



North Bristol Amateur Radio Club

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G4GCT, M0NBC, G6PNB

April 2021

Covid-19 Edition

After all the hype, there has been a massive fault with the Icom ic705. It has also effected the IC 7300 to a lesser extent. It doesn't however effect the Yaesu ft991a or their latest ftDX 10



Icom ic705

The waterfall has developed a leak causing puddles of water on the work bench. There is a temporary cure for this leak, is to top up with distilled water. There is a small aperture on the top left of the display. The easiest way to top up is using a syringe and only takes a few minutes. To cure permanently, I consulted Icom. They said the display is not covered by the Guarantee but they would repair it for free as a mark of good will, if returned on any April 1st



Ofcom putting spreadsheet out to tender

Help Our Hobby

A call goes out to anyone who can make head or tail of the new Ofcom EMF regulations. I used the on line calculator to see the separation details for my HF Doublet antenna. At 14Mhz and an ERP of 10w or 100w allowing for the gain of a Dipole and the loss in the cable a separation of almost 3.39m is required all around including over my neighbours garden (Not Allowed.) Why the same distance from 10 to 100w? Answer No More 20m from my garden.

Take it 2.5gig at 4kw, yes, a blood boiling 4,000 watt EIRP (I wouldn't stand in front of it) the Distance 9.03m. At least frequencies below 10Mhz at the moment, seems like Ofcom are ignoring, although the ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines are from 100Khz to 300gHz

The RSGB together with the ARRL are on the case but, it still looks like Ofcom are still going ahead with their interpretation of the ICNIRP. Most of this document is beyond my knowledge of the subject but, common sense does prevail. They have produced a spread sheet that will calculate for you the safe separation. The ICNIRP is a 44 page document that is headed “guidelines” not law. Ofcom however are trying to make a meal of it and turn it into licensing regulations thus, Law.

March edition error

Somehow the gremlins got into M0RKE's article last month and Fig4 was left out. I hope this didn't detract from the Excellent article. It was most probably my fault in the final edit.

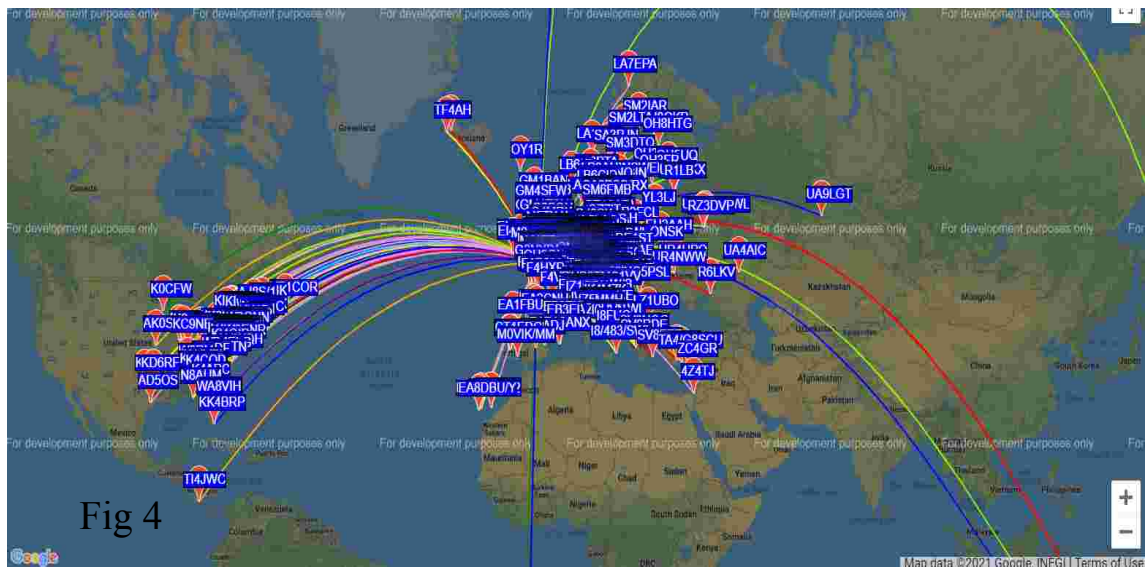


Fig 4

When will we be back at the club?

