FOCUS ON BEGINNERS
This Month: Maritime & DXTV

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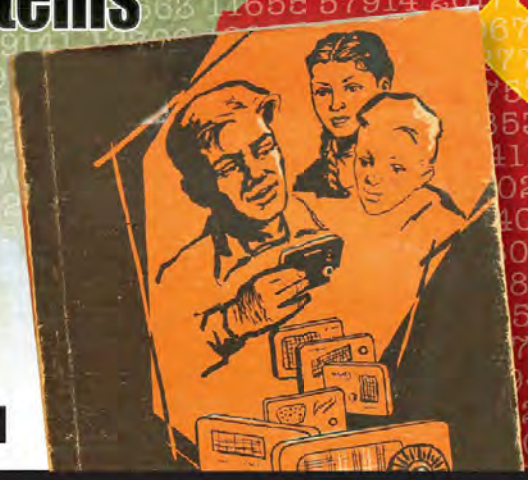
REVIEW Reuter RDR Pocket C4
We take a look at this handheld SDR Receiver/Transceiver

COLD WAR SPECIAL
RADIOS, SPIES, INTELLIGENCE AND PROPAGANDA

Number Stations
The Mystery Continues

Transistor Radios behind the Iron Curtain
From Windows to the World to Collectors' Items



Utility Monitoring
Russian Aero Nets

Propagation
The F10.7cm Radio Flux

Digital Radio
Audio Images & Stereo Sound

• CB & PMR 446 • Software • Decode • MW and SW DXing
• Airport Comms • Radio Heroes • News • Rallies • Books

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- Weight: 235g

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DUE MAY

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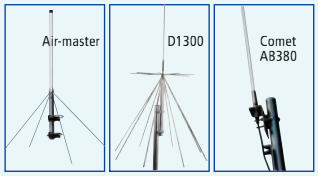

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radiouser
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DV-1	**£1299.95**
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A great buy.

AOR of Japan

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Hello and welcome to the May 2018 issue of *RadioUser*. Some leading lights have gone out of late. **Stephen Hawking** for one and **Billy Graham**. BBC Radio Lancashire presenter and *Bullseye* host **Jim Bowen** passed away, as did **Trevor Baylis**, the inventor of the wind-up radio.

It is hard to overstate the impact of this device. In areas of the Global South, battery-free (and mains-electricity-free) access to radio saves lives, enables farmers to share good practice on crop cultivation, warns of threats and poachers, co-ordinates aid, fights terrorism and builds networks.

Trevor Baylis's story is one of both triumph and patent injustice and we honour him especially this month.

Some news I have come across of late has made me think about missed opportunities for our April issue. A spat between Serbia and Kosovo knocking Europe's standard 50Hz electricity frequency off-kilter and making our clocks slow? Amazon's *Alexa* freaking out its users with unprovoked, demonic, laughter?

At least, when laughter comes from my AOR7030, I know it's from a short wave station somewhere. Possibly. And my HF radio does not 'listen' in on me. Not yet.

In the radio world, the BBC says FM is not dead and there will be a 'hybrid' future, which is good news.

It has been reported that smart speakers – manically laughing or not – will 'undermine' radio listening for good because they just learn (and play for us) our preferred playlists. The *Everybody's Talking* report found that time spent listening to them is less time spent on radio stations. Make up your own mind – what *is* radio, after all, in this brave new SDR and Streaming World?

www.bpi.co.uk/media/1645/everybodys-talkin-report.pdf

This issue brings back the Cold War: Against the backdrop of the Salisbury poisoning, two of our main features look at different aspects of this conflict and of its proxy wars: **HJ Hagermann**, in the first of a two-part article, looks at those mysterious *Number Stations* and **Robert Davidson** investigates *Transistor Radios from Eastern Europe*. **David Harris** reviews a volume on *Radio Wars* and **Chrissy Brand** reflects on the Cold War period. Meanwhile, **Nils Schiffhauer** listens to contemporary Russian Aero Nets.

There is a 'UK-First' this month: A review of an SDR receiver that many of you will not have heard about – the *Reuter RDR Pocket (C4),* a software-defined radio without software, as it were. Read about what **Keith Rawlings** thought of this unusual approach to SDR technology.

Later, **Robert Connolly** and **Bill Robertson** provide detailed frequency information in *Maritime Matters* and *Scanning Scene*. **Keith Hamer** and **Garry Smith** offer advice for beginners in the DXTV hobby. And while **Mike Richards** offers his final *Decode* column in this issue, from next month, our new author Keith Rawlings will offer a monthly look at antenna topics across all bands, including shared hints and tips and mini-reviews.

Enjoy this issue and stay in touch with your suggestions. **Georg Wiessala**

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review

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In another exclusive *RadioUser* 'UK First', Keith Rawlings reviews the Reuter RDR Pocket (C4) SDR, a very versatile receiver and transceiver with a difference. It is virtually unknown in the UK so far.

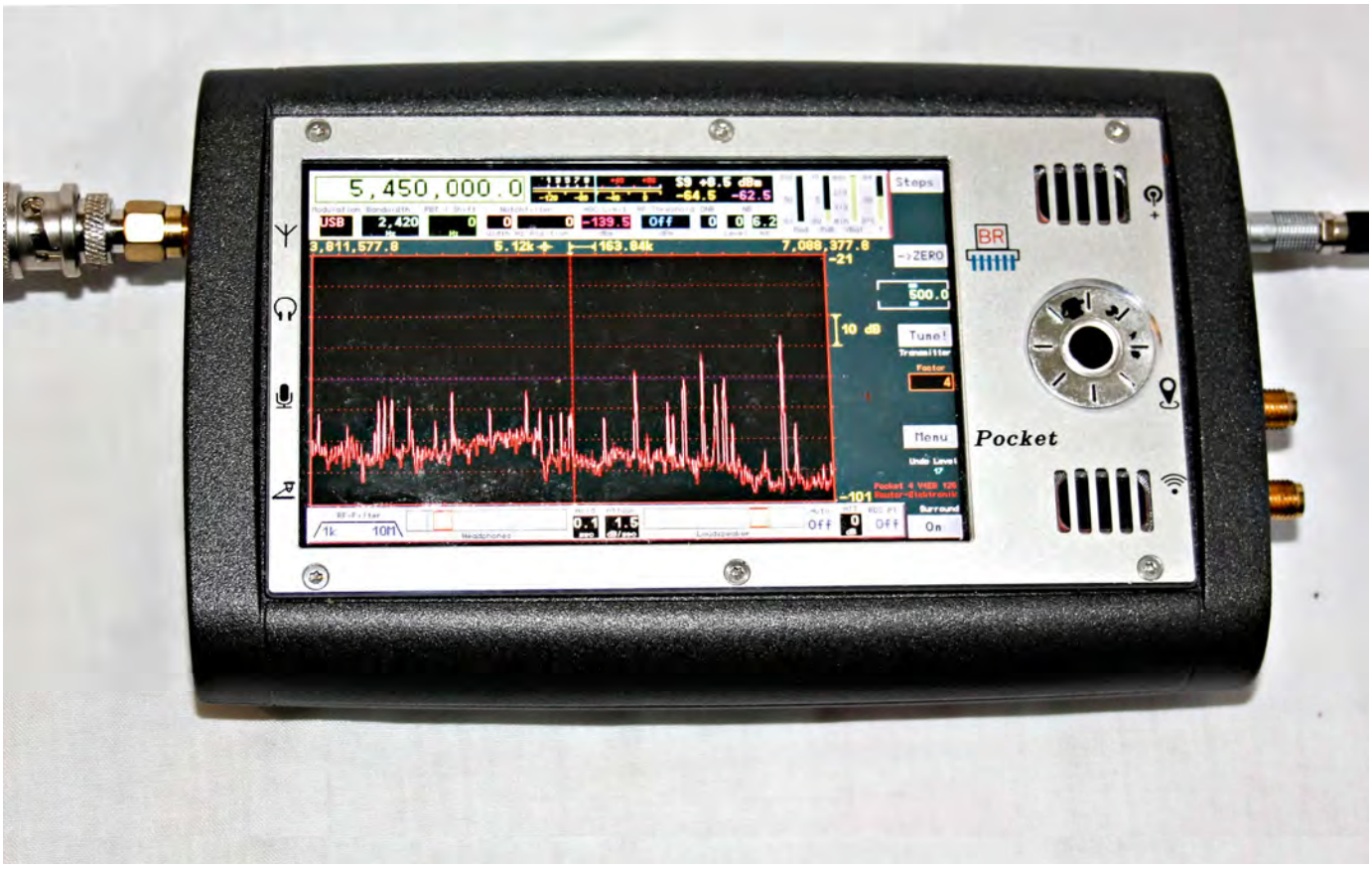

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Fig.1: The Reuter Pocket (external view).

A Rocket in your Pocket

There have been a number of SDR transceivers and receivers hitting the market over recent years and readers will be familiar with many of the names such as Winradio, SDRPlay, Air Spy and so on, not forgetting the many cheap USB dongles that are so popular.

One name that may have escaped some readers, me included, is that of *Reuter Elektronik*, a small company based in Germany, that has a line of SDR based products, one of which is the 'RDR Pocket'.

Therefore, when the editor asked me if I would like to review this portable SDR receiver, I immediately replied yes and then wondered what on earth an RDR Pocket could possibly be.

Google came to the rescue and, once I had seen what I would be reviewing, I became intrigued.

Basic Description

The Pocket is a small, hand-held, SDR receiver/ transceiver for mobile and portable operation (**Fig. 1**). It features a 4.3" high-definition, 800 x 480-pixel WVGA touchscreen display and built-in lithium-ion batteries that allow up to 4 hours of operation. With the exception of an encoder-based scroll wheel, all controls are operated via the display. The dimensions of the small radio are 58x110x 30mm (WHD) and it weighs in at 700g.

There are various models available with different options, including a transmitter but all of them cover the frequency ranges from 0 to 30MHz and from 50 to 71MHz, with either 14- or 16-bit ADC.

Other options offer the frequency range of 87.5 to 108MHz for FM radio (including RDS) and from 136 to 151MHz or 170 to 240MHz for DAB +.

A Bluetooth facility will be included in the very near future.

All models allow the viewing of the visible spectrum on the built-in display with up to 10Hz resolution.

Internally the radio does not have the usual mixers, phase locked loops, voltage-controlled oscillators, filters and associated circuitry of more conventional receivers.

Instead, direct sampling is used, in common with a number of SDR radios.

The result is a very linear phase response, without additional phase noise or mixing products. Moreover, there is only a single free-running fixed frequency oscillator, which makes for a very clean receiver.

Needless to say, all processing is

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Fig. 2: Burkhard Reuter and his Pocket SDR C4 Receiver.

done by FPGA (Field Programmable Gate Array).

As the Pocket receives the entire spectrum, from almost DC to 151MHz, there are several pre-selectors, with low-pass filters below 10MHz or high-pass filters above. There is a bandpass filter for 50 to 71MHz and two broadband, highly selective, SAW filters (Surface Acoustic Wave) for 87.5 to 108 and 136 to 151MHz.

What makes the Pocket so fundamentally different is that a PC is not needed, no external keyboards, monitors or mouse. It is a fully stand-alone, compact, take-anywhere, SDR that has all of its controls and system software (firmware) built in.

The Manufacturer: Reuter Elektronik

I am told that **Burkhard Reuter's** company *Konstruktion & Musterbau* ('Construction and Custom-Build') dates back to 1991. Eventually, **Ralph Menn** contacted Burkhard (**Fig. 2**), in connection with the supply of a test unit, which the former required. Ralph was so impressed with the quality of the equipment when it arrived, that the two started to collaborate.

Both engineers are passionate about what they do and – as self-confessed 'radio fanatics' – they pooled their professional knowledge into producing a line of very high-quality equipment indeed. The first receiver was the RDR54 in 2009 and the current RDR55 model was reviewed in *WRTH 2017*.

I am told that Burkhard Reuter does 'practically everything' and that Ralph Menn has specialised in the man-to-machine-interface and many of the FM features because he is a self-confessed 'high-end FM audio fanatic'.

The website lists the full line of products (see at the end of this review).

With the current and further development of the Pocket, Reuter also provides a forum for discussion on product evolution. The company is very responsive to feedback from customers and 'experimenters'.

Therefore, for me, the question was: Does this collaboration, responsiveness and fanaticism show through in the Pocket?

Unboxing and First Impressions

When the review model arrived, I found it was the 'C4' model, which has the following specifications: The reception range is 0 to 30MHz, 6m (50 to 71MHz), 3m (87,5 to 108MHz), 2m (136 to 15MHz) and the DAB+ band.

Also built in was the 2.5mW transmitter option, which, at the danger of stating the obvious, turns the Pocket into a transceiver.

Upon opening the box, I found a good-quality, semi-rigid, protective case and securely tucked inside was the Pocket. It also came with a PDA stylus for the touch-screen display, a DC cable, an SMA-to-BNC lead, a software CD and a small GPS aerial.

The software on the CD included a utility to update the firmware and to download screenshots.

There was a PDF user manual that was in German. An English version was available from May 2018.

On picking up the Reuter Pocket, I immediately realised that this was a quality product, it is reassuringly heavy and solidly built, made of a two-part, high-strength, magnesium case with an aluminium front panel.

Not only is this radio tough, it is also well-screened and less likely to suffer any mechanical instability.

Powering up is by means of a button in the middle of the scroll wheel. A prolonged press of this button presented me with a bright, clear, razor-sharp and flicker-free display; once again quality came to mind and I felt that nothing had been skimped in either design or construction.

As mentioned before, the Pocket has a touch panel for operation, which allows the user to 'pick off' the function required. Subsequently, the scroll wheel can be used to select a value or parameter as needed, for example, the speed of the scroll wheel.

The first thing I did after switch-on, was to navigate my way around the screen and using the supplied stylus, to select the various options and settings available.

Straight away, I found that the layout and procedure of operation were very well thought-out. A quick tap on the box, at the top left corner of the screen, where the frequency display is located,

highlighted this box. A turn of the scroll wheel changed frequency, either up or down, in relation to the selected frequency step.

A second tap brought up a page where I could enter a discreet frequency manually. A few more taps on the displayed digits on this page and a press of *OK* and I had entered a new frequency.

Changing step size consisted of a similar procedure; tap on the *Steps* box and a couple of boxes below the step size indicator changes colour, you can then change the tuning steps, using the scroll wheel. Alternatively, with a tap on the *Step* display, a menu pops up with a list of pre-set step sizes.

A tap on the *Menu* box called up a list of items used to configure the radio.

I felt that all this was very easy and straightforward, and I had not even connected an aerial as yet!

More Features

Carrying on exploring the screen, I found that there were an interesting number of modes provided. Some of them will be familiar such as USB, LSB, CW and so on. Others were not, like AM-E (Envelope Detector) for example.

Mode selection takes the same format as other functions: Tap the *Modulation* box until it is highlighted and scroll through them all or tap again to bring the full modes menu up on the screen.

Modes are split into two groups, 'spectrum-based' or 'time-based'.

As this point is important, I think that the manual can describe it best: "*The time-based demodulators are distinguished from their spectrum-based counterparts mainly due to lower THD, constant group delay in the passband and substantially less signal delay in the acceptance of a few ms to about 100ms at SBS (*spectrum-based signal processing*). This makes them especially suitable for signal output to the sound card of a PC.*

"The output is sent to the two channels of the headphones terminal separately as I and Q signal. This enables the use of common SDR software for further processing. Especially in DSBQ mode, with 12kHz bandwidth, the signal corresponds to a simple direct conversion receiver but with much higher signal quality. The pocket can thus be used as a high-quality SDR."

Next to the *Modulation* selection box, there is the *Bandwidth* selector box. There are a number of pre-set bandwidths that can be selected as previously mentioned. Settings may also be varied, using the scroll wheel.

The user's choice of mode determines the available bandwidths. Moreover, operators can visually determine the selected bandwidth on the screen, in the shape of two vertical lines.

As in all good receivers, Pass Band Tuning (PBT) has been included. This allows the user to shift the receiver passband away from interfering signals or carriers. When in operation, the position of the passband may be seen via two vertical bandwidth lines.

Moving along to the Notch Filter (NF) there are two control boxes, *Width* and *Position*. The filter is activated by increasing the width, from zero. Once activated, two vertical lines appear; their distance from one another depends on the notch width selected. The position of the notch filter can be moved around within the selected filter bandwidth and placed on an offending signal and the width can be adjusted for best results, all in plain view on the screen. The NF was effective and, I felt, very well implemented.

Noise Reduction and AGC

Digital Noise Reduction (DNR) or, in the case of the Pocket, 'Dynamic' Noise Reduction', is a common facility, which is usually built into add-on DSP noise filters for more recent 'conventional' radios.

The feature is also frequently designed into the SDR software for receivers, most of which are working well – some better than others.

One problem is that DNR can break up the wanted signal, usually making it sound 'watery'. In some cases, this happens *before* noise reduction becomes effective.

The DNR in the Pocket worked very well. Certainly, when wound right up, break-up occurred on some signals. However, this was after sufficient noise reduction had already taken place.

A Noise Blanker is incorporated into the Pocket to combat impulse noise. It can be set to *Level*, with '0' representing 'off' and 'Time' (in milliseconds) during which a substitute signal is inserted in place of any detected interference.

The only interference I could try this out on was the annoying and aggravating 'popping' caused by a PLT device in connection with the wretched Sky-Q that I have around here.

Not one of my SDR receivers or software are capable of eliminating this rubbish while (slightly surprisingly) the noise blankers on my conventional Icom R8500, Drake R8E and Kenwood R5000 cope remarkably well.

In terms of SDR receivers, my G313i comes the closest to nullifying it but only at the cost of significant distortion of the wanted signal.

Alas, the Pocket noise blanker too was not able to cope with this type of QRM. This is not to say that the noise blanker is ineffective because, as already stated, it is really aimed at rejecting impulse type interference and not this form of PLT junk. However, I thought it worth trying.

The setting of a receiver's Automatic Gain Control (AGC) can be important and the Pocket is no exception here. The AGC parameters can be set via the two boxes at the centre bottom of the screen. Both *hold time* and *attack rate* are adjustable. *Reuter Elektronik* suggests that the hold time be set to a range of between 0 and 2 seconds and the attack rate at 4 to 40 dB/s, with the settings optimised as needed, according to the prevailing conditions.

I found the AGC settings to be very flexible as they enabled me to 'tailor' the receiver's response to my needs, in exactly the way I required.

Other Features

At the bottom of the display, there are two separate 'virtual' sliders. The left-hand one varies the audio output to the headphone socket and the one to the right regulates the audio output to the inbuilt stereo speakers.

Straight away, I could see this was useful for digital modes and recording, with the earphone-out being fed into a computer soundcard and the speakers used to monitor the received signals.

I noted that – as well as using the scroll wheel to alter the values in the various control boxes – it was possible to drag the stylus across the screen, to achieve the same result. With the required box highlighted and by then dragging the stylus across the screen, the values in that box change. It is possible to change frequency, step size and volume in this manner and to step through the array of operating modes available.

Operators are not limited to using a stylus and I found it possible to achieve the same results using just a finger. Although not as easy, it is still possible

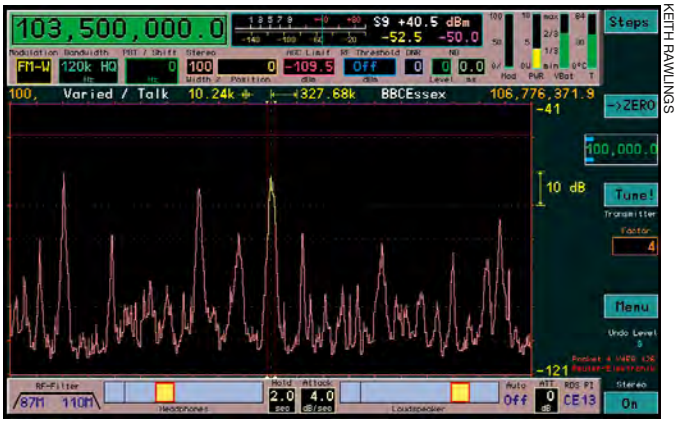

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Fig.3: The 100 to 106.776MHz spectrum range, centred on 103.5MHz.

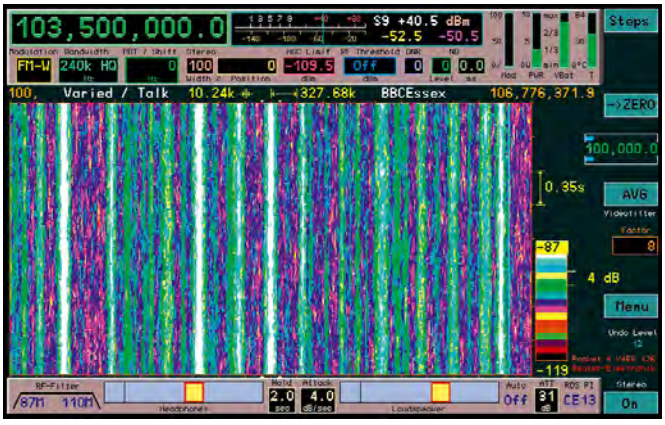

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Fig. 4: The Reuter Pocket Waterfall Display (Spectrum Range as in Fig. 1).

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Fig. 5: Zooming in.

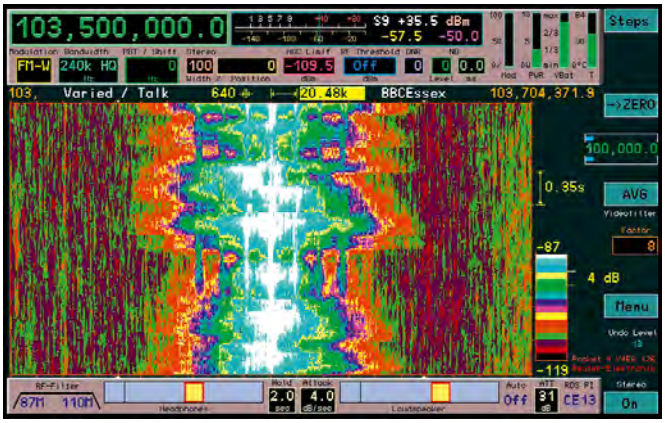

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Fig. 6: Magnifying the display further.

and someone whose fingers have not had such a bashing as mine over the years and retain a little more dexterity should have no problems.

Spectrum Display 1

As you can see in **Fig. 3**, I selected a spectrum span from 100.0 to 106.776MHz, centred on 103.5MHz.

On either side of the centre-frequency, other transmissions can clearly be seen. By using the scroll wheel, the spectrum can be shifted along to select another station.

The screen can also be set to display a waterfall (**Fig. 4**).

This image covers the same spectrum range as in **Fig. 3**.

The Spectrum range can be expanded or contracted as required from the *Spectrum Span* control box.

For example, on HF the span can be set to a maximum of 0 to 52.4MHz.

The display range may also be brought right in, in order to examine a signal in finer detail (**Figs. 5 to 7**).

On the immediate right of the spectrum display, there are controls to adjust the level and scaling of the display. Tapping on the digit to the top right of the display sets the upper limit of the spectrum. In the centre, tapping on the digit marked in dB adjusts the scaling. The lower digit represents the lower spectrum limit.

Hence, the vertical position (baseline) of the spectrum can be adjusted, as can the resolution (at 2,4,10 or 20dB).

In waterfall mode, these controls alter the colour setting of the display.

It is possible to view the spectrum display in *Paint* mode (**Fig. 8**).

There is also a *Video Filter*, which enables the user to initiate the following: *Maximum Hold* of the display, with the hold time adjustable from 25ms to infinity. There are also *Minimum Hold, Average Hold* and *Off.*

An Attenuator has been provided with 0 to 31dB of attenuation. This may be used in cases of overload.

Spectrum Display 2

The display is rather a 'busy' place: In the centre at the top, is the (very accurate) signal strength display or RSSI.

Values are shown, based on 50Ω impedance, on a horizontal bar marked in S-Points above and below (dBm or dBuV) referenced to 1mV, depending on your selection.

To the right of this (in yellow), the signal levels are represented in a digital format, with absolute values of dBm/dBu. Next to this (in purple) is the AGC limit.

The latter was included after a few operators complained about some distorted sound. I understand that they had signals 40dB over the AGC max limit. Therefore, it is small wonder that they experienced ADC-clipping!

Further on the right to this on the screen, you will find a bar-graph display, illustrating,transmitter modulation, present power consumption, transmitter-and output power. Next to this is the battery level and then there is a temperature graph too.

The Pocket does get warm in normal use. By clicking on the bars, the *Power Management* dialogue box opens up, as can be seen in **Fig. 9**. Here, the users can monitor battery voltage and charge. They can also switch off one of the ADCs to save power, at the cost of a reduction in receiver performance.

Connectors and Wi-Fi

At either end of the Pocket case, there are connectors. The display can be reversed, depending on what angle the Pocket is held at. Taking this into account, on the right (or left) of the case, there are two SMA connectors; one for a Wi-Fi aerial and the other one for a GPS aerial.

Next to these, is the DC input

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Fig. 7: Enlarged display at 909kHz MW.

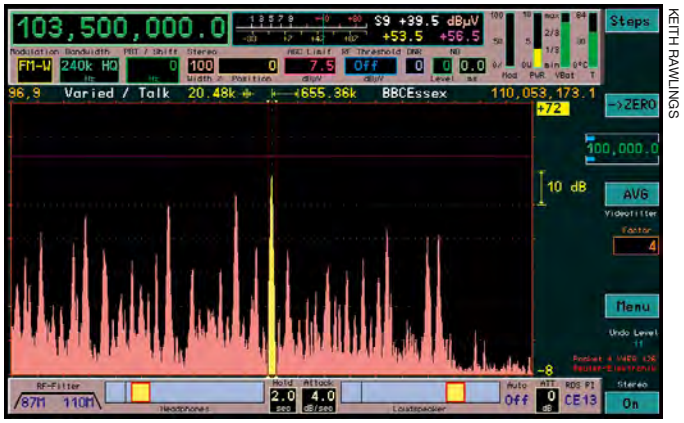

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Fig. 8: Spectrum Display Paint Mode.

connector. On the opposite side of the case, there is a single SMA connector for the main RX/TX aerial.

You will also find three 3mm jack sockets, one each for headphones-out, microphone-in and a (Morse) key.

Plugging in the supplied GPS aerial and placing it on my windowsill, the Pocket very quickly locked on to enough satellites to work out where it was. By going to the *Menu* and tapping *GPS* the *GPS Receiver* dialogue box came up, offering details of the number of satellites found, SNR and, of course, my position and height above ground.

The Pocket uses the GPS as a reference source for time and frequency measurements. This effectively turns it into a precision measuring instrument.

Moreover, there is a Wi-Fi connection. An external aerial was supplied and there is also an internal aerial built into the pocket. Using either aerial, my computer's network picked up the Pocket easily at a distance of about 20ft.

As the connection was by access-point, I had to disconnect from my wireless network to 'talk' to the Pocket.

The supplied PC software allows screenshot capture and images can be transferred over the Wi-Fi connection.

I found that, on my system at least, the connection seemed to 'time-out' out rather quickly.

Recording and Memories

The Pocket has an integrated, real-time, Flash Audio Recorder with 24-bit resolution, accessed via the main menu. It samples at 44.1kHz and the review model had 1020MB of memory.

The operation is simple enough, with traditional controls like *Play, Stop, Record, Erase* and so on. The recording function is accessible directly from the user interface and the radio's parameters can be changed while recording.

No radio today is complete without memories and the pocket is no exception. It has 199 channels, which store most of the settings at the time the channel is written.

This includes mode, spectrum settings (such as span) as well as the display configuration, including brightness settings. The memory dialogue box is accessed along with the frequency entry box.

There is an integral charger for the internal batteries and DC can be left connected indefinitely without battery damage.

The Pocket in Use

I found the radio performed brilliantly. Its RF performance was excellent. I had no noticeable problems with ADC overload and at no point was it necessary to use any external filters to 'cure' image or overload problems.

On VLF to HF, I switched between a combination of my PA0RDT Mini-Whip, a 120ft Delta Loop 66ft end-fed and a home-made active magnetic loop.

In all cases, the operation of the Pocket was flawless.

During the review, my aerials could be fed (in turn) into a multi-coupler, so that each receiver had an identical signal at its input. I made some side-by-side comparisons with my Winradio G313i and SDRPlay RSP2. In all cases, the Pocket resolved signals as well as – and often better than – my other receivers.

NDB reception left me very impressed indeed. By adjusting the display resolution down to either 640 (or, preferably, 320) kHz, the sidebands of beacons could clearly be seen on the spectrum display. I set the mode to CW and adjusted the filter bandwidth to 1KHz. By using the notch filter, it was possible to eliminate the annoying heterodyne on the centre of the carrier, which then greatly improved the task of resolving the beacon ident.

I noticed that I was often able to resolve multiple idents on the same frequency when using the Pocket and this was considerably easier than on my other receivers.

I am not sure why this is, whether it is the way the signals are processed or whether it is down to the dual speakers. Whatever the cause, it helped me to log a number of new beacons.

Something I liked doing was (by a careful adjustment of the waterfall display) revealing the beacon idents graphically. You can see this in **Fig. 10**, where you are able to make out the ident as **NWI**.

Owing to QRM, I do not find NDB DXing as enjoyable as it once was. In fact, it can be a bit of a struggle. However, I certainly liked the way the Pocket coped with the task.

Just towards the end of this review, the author of MultiPSK added an NDB decoder to the software and initial results with the Pocket were good.

DAB Reception

Using a simple discone antenna – and at the opposite end of the Pocket's coverage – I had a go at DAB reception.

By tapping on the frequency display and bringing up the frequency entry page, you can call up a box captioned *Discovery DAB*.

Tapping on this, brings up a *Search DAB* caption, in the place of the normal frequency display. After a short while, a list of available stations is displayed on the screen, along with details such as station name, frequency block, DAB or DAB+ transmission, station genre and general information.

Also displayed are the sampling rate, bit-rate, RSSI and Mot1&2.

The scroll wheel is used to trawl through the list and tapping on an entry immediately tunes to that particular station.

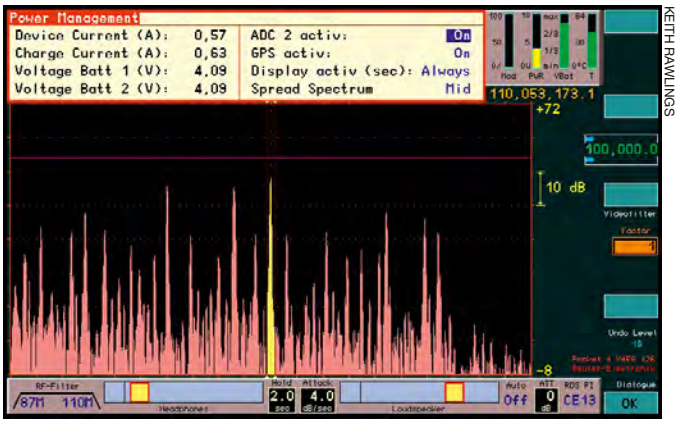

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Fig. 9: The Power Management dialogue box (top left).

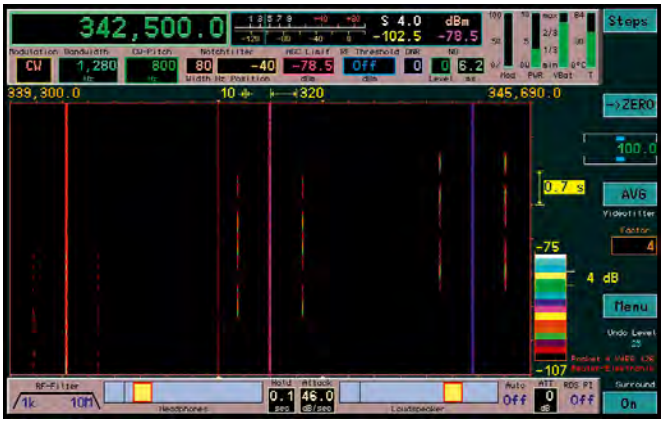

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Fig. 10: Revealing a beacon ident graphically.

The audio quality through the built-in speakers was surprisingly good and audio levels were more than adequate. There was some distortion at high output levels but considering the size of the speakers, I was not surprised.

Listening through headphones brought about a transformation. This, obviously, depends on the quality of your headphones. However, even using some cheap-and-cheerful supermarket earbuds, yielded excellent results.

There is no spectrum display during DAB reception.

FM and AM Performance

Moving down a bit to the FM broadcast band, I found that, with tuning steps set to 100kHz, it was easy to scroll along the spectrum display, stopping on stations of interest.

RThe DS information is displayed within the *Spectrum Span* area, just above the spectrum display.

Once again, the audio quality was very good, both on the speakers and using earphones. The sound was very pleasant for extended listening.

I undertook a fair bit of medium wave and short wave broadcast listening, both during the day and at night and I have to say that the Pocket performed very well in these areas.

The reception of signals was more difficult on the higher HF bands but this was due to the chronic QRM problems at my location, rather than anything to do with the Pocket. The recent addition of more pollution from a neighbour's Sky-Q installation has exacerbated the issue somewhat.

That I was able to salvage something on the higher bands, speaks well for the Pocket.

It coped somewhat better than my WR G313i in this respect (even when using the add-on of the WR *Advanced Digital Suite* option) and I had no noticeable problems on strong signals, even in the evenings, when some transmissions were very strong. The resolved audio was of high quality, even with heavily-fading and fluctuating signals.

Digital Modes

I was keen to see how the Pocket performed with digital modes. Thus, with a lead taken from the headphone socket and connected to my computer's soundcard, I tried various different modes and achieved great results.

Mainly using MultiPSK, I received some good fax charts from Northwood on **4610kHz**, despite the strong broadband 'hash' I frequently experience in this part of the band.

Likewise, RTTY reception was excellent from DDH77 on **147.3kHz** and on short wave.

Turning to STANAG 4285, I moved to **4295kHz** and, within seconds, MultiPSK was decoding **FUE** with 100% reliability.

I could not resist trying DRM.

Radio Romania International (**9810kHz**) can be a strong signal here. After selecting *DSBQ* and typing the frequency on the virtual 'keypad, the distinctive shape of a DRM waveform appeared on the screen (**Fig. 11**).

I used *Dream* to decode the signal and, almost immediately, I had a perfect and uninterrupted stream of audio.

This really impressed me; the Pocket was giving me results far better than I had experienced with other equipment.

VHF Performance

I now turned my attention to VHF. Setting the receiver to *FM-N*, I tuned to some radio pagers and, within a short while, MultiPSK was decoding lines of text. This was, no doubt, made possible by the way the Pocket feeds its *time-based* modes to the headphone socket.

Tuning slightly higher in frequency, I found that London buses were clearly heard. Aircraft too, were easily received on the part of the air band that the Pocket covers, including ACARS messages.

In terms of satellites, *FM-W* was used, with 38 and 50kHz bandwidth settings, to successfully capture NOAA APT transmissions.

ORBCOMM satellite reception was also possible, despite the preference for audio to be taken directly from a receiver's discriminator (**Fig. 12**).

Transmitter Functionality

Although this subject is out of the scope of *RadioUser*, I will briefly mention the transmitter section. Output power is rated from 0 to 2.5mW and I found that transmission was possible from 100kHz all the way up to 151MHz.

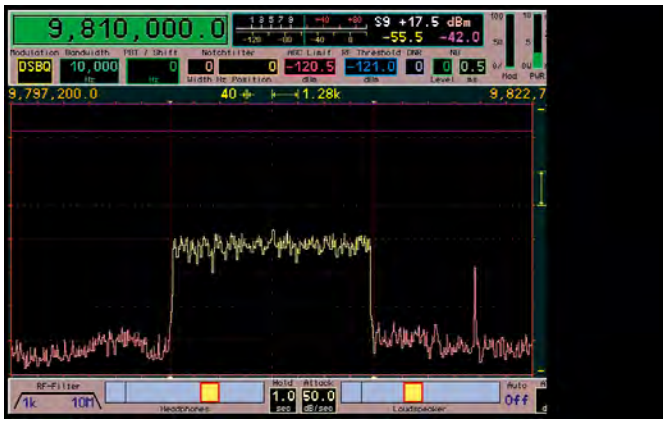
In the places where the Pocket has gaps in receive coverage, it is possible to add an offset to the transmitter, so that it is transmitting in those gaps, giving full TX up to 151MHz.

This feature is useful because it means the Pocket can be used as a very accurate signal generator from 100kHz to 151MHz, with which you can also create a 2-tone signal to perform IP measurements.

On CW, the output was measured at 2.5mW and, although only having one local contact on 40m, I received a report of a clean tone and no problems with the transmission.

