Ridgeway Repeater Group. Newsletter Third Quarter 2020

GB3TD, GB3WH, GB7TC & MB7USW

Messages/Notices

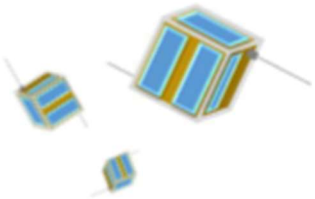
A message from the Secretary

Firstly, I hope you and your families are keeping safe and well despite the current challenges of the COVID19 virus.
These are some very challenging times, which most of us have not witnessed before.
Our repeaters have been busier than normal with some stations now “working from home”, adding to the usual local stations. Echolink has also been busier and It’s certainly pleasing to hear the bands so active. Our hobby revolves around communication and it is obvious that our talents are being put to good use.
You are probably wondering what the situation is with regard our Annual General Meeting which is due in May. A date and a venue had been arranged some time ago, however due to the lockdown, this has required us to postpone the AGM until the lockdown restriction has been removed.
The AGM is the due date for subscriptions for the coming year 2020/2021. The easiest way to do this is on line and use the Donate button and PayPal on the RRG website. Cheques can be sent to Martin, G0BQK whose postal address can be found on the Membership form which can also be downloaded from the RRG website www.rrg.org.uk
Further information regarding the AGM will be given on this website when the situation changes.
Your committee will continue to function as normal and ensuring our repeaters are kept on the air.
For those not aware, the Swindon and District Amateur Radio Club have a weekly net on GB3WH on Thursday evenings at 19.30 local. The net is primarily for SDARC members but everyone is welcome to call in.
I hope to have a QSO with you soon on GB3TD, GB3WH or GB7TC.

73 Rob G4XUT

Next we have a very comprehensive article on how to start enjoying amateur satellites compiled by Robin G8VVY so a big thank You to him for putting together this article.

A Beginners Guide to Weather and Amateur Satellites and the ISS



Living in a property with tight restrictions on external antennas – namely, you can't have any – and the possibility of having a DX QSO without having to take a rig, antenna, mast etc. on a journey, was the driving force behind looking into the idea of, initially, receiving signals from satellites and eventually transmitting via them too.

Weather Satellites

I thought a good place to start would be to do some listening and see if I could pick up any of the weather satellites.

The NOAA satellites are Polar-orbiting Operational Environmental Satellites (POES) with a nominal orbit height of about 500 miles and circle the planet roughly every 100 minutes.

A recommended method of receiving, and decoding, signals from the currently active NOAA weather satellites - NOAA's 15, 18 and 19 - is a suitable antenna, an inexpensive RTL-SDR module, SDR application such as CubicSDR, SDR Console or SDR Uno, a virtual audio cable and a programme to decode the APT/Automatic Picture Transmission signals – e.g. WXtoImg.

A very simple, but effective antenna is a 120 degree horizontal dipole cut for around 137.5 MHz. It has a near figure '0' shaped radiation pattern, as opposed to the straight dipole's figure '8'. Being both directed towards the sky and in the horizontal plane, it effectively reduces the strength of nearby FM terrestrial signals.

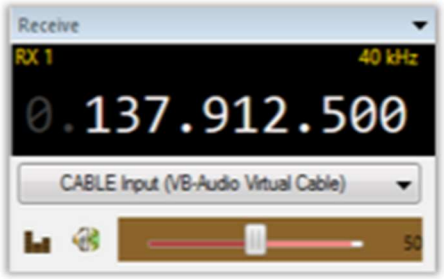
I decided to see first if I could use a short 2m/70cm dual band Yagi. My plan was to use it for hopefully working the amateur satellites and, with any luck, it would have sufficient gain to pick up signals through the roof tiles, avoiding taking computer equipment outdoors!

G4ELI/Simon Brown designed, and continues to develop, SDR Console and I found that it has a very intuitive interface – ideal for a beginner such as me. He also has an excellent guide on how to use his SDR programme together with the WXtoImg software on his website:

https://www.sdr-radio.com/weather

Some of the basic points, and these are all detailed clearly in G4ELI's notes, were:

- As indicated below; select the Virtual Audio Cable from the dropdown ...



You need to calibrate the WXtoImg programme by ...

