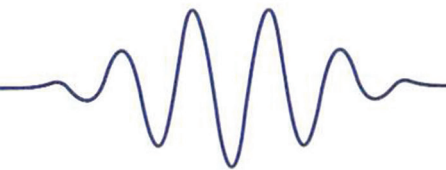


VDSL Interference



Radio Society of Great Britain

Advancing amateur radio since 1913



I am seeking your help. In many areas of the UK, all the HF amateur bands up to and including 20m are being blighted by interference from VDSL (Very high-speed Digital Subscriber Line), the most widespread means of providing residential broadband internet services in the UK. Unfortunately, Ofcom, which is responsible for investigating radio interference, appears unwilling to recognise the seriousness of this problem or to take any significant action. As a result, for many radio amateurs, VDSL interference swamps the natural background noise level on the HF bands to such an extent that only the strongest signals can now be heard, making some, or all, of these bands virtually unusable.

Since 2016, the RSGB has had extensive discussions with Ofcom about this problem and have presented them with considerable evidence of the extent of VDSL interference. In 2017, we conducted a survey about VDSL interference and from more than 1,200 replies, over half said that they were suffering significant VDSL interference. Nevertheless, Ofcom is refusing to take action against this interference in any meaningful way. One justification given by Ofcom for not acting is the principle of 'proportionality' – while there are around 29 million VDSL users in the UK, over the past 5 years Ofcom has received, on average, only 6 complaints per year about VDSL interference.

Despite our evidence indicating that a significant proportion of amateur radio operators are now experiencing interference from VDSL, it seems that very few of us have ever formally complained to Ofcom. There are probably many reasons for this, including that it is sometimes hard to positively identify that VDSL is the cause of high background noise levels, along with the perception that complaining to Ofcom will just be a waste of time since hitherto they have been unwilling to act.

We need, urgently, to demonstrate to Ofcom the size of the problem. Therefore we are asking every radio amateur who is suffering from VDSL interference to submit a complaint to Ofcom. The full details of how to do this are on the RSGB website at www.rsgb.org/vdsl-reporting and brief details appear on pages 19 and 20.

Unless we stand together and make our voice heard on this point, there is every indication that interference levels will continue to increase, and eventually the HF bands could become unusable to everyone except those living in the most remote and isolated areas. Furthermore, unless we act now, there is a danger that future broadband technologies (such as G.Fast) will cause even more interference over a much wider spectrum range, and thus potentially make all of our existing HF, VHF and UHF spectrum allocations virtually unusable.

I very much regret that we have been put in a position where it has become necessary to seek your help directly in this way but please accept my thanks in advance for your support.

This call to action is just one aspect of a wider campaign that the Society is planning for the coming months against both VDSL interference and escalating levels of interference from other sources. We anticipate that this will be a difficult battle, but together, please be assured that we will fight vigorously to defend your rights against the growing fog of interference.

Dave Wilson, M0OBW
President RSGB

– Call to action

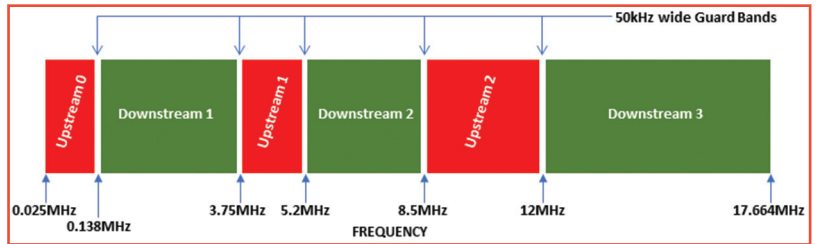
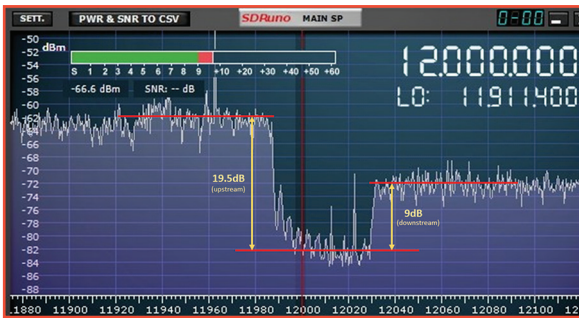


FIGURE 1: VDSL spectrum showing the position of the VDSL guard bands.