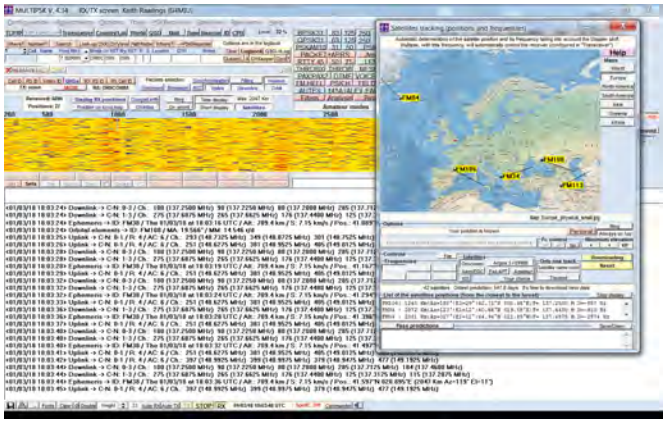
I kept the transmission short because I detected the second and third harmonics were quite high and I relied on the ATU to give me some suppression.

Because of this, external filtering would be needed before any serious use. Most users would likely want to use a PA and low pass filters could be added at this stage.



KEITH RAWLINGS

Fig. 11: Radio Romania International DRM Wave Form.



KEITH RAWLINGS

Fig. 12: ORBCOMM Decoding, using MultiPSK with the Pocket.

Summary and Conclusion

In every aspect, the Pocket seemed to excel. The IF filtering was razor-sharp, with some ringing only at the narrowest of bandwidths when set to CW. Audio quality was excellent throughout.

The display was sharp and easy for me to read. Despite its many features, I found operating the Pocket a breeze.

In fact, it was not until I needed to understand the use of the various modes, that I referred to the manual.

For those whose eyesight is not at 100%, the operation may be a challenge. However, the display brightness can be varied from 'off' to 'very bright' and I had no difficulty in reading in broad daylight. I was unable to try operating in sunlight as there wasn't any – just snow!

At no time did I find image problems on the receiver, something my RSP2 can suffer from badly at times, admittedly though, at much lower cost. Pagers were never a problem during WXSAT reception.

I was able to receive transmissions at VLF with ease, the noise floor was remarkably quiet, especially after I had recognised a problem with my PA0RDT mini whip and had re-erected it, in a near-blizzard!

With the aerial disconnected, I did find some spurious responses from around 2 to 2.3MHz at a level of S3 and there were also a few that appeared when the DC supply was connected. These were of a very low level, typically S1, except for one at 717KHz that ran at S5 and could be heard in the background of BBC Radio 4 on 720kHz, which was running at S9+10. It disappeared when the DC supply was disconnected.

It could be seen on the display, in the passband of the station and I removed it with the notch filter.

Initially, one could be forgiven for thinking of the Pocket as just another world band radio but do not make this mistake.

This it is not – in fact, far from it. This is not a toy. It is a very sophisticated bit of kit and it performs its tasks very well and is still relatively easy to use.

For some, there will be a learning-curve, as there is for anything complex. I feel I should add that newcomers to the hobby who are not used to the terms and procedures used to operate a complex receiver may have to put in a bit of time to get up to speed.

Although it is aimed at portable use, the Pocket, with a suitable stand, would make an excellent and compact base. No reaching for the mouse or looking for keys on the keyboard just tap, tap, job done – just don't lose the stylus!

In all respects, I found the radio a superb all-rounder. Not least owing to the fact that there is no embedded operating system here, which makes this SDR receiver so very fast.

To get best results, a decent aerial is needed – so nothing unusual there. It will give great results for the broadcast listener from long wave to short wave and on FM as well as DAB.

The use of a computer provides the option of DRM reception. The utility listener will appreciate the different modes, filters and IQ facilities and the ease of decoding digital signals.

Radio amateurs will, likewise, enjoy its performance on the amateur bands and those that like to lurk down in the lower depths of the spectrum will find its performance excellent there as well.

In fact, if reception from DC to daylight is not needed, this receiver could be the only radio you ever need.

Yes, I liked it a lot but was there anything I did not like? No, not really. Possibly I would have liked to have seen a touch-tune facility, where a tap on the spectrum display would tune to a signal trace. Automatic speed-up, when tuning using the scroll wheel, would be a handy feature too and *integrated* DRM would have been nice to have. However, I accept that the licensing costs involved in implementing this would be crippling.

If I were to 'nit-pick', I'd probably say that having wires in all the connectors to both sides simultaneously can make operation a bit unwieldy but when all is said and done, this is manageable.

An English user manual is out as this review is published and support (via e-mail) from **Ralph Menn** was first-class. Friendly replies to my questions often came back within minutes.

This kit does not come cheaply but you get an SDR that has test instrument specifications, along with a huge potential for specialist uses.

In answer to my question of *"does this collaboration and fanaticism show in the Pocket*?" I can answer honestly and say, yes, it certainly does.

At the time of writing, the Reuter pocket C4 retails at around €2,099.

For everything I have had to leave out and for fuller specifications of the Reuter Pocket, visit this URL:
www.reuter-elektronik.com/html/pocket.html

There is also a very useful document entitled *Receiving Examples*, written by Ralph Menn, at this website:
www.reuter-elektronik.com/RDR_Receiving_examples_E10.pdf

For additional information, see also the website of the Swiss radio trader 'Fenu-Radio':
www.fenu-radio.ch/Reuter_Pocket-en.htm

My thanks go to *Reuter Elektronik*, especially to Ralph Menn, for his help and patience and also to my fellow *RadioUser* contributor **Nils Schiffhauer DK8OK** for a copy of his (German) review on the Pocket in the magazine *Funkamateur*. ■

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AIRSPY R2

£199.95

Airspy R2 sets a new level of performance in the reception of the VHF and UHF bands thanks to its low-IF architecture, high quality ADC and state of the art DSP. The coverage can be extended to the HF bands via the SpyVerter up-converter companion. The Airspy R2, like its predecessor is 100% compatible with all the existing software including the de facto scanning standard SDR#, but also a number of popular software defined radio applications such as SDR-Radio, HDSDR, GQRX and GNU Radio.

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Bill Robertson
E-mail: bill@scanman.org.uk

This month, Bill Robertson clarifies important details on the legality of VHF and UHF licensing, details activities at this year's BAPCO conference and lists key summer event frequencies.

Licensing, BAPCO 2018 and Event Frequencies

We are now coming up to the season of outdoor events around the country. At many of these, the organisers use two-way radio communications – typically handheld transceivers – for event management and safety.

Along with this, many visitors also use low-cost PMR446 'high-street' handhelds to keep in touch with family.

This is especially the case, where events have poor or non-existent mobile phone coverage, as can be the case in many rural locations.

Large events covering significant areas (such as air shows) usually have a temporary repeater site in use.

More modest gatherings like a balloon festival, town or village show and so on, might use either licensed 'UK Simple' VHF or UHF transceivers or deploy licence-free, lower-power, PMR446 handhelds.

Simple UK Licence

There is a very useful licensing system, offered by the UK radio regulator, Ofcom: **www.ofcom.org**

I hold one of these licences. It covers simplex handhelds and mobiles of up to 5W ERP (Effective Radiated Power) anywhere in the UK and costs just £75, per five years, for unlimited radios. This is much cheaper than a business licence.

The channel frequencies (**Table 1**) are shared between all users of the licence. However, the use of CTCSS tones and DCS codes is allowed to ensure a virtually 'private' channel – as long as no stronger transmissions are on the chosen frequency.

Fig.1: The logo of BAPCO, the British branch of APCO, the Association of Public Safety Communications Officials.

The use of base stations or masts is not allowed and neither are repeaters.

The radios can also be used on vessels on inland waters, rivers and canals but not at sea. For this, you can get a free VHF marine ship handheld licence, also from Ofcom.

The 5W power is about the limit that most VHF and UHF handhelds have. Depending on topography, this can give a communications range of around a mile or two (handheld-to-handheld) in a flat, outdoor, location.

Much more can be achieved in a 'line-of-sight' scenario. For example, I made a VHF contact over 500 miles of distance, by using just my 5W handheld.

I transmitted from the summit of *Aiguille du Midi*, a 3,842m peak adjacent to *Mont Blanc* in the French Alps. No, I didn't trek up there, I took the cable car! You can take a look at the licence conditions here:
http://static.ofcom.org.uk/static/businessradio/BusinessRadioSimpleUK.pdf

Short-Term Hire Licence

Officially called a *Business Radio (Suppliers Light) Licence*, this is a higher-power permit, renewable every five years. It can be issued to two-way radio dealers for short-term hire, as the name suggests.

This type of license is commonly used for large-scale events and as a 'demonstration-licence'. It can also function as a (short-term) 'holding-licence' for a (more long-term) user, where the latter is awaiting the allocation of more permanent frequencies.

Its use allows base station (mast-mounted) antennas, along with repeaters. Simplex frequencies are also allowed. The maximum permitted ERP for base stations is 10W; for mobile stations, it is 25W. The maximum allowable base station antenna height, above ground level, is 20m.

Again, the frequencies are common to other users. CTCSS or DCS is commonly used when radios are hired out.

PMR446

These are the licence-free 'walkie-talkies' you typically see on sale in high street stores. They can cost less than £20 a pair.

They are limited to handhelds with attached (non-removable) antennas and 0.5W maximum ERP. This is one-tenth that of a Simple UK License handheld. Therefore, these offer a more limited communications range.

Only speech communication is allowed. No mobile equipment is permissible in this case and neither are external antennas.

Do not believe the hype about *"up to 8km range"* or similarly inflated claims. This range can only be attained with line-of-sight conditions, which are absolutely clear and have no obstructions whatsoever.

The *Inverse Square Law* applying to the range of radio communications refers to the inverse of the square of the distance from the transmitting source.

In our context, this means that PMR446 radios will have a significantly *smaller* range than 5W handhelds – I leave it to you to do the maths!

All PMR446 infrastructure uses a European standard, managed by the CEPT (European Conference of Postal and Telecommunications Administrations). Although PMR446 frequencies and channels are harmonised across Europe, not all countries allow their use. Users should

BILL ROBERTSON

Fig. 2: Plenty of visitors at the 2017 *BAPCO Exhibition*.

check with the relevant authorities, before using them.

There are eight PMR466 channels in total, spaced 12.5kHz apart.

Although these are not many channels, the short range means that levels of interference are tolerably low.

Apart from their prevalence in business, these radios are often used as a 'personal' radio service for individuals, where they can enable communication to be made cheaply and easily, using just two-way handhelds.

BAPCO 2018

The two-day *BAPCO Conference and Exhibition* in Coventry took place from March 21st to 22nd this year. I could not attend in person this time but have remained fully aware of the proceedings and conducted some research.

www.bapco.org.uk/events

Launched in June 1993 as the British Association of Public Safety Communications Officials, the British branch of APCO (BAPCO, **Fig. 1**) is now widely acknowledged as the UK's leading association for all professionals involved in, using or developing public safety technology.

British APCO is a growing community with extensive knowledge in public safety technology, garnered from their members' use and delivery of real-life public safety solutions. They are a user-led, not-for-profit association, working independently to improve emergency services, public safety communications and information technology for everybody's benefit. The event always attracts plenty of visitors (**Fig. 2**).

The event is usually attended by emergency services staff such as the police, fire and rescue, ambulance, RNLI, UK Coastguard and Coastwatch, land and offshore SAR personnel and the like.

The two-day conference normally includes key speakers outlining the future of radio communications in this area and relating their past experience (**Fig. 3**). The 2018 event was no exception.

I will further report on the 2018 BAPCO Conference in my June column for *RadioUser*.

ESN Delay

I have previously mentioned that I found it hard to see the migration of *Airwave* (TETRA) to a new ESN (Emergency Services Network) in time for the UK Government's deadline of this year.

As I write this, ESN suppliers, Motorola Solutions and Vodafone, have agreed on a plan to keep the *Airwave* TETRA (mission-critical) voice network operational until at least 2020 (**Fig. 4**).

Furthermore, the Home Office stated that a report – with a revised timeline and budget for the Emergency Service Network – should be available by the end of July 2018. In 2017, the Home Office had information on Vodafone planning to switch off *Airwave* from March 31st, 2020. As you might know, Vodafone is a subcontractor to Motorola, which owns the *Airwave* network.

Frequency Allocations

Ofcom 'Simple UK' Licence Frequencies

VHF Low Band (MHz)
77.6875
86.3375
86.3500
86.3625
86.3750

VHF Mid Band (MHz)
164.0500
164.0625

VHF High Band (MHz)
169.0875
169.3125
173.0500
173.0625
173.0875

UHF1 Band (MHz)
449.3125
449.4000
449.4750

Ofcom Short-Term Hire Frequencies

Repeater Frequencies (MHz)

Base	Mobile
82.1250	68.6250
85.8750	72.3750
163.2875	158.7875
163.6875	159.1875
163.7500	159.2500
163.8500	159.3500
163.9000	159.4000
163.9250	159.4250
163.9500	159.4500
167.2000	172.0000
453.6875	460.1875
454.4250	461.4250
456.3875	461.8875
456.9875	462.4875
456.0125	461.5125
456.3375	461.8375
456.4625	461.9625
456.5625	462.0625
456.6875	462.1875
456.9250	462.4250
456.9625	462.4625

Simplex Frequencies (MHz)

26.8350	163.9500
26.9200	163.9875
48.9750	164.0000
48.9875	164.0875
68.6250	164.1250
72.3750	164.1875
82.1250	167.2000
85.8750	169.0125
158.7875	169.1375
159.1875	169.1625
159.2500	169.1875
159.3500	172.0000
159.4500	453.6875
159.4875	454.4250
159.5000	456.3875
159.5875	456.8625
159.6250	456.9250
159.6875	456.9875
163.2875	460.1875
163.6875	461.4250
163.7500	461.8875
163.8500	462.3625
163.9000	462.4250
163.9250	462.4750

PMR466 Frequencies

Channel	Frequency (MHz)
1	446.00625
2	446.01875
3	446.03125
4	446.04375
5	446.05625
6	446.06875
7	446.08125
8	446.09375

BILL ROBERTSON

Fig. 3: Conference activities at the 2017 BAPCO event.

On a wider scale, ESN is a nationwide public-safety Long Term Evolution (LTE) network. It has been earmarked to replace *Airwave*.

Stephen Webb is responsible for the Emergency Services Mobile Communications Programme (ESMCP) at the Home Office. He claimed before a UK Public Accounts Committee on February 21st that a new solution, at no extra cost to taxpayers, would be ready by March 2020. He added that, *"Vodafone will be providing essentially a replacement service over standard IP kind of technology."*

Fig. 4: *Airwave* runs the current TETRA Emergency Services Communication System infrastructure.

Motorola Solutions Chairman and CEO **Greg Brown** confirmed the new contract with Vodafone during a *Financial Investor Webcast* on February 27th, 2018. **https://tinyurl.com/yarztdly**

Out for Now

I am off for a break for a week now and yes, I will certainly be taking my handheld 'close-call' scanner with me! See you next month.

Editor's Reading Suggestions:

BAPCO/ RUSI:
Emergency Services Communications: Resilience for the 21st Century
https://tinyurl.com/y8x6u56w
Communications Museums Trust:
History of the 999 Service
http://www.comms.org.uk/emuseum/emergencycalls
Home Office:
Ready for ESN
http://readyforesn.com
House of Commons, Public Accounts Committee:
Upgrading Emergency Service Communications
52nd Report of Session 2016/17 [HC997]
https://publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/997/997.pdf]

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Noisy signals getting you down? ..Hear clearly with a bhi DSP noise cancelling product!
ParaPro EQ20 Audio DSP Range
New!
- 20W Modular audio power amplifier
- Parametric equaliser - bhi dual channel DSP noise cancelling & Bluetooth optional
- 4 versions: EQ20, EQ20B, EQ20-DSP, EQ20B-DSP
- Supplied with full accessory kit and user manual
Professional grade equalisation for amateur radio!
NES10-2 MK3 - Amplified DSP noise cancelling speaker - 2.7W audio output - Headphone socket - 8 filter levels - Rotary filter select switch - Connect to a 12V DC power supply - Easy to use!
DESKTOP
10W Amplified DSP noise cancelling base station speaker - Separate volume and filter level controls - 8 DSP filter levels 9 to 35dB - Speaker level and line level audio inputs - Sleep mode - Size 200x150x160mm - Supplied with manual, audio lead and fused DC power lead
DSPKR
10W amplified DSP noise cancelling speaker - Easy control of DSP filter - Sleep mode - Filter select & store - Volume control - Input overload LED - Headphone socket - Supplied with manual and fused DC power lead
Dual In-Line - Dual Channel amplified DSP noise eliminating module - Suitable for all radios, receivers and SDR - Mono or stereo input & output options - 7W mono audio output, line level & headphone o/p sockets - Ideal for DXing and special event stations - Includes new improved DSP noise cancelling!
Compact In-Line
- Use in-line with your radio and headphones
- New improved DSP noise cancelling
- Easy to use with mono or stereo inputs
- 8 filter levels 9 to 35dB
- Separate volume control & input overload
- Use mobile or in the shack - Over 40 hours battery life from 2 x AA cells or use 12V DC input - Size: 121x70x33mm
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E & O.E.

The editor, with the help of some of our regular contributors, offers a respectful appreciation of one of the greatest British inventors ever.

Winding Up Broke*

How about an electric shoe, which re-charges your mobile phone as you walk? A radio you can wind up and use independently of electricity? You know where this is leading, don't you?

Both of these ideas – and much more besides – were conceived of by British inventor **Trevor Baylis**, born on 13th May 1937, who passed away on 5th March 218, at the age of eighty. He suffered from *Crohn's Disease*.

Trevor Baylis was a champion-swimmer, pipe-smoker, stunt man, designer, maverick and brilliant inventor. Many of his early ideas for cutting-edge design and innovation reflected his concern for others and recognition of his ability to make a difference.

For example, the Open University pointed out that, from an early stage, Baylis was interested in developing a range of products for physically disabled people under the *Orange Aids* label.

However, his lasting legacy must surely be the *BayGen Freeplay* wind-up radio, developed in 1992 for people without access to electricity or batteries.

More than 25 years after the *Freeplay*, this is still an astonishing one quarter of the global population.

https://tinyurl.com/y7vhrq56

In the early 1990s, when AIDS first came to the forefront of global attention, Baylis hit on the idea of creating a 'clock-radio', modelled on an old-fashioned gramophone, to help get information to people.

The prototype was, *"cannibalized from a small transistor radio, the motor from a toy car and the clockwork mechanism from a music box"* (*The Times*, *Obituaries*, Tuesday, 6th March 2018: 49).

The idea really took off after a 1994 feature on *Tomorrow's Word*, which brought the inventor into contact with the public, and with personalities like **Nelson Mandela** and many others.

When the radio entered commercial production, it sold in its millions.

The *Radio Times* listed the radio as one of the fifty greatest British inventions of all time. However, when Baylis sold his 51% share in his original company, his invention slipped from his grasp.

Subsequently, other manufacturers

made radios that charged a *battery*, instead of using a *spring* to generate power. A legal loophole lost the inventor his patent.

The *'I'* newspaper reported (on March 6th 2018: 11) that Trevor Baylis received almost no profits from his radio because others took advantage of patent laws to sell versions of his invention. A salutary lesson, indeed.

Against this background, the creator of the *Trevor Baylis Foundation* and of the *Trevor Baylis Brands plc*, campaigned to outlaw intellectual property theft.

The Open University awarded Trevor Baylis an Honorary Doctorate in 2001. He lived on Eel Pie Island, on the River Thames at Twickenham. **David Bunting**, CEO of *Trevor Baylis Brands*, said that Baylis had no living relatives.

http://www.trevorbaylisbrands.com

Here is what some of our regular contributors said about Trevor Baylis:

Don Field, Editor of *Practical Wireless*, said, *"My BBC news friend **Laurie Margolis G3UML** tells me that Trevor was passionate about using these radios in Africa in order to dispel some of the ignorance about AIDS. The RSGB (when I was on the Board) invited Trevor to Edinburgh as a guest speaker at the AGM. My family had come with me to make a weekend of it and my wife, daughter and daughter-in-law had their photo taken with him..."*

Clint Gouveia added, *"Trevor Baylis was a visionary. He took 15th Century mechanical clockwork technology and combined it with 20th-Century electronics to create a radio intended to educate, and ultimately save the lives of, those in the Global South, without access to mains power or batteries. A truly philanthropic initiative future generations will benefit from..."*

Chrissy Brand commented,

"I remember seeing Trevor Baylis on BBC's Tomorrow's World *a few decades ago. His most famous invention was surely the clockwork radio. It's such a simple and straightforward idea when you think about it. I'm amazed nobody thought of it sooner. It's helped thousands of people around the world tune to radio, whenever they choose.*

"Previously, in electricity-free areas, battery-powered radios were the only option. But they are an expense (not to mention an environmental hazard) that many cannot afford, especially in the developing world. Radio, as we know, gives far more than entertainment.

"The information on health, weather, political upheaval that thousands have heard on their local stations, thanks to the clockwork radio, has been, in many cases, lifesaving. On a personal note, the annual BDXC UK gathering on the banks of the Thames is opposite Trevor's Eel Pie Island home. He often cropped up in conversation during these social meetings: this summer, we will raise a glass across the water..."

Key Obituaries

The Times:
https://tinyurl.com/y8ow9dcl
The Guardian:
https://tinyurl.com/ybpvkpx7
The Telegraph:
https://tinyurl.com/ydgg8n65
Express: **https://tinyurl.com/ycyd4t3p**

[*Editor's Reading Hint:* Baylis, T. (1999) *Clock This – My Life as an Inventor* (London: Headline Books Publishing)].

*phrase respectfully borrowed from the *Telegraph*, 7th February 2013.

Robert Connolly
E-mail: gi7ivx@btinternet.com

Robert Connolly explains marine band scanning for novice monitors, provides new frequency information and looks at the former link call facility, before visiting a maritime museum and assessing a vintage transceiver.

Marine Band Essentials, Gold Francs & Museums

ROBERT CONNOLLY

Fig. 1: A portable MF distress transceiver.

By the time you read this column, summer will, hopefully, be just around the corner, along with the two Bank holidays in May. Some of you may be considering a visit or holiday to one of our fine coastal resorts and will want to bring along a scanner, in the hope of listening to some maritime communications.

Others may be relatively new to the marine radio hobby and unsure about what frequencies to listen to. For this reason, I am providing advice for newcomers in my column this month. I hope that the more experienced regular readers will not object; we all had to begin somewhere.

Legalities first: On the marine band, you can legally listen to weather and navigation information (MSI).

Using a dedicated marine *transceiver* requires a license available from Ofcom. It is free, if applied for on-line.

To be able to *legally transmit* on it, the operator must have a *Certificate of Competence for Short Range Radio*, unless operating under the guidance of a person who holds such a qualification.

A marine transceiver licence does not cover the use of the transceiver if it is being used for communication between the land and a vessel; this requires a special *Coast Station Licence*.

The Ofcom document *Guidance on Receive-Only Radio Scanners: Legal position and common questions on Receive-Only Radio Scanners* refers to these matters and can be accessed here: **www.ofcom.org.uk/__data/assets/pdf_file/0027/89037/Guidance-on-Receive-Only-Radio-Scanners.pdf.**

Beginners Guide

With this out of the way, a good channel to start listening is **Channel 16** (**156.800MHz**). This is the calling and distress channel. It is also used by the UK Coastguard to announce

their Maritime Safety Information (MSI) broadcast, along with the working channel they will be using. This channel is also used by vessels calling the Coastguard or making initial contact with ports or pilots.

Channel 67 (**156.375MHz**) is another useful marine channel; it is often used by the Coastguard as a small ships safety channel. The Coastguard may use either or both Channel 16 and 67 for SAR purposes.

Another private channel, **Channel 0** (**156.000MHz**), is used for communications between mobile teams and RNLI lifeboats. It carries the paging signal used for local volunteer coastguard call-outs. Coastguard helicopters are also equipped with this channel in the UK and, more recently, in Ireland.

Channel 99 (**160.600MHz**) is a UK Coastguard private channel, used by land-based SAR teams.

Frequencies and Phrases

When listening to marine VHF, you may come across words or phrases that sound rather strange, especially if you are listening to an ongoing SAR tasking. In **Table 1**, I have detailed these and explained their meaning. In **Table 2**, you can see the current VHF marine band frequencies available to the Coastguard in the UK and Ireland, along with other marine VHF frequencies.

If you are seeking information on marine channels used at specific ports and harbours around the British Isles, the excellent website run by **Robert Maskill G4PYR** carries a detailed listing of the public marine VHF channels used in harbours around the coast.
http://coastalradio.org.uk

If you are in England and Wales, you well may come across the National Coast Watch Institution (NCI) operating in your area on **Channel 65** (**156.275/160.875MHz**).

The NCI is a volunteer organisation, which monitors the safety of marine traffic in coastal areas. It does so in a similar fashion to the task that the Coastguard used to carry out years ago, when their coastal watchtowers were staffed.

You can learn more about the NCI by visiting their website at this URL: **www.nci.org.uk.**

More Frequencies to Watch

A couple of other useful frequencies to program into your scanner are **Channel 10** (**156.500MHz**) and **Channel 12** (**156.600MHz**).

Channel 10 is a Coastguard backup channel for SAR, MSI and pollution incidents. It might also be used for communication between coastguard rescue helicopters and casualty vessels, instead of **Channel 06** (**156.300MHz**).

Channel 12 is often used for port operations and communications with ships' pilots.

Leisure vessels will often be in contact with marinas for manoeuvring and berthing information. They might use **Channel 37** (**157.850MHz**), often referred to as '**M1**'.

Alternatively, they could use **Channel 80** (**157.025/161.625MHz**), sometimes labelled **'M2'**.

Please note that the above are *UK and Ireland only* frequency allocations and not part of the international list of marine VHF channels. If you consult the latter, you will see that **Channel 75** (**156.775MHz**) and **Channel 76** (**156.825MHz**) are restricted to ship use and for navigational information only; in this case, low power should be utilised. This sensible rule protects Channel 16 (156.800MHz) – the distress channel – from possible interference.

Signal Propagation

When listening near the coast with your scanner, you will probably be able to receive Coastguard and port operation transmissions. However, do not be surprised if you do not hear many ships, particularly if you are just using the standard flexible 'rubber-duck type antenna.

As a rule of thumb, the range of marine VHF radio transmissions extends roughly up to the horizon. However, distance can vary greatly, depending on the height of both the transmitter and receiver antennas. If you are sitting on the beach with your scanner in your hand, the distance to the horizon will be a lot shorter than standing (safely) on top of a cliff, where your distance to the horizon is greater.

The height of any transmitting antenna also affects reception distance. For instance, a small day-boat, using marine VHF, will have a much shorter transmission range, compared to an ocean-going cruise liner, whose antennas are much higher.

Coastguard transmitters are normally located on high ground, to provide the maximum possible coverage for both reception and transmission of radio signals to and from vessels of all sizes.

Nevertheless, there can be 'blind spots'. This phenomenon can affect radio signals to and from small craft, if the latter are operating close inshore or under tall cliffs.

There is a formula that vessel skippers can use to calculate their marine VHF range. For the casual listener, the rule of thumb distance to the horizon is fine.The 'professional' formula is as follows: 1.144 x (√H1+ √H2 (in feet)) = distance in miles or 2.072 x (√H1+ √ H2 (in metres)) = distance in miles. H1 is the height of the transmit antenna and H2 is the height of the receive antenna.

Link Calls

Years ago, when shore stations were operated as coast radio stations, rather than the current Maritime Rescue Co-ordination Centres (MRCC), you could hear 'traffic lists', announced by the coast station at certain times of the day. These would have been referring to vessels from which 'link calls' had been requested, by a land-based telephone caller, wishing to contact that vessel.

It was a system by means of which the coast station connected the vessel (via marine VHF) to a requested landline telephone number or vice-versa. Vessels could only make such calls, if they had an authorised account with an approved provider. In those days, when applying for a marine VHF license, there was also a facility to apply for an account with a provider for link calls.

Calls were charged using a virtual currency called the 'Gold Franc'. This did not actually exist but was used as a common basis for calculating the cost of the link call in local currency. Probably the closest equivalent we have today is 'Bitcoin'.

Link calls no longer exist, thanks to satellite and mobile phone developments.

However, it is possible (in an emergency) for the coastguard to connect a vessel, via marine VHF radio, to a telephone line, to allow a doctor, for instance, to provide urgent medical advice to the crew of the vessel.

Museum Marvels

Recently, I was on holiday in Co. Donegal, Ireland and visited the fishing port of Killybegs on the Atlantic coast. This is probably the largest and busiest fishing port in Ireland, with some quite large Atlantic trawlers operating from there. It is also home to a training school, where fishermen can gain their qualifications as a fishing vessel skipper.

While I was there, I paid a visit to the local Carpet Museum, where hand-made Donegal Carpets used to be produced, some for very important buildings such as Buckingham Palace, the Houses of Parliament in England and the official residence of the President of Ireland in Dublin. The

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Fig. 2: The Killybegs fishing vessel Atlantic Challenge.

Killybegs International Carpet Making & Fishing Centre is also home to a small Maritime Museum. This displays various radio communication and navigation items and a 'virtual-reality bridge', from which you can attempt to steer a fishing vessel into port.

www.visitkillybegs.com

Distress Transceivers

The item shown in **Fig. 1** is a portable MF distress transceiver. It operated on the **2182kHz** distress frequency. With the two-metre-long telescopic antenna fully extended, the unit was about three metres tall and was used in life rafts, to aid rescue when out of VHF radio range.

These devices were fitted with a special battery, which had to be replaced from time to time. They had a three-way switch, with the central position for 'receive'. If you turned the unit one way up, it would display a 'test-light', indicating the unit was working. Turning the radio around revealed the 'transmit' function.

The one pictured here dates from the late 1970s or early 1980s.

It has a six-metre stainless-steel wire fitted and a weight on the end, stowed in a pocket at the bottom.

When the unit was in use, the wire was removed from the unit and thrown into the sea. Its weight then caused it to sink, providing a suitable counterpoise for the antenna.

The antenna had to be fully extended.

The transmitter output was around 5W and the device had a range in excess of 80nm.

The unit was waterproof up to 1.4m of depth and its battery was designed to last for approximately 80 hours.

When transmitting on 2182kHz, it would also activate a two-tone alarm on that frequency. This indicated that a distress signal was about to be transmitted.

I have a unit similar to this one in my small technology collection. It dates from the early 1960s and is operated in much the same way.

I recently replaced the battery with an external power source and I disabled the transmit function, leaving it on receive-only, for demonstration purposes.

Although it was designed to operate on AM, I found that it did receive a readable USB signal. When testing its receiving capabilities after darkness, the furthest station I was able to hear was from Italy.

When used 'in anger' at sea, as it were, the best time to send out your distress would have been during the three-minute silence period that occurred twice each hour, starting at H+00 and H+30. These silence periods were assigned to enable the clear reception of weak MF distress signals.

Finally, this month's picture (**Fig. 2**) is of the (59m) Killybegs fishing vessel Atlantic Challenge.

Until next time, fair winds.

Procedural words	Meaning
Mayday	*Distress call when there is an immediate risk to life.*
Mayday Relay	*Distress call on behalf of another vessel.*
Pan-Pan	*Urgency call when there is not an imminent risk to life.*
Pan-Pan Medico	*Call requesting urgent medical advice.*
Seelonce Mayday	*Channel 16 Radio silence, imposed by station controlling a distress (from French: 'silence')*
Seelonce Distress	*Channel 16 Radio silence, imposed by a station other than the one controlling a distress*
Prudonce	*A concession by the distress controlling station to (from French: 'prudence')*
Seelonce Feenee	*End of radio silence (from French: 'fini[e]')*
Sécurité	*Safety signal; to indicate a message of navigational importance is about to be transmitted.*

Table 1: Words and Phrases in Maritime Emergencies.

0	**156.000**	**156.000**	HM Coast Guard private channel.
2	**156.100**	**160.700**	Irish Coastguard MSI
4	**156.200**	**160.800**	Irish Coastguard MSI
6	**156.300**	**156.300**	SAR Communications - Ships and Aircraft.
8	**156.400**	**156.400**	Ship to Ship Primary Working Channel.
10	**156.500**	**156.500**	SAR, Pollution Incidents, MSI Broadcasts. Coordinated with HMCG (Back up channel)
12	**156.600**	**156.600**	Pilots & Port Operations
16	**156.800**	**156.800**	International Distress, Safety and Calling Channel
23	**157.150**	**161.750**	HMCG SAR /MSI & Irish Coastguard MSI
24	**157.200**	**161.800**	Irish Coastguard MSI
26	**157.300**	**161.900**	Irish Coastguard MSI
28	**157.400**	**162.000**	Irish Coastguard MSI
31	**157.550**	**162.150**	RNLI private channel
37(M1)	**157.850**	**157.850**	UK & Ireland Marinas private channel
61	**156.075**	**160.675**	Irish Coastguard MSI
62	**156.125**	**160.725**	HM Coast Guard & Irish Coastguard MSI
63	**156.175**	**160.775**	HM Coast Guard Marine Safety Broadcasts
64	**156.225**	**160.825**	HM Coast Guard Marine Safety Broadcasts
65	**156.275**	**160.875**	National Coastwatch England & Wales
67	**156.375**	**156.375**	HMCG & Irish Coastguard SAR
70	**156.525**	**156.525**	International DSC Distress, Safety and Calling (No voice)
72	**156.625**	**156.625**	Ship to Ship Primary Working Channel.
73	**156.675**	**156.675**	HMCG / SAR
77	**156.875**	**156.875**	Ship to Ship Primary Working Channel.
80	**157.025**	**161.625**	UK & Ireland Marinas private channel
83	**157.175**	**161.775**	Irish Coastguard MSI
84	**157.225**	**161.825**	HM Coast Guard Marine Safety Broadcasts
85	**157.275**	**161.875**	Irish Coastguard MSI
86	**157.325**	**161.925**	HM Coast Guard Marine Safety Broadcasts
99	**160.600**	**160.600**	HM Coastguard SAR & training. Private channel
M2	**161.425**	**161.425**	UK & Ireland Marinas private channel
AIS1	**161.975**	**161.975**	Automatic Identification System (No voice)
AIS2	**162.025**	**162.025**	Automatic Identification System (No voice)

Table 2: Current VHF Marine Band Frequencies.

Maritime Radio

Here is a short selection of international maritime radio internet resources, for those of you who enjoy our regular *Maritime Matters* column and for all other radio hobbyists. Write in with your additions!

Admiralty
www.admiralty.co.uk

Admiralty List of Radio Signals (ALRS)
https://tinyurl.com/ya6o5wqg

Amateur Radio Lighthouse Society (US)
http://arlhs.com/contact

HMS Caroline (Belfast) National Museum of the Royal Navy
https://tinyurl.com/kobzpuf

International Maritime Organisation (IMO)
www.imo.org

IMO Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)
https://tinyurl.com/ydfrr3nb

ITU – Radio Communications Sector
www.itu.int/en/ITU-R https://www.itu.int/pub/R-REC/en

Lifeboat Amateur Radio Society
http://lifeboat-amateur-radio.org.uk

Liverpool Marine Radio and Electronics Society
http://www.radiooffficers.org.uk/index.html

Maritime and Coastguard Agency (MCA)
www.gov.uk/government/organisations/maritime-and-coastguard-agency

MCA Marine Notices
www.gov.uk/topic/ships-cargoes/m-notices

Maritime Radio Historical Society (USA)
http://radiomarine.org

Mourne Maritime Centre
http://mournemaritime.com.gridhosted.co.uk

National Coastguard Institute
www.nci.org.uk

Ofcom: Ship's Radio and Ship Portable Radio
https://tinyurl.com/yahtctg6

Radio Officers' Association
https://www.radiooffficers.com

Royal National Lifeboat Institution (RNLI)
https://rnli.org

RNLI Guide to VHF Radios
http://completeguide.rnli.org/vhf-radios.html

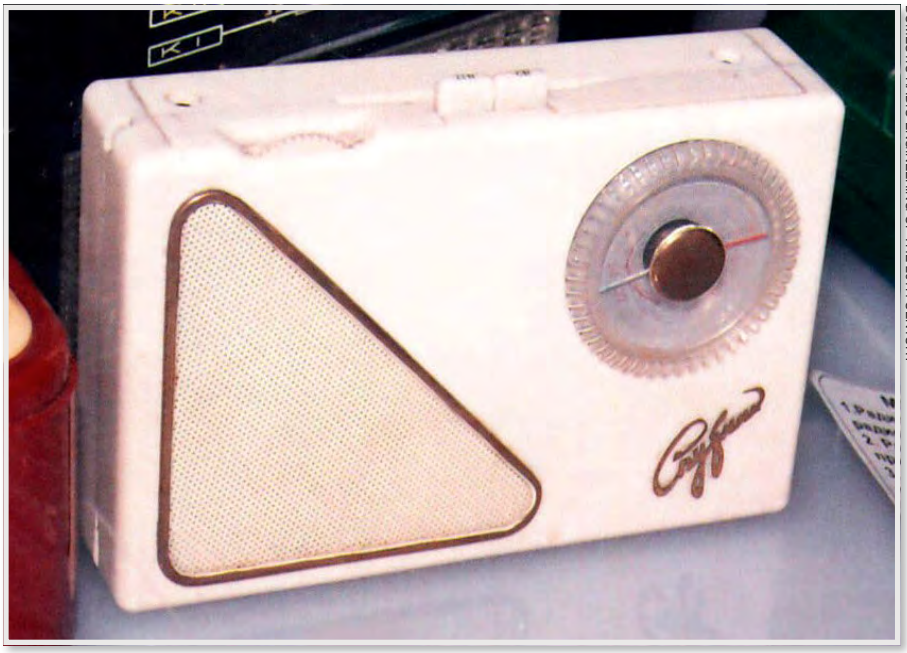
Royal Naval Amateur Radio Society (RNARS)
http://www.rnars.org.uk

Scarborough Maritime Heritage Centre
https://tinyurl.com/y8ervqve

[Thanks to **Steve Carson, Robert Townsend, Samantha Sinclair, John Periam** and **Robert Connolly** – **Ed**.]

