Imperial War to defend a colony. The author retells the story of the capture and retaking of the Falklands in considerable detail, emphasising that it was a close-run affair: according to him, Britain could have easily lost the war if the Argentinians had been better prepared – and perhaps a bit luckier.

Overall, this book covers a huge range of



Behind the Enigma. The Authorised History of GCHQ, Britain's Secret Cyber-intelligence Agency
John Ferris. Bloomsbury. 2020. 823 pp. Hbk. £30
ISBN 9781526605467
www.bloomsbury.com



For the Record
David Jensen. Little Wing (Mango) 2020
239 pp. Pbk. £15.
ISBN 9781911273950
www.littlewingbooks.com

activities and events. I think it might have worked better if split into two volumes (corporate and operational). Furthermore, perhaps, an abridged version would, in future, be more accessible to the general public. Nevertheless, this is a huge achievement and Professor Ferris should be congratulated for this book, which will be the standard work on GCHQ for many years to come.

Jensen's Dimensions

David ('Kid') Jensen is well known popular music radio presenter. His autobiography takes us through his radio career, which spans more than 50 years. However, the book begins in a sombre mood, with David talking about how he was diagnosed with Parkinson's Disease and how this has affected his life.

David was born in Canada, where his father was a radio presenter too. He left school at 16 to get his first job in radio at CKOV, Kelowna, British Columbia. David had ambitions beyond small-town Canada and heard about 'Swinging-Sixties' Britain. In 1968 he started sending tapes of himself to foreign broadcasters, including the BBC and Radio Luxembourg. Quite incredibly Luxembourg offered him a job on the strength of that tape, and he sold up to buy an air ticket to London.

He first based himself in London, where programmes were recorded, before being sent to Luxembourg for transmission. This was an exciting time in radio: BBC Radio One had started just recently, but the new station only broadcast during the day. Luxembourg, on the other hand, was the only source of night-time pop music for Britain's music-starved young people.

Consequently, David moved to Luxembourg where he became part of the 208 'Family', working with famous names such as Noel Edmonds, Tony Prince and Paul Burnett. David was the youngest member of the team and was, therefore, given the name 'Kid'. David was a young man, living far from home, but he went to great lengths to stress the very supportive family environment provided by both his colleagues and the station management. Later in the book, he contrasts those days with the ruthless hire and fire policies of commercial radio in recent years.

David spent seven years in Luxembourg. The station, which broadcast on 208 metres MW, had over 3.6 million listeners in the UK. Big names in music came to Luxembourg to promote their albums, and we hear anecdotes about Roxy Music, Al Stewart, David Bowie, and Thin Lizzy. David was given his own free-format show called *Jensen's Dimensions*. He could play bands such as Wishbone Ash and Santana. In the early evening, Luxembourg was a pop station, but it did also have late-night programmes, which played rock music.

In 1974 he met Gudrun, an Icelandic air hostess whom he married in 1977. They have been married for over 43 years and have three children. The strength of David's marriage, and the importance to him of his family, are in marked contrast to virtually every rock music and radio biography I have read. This is not a book chronicling drink, drugs and debauchery, but the story of a family man who also happens to be a dedicated radio presenter and possessed of a genuine love of music.

David was also starting to appear on television in the UK. He was ambitious and yearned to work for the BBC. He was advised to get radio experience in the UK and left Luxembourg to work for commercial station Radio Trent, Nottingham (now Capital Radio). After a year, he finally landed a job with BBC Radio One and also becomes a presenter for the TV show *Top of the Pops (TOTP)*, which attracted around 15 million viewers.

David was at the height of his fame in the UK when he was head-hunted in 1980, to present a news programme on the Turner Broadcasting System network (later to become CNN) in Atlanta, Georgia. He spent 18 months there but missed the world of radio and eventually returned to Radio One. He was always positive about the BBC and how well it treated its presenters. Fortunately, he left the BBC some years before the infamous 'cull' of the early 1990s, which despatched many of the 'old guard', such as Simon Bates, Dave Lee Travis and Johnnie Walker.

Now in his mid-thirties, David did, however, eventually move on from the BBC, and he joined commercial station Capital Radio (then only broadcasting in London). He also presented the prestigious *Network Singles Chart,* which was syndicated to most commercial radio stations in the UK.

In 1998, David moved on from Capital to Heart, but he lost his job in 2002. Since then, he has worked for Capital Gold, The Jazz, Planet Rock. He has just joined Jazz FM for a new series.
https://tinyurl.com/xvb6dc4u

In conclusion, if you are interested in music radio or have ever wondered what it is like to be on the radio then I do commend this well-written, honest book by a genuinely decent man who has given pleasure to millions over 50 years through his radio programmes.

This is, quite simply, the best biography of a radio personality that I have ever read.

Tim Kirby
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TIM KIRBY

2

Push To Talk

In his brand-new column, **Tim Kirby** examines multi-norm CB sets, looks at recent changes for Zello and has some exciting news of radios for Business Radio operators and PMR446 users.

Welcome to *Push To Talk*. I am very excited to have the opportunity to write this column. I hope you will enjoy it too and get involved. The plan is for the column to cover the kind of two-way radio operation you can engage in.

I aim to write about CB Radio, PMR446, Network Radio, as well as simple operation on the amateur bands for those who have achieved an *Amateur Foundation Licence* or higher. Moreover, I wish to highlight the sort of operation you can try out yourselves. I hope that you will share your own experiences through this column.

First, I would like to pay tribute to the authors that have paved the way for this column. CB Radio was covered admirably for many years by Simon Parker, who continues a very successful and informative blog at this URL:
https://simonthewizard.com

Chris Rolinson too wrote a fascinating column about *Network Radio*, which I know inspired some readers to take the plunge and get involved in this aspect of the hobby. I will do my best to follow in all of your footsteps.

For me, there is a magic about communicating by radio – how signals from your radio set can cross a distance, sometimes big and sometimes small, and reach someone else. That's the magic that I would like to help you enjoy; and if you feel the same, perhaps you would like to share it with the readers of the column.

CB Radio has changed beyond recognition since the early 1980s, and it is now possible to operate legally on both AM and SSB on the CEPT (mid-band) allocation. As I am sure you can appreciate, neither I, *RadioUser* magazine or Warners can condone or be seen to encourage any illegal operation on the air. We'll therefore have to assume that any discussion of AM or SSB activity on CB will have taken place in the CEPT segment.

The same would be true on PMR446, where I know some activity is with equipment that does not conform to the appropriate specification, again, we can't encourage you to do this. Happily, within this framework, there is a lot that we look at.

Multi-norm CB

There are a lot of 'multi-norm' CB sets around now. Many of them are almost identical but have different names! These sets have various channel allocations and power levels permitted by different countries programmed into them so that users can select the appropriate configuration for where they are operating.

For example, if you are in the UK, you can legally use the UK 27/81 FM channels and the CEPT (mid-block) channels on AM/FM and SSB. The vast majority of multi-norm sets are AM/FM and do not include SSB.

Mike Devereux of Nevada Radio wrote with news of a new Midland set, the Midland 88 (Fig. 2).

Mike said, *"The Midland 88 is a versatile AM/FM CB radio with a front-mounted speaker suitable for mounting on any surface or in a DIN compartment. It is multiband so capable when travelling of adapting to all the European channels. The transceiver can be powered from either 12V or 24V supplies therefore ideal for both truck and car alike. With all the accessories included in the package, you can fix it to the windscreen or place it on the dashboard. A large TFT colour display enables both channels, S meter and all other functions to be read easily. The supplied microphone allows control of the radio with up/down channel controls and an on/off switch. With a noise blanker and automatic digital squelch, it has all the facilities to allow clear and long-distance communication. The radio is packed with functions such as PA, 4 channel memory storage, Dual Watch facility, Roger Beep and background noise reduction filters. The Midland 88 CB radio is priced at £159.95 and available from UK exclusive distributors NEVADA www.nevadaradio.co.uk or our dealers."*
https://tinyurl.com/29k6wacd

This transceiver is already acquiring a good reputation for its audio quality, particularly on AM.

For me, the ability to listen and use the CEPT channels is a good one, since I am always interested in where signals are coming from. Equally, there are those, like Richard of the excellent *UK CB Radio Servicing* channel on *YouTube*, who are not interested in the CEPT channels, preferring to talk to people locally and viewing the signals arriving from a distance as 'interference'. Either viewpoint is completely valid.

Fortunately, we can use both the CEPT

channels and the UK channels – the UK ones being less prone to interference from elsewhere, so you can choose what you want to do.

Before Christmas, the conditions on the bands were quite interesting, with signals from Brazil and South American being heard quite often on SSB in the late afternoons. There was also some short skip on AM/FM during the day. Here in West Wales, the CEPT band was full of French, German and Italian signals. Since early January though, things have seemed a lot quieter, although there have usually (but not always) been a few weak signals to be heard from South America on SSB. As the Spring approaches, you should start to hear more signals on the CEPT band from around Europe. When conditions are right, you should be able to, if you wish, contact some of the stations on AM or FM, with a standard multi-norm set.

I asked Mike at Nevada what their CB sales had been like, especially in the lockdown and he said that things had been extremely busy. FM sets had been very popular with both 4x4 enthusiasts and clubs as well as farmers. Radio enthusiasts generally opt for SSB equipment. Certainly, the majority of local activity here in rural Pembrokeshire on the 27/81 channels is from farmers, although signals occasionally pop up from other users.

The Anytone AT-500M AM/FM CB radio

I have been trying out one of the Anytone AT-500M AM/FM CB radios (Fig. 1). It works on all the expected CB bands, including the CEPT and UK 27/81 channels. It is a small radio which would probably fit in most cars as well as being easy to pop in the corner of an operating desk. The receiver seems fairly sensitive, and I was able to hear some weak signals on the 27/81 band.

If you are interested in a detailed technical view of the set, you can see Richard Shireby's video which looks at all the adjustments possible on the set (all done through software and the front panel!) on YouTube at this URL: https://youtu.be/bbdTDlWROdU

My only criticism of the set would be that the transmitted audio seems a bit 'thin', albeit acceptable. Maybe a different microphone would help. I also spent some time with the set in the CEPT (mid) band listening on AM on channel 6, the US 'Superbowl' channel. Although conditions were not particularly good, some weak signals from the US were noted in the early afternoon.

NEVADA RADIO

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The transceiver can also be put in an 'export' mode, which, *for licenced amateurs* means that it can be used on both the 10m and 12m amateur bands on both AM/FM with up to 15W on FM and 8W of AM. It is interesting to see that the set covers not only the 10m band but 12m as well. 12m has historically been less served by 'converted' CB radio equipment. The 12m band plan does not allow for FM operation as the band is comparatively narrow. However, it does allow for AM activity, as long as users are conscious of band activity and other users.

If you are an amateur radio foundation (or higher) licence holder, then over the summer months, with a radio such as this and a whip antenna on the car, or a dipole or vertical at home you can have some fun on the 10m FM segment – the calling frequency is 29.600MHz FM. You may hear some repeater outputs above 29.600MHz, the corresponding input is 100khz lower, but there is plenty of simplex activity too. There is also some AM activity, usually based around 29.000MHz, in 10khz channels, which I find particularly enjoyable. 29MHz FM mobile used to be quite common.

Therefore, if you do have a suitable set and antenna, why not give it a go from a local hilltop and see what contacts you can make? With one of the multi-norm sets, you can easily go back onto the CB channels and look for some contacts there as well, making the best of both worlds.

Network Radio

Over on Network Radio, the Zello platform which has been very popular amongst hobbyists was revealed to have been used by insurgents during the attack on the US Capitol on January 6th. Up until that point, Zello had not tried to moderate the content. Since the attacks, Zello has made it more difficult to search across its thousands of channels, so that to find a channel you need to know the exact name and spelling, rather than browse a list.

They have also closed over 2,000 channels suspected of being used by 'insurrectionists'. Use by hobbyists, of course, continues and I was delighted to have an excellent chat with *RadioUser* reader and contributor, Kev, based in Gibraltar, via Zello recently. Barbara, another good friend of *RadioUser*, based in Southeast England, continues to enjoy some excellent conversations on the Zello channels and has recently been experimenting with a Bluetooth microphone. For licenced radio amateurs, the *Echolink* application (Fig. 4) allows access to amateur repeaters, gateways and other stations from both computers and smartphones. A few weeks ago, a newcomer to the hobby, Andy from Shropshire, contacted me with some questions and we had a very enjoyable chat about it all. A few days later, Andy messaged me to say that he had passed his Foundation Licence and had now got a callsign. What struck me as fascinating though, was that whilst Andy was waiting

Fig. 1: The Anytone AT-500M CB transceiver.
Fig. 2: The new Midland M88 CB Radio.
Fig. 3: The Senhaix 1410 ultra-slim transceiver, which can be used for Business Radio or could be programmed for amateur FM use.
Fig. 4: If you have an amateur radio licence, you can use the *Echolink* application on your smartphone to connect to, and speak through, repeaters, near and far.

MOONRAKER

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for his radio equipment to arrive, following the arrival of his licence, he had already registered on the *Echolink* system and was already making some contacts around the world and thoroughly enjoying learning more about the hobby. Similarly, you could do this if you have an amateur licence, but no equipment!

Business Radio and PMR446

I asked Chris Taylor at Moonraker UK Ltd what new sets he had which might be of interest (e.g. Fig. 3).

For business users, who have an OFCOM business licence, there are the following radios:

- Two new Senhaix programmable 400-470MHz transceivers,
- An ultra-slim 16 channel version, the Senhaix 1410 at £29.99
- A larger, but waterproof model at £49.99

https://tinyurl.com/c89peu2k
https://tinyurl.com/7fnmdcrm

If you are a business needing a radio channel, licences start at £75 for 5 years, so costs need not be prohibitive.

For PMR446, Chris also mentioned some nice new Uniden handheld sets, complete with a base-charger, which have been added to stock.

https://tinyurl.com/46uxczpy

The application form for an OFCOM Business License can be found here:

https://tinyurl.com/jnz3a2fv

Over to you

It would be great to hear from readers to see what contacts they have been making. I am also keen to publicise any regular 'nets' (on-air get-togethers) you may be involved in and will happily include reports from organisers from any CB, PMR446 or amateur radio activity sessions on air.

Hopefully, by including the details of your activity periods in *RadioUser*, you may inspire more people to listen out for you or join you on air.

I am looking forward to hearing from you – photos are always very welcome – maybe of your favourite two-radio or your operating bench?

TIM KIRBY

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Radio News

GEO NEWSLETTER: The March PDF of the GEO Newsletter weather satellite publication produced by the *Group for Earth Observation (GEO)* is now available for free download. The *Group for Earth Observation's* aim is to enable amateur reception of weather and earth imaging satellites that are in orbit or planned for launch shortly. Membership of *GEO* is free. This edition features: (1) A tribute to Francis Bell G7CND, who passed away early in January; (2) Two articles about Iceberg A69a, covering its 3-year journey and encounter with South Georgia; (3) An introduction to 'NASA Worldview Snapshots', which provides imagery from NOAA 20; (4) Plus features on the Strait of Hormuz, Lake Turkana, and the SOHO solar observatory.
(SOURCE: *ICQ Amateur | Ham Radio Podcast*)
https://tinyurl.com/36j3r4c9

GREEK REVOLUTION SPECIAL EVENTS STATION : In 2021, Greece is celebrating the bicentennial of the 1821 Greek Revolution, following 400 years of occupation by the Ottoman Turks. The Greek Revolution of 1821 is a key chapter in Greek history as well as a piece in the puzzle of world history. Additionally to the projects and events that are officially planned and organized in Greece and globally by state and private organizations, Greek radio amateurs will be active throughout 2021 with the following special call signs: Radio amateurs with a license of Class 1 will use the prefix SX200, followed by the suffix of their home call sign, e.g. SV1XXX will operate as SX200XXX. Radio amateurs with a license of Introductory Level will use the prefix SY200, followed by the suffix of their home call sign, e.g. SY1XXX will operate as SY200XXX (Please take into consideration that there are restrictions of this license re. frequencies and modes). Club stations will use the prefix SZ200, followed by the suffix of their home call sign; for example, SZ1XXX will operate as SZ200XXX
(SOURCE: Colin Butler, *ICQ Amateur / Ham Radio Podcast*, February-March 2021)
www.greece2021.gr
https://tinyurl.com/58m8gpg4

DX MAGAZINE 2 | 2021: The new edition of the *DX Magazine*, of the *World Wide DX Club*, is now available for download. It features plenty of loggings and articles, for example on the history of German Radio.
(SOURCE: WWDXC, via Chrissy Brand)
https://www.wwdxc.de

Radio News

RADIO LISTENING UP IN LOCKDOWN: New research commissioned by *Radiocentre* shows that almost 8m adults working from home listen to commercial radio every day to help accompany their working day. The research, by DRG, also shows how those working from home have saved money in the last year, have big spending plans and will seek to continue working from home once the restrictions are lifted. This new *Radiocentre* research, called *New Ways of Working, New Ways of Connecting*, is the industry body's fifth listener study since the pandemic started and explores how commercial radio can help advertisers connect to 56% of the total full time working from home audience. The research, which was in the field in February, looked at the financial status of the working-from-home audience, as well as their shopping habits and spending intentions. It discovered all those now working from home full-time are predominately (83%) aged between 25 and 54. They are in a range of different jobs with 50% of them coming from sectors such as finance, IT, healthcare and government. Although they are based all around

the UK there is a higher concentration of home working in London and the South East. 84% of them are ABC1, and two-thirds of this audience also own their home. They have high incomes, with a household income, on average, 45% greater than the national average. (SOURCE: *Radiocentre, RadioToday*, National Press)

https://tinyurl.com/4untkjf4

YEAR OF THE OX QSL: Radio Free Asia (RFA) announces its latest QSL card commemorating 2021 as the *Year of the Ox* according to the Chinese astrology calendar. People born in Ox years are considered kind, caring, logical, positive, having a great deal of common sense, and are living with their feet firmly planted on the ground. They are also considered to be hard workers in order to provide comfort and security for their families, while also highly intelligent and strong-minded. The ox is one of 12 animals used in the Chinese Zodiac; the others are tiger, rabbit, dragon, snake, horse, goat, monkey, rooster, dog, pig, and rat. This QSL card confirms all valid reception reports from 1st January to 30th April, 2021. The design was created by RFA's Brian Powell – Created by Congress in 1994 and incorporated in 1996, RFA broadcasts in Burmese, Cantonese, Khmer, Korean to North Korea, Lao, Mandarin Chinese, Vietnamese, Tibetan (including Uke, Amdo, and Kham dialects), and Uyghur. RFA strives for accuracy, balance, and fairness in our editorial content. As a 'surrogate' broadcaster, RFA provides news and commentary specific to each of our target countries, acting as the free press these countries lack. RFA broadcasts only in local languages and dialects, and most of our broadcasts comprise news of specific local interest. More information about RFA, including the current broadcast frequency schedule, is available at this website:

www.rfa.org

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1

The ELAD FDM-S3 Direct Sampling Wideband Receiver

Clint Gouveia has had the opportunity to take a closer look at the feverishly-anticipated new ELAD FDM S-3 Software-Defined Receiver. In the following, he shares his findings on this exciting new radio.

When I got back into DXing in 2015, the first radio I purchased was a Tecsun PL-360. My choice then was firmly based on *price*. After all, I had no idea whether this second foray into radio would last, and it had been about 20 years since I last 'tuned the bands'.

A couple of months later, I realised I was here to stay in the hobby and so I purchased my first 'proper' rig – a Yaesu FRG-8800. This choice was based on *emotion* – it was the radio I had always wanted as a kid.

Finally, after about 6 months, I bought a transceiver based on *performance*: the ELAD FDM DUO.

At the time I was into medium wave DXing and had learned from others that the best way to DX on this band was to 'fish with a net', rather than a single hook.

The trick was to record the whole band and analyse it retrospectively.

This concept was a game-changer. More than 1,000 transatlantic copies later, there's a new ELAD SDR in town; the much-anticipated FDM-S3. To my mind, the S3 has two barriers to overcome: firstly a clear performance delta over and above the much-loved FDM DUO and *FDM-S2*; and secondly, a highly competitive SDR market at various prices and performance levels.

Mind-Boggling Specifications

The FDM-S3 is a 16-bit direct sampling (variable at 122.88MHz or 98.304MHz) SDR receiver, with an RX range of 9kHz to 108MHz. Rather amazingly, it supports spectrum acquisitions from 192KHz up to 12 or 24 MHz in bandwidth.

There are 8 slots for optional preselection filters. The radio's particular TCXO version has a temperature compensated oscillator, offering very good frequency stability while minimizing energy consumption.

The FDM-S3 is also fitted with a Reference Clock Manager. This feature allows the user to 'toggle' between the internal TCXO / OCXO or between two reference clocks.

The review unit, kindly supplied by ML&S, came with a Global Navigation Satellite System Disciplined Oscillator (GNSS-DO) and a suitable aerial on a length of wire for easy siting near a window.

Alternatively, an external signal supplied at the standard value of 10MHz can be used via a port on the rear of the unit.

All of the above contribute to superb levels of stability, allowing new DX methods such as 'Millihertzing' where an entire band can be recorded, with signals tracked for up to 24 hours to an accuracy of less than 1Hz.

What this means to your average DXer, who probably constitute 90% of the potential market for this SDR remains to be seen. However, this is new territory in absolute stability performance for a 'hobby grade' SDR.

In terms of sensitivity, a figure of -122 dBm for CW on HF & 50MHz has been quoted, whilst the minimum detectable signal (MDS) on 14MHz/50MHz/91KHz will be around -130 dBm.

The figure for Wide FM is quoted as 0.7 uV at 91.1MHz. With all of these figures, various conditions and settings apply, but you get the picture; a very sensitive receiver with very low internal noise indeed.

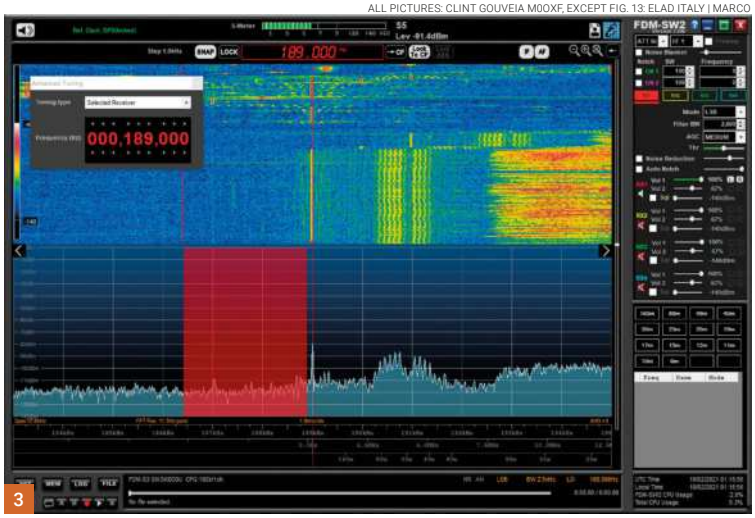
Unboxing and First Impressions

The unbranded cardboard box contained several peripherals, including the USB-3 control cable, SMA-to-BNC adaptors, a USB dongle containing various documents, including the user manual, and a single power pole cable-set. As I removed the SDR from the plastic bag it was immediately obvious that this was a heavy receiver (2.15kg) – heavier than my FDM DUO or other SDRplay receivers.

It is also larger than any SDR I have owned, and the quality of the construction and materials used was very obvious from the start. Even the power switch on the front fascia was much better than the switch on the back of my DUO. It did strike me as a *professional* piece of kit.

There are indicators only on the front panel – no knobs: Bias 1 & 2 and for the Clock

ALL PICTURES: CLINT GOUVEIA M0OXF, EXCEPT FIG. 13: ELAD ITALY | MARCO



control; GNSS/external/internal lock (Fig. 1).

On the rear panel (Fig. 2) you will find six SMA sockets: RF in and out, GNSS antenna, HF 1 & 2 antennas and VHF antenna. It is a very nice touch by ELAD to include 3 SMA to BNC adaptors.

On First Power-Up

In preparation for this review, I updated the *FDM-SW2* software on the 2 Lenovo laptops I use with the FDM DUO and a third – a Microsoft Surface Book which is only a few months old. All three computers are running the latest version of Windows 10 with all updates loaded. In the first instance, I updated to the latest, supported version of *FDM-SW2 - version 3.47*.

Upon USB connection of the FDM-S3, the usual loading of drivers etc. seemed to be occurring. However, after about 30 seconds I was presented with the message: '*Unknown USB Device*' (*Device Descriptor Request Failed)*. I experienced the same problem with all three of my laptops, all of which are well within the required specification. In the end, I contacted Vianney at ELAD Support. He was extremely helpful in making suggestions to resolve the issue, including reloading the driver. I then managed to get the S3 to reliably talk to my Microsoft Surface Book and Lenovo U31.

Finally, using a PSU and with the GNSS antenna connected to the S3 and placed on a window sill, it only took a few seconds for the *Clock*, *Gnss* [sic], and *Lock* LEDs to illuminate – I was in business.

Sensitivity and Selectivity – Ground-Breaking on Long Wave

All of my LW/MW/SW reception tests were carried out with a Wellbrook ALA1530 active magnetic loop.

Often considered the gold standard for compact antenna DX applications, its broadband response is perfect for testing from below longwave, through the medium wave band and into HF.

Fig.1: ELAD FDM S-3: The well-designed front panel. Fig. 2: ELAD FDM S-3: Functional rear panel. Fig. 3: Gufuskálar, on 189kHz. Fig. 4: Monitoring three transmitters from Mongolia. Fig. 5: Mongolia; a carrier on 209 kHz. Fig. 6: RBU Time Signal from the Taldom transmitter on 66.667 kHz Fig. 7: VOCM in Newfoundland and Labrador, on 590kHz.

For VHF I used a simple whip antenna.

I started on long wave for a number of reasons. Firstly, I have used a large number of SDRs over the years.

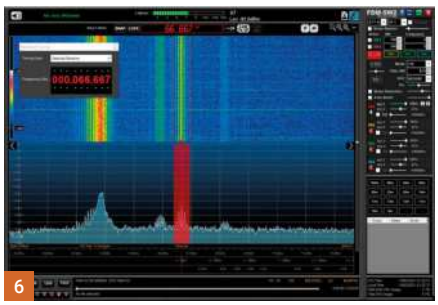
Whereas many have been excellent, I have at times found sensitivity and IM signals at lower frequencies to be an issue. The Icelandic signals on 189 and 207kHz, for example, are often weak and suffer from severe adjacent splatter from BBC Radio 4 on 198kHz. Thus, they present an excellent opportunity to calibrate sensitivity and selectivity.

The other reason was to search for what many consider the Holy Grail of DXing; a signal from Mongolia on long wave.

Tuning to 189 kHz, I copied the arguably more difficult 100kW signal from Gufuskálar on the Eastern seaboard of Iceland. The audio was fully discernible in LSB mode, avoiding the splatter from BBC Radio 4 very effectively. Signal strength was peaking around S7, which is what I would have expected from a very good receiver (Fig. 3).