FIGURE 2: (LEFT) Example showing the level of VDSL interference around the 12MHz guard band.

What we need you to do

If you are suffering from VDSL interference, we need you to write to Ofcom to complain. It is only if enough numbers of radio amateurs complain to Ofcom that they will be made fully aware of the scale of the problem and hopefully they will finally take the problem seriously. Full details of the information required and how to make your complaint is on the RSGB website at www.rsgb.org/vdsl-reporting.

Rather than Members submitting identical letters, we would encourage you to submit a complaint to Ofcom in your own words, stressing your particular circumstances and the effect that the interference is having on you.

Nevertheless, you can make the submission using the pro forma you can download from the VDSL web page, www.rsgb.org/vdsl-reporting. We also encourage you to copy your submission to your local MP in order to raise the profile of the complaints. Feel free to include a copy of this article as background.

It would also be helpful if you can send a copy of your submission to the RSGB via vdsl@rsgb.org.uk so that we can track the number of complaints and pursue them with Ofcom. You can submit your complaint to Ofcom as follows:

- by letter to: Ofcom, Spectrum Management Centre, Baldock Radio Station, Royston, Baldock SG7 6SH
- by email: interference.report@ofcom.org.uk
- or by completing the form at <https://ofcomforms.secure.force.com/formentry/SitesFormAmateurRadio>

How to identify and measure VDSL

(In the UK, the current VDSL service uses a technology known as VDSL2. For simplicity, the generic term VDSL is used here throughout). VDSL uses the existing unscreened, twisted pair ‘telephone’ cables to carry high speed broadband data signals in the spectrum from 25kHz to 17.664MHz between the network provider’s street cabinet and the customer’s premises (typically a distance of up to a few hundred metres). Because VDSL is carried by twisted pair cables designed originally to just carry audio telephone signals up to 3.4kHz, the cables are not screened and are often poorly

balanced, and as a result the VDSL signals leak out creating the potential for interference on the HF bands. VDSL uses wideband, sophisticated digital coding and, on an HF receiver, the interfering VDSL signal appears as wideband noise, with no easily discernible characteristics. The effect is to raise the apparent background noise floor, in some cases by tens of dB.

The transmitted VDSL spectrum is divided into six discrete frequency bands; three of which are used to carry upstream data (ie from the subscriber towards the broadband network) and three of which carry downstream data (ie from the broadband network towards the subscriber). These six bands are frequency interleaved and are separated by small (approximately 50kHz wide) guard bands (see **Figure 1**). No VDSL signals are transmitted within these guard bands. Searching for these guard bands will enable you to identify the presence of VDSL interference. If a lower background noise level is observed within these guard bands when compared to the noise level immediately adjacent to the guard bands, then this indicates the presence of VDSL interference. The best guard bands to investigate are at 3.75, 5.2, 8.5 and 12MHz. When looking for the VDSL guard bands, you should be aware that the precise position of any of the guard bands may be displaced by up to 20kHz either side of the nominal frequency and that any particular VDSL system may not necessarily use all the up and downstream bands, so it may be necessary to check more than one of the guard bands.

Another means of identifying whether you are suffering from VDSL interference can be made using a specially developed software application called Lelantos. This uses sophisticated digital processing to uniquely identify whether VDSL interference is present in a radio spectrum recording. The instructions as to how to use Lelantos can be downloaded from www.rsgb.org/vdsl-reporting.

Using either approach, it is possible to identify that you are suffering from VDSL interference. This is adequate proof to justify making a complaint to Ofcom, and we encourage you to do so. However, if you wish, you can take it one step further. By measuring the size of the step in the noise level between the middle of the guard band and the noise level on frequencies adjacent to the guard

band (eg 50kHz below and 50kHz above the guard band) this gives an indication of how much the noise floor is being raised by the presence of the interference. **Figure 2** shows a spectrum display of the 12MHz VDSL guard band showing substantial VDSL interference. This spectrum display has been annotated to show the size of the step (in dB), an indication of the level of the interference that is being experienced.

