# Getting started in ATV - DATV reception

*More and more amateurs are starting to transmit digital ATV signals on 23cms and 70cms for simplex/DX operation and most repeaters also have a digital output capability. This article gives a quick introduction to the various technologies and modes in use and looks at some practical ways to receive these digital ATV signals.*

MPEG-2 video encoding and DVB-S QPSK modulation has been adopted as the current standard in the UK for DATV on 23cms and 70cms. This means we are using the same technology as standard definition satellite TV services such as the FreeSat service in the UK and the signals can be received on a standard consumer Free To Air Set Top Box (FTA STB).

DVB-S uses a variable bandwidth modulation scheme, depending on the video and audio bit rates transmitted and the amount of Forward Error Correction (FEC) applied. As a variable bandwidth system, it is ideally suited to 70cms where we are now able to run full colour video and 2 audio channels in 2 MHz. On 23cms, where bandwidth is not at such a premium, we can run 4 Msymbols, thereby achieving better picture quality within a slightly increased bandwidth of 4 MHz.

Note that the DVB-T (OFDM) modulation scheme as used by FreeView has not been adopted by amateurs in the UK and a FreeView box will not receive UK DATV signals. This is primarily due to the fixed 6/7/8 MHz bandwidth of the system, which gives a lower power / bandwidth ratio than 2 or 4 MHz QPSK and requires highly linear PAs and group delay correction over the full 8 MHz spectrum.

## DATV activity in the UK

**70cms** – ATV activity on this band, which has the potential for real DX working, has been revitalised by the use of DVB-S QPSK modulation. With a bandwidth of only 2MHz centred on 437 MHz (the DATV operating frequency), we can achieve reasonable power levels and linearity from amplifiers designed for narrow band operation.

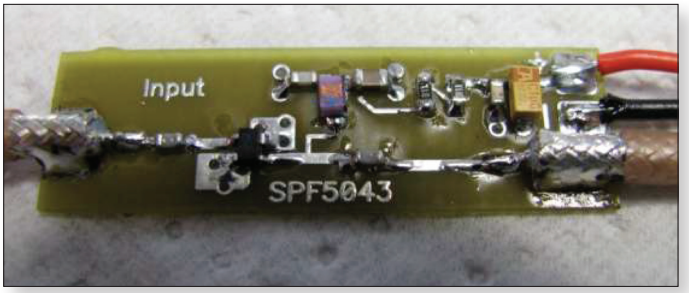
**23 cms** – Once again DVB-S is being adopted, using a slightly higher symbol rate of 4 Msymbols, which typically occupies 4 MHz and good results are being achieved by stations using DATV for simplex contacts. A noise free digital picture with 2 audio channels can normally be locked when a P2 noisy analogue ATV signal is received.

Most repeaters are now equipped with either DATV receive or transmit capability or both and noise free pictures can be achieved when a digital input signal is relayed via a digital output.

**Higher bands** – Tests have been carried out on 2.3 and 3.4GHz with good results and there are a couple of repeaters running digital 10GHz outputs.

## Receiving DATV - Mast head pre-amplifiers

In order to achieve reasonable results on any band above 50 MHz it is essential to use a mast head pre-amplifier. The latest generation of MMICs mean that a sub 1dB noise figure and very good cross modulation performance can be achieved from very simple designs which are easy to build and at very low cost. Sam Jewell, G4DDK, does a kit of parts for a pre-amplifier based on the SPF5043 which, despite its small size, has extremely good performance at 70cms, 23cms and even 2.3 GHz at a cost of only £12. See ***http://www.g4ddk.com/SPFAMP.pdf***




▶ *G4DDK SPF5043 pre-amp*

The pre-amp should be mounted in a waterproof box as close as possible to the antennae feed point, along with a change over relay if transmit operation is envisaged. As the system noise figure is already determined by the pre-amp, and as long as the cable run is not longer than 20 metres, good quality satellite TV co-ax can be used to connect the pre-amp to the receiver in the shack and also feed DC power up to the pre-amp and antennae change over relay.

## Receiving DATV – 23cms

Receiving 23cms DATV is easy! A basic Free to Air (FTA) Digital STB from ebay or Maplin (a lot of people use the Comag range of receivers from Maplin) will tune 23cms without any modification, although most require additional gain in the shack for optimum performance. A satellite L

band line amplifier (also available from many suppliers on eBay) will work in most circumstances and if you live in a noisy RF environment, you may need to provide some band pass filtering.

Even the cheapest satellite receivers seem to have a "pass through" L Band output and your existing 23cms FM ATV receiver can be fed directly from this output without the need for a separate splitter.