Robert Davidson
robertd3131@gmail.com

Robert Davidson OM/WB8IPB documents some of the beautiful and remarkable transistor radios in use throughout the Eastern Bloc during the Cold War period.



DOMESTIC RADIO ENGINEERING OF THE 20TH CENTURY

Fig. 1: The 'Sputnik' (1957/8).

Transistor Radios Behind the Curtain

Western European transistor radios made in the 1950s and '60s are about as well-documented these days as are their US and Japanese counterparts, yet transistor radios produced in Eastern Bloc countries during those same times still seem to be relatively unknown in the West. While much of this comes from an understandable lack of information sources and few examples of Eastern Bloc radios are to be found in the West, there is also an element of indifference here, perhaps partially fueled by a lingering prejudice best summed up by the 1960's American sentiment that *'the Russians can't even build a decent refrigerator.'*

It was not until 1959 or 1960 that Russia found herself capable of building a reasonably decent transistor radio for mass production and the radios that it did produce over the following few years offered few innovations that hadn't already been found in transistor radios made in the West several years earlier.

By contrast, the US's first transistor radio was marketed in 1954 and Japan's first transistor radio in 1955. By 1959, both countries had marketed a large array of models produced by dozens of different manufacturers.

Yet these Soviet-made radios were listened to by hundreds of millions of people sequestered from the rest of the world – these were the radios that were taken along to football matches, checked for weather reports, enjoyed for musical offerings. Regardless of their performance standards, the radios were part of the everyday lives of millions.

In the Soviet-occupied Eastern European countries of Poland, Czechoslovakia, the German Democratic Republic and Hungary, transistor radios with good quality reception performance arrived on their local markets several years ahead of Soviet radios, although they often did so by employing transistors made by European or Japanese manufacturers (Philips, Telefunken, Hitachi) in the circuits of their earliest radio models.

The development – first of the transistor devices themselves and then of the transistor radios incorporating them – took very different paths in the Soviet Union and in its Eastern European satellite countries.

Semiconductors Behind the Curtain

The Soviet Union's development of transistor devices was well behind the times, though probably not as far behind as most people in the West might have thought.

The USSR's first point-contact transistors were created in the early 1950s and the first Soviet-made junction transistors were produced in the mid (and late) 1950s.

Later devices among these included the black 'top hat' versions found in most of the early Soviet transistor radios from the late-1950s through the mid-1960s. Early Soviet transistor radios often relied on only two different transistor types for their circuits, even if the radio's circuit was comprised of up to ten transistors! This sort of thrift continued up until 1963 or 1964.

Transistor radios made in Eastern Europe at the time didn't make use of Soviet-made transistors – rather, the earliest radios employed transistors made in the West or ones developed within their own country.

Hungary's first transistor radio, the 1957 'Tunde', described as an experimental set, used transistors made by Telefunken. The 1958 'mass-production' version of the Tunde used Hitachi transistors.

East Germany's transistor production plant, the *Werk für Bauelemente der Nachrichtentechnik (WBN)*, began production of junction transistors in 1959 but the country's state radio manufacturer, *VEB Stern*, still had to rely on transistors from Western European manufacturers to complete its sets' circuits during its

first several years of transistor radio production.

The earliest examples of Poland's first transistor radio (the 'Eltra MOT-59', see **Fig. 13**) used transistors made by Telefunken, while later examples used Philips transistors. Poland's 1961 Eltra Koliber MOT-601 also most likely made use of transistors from a Western European manufacturer, probably Philips.

Poland's own TEWA semiconductor manufacturing plant did not begin producing transistors until 1960 and then only AF (audio frequency) transistors for the first year or two. It is likely that the 1963 'Eltra Koliber 2' was the first Polish transistor radio to routinely employ Polish-made transistors.

Fig. 2: The 'Surprise' (1958).

Soviet Transistor Radios

There is a comprehensive Russian-language Russian radio history site (Отечественная Радиотехника XX века; *'Domestic Radio Engineering of the 20th Century')* at this URL:

www.rw6ase.narod.ru

Interpreting the wealth of data amassed here, it appears that roughly 70 transistor radio models were produced in the former USSR up to 1965, though hundreds of more models were produced in subsequent years and up to 1989

The one model reportedly made in 1956 ('Travel') and the five models reportedly made in 1957 ('Surprise', 'Sputnik', 'Progress', 'Sverdlovsk' and 'Festival') were all described as 'experimental units', produced in runs only in the low hundreds or low thousands.

Russia had been doubly embarrassed; first by its slow development of transistor devices, as compared to the West (the USSR's 1957 history-changing 'Sputnik' satellite went into orbit without a single transistor in its circuits) and second by its slow-to-market application of transistors to consumer products such as radios.

Today, it is difficult to know exactly what these first few radio models truly represented: Were they really produced – albeit in small quantities – or did they just function as 'face-saving' prototypes?

The 1957 'Surprise' model is said to have had a production run exceeding 3,000 units but I have not yet found any evidence of an *actual radio*.

By contrast, the 1957/58 seven-transistor portable radio 'Sputnik' (**Fig. 1**) is definitely known to exist in collections today. It is reported to have had an initial production run of about 1,000 units. The original 'Sputnik' is reported to have had a solar power unit. However, I have never seen a photo showing this, just a sketch on a web page.

As of now, the 'Sputnik' appears to be the earliest *verifiable* commercial transistor radio to have been produced in the Soviet Union.

The 1958 (seven-transistor) coat pocket radio that shared the name 'Surprise' (**Fig. 2**) with a previous (and questionable) 1957 model is a radio that certainly does exist in collections today; a small but verifiable number of examples are known. It is claimed to have had a production run of around 2,700 units.

However, a former worker at the Saratov plant, where it was produced, suggested to me in an e-mail that he believed that only about 500 units were, in fact, produced.

The Surprise's ornate Slavic cabinet design makes it nearly unique among transistor radios made in any country. It is a truly beautiful radio in its own right and a very rare one to boot.

Most likely, the first mass-production transistor radio produced in the Soviet Union was the 1959 'Atmosphere' (**Fig. 3**), a two-band, long and medium wave, seven-transistor, portable radio.

'Mass-production' may well be a generous term here; the Atmosphere's initial production run may not have exceeded 10,000 units.

In **Fig. 4** you can see a close-up of the transistors on its circuit board, with each one neatly laid out on its side.

It should be noted that these three radios ('Sputnik', 'Surprise' and 'Atmosphere') are not designated by any *model number*, only by their *names*.

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Fig. 3: The 'Atmosphere' (1959).

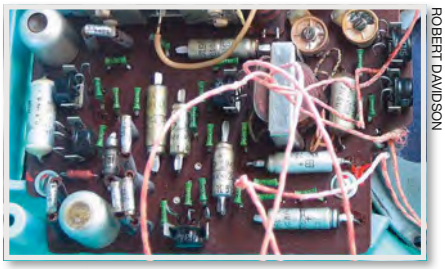

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Fig. 4: The Chassis of the 'Atmosphere' (1959).

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Fig. 5: The 'Gauja' (1961).

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Fig. 6: Handbook РАДИОПРИЕМНИК В КАРМАНЕ (Pocket Radio) (1961).

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Fig. 7: The Топаз-2 ('Topaz-2') (1963/4).

This was something typical in early Soviet transistor radios: Rather than having a model number, almost every Soviet transistor radio model had its own name and only its name – 'Atmosphere', 'Gauja', 'Mir', 'Neva', 'Sokol', 'Topaz' and so forth.

Western manufacturers such as Emerson, Hitachi, Grundig, Voxson (and Tesla in the East) also frequently gave their radio models names, yet these always were accompanied by model numbers as well (for instance Grundig's 'Mini Boy 200' and 'Solo Boy 201' and Tesla's '2702B Doris' and '2710B Zuzana').

The US manufacturer's Emerson 888 series is probably the best-known example of transistor radios with names attached to a model number ('Pioneer', 'Vanguard', 'Explorer', 'Atlas', 'Satellite' or 'Transitimer'); all these were Emerson 888s. However, radios produced in the Soviet Union are pretty much unique for having only names, free of *any* model numbering.

Several names found on Soviet transistor radios were 'recycled' over the years, sometimes more than once. The 'Atmosphere', for example, reappeared on two very different looking radios, first as 'Atmosphere 2' and later as 'Atmosphere 2M' — and why not, with a name as evocative as 'Atmosphere'?

The first *true* mass-production transistor radios in the USSR did not appear until the first few years of the 1960s, beginning with the Russian-made 1960 'Neva' shirt pocket radio, the 1960/61 'Spidola' multiband portable radio from Latvia and the 1961 'Gauja', also produced in Latvia. These radios had large production runs and were kept in manufacture over the course of several years.

Many Soviet transistor radios were exported in large numbers to Western European countries and Eastern European Soviet satellite states. This practice began in the early 1960s, with the above-mentioned 1960/61 'Spidola' multiband portable and the 1961 'Gauja' (**Fig. 5**), a six-transistor, long and medium wave, coat pocket radio.

Both models were made both for export and for the Soviet domestic market, with export models bearing the telltale English-language 'MADE IN USSR' imprint on the cabinet's back face.

Most, if not all, of the Soviet Union's transistor radio models produced over the following years were made both for export and for the domestic market.

One historical oddity here can be found in a small paperback book on transistor radio repair published in 1961 (РАДИОПРИЕМНИК В КАРМАНЕ, *Pocket Radio*) (**Fig. 6**). Among the many Eastern Bloc transistors radios detailed in it (with text, photos and schematics) are, in fact, three *Western* radios; the US 'Hoffman BP-706' solar-powered coat pocket radio, West Germany's 'Grundig Micro Boy 201' and Japan's 'Toshiba 6TP-357' shirt pocket radio.

It is unclear why these radios were included in the book – Western manufacturers were not exporting durable goods such as radios into the USSR at the time – and my own best guess is what one collector in Russia has suggested to me; the few Western radios that came into the Soviet Union arrived there only as personal possessions of Communist Party officials returning from visits to the West.

However, I still find the fact that a Russian book on radio repair should include these Western examples very strange.

Catching up with the West – Slowly

The use of only two different transistor types in Soviet radios continued until 1963 or 1964, changing with the introduction of radios such as the 1963/64 'Топаз-2' ('Topaz-2') (**Fig. 7**) and 'Нева-2' ('Neva-2'). In **Fig. 8**, you can see the 1963/4 'Нева-2' manual. Both these radios incorporated three different transistors in their circuits.

These models were, in turn, followed by the 1964 'Планета' ('Planeta') (**Fig. 9**), using four different transistors in its circuit. The 'Topaz-2' is of interest for its handsome cabinet design, including a translucent red cabinet in the example shown here, while the 'Planeta' is unique for having its tuning dial at the bottom of its cabinet face.

Even given its limitations with transistor development, Russia did produce some innovative radios in the mid-1960s. The 1965 'Micro' (**Fig. 10**), was a stunningly tiny (45 x 30 x 13mm) six-transistor long and medium wave earphone radio, often described as the smallest transistor radio of its time produced anywhere in the world. It was all the more impressive for having been a two-band radio.

The domestic-market 'Micro' was also sold for export under that same name as well as under the name 'Astrad Orion'.

In 1967, the 'Orljonok' ('Орлёнок') (**Fig. 11**) was introduced: a very pretty, long and medium wave, seven-transistor, 'micro radio' (97 x 54 x 29 mm), which was produced in a variety of toy-like cabinet colours. This radio managed to house two separate ferrite-rod antennas in its compact body, one for long wave and another one for medium wave.

Over the following years, the transistor complements in Soviet transistor radio circuits would finally reach par with those found in Western transistor radios.

Interestingly, it is not at all clear how important it was to get there. Several of the earliest US transistor radios ('Regency TR-1', 'Raytheon 8TP', 'RCA 7BT-9J') made use of only three transistor types in their circuits. Most other US transistor radios manufactured before 1958 used just four transistor types in their circuits.

The question was whether having only two transistor types in a radio's circuit could provide good performance, especially in a radio such as the 'Spidola', covering frequencies up to 12MHz.

I put this question to several collectors who have a thorough knowledge of semiconductor devices and as of now there is no clear consensus.

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Fig. 8: The 'Нева-2' Owner's Guide (1963/4).

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Fig. 9: The 'Планета' ('Planeta') (1964).

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Fig. 11: The 'Орлёнок' ('Orljonok') (1967).

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Fig. 12: The 'Электрон-2М' ('Electron 2M') Kit Radio (1969).

Radios 'for Young Experimenters'

During the Cold War years, a fair number of transistor radios in kit form were produced in the Soviet Union, often described on their boxes as aimed at *"young experimenters"* or "*young radio amateurs"*. These sets were, to some degree, part of the USSR's conscription campaign for technical talent that followed the start of the space race with the US in the early 1960s. This campaign also included State allocations of funds for amateur radio clubs and societies throughout the Soviet Union.

Most of these 'kit-radios' were very basic in circuit design and were targeted primarily at children, as opposed to the vast selection of sophisticated kits offered in the West by Heathkit and other manufacturers at that time.

One example of what was offered in the USSR is the 1969 'Electron 2M' ('Электрон-2М') (**Fig. 12**), a six-transistor super heterodyne medium wave radio using three different transistor types in its circuit.

While the space race imperative was certainly part of the motivation for offering kit radios such as the Electron 2M, radio kits had been produced routinely over the decades in the USSR, beginning as early as the 1920s. Kit radios such as the 'Electron 2M' were likely offered to the public as much for simple entertainment for children as out of any wider, geopolitical, motives.

Short Wave Listening in the USSR

If you remember the ubiquitous 'airplane drone' sound of Soviet jammer stations on the short wave bands during the Cold War years, you'll have to wonder just why the USSR produced so many multiband short wave radios for its citizens in those years. The 1960 'Spidola' was only the first of many multiband radios to be produced under that name over the following ten years or so; many other multiband portable radios, under different names, were produced for the Soviet public over the following decades, right up until the collapse of the Soviet Union in 1989.

All these radios were perfectly capable of receiving broadcasts from overseas. The only thing impeding their reception was interference from Soviet jammer stations, a fact that didn't stop Soviet authorities from arresting and prosecuting citizens found to have been involved in "*illicit receptions"* of broadcasts from the West.

An explanation for this seeming paradox is the obvious fact that Russia is a huge country that spans eleven time zones. Medium wave and long wave broadcasters could easily cover their nearby urban populations, not to mention the single-station 'cable' speaker boxes wired into every urban area residence.

However, more remote rural areas could only be reached by short wave broadcasts, specifically the 75 to 25m bands found on many short wave receivers available on the Soviet domestic market. Providing radios that covered the short wave bands was, in some sense, simply a 'necessary evil' for Soviet authorities at the time.

While it is true that each of those various radio models is now of interest on its own commercial and technical terms, every one of the millions of Soviet-made short wave radios produced in those days can also be seen as an object with both political and historical significance.

Consolidating Eastern Europe

During these early years of the transistor radio in the Soviet satellite states of Eastern Europe, Tesla appears to have been the only radio manufacturer in Czechoslovakia, VEB Stern the only radio manufacturer in the GDR (East Germany) and EMV the only radio manufacturer in Hungary.

In Poland, several different manufacturers were in operation at the time (Eltra, Diora, Omig). It is not clear to me how soon they were grouped together under the Unitra label and whether this occurred in the 1960s or the 1970s.

However, it is certainly clear that each of these Eastern European countries originally had numerous private radio manufacturers. Not long after Soviet hegemony, those separate companies

were consolidated under a single manufacturer's name within each Eastern European country.

For example, all radio manufacturers in Czechoslovakia were placed under the single name of Tesla, all in the GDR were placed under the name of VEB Stern, all in Hungary were placed under the name of EMV and so on.

Interestingly, many of these East European sets were equal to – or surpassed – their West European counterparts in terms of cabinet design.

Poland's first transistor radio, the 1959 'Eltra MOT-59' (**Fig. 13**) is a classic 1950s 'retro'-looking design; at the same time, the GDR's first all-transistor radio, the 1959 Sternchen ('Little Star' **Fig. 13**) displayed a modern design, backed up by a wide choice of cabinet colours, several of them translucent. It should be noted that the 'Sternchen' was clearly copied from a Japanese cabinet design, the 'Kobe Kogyo KT-6', from around 1957. However, the Eltra's design was all its own.

The Czechoslovak Tesla Corporation's first radio, the 1958 'T58 2800B' (**Fig. 14**), was a compact transistor radio model with that nice, clean, look, which is so often missing in the larger, 'frumpier', portable radios made in Western Europe at the time under review here.

ROBERT DAVIDSON

Fig. 13: The 'Eltra MOT-59' (1959).

ROBERT DAVIDSON

Fig. 14: The 'Tesla T58 2800B' (1958).

Remembering a Shared History

A few years ago, I watched a Czech movie made in the mid-1960s. In one scene, a small group of men were sitting in the stands at a football match. One of the men had a pocket transistor radio hanging from a leather strap around his neck, which he was listening to as he watched the match, yelling and cheering along with his friends. It was such a simple scene of camaraderie and everyday life, yet it was staged in an occupied country behind an opaque curtain of repression.

I often think of that man portrayed in that old Czech movie made long ago, at the height of the Cold War: He was a fictional character, an actor. His pocket radio, however, was very real and today we have the opportunity to place that radio – and others like it – within the wider, ongoing history of radio.

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Author's pages

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www.abetterpage.com/wt/index.html

Nils Schiffhauer DK8OK
dk8ok@gmx.net

Nils Schiffhauer DK8OK looks behind the former Iron Curtain. He is flying, as it were, over some HF Aero Nets on HF that work entirely in Russian. Fear not, the relevant vocabulary is restricted to just a few words.

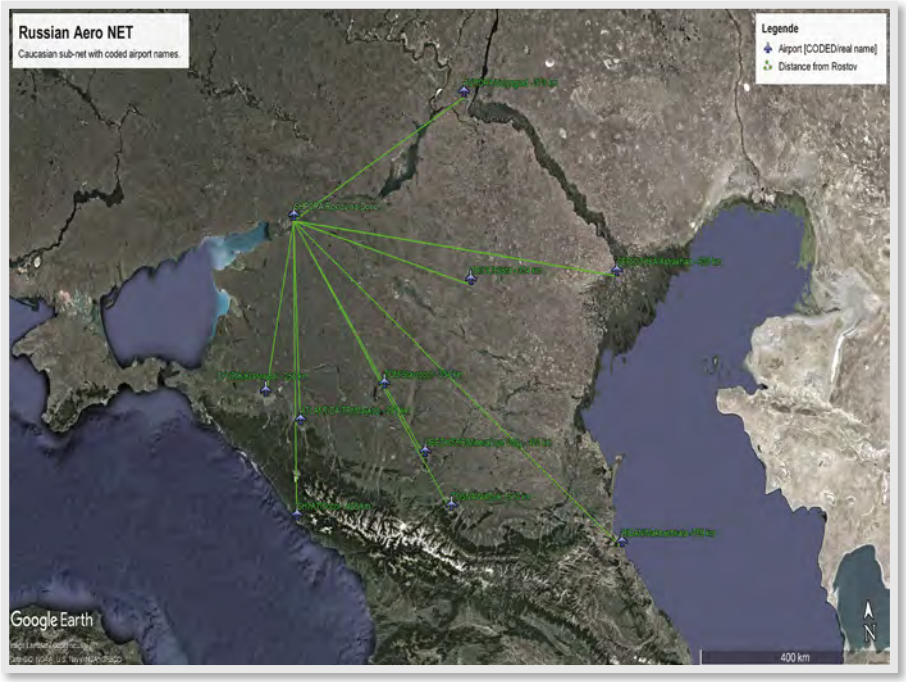


Fig.1: The 'Caucasian' or 'Southern' Net is controlled by Rostov Airport. Names are coded and distances are well under 800 km.

Russian Aero Nets

Russia has about 270 civil airports. This does not, of course, come as a surprise; it is the biggest country on the globe, sparsely populated, with just 8,4 people per square kilometer (UK: 270,7).

Many of these airports can be heard daily on short wave, as can some others from the region of Central Asia.

Russia and some of the republics of the former USSR maintain an active HF net of airports. A typical setup consists of an SSB transmitter (code name: 'Polosa') with 1kW of power and a kind of cage-dipole. The dipole is named 'Nadenenko,' after **Sergey Nadenenko**, who developed it back in 1932.

Organized into sub-nets, even the farthest airport of such a net is within reach of one ionospheric hop – a circle of less than 3.000km around the net control site (**Fig. 1**).

Operators transmit on frequencies between 2.7 and 8.1MHz, with a focus on the range of 4.6 to 5.7MHz. This allows for regular reception in the whole of Europe, though limited to the hours of dawn and dusk between the transmitter and your location.

The maps in **Figs. 2a** to **2c** show a propagation outlook pertaining to these signals for May 2018, towards a receiver in London.

Just a few Seconds

All traffic is, naturally, in Russian. However, the vocabulary of the radio checks is often rather restricted, as you can see in **Table 1**. Listening to this, reminds me of a 'pile-up' in the amateur radio bands, where operators just hand out '5/9' as a report. In our case, the equivalent would probably be *khorosho* ('good') or *tri balla* ('of medium signal strength').

A typical radio check could work like this:

"Samara, Samara, ya Rostov."
"Rostov, khorosho, Samara"
"Samara, Rostov – tri balla."
"Celyabinsk, Rostov?"

Here, Rostov is calling Samara. Samara responds, to say it is receiving Rostov with a good signal. Rostov answers Samara and calls Chelyabinsk next. All of this takes but a few seconds.

Given at least fair propagation conditions, there are two challenges: catching one of these short radio checks and not being fooled by the somewhat strange pronunciation, which can include some peculiarities. For instance, Syktyvkar Airport is frequently just referred to as *Syvka*.

As I mentioned before, all communications are in Russian. This applies even to those from Central Asia. Thus, the capital of Uzbekistan (*Toshkent* in Uzbek) is called *Tashkent*. *Daşoguz*, in Turkmenistan, is called *Tashauz*.

Tashauz is transmitting with just 150W and using a shortened R&S dipole.

Sometimes, the word 'centre' is added to these communications. At other times, the term 'radio' is used.

Examples of this usage are 'Aşgabat Centre' and 'Petersburg Radio'.

Many nets use the name of each airport in clear.

However, on some channels, operators are still using codenames, maybe as remnants of the Cold War and not updated ever since.

In this world, Volgograd is called *Avrora*, *Katjusha* stands for Novosibirsk and if they seem to catch *Sardina*, they are calling Baku by the Caspian Sea – got it?

Mondegreens and Patterns

The overwhelming majority of the operators at these stations are female. However, you will also hear a few male voices, especially in the Russian North, from Petersburg or Kotlas.

Some voices can, in fact, be hard to gender.

Compared to the mood that predominates other transmissions – like those in international air traffic control – the tone set in Russian nets is occasionally one of 'rough cordiality', sometimes betraying, perhaps, just a

grain of impatience.

Finding out about the location and details of these transmissions can be useful and entertaining. There are two main techniques you can employ to penetrate these voice transmissions.

First, you can use the 'cocktail-party-effect', to just 'lock-on' to one individual voice and listen to *just* this one, even though there may be many others calling.

Second, be aware that you might be fooled by an unconscious, reliable, auditory effect, known as *pattern-recognition*. If you hear 'something', your ear-brain system will try and detect a known (or an anticipated) pattern in what you are hearing, in order to make sense of it.

It is this phenomenon – also known as *Mondegreen* or *Soramimi* effect – that will let you understand 'Margarite', although what was actually said was 'Makhavik'.

Times and Characteristics

There do not seem to be any exact schedules for these radio checks. In **Fig. 3**, you can see activity on **4712kHz**, from 13:00 to 08:00 UTC, with each vertical bar representing one of the 58 complete radio check sessions, each of which consists of several separate stations.

It is a good idea to make an audio recording of either an individual channel or of an entire HF band and to analyze it afterwards. Some stations show individual characteristics, through which they can easily be distinguished from others.

Samara, for example, transmits a *double* side-band signal with suppressed carrier (**Fig. 4**).

Tashkent uses USB with a strong carrier and starts with a transient (**Fig. 5**).

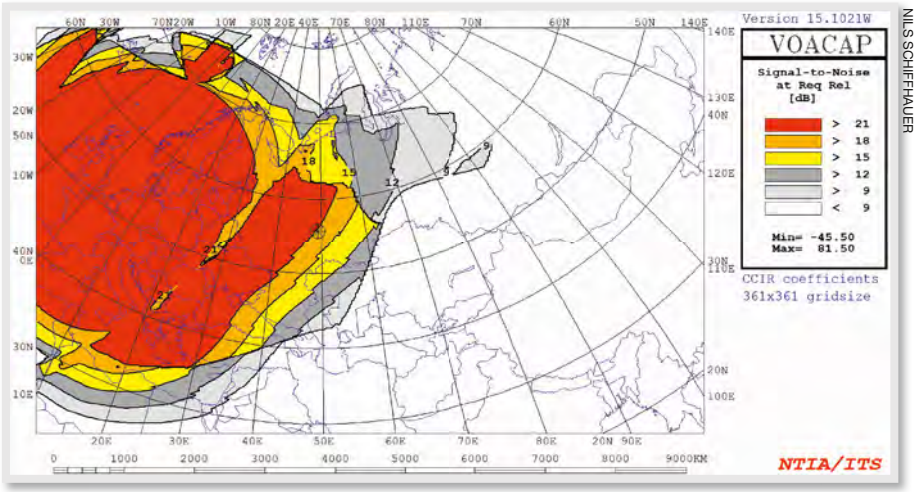
Chelyabinsk seems to use a similar transceiver.

Loggings

The figures in **Table 2** represent a summary of some of my logs in 2018. There are more frequencies than this and many more stations. However, these logs should enable you to make a successful start.

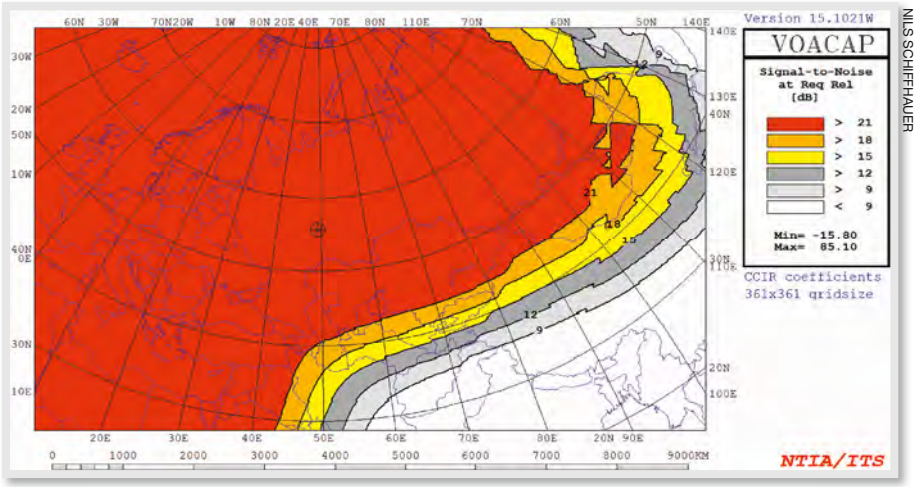
The 'easiest' frequency to catch seems to be **5568kHz.** It is also quite active. Finding something on **3255kHz** may well be a little bit more difficult.

If you do experience problems in receiving stations in the North (**4672** and **5596kHz**) you may have to wait for the European autumn and the appearance of more favourable propagation conditions.



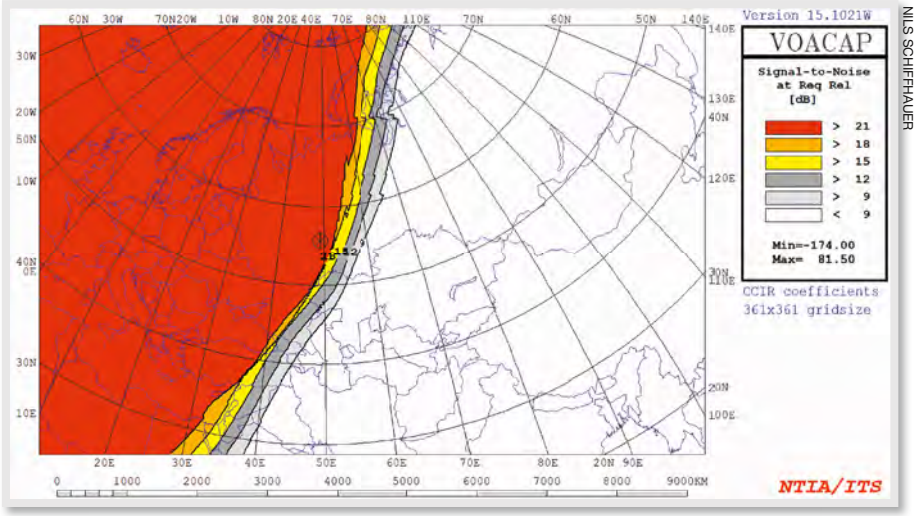
NILS SCHIFFHAUER

Fig. 2a: This footprint (signal-to-noise ratio at 2.4kHz bandwidth) can be expected with a likelihood of 50% (or every other day) at 15:00 UTC in May from London, when propagation starts into Russia on 5MHz. The smoothed sunspot number is 15 and the map centres on Kazan, in southwest Russia.



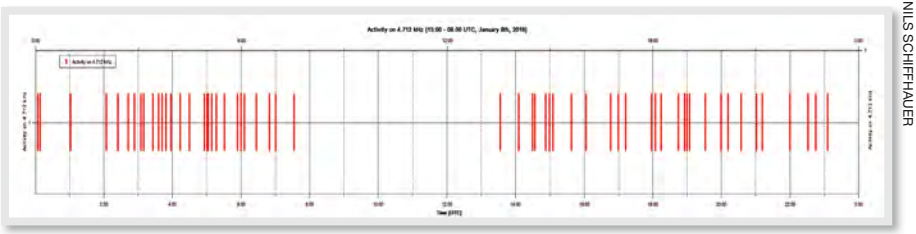
NILS SCHIFFHAUER

Fig. 2b: At 20:00 UTC, the biggest footprint on Russian soil can be experienced on 5MHz.



NILS SCHIFFHAUER

Fig. 2c: At 05:00 UTC, monitors can expect the last call from Russian aero stations around the 5MHz mark.



NILS SCHIFFHAUER

Fig. 3: The monitoring of 4712kHz (from 13:00 to 08:00 UTC) resulted in 58 complete radio check sessions. They are represented here by vertical bars and do not reveal any specific schedules.

Alternatively, you can make use of one of the remote receivers on the internet.

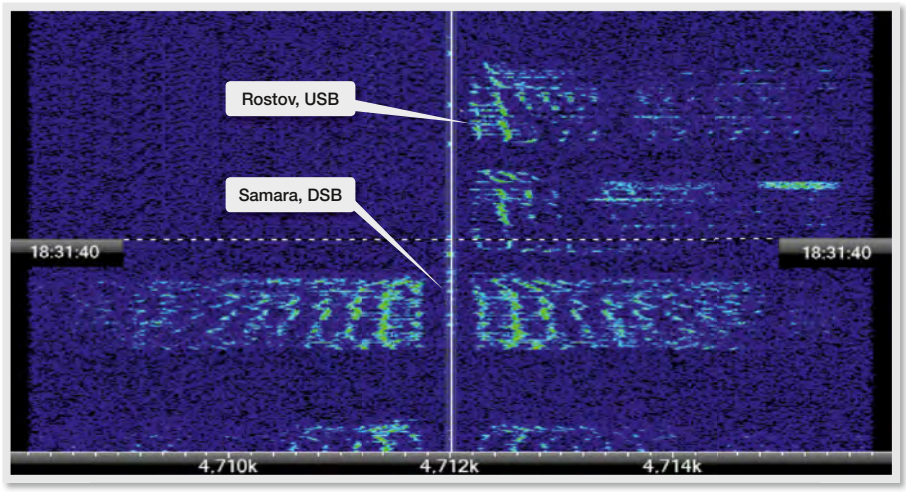
Do not forget to look at the airports you hear, via Google's *aerial views* feature. They will give you a good impression of the sheer remoteness and loneliness of some of these locations. *Naryan-Mar* is one example.

Many stations do answer reception reports in either English or Russian (try *Google Translate*, it will be understood).

Austrian DXer **Patrick Robić** has been quite successful in getting back his prepared postcards, duly filled-out, signed and stamped (**Fig. 6**). However, he added, with fading hope, *"there are also a lot of replies I am still waiting for."*

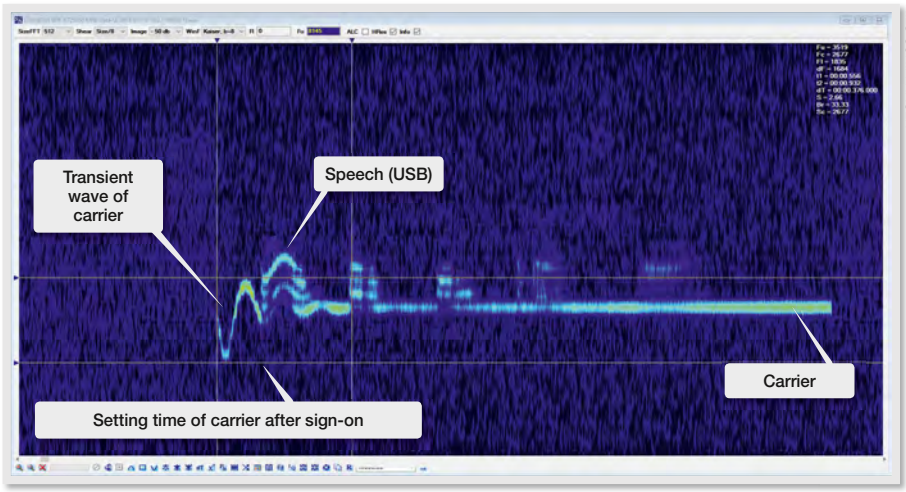
For further information on the Russian aero nets, you can read my multi-media pdf, with mp3 files, from 2015. Much of it is still very relevant:
https://goo.gl/WVmwBg

Fig. 6: Makhachkala was one of the stations, from Patrick Robić received a QSL.



NILS SCHIFFHAUER

Fig. 4: Most stations transmit in USB (with and without a carrier) but Samara uses double sideband, with its carrier suppressed.



NILS SCHIFFHAUER

Fig. 5: Upon switch-on, Tashkent's carrier requires some 100ms to 'settle'. This 'transient' measures nearly ±800 Hz.

Airport A calling Airport B: City B – City A
Airport B answers: *City A, City B, khorosho ('good')*.
Airport A finishes the radio check: City B, City A, *khorosho*.

Signal Strength
A medium signal strength (S3) is reported as: *na tri [balla]* (на три [бала]) or *[na] troitschko*).
And an even lower signal strength (S2) as: *dwa* (*два*).

Other Phrases
Sometimes, a *'Good [Morning]'* is added: *dobroe [utro], khorosho* (доброе [утро], хорошо).
Or even an *'Until Next Time'*: *do svidanja* (до свидания).
Da (да) = 'yes' – *ya* (я) = 'I', 'self', in the sense of 'this/here is'… .
Prijom (приём) = 'you are allowed [to transmit] / 'over'... .

