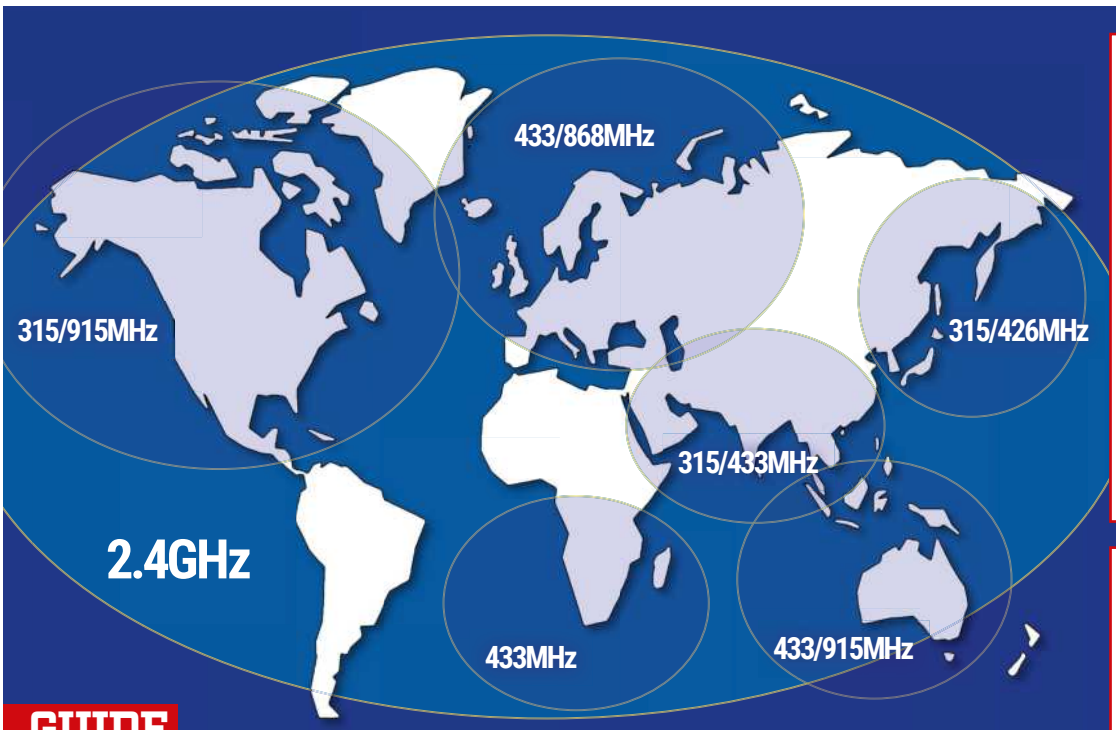
THE 'CANADIAN TITANIC'

The senior radio operator's story told

RadioUser

January 2021 £4.99 www.radioenthusiast.

2020 INDEX | Your handy guide to every article inside



GUIDE

GO LONG RANGE

Taking a look at the world of LoRa and its benefits for controlling devices remotely

Latest products

SDR-RX-888, Icom-705 100W amplifier, and more

Portishead tales

A look at the lesser-known services from the station

HISTORY From Marcuse sundials to atomic clocks

A look at methods of time measurement and regulation of interest to radio users

SPACE Explaining data packets and digipeating

Decoding packet radio transmissions from the ISS without any wires!

SONAR | International Radio | Radio News from Around the World
Brazilian Radio | Future of Radio Listening | Vector Network Analysers

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- Large 4.3 inch TFT colour touch screen display

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- 1000 station memories
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SY50-5.....5 el 50MHz 10.5dBi.....**£129.95**
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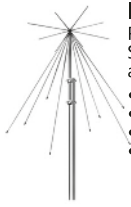
WY400-10n10 el 432MHz (wide band) 14.0dBi.**£119.00**

ICOM



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Now with Improved:

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- Plus more!

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- Software upgradable
- Good dynamic range

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per metre.....£3.79 price per 102m drum **£359**

Ecoflex 10 Plus
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Aircell 7
per metre.....£2.99 price per 102m drum **£269**
PL259 connector (part: 7390).....**£2.65**
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- Memories: 1000 (20 banks)

£649.95

Optional Mains Power supply £25.95

AOR

LATEST FIRMWARE

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- 100kHz-1300MHz analogue and digital modes
- TETRA, P25 (Phase 1+2), DMR, Mototrbo, dPMR

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£939.95

ICOM

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Digital & Analogue Multi Mode Scanner

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ICOM

IC-R6E
Pocket sized Wideband Scanner

- Freq: 100kHz-1309.995MHz
- Modes: AM, FM, WFM
- 1300 memories
- High Speed Scan 100 channels/second
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Optional BC-194
Drop-in charger stand
.....**£22.95**

£199.95

ALINCO

DJ-X11E
All Mode 1200 Channel

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- AM/FM/WFM/ SSB/CW
- 1200 memories
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- IQ output for SDR use
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BEARCAT

BCT-15X
Latest Base Mobile Scanner with 'Close Call'

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- 9000 memories
- AM/FM/WFM
- Band scope
- CTCSS/DCS decoding
- Alpha-numeric tagging feature
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Supplied with:
- Mains adaptor
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Advanced Digital & Analogue Scanner

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- Weather Resistant IPX4

Standard Version
(licence required to activate DMR, NXDN) **£599.95**

Activated Version
(DMR, NXDN already activated) **£649.95**

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Bearcat SDS-200E
Digital Scanning Receiver

- With DMR, NXDN, and ProVoice monitoring modes
- Covers: 25 - 512MHz, 806 - 960MHz, 1240 - 1300MHz
- Too many features to list here - visit our web site for more details!

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UBCD-3600XLT
Digital Scanner with 'Close Call' and Analogue AM/FM

- Receives: 25-1300MHz
- SD card slot

£425

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

£479.95

WHISTLER

Whistler TRX-2
Digital Scanner

- Receives 25-1300 MHz (with gaps)
- Covers DMR, MotoTRBO - and more!
- Upgradable CPU, DSP, and library
- Store Scan lists
- EZ Scan PC software
- IF/discriminator output
- Record & save to Windows
- Clock & Calendar function
- Spectrum Sweeper

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- Covers DMR, MotoTRBO - and more!
- Upgradable CPU, DSP, and library
- Store Scan lists
- EZ Scan PC software
- IF/discriminator output
- Record & save to Windows
- Clock & Calendar function
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500 Channel AM/FM scanner

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- Includes civil/Military Airbands
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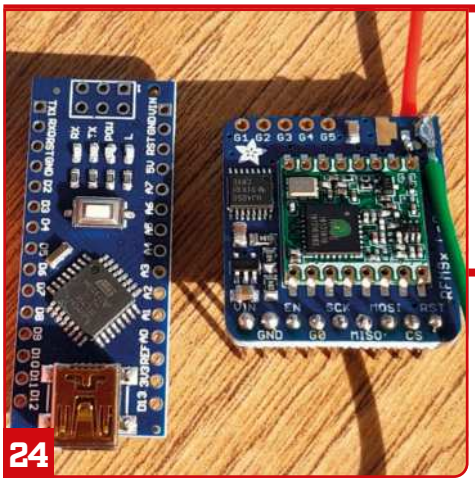
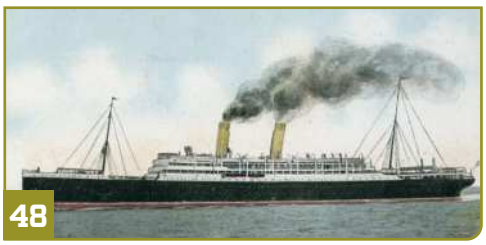


Cover Story

Welcome



Looking Forward to a New Radio Year

Hello and welcome to the January 2021 issue of *RadioUser*. I do hope that you have all had a good Christmas and New Year period, at the end of this most challenging of years. I have a feeling that many a new radio under Christmas trees may have helped to alleviate any post-lockdown blues. It certainly has here.

Our first issue of 2021 has a little bit more of a technical flavour to it than is usual. There have been several very new and exciting radios of late, especially of the SDR variety, and you will see this reflected in our *News & Products* section.

Continuing this theme to a larger or lesser degree are some of our features; while RAOTA President David Reynolds investigates the links between metrology (time measurement) and radio, Daimon Tilley offers a fascinating hands-on introduction to the world of long-range radio, which, I feel certain, will inspire you to build, invent and tinker. Robert Connolly, meanwhile, introduces the workings of SONAR, and Keith Rawlings explores the workings and use of Vector Network Analysers, such as the *Nano VNA*.

In our *Airband News*, David Smith sheds light on some brand-new radio-based navigation technologies, and, on a related subject, Larry Bennett delineates the history of Aeronautical Services at the *Portishead Radio* station. Rising even higher up, Tim Kirby shows you how packet radio from the International Space Station works, and how you can easily receive it.

In our other features, we proudly offer our first longer contribution on radio in South America. In his essay for *RadioUser*, our friend Martín Butera reports on his visits to some outstanding radio stations in Brazil.

In our other regular columns this month, you will find a rich post-festive smorgasbord of radio fare.

These range from Chrissy Brand's recommendations for top international listening and the story of radio operator Ronald Ferguson to a critical look at TV under the Nazis, and a preview of the key digital radio trends and technologies for 2021.

This is the issue in which you will find our *Annual Index* of everything published in *RadioUser* in 2020, a resource I trust you will enjoy. The issue is rounded off by Stig Hartvig Nielsen's update on *Private European Short Wave Stations*, which we will occasionally carry.

Moreover, there is some extra news about space weather and radio wave propagation at a time when the Sun seems more restless.

The editor too can be said to be restless and will endeavour to bring you the absolute best possible monthly radio magazine throughout the year to come.

Maybe we will even meet at a radio show this year?

Stay in touch and, as always, stay safe.

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

What's New

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

Multifunction Device for Makers: The IOT Cricket

Would you like to build their own IOT devices which could transmit data to phones or other services over Wi-Fi / Internet? Then the IOT Cricket may be for you.

The IOT Cricket Wi-Fi module is a plug-and-play device, which can be easily integrated to various IOT end nodes such as alarm systems (window, door), smoke detectors, temperature sensors, humidity sensors, leak detectors, buttons, switches, and so on.

Once you integrate it to a device, it is ready to send data either locally within your Wi-Fi or globally over the internet to your smartphone/laptops. It can be powered directly with batteries, and for a very long time.

On top of that, you do not need to write any code for it. Thingsonedge are a small start-up based in Cambridge, UK, designing an easy-to-use, ultra-low-power Wi-Fi module for electronic device makers, scientists and hobbyists.

The firm has developed several projects and published them as blogs. Have a look at the following URLs.

http://thingsonedge.com
sylwester.bala@thingsonedge.com

Electronic Circuit Analysis Program Available as Freeware

Due to the retirement of their software developer, Spectrum Software have made available their Electronic Circuit Analysis Program as freeware.

Micro-Cap 12 is an integrated schematic editor and mixed analogue/digital simulator that provides an interactive sketch and simulate environment for electronics engineers.

Since its original release in 1982, Micro-Cap has been steadily expanded and improved. Micro-Cap 12, the twelfth generation, blends a modern, intuitive interface with robust numerical algorithms to produce unparalleled levels of simulation power and ease of use. Valued at $4,500, the software is available for 32- and 64-bit Windows.

(SOURCE: Colin Butler, ICQ Amateur Radio Ham Radio Podcast)

https://tinyurl.com/y2aq8zyn

Cross Country Wireless Cardioid Loop Aerial

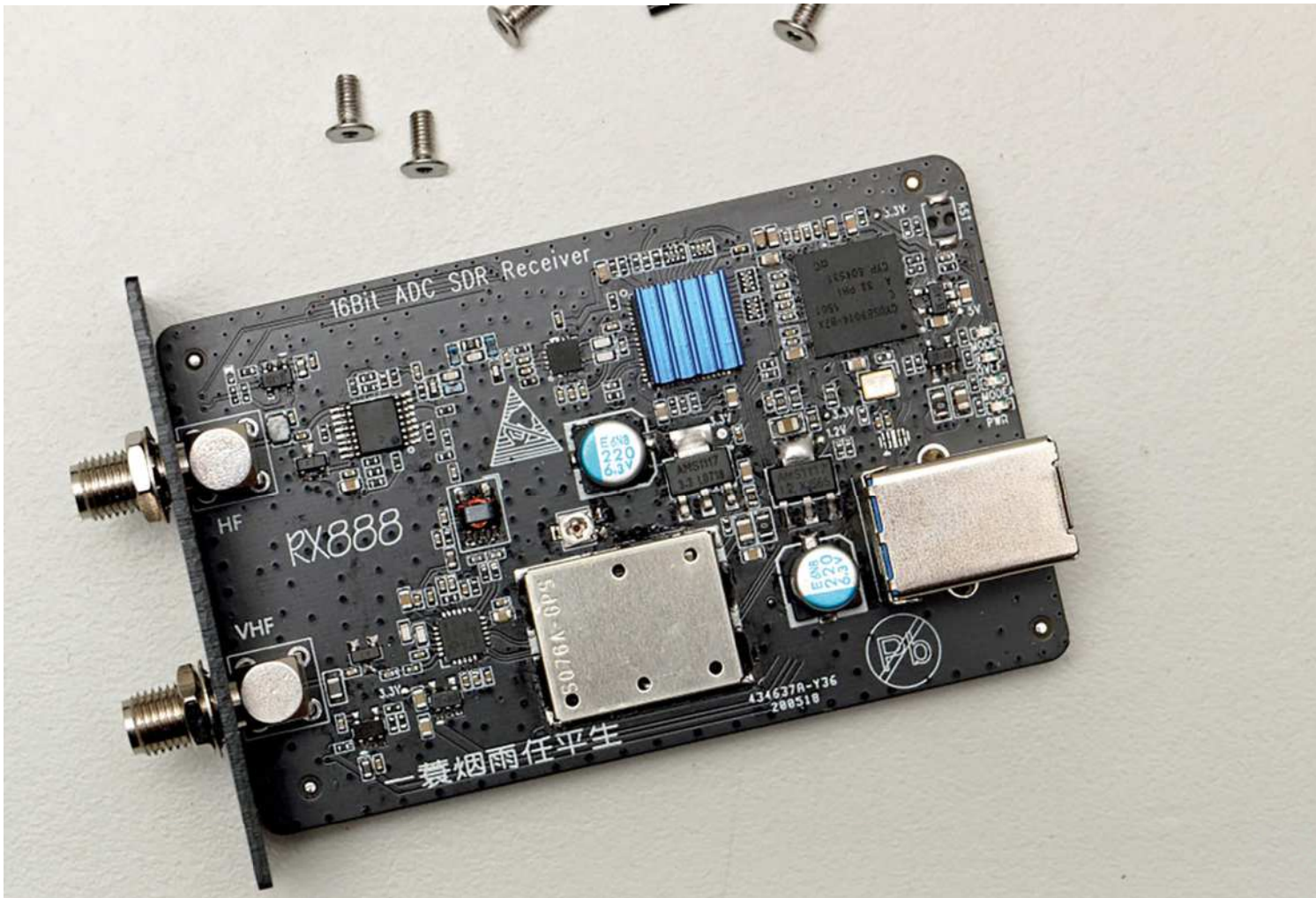
The CCW website currently offers an interesting building project: A CCW wireless cardioid loop aerial with a Cross Country Wireless loop antenna amplifier.

A conventional loop has a figure-of-eight pattern with two main lobes opposite each other with two deep nulls at 90 degrees to the main lobes. A cardioid loop has a single main lobe with a high front-to-back-ratio over a wide angle to the rear of the antenna. This allows the cardioid loop antenna to be pointed at a target station to provide a far higher signal to noise ratio than a conventional loop antenna due to the reduced level of noise and interference received off the back of the antenna. Actual measurements taken with the prototype antenna in the photograph give a -3 dB beamwidth of 110 degrees with a similar angle at the rear of the antenna greater than 15 dB down on the forward direction. A sharp null at the rear of the antenna can be used to null out individual interfering stations on the frequency. The polar diagram plot shows the measured signal levels from a strong broadcast station within ground wave range on 909 kHz as the antenna is rotated through 360 degrees.

Note that there is a small peak at 120 degrees due to the reflection off a metal-clad building 20m away from the aerial. The cardioid loop has directivity up to 8MHz. Above this the pattern becomes omni-directional. Further information, images and full instructions are at this URL:

(SOURCE: Cross Country Wireless)

http://www.crosscountrywireless.net



The SDR RX-888

RadioUser friend and former contributor Nils Schiffhauer (DK8OK) published a first review of the brand-new SDR RX-888 in *Radio Kurier* (12/2020: 40-44). Since this new SDR deserves to be much better known in the UK, I have taken the liberty of producing a short synopsis of Nils's review. The specifications of the RX-888 are remarkable; the radio offers 32MHz bandwidth streaming from 1kHz (!) to 1.8GHz at a sampling rate of 16 Bit (below 32MHz – above 32MHz the SR is 8MHz/8Bit). At around US$ 200, at the time of writing, it is also a very affordable piece of kit. The design was invented up by Oskar Steila, IK1XPV, who developed the BBRF103 receiver module around three years ago – you can easily find its PCB layout online.

This was followed by the RX-666 'Dragonfly' (available, for example, via the seller elecdesign2015), which, in Nils's opinion is nearly on par with SDRs such as the ELAD FDM-S2 and FDM-S3. A short while later, the new RX-888 appeared, with the addition of a preamplifier (+20dB). It is significant to note that this SDR is a result of much open-source development and shared ideas – which, of course, is the way it ought to be in the hobby radio community. At the heart of this SDR lies an LTC2217 module and an ADC by Analog Devices offering a maximum of 105MHz sampling rate at 16Bit. It can run with the popular HDSDR software suite by Alberto di Bene and the more versatile SDRC V.3 software by Simon Brown, G4ELI, providing e.g. up to 24 demodulators in parallel over the full bandwidth.

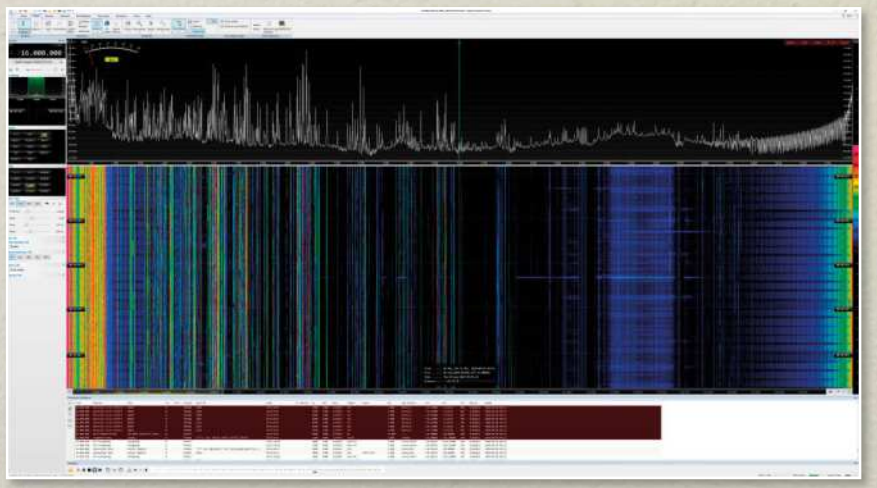
https://www.analog.com/en/index.html
www.hdsdr.de
https://www.sdr-radio.com/support

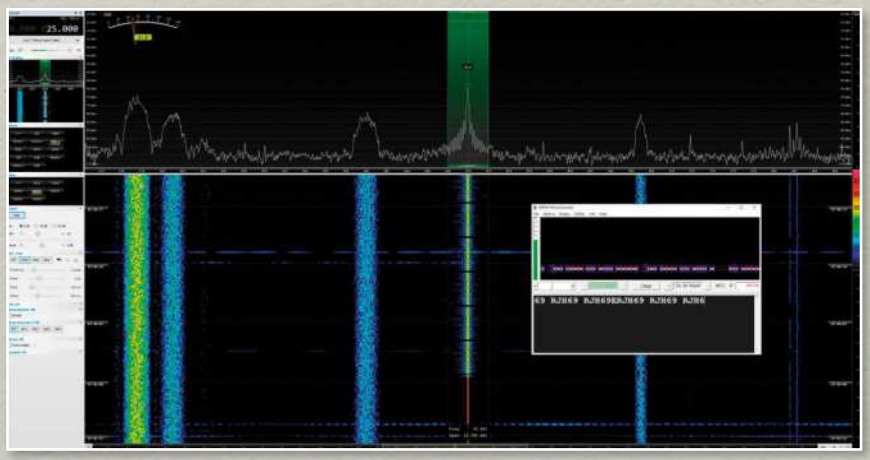
The RX-888 was evaluated with the help of other DXers, such as Bjarne Mjelde, Guy Atkins, and Simon Brown (see above). Following installation, the user may benefit from all the advantages of this program, such as DRM decoding (with the DREAM decoder) and synchronous detection.

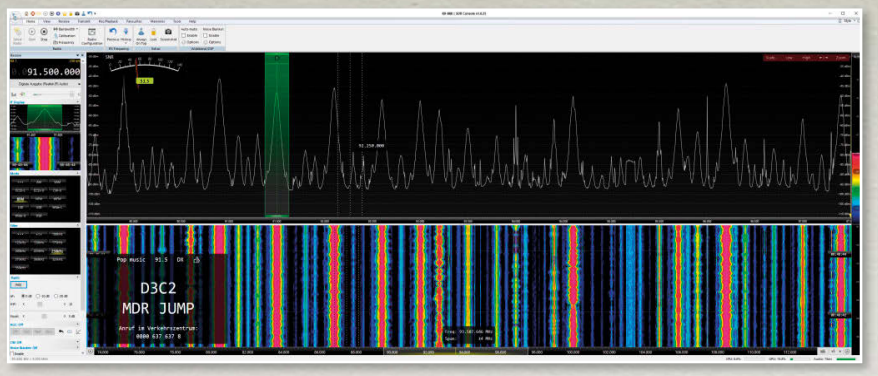
The DX-888 was reviewed using a Bonito MD-300DX dipole aerial

https://tinyurl.com/y3pgwqb8

Nils' main findings can be summarised as follows: (1) This is a serious piece of kit, is stable and deals well with strong signals; (2) Reception (with SDRC V.3) was excellent, and a range of 32MHz can be recorded and played back (3) Nothing is missing in this SDR, and nothing seems superfluous; and (4) Above 32MHz, the receiver uses an R820T2 chip, which streams just 8MHz in bandwidth, not







32MHz (see above).
At a location with a challenging density of FM broadcast signals, the RX-888 largely benefits from 30MHz lowpass filter, available e.g. from Heros Technology.
https://tinyurl.com/y3n622z2
At this price point, this is, therefore, an SDR that can be wholeheartedly recommended, on account of its dynamic range, sensitivity and coverage, to both novices and much more demanding hobbyists. There were some issues which can easily be addressed via software updates.

Nils Schiffhauer is offering more information and some audio examples on his website:
https://dk8ok.org

Radio News

SDRPLAY COURSE: SDRplay Ltd. Recently announced a new Radio Communications course for undergraduate teaching as part of its *SDRplay Educators Programme*. Understanding Radio Communications enables students to grasp the key elements of radio communications. This one-semester course provides teaching materials and practical workshops that lead students from the first switch-on of a Software Defined Radio (SDR), through to signal reception, demodulation, and finally, successful communications with satellite signals. As well as guides and set-up instructions for the teachers, for both the lecture and lab sessions, there are downloadable teaching materials in both PowerPoint and .pdf formats. These are supported by video guides showing the lab activities, and a dedicated new forum for teachers to share experience and get assistance from the authors.
The course was created in association with academic partners at *La Sapienza University of Rome (Department of Mechanical and Aerospace Engineering)* whose intention is to create a practical course that will inspire Science, Technology and Engineering (STEM) students to grow their understanding of radio communications.
The course started life as a 12-hour optional course for third-year bachelor students in Aerospace Engineering and has been broadened to make it suitable for all students that have some basic knowledge of signal theory and signal processing.
It can be run either as an additional or optional module or adapted to be included within a full year radio communications subject. Robert Owen, University Programme Consultant at Essaimage Associates who guided the academic team, says, "*I have spent 26 years in global 'University Programmes' and across this time I've learned two fundamental principles. The first is that teaching materials must fill an essential need in the curriculum, not just be something that business thinks should be taught. And secondly, that the best teaching materials come from academics, not commercial trainers. This course, Understanding Radio Communications, fulfils these principles generously, and I am proud to be associated with it!*"
https://tinyurl.com/y2teddb6
www.sdrplay.com/educators
https://www.sdrplay.com/understandingradio
Jon Hudson: Tel: +44 (0)1223 911044
E-mail: jon.hudson@sdrplay.com

New Products at Martin Lynch

100W Amplifier for Icom IC-705 & FT-817/8 A very compact and powerful 100W HF-6m Linear Amplifier ideal for QRP transceivers with 1-5 Watts of output. The new XPA-125B has its own built-in Auto ATU with back-lit LCD display showing Power, SWR, Current etc. Solid metal housing and works very well alongside the Icom IC-705, Yaesu FT-817/8, Elecraft KX7 and other QRP transceivers. Available for £469.90.
www.HamRadio.co.uk/XPA125B

MyDEL FT817/8 Feet and Fold-Away Stand An easy-to-fit neat fold-away stand, with four rubber feet specifically designed for the Yaesu FT-817 & FT-818. Replaces the original strap panels and neatly folds underneath the body of the transceiver when not in use. Available from ML&S at £49.95.
www.HamRadio.co.uk/FT818FEET

Standalone SDR from Afedri

This new Stand-Alone Software Defined Radio is the successor to the LAN Alfedri. Alexander Trushkin (4Z5LV) has been developing and producing SDR receivers since 2012. These are offered under the 'Afedri' brand on its website. 'Afedri' means: 'Analog Front-End Digital Radio Interface' and refers to the DDC chip Afedri8201 from Texas Instruments. (SOURCE: FENU Radio)
https://tinyurl.com/yxc7c6pq

IRCA MEDIUM WAVE ARCHIVE: Recently, the North American DX club, IRCA (The International Radio Club of America), has released to the public more than 900 past articles from their publication, DX Monitor.
Since 1964, the International Radio Club of America has been documenting medium wave DXing and DXers' efforts to improve their understanding of radio reception and to develop better listening techniques. During that time, over 900 articles have been written, that have furthered the art of DXing.
Many of these continue to be relevant to the more general radio hobbyist, including articles about antennas, radio propagation, receivers and accessories, plus general technical information. Previously, those articles were available only to club members, but they are now available to all. (SOURCE: Chrissy Brand, IRCA)
www.ircaonline.org

FREQUENCY BOOKS ARCHIVE: Here is a link to a comprehensive listing of old radio frequency books and lists, which you might enjoy: (Peter Newton, VLF-ULF-ELF Facebook Group)
https://tinyurl.com/y59md9s2

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

QRM Eliminator at Martin Lynch

Problems with local QRM on short wave? Very often the answer to this question is a clear 'yes'. Those living in rural areas know how 'clean' the frequencies can be - except maybe the near-by high-power landline makes noise. However, most interference is caused by local electronic sources, like TV's, computer, and bad connections.

With this new accessory, you can get rid of local interference up to an S9 level almost entirely; the result is a clean QRG! You do not have to know what kind of interference is present neither would you have to know the location of the interference.

It does not matter if the interference originates from the own Packet station of from a welder 100 meters away. The QRM Eliminator is inserted into the feedline from the TRX to the aerial, without any additional modifications required to the radio.

The box has a built-in PTT control which enables the Eliminator to stay connected during transmit.

An additional auxiliary receiving antenna is required, though, like a 2m antenna or simply a couple of meters of wire in the shack. The unwanted signal is received with both antennas resulting in different phases.

The QRM Eliminator now allows adjusting the phase angle, as well as the amplification, in a way to cancel out the unwanted signal before it reaches the receiver front end.

It is based on an innovative concept, and it cannot be compared to the performance of a normal noise blanker. Additional data: Dimensions: 200x130x56mm; Terminals: 3xUHF connectors for TX, base station and auxiliary antennas, 1 x cinch jack for PTT and 1x jack socket for power supply, 12V/150mA.

https://tinyurl.com/y3k3rw5u

BOOMradio

BOOM RADIO LAUNCHES : As radio stations move younger, what about those of us who happened to be born many years ago but still feel 25? How about a radio station for baby boomers? We built on that idea - and announced a new radio station today - Boom Radio. It launches next year on DAB. Complementary commercial and marketing partners most welcome - talk to me. Let's work together:

(SOURCE: David Lloyd, via LinkedIn/ Chrissy Brand:

www.boomradiouk.com

Retevis Ailunce HS2 SDR Transceiver at Moonraker

The HS2 offers receive frequency coverage is 300kHz t 1.6GHZ. The built-in network port can allow remote operation and remote firmware upgrade. The HAM-BOX mobile app (for the android system) has been developed to allow the mobile phone to easily control and play radio stations (the app is still under development, any progress we will post on Ailunce website). HS2 adopts a full keyboard design, built-in Bluetooth module, sound card module and serial communication port module. Full support for currently popular radio control software and logging software. The key features of this transceiver are on the Moonraker website.

https://www.moonraker.eu

BATH-BASED DISTANCE LEARNING 2020/21: Following a year of updating their material to match the current syllabus, the Bath-based team who previously ran Advanced level courses have re-started their training. This time out they are running an Intermediate level course and have over 50 students in the class and 10 tutors helping out. Weekly tutorials are being held on Zoom with recordings made available for those who cannot 'tune in' live. The team provide weekly instruction showing which pages of the textbook to read, which videos to watch and which practical exercises to do to bring the theory to life. Each week students are sent revision questions to check knowledge and understanding, there are also progress quizzes and mock exams at the end. All of that is delivered via a virtual classroom using the *Edmodo* system. Whilst on-line working is new to many, the feedback so far suggests the system is working well and everyone is on track to sit the exam in March. After that, the team will run their first Full level course, but they are not yet taking registrations; please wait for further announcements before asking for a place (Picture: Steve Hartley G0FUW, leading one of the Intermediate tutorials).