Turning to Mongolia, I was able to monitor their 3 transmitter frequencies (164, 209 and 227 kHz) simultaneously using the 'virtual receiver' option within the *FDM SW2* software (Fig. 4).

Monitoring these frequencies for a short



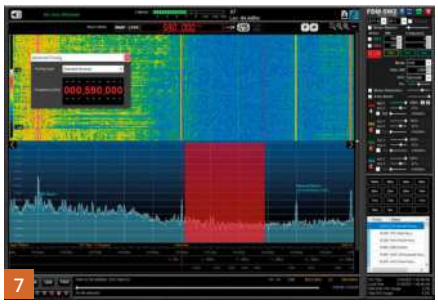


Fig. 8: Voice of Korea on 12015kHz from the DPRK. Fig. 9: Radio New Zealand International on 6115kHz. Fig. 10: The RDS decoder built-in to the *FDM-SW2* software. Fig. 11: Radio France International on DRM, 3965kHz.

while, I observed a Mongolian carrier on 209 kHz, but without audio (Fig. 5). This is an excellent result: It took me three years of monitoring before I finally observed a carrier from Mongolia on LW, and 5 years before I finally copied any audio.

For a final test on this band, I tuned to the RBU Time Signal from the Taldom transmitter, north of Moscow, Russia, which is actually below the longwave band on 66.667 kHz (Fig. 6).

This is another difficult signal to copy and with the S3 the signal was around S7 using CW modulation.

Overall, this is a brilliant result on long wave.

DX Performance on Medium Wave

For medium wave, I decided to test the sensitivity and selectivity of the FDM-S3 against a receiver that I know very well and one which I regard as one of the best SDRs to-date; the ELAD FDM DUO.

Using the same antenna – the Wellbrook ALA1530, via an antenna switch I was able to compare signals of both receivers in real-time.

SDRs are, for obvious reasons, very popular with medium wave DXers.

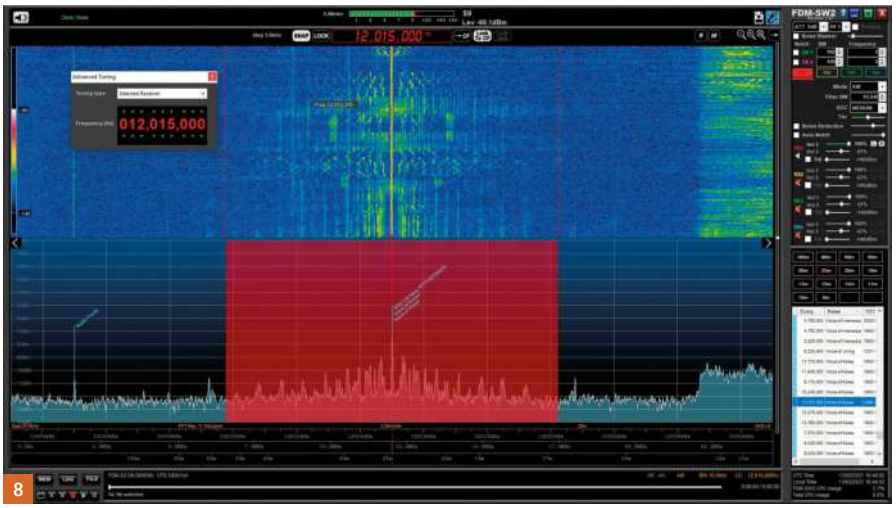
The ability to record the entire band and analyse the signals retrospectively is an enormous advantage of course, but even more fundamental is the ability to visualise the signal you are trying to copy and apply an almost infinite combination of filtering and signal conditioning options.

I started by tuning to 590kHz VOCM in Newfoundland and Labrador. This station is always one of the very strongest transatlantic stations and there it was, with excellent audio at S8 (Fig. 7).

I then tuned around the medium wave band, logging various stations and recording their signal strength.

The choice of AM versus SSB and audio filter bandwidth was based on optimising the quality of the recovered audio and rejection of adjacent channel noise.

As you can see from Table 1, there is little discernible difference in sensitivity between the FDM-S3 and the FDM DUO. The FDM DUO remains a superb marker against which to compare the sensitivity of the FDM-S3 on the medium wave band.



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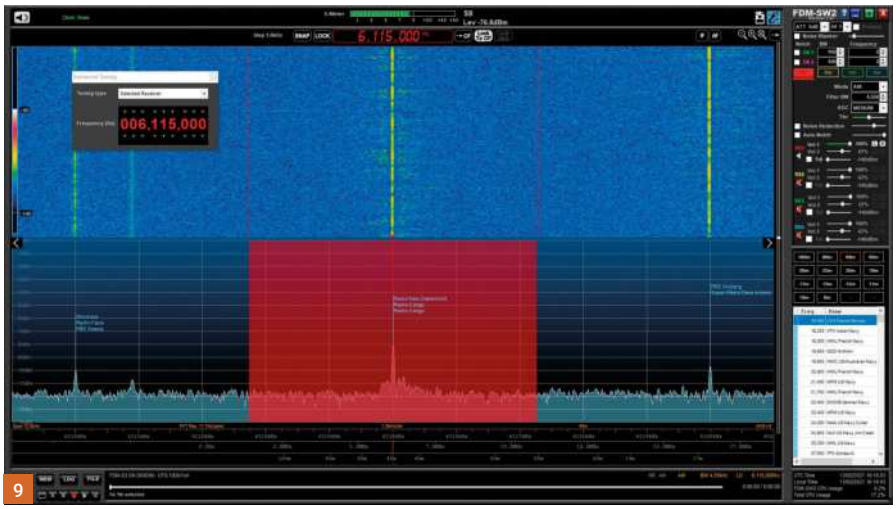

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Short Wave – By Day and Night

On short wave, as before (see above) the choice of SSB versus AM or ECSS was based on maximising recovered audio and rejection of adjacent noise.

I deliberately chose weak signals as targets to really push the FDM-S3 for sensitivity; the table below details some of those stations copied, all of which – except, perhaps, the CHU time signal from Ottawa – are often very difficult indeed to copy from Europe.

This is simply a fantastic result for the FDM-S3.

In addition to this, I spent some time with the S3 during the day. Notable signals recorded during daylight hours included The Voice of Korea on 12015 kHz from the DPRK (Fig. 8). This was heard at S9+5. Moreover, Radio New Zealand International on 6115kHz came in at around S9 (Fig. 9).

Table 2 illustrates the excellent performance of the ELAD FDM S-3 on Short Wave.

The conclusion here is very clear: The FDM-S3 is simply a superb SDR that is capable of delivering even the most difficult DX, in a suburban environment, using just a magnetic loop.

Other Reception Modes and Decoding Options

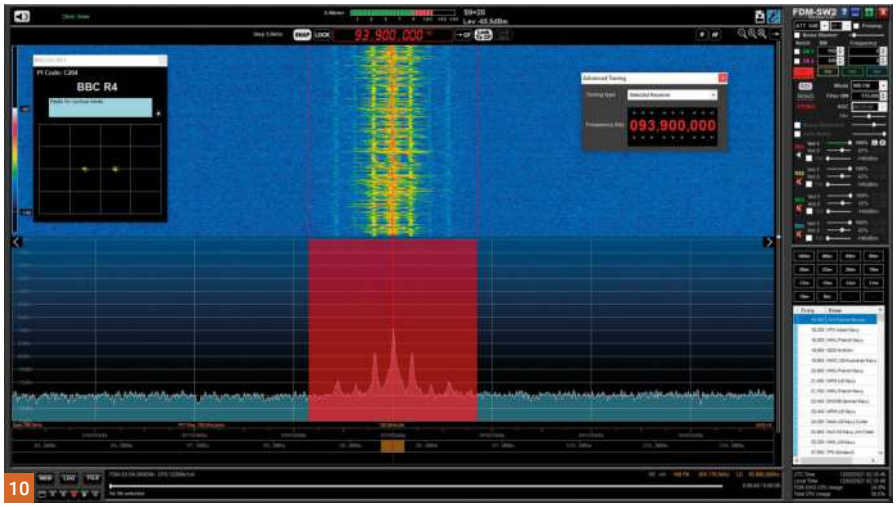
On the FM broadcast band, I was able to utilize the RDS decoder built-in to the FDM-SW2 software. It worked perfectly on all strong signals (Fig. 10).

The integrated DRM decoder also works very well, except where signals were particularly weak.

The Radio France International DRM signal on 3965 kHz was copied on the FDM S3 with a signal-to-noise figure reported at about 19.5 dB from the software algorithm (Fig. 11).

I was able to successfully decode both RTTY and NAVTEX signals using the FDM-S3. The *FDM-SW2* software allows the user to route the audio out of the program and into another using a virtual audio cable.

This is quite simple to install and even



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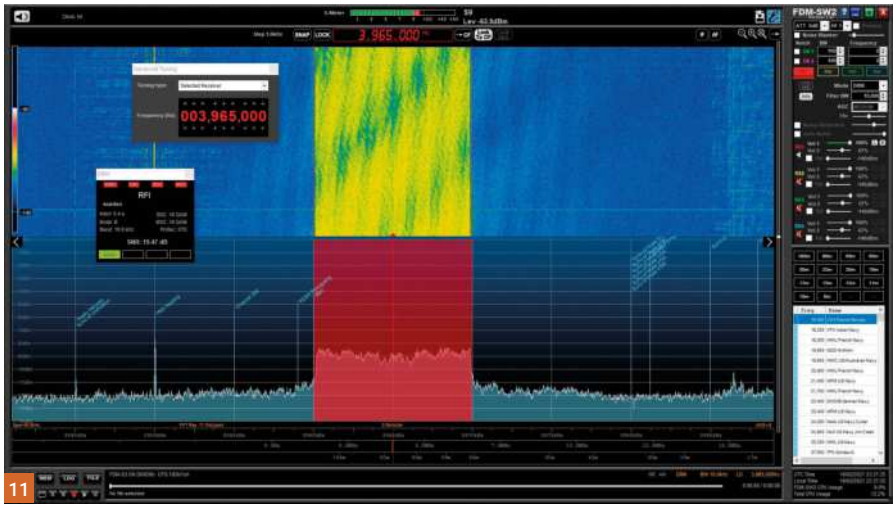

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simpler to utilise from within the FDM-SW2 settings menu. I was using the *MultiPSK* software, which is freeware and had no issues at all.

This particular piece of software measures and displays the signal-to-noise value for whatever signal you are receiving, and I found that with a signal strength of around 1 dB, the decode would commence, reliably.

It was interesting to note that for both RTTY and NAVTEX, the *FDM SW2* software works best if you de-tune by about 1kHz and employ USB (Fig. 12).

Filtering and Noise Suppression

The FDM-SW2 software has a myriad of signal conditioning options and settings that are way beyond the scope of this review. However, some very notable features must be mentioned.

Firstly, the notch filters are superb and rejected even severe adjacent noise, harmonics. The software allows you to set the variables yourself – the ultimate in flexibility. The ACG is also flexible, but for very weak signals I found it desirable for it to be switched off completely and the gain set manually.

The reason for this was to protect the quality of any weak modulation/audio, which will be adversely affected by engaging the AGC.

This is true of the FDM DUO and presumably other ELAD devices. Of course, at higher signal strengths, it works exactly as is necessary.

Next, the built-in noise blanker is outstanding. Even when electrical noise is present at around -120 dBm, engaging the blanker was extremely effective in removing all artefacts.

The audio filter bandwidth setting is supremely flexible. You can set AM, SSB and FM from zero to 24 kHz and WFM up to 192 kHz or anywhere in between. The noise reduction control is via a slider that can be toggled on and off.

I found this to be of limited use when DXing, for the same reason as keeping the ACG off – it affects the quality of recovered audio in a way that is detrimental to very weak signals. However, for general listening etc. it works very well indeed.

Recording Spectrum and other Functions

The recording of entire bands with *FDM-SW2* has been possible for many years; however, with the FDM-S3, it is now possible to record a spectrum of 12 (or even 24) MHz in width.

This is simply an amazing feat of radio engineering.

Coupled with excellent clock accuracy, DXers are now able to *track and record signals over 24 hours or more to accuracies of around 1Hz*. You can now, for example, follow a transatlantic MW signal over a day and then graphically represent how their signal appears in the evening and then disappears in the morning.

Recording datasets such as this can require some Terabytes of storage and this new application might not always be a priority for the average DXer.

However, I know first-hand that those on the cutting edge of the hobby are very excited by this development, only made possible by a receiver capable of such stability and bandwidth.

Given a 24MHz bandwidth recording facility means that signals must be analysed manually and in retrospect. Zooming into such a spectrum to a bandwidth of 192kHz, for example, results in a significant loss of graphic (but not audio) detail. I should point out however that this is a small point of detail in what is a fantastic new opportunity to make such wide-band recordings.

Bear in mind that the 'OCXO' and 'TCXO' are two purchase options: the TCXO option entails lower frequency stability, while the OCXO alternative offers higher frequency stability. However, both can be disciplined by GNSS. The internal clock (TCXO or OCXO) can also be locked to an external reference providing 10MHz, instead of GNSS. Users can also use the *u-blox* utility to monitor GNSS satellites (Fig. 13).

Last but not least, remember that the 88-108FM broadcast band can be recorded in its entirety.

Conclusions

The FDM S3 is a very fine receiver indeed. There is no doubt that it is one of the very best available SDRs on the market right now and certainly *the best* in terms of long-term stability and bandwidth.

It comes at a price, which is commensurate with its performance.

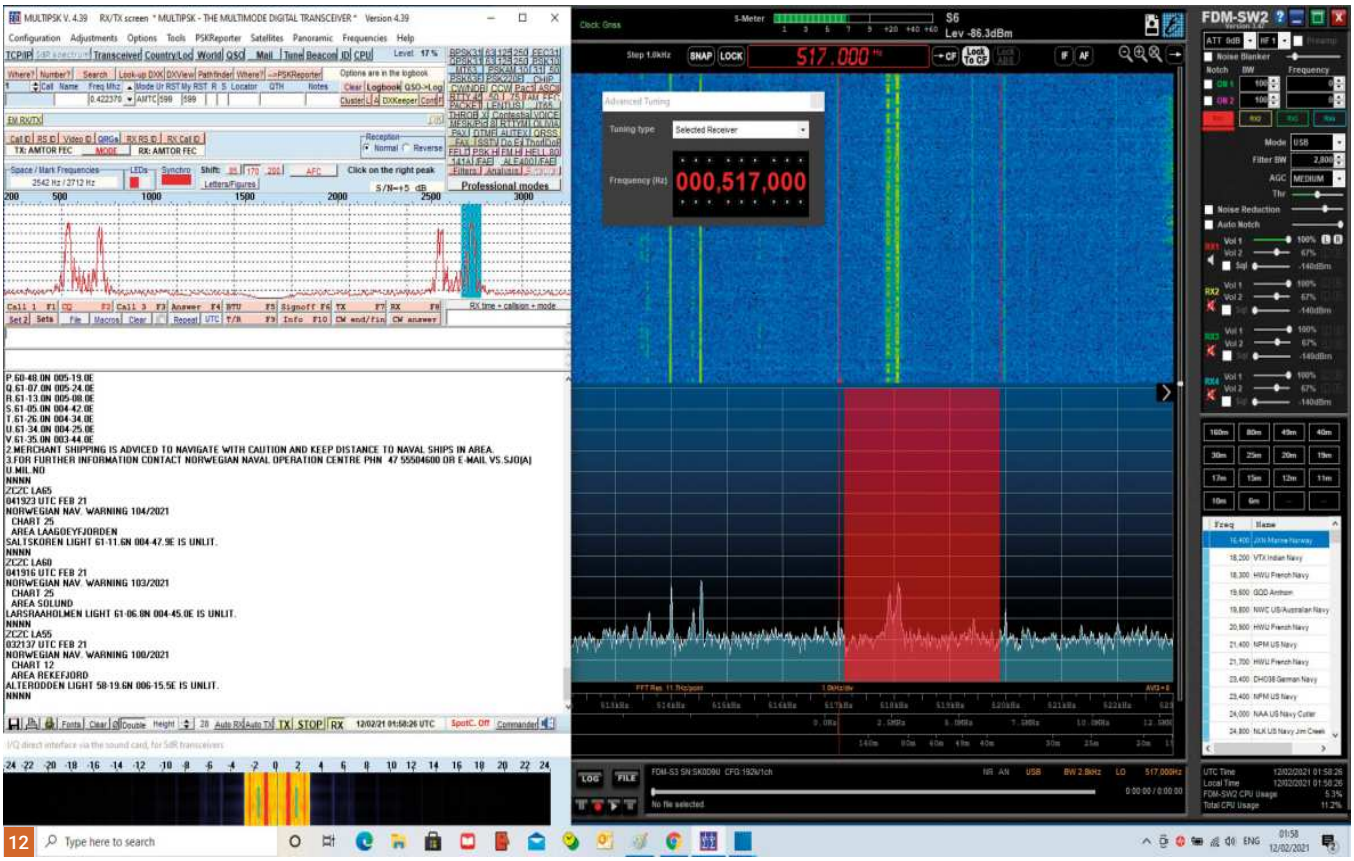


Fig. 12: NAVTEX decode on 517kHz. Fig. 13: The full FM Band | GNSS Satellite Tracking.

I feel that, to some extent, the FDM-S3 occupies the same space in the SDR market as the FDM DUO:

A top-end receiver with features and benefits that extend beyond most other 'black-box' type SDRs.

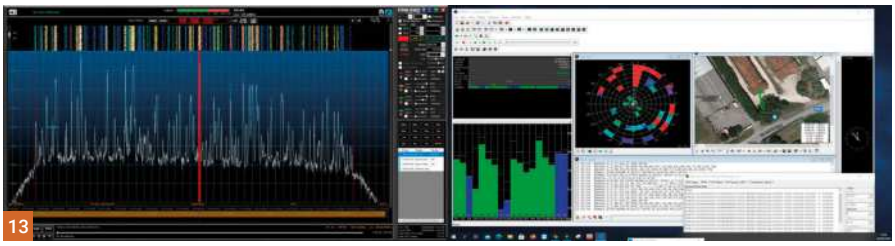
However, given the DUO remains one of the most popular SDRs after several years, there is absolutely no reason to believe that the FDM-S3 will not do equally as well, or better, given that it is, in a holistic sense, *superior* to the DUO.

I hope the FDM-S3 will do very well. The features and performance it packs today, albeit at a higher price, will eventually filter-down into the cheaper, more value-driven SDR products.

But for now, all I can say is bravo to ELAD for having the vision and engineering excellence to produce an SDR that is, in a technical sense, a work of art.

[Thanks to Marco at ELAD for some additional information provided; and warm thanks to **ML&S Martin Lynch and Sons Ltd**., *for the loan of the review unit – **Ed**.].*

https://www.hamradio.co.uk



Station	Frequency/ kHz	FDM S3 mode/signal	FDM DUO mode/signal
Newstalk Toronto 1010	1010	USB/S8	USB/S8
Bloomberg Radio New York	1130	AM/S9+5	AM/S9+
Harbour Light of the Windwards, Grenada	1400	AM/S9	AM/S9
WGIT Puerto Rico	1660	LSB/S6	LSB/S6
China Radio	1377	AM/S8	AM/S9

Table 1: The ELAD FDM S-3 / ELAD FDM DUO on Medium Wave.

Station	Frequency/ kHz	FDM S3 mode/signal	FDM DUO mode/signal
XEPPM Radio Educación, Mexico City	6185	ECSS/S7	ECSS/S7
Radio Mosoj Chaski, Bolivia	3310	AM/S6	AM/S6
Rádio Clube do Pará, Brazil	4885	AM/S7	AM/S7
Radio Voz Missionaria, Brazil	5939.41	USB/S6	USB/S6
Radio San Antonio, Peru	4940	AM/S5	AM/S6
CHU time signal, Ottawa Canada	3330	USB/S6	USB/S5

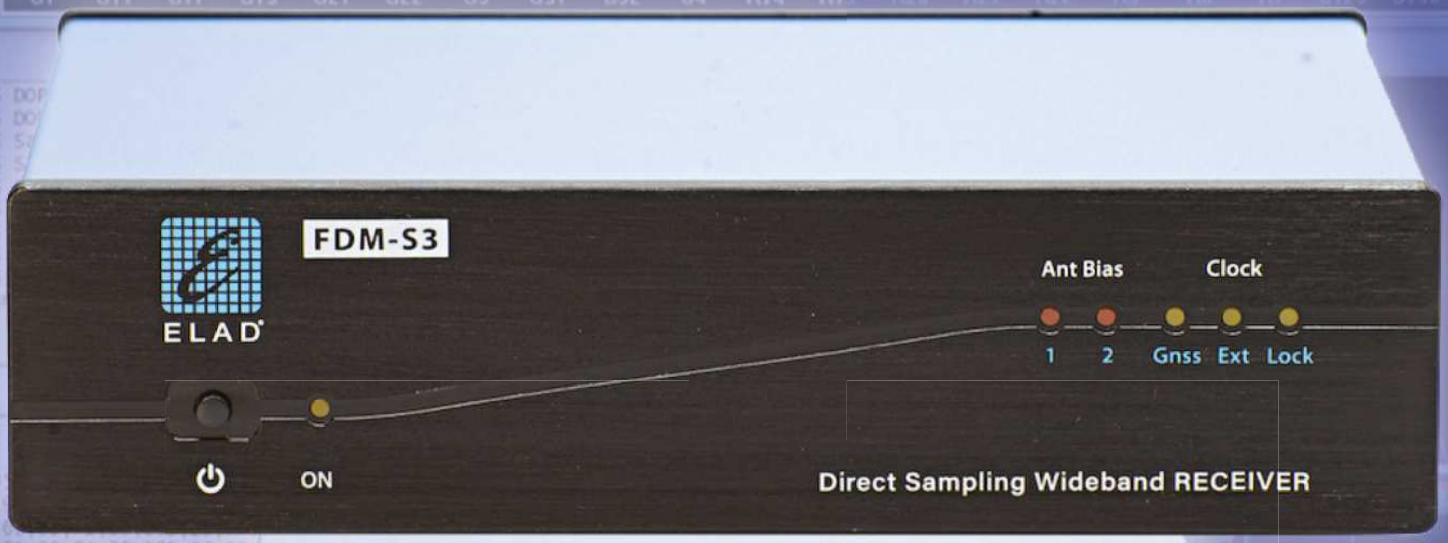
Table 2: Short Wave Performance with the ELAD FDM S-3 / ELAD FDM DUO.

ELAD FDM-S3 SDR Radio

The **ELAD FDM-S3** is a 16bit state of the art Software Defined Radio, for radio enthusiasts, shortwave listeners and radio hobbyists and test labs. The S3 contains several exciting options. It will allow for reception of up to 24MHz of bandwidth across the frequency range of 9kHz to 108MHz as standard. (Extended range from 9kHz- 2GHz will be available later in the year with an optional internal downconverter.)

Oscillator features:

- Standard Oscillator version with TCXO 0.1ppm lockable to GPS (included) need only GPS antenna
- Optional Oscillator OCXO with less phase noise and accuracy lockable to GPS. Includes GPS Antenna.
- Can be used with ELAD's famous SW-2 software or third-party software, like SDR-Console from Simon Brown.
- Bias-T power on two of the three antenna ports, one for HF and one for VHF to enable items like powered LNA/Filters
- Connects to PC via USB3.0 cable (supplied) and GPS can also be interrogated via UBlox software.



"Game-Changer & Technical Work of Art"

"The FDM-S3 is a very fine receiver indeed. There is no doubt that it is one of the very best available SDRs on the market right now and certainly ***the best*** in terms of long-term stability and bandwidth."

Says Clint M0OXF in this issue.

ELAD

ELAD FDM-S3 SDR Radio

TCXO version without GNSS Antenna £949.95
TCXO version with GNSS Antenna.....£969.95
OCXO version with GNSS Antenna.....£1169.95

www.HamRadio.co.uk/elad

News Extra

Have you got something to tell our readers about? If so, then drop a line to **wiessala@hotmail.com**

The Story of RadioGeeks

Tom Morris, GM3HNN introduces his business, RadioGeeks, looking at how it all began, introducing his ever-popular Air Antennas, and outlining some of his ideas and plans.

Hello there, I would like to thank all at *RadioUser* magazine, for giving readers an insight into the creation of *RadioGeeks UK*. Like most of you, my interest in radio started at a very early age – seven years old to be precise. My granny, who used to look after me, one day let me see an old valve radio set, that was stuck in a cupboard, behind her three-channel push-button black & white TV from *Radio Rentals*!

I asked Granny, what this piece of 'furniture' this was, and she happily informed me this was a radio, for listening to stations all over the world. *"All over the world?"* I said' I couldn't quite grasp this, after all, I was only seven, but I still found it all a little confusing. Granny explained to me that the words written on the dial, were the countries, that the radio could sometimes tune into. Once again, a look of disbelief came across my young face. She pointed to the dial and said, "this says Moscow, this says Paris, this one says Oslo!" Before she could rhyme out anymore, I said, *"let me hear this!"*.

She obliged me by plugging it in and informed me that it required three to four minutes to 'warm up'.

Thinking back to that time – and much later in life – my first experience of valves lighting up was such a joy.

Anyway, the rest is history. The radio in question was a DAC90A, I have attached a

picture of the actual set, it takes pride in 'Tom's Personal Vintage Radio Collection' now.

So many years passed; I did the normal 'CB thing' in the mid-1970s, moved to SSB, then realised, I needed something a bit better. This led to my Ham radio interest. I joined a local SWL club and found out that I could study for the then 'RAE' at the Nautical College in Glasgow.

After this, I was all set, for two days a week. I then tried, and failed several times, on my Morse, to get to the 12wpm goal – I could not for the life of me, get past 8wpm!

However, somehow, eventually, I got it, and what a proud guy I was then.

I was still in my teens, and the 'usual distractions' kicked in, girlfriends, work, and eventually tying the knot with my wife when I was 19 years old (I am still with her); yes, this was very young, but I wouldn't change anything in the past. However, I moved away from everything radio related, for 25 years, yes, did not pick up a microphone or a straight key, until many years later – 2014 to be exact.

So in those 25 years, I worked for Apple, Tiny & Time computers, as a European sales manager, travelling all over the globe. I was based in London & Brighton, for over 25 years, only visiting the Motherland in Scotland, on the odd birthday or Christmas break. My current day-job for the last 15 years, has been as a global sales director for a company that manufactures and develops antennas for various sectors, for example, automotive, smart metering, GPS tracking, and so on.

On my return to Scotland, (we purchased a house in Prestwick Ayrshire), I happened to stumble across the *Ayrshire Amateur Radio Group*, on a Prestwick Gala Day. I think it would have been in August, they were, and still very much are, a very jovial, welcoming, bunch, with many members, actively supporting Ham radio, for 50 years and more – so I joined the club.

