



- The following is a ‘living’ document which we hope to develop further
- Should you have suggestions, they may be forwarded to vhf.manager@rsgb.org.uk

1) What is the background to the RSGB’s position on the 146-147 MHz allocation?

Both the RSGB’s proposals to gain access, and Ofcom’s objective in allocating this new part of the spectrum, were to encourage amateurs to experiment and test new communications schemes and systems, rather than provide for “more of the same”. In the commercial world, the switch from analogue to digital transmission has largely taken place. In the amateur world this is just starting to happen and this additional 1MHz adjacent to the top of the 144 – 146 MHz amateur band gives us a unique opportunity to introduce new digital technologies whilst minimising the disruption to current users of analogue modes. Therefore the focus should be to concentrate on the development of amateur digital techniques in the 146-147 MHz allocation and vividly demonstrate that amateurs can still innovate in the 21st century.

2) When do the 146-147 MHz band NoVs expire?

All of the amateur NoVs for 146-147 MHz expire on 31st October 2017. The RSGB hopes that amateurs will have demonstrated innovative use of this new spectrum in that time, so we can make the case to Ofcom to enable the NoVs to be renewed for a further period.

3) Why is the 146-147 MHz band unavailable in parts of the UK?

In contrast to other regions of the world such as the Americas, 146 – 147 MHz is not allocated to the amateur service in Europe or Region-1. Therefore any use by amateurs must be on a non-interference basis to neighbouring countries. These frequencies are used by other services in neighbouring countries and are subject to international agreements concerning interference levels. Ofcom have stated; *“Amateur Radio use of this frequency will be on a non-protection/ non-interference basis and will be subject to some geographical restrictions to ensure that there is no interference to neighbouring countries.”* The ERP, antenna height and geographic restrictions have been put in place by Ofcom to ensure that the UK complies with these international agreements. Ofcom have agreed to; *“temporary access to 1 MHz of spectrum (146 to 147 MHz) for Amateur Radio use, until such a time as it is needed by Business Radio or other services”*. The temporary use of these frequencies is therefore accompanied with strict conditions and is not a re-allocation of 146-147 MHz to the amateur service.

4) Why is there an upper band limit of 146.93750 MHz in Scotland?

This upper band limit also applies anywhere within 40km of the border between England and Scotland or within 40 km of the Scottish coast. It is there to provide protection against interference to existing services which remain above this frequency.

5) Why is the 146-147 MHz NoV only available to holders of a Full amateur licence and not Intermediate or Foundation licensees?

In terms of enabling innovation and experimentation it might have been preferable if Ofcom was prepared to grant 146 MHz NoVs to holders of all classes of UK amateur licence. However, the Ofcom view was that because Full licensees have demonstrated a greater comprehension of the interference aspects, NoVs will only be available for holders of full amateur licences.

In the Ofcom statement it states:

“We acknowledge the views expressed about restricting use of the spectrum to Full Amateur Radio licence holders. In our earlier response, we note the risk of harmful interference to users of radio in other countries, given the international reach of Amateur Radio. In order to successfully manage and minimise the risk of interference to other users (notably those in other countries), licensed Radio Amateurs who use these additional frequencies need to possess an advanced level of practical ability and an advanced understanding of radio theory and radio operating techniques. This is demonstrated by passing the exacting examination required to hold a Full licence. We therefore remain of the view that the availability of the additional spectrum should be for Full Amateur Radio Licence holders only. Our decision is consistent with the availability of a number of the other variations available to licensed Radio Amateurs, which we also restrict to Full licences. Furthermore, the availability of an NoV to Full licence holders is in line with our standard policy procedures.”

6) Why do Ofcom state in the NoV; ‘These band limits are absolute limits and not centre frequencies’?

Ofcom have expressed it this way in order to avoid any confusion that amateurs might have about transmissions near the edges of the 146-147 MHz band. It is there to ensure that there is no interference by amateurs with other services above 147 MHz (or 146.93750 MHz for anywhere in or within 40km of Scotland or the Scottish coast). It also means that amateurs using digital transmission methods must ensure that their transmissions do not spread beyond the band edges. We would recommend that all amateur transmissions should be suppressed by at least 60dB at the edge of the band in accordance with ITU-R recommendations.

7) Will the RSGB publish a band plan for the 146-147 MHz band?

Yes - it will follow shortly

8) Why are there no allocations in the band plan for analogue modes such as; CW, SSB, FM or AFSK?

During the discussions concerning VHF Spectrum Release, which resulted in the 146-147 MHz temporary allocation, Ofcom’s view was that they were not keen on allocating additional VHF spectrum to amateur radio for 'more of the same'. As the RSGB case was that we needed some additional spectrum for amateurs to experiment and test new digital communications schemes and systems, there will not be any 146-147 MHz band plan allocation for CW, SSB, FM or AFSK data.