- Entering your Latitude and Longitude information into <Options> and <Ground Station Information>.
- Updating the Keplers, (Keplerian Elements), the 7 definitions that define any satellite orbit path.
- Checking and adjusting the volume levels.
- Selecting <Options> and <Recording Options> and making sure they're set to record when satellites overhead:

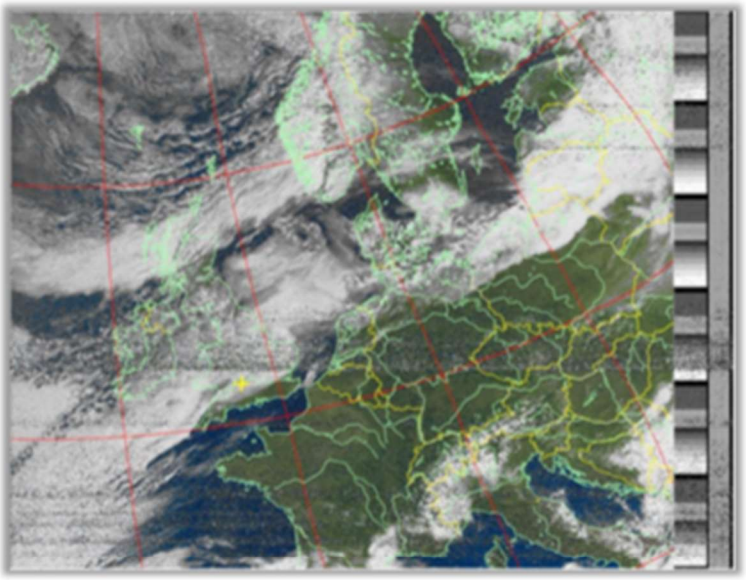
I left the settings 'as is' even though I had my antenna indoors and would only get signals when the satellite was high in the sky.

I'd rather have a larger file than necessary than possibly miss any information.

- Choose <File> <Record> and click the <Auto Record> button, leaving the default settings to auto process and create images.

Given the compromise conditions described earlier, I was able to receive and decode a number of images, including this one below.

With some success at cloud formation images, I then decided to try receiving data from the ISS - International Space Station.



ISS AND APRS

One of the pieces of equipment on board the ISS is a digital repeater, or digipeater, which will allow the receiving and re-transmitting of Automatic Packet Reporting System – APRS – data.

Guy Roels/ON6MU's programme 'UISS' is about the simplest way to get up and running on receiving APRS information.

It is used in conjunction with a software modem – Andrei/UZ7HO's 'SoundModem' – and will, with a suitable transceiver, allow you to receive, and send, APRS text messages.

The ISS messages are up and downlinked on 145.825 MHz using 1200 bps packet FM. The earlier hardware TNCs, which would format data into packets and then modulate it into audio, and vice versa, are replaced by a suitable computer and soundcard.

The UISS programme provides 3 separate GUIs; the main application window, a map and the SoundModem configuration window. I didn't need to change anything in the SoundModem configuration and apart from entering callsign information and changing the 'Ports' configuration (see below) to 'All'.

Used in conjunction with an RTL-SDR and SDR Console plus the Yagi antenna mentioned previously, I found UISS very effective at decoding APRS text messages from the ISS.

The 'UI' AX.25 connectionless packets used in communicating through the ISS require no handshaking and you effectively broadcast your comment to anyone capable of receiving it.

The 'follow-on' from decoding ISS repeated messages was to both send and receive data.

I had treated myself to a Kenwood TH-D74E handheld transceiver. Another handheld had decided to systematically lose functionality; programming via cable failed then the keypad failed, so I decided to plan for total breakdown! The Kenwood is 'almost' the ideal handheld rig for satellites as it has a built-in packet TNC running at either 1200 or 9600 bps and runs both APRS 1.2 and KISS protocols, plus it will receive SSB on both 2m and 70cm.

This makes it ideal for using alongside, for example, the FT817 for linear satellite working.

A number of settings have to be made from the 'APRS/Basic Settings' menu:

- Callsign.
- Icon – some icons do not appear to display properly on ariss.net website.
- Status Text.
- Packet Path – this is the critical one.
- Data Speed – also very important.
- Which VFO you want to use – I choose Band 'B'.