In this way, I was slowly re-catching the 'radio bug'. I found myself using my acquired antenna-building skills, to develop some antennas for the Ham bands. This led to the *Air Antennas* being developed, an inflatable antenna range, for Ham, Search & Rescue, and Military Airband listening.

The latter is still very much a growing business, I develop these for customers all over the globe.

For the Los Angeles Amateur Radio Emergency Services, for instance, I developed dual inflatable antennas for the Ham bands and GMRS/FRS – a bit like our PMR466 band.

I supplied them with these, and I am currently working with Search & Rescue customers in the USA, Australia & Canada, in the context of delivering similar antennas.

Our Ham V2 Dual-band 2m/70cm inflatable antenna, is still a 'best-seller': Tim Kirby, our good friend and well-known contributor to both *RadioUser* and *Practical Wireless*, will be reviewing it for the April 2021 edition.

[We reviewed the 'Black Knight' *Air Antenna in RadioUser, August 2020: 24 –* ***Ed****.]*.

So back to *RadioGeeks*; having long been a customer of (the now long-gone) *Jaycee Electronics*, I thought about why there was no Ham radio distributor in Scotland? There followed a few conversations between me and Yaesu UK; and *"the rest"*, as they say, *"is history"*.

As well as Yaesu, we are approved distributors for Standard Horizon, Cobra Marine, Nagoya, and our very own Air Antennas. We will be adding Hytera APEX Radios soon, and a few others, which I need to keep quiet about for the moment; but watch this space.

While it was started, very much as a hobby project, *RadioGeeks* has now taken off, at great speed. Our plans to maintain and develop many new products will come true in due course.

I would like to thank everyone who has supported us and is continuing to support, 'the new kid on the block', as it were. We also have a full *UK-wide Service & Repair Department*, run expertly well, by Gavin Nesbitt, MM1BXF. Gavin's experience and knowledge of radio are simply quite superb, it has to be said.

You can find more about *RadioGeeks*, from our Live Twitter Feed or the website

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The Birth of Tuning, Graphic Design, and Amateur TV

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Garry Smith
Garry405625.gs@gmail.com

In their newly-expanded monthly column, Keith Hamer and Garry Smith unearth vintage advertisements for wireless equipment, introduce amateur and satellite television and look at the role of graphic design for TV.

In our March 2021 column (*RadioUser*, March 2021: 30-31), we mentioned that, as early as 1889, Professor Oliver Lodge (1851-1940, Fig. 1) had invented his first *coherer*, or *tuner*, in which he used two metal spheres separated only by a minute air-gap to detect 'Hertzian Waves'. Lodge thus foreshadowed the principles of tuning circuits to respond to the desired frequency by his famous *Syntonic Jars* experiment. It was not until 1897 that he took out a patent based on this earlier work, in which he stated the fundamental principles of *tuning*, which were incorporated into every broadcast receiver manufactured in the early 1920s.

At around the same time, both Oliver Lodge and Guglielmo Marconi (1874-1937) were using metal cones and cylinders in place of the *aerial* and *earth* as they became known in the 1920s. In succeeding years, various other forms of *aerial* were used too.

From 1897 onwards, Marconi set up many long-distance records, culminating in sending signals across the Atlantic from Poldhu in Cornwall to St. John's, Newfoundland, at a distance of 1,800 miles. At the receiving station in Newfoundland, Marconi used as an aerial a single wire which was held aloft by kites, and as a detector, a mercury type of coherer, then in use by the Italian Navy.

On a slightly different topic, it is interesting to note that, by the end of 1923, no less than 595,311 broadcast receiving licences had been issued in the UK. By the end of September 1925, with the opening of the high-power station at Daventry (at the same time, the Chelmsford station was taken out of service), the number of licences had mushroomed to 1,464,674. This had increased dramatically to 2,299,822 by the end of June 1927. The broadcast receiving licence, introduced on November 1st, 1922, cost 10 shillings (50p) so the BBC had plenty of money in the kitty with which to continue broadcasting.


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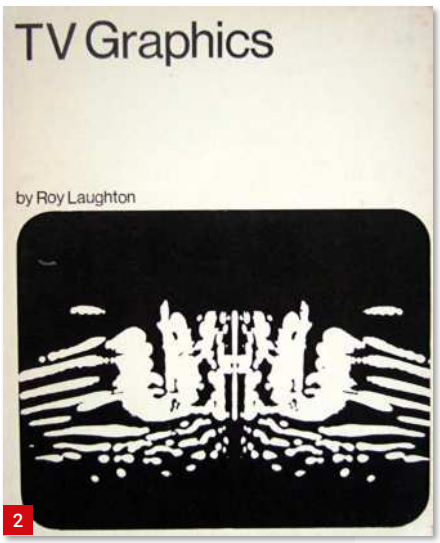

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Fig.1: Professor Oliver Lodge, inventor of the first coherer, following experiments with his famous 'Syntonic Jars'. Fig. 2: Advertisement in 1927 for the Lissenola loudspeaker system. Fig. 3: *TV Graphics* by Roy Laughton, published in 1966. Fig. 4: The American graphic designer, Saul Bass. Fig. 5: A test card suitable for ATV with a variety of technical features. Fig. 6: Shaun O'Sullivan G8VPG, enjoying ATV alfresco-style!

Vintage Wireless Equipment

This month's leaf through vintage copies of well-thumbed newspapers and magazines has unearthed the amazing *Lissenola* loudspeaker system (Fig. 3). This is the full description of the equipment originally featured in a *Lissen Limited* advertisement, dated 1927: "*Here is the LISSENOLA Loud Speaker as sold complete for those who do not wish to build their own loud speaker. Full toned - full-sized - full-powered. Volume coming to you with a richness of tone that makes a radio broadcast a thing of sheer entertainment. No faintness of sound, no harshness of voice, but a surge of glorious music that transcends any reproduction you have heard before. Listen to the bass. Hear how natural the soprano sounds. Marvel at the way the timbre of each instrument is preserved. Yet due to the elimination of big wholesale profits, the complete LISSENOLA LOUD SPEAKER costs only 34/-. Hear it talk, play, and sing across the room. LISSEN LTD., 47-56 Friars Lane, Richmond, Surrey.*

MANAGING DIRECTOR: THOMAS N. COLE."

If only the authors could find a Lissenola, they would be able to "*sing across the room*" with "*no harshness of voice*". It sounds like a truly miraculous piece of equipment, although we're not sure who would be singing soprano!

Graphic Design Pioneers

Watch any film or television programme and, invariably, amongst the credits will be a heading such as *Graphic Design*. Perhaps most viewers will be unaware of this facet of production, but it is, nevertheless, an integral and very important part of the overall presentation. The actual form of the graphic design for a particular production may be simply the choice of the font style used for the title sequence and credits, or the designs can be very expensive, lavishly constructed, and extremely technical creations.

There have been, and still are, many exceptionally gifted graphic designers involved in literary, film and television production. In this series, we will highlight the careers of just four of the most influential graphic designers, namely Saul Bass, Abram Games, John Aston, and Martin Lambie-Nairn, all of whom are, sadly, no longer with us.

In 1966, the former *Head of BBC Graphics Department*, Roy Laughton, wrote a book featuring hundreds of examples of televi-

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THE KEITH HAMER+GARRY SMITH ARCHIVE COLLECTION.

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sion graphics from around the World. The book was the first to comprehensively cover this subject. Apart from working for the BBC, he was also associated with the European Broadcasting Union (EBU) in Geneva, Switzerland. The history of the EBU was featured in the February 2021 issue (*RadioUser*, February 2021: 38-41).

The 96-page book, entitled *TV Graphics*, was a prized possession of John Aston who later became *Manager, BBC Graphic Design*. When we were invited by John in January 1988 to a special luncheon held in their honour at BBC Television Centre in London to assist in deciding the future of the BBC-1 on-screen Globe Symbol, John kindly presented them with his personal copy of the book (Fig. 2).

Saul Bass

We begin this series with a look at the career of Saul Bass (Fig. 4). He was born on May 8th, 1920, in The Bronx, New York (USA). After leaving school, he soon became a prominent graphic designer and was mainly active in the field of designing motion picture title sequences, corporate logos, and posters to advertise forthcoming films. He was a pioneer in designing eye-catching title sequences which captured everyone's imagination. Together with his second wife, Elaine, he had a successful career spanning forty years.

His unique style of title sequences employing, for the first time in film production, distinguished kinetic typography, won him the Academy Award for several of his amazing graphic designs. Amongst his most memorable designs are the iconic title sequences used for famous films such as *The Man with The Golden Arm* (directed by Otto Preminger, 1955), *Vertigo* (Alfred Hitchcock, 1958), *North by Northwest* (Hitchcock, 1959), and *Psycho* (Hitchcock, 1960). Hollywood graphic designers had all previously used static titles.

Amateur Television (ATV)

Amateur television is a somewhat specialised hobby, generally using fast-scan techniques similar to those used in public TV broadcasting.

Decades ago, amateur transmissions around the globe tended to follow the conventional practice of public broadcasters in the various countries concerned, such as the number of lines and colour system, namely PAL, SECAM, or NTSC. In many cases, a reduced transmission bandwidth was used, due to the restricted frequency allocation.

Amateur television in the United Kingdom was once popular in the 70cm band (435 to 440 MHz) which lies just a few MHz below UHF Channel 21 (471.25MHz vision carrier). Unfortunately, this band was outside the lower tuning limit of most mechanical TV tuners but in the early 1970s, TV DXers began experimenting with varicap tuners.

Depending on the type of tuner, tuning below Channel 21 would occasionally reveal pictures originating from amateur enthusiasts, especially during periods of tropospheric enhancement.

TV DXers suddenly realised that they had the means to tune into amateur broadcasts, thus adding an extra dimension to an existing hobby.

One particular Japanese-manufactured TV model, a mechanically-tuneable Hitachi, was able to tune well below Channel 21 and receive these transmissions in colour without modification or any extra equipment being involved. Most DX-ers were using wideband aerials for DX-ing and the ubiquitous grid or 'panel' aerials of the time easily covered the 70cm band.

During tropospheric openings into Europe, DXers would often report the sighting of unusual-looking test cards featuring the originator's call-sign and even 'live' pictures. A test card featuring all the necessary technical attributes is shown in Fig. 5.

Unlike public broadcasting, amateur enthusiasts often transmitted only via pre-arranged link-ups with others, so transmissions were generally random; even a good tropo event did not guarantee success!

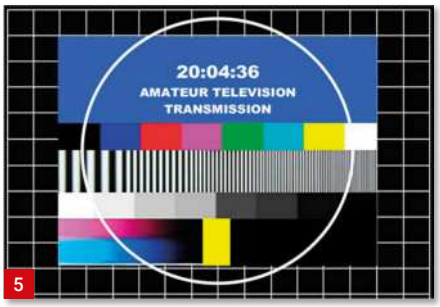
Specialised ATV Equipment

The 23/24cm band (1.24GHz to 1.325GHz) began to increase in popularity, probably around the late 1970s, using frequency modulation (FM) as opposed to amplitude modulation (AM) which had been the norm on the 70cm band for video transmission.

This migration meant that, unless DX-ers had access to specialised receivers similar to those the amateur enthusiasts were using, then attempting to tune into these frequencies using existing equipment would be pointless. The 2.24GHz frequency was well above the upper tuning limit (around 900MHz in the USA) of a typical TV tuner, and signals were not as readily propagated as those on 70cm.

Digital Trend

Over the years, much higher frequencies have become available for amateur television transmissions including 3GHz and 5GHz. Digital transmission standards were also adopted, based on those used by terrestrial and satellite public broadcasters. Some of these were adapted to allow narrow-bandwidth operation, known as *Reduced Bandwidth DATV (RB-TV)* using transmission bandwidths of only 1MHz, or less, which still allowed acceptable picture quality.



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Back to Basics

Recently, one of our regular correspondents, Shaun O'Sullivan G8VPG (Bristol), was experimenting using good old-fashioned analogue FM modulation on the relatively new 6cm (5.665GHz) band having obtained some very inexpensive modules from China. These were intended for use as video senders and receivers for drone activity and, fortunately, one of the channels fell into the amateur band allocation.

A small grid dish was used as the aerial and a microwave relay was employed to switch from transmitting to receiving. The whole set-up cost less than £100. Shaun has commented that it was, *"good to see a screen full of noise again and be able to establish a picture simply by rotating the dish to see the signal come and go"*.

Shaun is also a fan of participating in ATV – alfresco-style (Fig. 6)

Recently, new experimental allocations on six metres (approximately 50MHz) and four metres (around 71MHz) have been agreed and this is encouraging news. It is certainly worth taking a look at Shaun's video at the following website:

https://tinyurl.com/p34us2hk

With the demise of analogue reception in Band I, many TV DXers were tempted to purchase suitable equipment and experiment with transmitting and receiving ATV signals during the bouts of Sporadic-E activity!

Further Reading

The following two organisations have websites which are well worth visiting. They give in-depth information about current trends and transmission standards associated with amateur television.

The British Amateur Television Club

https://batc.org.uk

The Radio Society of Great Britain

https://tinyurl.com/4pdc4ead

Satellite Scene

If you are bored sick of the repeats and lengthy adverts that seem to go on longer than the actual programmes you are watching, then it is high-time you explored the fascinating world of satellite television.

Astra at 28.2º East is the satellite *Sky* or *Freesat* viewers are tuned to in the UK, but others are available which will allow access to services in Europe and beyond. *Hotbird*, located at 13.0° East, and *Astra-1* at 19.2° East, are two very popular satellites. Even with a simple installation, the channels are worthy of exploration, especially if you are a TV DX-er or simply curious about graphics and programme presentation. Many countries have migrated to subscription packages which means you won't be able to view them although some still offer a free-to-air news channel.

For those who yearn for the good-old-days, the original Ceefax-style Teletext system is still in use by many overseas broadcasters. Unfortunately, test cards are rare, so you are definitely in luck if you spot one!

General Experimentation

For general experimentation, it is much simpler to obtain a free-to-air receiver (as opposed to Sky or Freesat), fed from its own dish. Such a set-up won't break the bank and it will also help to preserve the domestic peace when the head of the house suddenly announces that her (or his) favourite soap is about to start just when you have tuned to another satellite and engrossed in a fascinating news bulletin in a language you don't understand.

Forget about using an existing Skybox or Freesat box as these are tailored for their particular services. Also, blocks are put in your way to prevent you from readily watching alternative BBC or ITV regions.

The prospect of a complex installation involving a huge rotatable dish often deters people from experimenting. The thought of dragging a ladder out of the garage to tinker with an existing wall-mounted dish is also off-putting.

Dish Size

Many years ago, a Sky set-top box and standard pole-mount elliptical 45cm (Zone 1) mesh dish was used as part of a short-term project. Other enthusiasts had reported good results with indoor dishes positioned in front of a south-facing window. Consequently, this approach was explored rather than have the inconvenience of a wall-mounted dish.

The dish was fitted atop a short 25mm alloy support pole attached to a laminated chipboard baseboard. With this arrangement, the dish could be easily removed for storage or transport.

Initial set-up was relatively easy with the help of a *satellite-finder meter*. This was connected to the LNB and powered via the co-axial cable from the receiver. Fortunately, an open front door faced a large portion of the sky from south to east, so the dish was initially positioned just inside the hallway to avoid any attenuation due to the glass. The dish was roughly aligned by comparing its direction and vertical alignment (elevation) to that of neighbouring dishes; the satellite-finder meter was then used to *fine-tune* the positioning.

Once the channels had been scanned in and stored, repositioning the baseboard was quick and easy. It was simply moved into position until the pictures appeared on the TV. The indoor system worked well, even with the curtains drawn but, alas, when a toughened double-glazed window was installed sometime later, the signals simply disappeared!

However, the baseboard-mounted small dish approach was still considered a useful tool for general experimentation to continue, either in the hallway or in the garden, preferably during warmer weather.

Eventually, a free-to-air set-top box was purchased to explore the possibility of receiving Astra-1 and Hotbird. Although a minimum dish size of 60cm is recommended, the smaller base-mounted 45cm dish still provided sufficient signal for experimental purposes, certainly in the Midlands. So if you have a spare dish, or are offered one, then it is well worth a try. Some dishes can be attached directly to a support mast (pole-mounted) while others have an adjustable arm and wall bracket. This assembly can be removed and with some mechanical jiggery-pokery, adapted to fit a vertical support.

The further north you live, the weaker the satellite signals tend to become, so a 60cm (Zone 2) dish might be required in some cases. If you have to purchase a dish, then a 60cm or 80cm dish is possibly the preferred option. Take a look at some of the local installations to see what the trend is. If you live in the south and you opt for a larger dish, it will provide a healthier signal with some in reserve for those cloudy or rainy days when signals can be attenuated causing break-up, or even the loss of some channels if using a smaller type. Happy channel hunting!

Recent Channel Changes

For readers who already have a satellite system, here are details of some recent changes to programmes offered via the Eutelsat 9B satellite, located at 9° East. This satellite currently provides 590 channels.

TVT Radio 2 (*Radio Kara*) is a new French-language DVB-S2 unscrambled station on 11.900 GHz, with horizontal polarisation, Symbol Rate (SR): 27500, and Forward Error Correction (FEC): 2/3.

TVT Radio 1 (*Radio Lomé*, French) is on 11.900 GHz, horizontal, SR: 27500 and FEC: 2/3.

TVT International has changed its parameters to 11.900 GHz, horizontal, DVB-S2, SR: 27500, FEC: 2/3. The station is unencrypted.

DX-TV & FM News

The latest news about changes to broadcast television and radio services is now available on-line via the *Radio Enthusiast* website: **www.radioenthusiast.co.uk**

Stay Tuned and please send archive photographs, information, news or suggestions for future topics via the E-mail addresses shown at the top of this column.

Radio News

IN THE MOOD: *Brit Award*-winning singer-songwriters Jorja Smith and Celeste are to host two series of mood-led music show on BBC Radio 3. The shows will include emotive music with its comforting and therapeutic benefits to lift the mood and soothe the soul. Mood-led mixes of music have become more popular recently, particularly during the lockdown and these programmes will aim to help listeners through difficult times. Jorja Smith (Right), who has worked with the likes of Drake, Stormzy and Loyle Carner, will explore the healing powers of sad music, from piano classics such as Moonlight Sonata by Beethoven to the soothing electronica of artists like James Blake. In her series Downtime Symphony, Celeste (Above) will play an hour of 'escapist' music and 'down-tempo selections' to help listeners unwind, from the classically-infused house and hip-hop to choral music and jazz fusion. BBC Radio 3 controller Alan Davey said: *"We know that younger audiences are discovering orchestral and instrumental music through streaming cross-genre playlists and find it not only enjoyable and enriching, a time for discovery, but also relaxing and calming and helping to manage their moods." Jorja Smith added: "It's important to try and find time to just let go and let the music take you to a different place. I hope the music in my new series – from strings and piano to songs and soundtracks – will help you whatever you're feeling, bring out different emotions and make you feel a little better. Presenting it made me feel a lot more relaxed too."*

(SOURCE: *On the Radio*, BBC Radio 3, BBC Newsletters and National Press)
https://tinyurl.com/yxax2f8y

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ICOM

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Uniden is the best known manufacturer of scanner radios in the world. Under its renowned "Bearcat" brand name, Uniden scanners are at the cutting edge of design and technology. Their high-end scanner radios, while complex, are used by radio hobbyists, media, businesses and at all levels of government and there lower end versions are beautifully designed and easy-to-use

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Accessories

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Based in Japan, Diamond Antenna manufactures a wide range of antennas and accessories for both hobby radio and commercial use. They are well known products that meet the highest standards in quality.

Scanner Antennas

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Handheld

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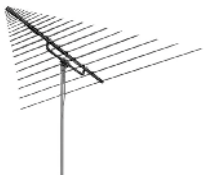

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AOR, LTD is a renowned Japanese communications equipment manufacturer established in 1978, headquartered in Tokyo, Japan, serves the monitoring enthusiasts, communication professionals, amateur radio operators and electronics industries throughout the world

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Robert Connolly
gi7ivx@btinternet.com

HF Voice, Lifeboat Transmitters and SDR Recording

In a varied column, **Robert Connolly** engages more in MF and HF listening, discusses QRM and lifeboat transmitters, explores the NDB band with SDRs, and offers his Quarterly NDB Logging Survey.

After more than one full year, we are still in the tight grip of the Coronavirus (Covid-19) pandemic. We have been through several lockdowns and other restrictions for many of the things that we normally do or enjoy. Many have been required to work from home, school children are being taught at home, unable to go to a restaurant or pub and, of course, there is a limit to the amount of television that you can watch without becoming bored.

What is more, this current lockdown seems to have been harder compared to other lockdowns, primarily because it is winter; the cold and wet weather is keeping us indoors much more.

However, we do have one thing in our favour, something that helps us to avoid total boredom or becoming a proverbial 'couch potato' – our radio hobby.

I am sure that many of you have increased listening time in the area of our hobby that interests you. Maybe you have even experimented with listening to other areas of the hobby that you have not tried before.

I have found myself listening to much more maritime radio on MF, HF and VHF frequencies.

I am also logging reception information, such as frequencies, much more than I used to, especially regarding MF and HF marine transmissions.

In doing so, I have come across a few surprises and a mystery – more on that later.

MF & HF Listening

The advantage of listening to MF and HF marine frequencies is that you do not have to live near the coast to receive these frequencies, unlike in the case of marine VHF. Marine MF and HF frequencies may be heard anywhere in the British Isles at any time, day or night. Reception during darkness is, of course, more varied, given the reception of stations from Europe and beyond. With a decent general coverage receiver or SDR, combined with a good antenna (I use a PA0RDT mini-whip) and some good propagation conditions the world is your oyster, as the saying goes.

As an example, In the evening I frequently receive HF Volmet stations from Asia and Australia, along with metrological broadcasts from Thailand. Bangkok Meteo is rather unique in that it transmits musical intervals. It transmits on 6765.1 kHz and 8743 kHz and is often receivable in Europe. I will provide a detailed update to MF coast stations received here in my next column.

Lifeboat Transmitters

In addition to this, most coast stations will transmit initially on 2182kHz, the distress and calling frequency, announcing the frequencies that their weather transmissions will be broadcast on. It used to be that case that marine MF/HF distress frequencies were subject to two silence periods every hour, for three minutes past the hour and three minutes past the half-hour. The purpose of this was to facilitate weak stations calling for distress purposes, perhaps a yacht or a fishing vessel or even calling from a ship's lifeboat or life raft using a special portable 2182kHz lifeboat transmitter (Figs. 1 and 2).

These transceivers had a power of 5W on 'high' power, and 2W on 'low'.

You will notice that the transceiver shown (Fig. 1, from my collection) has a length of stainless steel wire wrapped around it. This was terminated in a stainless-steel sinker and was thrown into the seawater as an earth for the unit. I should also point out that these portable transceivers are not something that you carry in your pocket: when the telescopic antenna (Fig. 2) is fully extended, the total height of the unit is around 2.5 metres, with the actual transceiver measuring approximately one metre. It is as thick as your upper arm.

These measurements do not include the stainless-steel earth wire that is two metres long when deployed.

MF/HF Range Freq.	Day-light	Darkness
2 MHz	200 NM	500NM
4 MHz	400 NM	800NM
6 MHz	600 MN	1200 NM
8 MHz	800 NM	1600NM
12 MHz	1200NM	2400NM
16 MHz	1600 NM	fade-out

Table 1: Frequency Ranges

The radios were powered by special battery packs and were equipped with a test switch that the user could use to ensure that the unit was functional without having to make an actual transmission.

The unit I have in my collection was donated to me by the owner of a local fishing trawler several years ago when he had to update his radio equipment to meet new regulations. It was housed in an orange waterproof padded bag as part of the life raft standard equipment. I adapted it to ensure that it could no longer transmit and used it occasionally to monitor 2182kHz for demonstration purposes. While their transmit power is quite low, these are sensitive receivers, and I did receive stations from as far away as Italy.

These days, international regulations no longer require silence periods to be observed, however, some countries, for example, Australia, still observe them for 2182, 4125, 6215, 8291, 12290, 16420kHz, and on VHF CH16 (156.800MHz).

There is no requirement for silence periods for distress calls for MF/HF/VHF DSC frequencies.

Fig.1: The lifeboat transmitter from the author's collection. Fig. 2: Overall view of the *callbuoy* lifeboat transmitter.

Coast Stations

I am sometimes asked why it is mainly coast stations that are received on MF and HF when you can hear both aircraft and ground stations? Coast stations use more transmitter power and larger antennas compared to ships. The maximum MF/HF permitted transmitter power for a ship radio is 1.5KW PEP. For coast stations, the maximum permitted is 15 KW PEP.

Besides, the MF/HF antenna used on ships is much smaller, normally in the range of 7.01 metres for a vertical whip. As height above sea level affects the transmitter range, you must also remember that ship antennas are mounted either on the mast or on top of the bridge. However, aircraft using HF flying across the ocean are normally well above 30,000 feet above sea level. Having said that, ships may be heard if closer to your location, roughly 100 nautical miles per 1MHz during daylight.

Take a look at Table 1 for approximate ranges; Table 2 details the maritime distress frequencies; and Table 3 shows the primary ship-to-ship HF frequencies.

QRM Issues and SDR Recording

Regarding the fascinating hobby of NDB listening, the Covid-19 lockdowns have created much more man-made interference (QRM). This is most likely due to more people being at home, working from home and home-schooling. It used to be that I would have begun an NDB listening session using my NRD 525 around 2300 local time, when many people had gone to bed, reducing the amount of local QRM.

However, I have had a long-running problem with a neighbour's sodium security light that seems to be on a timer switch. Last winter, it would have switched off at midnight allowing me a quite band to play with after that. During the summer it was not switching off until 0100 local times, and I assumed he had forgotten to change the timer clock. Unfortunately, now it is still not going off until 0100 local and a listening session would keep me up until about 0300, not very conducive to keeping the 'local management' happy.

Having said that, all is not lost: I do have my SDR RSP1A that I can use to record the NDB band while I am asleep. I can use either *SDRuno* or *SDR Console* (software 64-bit version 3).

https://www.sdrplay.com/downloads
https://www.sdr-radio.com/Console

My personal preference is the latter, as I believe that it provides stronger signals. *SDR Console* also has the advantage of being able to programme multiple recording sessions for the one night or schedule programmed recording sessions to run at set times on any or all days; subject, of course, to the computer being switched on at that particular time.

While I have found NDB reception not as good compared to using a live session with my NRD 525, I can set up recording sessions for more nights without having to stay up late and use matchsticks to keep my eyes open. For a recording session, I normally set *SDR Console* to 500kHz bandwidth and set the recording for around 0115 local time (after the pesky light has switched off) with a centre frequency of about 360kHz and the option for weak signal recording option selected.

I normally record a ten-minute session of the band. The saved file can be listened back to through *SDR Console* at my leisure repeating the playback as required while checking frequencies across the band.

NDB Listening Tips

If you are using an SDR receiver for NDB listening be careful with the 'RF Gain' level; the default setting is '7', although I occasionally use higher settings ('9' is the maximum) for receiving some voice communications.