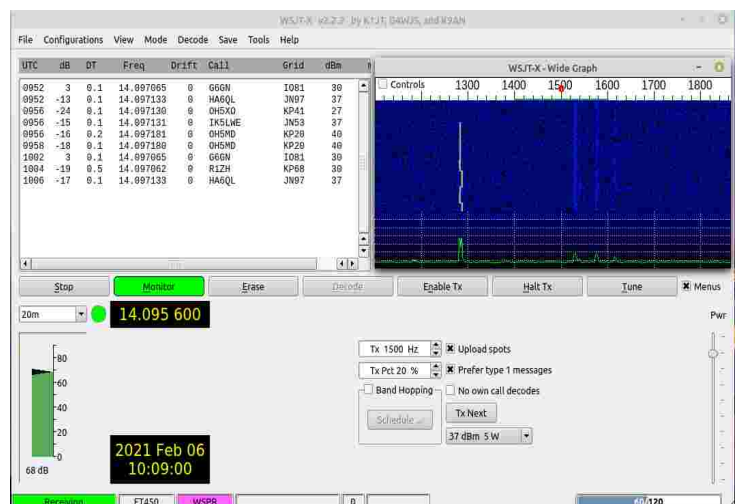
I am often asked this question, It is not known for definite but, if the Road To Recovery goes to plan the country opens up on June 21st so Friday 25th looks good to me. Obviously this is also if our landlords SHE7 are ready for us. At least it is a date to look forward to. Remember to get your vaccination and stay safe.

A Lock-down WSPR Project

By Steve G8KUW

For those who have not yet encountered it, WSPR (Weak Signal Propagation Reporter – pronounced “Whisper”) is a global Amateur Radio experiment investigating how the propagation of very weak RF signals are affected by antenna design, the time of day and seasons of the year. Amateurs and SQL's around the world report the reception strength of WSPR signals or “spots” into a central database. This data can be mapped and presented to anyone on the internet. When I search for my own signals, I am constantly amazed at how my pitiful 1 Watt of 10MHz sent into the ether by my rather haphazard antenna setup, is heard as far away as New Zealand! The PC or Raspberry Pi in the ZL station that heard me, knew that it was my signal because my call sign and QRA locator is encoded at a very slow data rate onto the carrier - so slow in fact, that the transmission lasts for nearly two minutes. There are many modes of communication (EME, Meteor scatter, Troop and regular ionospheric ducting) that the WSPR project seeks to investigate. This is the story of my most recent foray into WSPR. I have often

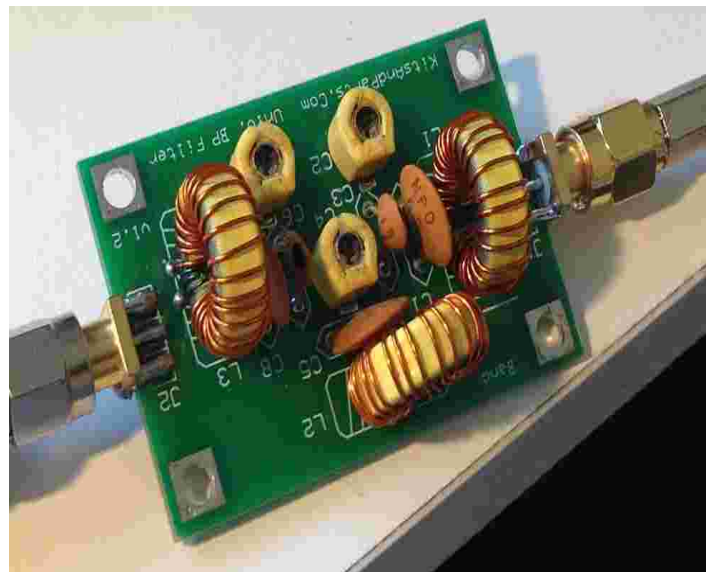
been fascinated by how a signal with all the power of a small light bulb could be received as far away as the other side of the world. It was partly what got me into Amateur Radio back in the early 70's. More recently, I have been tinkering with WSPR, at least for the last few years since Joe Taylor (K1JT) started his experiment. I originally employed