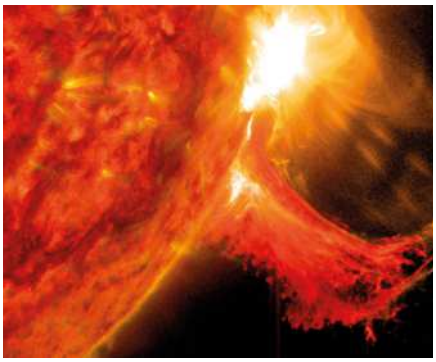
(SOURCE: Steve Hartley G0FUW)

Radio News

ROLL OVER BEETHOVEN: The BBC is inviting audiences and first-time producers to create their mixes for potential Radio 3 broadcast. *Beethoven Remixed* is part of a year-long pan-BBC season, *Beethoven Unleased*, marking the 250th anniversary of the composer's birth. BBC Radio 3 and the BBC National Orchestra Of Wales have recorded the individual orchestral lines that make up the work for anyone to download from its website and remix for free using the basic ingredients to make their masterpieces and potentially have them broadcast on BBC Radio 3 programmes *In Tunes* and *Late Junction*. Launched this week by composer and turntablist Shiva Feshareki on Radio 3's *In Tune*, a Beethoven remix from drum and bass producer and DJ, *High Contrast*, will be broadcast on Radio 1 next week, as well as further remixes to be broadcast across the BBC's popular music radio stations throughout the week. Alan Davey, Controller Radio 3 & Classical Music at the BBC, said: "*This exciting initiative is all about allowing everyone to get involved in music production and create something entirely fresh using Beethoven's timeless and well known fifth symphony. Our unique celebration of Beethoven is all about offering audiences an opportunity to explore the achievements of a musical giant and a new way of understanding why he matters. Whether you're passionate about music and want to give producing a first time go or you're a remix virtuoso, everyone is invited to give Beethoven's definitive sound a new twist.*" Lorna Clarke, *Controller of Pop Music* at the BBC added: "*Music's appeal is universal whether it's pop or classical, so this is a great opportunity for anyone interested in making their music to get creative, explore the music Beethoven created and to take his composition in new directions.*"
(SOURCES: BBC Radio 3, Radio Today)
https://tinyurl.com/yyhveq3s

MILITARY RENAISSANCE IN HIGH-FREQUENCY COMMUNICATIONS: Andrew White of C4ISRNET reported that special operations commands across Europe are ramping up their capabilities with high-frequency communications to ensure connectivity on the battlefield. Many leaders there are turning to high-frequency communications as a way to optimize properties that provide a low probability of interception and detection. Special forces in France, Germany, Poland and Ukraine continue to receive high-frequency, or HF, systems as a way to diversify communications plans, industry sources confirmed to C4ISRNET. Enhancements in HF come at a time when NATO members and partner forces are suffering from a disruption of satellite communications, particularly along the alliance's eastern flank where Russian armed forces continue to conduct electronic warfare. In a presentation on Aug. 6, Paul Denisowski, product management engineer at Rohde and Schwarz North America, described how communications satellites are vulnerable to anti-satellite systems as well as ground-, air- and space-based 'kill-vehicles'. "China, Russia and the U.S. have all carried out ASAT tests and many other countries are developing ASAT capabilities," Denisowski said, using an acronym for anti-satellite. To boost resilience, some commands are turning to high-frequency communications. During his presentations on 'Lost Art of HF and 'Rebirth of Short Wave in a Digital World', Denisowski explained that HF is making a comeback in local and global communications.
(SOURCE: C4ISRNET/ Sightline Media Group)
https://tinyurl.com/yyby6u2l

SOLAR FLARE PREDICTION: In September 1859, a coronal mass ejection struck Earth and caused the most intense geomagnetic storm ever recorded. Aurorae appeared around the world, and telegraph systems failed in North America and Europe. Some operators received electric shocks; sparking lines also caused fires. Known as the Carrington event after observer Richard Carrington, the storm has inspired grim scenarios of what a similar disruption could do to our society today. In 2013, Lloyd's and Atmospheric and Environmental Research said a Carrington-level event is inevitable and could cause up to $2.6 trillion in damage. Researchers in Japan say they have devised a method to accurately predict a key driver of such events: solar flares. A reliable method of predicting dangerous solar flares could help governments mitigate their impact. Solar flares form when magnetic fields on and around the Sun reconnect. Although most solar flares are harmless, they can release enormous amounts of energy that accumulates around sunspots, sending plasma and high-energy particles into space. Even flares that are not Carrington-level events



can cause serious disruptions to electrical, communication, and transport networks. A reliable method of predicting dangerous solar flares could help governments mitigate their impact. Previous attempts to predict solar flare activity have been based on observations of sunspots, for instance, estimating flare size on the basis of sunspot and magnetic field properties. In a paper published this summer in Science, the researchers from Nagoya University and the National Astronomical Observatory of Japan describe what they call "a physics-based method that can predict imminent large solar flares." Read the full article here:
(SOURCE: AGU, EoS Science News)
https://doi.org/10.1029/2020EO149965

FREE DOWNLOAD OF AMATEUR RADIO AUTHOR BOOK: *EQUINOX*, DM Barrett's bestseller that blends science fiction with amateur radio and shortwave, can be downloaded free in eBook format from Amazon on the following dates: Thursday, October 22, 2020; Thursday, November 5, 2020; Thursday, November 12, 2020; Thursday, November 26, 2020, and Thursday, December 10, 2020. N4ECW's *EQUINOX*, as well as his other novels, can be obtained at Amazon and Barnes & Noble. The audiobook versions are available at audible.com and iTunes. *EQUINOX* was reviewed as part of the *ICQPodcast Episode 296*:
https://tinyurl.com/y6gfy47n

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"easy-to-use device that improves the audio clarity of amateur signals" EQ20B-DSP *QST Dec 2019* review

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Now includes the latest bhi DSP noise cancelling technology for even better receive audio!

10W Amplified DSP noise cancelling base station speaker
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1

The Changing Dynamics of Contemporary Brazilian Radio

Writing from Brazil, RadioUser friend and journalist **Martin Butera** profiles two popular and varied radio stations in São Paulo: Radio Globo and Radio CBN are engaged in broadcasting and podcast production.

São Paulo is the largest city in the southern hemisphere and one of the most populous conurbations in the world. It is also the most cosmopolitan centre in Brazil. Brazilians have a strong habit of listening to a lot of radio and it seems that nothing will change that custom.

Against this backdrop, CBN and Rádio Globo occupy a privileged place in the hearts of Brazilian listeners, and many say that these two are the most listened-to radio stations in the country. There are more than 780 Brazilian cities, where Rádio Globo and CBN can be heard; this means there are a total of 89 million potential listeners.

In just under 2 years, the stations have set up their new studios in the impressive *Tower Bridge Corporate*, located in the East side of Sao Paulo, on *Avenida Jornalista Roberto Marinho*. The impressive building has a total of 25 floors and the 2 stations are located on the 24th floor with a privileged view of the city of São Paulo.

This was the first time a foreign journalist (I am from Argentina) has had access to an exclusive visit to the facilities of these two stations (Figs. 1 and 2).

Building the Studios

I was received by Leandro Marcher, the technical coordinator of the Globo radio and CBN system (Fig. 1). Leandro has wide-ranging experience in Broadcasting in Brazil, and radio technology. He said, *"I have worked in various projects of armed radio studios, audio systems, RF transmission systems, satellite transmission systems, automation for studio environments, external broadcasts for concerts, external soccer broadcasts and more, such as Audio over IP (AoIP) and the Internet."*

Leandro was responsible for the project and layout of both studios (Rádio Globo and CBN). He adds, *"Everything here was planned and calculated to the smallest detail, throughout more than 50 meetings."*

Once they were sure of everything, engineers mounted everything in the record time of two months. Therefore, during my visit, I felt that was privileged to see the largest IP audio system in Brazil and the most modern digital radio studios in the country.

You can get an impression of my visit – and the studio design – by looking at the videos at these URLs:

https://youtu.be/jjIPlCX5dx8
https://youtu.be/ZdPgOIms3Ck
https://youtu.be/dTwBwMABE4U
https://youtu.be/YZUZwChCLsA
https://youtu.be/jPiBTCxcq9Q
https://youtu.be/xq-5prBEupw

Advanced Technology

The studios are, indeed, hyper-modern. Fig. 3 shows a photograph of the Rádio Globo and CBN Brazil radio rooms, equipped with their 24-channel console with AoIP digital technology.

Fig. 4 is an image of the Radio Room E in the studio, with shift operators and Leandro Marchiori.

For the next part of my visit, I was taken to the studios of Radio Globo. These are not

ALL PICTURES: MARTÍN BUTERA / LIGIA KATZE / MARK MELZI

only equipped to transmit audio but also to allow the listener to observe the presenters, commentators and reporters who speak to him every day.

Fig. 5 shows the author at the console of the central studio of Radio Globo, Sao Paulo Brazil

The studios are equipped with artistic lighting and special HD cameras, for online programming, podcasting and digital audio productions.

On 10th February 2020, the station finally turned off its frequency at AM 1100kHz after almost 68 years on the air, to continue broadcasting on FM and through digital TV channels and virtual platforms.

https://youtu.be/1_ezB4QjJAo
https://youtu.be/YOfYILTcDTA
https://youtu.be/ehee2pl5Fbk

A Follow-Up Interview

Following my hands-on studio visit, I took advantage of my time here to interview an iconic journalist currently on Radio in Brazil, and who has also been a correspondent for CRI (China Radio International).

Camila Olivo is the presenter, screenwriter and editor of the daily *CBN Panorama* podcast and the CBN Professional weekly podcast. According to an IBOPE/ CBN survey, 40% of internet users in Brazil are also podcast listeners. And the country is already the second-largest consumer of the format, according to *Spotify* data – only behind the United States. Camila is one of the most listened-to journalists in this format in Brazil (Figs. 6 and 7).

You can get an impression of my interview with Camila on these YouTube videos I have uploaded.

https://youtu.be/TtSUyILkmeQ
https://youtu.be/xI6f1wTKgok

Table 1 contains a transcript and translation of my original (Portuguese-language) interview of 20th February 2020, in which we discussed, in particular, the role of podcasting and the significance of reaching out to a younger listenership.

In the remainder of the interview, we covered Camila's time at the Portuguese services of CRI, distributing news and views with a Chinese flavour across Asia, and establishing relationships with both colleagues and listeners, against the background of Chinese cultural diplomacy.

Fig. 1: The author with his guide, Leandro Marchiori. Fig.2: Tower Bridge Corporate, located in the East side of Sao Paulo, on *Avenida Jornalista Roberto Marinho*. Fig. 3: One of the main studio consoles. Fig. 4: A look at the workings of Radio Room E. Fig. 5: The author at the main console of the central studio of Rádio Globo. Fig. 6: An interview with Camila Olivo, presenter, screenwriter and editor of the daily *CBN Panorama* podcast.

The Pandemic Kicks In

Through an official statement, on May 31, 2020, Rádio Globo announced the closure of its São Paulo city branch (FM 94.1MHz) and all its stations within Brazil. The Globo Radio System will now only be focused on the city of Rio de Janeiro, investing in a program aimed at the popular young public, occupying only the FM 98.1 frequency in Rio.

However, there were no layoffs, since Rádio Globo had been operating automatically for more than a year from Rio de Janeiro for all its radio subsidiaries, as can be seen in one of the videos that Martín Butera filmed. Here, the operator's console works remotely.

The station is on the air occasionally, for local advertising, some report from the air (via helicopter) on the chaotic traffic of the greater São Paulo area, or for breaking news.

The radio studios we see in the photos remain, since all the journalistic information for its programming, as well as sports, will continue to be provided, with the collaboration of Rádio Globo, by CBN Radio team.

This restructuring is undoubtedly due to the crisis of the Covid 19 pandemic.]

Besides, mainstream media are realizing that power is no longer focused on radio stations 'on-the-air', but also in digital format, since audience measurements show that many people listen on the Internet.

6

[N.B.: At the time of the visit and interview Martín describes here, the COVID-19 Pandemic had not yet reached Brazil, so he and his interviewees do not wear masks or respect social distancing.

MB wishes to extend his gratitude to Ligia Katze and Mark Melzi for the images included in this article.

*Martín Butera is an Argentine journalist. He is also a radio amateur and passionate DXer. His Argentinian callsign is LU9EFO, and his Brazilian callsign PT2ZDX - **Ed**.].*

MB: How did CBN Radio come up with the idea of betting on the digital podcast format?

CO: The first *CBN Radio Podcast* is already about 4 years old and it is a weekly podcast, which is called *CBN Professional*. That podcast had a lot of success and it was there that the radio began to transform its products to podcast, although these were cuttings from the programming (recordings), for example, a comment, an interview, things like that, the radio began to perceive that these 'cuts' had quite an audience, they were listened to, the downloads demonstrated this. It was then that the radio realized that it had to produce an independent product, beyond 'live' radio on-air, and that is how some more podcast-specific products began to emerge, which were not - or are not - on the air.

MB: After that beginning, what is the evolution that you witnessed on these products? Do you think people are listening to more podcasts?

CO: I perceive that it grew a lot; last year (2019) was considered the year of the podcast, many people in Brazil had no idea that it was a podcast, but last year they aroused their curiosity, 2019 was very emblematic for us here in the radio. Now […] those of us who do radio know that audiences tend to drop a bit, people are on vacation, more relaxed, distracted. Here in Brazil, we use a phrase that says: *"that the year begins after carnal"*, that is, after March. Well that this year did not happen, in February we had many downloads, and that was a surprise for all of us.

MB: Camila, do you think that with the podcast, there is a new approach to radio with a younger audience? Do you think the podcast offers something like *Netflix* – watching a movie or series when you want, and on demand? Do you see any kind of similarity in that?

CO: Yes, of course, it is very similar to *Netflix*; we have many young people who are listening to the podcast today, and the funny thing is that these young people did not have the habit of listening to the radio or they never even listened to the radio, nor did they know about its existence (laughs). Many of this new generation of listeners are young people who were born in the era of *YouTube*, and from there jumped to podcasts. Many young people today know CBN Radio thanks to the podcast. I believe that this approach of young people is related to time, with the speed that is lived today, young people today do not want to turn on the radio and wait to hear what they want, for example, let's imagine a young man who wants to hear a piece of news about football Brazilian and it occurs to him to turn on the radio, he is going to have to wait and listen to other things, maybe a news economy, culture, advertising, music, and then finally hear about soccer and today young people do not want to waste that time, that's why today they are used to going and searching the internet for what they want. Continuing with the example, the young man who wants to listen to some football goes and looks for a football podcast and that is it. Besides, you already know how long it will take to listen, you know if it lasts 20 or 10 minutes, that on conventional radio does not happen […]

Table 1: Excerpt from Martín's interview with Camila Olivo of CBN.

Join the RadioUser Team

You love your regular monthly radio magazine. Could you also write for us? The editor is looking for new authors to join our team in 2021, potentially in the following areas:

- **Network Radio**
- **CB and PMR446 Radio**
- **Software for Radio, and Software-Defined Radio (SDR)**
- **Propagation, Space Weather, Radio Astronomy**

If you would like to share your expertise and enthusiasm with our readers, and if you enjoy testing equipment and software, then please drop me a line. Previous experience in writing for publication is an advantage but not a prerequisite.

Georg Wiessala
wiessala@hotmail.com

An Overview of Global Radio History

David Harris
mydogisfinn@gmail.com

David Harris reviews a short book about the history of broadcasting in the UK, the US, Australia and New Zealand, which touches on a number of broadcast formats and major radio personalities.

There is a gap in the market for a general history of broadcasting. Potentially it is a huge subject, but Scottish broadcaster Gordon Bathgate has condensed the subject matter down to a relatively slim overview-volume of just over 200 pages.

The title begins with a quick run-through of 19th Century scientists whose discoveries provided the science behind radio broadcasting. These included Ørsted, Faraday, Maxwell, Edison, Hertz, Tesla, Lodge and Rutherford. Marconi's early experiments resulting in the first trans-Atlantic communications get a brief mention. The history of voice broadcasting began in the early years of the 20th Century, with US pioneers such as Lee De Forest (1873-1961) and Charles Herrold (1875-1948).

The book takes off with an account of the first experimental broadcasts made in 1920 by Marconi from Chelmsford using the call sign 2MT. By 1922, Marconi had started 2LO in London.

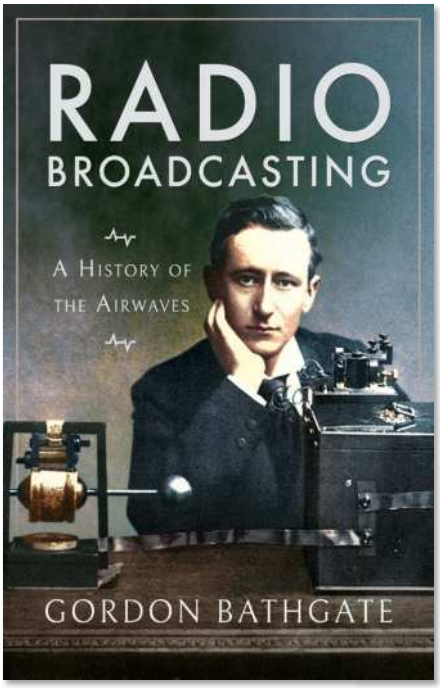
At the end of that year, the British Broadcasting Company Ltd had been formed with John Reith as the General Manager. In 1923, the first edition of the *Radio Times* was published to accommodate listings for the eight regionally based BBC stations which were now broadcasting to most of the UK.

You can read all the back issues of the *Radio Times* here:
https://genome.ch.bbc.co.uk

The BBC's long-running struggle with politicians began back in 1926 when it adopted a 'neutral' attitude on the General Strike which had closed down most of Britain. Winston Churchill wanted to take over the BBC as an official source of government news, but Reith held firm to his belief in the independence of radio.

In December 1926, the British Broadcasting Corporation (BBC) was formed as a Crown chartered non-commercial body, a status which it continues to hold today.

"The first edition of the Radio Times was published to accommodate listings for the eight regionally based BBC stations"



Radio Broadcasting – A History of the Airwaves
by Bathgate, G. (2020)
Pen & Sword. 2020. 210 pp. Pbk. £14.99
ISBN 9781526769404
www.pen-and-sword.co.uk

Now radio began in earnest in the UK; by 1939, the BBC was a vast organisation with five separate services: *National, Regional, Overseas, Empire* and *Television*.

Bathgate provides a brief chapter on the radio in the USA, which, in my view, rather disrupts the narrative thread of the book. However, this chapter is followed by a section of more relevance to UK readers and dealing with English-language broadcasts to the UK from Radio Normandy and Radio Luxembourg.

We remain in the UK with a chapter on broadcasting during the Second World War (1939-1945). Readers will learn of the creation of the *Forces Network* (which became the *Light Programme*, now Radio 2) as a source of music and general entertainment. The war chapter covers propaganda broadcasting including the very popular transmissions from Germany featuring William Joyce ('Lord Haw Haw').

The post-war years began with a major reorganisation of the BBC, which created the *Light Programme* and the *Third Programme* (now Radio 3). FM broadcasting began in 1955. However, radio audiences began to decline somewhat as more people now owned TV sets.

This is followed by a chapter on the history of broadcasting in Australia and New Zealand. The British narrative resumes with the rise of offshore pirate stations in the 1960s and the 1967 reorganisation of the BBC which gave us Radio 1, 2, 3 4 and the first BBC local stations.

By 1973, BBC radio had its first legal competition, in the form of commercial radio, which had taken over 50 years to arrive in the UK.

The 1990s brought Classic FM, DAB and the gradual consolidation of commercial radio into the hands of a few big corporations. In the 21st Century, we are witnessing the decline of medium wave and short wave broadcasts, accompanied by the rise of internet radio, music streaming services and smart speakers.

The book has no index which is a serious omission. The bibliography is also rather disappointing with no books listed that have been published in the last 10 years. As *Radio User* readers will know, many new titles have appeared in recent years, some of which have been reviewed here (for example, *Radio Caroline Bible* by Paul Rusling (*RadioUser*, December 2019: 18; *Marconi* by Marc Raboy (*RadioUser*, December 2016: 56); *V for Victory* by David Boyle (*RadioUser*, October 2016: 15), and *BBC, the Myth of Public Service* by Tom Mills (*RadioUser*, April 2017: 29).

Overall, there are plenty of names and dates but, in my view, no real discussion on what radio has achieved and where it has failed. The chapters on the USA and Australasia are, arguably, of minor relevance to a British reader, and I feel that this space could have been better used by having a more detailed analysis of each decade of British radio history.

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Peter Waters G3OJV

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MIKE GILES ON UNSPLASH

1

Resilience, Reach, and Your Yellow Brick Road

Chrissy Brand
chrissyLB@hotmail.co.uk

Chrissy Brand examines how global radio stations have adapted to broadcast via television, speakers, and apps, while audiences consume content more and more seamlessly.

Once upon a time, families and friends would gather by the fireside and listen to the 'wireless' together. This shared experience frequently offered classical and middle-of-the-road music, dramas and comedy shows. In our own time, this "one-size-fits-all" approach has evolved.

I found a typical 'blast from the past' on the *BBC Genome* site (*Radio Times* listings, 1923 to 2009). The *BBC Light Programme* on New Year's Day 1965, for example, saw Bruce Forsyth presenting *Housewives' Choice*; then Brian Johnson commentated on the cricket Test Match between apartheid South Africa and England. *Any Questions* and *Friday Night is Music Night* doubtless also entertained many families, deprived of much in the way of radio alternatives.

https://genome.ch.bbc.co.uk

Today, every member of the family has their own portable listening device and radio; in fact, all media content is now a highly individualised experience. There may be some overlap and common interests within families and peer groups, but with so much choice, it is no surprise that we follow our own 'yellow brick road', headphones on, enjoying our unique collection of music, podcasts and radio stations.

Families may still gather to stream films and watch television programmes, especially at this time of year, but the shared experience is probably all the richer for this now being a rarity rather than the norm.

Tuscan Choice

In the autumn, I savoured shared audio experiences, when in Tuscany, helping my friend Dave, a former sports journalist

BAHIA FM FACEBOOK

2

Fig. 1: Are we uneducated about the musical genres played on the radio? Fig. 2: Bahia FM in the state of Salvador, Brazil, is *"connected with you" ("ligada em você")*. Fig. 3: In-car entertainment, talking Italian on Radio Subasio. Fig. 4: The lucky 13 broadcasters of *Euranet Plus* are shown in this graphic.

for *The Irish Examiner* newspaper, with his olive harvest.

One evening, we dined at a friend's house. Peppers and sausages were roasted on the kitchen's open fire by hostess Rachel, we were poured a Martini spritz aperitif, and the wide-screen television in the corner was tuned to the SRG SSR Radio Swiss Classic station, 700km away in Bern. As the meal progressed, host Patrizio moved the mood and tempo up a notch by retuning to Radio Swiss Jazz.

That evening, we switched between German-speaking Swiss radio and Italian television to watch developments in the US presidential election unfold.

I spent most evenings by the fireside whilst away. Internet radio provided accompaniment, streamed through a *JBL Flip Essential* portable Bluetooth speaker. I have added one to my festive wish list. It offers great sound quality for streaming music from Spotify, MixCloud, Apple Music, plus radio stations.

The *JBL Flip* retails for around £80 in the UK, and there are other, more expensive versions, such as the *JBL Flip 4* in blue at £99 and the *JBL Flip 5*. There is a yellow version available at £109, and a red one, which I have seen advertised for as low as £79.

Dave's station of choice most evenings was Bahia FM from Salvador in Brazil, streamed via the *Radio Garden* app. "Salvador's Happiest Station" plays Brazilian, top 40 and pop music (Fig. 2). Colombian radio got a look in as well, including medium wave Melodica Stereo, a medium wave station in Bogota that specialises in bolero, blues, jazz, and tango music.

At the Heart of the Home

The point I am making with all this is that radio still plays a major role in the heart of many homes. It may not be the shared experience it once was, but it is none the poorer for that. A few decades ago, only DXers were aware of the possibilities of hearing radio from other continents. Today, everyone can choose that option, and many do so instead of, as well as in addition to, whatever their domestic radio options. It is also heartening to realise that many still turn to radio as the obvious accompaniment to dinner parties and quiet solo evenings.

Our hire car in Italy was a new Fiat Tipo. Its in-car entertainment system was comprehensive, easy to use and unremarkable. As you would expect, you could pair a smartphone, for navigation or playing music.

The radio itself offered FM, medium wave and DAB. There is no sign yet of the 'connected car' appearing in rental vehicles in the price range that I hire!

There were plenty of opportunities to check out the radio scene. Although Italy's Covid-19 restrictions limited us to travel only in the region we were staying in, this was no hardship, with radio stations from Arezzo to Volterra to choose from. The decline of medium wave continues, with state broadcaster RAI (*Radiotelevisione Italiana*) Radio 1 on 657kHz being the only station the radio found on automatic scans. However, tuning medium wave manually brought up Radio Studio X on 1485 and 1584kHz, as well as on FM (87.3MHz).

Radio Studio X is a good example of how radio enthusiasts can play a role in radio stations. With the demise of medium and short wave, there are opportunities for private operators and other organisations, who, with enough technical and financial nous behind them, can indulge their radio passion. Restoring equipment, running a station and finding new audiences are all positive outcomes as traditional radio fades and is overtaken by more contemporary delivery technologies.

You can connect with Radio Studio X, its output of jazz and dance music, and with an 'online museum' of all the equipment that they have rescued and restored, from amplifiers to transmitters.

I was surprised to be able to hear seven DAB multiplexes, with three nationals that appeared as DAB Italia, DAB+ RAI and EuroDab Italia. There were two regional ensembles, from the region I was in and a neighbouring one, Toscana DAB and Umbria DAB. In addition, one showed as C.R. DAB Toscana, offering six stations, while another, Radio Dig Toscana, offered just two.

Programme content-wise, the stations that stood out for me as offering something a little different, were RAI Radio Kids and Lady Radio.

The Italian FM band contains a huge number of stations but, just like most other countries, but not enough choice when it came to musical genres. That is not to say that there was nothing to enjoy. Radio Bruno and Radio Subasio (Fig. 3) provided plenty of contemporary ballads, pop, indie and dance music, performed by Italian musicians, as well as the ubiquitous American and English bands.

CHRISSY BRAND

3

www.radioswissclassic.ch/en
www.radioswissjazz.ch/en
www.radiobahiafm.com.br/bahia-fm-887
www.colombia.com/radio
www.radiostudiox.it

Supportive Radio

Our Italian dinner party talk turned to the subject of radio – as it often does when I am at the table – and I was intrigued to hear of another friend, an entrepreneur and part-time olive farmer, who is involved in setting up a radio station for refugees in Italy. I am uncertain if it is part of the *Refugee Radio Network*, based in Hamburg, which is another fantastic organisation.

This multi-award-winning media project is an independent social initiative by self-organised refugees. It also works in partnership with the *United Nations Global Compact for Migration*, the *European Commission New Pact on Migration and Asylum*, The *Voice of America* and the European Union's *SMART* program. The latter stands for *Specific Methodologies and Resources for Radio Trainers* and offers training opportunities for community radio.

The *Second Conference on Migration and Media Awareness* is scheduled to take place next autumn, from October 28th to 30th 2021 in Hamburg. In the meantime, there are programmes, videos, policies and other useful information at the Refugee Radio Network website.

Radio has the potential and the ability to support people from all walks of life and to help with challenges thrown at us. I would say that this factor is one of the most exciting developments in the field of radio in recent years. Whether it is online or on the air, positive programmes and personalities can bring people together and, specifically, support isolated individuals and minority communities.

An example of an online radio station about to achieve this is Seven Bridges Radio. Launching in January, from Newcastle upon Tyne, named after the iconic bridges over the River Tyne; it aims to support those experiencing mental health difficulties; by providing a safe space for creative self-expression, as well as providing an open forum to talk about mental health in its many facets. Seven Bridges aims to be not only a radio station but a well-being station, for presenters and listeners.

The *Captain Balderdash Power Shower Hour* has a, "*practical smorgasbord of groovy jams! Prepare your bodies, minds and souls because radio is about to get a whole lot more delicious*."

Meanwhile, *50 Shades of Blues* gives a space to, *"itinerant train travellers and soul-sellers to the 12-bar string benders and sliders, the men and women who played and sang their lives and times, then and now."*

With a Little Help from My Songs features music that has helped listeners through tough times, in their own words, while *It's Not All Bad* is a show about all things good.

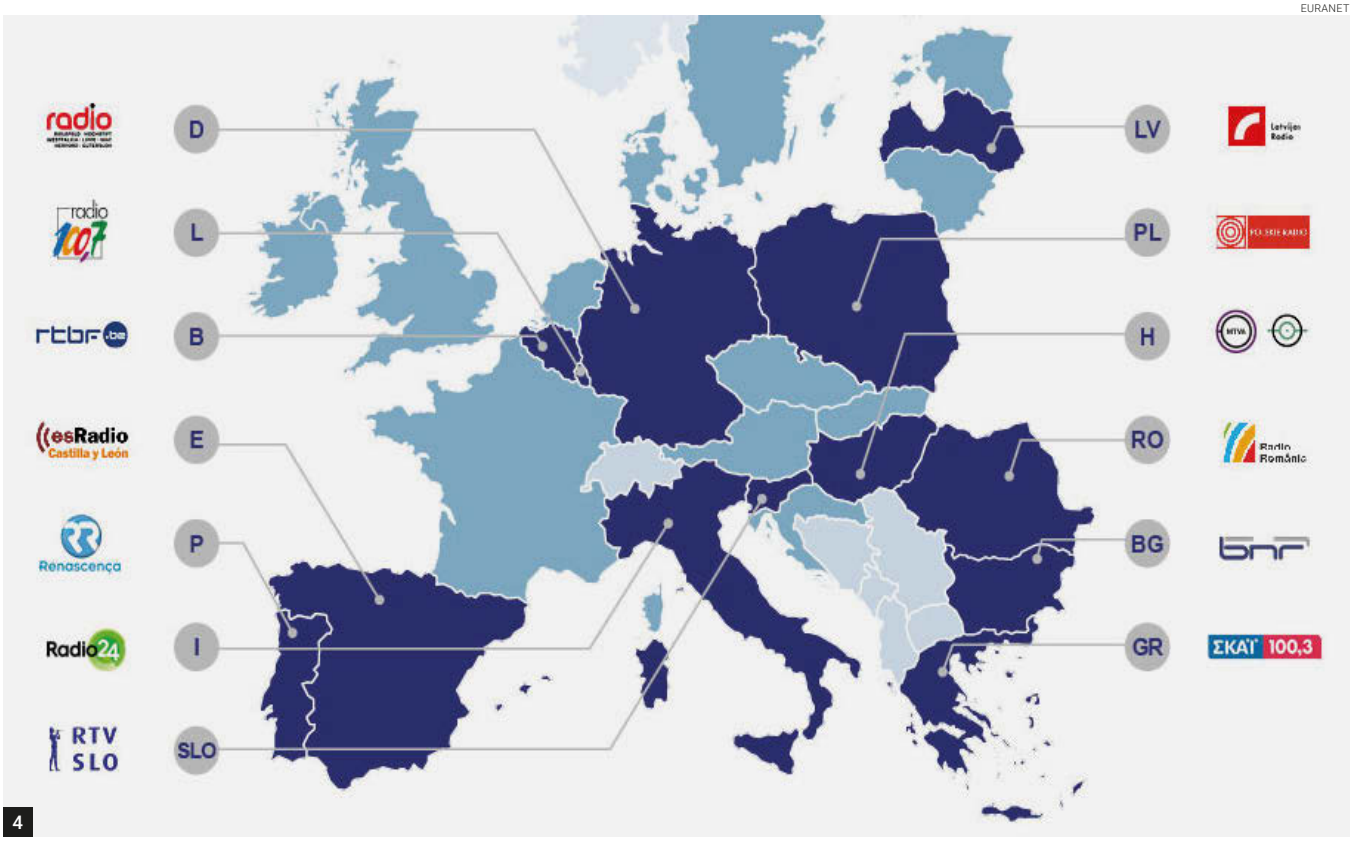
www.refugeeradionetwork.net
www.mixcloud.com/refugeeradionetwork
https://smart.radiotraining.eu/en
www.cmma2020.info
www.sevenbridgesradio.com

We Are What We Listen To

I have also been pleased to notice international radio stations being streamed in cafes, to create additional ambience, sometimes in place of a music playlist. I hasten to add that there is nothing wrong with a varied playlist; I have 'Shazammed' and discovered countless exciting musicians that way, particularly in cafes around Hastings and St. Leonards-on-Sea in 2020, as I lingered over an Americano coffee and pondered my *RadioUser* columns.