If you are very close to your local repeater you may be able to use a flat plate or Alford slot antenna to receive it – where more gain is required a 23cms narrow band yagi with mast head preamp will give good results in most other situations .

To be able to receive a DVB-S signal you will need to know the symbol rate (effectively the bit rate) and possibly the FEC to set your receiver up with the correct parameters along with the frequency of the transmission. Typical parameters for 23cms are 4.000 Msymbols at ½ or ¾ FEC - exactly how these parameters are entered and the receivers is tuned depends on the make and model of STB.

Note, the box MUST be able to receive FTA broadcasts and a SKY or similar dedicated satellite service box will NOT tune to the DATV parameters.

F6DZP has developed the Tutioune PC software specifically for DATV and as well as being a high performance reciever gives very detailed analysis of the signal and also enables web based monitoring of the received signal – see the link below for an example from my DATV station: ***http://www.vivadatv.org/tutioune.php?om_id=G8GTZ&station_id=1***

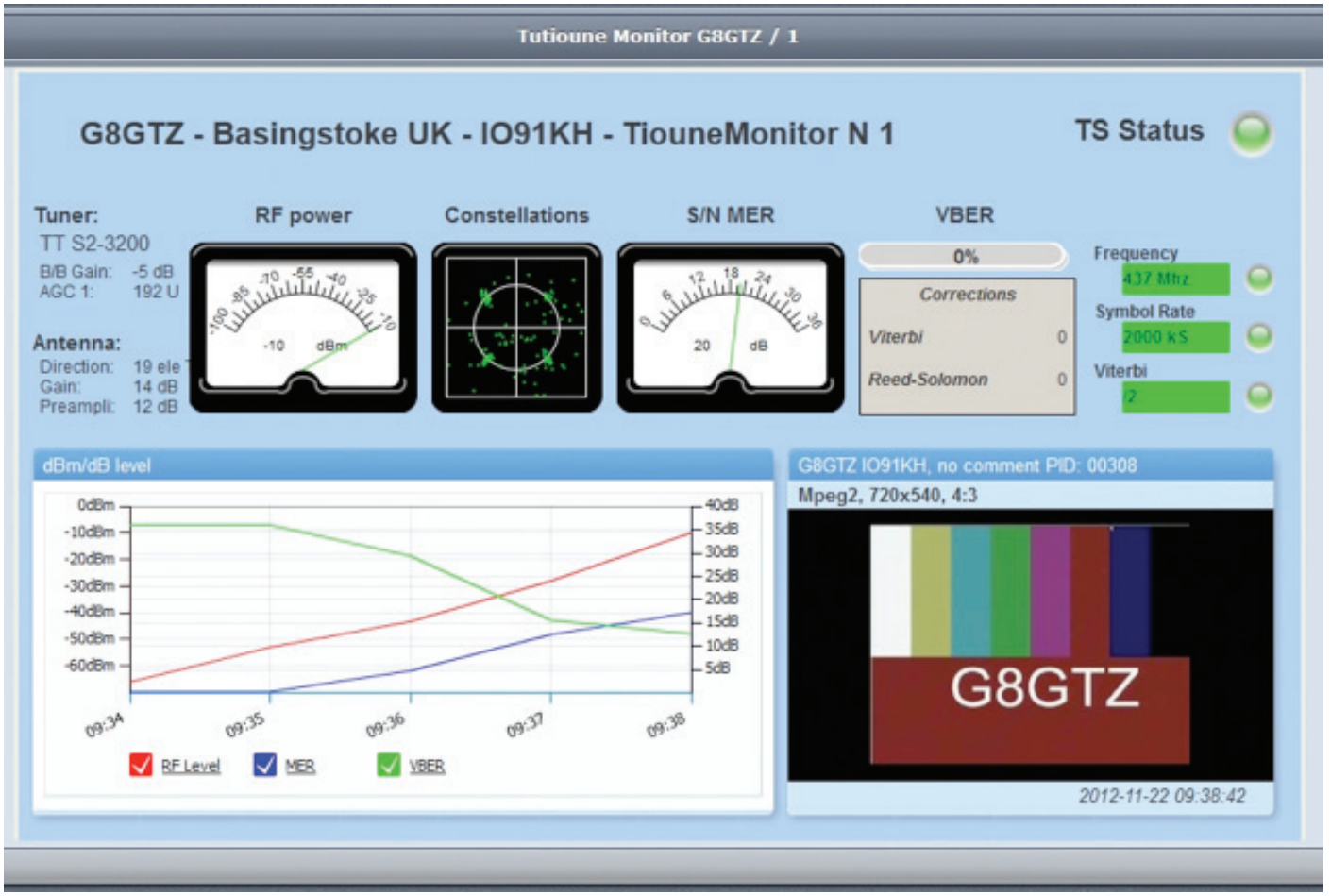
The software runs on a Windows PC and used the USB minituner hardware featured in CQ-TV. The major components for this project are available from the BATC shop.