my venerable Yaesu FT450D with its audio input and output connected to a PC running K1JT's software – wsjt-x. However, this seemed to be an inefficient use of shack hardware if I wanted to leave a WSPR beacon going all day, also, the *minimum* output power of the FT450 is 5 Watts (unless I want to go messing with ALC voltages) – 5W is not exactly weak! So next, I looked at utilising one of the many Raspberry Pi's that I have laying around the shack. A few years ago a ham in the US realised that the state of a GPIO (General Purpose Input Output) pin on the Pi could be toggled fast enough to emit RF. This could be used as the basis for a WSPR transmitter or beacon. The major problem is that because the GPIO pin toggling is effectively generating a square wave, it is full of nasty harmonics.

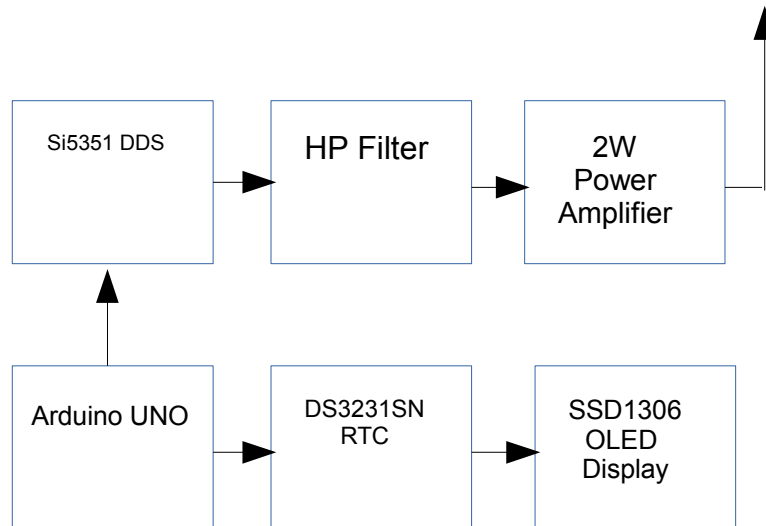
Therefore, some serious filtering **MUST** take place before that RF is allowed anywhere near an antenna. This photograph is of a commercially available filter, or you can build your own like I did.

Nevertheless, I tried the Rpi, and achieved some promising results with only a few mW ERP. (see WsprryPi). I never got around to adding an SDR dongle to the Pi to *receive* WSPR as others have done, I just wanted a WSPR TX beacon. Unfortunately, another limitation with the Rpi approach is that it needs to be permanently connected to the Internet to keep the system clock accurate – not something that was easy to arrange out of WiFi range at the bottom of the garden.