Graze on Grand is a favourite seafront café of mine, for lunch or a cheeky glass of wine, gazing out to sea (Fig. 1). I was speaking to the owner recently, complimenting her on the music being streamed, which was clearly from a radio station. The two preferred stations that the café

EURANET



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streams are Parisian Radio France station, FIP, and Jazz Radio from Berlin. FIP states that it is, "*the most eclectic music radio*", while Jazz Radio's influences cover Latin, soul and smooth up to swing and electronic music.

www.fip.fr

https://jazzradio.net

Is there a flip side to the fact that so many people now eschew mainstream radio and choose stations that are further afield? Stephanie Kerber, an author and a friend of mine, raised an interesting point on social media the other week. She wrote, *"I mentioned the band Steely Dan to four of my work colleagues today, whose ages ranged from 24 to mid-forties. No one had heard of them. I blame the splitting of radio stations into genres. When I was growing up, BBC Radio 1 and Capital Radio played everything: oldies, new stuff, pop, rock, soul, disco, and so on. We grew up with a solid knowledge of popular music history because of that. That is why I know about music from way before my time. It is why I am a huge Beatles fan. I was a baby when they were at their height, but the radio stations I listened to played that stuff, along with whatever was around at the time.*

"Sometime in the 1980s (I think) radio stations split into distinct genres and all that background knowledge became lost. If your parents only ever listened to pop stations or dance music stations, rock stations, whatever, you were never exposed to the other stuff. You never learned the foundations of music and you never learned to have wide-ranging musical tastes. I think it's a real shame."

Stephanie's own musical heritage and knowledge are showcased in her trilogy of *Julie Diamond* books, set amidst the 1980's Liverpool music scene. They are a very worthwhile read.

https://tinyurl.com/y2kajjlt

I understand where Stephanie is coming from, and I celebrate the fact that radio today can open our eyes and ears to so many styles and voices from all over the globe. Certainly, in the UK alone, there are dozens of more genres of popular music today than there were in the 1970s, although this is often only reflected in specialist radio programmes.

Perhaps a solution would be to produce a general music education radio series, then try and make it go viral. It might cover the history of popular music by countries and regions. This could benefit partnerships of music radio broadcasters as well as listeners.

Partnerships between international broadcasters are commonplace, for instance, the *Network Europe* current affairs radio programme initiative of around fifteen years ago. *Network Europe* was co-produced by Radio Prague, Deutsche Welle, Radio France International, Radio Netherlands, Radio Polonia, Radio Prague, Radio Romania International, Radio Slovakia International, Radio Sweden and Radio Ukraine International.

Euranet Plus is another example, being a network of radio broadcasters collaborating to share European news. Maybe they should join forces to produce a multilingual, multicultural history of European popular musical genres?

Euranet Plus is composed of, *"13 leading public and private broadcasters within the European Union reaching more than 15 million listeners in a daily cumulated reach."* (Fig. 4).

It broadcasts EU-related content through its international, national and regional radio in 13 of the EU states.

https://euranetplus-inside.eu

Next month we will look at some of the radio programmes that have won awards for their Covid-19 coverage and that still provide a well-balanced and supportive service for listeners.

2020 has been a tough year for everyone. I hope you find some quality time over the festive season and that 2021 is a happier and healthier year for us all.

Daimon Tilley G4USI
daimontilley@hotmail.com

Low-Power Long-Range Radio and the Internet of Things

Daimon Tilley G4USI introduces the world of Long-Range (LoRa) radio, used in everything from balloon-tracking to environmental observation, and which enables you to remotely control your sensors and devices

Welcome to the world of LoRa radio. In this article, I would like to explain the basics of what LoRa is (and is not), explore its applications in the real world, show how it works, provide information about frequencies and licensing, demonstrate how I am using LoRa myself, and share tips on how you too can get started and play with this technology relatively simply and cheaply, with no licence required.

First of all, how on earth are we pronouncing 'LoRa?' Personally, I prefer 'Laura' but others I have heard, use 'LowRa' – take your pick.

'LoRa' is a trademark of the *Semtech Corporation* and stands for 'long range.' It is a radio technique that uses a specific form of modulation. This allows very low power radio signals to travel further than they might otherwise do. Because of this low power / long-range combination, it has become a standard type of technology in the world of the 'Internet of Things' (IoT).

According to a Semtech, whose integrated circuits form the heart of many LoRa transceivers, there are now over 100 million devices connected to networks using LoRa in over 100 countries worldwide.

Key Features

Let us delve into some of these key features a little deeper for a greater understanding: LoRa is designed to send *packets* of information. It is a low-bandwidth technology. This means that it is ideal for transmitting sensor data, for activating and tracking things. As a result of its low bandwidth, it is entirely unsuitable for sending audio or video, for example. In these use cases, Wi-Fi, Bluetooth and cellular technologies are a better 'wireless' option.

It is this that is LoRa's advantage. It can operate where Wi-Fi and Bluetooth are not available or cannot reach, and at a much lower cost than the use of cellular. These strengths make it ideal for the transmission of simple data packets over relatively long distances, cheaply and reliably.

The nature of the technology also means that it works well in both urban and rural environments.

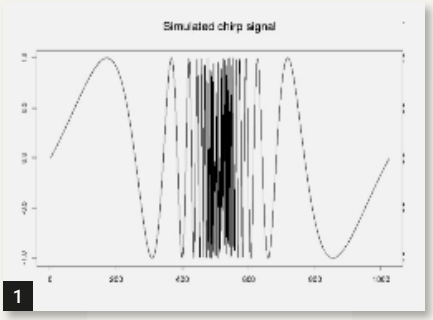
Where it comes into its own, and starts to have a wider impact, is when you connect one or more LoRa transceivers ('nodes'), via a gateway and into the internet, using a protocol called *LoRaWAN*, and it is from this mechanism that we get the term the 'Internet of Things' or 'IoT' for short.

User Scenarios

Building on what I have just described, LoRa can operate at two key levels. First, it is possible to just connect one LoRa transceiver to another (node-to-node) for simple messaging between the two (or more) devices. In addition to this, we can use LoRaWAN technology to feed these connections into the internet to be shared more widely or to increase the distance over which we can send data.

Let us have a look at some practical cases in which this technology can be used.

Starting with the environment, LoRa sensors are great at transmitting data or activating devices. For example, LoRa is used to provide longer-range telemetry for weather stations, environmental data such as soil temperature and moisture, flood warnings, smart farming and livestock management, poaching prevention, irrigation control, and much more. Meanwhile, in Healthcare, LoRa is effective in connecting health monitoring devices and providing the data over a network.



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In the context of the 'smart home' and building, this technology can find lots of uses, such as controlling lights, heating and security, as well as smart appliances. The reality is though, that in your home, it would be simpler and easier to use your Wi-Fi network for some of these things. However, in larger, industrial and office buildings or complexes, where there is no single Wi-Fi network covering the whole building, LoRa becomes very useful indeed.

In terms of entire 'smart cities', LoRa can manage city lighting, air quality and pollution monitoring, smart parking, waste management and many other services.

In industrial applications, this form of radio is useful for radiation and leak detection, item location and tracking, and shipping and transportation.

When it comes to using LoRa for our hobby, well, it seems you can operate

this for whatever you want to use it for. Later in this article, I am introducing my home projects. For now, perhaps the most obvious use of LoRa is to replace existing UHF wireless systems, which have tens of metres of range, with a system that can achieve hundreds of metres or more. Indeed, the right conditions, such as 'line-of-sight' between nodes, can result in 10 or more kilometres of range.

One good example of LoRa in use is in High Altitude Balloon (HAB) tracking, where distances achieved between transmitter and receiver are in the order of hundreds of kilometres. If you are interested in finding out more about this, I can recommend the website of the UK High Altitude Society (UKHAS). It has a guide on how to build your own LoRa receiver for tracking purposes. Details are below in the 'Further Resources' section.

But essentially, from a hobby perspective, if you want to send low-bandwidth data over ranges that Wi-Fi and Bluetooth cannot manage, with long battery life, then LoRa could be the best solution.

How Does it Work?

LoRa works using a proprietary modulation system, based upon something called Chirp Spread Spectrum (CSS) techniques, used heavily in radar applications. The techniques offer a higher degree of immunity to interference and fading. This allows the system to work at, or below, the 'noise-floor.' Some reports put this capability as being possible at nearly 20dB below the noise floor.

This provides significant advantages, in both range and reliability, over 'traditional' FM signal systems found in many consumer products, such as weather stations and other devices.

A 'chirp' is a sinusoidal signal whose frequency increases or decreases over time. The method works by using the entire allocated bandwidth to broadcast a signal. Each bit of information is represented by multiple 'chirps.' The amount of bandwidth, or spread, can be adjusted.

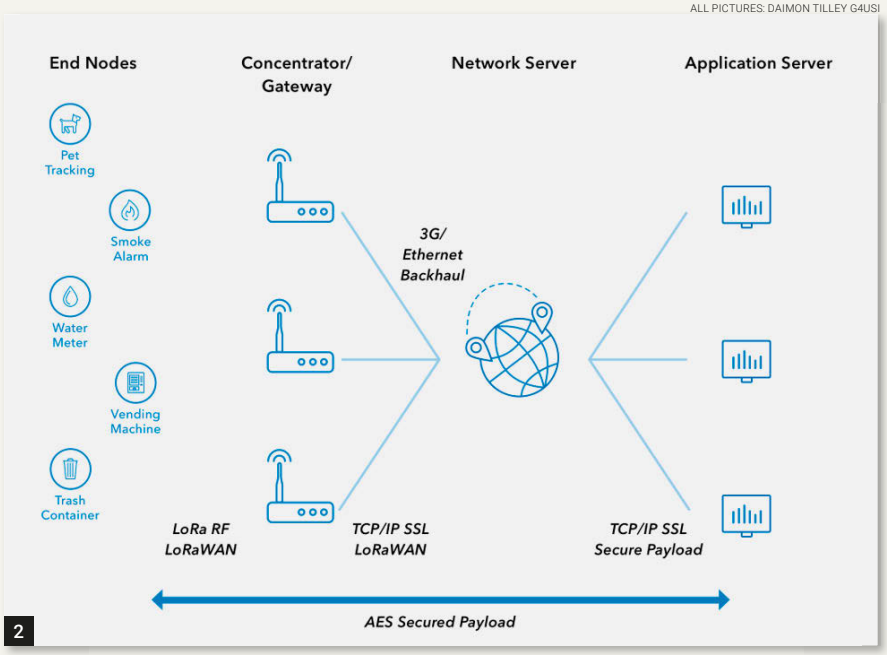
Because of this methodology, the signal is resistant to multipath fading and the Doppler effect. Interestingly, this could be useful in satellite applications where the Doppler effect is an issue to be addressed, due to the relative velocities between the satellite and a point on the earth.

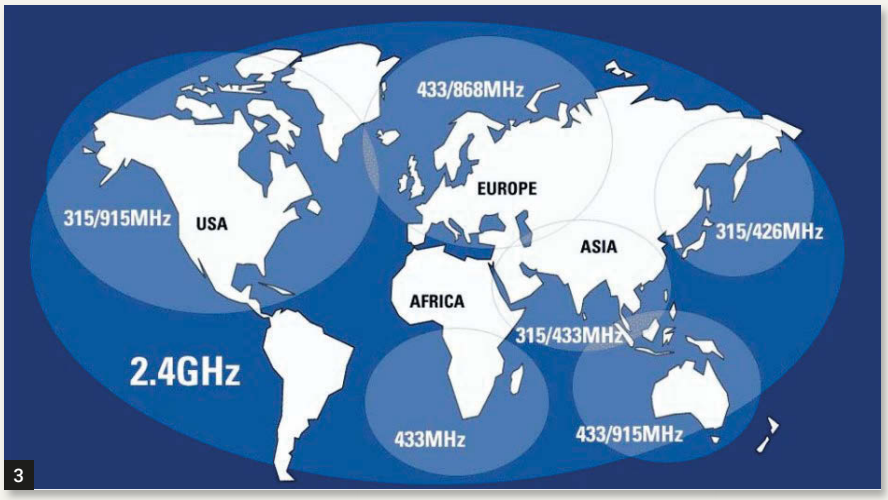
Indeed, according to some sources, one or more companies are working on satellite-based LoRa services to enable much greater LoRa node connectivity. Fig. 1 shows a diagrammatic view of a 'chirp.'

Currently, it is possible to conduct simple node-to-node LoRa comms with no internet connectivity. By adding LoRaWAN gateways (a form of a router) it is possible to connect many nodes and then upload that information to the internet, thus significantly enhancing connectivity.

The LoRa devices or nodes, use low-power to connect to the gateway, whilst the gateway utilizes higher bandwidth networks, such as cellular or Wi-Fi, to connect to the 'cloud'. Interestingly, a single gateway can serve thousands of

ALL PICTURES: DAIMON TILLEY G4USI





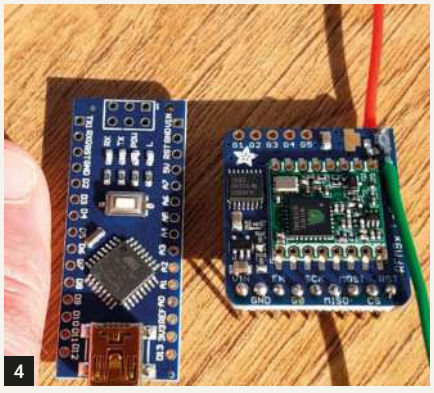
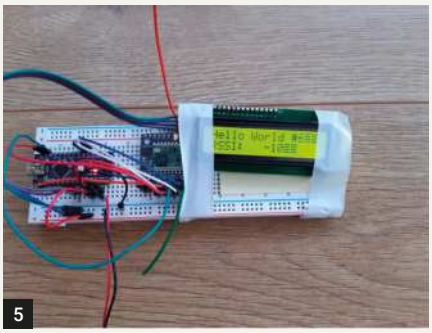


Fig. 1: A diagrammatic view of a 'chirp'.
Fig. 2: An overview of the LoRaWan architecture.
Fig. 3: The global Industrial, Scientific and Medical (ISM) bands.
Fig. 4: My LoRa 'receiver' and 'transmitter'.

Fig. 5: The Arduino-linked transmitter.
Fig. 6: The Arduino-linked receiver.
Fig. 7: Author, and dog, at the summit of their achievement.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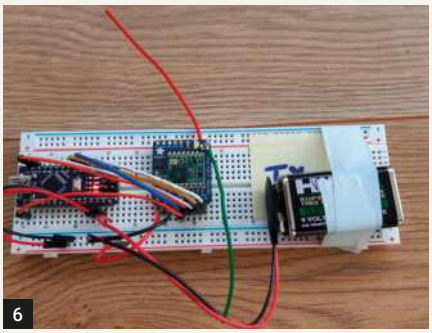
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devices. Public and private gateways are being installed all the time and can be shared among users, a bit like public Wi-Fi networks. These keep investment costs low and connectivity rates high. They are now becoming increasingly common in cities around the world. For example, according to one source, Zürich is one of the most connected cities, with over 170 LoRaWAN gateways available.

The Internet of Things (IoT)

This is one source for the term 'Internet of Things' IoT. By adding satellites to the equation, it becomes possible to significantly increase the 'footprint' of gateways to cover rural and hard-to-reach areas, even oceans. Global networks become possible.

One cloud-based provider for the IoT, *The Things Network*, provides free services for companies and private individuals alike. Using their services allows users to connect LoRa devices and sensors and to monitor them remotely from anywhere they choose using the internet. Of course, this opens up the possibility of sharing that information and collaborating with others.

One good and increasingly widespread example of the Internet of Things, is the growth in smart meters for monitoring, say, electricity usage. Smartwatches are another example. In my case, my smartwatch is GPS-enabled and tracks my running and cycling. When I get home, I connect it to my computer and the data is uploaded to several social networking sites relating to fitness. This allows me to review and analyse my running data and performance but also enables friends (with my permission) to see my exercise routes.

My running club makes quite a bit of use of this, for example.

Fig. 2 shows a diagrammatic view of the *LoRaWan* architecture, courtesy of *The Things Network*.

Frequencies and Licensing

So, who can play with this technology? The answer is - 'everyone' as no license is required! LoRa operates in a set of internationally-recognised frequencies known as the ISM bands (Industrial, Scientific and Medical). These bands are license-free, subject to certain conditions. These frequencies are broadly standard but do vary a little around the world (Fig. 3).

In Europe and the UK, there are some ISM frequency bands (see Ofcom website for details). LoRa transceivers are sold by a specific frequency band and usually, these are 433, 868 and 915Mhz. In the UK we can use the 433 and 868MHz bands. The actual frequency in these bands can be set in software by the user, as long as you keep in the frequency allocation for your country. This is helpful if you want to run multiple transceivers for a different purpose, without interference.

My application of LoRa

So, as keen radio users, how might we want to use LoRa for practical applications? Well, to be honest, if you want to send basic sensor data or you wish to, say, activate a relay, over a distance wirelessly, then the sky is the limit. I became interested in LoRa is through the amateur radio hobby. I am lucky enough to live on a smallholding with plenty of room to play with antennas. I decided I wanted to have a directional antenna, providing gain, on 40m. I already have a 40m band home-made ground plane antenna. I decided that I wanted to add a further two 'elements' to provide a vertical beam. I would do this 'Yagi' style: The existing antenna would be the 'driven element', and two further verticals, not connected to coax or RF directly, would be passive; one would act as a reflector, and one as a director.

This was fine for a single direction, and I could point to the US quite readily, but what about signals and contacts in the other direction? I needed a way to switch direction by 180 degrees quickly and easily. I won't bore you with too many details here, but I could achieve this by switching in and out a small inductance at the base of the passive elements. This would allow me to make one passive element electrically longer by switching in the inductor, and one electrically shorter, by switching it out. I could 'flip-flop' between these elements to change direction. All I needed was some latching relays at the base of each passive element to allow the switching.

But how to switch the relays? The obvious answer would be to feed the relays with cable back to the shack to switch them, and this would certainly be the most electrically simple method. However, I would have to run two cables (one to each passive element) over 40 metres distance or more, entailing more garden digging to go around the patio, across the lawn and to the other side of the house. An added complication would require me to cross the bed of 16 buried radials I had buried last year – a prospect fraught with the likelihood of chopping my radials off short!

Next, my attention turned to the BBC Micro-bit, a small microprocessor board, of which I have a number. These have a small radio transmitter function operating at 2.4Ghz. This allows Bluetooth connection, as well as a much simpler method of communication MicroBit-to-MicroBit. Tests were eagerly carried out, but the range was just insufficient, not aided by the two-foot thick stone and cob farmhouse walls!

Then I thought of Wi-Fi and of using some spare Raspberry Pi Zero boards, which have built-in Wi-Fi. I can get Wi-Fi in certain parts of that area of the garden, but again, tests showed this was only achievable at one of the two passive element locations.

Finding a Solution

This was when I turned to LoRa. LoRa

is more than capable of overcoming these hurdles, so my quest to experiment started. First of all, I ordered the necessary pieces of electronics (see next section) and wired and coded these via the Arduino Nano (clone) microprocessor, as these are small, cheap and use very low power.

I began by building and coding two transceivers on a breadboard. The first (I call it the 'transmitter', but it is a transceiver) sends out a "Hello World" message every few seconds. The second (the 'receiver') receives this signal, and displays it on a small LCD display, along with the RSSI (Received Signal Strength Indicator.) It also replies to the 'transmitter' to acknowledge receipt.

You can see a picture of the two devices in Fig. 4, with my little finger for scale! The red and green wires are two halves of a dipole, cut for your chosen frequency.

Fig. 5 shows the Arduino-linked 'transmitter' and Fig. 6 the Arduino-linked radio 'receiver.'

Leaving the 'transmitter' inside my shack, I explored the full four acres of our property with the receiver and was pleased to find a strong signal everywhere on the property, including the area I plan for the antenna array.

Next, I put the receiver in the car and did a four to a five-mile circuit of the property on the surrounding roads. Coverage was patchy. I live rurally, but at the edge of the Brendon Hills near Exmoor, so the terrain is somewhat 'lumpy.' I was pleased to be getting line-of-sight reception one mile away over the fields, however.

Today, as I put the finishing touches to this article, I took *Georgie*, my Sproodle dog, and the LoRa receiver to a SOTA summit called *Wills Neck* in the Quantock Hills. It is almost exactly eight miles from my QTH and has a line of sight into my field. I suspended the transmitter in a waterproof box eight feet above ground in the field and headed to the summit. It's about a 30-minute walk from the car part to the summit and it took all my self-control not to start testing on the way up, but I managed it. At the trig point, out came the 'receiver' on went the battery... and... success! A good, reliable, signal over eight miles.

Now I need to find a longer distance to try!

Fig. 7 shows *Georgie*, LoRa and me at the summit.

7

This technology was going to do what I needed. This is a far as I have progressed with that particular project – I now need to create three transceivers. One will be in the shack where the Arduino and radio module will be linked to three buttons and an LCD display. Button one and two will select either an Easterly or Westerly direction by switching the relays, and button three will switch both passive antennas 'open circuit' from their radials, to retain the single omni-directional capability of the driven element.

The other two transceivers will be battery-powered, sitting at the base of the passive elements to switch the inductance in and out or to open circuit the vertical element from the radials. Of course, the nature of our radio hobby is that it can be addictive, so before I have finished this first project, I have already started thinking of (and playing with) others! For example, I am thinking of making a remote weather station, which will be sited at the bottom of our main field some 250 metres away. LoRa will be great for getting the data back to the house and onto the internet for me and local friends to share.

I am also considering experiments with LoRa to monitor the water level and flow in the stream on my property and to monitor temperature, pressure, humidity and soil moisture in my large poly-tunnel over 150m from the house.

The essence of these examples is, if you want to send small packets of data to and from sensors, or activate switches and relays, beyond the range of conventional low power radio modules, Bluetooth and Wi-Fi, then LoRa may be the ideal tool for you.

Getting Started

If you want to have a play for yourself, Table 1 contains a basic shopping list.

Further Reading

- Adafruit LoRa module tutorial for LoRa with Arduino **https://tinyurl.com/jzg4l96**
- Circuit Digest tutorial for LoRa with both Pi and Arduino **https://tinyurl.com/yym3qxv5**
- Information about Satellite LoRaWAN gateways: **https://lacuna.space**
- Met Office Weather Observations Website (WOW): **https://wow.metoffice.gov.uk**
- Pi Supply tutorial for a LoRa node with BBC MicroBit **https://tinyurl.com/y6dndscp**
- Pi Supply tutorial for using a Lora pHat with a Raspberry Pi Zero **https://tinyurl.com/y3a2wf3n**
- Semtech website: **https://www.semtech.com/lora**

(1) A LoRa transceiver. Look for an RFM95W board. Do not buy an RFM69 board – these are non-LoRa radios with a very short range of just a few metres. Choose from one in either the 433 or 868MHz bands, which are licence-free in the UK.
(2) A microprocessor or microcomputer board. Most of the transceiver modules can be used with the Arduino, the BBC MicroBit and the Raspberry Pi variants. For the Arduino, you can use a separate module, or you can buy boards with Arduino clones and the transceiver combined for a really easy set-up (the Adafruit Feather with LoRa, for example.) In addition to stand-alone radios, you can buy boards, known as HATs ('hardware-on-top') that plug directly onto and piggy-back on the processor, minimising wiring and footprint. One of the advantages of using a Raspberry Pi is the ability to connect directly to the internet. This allows you to both upload data to the cloud, but also remotely control your LoRa nodes from anywhere in the world.
(3) Code. You need code (a computer/microprocessor program) to set up the transceiver, adjust frequency, set power output, and to send and receive packets of data and complete instructions (for example, 'if this message is received, then turn on that relay.') Some of the radio module and HAT providers also provide clear instructions on wiring and basic code examples to get you started. I have recommended some tutorials, below.
(4) Some breadboard, breadboard connectors, a suitable power supply or batteries.

Table 1: What you Need to Make a Start with LoRa.

I hope you are now better informed about LoRa and its benefits and uses. Better still, I hope you are inspired to have a play for yourself. Good luck!

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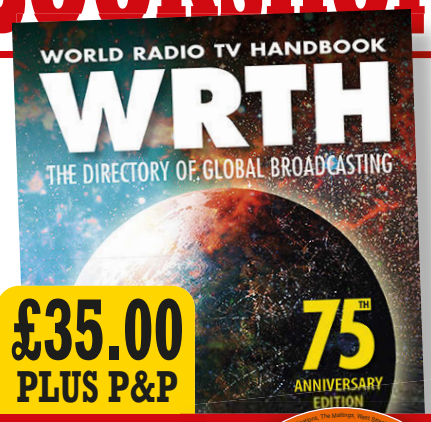
This great directory continues to offer the most comprehensive guide to broadcasting on the planet. With the help of our international network of contributors we again provide the most up-to-date information on mediumwave, shortwave and FM broadcasts and broadcasters available in any publication. **World Radio TV Handbook** consistently sets the radio hobby standards. It remains the best, most authorative and comprehensive radio reference book in the world; one that should be in every hobbyist listening post or radio room.



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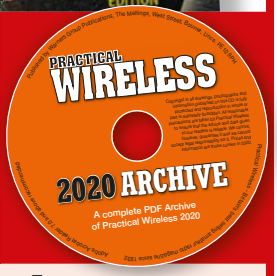

The Magic Bands

Written by the editor of Practical Wireless Don Field, G3XTT, this book provides a comprehensive guide to these fascinating bands and lets you into the secrets that make them so popular.

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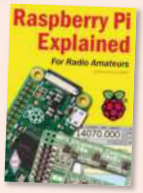
Raspberry Pi Explained

Raspberry Pi Explained guides you through step-by-step instructions to get the Pi working for you.



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Software Defined Radio

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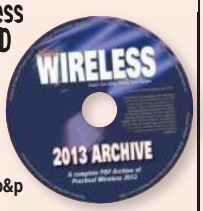

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David Smith
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David Smith analyses European aircraft movement forecasts, introduces an invention that allows pilots to 'see' through fog and profiles Blackbushe Airport in Hampshire.

DAVID SMITH

1

Air Traffic Forecasts, Early Airband Radios, and Synthetic Vision

In response to the Covid-19 (Coronavirus) crisis, Eurocontrol has released a new forecast looking at the possible evolution of air traffic in Europe over the coming five years. In the most optimistic scenario, traffic is forecast to return to 2019 levels by 2024. However, in the second forecast (most likely), 2024 traffic would only be at 92% of the 2019 figure. In the third model, traffic in 2024 would be 75% of the 2019 figure and would not reach 2019 numbers until 2029.

Eamonn Brennan, Director General of Eurocontrol, commented: *"Even in the most positive scenario, we do not expect a recovery to 2019 levels before 2024. There is a very real prospect that this recovery could take even longer, perhaps to as far out as 2029. This is a catastrophic picture for the aviation industry and shows clearly why it is so important for States to take consistent and coherent measures to support the aviation industry and make passengers feel safe to fly again."*

The forecast is based on three headline scenarios:

Scenario 1 – Vaccine Summer 2021: Vaccine widely made available for travellers (or end of the pandemic) by Summer 2021, with traffic only returning to 2019 levels by 2024.

Scenario 2 – Vaccine Summer 2022: Vaccine widely made available for travellers (or end of the pandemic) by Summer 2022, with traffic only returning to 2019 levels by 2026.

Scenario 3 – Vaccine not effective: Lingering infection and low passenger confidence, with traffic only returning to 2019 levels by 2029.

The forecast shows that the evolution of the aviation sector is strongly dependent on how soon an effective vaccine is made widely available and by levels of public confidence.

At the time of publication, there was some encouraging news on vaccines, so this is a developing area.

Arrival Routes Set to Change

A public consultation to help determine new arrival routes for flights into London Luton Airport opened on 19 October and will be running until 5 February 2021. It offers residents and communities in the surrounding areas the chance to have their say and shape the outcome. Luton currently shares arrival routes and holding stacks with Stansted, a unique and unsustainable situation for airports of this size in the UK. Any delay at one airport, either in the air or on the ground, impacts on the other and can cause additional delay, noise and carbon emissions.

The proposed changes will separate routes further out and higher up and create a new hold for Luton arrivals, to ensure that operations for Luton and Stansted do not affect each other. The joint consultation, co-sponsored by Luton and NATS, is looking at two options to simplify the arrival routes for flights into the country's fifth-busiest Airport and segregate them from Stansted's, ensuring safety.

The first option uses the latest air navigation technology (Performance Based Navigation – PBN) at higher altitudes (approximately 8,000ft and above) to separate Luton's arrivals from Stansted's, with controllers tactically descending and directing aircraft from approximately 8,000ft to landing. The second alternative – which is the preferred option – is the same but extends the availability of PBN to *final approach*.

This allows a predictable, more equitable distribution of flights for communities beneath.

The proposals being put forward by LLA and NATS affect areas not only near the Airport but also wider areas across Bedfordshire, Buckinghamshire, Cambridgeshire, Essex, Hertfordshire and Suffolk. An online postcode tool allows anyone living or working in these areas to see what the changes may mean for them: https://tinyurl.com/y2vvhcm5

Synthetic Vision Through Bad Weather

North Carolina's Vū Systems and Sweden's Saab are joining forces to put a revolutionary new Enhanced Flight Vision System on the market for the first time,

Fig. 1: A fighter line-up at Duxford.

enabling pilots to 'see' in zero visibility. Vū Systems was founded in North Carolina in 2013, with 'Vū' meaning 'Visibility Unlimited'. In 2015, the company flight-tested an initial prototype of a passive millimetre wave (PMMW) camera, proving its ability to 'see through' weather. Work continued to create the so-called *Vū Cube* sensor, and a strategic partnership was forged with Saab, who was already highly experienced in head-up displays, synthetic vision and flight deck avionics.

Put simply, where visibility is reduced to zero because of dense fog, heavy precipitation, blown sand or dust, or even smoke, the PMMW sensor enables safe flight to touchdown without the requirement for extensive airport landing aids. It means aircraft equipped for Area Navigation (RNAV) and Required Navigation Performance (RNP) will be able to continue for zero-visibility landings at smaller airports, avoiding diversions and missed schedules, and increasing safety.

Vū Cube works on the principle that as objects naturally emit light and infra-red (IR) radiation, so they also emit millimetre-wave energy. This occurs at wavelengths longer than those of IR, typically between 1 and 10mm, and lower frequencies in the extremely high frequency (30 to 300GHz) band. Millimetre-wave radiation is typically blocked by raindrops, for example, which are of a similar size to its longer wavelengths.

However, at its higher frequencies, its shorter wavelengths enable it to penetrate precipitation, albeit over relatively short ranges. It is this quality that Vū is exploiting. Significantly, there is also a distinct contrast between the levels of MMW emitted from the sky and, for example, a runway surface, regardless of ambient conditions. Its lower frequency, compared to IR, means that MMW produces a less detailed image. Nonetheless, with computer enhancement, the resolution is sufficient to define landscape features, buildings and other structures and, crucially, the runway threshold and associated detail. VU Systems is confident in specifying a range of two nautical miles, but trials have shown its ability over twice that distance.

MMW comes into play in combination with other sensors. This is where Saab comes in, combining *Vū Cube* with its Synthetic Vision System (SVS) to generate an Enhanced Flight Vision System (EFVS).

ATC & Aerodrome Flight Information Service Profiles 27: Blackbushe Airport

ICAO Code: EGLK IATA Code: BBS

Frequencies	(MHz)	Hours of Operation
Blackbushe Information	122.305	0700-22

AFIS service is subject to downgrade to Air/Ground at short notice.

NAVAIDS NDB BLK 328kHz
DME BLC 116.200MHz

HOLDS No holding provided

RUNWAYS
07 1335 x 46m
25 1335 x 46m

NOTES (A-Z)

Airport Regulations
Non-radio aircraft not accepted except in an emergency. Circuit training is limited to four aircraft. All circuit bookings managed by ATSU.

Cat II/III Operations
Not applicable

Circuit Procedures
Circuits are always to the south of the Airfield and are flown at 800ft QFE for most fixed-wing aircraft. For jet, turboprop, or other high-performance traffic, circuits are flown at 1,200ft QFE ('QFE' = atmospheric pressure at aerodrome elevation). Rotary wing circuits are flown at 800ft QFE, typically inside the fixed-wing circuit. All pilots should be aware of rotary traffic using non-standard circuits when using the Helicopter Training Area to the south of Runway 07/25. Pilots must remain north of the M3 motorway to avoid infringing the Farnborough Aerodrome Traffic Zone (ATZ) / Controlled Traffic Region (CTR).