Normally I set the RF gain in SDR Console to '6', as this reduces intermodulation from broadcast stations in the long wave band. During one recent session, I forgot to reduce the RF gain, and it was still at '8' after I was listening to Volmet signals from Asia. I found that local, strong, NDBs appeared again on different frequencies in the band when checking the recording. In my case, the Dublin NDB OP on 397kHz was making a strong appearance of 379 kHz. It was only when I received Gormanstown GMN (334kHz) that the proverbial penny dropped!

Joining the ndblist

The *ndblist* is a private internet reflector group whose members are all NDB DXers. Its useful website contains information regarding NDB listening, numerous useful beacon-related links and, of course, details on how to join the group.

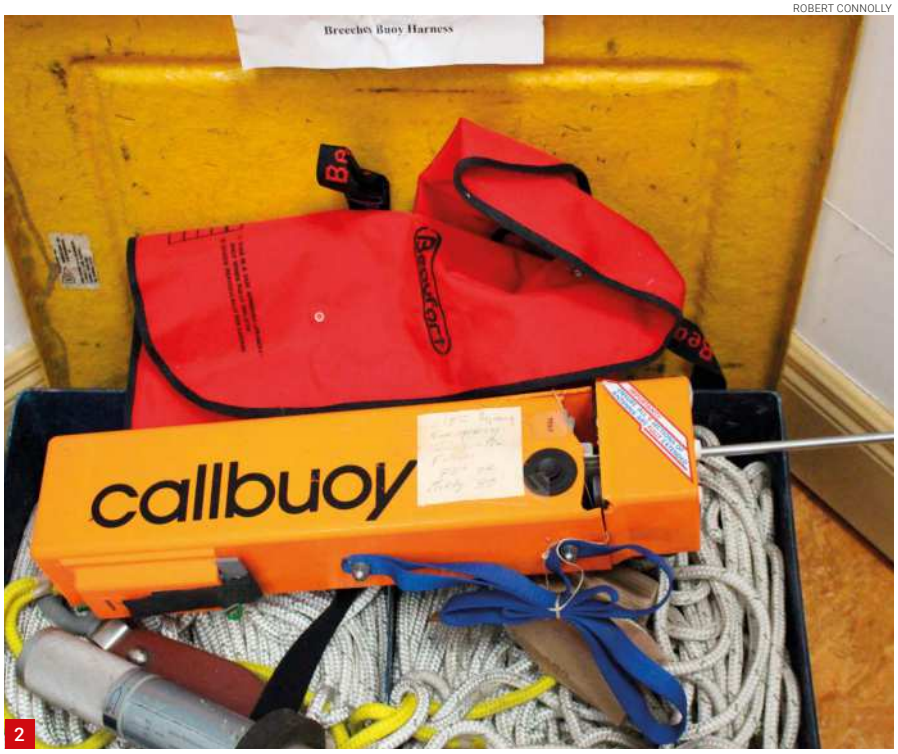
www.ndblist.info

Many members regularly post their NDB logs, and there are special monthly

ROBERT CONNOLLY

1

ROBERT CONNOLLY



2

Band	R/T Frequency	DSC Frequency	Day Time Range	Night Time Range
MF	2182 kHz	2187.5 kHz	150 NM	500 NM
HF4	4125 kHz	4207.5 kHz	300 NM	1000 NM
HF6	6215 kHz	6312 kHz	600 NM	1500 NM
HF8	8291 kHz	8414.5 kHz	1000 NM	2000 NM
HF12	12290 kHz	12577 kHz	2500 NM	
HF16	16420 kHz	16804.5 kHz		
VHF	156.800 MHz (Channel 16)	156.525 MHz (Channel 70)	30 NM	30 NM

Table 2: Marine Distress Frequencies

Channel	4 MHz	6 MHz	8 MHz	12 MHz	16 MHz	18 MHz	22 MHz	25 MHz
A	4146 kHz	6224 kHz	8294 kHz	12353 kHz	16528 kHz	18825 kHz	22159 kHz	25100 kHz
B	4149 kHz	6227 kHz	8297 kHz	12356 kHz	16531 kHz	18828 kHz	22162 kHz	25103 kHz
C		6230 kHz		12359 kHz	16534 kHz	18831 kHz	22165 kHz	25106 kHz
D				12362 kHz	16537 kHz	18834 kHz	22168 kHz	25109 kHz
E				12365 kHz	16540 kHz	18837 kHz	22171 kHz	25112 kHz
F					16543 kHz	18840 kHz	22174 kHz	25115 kHz
G					16546 kHz	18843 kHz	22177 kHz	25118 kHz

Table 3: Ship-to-Ship Communications.

co-ordinated listening events; these are not a contest.

I have been a member since its inception, although I do not post as much now as I used to do. The group was formed in November 1998, and now has around 600 members in more than 40 countries. If you are just beginning NDB listening and join the reflector group, you will find that there is no such thing as asking a 'silly' question – we were all beginners at some point.

Often you will come across an NDB transmitting 'T' or 'TST'. This happens when the beacon is transmitting a test signal for technical reasons, perhaps after having been fitted with replacement equipment, going through its certification, or even on occasion a new NDB. By cross-referencing its frequency, it may be possible to determine exactly what beacon it is. In some cases, if you have a rotatable or directional antenna getting the bearing from your location may help in identification or establish an approximate location, especially if you know other NDB listeners who can take a bearing.

The *ndblist* group I mentioned earlier have in the past managed to identify the location of some NDBs before their information appeared in most official sources.

"I also noted that improvements to my PA0RDT Mini Whip Earth arrangements have made a worthwhile difference to its rejection of noise"

Update on Recent Logs

Many thanks to Keith Rawlings who kindly sent me some interesting logs just after the deadline for the last NDB review. Keith tells me "*It is a bit of a mix, equipment-wise. Aerials used were my end-fed, Wellgood loop, PA0RDT Mini Whip and, for a short while, a Bonito Megadipole. I found the Megadipole worked exceptionally well on LF, but as it was used during the later summer months I found static being a limiting factor.*

"I also noted that improvements to my PA0RDT Mini Whip Earth arrangements have made a worthwhile difference to its rejection of noise. There has been a bit of a combination receiver-wise as well. I was lucky enough to try out an AOR AR5700D for a while but did not find it sparking on NDB's, although overall it was a good receiver. I also had an SDRplay RSPdx to play with and noted a considerable improvement over my RSP2 below 2MHz; so much so, that I bought one and all logs after around mid-September were made using that receiver."

Thanks also to Andy Thomsett who kindly supplied an extensive set of logs, containing some excellent transatlantic catches, using his Airspy HF+ Discovery.

As usual, the very latest NDB logs are available on the *Radio Enthusiast* website: **www.radioenthusiast.co.uk**

Until next time, "*Fair Winds*".

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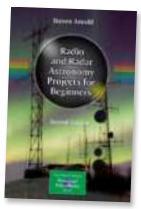

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David Smith
dj.daviator@btinternet.com

PanAm Radio, Flying Taxis, Contrail Prevention, & HF Drone Control

David Smith talks ATC in times of Covid-19, spotlights an interesting US HF station, investigates future urban aerial transport and presents the first part of a new series outlining ATC operations at UK military airfields.

For decades, aircraft flying across the North Atlantic have largely followed the Organised Track Structure (OTS), a series of parallel routes to maximise efficiency in an environment out of range of a land-based radar. Up to 12 tracks change twice a day to take account of tailwinds, but capacity on the most efficient routes has always been limited by the huge separation distances required. That changed in 2019 when NATS and Nav Canada became the first air traffic service providers in the world to start using the Aireon real-time, satellite-based, ADS-B surveillance system to monitor North Atlantic air traffic.

As well as the obvious safety benefit which having real-time surveillance brings, it has also allowed the safe reduction in separation distances, down to as low as 14 nautical miles.

This, in turn, offers aircraft more flexibility in terms of their speed and trajectory. That has meant more flights have been able to take advantage of the best routes but have still been flying within an OTS environment.

A reduction in the OTS has long been part of NATS and Nav Canada's vision for the North Atlantic. The dramatic fall to around 500 flights a day instead of the usual 1,300, caused by the Coronavirus (Covid-19) pandemic has provided an opportunity to do things differently, and to introduce things more quickly than otherwise might have been possible. So, on days where ATC supervisors do not believe it is necessary, the Organised Track Structure will be suspended.

Therefore, no tracks will be published either west or eastbound, and airlines will be asked to flight-plan based entirely on their optimum route, speed and trajectory. It is hoped that analysis of these flights, together with other tabletop exercises, will provide the evidence needed to decide on the value of permanent changes.

PanAm Radio

Mark Allen, Chief Engineer of PanAm World Radio, a Long Distance Operational Control station based in Texas, has kindly contacted me to make *RadioUser* readers aware of its operations.

HF Communications Services, Inc. was established in the mid-1970s.
https://www.hfcom.world
http://www.panamradio.world

As a long-time consultant for HF radio operations in the overseas shipping business, the company accumulated vast experience with long-range global communications. As the need for HF radio was written out of the operating regulations for large ocean-going vessels, the company sought to put its experience back to work in HF radio for aviation. The result was its subsidiary, Pan American Global Radio.

It serves aviation clientele in the Central and Latin American regions, the name PanAm being consistent with its areas of operation. It also pays tribute to Pan American Airways – a company that set high standards for customer service during its long and distinguished existence.

The services offered to airline and other customers cover a wide range and include operational message relay, phone patches, weather information, SELCAL and radio checks.

Mark tells me that the frequencies used are: 2890, 5511, 9210, 10033 kHz, 17901, and 21955kHz. He says: *"We have been receiving many QSL cards from SWL's around the world, so I know the station is being heard. The transmitters are 5kW, however, the antennae are pointing southward from the USA toward the preferred routes. The frequencies are a bit quiet (too quiet) based on reduced air traffic because of the pandemic."*
http://www.panamradio.world/swl-qsl

A Project for Aerial Transport in Urban Areas

A consortium of urban air mobility and aviation companies has commenced work on a concept of operations for integrating air taxis and electric vertical take-off and landing vehicles (eVTOLs) into the UK's airspace. The consortium, which is led by Eve, the first company to graduate from EmbraerX, will be working with the UK CAA as part of its Future 'Air Mobility Regulatory Sandbox'.

The project will examine how eVTOLs may operate in transporting passengers and cargo over urban and regional areas. In addition to Eve, the consortium includes several aviation industry companies, including Heathrow Airport, London City Airport, NATS, Skyports, Atech, Volocopter, and Vertical Aerospace.

The Regulatory Sandbox was established to create an environment where innovation in aviation can be explored in line with the CAA's core principles of safety, security, and consumer protection.

Initially working alongside local authorities, the consortium will explore how eVTOLs can transport passengers from London City Airport to Heathrow Airport, with stops in between. Data from simulations will help policymakers develop community-friendly rules, mitigate community noise effects, and draft airspace procedures for future flight tests.

The introduction of eVTOLs can offer greener and faster modes of transportation for passengers and cargo, improve urban and regional connectivity, create new jobs, and spur innovation. The concept of operations will help make eVTOL operations in the UK possible, allowing the industry to scale and deliver environmental and economic benefits to the UK.

Contrail Prevention Trial

In an effort to minimise the impact of aviation on the environment, the International Civil Aviation Organisation and Eurocontrol, in conjunction with Maastricht Upper Area Control Centre, are running a Contrail Prevention Trial until the end of 2021.

The operative times are between 1500-0500 UTC (winter) and 1400-0400 UTC. Flights may be requested to deviate from the planned route to observe their impact on contrails. The plan is to sometimes re-route aircraft around atmospheric conditions that are most conducive to contrails.

In the words of the official announcement, *"Flights may be tactically requested to deviate from the planned/ requested Flight Level by the sector controller. Any flight flying via Maastricht sectors between these times may be chosen. The trial will go ahead dependent on the weather conditions."*

Drone Control via HF

General Atomics Aeronautical Systems, Inc.(GA-ASI) completed the first Beyond Line of Sight (BLOS) High Frequency (HF) Command and Control (C2) demonstration for an Unmanned Aircraft System (UAS). The HF C2 capability does not require a Satellite Communications (SATCOM) link and is capable of providing BLOS connectivity up to 8,000 miles, depending on transmit power and link geometry.

The demonstration was flown by an MQ-9A Reaper UAS out of an Army airfield in Arizona in December. It was commanded from Austin, Texas, about 1,000 miles away, over an HF link. GA-ASI have created a software adapter to manage the constraints of the normal HF waveform, thus enabling an operator to control the MQ-9A without needing SATCOM. This would be essential for operation in SATCOM-denied or contested environments.

https://www.ga-asi.com

This month's aircraft photograph is of a *Jaguar XX825* at RAF Cosford

RAF ATC Profiles 1: Northolt

ICAO Code: EGWU IATA Code: NHT

FREQUENCIES	**(MHz)**
Northolt Approach/Radar	126.450
	(Lower Airspace Service during Radar opening hours to 30nm range).
Northolt Director	130.350
Northolt Talkdown	125.875
	123.300*
	343.750
Northolt Departures	129.125
Northolt Tower	120.675
	279.925
	257.800*
Northolt Ground	121.575
Northolt Ops	389.450

* NATO Common Frequency. Available on request only.

ATIS	
Northolt Information	125.125
	299.800
Navaids	ILS CAT I Runways 07 and 25
Runways	07 – 1685m x 40m
	25 – 1683m x 4

Engineered Material Arrestor System (EMAS) bed located in the overruns.

NOTES (A-Z)

Aircraft inbound to Northolt.
The standard routes for inbound aircraft to Northolt are the same as those for London Heathrow. They may, however, be varied at the discretion of ATC. Inbound aircraft, after the clearance limit, will be radar-vectored and issued with descent clearance by Heathrow Director.

Ground Movement
Aircraft are to remain with Northolt Ground 121.575MHz when manoeuvring around the aerodrome. After landing, aircraft are not to be taxied off the runway until instructed by ATC.

Helicopter Operations
Helicopter Operating Area: between taxiways Alpha and Golf, north of Runway 07/25. Helipad South: adjacent to the eastern end of ASP1, marked with an 'H'. When Northolt is closed: Heli routes / Aerodrome Traffic Zones transits are controlled by Heathrow Radar on 125.625MHz.

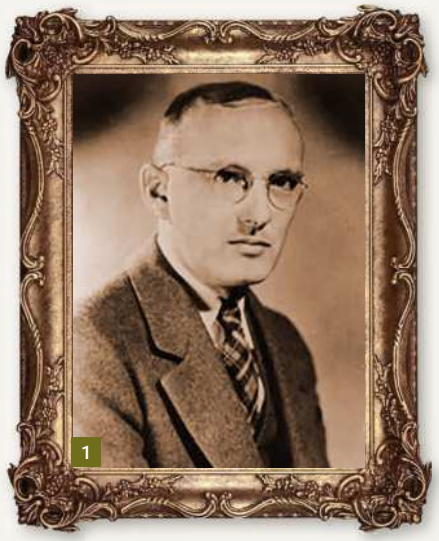
Mode-S Barometric Pressure Setting Data.
London Terminal Control can downlink Mode-S Barometric Pressure Setting (BPS) data. Therefore, if the downlinked pressure data is at variance with the BPS expected by Air Traffic control, pilots can expect an additional challenge. When ATC pass a reminder of the appropriate BPS, it is anticipated that the aircrew will cross check the altimeter settings and confirm 'set'.

Training
Practice asymmetric approaches and landings are not permitted.

Use of Runways
Runway direction comparable to Heathrow. Tailwind component may be experienced occasionally. Aircraft unable to complete an approach to the duty runway with a tailwind component should notify Northolt Director at the earliest opportunity. Aircraft departing Northolt, and which are unable to accept a tailwind component, are to inform Northolt Tower at the earliest opportunity.

Visual Circuits:
Visual Circuit available by prior permission only. Circuit Directions: Runway 07 - Left Hand. Runway 25 - Right Hand. All to the north to avoid Heathrow traffic.

Warnings
Approaches to Runway 07 are offset by 30 degrees to the left of the centre line until 4.2nm from touchdown, to deconflict with Heathrow traffic. Denham Aerodrome is 4nm NW of Northolt, circuit altitude 1000ft. All departures from Northolt Runway 25 are to ensure they cross the Denham ATZ not below 1500ft QNH. There are uncontrolled vehicles on public highways in the undershoot to both runways 07 and 25.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Scott Caldwell
Scottandrew.caldwell@yahoo.co.uk

Good Weather for Monkeys– and the Norfolk Island Effect

Scott Caldwell chronicles the remarkable life and achievements of Elizabeth Alexander, a pioneer of radio astronomy with a love for geology and a wide range of other interests.

Radio astronomy has some of its origins in the 1930s in the pioneering research of Karl Guthe Jansky (1905-1950, Fig. 1) and Grote Reber (1911-2002, Fig. 2) who founded and popularised it as a scientific discipline.

However, historians also regard Frances Elizabeth Somerville Caldwell (aka Elisabeth Alexander, 1908-1958, Fig. 3) as a pioneer, in terms of both her academic contribution to the emerging discipline of radio astronomy and in respect of the fact that she was a woman who frequently defied the more conformist social norms of her own time.

In this era, it was extremely rare for a woman to be a world-renowned scientist; society still viewed that their role was a traditional one in the home raising children and looking after the household.

Like Ruby Payne-Scott (*RadioUser*, September 2019: 42), Elisabeth Alexander broke new ground; she was the first woman to correctly identify radio emissions from the Sun, while attempting to solve a problem with radar equipment (Arnold, 2021: 17-18, reviewed in *RadioUser*, March 2021: 52).

Her Early Life

Frances Elizabeth Alexander was born in Merton, Surrey, on Sunday 13th December 1908. Her second middle name was a tribute to the Scottish scientist Mary Somerville (1780-1872), an ancestor. Her parents initially called her Betty, but she preferred Elizabeth from an early age.

In 1910, her inquiring mind was evident, when she was forbidden to play outside until the rain had completely stopped. After a few minutes of quiet reflection, she decided to go directly to the perceived source of the issue and promptly asked God the following question: *"Is this the weather for monkeys"?*

Elizabeth spent the majority of her childhood in India, where her father, Dr Kenneth Somerville Caldwell was a professor at Patna College. She returned to the United Kingdom in 1918 to commence her secondary education. She received a PhD in Geology for a thesis entitled *Aymestrey Limestone of the Main Outcrop*, from Newnham College at Cambridge University, under the academic supervision of Owen Thomas Jones (1878-1967). Like all female graduates of Cambridge University at that time, she was not permitted to become a full member of the university until equal rights legislation was enacted post-1945.

In 1935, she married Norman Stanley Alexander (1907-1997) a physicist from Te Awamutu in New Zealand. The mar-

riage produced three children: William Somerville Alexander (1937), Mary Harris Alexander (1939), and Bernice Jones Alexander (1941).

The Second World War

As political and economic tensions escalated in the Pacific region, Alexander held the rank of Captain in the Royal Navy's clandestine division, universally known as the *Navy Intelligence Service*, based at the strategically vital naval base in Singapore. Elisabeth's research work at the time primarily focused on developing calibration for radio direction–finding (DF) equipment. Her work consisted of statistical analysis, predicting ionospheric behaviour, and developing charts showing the optimum wavelengths for radio communications.

However, the growing threat of invasion by Imperial Japan forced Elizabeth and the children to evacuate to the relative safety of New Zealand. The odyssey across the vast Pacific Ocean was physically and mentally exhausting and it took four days of flying. Unfortunately, Norman remained behind and was imprisoned in the notorious Changi POW camp. Early communication from the Red Cross had suggested that he had died in the camp, causing Elizabeth extreme stress and anxiety as she waited for confirmation of the earlier dispatch.

In Wellington, Elizabeth secured a position as a Senior Physicist and Head of the Operational Research Section of Radio Development. Her efforts were focused on studying propagational effects and constructing fundamental theory enabling radar performance to be predicted from collated meteorological data.

The 'Norfolk Island Effect'

In 2005, Elizabeth was described by the astronomer Wayne Orchiston as the world's first female radio astronomer, in recognition of her research on the 'Norfolk Island Effect'. Being somewhat older than most of her fellow researchers, she had a wealth of research experience to fall back on. This proved invaluable when administering the 'Norfolk Island Effect' project. It was fortunate that her academic experience in Geology had a strong interdisciplinary background in Mathematics and Physics, making her an ideal lead-researcher.

Between 27th March and 1st April 1945, a very striking fluctuation in radio noise was detected on 200MHz by the officer in charge of a Royal New Zealand Airforce unit, sited on Norfolk Island (Fig. 4). Elizabeth was selected to scientifically investigate this phenomenon, later termed the 'Norfolk Island Effect'.

She subsequently authorised a period of systematic monitoring to commence within a one-hour time frame at five different radar stations. The instructions to all five monitoring stations were recorded in Alexander's research logbook: *"All five stations were instructed to record the increase in noise and the azimuth of maximum increase every few minutes, and the time observations were taken together with a general description of the weather at the time of taking the observations"*.

The monitoring exercise was conducted from April 10th until the 23rd of 1945.

In the course of this project, solar measurements were systematically recorded at all five stations.

Most interestingly for the researchers, this noise enhancement appeared to originate from outside the radar antenna, turning gear and receiver. It only materialised within a limited time window of half an hour after the rising and setting of the Sun.

Published Results and Recognition

In 1946, Elisabeth published a short research paper in the newly established journal *Radio and Electronics* and concluded it with the following observation: *"The maximum increase of noise was on the bearing of the Sun and rotation of the aerial showed noise fluctuations corresponding fairly closely to the radiation diagram of the aerial. At its maximum, the noise reached saturation on the azimuth of the sun, and peaks of noise were also observed on azimuths corresponding to the first and second pair of slide lobes. Switching off the transmitter had no effect on the noise"*.

Fig. 1: Karl Guthe Jansky (1905-1950).
Fig. 2: Grote Reber (1911-2002).
Fig. 3: Frances Elizabeth Somerville Alexander (1908-1958).
Fig. 4: Norfolk Island and New Zealand.
Fig. 5: Mary Harris's book on Elisabeth Alexander.

Unfortunately, Elizabeth's interesting research paper was published in the inaugural issue of the journal, which saw no international publication, thus limiting its dissemination and impact amongst the academic community. This has only been rightfully addressed by both academics and historians in recent years.

Elizabeth was not a career physicist. When she relocated to New Zealand in 1942, she needed employment to financially support her three young children, with no safety net of savings and investments, and she believed that her husband had died. However, at first, she received some financial assistance from the British government as the wife of a missing serviceman.

When it was conclusively established that Norman was an internee, she automatically received half of the salary that he would have earned under normal employment conditions.

Blending In

Her position at the Operational Research Section (ORS) of the Radio Development Department was born out of financial necessity, rather than academic career development. Elizabeth developed a working costume to blend into this male-dominated environment: a masculine skirt and jacket with collar and tie, and a 'severe' hairstyle. Once the working day was completed, she reverted to being a loving mother to her children, she would entertain them by drawing smiling whales on her hand-drawn maps.

Visitors to the family home were impressed by Elizabeth's ability to multi-task, she could read, knit, and smoke at the same time. A naval officer in charge of the northern monitoring stations took alarm at the idea of a woman spending a few nights on service vessels and stations and recommended that a male officer should be enlist-

Further Reading

- Arnold, S. (2021) Radio and Radar Astronomy Projects for Beginners (Springer).
- Harris, M. (2017) 'Rocks, Radio and Radars: Elizabeth Alexander and the DSIR Radio Development Laboratory 1942 – 1945', Journal of the Royal Society of New Zealand, 47(2), pp. 193 – 198.
- Harris, M. (2019) Rocks, Radio, and Radar: The Extraordinary Scientific, Social, and Military Life of Elizabeth Alexander. London: World Scientific Publishing Europe Ltd.
- Orchiston, W. (ed.), 2005. 'The New Astronomy [...]'; Dordrecht, Springer, pp 71-92.

ed. However, the surviving military records reveal that Elizabeth eventually gained the professional respect of the navy personnel. They documented her, *"sound training, unremitting energy, remarkably cooperative personality, and high intellect"*.

Elizabeth initially recorded her thoughts in a diary during her stay in New Zealand; she planned it as a gift to Norman that documented her feelings and work. However, when she was (mis-) informed about Norman's 'death' in Singapore, she did not have the desire to continue and destroyed the diary as she deemed it a worthless exercise.

Fortunately, for historians, she started a new diary when the news reached her that Norman was alive, giving her a fresh aspiration to continue with her professional and personal life.

Solar Astronomy

Her research also led to further solar radio astronomy projects in New Zealand and was a driving force in the launching of a radio astronomy programme at the Division of Radiophysics (CSIRO) in Sydney (Australia).

Elizabeth also played a leading role in the *Canterbury Project*. This attempted to investigate meteorological effects on short wave radar technology. New Zealand had the ideal climate to conduct the research project as it had long been determined that the transmission of short wave signals varied with temperature and humidity.

She organised a series of field trips that involved "*a number of kites – flying and balloon – losing scientists, moving about the countryside in a camouflaged truck*".

Elizabeth worked hard to secure government funding and support to continue the *Canterbury Project*. However, the work was frustrating, and the pace was painfully slow. When hostilities in the Pacific ceased, Elisabeth had to commence renegotiations with a newly-elected peacetime government. Her diary entry for Sunday 15th July 1945, reveals her displeasure: *"Work has not advanced at all. I have found more stupidity in the upper levels than before but have long ceased being surprised at anything. My belief in many things has been shocked out of existence long before, and I have sadly discovered that most men are liars and rogues"*.

Post War a Fresh Start

In September 1945, there was an emotional family reunion in New Zealand; Norman was ordered to take six months of compulsory sick leave. The harsh treatment of the POW had left him an emotional and physical wreck. Elizabeth's contract in New Zealand ended with the unconditional surrender of Japan.

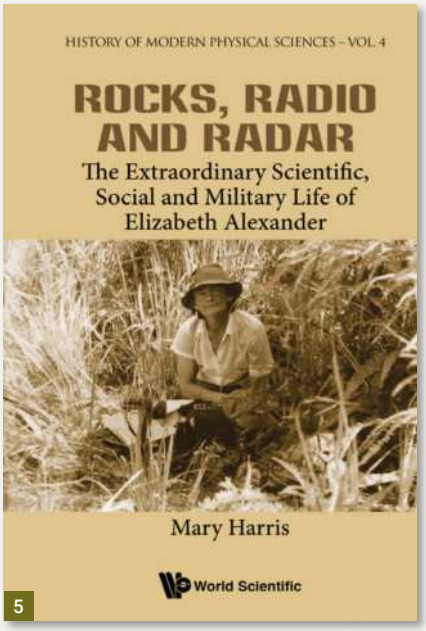
The four long years being held as a POW left a deep emotional impact on Norman who struggled to relate to his three young children. In retrospect, Norman needed the support of his wife to continue his passion in academia, without the added 'burden' of raising their children who demanded continuous love and attention.