If you don’t have a receiver with a spectrum display, then the same observations can be made by carefully recording the noise level as shown by an S-meter as you tune around one of the VDSL guard bands. Tuning up to 50kHz either side of the guard band centre should be sufficient to make the necessary measurements. You should see a dip in the background noise level within the guard band, rising either side as you tune away from the guard band.

Note that it is not necessary to make measurements at every one of the guard bands, although it may be interesting to do so in order to assess how the level of VDSL interference varies across the HF spectrum. It is best to perform the measurements with the receiver AGC turned off to avoid the risk that the AGC masks the variations in the noise level.

You may find higher or lower levels of interference than was recorded in **Figure 1**. Whatever level you observe, if you can see a decrease in the background noise level inside one or more of the VDSL guard bands then VDSL interference is present and will likely be masking genuine signals. If you find VDSL interference then please submit a complaint to Ofcom.

Further help and support

If you need further help in how to identify VDSL interference, to make the necessary measurements, to interpret the results or how to submit the complaint to Ofcom, then members of the EMC Committee are available to provide additional assistance. They can be contacted by email to vdsl.help@rsgb.org.uk.

www.rsgb.org/vdsl-reporting

Making a spectrum recording for use with Lelantos software to identify VDSL interference



FIGURE 1: Typical SDR UNO settings to make the necessary recordings.

VDSL uses twisted pair telephone cables to carry broadband data signals up to 17MHz to over 29m broadband subscribers in the UK. Unfortunately, because these cables are not screened and are often poorly balanced, the VDSL signals leak out, creating wideband noise interference on the HF bands and raising the apparent background noise floor.

Because of the wideband characteristics of this interference, positively identifying this as VDSL interference is notoriously difficult. But now help is at hand with a new software application called Lelantos that can be downloaded from the RSGB website, www.rsgb.org/vdsl-reporting.

In order to use this software, you will need

to make a recording of the radio spectrum in which VDSL interference is suspected. This article briefly describes using an SDRplay RSP1A receiver to make a suitable recording for feeding into Lelantos



Recording a suitable .wav file

To use Lelantos, you need to make a standard I/Q format .wav file recording of the radio spectrum. Most SDRs can be used to make this recording.

The recording need only be around 0.5 seconds long, and ideally should cover 2MHz of spectrum bandwidth. This slice of bandwidth can be centred anywhere in the HF spectrum up to 17MHz, although if you want to be able to measure the size of the change in the background noise around the VDSL guard bands then it should include one of the VDSL guard bands (at 3.75MHz, 5.2MHz, 8.5MHz or 12MHz).

In addition, it is recommended to also make recordings that cover the amateur bands up to 20m since we can legitimately complain to Ofcom about loss of service in these bands.

In this example we used an SDRplay RSP1A receiver with SDRUno software to make the recording.

Start the receiver by pressing 'Play!', then set the IF mode to 'ZIF' (Zero Intermediate Frequency) and the display bandwidth (SR MHz) to 2.0 in order to display 2MHz of spectrum. Next set the main VFO to the centre frequency of the spectrum that you wish to record, and adjust the RF preamplifier gain control to maximise the signals relative to the background noise as seen on the spectrum display on the Main SP console. You can ignore other settings for mode, noise blanking, squelch, AGC etc since these do not affect the raw I/Q output.

Then open the recorder by clicking 'Rec Panel' on the Main Console, right click on the recorder panel and select an appropriate folder where the recording will be saved. Then click

SDRplay RSP1A receiver used to make a suitable recording for feeding into Lelantos.

'Record', wait for at least 0.5 seconds then click 'Stop'. This will save the file in the chosen folder. A half second long recording of 2MHz wide spectrum will create a .wav file with a size of around 4 Mbyte. Increasing either the length of the recording or the bandwidth recorded will lead to significantly larger size files and will not make a significant improvement to the detection of VDSL by the Lelantos software.

Changing the file name

The recorded file file name format is SDRuno_DDDDDDDD_TTTTTT_FFFFkHz.wav where DDDDDDDD is the date, TTTTTT is the time and FFFF is the centre frequency of the recording.

If you intend to share the file with others then add your callsign to the file name for reference. This file is now suitable for use with the Lelantos software. Complete instructions of how to install and run Lelantos, and how to interpret the results, can be downloaded from www.rsgb.org/vdsl-reporting.

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