Table 1: Russian Phrases in Use on HF Aero Nets ('radio checks' or proverka svyazi [проверка связи]).

Northwestern

Net & Frequencies	Stations monitored (Identification/Location)
4672kHz	Amderma, Arkhangelsk, Petersburg, Kotlas, Naryan-Mar, Volodga, Vorkuta.
5596kHz	Amderma, Arkhangelsk, Pečora, Syvka/Syktyvkar.

Southern

Net & Frequencies	Stations monitored (Identification/Location)
4736kHz [coded]	Tom/Stavropol, Stavok/Vladikavkaz
5568kHz [coded]	Atlantida Tri/Maykop, Avrora/Volgograd, Ridan/Makhachkala, Serioshka/Astrakhan, Shpora/Rostov-na-Donu, Shtat/Sochi, Stavok/Vladikavkaz, Tom/Stavropol, Tyurik/Krasnodar, Ubizeshe/Mineral'nye Vody.

Urals

Net & Frequencies	Stations monitored (Identification/Location)
4712kHz	Chelyabinsk, Kazan, Perm, Rostov[-na-Donu], Samara, Saratov, Syvka/Syktyvkar, Ufa, Ural, Yekaterinburg.
4720kHz	Orenburg.
4755 kHz [coded]	Alenki/Yekaterinburg, Amba/Samara, Assistent/Mosdok, Brashka/Chelyabinsk, Kapel/Omsk, Katjusha/Novosibirsk, Makhavik/Kurgan, Melodija Dwa/Kazan.

Central Asia

Net & Frequencies	Stations monitored (Identification/Location)
3255kHz	Ambarchik/Aktyubinsk [Aqtöbe] (KAZ), Aşgabat (TKM), Nukus (UZB), Türkmenbaşy (TKM)
4728kHz	Aşgabat (TKM), Bishkek (KGZ), Tashauz (TKM), Tashkent (UZB).

Table 2: Nets, Frequencies and Stations monitored by DK8OK in 2018.

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David Smith
E-mail: dj.daviator@btinternet.com

David Smith reports on a flight safety website, remote towers and the future integration of drones and manned aircraft in UK airspace. He also presents the second instalment in his new series of airport ATC profiles.

DAVID HARRIS

A Hungarian-registered Antonov An-2 at Halfpenny Green, Staffordshire.

SKYbrary, SKYClips, Drones & Digital ATC

Created collaboratively by the European Organisation for the Safety of Air Navigation (Eurocontrol), the International Civil Aviation Organization (ICAO) and the Flight Safety Foundation, the SKYbrary website is a remarkable repository of safety knowledge related to flight operations, air traffic management and aviation safety in general. It is also a portal (meaning a common entry point) which enables users to access the safety data made available by various aviation organisations such as regulators, service providers and the industry.

www.eurocontrol.int
www.icao.int/Pages/default.aspx
https://flightsafety.org

A feature called SKYClips has recently been added to the site. SKYClips is a growing collection of short video animations of around two minutes' duration. Each of the videos focuses on a particular safety topic in aviation.

Among the topics currently covered are those listed in **Table 1**.

The term 'somatogravic illusions' refers to a vestibular ('false-sensation') illusion, which is prevalent during high accelerations and decelerations, when a pilot lacks clear visual references or cues such as in instrument or night flying.

www.skybrary.aero/index.php/Somatogravic_and_Somatogyral_Illusions

A link to all the SKYclips can be found in the *Toolkits* section on the SKYbrary homepage, at this URL:
www.skybrary.aero

Remote Tower Collaboration

Ports of Jersey has entered a partnership with Systems Interface Limited, a member of the Frequentis Group, for the purpose of the development and delivery of remote tower operations. The aim is to expand remote tower operations in the British Isles, starting with the initial installation at Jersey Airport.

The concept of carrying out air traffic control services from any location and the ability to monitor several airports from a central location is gaining momentum, as my last few columns have demonstrated.

By means of this technology, better visibility can be provided, through the use of infrared camera capabilities in bad weather conditions.

Furthermore, operations can be made

much safer by using 'augmented reality', along with object detection and tracking.

Frequentis and Ports of Jersey are well known to one another. They worked together in 2016, on a project to modernise vessel traffic services (VTS) and to provide an integrated communications system to enhance search and rescue operations in British waters.

Digital Tower Research Laboratory

NATS and Searidge Technologies are to launch a digital tower research and development programme, designed to improve efficiency, weather resilience and contingency operations at the world's busiest airports.

The programme will centre on a brand-new state-of-the-art (digital) tower research laboratory, to be located at Heathrow Airport control tower.

The system will comprise of two controller positions and a newly-developed, highly intuitive, user interface. For the first time ever in a 'digital tower', there will be 4K day/night cameras.

These, together with independent pan-tilt-zoom cameras, will be used to present a totally seamless 'panoramic' view of the airport and surrounding airspace on an ultra high-definition video wall.

Heathrow has been chosen because of the benefits of using real-time operational data as part of the work.

Cameras around the airport will provide enhanced surveillance of holding point lines to improve resilience in adverse weather conditions.

The data from the airport's Advanced Surface Movement Guidance and Control System will be integrated with the Searidge system to offer controllers enhanced situational awareness by means of customised data overlays.

Integrating Drones Safely

NATS and the fast-growing, UK-based, drone traffic management solutions company Altitude Angel, have entered a long-term partnership, aiming to lay the foundations for a future in which drones and manned aircraft can safely co-exist in the UK's busy skies.

Drones offer huge potential benefits to public services and the economy, with a growing number of organisations, from online retailers through to emergency services, expecting to increase their use of drones in their everyday operations.

However, reports of incidents involving drones flying dangerously close to manned aircraft are on the rise. Drone incidents now account for more than half of all 'airprox' (near-miss) reports received by NATS.

As the number of unmanned aircraft steadily grows, increasing the visibility of drone flights is crucial to keeping the skies safe. The partnership between NATS and Altitude Angel will enable the integration of drone flight and operational data with information and systems involved in managing manned aviation.

Merging the two information streams will increase situational awareness among all legitimate airspace users and will provide the digital foundations necessary to allow air traffic controllers to engage with drone operators.

It is hoped that this partnership will prepare for a future, in which access to lower-level airspace could increasingly be granted digitally. This would link the traditional knowledge of an operator's aircraft, their qualifications and mission with a pioneering new form of airspace management suited to the changing use of our skies.

ICAO Code: EGSS
IATA Code: STN

Frequencies	**(MHz)**	**Hours of Operation**
Approach (callsign ESSEX RADAR 120.625)		H24
Stansted Tower:	**123.800**	H24
Stansted Tower:	**125.550**	as directed by ATC
Stansted Ground:	**121.725**	Winter: 0630-2200 – Summer: 0530-2100
Stansted Delivery:	**121.950**	as directed by ATC
Stansted Director:	**136.200**	as directed by ATC
ATIS		
Stansted Information:	**127.175**	H24
Stansted Information: Broadcast on Clacton VOR	**114.550**	H24
Stansted Fire:	**121.600** (non-ATC)	Fire vehicles attending aircraft. Any flight crew can talk directly to them.
Airline Services Pad Control:	**121.916**	Remote de-icing frequency
Ryanair Pad Control:	**121.555**	Remote de-icing frequency

Navaids ILS Cat III on both runways.

Holds There are two holding stacks, LOREL and ABBOT. Both are shared by London Luton and Cambridge Airports.

Runways 04 3049m x 46m
22 3049m x 46m
Paved shoulders extend for 7.6m either side of the declared runway width, which is denoted by white side stripes.

Notes (A-Z)

Mode S Barometric Pressure Setting Data
Pilots are reminded that 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 ATC, pilots can expect to be challenged. When ATC pass a reminder of the appropriate BPS, it is anticipated that the aircrew will cross-check the altimeter settings and confirm set.

Operating Hours of delivery vary, according to traffic demand. Exact hours will be broadcast on ATIS. When delivery is closed, pilots should request clearance from Stansted Ground.

Special VFR Flights
To reduce conflict with Instrument Flight Rules (IFR) flights, Special Visual Flight Rules (VFR) for arriving and departing flights will normally be cleared (but not above 1500ft altitude) via the following routes:
(1) Audley End Railway Station VRP (Visual Reporting Point) via M11 Motorway.
(2) Great Dunmow VRP via B1256 (old A120) and Takeley Village.
(3) Puckeridge VRP via A120 Trunk road, avoiding Bishops Stortford.
(4) Nuthampsted VRP.

Standard Instrument Departures (SIDs)
UTAVA and NUGBO for westerly departures; Barkway for northerly departures; Clacton for easterly departures. Detling/Lydd for south-easterly departures; Lambourne for south-westerly departures. The RNP1 SIDs, Clacton 1E and Detling 1D, can only be requested by an operator who has been approved by their state of registry for RNP1 operations, available only to aircraft, which are GNSS-equipped and approved.

Stansted Transponder Mandatory Zone
Aircraft operating outside Stansted's controlled airspace and monitoring Essex Radar must select transponder code 7013.

Surface Movement Radar
Stansted Airport is equipped with an advanced surface movement radar, utilising Mode-S. Therefore, aircraft operators intending to use Stansted should ensure that Mode-S transponders are able to operate continuously when the aircraft is on the ground – from the request for 'push back' or 'taxi' (whichever is earlier) to the time after landing, until the aircraft is fully parked on its stand. After parking, the Mode-A code 2000 must be set before selecting 'OFF' or 'STDBY'. The flight crew of aircraft equipped with Mode-S and an aircraft-identification feature, should also set the aircraft identification as in the Flight Plan.

London Stansted Airport ATC Profile.

Keith Hamer
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Garry Smith
garry405625.gs@gmail.com

Keith Hamer and Garry Smith anticipate a new Sporadic-E season, offer recent reception reports, explain ionisation and provide a short introduction to the FM and TV DXing hobby for beginners.

Ionisation & DXTV for Beginners

With relatively quiet conditions at the beginning of the year, it makes sense to prepare for the new 'DX-Deluge', when the new Sporadic-E season begins.

With this in mind, we are featuring a new section dedicated to new readers of this column who want to know more about starting out in the fascinating world of TV/ FM DXing. Before all that, here are the reception reports for February 2018.

Reception Reports

On February 7th, from 0715 UTC, **Niels van der Linden** (Mol, Belgium) discovered a variety of TV signals, via tropospheric ducting, originating from the former GDR (German Democratic Republic, East Germany).

These included some of the new DVB-T2 HEVC (High-Efficiency Video Coding) transmitters, viewed using a special set-top box. They included Brocken D45 (MUX: MDR1 HD), Schwerin D29 (MUX: NDR-MV HD) and D36 (MUX: ARD-NDR HD). The old DVB-T transmitters of Cottbus-Calau on D57 (MUX 2: RBB) and Helpterberg D23 (MUX: ZDF mobil) were received, using a Philips 43PUS6162 TV receiver.

A pair of horizontally-stacked Wisi EZ74 antennas were installed for horizontal reception and a single array was used for vertically polarised signals.

DAB+ transmitters were identified from the same region: Brocken 6B (MUX: MDR Sachsen-Anhalt), Berlin 7D (MUX: RBB Berlin), Marlow 8B (MUX: NDR MV) and Cottbus 10B (MUX: RBB BRB).

On the following morning, **Gösta van der Linden** (Rotterdam, Netherlands) identified Wesel-Büderich on D46V (MUX: WDR Düsseldorf) and D55V (MUX: N24); both multiplexes are 50kW ERP.

By February 18th, high-pressure systems over the United Kingdom produced a very strong opening, mainly to north-east England.

From 1003 UTC, using a dipole positioned against the window and a Portal FM receiver, **George Garden** (Inverbervie, Scotland) identified signals from Pontop Pike, Bilsdale, Selkirk, Eston Nab and Penicuik. Holme Moss was the most distant capture, airing Classic FM on **101.1MHz**.

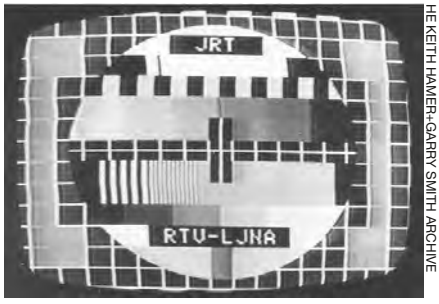
Classic FM was also identified on **99.9MHz** from Sandale.

On the 22nd, another 'lift' produced Heart on **100.7MHz** and TFM on **96.6MHz** (both from Bilsdale), Classic FM on **100.3MHz** (Pontop Pike) and Capital on **105.3MHz** (Burnhope). Strong signals from Classic FM on **101.9MHz** were also heard. A minor opening occurred on the 25th.

Thanks also to **Simon Hockenhull** (Bristol), **Nick Gilly** (Whitchurch, Hampshire) and **Stephen Michie** (Bristol) who have kept us up-to-date regarding the generally poor conditions experienced by many of us during the month!

KEITH HAMER+GARRY SMITH

Fig. 1: The shaded map area shows a 'typical' range, from which Sporadic-E signals frequently arrive here.



HE KEITH HAMER+GARRY SMITH ARCHIVE

Fig. 2: A Philips PM5544 test card (RTB Ljubljana) from the former Yugoslavia, on Channel E3 (55.25MHz).

HE KEITH HAMER+GARRY SMITH ARCHIVE

Fig. 3: Spain was always an easy capture via Sporadic-E due to its network of high-power Band I transmitters. This picture shows some colourful station opening graphics.

The Phenomenon of Sporadic-E

The lower VHF bands provide rich pickings during the summer months, when ionisation occurs within the upper atmosphere, due to a phenomenon known as 'Sporadic-E'.

Activity develops mainly between May and September (between November and March in the Southern Hemisphere). During this period, ionised layers refract signals within the 48 to 108MHz spectrum.

The phenomenon of 'skip-distance' is involved here and this will vary, depending upon the angle of refraction of the signal in the atmosphere. However, it is typically between 700 and 2,000km (approximately 435 to 1,245 miles). Naturally, the shallower the angle of refraction, the greater the skip-distance (**Fig. 1**).

Occasionally, longer signal paths can extend into the Middle East, Africa and even across the Atlantic.

The ionised layers are generally unstable and volatile, which means direction and distance can vary frequently. The openings and their duration are random and occur at any time of the day or night. Signal strengths

HE KEITH HAMER+GARRY SMITH ARCHIVE

Fig. 4: The world-famous D-100 DX-TV Converter with IF bandwidth reduction.

SIMON HOCKENHULL

Fig. 5: A Roberts 'Play' radio featuring RDS.

vary constantly, and many stations may battle for supremacy (**Figs. 2** and **3**).

Where to Look or Listen

Monitoring the lower frequencies (Channel R1 on **49.75MHz** for TV and **87.6MHz** for FM) will provide some indication of whether the bands are showing promise. It is worth checking propagation sites, which show prevailing signal paths and the intensity of openings. The following URL is a good starting point:

www.dxmaps.com

Signal strengths can attain high levels at times. Therefore, it is possible to use simple dipole antennas. If space permits, a larger multi-element array is recommended for weaker DX conditions.

Starting out in TVDX

The well-known D-100 DX Converter (designed and manufactured by *HS Publications* in Derby) has been favoured by DXers worldwide for the past 35 years, due to its ability to reduce the IF bandwidth. This makes weak images more prominent, with improved selectivity. Unfortunately, new units are now in short supply (**Fig. 4**).

Most LED TV sets feature analogue tuning throughout the VHF Band I spectrum (**48** to **70MHz**). However, the frequency can usually not be stored in advance without the presence of an initial signal. A scanner is ideal for checking Band I carriers.

FM DXing

For FM reception, a receiver with RDS (Radio Data System) is essential. We recommend you do some homework first before parting with your hard-earned cash (**Fig. 5**). Sometimes, vital features are missing from the manufacturer's specification and retail staff are often 'in the dark' as to what it is they are selling.

RDS embeds small amounts of digital information (such as station names) into standard FM radio transmissions.

A receiver with an external antenna connection is desirable but nowadays these seem to be few and far between.

It is possible to introduce a signal from an external antenna by using an amplifier to boost the broadcast.

By simply making a connection using just the coaxial 'inner', connected to the rod antenna, signals can be introduced; it may sound crude but it does work.

Radio Gibraltar Celebrates 60 Years

Kevin Hewitt (Gibraltar) tells us that Radio Gibraltar launched on Sunday, February 16th, 1958 at 11.50am, transmitting on 202m AM from home-made studios at Wellington Front. *"This is Gibraltar"*, announced by **Esther Garson**, were the first words listeners heard as the station went on the air, 60 years ago.

Celebrations included special musical nostalgia, jingles and audio clips from the era as well as a *Road Show* held at the Piazza in Main Street.

Radio Gibraltar currently serves the Rock from South Barracks on **91.3**, **92.6** and **100.5MHz** on FM. It is also aired on **1458kHz** MW and DAB+ (on Blocks 12B and 12C). The station is also available via its internet stream.

www.gbc.gi/radio/listen-live

Satellite News

Roger Bunney (Romsey) submitted a couple of African newsfeed pictures received via Eutelsat 10A at 10°E.

One of them shows an outside broadcast by Nile TV 'live' from the River Nile (**Fig. 6**). The other one is a test pattern from Luanda, Angola (**Fig. 7**).

The Austrian national television service ORF (Österreichischer Rundfunk), SD (Standard Definition) bouquet via Astra 19.2°E on **11.244GHz** (horizontal, SR 22.000, FEC 5/6) has reduced the

ROGER BUNNEY

Fig. 6: A 'live' Nile TV O.B. from the River Nile.

ROGER BUNNEY

Fig. 7: A test pattern received via satellite from Luanda, Angola.

number of standard channels from ten to just four. The other six are now in MPEG-4 QPSK.

Another ORF SD packet (also via Astra 19.2°E on **12.692GHz**, horizontal, SR 22.000 and FEC 5/6) now broadcasts the 24-hour news channel, n-TV Austria, in MPEG-4 QPSK. The programme is currently unscrambled.

Further Information

Some of the items, which initially appeared on our original DX-TV and Test Cards websites, can now be accessed in portable document format on the PDF Archive website.

https://document.li/m5FV

Keep in Touch!

Please send your TV and FM reception reports, news, comments and photographs by the end of the month to **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS**. Our e-mail addresses are in the head of this article. ■

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Uniden

Handheld

EZI-33XLT (right) The most popular handie. Frequency range: 78-174/406-512MHz ..... **our price just £59.95**

UBC-75XLT Nice new design. Frequency range: 25-512MHz .....**our price just £89.95**

UBC-125XLT Good value. Frequency coverage 25-88/108-174/225-512/806-960MHz.....**our price just £119.95**

UBC-3600XLT (right) 25-1300MHz VHF/UHF Digital scanner **£425.00**

Base

UBC-355 (left) Bargain desktop. Frequency coverage 25-87/108-174/406-512/806-960MHz.... ..... **our price just £79.95**

UBC-360CLT Good base station. Frequency coverage 25-87/108-174/406-512/806-960MHz .....**our price just £99.95**

Handheld

The IC-R6 has 100 channel per second scanning speed, 1300 memory channels, 15 hours of continuous receive capability, optional drop-in charger stand and voice control squelch. All these features combined with a high degree of usability means that the IC-R6 will be equally at home with any casual listener of broadcast stations or the serious scanning enthusiast seeking a pocket sized quality receiver.
....**our price just £199.95**

ICOM

FUNcube Dongle Pro+ The new Pro+ gives unlimited access to the frequency range 150kHz to 1900MHz. (240-420MHz omitted).It's also all-mode: this means that it's not just limited to narrow band FM reception. As well as data, the FUNcube Dongle Pro+ will also receive many other narrow band signals including AM, FM and SSB. It now has amazing performance on 2m & 70cm thanks to high performance (and expensive SAW filters fitted on board) ....
Amazing Value £149.95

Digital Scanners

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

WHISTLER

TRX-1 25-1300MHz Digital Handheld Scanner (left) **£419.95**
TRX-2 25-1300MHz Digital Base Scanner (right) **£479.95**

Analog Range

WS1025 Analog Desktop Scanner
This 200-channel scanner lets you listen to FM radio bands and can be categorised into 10 separate memory banks. Also, it offers the convenience of one-touch searches of marine, air and ham. Frequency coverage 29-512MHz (with gaps - see web for full spec) **£89.95**

WS1040 25-1300 MHz Digital Trunking & Analog Handheld Scanner
The WS1040 scans most common trunked radio system signalling formats, including Motorola, EDACS, LTR and P25 trunked radio networks. Talk group and individual call monitoring is supported. When monitoring P25 digital systems, the exclusive Automatic Adaptive Digital Tracking instantly adapts the digital decoder to the digital modulation format of the transmitted signal, then analyses the signal over 50 times each second and adapts to any subtle changes caused by multipath or fading.....**£279.95**

WS1010 25-512MHz Analog Handheld Scanner
This 200-channel scanner lets you listen to FM radio bands and can be categorized into 10 separate memory banks. Also, it offers the convenience of one-touch searches of marine, air and ham **£79.95**

WS1065 25-1300MHz Analog Base Scanner
The Whistler WS1065 employs cutting edge technology to bring a high level of performance and innovative features. This model clearly raises the bar in the area of advanced trunking scanners. Frequency coverage is extensive, including: 25-54, 108-17, 137-174, 216-512, 764-776, 795-805, 849-869, 896-960 and 1240-1300 MHz.....**£279.95**

AOR

AR-DV1 100kHz–1300MHz Base Receiver £1299.00

- 100kHz-1300MHz wideband reception.
- Multi-mode a demodulation.
- All mode analog reception.
- Built in SD card reader (audio firmware updates).
- Memory scan.
- NR, notch, digi-data display.
- Clock, calendar (sleep timer, alarm, timer recording, reception logging on SD)

AR-DV10 100kHz–1300MHz Handheld receiver £995.00

- 100kHz-1300MHz analogue & digital modes
- 10 Digital Modes : TETRA,P25(Phase 1+2),DMR,Mototrbo,dPMR, NXDN, D-STAR,Alinco,Yaesu
- Automatic detection of digital modes during scan & search modes.
- IPX5 water resistant
- Micro SD card slot for recording, backup and firmware updates.
- Lithium-ion battery, charger, belt clip
- Memory data management software.

SDR PLAY RSP-1A Receiver £99.95
The SDR-Play RSP1A is a major upgrade to the popular RSP-1, it is a powerful wideband full featured 14-bit SDR which covers the RF spectrum from 1kHz to 2GHz. All it needs is a PC and an antenna to provide excellent communications receiver functionality.

SDRplay

SDR PLAY RSP2 Receiver £159.95
The RSP2 covers the radio spectrum from 1kHz (VLF) to 2GHz (Microwaves) with up to a massive 10MHz bandwidth.

SDR PLAY RSP2 PRO £189.95
The RSP2pro is electrically identical to the RSP2 which is the new enhanced version of the popular RSP1 which provides three software selectable antenna inputs, & new stability and clocking features ideally suited to industrial, scientific & educational applications!

ARE YOU A RETAILER OR AN E-TAILER LOOKING FOR A BETTER DEAL TO COMPETE ONLINE? - THEN CONTACT US NOW!

FlightAware has revolutionized the world of USB SDR ADS-B Receivers with the FlightAware Pro Stick and Pro Stick Plus, high-performance USB R820T2 software defined radios (SDR) with a built-in RF amp for maximum ADS-B/MLAT performance. The first of its kind, FlightAware's Pro Stick is compatible with PiAware or any other device that supports USB RTLSDR receivers, and is less expensive than any other RTLSDR USB receiver in the world. The Pro Stick Plus adds a built-in 1090 MHz bandpass filter for increased performance and range of reception in areas with moderate RF noise as is typically experienced in most urban areas.

Flightaware Prostick Plus.....**£25.00**
Flightaware Prostick.....**£19.99**
FlightAware ADSB1090MHz Band-pass SMA Filter.....**£14.99**

AIRSPY SDR Receivers

Redefining The Radio Experience.

AIRSPY HF Plus £229.95
The Software Defined Radio revolution brought great flexibility in VHF and UHF reception. Today Airspy offer the best wide band receivers which address these needs. Airspy also provide a high performance extension for weak-signal wide band reception on HF – something other competing solutions fail to address efficiently Airspy HF+ is a paradigm shift in high performance HF radio design. It is a joint effort between Airspy, Itead Studio and a top-tier semiconductor company to build a state of the art SDR for HF and VHF bands. Like most high-end HF receivers, the HF+ uses very high dynamic range ADC's and front-ends. But unlike the current offerings in the market, it also brings more frequency agility by using high performance passive mixers with an excellent polyphase harmonic rejection structure. No external band filtering is required unlike the lower end HF receivers, which makes it the ideal companion for light portable high performance operation. Both the architecture and level of integration achieved in this design allow Airspy to offer top performance reception at a very affordable price.

Boni-Whip Active Antenna 20kHz – 300MHz £109.95
Despite its size (only approx. 17cm long), it renders excellent reception results on long, medium and shortwave and additionally for VHF up to 300MHz.

GigActiv GA3005 Ultra Wideband Active Antenna 9kHz – 3GHz....£349.95
Where space is at a premium, the GigActiv GA3005 is the ideal solution for the avid listener with a wideband receiver. The low noise GigActiv 3005 Extreme Wideband Active Antenna by NTi covers the whole frequency range from 9kHz - 3GHz. The antenna radiator measures only 10cm (approx 4 inches) and so the unit can be mounted unobtrusively.

Receiving Antennas

DIAMOND ANTENNA

D777 Civil & Military Receiving Antenna £64.95

High quality antenna from Diamond Japan - The antenna is constructed from fibre glass materials and it is pre-tuned and fully weatherproofed

- D777: 120/300 MHz (Receive only)
- Type:5/8 wave (120MHz) 2x5/8 wave (300MHz)
- Length: Approx.1.7m
- Weight: 1.0kg
- Gain:3.4dBi (120MHz) 5.5dBi (300MHz)
- Impedance: 50ohms
- Connector: N-Type
- Rated wind velocity: 60m/sec
- Mast diameter :30mm to 62mm

MOONRAKER

DBAB VHF/UHF Civil & Military Antenna £44.99

Dual band air band receiving base antenna optimised for Civil and Military air band

Key Features/Specifications:

- Type: Parallel quarter wave vertical receive antenna
- Frequency: RX 108-140/220-391MHz
- Length: 65cm
- Radials: 4 x 24cm
- Mast: upto 51mm (2")
- Connection: N-type

BS-1105KIT base antenna is designed for optimum performance and is manufactured in the UK by Panorama antennas. Built to last and discreet, this is one of the best-selling antennas in its class with 5db gain and N-Type connection. Completely waterproof and supplied as a kit with 10 metres of hi quality CS29 Coax Cable terminated in an SMA **£90.00**

MD-1100SBS Original ADSB replacement antenna ...**£22.00**
MD-1100MINI compact micro mag antenna compete with 2.3m or coax terminated in an SMA for SBS-3 or similar ADSB receiver **£22.00**

ScanKing Royal Discone 2000

Generally regarded as the best all round discone antenna. Not only does it cover 25-2000MHz on receive you can also transmit on 6/2/70 & 23cm - find any other antenna on the market that can achieve all that

Key Features/Specifications:

- Frequency: RX 25-2000
- Frequency: TX: 50-52/144-146/430-440/900-986/1240-1325 MHz
- Gain: 4.5dBi over standard discone • Length: 155cm
- Mast: Upto 50mm • Radials: 8 X 83cm 8 X 29cm
- Connection: N-type

SkyScan Desktop 25-2000MHz Scanner Antenna

This is the best all round wideband desktop scanner antenna on the current market. Keeping within the famous discone design but smaller for internal use has proved wonders for indoor reception

Key Features/Specifications:

- Frequency: 25-2000MHz
- Base: Heavy duty 125mm magnetic plate for vehicle use if required
- Length: 70cm • Cable: 4m RG58 mil spec coax
- Connection: BNC male plug fitted

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The A18 short wave season started on March 25th. Chrissy Brand shares readers' observations of what was heard in the last few weeks of winter and offers a report from the North American *Winter SWL Fest*.

QSL Cards & a New Season

I **heard quite a few stations broadcasting items about *International Women's Day* on March 8th.** TRT the Voice of Turkey, Radio Romania International and BBC World Service were among the short wave stations to produce features. In 2015, TRT the Voice of Turkey even produced a commemorative QSL card to celebrate that day (**Fig. 1**). The station issues a range of colourful QSL cards and, as with all stations still doing this, it's worthwhile sending in reception reports. Listener feedback is paramount to stations and can influence how future budgets and cuts to services pan out.

Radio Romania International also issues QSL cards, on a monthly basis. The 2018 series depicts twelve photos of the historic district of Alba Iulia (**Fig. 2**).

One hundred years ago, on a nearby plateau near this medieval citadel, Romanian provinces voted for a union into a new nation-state.

CHRISSY BRAND

Fig. 1: A 2015 QSL card from The Voice of Turkey to mark International Women's Day.

Short Wave

I am a fan of all three previously mentioned broadcasters. They still have a significant presence on short wave in many languages, cover a wide range of news content, produce thought-provoking feature programmes and are active across social media.

On March 8th, TRT reported on, "*3,000 women from 55 different countries dubbed the* Conscience Convoy. *They reached the Syrian border in Turkey on* International Women's Day *after a three-day journey from Istanbul, to raise awareness of the women who are detained and under persecution in Syria.*

"According to the latest reports, 6,736 female prisoners, including 417 children, are still being held in Assad regime prisons and face ongoing abuse, torture and rape. This has been going on since the beginning of the civil war in 2011."

I'm sure that many *RadioUser* readers will want to collect this year's series of Radio Prague QSL cards because they feature radio equipment. They show a blatnerphone, a crystal set, a Czech Radio (Český rozhlas) van, an airstream caravan parked outside Czech Radio HQ and other equipment, both modern and vintage (**Figs. 3** and **4**).

Although you can send reception reports for Radio Prague programmes heard online, I'm sure we'd all prefer the traditional method of sending a report after hearing the station on short wave.

Radio Prague can be heard that way, thanks to regular relays via **WRMI** in Florida on **7780kHz**. During the B17 season, these were transmitted in English at 0230 UTC on Mondays.

Graham Smith listens regularly on 7780kHz and he noted that you hear all sorts of different stations being relayed by WRMI. These included Radio Slovakia International in Slovak at 0000 UTC and in English half an hour later. Radio Ukraine International was in English at 0200 UTC, although, on some days, the AWR DX programme *Wavescan* was broadcast.

Graham added, "*However, I haven't heard* The Power Hour, *which is supposed to be on that frequency and there is sometimes a crackling-type interference, which sounds like the spark plugs of a car engine. One former presenter of the show, **Joyce Riley**, has died, I notice*."

Jeff White, from WRMI in Florida, noted that the station planned to use **5010kHz** for 24 hours a day during the A18 season, which started during the last weekend in March.

Readers' Reports

On **3955kHz** at 2010 UTC, **Lionel Clyne** logged South Korean broadcaster KBS World, in German, from the Woofferton transmitter. He also heard another big player in international broadcasting, Radio Romania International, with a Romanian broadcast from the transmitter at Galbeni. This was on **7375kHz** at 1955 UTC, with a perfect all-5 SINPO.

The Italian Radio Relay Service was heard on February 25th at 1130 UTC on **9635kHz** with an all-4 SINPO. This English language broadcast was transmitted from Kostinbrod in Bulgaria. Lionel wrote, "*There was a positive station identification at 1145 UTC. There was surprisingly good reception, considering that it was broadcasting at only 50kW. It was one of the few stations I was able to identify across several metre bands at the*

CHRISSY BRAND

CHRISSY BRAND

Fig. 2: The Citadel at Alba Iulia, on a 2018 QSL card from Radio Romania International.
Fig. 3: Radio Prague's 2018 QSL card series features some radio equipment.

time, possibly due to local interference."

Lionel commented, that having read about **Brother Stair** and the *Overcomer Ministry's* trials and tribulations (*RadioUser,* March 2018: 40-41), he did some further reading online. He worked in the US for much of his career and said that nothing surprises him with regard to life in the 'Bible Belt'.

The *Overcomer Ministry* was noted popping up again on short wave but it's no longer the force it was. It was logged by **Tony Stickells** on **5130kHz** at 0400 UTC from the Monticello transmitter in Maine and on **5890kHz** at 0730 UTC from a Nashville, Tennessee transmitter.

Tony Stickells got to grips with his RSP2 SDR receiver. He achieved, *"… some fantastic results, the filtering system on the SDR is great for medium wave stations that are close together, especially from across the pond. This month, I managed to receive and identify 40 stations from North and South America. The recording facility on the SDR is superb, as you can skip through a recording for a station identification. This saves hours of monitoring, waiting for a station to broadcast its identification*."

Tony logged two stations from India, on **585** and **594kHz** and reported that, with the two inputs for antennas on the SDR, he gets the best of both worlds. A click of the mouse and use of two directional antennas help with receiving these stations and with nulling out the more powerful Spanish stations on the same frequency.

Another medium wave highlight for Tony was TRT 1 from Turkey on **891kHz**. This was a hit-and-miss experience: On some nights it was audible and on others, there was not a sniff. On **1395kHz**, he heard Dengê Kurdistan, using the 500kW transmitter in Yerevan-Gavar on several nights.

Tony continued, "*On the short waves, the SDR comes into its own with the recording facility. I caught 891 different stations from all over the world. The upper bands are very difficult but the lower bands are good all day. On the 90m band, I received a pirate French station on **3465kHz** LSB. This was a bit naughty, to be fair, as it is within the aeronautical bands. There was a nice clear signal but no ID. They were playing French folk music. I am ordering a pre-selector from* Cross Country Wireless *to enhance the reception. This is due to imaging on the SDR and will open up the bands for some rarer and weaker stations, which, at the moment, are very difficult to hear."*

Graham Smith made a number of interesting observations. He wrote, "*Firstly, it seems I spoke too soon on RTBF. That station is due to close its MW stations by the end of 2018, according to* Télépro Magazine*. This includes **621kHz**, which I can hear in the daytime*."

www.telepro.be

In January, Dutch religious station Radio Bloemendaal was forced off the air (on **1116kHz**) due to storm damage. It returned, although with reduced power, in late February. Spirit Radio (**549kHz**) from Ireland was again off the air for a while. Once again, this was due to transmitter problems. However, the station is back up and running now. This Christian station started in 2011 and also broadcasts on FM in the Republic of Ireland.

DX Meetings

The annual *NASWA Winter SWL Fest* is one of the largest events in the US DX calendar. As usual, this year's event took place in Greater Philadelphia in March. However, winter weather conditions created problems, including the loss of power to the conference venue. As an adaptable and versatile bunch, DX delegates and speakers were soon up and running (thanks to generators, batteries and candles) and the meeting continued as planned (**Figs. 5** and **6**).

Presentations included **Tracy Wood**, reporting on the Iberian Broadcasting Scene, with slides of a visit to Radio Exterior de España. **Rob deSantos** examined the impact of smart speakers

CHRISSY BRAND

Fig. 4: A radio caravan, another Radio Prague 2018 QSL card.
Fig. 5: Some of the kit at the SWL Winter Fest 'silent auction'.
Fig. 6: Dan Srebnick talks about SDR at the SWL Winter Fest.

on the listening experience. He wrote that internet radio and international radio still live – but they live *inside the speaker*. Included were accounts of Rob's personal testing of systems such as *Amazon Alexa* and *Sonos* and a comparison of costs, limitations and benefits when using these as alternative listening sources. There was also a 'trivia quiz' and a screening and Q and A session on **Amanda Dawn Christie**'s *Spectre of Shortwave* film.

Thomas Witherspoon wrote a comprehensive account of what sounded like a fantastic event, at his *SWLing Post* blog. He also commented on the storm: "*Of course, what everyone at the* 2018 Winter SWL Fest *will remember is that Friday morning, we were hit by a Nor'easter, a storm with strong winds and driving rain that by noon had turned to snow. Traffic outside the hotel was an absolute mess and quite treacherous.*

"Of course, there are advantages to being in a hotel with little power and much less RF noise – I was able to do some satisfactory MW DXing from my room window. A rare opportunity! We held the Saturday night banquet in the hotel's atrium area, which was better-lit than the interior conference rooms. It was a very memorable banquet.

"All in all, the Fest was a massive success. I heard very few complaints about the power outage, only praise for the forums, our guest speaker (Amanda Dawn Christie) and all of those who

THOMAS WITHERSPOON

THOMAS WITHERSPOON

make the Fest *a reality, especially* ***John Figliozzi*** *and* ***Richard Cuff****. It was a little crazy. Right around 2.30, only a minute after my presentation ended, the mains/ grid power flickered out*."