In March 1946, Norman opted to return to Singapore to restart the Physics and Chemistry Departments at Raffles College.

Meanwhile, Elizabeth wished to return to England with the children where they would attend boarding school and receive a traditional English education. Elizabeth's stay in England was only a short one, and the children would be looked after by her sister, continuing the unwelcome family tradition of the 'colonial orphanage' that Elizabeth had experienced during her childhood.

In 1949, she was appointed to the prestigious position of Geologist to the Government of Singapore. Her main responsibility was to survey the island's natural resources of granite stone and compile a geological map of Singapore Island.

But by 1952, the family had relocated to Nigeria, as Norman and Elizabeth accepted academic positions at the University College of Ibadan. Elizabeth was appointed as a Senior Lecturer and Head of the newly established Department of Geology. At last, she had the opportunity to research in her preferred disciplines of Agronomy and Soil Science.



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At the same time, Norman was appointed to the prestigious position of Chair of the Physics Department.

Unfortunately, after only three weeks tragedy struck when Elizabeth suffered a major stroke; she died just a week later on Wednesday 15th October 1958.

In her obituary, Elizabeth was remembered for a, *"warm welcome for those who dropped into the Alexander household; there are many who are grateful for the hours they have spent there, either quietly listening to Beethoven, or else to a conversation in which, above all, an air of sanity prevailed"*.

Conclusion

Elisabeth Alexander was an extraordinary scientist whose wartime and post-war achievements have become lost in the history of science and war. However, the oversight is now being addressed by academics and historians (e.g. Arnold, 2021: 18).

As a lasting tribute to Elizabeth, Norman edited her last research paper on her passion – Geology. It was posthumously published in the prestigious Journal of the Geological Society of London.

Elizabeth was laid to rest in an unmarked grave in St Anne's Churchyard (Ibadan, Nigeria).

Fig. 5 shows the title of one of the very few books on this remarkable pioneer.

A Long Wave Receiver for BBC Radio 4

Roger Thomas
drmradio@gmx.co.uk

Roger Thomas introduces a simple construction project for a long wave radio, tailored to the reception of BBC Radio 4 on Long Wave.

This receiver (Fig. 1) is designed for reception of BBC Radio 4 on 198kHz only. The expectation is that the received Radio 4 signal is the strongest radio signal on long wave, and that the other radio stations are much weaker in comparison. The main Radio 4 transmitter is located at Droitwich (500kW) with radio coverage of most of England and Wales. Transmitters located at Burghead and Westerglen (both 50kW) cover Scotland.

This receiver consists of several RC filter networks and a dual operational amplifier (NE5532). These are followed by an AM (Amplitude Modulation) demodulator that converts the received radio signal into an audio signal. The audio output connects to the PC's sound card or an audio amplifier.

The long wave receiver circuit is shown in Fig. 2, and the component list is reproduced in Table 1.

The advantage of this simple radio design is that it can be easily built on to protoboard using a few components and a single chip. An additional bonus is that there are no coils to wind, no transformers, no setup, and no tuning!

The RC filter

An RC filter is made up of a resistor and a capacitor; hence the name. The frequency response of RC filters is typically given by the cut-off frequency (Fc) where an input signal is attenuated by 3dB (70.7%) compared to its peak value. The frequency response roll-off is 20dB per decade for a single RC filter.

A high pass filter (HPF), as the name suggests, passes only the high-frequency signals above the cut-off and attenuates frequencies below the cut-off. Fig. 3 shows the idealised frequency response curve.

Conversely, a low pass filter (LPF) passes only lower frequency signals than the cut-off frequency and attenuates above the cut-off frequency. Fig. 4 shows this response curve.

The formula to calculate this cut-off frequency (also referred to as the 'corner' or 'break' frequency) for either low pass or high pass filters is given by:

$$Fc = \frac{1}{2\pi RC}$$

Here, Fc= cut-off frequency in Hertz, R = resistor value in Ohms (Ω), and C = capacitor value in Farads.

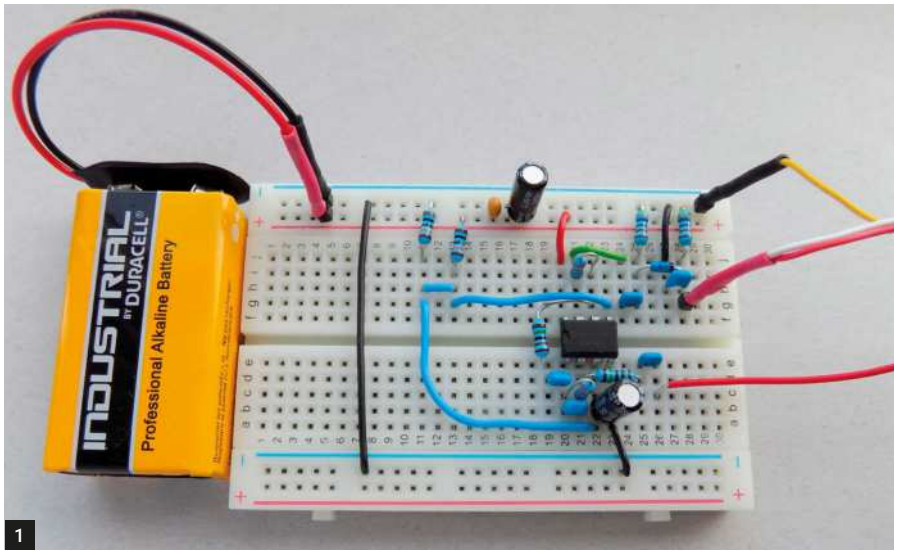

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Table 2 shows these RC component cut-off frequency calculations.

It is perhaps counterintuitive but the attenuation of frequencies below 198kHz is set by the high pass filter (HPF), and attenuation of the frequencies above 198kHz is set by the low pass filter (LPF) – very easy to get these the wrong way round!

Adding a high pass to a low pass filter creates a band-pass filter (BPF). A BPF passes frequencies within a certain range, provided their respective cut-off frequencies are correctly spaced, and attenuates frequencies outside this range. This is the type of filter that we need, centred on 198kHz.

Operational Amplifiers

The name comes from the early days when operational amplifiers were used in analogue electronics. With a few external components, various mathematical operations could be performed on the analogue voltage (multiply, divide, add, and so on); hence the term 'operational' amplifier (op-amp).

The NE5532 (Fig. 5) is an 8-pin dual op-amp and like all op-amps has two input pins marked –IN and +IN, the – input inverts the phase of the signal, the + input preserves the phase and an output OUT pin. Pin 4 and 8 are used to power the device.

The most important characteristic of any amplifier is the range of frequencies (or bandwidth) it can amplify. At a very low frequency (tens of Hertz) the open-loop gain (no feedback) of an op-amp is high. From the 'NE5532 ON Semiconductor' data sheet (Fig. 6) the open-loop frequency response graph shows that below 1,000Hz this op-amp has a gain of 100dB which is a voltage gain of around 100,000!

In practical circuits, this open-loop gain is converted to closed-loop gain by the use of resistors, such as resistor R2, which provides feedback and R2/R1 (and R4/

ALL PICTURES: ROGER THOMAS

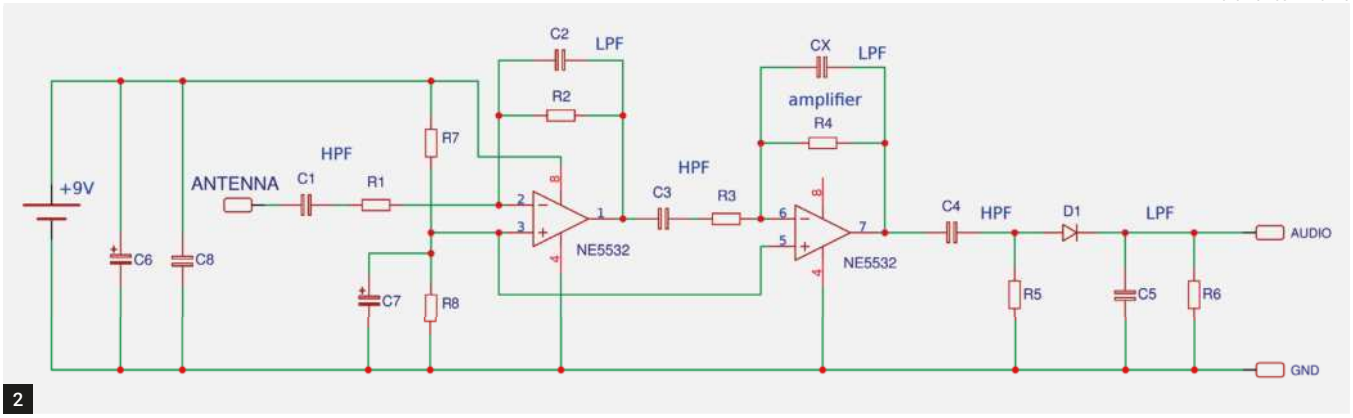

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Fig.1: Radio 4 long wave receiver project built on a 400-tie point protoboard. Fig. 2: Circuit diagram for the 198kHz long wave op-amp receiver. Fig. 3: Idealised frequency response of high pass filter (HPF). Fig. 4: Idealised frequency response of low pass filter (LPF). Fig. 5: NE5532 op-amp pinout (ON semiconductor datasheet). Fig. 6: NE5532 Open-loop frequency response taken from ON semiconductor datasheet. The discontinuity seen at 40dB is a drawing artefact, not an abrupt frequency shift. Fig. 7: NE5532 closed-loop frequency response taken from ON semiconductor datasheet with different value gain resistors (RF – feedback resistor).

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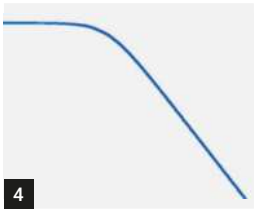

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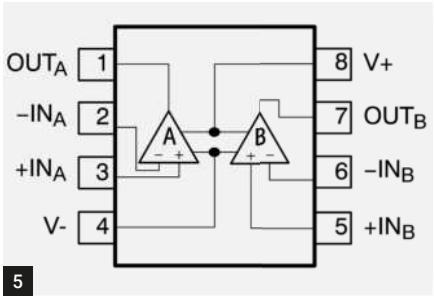

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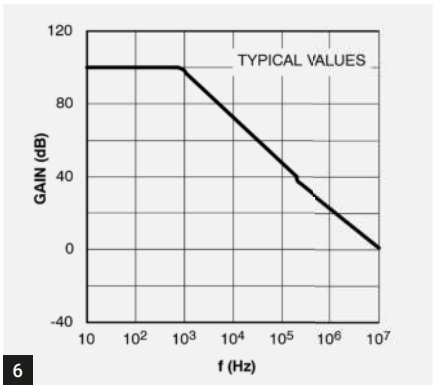

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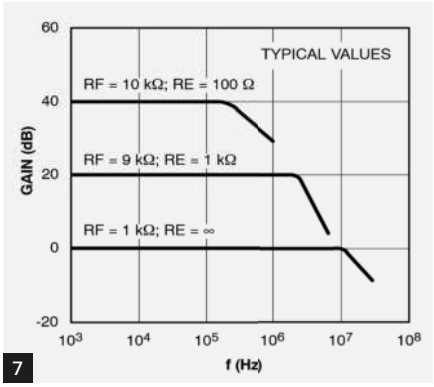

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R3) sets the gain of each op-amp. This closed-loop considerably reduces the unwieldy gain and gives a more useful level frequency response, with the added benefits of negative feedback reducing distortion. Fig. 7 shows this graphically.

Above 1,000Hz, the gain (like all op-amps) falls at 20dB per decade. A cursory glance at the datasheet for the NE5532 chip shows a maximum frequency of only 10MHz. At this frequency, the op-amp gain has fallen to 0dB; unity gain (Fig. 7).

This parameter is referred to as the 'Gain Bandwidth Product' (GBP) factor in the data sheets and precludes general purpose op-amps as radio amplifiers particularly in short wave receivers. The NE5532 has a higher GBP than many similar op-amps. At audio and low radio frequencies, however, these devices are very useful.

Amplifier

For each stage of the inverting op-amp design, the gain is given by the formula -

$$\text{gain} = -\frac{R2}{R1}$$

calculating the gain for this circuit

$$\text{gain} = -\frac{33000}{1500} = 22$$

The minus in this formula means an inversion of the output signal (180^{o} out of phase concerning the input); not attenuation. For this application, this phase shift has no relevance. R2 is the feedback resistor and must be a higher value than R1 for the op-amp to amplify.

DC Biasing

Resistors R7 and R8 (100kΩ) create a voltage divider network. As both resistors are the same value +4.5V will be measured at the midpoint when powered from a 9V battery (Ohm's Law).

This is 'virtual ground' – connected to the non-inverting input of the two op-amps providing a DC offset (pin 3 and pin 5). This allows the received AC signal to be ±4.5 volts (maximum), despite being powered from a single voltage source.

As op-amps can amplify both DC and AC a capacitor is needed (C3) between op-amp stages to block this DC offset voltage but allows the wanted AC radio signal through. High-value capacitors across these two resistors help maintain the DC level of virtual ground.

Filter

Filtering of the input radio signal is more important than signal gain as Radio 4 should be the strongest signal, if not then this design may not work. Some gain has been sacrificed to improve the filter response centred on 198kHz as the frequency response of the LPF and HPF intersect.

The reason is simple - without filtering any AM radio stations received will not be correctly demodulated, whatever its broadcast frequency; and we are only interested in listening to Radio 4 for this project.

Remove capacitor C2 and you may hear radio stations above 198kHz that are otherwise being attenuated by the LPF. The most likely radio stations that could

Fig. 8: Protoboard wiring layout of long wave receiver. Fig. 9: Protoboard showing the location of resistors. Fig. 10: Protoboard showing the location of all components.

cause reception problems of Radio 4 are, depending on where you live in the UK, RTL on 234kHz (French) and/or Ireland's RTE Radio 1 on 252kHz.

There are other op-amp filter configurations available, with *Sallen-Key* perhaps being the most well-known. However, keeping the RC filters separate makes for easier calculations. If required additional op-amp stages could be added to increase the overall gain or change RC values to improve the filtering.

Cx

Capacitor Cx (22pF) can be inserted across R4 if you are hearing other long wave radio stations. This will add another LPF (same as R2, C2) at the expense of gain. If there is reception of medium wave radio station then make Cx a 10/12pF capacitor as this will help prevent these radio signals reaching the demodulator but should not affect reception of Radio 4. I did not need to install Cx on my protoboard.

AM Demodulator

The simplest AM (Amplitude Modulation) demodulator uses a diode to rectify the signal and pass the positive half to a low pass filter. The voltage across the RC filter follows the envelope of the radio signal; this envelope is the wanted audio. Essentially this filter removes the high frequency (198kHz) carrier and leaves the wanted audio (4.5kHz bandwidth). The quality of the demodulated audio is satisfactory for speech, the main output of Radio 4.

The BAT43 Schottky diode (D1) has a turn-on voltage, or forward voltage drop, of around 0.3 volts. This is better than silicon diodes (Si) which have a higher turn-on voltage of around 0.6 volts. If a silicon diode is used here it will have reduced output and increased distortion. In years gone by, a Germanium diode (Ge) would be used but these are now expensive.

Protoboard Layout

To help with protoboard construction, three protoboard images showing component layout have been created with the open-source fritzing software: www.fritzing.org

If in doubt regarding a component's

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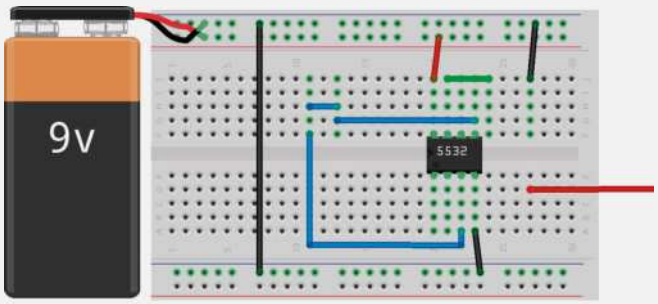

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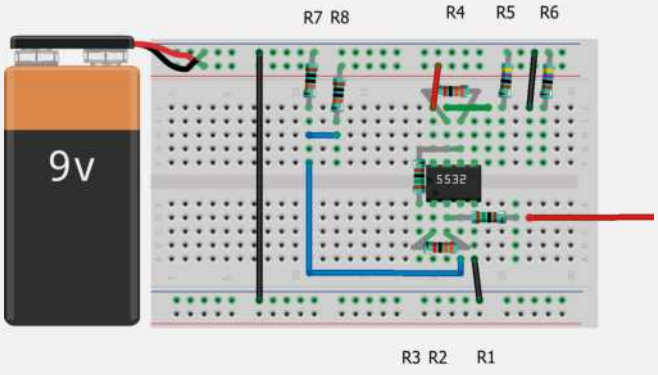

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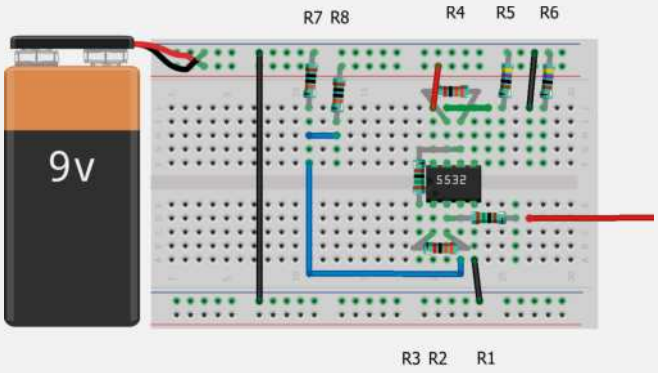

Required Components

R1, R3	1.5kΩ	resistor (HPF)
R2, R4	33kΩ	resistor (LPF)
R5, R6	4.7kΩ	resistor (HPF/LPF)
R7, R8	100kΩ	resistor (op-amp)
C1, C3, C4	680pF	ceramic NP0*(HPF)
C2	22pF	ceramic NP0 (HPF)
C5	4.7nF	ceramic NP0 (LPF)
C6, C7	100µF	electrolytic (power supply)
C8	100nF	ceramic (decoupling)
Cx		ceramic - see text
D1	BAT43	Schottky diode
IC1	NE5532	dual op-amp

Miscellaneous: protoboard, wire, 9V battery, 3.5mm audio lead.

* NP0 (negative, positive, zero) capacitor's value has negligible change with temperature change. Capacitors 2.5mm spacing, resistors ±1%.

Table 1: Components required to build the Radio 4 receiver.

High pass filter		**High pass filter (AM demodulator)**	
R1,R3	1,500 Ω	R5	4,700 Ω
C1,C3	680 pF	C4	680 pF
Fc =	156 kHz	Fc =	49.8 kHz
Low pass filter		**Low pass filter (audio)**	
R2	33,000 Ω	R6	4,700 Ω
C2	22 pF	C5	4.7 nF
Fc =	219 kHz	Fc =	7.2 kHz

Table 2: Calculation of Frequency cut-off (Fc) for RC filters.

exact location, you can use the circuit diagram.

Fig. 8 shows the wire connections; use solid core or jumper wire as stranded wire should be avoided. The blue wire is the virtual ground DC connection, the green wire is op-amp output to AM demodulator, and the black wire is 0V. The red wire is the 9V battery power to the op-amp, and the external red wire is the antenna.

Fig. 9 shows the location of the resistors. R2 and R4 should be inserted vertical 'hair pin' style, rather than flat (see photo).

The complete protoboard layout with all the required components is shown in Fig. 10. The audio output from the AM demodulator is taken from location G28 and 0V (i.e. from across R6). The audio can be fed into the line-input or the microphone input of your PC. Make sure that whatever PC input is used, the 'listen to this device' option is selected in 'sound properties' and any audio enhancements are switched off.

To connect this receiver to my PC I purchased a 3.5mm jack-to-jack audio cable and cut it in half. Then I soldered the wires to straight header pins, along with heat shrink sleeving. If you follow this advice don't assume that the wire colours of your audio cable will be the same.

I also soldered the battery clip wires to header pins to power the radio circuit. This to make it easier to connect the protoboard to the battery and audio to the PC.

Battery

When powered from a 9V alkaline battery, this op-amp receiver required around 2mA when receiving Radio 4. A typical alkaline battery is 500mA/hour, so battery life is around 250 hours. The receiver will still work even if the battery voltage has dropped below 7V, but with increased audio distortion and reduced audio output.

Antenna

A simple length of wire should be all that is necessary to receive Radio 4 (red wire in Figs. 7, 8 and 9). I use about 3 meters of solid core wire indoors. The orientation of the antenna should be parallel to the Radio 4 transmitter to maximise reception. Some 'trial-and-error' of the aerial orientation and length may be necessary. Depending on your location, a compromise may need to be found between the reception of Radio 4 and to minimise the reception of other long wave radio stations. At my location, about 100km northeast of the Droitwich transmitter, the signal strength is good but not exceptional.

Radio News

THE RADIO ACADEMY *WOMEN IN RADIO & AUDIO AWARD*: The Radio Academy will be celebrating Women In Radio & Audio this spring with a series of lunchtime webinars highlighting inspiring leadership and creative achievement. The programme of six talks launched on Wednesday 24th February with a leadership panel hosted by Head of BBC Radio 2, and Chair of The Radio Academy, Helen Thomas.

She was hearing the stories of women in the business, including KISS Network Content Director Rebecca Frank, BBC Controller of Popular Music Lorna Clarke, CEO of Radiocentre Siobhan Kenny, and Chief Executive of Ofcom Dame Melanie Dawes. The launch event was followed by five in-conversation talks, each taking place on a Wednesday lunchtime during March – *International Women's Month*. Future talks will explore a broad range of areas of radio and audio, and confirmed guests include BBC Radio 2's Sara Cox and her producer Louise Molony, and podcaster Helen Zaltzman. More names will be announced in the coming weeks. In addition to the live events, March will see the return of the *Radio Academy's Inspirations* audio series, releasing daily clips of women in radio and audio talking about their heroes and inspirations in the business.

Announcing the project, Chair of The *Radio Academy* Helen Thomas, said: "*I'm so pleased that my first role as Chair of The Radio Academy is to host this fantastic event. I can't wait to hear about the journeys of some of the women I most admire, and who have motivated me in my radio career. The whole Women In Radio & Audio project throughout March is designed to inspire and encourage members, with brilliant stories and extraordinary achievements.*" All six events will be available free to *Radio Academy* Members through a live stream on The Radio Academy website and made available on-demand. *Radio Academy* Membership is free for many people in radio, and costs just £36 a year otherwise. Members can register their interest now, at the URL below:

(Source: *Radio Academy, RadioToday*)

www.radioacademy.org/women

COMMUNITY RADIO SURVEY: The DCMS (Department for Digital, Culture Media and Sport) is conducting a survey of who listens to community radio. It is well worth participating in this. If you are interested, you can start at the following URL:

(SOURCE: Community Media Association, via Chrissy Brand)

https://project.tolunastart.com/s/a5ERo3b

WARDENCLYFFE TOWER AND TESLA: Also known as the 'Tesla Tower', Wardenclyffe was an early experimental wireless transmission station designed and built by Nikola Tesla in Shoreham, New York in 1901–1902. Tesla intended to transmit messages, telephony and even facsimile images across the Atlantic to England and to ships at sea based on his theories concerning the use of the Earth to conduct the signals. The Serbian-American experimented with VLF signals too.

(SOURCE: Wikipedia, via Bob Houlston; Norman G8ATO; Tesla Science Center)

https://teslasciencecenter.org

An Introduction to Digital Radio

Kevin Ryan
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In this month's column, Kevin Ryan goes back to basics. He explains the development and details of the different standards in digital radio and assesses their likely success and distribution in the future.

Digital broadcasting quite quickly became the preferred method for national broadcasting, especially in Europe. Not so long ago, a 'digital' radio meant an analogue radio that had a digital readout of the tuned frequency, and they were a huge leap forward from the dial and pointer method of tuning.

Nowadays, the term denotes an audio service broadcast as a *data stream*, just like the files stored on your tablet or PC. The ITU has approved two digital radio systems for worldwide use *below 30MHz*.

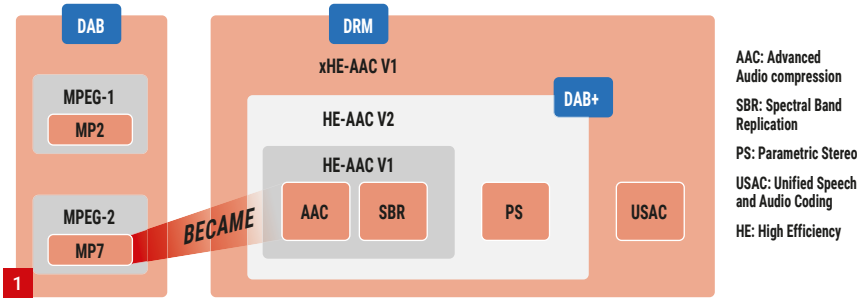
DRM can be used worldwide, but HDRadio is designed for use on medium wave in the USA. In countries outside of North America, the digital information located on the same channel (called *In-Band-On-Channel*) as the analogue is subject to interference, and the system does not work as intended.

A further six systems are approved for use *above 30MHz*, of which DAB, DRM and HDRadio are used outside the country that invented them. China, Russia, and Japan invented systems primarily for use in their own countries; these are not in use anywhere else; Russia will probably use DRM, rather than its own system (Fig. 1). I'll cover DAB and DRM in some detail and look at the unique features of HD Radio.

A Short History of DAB

Digital Audio Broadcasting or DAB was born in 1986 as the *Eureka 147 Project*. In 1995, the UK experienced the first network transmissions from the BBC. Digital One began a second national multiplex in 1999, and local DAB multiplexes appeared shortly after that. I think the success of DAB may lie in the fact that governments, broadcasters, equipment makers, and mobile phone operators could all see the long-term benefits for them of moving to digital from analogue transmissions.

Looking back through my copies of the *Radio Listeners Guide*, the 2003 edition celebrated the arrival of the first £99 DAB receiver, the *Pure Evoke 1*. Up to then, many DAB receivers were Hi-Fi tuners because there was



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an expectation that DAB would deliver Hi-Fi ('high-fidelity') audio. The *Pure Videologic DRX-601EX* retailed at £440 around that time – a lot of money in those days.

Nowadays the typical price for a DAB receiver is around £30 in the UK.

Quantity Over Quality? The Perceived Benefits of DAB

DAB promised higher fidelity, more stations, and more resistance to noise, co-channel interference and multipath distortion than is commonly found in analogue FM radio. This promise boiled down to CD-quality audio coming from our DAB radios.

High Fidelity (Hi-Fi) means the reproduction of sound that is as close to the source as possible. There are lots of audio encoders–decoders (abbreviated to 'codec' – see Fig. 2) around. However, few of them use *lossless* audio compression, where every bit of detail is retained from the source.

Have any of the suggested benefits been delivered? I live in an area with good FM reception and I cannot say that DAB has eliminated noise, interference, and so on. Certainly, DAB carries many more stations that we imagined, but the overall audio quality has dropped in line with the medium's further expansion.