Ground Movement
All IFR departures and all aircraft parked on the main apron are required to obtain approval from AFIS before starting engines.

Helicopter Operations
Helicopters must avoid flying parallel with fixed-wing aircraft on final approach.

Use of Runways
When the RVR is below 500m, departures are not permitted unless Air Operator's Certificate holders have less restrictive authorised take-off minima. Pilots are advised that there is no runway centre-line lighting and departure in Runway Visual Range (RVR) conditions of less than 400m is at the pilot's discretion. Take-off will not be permitted if the RVR is less than 250m.

Visual Reference Points
Fleet Pond
M3 Junction 4

Warnings
Fast jet aircraft mixing with much slower GA (General Aviation) aircraft should be expected at any time during operational hours. All pilots must exercise caution and always obtain traffic information before entering the ATZ. The grassed surface south of Runway 07/25 between Taxiways C and D is unsuitable for use by certain types of helicopter due to its poor grading. Pilots are cautioned to positively ascertain that the grading of this area is suitable for their operational requirements. Visual glide-slope guidance signals for both Runways 07 and 25 are visible to the south of the extended runway centrelines where normal obstacle clearance is not guaranteed. They should not be used until the aircraft is aligned with the runway. Helicopter training in designated areas takes place at the airport. Blackbushe is located 3.8nm northwest of Farnborough aerodrome, which shares a similar runway orientation. Pilots should exercise caution in identifying the correct aerodrome from the air, notably when approaching Blackbushe from the south and southeast. Farnborough is distinguishable by a large silver coloured hangar and terminal complex located to the north of the runway. Farnborough controlled airspace exists south of Blackbushe. Pilots are to remain outside this controlled airspace unless in receipt of clearance directly from Farnborough Radar or Blackbushe Information.

N.B.: Co-ordination procedures with adjacent Farnborough are complicated and can be found in detail online (see above).

The Saab- Vū EFVS combines visuals from PMMW, infrared, synthetic vision and other sensors to generate imagery that may be displayed in front of the pilot on Saab's high-performance HUD, itself based on technologies well proven in a variety of applications, including military transport aircraft.

https://www.vusystems.com

Early Airband Radios

Vintage Airband Radio is a fascinating new website dedicated to the airband radios that began to come on the market in the late 1950s and early 1960s. Notable was *Shorrock Developments Ltd.* in Blackburn, Lancashire, which is believed to have been the first company in the UK to produce and sell airband radios.

These were marketed originally as an emergency receiver for light aircraft and glider pilots, and for use by those with aviation interests, encouraged in small print in the advertisements. Airband coverage was limited to 109 - 131MHz ('Megacycles' in those days, of course), along with standard broadcasts on medium and long wave bands.

Other receivers soon appeared, including Gauers, Nova-Tech, Volstatic and Park Air, most of which were well-known to enthusiasts of the time. Not so familiar - to me anyway - were sets by Lafayette, Juliette, Aiwa, and Sanyo. All of these are described in some detail, with photographs, line drawings and contemporary adverts. The Webmaster writes that his site is very much a work in progress, and he welcomes any information for others to enjoy.

https://www.airband-radio.co.uk

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ICOM

Icom have been building radio receivers and scanners for a variety of applications for many years, enabling professionals and Amateur enthusiasts to monitor an increasing number of broadcasts. Icom's receiver and scanner range includes models that connect to your home PC, desktop or base-station receivers,

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Accessories

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CP-18E cigar lighter cable **£24.95**
CS-R6 cloning software for IC-R6 ..... **£34.99**
SP-27 clear acoustic earpiece **£24.95**
BC-223 rapid charger for IC-R30 ..... **£59.95**
BP-287 hi capacity 3280 mAh replacement battery for IC-R30 ..... **£74.95**
BP-293 dry cell case (3x AA) for IC-R30 ..... **£34.99**
CS-R30 programming software for IC-R30 ..... **£59.95**
LC-189 soft case for IC-R30 ..... **£24.95**
CS-R8600 software for IC-R8600 ..... **£69.95**
RS-R8600 remote control software for IC-R8600 ..... **£99.95**
RC-28 remote control system for IC-R8600 ..... **£279.95**
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bhi design & manufacture a range of DSP noise cancelling products that remove unwanted background noise & interference from noisy voice & radio communication channels to leave clear speech. Aimed at a number of different radio related & voice communication markets, our products incorporate unique Digital Signal Processing technology to enable clear communications from within noisy environments.

NES10-2 MK4 Noise Eliminating Speaker replaces the MK3 version and removes unwanted background noise, hiss, hash, QRM, QRN, computer hash, plasma TV interference, white noise etc from speech, so that you can hear more clearly and listen stress free. Works across all radio bands and is also suitable for shortwave listening and for use in radio base stations. **£119.95**

Uniden

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

PRE-LOADED UBC-125 DELUXE AIR BAND KIT WITH ACCESSORIES JUST £219.95

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UBC-125XLT (best seller) 25-960 MHz 500 channel analogue scanner **£139.95**
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SDS-100 Advanced 25-1300 MHz Digital & Analogue scanner **£589.95**

Mobile/Base

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ARC-536 basic software for UBCD-3600XLT **£29.99**
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DIAMOND ANTENNA

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

Scanner Antennas

D777 is a VHF/UHF civilian and Military air band receiving antenna. It has a gain of 3.4dB on VHF (120MHz) and 5.5 dB UHF (300MHz) with a length of 1.7m and SO239 socket for easy connection **£64.99**

D-190 is a high performance wideband discone antenna covering 100-1500 MHz including 10m RG58 terminated in PL259 ..... **£99.95**

D-130M is a Discone antenna with wide frequency coverage on receive 25 to 1300MHz and covers 6m (20W) and 2m (200W) when used with a transmitter. This model is supplied with 15m RG58A/U and 2 x PL259 plugs **£129.95**

WHISTLER

The Whistlers Scanners are USA designed and built to last – The TRX-1 & TRX-2 are our best-selling digital versions with sales 10-1 against any other brand. We have worked with Whistler to customise a UK band plan for these 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.

Handheld

WS1010 25-512MHz 200 channel analogue scanner **£89.95**
WS1040 25-1300 MHz storage for 1800 frequencies analogue scanner **£299.95**
TRX-1E 25-1300 MHz best-selling Digital & Analogue scanner **£419.95**

Mobile/Base

WS1025 29-512 MHz 200 channel analogue scanner **£99.95**
WS1065 25-1300 MHz storage for 1800 frequencies analogue scanner **£279.95**
TRX-2E 25-1300 MHz best-selling Digital & Analogue scanner **£499.95**

Accessories

TRX-1 leather case **£29.99**
MRW-TRX3 Triple hand held replacement antenna pack to increase performance **£39.95**
TRX-1 or TRX-2 SD Card – preprogramed with Airband, Marine, 446, FM/DMR/NXDN/25 Repeaters + FM/DMR simplex **£19.99**

LEATHER CASE for TRX-1 £29.95

FlightAware

Live Flight Tracking

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 **£29.99**
Flightaware Prostick **£24.95**
FlightAware ADSB 1090MHz Band-pass SMA Filter **£17.99**

AIRSPY

Redefining The Radio Experience.

Airspy is a line of super popular Software-Defined Radio (SDR) receivers developed to achieve high performance at an affordable price using innovative combinations of DSP and RF techniques. The goal is to satisfy the most demanding telecommunications professionals and radio enthusiasts while being a serious alternative to both cost sensitive and higher end receivers. Airspy Radios feature world class reception quality and ease of use thanks to the tight integration with the de facto standard free SDR# software for signal acquisition, analysis and demodulation.

HF+ Discovery 0.5kHz – 31MHz VHF 60-260MHz SDR receiver **£199.95**
R2 VHF/UHF 24-1800MHz SDR receiver **£209.95**
MINI VHF/UHF 24-1700MHz SDR dongle **£119.95**
Spyverter R2 extend your AIRSPY coverage **£59.99**
NEW YouLOOP indoor HF Antenna 0.5-52MHz **£29.99**

TECSUN

Tecsun is a world famous manufacturer of AM,FM and shortwave radios. They offer a great range of portable options from just £44.95

Portable

PL-360 This pocket world band radio, with AM & FM reception, keeps you in with the action from Long Wave , Shortwave(2.3-21.95MHz), FM (87-108MHz) **£49.99**
PL-606 is a DSP-based portable LW/MW/FM/SW (2.3-21.95MHz) shortwave radio **44.95**
PL-310ET is a portable multi band radio covering FM 76-108 AM 522-1620 kHz SW 2300-21950 kHz LW 153-513 kHz **£49.99**
PL-680 is a fully featured world band portable radio with SSB covering FM 87–108 MHz MW 522-1620 kHz SW 1711-29999kHz LW 100-519 kHz AIR 118-137 MHz **£149.95**
PL-880 is the flagship portable radio fitted with analogue Hi-IF circuit, multi conversion , & DSP decoding technology, which greatly enhances the sensitivity, selectivity and reduces interference from close by stations. Covering FM 87-108 MHz, SW 1.711 – 29.999 MHz, MW 522 – 1620 kHz, LW 100 – 519 kHz **£189.95**

MFJ

MFJ Enterprises, founded in 1972 by Martin F. Jue, is a manufacturer of a broad range of products for the hobby radio market. They specialise in station accessories, such as antenna tuners and antenna accessories. MFJ manufactures more amateur radio products than any other company in the world.

Receiving Products

MFJ-1022 300 kHz – 200 MHz active antenna covers the HF to VHF bands. It easily plugs into your general coverage receiver or scanner **£94.95**
MFJ-1020C 300kHz to 30 MHz tuned indoor active antenna system performs as well if not better than a long wire ten metres long. Tuned circuitry minimises intermod, improves selectivity and reduces noise. You can also use it as a tuned preselector with an external antenna **£129.95**
MFJ-1024 50 kHz – 30 MHz active antenna complete with control unit, 15m coax and external antenna **£197.99**
MFJ-1025 1.5-30 MHz noise canceller (alternative to the MFJ-1026) without the built-in Active Antenna. Plug your station antenna into the MFJ-1025 and your antenna system turns into a directional receiving array! **£269.99**
MFJ-1026 This unit is designed to eliminate local electrical noise even before it reaches the antenna socket of the receiver – it covers 1.8-30MHz – great just to only here the wanted signal in the clear. **£279.95**

Bonito

The Bonito brand defines over 38 years of reliable software in the field of worldwide weather data reception on board and of course Ham radio. Bonito is one of the leading software manufacturers for receiving weather information via shortwave radio, such as WeatherFax, Navtex, RTTY, CW and Synop as well as Satellite Fax Images from NOAA, Goes, ESA / EUMETSAT Meteosat. As well in Ham radio Software, SDR-Receiver and active Antennas and many more ham radio and DXer products.

Boni-Whip 20 kHz-300 MHz portable (17cm length) active wideband antenna **£109.95**
MA305FT MegActiv 9 kHz -300 MHz portable (30cm length) active wideband antenna **£179.95**
POLORAN 200 9kHz – 200 MHz broadband passive loop antenna. **£179.95**
GA3005 GigActiv 9 kHz–3000 MHz portable (19cm length) active wideband antenna **£379.95**
MEGALOOP FX 9 kHz – 180 MHz indoor/outdoor flexible loop antenna **£349.95**
MD3000X Mega Dipole 9 kHz–180 MHz active wire antenna **£389.95**

ALINCO

Alinco is a Japanese manufacturer of radio equipment, established in 1938 in Osaka, Japan and has been a trusted source for radio scanners for years.

Handheld

DJ-X3ED 100 kHz – 1300 MHz AM/FM/WFM 700 channel analogue scanner **£119.95**
DJ-X11E 500 kHz – 1300 MHz All mode 1200 channel analogue scanner **£349.95**

Base

DX-R8E 150 kHz – 35 Hz all mode 600 channel receiver **£469.95**

Accessories

ERW-7 USB computer interface cable for DX-R8E **£39.95**
ERW-8 USB Interface cable for DJ-X11scanner **£39.95**
ESC-50 soft case for DJ-X11 scanner **£23.95**
EBP-74 replacement 1800mAh battery for DJ-X11 ..... **£34.95**
EDH-36 spare dry cell case for DJ-x11 ..... **£17.95**
EME-26 curly cord earphone **£10.95**
EME-6 straight cord earphone **£10.95**
EPB-54N high power battery for DJ-x3 ..... **£29.95**
EDC-105 drop in charger for DJ-X3 ..... **£14.95**
EDC-43 DC power cable for DJ-X3 ..... **£14.99**
EDC-37 12v DC cable for Alinco scanners **£9.95**
EDS-17 remote head fitting for DX-SR8 ..... **£49.95**

SDRplay

The people behind SDRplay are a small group of engineers based in the UK with strong connections to the UK Wireless Chip Industry. They have both software and hardware expertise and the RSP was designed by them here in the UK.

RSPDUO is a dual-tuner wideband full featured 14-bit SDR which covers the entire RF spectrum from 1kHz to 2GHz giving 10MHz of spectrum visibility **£239.99**
RSPDX covers all frequencies from 1kHz through VLF, LF, MW, HF, VHF, UHF and L-band to 2GHz, with no gaps **£194.95**
RSP-1A 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 **£99.95**

AOR

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

Handheld

AR-8200MK3 super wide band 100 kHz-3000 MHz 1000 channels analogue scanner **£459.95**
AR-8200D same as AR-8200-MKIII with the following added features. * APCO25 Decoding * Voice Recording * MicroSD Card Slot * 4GB MicroSD card Included * USB Port * CTCSS built-in * Voice Inversion built-in **£669.95**
AR-DV10 100 kHz-1300 MHz Digital scanner with TETRA DMR. NXDN. dPMR. APCO25. D-STAR **£939.95**

Mobile/Base

AR-8600 MKII 100 kHz-3000 MHz all mode analogue scanner **£649.95**
AR-DV1 100 kHz -1300MHz Multi mode digital base scanner **£1199.00**
AR-5700D 9 kHz – 3700 MHz Advanced digital communications receiver **£4595.00**

Accessories

DA-3200 25-3000 MHz professional discone antenna **£169.95**
DA-5000 700-3000 MHz professional compact discone antenna **£269.95**
LA-400 10kHz – 500 MHz Magnetic receiving loop **£399.95**

MOONRAKER

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WS200 V2 Professional Solar Weather Station

This Moonraker Weather station utilises a solar panel for the outside unit which sends the collected data to the indoor display unit wirelessly. The indoor unit displays Indoor and outdoor humidity, Indoor and outdoor temperature, Wind speed, Wind direction, Rainfall, Time, Date and available memory **Only £64.99**

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1

Marcuse Sundials to Atomic Clocks

David Reynolds G3ZPF, the President of the Radio Old Timers Association (RAOTA), looks at time measurement methods, time regulation & artificial time standards of interest to radio enthusiasts.

David G3ZPF
http://www.g3zpf.raota.org

Having a *standard* time throughout the world is a fairly recent introduction. I only realised just *how* recent (1847) after watching one of the *What the Victorians Did for Us* series on UK television a while ago.

With my curiosity aroused sufficiently to read more on the subject I quickly became aware that GMT, UT, and UTC, are not different terms for the same thing, as I had always assumed – but more on that later.

Local Time

To begin with, every locality in the UK set its own time based on the Sun. It was noon at that location when the Sun was highest in the sky. Alternatively known as 'apparent solar time', this can be measured using a sundial.

Basically, a remarkably simple device, a sundial consists of a marked plate (usually horizontal) and a rod called a 'gnomon' to cast a shadow, but they gradually became more intricate.

One sundial of special interest to radio amateurs can be found in the churchyard at Bosham village, in Sussex, as a memorial to Eugen Gerald Marcuse (G2NM, Fig. 2).

It was Marcuse's early experiments proved the viability of a 'BBC World Service'.

Timekeeping in the absence of sunlight was initially accomplished using water clocks, or candle clocks. The URL below offers a quick overview:
https://en.wikipedia.org/wiki/Clock

However, it was not until the advent of mechanical clocks that accuracy began to improve. Even then it was not until the invention of the Marine Chronometer that accurate location at sea became possible to determine.
https://tinyurl.com/a3kldgw

The Role of The Railways

A Standard Time throughout the country became essential when transport

Figs. 1 & 3: The *Royal Corn Exchange Building* in Bristol. Fig. 2: A 'Marcuse' Sundial, located in the churchyard at Bosham. Fig. 4: Louis Essen and JVL Parry standing next to the world's first atomic clock, developed at NPL (1955). Fig. 5: The LCDs on the *MFJ-890 IBP Beacon Monitor* can be made to flash in synch with the UK Time Signal Transmitter on 60kHz. Fig. 6: World Time Zones Map.

2


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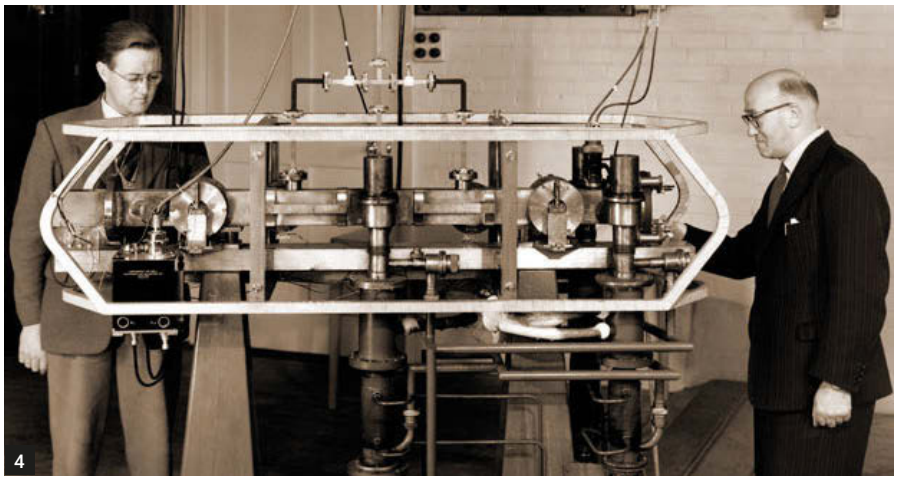
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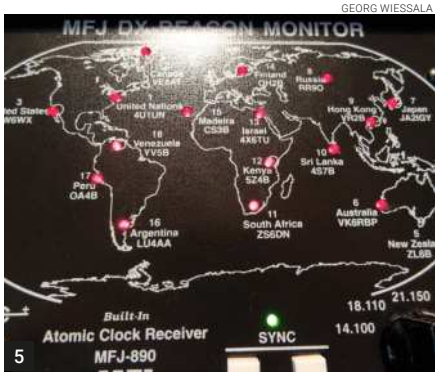
GEORG WIESSALA



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systems became so quick that they could not operate properly without it. Standard time throughout the world only became possible after the invention of the telegraph, and later the radio.

Britain became the first country to have its time set to one standard, after intense lobbying by the railway companies. The *Great Western Railway* was first one to adopt GMT across its network in November 1840.

In September 1847, the 'Railway Clearing House' (the Railways Standards Institute) recommended that Greenwich Mean Time (GMT) be adopted at all stations. By 1855, most public clocks in Britain were set to GMT, but it would take another 34 years before all the USA railroads agreed on a common time standard.

Irrespective of how logical & useful a country-wide time system was, the resistance to adopting GMT was indicated by the fact that, for a few years after its introduction, some enterprising souls made a living supplying clocks with an hour hand and *two* minute-hands. One was set to Local Time, the other one to GMT (Fig. 1). One such clock exists to this day, on the front face of the Royal Corn Exchange Building in Bristol (Fig. 3).

The Exchange is a Grade-1 listed building, constructed in 1741 by John Wood the Elder, on Corn Street, near the junction with Broad Street in Bristol. Originally referred to as The Royal Corn Exchange Building, because it was used as a corn and general trade exchange, it is now used as offices and St Nicholas Market.

At first glance, the front facade seems little different from any other public building of a similar age in the UK but look closer and you will see that the clock has a second minute-hand.

The Greenwich Meridian

The Royal Observatory at Greenwich was established as the reference point for timekeeping, serving the maritime interests of the UK. Mariners kept their navigation timepieces on GMT to be able to calculate their longitude, relative to the Greenwich Meridian, whilst still using solar time to determine 'ship-borne' time.

This was mainly because mariners of all nations already made extensive use of Nevil Maskelyne's 'Method of Lunar Distances' (based on observations at Greenwich).

GMT was established as a world time standard at the *International Meridian Conference* in 1884, along with different 'Time Zones' around the world. Halfway around the world from the Greenwich Meridian is the 'International Date Line', also known as the 'Line of Demarcation'. It runs from the North Pole to the South Pole, but it is not straight and 'zigzags' to avoid political and country borders.

If each time zone were 1 hour apart and organised strictly along lines of longitude, there would be 24 of them but allowing for national boundaries complicates things. Most, if not all, readers will be familiar with the time-zone map of the world (Fig. 6).

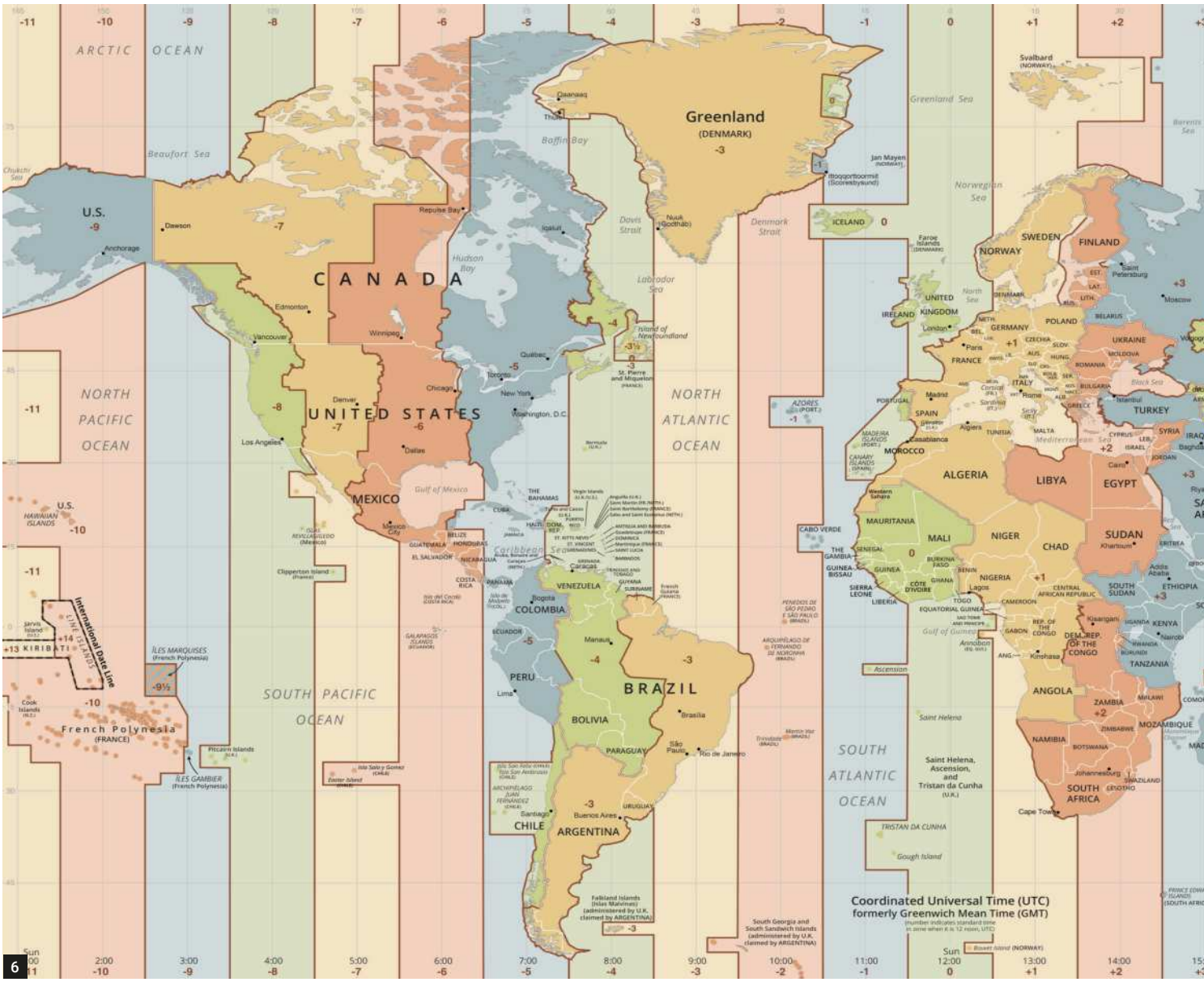
www.timeanddate.com/time/dateline.html

GMT, UTC, and UT

There is more to GMT than everyone just using the time of day when the Sun is directly over the Greenwich Meridian.

The Earth's orbit is elliptical, and its axis is tilted, so solar time can be plus or minus about 15 minutes at certain times of the year.

This non-linear timescale was transformed into a *linear* one (mean solar time) by averaging time over a year, based on the position of an imaginary Sun that moves across the sky with uniform speed. GMT is the mean solar time on the Greenwich meridian, based on the position of this 'Mean Sun' – not on the position of the real Sun. The difference between apparent solar time and mean solar time is known as 'The Equation of



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T ime'. Greenwich was certainly not the first location to use mean solar time, instead of apparent solar time. Many methods have been used to simulate mean solar time throughout history. The earliest were Clepsydras (water clocks) used from the Second Millennium BCE until the early Second Millennium CE.

Before the middle of the First Millennium BCE, they were adjusted to agree with apparent solar time and were thus no different from the shadow cast by a gnomon, except that they could be used at night.

Most people use the terms GMT, UTC, and UT, as different expressions for the same thing, but they represent different standards. In 1928, astronomers introduced the term Universal Time (UT) to indicate time measured from GMT midnight.

To be entirely accurate, they introduced 3 different variants of Universal Time (UT0, UT1, UT2).

However, as the maximum difference between all of them is around 50 milliseconds, it is hardly surprising that most people are unaware of them. The term UT is generally used without any qualification.

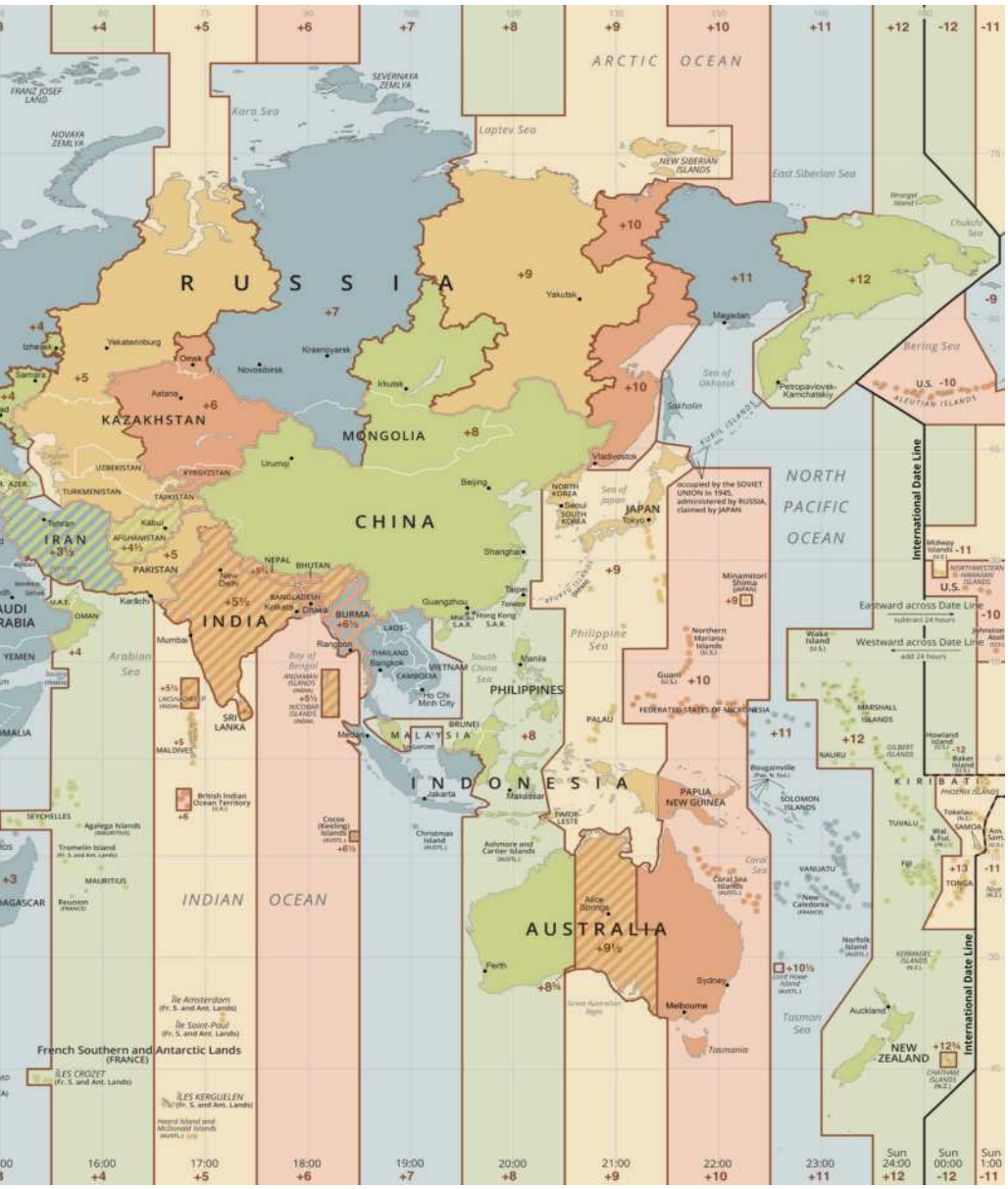
Artificial Time Standards

Artificial time standards became more accurate than standards based on astronomers' observations, or the rotation of the Earth when atomic clocks were introduced in the 50s (Fig. 4). In 1967 the standard (SI) second was re-defined, based on the time generated by a Caesium atomic clock

The international time scale based on this SI-second is International Atomic Time (TAI). This time scale was synchronised with UT at the beginning of 1958, but UT and TAI gradually drift apart because they are based on totally different principles.

Universal Coordinated Time (UTC), sometimes referred to as 'Zulu-Time', is a compromise between TAI and UT. It was introduced in 1972 but runs fractionally faster than UT. To ensure that the difference is never more than 1 second, a 'leap second' is added each time that UTC gains about half a second.

Leap seconds are 'added' by pausing the UTC clock for one second. Standard time signals are all based on UTC.



The National Physics Laboratory (NPL) broadcast UK time on 60kHz from Rugby for many years; however, in 2007 transmissions were relocated to Anthorn in Cumbria. The MFJ-890 Beacon Monitor (U Version) has an iuilt-in atomic clock receiver for that frequency (Fig. 5).

Central European Time is broadcast on 77.5kHz from DCF77 at Frankfurt.

Space-Time

Time is now based on the International System of Units (SI) second, which derives from the atomic resonance of Caesium and has nothing to do with a fraction of a 'real' day. Newton's laws of motion depend on time for accuracy, but we have fudged the definition of time.

https://tinyurl.com/y2x6msfw

For everyday use, the differences are of little consequence, but what about space travel? Enter 'Barycentric Dynamical Time' (TDB). This variant of atomic time is now used when calculating the orbital positions of planets and other solar system objects. Historically, positions were given as printed tables of values, given at regular intervals of date and time.