9) Does that mean that we should not use analogue modes in the 146-147 MHz band?

The strict geographic and ERP restrictions Ofcom have put in place to protect other services will limit the range on 146-147 MHz well below that to which most amateurs are accustomed on 144-146 MHz.

The existing 144-146 MHz Primary allocation has more than enough room for users of analogue modes and where it is possible the 144-146 MHz band plan provides protection of users from interference from other modes. In contrast the 146-147 MHz band plan is designed to give digital modes, including wider bandwidth ones precedence over analogue modes.

As we have been granted this new spectrum after making a case based upon innovation and experimentation with digital communications techniques it would be a shame if amateurs just used this new allocation for the same things for which we already have 2MHz in the 144-146 MHz band. This could undermine the RSGB case for UK radio amateurs keeping this spectrum in the long term and further requests as Ofcom releases other currently 'unused' spectrum.

10) Are there going to be repeaters in the 146-147 MHz band?

There have been suggestions of moving repeaters into the 146-147 MHz band. This is not possible under the current temporary NoV terms. In the longer term, unless there was some new experimental aspect, digital voice repeaters are likely to be regarded as 'more of the same' and would be unlikely to gain a licence. Even if Ofcom did agree to licence experimental repeaters (such as single frequency TDD), the non-interference conditions imposed in the 146-147 MHz band would severely restrict the radiated power and coverage compared with those operating in the 144-146 MHz band.

11) What sort of digital modes can we use in the 146-147 MHz band?

There is a wide range of possible methods of communicating with Digital Voice in addition to the more established D-Star and DMR schemes. These include experimentation with Codec 2 and using other techniques not yet attempted by radio amateurs. Amateur TV enthusiasts have already demonstrated DVB-S transmissions with rates as low as 250 and 125kS/s, so there is certainly room for narrowband Digital Amateur Television. Likewise there is room for moderate bandwidth data modes, up to 350kb/s. Although we have been allocated 1MHz of spectrum there are issues with the spectral control of digital TV and data modes. Amateurs will need to pay close attention to amplifier linearity and strictly control the final transmitted bandwidth. For the true experimenters there is a wide range of spread-spectrum, chirp and OFDM techniques which have not been tried by radio amateurs.

12) What sort of data transmissions can we use the 146-147 MHz band?

The 146-147 MHz band is ideal for testing new forms of medium bandwidth data transmission that can surpass traditional methods such as amateur AX25 packet data. Some higher speed data modes used by amateurs on microwave frequencies produce a very wide transmitted spectrum and are clearly not suitable for the 146-147 MHz band. Even the 128kbps medium data rate D-Star 'DD Mode' used on the 1296 MHz band fills up over 500kHz of bandwidth at 60dB down on the peak transmitted power. However we do expect that amateurs will be able to develop solutions compatible with the spectral constraints of the 146-147 MHz band.

In the initial 146-147 MHz band plan there is a recommendation that wider bandwidth data modes should be centred at 146.500 MHz to make sure that all of the sidebands are contained within the 146-147 MHz band. For initial experiments the recommendation is to use data rates of no more than 350kbps and measure the total bandwidth at the transmitter output in order to ensure maximum protection of other users at the 147 MHz band edges and amateur satellite users below 146 MHz. As amateur radio access to the 146-147 MHz band has been granted on a non-interference basis, it is important that all amateurs adhere to these guidelines in order to ensure that there is no interference with users of adjacent bands. In the longer term it might be possible with bandwidth tailoring and pre-distortion techniques to produce cleaner transmitters to permit greater data rates with sharper spectral slopes.

13) What frequency and what sort of bandwidth can I use for DATV in the 146-147 MHz band?

If DATV is used in the 146-147 MHz band it should be centred on 146.5 MHz to make sure all of the sidebands are contained within the band. The recommendation for initial experiments is to use no more than 700kHz total bandwidth as measured at the transmitter output in order to ensure protection of other users above 147 MHz and amateur satellite users below 146 MHz. For DVB-S modulation this may limit the maximum symbol rate used to no more than 350kS/s. Some enthusiasts might claim far lower theoretical bandwidths for higher symbol rate DATV. However these are rarely realised due to degradation from real amateur amplifier chains when measured at transmitter outputs. The spectral standards that amateurs have previously applied on the microwave bands are simply not adequate at VHF. This is particularly the case on the 146-147 MHz band where high spectral purity is required at the edges of the band, to protect users of adjacent bands. As amateur radio access to the 146-147 MHz band has been granted on a non-interference basis it is important that amateurs adhere to these guidelines in order to ensure that there is no interference with users of adjacent bands. In the longer term it might be possible with bandwidth tailoring and pre-distortion techniques to produce cleaner transmitters to permit greater symbol rates and possibly higher definition DATV.