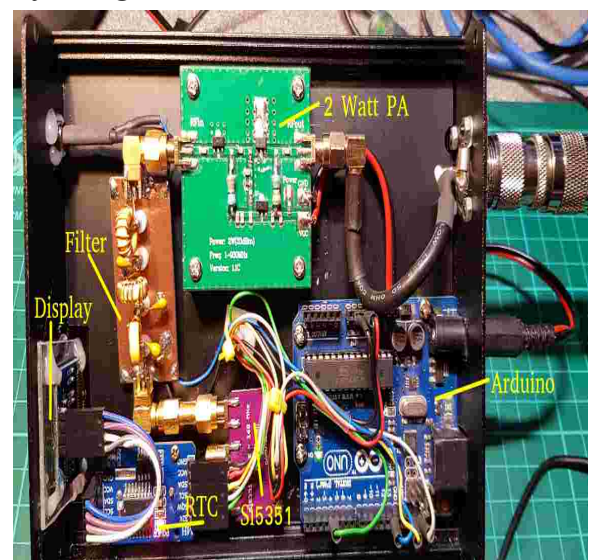
One of my Covid-19 lock-down projects, was to build a cleaner and simpler WSPR stand-alone beacon based around a DDS (Direct Digital Synthesis) chip and an Arduino. An Arduino is a very capable open-hardware design microcontroller from Italy. I had various DDS modules and Arduino boards in the shack. Whilst researching which of the available DDS modules I had on hand would be the best suited to this application, I stumbled across a QEX article by W3PM who had already described and built almost exactly what I wanted to do! The W3PM design called for an Si5351a DDS and a DS3231SN RTC (Real Time Clock), all of which I already had in my toy box. Gene's (W3PM) design is a bit more sophisticated than I need, my plan was to transmit a clean WSPR signal on just one or two bands rather than his manned and fully tunable LF to 10m (with FST4W and WSPR) functionality. Nevertheless, the W3PM design confirmed that an Si5351a DDS was an appropriate choice for my project. My design was to add a high pass filter to limit the transmission of harmonics and I wrote my Arduino code to be fully stand-alone and automated. The DS3231SN RTC claims accuracy to better than 2 ppm with optional clock ageing compensation. The start of a WSPR transmission needs to be accurate to within 10-12 seconds at the top of the minute, so my if all goes to plan, the RTC should not need to be re-calibrated for a few weeks. This proved to be true and obviated the need for internet NTP (Time Protocol) access or a GPS time receiver. I only need to very occasionally connect to the Arduino via USB to reset the time. It's important to specify the SN variant of the DS3231 to achieve this level of accuracy, many vendors will happily ship to you the less accurate M version. I also added a multicoloured OLED status display.

Here is the block diagram of my final design. The Arduino MCU communicates over I2C with the RTC, DDS and the OLED display. Each module has its own address on the I2C bus. The DDS signal generator generates the sine waves at 10.1402MHz and 14.0971MHz for the two bands that I want to investigate. It alternates between these frequencies every five minutes. Whilst these carriers are being transmitted, their frequency is modulated very slightly with the data symbols representing my call sign and QRA locator conforming to the WSPR standard.