The orbital position tables (*ephemerides*) used to be tied to direct observations of planetary motion. Fragments of Babylonian tablets containing such tables have been discovered from as far back as the 1st Century BCE.

More recently, printing tables of ephemeris became one of the first tasks routinely assigned to mechanical computers. Modern ephemerides are usually computed electronically from mathematical models of the motion of astronomical objects and the Earth instead of observation, but printed ephemerides are still produced as they are useful when computational devices are not available. The TDB timescale is then 'fitted' so that Newton's Laws of Motion are followed (with corrections to allow for General Relativity)

Further Reading

- De Carle, D. (1947) *British Time* (London: Crosby Lockwood & Son Ltd.)
- Essen, L., and Parry, J.V.L. (1955) *An Atomic Standard of Frequency and Time Interval*. In: *Nature*, 13th August 1955: 280-282
- Franklin, J. & M. (2015) *The Global Transformation of Time, 1870-1950* (Harvard UP)
- Hancock, M. (2017) *The History of Rugby Radio Station* (*MH and Urban&Civic* plc.)
- Hand, D.J. (2016) *Measurement – A Very Short Introduction* (Oxford)
- Hillis, D. et. al. (2002) *Time in the 10,000-Year Clock* (AAS 11-665) **https://tinyurl.com/7z9wmaq**
- Holford-Strevens, L. (2005) *The History of Time – A Very Short Introduction* (Oxford: OUP)
- Howse. D. (2001) *Greenwich Mean Time and the Longitude* (Philip Wilson Publishers Ltd.)
- Jespersen, J. and Fitz-Randolph, J. (1999) *From Sundials to Atomic Clocks* (Mineola, New York: Dover Publications)
- Lombardi, M.A. (2006) *Time Signal Stations* **https://tinyurl.com/y6ypwtsv**
- Nelson, G.K. (2019) A Century of WWV; *Journal of Research of the National Institute of Standards and Technology*; Volume 124,
- NPL (4th ed., 2013) *The Little Big Book of Metrology* (NPL)
- Piester, D. et al (2011) *Time & Frequency Broadcast with DCF77* **https://tinyurl.com/unyqk9y.**

And Finally, ...

Have you ever wondered why each hour is divided into multiples of 60 and not 100? It dates back to the ancient Sumerians, in the 3rd Millennium BCE and has as much to do with pure mathematics as with time-keeping.

https://en.wikipedia.org/wiki/Sexagesimal

N.B.: An earlier version of this article appeared in **OT News**, *the quarterly magazine of the Radio Amateur Old Timers' Association. Contrary to what many people believe, you do not need to be 'old', or to have held a licence for 25 years, to become a member. RAOTA members may have an interest in the past, but live in the present, and the articles in* OT News *reflect that. Full details can be found at* **www.raota.org**

1

Tim Kirby
longworthtim@gmail.com

Data Packets & Digipeating

This month Tim Kirby looks at how to decode packet radio transmissions from the International Space Station (ISS) using your scanner, a computer and no wires in between.

Writing for *RadioUser* is, of course, always a pleasure, as it is for any printed publication. Sometimes, though, what you write gets overtaken by events!

This was the case in my last *Signals from Space* column (*RadioUser*, November 2020: 16-18).

! If you tried to listen for the crossband repeater onboard the International Space Station (ISS), as I described in the last column, you probably will not have had much success.

The reason for this is that the amateur radio equipment onboard the ISS can be configured in several ways, including the crossband repeater. Just after I wrote the column, the equipment was reconfigured differently, meaning that the crossband repeater was no longer available! I do not doubt that, in due course, the equipment will be reconfigured once again to enable the crossband repeater. So, what I wrote in terms of some instructions on how to listen for it will still be valid.

Packet Radio and APRS

This month I am going to take the risk of describing how the equipment is arranged at the time of writing and how you can 'listen' to it. It may be that between now and the time of publication, the equipment is reconfigured once more, but at least you will have all the information you need to listen to the most commonly set configurations of the amateur radio equipment on the ISS.

The amateur radio on the ISS is currently aligned as an APRS digipeater using 1,200 baud packet radio, transmitting and receiving on 145.825MHz (Figs. 1 and 3). If you listen on that frequency, with your scanner when the ISS is overhead, you will mostly like hear a series of data bursts, sounding a bit like *'braaaap'* as the space station passes overhead. What are these data bursts and what do they mean?

Wikipedia summarises Packet Radio as follows: *"Packet radio is a digital radio communications mode used to send packets of data. Packet radio uses packet switching to transmit datagrams. This is very similar to how packets of data are transferred between nodes on the Internet. Packet radio can be used to transmit data long distances. Packet radio is frequently used by amateur radio operators. The AX.25 (Amateur X.25) protocol was derived from the X.25 data link layer protocol and adapted for amateur radio use. Every AX.25 packet includes the sender›s amateur radio callsign, which satisfies the US FCC requirements for amateur radio station identification. AX.25 allows other stations to automatically repeat packets to extend the range of transmissions. Any packet station can act as a digipeater, linking distant stations with each other through ad hoc networks. This makes packet radio especially useful for emergency communications.*

"Packet radio can be used in mobile communications. Some mobile packet radio stations transmit their location periodical-

FIG. 1: PIXABAY FIG. 2: COURTESY NADER OMER

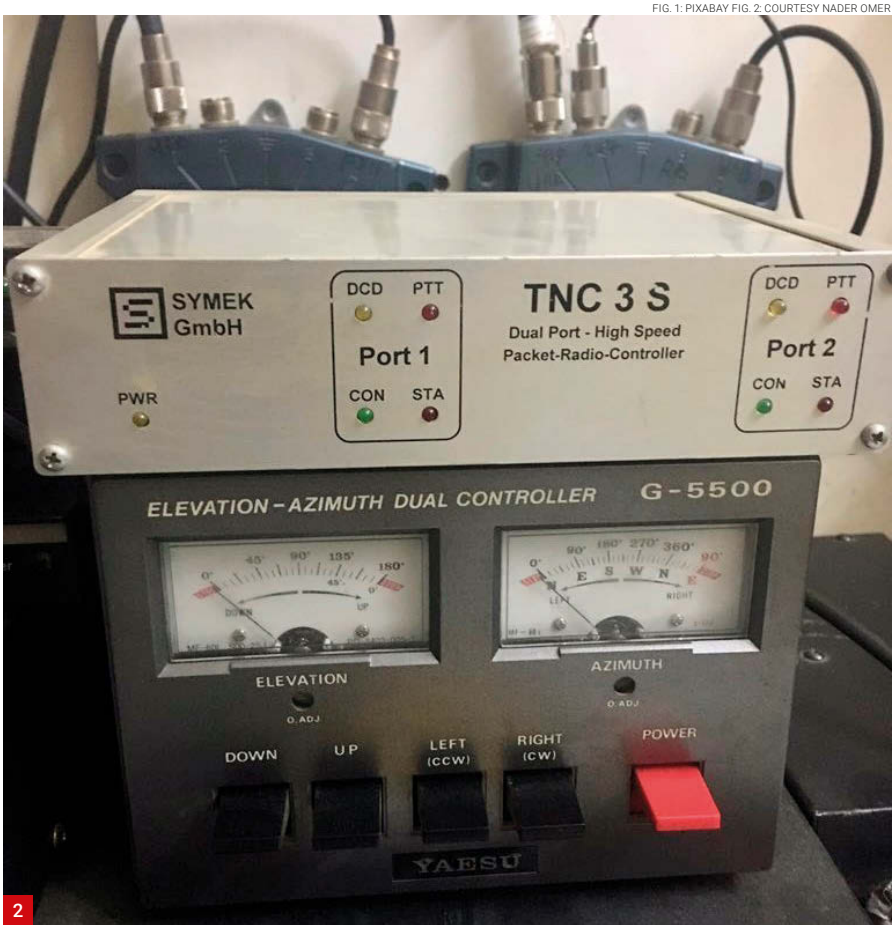


Fig. 1: At 270 miles above the Earth's surface, the coverage of the packet radio station on the International Space Station (ISS) is considerable. Fig. 2: A Terminal Node Controller (TNC) for the decoding of packet radio and data signals. You do not need one of these to decode transmissions from the ISS. Fig. 3: Trying out decoding terrestrial packet radio signals using the *Soundmodem* software. Fig. 4: Decoding packet radio from the International Space Station.

using the Automatic Packet Reporting System (APRS). If the APRS packet is received by an «igate» station, position reports and other messages can be routed to an internet server and made accessible on a public web page. This allows amateur radio operators to track the locations of vehicles, hikers, high-altitude balloons, etc., along with telemetry and other messages around the world."

If you want to have a listen and hear what packet radio sounds like and the ISS is not around, take a listen with your scanner on 144.800MHz (if you are in North America 144.390MHz). You should hear a series of data bursts.

In my introductory paragraph, I described that the packet radio system on the ISS is configured as an APRS digipeater. But what is APRS? Wikipedia offers this:

"The Automatic Packet Reporting System (APRS) is an amateur radio-based system for real-time digital communications of information of immediate value in the local area. Data can include object Global Positioning System (GPS) coordinates, weather station telemetry, text messages, announcements, queries, and other telemetry. APRS data can be displayed on a map, which can show stations, objects, tracks of moving objects, weather stations, search and rescue data, and direction-finding data.

"APRS data is typically transmitted on a single shared frequency (depending on the country) to be repeated locally by area relay stations (digipeaters) for widespread local consumption. Besides, all such data are typically ingested into the APRS Internet System (APRS-IS) via an Internet-connected receiver (IGate) and distributed globally for ubiquitous and immediate access. Data shared via radio or Internet are collected by all users and can be combined with external map data to build a shared live view.

"APRS has been developed since the late 1980s by Bob Bruninga, call sign WB4APR, currently a senior research engineer at the United States Naval Academy. He still maintains the main APRS Web site. The initialism [sic] *'APRS' was derived from his call sign.*

If you want to have a look at all the stations transmitting APRS signals, have a look at the website. There is a huge amount of data to look at and there is always something interesting going on.

http://www.aprs.fi

Decoding with *Soundmodem*

We digress though! You have heard the data bursts on 145.825MHz – perhaps you would like to try decoding them. Fortunately, this can be done quite easily now – using software on a computer. Back in the 1980s, when packet radio was in its' prime, specialist hardware was required to connect between your radio and your computer to decode the packet radio tones and allow the information to be displayed on your computer screen.

The specialist unit was known as a Terminal Node Controller (TNC, Fig. 2).

These were, as I recall, quite expensive!

Fortunately, no additional expense is now required. If you can connect your scanner's audio output to the input of the soundcard on your computer (a simple 3.5mm stereo jack to 3.5mm stereo jack cable will suffice in many cases) you are all set! If you do not have a cable, then in an emergency, 'audio coupling' will work. Audio coupling is the bluffers' way of saying 'place the speaker of your scanner close to the microphone of your computer'! It is not ideal, but it will work and if you just want to try it all out, you should get some results that way.

For this article, that was all I used.

Of course, you will need some software to run on your computer. Assuming you are running Windows, then a particularly good program for receiving packet radio is *Soundmodem* by UZ7HO (Fig. 4). It will allow you to decode the 1200baud packet from the International Space Station, or indeed, terrestrial packet radio on 144.800MHz, but if you get interested in decoding data from other satellites, then this is possible too, using the software.

Soundmodem software can be downloaded from this source:

http://uz7.ho.ua/packetradio.htm

The installation is quite straightforward – the download is a Zip file which you can place on your machine and extract the soundmodem.exe program which is all you need.

When you run the program for the first time, it will default to the required *AFSK AX25* 1,200baud protocol, which you will see at the top of the *Soundmodem* screen. Go to the *Settings* menu item and select

Devices. Check that the input device is set to something appropriate. In my simple 'Audio Coupling' example, it was set to *Microphone*, but if you are using a wired connection, it may well be the *Line In* device, or similar, on your soundcard.

With that set, you are already to see if you can decode some packet data (Figs. 3 and 4).

Assuming that the ISS is not conveniently overhead at the time, tune your receiver to the terrestrial APRS frequency, 144.800MHz (144.390Mhz in North America). Assuming that you are using 'audio coupling', place your computer near your scanner. Perhaps turn the volume up a little on your scanner to be certain that there is enough audio. In the *Soundmodem* program pull the *DCD Threshold* slider across to the left. With luck now, when there is a data burst on your scanner, you will see a decode of some data on your screen.

To start with it may look like gibberish, but it is not! Congratulations, you have just decoded packet radio data.

The Joy of Digipeating

In Fig. 3, you will see on the left hand of the line of data Fm and then a callsign. In my case it shows:

1: Fm EI7IG-9 to UR1URS Via EI2MLP-2, WIDE1*, WIDE2-2*

What this means is that this data was originated by an amateur radio station in Ireland, EI7IG. Because of how packet radio works, a station can rebroadcast the data it 'hears', a process called 'digipeating'. So, this does not necessarily mean that you have heard the originating station, EI7IG. In this case, we have heard EI7IG's data rebroadcast by another station, a digipeater, with the callsign EI2MLP-2.

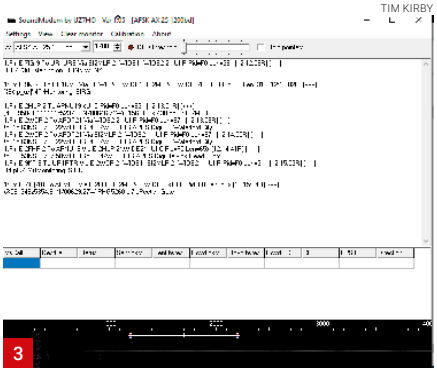
How do I know that? I know because, in the data line, there is an asterisk to the right of the station which digipeated the data which I heard. In this case, EI2MLP-2. The eagle-eyed may also notice an asterisk to the right of WIDE1! This is not a callsign, but a special type of 'PATH' which we do not need to go into for our experiment with the data from the ISS.

Have a play around receiving the terrestrial data and work out the volume required for decoding and the setup of the Soundmodem software. Once you are happy that you can make it work and decodes are happening, it is time to try and decode data from the ISS.

Catching a Pass

Assuming you have a vertical aerial outside, it will be best to look for an ISS pass where

TIM KIRBY



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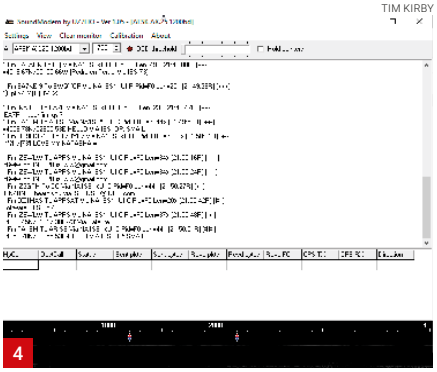
TIM KIRBY



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the spacecraft does not come up more than about 15 degrees or so from the horizon – as your aerial should then be able to 'see' signals from the ISS throughout the pass. If the pass goes higher in the sky, there may be sections of the pass where your aerial will not detect the ISS, and you will not get any decodes. Certainly, try on any pass and you may find that you get good signals at both the beginning and end of the passes when the ISS is close to the horizon.

You should be able to find out details of the ISS passes online – perhaps use the *Heavens-Above* website or one of the many apps for smartphones, both Android and iOS:
http://www.heavens-above.com

Before the pass, set your scanner or receiver on 145.825MHz leaving the volume as it was when you were receiving terrestrial packet signals. Make sure that *Soundmodem* is on and configured as it was before. As the ISS comes over the horizon you should start to hear packet bursts. If all goes according to plan, you will see some decoded data on your Soundmodem screen. Do not despair if you do not decode each packet! Hopefully, as the signal gets stronger, you will get some decodes; but do expect some to be missed, especially towards the very beginning and the very end of the pass.

If everything works ok, you should see some different packets on your screen. Some will be 'beacon packets' sent from the ISS's digipeater under the callsign of NA1SS. Other packets will be transmissions sent from packet stations in the footprint of the Space Station which use the digipeater on the space station to retransmit their signals. Some of these packets are beacons, some are messages, and some contain geographical information.

You can compare what you have received on a pass with the contacts-documentation website at ARISS:
http://ariss.net

On this page, you can see a listing of the amateur stations which have been heard through the packet radio digipeater on the ISS. If you page down, you can see the raw packet radio data which will be similar to what has been displayed on your *Soundmodem* program screen.

I thought that I would try what I have suggested to you, setting up the *Soundmodem* program, on a computer, using the microphone close to the speaker on a 145MHz FM receiver tuned to 145.825MHz using a vertical aerial.

The ISS pass was a low one to the south-east, rising to a maximum of 10 degrees above the horizon. As you can see from the screenshot, a variety of messages was received. The most distant was from a radio amateur in Turkey, TA1BM (Figs. 3 and 4).

The ISS is not the only satellite to transmit packet data on 145.825MHz, although it is now the most reliable. The NO-84 and NO-44 satellites are capable of doing so, but neither are in particularly good health – so do not expect to hear them regularly, but you may occasionally decode a packet from them.

I hope you have found this interesting and will be tempted to try and decode some of the packet data transmitted by the International Space Station – it is a fun combination of space, computers and radio. Hopefully too, now you have all the information you need to receive either the Crossband repeater or packet radio transmissions from the International Space Station.

My best wishes to you and your families for the remainder of the festive season and the New Year.

Further Resources

- APRS: **http://www.arrl.org/aprs-mode**
- APRS (by its' inventor) **http://www.aprs.org**
- Packet Radio - London Hackspace article **https://tinyurl.com/y4txlfzy**
- Introduction to Packet Radio: **https://tinyurl.com/y3qk2slk**
- How to work the ISS using packet radio: **https://tinyurl.com/yyw748qa.**

The Portishead Radio Aeronautical Service

Larry Bennett G4HLN
lawrence.bennett@btinternet.com

Larry Bennet, the author of a recent book on the history of Portishead Radio*, delineates the services the station provided to aircraft and a host of other users, such as military units, charities, and fixed stations.

Portishead Radio (Fig. 1) is always remembered as being the world's largest and busiest *maritime* radio station, providing communications both to and from ships for over 80 years before closure in 2000.

However, what tends to be forgotten is the fact that the station also provided vital communication links for *aircraft* for many years, as far back as the 1930s.

When the station was handling traffic from the great transatlantic liners, it was not uncommon to also process messages from the large flying boats which operated in the Mediterranean and the Eastern seaboard of the USA.

Such aircraft carried radio officers who regularly sent and received messages (by Morse code) via Portishead.

During World War Two (1939-1945), Portishead also handled messages from the North Atlantic Patrol aircraft, using the directional aerials originally designed for ships in the area. There were no specific frequencies for aeronautical use at the time, so the aircraft used the existing maritime frequencies.

However, once international air travel became affordable during the 1950s and 1960s, many airlines operated their own HF and VHF stations, enabling aircraft to communicate directly with their operations offices.

Nevertheless, such stations were not allowed to connect R/T calls into the national or international telephone network. To provide such functionality, existing maritime stations at Bern/Berna (Switzerland) and Stockholm (Sweden) opened HF aeronautical radio services.

These stations used more powerful transmitters and better aerial systems, thereby improving the quality of calls. Stockholm Radio opened in 1968, with Berna Radio following in 1971.

Portishead handled the occasional R/T call on the maritime channels, mainly from 'Watchdog' patrol aircraft from the South Atlantic and around the UK, but these were sporadic, and no specific watch was maintained.

ALL PICTURES: LARRY BENNETT

1

A Dedicated Service

It was not until the move to the new operations centre at the Highbridge receiving site that a formal aeronautical service (Fig. 2) was considered.

Subsequently, some GKA staff were dispatched to the offices of all major UK airlines to discuss the feasibility of such a service, and permission was obtained to operate on specified simplex frequencies.

An existing maritime R/T console was designated for aeronautical use, and test calls were arranged with Dan-Air to 'prove' the system. It soon became clear that the existing duplex terminal equipment on the GKA consoles would not be suitable for the handling of simplex calls; there were initial feedback issues which could be controlled by careful use of the RF Gain and Line amplification controls, but these had to be adjusted for each call, depending on the signal strength and quality.

Therefore, it was simpler to use the manual radio/line switch to allow simplex communication, but it was easy to get 'out of sync' with the conversation. Eventually, new terminal equipment was purchased, designed for simplex use, which made the handling of calls much easier. This was installed on the aero console.

Each console (Fig. 3) comprised two circuits, each with a Racal MA1075 receiver front panel (the aerials and receivers were located at Somerton and connected via a

2

microwave link), line controls and amplification units, transmitter control units, call timing mechanisms, and other ancillary equipment.

As more airlines signed up to use the service, an extra console was installed, with loudspeakers monitoring all the calling frequencies added. Existing Racal MA1075 receivers were programmed to scan all the calling frequencies, and new 'quick-tune' transmitters were brought into service at the Rugby transmitter site, meaning that a change of frequency could take place within seconds.

SELCAL units were added to each console, ensuring that aircraft could be called on a specified frequency, at the request of their operations office.

Satellites, Phones and Weather

The site became part of the SITA (*Société Internationale de Télécommunications*

Fig. 1: An aerial view of the Portishead Radio receiving facility at Highbridge. Fig. 2: The Aeronautical R/T consoles; SELCAL units are visible on top of each console. Fig. 3: An overall view of the operating consoles in the early 1980s. Fig. 4: An example of one of the *OTF Guides* supplied to customers. Fig. 5: One side of the credit card-sized frequency cards given to pilots. Fig. 6: One of the Rotating Log Periodic (RLP) transmitting aerials at Rugby. Fig. 7: Covers of the *BT Gateway* publicity brochures. Fig. 8: The author's recent book on *Portishead Radio*.

Aéronautiques) network and had two addresses: BRSOOXH and BRSOOYF. These would allow the station to obtain updated weather information to pass to aircraft on request using the SITA terminal installed on the console.

It also became an enquiry point for the satellite-based *Skyphone* service, which was operated by BT and used by first-class passengers on some major national carrier aircraft such as British Airways and Singapore Airways.

Calls were costed on a 'per-minute' basis and were charged using a PIN system. This enabled operators to charge calls to a credit card, with details securely stored in the Portishead Radio accounting system. Pilots would simply quote their 5-digit PIN to have their calls charged to their designated card. Alternatively, calls could be charged to dedicated UK telephone number and charges would appear on the next phone bill.

Portishead Radio provided regular Optimum Traffic Frequency (OTF) guides (Fig. 4) to all customers, as well as credit-card sized information cards with contact and frequency details (Fig. 5). Advertisements were regularly placed in some aeronautical industry magazines, and the service became fully established during the mid-1980s.

Service Users and Schedules

British Airways, along with the large charter airlines of the time such as Britannia, AIR2000, Dan-Air, Monarch, and Air Europe, became regular users of the service, as did many international cargo airlines such as Heavylift, Gas Air Cargo, Flash Airlines and Volga-Dnepr. Besides, calls from major international airlines like Virgin Atlantic, Pan-Am, KLM, Lufthansa, and Sabena regularly took place.

The USA-based Eastern Airlines used the station as their European Hub communications station, with all of their aircraft flying to and from European destinations calling

3

the station daily. The USA pilots always referred to the station as "UK Radio", which caused some initial consternation.

Formal schedules were arranged with the MAFF 'Watchdog' aircraft referred to earlier, with the station calling each aircraft regularly on pre-arranged frequencies. The famous RAF Hercules transport aircraft were also regular customers, and the station was pleased to receive visits from their crew on a few occasions.

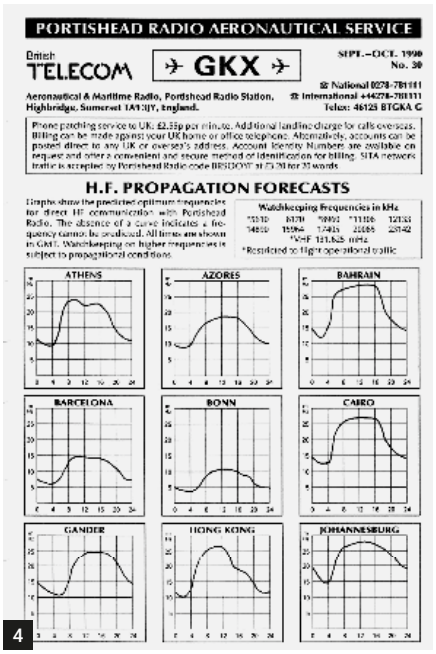
Naturally, airlines such as Swiss Air and SAS tended to use their 'home' stations at Berna and Stockholm respectively, although attempts were made to lure them away. On one Swiss Air flight, the Portishead Radio station manager passed the pilot full details of the service, only for the information package to be returned by a stewardess, with the immortal phrase "The Pilot says no"!

A further expansion of the services took place in the early 1990s, with the use of Rotating Log Periodic (RLP) transmitting aerials (Fig. 6) which enhanced the quality of the transmitted signal. Reliability of these was initially poor, but eventually, these became an integral part of the service. Rotation of the aerials was remotely controlled by the operator at the Highbridge site.

A VHF Channel and a Special Call

Moreover, a VHF channel was added, to enable aircraft within a radius of around 200 miles from the site to contact the station, although only operational calls were allowed on this channel.

It was not just aircraft which used the service; calls from large hot-air balloons,



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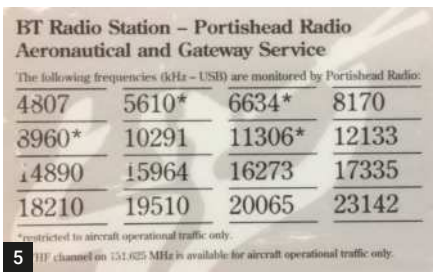

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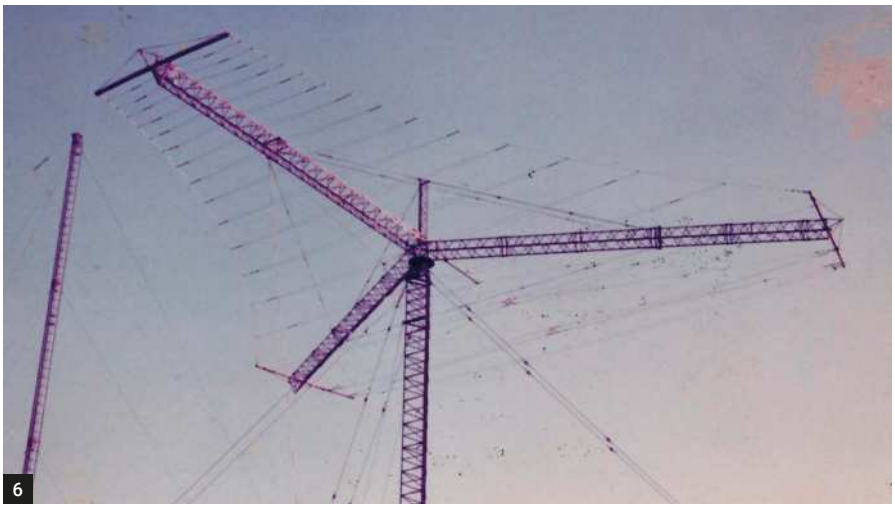
such as those piloted by Richard Branson and Per Lindstrand on the *Virgin Atlantic Challenge Balloon*, were handled regularly, as well as those from other long-distance record attempts, such as the *Dalgety Flyer* (London to Sydney, 1988) and other record-breaking activities.



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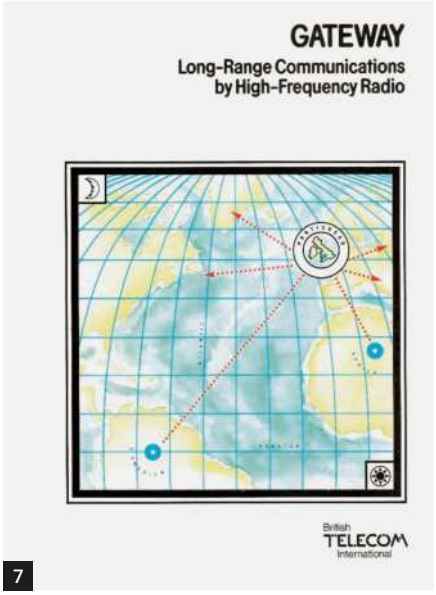

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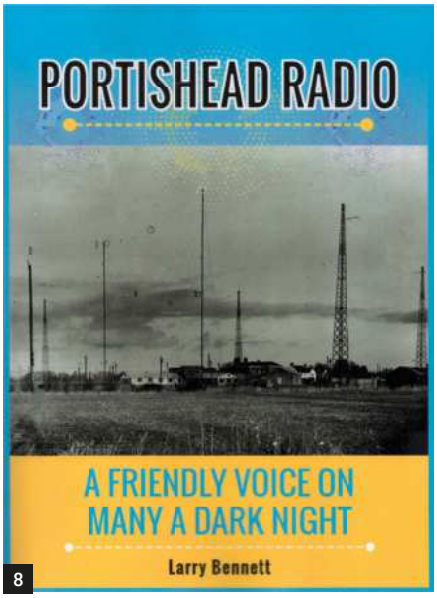

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A particularly interesting call linked the Chief Pilot of *Concorde* to the Captain of the *QE2*, which involved a great deal of planning and timing for both the aeronautical and maritime sections of the station.

Also, it was quite common for broadcasters such as the BBC to speak to celebrity passengers during *Children in Need* or similar transmissions, and many calls were handled by the station for both TV and radio programming.

The station enjoyed excellent relationships with many pilots, and it was not uncommon for a Pilot to call up the station to ask about football or cricket scores, which they would relay to their passengers.

Some radio station staff were invited to the flight deck on occasions and allowed to use the radio equipment to call home. The aeronautical section of the station was decorated with pictures, models, and posters of aircraft, all provided by grateful pilots and airlines worldwide.

The GATEWAY Service

It soon became clear that there was also an opportunity for the station to handle radio traffic from fixed stations worldwide, using both the radio telex and radiotelephone services. International aid agencies in Africa such as *Médecins Sans Frontières (MSF)*, OXFAM, and the Red Cross all set up radio stations in remote locations.

Calls from military units during the Balkan and Gulf conflicts were also handled.

This became known as the GATEWAY service. It ran alongside the aeronautical service and shared the same consoles. Users of the service were charged using the same PIN mechanism or by direct billing as explained earlier (Fig. 7).

At its peak, the Portishead Radio Aeronautical/Gateway service was one of the busiest areas of the station, with two consoles each operating two circuits. Many one-off relief expeditions also utilised the GATEWAY service, and adventurers such as Sir Ranulph Fiennes and David Hempleman-Adams also made use of the service, making vital R/T calls back to the UK through the station.

The End of the Service

As more aircraft became fitted with satellite communications equipment, the requirement for HF radio communications diminished. Traffic figures decreased rapidly, and the R/T consoles were combined with those of the maritime service.

Special billing arrangements were made with some airlines, in an attempt to maintain their custom, but it was clear that the future of the station was in serious doubt.

Berna Radio closed in 1998, but this had little impact on traffic levels, and when the closure of Portishead Radio was announced in 1999, the remaining airlines still using the service simply transferred their allegiance to Stockholm Radio.

The station finally closed for good at 1200 UTC on Sunday 30th April 2000, and unlike the maritime side of the station, there was no final transmission or commemorative broadcast; the receivers were simply switched off at the designated time without any fuss or ceremony.

Engineers moved in to dismantle the consoles later that afternoon and Portishead Radio was sadly no more.

The service, although only regularly active for less than 20 years, did provide a valued service to the aeronautical community. There is no doubt that it prolonged the life of the station.

However, the demise of HF radio as a cost-effective mode of communication, and the continued advances in satellite technology meant that the continued operation of the station could not be a viable proposition.