Chris Freitas is another well-known DXer and he compiled a 15-minute video of the *Winter SWL Fest*, which can be accessed on his YouTube channel.

Next year's event will take place from February 28th to March 2nd in Greater Philadelphia.

www.swlfest.com
https://swling.com/blog/2018/03/a-recap-of-the-2018-winter-swl-fest
www.youtube.com/watch?v=vYO6G1T5_ic

The EDXC published a list of DX events taking place in 2018. Highlights include the *EDXC Conference* in Bratislava from August 31st. This year's conference is being organised by the Austrian DX Board (ODXB-OE).

The HFCC is also meeting in Bratislava that month and, hopefully, there will be some attendees from there who will come along to speak at the EDXC Conference.

https://edxcnews.wordpress.com

Log Contributors

CG = Clint Gouveia, Oxford. Elad FDM DUO and Wellbrook ALA1530 magnetic loop. XHDATA D-808, Eton Satellit and 50m long wire. Sony ICF-SW100.
GS = Graham Smith, Bury St Edmunds, Suffolk. Sony ICF-SW600 and a telescopic antenna.
LC = Lionel Clyne, Faversham, Kent. Lowe HF-150, random wire or homemade loop.
OR - Owen Rutherford, London. Lowe HF-150 and a Wellbrook loop.
TS = Tony Stickells, Wrexham. SDRplay RSP2, AOR AR7030 and a 500ft long wire.

Short Wave Logs

All logs in this month's column were made before the B18 short wave season commenced on March 25th. ■

Short Wave Logs

All logs in this month's column were made before the B18 short wave season commenced on March 25th.

UTC	kHz	Station	Language	SINPO	Initials
0000	4885	Rádio Clube do Pará, Belém, Brazil	Portuguese	54545	CG
0001	7780	Radio Slovakia International	Slovak	35333	GS
0002	9725	Rádio Evangelizar, Curitiba, Brazil //11935	Portuguese	54555	CG
0004	4875.3	Radio Difusora Roraima, Brazil	Portuguese	35223	TS
0007	4949.7	Radio Nacional Angola	Portuguese	35333	TS
0009	5040	Radio Habana, Cuba	English	55334	TS
0052	7780	Radio Slovakia International (WRMI)	English	35544	TS
0115	5130	WBQC The Planet, ME, USA	English	35223	TS
0148	4010	Kyrgyz Radio 1	Kyrgyz	35443	TS
0211	7780	Radio Ukraine International (WRMI)	English	45544	TS
0230	7780	Radio Prague (WRMI)	English	35534	GS, TS
0238	5940	Radio Melodia, Peru	Spanish	33223	TS
0243	7505	WNRO New Orleans, LA	English	25343	TS
0407	7234.8	Voice of Peace and Democracy, Ethiopia	Tigrinya	45222	TS
0509	6155	NHK Radio Japan	English	55555	TS
0607	6060	Radio Habana Cuba // 6100	English	45444	OR, TS
0636	6155	Radio Austria International	German	55555	TS
0639	9735	Radio France International	English	25323	TS
0704	5980	Radio Marti, Greenville, ME // 6030	Spanish	35344	TS
0705	6045	KBS World Radio	Korean	55544	TS
0814	6005	Radio Belarus	German	55344	TS
0906	7310	Radio Canada International	English	45434	TS
1013	15770	All India Radio GOS	English	15223	TS
1130	9635	Italian Radio Relay Service, Bulgaria	English	44444	LC
1134	9700	Radio New Zealand International	English	25223	TS
1157	17590	Vatican Radio	English	25212	TS
1207	17650	Radio Romania International // 17765	English	55555	OR, TS
1304	6005	Voice of Mongolia	English	35444	OR, TS
1330	6005	Radio Tirana	English	55243	TS
1409	9560	NHK Radio Japan	English	25112	TS
1424	12015	Voice of Korea, North Korea	English	35333	OR, TS
1425	17885	Voice of America	English	45544	TS
1439	9560	Furusato-no- kaze, Taiwan	Japanese	35444	TS
1443	7590	North Korea Reform Radio, Uzbekistan	Korean	35323	TS
1456	15140	Radio Sultanate Oman	English	45545	OR, TS
1458	13680	Voice of Hope Africa, Zambia	English	32232	CG
1502	5920	HCJB Voice of the Andes (via Germany)	German	35222	TS
1510	6085	Radio Mi Amigo, Germany	English	45444	TS
1515	6150	Radio Marabou, Germany	English	45545	TS
1518	7390	Radio New Zealand International	English	35313	TS
1539	5915	ZNBC Radio 1, Zambia	English	22333	TS
1548	9515	KBS World Radio, South Korea	English	45233	TS
1606	5985	Myanmar Radio, Burma	English	33223	TS
1607	6005	Radio Polonia	German	35323	TS
1634	9405	Radio Taiwan International	English	45333	TS
1652	15110	Radio Biafra	Hausa	25223	TS
1741	11730	TRT Voice of Turkey	English	45444	TS
1801	5840	World Music Radio, Denmark	English	35333	TS
1805	5935	Radio Romania International	English	55545	OR, TS
1811	11800	NHK Radio Japan	English	55434	TS
1837	4965	Voice of Hope Africa, Zambia // 6065	English	45223	OR, TS
1908	7280	Voice of Vietnam	English	35333	OR, TS
1935	9390	Radio Thailand	English	55544	TS
1939	9485	NHK Radio Japan	English	55555	TS
1941	9650	Radio Guinée, Conakry, Guinea	French/English	54545	CG
1951	7120	Radio Hargeysa, Somaliland	Vernacular	43333	CG
1955	7375	Radio Romania International	Romanian	55555	LC
2003	4949.7	Rádio Nacional de Angola, Mulenvos, Angola	Portuguese	33443	CG
2010	3955	KBS World	German	55444	LC
2020	11735	Zanzibar Broadcasting Corporation	Kiswahili/ Arabic	54444	CG, TS
2023	7365	Vatican Radio	English	45544	TS

2026	6110	Radio Fana, Ethiopia	Vernacular	54545	CG
2026	11780	Radio Nacional da Amazônia, Brasilia, Brazil	Portuguese	44444	CG
2030	3985	Radio Slovakia International	English	35444	TS
2030	11855	Radio Aparecida, Aparecida, Brazil	Portuguese	43544	CG
2034	11936	Super Rádio Boa Vontade, Porto Alegre	Portuguese	34333	CG
2041	4775	Radio Sora de Congonhas, Brazil	Portuguese	33333	CG
2043	7220.1	Voice of Vietnam	English	45343	TS
2045	3985	Radio Tirana	German	35444	TS
2047	9650	Radio Nationale Guinéenne	French	35433	TS
2105	3975	Shortwave Radio Service	English	35444	TS
2140	7310	Radio Romania International	English	55555	OR, TS
2145	9620	Reach Beyond Australia	English	35333	TS
2208	7490	WBCQ The Planet, Monticello ME	English	35443	TS
2210	9725.4	Radio RB2, Brazil	Portuguese	25222	TS
2243	6060	Sichuan RGD Xinwen Guangbo, China	Chinese	43323	TS
2254	4775	Radio Tarma Internacional, Tarma, Peru	Spanish	34433	CG
2257	4875	Radio Difusora Roraima, Boa Vista, Brazil	Portuguese	33433	CG
2306	4955	Radio Cultural Amauta, Huanta, Peru	Spanish	34433	CG
2327	9665	Radio Voz Missionaria, Camboriu, Brazil	Portuguese	44444	CG
2330	9819	Rádio 9 de Julho, São Paulo, Brazil	Portuguese	44434	CG

Medium Wave Logs

This month's medium wave logs concentrate on stations from North and South America, which were heard in the UK during January and February.

kHz	UTC	Station	Location	Country	Language	SINPO	Initials
570	0419	CFCB	Corner Brook, NL	Canada	English	33243	TS
580	0424	CFRA	Ottawa	Canada	English	43232	TS
590	0158	VOCM	St. John's, NL	Canada	English	33433	CG, TS
670	0404	WSCR, The Score	Chicago, IL	USA	English	45222	TS
710	0158	CKVO	Clarenville, NL	Canada	English	32333	CG, TS
710	0409	Radio Rebelde	Chambas/CTOM3	Cuba	English	34333	TS
730	0358	CKAC	Montréal, QC	Canada	French	23322	CG
740	0158	CHCM	Marystown, NL	Canada	English	32333	CG, TS
750	0501	CBGY	Bonavista Bay	Canada	English	32242	TS
760	0539	WJR	Detroit	USA	English	32452	TS
770	0419	WABC News Talk 77	New York, NY / Lodi, NJ	USA	English	43323	TS
780	0425	WBBM	Chicago, IL	USA	English	33243	TS
800	0316	VOWR	St. John's, NL	Canada	English	45223	TS
840	0235	WHAS, News Radio 840	Louisville	USA	English	24223	TS
850	0259	WEEI	Boston, MA	USA	English	43333	CG
850	0429	WEEI	Boston / Starr Ridge ME	USA	English	43333	TS
860	0414	CJBC	Toronto, ON	Canada	French	34242	TS
890	0149	Radio Progreso	Chambas	Cuba	Spanish	33123	TS
930	0512	CJYQ	St. John's, NL	Canada	English	35233	TS
940	0505	CFNV	Montréal/Châteauguay	Canada	English	45343	TS
940	0505	CFNV	Montréal/Châteauguay	Canada	English	45343	TS
1010	0507	WINS	New York NY / Lyndhurst NJ	USA	English	43243	TS
1020	0258	Newsradio KDKA	Pittsburgh, PA	USA	English	22242	CG
1050	0320	WEPN	New York, NY /East Rutherford, NJ	USA	Spanish	33333	TS
1100	0158	WTAM	Cleveland, OH	USA	English	22232	CG
1130	0509	WBBR	New York, NY / Carlstadt, NJ	USA	English	44233	TS
1140	0534	CBI	Sydney, NS	Canada	English	42222	TS
1200	0503	WXKS, Kiss 108	Newton, MA	USA	English	43243	TS
1280	0512	ZYJ455 Super Rádio Tupi	Rio de Janeiro / Rua Antonio Leoncio	Brazil	Portuguese	44233	TS
1310	0518	WCCW	Traverse City, MI	USA	English	44254	TS
1380	0531	WKDM	New York, NY / Carlstadt, NJ	USA	Chinese	44253	TS
1430	0514	CHKT	Toronto Island, ON	Canada	English	45243	TS
1480	0333	WHBC, News Talk 1480	Canton, OH	USA	English	25233	TS
1500	0359	WFED Federal News Radio	Washington DC	USA	English	43344	CG, TS
1520	0524	WWKB	Buffalo, NY	USA	English	45344	TS
1540	0527	WNWR	Philadelphia, PA	USA	English	45444	TS
1560	0531	WFME	Queens, NY	USA	English	44354	TS
1580	0524	CKDO	Oshawa, ON	Canada	English	45354	TS
1600	0531	WUNR Community Radio	Brookline, MA	USA	Spanish	45433	TS

book review

David Harris
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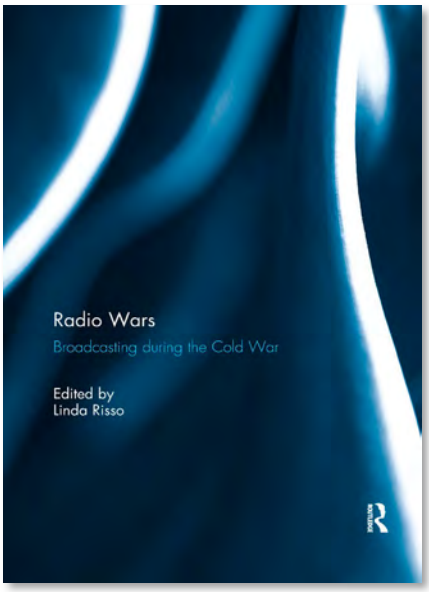
David Harris examines a captivating collection of essays covering the social and political roles of radio broadcasting and alternative channels of information in the Cold War, in both Western and Eastern Europe.

Ethereal Democracies & Tangible Propaganda



Radio Wars – Broadcasting During the Cold War by Risso, L. Routledge, Abingdon. 2017. 140 pp; pbk; £36.99 (ISBN 139781138302822) **www.routledge.com**

This slim volume of edited scholarly essays was first published in hardback in 2016 and previously appeared in the academic journal, *Cold War History* in May 2013. www.tandfonline.com/doi/pdf/10.1080/14682745.2012.757134

The book comprises of seven separate essays by leading analysts from British and German universities. The focus is on broadcasts aimed at Eastern Europe and the Soviet Union during the Cold War.

One of the key challenges in trying to evaluate the broadcasts of such stations as the Voice of America (VOA), Radio Free Europe (RFE), Radio Liberty (RL) and the BBC is whether they actually *helped* to bring the Cold War to an end. This is a complex issue because it is hard to assess the impact of the broadcasts and to estimate the number of listeners.

In her introduction, editor **Linda Risso** asserts that up to one-third of urban Soviet citizens listened to foreign broadcasts and that half of all adults tuned in to the West.

In another chapter, **Hilary Footitt** surveys the BBC's broadcasts to France in the period immediately after World War Two. There was support for communism in France during this period and the BBC had to tread a fine line between anti-communist propaganda and its normal role of broadcasting positive messages about the UK. The Corporation was very reliant on staff at various missions around France to provide feedback on broadcasts.

There was a lot of debate about whether content should be written by English writers and translated or whether broadcasts ought to be crafted by French writers, with a better understanding of life in France.

In a separate section of the book, **Simona Tobia** discusses post-war Italy, where there was a very strong Communist Party. The VOA did broadcast to Italy from 1945 to 1957 and, eventually, it decided to provide programmes in Italian for transmission by state broadcaster RAI. The BBC also supplied Italian-language programmes about the UK and gave advice on the foundation of the Italian television service in 1954.

RFE and RL are further scrutinised by **Friederike Kind-Kovacs**. RL targeted the USSR and RFE focused on Czechoslovakia, Hungary, Poland, Romania and Bulgaria. These stations were presented as 'independent' from US government control. However, in 1971 it was revealed that the main funder had, in fact, been the CIA.

Both RFE and RL recognised the importance of cultural content in their broadcasts. Listeners behind the Iron Curtain did not want to hear anti-communist propaganda. Instead, they were keen on discussions about art and literature, particularly works by dissidents such as **Aleksandr Solzhenitsyn**.

The chapter I found the most interesting is by **Alban Webb** who went on to write *London Calling*, the story of the BBC during the Cold War (See my review in *RadioUser*, August 2015: 52).

Webb investigates external broadcasting to Hungary and the Hungarian Uprising of 1956, in which 2,700 people died. Previous writing on this event led to claims that Western broadcasters had encouraged it and that the West would intervene. Webb looks at surveys of Hungarian refugees who fled after the Uprising. He finds that large numbers of them listened to the VOA, the BBC and to RFE. He finds that conditions *inside* Hungary (rather than foreign intervention) were, in fact, to blame for sparking the protests and that broadcasts after the Uprising were, generally, much more measured and restrained in tone.

The situation in the German Democratic Republic ('GDR', East Germany) was different, in that its citizens could – and did – easily tune into domestic stations from West Germany, if they wanted an alternative view from what was broadcast by East German media. The VOA and the BBC had German services but RFE and Radio Liberty did not target Germany. **Christopher Cassen** looks at letters written by East Germans to their own media. In these, they complain about 'bugbears' such as too many political talks and too much classical music.

As in most countries. people just

Radio Heroes

Meet some of the electrical pioneers, inventor and natural philosophers without whom, our hobby would not be what it is today. Who else should be in this hall of fame in the future?

Benjamin Franklin	(1706-1790)	Positive and negative electric charge
Alessandro G.A.A. Volta	(1745-1827)	Electric battery ('voltaic pile')
Hans Christian Ørsted	(1777-1851)	Electromagnetism
Georg Simon Ohm	(1789-1854)	Ohm's Law, electrical resistance
Michael Faraday	(1791-1867)	Mutual induction, electric motor, the magnetic field
Heinrich Rühmkorff	(1803-1877)	Induction coils
Heinrich Geissler	(1814-1879)	Gas discharge tube
Mahlon Loomis	(1826-1886)	Aerial telegraph (radio transmission)
James Clerk Maxwell	(1831-1879)	Theory of radio waves
Édouart Branly	(1844-1940)	Radio conductor/ coherer
Oliver Lodge	(1851-1940)	Electromagnetic waves
Phoebe Sarah Hertha Ayrton	(1854-1923)	Arc lighting, electricity, materials science
Joseph John Thomson	(1856-1940)	The electron
Nikola Tesla	(1856-1943)	AC motor, Tesla-coil, radio transmission
Heinrich Hertz	(1857-1894)	Radio transmission
Jagadish Chandra Bose	(1858-1937)	Microwaves, semiconductors, crystal detector
Alexander Popov	(1859-1906)	Radio transmission
Reginald Fessenden	(1866-1932)	Radio, voice transmission, sonar
Guglielmo Marconi	(1874-1937)	Radio transmission
Ernst Alexanderson	(1878-1975)	Alexanderson alternator/ VLF transmitter
Hedy Lamarr	(1913-2000)	Remote control, spread-spectrum technology

wanted to listen to popular music. Many East Germans also tuned to Radio Luxemburg whose strong long wave signal was then heard throughout most of Europe.

In the final chapter, **Patrick Major** looks at the BBC's *German Service*, inaugurated in 1938, in order to combat the rise of Nazism. Separate programmes to East Germany were broadcast until 1973 and the German Service finally ended in 1999.

The BBC received many letters from East Germans, in which people wrote about shortages, a sense of 'abandonment' by the West, anti-communism and the wish of some socialists to pursue a 'third way' (*Der Dritte Weg*), different from Stalinism.

BBC discussion programmes also gave East Germans a form of 'ethereal democracy'. Their (often anonymous) views were openly discussed, in a way that was not possible in their own media.

In conclusion, *Radio Wars* is a fascinating collection of articles about the role of foreign propaganda broadcasts to both Western and Eastern Europe.

This subject is clearly one which deserves a wider audience.

If you enjoyed reading *London Calling* by Alban Webb (*RadioUser*, August 2015: 52) and *Russia in the Microphone Age* by Stephen Lovell (*RadioUser* May 2016: 38), you will find this volume of interest.

[(1) See also the feature article on Number Stations in this issue of RadioUser*.*
(2) A selection of book reviews previously published in RadioUser*, is now also available on the* Radio Enthusiast *website* – **Ed.***]*
www.radioenthusiast.co.uk

feature

HJ Hagermann reveals the meaning of number stations on the short wave bands. In this first part, he sets the historical scene and looks at traitors, targets and technologies. Part Two follows next month.

Numbers Stations During the Cold War (Part 1)

Cold War Timeline

The historical period often described as the 'Cold War' is traditionally mentioned as the backdrop for the operation of clandestine broadcasters and number stations. It can be a challenge to pin down this period, in terms of a timeline. Against the backdrop of recent news, many would, perhaps, argue it is not over yet.

However, the first mention of the term 'Cold War' appears to have been traced to 1947 and to a speech made by **Bernard Baruch**, a US financier. He delivered his speech to the House of Representatives in the state of South Carolina, USA.

As I was also born in 1947, it seems as good a place to start as any!

The 'end' of the Cold war is not so easy to define. Most historians might say that it ceased at the same time as the USSR dissolved (31st December, 1991). On this date, the official state institutions of the old USSR stopped operating because it had been decided to dissolve the USSR on 26th December.

Some would say – as do I – that, in fact, the Cold War never really stopped as yet.

Given the recent poisoning in Salisbury and the visits, to our national borders, by Russian ships and aircraft, about the only visible difference is our current ability (or the lack thereof) to respond to these events.

However, for now, we will go with the traditional, 1991, end-point.

Key Players

One of the main players in the Cold War was the *Warsaw Pact*. It consisted of Albania (seceded in 1968), Bulgaria, Czechoslovakia, East Germany (The German Democratic Republic, GDR), Romania, Poland and Russia. Naturally, Russia was the dominant partner and supplied, far and away, the bulk of arms and equipment to the armed forces and the intelligence services of the various Member States of the Warsaw Pact. They shared information and cooperated in many other ways.

N.B.: Disclaimer: All opinions expressed, or conclusions drawn, are my own and in no way reflect those of any police, military or government organisation with which I am now, have in the past been, or may in the future be, associated. I am bound by the Official Secrets Act *as a former British soldier, civilian police officer, and retired member of the British Civil Service.*

Opposing states were allied in the *North Atlantic Treaty Organisation (NATO)*, consisting (at that time) of the USA, the UK, France, Belgium, Canada, Denmark, Luxembourg, Italy, The Netherlands, Norway and Portugal. France left in 1966 and became a member again in 2009. It remains a member to this day.

I am including these facts, in order to help you understand that, at the time of which I am speaking, Bulgaria, Czechoslovakia, East Germany, Romania, Poland and Russia were allies. Therefore, they had numerous common interests, and radio stations in 'Eastern Bloc' nations were, naturally, supporting Soviet interests.

Having skimmed over a rough timeline and some of the main players, I would now like to look at those 'Number Stations' in more detail.

Electronic Warfare

I have no doubt that many of you have found such stations on your journeys around the short wave dial. If you have, then, like my colleagues of E2K and I, you may have often wondered what they are. I did wonder too.

My own background in radio started in my early teens and it continued after I joined the British Regular Army in 1964. I trained for – and was employed in – radio and communications. I served as a Regular until 1971 and became a Regular Reservist from 1972 to 1984.

Most of my service was in Germany (at that time West Germany, the Federal Republic of Germany, FRG). Some of my work was in Electronic Warfare, due to my being a German speaker.

In this capacity, I encountered many number stations.

Number Stations

Initially believed to have been used since the First World War, these stations were especially active during World War II. However, they really got going during the Cold War (see the previous section).

Most political and military actors in the Cold War mentioned above, operated some variety of number station or another form of 'clandestine' radio communications networking.

As to who sends the messages, theories range from drug cartels to people trapped in the void of the Bermuda Triangle – I kid you not!

My colleagues at Enigma 2000, in the UDXF and in other serious monitoring groups do believe that these broadcasts were (and still are) of an 'intelligence' nature because many intercepts seem to have indicated this over the years. That is to say, the transmissions are from a central control station. They are sent to agents in the field or to other parties – wherever and whoever those may be.

Classification of Stations

The numbers community is now commonly using a naming system

devised by the European Numbers Information Gathering and Monitoring Association (ENIGMA). It is called the *EK2 Classification System*.

This method classifies number stations by *language* or *type of signal*.

The most common prefixes used are shown in **Table 1**.

In **Table 2**, I indicate a number of key acronyms of organisations with relevance to this article and my next one.

Most of them relate to the former East Germany, the German Democratic Republic (GDR).

As from early 2014, the use of the digit '9' after the respective letter has indicated a temporary assignment for stations under investigation.

Some number stations belong to a 'family'. This means that there is more than one station, sometimes working in multiple languages and via multiple modes of communication.

I have tried to indicate this in the list of the various stations, which shows (where applicable) languages used and the families to which various stations belong.

A family of stations can consist of voice, Morse code, data or RTTY transmissions or any combination of these communications modes.

A family can also be of a multi-lingual nature.

The classification system is currently maintained and monitored by Enigma 2000.

http://www.apul64.dsl.pipex.com/enigma2000

Reception Requirements

All that is needed to receive number stations is a reasonably good domestic radio receiver – nowadays preferably one capable of resolving SSB.

At the height of the Cold War, even that was unnecessary and a simple AM Superhet receiver would have sufficed for most transmissions.

Throughout Eastern Europe, at the time in question, even an SSB-capable set would have raised many eyebrows, should the owner (or their dwelling or workplace) be searched – as all too frequently happened.

The number of agents caught making use of number stations is too large for it not to be good evidence to support our theory of who the end-users for these broadcasts were.

In the next section, I offer a short glimpse of some key personalities and agents. This is not, of course, the place for an in-depth intelligence analysis.

For that, please have a look at the editor's reading suggestions at the end of this article.

Key Personalities and Spies

First, our very own **Geoffrey Prime**. Born in the UK in 1938, he was called up for National Service in the RAF in 1956 and trained as a linguist in both the Russian and Swahili languages because he had displayed considerable linguistic ability.

Geoffrey was posted to RAF Gatow (Berlin) where he was an 'intercept operator' in Eastern Bloc radio traffic.

He contacted the Russians and was consequently 'recruited' as a spy.

On demobilisation from the RAF, he was employed in the Russian section of GCHQ Cheltenham, still spying for the USSR. During this time, he was known to use an HF radio receiver, usually at night, to receive messages from his Russian handlers. He is known to have betrayed vital intelligence.

However, one of his neighbours is supposed to have overheard his late-night listening (and its content of number groups) and is said to have remarked, *"That bloke must be a spy!"*

Remaining with the UK, **Erwin van Haarlem** (real name **Václav Jelínek**, born 23rd August 1944) was a Czech agent in London, posing as a Dutch art dealer. He was arrested in 1988 and convicted of espionage. He was jailed from 1989 to 1993 and was subsequently deported to Czechoslovakia, then about to split into the Czech and Slovak Republics. On arrest, he was using a short wave radio to receive messages via a number station and a search of his flat revealed one-time pads.

Next, **Ana Belén Montes** (born 28th February, 1957) was an American senior analyst at the Defence Intelligence Agency in the USA.

Recruited by Cuban Intelligence, she was eventually caught. She is known to have used HF radio to receive messages. She was convicted of spying, escaped the death sentence and her tentative release date is 1st July, 2023.

Cuban number stations are active to this day, as you will see later. Sadly, they are also difficult to monitor in the UK.

High-Level Users

A colleague from the *NVA Forum*, a former senior officer in military intelligence in the East German Central Registry of Information, confirmed to me that, among the end-users of the encrypted messages sent by these stations, were many military attachés who served overseas, in the foreign Embassies of the German Democratic Republic. Agents of the GDR (German acronym: DDR, *Deutsche Demokratische Republik*) on intelligence-gathering missions also used this method of communication as did those run by East German Intelligence (The 'State Security Service' or *Staatssicherheitsdienst*) (See section on East German stations).

Encounters

Radio amateurs and HF listeners who first monitored these stations were puzzled by what they were hearing and, naturally, tried to find out what it was. In this context, it might be useful to examine just how helpful, or otherwise, various official bodies and sources were.

Starting with the USA, there was a TV Feature of May 2000 (*Lost and Found Sound*) by **Peter Rosen** from KUTV, in Salt Lake City (Utah). On this show, a member of the US Federal Communications Commission (FCC) appeared, stating, *"My name is **John R. Winstone**. I am the assistant chief of the Enforcement Bureau of the FCC. We don't intend to discuss these stations – if any exist at all – and I am not saying that they do, [and that they are] transmitting in this county. We know of innumerable ones outside this country. Our only interest is if they cause interference. We then work with the country of origin to find a solution."*

So far, so little. However, for sheer arrogance, an anonymous official of the British government beats it all. From the same source as above comes the following quote: *"People should not be interested in number stations because they are illegal to listen to."* Not only arrogant but at variance with a statement reported to have been made in 1997 (by MI6). In it, the agency, allegedly, admitted running them.

The unnamed official must have worked in the same section as the one quoted in an article from a 1998 edition of *The Daily Telegraph,* which attributed a quotation to the *Department of Trade and Industry Radio Regulatory Section*. He is quoted as saying, *"These [number stations] are what you suppose they are. People shouldn't be mystified by them. They are not for, shall we say, public consumption."*

Finally, speaking on a BBC programme, a retired Diplomatic Wireless Service operator, **David White**, stated

that, in the course of his service, he met young ladies who were tasked to read strings of numbers, such as are transmitted in these messages. They were not inquisitive as to the purpose of these transmissions and they were not told. Read on and decide for yourselves! (Source: *Tracking the Lincolnshire Poacher*: BBC: BBC Radio 4).

Listening In

When I started with this aspect of the radio hobby in the late 1980s, I used the most basic receiver I had then.

This was a 'Tempest' model, manufactured in South Africa. It had the all-important HF bands, covering: 2.5 to 6.5kHz ('HF1') and 2.7 to 20kHz ('HF2').

The inbuilt rod-aerial extended out to two feet, and a plug-in external aerial socket allowed for better reception of distant signals. Anyone using these 'in the field', as it were, would probably not have had at their disposal any more sophisticated kit and they would surely not be hanging long wire aerials around the place to advertise their activities!

I will offer more on number stations in Part 2 of this article next month. In the meantime, try and catch one of these stations yourselves and, maybe, delve a little into the mysterious world of those stations by following some of the reading suggestions.

Enigma 2000 Skeds

The Enigma 2000 forum offers a wealth of information on number stations. Those who wish to do so, are most welcome to join. We publish an online, bi-monthly, *Newsletter*. It contains, among other things, schedules ('skeds'). These skeds forecast transmission times and dates as well as some frequencies of the known number stations still operating – of which there are many.

Enigma 2000, started life as Enigma. It was reformed in 2000 and renamed Enigma 2000. The acronym stands for European Number Investigation Gathering and Monitoring Association.

Small wonder, we call it Enigma 2000 (or 'E2K')! It is by these acronyms that I shall refer to it in both parts of this article.

Last but by no means least, my thanks to **Paul**, my friend and colleague, without whose help this article would not have been possible. I am also indebted to the NVA Forum and to **Ary Boender** (Netherlands) of the Utility DXers Forum (UDXF) for his valued help over many years.

E	English-language voice broadcasts
G	German-language voice broadcasts
S	Slavic-language(s) voice broadcasts
V	Voice broadcasts in all other languages
M	Morse code
XP	Russian stations using MFSK modes
SK	Other digital mode stations that do not use MFSK [Only SK01]
HM	Hybrids of both voice/Morse and digital modes
DP	Hybrids of (M)FSK and other types of digital modes [Only DP01]

Table 1: Prefixes used in the Classification of Number Stations

BND	*Bundesnachrichtendienst* (Federal Intelligence Service, the West German Intelligence Service)
DDR	*Deutsche Demokratische Republik* (German Democratic Republic, GDR or East Germany)
DWS	Diplomatic Wireless Service (radio operators providing communications for the Diplomatic Service
ELINT	Electronic Intelligence Gathering (all other forms of electronic intelligence gathering and monitoring).
EW	Electronic Warfare (also called ECM or Electronic Counter Measures)
HVA	*Hauptverwaltung Aufklärung* (Part of the East German Intelligence Service)
IM	*Inoffizielle Mitarbeiter* (Agents who worked for the Stasi but were not recruited full time)
MI5	Military Intelligence Department 5 (espionage and counter espionage on *British territory*)
MI6	Military Intelligence Department 6 (operations conducted *outside Britain*)
MfS	*Ministerium für Staatssicherheit* (Ministry for State Security). The former 'Stasi' (the GDR Secret Police)
NULL	Null-Message (message consisting of a string of zeros, and which signifies no message content)
NVA	*Nationale Volksarmee* (National People's Army). The former East German Army
OM	Man
SIGINT	Signals Intelligence (radio monitoring and other forms of signals interception)
YL	Woman

Table 2: Acronyms in the Number Stations World

Books

Bush, L. (2018) *Shadows of the State* (Brave Books) *[Reviewed in RadioUser, April 2018: 34/5 – **Ed**.]*
Hawkins, P.M. (2017) *Point to Point […]* (New Generation Publishing)
Hughes-Wilson, J. (2017) *On Intelligence: The History of Espionage and the Secret World* (Constable)
Koehler, J. (2000) *Stasi: The Untold Story of the East German Secret Police* (Basic Books)
Mason, S. (1991) *Secret Signals – The Euronumbers Mystery* (Tiare Publications)
Risso, L. (2015) *Radio Wars: Broadcasting in the Cold War* (Routledge) [Reviewed elsewhere in this issue **- Ed**.] (for German-language books, please contact the editor)

Websites

Chrissy Brand blog (2001):
http://dxinternational.blogspot.co.uk/2016/01/from-archives-numbers-station-game-part.html
http://dxinternational.blogspot.co.uk/2016/01/from-archives-numbers-station-game-part_2.html
Simon Mason's Website:
www.simonmason.karoo.net

Audiovisual

James Reevell/BBC News: *Numbers Stations: The 'Spy Radio' That Anyone Can Hear* (10th February 2018)
https://tinyurl.com/y9kh853p
The Conet Project / 1111 (Audio recordings of Number Stations)
https://www.irdial.com/conet.htm

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In his valedictory column for RadioUser, Mike Richards rounds off his coverage of the license-free ISM (Industrial Scientific and Medical) bands by looking at the busy 433MHz band.

ISM Signals Analysis and Reverse Engineering

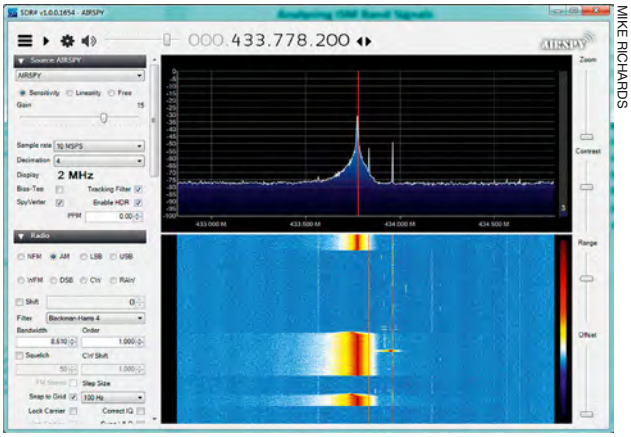

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Fig. 1: 433MHz spectrum display in SDR Sharp. The strong signal is a remote socket controller.

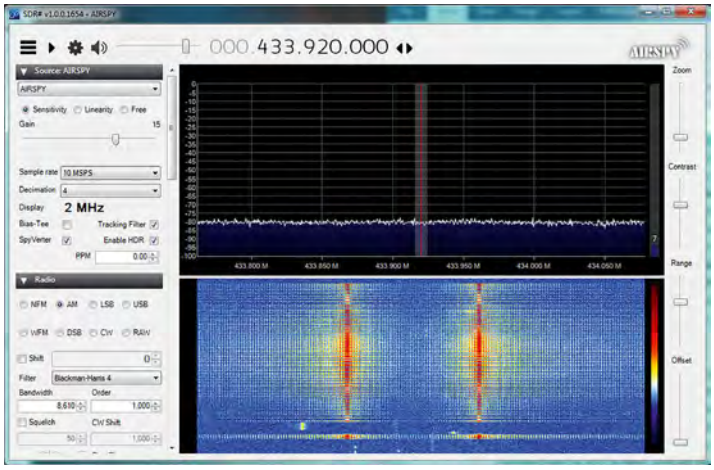

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Fig. 2: Paused SDR Sharp display showing a Honda FSK signal.

Band Characteristics

I have shown details of the UK VHF/UHF ISM bands in Table 1. These bands are much narrower than the 2.4GHz band and are unsuitable for the high-speed digital traffic that is found on the higher bands.

However, these frequencies do propagate more successfully in an indoor environment. Therefore, they are ideal for low data-rate, short-range, communications around the home and office.

Typical applications are car key fobs, remote control lighting and sockets, TV remote controls, temperature sensors, weather stations and a diverse range of other household and office items.

The common characteristic of all these devices is that they send very short duration, low data-rate, signals. The licensing authorities group these transmissions together as SRDs (Short Range Devices) and the UK regulations for the operation of these devices can be found in the Ofcom document here: **https://tinyurl.com/y7cbvj52**

The allowable power in these bands varies from 250µW to 500mW, depending on the band segment used.

The 433 and 886MHz bands also allow operation from an airborne device and that flexibility is used to good effect by the HAB (High Altitude Balloon) community.

The HAB teams often work with schools, so the students can launch sensors and cameras into near-space to carry out all manner of educational experiments. This is a fascinating aspect of the radio monitoring hobby that's well worth exploring.

In addition to being able to receive images from the balloons, your received data can be fed into the HAB network to provide valuable tracking and telemetry data for those launching the balloons. The other positive point about HAB monitoring is that all the software is free and there are plenty of support groups to help you if you get stuck. If you would like to find out more, you can visit this helpful website: **https://ukhas.org.uk**

Analysing ISM Band Signals

There are several ways in which you can look at signals in the 433 and 869MHz ranges and the popular RTL-SDR receiver dongles constitute a cheap way to monitor activity.

Receivers like these can be used with any of the popular SDR packages. SDR Sharp, SDR-Console and HDSDR are currently the most common choices.

If you are analysing the signals in your own home, you do not need much of an antenna and the tiny whip, often supplied with RTL dongles, becomes quite useful!