I feel a future where DAB became a *replacement* for AM was only averted by the introduction of DAB+.

When I listen to speech and music stations using these lower bit rates on DAB and DAB+ I cannot honestly hear any difference between the left and right speakers. I even tried using a piece of software called a Vectorscope to analyse the stereo signal, and I still could not detect much difference between left and right channels.

However, DAB continues to give UK listeners more choice in nearly all radio genres; some 'consolidation' took place in 2020 when many local stations disappeared in the Bauer 're-branding' exercise. A new generation of local stations will, no doubt, replace them in time, along with many more community stations. DAB is loaded with features (Fig. 3) – like in the parallel case of DRM. Many of these are hardly used by any country, and the features in receivers are often pretty basic; for example, many radios only have a tiny two-line display (Fig. 4). Thus, the future vision of DAB can, perhaps, be described as 'quantity over quality'.

The Development of DRM

The reason that Digital Radio Mondiale or DRM happened was a little different. Major broadcasters started the ball rolling because at that time they saw AM as a key part of both national and international broadcasting. The international broadcasters saw that something needed to happen to counter what was seen as an 'inevitable decline' in listeners

2

	Long Wave	Medium Wave	Band I 47-68 MHz	Band II 88-108 MHz	Band III 174-240 MHz	Other Bands
DRM						
DAB						L-Band
HD Radio						
CDR (China)						
RAVIS (Russia)			66-74 MHz			
ISDB (Japan)					188-192 MHz	S-Band

ALL PICTURES: KEVIN RYAN

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Some Digital Terminology & Concepts

Digital Stereo

The FM Stereo model transmits left and right audio channels (L and R) by creating two mono channels (L+R and L-R) from which the original (separate) channels can be re-created. DAB Stereo is supported in MP2, where the L and R channels are encoded and transmitted separately. Radio 3 is the only example in the UK, although all BBC Radio channels on Freeview use the stereo mode. DAB Joint-Stereo uses a technique to lower bit rates. Classic FM is a good example along with all BBC Local Radio. The idea of joint stereo encoding is to band-limit the audio spectrum in the L-R signal (thus reducing overall differences between the L and R channels and the original stereo effect) and to transmit information about how to pan those combined frequency regions to create a stereo effect in the receiver. The UK was a very early adopter of DAB, and we have been 'stuck' with the best-suited encoder of the 1990s, called MP2. If you scroll through the info screens on your radio, you will come across it. On the plus side, it has a good error correction to recover segments of data lost in transmission. Parametric Stereo is used by the AAC family of encoders to transmit a stereo signal using as little of the multiplex capacity as possible. On the SDL multiplex DAB+ stations, nearly all use 32 kb/s – half the bit rate of many of the older MP2-based mono services. AAC is a very complex process. Putting it simply, AAC reduces a stereo signal down to a mono signal. This is then split into lower and upper frequencies. The split does not have to be at the half-way point. The data sent to the receiver consists of the lower baseband frequencies, a set of data to reconstruct the 'missing' upper-frequency band (Spectral Band Replication or SBR) and a second set of data to re-create the stereo effects (Parametric Stereo or PS). China transmits a baseband of 5kHz that SBR expanded to 15kHz, although a more successful option is to expand to around 11/12kHz.

Audio Encoding

Audio encoding is converting the sounds we hear into a digital format that can be transmitted in limited bandwidth and then reproduced (decoded) in a receiver to sound like the original (see info on 'Codecs', below). The first important concept is 'Sampling Theory', which specifies the number of measurements (usually expressed in kHz) and the accuracy (number of bits) you need to use on an analogue signal (with constant variation) to convert it into a digital form (with discrete values) which can be later converted back to analogue. In a studio where audio usually spans 20Hz to 20kHz, the recommendation is 48,000 measurements per second with each sample generating 16-bits of data. In this example, the data rate is about 1.5 Mb/s for two-channel stereo. This is better than CD quality and that bit rate just about fits into a DAB channel (called a 'multiplex' or 'ensemble') with a raw data capacity of 2.4 Mb/s available. Broadcasters like the BBC want to fit many more services into their multiplex. A quick calculation shows the BBC mono and stereo services have a combined data rate of around 14 Mbit/s. This data rate needs to be compressed down to around 1.5 Mb/s, a factor of 10:1. Here is the second important concept in digital broadcasting: Data is deemed 'redundant' if our ears cannot hear it. This method of data compression is called perceptual encoding. Put simply, engineers worked out that we only hear the loudest sounds at any moment in time and that many of the other audio samples can be discarded for that short period. For example, if there is a crash of cymbals during an otherwise quiet orchestral piece, our ears will only hear the loudest sounds, which are the cymbals. Most encoders like MP2 and AAC are classed as 'lossy', meaning there is a corresponding reduction in the quality of the reconstructed audio signal. In this context, the lossy is lossless audio encoding. MP2, encoded at 256 kb/s, was judged to provide a high-quality stereo broadcast signal. However, a small reduction to 224 kb/s is often adequate. However, at 192 kb/s, it is relatively easy to hear imperfections in critical audio material.

Codecs

A 'Codec' is a short name for an audio **co**der and **dec**oder. The DAB codec is MP2 (or MPEG-1 Layer 2) audio compression. MP3 (MPEG-1 Layer 3) dominates the internet because it provides reasonable quality at a lower bit rate. However, MP2 has superior error-handling. At higher bit rates, it is often regarded as sounding better; it includes a 384 bits/sec option not found in MP3. DAB+, DRM and HDRadio use the AAC (Advanced Audio Compression) audio coder that is part of the MPEG-2 multimedia standard. DAB+ stations nearly all use HE-AACv2, although a few still use HE-AACv1 while DRM stations can use any one of the AAC family (Fig. 1).

on the AM bands, in favour of FM, DAB and satellite radio.

Unfortunately, they did not foresee the role the internet would play in shifting the focus of international broadcasting away from short wave radio.

The first formal meeting of a 40-strong *DRM Group* took place on April 4, 1997, in Las Vegas, Nevada.

The meeting agreed to create a formal organization called Digital Radio Mondiale (DRM) to design a digital AM standard, which would be non-proprietary, market-driven, and consumer-oriented. It would work to spread AM digital technology around the world.

On March 5, 1998, 20 of the world's broadcast-related organizations signed the *Digital AM Memorandum of Understanding* in Guangzhou, China, thus putting DRM on a formal footing. Later, on 10th September 1998, in Amsterdam, the *Consortium Agreement* replaced the Memorandum of Understanding and DRM was officially born. The ITU provided quick approval for the standard as the DRM system was designed to *co-exist* with the current analogue broadcasting infrastructure.

The Advantages of DRM

DRM was supposed to transform broadcasting on the AM bands and provide similar benefits to DAB, such as 'FM-like', clear, reception, more than one programme on the same frequency, text, and traffic information. It would also offer Electronic Programme Guide (EPG), selected web sites and other multimedia, an early warning system, and the automatic retuning of the receiver.

In addition to this, the technology would

Fig. 1: The six *standards* approved for use by the ITU. DRM is the most versatile, but DAB is likely to be the most widely used. Fig. 2: The family of *codecs* used in many digital radio systems. MP2 is very dated and I think only widely used in the UK. Fig. 3: *Electronic Programme Guide (EPG)* and *Alternate Frequency Selection (AFS)*, covering AM/FM/DAB alternatives, are two of the features *removed* from later DAB receivers. Fig. 4: The *Morphy Richards MR27024* is one of the best multi-standard radios and sometimes comes up for sale on the internet. Fig. 5: This is the last DRM receiver I purchased. Unfortunately, the keypad failed. Now out of production. Fig. 6: More on Digital Radio in here...

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COURTESY OF RLG

prolong the life of expensive national transmitters and continue to make short wave broadcasting relevant and attractive against the tidal wave of DAB, satellite, and the internet.

DRM had a good start, with countries like Germany and Luxembourg upgrading or buying new medium wave transmitters and equipping their short wave stations with DRM computer equipment. From my records, I think the interest in DRM from broadcasters peaked between 2004 and 2006 when I noted around 1,000 hours of DRM broadcasts per month. The BBCWS, Radio Luxembourg and Deutsche Welle were leaders in developing the deploying the technology.

Eventually, the decline of the DRM format paralleled the general deterioration in AM in the western world and happened mainly because governments did not see the benefit of continuing to fund international short wave broadcasts when the public did not want super-powered transmitters near their homes.

For some reason (which I never quite worked out) DRM radios did not appear in significant numbers (Fig. 5) and at an attractive price because not one of the major receiver manufacturers showed any long-term interest.

Unlike DAB – which is fundamentally a *radio service* – DRM tries to find niche applications, such as a role in remote education, public signage, and naval services (to reach ships unable to use satellite systems). DRM has, however, achieved something of a foothold in Asia especially in India, China, and Russia.

Other countries are likely to follow suit.

DAB or DRM?

Most countries tend to test both systems, and several have already made their national choice. However, many others in Asia and Africa are still undecided about whether to opt for DAB and DRM. HDRadio will probably be only ever used in North America. South Africa decided that both DAB and DRM will work for them, as did the UK (broadcasts DRM on shortwave from Woofferton) and many other European countries.

DAB has a distinct advantage, in that there is a multitude of receivers available. Coverage is similar to FM (basically line of sight) and it is expensive to cover big countries with a large rural population, on account of the large number of transmitters required.

DAB also requires some spectrum in Band III that may not be readily available.

DRM is better for wide-area coverage because many existing AM transmitters (LW, MW, SW) can be upgraded for digital use but there are no receivers available outside of car radios in India. DRM also works in Band II (VHF-FM) and can be squeezed into gaps between FM stations.

However, both systems still cannot compete in certain countries reliant on 'old-fashioned' AM and FM. Here, cheap receivers costing a few pounds are readily available and one set of batteries lasts a long time. There has never been a cheap DAB radio (£20 is the lowest price I have seen), even though this very goal has become the 'Holy Grail' of the DRM Consortium.

Those who are driving this development appear to inch closer to achieving this objective but consistently fail to find an investor to fund a high-volume production run (10,000+) of even the most basic DRM receiver.

HDRadio

The *iBiquity* company (now owned by Xperi) has developed the HDRadio system the US Federal Communications Commission (FCC) selected in 2002 as its domestic digital radio standard. The format has an all-digital mode.

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However, most AM and FM stations operate in *hybrid* modes, where the digital data is broadcast on the same channel as the analogue station. The system is also known as IBOC for *In-Band* and *On-Channel*. All-digital is now allowed on AM but take-up is slow.

HD Radio promised 'CD-quality' on FM channels and 'FM-quality' on AM channels, which is a really good marketing approach. Other features include up to two additional FM channels, alongside the main digital channel; media-tagging to create playlists from songs you hear on the radio (by linking to *iTunes*); song titles and artists' names displayed on the radio. There is also the ability to pause live streams for up to 15 minutes.

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Youthful Voices, Global Messages, and Earworms

In this month's column, **Chrissy Brand** introduces a young American flying the short wave flag, breathes a sigh of relief at the Voice of America and recommends some programmes to exercise the brain.

According to a predominant perception, the radio world – especially in the areas of short wave listening and DXing – is predominantly the domain of 'older' people, certainly those aged over 35.

The wider audio world of radio broadcasts and podcasting is better populated with a wider age range. Indeed, it needs to be, as we all age and eventually fade away, and there needs to be a constant influx of the next generation of broadcasting professionals and listening enthusiasts.

The radio industry, from free radio to national and commercial stations. does employ younger people in key posts, including graduates who become presenters, producers, marketing gurus and engineers.

The world of short wave and international broadcasters may have fewer younger presenters than other forms of radio, but there are still some inspirational younger stations and voices.

The UK radio and podcast scene is also bursting with young talent. The Radio Academy highlighted the tip of that particular iceberg in its awards last year. The '30-under-30' category highlighted producers and presenters, some of whom you may have heard on the air, such as Emma Pearce on BBC Radio 4, Reha Kansara on the BBC World Service, Tim Hunter on BBC Guernsey, BBC Jersey and *BBC Introducing*, Jay Lawrence on Absolute Radio, Rachael Venables on LBC, and Lauren Mitchell on Northsound 1 in Aberdeen.

www.radioacademy.org/30-under-30

Voices From America

Meanwhile, across the pond, I have been listening to a US radio station that is run by, but not exclusively for, young people, expressing insightful views.

In San Fernando, California, KPC Radio is home to *Electronic Echoes*, a programme exploring, *"the hidden world of Shortwave Radio."* Presenter Aaron Castillo speaks with various DXers and experts.

The KPC website has a number of these programmes to stream, including interviews with Radio New Zealand Pacific's frequency manager Adrian Sainsbury and Macon Dail, at the Voice of America's *Edward R Murrow Transmitting Station* in Greenville, North Carolina.

Part of the latter interview was aired by two veteran US short wave broadcasters, Dr Adrian Peterson and Jeff White on AWR *Wavescan* (Programme No. 621) on WRMI in January, along with a short wave report from Bangladesh and a feature on Radio Nepal.

https://tinyurl.com/y2kcz6jy

1

Following the *Electronic Echoes* on Twitter is probably the best way to keep up with the latest broadcasts because the KPC Radio website is not always up to date.

https://tinyurl.com/wetrth97
Twitter @ElectronicEcho1

KPC Radio is based at Pierce College and broadcasts news, features and local content. The station streams live, although that facility is unavailable in the UK. Instead, I have listened to station programmes through its podcast page.

It would be nice if more programmes were added, as the content is thought-provoking and intelligent. A documentary on *Social Media Stars and Influencers*, hosted by Kennedy Cashman, was highly informative, as was her documentary on homelessness in LA, in a feature programme, *The Leading Life*. This contained conversations with young community leaders in the San Fernando Valley.

http://KPCRadio.com
https://kpcradio.com/category/fall-2020

To follow student radio in the UK, the Student Radio Association would be a good place to start, although the website was down at the time of writing. Its Facebook page is another place to catch up on the latest radio news from our campuses.

www.studentradio.org.uk
www.facebook.com/studentradio

Next, we turn to a short wave broadcaster in his early twenties, John Jurasek. His dapper appearance of slicked-back hair and vintage suits makes him appear to have arrived on a time machine from the 1940s.

He started a YouTube channel ten years ago, reviewing energy drinks and fast food. A quick search online comes up with his estimated net worth to be half a million dollars. John, who is a self-proclaimed 'creature of the night', is clearly in that cohort of young people who have become social media influencers.

The income from his social media channels, donations to Patreon and PayPal, advertising and merchandise, all finances his airtime on short wave. You may have heard VORW (Voice of The Report of the Week Radio International) aired on WRMI and Channel 292 (Fig. 1).

Different versions of this programme can be heard on YouTube, Soundcloud or the podcast app of your choice.

A verification letter I received in January 2021 states that the station mission is to, *"provide an enjoyable light entertainment programme over the airwaves"*, including,

CKRM

2

"music exclusively comprised of listener requested tunes."

John is also known as 'Review Brah' and, rather confusingly, *Report of the Week*. He holds court and talks freeform for anything up to five hours at a time, although the short wave programme is limited to more manageable, one-hour segments. I have heard him talk about radio, philosophy, current affairs, tropical weather, aliens, food, internet addiction, fan art, and listener interaction.

Voice of the Report of the Week has listeners all over the world, with Croatia and Korea being just two of the, perhaps unexpected, countries with audiences. Perhaps you will join with his 2.1 million subscribers?

https://tinyurl.com/14w7pmcj
https://soundcloud.com/vorw
https://tinyurl.com/29ece7ah

Meanwhile, there have been changes at the Voice of America. Donald Trump had appointed Michael Pack as the CEO of the Agency for Global Media, but his position became untenable in January, as pressure mounted against his actions. Pack was accused of illegally diverting over US$4 million to his private documentary company. Five recent chiefs of Radio Free Europe/Radio Liberty also stated that Pack posed a long-term threat to the credibility and professionalism of the networks he oversees. So, it came to pass, that on the day President Biden took office, Pack was sacked. This was followed by the demise of other high-ranking USAGM officials who were aligned with Trump.

Biden appointed veteran Voice of America journalist Kelu Chao as the temporary head of the USAGM. She said that, under Pack, journalists at the Voice of America, *"have been excessively cautious, slow to produce stories, and afraid to run down important stories and leads, particularly about politically sensitive topics, no matter how important."*

The US. Agency for Global Media (USAGM) was formerly known as the Broadcasting Board of Governors (BBG). It is an independent agency of the US government which supervises the Voice of America, Radio Free Europe/Radio Liberty, Radio y Televisión Martí, Radio Free Asia, Alhurra TV and Radio Sawa.

https://tinyurl.com/kfu8hx77
https://tinyurl.com/4gjvjxyx
https://tinyurl.com/27erfsey

Medium and Short Wave

Mika Makelainen is a well-known DXer and a foreign news journalist for the Finnish Broadcasting Company. In November, he logged Oklahoma country music station KWHW, on 1450kHz, broadcasting a song by Mark Nelson Chesnutt. This was on a DXpedition in Finnish Lapland, using a Perseus receiver and a 3,000 ft long wire.

KWHW The Legend is a country music station. Its staff were delighted to learn of Mika's catch and promoted it on the station's social media.

Jan-Mikael Nurmela heard a mention of his DXing activities on the air: In January 2021, a Saskatchewan country music radio station, 620 CKRM *The Source* (Fig. 2) mentioned his reception report from Central Finland. The two presenters spoke about Jan-Mikael's work at a radio museum and stated that, *"this long-distance listening is quite the thing … he sounds like a fascinating young man."*

I had a listen to CKRM online. This Canadian station, based in Regina, has a dedicated station app, but only two of its programmes are advertised as podcasts on the website: *The Sports Cage* and *Saskatchewan Agriculture Today*.

The latter is a weekday show, presented by Jim Smalley who has, *"over 40 years on the farm beat."*

Fig. 1: 'Fan-art' is featured on *The Voice of Report of the Week's* QSL cards. Fig. 2: Canadian farming news on CKRM Regina in Saskatchewan.

Listen to features on grain shipping, rail transportation, tractor technology, and an organisation started by Quebec farmer April Stewart called *The Farmer's Survival Guide*. It is like no other radio programme I have ever heard.

www.kwhw.com
www.620ckrm.com/podcasts

RadioUser reader Stewart Hayes heard China Radio International on 17490kHz from 0900 to after 1100 UTC. The transmission consisted of feature programmes, music and *Studio Plus*.

Studio Plus is a daily show that, *"brings diverse opinion, fun, and light-hearted insight to listeners around the world."* A series on winter sports covered the history of ski jumping, curling and speed skating.

More sobering topics included the pollution of the Arctic Ocean by tiny plastic fibres from clothing. A more uplifting feature concerned Wan Zuocheng and Xiong Gengxiang, who run a communal kitchen in Nanchang - 200 people a day use the kitchen to cook their own food (Fig. 3).

To hear a selection of the station's programmes any time, there is a list of podcasts available at the website, in categories of news and business; society and culture; arts and music; education; and audiobooks.

http://chinaplus.cri.cn/podcast
http://chinaplus.cri.cn/podcast/list/15

Graham Smith has some useful observations. Syrian station Radio Dimashk (Damascus) on 783kHz from Tartus on the Mediterranean coast was off the air. It was logged last October by two members of the British DX Club (BDXC). Due to the ongoing conflict, stations and transmitters operate

Date	Time (UTC)	Station	Programme	Podcast	URL/ Stream/ Frequency
Daily	2000 to 2100	Radio Nacional de Angola	News, diaspora programmes, music	Google Podcast app	https://tinyurl.com/rekvy9m4 and 4950kHz
Monday to Thursday	1900 to 2200	BBC Radio Wales	Janice Long (misc. music and interviews)	BBC Sounds App	https://tinyurl.com/4s448ham DAB and FM
Friday	0000 to 0100	KOOP, Austin, Texas	People's Republic with Brianna Griffith	https://tinyurl.com/4yaxdhax	https://koop.org and 91.7 MHz in Austin
Saturday	1100 to	Sunshine Radio, Dublin	Travel Talk with Ed Finn on Saturday Live with Carol Dooley	https://tinyurl.com/cccmn2sk	www.sunshineradio.ie and 106.8 MHz
Sunday	1000 to 1400	BBC Radio Essex	Mid-Morning, Essex Quest	BBC Sounds App	https://tinyurl.com/3yuyfv8u DAB, FM and 765 kHz
Sunday	1100 to 1145	Rádio Nacional de Angola	The Saturday Show (music requests)	http://radioben.co.uk/3/index.html	https://tinyurl.com/3wvbtxv7 and www.rna.ao

Table 1. My top listening recommendations for the month ahead in international radio.

CHINA PLUS LI YI

Fig. 3: The *China Plus* programme, at a communal kitchen in Nanchang.

RNCM

Fig. 4: Music, mind and 'earworms' on *BBC Six*.

irregularly. It broadcasts in Arabic, French, Hebrew and Russian.

Two stations with Moldovan connections sign on at 0400 UTC. Graham logged Radio Moldova Actualitati Moldovan on 1494kHz. It delivers programmes for ethnic minorities in Russian, Romany, Gagauz, Ukrainian and Bulgarian.

On 621kHz, Graham heard Russian music. This would be the second station of the Pridnestrovian Moldavian Republic from a 150kW transmitter at the Transnistrian Radio and Television Center in Maiac.

A German student station called 'Joe', on 1485kHz from 0500 to 0000, is airing *Funklust - Deine Campusmedien*. A periodically-interrupted, 1kHz sinusoidal tone is heard at other times.

https://tinyurl.com/dne9ne43

Mind-Expanding Programmes

Radio and podcasts cater to all tastes and sometimes I like to exercise my cerebral side. There are at least two podcasts that share the name of *The Looking Glass*. Both are well-produced and packed with intelligent thought. One, based in the USA, has episodes about living in a digital world, the future of diplomacy and the US foreign service, and the future of US-China relations.

It is, "*the premier international relations podcast by The SAIS Review of International Affairs with support from The Foreign Policy Institute.*"

https://tinyurl.com/k7ntkew

The other *Looking Glass* programme started in November 2020 in the UK. Author and journalist Angela Saini hosts challenging conversations about society. Ideas and innovations across disciplines are examined, to create a better world. The series has been commissioned by the Institute of Physics. Episode 6 offered a blueprint for the future.

https://tinyurl.com/2e2c6edy

A Way with Words is a radio programme about language and linguistics. It is syndicated across the US and has an international interactive audience too. It first took to the airwaves in 1998.

Presenters Martha Barnette and Grant Barrett talk with callers about dialects, word origins and family expressions. They also, "*settle disputes, play word quizzes, and discuss language news and controversies.*"

www.waywordradio.org

In Australia, ABC Radio's *Conversations* veers between the enthralling and the amusing. The presenters have interesting backstories of their own. Before becoming a radio host, Sarah Kanowski was a goat herder in Chile and an Oxford literature student. Richard Fidler is a best-selling author who has interviewed prime ministers, falconers, scientists and astronauts.

Hear about adventurous female lighthouse keepers; Yuwaalaraay writer and storyteller Nardi Simpson on art and the meaning of country and Dr Culum Brown's work on fish cognition which found that, "*fish have long memories, sharks have friends, and stingrays know when it's the weekend.*"

https://tinyurl.com/3h4323h9

BBC Radio Six Music's *Journeys in* Sound was incredible. Aired in January and February, DJ and integrative psychotherapist Nemone was joined by musicians and scientists to examine the links between music and the mind. Neuroscientist Dr Daniel Levitin stated, "*Great musicians can add all kinds of nuance to their performance that function like ear candy.*" The music psychologist Dr Victoria Williamson was one of several experts interviewed. A few years ago, I arranged for her to give a Royal Northern College of Music research forum lecture on the topic of 'earworms' (Fig. 4). These are, *"tunes that get stuck in the head - stories, suspects and solutions Spontaneous, repeating musical imagery (the 'earworm' phenomenon) affects 90% of people at least once a week."*

The *RNCM Research Forums* are free to the public and are currently held online. Some of the previous forums can be viewed on the RNCM YouTube channel.

www.bbc.co.uk/programmes/m000rbl9
www.rncm.ac.uk/series/research-forum-swww.youtube.com/rncm1.

Chrissy Brand
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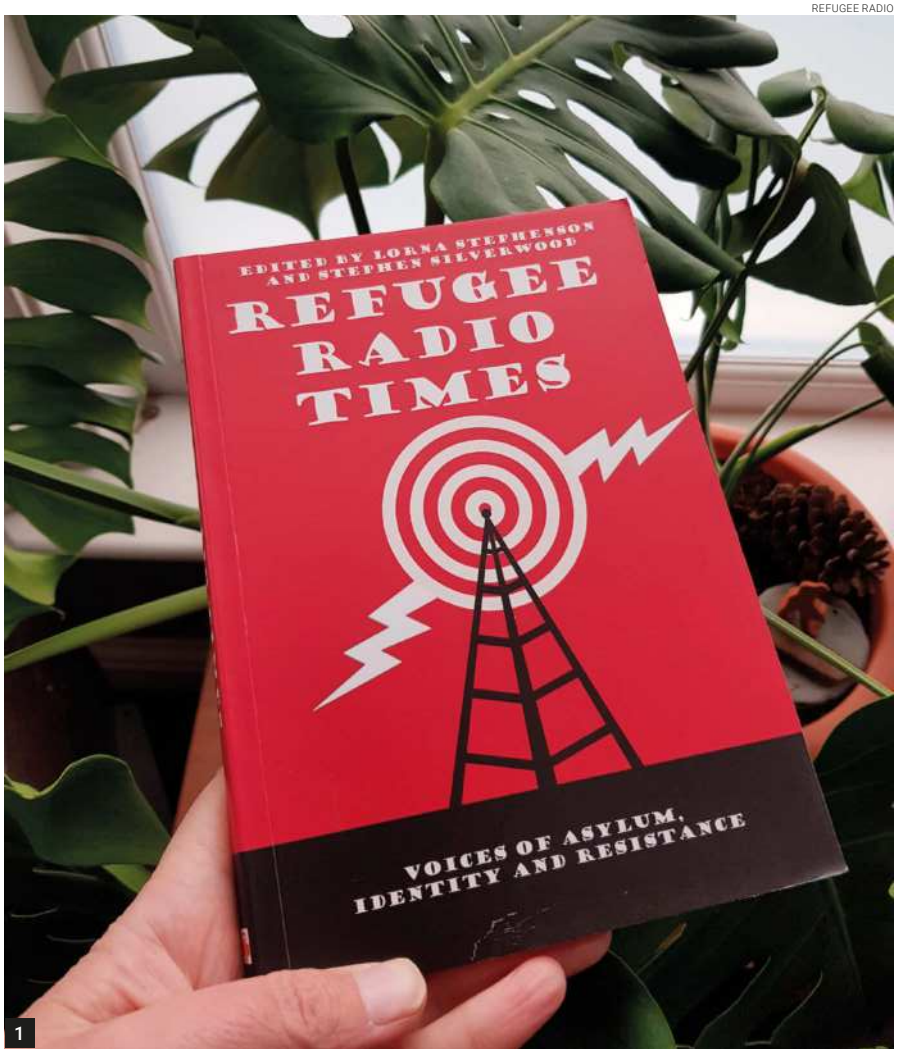
REFUGEE RADIO



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The World is our Home: Refugee Radio

Chrissy Brand looks at radio programmes and podcasts set up by - and for - refugee communities. She examines some broadcasts that counteract lazy scapegoating and celebrate stories of overcoming adversity.