Interestingly, Stockholm Radio continues to operate under the StoRadio name, and details can be found from their website: **www.storadio.aero**

Further details and photographs of the Portishead Radio service – including a specific section devoted to the aeronautical radio service – can be found at this URL: **www.portisheadradio.co.uk**

** [Larry Bennet is the author of* Portishead Radio – A Friendly Voice on Many a Dark Night (Fig. 8), *which was reviewed in* RadioUser, *August 2020: 16, and* Practical Wireless, September 2020: 50).

JOSH HILD ON UNSPLASH

1

Australia on Medium Wave & Drunk Women Solving Crime

This month, **Chrissy Brand** offers up salsa on the south coast and samples radio programmes on poetry and literature. There is time to raise a laugh too, with some comedy podcasts.

Chrissy Brand
chrissyLB@hotmail.co.uk

Although many genres of music are played on radio stations around the world, I believe that only three types of radio station formats can exist. These are music radio, talk radio or a combination of music and talk. Out of these three formats, all radio stations broadcast and blossom. Whether you enjoy the short wave crackle of music on China Radio International or prefer the FM and DAB audio quality given in the mellow hits approach of Smooth Radio, every radio listener is spoiled for choice.

To enjoy listening to radio stations that are located almost anywhere on the planet, there is no need to pay a monthly subscription or even to download a specific station app. With a conventional analogue or DAB radio, an in-car entertainment system or internet connection, the world awaits, to take you on a journey of global audio delights.

I make it my mission every new year to try and introduce as many people as possible to the possibilities of radio. Most members of the public still seem unaware of the extent of radio and podcasts, beyond the BBC or national commercial networks. I tell friends about some of the non-mainstream radio stations I am moved by and, every so often, it leads to someone exploring beyond their usual listening habits.

As we enter a winter of uncertainty (Fig. 1), radio can be a comforting companion, and a purveyor of entertainment, as well as of vital information.

Music Radio

World Radio Paris carried an interesting feature in the autumn about music recording terminology: Whilst you will know what a *sample* is, what about a *splice* or a *loop*? Catch up with your music lingo in *Music and Stuff*.

World Radio Paris was created by expats in 2003 and has broadcast since 2014 in Paris and on the French Riviera (Monaco, Cannes, Nice) on DAB+. The current schedule specialises in feature programmes, including rebroadcasts from ABC, BBC, CBC - and Democracy Now! Some of the home-grown content is subject to change due to the pandemic.

FIESTA FM

Fig. 1: Come in from the winter cold and embrace the warmth of radio. Fig. 2: Music to your ears on *Fiesta FM*, with Hispanic culture and more. Fig. 3: Getting lost in a good book with the BBC World Service *World Book Club*. Fig. 4: The spirit of the revolution lives on at Radio Havana, Cuba.

https://tinyurl.com/yxrpuxv7
www.worldradioparis.fr/schedule

Perhaps the best music radio station I heard in the UK in 2020 was Fiesta FM, specialising in salsa and tropical music (Fig. 2). Its Ofcom character of service description states that Fiesta FM provides a service, "*primarily for people with Latin American, Spanish, and Portuguese heritage living in Southampton. It reflects and celebrates the achievements, aspirations, and culture of Latino, Portuguese and Spanish people and promotes community cohesion.*"

Try the station for yourself. I enjoy dipping into the morning shows for lively sounds, plus *Rumba 4U* on Thursdays at 1500 UTC and *Fiesta en Concierto* on Sundays at 1400 UTC. On Wednesday evenings, the programme offers DJ Oz's *Island Vibrations*, consisting of calypso and reggaeton, dancehall, lovers, ragga, reggae, seggae, and roots music.

Radio theatre ("teatro") is also aired, with Mocho and Cholanda from Argentina presenting a Spanish-language, twenty-minute tragicomedy, on Wednesday and Sunday at 0900 UTC and Friday at 1400 UTC.

Fiesta FM broadcasts on 95.0MHz and online. To stream the station, choose from one of four links at the foot of its home page. The station is currently advertising on the air for new presenters, and you do not need a tropical music specialism. Step forward all the wannabe DJs, but please form a queue behind me!

https://fiestafm.co.uk

The Huey Show is on BBC Radio 6 Music on Saturdays, from 1000 to 1300 UTC. It is fronted by 52-year-old New Yorker Huey Morgan, who found fame in hip hop and rock band Fun Lovin' Criminals. He plays a range of accessible music that crosses many genres.

You will hear bright, current-day music from artists like Pillow Queens, Death Bells, Bastien Keb, The Last Dinosaur and Laura Marling. Music from the distant past is also played by Huey and it blends in well. I heard Billie Holiday (whose given name was Eleanora Fagan) singing *Strange Fruit*, a song about the lynching of African Americans, which seemed a poignant song for 2020, even though it was written back in 1939.

https://tinyurl.com/y4mzez93

There are a couple of features in *The Huey Show* each week. One is *Block Party*, where a different artist's music is showcased. The programme I heard celebrated the fiftieth anniversary of the first solo album by Curtis Mayfield.

Player's Ball is another well-crafted feature. In the October 3rd programme, it focused on fretless bassist and creator of the Chapman Stick and Funk Fingers, septuagenarian Tony Levin. If he is known at all by the general public, it is most likely to be for recordings with musicians Carly Simon, David Bowie and Pink Floyd.

I was chatting with Steve Skaith, frontman of Latin Quarter, the 1980's band known for its political stance and hit single *Radio Africa*. The band have been active again since 2012, producing four new albums.

In October, with the US election looming, Latin Quarter produced a new single, *MAGA: a very stable genius*. The song received airplay on several stations, including Kristian Thees's programme on Südwestrundfunk (SWR3) in Germany.

Whether you speak German or not, why not give SWR3 a listen? With songs from the "*popular music artists of Baden Baden, Germany and the whole world, SWR3 is all set to take you to a musical world where you are gonna come again and again.*"

https://tinyurl.com/yxbs8jvn
www.latinquartermusic.com
www.swr3.de

Radio Talk

I recommend China Radio International's *Chinese Folk Tales*, which delivers entertainment in ten-minute episodes. This broadcasting giant still dominates short wave but does put out some interesting cultural programmes and features.

http://chinaplus.cri.cn/podcast/list/40

BBC World Service's *World Book Club*, with Harriet Gilbert, has been running since 2002, with over 135 episodes to listen to (Fig 3). Join the world's great authors as they discuss their best-known novel. It is broadcast on Wednesdays at 1006 UTC, Sundays at 0306 and 1406 BST on BBC World Service on DAB, online and via the BBC Sounds app.

Or listen online at your leisure.

www.bbc.co.uk/programmes/p003jhsk

Authors on the programme have included Hilary Mantel, Robert Harris and Juan Gabriel Marquez, while the works of the late Albert Camus, Agatha Christie, Jane Austen and JD Salinger have also been discussed. The latter's work was featured in a special programme in 2015, broadcast from New York City's Algonquin Hotel.

www.bbc.co.uk/programmes/p02myqpw

The 59th BDXC Sheigra *DXpedition* took place in October, where many great catches were made by Alan Pennington and Dave Kenny.

In terms of logging – and in a first of its kind – 5RN ABC Radio National Adelaide was heard on 729kHz by Alan. He wrote, *"I listened again to some recordings, one of which was an Australian-accented presenter including mention of 'Guardian Australia' and the Sydney Opera House.*

"After some research, I eventually matched this to ABC programmes on their website. This is the first time Australia has been heard at Sheigra (north-west Scotland) on medium wave (and could be the first reception of Australia on medium wave in the UK!). The Great Circle map distance from Sheigra to Adelaide was 10,121 miles. Thanks to Graham at ABC for quickly confirming my report with an email QSL."

Congratulations to Alan on making history. For the rest of us, we may not be able to hear ABC Radio National on medium wave but need to make do with the internet. The station has become known as the Ideas Network, where people can hear the latest in science, books and publishing, religion, social history, the arts and current affairs.

www.bdxc.org.uk/articles.html
www.abc.net.au/radionational

Date	Time (UTC)	Station	Programme	Podcast	URL/ Stream/ Frequency
Daily	1000 to 1030 1530 to 1600 1630 to 1700	Radio Slovakia International	Slovakia Today, (politics, society, art, culture, business, science, healthcare, and sport)	www.rtvs.sk/radio/archiv/1487	Shortwave Service on 6005 kHz
Weekdays Weekends	0430 to 0500 0500 to 0530	NHK Radio Japan	News, features. Friends around the World (Sunday)	NHK World Japan app	https://tinyurl.com/y5v3nb5a
Monday	1500 to 1600	ABC Radio National	Speaking Out with Larissa Behrendt (politics, arts, and culture from indigenous perspectives)	ABC Listen, Apple and Google apps plus RSS feed	https://tinyurl.com/y2okt5fp
Tuesday	1700 to 1900	Fiesta FM, Southampton	Walking the Earth with Lucky Larry (African and US music)	Only live listening is available	https://tinyurl.com/y2lk9w4w and 95.0 MHz https://tinyurl.com/y2pcw368
Saturday	1900 to 2000	XS Manchester	Boon Army Party Show with Clint Boon	XS Manchester app	www.xsmanchester.co.uk/radio/player and DAB, 106.1 MHz
Sunday	1400 to 1800	BBC Solent	The Kitchen Garden with Rebecca Parker	BBC Sounds app	https://tinyurl.com/yxwdebhy and DAB, 96.1 MHz

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

Comedy Podcasts

Humour can be a helpful distraction in these challenging times. Product designer, podcast devotee, and occasional guest columnist here, Tim Sutton-Brand, recommends the following comedy podcasts.

The premise to *My Mate Bought a Toaster* is simple, host Tom Price interviews celebrity guests by reading out a transcript of their entire Amazon buying history, which often dates back over 15 years. As you can imagine, this leads to many awkward and embarrassing conversations as people hastily try to justify their purchase history.

This extensive list of eclectic items reveals a lot about the guest's life, and brings about a plethora of wonderful anecdotes, making this podcast well worth a listen.

https://play.acast.com/s/toaster

Did you know that the geographical centre of North America happens to be in a town in North Dakota that is coincidentally called *Center*? Or that the sweets known as *Flying Saucers* were originally made with communion wafers after a decline in Christianity left manufacturers with leftover supplies of wafers, deciding to make sweets by sandwiching two pieces of a wafer with sherbet in the middle? The chances are if you did know this, you are also a fan of *No Such Thing as a Fish*.

This award-winning weekly podcast (of which there are over 300 episodes) is presented by a panel of four who work as researchers for the BBC 2 quiz show, *QI*.

Every host presents a different fact, each guaranteed to be bizarre, amusing, or often downright unbelievable. The roughly 45-minute-long episodes lead to hilarious conversations about strange topics, with fascinating insights into the worlds of history, biology and pop culture, among many others.

www.nosuchthingasafish.com

Drunk Women Solving Crime is self-explanatory. The three hosts and a guest try to solve interesting historical true crimes cases, as well as often attempting to crack smaller, more personal crimes, which guests or listeners bring to the panel. All while plenty of booze is provided, of course.

https://drunkwomensolvingcrime.com

Karl Smallwood is best known for his YouTube channel, *Fact Fiend*, presenting the audience with amusing facts. However, it is not the facts that make the channel so enjoyable, but Karl's humour and quick wit. In *Karl's Corner* podcast, Karl takes a step back from facts, in improvised conversations with his friend Lucas, often over a few drinks, discussing personal anecdotes and stories, news, current affairs, films and television.

Karl's impressive ability to talk for hours make this podcast feel like a conversation with a good friend at a pub and might be one of the best ways to experience casual pub chat during the current pandemic.

This podcast can only be found on *Spotify*, where it can be listened to for free, without adverts or sponsors.

https://tinyurl.com/y2m9klyd

A Problem Squared is a monthly podcast. Matt Parker and Bec Hill solve a variety of listener problems that you have likely never wondered about before, such as "When does a room become a room?", or "Is there a mathematical equation for calculating the number of Ferrero Rocher chocolates that can be stacked to form a giant pyramid?".

MARK WILLIAMS ON UNSPLASH

3

The hilarity comes from not the answers themselves but lies in the hosts' ingenious ways of solving them, which often involve ridiculous mathematics and highly impractical testing solutions.

https://aproblemsquared.libsyn.com

Off-Menu is a popular podcast where James Acaster and Ed Gamble welcome guests to their imaginary "Dream Restaurant", in which the guest chooses their favourite ever meal, consisting of a drink, starter, main course, side and dessert.

Some guests choose extravagant meals from high-end restaurants they have eaten at, while others take a humbler approach, choosing food as simple as their mum's homemade pasta bake.

CUBA CALLING

4

Off Menu offers up hours of hilarious content. My personal favourite episodes are Dianne Morgan's, for her brilliantly sarcastic comedic style, and Louis Theroux for his passionate love of toasted almonds, although it is hard to find a single bad episode in the series' span of four seasons.
www.offmenupodcast.co.uk

Cuba Calling

Lionel Clyne was pleased to hear Radio Havana Cuba (Fig. 4), in Arabic on 5040kHz at 0105 UTC, English on 6100 and 6145 at 0040 UTC and Spanish on 6060kHz. He wrote that, *"Short wave logs are a bit like London buses: I have waited over a year to log this broadcaster and then due to an outbreak of insomnia I logged three frequencies in less than half an hour."*

Radio Havana Cuba started broadcasting in 1961. However, this station was preceded by Radio Rebelde in 1958 which was co-founded by Che Guevara, of whom Lionel comments, *"one usually associates more with a Kalashnikov than a microphone."*

In order to counteract this, the US set up Radio Marti. During the Cold War, Radio Havana broadcast relayed propaganda from North Korea, North Vietnam and the USSR. Lionel concludes, *"Unlike the hissy-fits between North and South Korea I can find no evidence of either party trying to jam the others broadcast. However, as the wise person said, absence of evidence is not evidence of absence."*

I would contest the comment about Che being associated more with a gun, by saying that radio is a more useful tool to counteract establishment propaganda. Further evidence of this is documented at the Patepluma Radio website, which noted, *"Castro had always seen the importance of broadcasting, but Che Guevara was the main rebel proponent of a clandestine station. Guevara knew that a radio station was the only way to speak directly to the Cuban people. Guevara rounded up a technician, a former newspaper reporter and two ex-announcers from Havana's popular Radio Mambi from among supporters. An old ham transmitter would do the broadcasting."*

Tune into Radio Havana, 'a friendly voice around the world', on short wave and online.
www.radiohc.cu/en
www.hey-che.com/radio-rebelde
http://pateplumaradio.com
https://tinyurl.com/yxw7q8b4

Radio News

IN CONCERT 50: BBC Radio 2 is marking 50 years of pop music performances on the BBC with *In Concert 50*. From Fleetwood Mac and Bill Withers in the 70s to Craig David, Florence and the Machine and Sam Smith in the 21st Century, *In Concert* on the BBC in sound and vision has charted the history of popular music and this month of special archive shows and performances looks back across 50 years. From Sunday 1 November, all 50 performances are on *BBC Sounds*, with a special 10 artist Box Set available to watch on BBC iPlayer. BBC Four broadcasts Dido (Friday 30 October) and Seal (Friday 13 November) as TV-first In Concert exclusives. Dido performs at the BBC's Maida Vale Studios from 2019, featuring tracks from *No Angel, Life for Rent* and *Still on my Mind*. Seal is from the BBC Radio Theatre in 2015, performing tracks from his album 7 and hits including *Kiss from A Rose* and *Crazy*. And Radio 2 presenters are curating their favourite tracks of all time from *In Concert 50* to play during shows across the month and in special programming on the station. *In Concert* presenter, Jo Whiley said: "As the presenter of *In Concert* it's been an absolute thrill to watch some incredible performances by the hugest of music legends in the tiniest of intimate venues. But there are many more that I've not yet seen and that is the joy of *In Concert 50*. Nowhere but the BBC has such a unique archive of music performances from some of the most important artists of the 20th and 21st centuries." Jeff Smith, Head of Music, Radio 2 and 6 Music, added: *"We are all missing going to see live music at the moment so this November, even though we cannot stage a full scale In Concert season at Radio 2, we can celebrate 50 years of In Concert performances that we think audiences will love from the BBC's* In Concert *vaults. It is a unique collection from some of the world's greatest musicians to hear on Radio 2 and* BBC Sounds *and watch on BBC iPlayer. I have so many special memories from these performances, I can't wait for audiences to enjoy these performances once again."*
(SOURCE: *Radio Today*, national press)
https://tinyurl.com/y6yojh23

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A doomed Empress and the Courage of the Radio Operators

Scott Caldwell examines the life and career of Senior Marconi Wireless Operator Ronald Ferguson, OBE, who worked on the 'Canadian Titanic' at the time of its sinking in 1914.

Unlike the *Titanic* and *Lusitania*, the sinking of the *RMS Empress of Ireland* – the flagship of the *Canadian Pacific Steamship Company* (Figs. 1 and 2) and the life of its main radio officer – have received comparatively little attention. However, this tragedy has a very interesting story, in the shape of the biography of Ronald Ferguson, the vessel's Senior Marconi Wireless Operator. Ferguson spent most of his working life as a global pioneer in the radio communications industry. His life in radio was celebrated in 2014 when the Chelmsford ARS operated under the call sign GB100MWT. His work was also recognized with an OBE.

The *Empress of Ireland* operated the Quebec-to-Liverpool route. She was constructed by the *Fairfield Shipbuilding & Engineering Company*, based at Govan. (Scotland). She had accommodation for 310 first-class passengers, 470 second-class travellers, and 750 guests in third class. The ship's overall length was recorded as 570ft and her beam as 65.6 ft. The ship carried a range of passengers, ranging from celebrities Laurence Irving and Mabel Hackney to 170 members of the *Salvation Army*, travelling to a convention in London.

Radio Equipment

In the 1912 Edition of *Wireless Telegraph Stations of the World*, the ship's wireless range is recorded as 85 nautical miles; the radio equipment was capable of operating on 110 and 300 meters.

Ronald Ferguson was born on 30th March 1894, in Birkenhead (near Liverpool). His family was large, in keeping with the social norms of Victorian society. His mother was Elizabeth Ferguson (née Scott). She was employed as a boarding school teacher. This put them into the middle-class spectrum and resulted in Ronald receiving a good standard of education. The latter was a necessity for Marconi Marine wireless operators at the time; they had to work under pressure and to concentrate for long periods. According to an article in the *Flintshire Observer*, his father was lost at sea when Ronald was growing up. He joined the *Marconi Marine Company* in March 1910 and attended training at the 'Tin Tabernacle' (The Marconi Training School).


1

A Tragedy Brewing

On 28th May 1914, the *Empress of Ireland* embarked on another voyage to Liverpool; however, this voyage would lead to a great tragedy. The ship carried a total of 1,477 passengers and crew, who had complete faith in their ship and captain. The fog had come down across the St. Lawrence River, making safe navigation difficult in the busy shipping lanes. At 02:00 hrs, (29th May) a collision occurred between the *Empress of Ireland* and the vessel *Storstad*. The damage sustained by the *Empress of Ireland* was catastrophic. Many passengers who occupied cabins on the starboard side of the ship did not stand a chance as the water cascaded in.

The *Storstad* – a collier carrying a cargo of 10,460 tons of coal, transiting from Halifax to Montreal – had no wireless apparatus on board. She was designed with 'longitudinal bracing', ideal for cutting through field ice. This both resulted in her not sinking and accounts for the extreme damage inflicted on the *Empress of Ireland*. The cause of the collision between both ships is regarded by maritime historians as controversial. Captain Kendall of the *Empress of Ireland* always blamed the *Storstad*, when he was rescued by her crew; he uttered: *"You have sunk my ship!"* He maintained to his dying day that he faithfully followed the *Rules of the Road* and attempted to past the *Storstad* on a starboard-to-starboard course.

Radio Watch

At the time of the collision with the *Storstad*, Junior Operator Edward Bamford had just taken over the watch. He barely had any time to react and was promptly dispatched by Ronald Ferguson, to the bridge for instructions. To try and clear the airways he had the foresight to send the following message: *"CQ CQ CQ de MPL MPL MPL; Standby for a distress signal; have struck something"*. MPL was the Marconi call sign allocated to the *Empress of Ireland*. In a few minutes, Edward Bamford returned with orders from the Chief Officer, to send an SOS distress message. *"SOS SOS SOS de MPL*

ALL PICTURES: PUBLIC DOMAIN

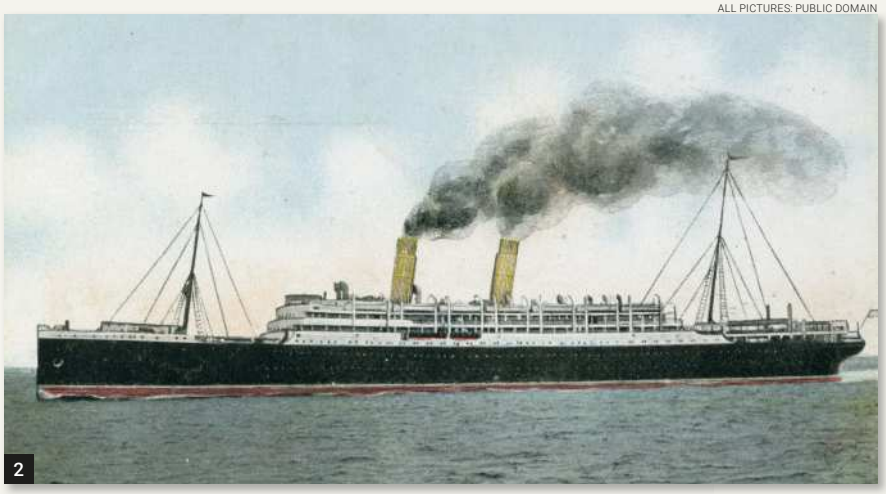

Fig. 1: Ronald Ferguson, OBE.
Fig.2: The *RMS Empress of Ireland*, the flagship of the *Canadian Pacific Steamship Company*.

MPL MPL – have struck something, sinking fast, send help". The shore station at Father Point, responded almost instantaneously with the simple question: *"Where are you?"* The station at Father Point was currently manned by its Second Operator, Leslie Crawford. He also managed to inform his Senior Operator, William Whiteside. Between them, they contacted several vessels. The *Eureka* and *Lady Evelyn* headed directly to the rough location reported, 20 miles past Rimouski. Whilst he was working with Father Point, he asked Edward Bamford to fetch his clothes.

By now the end was very near for the *Empress of Ireland*, she was listing to starboard and without a supply of power from the engine room. The only way of continuing to send drastic SOS pleas was to use the emergency radio set. However, the emergency batteries fell out of their storage cupboard, due to the vessel's dramatic list. There was no need to wait for an *Abandon Ship* order, it was now time for them to try and save themselves.

Edward Bamford escaped, after being thrown into an inflatable life raft. The vessel lost her metacentric point of gravity and rolled over on to her side, while open portholes increased the ingress of water into her superstructure). Edward Bamford was ultimately rescued by one of the *Storstad's* lifeboats. The water temperature in the St Lawrence River, at the time of the sinking, was recorded at 4°C.

Ronald Ferguson had a more dramatic escape, which was reported as follows: *"As it was impossible to do anymore, I went out on deck and picked up a deck chair, and just as I had put my arm through it, I was thrown into the water."* He had to await the arrival of the *Lady Evelyn*, in the freezing St Lawrence River.

The Heroism of the Radio Operators

Once onboard the *Lady Evelyn*, Ferguson climbed through a window of her wireless room and continued to coordinate the rescue operation. Once again, wireless operators employed by Marconi Marine displayed a great devotion to duty and great courage.

The final number of fatalities was on a scale similar to the *Titanic* disaster of 1912: Of the 1,477 passengers and crew on board, 1,012 had lost their lives. One of the main reasons for the high fatality rate is that the *Empress of Ireland* sank with just over 10 minutes, making the forward-thinking and the iron nerve of the operators remarkable in managing to send an accurate distress message. The newspapers of Caerwys (North Wales) took great delight in reporting the heroism of Ronald Ferguson, who had resided in the local area before his family moved back to Birkenhead.

The role played in this disaster by wireless was acknowledged by Ronald Ferguson, who stated that: *"I do not think it has been realised what part wireless played in this affair. Only eight minutes was I able to work, but without that the only boats available for the passengers would have been those on the Starboard side of the* Empress*, and it is not likely more than forty or fifty would have been saved"*.

A court of inquiry was held and headed by Lord Mersey of Toxteth, the leading Wreck Commissioner of Great Britain. The inquiry commenced on 16th June 1914, at Quebec City, it concluded that the *Storstad* was at fault. However, a Norwegian court of inquiry published a very different final report and ultimately exonerated Captain Thomas Anderson of the *Storstad*. The cause of the collision is still debated by maritime historians.

A Confused Aftermath

In the immediate aftermath of the disaster, confusion reigned. The wireless operator of *Eureka* sent an incomplete list of survivors rescued. Police had to be called at the Liverpool office of the *Canadian Pacific Railway Steamship Company*, to restore order as the mass of people demanded news of love ones: One woman cried out *"My poor husband, my poor husband: What shall I do!",* as tears were streaming down her face. In many ways, it was just like the *Titanic* disaster all over again.

Meanwhile, the wireless network could not cope with the volume of traffic to be sent, creating many messages being repeated and often jammed.

After the First World War, Ronald Ferguson joined the *Radio Communication Company (RCC)* and was eventually promoted to the position of General Manager. Under his management, the broadcasting industry was standardised and six rival companies merged to form the *British Broadcasting Corporation*, on 1st January 1927. This merger led to Ronald Ferguson returning to the *Marconi Marine Company*, in the position of Joint General Manager. He was based at Chelmsford and his astute management enabled the company to survive the Great Depression of the 1930s.

His reputation as a radio pioneer led to his secondment to Egyptian State Radio, from 1934 to 1946. He played a major role in the propaganda war against the Axis Powers, in the North African Campaign, during the Second World War. For his services to the development of Egyptian Radio, he was awarded the *Order of the Nile*, coming back to Marconi Marine in 1947, as General Manager. The pinnacle of his career was in 1959 when he was appointed Managing Director. He held this position, until his retirement in 1967. He remained a keen radio amateur with a lovely hand and encouraged new members to take up the hobby. Ronald Ferguson passed away in 1985, aged 91, after a full and rewarding life in radio communications.

Stowaways, Brexit Implications, and an Introduction to SONAR

Robert Connolly
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Robert Connolly sheds some light on several recent serious marine incidents, looks at various types of SONAR equipment and provides a short review of a difficult year in shipping.

JOHN PERIAM - SHOREHAM HARBOUR LIFEBOAT.

1

Late October 2020 proved an interesting period regarding maritime incidents. A 4000 GRT cargo ship, *Lily B*, lost power two nautical miles from Hook Head in the Republic of Ireland, while on passage from Germany to New Ross in the Republic of Ireland. It began to drift dangerously close to the rocky shore.

A distress call was issued to Dublin coastguard at 3 pm with RNLI lifeboats from Dunmore East, Kilmore Quay and Rosslare subsequently tasked. The Irish Coast Guard helicopter, *Rescue 117*, based at Waterford Airport, was also deployed in case the crew needed to be evacuated. The RNLI said that lifeboat crews had to contend with force eight winds and six-metre-high waves, as indeed, they often must (Fig. 1).

The cargo vessel with a crew of nine onboard was carrying coal when it lost power and came within half a nautical mile of coming ashore on the Hook.

Dunmore East and Kilmore Quay RNLI first established tow lines onto the drifting vessel. The two lifeboats maintained the tow and kept the cargo ship away from shore while a tug was en-route from Waterford. Meanwhile, Rosslare RNLI stood by. Battling the high waves, the three lifeboat crews worked together to ensure the cargo vessel stayed away from the rocks until the tow was passed to the tug, "*Tramontane*" on its arrival at 5.40 pm.

The casualty was safely towed to calmer waters in the entrance to Waterford harbour escorted by the three lifeboats. Speaking afterwards Rosslare RNLI Lifeboat Operations Manager David Maloney said, "*If it weren't for the work of the three lifeboat crews out in force eight conditions, I fear the vessel would have hit the rocks and there could have been a serious loss of life. The seas were huge, and it would not have been pleasant for anyone out there in those conditions. The lifeboat crews were out for over twelve hours in a callout that involved serious skill and concentration and I am tremendously proud of all three lifeboat crews involved.*"

To the Citadel

A few days later, a rather unusual incident for UK waters unfolded. The oil tanker "*Nave Andromeda*" was off the Isle of Wight on passage from Nigeria to Southampton. Earlier in the voyage, seven stowaways had been discovered on the vessel and the crew decided to lock them in a cabin in preparation to hand them over to the authorities when the vessel docked in Southampton a few hours later. The stowaways became aggressive and threatened the crew and the ship. The 22 crew members retreated to the citadel and issued a radio call to coastguard for assistance.

In terms of ships, a 'citadel' refers to a secure room, designed to withstand any kind of weapon impact, where the crew of the ship can hide in case there is a pirate attack on the ship or when the pirates are aboard the ship.

The citadel requires not just food and water supplies, but also effective communication channels to be able to communicate with the outside world, and a proper system of ventilation and a first aid kit. The room can also be fitted with CCTV cameras and should have the controls for switching off the engines – both main and auxiliary. Often the citadel is in the ship's engine room. Most ocean-going ships are now equipped with a citadel, part of their anti-piracy measures (Fig. 2), and to be used as a last line of defence.

On receiving the distress call from the ship, the coastguard alerted the police who in turn requested assistance from the military, a move that had to be approved by the Home Secretary. Ten hours later, with military intervention approved, and under the cover of darkness, 16 members of the UK Special Boat Service boarded the ship, some fast-roping from two Royal Navy Merlin helicopters and others climbing up the side from rigid inflatables with snipers watching from a *Wildcat* helicopter. It is believed that the Royal Navy frigate, *HMS Richmond*, was also on standby to assist, as were naval mine clearance divers. When the operation was about to take place, the ship's captain, who was in constant radio contact with authorities from the citadel, switched on the

COURTESY OF MARINE INSIGHT

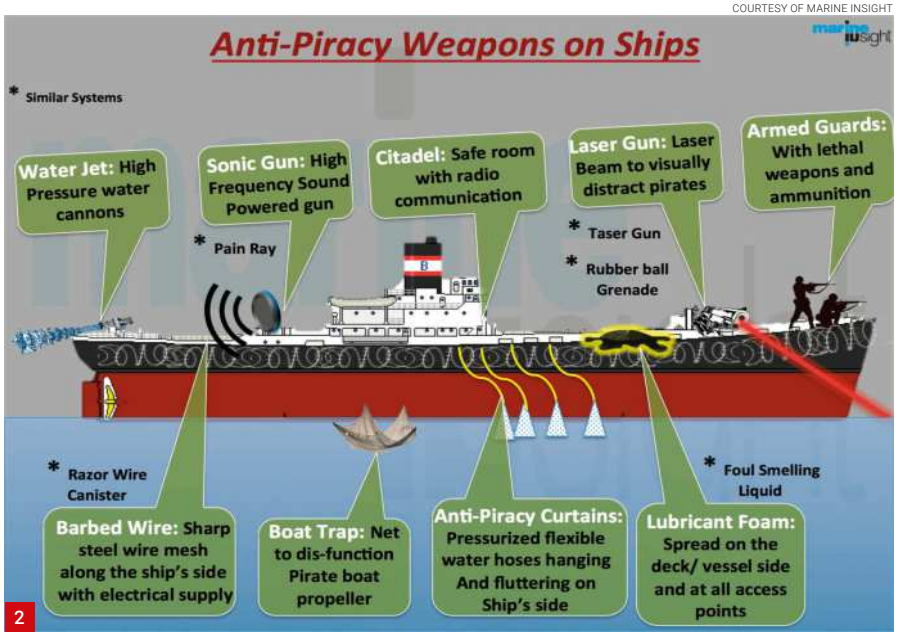

Fig.1: A RNLI Lifeboat in heavy weather. The image is of the *Tyne Class* boat at Shoreham, called *Davy's Family*. Fig. 2: Some of the anti-piracy measures protecting a cargo ship. Fig. 3: A *Furuno* full-circle scanning Sonar. Fig. 4: The superyacht *Artefact*.

ship's lights to discombobulate the stowaways. In just seven minutes, the ship was secured; the seven stowaways were detained and later handed over to police who arrested them on suspicion of "*seizing or exercising control of a ship by use of threats or force under Sections 9(1) and (3) of the Aviation and Maritime and Security Act 1990*". The 22 crew members were unharmed, and the ship continued its passage to Southampton.