## Receiving DATV – 70cms

The reason why it is easy to receive 23cms DATV is that the satellite boxes tune L Band (950 – 2150 MHz) which of course includes 23cms. However, in order to receive 437 MHz (70cms) DATV on a standard satellite STB, you need to up convert the signal to L band.

Luckily there is a consumer device available in the USA which is used on cable networks to up convert UHF signals to L Band where they are then received on a standard satellite box. These units are made by a company called Zinwell and known as SUP-2400. They are available on ebay, but only in the US and they do require modification, which involves SMD components, to work on DATV.

▶ *G8GTZ Tutioune monitor page*



▶ *SUP-2400*

In order to help promote the use of 70cms DATV and to compliment the Digilite 70cms project, the BATC shop now has stock of these units in un modified form and can be modified as described in the article in CQTV 250, page 29. Alternatively a small Disecq controller to enable their use on 70cms without hardware modifications by Ron G7DOE was published in CQ-TV 250

Most ATV operators on 70cms use a long yagi or similar high gain aerial designed for narrow band use. To receive 70cms DATV, the SUP2400 is put in line between your 70cms mast head pre-amp and the digital STB. As the upconverters are very wide band it is possible a band pass filter will be required between the mast head pre-amp output and SUP-2400 input.


▶ *The popular BigSat set-top-box, used for receiving DATV*

The digital Set-Top-Box is tuned to the up converted 70cms frequency – the SUP-2400 has a high side 2400 MHz LO and so 437 MHz is tuned at 1963 MHz. The DVB-S parameters are entered as normal which for 70cms operation are 2 Msymbols with ½ or ¾ FEC.

## Receiving DATV – the higher bands

Narrow band QPSK operation is possible on the higher bands and reception is relatively easy on 3.4 GHz and 10 GHz.

**2.3 GHz** - As well as the problems caused the pollution from wi fi and other ISM services, there are no consumer devices to enable easy reception of 2.3GHz DATV signals although home brew converters down to L band are relative easy to make.

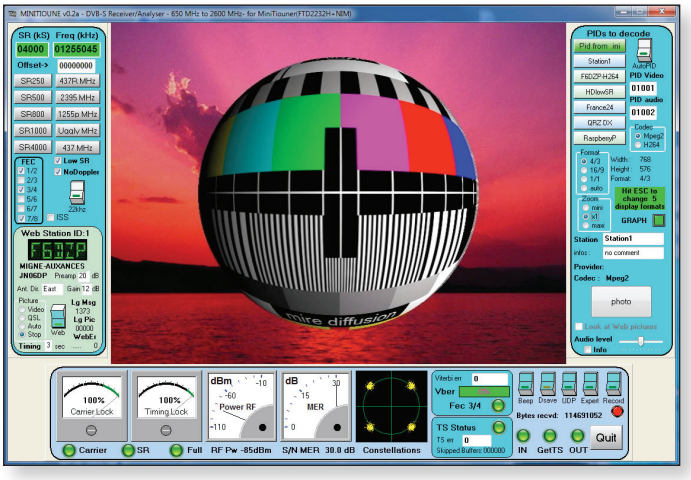
**3.4 GHz** – There are now several ATV repeaters in the UK transmitting DATV signals on 3.4 GHz - it is easy to receive DATV signals at 3.4 GHz as C band LNBs cover the band and down convert signals to L band, thereby enabling the use of a standard receiver. Several ATV operators have found they can use just the LNB to receive their local repeater but the LNB can be used with a Sky mini dish simply by replacing the standard Sky LNB with the C band unit and makes a 20+ dB gain antenna!

**10 GHz** - Similarly, the use of modified standard satellite LNBs to cover the 10 GHz amateur band which are readily available on ebay, make for easy reception of DATV signals on that band.

## Summary

Receiving DATV signals is not hard, particularly if you have a reasonable narrow band station on 70cms or 23cms – you simply need a simple STB or PC running Minitune software. For more details visit the BATC wiki pages ***https://wiki.batc.tv/BATC_Wiki*** or join in the discussions on the BATC forum ***http://www.batc.org.uk/forum/***

▶ *A MiniTuner - see the BATC shop for details of the parts available to purchase.*




▶ *The MiniTioune sftware for running the MiniTuner - full details from* ***http://www.vivadatv.org/***