Then in 'APRS/Beacon TX Control' menu:

- Set it to 'Manual' and send, or 'beacon', your texts via the No. 6 key/'BCN'.

Points to note when working the ISS using APRS:

- Set the deviation to Narrow FM.

- Choose the highest passes possible – as close to 90 degrees i.e. directly overhead.

- I use N2YO's website for pass prediction information. It is ***imperative*** that you login to the site before using the information. If you don't, it will make a default guess at your location – I've seen both London and Glasgow come up – which can make a huge negative impact on the pass information.

- You will only see your aprs.fi status information showing that you digipeated through the ISS if a suitable Internet connected ground station gateway was able to receive your confirmation data from RS0ISS.

- For your location to be acknowledged, you have to format the Status text message appropriately
    - =51.60N/2.12W-Take care Robin IO81WO

      It has to start with an '=' sign and follow immediately with decimal Latitude and Longitude and finish with a hyphen. You can then enter your text but keep it short and don't use symbols to make emoticons, as these can be incorrectly interpreted!

- The passes are around 7 minutes to 11 minutes in length – from acquisition to loss of signal – but I found that nearly all the activity is at the 'top' of the pass. If you start beaconing about 45 seconds before maximum elevation and do so every 15 to 20 seconds, you stand a good chance of getting a report back.

  This also means that you will be pointing the antenna directly overhead and, as you get very little (if any) time to adjust its position, you'll be maximising your opportunity to get in.

  Quick bursts of data doesn't give you much time to adjust the antenna position!

FM Amateur Satellites

So; after a number of successful APRS contacts with the Space Station, I decided it was time to try and make contact through one of the so called "easy" voice satellites – an FM transponder satellite.

There are a large number of Orbiting Satellite Carrying Amateur Radio – OSCARs – circling Earth and fortunately there are plenty of places online to find out which are active and how you need to set-up your equipment in order to make a voice contact through one.

AMSAT is possibly the best source of information though I like to use N2YO's pages for the orbital data.

A good place to start would be AMSAT's 'Live OSCAR Satellite Status Page':

https://www.amsat.org/status/

where you can see a simple table showing live user information regarding whether a particular satellite has been hear recently, or not.

It's also a good idea to check whether a specific satellite, that you're looking to work through, has any up/downtime schedules. For maintenance and data downloads etc., they are not always active 100% of the time.

In addition, in order to conserve power, the transponder may be switched off. You may find that you need to turn on the transponder yourself if it has a 'time out' timer. If everyone is hoping that someone else will activate it, it's possible it will pass across with no QSOs!

I decided to concentrate on one satellite initially, and not to try one and if unsuccessful, try another and another etc.

New variables would be introduced each time I tried to work a new satellite; up and downlink frequencies, access tone frequency, whether it is V/U, (VHF up and UHF down), or U/V etc.

Diwata-2 or PO-101 (Philippines Oscar 101) is a relatively new satellite – launched in October 2018.

It carries a Spaceborne Multispectral Imager for environmental monitoring, and a high precision telescope for rapid post-disaster assessment. In addition, it hosts enhanced resolution cameras. It also has deployable solar panels to power the satellite's payloads.

The Amateur Radio Unit was designed and manufactured in the Philippines and is equipped with:

- FM voice repeating (uplink/downlink)
- APRS message repeating (uplink/downlink)
- Morse-based beacon (downlink)
- APRS-based beacon (downlink)

It was the first of these that was my goal!

Diwata-2 has a downlink – what you would be receiving on – frequency of 145.9 MHz and an uplink – the frequency you would transmit on – of 437.5 MHz. Sometimes this is termed U/V.

A dual-band handheld transceiver running no less than 5W o/p will be capable of accessing this, and similar, repeaters.