More Brexit Woes

The time around early November 2020 was of enhanced local interest here in Northern Ireland when at one point up to eight cargo vessels were waiting at the anchorage to enter our two local ports to discharge cargo. With the countdown to Brexit and new regulations being implemented for cargo entering Northern Ireland, there seemed to be a rush on to secure adequate stockpiles of materials before the rule changes come into effect.

As you know, Northern Ireland must follow EU import rules after Brexit, and long delays on goods entering the Provence are now increasingly likely. Normally we would not see more than three cargos ships waiting to enter the ports. It was also notable that unloading at the port was now operating on a 24/7 basis.

An Introduction to SONAR

This month I would like to introduce Sound Navigation Ranging (SONAR). Keeping a check of the depth of water under a ship has always been important. This used to be done by dropping over the side a lead-loaded line which was marked in fathoms. Then came the development of depth sounders. These constantly transmitted a radio signal that was bounced off the seabed and produced a marking via an ink pen on calibrated paper in the receiver unit.

It quickly became apparent that this system not only provided a representation of the seabed but also schools of fish under the vessel and was used as a fish-finder by many fishing vessels. We are also all aware, either through reading history books or even watching WW2 films, that sonar was used by navies to locate submarines. The basic principle of sonar dates to 1490 when Leonardo da Vinci used a tube inserted into the water to detect vessels by ear.

In 1912, the Canadian engineer Reginald Fessenden built an experimental system that was initially tested in Boston Harbour before being deployed in 1914 from the US Revenue Cutter *Miami* on the Grand Banks off Newfoundland. The test demonstrated depth sounding, underwater communications and echo ranging (detecting an iceberg at a 2-mile [3.2 km] range). The *'Fessenden Oscillator'* operated at a frequency of about 500Hz. It was unable to determine the bearing of the iceberg, due to the 3-metre wavelength and the small dimension of the electrostatic transducer's radiating face (less than ⅓ wavelength in diameter).

By 1918, Britain and France had built prototype active systems that used quartz piezoelectric crystals to produce the world's first practical underwater active sound detection apparatus. In 1940, some sonars typically consisted of a magnetostrictive transducer and an array of nickel tubes connected to a 1-foot-diameter steel plate attached back-to-back to a Rochelle salt crystal in a spherical housing operating on 24kHz.

A magnetostrictive transducer makes use of a type of magnetic material in which an applied oscillating magnetic field squeezes the atoms of the material together, creating a periodic change in the length of the material and thus producing a high-frequency mechanical vibration. Magnetostrictive transducers are used primarily in the lower frequency ranges and are common in ultrasonic cleaners and ultrasonic machining applications.

This assembly penetrated the ship's hull and was manually rotated to the desired angle. By the end of World War II, the standard US Navy scanning sonar operated at 18kHz, using an array of Ammonium Dihydrogen Phosphate (ADP) crystals. The longer ranges desired, however, required the use of lower frequencies. The necessary dimensions were too big for ADP crystals. Therefore, in the early 1950s magnetostrictive and barium titanate piezoelectric systems were developed. However, these suffered from problems in achieving uniform impedance characteristics, and the beam pattern suffered. Barium titanate was then replaced with more stable lead zirconate titanate (PZT), and the frequency was lowered to 5kHz.

Types of Equipment

There are two basic types of sonar; first, active sonar transducers that emit an acoustic signal or pulse of sound into the water. If an object is in the path of the sound pulse, the sound bounces off the object and returns an "echo" to the sonar transducer. If the transducer is equipped with the ability to receive signals, it measures the strength of the signal. By determining the time between the emission of the sound pulse and its reception, the transducer can determine the range and orientation of the object.

Second, there are passive systems – used primarily to detect noise from marine objects (such as submarines or ships) and marine animals like whales. Unlike active sonar, passive sonar does not emit its own signal. This is an advantage for military vessels, which do not want to be found, and for scientific missions that concentrate on quietly "listening" to the ocean. Rather, it only detects sound waves coming towards it. Passive so-

FURUNO

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nar cannot measure the range of an object unless it is used in conjunction with other passive listening devices. Multiple passive sonar devices may allow for triangulation of a sound source.

Present-day sonar is much more than a device for determining the depth of water under a ship or finding fish or, in the military theatre of operations, finding submarines. Nowadays, side-scan sonar can not only accurately map the ocean floor but will also detect shipwrecks in a three-dimensional aspect and even determine which material the ocean floor is made of. Depending on the type of sonar to be used, the frequency of the transducer can be 20, 85 or 180kHz. Alternatively, it can be selectable from 60/88/150/180/240, 60/153; 85/215, 230/540, 230/850 or 270/540kHz.

The sonar operating range may be up to 2,000 metres. Fig 1 shows a basic depth-sounder that was produced by NASA Marine for the small boat market. I had one of these fitted to my skiff some 25 years ago; at that time, it cost £65 for the basic model. A pre-placement transducer cost around £20. Its operating frequency was approximately 150kHz, and it had a through-hull transducer.

[N.B.: a transducer (sensor) is a device that converts variations in a physical quantity, such as pressure or brightness, into an electrical signal, or vice versa – Ed.].

Fig. 3 shows a current *Furuno* 'full-circle' Scanning Sonar.

A Brief Review of 2020

2020 was a very strange year for the shipping industry, due to the Coronavirus (COVID-19) pandemic. The world's cruise ships ceased operating in the early summer and were laid up, with many not planning to recommence operations until early 2021. Crew members were effectively trapped on board due to restrictions placed on passenger flights. What is more, the closure of many countries' borders resulted in cruise lines having to pool their resources to get crew members home by using some cruise ships. The pandemic caused the usage of oil to dramatically drop, resulting in tankers anchoring up waiting for new orders or being chartered for use as oil storage vessels.

KEVIN HEWITT

4

The general cargo market was also affected because Asian imports and exports stopped. This had a dramatic effect on the shellfish industry, as local factories and markets closed. Crews were furloughed and boats tied up. Even when the market began to re-open, local shellfish boats were operating under restrictions.

As an example, in November 2020, at the beginning of the scallop season, a number of our local boats would have moved out to fish out of the Isle of Man where they had been granted fishing permits by the Manx authorities. This year, although they were granted permits and allowed to land in the Ilse of Man, they were not permitted to set foot on Manx soil, not even to discharge their catch. They were also prevented from staying in a Manx port overnight – in case they had to cross a Manx vessel to access their own and possibly contaminate it with Covid-19.

The Manx authorities had very tight Covid controls from the word go, and these are still in force.

https://tinyurl.com/y24962s5

Hopefully, 2021 will a return to something like normal with us being able to holiday at home or abroad or even have a short break at the seaside.

Finally, this month, thanks to Kevin Hewitt for a picture of how the other half lives (Fig. 4): *Artefact, is* an 80m hybrid superyacht on its maiden voyage to Gibraltar after departing the famous *NOBISKRUG* yard in Germany. The hull is built from steel while the superstructure is built from glass-reinforced plastics (GRP).

https://www.nobiskrug.com/contact

The vessel is fitted with *Azipod* propulsion (a gearless, steerable, propulsion system where the electric drive motor is in a submerged pod outside the ship's hull), and a dynamic positioning system, which can hold the boat's position without dropping anchor, to protect the seafloor.

The ABB diesel-electric propulsion system meets the Tier III emissions regulations of the International Maritime Organisation (IMO).

https://tinyurl.com/y3a6xq65

An Introduction to Vector Network Analysers

Keith Rawlings
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Keith Rawlings gets up close and personal with Vector Network Analysers, looking at their key components and functions and introducing the Nano VNA in the process.

While at the Newark rally last year, my friend spotted a stall that was demonstrating a handheld Radio Frequency (RF) Vector Network Analyser (VNA). It was a battery-powered, two-port device with a small but clear built-in colour display. It could be used either as a standalone unit or be connected to a PC running under free software. Its frequency range was from 50kHz to 900MHz, and it had a claimed dynamic range of 40dB. It was no surprise that sometime later my friend announced he had purchased a version of the NanoVNA off of Amazon for about £40. He then very kindly lent it to me to play with.

What is an RF VNA?

I have covered Vector Network Analysers before, but it is worth returning to this topic, in my view.

There are two main types of network analyser, ignoring the Large Signal Network Analysers. These are

1. An SNA or Scalar Network Analyser.
2. A Vector Network Analyser (VNA).

An SNA generally will only display the *amplitude* of a measurement whereas a VNA will display *both amplitude and phase* (Don't worry about these terms at the moment).

The VNA is the more versatile of the two, as it provides more comprehensive information.

These devices are used to characterise the RF properties of a 'network'. These networks will have 'ports.

For example, an aerial can be regarded as a 'network' and will (usually) have one single port. A low pass filter or an amplifier will have two. Devices such as directional couplers, mixers and the like can have three ports, and a multi-coupler can have many more.

There are a number of relatively cheap VNAs available. Remember that aerial analysers such as the MJF269, Sark, Rig Expert are, in fact, network analysers.

Mostly, these later units have a single connector and are termed single-port-analysers. They can measure parameters such as impedance, SWR and so on.

The Nano VNA, being a two-port VNA, can also perform two port 'through-measurements', in addition to single-port measurements. Therefore, with the Nano VNA, we can make single port measurements on 'single-ended' DUTs (Devices Under Test) such as aerials dummy loads, and so on. We may also perform two port/through measurements on devices like filters, attenuators, amplifiers and others.

Put simply, it does this by injecting RF into a given port of the DUT (Device Under Test).

If it is a single port, it measures the level of RF at that port as reflected power.

In case of a through-test, the RF level at port 2 is measured.

These measurements are represented by 'S' Parameters (Scattering Parameters, for instance, 'S11', 'S21').

A more detailed description of these is beyond the scope of this column, but I can direct readers who wish to learn more to the links provided at the end.

The Nano VNA promises to be a very powerful tool for the aerial/RF experimenter. It is popular, cheap, ideally suited for the beginner as well as the experienced user, and it offers a huge amount of background information online. I think it is worth delving into the basic technicalities of it, before moving on to make some basic measurements next month.

The Nano VNA

The Nano VNA is a small unit, measuring 86 x 54 x 15mm. Along one edge, there is a USB port for battery charging and PC software, an on/off switch and a thumbwheel, which is used to select settings of the Nano, in combination with the touch screen. On the left-hand edge of the unit, there are two SMA female connectors, one for the Transmitter Port (CH0) and the other one for the Receiver Port (CH1). On top of the case, users can find makings for each port. These graphically illustrate the 'direction' of parameters S11 and S21.

Below this, and on the reverse of the case, the *Transmit (TX)* and *Receive (RX)* ports are marked, together with the 'Reflection' and Transmission' direction. These markings help reduce confusion when setting up to make measurements.

Readings are displayed on a 2.8" colour touch screen display. Despite having an internal battery, the unit weighs next to nothing. On switching on, the user is presented with an introductory screen. After a short delay, the Nano displays its main working screen. The information displayed is, quite naturally, in a tiny format but is readable for those with good eyesight.

Moreover, a USB lead and SMA SOL calibration kit are provided with this Nano.

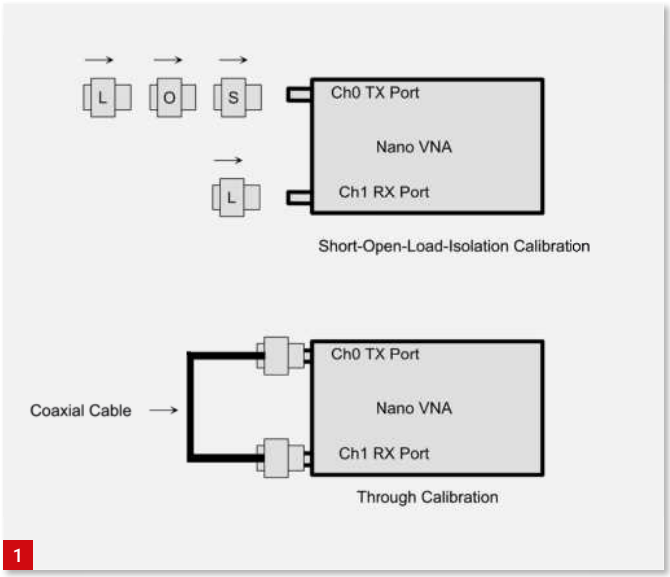
A Question of Calibration

The calibration of any VNA is essential before use. From switch-on, a VNA may have no calibration parameters set, or it may store a Master Calibration, which should give passable measurements.

With my SDR-Kits VNA, I calibrate for each individual job, in order to avoid mistakes with incorrect calibration parameters.

First, I set the frequency span I require, sweep speed, data points, and so on; subsequently, I perform a calibration based on these settings. These also include the parameters of the calibration kit in use. When not using software, it seems that (with the Nano) just a simple SOL (Short-Open-Load) calibration is undertaken.

The Nano *'Master'* calibration procedure involves placing each element of the calibration kit on the TX port (CH0) in



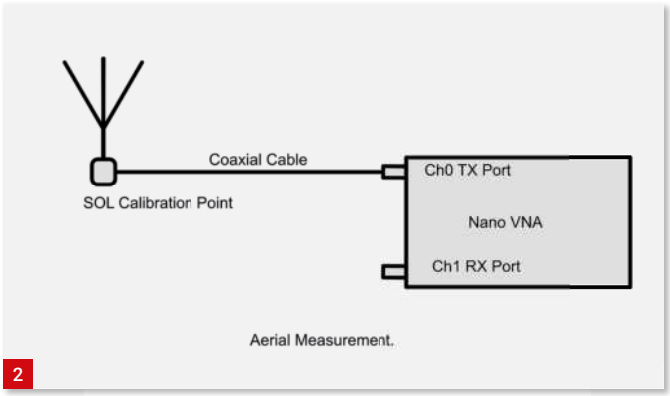


Fig. 1: Diagram of connections for master calibration.
Fig. 2: Illustration of calibration point for aerial measurement.
Fig. 3: Chart of through-calibration.
Fig. 4: Schematic of through/two-port measurement. Fig. 5: NanoVNA with 50 Ω load in place. Fig. 6: NanoVNA set for through-calibration.

turn. Reflected measurements are then possible, of values like VSWR, Return Loss, Impedance and so on, as used for making measurements on aerials, checking dummy loads and similar cases.

If you want to make through-measurements, such as to measure a filter, you will have to undertake a SOLT (T= through) calibration. This is simply the same procedure as an SOL, and you will now need to add the Load to CH1 and then connect a cable between CH0 and CH1 (Figs. 1, 5, 6).

However, this only calibrates the Nano at its source; remember that usually, you will need to make a calibration at some other point, such as at the end of a cable.

Adopting the Correct Procedure

The calibration of the Nano involves you touching the screen (or thumbwheel) to bring the menu up on the right-hand side, navigate to the *Cal* option and select *Calibrate*. You then connect the Open component of the calibration kit to CH0 of the Nano and press the *Open* option. You do the same for Short and the (50Ω) Load.

If you are going to undertake through-measurements on the Nano, you have to also connect the Load to CH1, select *Isoln* and connect a cable from CH0 to CH1. Then, select *Thru*.

The information on the Nano website seems to suggest that this Master calibration is made from 50kHz to 900MHz. The parameters can be saved to the Nano 'Memory' 0 (Fig. 1).

Ideally, a torque wrench is used to tighten SMA connectors, but finger-tight should suffice. When checking something like an aerial, it is usual to connect a cable to CH0 and make an SOL calibration at the end of that cable where the aerial is to be connected (Fig. 2).

For, say, a filter, a second cable is attached to CH1 and is coupled to the first with an inline adaptor; a though calibration is then made using both cables (Fig. 3).

As we now have a calibration point to the end of both cables, we can connect our filter in place of the adaptor and measure its parameters (Fig. 4).

For a filter, we could be interested in S11 measurements such as VSWR and Impedance, or in S21 dB through-measurements, which will allow us to measure not only the shape of the filter but also bandwidth, cut off point, overall insertion loss and so on.

I used this type of through-checking when diagnosing the Aerial Facilities Coupler covered in AN recently.

Needless to say, the accuracy of measurements on a VNA is directly linked to the accuracy of the calibration kit used. Those used commercially are very expensive, and if you need more than one type of connector, you will need more than one kit.

However, for the majority of readers, the level of precision that these kits provide is not required. Although the Nano only comes with an SMA kit, it is more than possible to make your own calibration kit from connectors such as BNC and Type N ones. If care is taken with construction, these can be used quite confidently over (at least) the HF range.

Also, please remember that you may find you need a female *and* a male calibration kit.

Next month, we will put the Nano (Figs. 5 and 6) to a more thorough use, to conduct some useful measurements.

Invaluable Reader Feedback

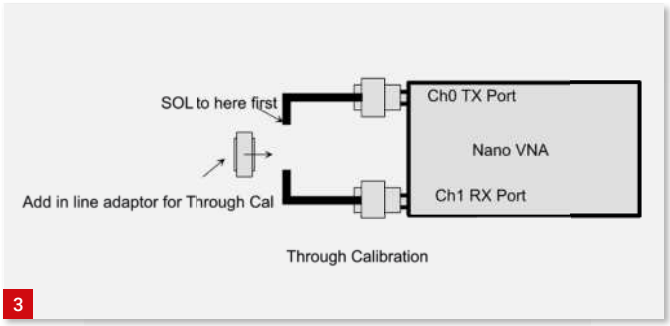
In November's column (*RadioUser*, November 2020: 53-55), we printed a question from Lionel who was experiencing problems with his MFJ1020B Preselector. I am happy to report that readers Adrian Gardiner and David M0TFY came back to me with some suggestions for Lionel.

Adrian replied, "*Just been enjoying your latest column in Radio User. You mentioned about Lionel's preselector problem where it drops S points when powered up. I would question whether Lionel has a better signal strength if the preselector is bypassed altogether. Although I do not have experience of his particular model, I would suggest the most likely issue is a leaky RF transistor. When no power is applied, the RF energy*

Further Information

NanoVNA Made Simple:
https://tinyurl.com/y5uwnfkr
NanoVNA website:
https://tinyurl.com/y5dqv8od
S Parameters:
https://tinyurl.com/y4j5k6ec
NANOVNA Measuring Bandpass Filters:
https://tinyurl.com/yyvrlmjv
Why a VNA Needs To Be Calibrated:
https://tinyurl.com/yyxjmusk
General:
https://tinyurl.com/yxgs2jym
SDRkits:
https://tinyurl.com/y36xyp9c
What is a VNA:
https://tinyurl.com/y52u43rh.

ALL PICTURES: KEITH RAWLINGS



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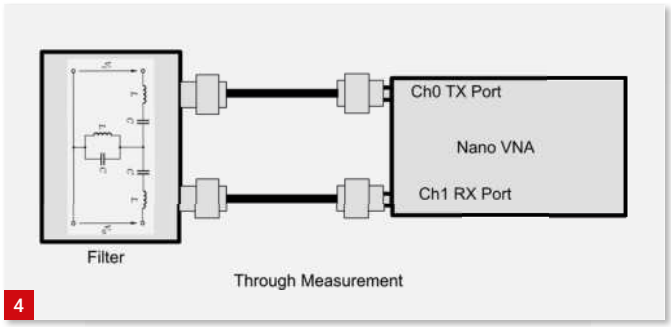

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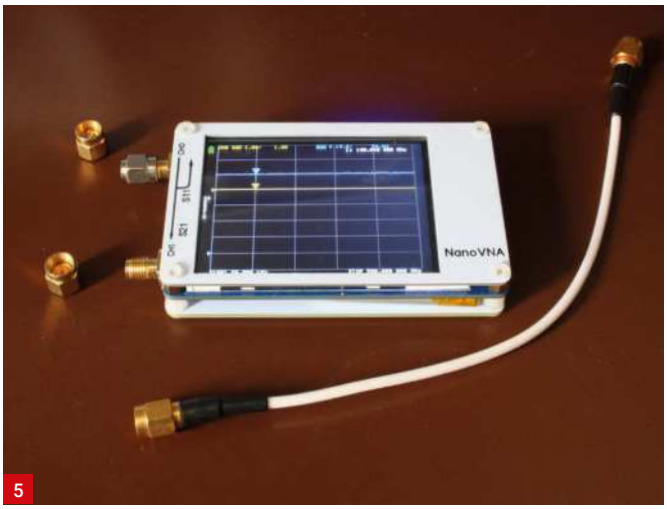

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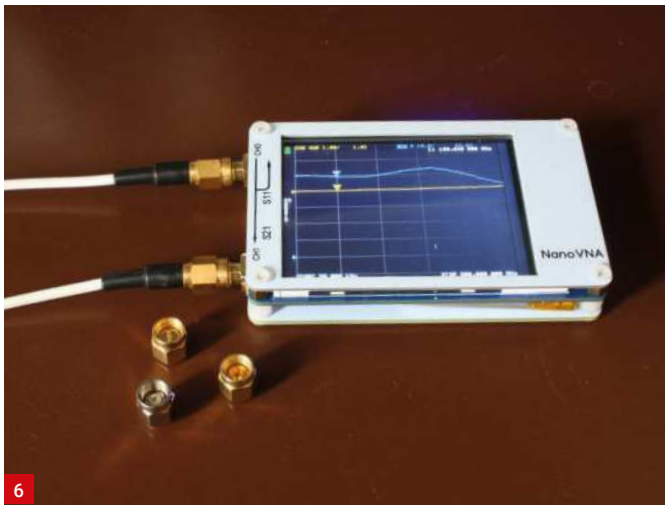

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will simply be coupling through, either directly with a 'bypass' style design or just inductively; hence my question of whether it is better if not in circuit at all. However, once power is applied, a leaky transistor would then start to conduct heavily, effectively shunting the RF energy to ground, rather than amplifying it. I hope this potentially helps Lionel. Either try replacing the transistor or seek assistance from someone who can.

I now see from the schematic that the MFJ1020B uses a 40673 Dual Gate MOSFET. In the past, I have known these to fail due to high RF fields/ESD damage. Therefore, I wonder if indeed it is the transistor that has gone 'leaky'. The MFJ1020C model uses a J310 J-FET.

And from David came this reply: *"Hi Keith, I enjoyed your column as usual. Funnily enough, I have been hunting through eBay, looking for a Lowe PR-150 to match my HF-150, which I bought many years ago, but which is still a wonderful receiver. I read about Lionel's issue.*

"I love the sound of his antenna and I am going to have to build a model. A couple of things jump out at me: Lionel doesn't mention whether the system is grounded? Even a couple of metres of counterpoise might be beneficial? It sounds like he is losing signal when he powers up the MFJ. I wonder if he is using a quiet power supply. Switch modes are notoriously noisy and feeding one directly into the radio circuit might be problematic. He might get away with 9V PP3 to power it (I know MFJ kit all like 12V, but a preselector might work on 9V). Try decoupling from the noisy mains. Perhaps trying a small 12V (mobility scooter/cordless drill type) rechargeable battery [charged up when not listening] will help? Also, try putting ferrites on the power cables."

My sincere thanks to Adrian and David. This information has been passed over to Lionel and has also been included here because it contains some good points and may be of help to other readers.

Until Next time Stay safe!

The WorldDAB General Assembly and a Hybrid Radio Future

Kevin Ryan
kevin@radio-digital.co.uk

Kevin Ryan shares what he learnt from the virtual WorldDAB General Assembly, and he investigates how this might drive forward future digital radio technologies and affect listeners.

ALL PICTURES: KEVIN RYAN

1

The annual WorldDAB General Assembly (WDABGA, Fig. 1) was held online in 2020. The event provided some insights as to future changes in digital technology, especially in the area of DAB+.

DAB+ Objectives

The President laid out three clear objectives World DAB hopes to pursue in 2021. First of all, the forum needs to make listeners, broadcasters, and policy makers more aware of the benefits of DAB+. I cannot recall other than a passing reference to the older DAB still very much in use in the UK. For listeners, it is mostly about choice but DAB+ might give clearer sound in a crowded FM band, and I do not think that we suffer much from that in the UK.

Broadcasters get a free-to-air technology that is reliable in emergencies, and they can also build brands to segment their market. Living in the UK, the speaker highlighted the range of 'themed' stations created by Virgin, Heart and Absolute Radio. For policy makers, DAB+ is a green technology costing significantly less than FM. This was something the BBC speaker tried to illustrate later in the day.

The second point – and the main focus of the 2020 conference – was that DAB+ is the key to *securing the long-term position of radio in the car*. WorldDAB thinks that DAB+ and IP (streaming) will combine to form a hybrid radio solution when our cars are all connected to the internet. A first step is an implementation of the *European Electronic Communications Code (EECC)* directive that mandates that radios in all new cars must be able to receive digital terrestrial radio. For most member countries of the EU, this means DAB+.

https://tinyurl.com/y5crt8v8

Cars (but not commercial vehicles) will have to comply with this law in the UK from December 2020.

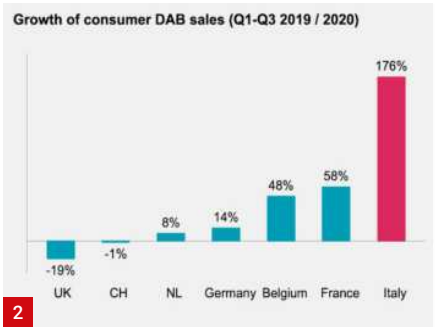
I found out the interesting fact that 64% of all consumer radios sold in Europe are still analogue, and the speaker felt that this slowed deployment of DAB+ unnecessarily. That might be so, but I feel that we (the listeners) must have some choice as to how we 'consume' radio services.

There were no numbers of how many analogue radios are sold in the UK but a graphic (Fig. 2) showed that sales of DAB+ radios in the UK dropped by 20% last year. Perhaps the early adopters of DAB+ have now bought enough radios and FM will retain a significant portion of the market for the next few years?

WorldDAB is seeking out new territories to expand into, in Europe, Spain, Portugal, Greece, Romania and Bulgaria are on the list for increased activity. In Asia, Thailand, Malaysia, Indonesia, and Vietnam that have all run recent trials and are the best candidates for wider adoption of DAB+. Meanwhile, Tunisia and South Africa are expected to be leaders in deploying DAB+ in the continent of Africa.

The Future of Radio

I thought this would be a thought-provoking session, with a new vision for radio in the future. I found out that 90% of people still listen to the radio and use it more in times of crisis, and also that there are distinct changes in the patterns of listening during the day. The future seems to closely align with WorldDAB's strategy of us using DAB+ and IP in a hybrid radio world. Moreover, recent RAJAR data showed that 15-24-year old listeners prefer to use their smartphones to listen to audio while the over 55s mostly use a radio.



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[See also David Harris's article on RAJAR, elsewhere in this issue – Ed.].

Younger listeners' decreasing awareness of radio also came out in a presentation by Ford Ennals, the CEO of Digital Radio UK. His organization is running e-training for retail staff so they can help customers who want to buy a radio.

Furthermore, a point directed at broadcasters was that they should consider creating dual-purpose content fit for podcasts and live broadcast, rather than chopping up bits of live radio to make podcasts. A similar argument was put forward from Germany; in this view, radio is all about the *audience* who want variety in a controlled way because they want to listen to the same station for longer periods.

UK Radio and Audio Review

I have mentioned this review before; it is supposed to set the future direction of radio in the UK. Consequently, I expected an update on the progress of the group. The speaker emphasized that the review is not trying to set a switchover date but instead is looking at the survival of digital radio in the future. That statement does imply the retirement of analogue services

Fig.1: This year's theme at the WorldDAB General Assembly was *Hybrid Radio in the Car*.
Fig. 2: A slide presented at the WorldDAB conference. It shows a significant drop in DAB+ receiver sales in the UK.
Fig. 3: A prototype from *Radioplayer* displaying a mix of radio stations available on the dashboard.
Fig. 4: A conference slide showing *Gracenote's* hybrid radio concept.

3

at some point as the group considers future radio platforms.

Part of the review is to consider future devices, both now and into the future. This left me thinking that this group's ideas will be similar to WorldDAB's hybrid radio. The BBC and Arqiva are involved in several projects associated with this concept, so I guess it will.

https://tinyurl.com/wh4t2td

This session offered a news update starting with RAJAR suspending their listening reports because some of its data is routinely gathered in face-to-face interviews. There are now 54 national stations using DAB/DAB+ with Capital Dance launching in October 2020. Other news items surrounded Ofcom support for small radio stations during the current Coronavirus (COVID-19) pandemic and the fact that 100% of new cars now have digital terrestrial radio as standard.

https://www.rajar.co.uk
https://www.ofcom.org.uk/home

Country Updates

There were country updates from Australia, South Africa, Italy, Czech Republic, and the Middle East and North African (MENA) region. The Spanish update was interesting containing a potted history of DAB. DAB trials started in 2000 and cover Madrid and Barcelona (about 20% of the population). However, nobody has any idea of how many people are listening. The multiplex carries three national networks and 18 other stations. There has never been a campaign to promote the technology. An agreement on how to progress digitalisation was passed by the Council of Ministers in 2011 covering a transition to DAB+, promotion of digital radio, evaluation of DRM and DRM+, and the switching off of FM. This plan never went forward but a revised plan is now in the process of being approved.

The key differences are that DRM has been dropped and medium wave switch off is now voluntary, whereas FM seems to be subject to switchover. DAB+ coverage must be equivalent to that of FM, and there will be three DAB tiers of 'national', 'regional' and 'local'.

Switzerland firmed up its plans to switch off FM. The state broadcaster SRG-SSR agreed to switch off FM networks in August 2022 and the private FM radio stations six months later in January 2023. The Swiss seem confident because of the way listening habits changed in favour of DAB+ in the previous five years. In 2015, FM accounted for 51%, DAB 23% and online 26% of listeners, whereas, by 2020, FM only had 29% against 39% for DAB+ and 32% for online.

In 2022, I estimate that FM will still account for 20% of all listening and the radio industry, like the one in Norway (now three years after the switchover) will take a while to win back those lost listeners.

In June this year, France plans to celebrate the centenary of the first radio transmission from the Eiffel Tower and the 40th anniversary of the opening of the FM band as part of its Radio Festival. The French *Conseil supérieur de l'audiovisuel (CSA)* hopes to celebrate the launch of two national DAB+ networks.

https://www.csa.fr

These networks will be built out in two stages, using a 'nodes and arcs' method in the first phase. The 'nodes' are the 50 biggest cities, and the arcs 'are' the highways that connect them. When Bordeaux and Toulouse come on air the population coverage will be about 30%. In Phase Two, called rather uniquely the 'percolation phase', operators will fill in the gaps in coverage by adding 50 extra smaller cities and their regions.

BBC Energy Saving Plans

The detailed presentation from the BBC focused on a study of various scenarios about how much energy could be saved by switching off various bits of the media industry. However, this work did not represent a BBC intention on how it plans to proceed. Interesting facts were that the total annual energy use for all radio platforms is 325GW: 0.1% of the UK's power consumption; 250GW or so is used in listening to the radio, and 50% of that comes from keeping devices in standby. FM uses 40% more energy than DAB, mainly because of consumer standby power. These are quite sobering thoughts, even though it is not always practical or desirable to switch devices off at the wall. As you would expect from a conference sponsored by WorldDAB, DAB+ is the least energy-intensive platform, while DTV uses the most energy.