Humans have always traversed the globe, in exploration, for betterment or to flee persecution. The refugee 'crisis' is nothing new. There are people in every country in the world, usually minority groups, that face daily attacks (mental or physical) from the ill-informed, often whipped up by right-wing populism.

Fortunately, many organisations support and champion the plight of minorities. They are needed to overcome the hostility in the UK mainstream that is often unjustly aimed at asylum seekers and refugees. Many heartening initiatives support and educate on the refugee situation, with radio stations and podcasters playing a major role.

Radio as a Refuge

Many refugee crises are caused by western governments interfering in other countries, for example, by actively encouraging arms trade exports. A current case in point is Yemen, with UK and US governments effectively enabling the devastation of what was already the Middle East's poorest country.

World War One saw the largest influx of refugees into the UK. For example, 250,000 Belgians arrived. Had radio not been in its infancy at that time, I envisage that there might have been programmes produced in Flemish and Walloon to help those Belgians. Information, especially audio, probably more so than the printed word, helps new arrivals to settle and imparts knowledge about their host country. It can also be an aid to dispel the fear and ignorance prevalent in certain sectors of the public.

Migrants and refugees (once they have been granted asylum) can go on to play a key role in their adopted country. Today, that is often as workers in the NHS and other public services; In World War Two, there were dozens of German-speaking Jews fleeing Central Europe as refugees who found employment in the *BBC's German Service*.

One of many ways to counteract misinformation is to educate refugees and the wider public on all matters. Radio broadcasters and podcasters have a key role in this. As part of their remit, public and commercial radio broadcasters should surely also be involved in this effort, although most fail to do so.

It is often left to publishers, community broadcasters and refugee organisations to be the voices of reason, sanity and empathy (Fig. 1).

Current Stations

There are stations and programmes all around the world that are run by, and for, refugees. COSMO Refugee Radio (Fig. 2) is one example, regularly broadcast on German station Westdeutscher Rundfunk. It is aimed at Arabic-speaking refugees but also contains some English programming. Content includes information about healthcare services, legal matters, integration and volunteering. In addition,

Fig. 1: Many see this book as a key resource in refugee radio matters. Fig. 2: *Cosmo Refugee Radio* has a home on *Westdeutscher Rundfunk*. Fig. 3: *Renegade Radio* airs bold voices from Kuala Lumpur. Fig. 4: *Solidaritee* is a student-led refugee charity and podcaster.

WDR

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it gives updates on the situation and political discussions regarding refugees in Germany.

Elsewhere, Radio Calais started in November 2020. It weaves together global music and soundscapes, with information about the unofficial settlements of refugees in northern France. It is hosted by DJs and activists who, *"campaign for an end to the hostile environment and a borderless world."* Radio Calais is also aired on Brighton's Reverb Radio, on 97.2MHz.

Closer to home, Refugee Radio is a UK charity supporting refugees, asylum seekers and vulnerable migrants. As well as coordinating community projects on mental health, isolation and social exclusion, it uses radio and music to give a voice to those who would otherwise not have one. The station has made a variety of informative and supportive programmes that I believe should be reaching an audience as wide afield as humanly, and humanely, possible.

Its *Refugee Desert Island Discs* programme gives under-represented voices a chance to talk about their life stories and hopes. *Episode 53* is typically haunting, with a refugee called Amir simply talking about wanting to stay alive.

Asylum seeker and refugee musicians also have a stage at Refugee Radio. Listen to a Kurdish New Year party, a Kora Night, and the *Refugee Radio Orchestra*, among other multi-talented artists.

Documentaries and special programmes have also been produced and can consist of topics from international law to poetry. Although usually driven by refugees themselves, other advocates also get a say. Kate, a human rights lawyer was interviewed for one programme, while David Miliband spoke about the International Rescue Committee. The IRC responds to, *"the world's worst humanitarian crises, helping to restore health, safety, education, economic wellbeing and power to people devastated by conflict and disaster."*

Further afield, Zaatari Radio is a refugee-run FM radio station in Zaatari Village, Jordan. It began in 2018, in partnership with the humanitarian organisation, *Acting For Change International*. It was created by Kotaiba Alabdullah, a Syrian who relocated to Jordan ten years ago. Workshops and radio programmes that have been run through this collaboration have relayed health messages, and they also inspire creativity through radio.

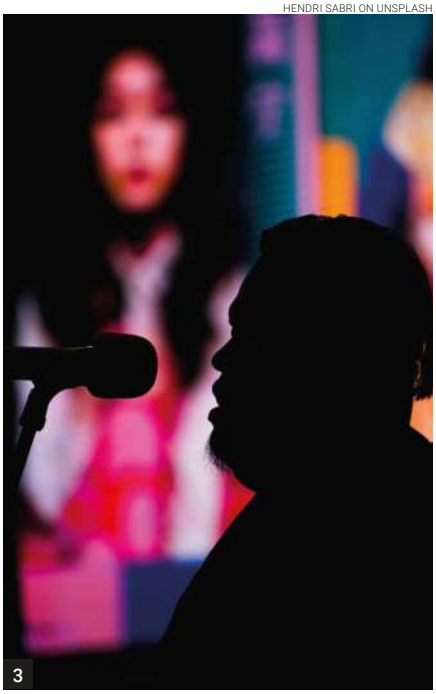
Meanwhile, Malaysian podcaster Renegade Radio was set up in 2018 with *"an eye and ear for bold and independent voices."* Its podcast, *Lone Passage*, is about unaccompanied child refugees, who are surely the most vulnerable and invisible in society (Fig. 3). It shines a light on the stories and struggles of children who ended up in Kuala Lumpur, asking what the future holds for young refugees, in a country that does not even recognise the rights of refugees.

Another excellent example of support is *The Refugees Stories* podcast, which starts from the point of public awareness about the war in Syria. It states that, *"Most of us have an opinion about it, but very few of us have had the opportunity to sit in a refugee's tent and listen to their story. Refugees' Stories aims to change that."* A season of *The Refugees Stories* last year followed the lives of those who sought asylum, due to their lives being endangered because of sexuality or gender identity.

Two European broadcasting giants that do carry trustworthy and often innovative coverage of the refugee situation are Deutsche Welle and Radio Sweden. Whilst many stations only carry headlines and soundbites about a story, the English services of these two stations (and presumably their other language services as well) follow up with innovative features and interviews. It answers important questions about what happens to a family once it has settled, and how to integrate into new social and cultural scenarios. The stations reflect the fact that Swedish and German governments have been, arguably, among the more progressive and humane in Europe when it comes to welcoming refugees.

One Radio Sweden feature noted how

HENDRI SABRI ON UNSPLASH



3

refugees have boosted the economy and the community in Kiruna, the country's northernmost city. Monica Isaksson, the municipality manager for jobs and integration, confirmed that, *"It's gone very well, Kiruna has a thriving labour market and most of those new arrivals who have stayed here, have found work and started to integrate into the municipality."*

In January, Deutsche Welle asked if Germany had forgotten about its refugees amid the Covid-19 crisis. Memet Kilic of the German Council on Immigration and Integration thinks that this has indeed been the case, stating, *"Refugees are the group suffering most in the pandemic and the ones who have been, simultaneously, forgotten. Naturally, they still can't articulate themselves very well and are, above all, happy to have escaped with their lives."*

Programmes for Allies

There are many programmes, well beyond the mainstream media, that inform and educate those who choose to listen. Radio

NAZY RAOUF

4

programmes and podcasts, along with campaign groups, can often bust the racist myths around refugees that are often bandied about on social media. Groups in Hastings (*City of Sanctuary, Hastings Supports Refugees* and *The Hastings Refugee Buddy Project*) launched a campaign last year to counteract this, with a social media campaign of graphics, as well as being a voice on podcasts.

One of the many other forces for positive change is the *Right to Refuge* podcast that commenced last autumn. In it, *SolidariTee*, an international, student-led, charity fighting for long-term change in the refugee crisis, offering vital facts and education to everyone (Fig. 4). *"This podcast will try to answer all the questions you've always been too scared to ask, while also spotlighting some of the incredible organisations making an impact. From legal aid to the power of language, we hope to break down one of the most pressing issues of our time and ensure that accurate, up-to-date information is accessible to everyone."*

In one episode, *Regional Focal Point* Anna Marshall and a member of the Comms Team, Cicely Day, discussed approaching difficult conversations with friends, family and strangers, who might disagree or simply might not know much about the refugee crisis. Similarly, The Worldwide Tribe's *Stories from the Refugee Crisis* is a podcast that takes you on a journey across the world. It gives time and a voice to people who needed to abandon their home lives, people living in refugee camps and those working on the front line*: "The humans behind the statistics and the headlines. The real heroes of today. Transcend borders, nationalities, religions and languages to hear from the people with which we share this world ... our Worldwide Tribe."* The podcast is now in Series Four, but the first-ever episode of series one is just as relevant today and has resulted in a positive outcome. Abdulazez Dukhan was in an inspirational conversation about his life, which took him from Syria to a refugee camp in Greece, before studying in Belgium.

In Australia, SYN is a media organisation run by a community of young people for young people, providing broadcast and training opportunities for young Australians.

It produces a programme called *Refugees On Air*. This is a Melbourne-based programme (on FM, DAB+ and online) that is a platform for, *"refugees, migrants and asylum seekers from all over the world to share their inspirational stories. It was created by 19-year-old Syrian twins Sarah and Maya Ghassali in hopes of putting a human face to stories that often go unheard."*

Future Perspectives

This article is a short overview of some of the solutions offered, by progressive broadcasters, podcasters, community-, and third-sector organisations. It seems that the entire western world needs to get more used to and accept the diversity and benefits refugee communities can bring to any country. With the climate crisis also in full swing, there will be tens of millions of climate change refugees needing to leave their homes and travel to new countries.

Although Europe is already affected by the changing weather patterns and global warming causing extreme temperatures, it will not lose as much land to sea and desert as parts of Asia, Oceania and Africa. However, more and more radio stations include environmental programmes in their schedules. It is not just the developing world that climate refugees will come from. In January, US television and radio broadcaster, CBS News, reported how the deadliest wildfire in California history, which destroyed 95% of the town of Paradise, had created climate-refugees.

Jesse Keenan, Tulane School of Architecture, and a leading scholar on the effect of climate change on people and cities stated, *"There isn't a community in the USA, particularly in coastal America, where we are not seeing some transition away from the coast and moving to higher ground. Places like Miami, New Orleans, San Francisco, even in D.C., we see an environmental risk from flood shaping property values and shaping where people want to live."*

When we turn to what passes for radio in another twenty years, there will be many more nationalities for each domestic broadcaster to consider. Whatever organisations occupy the UK space currently dominated by Global, Bauer and the BBC will need to produce more programmes in many languages for different people. It is another challenge to be risen to, but every country is, of course, enriched by its immigrant populations. As The Worldwide Tribe puts it, *"We are all human, the world is our home."*

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- Refugee Radio UK **https://refugeeradio.org.uk** **www.facebook.com/RefugeeRadioUK**
- International Rescue Committee **www.rescue.org**
- Radio Sweden audio features on immigrants and refugees **https://sverigesradio.se/grupp/22757**
- Coronavirus: Germany loses sight of its refugees, Deutsche Welle **https://tinyurl.com/3sju9bf9**
- The Refugees Stories podcast **www.refugeesstoriespodcast.org**
- Hastings Refugee Buddy Project **https://tinyurl.com/7tv87w**
- The Worldwide Tribe: Stories from the Refugee Crisis **https://theworldwidetribe.com** **www.facebook.com/theworldwidetribe**
- Climate refugees: The quest for a haven from extreme weather events, CBS News **https://tinyurl.com/stkkvt9k**
- Refugee Radio Times Edited by Lorna Stephenson and Stephen Silverwood ISBN-13: 978-0-9929374-0-9 **www. https://tinyurl.com/lyt3ypeg.**

Waves and the Virus

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In Part Two of his investigation, the editor looks at how the Coronavirus pandemic has profoundly altered amateur radio- and two-way communications, local radio, the industry, and the world of hobbyists.

The many amateur-radio-related Covid-19 initiatives discussed in Part One of this article (*RadioUser*, March 2021: 44-48) are both necessary and innovative – although I think that many amateur radio operators do not need prompting and are naturally inclined to reach out to others in need anyway.

This is amply demonstrated by the many RAYNET (and RAYNET HF) groups and through numerous other examples. Amateur radio clubs – now as many times before – are the first point of call in emergencies, natural or man-made disasters, such as hurricanes in the US and flooding in the UK.

In the UK, RAYNET was formed in 1953 following the East Coast flooding weather event, to provide a way of organising the valuable resource that Amateur Radio can provide to the community. Since then, it has grown into a very active organisation with around 2000 members, providing communication assistance on many hundreds of events each year.

The Coronavirus crisis, combined with the severe weather events in the UK in 2020, has demonstrated the importance of this kind of network, especially in terms of the delivery of medical supplies and food parcels to those who are shielding or self-isolating.

Many Hams have thus answered the Covid-19 call. They continue to do so, as can be witnessed in the pages of the *ARRL Letter, The Spectrum Monitor, RadioUser* or *RadCom*, or through events such as *Skywarn Recognition Day* (Fig. 11).

[see Peter Hyam's article on 'Using Hobby Radio in Emergencies'; RadioUser, *March 2021: 34-37 -* ***Ed****.].*

https://www.raynet-uk.net
https://raynet-hf.net

If you wish to learn more about emergency communications and amateur radio in general, Tim Kirby has written an excellent four-part guide to this topic in *RadioUser* in 2019 (04/30; 06/40; 08/32; 10/64).

www.radioenthusiast.co.uk

ARRL

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Two-Way Radio: Schools and Business Communications

Staying in touch with family, friends and colleagues – and with the vulnerable in our communities – is imperative during the Covid-19 pandemic. Smartphones may be ubiquitous, but not everybody wishes to engage with one, and coverage in many remote areas ranges from a bit patchy to downright pitiful.

Small wonder then, that all forms of two-way communications have experienced a resurgence in 2020, especially licence-free radio, walkie-talkies, VHF/ UHF, CB and PPR 446 transmitters.

The evidence from all the main UK radio traders points to a massive upsurge in sales for these devices, for both private and professional use.

Furthermore, the audio from my home scanners (an Icom IC R-20 and a Whistler TRX-1) would suggest a much higher local volume of traffic on the amateur radio bands and in the licence-free allocations.

On top of this, many businesses, large and small (Fig. 12), have (re-) discovered the ease and convenience of CB or similar technologies for business communications, or simply to keep their workflow going.

Local delivery and taxi drivers have always known this, of course, communicating as they do, on VHF/ UHF, but some of this is quite new to the local care home, community hospital, kindergarten, supermarket, take-away or school.

Regarding the latter, for example, blogs like the one by *2CL Communications* are revealing the clear advantages of using two-way radios – rather than phones or e-mail – for the new school-lockdown procedures, which at the time of writing have become the 'new normal' here in the many parts of the UK.

The blog states that *"with two-way radios, school staff can communicate in real-time and school-wide. Transmissions are instant – users just need to press the transmit or push-to-talk button to be able to communicate with everyone currently on the frequency (channel) – and there's no limit to the number of users that can be active on a frequency, allowing school staff to scale communications across the entire site."*

www.2cl.co.uk
https://tinyurl.com/y4ygo4w7

In other areas, businesses have seen the use of two-way radios rise, to help with the security of 'lone' workers in (partly or wholly) deserted work environments, with safeguarding and emergencies, GPS tracking, health-and-safety issues, as well as achieving more immediate, targeted, and faster communication.

Traders and manufacturers, such as *Education Radios*, are locking on to this and are now promoting two-way radio technology – as well as, in some cases, DMR licenced systems – for professional teams to keep communications flowing once they return to work as lockdowns and furloughs are lifted.

RADIOTODAY / PEXELS

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https://tinyurl.com/y2rhbru6
https://www.educationradios.co.uk
https://tinyurl.com/2etjy64w

In the context of 'emergencies' beyond Coronavirus, it appears that the advantages of two-way communications – licenced or not – are more obvious now. For instance, improved communication, staff protection, nimble teamwork and connectivity, and business continuity.

I feel that this may well create new patterns of communication, beyond the current downtime.

Local and Community Radio

One of the more global evaluations of the effect of the virus on community radio comes from UNESCO. It focuses on Africa and links health issues and radio, through the UNESCO *International Programme for the Development of Communication (IPDC)*.

www.tinyurl.com/4r2ktwca
https://en.unesco.org/programme/ipdc

On a smaller scale, at least one observer at *mediatel news* has quipped that radio was *"almost made for a crisis"*. He refers, in particular, to local radio, because it is, *"live, personal, supportive, informative, and in a crisis, the medium's clear public purpose is much enhanced"*.

The crisis is boosting the future of radio and audio. Consequently, both the Australian and UK Governments have run campaigns with the tenor that, when it comes to the virus, *it pays to stay informed*.

The many pandemic-related activities of local (community) radio are, arguably, among the most remarkable stories of this challenging time. In times of enforced social isolation, and the concomitant rise in food and fuel poverty levels, for many people, their local radio station has come to the rescue in a big way.

Fig.11: The US ARRL Skywarn Recognition Day logo. Fig. 12: A boost for two-way radio business communications. Fig. 13: Maureen Little, presenter of *A Little Classical Music* on Ribble FM (http://www.ribblefm.com/) Fig. 14: A Ribble FM radio station facemask, distributed in many parts of Lancashire.

A host of Ofcom-registered community radios have seen their levels of funding rise during the pandemic. This has occurred in the context of the Ofcom *Community Radio Fund (CRF)* or through many increased private donations. Many others, though, have not survived the pandemic and staff furloughs.

https://tinyurl.com/j6defwk

Importantly – and specific to the UK – there have been a few examples of the UK Covid RSL stations (broadcasters operating under a *Restricted Serviced Licence* from Ofcom, the UK Regulator). This was an unprecedented move. Last but not least, such events as the *Radiodays Europe Covid Radio Awards* have reflected these and similar developments.

https://tinyurl.com/y47ps4so
https://tinyurl.com/yyhr2gbe

Hands-on Help and Information

Our own indispensable community radio station here in Lancashire (which was in 'Tier' 3 at the time of writing) has stood out in several ways. Ribble

According to **Radiocentre**, in the UK, 38% of commercial radio listeners are tuning in for an extra hour and 45 minutes each day since lockdown amid the Covid-19 pandemic, as they adjust to spending more time at home. The children's radio station Fun Kids has seen streaming hours up 80% overall, with some shows having increased fivefold during the day.

The BBC has seen listening figures for its stations rise by 18 per cent during the lockdown plus Global and Bauer have both witnessed increases of 15%. In the United States, remote workers are listening to the radio at the same rates as employees who were not working remotely — an astonishing 95%. Radio consumption is increasing with 83% of consumers saying they're listening as much or more to traditional radio as they were before the Covid-19 pandemic. In Australia, radio listeners are spending more time with radio throughout Covid-19 lockdown restrictions, listening on average for around 1 hour 46 minutes longer per week compared to the weeks before the lockdown.

Besides, 72% of Australians are listening to as much or more radio during the pandemic. In India, the radio industry has a listenership of 51 million people and 82% of people have been tuning in to radio during Covid-19. A few more noteworthy highlights include; radio's at home listenership which has increased by 22% and has grown from 64% to 86%. The time that people spend listening to the radio has increased by 23% to 2.36 hours every day during the lockdown, second only to television.

In South Africa, NAB conducted a survey on radio listening that reported that 36% of participants say they are listening to more radio during the national lockdown. Meanwhile, in Italy 81% of listeners who were listening to the radio before lockdown are still doing so, to which 2.4% of new listeners can be added.

In Spain, most listeners consumed between 15 minutes and two hours of radio in a day, now they are listening between 30 minutes and three hours. Spanish listeners are listening to more radio and different radio stations (of different ideological positions). Additionally, before Coronavirus, they listened to the radio primary alone, now half of them are listening accompanied and in the living room […].

Table 3: Covid-19 and new patterns of radio consumption.

Resources

- 2CL Communications (School Lockdown Procedures): **https://tinyurl.com/eyzvktjs**
- AltechElectronics: **https://tinyurl.com/tucad4yv**
- Audiolink: **https://tinyurl.com/42bb6ptj**
- Avoira: **https://tinyurl.com/sy4667hk**
- BBC (Amateur Radio / Essex Ham): **https://tinyurl.com/4s9st4dd**
- Birkbeck University: Radio During Lockdown: **https://tinyurl.com/yjuujhws**
- British Science Association: **https://tinyurl.com/fv6npvdh**
- Education Radios (UK): **https://www.educationradios.co.uk**
- Jayaprakash, D (2018) 'Science Communication through Radio' (IJESI, Vol. 7 No. 5: 47-50)
- KANTAR: **https://tinyurl.com/4ke78t4h**
- Mazzonetto, M. et al (2009) Science in Radio Broadcasting (Polimetrica)
- Merzagora et al (2006) 'SCIRAB: Science in Radio Broadcasting' PCST, 2006: **https://tinyurl.com/4ma5zts6**
- NPR: Science on the Radio: **https://tinyurl.com/2ds99tap**
- Ofcom (Covid-19 News): **https://tinyurl.com/ybqmmjbh**
- Ofcom: Broadcast Standards during the Coronavirus Pandemic: **https://tinyurl.com/y2d2pqso**
- Radio Conversations (#SciCoommPLOS): **https://tinyurl.com/4xfnyuca**
- Royal Society: **https://tinyurl.com/7wxv8uj**
- Science Communication through Radio (2018): **https://tinyurl.com/jbdhr8eu**
- Science Museum (London): Radio Communication: **https://tinyurl.com/kwtss4snn**
- Science on Air Symposium (2004): **https://tinyurl.com/y53vc238**
- SFL: **https://www.sflmobileradio.co.uk**
- UNESCO: **https://en.unesco.org**

Table 4: Further Reading, Contacts and Resources.

GEORG WIESSALA

13

14

FM (Figs. 13-14), named after the local river, is an Ofcom-registered community radio station providing regular entertainment programming, local news and events information aimed at the 35+ demographic.

The broadcaster already works with many local community groups to help with publicity and support at events. It is a CIC not-for-profit organisation with around 30 volunteers whose diverse duties include presenting, administration, technical support, outreach, and social media management.

The station was first off the mark when it came to local fundraisers and coordinating emergency aid, even before the local council could spring into action.

The station became involved, for example, in organising and distributing masks (Fig. 14), home-schooling materials and food parcels to the ever-increasing number of families affected by school closures and other Coronavirus measures.

Station owner and Manager Lee Roe gave me an insight into the role of the station in these challenging times. I learned about the new *Ribble Valley and Community Support (RVCS) Group* and deliveries to the vulnerable, about adapting station schedules and coordinating supplies and distribution centres.

Most importantly I understood how the perception of the radio station amongst the people who call the Ribble Valley home, has changed (*RadioUser*, January 2020: 16; August 2020: 8).

There are many other such success stories, nationally and globally, of local communities being brought much closer together by local radio, and think-tanks, such as *Radiocentre and Radio Today* are documenting many encouraging case studies on their websites.

http://www.ribblefm.com
https://radiotoday.co.uk
https://www.radiocentre.org

In a related context, Coleman (2020) has investigated how well-equipped and prepared stations were to react and adapt to Covid-19-related social distancing and lockdown measures.

The findings of the project, *UK Community Radio Production Responses to Covid-19*, suggest that UK community radio stations have been able to continue broadcasting, adjusting and innovating in ways that have enhanced their resourcefulness, especially in presenting

shows, providing entertainment, sourcing and sharing important information.

Both career presenters and volunteer practitioners have been able to adapt their media production practices using digital technologies and techniques not dissimilar to those used by mainstream professionals.

Consequently, the crisis revealed the sector's ability to respond to and reflect local audiences' specific interests and needs.

Impact on Industry, Hobbyists – and Radio Magazines

Finally, what are the key implications of the virus on the radio industry and hobbyists? In both the USA and the UK/EU, much metaphorical ink has been spilt on this subject.

And while it is still too soon to fully assess the long-term effects of Covid-19, what we can already witness is a change to the methods of broadcasting.

As a result, podcasts are becoming ever more numerous, and most (if not all) radio station staff and presenters are now working from their homes, instead of in the studio (e.g. Fig. 13)

Kevin Hilton has argued that, *"The speed with which this happened was made possible by the technology and experience being available. Despite this, before the Covid-19 outbreak, the norm in radio production remained a presenter, or presenters, in the studio and the production team - producers, assistants and studio managers (SMs) or technical operators (TOs) - in the control room."*

https://tinyurl.com/yytvbeke

To make this easier – as many radio stations close or reduce their physical presence, to protect staff – substantial industry resources are being poured into old and new connectivity technologies, Furthermore, programmes like *BBC Radio 4* have created technology to enable and facilitate live audience interaction, where formerly these shows would have had guests in the studio.

Well-known companies such as *Broadcast Bionics* and others are at the forefront of these developments.

http://www.bionics.co.uk

In the USA, observers from *Mediatracks Communications* have speculated how Covid-19 will change the industry. They observed that, *"As Americans continue working from home, staying put with their loved ones, it remains a stressful and anxious time for everyone. Experts have predicted that media consumption would rise as more and more Americans stay in place."*

Pointing to a recent *Nielsen* study, the key assumption of reports like this one is that people spend more time indoors, that this will naturally lead to increased radio/media consumption, and that radio during Covid benefits from advantages, such as trust, local coverage, balance, and the power of music.

https://tinyurl.com/yynmywgp
https://tinyurl.com/y35ba2dc

For the UK, the findings are quite similar. For example, *Radiocentre's* strategy paper on *Representing Radio During Covid-19* makes for interesting reading, from both the points of view of station operators and listeners, focussing, as it does, mainly on changed listening behaviours.

https://www.radiocentre.org/coronavirus

Against this backdrop, some of the research coming out of the *2020 Radiodays Europe* event is worth quoting in full, and Table 3 summarises the key findings on changing listening habits under Covid-19.

Hobbyists and Enthusiasts

Where does this leave us as hobbyists and radio enthusiasts, short wave listeners and radio amateurs?

The overall picture seems to be quite a mixed bag at the moment. Yes, some supply chains to traders have been interrupted, resulting in longer waits for that new model of airband scanner or world band portable.

On the other hand, sales of all kinds of equipment are booming, and this, naturally, has an on-effect on radio magazines such as *The Spectrum Monitor* and *RadioUser*.