Once you have the receiver up and running, tune to **433.92MHz** and set the modulation to AM; this is the most common frequency for car fobs and household devices. You can easily check all is working well, by operating a car key fob close to the receiver. You should see a short but strong signal on the spectrum and waterfall displays (**Fig. 1**).

While 433.92MHz is a common operating frequency, there are different modulation systems in use. Older cars tend to use variations on AM and more

Band
83.996MHz to 84.004MHz
167.992MHz to 168.008MHz
433.05MHz to 434.79MHz
886MHz to 906MHZ

Table 1: The UK VHF/UHF ISM Bands.

modern vehicles (like my Honda CR-V) use FSK with a shift of 100kHz. These characteristics are easily measured using the SDR waterfall display.

Table 2 shows a step-by-step guide, using SDR Sharp.

Signals using AM or PWM (Pulse Width Modulation) will display with a central carrier (**Figs. 2** and **3**).

Message Analysis

While we can carry out some analysis of RF transmissions quite easily with our SDR radios, it is not easy to decode the underlying messages. However, help is at hand, thanks to a clever little decoding application called *rtl_433*.

As you can guess from the name, this software makes use of the popular RTL-SDR dongle (**Fig. 4**) as the receiver. It includes software decoders for different modulation schemes, along with payload details for many 433MHz devices.

The application is intended for use in a Linux operating system, so you will need to run it on a Linux virtual machine on your PC. Alternatively, you can make use of the popular Raspberry Pi.

I have tried *rtl_433* on the Raspberry Pi and it works very well so I will run through the installation and operation.

When trying something new on the Pi, it is good practice to start with a 'clean' operating system image. Full instructions for 'burning' a microSD card can be found on the Raspberry Pi website: **www.raspberrypi.org/documentation/installation/installing-images/README.md**

Once you have your clean image running, you should run the *update/upgrade* command to install the latest repository data, along with any bug fixes or patches. This is done by opening a terminal session and entering the following command line: *sudo apt update && sudo apt upgrade*

With the image up-to-date, you can now add the supporting packages that are required by *rtl_433*.

This is done by entering the following commands, which should be entered all on the same line, with a space between each entry.

sudo apt install -y libtool libusb-1.0.0-dev librtlsdr-dev rtl-sdr build-essential autoconf cmake pkg-config

When you hit *Return*, the software will be installed.

Before you continue, you should reboot the Pi, to make sure that it is still working properly.

The next step is to download the *rtl_433* files from my *github* site as follows:

cd /home/pi

git clone ***https://github.com/merbanan/rtl_433***

You will see progress reports in the

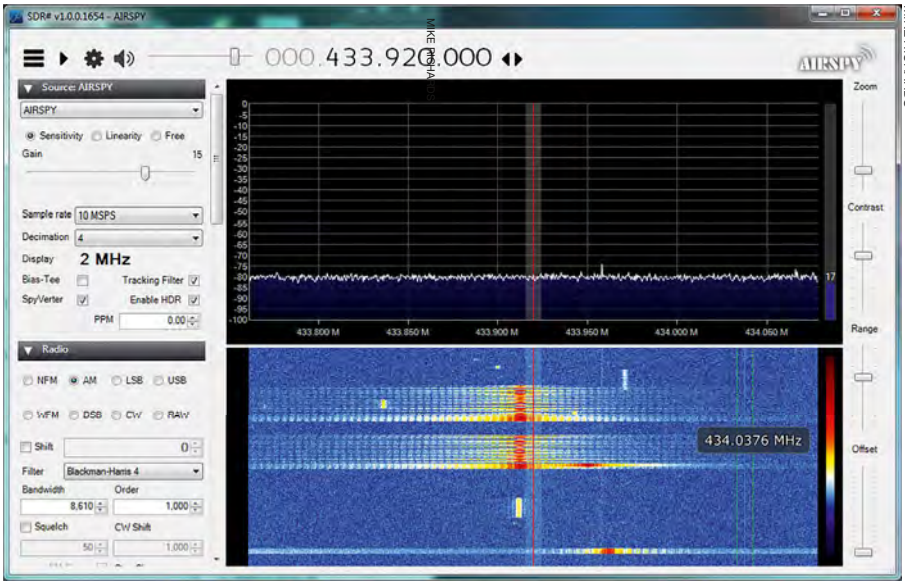

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Fig. 3: Paused SDR Sharp display showing a Nissan AM signal.

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Fig. 4: One of the popular RTL-SDR Dongles.

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Fig. 5: The excellent-value Pi Zero-W: It is ideal for the *OpenHAB* server.

Start the receiver and tune to 433.92MHz

Press and hold one of the buttons on the key fob.

After a few seconds, stop the receiver and the waterfall will 'freeze', with a signal still showing, as in **Fig. 2**.

The two red lines represent the two positions of the carrier and the distance between them is the shift.

To measure the shift, hover the cursor over the centre of the right-hand red line and make a note of the cursor frequency displayed.

Now move the cursor to hover over the left-hand red line and note the frequency again.

The shift is found simply by subtracting the two frequency measurements you have just taken.

In this example, the shift is 930kHz.

Table 2: Analysing Signals on 433.92MHz with SDR Sharp

```
cd /home/pi/rtl_433
mkdir build
cd build
cmake ../
make
sudo make install
reboot
```

Table 3: Building the Software for the Pi.

terminal while the code is downloaded to the Pi.

Next, you will need to build the software for the Pi. **Table 3** contains a step-by-step guide to doing this.

This completes the installation.

You can now start using *rtl_433* for the analysis of devices operating in the 433MHz band. The program is command-line only and you control its action by adding command-line options.

Table 4 contains some examples to get you started.

Another useful feature is the facility to re-route all the decoded output. It can be sent to a file or to an MQTT broker. While I appreciate that this level of analysis is not for everyone, sometimes these tools can be useful.

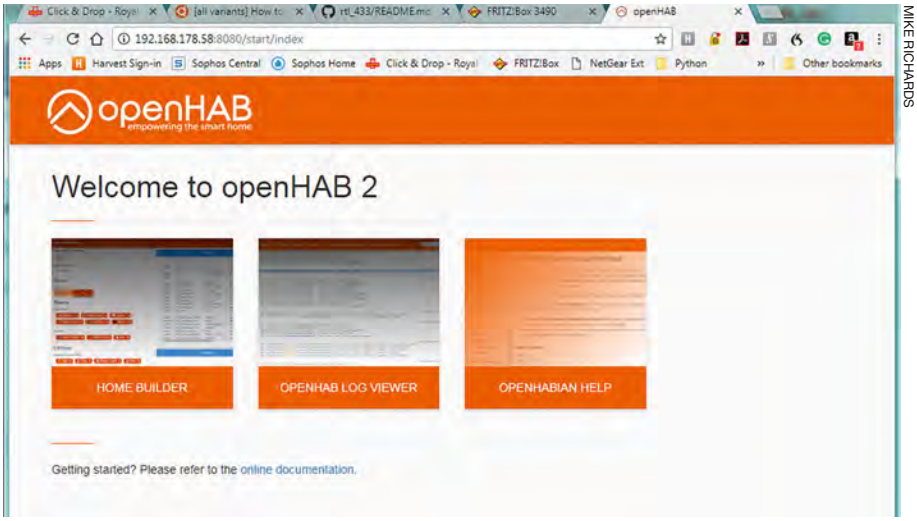

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Fig. 6: Web interface to the *OpenHAB* server, running on a Pi-Zero-W.

rtl_433 -G
This is a good command to start with, as the decoder will attempt to resolve all known signal types. If you need to analyse the incoming signal, then use:
rtl_433 -a
This provides a text description of received signals. Another useful tool is the 'pulse-analyser', which will report the pulse timings of the signal:
rtl_433 -A
While *rtl_433* has a default frequency of **433.920MHz** you can change this by adding -f and the frequency you want. For example, if you want to use the -G option but on 434MHz, you would enter rtl_433 -G -f 434000000

Table 4: Controlling rtl_433 with Command Lines

Reverse Engineering

An area attracting attention from the 'Maker' community is the issue of reverse-engineering IoT (Internet of Things) devices.

If you have dabbled in home automation, you will, no doubt, have noticed that everyone is trying to 'lock' you into their proprietary systems. While this can be very convenient and can result in a simple-to-use solution, it also means that changing platforms becomes an expensive and wasteful process.

As we are still relatively early in the home automation development cycle, there will be new players coming onto the market who will offer a better solution, albeit with new hardware.

I am sure the future will bring some form of regulation or harmonisation of IoT protocols. This might enable data and control signals from different manufacturers to be shared between systems.

With this kind of standardisation in place, boiler controllers and thermostats from one manufacturer could be controlled from the central hub of another manufacturer and so on.

However, we are a long way from that situation. Therefore, reverse-engineering has a place for those who want to mix-and-match now. This is why the *rtl_433* tool can be so useful.

One project that has made good progress is *OpenHAB*. As the name implies, this is an open-source project. It has created a home hub, which can be used to assimilate data from many different sources. The hub can be operated on a wide range of computing platforms but one of the more popular is the Raspberry Pi.

The OpenHAB processing overhead is relatively light, so the server can run very well on a £10 Raspberry Pi Zero-W (**Fig. 5**). This model is the original Pi Zero but with Wi-Fi and Bluetooth added.

Setting-up an *OpenHAB* server with the Pi Zero is simple because the *OpenHAB* team have a dedicated Raspberry Pi image available for download, with *OpenHAB* already pre-installed.

Once the *OpenHAB* server is up and running, you access it via any other computer or mobile device connected to your local network (**Fig. 6**).

This can be further extended, by the use of your router's 'port-forwarding' options, to expose your *OpenHAB* to the wider internet.

There is lots of potential in this project and I suggest you visit this website for the latest information:
https://docs.openhab.org/index.html

Website Back Online

Those of you who have used the Raspberry Pi in the past, will be pleased to hear that my website is back online. The site was 'hacked 'at the end of last year and I had to take it down and start again.

This time, I have made a much more secure site so there is less chance of it being damaged. In addition to the Raspberry Pi cards I sell, my blog holds lots of tips and notes on how to do things with the Raspberry Pi. You can find all the details here:
www.g4wnc.com

Final Word

The time has come for me to hang up my hat with *RadioUser*. I have had a long journey over the past 30 years as the magazine has transformed from *Short Wave Magazine* to *Radio Active* and then on to the *RadioUser* magazine that we have today.

The change to a new management team with a new editor marks the next step in its transformation and I wish them well. I have lots of demands on my time and am looking forward to taking on some new challenges.

*[I would like to convey my own thanks, and those of the Warners team, to Mike Richards for his advice to me personally and for his innumerable contributions to various incarnations of this magazine over the years. Best of luck for your many other projects, Mike and stay in touch – **Ed**.]*

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Tomas Hood looks at the F10.7cm Radio Flux measurement and what it means for radio wave propagation. He then offers his updated monthly propagation predictions for May.

The F10.7-cm Radio Flux and Radio Reception

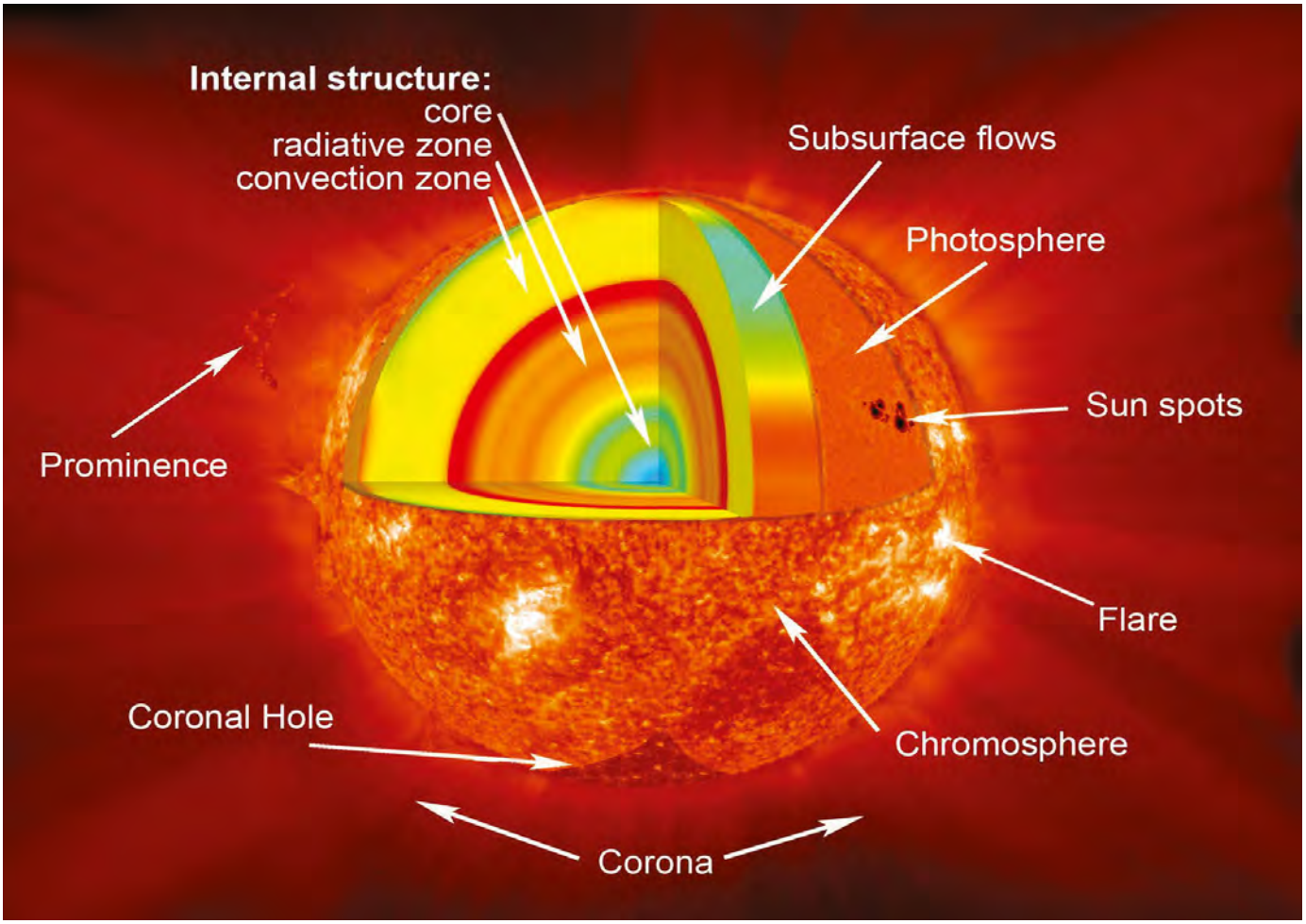

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Fig.1: The structure of our Sun.

Last month, I explored one of the most prominent features on the Sun: Sunspots. This time, I would like to continue by explaining one of the most common measurements with regard to the solar influence on the ionosphere around our Earth: The F10.7-cm Radio Flux measurement.

This value is an expedient measurement to the radio amateur because it provides an accurate way to assess the level of radiated energy coming from the Sun. Since long-range DX depends on the ionospheric refraction of shortwave radio signals, and because the ionosphere depends on solar energy for its existence, the more solar energy is available, the better will be the DX.

Scientists have been routinely measuring the flux of microwaves from the Sun at wavelengths between 3 and 30cm (frequencies between 10 and 1GHz) since 1947. These solar radio emissions come from high in the Sun's Chromosphere and low in the Corona (**Fig. 1**).

Sources and Mechanisms

Specifically, the radio flux has two different sources.

The first one is thermal *bremsstrahlung* (fr.: German, '*bremsen*', 'to brake' and '*Strahlung*', 'radiation') http://g.nw7us.us/JGG142

The phenomenon of *bremsstrahlung*

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Fig. 2: A typical F10.7-cm Radio Flux Receiving Antenna.

is due to electrons radiating – when changing direction – by being deflected by other charged particles and 'gyro'-radiation. The latter is owing to electrons radiating when changing direction by gyrating around magnetic field lines. This website further explains the process: **http://g.nw7us.us/JGGpQ5**

These mechanisms give rise to stronger radiation, at those times when the temperature, density and magnetic field are enhanced. This is why this microwave radiation is a good 'measure' of 'general' solar activity.

Strong solar magnetic fields exist in specific regions (often in active sunspot regions) that can live for weeks. These active regions often reoccur at or near the same location on the solar disc for months, perhaps even years. During the typical solar cycle minimum, especially a prolonged one we witnessed between Cycle 23 and the current Cycle 24, the effect of active regions disappears and we observe a sort of solar 'ground state.'

Unlike sunspot count numbers, the radio flux measurements are unaffected by factors like observing techniques, differences in atmosphere and instruments used (**Fig. 2**).

Therefore, radio flux measurements can be a 'truer' and more objective indication of solar activity.

Calculations of the Measurement

The 10.7-cm radio flux index is written as the $F_{10.7}$ index or simply, $F_{10.7}$. The global daily value of $F_{10.7}$ is measured at (local) noon at the Penticton Radio Observatory in Canada.

www.nrc-cnrc.gc.ca/eng/solutions/facilities/drao.html

The $F_{10.7}$ measurements can be used as a daily index or they can be averaged over longer periods to plot the trends in solar activity more smoothly. Typically, $F_{10.7}$ is averaged over one of three ranges: A month, a 90-day period or a year.

Even though $F_{10.7}$ and the sunspot number both indicate the level of solar activity (specifically, the solar energy that directly influences the ionosphere) they each have significantly different scales.

For example, $F_{10.7}$ never drops below a value of approximately 67, even during a solar minimum, when the sunspot number is very close to zero. We are witnessing this right now, at the end of Sunspot Cycle 24 (**Fig. 3**).

The following equations allow you to convert between a 10.7-cm flux index number (F) and a sunspot number (R). The equations are valid on a statistical (i.e. average) basis.

$$F = 67.0 + 0.572R + (0.0575R)^2 - (0.0209R)^3$$

$$R = 1.61FD - (0.0733FD)^2 + (0.0240FD)^3$$

where, FD = F - 67.0.

The $F_{10.7}$ index has been recorded routinely by radio telescopes near Ottawa from February 14th, 1947, until May 31st, 1991. Radio telescopes at Penticton, British Columbia have recorded $F_{10.7}$ since June 1991. Each day, $F_{10.7}$ levels are determined at local noon, which is 2000 UTC at Penticton. They are then corrected, to allow for factors such as antenna gain, atmospheric absorption, major solar events (like a flare in progress) and other factors.

These numbers are maintained at the Penticton site in British Columbia: **http://g.nw7us.us/IbUc01**

There are three measurements per day with small systematic differences. For daily records and analysis of propagation, only the noon-value for Penticton is used, at 2000 UTC. This has been practised since 1991.

How Accurate is the Flux Average?

In their study, *Limits to the Accuracy of the 10.7 CM Flux* in the journal *Solar Physics* (Vol. 150, 1994) **K. F. Tapping** and **D. P. Charrois** of the National Research Council, Penticton, BC, Canada concluded that spot measurements are usually within 1% of the daily-average fluxes. They explain that the daily 10.7-cm flux data are spot measurements of the solar flux density at the 10.7-cm wavelength. These values are frequently used as the average flux for that day (**Fig. 4**).

Since each spot measurement takes about one hour to make (and the Sun's emissions at that wavelength can vary over time scales shorter than the intervals between the measurements) the data are unavoidably under-sampled. Does this mean that the daily spot measurement is not accurate as an index of daily flux activity?

Radio emissions from 'transient' events, such as flares, are defined as 'contaminants' of the flux. Specific, largely empirical, procedures have evolved, which are used to filter them from the data. The utility of the $F_{10.7}$ index over more than 40 years suggests that the consequences of the under-sampling and of the use of largely-empirical data filters are not serious ones.

Rather, researchers have found that the daily measurement is very useful, when paired with current models of ionospheric behaviour.

This, in turn, means that working with analysis and propagation forecasting models (like ACE-HF Pro with the VOACAP engine) and using the 10.7-centimeter flux index are both reliable and practical methods.

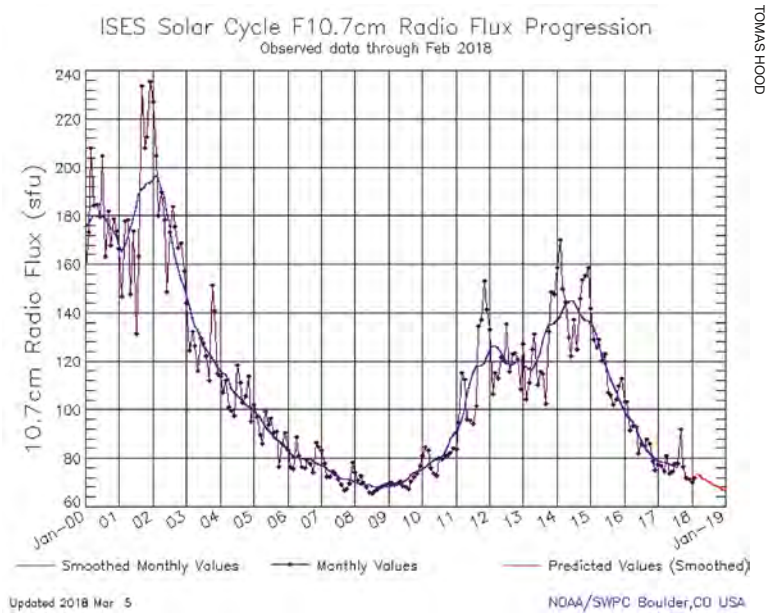

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Fig. 3: Solar Cycle 24: F 10.7cm Radio Flux Progression.

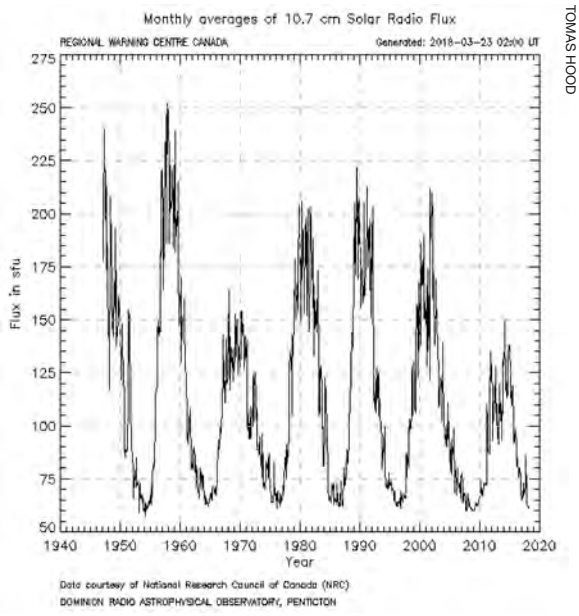

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Fig. 4: Monthly averages for the 10.7-cm flux (March 23rd, 2018).

Hard X-ray Energy

The late **Dr Robert Brown NM7M** proposed an even more accurate way to assess the energy available for the ionization of the ionosphere on any day. His excellent introduction to radio signal propagation is at this URL:
http://g.nw7us.us/ltbyn0

Brown explained that the 'hard X-ray energy' present from the wavelengths of 1 to 8 angstrom (symbol: Å) provided the most effective ionizing energy throughout all the ionospheric layers in our atmosphere (**Fig. 5**).
http://g.nw7us.us/JGFDCA

The GOES satellites (Geostationary Operational Environmental Satellites) measure these wavelengths and the resulting measurements are reported as the *background X-ray level* throughout the day. A daily average is reported too.
https://www.swpc.noaa.gov/products/goes-x-ray-flux

Just like X-ray flares, the background hard X-ray level is measured in Watt per square meter (W/m^2), reported using the categories, *A*, *B*, *C*, *M* and *X*. These letters are multipliers; each class has a peak flux, ten times greater than the preceding one. Within a class, there is a linear scale from 1 to 9.

Brown recorded the daily background X-ray levels for several sunspot cycles and discovered that, during solar cycle minimum periods, the background X-ray levels remained at the A-class level. In the course of the rise and fall of a solar cycle, the background X-ray energy levels remained mostly in the B range. Throughout peak solar cycle periods, the background energy reached the C and sometimes even M levels. Most days now, at the end of Cycle 24, we are seeing many days with the background level at A0.

Shortwave Conditions

As we move away from the winter short wave season into the longer days of summer, the overall trend in short wave propagation is the opening up of the higher frequencies into many areas of the world. However, these openings can be variable in strength, are subject to fading and could be short-lived.

The cause of this change is complex. The length of daylight over a region of the ionosphere, the intensity of the solar radiation and the density and height of the various layers of the ionosphere all affect the propagation of the shortwave frequencies DXers are interested in.

Winter daytime propagation over a given path could sustain higher frequencies than the same path during the summer daytime, while the summer nighttime frequencies will be higher than the winter nighttime frequencies on that same path.

On the higher HF frequencies (16 to 11m) fairly good daytime openings should be possible on north-south paths during May. Sixteen meters will be your best bet out of the higher bands, not only because of propagation but also because more international broadcasters will still use this band around the clock.

The strongest signals will be found in the middle and lower HF bands. Look for peaks in signals around the hours of sunrise, just before sunset and into the late evening.

Daytime paths are best when they terminate in areas where it is dark. This enhances propagation to remote parts of the world and lengthens the DX window.

Twenty-five and 22m will have more stable signals than those on 19m, especially on north-south paths, again around the hours of sunrise and sunset.

Thirty-one meters again becomes one of the strongest and most reliable bands, although you will find it congested.

Look for Europe and Africa early in the morning and for north-south openings during the day, when solar activity is low (otherwise the D layer absorption will wipe out the band).

As sunset approaches, turn towards the South Pacific, then to Asia, as the sun sets. During the night, 41 to 60m should provide good openings from Europe, Africa and the East. Some DX should be possible on 75 to 120m but signals are expected to be mainly weak and covered by seasonal noise. Static levels increase during May; signals may sound weaker on DX openings during the daylight hours.

VHF and Above

Possible transequatorial propagation and occasional Sporadic-E propagation will keep VHF enthusiasts happy.

Sporadic-E ionization is expected to increase considerably during May and fairly frequent VHF meteor-scatter, short-skip, openings should be possible. These are likely to occur over distances of approximately 1000 to 1400 miles.

Although Sporadic-E openings can take place at just about any time, the best time to check is between 10am and 2pm and again between 6 and 10pm local daylight time.

A seasonal decline in transequatorial (TE) propagation is expected during

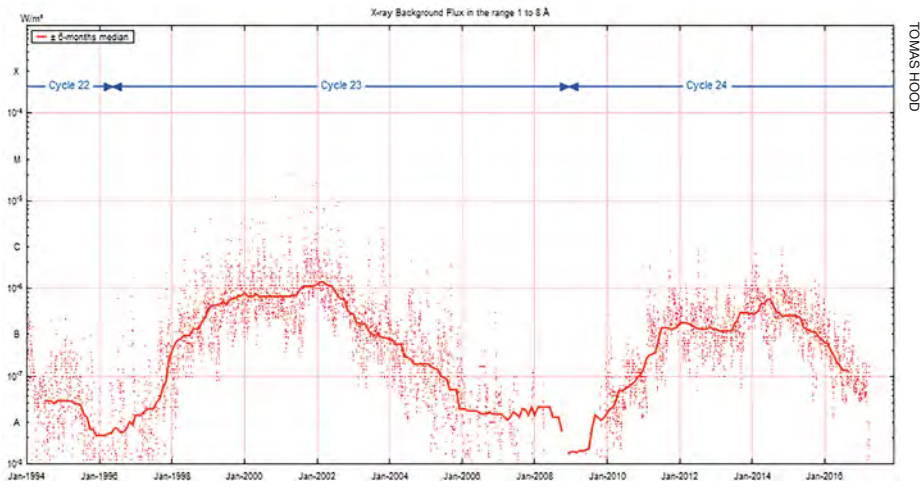

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Fig. 5: The X-Ray Background Flux in the range of 1 to 8 Å, for Solar Cycles 23/4.

May. An occasional opening may still be possible on VHF.

The best time to check for VHF TE openings is between 9 and 11pm local daylight time. These TE openings will be north-south paths that cross the geomagnetic equator at an approximate right angle.

Auroral activity is generally lower now than during March and April, due to the change in the orientation and position of the earth and magnetosphere in relation to the solar wind.

Watch for K_p values above 6, which occur on days when coronal holes or coronal mass ejections appear a few days after a major solar flare.

One particular meteor shower, the *Eta Aquarids*, will occur in May. The *Eta Aquarids* peak on about May 5th but start around mid-April. This shower has a peak rate of up to 60 visuals per hour. Look for FM broadcast pings (short bursts of signals, refracted off the ionized trails from the burning meteorite) during these events.

If you are an amateur radio operator, look for openings on 2 and 6m off the ionized meteor trails.

Solar Cycle 24 Today

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly average sunspot number of 6.4 for February 2018. The highest daily sunspot count was 28 on February 11th, while the lowest was 0 (zero) on February 1st to 3rd and 17th to 25th (a total of twelve days with zero sunspots).

The twelve-month running smoothed sunspot number centred on August 2017 is 11.7. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 11 is expected for May 2018, give or take 14 points.
www.astro.oma.be/en

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 72.0 for February 2018. The twelve-month smoothed 10.7-cm flux, centred on August 2017, is 76.3. A smoothed 10.7-cm solar flux of about 71 is predicted for May 2018.
www.nrc-cnrc.gc.ca/eng/solutions/facilities/drao.html

The geomagnetic activity – as measured by the Planetary-A index (A_p) – for February 2018 is 7.

The twelve-month smoothed A_p index, centred on August 2017, is 10.7.

Geomagnetic activity this month should be mostly quiet, with fair to good propagation conditions.

You can always find a last-minute forecast at this URL:
http://SunSpotWatch.com

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Kevin Ryan
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Kevin Ryan considers how analogue stereo concepts are still used in the digital era, shares some baffling results of his analysis of stereo broadcasts and updates us on the onward march of DAB+.

Stereo Audio Images and DAB+

Stereo audio is part of the DAB specification and the audio encoder determines how the two channels will be packaged for transmission and re-assembled for reception. To understand stereo in digital radio systems, it is worth comparing it to stereo in the analogue world and you will see some similarities in the design and need for compatibility.

Stereo Audio

An online dictionary states that the adjective *stereophonic* refers to sound recording and reproduction, by means of two or more channels of transmission and reproduction. The reproduced sound seems to 'surround' the listener and to come from more than one source. In stereophonics, there must be some relationship between the left and right channels; otherwise, it would be a dual-mono system. By the way, the noun 'stereophonics' also covers *quadraphonic* and *surround sound* systems.

Stereo Images

We perceive the position of a sound source by picking up several auditory 'clues'. These are *time difference* and *level difference*. Time difference determines when the sound arrives at each of our ears. Level difference means how strong the sound is in each ear.

Interestingly, our head has an inbuilt 'masking-effect', which attenuates a sound in one of our ears.

These primary clues help us to localize a sound in the horizontal plane, between left and right.

Finally, the shape of our outer ear acts a bit like a bandpass filter that varies depending on the angle of arrival of the sound. This allows front-back and bottom-top distinctions to be made.

There is a great website that teaches you a lot about stereo. You can play short audio files through your PC speakers to illustrate most of the concepts in stereo. **www.audiocheck.net/audiotests_stereophonicsound.php**

Image Shape

Stereo images are perceived to have the dimensions of *width*, *height* and *depth.*

Among those, width is the easiest to understand: If you have two speakers (the usual left and right) spaced some distance apart, then two sounds that are the same will appear to come from *between* the speakers via a 'phantom' centre speaker. The greater the contrast between the two sounds, the wider the image.

The depth of a stereo image arises from *how loud* a sound is. Quieter sounds appear to be further away.

The perceived height of a stereo image relates to frequency. Therefore, high-pitched sounds seem to originate from higher up.

AM Stereo

In around 1982, Motorola invented a stereo method for AM systems and, for years, **864kHz** from France was transmitted using this mode. This was called Compatible Quadrature Amplitude (C-QUAM).

There were competing standards but C-QUAM won out in the end. This was chiefly because bodies such as the FCC in the USA insisted that any new system had to be compatible with older (simpler) envelope demodulators, which were used in most AM receivers at the time.

The C-QUAM standard was widely adopted but many receiver manufacturers decided against implementing the costly design.

Put very simply (and I am probably diluting the elegance of the system) the mono audio – left and right channels added together (L+R) – is transmitted as

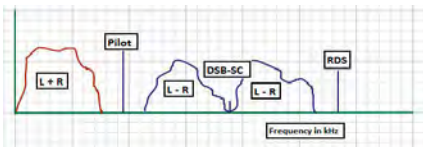

Fig. 1: The sum/difference signals of the left and right channels are carried at baseband and on a double- sideband suppressed carrier respectively.

Fig. 2: The DAB stereo and joint stereo decoders.

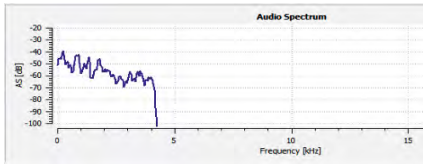

Fig. 3: The audio from Radio Kuwait, just as the *Dream* decoder 'locked'.

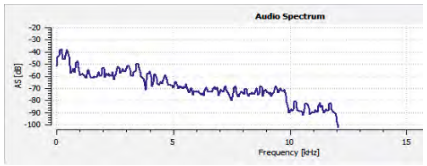

Fig. 4: The audio (see Fig. 3) a few seconds later, once the SBR information has been processed.

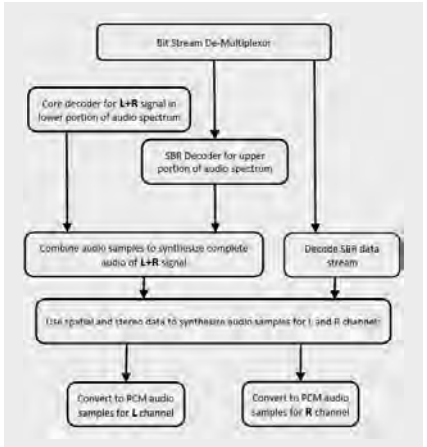

Fig. 5: The AAC decoder assembles the left and right channels in stages.

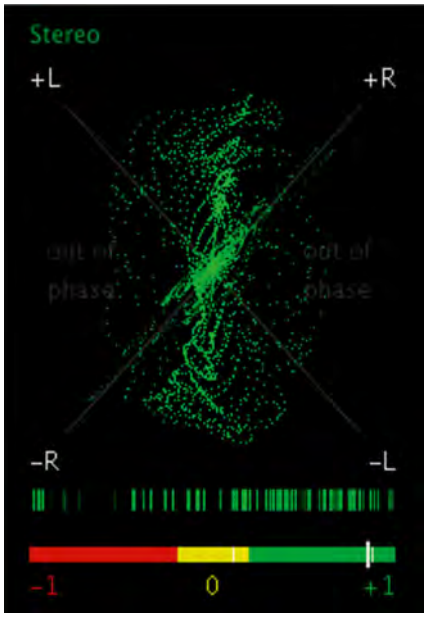

Fig. 6: The *MusicScope* manual shows the expected output from a stereo input.

Fig. 7: BBC Radio 3 broadcasting a piano solo. Maybe, there are few stereo effects.

Fig. 8: A portion of the same concert showing a similar vertical line, indicating few stereo effects.

normal.

The information from the *difference* between the two channels (L-R) is applied as a quadrature (90° out-of-phase) modulation to the transmitter carrier.

Early models of HD radios in the USA reportedly supported C-QUAM decoding, even though manufacturers never publicized the fact. Old-style AM will work on the same channel as an HDRadio system; in-band and on-channel. However, the C-QUAM stereo information is lost.

FM Stereo

The FM stereo system has to maintain compatibility with mono receivers and needs to transmit stereo audio. Here, the engineers came up with a system like C-QUAM: The sum signal (mono, L+R) and the difference signal (L-R) are multiplexed as shown in **Fig. 1**.

DAB MP2 Encoder

The MP2 encoder is a change from the usual solution to stereo, in that it can transmit the L and R signals as *separate* channels. BBC Radio 3 broadcasts in this stereo mode at a data rate of 192kb/s. All other stations using stereo have opted for the joint stereo mode.

The MP2 encoder splits the audio input of each channel into 32 sub-bands and the data samples are normalized or restricted to a tight range of values, using scale factors.

In stereo mode, the 32 sub-bands for the left and right channels are processed independently and transmitted separately.

In the joint stereo mode, some of the sub-bands are added together into a mono signal and sent with the scale factors for L and R to the receiver. This mode of stereo is a form of 'intensity' stereo known as joint stereo and, depending on the bit rate reduction, the required sub-bands 16 to 31, 12 to 31, 8 to 31 or even 4 to 31 are added together and sent as a mono signal.