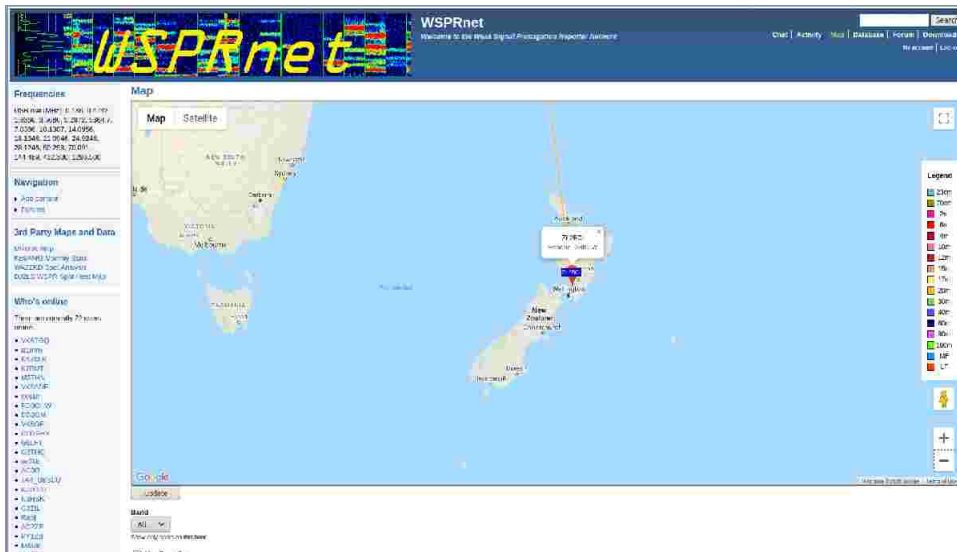


The DDS generated sine wave is sent through a High Pass filter in order to suppress any harmonics before being fed into the 2W PA module. This is a cheap typical Ebay wideband RF amplifier, and so doesn't have any PA tuning or filtering – that's why it's important to clean up the signal *before* amplification. Phase 2 might be for me to address that issue with a post PA filter, but the output currently looks fairly clean on the spectrum analyser, with sidebands at better than -30dB. I also under-drive the PA module with less than 10dbm, the PA module itself has a gain of around 20db, so everything runs nice and cool.

Here's what the final assembly looks like in its own self contained project box. When situated at the bottom of the garden, all it needs is +12volts and an antenna...



Finally, heard in New Zealand!



Editors comments

Steve, you have been busy.

WSPR is something on my list of things to do within the hobby. There are lots of versions of stand alone systems. Steve obviously made his own and in March Q5 Dave, M0RKE's made one as designed by Colin,G3YHV. Take a look in March Q5. The system I am looking at at the moment is the SOTA beams, WSPRlite. (Currently out of stock.) Of course you are able to use a QRP rig, if you have one. The ft 817 is ideal for this although I feel using a rig like this is a bit of a waste of a good rig, but it is your choice.

To add a bit of spice, Back in January, Dave took part in a WSPR knock out to see where and how far these little units would reach. However, I must mention that this system is not generally for contesting but the testing of antennas and propagation analysis, anyhow, it is great fun, that is what the hobby is all about.

If anyone is interested in a showdown, I am sure that Dave, M0RKE would be very interested in hearing from you.

Any questions you have for Dave or Steve, please email me at the editors desk then I will forward it onto them. g7byn@blueyonder.co.uk

Cost effective 100 watt dummy load.

- High power RF load

When the club was active, pre Chinese virus days, I listened to members about getting a cost effective high power load. I needed another one so I had a little look on the internet and found this one. A 100 watt, DC to 3GHz, continues operation across this one. was a bit dubious about it but for the price it was worth a punt. I then bought one then tested it to see how good it was and the results are tabulated below. It turned out to be worth it.

- Mechanical dimensions of load

Length = 80 mm

Diameter = 58 mm

- VSWR and Power Test

The VSWR is below 1.05 over the frequency measured band of 1.5GHz and this gives a reflected power of better than -30dB. Less than 1% of the power reflected back to the source.

Maximum voltage to give 100 watts is 70.7 volts and a current of 1.41 amps.

Company: Surecom
100W N-Male DC 3GHz 50ohm Dummy
Load for Receiving Electrical
Power/Electrical Output Port
Components Parts (0014-0100)

Ali express £21-00

Figure : 100 watt load



- Comment

One of the other good points is that the RF type N connector is of good quality and looks to have been machined.
The load looks well made and of robust construction.

- Temperature Stress test

18:15 01/02/2021

start of test $V_{CC} = 63$ volts with a current of 1.2 amps gives a power of 75 watts.

18:40 01/02/2021 Temperature stabilised at about 155 °C. (30 minutes)

- Conclusion and Results

This load is a bargain at £21-00 and is able to dissipate 100 watts in free air. (See Temperature Stress test.)

A VSWR check was done after the dissipation test to check that the unit had not sustained any damage.

The load showed no damage to the temperature stress.