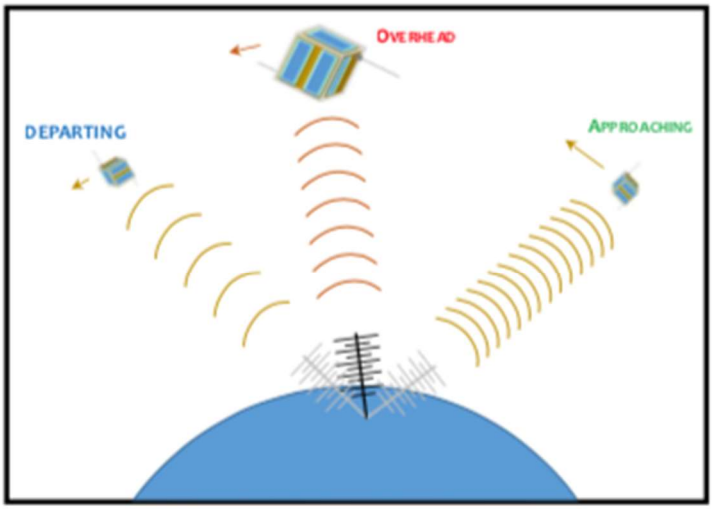
If you have the luxury of a full duplex device, you will be able – in theory – to hear your re-transmitted speech and then have the best indicator of how well you're accessing the satellite.

The handheld I have used has 'dual watch' so I can listen on two separate frequencies concurrently, but it only constitutes what is known as half-duplex. You have to take a chance that you're getting in to the satellite and only really know if someone responds!

It needs a tone to allow your signal through the repeater, and in this instance it is 141.3Hz.

Sometimes the satellite may be 'beaconing' and it is often useful to listen for the beacon – usually CW – if you don't hear any other activity.

Unlike the ISS and APRS, you will find that activity is present over the whole of the pass, so you need to prepare early, especially if you have a good clear take-off and can get in the whole 10 or 12 minutes.



If you can 'split' the volume and squelch settings for each VFO, the best thing is to completely turn off the volume on the transmit VFO and put the squelch to 'Open' on receive and adjust the volume to a suitable level.

Another important aspect is Doppler Shift – see previous diagram.

As the satellite is approaching you, especially if the uplink is UHF, you need to compensate for the Doppler Shift.

It will see the frequency slightly higher than what you are actually transmitting.

When it is directly overhead, it will be very close to the nominal frequency.

When it is moving away, the satellite sees a lower frequency than you are transmitting and so again you need to compensate.

If you look at the signals on an SDR waterfall display, you can actually see there is a small signal shift even on VHF/2m. I've not found it to present any major issues in reality though.

The usual adjustment for a UHF uplink is -10 KHz from the nominal at the start of the pass then raise by 5 KHz after about 3 minutes then another 5 KHz when it is overhead. Then another 5KHz after the next 3 minutes and a final 5KHz as it is leaving the pass.

If you're planning on working numbers of satellites, then it's probably a good idea to programme memory channels with these frequency changes; e.g. PO-101-5, PO-101-4, PO-101-3 …. etc.

Some of the quirks, and more obvious things when you think about it, that have appeared along the way whilst trying to get a contact through an FM satellite …

- Setting the uplink VFO to wide/normal FM and not narrow appears necessary. For example, the uplink bandwidth for Diwata-2 is 20KHz.

- My contacts have all been using a 'half-duplex' handheld. Whilst working together with Dave/M3FGR – who is using a 'full-duplex' Wouxun handheld, it was found that – in FD mode – the squelch noise is very off putting as it doesn't disappear when you key the PTT. This is as it should be, but as there would be a very limited opportunity to hear your own signal coming back, and the possible likelihood of a feedback loop, it was determined the better way to operate was actually half duplex … mute the downlink VFO audio when you key the PTT.

- Keep your antenna on the move and peak the signal! The unstabilised satellite's antennas will be constantly moving and the perceived polarisation will thus keep changing, in addition to the overall satellite's position in the sky.

- I can't stress enough the importance of having good feeder connections and an antenna with a good SWR. The signals that you are listening for are typically less than 1 watt!

Hopefully these guidelines will assist you with your first steps into world satellites.

They're a great way to get into a really engaging side of the hobby; you won't require highly sophisticated equipment to get going; ideal if you have problems with fixed/external antennas and you only need to devote 10 or 12 minutes of operating at a time.

I'd like to acknowledge the continuing assistance of Dave/M3FGR with the amateur satellite tests, and de-briefs of both the failures … and successes … and to wish him well with his foray into the world of amateur satellite communications!