This is based on the theory that, in the region of above about 2kHz, we get most stereo information from how loud the audio is (the *level difference*, see the previous section) rather than from the fine details in the timing (*time difference*) of the signal arriving at one or both our ears.

DAB MP2 Decoder

A much-simplified decoder for joint stereo transmissions is shown in **Fig. 2**. If stereo encoding is used, the joint stereo section is not enabled. The receiver's decoding process restores the original bit streams for left and right, by re-scaling the samples and reconstructing the sub-bands, to reproduce the PCM audio samples.

If joint stereo encoding has been used, the receiver processes those sub-bands separately and adds them into the left and right channel samples, to synthesize the original sub-bands, ahead of reproducing the Pulse Code Modulation (PCM) audio samples.

DAB+ Advance Audio Coding (AAC) Audio

Before we look at how AAC decodes the bit-stream, we need to know a little more about the processing techniques that AAC employs, to reduce data requirements as far as possible.

Spectral Band Replication (SBR)

SBR is clever stuff: The encoder analyses the upper and lower portions of the audio to find how well they mirror one another. Start by splitting the audio in two, 0 to 5 and 5 to 10 kHz, for example. Then, assume that the upper portion is a copy of the lower one.

Next, find where they are different and send just that information, rather than all the upper-frequency data.

It seems to work, and I can show you what happens, using a DRM signal that is slower to synchronize than a DAB one. In **Fig. 3** you can discern the audio from Radio Kuwait, just as the Dream decoder locked and **Fig. 4** shows the audio a few seconds later, once the SBR information was processed.

Parametric Stereo

AAC uses a different idea: It resembles the way Motorola engineers designed it into C-QUAM, to send the stereo information to the receiver. Parametric Stereo (PS) uses characteristics of the stereo effects, rather than sending either the left or right channel or some combination of the two.

The parameters are derived from the characteristics of the human ear. As mentioned earlier, for frequencies above 2kHz, the ear is pretty insensitive to the subtle phase differences between the left and right components of a stereo signal. This is akin to the ear's response to the timing differences exploited by the joint stereo feature in DAB.

AAC transmits spatial information by means of generating parameters for level differences, time differences and a new parameter called *coherence*.

The two input signals (left and right of

the stereo pair) are segmented into blocks of data, mainly to handle any transients and eliminate echoing effects.

AAC works using 64 audio sub-bands, whose bandwidth increases as the centre frequencies increase.

For each frequency band, three spatial parameters are calculated. I will use both the technical name and a simpler explanation.

First, Inter-channel Intensity Difference (IID) represents each sub-band as a *power ratio*. The IID is the *ratio of the power in the left channel to the power in the right channel*.

Second, Inter-channel Phase Difference (IPD) conceives of each sub-band as a *relative delay* between left and right channels.

Finally, Inter-channel Coherence (IC) for each sub-band represents the *degree of similarity of the left and right channels* and is used to regenerate source-width.

DAB+ AAC Decoder

The AAC decoder is shown in **Fig. 5**. Here, there are three separate bit-streams multiplexed together. The core AAC decoder extracts the mono, low-frequency, audio of the combined left and right channels, sometimes called 'mid stereo'. Side stereo is the difference between the left and right channels.

The first stage works to restore the high frequencies, using the SBR data.

This stage makes use of the parametric stereo data, to restore the stereo signal, left and right channels. Furthermore, it also extracts the spatial information, to re-synthesize the stereo image.

In Practice

All this theory is, no doubt, interesting. However, I wondered how it has been implemented in practice. I like to use a vectorscope as a way of checking how much of a stereo effect is reproduced at the receiver. I have used a handful of such tools over the years and have recently purchased a product called *MusicScope*.

Confusing Results

I am confused by what I can see on *MusicScope* and I wanted to compare the stereo images from FM, DAB and DAB+.

The Morphy Richards 27024 FM/DAB receiver has a line out socket that I connected to the line input of the PC. I will need to build an adapter to use the headphone output from my Pure radio to have a look at DAB+.

Fig. 6 is taken from the *MusicScope* manual. It shows exactly what I expected to see and that is the stereo image describing a kind of 'fuzzy circle', as the audio moves across the stereo width from left to right.

I compared BBC Radio 3 and BBC Radio 2 on FM and DAB as shown in **Figs. 7 to 10**. To my ear – and I would really welcome some feedback on this – both stations were almost in mono, with some stereo effects.

I also listened to BBC Radio 2 on my Technics tuner and the sound seemed to be exactly the same in both speakers when I used the balance control to switch between speakers.

The advantage is that the audio looks similar on FM and DAB. However, I am left wondering if there is something amiss in my measurements.

DAB+ Gaining Ground

More countries are now trying out DAB+, with Algeria, Greece and Ukraine starting trial services. Algeria has adopted DRM to replace AM and DAB+ to replace FM. The trial covers Algiers and relays four national channels. Greece has one multiplex covering Athens and operators are testing various bit rates in DAB+.

Licences should be issued this month, for both nationwide and local services.

In Ukraine, a single multiplex is planned to cover the capital Kiev and to carry up to 14 radio stations.

Raidió Teilifís Éireann Forward Plan

The Irish state broadcaster recently published its *Five-Year Plan.* The blueprint contained two interesting statements on radio.

First, the long wave service is to be replaced by a DAB service for UK listeners. I guess this might well be a DAB+ service on the Digital 2 multiplex.

Second, RTÉ did not see any need to expand DAB in Ireland beyond the four cities it covers at the moment. It also saw no need to use DAB to replace its FM network. It is unusual to find a country preferring analogue over digital. I think that Finland and Sweden hold similar views.

www.rte.ie/radio
https://tinyurl.com/yd492tq4

Welle.io and SDR-J

I have been comparing notes with **Bob Lee G8CQR** on the stability of both of these packages. Bob described the same behaviour as I experienced but then found that SDR-J worked well after a Windows 10 update.

I will undertake some more tests on both *Windows 7* and *Windows 10*. On a personal note, it was great to hear from Bob again, after some 30 years.

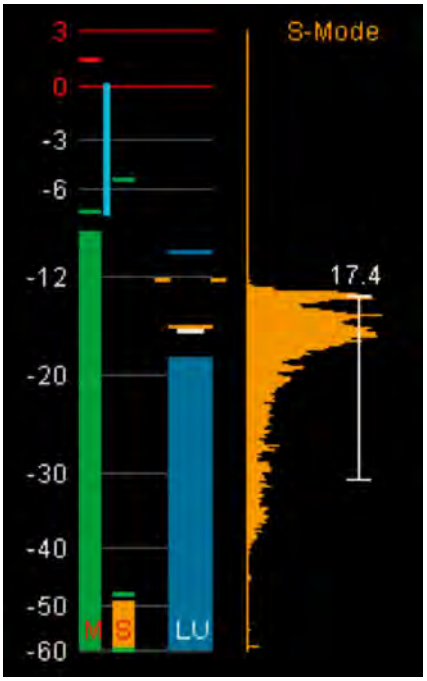

Fig. 9: A Blondie track, showing a peak on the M (mid stereo) bar that is the L+R portion of the signal.

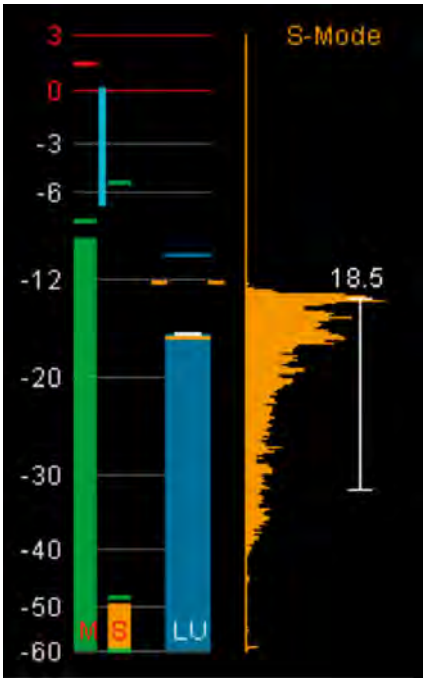

Fig. 10: The same track (see Fig. 9) on DAB, with the same peak on M and a much lower power on the S (side stereo L-R) indicating that the L and R audio must be very similar.

Next Month

In the next column, I will be devoting much of the column to some of the more interesting applications that Digital Radio Mondiale (DRM) has been put to in recent years.

I also hope to have more results from my stereo measurements on DAB, DAB+ and FM. ■

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Simon Parker examines development strategies, production processes, timelines and marketing imperatives in CB transceiver manufacture, addressing a large volume of readers' background queries in this area.

The Rise of the Clones and Market Conditions

This month's *Comms From Europe* is a little different. I have received an unusually high volume of messages across social media and by post. As a result of these, I have made many calls, sent e-mails and skyped people at all times of the night. All in the service of trying to find answers to some of your questions.

Radio can be complex as well as simple. Therefore, it is important for me to explain here (in as definitive a way as I can do) what the latest news is, in regard to CB transceiver factories, resellers and dealers.

I will focus here on why so many CB transceivers have become 'clones' and will try and get into the minds of the business planners and commercial strategists at the main manufacturers.

As you might imagine in this area, some of my contacts have been very forthcoming about future ideas and product development; some told me next to nothing and many were ambiguous about this hobby area.

Unlike in the highly-anticipated example of Apple's iPhone, the future of the CB radio hobby is more sudued, it seems.

Research and an Emerging Consensus

In terms of the overall state of CB radio, I have outlined this in previous columns. Now as then, I am basing my analysis on 40 years of experience of speaking with resellers and contacting factories as well as distributors.

Since the publication of the April issue of *RadioUser*, I have approached four equipment resellers, two large factories and three distributors in different countries. I asked them what their thoughts were, on the state of CB radio right now.

The consensus, which has emerged from this comes from exactly those people who make, design and resell you the equipment you are using or will be using in the next eight to twelve months.

In what follows, I am emphasizing four aspects; *market needs, cost considerations, innovation* and *time scales*. I am showing how these mechanisms inter-relate, using the example of what you might term the *Rise of the Clones* in the field of CB transceivers. I mentiuon certain technical features as examples for my points.

Market Needs: The Example of SSB

This is the area with a strong British voice. Overall, the belief is that there isn't any real need for many more SSB-equipped units unless they have some radically new and interesting features. Which they do not right now. By contrast, at the moment, this is truly a market of far too many 'identikit', cloned, lookalike-radios like the CRT6900, the AnyTone 5555, the CRT9900, the AnyTone 6666, the Alinco DR-135DX and the (now discontinued) CRE8900.

However, remember that, in this area, where development costs are routinely split among many companies, radios can be sold for a lower retail price overall.

By contrast, where transceivers like the President Grant II model are not sold under many different names but just one, development costs can be high because they are not normally shared.

Consequently, transceivers such as the one just named come at a higher price. However, the President brand seems to generally be a little more expensive.

However, when a Grant II transceiver is released at £250, many will, inevitably,

comment that a model from AnyTone, for instance, is much cheaper! This is true.

However, the more similar models become, the cheaper they are and the more cheaply they are sold. Sadly, this is frequently happening in 'Walmart style': 'Pile 'em high and sell 'em cheap'.

Cost Considerations: Modes and Cloning

CB transceivers equipped with both AM and FM are, without doubt, the biggest sellers worldwide. Like in the case of SSB capability (see previous section) many radios are 'identikit-clones', all based on the same or very similar designs.

For example, the President Barry, Andy, Andy USA and Seven-Colour Barry models all share the same shell, front display, plastics and heatsink at the back. Therefore, production costs are lower than in the alternative case of each of those being developed as individual units.

Add to this, for instance, the Anytone Smart and Mini series, which come under the names of Opti, Avanti, Team, Merx (and many others). Here, once again, multiple companies invest in start-up costs.

This means tooling costs can be recovered much quicker, rendering the units cheaper at the factory.

It comes down to simple economics.

Remember too that you can make 1,000 pieces of an AM/FM transceiver in a 10-hour factory shift as well as 250 of them with SSB. These figures come from a factory in Thailand. However, I can guess that these matters will be very similar in China, Malaysia and elsewhere.

Innovation: Detachable Fronts and 'Mini' Radios

Many of you have asked me about these two developments, in particular. However, the market does not seem quite ready for those. Cost is less of a reason here, it seems, and customer preferences come to the fore more strongly; and customer choice and manufacturers' willingness to invest are, of course, interrelated.

It is commonly known that the former changes all the time. Maybe, some future customers will realise that detachable fronts could be useful for new cars to camouflage other radio equipment (!)

The (so-called) 'mini-radios' are, perhaps, another case in point. Their ongoing development, it seems to me, is a good opportunity for innovation and improvement because many users have complained about the problems with brittle connectors, weak microphone sockets and so on, on their bigger cousins.

However, innovation and the chance to improve can also go in the wrong direction: I have recently seen a factory video about a planned new transceiver. The new kit was a simple AM/FM multi-norm device. It was envisaged to make this (in export mode) in such a way as to cover 24 to 30MHz and offering 30W of power.

I don't think anybody has signed up for this particular development as yet. It does seem to me, though, that the idea of having 24 to 30MHz in AM/FM is wide off the mark and quite unwarranted. What do you think?

Timelines and Planning

The market for radios and CB transceivers is getting bigger – of this, there is no doubt. Moreover, in general, customers are getting more discerning about what it is that they want.

In the UK, the ideal situation is to make everything possible technically and to retain a low price at the same time. In the cases of some transceivers, this is, indeed, possible; in most cases, it is not.

The time from the arrival of the initial 3D SimLab drawing, to the point when a transceiver arrives for a first look at a company's premises, is at least four to seven months.

After this, makers still have the debugging and conformity testing to perform.

From this point on, the unit, known as *Radio 1*, is kept behind, to test the production pieces against. It thus sits on the sidelines, while the makers need to acquire components, get fronts manufactured and set up the lines ready for a small run of 50 to 100 pieces. These will be made to test whether all is well with the line.

Additional Effort

The radios from this small run are then sent to Europe, where they are all tested against the initial *Radio 1* to make sure that all pieces are the same, there are no component tolerance issues and the products do what they are supposed to do.

This in itself is expensive, given, for example, the sometimes higher hourly rates of pay of European engineers.

Therefore, developers have some very significant payments going out and not a lot coming back to them at this stage.

Now, imagine that a firm is nine to ten months into a project. They can now 'sign off' on a new transceiver and it can be mass-produced.

All factories have 'windows of production' and developers will tell you when the transceiver will be made.

For instance, in the case of an AM/FM transceiver, the making of 5,000 pieces takes five days.

Following this, firms must arrange transportation for the completed transceivers. In some areas of Europe, you can choose four weeks by sea of two by air.

This means that companies face customs and import duties and taxes, further shipment to businesses and renewed testing. Following this, your transceivers need, at last, to be packaged and sent to dealers, to be featured at radio rallies, online and instore.

An Investment of Time and Money

Add all this up and you have invested a minimum of one year into the project and paid for hours of labour, shipping, duties and taxes and sales staff salaries.

Only after this can makers start to look into sales and at making a profit. That's why transceivers cost what they do.

Not all of them can come at £49, when the amount of money invested into them is running into the thousands of pounds.

Nobody writes to Icom and Yaesu, telling them the price is too much; they buy the radios!

However, in the area of CB, people believe that everything has to be cheap because it is supposedly cheap to manufacture. However, this thinking is wrong.

Maybe, some will never understand that everything comes at a cost; possibly, some will understand and move forward. Spend too little on thinking, testing, engineers and design and you get a far less reliable product than when you invest the 'right' amount of time and energy.

So, as per usual, the old adage is right: You get what you have paid for.

Summary

There you have it. I deliberately spent some time on these economic background details this month because so many of you have asked me to explain a little more of the development processes and pricing mechanisms in CB radio. I hope I have been able to make things clearer. Please write to me with your views.

All of this notwithstanding, I do hope to see more interesting radios and new features in the course of this year. Alas, at present, these seem about as far off as good DX conditions. I'll keep you posted.

Wishing you all a great month ahead and I hope I have addressed the questions you have sent me over the last few months, in your letters and messages. Till next time, 73 **Simon**

Oscar the Engineer
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Oscar the Engineer departs from his usual format, testing a new DAB radio and discussing some views on DAB from the free radio community. He then covers Laser and Love Sport

The Free Radio Column

This month, I include a brief look at a new budget radio receiver. As a free radio enthusiast, I have always found myself rather reluctant to embrace DAB as a form of radio broadcasting and – judging by the things that people say to me – it would appear that many others feel the same as I do on this matter.

The impression many free radio 'anoraks' have is that, with the DAB mode, the authorities tried to force us down a road against both our instincts and wishes.

Furthermore, this was done, many now feel, with an unwise urgency. It has meant that the standards adopted as 'default' were inferior on a technical level, compared to how things could have been, if those responsible had taken a little more time with the development processes.

The key claim from the DAB industry has long been that the DAB format would bring 'improved audio quality', when compared to analogue modulation systems, along with a much broader and more diverse choice of programming.

This has proved to be only partially true.

Many people in free radio circles continue to believe that the radio authorities were all too eager to steer things in this direction because it gave them greater control and power.

The main concern is that decision-makers will subsequently shut down broadcasting via AM and even FM, along the lines of the recent example of Norway.

The current announcement by the BBC, on a 'hybrid' radio future, has only partly allayed these fears.

I would comment that, as radio enthusiasts, I think that we must, naturally, welcome new platforms and technologies.

However, I believe that we should also insist on the more 'traditional' methods of transmission to continue.

The frequencies and bands we have been using for long should, above all, be kept clear of noise from sub-standard electronic devices and they ought to be populated with stations broadcasting programmes people want to hear.

Temptation Strikes

Most radio stations from around the world can be received online these days. I have enjoyed listening to this form of broadcasting for some years, along with tuning in to short and medium wave and VHF Band 2 stations.

Consequently, I have never really experienced any strong desire to purchase a receiver with DAB capabilities. Occasionally, there have been moments when I have thought that it might be nice, for example, to be able to listen to the new talkRADIO, without needing to use an internet connection. This station is an example of a broadcaster that is not available on any of the analogue bands.

Generally speaking though, I am aware of what is on offer in my area on DAB.

OSCAR THE ENGINEER

Fig.1: The Reka-branded DAB radio from Aldi.

Nevertheless, considering my aforementioned reservations, I have never really felt that I am 'missing out' very much, except, perhaps, for the occasional 'scan' of the band, merely out of curiosity as a general radio enthusiast.

Therefore, I actually surprised myself a little bit just the other day, when I found myself tempted by the sight of a shiny new DAB and FM radio receiver on offer in a glass display cabinet in a store not too far from my home.

First Look

I heard (on the radio) that Aldi has recently been voted the nation's 'favourite supermarket' and I must say it is a place that I do enjoy visiting. The stores sometimes offer interesting nonfood items, including electronic gadgets.

In this context, a new DAB and FM receiver caught my eye. The price tag seemed very appealing at £19.99, marked down from an original £35.00. The unit was available in black or white and had the appearance and style of a small table-top receiver you might see in a shack. It might also be suitable as a bedside or kitchen radio.

Well, to cut a long story short, I eventually 'took the plunge' and bought one of these radios. It is branded as *Reka* (**Fig. 1**).
www.aldi.co.uk/search?text=dab

The radio does not have any facilities for battery operation but comes with an external mains power supply, which delivers the required 5V at 2 amps. This connects via a socket at the rear. Other rear sockets are for headphones and auxiliary input.

I felt the power lead was a bit short. However, this is the sort of thing that is easy to remedy.

The aerial, also at the rear, was just a piece of flexible wire, about 30in long, sticking out of the case. I believe that, perhaps, a

telescopic rod antenna would have been very useful for this radio.

Alternatively, the manufacturers could have included an external antenna connector. I suppose there is some significant scope for some DIY modifications on this score, if someone felt so inclined.

The unit stands on four feet, with a sub-woofer cavity at the bottom. The main speakers are on the front panel, along with the dial. This can be pushed for 'on/off' and 'standby' functions and also offers the rotary volume control.

The multi-function display, including scrolling RDS, is also located on the front, in a central position.

Buttons and DAB+ Capability

Along the top of the radio, there is a bank of eleven buttons. These are used to control most of the functions, including tasks like snooze, alarm and a dimmer for the display.

One button switches between the four alternatives: *DAB, FM, Bluetooth* and *Auxiliary*. Another button initiates scans for stations.

I have many other, more sophisticated, radios I use for FM. Therefore, I was mostly interested in receiving DAB signals on this receiver.

My initial scan of this band detected more than 90 stations in the frequency range between 174 and 240MHz. Many of these are also transmitting in the analogue mode and some are DAB-only.

The latter ones include talkradio, which was coming through with reasonable audio quality (at a bit-rate of 64kbps).

There was also Cyber Hot Hits, a station I have written about several times in this column in the past.

Interestingly, this station broadcasts in DAB+ (rather than in the original, more 'basic', DAB). I was pleased to see that this receiver also resolves DAB+ because I know that some radios do not.

The bit-rate on this station is a mere 32kbps but the audio quality is superior because of the mp4 digital codec (encoding and decoding) system used by DAB+.

Only a few stations are using this because the mp2 DAB standard was officially adopted by the authorities.

Tuning and Other Settings

Once my initial scan had completed, I was able to use the two tuning buttons to navigate in either direction through all available stations. I used a second button to select the station I wanted.

This mechanism was also used for many of the other functions and settings. The full list of available stations was rather long and there was the facility to store and access up to ten personal presets on DAB and a further ten FM band favourites. Some might consider this too few; for me, however, this was enough.

The issue here is that – when you are stabbing at buttons in order to look through your options – you want to minimise the number of presses you have to do each time. To be honest, I think it might have been better to have a rotary-push dial for this.

After all, self-respecting 'anoraks' know that the tuning of a radio should always be done by a knob - or should it? Let me know what you think about the more modern tuning methods.

Having read the instruction booklet, I soon learnt that the volume dial might also be able to control other functions. However, I did not explore this further. Other useful controls included the Info button. Pressing this, cycled through various items of information, displayed below the station name. In DAB mode, these included frequency and audio bit-rate as well as signal strength and signal error rate.

These two latter indicators can assist with antenna positioning and are the sort of thing a radio enthusiast will often like to refer to.

The Menu button gave access to the system settings, navigated and selected with the *Tune* and *Select* buttons. One of the most useful functions is the equaliser or tone control. With this, you can choose from six presets, which are theoretically optimised for specific types of programmes. These are labelled *Normal, Classic, Jazz, Pop, Rock* and *Speech*. You also have a seventh option with *Loudness, Treble* and *Bass* settings, independently customisable.

The audio quality of the unit was good. It was especially practical to be able to adjust things according to one's personal taste and to take account of the acoustics of one's room and surroundings.

This was never intended to be an extensive review. However, I thought I would share my observations with you, having had the unit for a few days and tinkered around with it a bit to see what it does.

All in all, I would have to say that it has proved to be a most satisfactory purchase at a very reasonable price.

Charlie Wolf On 558 kHz

Charlie Wolf was one of the most outstanding and memorable DJs on one of the most excellent and unforgettable offshore pirate radio stations ever. *Laser* – from the MV Communicator, in the international waters of the North Sea – was a phenomenal success indeed, with listening audiences peaking in the 1980s.
www.offshoreradiomuseum.co.uk/page371.html

Many free radio enthusiasts will remember how it all sounded, including the drama of the 'Euro-siege', when the ship was under surveillance by a UK government vessel. Since that time, Charlie made numerous appearances as a presenter and commentator on other radio stations because he always had interesting things to say.

LOVE SPORT Radio

Therefore, it was good to discover that Charlie is now a regular presenter on a brand-new station called LOVE SPORT Radio, which coincidentally, broadcasts on **558KHz**, on DAB and online:
https://lovesportradio.com

The other day, I was listening to him speaking about how it felt sentimental to be back broadcasting on his original frequency again. Laser was his first 'radio-gig', after moving to the UK from the USA.

LOVE SPORT Radio has taken over the AM transmission facility at Crystal Palace, previously used by Spectrum Radio.

It has a wonderfully quirky, steep, slant-wire antenna up the side of the enormous TV transmission tower. The signal gets out very well and, even though it is intended just for London, it can be received further afield.

The station has backing from some well-respected figures from the sporting world and is run by **Kelvin MacKenzie**, who has held senior management roles in newspaper publishing and radio in the past. This included a stint in charge at talkSPORT.

Earlier reports had suggested that they were planning two new stations; one carrying sports and another one offering a general talk format. These were intended to be branded as 'CitiSport' and 'CitiTalk'. However, some expressed concern that there might be confusion with City Talk 105.9 FM in Liverpool and it was announced that the name used instead would be 'LOVE SPORT'.

The station began broadcasting, with a 'soft launch', in early March 2018. It has just the one outlet, which carries some sports talk and some general talk programmes. It remains to be seen if this will, at a later stage, be re-organised into two separate stations.

Some may say that it is sounding a little 'unpolished, and I cannot argue with that. However, I do applaud those responsible at the station for getting on the air and developing things 'on-the-fly', rather than trying to have everything fully decided upon before launching.

I am not a sports fan but will certainly be monitoring the general chat shows and my observations and opinions will be among the topics that I plan to talk more on over the forthcoming summer months.

Chrissy Brand
4 Cavendish House
Warrior Square
St. Leonards-on-Sea TN37 6BJ
E-mail: chrissyLB@hotmail.co.uk

Chrissy Brand scratches the surface of number stations, dishes up some readers' tips and homes in on some highly-recommended cultural and comedy podcasts.

GOOGLE MAPS

Fig. 1: Offices of the OLX Czech number station.

Number Stations & Phantasmagorical Radio Blends

It's good to see that the murky world of number stations is further illuminated in this month's issue. This subject fascinates me, and I have written about it before (see the links later in this article).

Two years ago, I was flattered to be asked by a Hollywood casting director to undertake an audition for a television series about number stations. *National Geographic TV* in the USA was planning to investigate this phenomenon.

The project was also intended to be a travel series, comprising of a team of a code breaker/mathematician, an explorer and someone who knew about the radio side of the subject.

I felt that the project was, perhaps, overly ambitious; tracking down number stations to their transmitting sites was going to be tricky at the best of times. It would be even more hazardous for a TV crew to (legitimately) gain access to certain countries whose intelligence services operate numbers stations, such as Israel, North Korea and Cuba.

I am sure that plenty of explanation and exaggeration would have been required, emphasising the 'travel' and 'tourism' aspects of this project.

In the end, I was told that funding was available. However, I have yet to read about the series being made.

I would have jumped at the opportunity, had I been chosen to co-present the TV series. However, the thought of meeting a fate similar to that of the 12 British plane spotters in Greece in 2001 did cross my mind.

http://news.bbc.co.uk/1/hi/uk/1697862.stm

Were it down to me, I would have started the series in Cyprus and the Czech Republic. The *Lincolnshire Poacher* number station, operated by MI6, was tracked to Cyprus.

In recent years, Czech number station OLX (which, bizarrely, even issued a QSL card!) was tracked to Prague (**Fig. 1**). To me, this is proof that these number stations do exist.

https://tinyurl.com/af4qo75
https://tinyurl.com/yd79rolz
https://tinyurl.com/yc26saq3

John Walters produced a report for the BBC One Programme *Here and Now,* over twenty years ago, in April 1997. The most interesting quote in it came from ex-KGB station chief **Oleg Gordieiski**, who explained what the Cold War era coded messages usually contained. He said, "*The messages are a mixture of professional instruction, what to do next and some personal messages from children, parents and friends. For example, Mr Gorbalov, next week please go to Vienna and use dead letterbox number 13. You will find $8,000. It is your salary for the next month and the rest [is] for your operational expenses*."

You can read a two-part article on numbers stations that I wrote way back in 2001, on my radio blog.

https://tinyurl.com/y7cq9hyf
https://tinyurl.com/ycjc5v8x

Readers' Tips

Regular *RadioUser* correspondent **Bradley Allen** wanted to know more about an American DJ called **Richard Bell**, who presented a radio programme called *Chestnut Cabaret*. *Chestnut Cabaret* was a nightclub in Philadelphia, open from 1975 to 2013 (by which time it was renamed *The Blockley*). Many famous western musicians played there, including **Nick Cave**, **Debbie Harry**, **Rory Gallagher** and The Fall. Philly radio station The Key covered the club's closure in 2013 and is also a radio station I enjoy listening to, playing a lot of local music.

However, I cannot find any information on Richard Bell. Maybe *RadioUser* readers can help Bradley with this one?

https://en.wikipedia.org/wiki/Chestnut_Cabaret
http://thekey.xpn.org

CHRISSY BRAND

Fig. 2: LOVE SPORT Radio launched online and on 558kHz in March 2018.

Bradley also recommended what is billed as the UK's first radio station for tradespeople, Fix Radio.

It started last year and can be heard online, as well as on DAB in London. I'd be intrigued to know what its audience figures are. The station states that it is dedicated, "*to 'working class heroes' - the tens of thousands of tradespeople working on sites and in people's homes. We're for builders, carpenters, electricians, plumbers, roofers, painters, decorators, scaffolders - in fact, anyone who makes their living in the trade. You'll love what we do - we play a massive variety of upbeat music from the 70s, 80s, 90s, 00s and today and there's loads of fun and banter from our cheeky DJs!*"

www.fixradio.co.uk

Workers in the capital are certainly well catered for on the radio dial. Along with Fix Radio, old-timers talkSPORT and talkSPORT 2, there is now a new medium wave station: LOVE SPORT Radio has taken over the **558kHz** slot vacated by Spectrum Radio. The team of presenters are mostly former athletes but there are also a couple of politicians and activists like Tory **Jerry Hayes** and libertarian **Claire Fox**.

Former LBC overnight presenter **Cristos Foufas** is also on the team (**Fig. 2**).

www.lovesportradio.com

[*see also* ***Oscar the Engineer's*** *column in this issue - **Ed**.*]

Graham Smith wrote that, while looking through the links at the bottom of the Al Jazeera English website, he came across an interesting venture called *Jetty* (**Fig. 3**). This initiative connects "*listeners around the world with podcasts that are engaging, challenging and consequential.*" Graham also noticed that Al Jazeera now has a Chinese website. Therefore, you can now get the news from *Bàndǎo Diànshìtái* (Chinese for: 'Al Jazeera Television').

www.jetty.fm

http://chinese.aljazeera.net

Graham also offered advice on short wave. He mentioned two websites, probably aiming at beginners but linking to other pages with more detailed information: The Radio and Television Investigation Service (**Fig. 4**) and the BBC.

https://tinyurl.com/y8jgvjpy

https://tinyurl.com/y999hygq

Moreover, Graham spotted a thought-provoking blog post claiming that foreign stations will eventually be allowed to broadcast on British DAB+. The Radio NL (Netherlands) page stated (in Dutch) that Irish stations would be first and that others would surely follow. Graham added, "*If this happens, it might be worth buying a digital radio*."

I imagine that the vast majority of *RadioUser* readers already own a digital radio or two, along with analogue receivers and transceivers. Do you?

More generally, I do agree that broadcasting a better variety of quality stations and more interesting programming through the UK's DAB multiplexes is a task that seems long overdue.

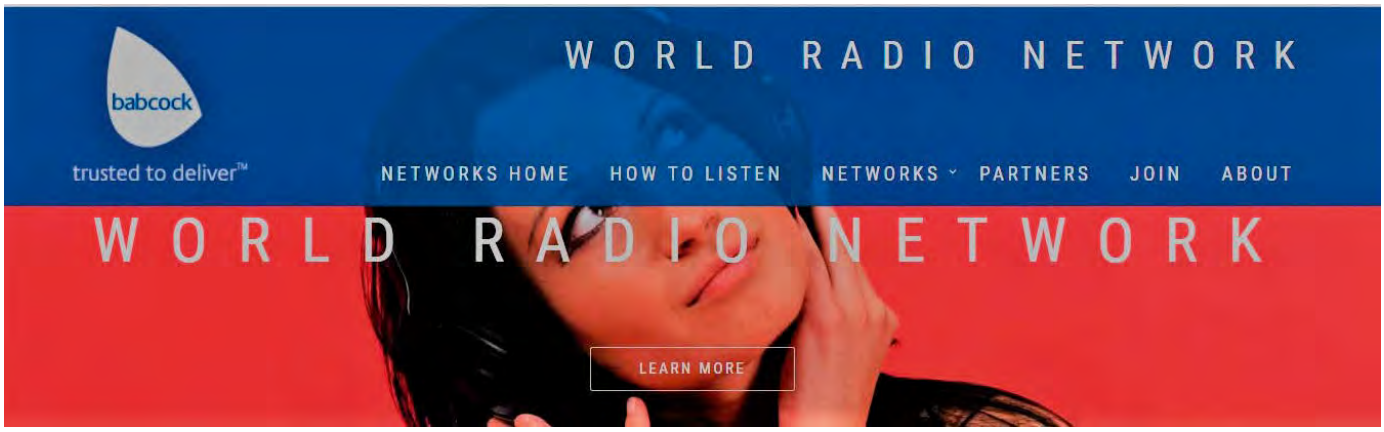
CHRISSY BRAND

Fig. 3: Jetty, podcasts in English by Al Jazeera.

CHRISSY BRAND

Fig. 4: The Radio & Television Investigation Service.

I have previously advocated that, as a starting point, the World Radio Network (**Fig. 5**) should be allocated a national channel on DAB. Its rebroadcasting of many short wave and other stations in English would surely engage audiences, who are hitherto unaware of anything beyond commercial radio and the BBC. The WRN, according to its website, is "*a unique radio service bringing together programmes from the world's leading international public broadcasters. World*



CHRISSY BRAND

Fig. 5: Should the World Radio Network be on DAB?

Radio Network majors on news and culture - national, regional and international - and because the programmes on World Radio Network come directly from the source, our coverage is unrivalled."
https://tinyurl.com/y9v3tvoo
http://babcock.media/world-radio-network
https://tinyurl.com/yb3m8blb

Bob Houlston G4PVB enjoyed an item by **Diana Eng** at *Make Magazine*. Diana wrote, *"My favourite ham activity is making contacts via satellites. Not only is there the romantic notion of sending messages into outer space but you have to trace the orbit of the satellite with your antenna while tuning the radio, to compensate for the Doppler effect ...*

"The following instructions will get you started listening to birds (satellites) on FM, which can be done with a simple VHF/UHF FM radio with a whip antenna, without the need of a ham license…"

Diana goes on to explain how to achieve satellite reception for the SWL. She is also a fashion and technology enthusiast. You can find a number of articles she has contributed online.
https://makezine.com/author/dianaeng

Online Stations

Stations I have enjoyed over the past month include Cornucopia Radio, based in Sheffield (**Fig. 6**). Since 2008, this station has produced a range of drama, comedy news and music shows. I recently became hooked on *Pod to Pluto,* a science-fiction comedy.
www.cornucopia-radio.co.uk

Probably one of my favourite online programmes is *The Paris Review Podcast*. Like Cornucopia Radio, it is available on a host of platforms, including Stitcher and Google Play.

The website, like the programme content, is very elegant and stylish. Audio material consists of, "*an audio odyssey through the life and times of* The Paris Review*, featuring a phantasmagorical blend of classic stories and poems; interviews with the likes of* ***James Baldwin, Jack Kerouac*** and ***Dorothy Parker****; and new work and original readings by the cutting-edge writers of our time."*

There is lots of atmospheric audio

CHRISSY BRAND

Fig. 6: Cornucopia Radio has produced drama and comedy for the past ten years.

there, evoking the spirit of past US radio as well as looking at radio now. I find *The Paris Review Podcast* a wonderful background accompaniment, as I potter around my flat on a grey day.
www.theparisreview.org/podcast

[(1) As regards number stations, you can read the article by ***HJ Hagermann****, elsewhere in this issue – (2) A review of* Shadows of the State*, by Lewis Bush, was provided by David Harris in* RadioUser*, April 2018: 34 –* ***Ed****].*

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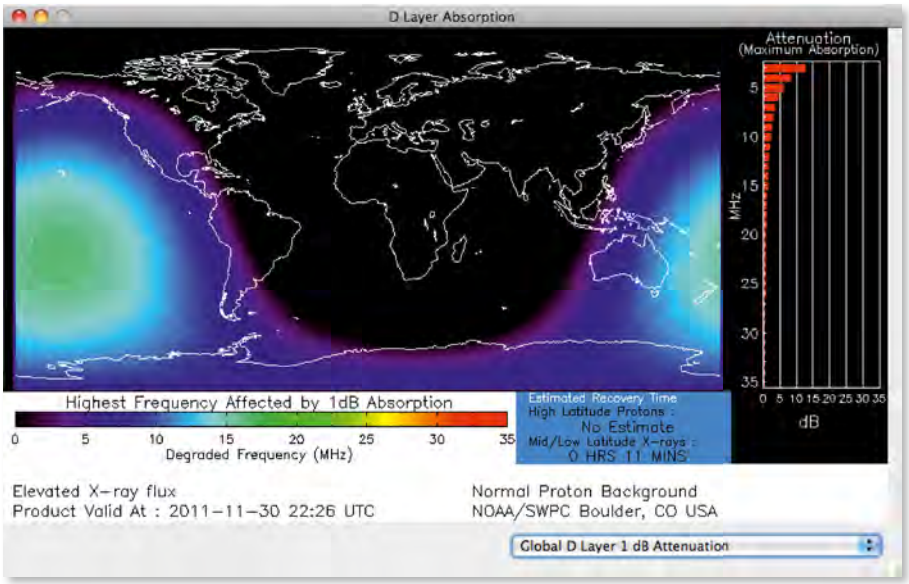
This month's 'digtal treasure-chest' is brim-full of programs you can use to develop your hobby activities, from overlay-mapping and Bayesian algorithms to impedance-matching, contesting and propagation monitoring.