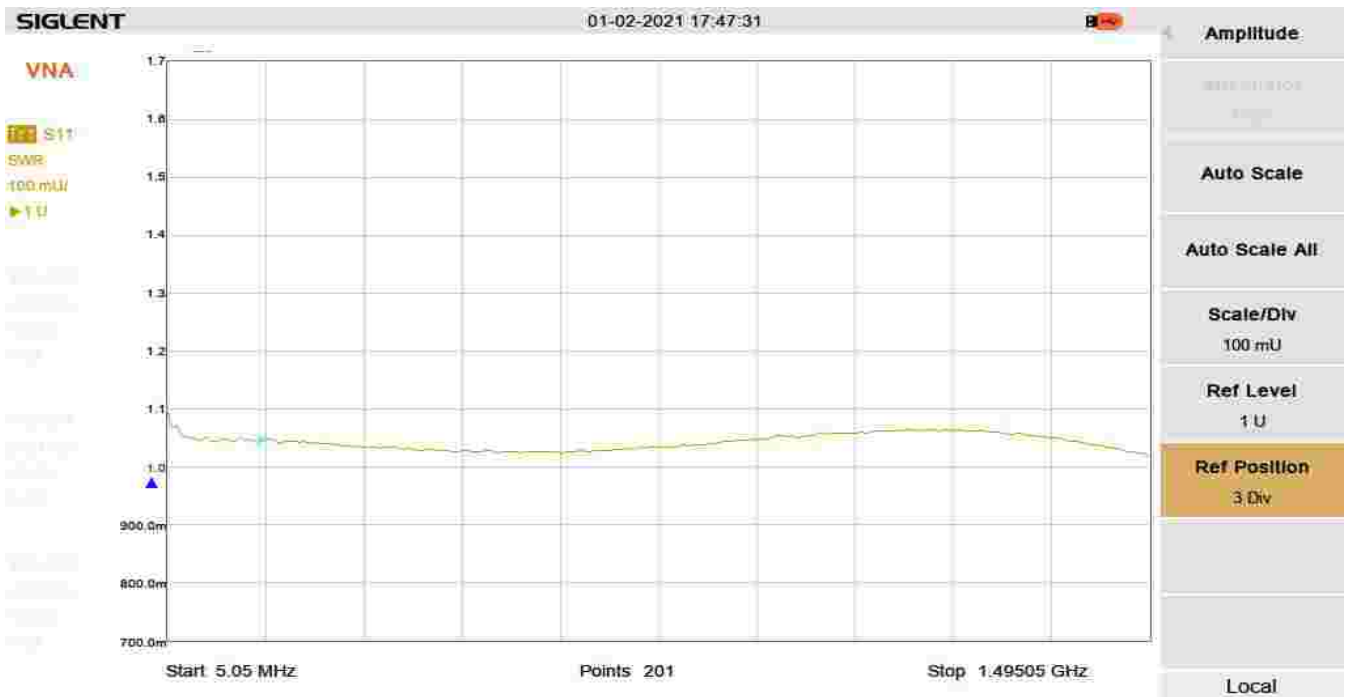


Figure : 100 Watt load VSWR

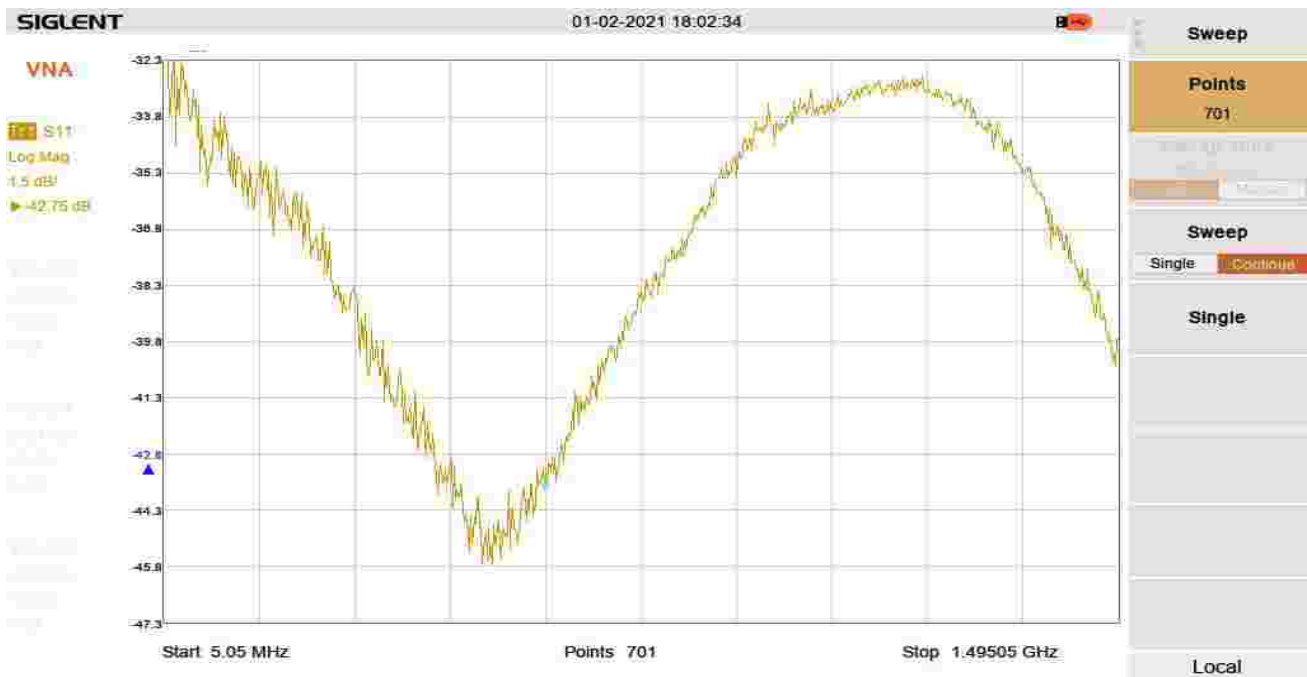


Figure : 100 watt load return loss

Editors Comments

Only Dennis would have thought of completing a test like this. Testing after heating up etc most of us would have just used it and hoped it was working ok.

If you want to buy from Ali Express be aware there may be Import duty to pay if, says HM customs and Excise, the due tax is less than £15 they don't collect. Always check the HMRC web site for any changes.

Another little money saving trick is to buy using US Dollars. This is easy is you use a Revolut pre payment card. Changing up your money into any currency is FREE and there are no fees Currently the US dollar is 72.31 pence. You can see from this that it is possible to get great deals, including your holiday money. Remember holidays?

NBARC Nets

To spice up our nets, the Wed net will be a Technical net. If members have a problem, or just want to know how something works, ask your question here. This came about because some participants of our nets didn't want to spend the night talking about the weather and general chit chat. They said it was boring, so wouldn't come on any net. The Chit Chat evenings will be the club night being Friday and the Sunday net. We hope this will cater for all.

Wednesday net GB3BS 20:00 to 21:00 Local

Friday net GB3AC 19:00 to 19:30 Then QSY to GB3BS 19:30 to 20:00

Saturday DMR Net GB7BS 19:00 to 20:00 South west cluster TS2 (950)

Sunday morning 80m Net 3.65MHz 08:00 to the start of the News. This net is run by Dave (M0HDJ)

Sunday Evening Net Dave, M0RKE ran this net on GB3AA for a while but, the Sunday Net now reverts to GB3AC 20:00 to 21:00 clock time.

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Next Q5

Beginning of May

Dave G7BYN

By the way, apologise for the April fools. It is April Q5 after all.

Please email me with any articles, Items for sale or Wanted. Any other subjects you would like covered, drop me an email and I will see what I can do.

The Club's SDR

Martin, G7NSU has passed on a bit more news on the Club's SDR as reported in the Feb 2021 edition of Q5. Martin has now installed it to an HF horizontal loop and is monitoring the WSPR net (www.wsprnet.org) for a list of received stations. This is prior to it's access by the membership. I hope to twist Martin's arm into writing an article for Q5.