Last but not least, in addition to the development of new forms of radio production broadcasting and listening, there are what you may call 'miscellaneous' consequences of the virus. Some things we would have wondered about, but which are now part of the 'new normal'; like published guidelines to cleaning and disinfecting your radio equipment.

If you are collecting QSL cards, you might find that you are in for long waits too, at present.

Take a look at the collected URLs below, to see how much Covid-19 has affected radio.

https://swling.com/blog/tag/covid-19
https://tinyurl.com/kphkk484
https://tinyurl.com/y3z2avl3

Table 4 points to some further reading and resources in this large subject area.

Radio News

SCALA RADIO COMPOSER-IN-RESIDENCE: Composer and Scala Radio presenter Alexis Ffrench has been appointed as the station's first-ever Composer in Residence. One of the UK's most distinctive and relevant artists, this new role will see Alexis compose a piece of new music every month in response to a personal story, topical event or anniversary shared by a Scala Radio listener. Speaking to Mark Forrest about the piece, Alexis said: *"It's a real pleasure to be a part of the ongoing Scala Radio success story, as a presenter and now as Composer in Residence. There are so many great stories out there, we hear them as presenters on Scala every day of the week. I'm always intrigued to get behind those stories and hear more about the individuals – their inspirations, their dreams, their aspirations. To be able to respond to that through music as well is going to be really special."* With over 250 million streams on *Spotify*, Alexis is a pianist, contemporary composer and producer, who is known for his unique style of combining his classical training with a love of roots music and R&B.

(Source: *OnTheRadio, RadioToday*)

www.ontheradio.co.uk
https://tinyurl.com/3f5jfb4m

LWCA LOWDOWN: In the November-December edition of this publication from the Long Wave Club of America (LWCA), you will find articles on a range of topics, for example:

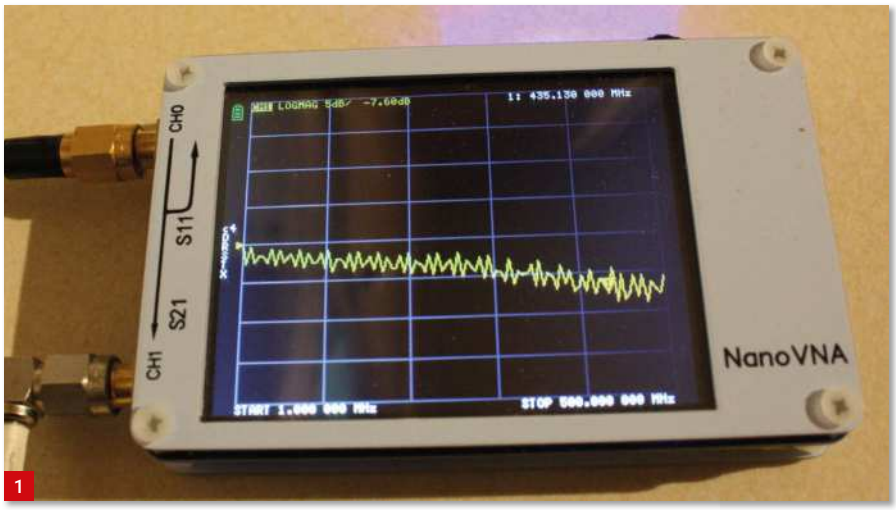
- 'DX Downstairs' (LF and VLF loggings).
- 'On The Air': Experimenters operating on the 160- 190kHz and lower bands.
- 'The Top End': MedFER and HiFER beacon activity.
- 'The LF Notebook', by John Davis.
- 'News From the Old World', by Alan Gale.
- 'Natural Radio', by Rick Ferranti.

The general LWCA website also hosts a range of resources.

https://www.lwca.net

Keith Rawlings
Keith.g4miu@gmail.com

Keith Rawlings explains how you can achieve accurate loss measurement in coaxial cables, and he takes a look at some sturdy vintage RF power measurement devices.



1

Accurate Loss & Power Measurement with Old & New Instruments

As you may have noticed if you follow this column, over the last couple of months I have been discussing the NanoVNA Network Analyser in some detail. I have looked, in particular, at how to set up the device, as well as how undertake a user calibration, perform a simple aerial SWR measurement and check the parameters of a VHF Low Pass filter.

I know that readers use a varied range of different coaxial cable types with their stations, ranging from the expensive high-quality, low-loss types, and the more 'common' RG cables, such as RG58/213, to just lengths of unknown-specification 75Ω TV cable which happen to be to hand.

All coaxial cable exhibits the phenomenon of loss, and the amount of loss will vary depending on the specification of the cable being used, its length, the frequency it is operating, and its condition.

Estimating losses on a cable run of known type, in new and good condition, is quite easy, just look at the spec sheets or go online and look for a coax loss calculator, such as this one:

https://tinyurl.com/znzfu4xr

If the cable is rather old, has been physically damaged, or if it is suspected that it has suffered water ingress, this will all make estimating losses quite difficult. This is where an aerial analyser of some sort can prove invaluable; and, of course, the Nano fits in here.

Accurate Loss Measurement

We have already covered the setup needed to measure the loss of a run of coax when we tested the low pass filter last month (*RadioUser*, February 2021: 54-56). This was a 'through' S21 measurement. To measure a length of coax cable for loss, we need to set a frequency span to cover the range that is of interest. If we are interested in VHF/UHF monitoring, for example, a span from 100 to 500MHz may suffice.

For HF, a maximum of 30MHz could be selected.

For this demonstration, I decided to try the Nano on a 10m length of unknown TV coax and chose to run the test over a span from 1-500MHz, which should cover frequencies many readers are interested in.

All I can tell you about the cable is that it was fitted to a cheap quality TV aerial of the type intended for use on a caravan. It has a reasonable-quality outer braid with a sturdy solid centre conductor, and the inner dielectric (isolation) looks like polythene.

So, the setup is as before: CH0 has to be calibrated using an SOL (Short-Open-Load) and CH1 calibrated with Isolation and Through. CH1 has to be selected as LOGMAG so we can see our S21 measurement in dB.

My calibration was made at the end of two short lengths of RG233 cable, which were fitted with SMA plugs.

To make this test on the Nano I soldered a pair of SMA sockets to the end of the length of the TV cable to be tested (Fig. 2).

In Fig. 1, you can see the result of the test.

The reference level has been set to mid-screen, the trace has been set to read 5db per division, and you can see that the response gradually drops away to the right, indicating increasing loss with increasing frequency. There is quite a large amount of ripple on the trace. At a frequency of 435MHz – midway in the 70cms band – the calculated loss(with the 50/75Ω mismatch) is 7.6dB.

This indicates a signal loss of over One S-Point at this frequency.

This is with just a relatively short run of 10m long, so it may be OK for an attic or bedroom-based shack close to the aerial; needless to say that, if this length were increased to run over a greater distance, the losses would also increase.

On HF, the losses are much lower but on longer runs, and these will still mount up.

Therefore, the NanoVNA is a quick and convenient way to check and see if a run of coax is up to the job.

A Comparative Assessment

I next moved the measurement over to my SDRKits VNWA.

https://tinyurl.com/2n9tfwz3

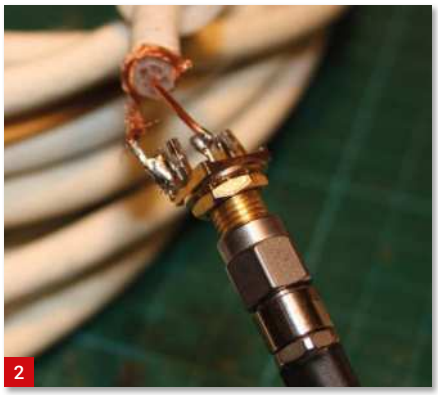
If we take a look at Fig. 3, we can see a comparison made between the white TV Coax (Yellow trace) and a 40ft run of old but *very* good quality RG213 (grey trace).

When I say old, I mean it: I bought the reel this cable was taken from in the late 1970s. This section is in good condition and it has never been used outside.

I used the VNWA for two reasons, One, I wanted to make comparisons between the Nano and the VNWA and Two, it is easier to make screen grabs with the VNWA!

As can be seen from the grey trace, the RG213, as expected, returns better results. At 1MHz, it is displaying a quarter of the loss of the TV coax (Yellow Trace), and at 500MHz the loss is around 1.6 dB, bearing in mind the run is 3m longer. The loss measured on the RG213 may be a little higher than might be expected but due to its age, I am not surprised.

ALL PICTURES: KEITH RAWLINGS



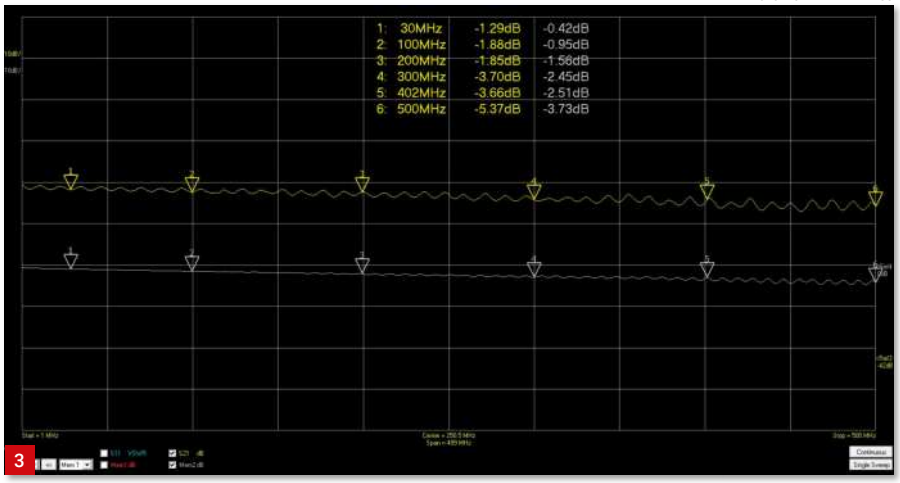


Fig. 1: NanoVNA displaying the TV coax measurement. Fig. 2: A TV coax cable with an SMA fitted. Fig. 3: An SDRKits VNWA plot comparing TV coax with a length of RG213. Fig. 4: The *Termaline* Dummy Load/Wattmeter. Fig. 5: A closer view of the *Termaline* front panel.

The image in Fig. 3 also demonstrates that the NanoVNA gives reasonably similar results to the VNWA. What discrepancies there are, maybe due to the calibration kits used. For the Nano, I used the supplied kit, and for the VNWA a *Rosenberger* 12GHz SMA kit. The measurement at 435MHz in Fig 2 is taken in a trough in the ripple, thus giving a slightly higher loss reading. The ripple is probably caused by the quality of the cable. Also, being coiled up might not have helped it.

Another Method.

I made this measurement with the cable inserted between the two ports of the Nano, but there are occasions where it may not be possible to get both ends of a cable to a point where this type of measurement is possible, for example, when the cable is at the top of a mast.

Assuming access is possible, there is a method where an S11 single port method may be used, by measuring Return Loss, with the far end of the cable either open or with a short across it.

Any aerials will have to be taken out of the circuit before these tests can be undertaken.

This method may not be as precise but should return an acceptable accuracy.

The VNA requires a single-port-calibration and is connected to the shack end of the cable.

Using the 'LOGMAG' feature on the NanoVNA, a CH0 reflection sweep is made, and the measured return loss is divided by two to get the result.

One benefit of owning a Nano is that it can be used to make tests on cable runs at any time (and anywhere), and the results can be kept for future reference. Therefore, if a cable fault is suspected in the future, it will be a relatively easy matter to compare results with your recorded data.

Some info on these methods may be found at this link:
https://tinyurl.com/95dsfhr7

A New Forum

By the time you read this a new user forum for the users of MMANA-GAL/GAL-ANA aerial simulation software should be up and running. Here is the URL to check out:
http://gal-ana.de/forum/index.php

RF Power Measurement, Vintage-Style

A friend of mine recently asked what kind of equipment I used for power measurement. I replied to him that the kit I used now was quite mundane, in that it just consists of a Bird Through Line model 43 or a Bird Termaline model 6104. *"Don't you have anything more precise"?* came back the reply,

and my answer was "No".

The simple truth is that what I have is more than good enough for what I need.

It seems he has 'blown up' his Hewlett Packard 435 Power Meter!

Although now quite old, these are still good power meters, but if the remote Power Sensor gets damaged they are not much use because the sensor heads are not interchangeable. Nevertheless, I believe that HP still supports them, so the meter may be repairable, at a cost.

From time to time, readers sometimes ask me what equipment I use, and this correspondence prompted me to think there may be interested to learn a bit more about these Bird meters.

While not strictly 'aerials' they do pug into a socket usually marked as such so that's good enough for me.

The Bird Termaline

This instrument is a Dummy Load/Wattmeter (Figs. 4 and 5). It has a 50Ω cylindrical film resistor as the load. This is immersed in a dielectric coolant, the whole of which is housed within a finned enclosure. RF power is applied to the Type-N socket located on the front of the enclosure. A rubber diaphragm allows for any expansion of the coolant due to heat. A IN79 Crystal diode rectifies the applied power.

This is read off of a meter mounted on a detachable housing. A length of about 1m of RG58 coaxial cable between the dummy load and meter housing allows the head to be detached for semi-remote use. There is a toggle switch on the front panel. It determines the scale used. Each scale has two ranges, which are selected by swapping the crystal diode between the two sockets provided on the front panel. This gives measurement ranges of 2-6-20-60W with a frequency range (on my model) of 25-512MHz.

The LOW scale marked in Black reads 2 or 20W, depending on the position of the toggle switch, and the HIGH scale reads 6 or 60W - again dependent on the switch's position. The modes are AM, FM, CW. The instrument's accuracy is claimed to be at 5% of the full scale.

Incidentally, AM modulation may be monitored directly from the DC meter circuit.

I have never needed to use my meter for power measurements greater than 50W, but I do have some power attenuators that can be used to measure higher levels if need be.

There is a latch mounted on the meter housing to enable it to be removed.

One thing to watch out for is with the dummy load section. Being filed filled, as it is, with a coolant (about 380ml) there may be leaks. I am not sure what this coolant is made from, but it might be worthwhile handling a leaking meter with care and avoiding contact with the skin.

5

Watts Going On

The meter works by the simple expression $W=E^2/R$.

Where E is the voltage across the resistor R and W is power in W.

This equation need not bother us, as the Bird simply displays voltage E on the meter as Watts.

The use of the meter is simple. Connect a transmitter to the front connector using as short a length of cable as possible. If you have to use a long run of the cable allow for its losses (perhaps using the Nano as above).

If you are not sure of the transmitter output power, select the higher ranges first, and then change ranges/scale to get a reading as close to FSD as possible. When swapping the diode it needs to be rotated in its socket to obtain maximum deflection on the meter.

There is one thing to remember with wideband loads such as the Bird. By being 'wideband', they will also measure any harmonics or spurious signals present. Harmonics may be suppressed with a low pass filter and spurious signals need to be eliminated anyway.

The load itself is good to 1GHz if used without the wattmeter.

I'll describe the Bird 43 next month.

Radio News

BOUNCE BACK STRONGER WITH RADIO: *Radiocentre* has created a new radio ad that rallies around British businesses and calls on them to use radio advertising to bounce back stronger. The spot features real listeners and business owners extolling the benefits of radio.

The ad has been launched following announcements this week of the easing of lockdown and promotes findings from *Radiocentre's* new studies Re-evaluating media for recovery and Beyond the bubble. The new ad, which is available to all Radiocentre members, hears from listeners who have found radio an important comfort and support during the last year. The spot, which can also be viewed here, hears from a business owner who has found that radio advertising has helped him reach new customers. Findings from Re-evaluating media for recovery, which launched in December, show that radio is the number one medium for targeting people – enabling brands to reach the right people, in the right place, at the right time. The ad also highlights the surge in radio listening during the pandemic, with research showing that listeners are tuning in for an extra 13 hours a week. *Radiocentre's* Head of Marketing, George Butler said: *"With this week's announcements setting out the roadmap out of lockdown, many businesses will be thinking about how they recover. We hope this ad will help them strongly consider radio as part of their media mix."*

(SOURCE: *Radiocentre, RadioToday*)

https://tinyurl.com/k886pywx

KONNECT : A new Christian radio station is being launched by former UCB presenter Gareth Cottrell. *Konnect Radio* is being billed as the UK's first and only mixed-format Christian radio Station, playing mainstream and Christian music together. Gareth, who will host the breakfast show, told *RadioToday*: *"Konnect Radio is really exciting. We are doing things differently and attempting something which has never been done before. Regardless of your belief, you'll enjoy the music, entertainment and personalities. We invite everybody to give it a try.* Konnect Radio *started as a small project broadcasting from a kitchen. It's now moved into a full professional studio."* Gareth previously worked at Cheshire's Silk 106.9 and Tameside Radio. The schedule also includes former *Hits Radio* and *Heart* presenter Chris Birks with a Sunday evening show.

Scotland

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You should state clearly in your advert whether equipment is professionally built, home-brewed or modified. The Publishers of Radio User also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

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*Please ensure you arrive with your own Face Mask.

Good News - Store will fully reopen April 12th 2021. Click & Collect still in operation.

RECEIVERS

ICOM IC-R8600

100kHz-3GHz Receiver with SDR Technology from IC-7300.

The IC-R8600 replaces the IC-R8500 wideband receiver and features technology incorporated into Icom's best selling IC-7300. The IC-R8600 receives a wide frequency range from 0.01-3000MHz frequency in analogue and various digital modes (D-STAR, P25, NXDN and dPMR). The IC-R8600 also features a larger 4.3 inch touch screen display which displays a fast moving spectrum scope and waterfall display.

ML&S: £2499.95

Includes an Icom AD-55 PSU worth £49.95!

ELAD FDM-DUOr

A Receive-only Version of the famous FDM-DUO!

10kHz-54MHz Direct Conversion SDR Receiver.

SDR receiver that offers the possibility to operate stand-alone like traditional radio or attached to a Personal Computer discovering the possibilities offered by the SDR technologies. After the great success of the FDM-DUO transceiver the manufacturer now offers the "R" as a receiver – as to be expected by Elad in a sleek Italian design and equipped with top-notch technology.

- Frequency range: RX 9kHz to 54MHz direct sampling receiver + VHF undersampling reception
- 10 selectable and customisable filter pre-selectors
- Internal switch box for use with an external transceiver
- Stand-alone Modes: CW CW+ CW- LSB USB AM
- ADC Linear LTC2165,16bit clocked @122.88MHz
- DDC FPGA Spartan 6 XC6SLX25 + Serial Flash for stand-alone mode
- Stand-alone RX demodulator with STM32F4 ARM floating point µController
- LPC1766 Cortex M3 for LCD & Keyboard control
- Clocking source Si5338 drived by 10MHz TCXO or External reference input
- CAT USB interface with FTDI controller
- Fully managed by FDM-SW2 software included

ML&S: £759.95

AR-5700D RECEIVER

Advanced digital communications.

Frequency range 9kHz-3.7GHz. Tuning steps 1Hz-999.999kHz.

ML&S: £4595.95

AOR AR-DV1

Communications Receiver

Covers 100kHz to 1300MHz in traditional analogue modes (SSB, CW, AM, FM, S-FM, W-FM) as well as various digital modes. In fact, we know of no other radio in this category that can decode Icom's D-STAR mode, Yaesu's new C4FM mode, Alinco's digital mode, NXDN (note: 6.25kHz only), P25 Phase 1, etc. Plus lots of interesting features! www.HamRadio.co.uk/ardv1

ML&S: £1199.95

SDR RADIO

SDRPLAY RSPdx

New Mid-range SDRplay Radio.

Complete redesign of the popular mid-range RSP2pro 1kHz–2GHz.

ML&S: £194.95

Multiple antenna selection, Improved pre-selection filters, Even more software, Selectable attenuation steps, Special HDR (High Dynamic Range) mode for reception at frequencies below 2MHz.
Designed and made in Britain.

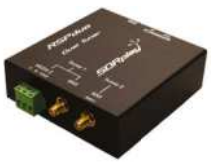
SDRPLAY RSP1a

Brand new design, the RSP1a is a major upgrade to the popular RSP1

ML&S: £94.95

Offering a powerful wideband full featured SDR covering 1kHz to 2GHz & up to 10MHz visible bandwidth. Better still, it's "Built & Designed in Britain"!!

RSPduo DUAL TUNER 14-BIT SDR



Dual-Tuner wideband full feature 14-bit SDR, 1kHz to 2GHz, 10MHz of spectrum visibility.

ML&S: £239.95

Simultaneously monitor 2 separate 2MHz bands of spectrum between 1kHz and 2GHz. 3 software selectable antenna inputs, & clocking features ideally suited to industrial, scientific, Ham & educational applications. Windows 10.

FUNcube Dongle Pro+

Wideband SDR Receiver. 150kHz-1.9GHz incl SAW Filters.

ML&S: £149.95

KerberosSDR

A Coherent RTL-SDR with 4x Channels.

For direction finding, passive radar, beam forming, or just as four RTL-SDRs!

ML&S: £179.95

HackRF One

HackRF One from Great Scott Gadgets is a Software Defined Radio peripheral capable of transmission or reception of radio signals from 1MHz to 6GHz.

ML&S: £219.95

DIGITAL & ANALOGUE

UNIDEN UBCD3600XLT

New digital TruckTracker V Professional Scanner Receiver, covers 25-1300MHz wideband frequencies.

The TruckTracker V operation allows this scanner to scan APCO 25 Phase 1 and Phase 2, DMR, Motorola, EDACS, LTR Trucked Systems as well as conventional analog and P25 digital channels.

ML&S: £449.95

ICOM IC-R6E

The 100 Ch/Sec Wideband Signal "Search Machine"

Communications handheld receiver. While retaining basic features of its popular predecessor the IC-R5, the IC-R6 contains many improvements including 100 channel per second scanning speed, 1,300 memory channels, 15 hours of continuous receive capability, optional drop-in charger stand and voice control squelch.

ML&S: £199.95

WHISTLER TRX-1 DIGITAL SCANNER

The Whistler TRX-1 Handheld Scanner is a multi-system adaptive digital trunking scanner with Motorola P25 Phase I, X2-TDMA, Phase II and DMR making it capable of monitoring unencrypted channels/systems.

ML&S: £419.95

AR-DV10

The ULTIMATE all mode digital handheld scanning receiver.

Latest firmware! 100kHz-1300MHz Analogue & Digital Modes.

ML&S: £969.95

ICOM IC-R30 SCANNER

The Icom IC-R30 has extremely wide coverage and supports all of the usual analogue modes (FM, AM, SSB, CW) as well a a few digital modes including NXDN, P25, DPMR and DSTAR. A worthy upgrade over the older IC-R20.

ML&S: £569.95

SF Screen Protectors

For Yaesu, Kenwood and Icom. *Maintain the value of your radios with professional screen protectors. No more scratched displays, the screen protectors last for years and protect reliably even at daily use.* ***ONLY £7.95***

ANTENNAS

BONITO RANGE AT ML&S

ANTENNA JET AAS300

ML&S ONLY: £234.95

A USB powered antenna splitter designed to work between 9kHz and 300MHz. Now you can use your one antenna with up to 3 receivers simultaneously. Finally, you can listen to marine band traffic, The Archers on Radio 4 and the air band at the same time (provided your antenna will cover it all!)

ANTENNA JET ASM300

ML&S ONLY: £189.95

A USB controlled antenna switch and mixer. It can be used as a simple switch, or can be used to switch in more than one antenna, to aid receiving to an optimum performance.

BONI-WHIP (PSU needed)

The active antenna that is raved about. Covering 20kHz to 300MHz and ideal for times when you can't erect a wire antenna. For home, for travelling and for DX camps. And despite the whip being only 4 inches long, it actually works!

ML&S ONLY: £109.95

GigActiv GA3005

ML&S ONLY: £386.95

A portable active antenna capable of covering 9kHz to 3GHz. Perfect if you are say on holiday and want to have a listen to the bands. You'll need to provide it with 5V via a USB cable (included) and some coax but it is just ready to go.

Diamond D-777

VHF/UHF air band receiving antenna, *not for transmitting. 3.4dB on VHF (120MHz) and 5.5dB UHF (300MHz) with an approximate length of 1.7 metres. The antenna is constructed from fibre glass materials and it is pre-tuned and fully weatherproofed. Mounting components are included. It's fitted with an SO239 connector, so can be connected to a PL-259 without the need of an adaptor. Tuned to receive 108-137.975MHz civilian air band, 225-400MHz military air band.*

RRP: £83.94 ML&S ONLY: £62.95

Diamond D-130M

Super Discone 25-1.3GHz
The D-130M Super Discone Antenna is an ultra-wideband antenna covering amateur radio, commercial 2-way, cellular, air traffic control and various utility frequency bands. Rust-free stainless steel is employed in major component parts making the antenna rust resistant and durable with 15m cable included with PL-259s.

ML&S ONLY: £124.95

MyDEL Smart Wire Kit

The MyDEL Smart Wire Kit antenna pack includes; 132ft of high quality flex-weave wire, 2x 3 metres of nylon guy rope and 2x heavy duty dog bone insulators.

ML&S ONLY: £44.95

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If you have enjoyed this magazine then do the next thing to shouting it from the rooftops and leave us a review instead! We all like to know when something is good and if something has been rated highly by others. Leave us a review to let others know what you think of Radio User.

The Battle of Britain
IN COLOUR

"Praise where due. This is the best magazine available which I have read - I am very impressed. I thoroughly enjoyed reading each chapter and it was written in such an easy style. It covered every aspect and I was saddened when I reached the end."

This 164-page special collector's edition commemorates the 80th Anniversary of the momentous Battle of Britain, making it the perfect gift for any aviation or Battle of Britain enthusiast.


THE BATTLE OF BRITAIN IN COLOUR

The Battle Looms

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.

After the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. However, 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 that BEF, a large Air Component was supplemented by an Advanced Air Striking Force. In total, these air forces amounted to 25 squadrons, six of which were Hawker Hurricane-equipped fighter squadrons. The remainder of the RAF force in France comprised largely light bombers and Army Co-Operation squadrons. Eventually, however, the 'Stukoj' became the 'Blitzkrieg'.

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 rolled inexorably onwards towards the English Channel and while the French and British tried desperately to stem the advance, so the situation became ever more hopeless.

Predicted Catastrophe

When the fighting had broken out in earnest on 10 May 1940, aircraft of the Air Component were in almost constant combat, and losses had to continually be made good from squadrons based in Britain. The Commander-in-Chief of RAF Fighter Command, Air Chief Marshal Hugh Dowding, had already stated as early as September 1939, that if he was expected to defend Britain's skies, then he would need 52 fighter squadrons. At that time, he had only 32 under his command and was told it would be impossible to produce the number he required. However, efforts would be made to provide him with a further eight.

During the fighting in France, increasing numbers of fighter squadrons were sent across the Channel, urged on by desperate appeals from the French Prime Minister, Paul Reynaud. Dowding saw his resources 'slipping away like

BACKGROUND TO BATTLE

THE RAF FIGHTER PILOT

THE RAF FIGHTER PILOT