Space Weather Prediction, Match-Making, Controlling

Each month, QSP73 Services offers a wide-ranging compilation of software exclusively for *RadioUser* readers. Many readers use a PC, laptop or tablet computer with their listening hobby. Therefore, QSP73 Services searches on a regular basis for new releases of the latest public domain, freeware, donationware and shareware hobby radio computer programs and apps to include in this column.

This month's collection is supplied on four 4.7GB data DVDs for your PC's DVD reader. The collection also includes the main headline software titles from the December 2017 to February 2018 *Software Spot* collections and programs from earlier issues, to give you more packages to evaluate, install, trial and use. Here is an overview of what is included in this month's collection:



DX Toolbox

DX Toolbox

This is a short wave, amateur radio and HF radio propagation monitoring program. DX Toolbox searches the web for you, gathering information on solar and geomagnetic conditions that affect radio propagation. It also features several propagation forecasting tools, allowing you to quickly and easily estimate HF propagation conditions between any two locations in the world. It is ideal for amateur radio operators, short wave listeners and other radio enthusiasts.

Global Overlay Mapper

This shareware program, from **EI8IC**, has been updated with all the latest prefixes, countries, and IOTA entities. A common problem with any map – whether stored in printed form or on your computer – is that there is either too little or too much information displayed. Overlay Mapping keeps everyone happy, by providing flexibility in the way a map is displayed, while displaying every item of data to its best advantage.

An Overlay Map has a number of layers ('overlays'). These can be turned on and off as required. Not only can you choose how much information you want on the screen at any one time, you can also choose which order the layers are displayed in. Overlay Mapping thus gives you exciting new possibilities never available in a fixed or printed map. Global Overlay Mapper is packaged in a single file, with a total size of about 22MB.

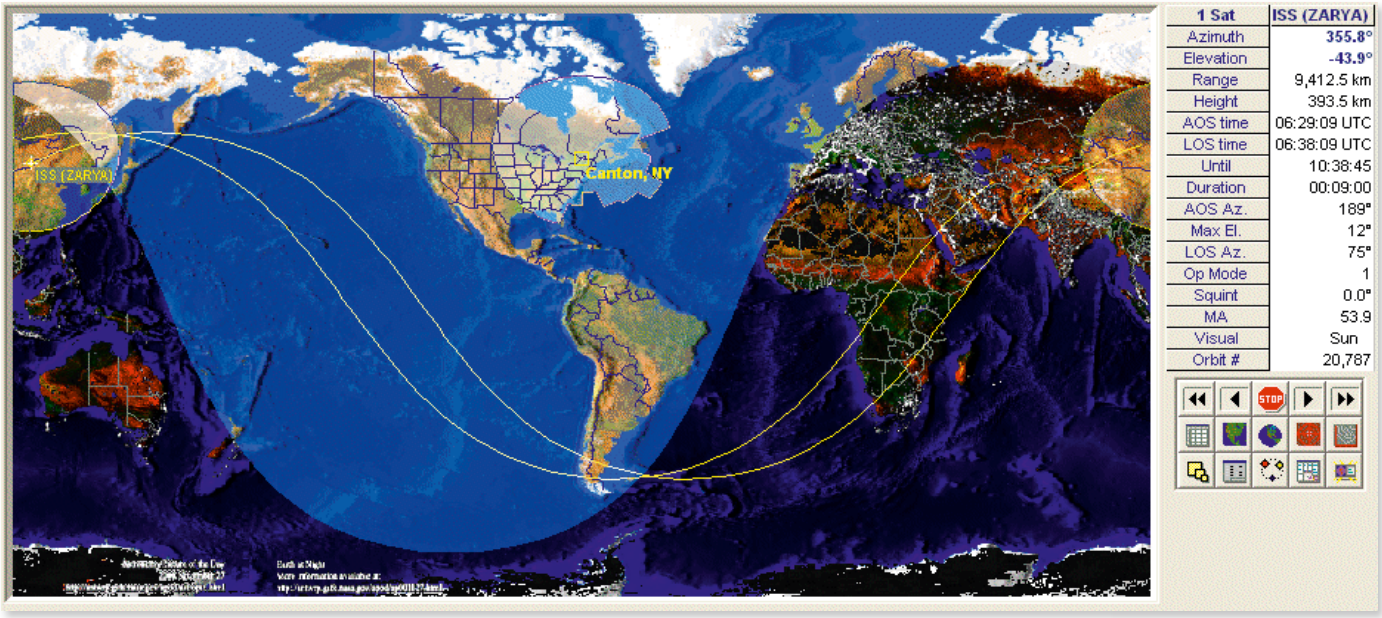
GRITTY

GRITTY is a freeware RTTY decoding program, based on the technology developed for the *RTTY Skimmer Server* project. This is not a skimmer, it decodes a single signal in the 3kHz bandwidth audio coming from the transceiver via a sound card, just like any other RTTY program. However, the decoding algorithm in GRITTY is based on the methods of Bayesian Statistics. This results in a better decoding accuracy than other algorithms, created by the trial and error method, typically achieve. In the Bayesian framework, all information is represented in the form of probabilities. In particular, the Bayesian decoder computes not only the 5-bit Baudot codes but also the probability of error in each of the bits.

IonoProbe

IonoProbe is a space weather analysis program for amateur radio. It monitors the key space weather indices and helps you understand what they mean. It resides in the system tray and monitors the space weather parameters that are essential for HF radio. The list of parameters includes SSN/SFI, Ap/Kp, X-ray/Proton flux, and auroral activity.

IonoProbe downloads near real-time satellite and ground station data, stores information for future use and displays it in a user-friendly way. Time-critical parameters, such as X-ray flux, proton flux



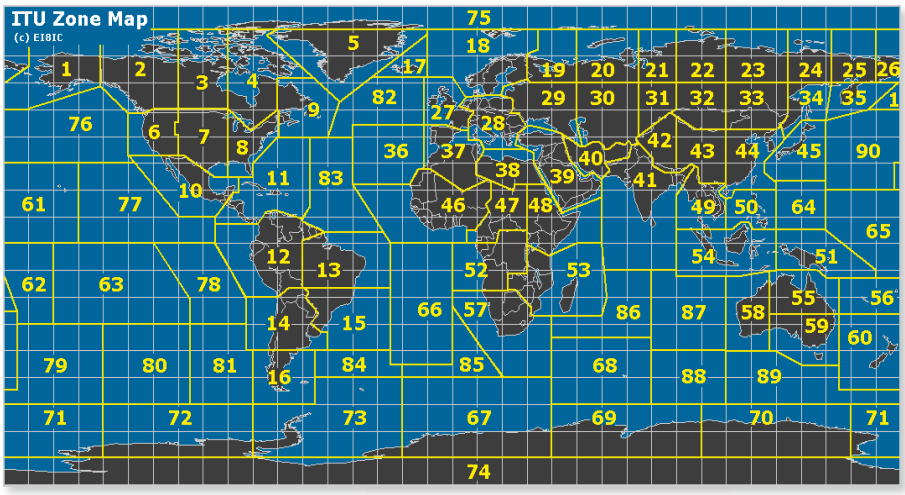
NOVA

and auroral index, are updated every 15 minutes. An alarm can be set up to notify you of a storm, within a few minutes after its start. The program integrates with DX Atlas and Ham CAP, both of which have been included in past collections.

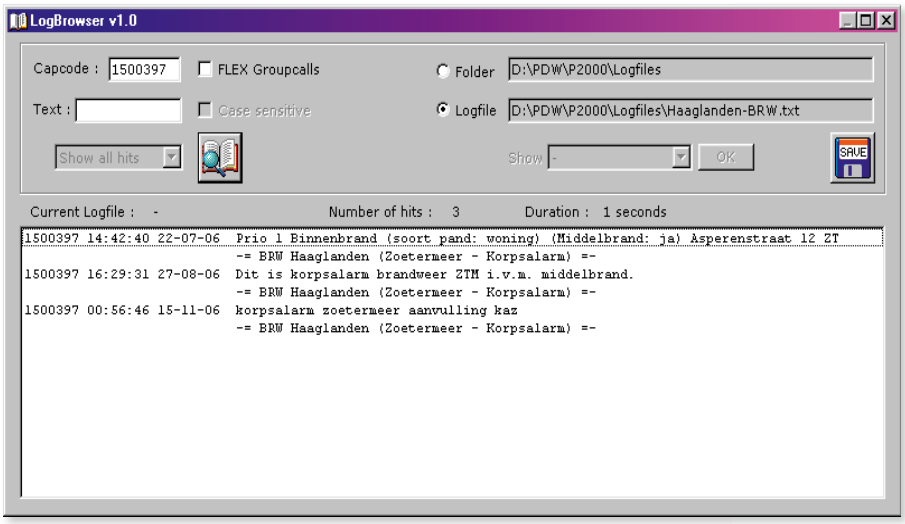
Log4OM

This is a simple multi-profile system that allows you to have different callsigns, different operative situations such as home, portable, contest call and club call, each with its own internal and external configuration. As an example, your QSO will be sent to the right eQSL account, if you are a subscriber. No action is required by you. The software will notify you, when you are away from your shack, that that long-awaited expedition has been spotted on the cluster and is ready to be worked. Log4OM saves operator effort and time by retrieving award and SOTA references from cluster spots, adding them to your QSO automatically.

Digital mode software, such as Fldigi, is fully integrated with Log4OM and, along with JT65 and JT-Alert, users are able to interact natively with the Log4OM database. The program is compatible with Windows XP SP3, Windows Vista, Windows 7, Windows 8/8.1 and Windows 10 and has been successfully tested on tablet devices running Windows 8.1. The 21.8MB program includes English manuals.



Global Overlay Mapper



PDW LogBrowser v1.0

MatchMaker

Matchmaker is an RF impedance-matching software, designed to make your radio fall in love with your antenna all over again. Using it, you can find the optimum match for your antenna and radio and instantly see the effects of various matching techniques. These include series capacitor, series inductor, shunt capacitor, shunt inductor, transmission line, open stub transmission line, shorted stub transmission line, open series transmission line and shorted series transmission line.

The impedance or admittance of each point is plotted on a chart and, as you apply matching techniques, MatchMaker determines the effect on each point, updating the chart and allowing you to adjust the parameters for that 'optimum' match.

Also included, from the past three months of featured software collections, are the following digital tools and programs:

AAVoice
Capacitor Values
Contact-Multi
CwGet and DSP Filter
CWtbk
DX Atlas
EchoFilter
ERP Calculator
ExpressPCB Free PCB Design Software
EZ QRA Locator
FT Series SuperControl Collection
FT-817 Commander
FTBasicMMO
GRITTY
HamAlyzer
IP-Sound
KLog
Kontest
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QTMM
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VX6 Commander
VX7 Commander
WinWarbler
WkdLog

How to order your DVD collection:
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By post: To order the **May 2018 Software Collection**, which also includes the main featured software from the past three months' compilations, send the original corner flash (the small coloured rectangle at the bottom corner of the first page of this feature) along with your name and address and either UK £5.00 note or a cheque or Postal Order for £5.00 (payable to QSP73 Services) to **May 2018 Software Offer**, **QSP73 Services, 58 Kingfisher Drive, Whitby YO22 4DY, United Kingdom**.
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QSP73 Services runs this service on behalf of *RadioUser*. Therefore, please do not contact magazine staff regarding this service because they will not be able to help you. Queries should be made to the QSP73 Services postal address, via e-mail to **software@qsp73.co.uk** or by phone to **+44 (0)1772 978229** (evenings/weekends).
All the software is offered in good faith as freeware, shareware, donationware or public domain software. You are not 'paying for' or 'buying' the software. QSP73 Services provides distribution services only and some software might have limited functionality until it has been fully registered.

MixW

This release of this popular station control program is easy to use and fun! MixW is a multi-mode, multi-functional, software for every-day logging and contesting. It has many useful features that make your QSO logging process almost a 100% automatic procedure. MixW for digital modes may also be used without TNC. The requirements are a computer running MS Windows, with a compatible sound card. This latest version adds PC control support for new transceivers such as the Yaesu FT-991, FT (DX)-1200, FT (DX)-3000, Icom IC-7100, IC-7300, IC-7410 and IC-7851. There are new panel function keys, a revised log bar and access to the online QRZ.com logbook.

Nova

Nova is a popular satellite-tracking program, providing fast and accurate, real-time, tracking information for an unlimited number of Earth-orbiting satellites. It provides full-colour 3-D maps, built-in auto-tracking for controlling azimuth/ elevation antenna systems, joystick control and one-click updating of Keplerian elements via the internet This software can be completely automated to deliver scheduled updates. There are sound alarms for satellite acquisition of signal, time of closest approach and loss of signal parameters. The program can track the moon, sun, planets, cosmic noise sources and cold sky. It can display a star background as well.

Orbitron

A freeware satellite tracking system for amateur radio and observing purposes, described as one of the easiest and most powerful satellite trackers, according to opinions of thousands of users from all over the world. This software is used by weather professionals, satellite communication users and astronomers. The application shows the positions of satellites at any given moment in real or simulated time, along with rotator and radio control. It features NORAD SGP4/SDP4 prediction models. A total of 20,000 satellites can be loaded from TLE files and all of them can be tracked at the same time. Furthermore, Orbitron offers Sun- and Moon-tracking, a search engine specifically for advanced passes and Iridium flares and several visualisation options.

PDW

PDW is a popular freeware application to monitor POCSAG and FLEX pager transmissions. PDW has many users worldwide, from radio enthusiasts to professionals.

PDW LogBrowser

This software allows easy browsing through PDW logfiles. **Peter Hunt** wrote it and it does the searching for you! Just place the *LogBrowser.exe* file in the *PDW LogFiles* subfolder and, when started, you will notice two search options: *capcode* and/or *text*. You will need to define the search locations, which can be a single log file, such as a separate filter file or a complete folder, in which LogBrowser will search chronologically. The search results will appear in the lower part of the window. By clicking on the blue floppy disk icon, they can be saved as a log file for later review. ■

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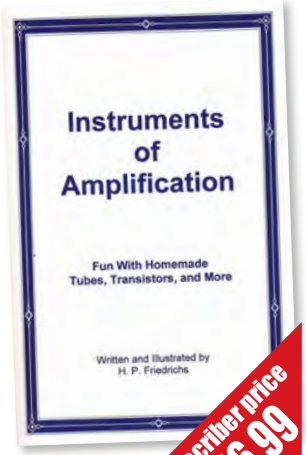
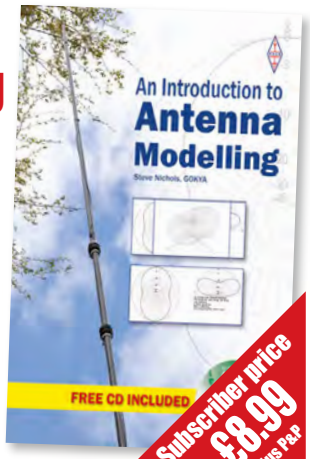


"Peter Friedrichs has written a truly superb book but has chosen a title that really hides its "light" under the proverbial bushel! Armed with the book, an interested constructor can literally build a radio from scratch anywhere! Maybe a better title should have been "Desert Island Radio for the Shipwrecked" because everything is covered from simple earphones, detectors and mechanical amplifiers to home made valves (tubes) and transistors." Very highly recommended"

£17.99 plus P&P

Subscriber price £16.99 Plus P&P

An introduction to Antenna Modelling



For many years, the only way for most radio amateurs to work out how well an antenna design would work was to build it and find out. the arrival of computer based antenna modelling programmes has changed this. This book looks at the Free MMANA-GAL antenna modelling program that will let you design and optimise a whole host of antennas and all on your PC.

£9.99 plus P&P

Subscriber price £8.99 Plus P&P

Scanners 7 - Tuning Into Digital & Analogue Communication

This new edition covers the rapidly increasing trend towards digital two-way radio communications and the latest handheld and mobile/base scanners with some digital modes fitted. Also included are details of an increasing number of "apps" for smartphones specifically for radio data decoding, including programs for digital scanner communications decoding for which a smartphone can be linked to an existing scanner radio to decode.

£9.95 plus P&P

Subscriber price £8.95 Plus P&P

The Amateur Radio Operating Manual

Operating is an essential part of amateur radio. We all learn early on how to communicate with our fellow amateurs. However, to get the best out of our hobby, skills must be learned. And no matter how skilled you are in your particular field, there is much to learn when embarking on another activity. Techniques for operating on all bands from 136kHz to 24GHz, and all modes from CW to ATV, are included.

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www.hamradio-shop.co.uk
/lamcomms

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Wanted

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Advertising

Please contact Kristina Green with all your advertising enquiries

Tel: 01778 392096

E-mail: kristina.green@warnersgroup.co.uk

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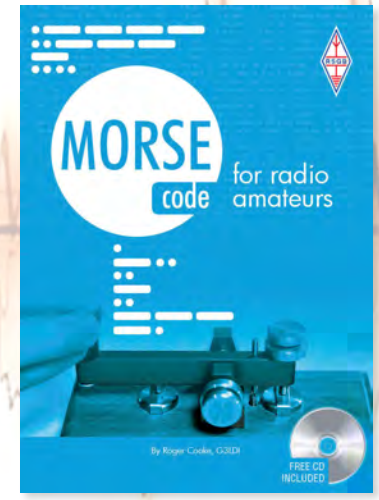

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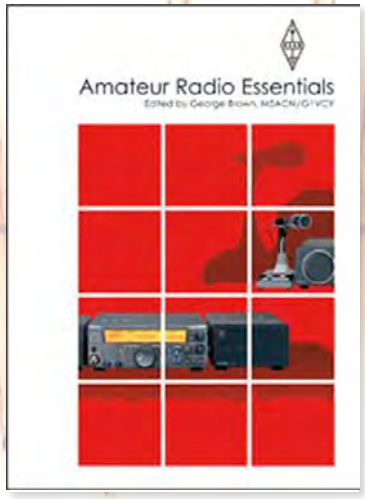

Amateur Radio Essentials **£9.99** PLUS P&P
SUBSCRIBER PRICE **£8.99** PLUS P&P

What's New in the World of Radio

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

The Infinite Dial 2018

The 2018 *Infinite Dial* Study by *Edison Research* and *Triton Digital*® showcases the latest research in digital audio, social media, smart speakers and podcast consumption in the USA. The two most talked-about sectors in audio today are podcasting and smart speakers. Podcasting continues to steadily grow, as 44% of Americans age 12+ now say they have recently listened to a podcast (up from 40% from last year). Podcasting's in-car gains continue too: A year ago, 18% of podcast listeners described the car as the place they most often listened to podcasts; this year, that figure is 22%.
https://tinyurl.com/y9o6m3z5

Radios in Films

You can find a growing collection of radios in film and television at the website below. Our US colleagues at *The Spectrum Monitor* have also had articles and competitions on radios from the movies. (Via **Chrissy Brand** & *SWLing.com*)
https://swling.com/blog/tag/radios-in-movies

Tintin and the Radio

Editor's Dirty Secrets: I am a life-long aficionado of **Tintin** and **Hergé**. Radios play a regular part in almost all the comic adventure books of the series. Now, someone has written about this (in Spanish). Translations, please? (Source: *Radio Noticias* Newsletter)
www.radionoticias.com
www.radionoticias.com/articulos/Tintin.pdf

WWII Codebreakers

The US National Cryptologic Museum has a website on female (US) codebreakers during WWII. (Source: *Smithsonian National Air and Space Museum/ Cryptologic Museum*)
https://airandspace.si.edu/stories/editorial/wwii-women-cracking-code

Icom IC-A25NE 8.33kHz VHF Airband Transceiver

The IC-A25NE is the latest development in airband radio technology, featuring built-in Bluetooth, GPS and significant VOR navigation functions. With 6W of output power, this transceiver's stylish design, easy-to-use interface and large 2.3-inch LCD combine to provide stress-free programming and easy in-flight operation. The handheld includes a large 2350mAh Li-ion battery, offering longer operating time. Often-used functions are assigned to the ten-key, enlarged, flat-sheet, keypad, which offers a smooth and swift operation.

Icom ID-31E PLUS

The new ID-31E UHF digital D-STAR, hand-portable, digital transceiver is being promoted as a great entry point into D-STAR. This radio allows users to communicate digitally across the worldwide network of connected repeaters and internet gateways. The transceiver comes pre-programmed with the latest list of digital and analogue repeaters. This will enable users to find nearby repeaters with the *DV/FM Repeater Search* function. Operators also have the opportunity to share pictures and text using the *RS-MS1A* application. Data can be sent in the *DV Fast Data* mode. An integrated GPS receiver shows a users' current location and altitude on the display and offers location-reporting and automatic-reply functions in DV mode. The GPS log can be saved on a microSD card. The ID-31E PLUS has a robust, lightweight, waterproof, body, which is perfect for the demands of operating in poor weather conditions. A special black-with-golden-trim version of the ID-31E PLUS is now available from all Icom Amateur radio dealers with a retail price of £299.94 including VAT.
www.icomuk.co.uk

Icom ID-31E PLUS

Icom IC-A25NE

A 'Hybrid' Radio Future?

BBC Director of Radio **Bob Shennan** stated that the future of radio in the UK needs to be a mixture of DAB, FM and internet, rather than just DAB. The Corporation has scrapped plans for an FM signal switch-off, for now. The *Telegraph* reported that listeners will not be 'forced' to abandon their FM radios, in favour of DAB ones (Sources: *World DAB* and *RadioToday*). https://tinyurl.com/y8pkhbjj

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Please write your advert clearly in BLOCK CAPITALS up to a maximum of 30 words, plus 12 words for your contact details on the form provided and send it together with your payment of £5 (subscribers can place their advert free of charge as long as they provide their subs number or mailing label). Cheques should be made payable to **Warners Group Publications plc**, credit card payments also accepted.

Please help us to help you by preparing your advert carefully. Any advert which contains ?? marks indicates that the advertising dept. could not read/interpret the wording.

Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted.

No responsibility will be taken for errors and no correspondence will be entered into on any decision taken by the Editor on any of these conditions.

You should state clearly in your advert whether equipment is professionally built, home-brewed or modified.

The Publishers of Practical Wireless also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

This is a free service for subscribers and very cheap otherwise so please USE IT OR LOSE IT.

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73 Bob G4PVB

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Bundle Sale, £900. All VGC with manuals. Icom718 with key and mic, Cat 10 Coupler, CMX 200, Eton Satellit 750, MJF 752d, Alinco 30A Power Supply, Standard AX700 Receiver, Uniden 125 XLT, Jim 75 Pre-Amp, photos available on request. Keith 01942 671874 after 6pm or weekends

Please contact Kristina Green with all your Radio User advertising enquiries

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radio events

We want to hear about all events for hobby radio enthusiasts, including airshows, conferences, exhibitions and rallies.

Send all your rally info to:
Georg Wiessala
E-mail: wiessala@hotmail.com

Plan your rally visits with our comprehensive list of forthcoming events. *RadioUser* will be at events marked with an asterisk – come along to our stand for great deals on subscriptions to *Practical Wireless* and *RadioUser*. Club Secretaries and Event Organisers – please send us details of your events if you would like them to be mentioned here.

APRIL

April 29th (Sunday)
NARSA Blackpool Rally
The 56th Norbreck Amateur Radio, Electronics and Computing Exhibition will take place at the Norbreck Exhibition Centre, Blackpool, FY2 9AA. The doors will be open from 10.30am (10.15am). There will be traders, a bring & buy, special interest groups, a talk-in, free parking and an RSGB bookstall.
Dave M0OBW
Tel: 01270 761 608
E-mail: dwilson@btinternet.com
www.narsa.org.uk

MAY

May 6th (Sunday)
Southern Electronics and Radio Fair (SERF/ *Eastbourne Rally*)
The Rally will take place at Eastbourne Sports Park, Cross Levels Way, Eastbourne, East Sussex BN21 2UF. Transport – via buses from Sussex Downs College on Cross Levels Way and Kings Drive – and by rail to Hampden Park station, a 10-minute walk from the Centre. The main hall is for dealers, traders and clubs and there is an outside car boot & table-top sale. Track area reserved for catering, camping and caravans.
www.serf.org.uk

May 6th (Sunday)
Thorpe Camp (*Dambusters*) Hamfest
The Hamfest will take place at the Thorpe Camp Visitor Centre, Tattershall Thorpe, Lincoln, LN4 4PL. Admission is £4 per person, children under 12 go free. Thorpe Camp Visitor Centre will be open for traders at 10am on Friday 4th May 2018. Overnight camping is £4 per night (with electric hook-up £7 per night). There will be hot and cold food on site and overflow car parking inside the grounds.
Anthony
Tel: 07956 654 481
E-mail:
secretary@thorpecamp.org
http://thorpecamp.wixsite.com/visitorscentre/dambusters-hamfest

May 7th (Bank Holiday Monday)
Dartmoor Radio Rally
The 2018 Dartmoor Radio Rally will take place at Tavistock College, Crowndale Road, Tavistock PL19 8DD.
Doors will be open at 10.30am (disabled 10.15am). Admission is £2, under 14's go free, when accompanied by an adult. Ample free car parking and on-site catering. Trade and club stands will be there, as will be the usual bring & buy stall.
Viv Watson G7AWG
Tel: 01752 823 427
E-mail: vivwatsondrc@aol.com
www.radioclubs.net/g1rcd/events.php?events_id=5317

May 13th (Sunday)
Lough Erne Amateur Radio Rally
Lough Erne ARC will host the Lough Erne Rally in the SHARE Centre, Lisnaskea, Co. Fermanagh, BT92 0EQ. Doors open at 11.30am. Free parking, bar, café, cooked lunch, free tables for trade, special interest groups, shack clearance and so on. RSGB sales stall. All in hall pay same door fee £4.00 (€5.00). A raffle is included in the door entry cost. The bring & buy is free. The venue is disability friendly. This rally traditionally benefits from a strong attendance, both from Northern Ireland and the Republic.
David GI4VHO, Secretary LEARC,
Tel: 078-4291-0076
E-mail:
calderwood110@btinternet.com
www.learc.eu

May 13th (Sunday)
National Vintage Communications Fair
The National Vintage Communications Fair will take place in the Warwickshire Exhibition Centre, The Fosse, Fosse Way, Leamington Spa, Warwickshire CV31 1XN. Normal Entry (10.30am to 4pm) is £10 (under-14s free). Early Entry (from approximately 9am) costs £25. No advance ticketing.
E-mail: info@nvcf.org.uk
https://www.nvcf.org.uk

May 18th, 19th and 20th (Friday to Sunday)
Dayton Hamvention®
The 2018 Dayton Hamvention® will take place at the Greene County Fair & Exposition Center, Xenia, Dayton, Ohio, USA. The doors will open at 8am. There will be trade stands and a huge flea market as well as special interest groups and an RSGB bookstall. A lecture programme will take place each day. There will be multiple catering outlets and family attractions on site. US exams are available and there is a raffle.
Email:
international@hamvention.org
www.hamvention.org

May 20th (Sunday)
SARCOM Braehead Radio Electronics Rally
The SARCOM Braehead Radio Electronics Rally will be at Kings Inch Road, Glasgow G51 4BN. Open 10am to 5pm. Entry £4.50. There will be trade stands, a bring & buy, flea market and special interest groups, an RSGB bookstall, lectures and a raffle. Catering and a bar will both be available on site.
Andrew Hood GM7GDE
Tel: 07825-932488
E-mail:
radiorally@scotlandmail.com
https://thehamradio.website/event/sarcom-braehead-radio-electronics-rally-2018

20th May (Sunday)
Dunstable Downs Radio Club 35th Annual National Amateur Radio Car Boot Sale
Held at the usual venue (Stockwood Park) in Luton. This is the 35th year, without a break, that this event has been run. The usual facilities will be there.
Contact: Phil Seaford G8XTW
Tel: 01525 384419
https://tinyurl.com/ycez94bj

May 26th (Saturday)
RADARS Flea Market Indoor Sale
The Rochdale & District RADARS Flea Market Indoor Sale is at St. Vincent de Paul's, Caldershaw Road, off Edenfield Road (A680), Norden, Rochdale, Lancs. OL12 7QR. Open from 10.30am (disabled access 10.15am). Admission is £2.50 (under 12s free).
The cost is £5 per pitch (for traders with their own tables) and £10 (for a pitch with a table provided). There will be bring & buy, trade and amateur radio sellers. Refreshments will be available, including bacon and sausage butties.
Robert M0NVQ
Tel: 07778-113333
E-mail: rally@radars.me.uk and m0nvq@outlook.com
http://www.radars.me.uk

May 27th (Sunday)
Durham District ARS Radio Rally
The Durham District ARS Radio Rally will take place at the Bowburn Community Centre, Durham Road, Bowburn, Co. Durham DH6 5AT. The event is open from 10.10am to 2.30pm, with disabled visitors gaining access from 10am. Admittance is £2. There will be a bring & buy, trade stands, special interest groups and an RSGB bookstall. Both catering facilities and a licensed bar are located on site.
Michael Wright G7TWX
Tel: 07826 924 192
E-mail: dadars@gmx.com

JUNE

June 1st to 3rd (Friday to Sunday)
Ham Radio Friedrichshafen
The Ham Radio Show Friedrichshafen will take place at Neue Messe 1, 88046 Friedrichshafen, Germany. (GPS 47.678150N 9.505990E). This year's *Leitmotiv* is *Germany Plays Host to the World*. There will be trade and IARU member societies' stands and a large flea market, lectures (some in English) and RSGB books. Parking is €5. Entry: daily €11/10; 3-day €23/20; concessions; open: Friday and Saturday, from 9.00am to 6pm; Sunday, from 9am to 3pm. For comprehensive details, please check out the website:
Tel 0049-7541-708-405.
www.hamradio-friedrichshafen.de/ham-en

June 3rd (Sunday)
Spalding and District DARS Annual Rally
The Spalding DARS Annual Rally is at the Holbeach Community Sports Academy, Pennyhill Lane, Holbeach PE12 7PR. The event benefits from easy access off the A17, a large area for boot traders and a modern hall for indoor traders. Doors will be open from 9.30am and admittance costs £2.50. There is a car boot sale, catering, flea market, RSGB book stall, special interest groups, trade stands and a prize draw/raffle.
Graham G8NWC
Tel: 0775 461 9701
E-mail:
rallysecretary@sdars.org.uk

June 10th (Sunday)
East Suffolk Wireless Revival (ESWR, Ipswich Radio Rally)
The FDARS Ipswich Radio Rally will take place on the Kirton Recreation Ground, Back Road, Kirton IP10 0PW, off the A14. The doors open at 9.30am and there is free car parking. Entry is £2. There will be trade stands, a car boot sale, a bring & buy, special interests groups, the GB4SWR HF station and an RSGB bookstall. Catering is available on site.
Kevin G8MXV
Tel: 07710 046 846
www.eswr.org.uk

June 10th (Sunday)
Junction 28 Rally
The Junction 28 Rally will be at Bowls Hall, Alfreton Leisure Centre, Alfreton, Derbyshire.
For further details, please contact **Anya Lawrence**:
Tel: 01246 456 625
E-mail:
adylawri@btinternet.com

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www.HamRadio.co.uk/icr8600

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www.HamRadio.co.uk/icr30

GREAT SCOTT GADGETS 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. Designed to enable test and development of modern and next generation radio technologies, HackRF One is an open source hardware platform that can be used as a USB peripheral or programmed for stand-alone operation. **See web for specification.**

ONLY £229.95

SDRPLAY RSP1a

The powerful SDRplay RSP1a is a fully-featured wideband SDR receiver that covers all frequencies from 10kHz to 2GHz. Just add a PC via a USB A-B cable and an antenna via the SMA socket and the device becomes an excellent communications receiver.

www.HamRadio.co.uk/sdrplay

SDRplay range RSP1a, RSP2 and RSP2pro

Identical to the FDM-Duo transceiver with the TX strip removed.

bhi ParaPro EQ20

www.HamRadio.co.uk/parapro

The bhi ParaPro EQ20 product range features a 20W modular audio power amplifier with a parametric equaliser plus the option of having bhi's latest dual Channel DSP Noise Cancelling technology and Bluetooth technology.
See web for prices.

DIGITAL AND ANALOGUE RECEIVERS

Whistler WS1088EZ
Handie Scanner with Adaptive Digital Tracking
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Whistler TRX-1
Digital Trunking Technology Scanner
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www.HamRadio.co.uk/whistler

Whistler WS1010
Entry Level Handie Scanner
Only £93.95

The 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: £425.99

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

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!

ML&S: £1289.95

www.HamRadio.co.uk/ardv1

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UPS DPD

SDR RECEIVERS

FUNcube Dongle Pro+

www.HamRadio.co.uk/funcube

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

ML&S: £149.95

Expert Electronics Colibri DDC Shortwave Receiver

This small-size receiver is intended to receive signals covering the HF frequency band 0.09MHz to 55MHz, and also (with the help of external filters) to receive frequencies up to 800MHz whilst working together with a PC.

ML&S: £439.95

Expert Electronics Colibri Nano SDR Receiver

Small dongle sized SDR receiver covering DC-500MHz with oversampling!

ML&S: £239.95

www.HamRadio.co.uk/sunsdrnano

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

10kHz-54MHz Direct Conversion SDR Receiver.

ML&S: £729.95

LATEST MODEL - ELAD FDM-S2

The FDM-S2 is the second device created from the ELAD SDR sampler technology line up.

Direct sampling receiver based on 122.88MHz. 16-bit single channel ADC converter covering HF/6m. Offering the possibility to exploit undersampling.

ML&S: £449.95

www.HamRadio.co.uk/fdms2

RF Space CloudIQ

The Cloud-IQ is the latest high performance software defined receiver from RFSPACE. The Cloud-IQ offers two modes of operation.

WAS £799
NOW £649

www.HamRadio.co.uk/rfspace

ANTENNAS AND ACCESSORIES

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The Antenna Jet AAS300

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!)

Only £234.95

Antenna Jet ASM-300

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.

Only £224.95

Megaloop ML200 *The perfect antenna for small scale listening. The ML200 is an active loop antenna that packs a serious punch. Covering 9kHz to 200MHz without the need for any tuning! Included in the box is the antenna wire, the amplifier and the coax power inserter. It's a simple case of just add coax!* **Only £284.95**

GigActiv GA3005

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. **Only £319.95**

Boni-Whip *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!* **Only £99.95**

SPEAKERS

These hand-crafted high performance communications speakers from Spain are now available exclusively from ML&S. You might change your radio but you will keep your Phonema speaker for ever.

PHONEMA

Phonema Rhea Speaker - Black Edition! The Rhea speaker matches the following transceivers: Icom IC-7610, IC-7600, IC-7410, IC-7400, IC-9100, IC-756, IC-746, IC-738, IC-751, IC-745, IC-R71 and IC-720. Yaesu FTDX3000, FTDX1200 and FT-950. Kenwood TS-870, TS-850, and TS-790. **Only £219.95**

The Phonema Miranda handles 10W with a frequency response of 120Hz-18kHz. It's housed in a compact enclosure featuring Rubber HM6, Acoustic Foam AG150 & Besotect. Minimalist design utilising a high-performance driver & best acoustic internals. **Only £149.95**

The Phonema Rhea Speaker uses beautiful Sucupira wood and employs the same internal construction as the Miranda. Has a two input switch for two rigs, selectable via the front panel. Frequency range is a very low 75Hz through to 18kHz. Weighing in at a very solid 2.25kg. **Only £219.95**

The Phonema KSP3 Speaker has been designed to match the Elecraft K3 series. Handling 30W of audio with a frequency range of 100Hz-20kHz. **Only £145.99**

Palstar SP-30H
Ultimate communications speaker, custom engineered. **Only £197.95**