There are several papers on the BBC Research and Development website on this topic:

https://tinyurl.com/y3bxqxmq

The 5G Network

A lot has been written about how 5G could threaten the radio industry. However, the speaker for this part of the conference clearly showed that this is far from true. 5G came about because regulators wanted a technology that could be adapted for many uses. It is not optimised for any particular application, and the current focus is on mobile broadband. This involves manufacturing equipment and creating standards. There are no defined targets for 5G network coverage, data capacity, reliability, and so forth.

The media industry will probably use 5G for *content production* before it considers using it as a *distribution method* like in the case of DAB+. Even so, it is thought that the user experience of using 5G for streaming will be similar to that of 4G, which already offers wide coverage and plenty of capacity.

All in all, I think we can safely assume that conventional broadcasting will be around for another couple of decades.

Service Following

This session looked at how service following

in DAB+ is implemented in three countries.

'Service following' is the term applied to maintaining the same audio or data content that the user has selected in varying reception conditions mainly when travelling by road or train. How broadcasters implement this feature depends on how many networks they have, and on whether or not they want 'seamless' network reception across the country, or rather have regional variations.

Until DAB coverage has reached sufficient levels in all markets, there needs to be provision for broadcasters to implement service following and linking from DAB-DAB/DAB-FM/FM-DAB, thereby allowing a seamless listening experience on the move.

In the UK, the BBC national multiplex links to the four national FM services. In the past, Radio 5 Live connected to medium wave transmitters as well. I have not checked the commercial national multiplexes.

SDL does not link to any other services, and D1 links up with one national FM service and local DAB services.

Automotive Developments

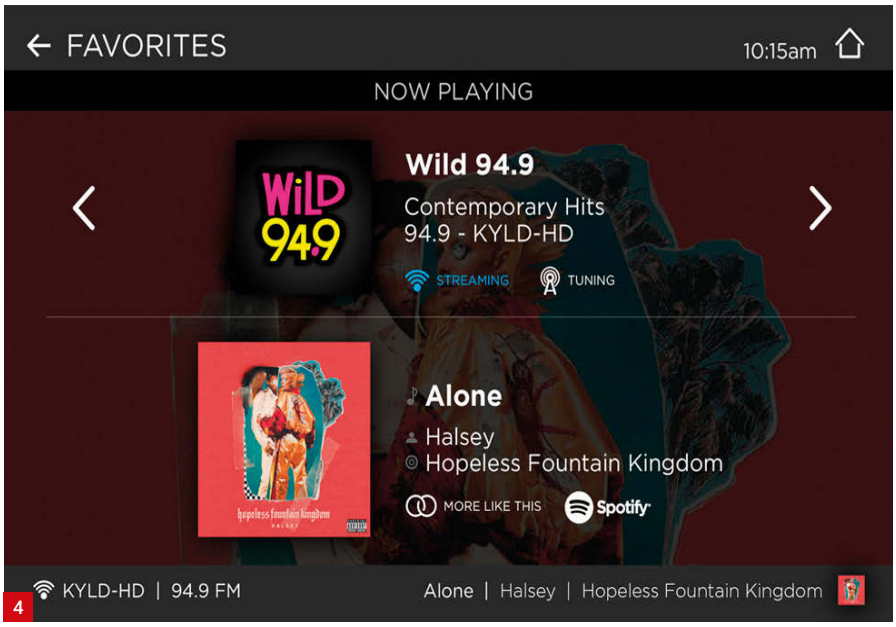
WorldDAB intends to maintain the current dominant position of broadcast radio in the car. However, it is under threat, as the big players like Amazon and Google also seek a share of the market. This area is developing its own language, but I will try to avoid using as much of the jargon as I can, even though phrases like 'strategy analytics' and 'automotive connectivity' sound really catchy!

To enable the future driving experience imagined in the conference, cars need built-in modems, rather than relying on one provided by another device, like in the case of a smartphone. At the moment about 50% of cars shipped worldwide have an embedded modem, and this will rise over the next decade to about 75%. Europe only accounts for about 10% of this total; most of today's sales are in North America and Asia.

It will take a long time to have a universal standard. For the next decade, individual brands will create bespoke solutions. Audi is the first marque to bring together broadcast and streaming seamlessly so that there is no break in the audio. It is expected that the wider Audi group (including VW, Seat, Škoda and Porsche) will use this in-house solution.

Vorsprung durch Technik indeed.

Hybrid radio solutions that combine broadcast and IP are multiplying. To this end, loose technical alliances are forming and working with selected car makers. For example, *Radioplayer* (Fig. 3) is part of the Audi solution, among others. The BBC (in the shape of *BBC Sounds*) and Xperi from the USA, the holder of the HDRadio patents are forming another team. *Radioline* is partnering with Panasonic to bring together podcasts, broadcast and streaming on Android.



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Names I had never come across before were *Gracenote* (Fig. 4) working with Tesla and Music Story. The working concept here is one of 'metadata' (data *about the content*) such as 'station ID', 'music ID' and 'events'.

There is a wealth of information on the web, at these URLs:

https://www.radioline.co
https://radioplayer.org
https://tinyurl.com/y5tszn98
https://tinyurl.com/y39oqyts

So where is all this heading? Once you add the smart speaker technology from either Amazon or Google, the car becomes a 'super-browser' like Google Chrome. However, Google wants to know where you are, what you are listening to, and so on; you can start to imagine where this is heading...

Finally, throw in some health and safety requirements provided by yet another innovation called 'driver monitoring system'. This will check that you are not distracted, drowsy or in distress in any way; else, the system takes control of the vehicle.

https://tinyurl.com/y46h4x8h

I do not think driving will ever be the same again.

Overall, there will be a lot of jostling in the market in the next few years. I do not know how it will turn out or whether all these features will only be in the high-end car market.

The least we can say now, however, is – as far as radio is concerned – WorldDAB intends DAB+ to be part of it. This explains why the organisation wishes to establish DAB+ as the digital radio standard in as many countries as possible.

FCC All-Digital AM

Tied into the 'connected car' is the decision by the FCC to allow AM stations to voluntarily move to the all-digital mode of HDRadio, a technology owned by Xperi. Keep in mind that Xperi/HD Radio wants all-digital AM to have some success. In part, this is because the group is constantly fighting to keep AM in the dashboard.

There is a very real possibility that car makers will start taking AM out to save a few pennies in upcoming model years. The planners at Xperi think that, if AM stations can use HD to provide the same sort of dashboard content (album art, song titles, and so on, which every other audio medium now provides) car manufacturers might be more willing to retain AM in the dashboard.

The DRM Consortium's request to be included as an alternative was rejected – which did not come as a surprise.

https://www.xperi.com
https://www.drm.org

Reciva Portal Closing

This radio portal is closing down at the end of the month. I have three internet radios that use this service (two Bush type 2015 radios, in the loft for many years and a Matsui adaptor for my Hi-Fi). If you were an early adopter of internet radio, then you might be affected by this too, and you might need a new radio.

I wish you all a Happy and Safe New Year.

Scotland

Somerset

South Yorkshire

Suffolk

Insurance

DealerGuide

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TradingPost

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Tel: 07931910741 Email: satmobile@hotmail.com
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MARCONI V2A very good condition but two coils missing. Sphinx tx good condition complete with control box untested. Two PX4 valves boxed and tested. A selection of Morse keys. About twenty sixties transistor radios. Reasonable offers, split or job lot. **Call Jim on 07774 246646 or Email jimmyatjim@gmail.com**

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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 Radio User also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

Censorship, Propaganda-TV, Globes & Robins

Keith Hamer
Keith405625.kh1@gmail.com
Garry Smith
Garry405625.gs@gmail.com

Keith Hamer and Garry Smith investigate TV under the Swastika, add a little Christmas cheer for these dark days, and provide the link to their regular on-line column, DX-TV & FM News.

In 1927, the BBC's Director-General, John Reith, attempted to explain to the listening public, in his usual rather rambling manner, the difficulties involved with censorship of programmes. He stated: "*The peculiar nature of broadcasting – open to all to hear, yet individual and intimate in its approach – inevitably transfers the choice, within the stock of available and technically manageable material, from the listener himself to the broadcaster.*

"The theatre manager, the editor, the preacher, deal each with his own public rather than the public, and the prima facie interest of the audience. To impose limits upon the freedom of such publicists, therefore, is sheer censorship, to be justified or not as such.

But the broadcaster's censorship, if it be fair to call it so, has a different basis. He has not to consider the willing but the unwilling audience, the people who if the matter were, say, performed in a hall would not be there.

And he has further to consider that even for the same people, a matter entirely proper in a hall or a newspaper may be in bad taste or even frankly objectionable in a family group. This is not Philistinism but common-sense.

In the domain of information, this positive policy is to give clear, accurate, brief and impartial news of what is going on in the great world, in a form that will not pander to sensation and yet will arouse a continuing interest, to which end the bare facts are (a) vitalised by 'running commentaries' on events, such as ceremonies and matches, and 'topical' talks in which either the man of the moment or an expert in the subject of the moment speaks to the people, and (b) rationalised by balanced discussion before the microphone."

So, those were the boundaries of censorship set in stone by John Reith in 1927. In 2021, it seems that over the past few decades, the BBC, and most other UK broadcasters, have stealthily changed the rules to 'anything goes' at any time of the day or night because they all know that the Ofcom quango (the acronym for *quasi-autonomous non-governmental organisation*) wants a quiet life and rarely intervenes, particularly in the case of the BBC who are, for some inexplicable reason, able to 'get away' with more than commercial stations!

Early Television and Paul Nipkow

We have profiled Paul Nipkow here before (*RadioUser*, November 2020: 25-27). He first witnessed public television at the Berlin technology exhibition in 1928. He remarked that, *"The televisions stood in dark cells. Hundreds stood and waited patiently for the moment at which they would see television for the first time.*

"I waited among them, growing ever more nervous. Now for the first time, I would see what I had devised 45 years ago. Finally, I reached the front row; a dark cloth was pushed to the side, and I saw before me a flickering image, not easy to discern."

Telefunken presented a television set prototype during the 1928 *Internationale Funkausstellung* event.

From 1929, television test transmissions were broadcast regularly from the *Funkturm Berlin* transmitter (*Rundfunksender Witzleben*). The first public transmission was broadcast from the Kroll Opera House on April 18th, 1934. In later years, as the prospect of war grew closer, the propaganda value of claiming that television was a German invention was soon realised by leaders of the 'Third Reich' (1933-1945).

The television station was operated by the *Deutsche Reichspost* which encompassed the *Reichsministerium für Volksaufklärung und Propaganda* (*Reich Ministry of Public Enlightenment and Propaganda*). It had been formed on March 14th, 1933, by the heinous Propaganda Minister, Joseph Goebbels, and its initial (already massive) budget was increased more than twelve-fold by 1941! It was dissolved on May 1st, 1945.

The identification caption is shown in Fig. 1.

In 1935, the Nazis the regime's first public television station, *Fernseh-Sender 'Paul Nipkow'* (Fig. 2). The station, which had a 180-line resolution, carried programming from *Deutscher Fernseh-Rundfunk* and was on-air from March 22nd, 1935, until it was closed down in 1944. The first on-screen announcer to greet new viewers was the somewhat stern-looking Ursula Patzschke (Fig. 3).

Incidentally, after the collapse of East Germany in 1990, about 280 rolls of 35mm film were discovered showing *Fernseh-Sender 'Paul Nipkow' Berlin* programmes. In recent years, much of that material has been broadcast on German and international channels.

In Germany, the re-discovered footage was used in the 1996 documentary, *Televisionen im Dritten Reich* (*Tele-visions In The Third Reich*).

This was a co-production by Westdeutscher Rundfunk (WDR) and Norddeutscher Rundfunk (NDR).

The material was also used in the 1999 German documentary, *Das Fernsehen unter dem Hakenkreuz* (*Television Under The Swastika* – see resources list and Fig. 5).

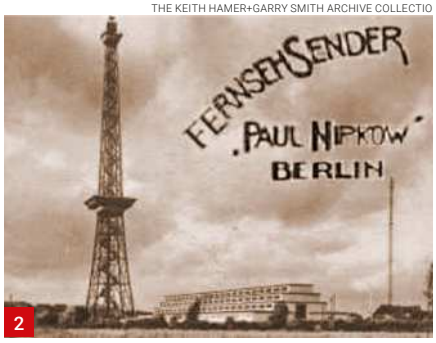
BBC Christmas Cheer

Since the late Sixties, BBC-1 and BBC-2 have always radiated special Identification Symbols during the Festive Season. The authors have meticulously archived all of them since 1969. Traditionally, they were only used for three days, from Christmas Eve until Boxing Day.

Nowadays, they are broadcast for several weeks, presumably so that the BBC have their money's worth from the out-sourced multi-national company that produces so much of the broadcaster's output, *Red Bee Media*. Even BBC Continuity Announcers are now controlled by the media giant in addition to the soon-

THE KEITH HAMER+GARRY SMITH ARCHIVE COLLECTIO

1



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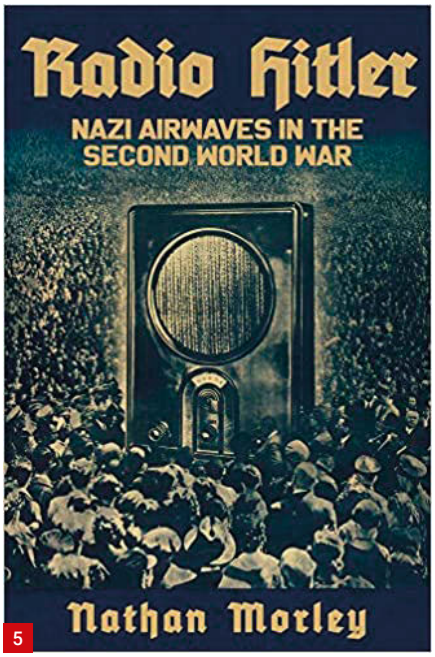

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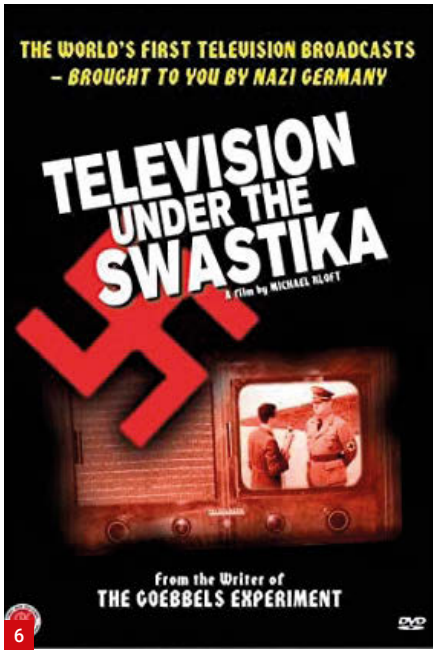


6

Fig. 1: The identification caption used in the German 'Third Reich' (1939-1945) by the *Deutscher Fernseh-Rundfunk*.
Fig. 2: The first German public television station (*Fernsehsender Paul Nipkow)* in 1935.
Fig. 3: The first on-screen announcer to greet new viewers in the 'Third Reich' was the somewhat stern-looking Ursula Patzschke.
Fig. 4: The 'troublesome-twosome' BBC-1 Christmas Robins in 1985.
Fig. 5: Nathan Morley's *Radio Hitler*.
Fig. 6: *Television under the Swastika*.

to-be slimmed-down *Red Button* Teletext service.

When the BBC was a truly in-house, self-contained organisation with traditional values, all programme graphics and on-screen Identification Symbols were designed and produced by the *BBC Graphic Design Department* in London.

In January 1988, an unwelcome wind of change began swirling around the department. The former Head of BBC Presentation, who knew all the long-standing BBC Presentation traditions, was replaced by Pam Masters from Channel 4. She was intent on scrapping the traditional, and much-loved, rotating BBC-1 Globe Symbol (see *Fifty Years Of BBC Colour Television - Part 2*, *RadioUser,* April 2018: 46-49).

The authors of this column were invited by John Aston, Manager of BBC Graphics, to a special luncheon held in their honour at BBC Television Centre in London in an attempt to persuade Pam Masters to keep the basic format of a globe motif. Fortunately, the authors, armed with extremely rare archive material and diplomatic suggestions, were successful in their quest, much to the delight, and relief, of the Graphic Design team!

During the visit, John Aston regaled the authors with a story about one particular Christmas Symbol which he had devised. Up until 1985, all the special Christmas graphics were mechanical models viewed by a camera and transmitted 'live' between every programme junction.

Just as John sat down with his family for Christmas Dinner, the telephone rang. It was BBC-1 Presentation, desperately informing John that the revolving Christmas Robins were stuck with wings not flapping and jammed-up squawking beaks (Fig. 4). It was a total disaster, and John was asked to go immediately to Television Centre to make some emergency repairs before the next programme was due to begin. After that escapade, all future Christmas Symbols were recorded on film or video. A few days later, Noel Edmonds was seen on-air blasting the troublesome twosome to smithereens with a blunderbuss!

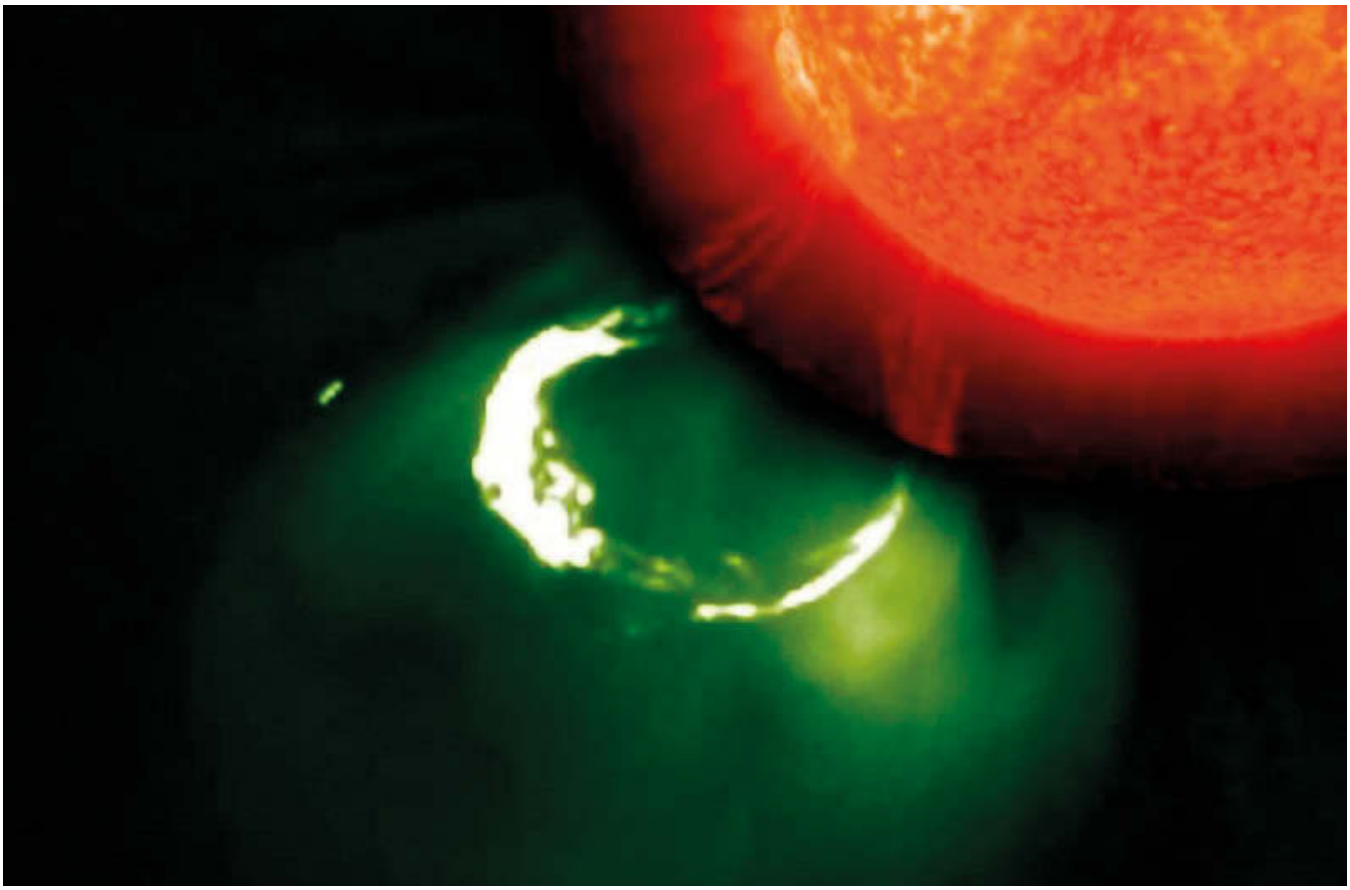
DX-TV & FM News

The 2020 Sporadic-E Season drew to a close in September with only occasional reception via Sporadic-E propagation. However, this was more than compensated for with intense reception via enhanced tropospheric conditions. Favourable tropospheric reception conditions were also noted during October.

For details of DX reception and news items covering September and October 2020, please check out the *Radio Enthusiast* website:
www.radioenthusiast.co.uk

Stay Tuned!

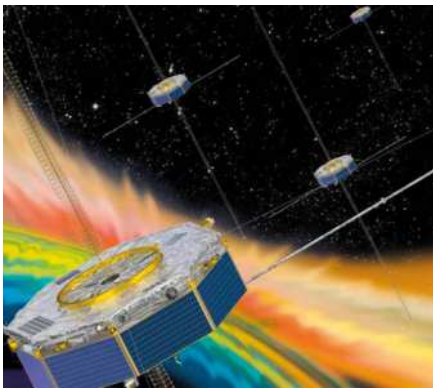
Please send archive photographs, information, news or suggestions for future topics to **Garry Smith, 17 Collingham Gardens, Derby DE22 4FS** or contact us at the E-mail addresses at the top of this column.



Radio News

SOLAR STORMS: The damaging effects of storms, from flooding caused by heavy rain or storm surges to strong winds knocking trees to the ground, are familiar to most people.
Fewer, however, are aware of the hazards of solar storms, though these events can disrupt radio communications, knock out electrical power, and damage satellites.
With our increasing reliance on technology, solar storm damage is now a greater threat than ever before. In a new study, Jones et al. turned to crowdsourced science to help protect against this hazard by identifying potential patterns in coronal mass ejections (CMEs), vast eruptions of plasma and magnetic field flung from the Sun.
The researchers showed participants side-by-side images of numerous CMEs taken by the *Solar Terrestrial Relations Observatory (STEREO)* spacecraft and asked them to select which one looked more complicated.
A standard CME is bulb-shaped in appearance, with a bright outline, dark interior, and another bright prominence within, but CME structure varies greatly in these images. In choosing the purposefully vague term "complicated," the scientists hoped the participants could draw out patterns that could form the basis of future study. Read more on this online.
(SOURCE: Thompson, E. (2020), Eos, No. 101, American Geophysical Union, AGU Eos Weekly E-alert)
https://doi.org/10.1029/2020EO151033
https://tinyurl.com/y387topo

SOLAR WIND AND MAGNETOSPHERE: Magnetospheric physicists seek to understand the nature of the solar wind's interaction with the Earth's magnetosphere.
Some seek to predict environmental conditions hazardous to spacecraft operations within the magnetosphere, such as enhanced fluxes of energetic ions and electrons within the Van Allen radiation belts.
Others focus on the fundamental processes that govern the interaction. In *Dayside Magnetosphere Interactions*, a book recently published by AGU, leading magnetospheric researchers describe our present understanding of this interaction [...] Earth's magnetic field carves out a cavity known as the magnetosphere in the oncoming solar wind plasma.
Because the solar wind is flowing at supersonic and super Alfvenic speeds, a 'Bow Shock' stands upstream from this magnetosphere to divert the flow of collisionless plasma around this obstacle.



Most of the solar wind mass, momentum, and energy simply flow around the magnetosphere in the magnetosheath.
However, a small fraction succeeds in penetrating the outer boundary of the magnetosphere, known as the magnetopause.
Small as this fraction is, it suffices to power both geomagnetic storms and substorms, two primary manifestations of space weather within the magnetosphere. Read the full article at the URL below, on the AGU website:
(Dayside Magnetosphere Interactions, 2020, ISBN: ISBN: 978-1-119-50960-8)
Eos, No. 101:
https://doi.org/10.1029/2020EO150995
https://tinyurl.com/yxuola7s

Radio News

BIGGEST ROUND YET: The *Audio Content Fund (ACF)* has announced the latest recipients of grant funding to make public service content for commercial and community radio, with its biggest single funding round. T
he newly-funded projects will broadcast across 84 different radio stations and will be produced by 15 different independent production companies.
The fund, which is financed by the UK Government, allocated £397k to the projects, which it estimates will be heard by more than five million listeners. This funding round is the first to benefit from an additional £400k contribution to the ACF from DCMS, which was announced by Minister of State John Whittingdale.
The new funds replace money that was brought forward by the ACF to support audiences during the first national lockdown and have enabled the ACF to restore its ambition for the 2020-21 financial year.
These latest awards take the *Audio Content Fund's* running total of grant funding to £1.65m since it started in April 2019, with a further £400k due to be allocated in its next funding round which opens on 7th December 2020.
Mukti Jain Campion, a member of the *Audio Content Fund's* independent funding panel, said: *"This was the strongest round so far with a very high standard of pitches. 'Indies' seem to have found their groove in working with commercial and community radio stations to add value for audiences with ACF funded projects. I am particularly delighted the ACF can support such a variety of genres this time and greater diversity in stories and production teams. More please!"*
And Sam Bailey, Managing Director of the Audio Content Fund, said: *"It's so satisfying to be able to award grants to so many high-quality projects from this funding round. The additional funds from DCMS have made it possible to support our biggest slate of projects so far – I think the panel would've found it very difficult to choose between them if it weren't for that additional support."*
(*ACF, Radio Today*, industry press)
https://tinyurl.com/yys8wv8c

ISS RESOURCE: The link below contains more than one would ever wish to know about the International Space Station (ISS) and ITS communications: *SPACECOMMS* by John, KG4AKV, Raleigh North Carolina, United States is a key resource, especially for ISS SSTV:
(Bob Houlston G4PVB)
www.tinyurl.com/isstvhints

European Private Shortwave Stations

Stand: December 1st 2020

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

kHz	Country	Name	Transmitter site	Schedule (UTC)
3920	NL	Radio Piepzender	Zwolle	Mainly weekends
3940	NL	Mike Radio	Heerde	We,Fr,Sa 15-23
3955	D	Radio Channel 292	Rohrbach Waal	24/7
3975	D	AM Shortwave Radio	Winsen	Daily 07-23
3985	D	Shortwaveservice	Kall-Krekel	Daily 15-23
3995	D	HCJB	Weenermoor	24/7
5825	DNK	Radio OZ-Viola	Hillerød	We 21-23, Sa-Su 12-14. F.pl.: 5980 kHz
5840	DNK	World Music Radio	Bramming	24/7. F.pl.: 5930 kHz
5895	NOR	The C / Radio Northern Star	Bergen	Daily 0429-1358 / 1359-2310
5920	D	HCJB	Weenermoor	Daily 06-17
5930	DNK	World Music Radio	Bramming	F.pl.: (from late Dec 2020) 0700-1745
5970	DNK	Radio208	Hvidovre	F.pl.: (from Dec 9th2020) 0700-1600
5980	DNK	Radio OZ-Viola	Hillerød	F.pl.: (from Jan 1st2021)
5980	FIN	Scandinavien Weekend Radio	Virrat	1stSaturday of the month
6005	D	Shortwaveservice	Kall-Krekel	Daily 09-17
6070	D	Radio Channel 292	Rohrbach Waal	Mo-Fr 06-22, Sa-Su 05-03
6085	D	Shortwaveservice	Kall-Krekel	Daily 08-17 (Radio MiAmigo)
6115	D	Radio SE-TA 2	Hartenstein	Irr. Sa-Su 10-12
6140	NL	Radio Onda, Belgium	Borculo, NL	Weekends only
6150	D	Europa 24	Datteln	Daily 07-16
6160	D	AM Shortwave Radio	Winsen	Daily 08-16
6170	FIN	Scandinavian Weekend Radio	Virrat	1stSaturday of the month
6195	NL	Mike Radio	Heerde	Su 05-11
7310	D	Shortwaveservice	Kall-Krekel	Inactive (10-14)
7365	D	HCJB	Weenermoor	Daily 09-14
9670	D	Radio Channel 292	Rohrbach Waal	24/7
11690	FIN	Scandinavian Weekend Radio	Virrat	1stSaturday of the month
11720	FIN	Scandinavian Weekend Radio	Virrat	1stSaturday of the month
15790	DNK	World Music Radio	Randers	From Dec 12th: Sa-Su 07-20
15880	NL	Radio Piepzender	Zwolle	F.pl.

This list is compiled by Stig Hartvig Nielsen (**shn@wmr.dk**) each first day of the month – and is based on details supplied by the various radio stations, the stations websites and HFCC registrations. The list is not copyrighted and may be published everywhere. Next list will be published on January 1st 2021.

AUSTRALIAN MW BROADCAST STATIONS:
Tecsun Australia has out an A-Z table of medium wave broadcast stations at this URL:
https://tinyurl.com/y62kxhnk

CANADA'S TIME SIGNAL STATION:
Radioworld magazine is offering a short article about CHU in its November 2020 issue:
https://tinyurl.com/y2scahvk

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RECEIVERS

ICOM IC-R8600

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

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

ML&S: £2499.95

Includes an Icom AD-55 PSU worth £49.95!

UNIDEN SDS200E

Desk Top/Mobile Scanner Receiver

Same high-performance features as the handheld SDS100 scanner plus much more. Larger base. Increased frequency range. True I/Q receiver, TrunkTracker X technology which provides the best digital decode performance in the scanner industry.

ML&S: £779.94

AR-5700D RECEIVER

Advanced digital communications.

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

ML&S: £4595.95

ELAD FDM-DUOr

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

10kHz-54MHz Direct Conversion SDR Receiver.

ML&S: £729.95

AOR AR-DV1

Communications Receiver

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

ML&S: £1199.95

SDR RADIO

SDRPLAY RSPdx

New Mid-range SDRplay Radio.

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

ML&S: £194.95

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

SDRPLAY RSP1a

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

ML&S: £94.95

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

RSPduo DUAL TUNER 14-BIT SDR

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

ML&S: £239.95

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

FUNcube Dongle Pro+

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

ML&S: £149.95

KerberosSDR

A Coherent RTL-SDR with 4x Channels.

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

ML&S: £179.95

HackRF One

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

ML&S: £219.95

DIGITAL & ANALOGUE

UNIDEN UBCD3600XLT

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

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

ML&S: £449.95

ICOM IC-R6E

The 100 Ch/Sec Wideband Signal "Search Machine"

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

ML&S: £199.95

WHISTLER TRX-1 DIGITAL SCANNER

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

ML&S: £419.95

AR-DV10

The ULTIMATE all mode digital handheld scanning receiver.

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

ML&S: £969.95

ICOM IC-R30 SCANNER

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

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ANTENNAS

BONITO RANGE AT ML&S

ANTENNA JET AAS300

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

ANTENNA JET ASM300

ML&S ONLY: £189.95

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

BONI-WHIP (PSU needed)

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

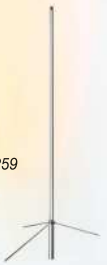
ML&S ONLY: £109.95

GigActiv GA3005

ML&S ONLY: £386.95

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

Diamond D-777



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

RRP: £83.94 ML&S ONLY: £62.95

Diamond D-130M

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

ML&S ONLY: £124.95

MyDEL Smart Wire Kit

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

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