2nd Generation Terrestrial

A truly global Digital Terrestrial TV standard

What is DVB-T2?

DVB-T2 is the world's most deployed digital terrestrial television (DTT) system owing to its superior robustness, flexibility and efficiency. It supports SD, HD, UHD, mobile TV, radio, and any combination thereof.

Background

Following its publication in 1997, DVB-T was widely deployed around the world, driving the switch from analogue to digital on terrestrial platforms in many countries. The analogue switch-off in Europe coupled with increasing scarcity of spectrum, led DVB to draw up Commercial Requirements for a more spectrum-efficient and updated standard. The resulting standard, DVB-T2, easily fulfilled these requirements, including increased capacity, robustness and the ability to reuse existing reception antennas. The first version was published in 2009 (EN 302 755) and the 2011 update added the T2-Lite subset for mobile and portable reception.

How does it work?

Like its predecessor, DVB-T2 uses **OFDM** (orthogonal frequency division multiplex) modulation with a large number of sub-carriers delivering a robust signal, and offers a range of different modes, making it a very flexible standard. DVB-T2 uses the same error correction coding as used in DVB-S2 and DVB-C2: **LDPC** (Low Density Parity Check) coding combined with **BCH** (Bose-Chaudhuri-Hocquengham) coding, offering a very robust signal. The number of carriers, guard interval sizes and pilot signals can be adjusted, so that the overheads can be optimised for any target transmission channel.

Additional new technologies used in DVB-T2 are:

- **Multiple Physical Layer Pipes** allow separate adjustment of the robustness of each delivered service within a channel to meet the required reception conditions (for example in-door or roof-top antenna). It also allows receivers to save power by decoding only a single service rather than the whole multiplex of services.
- **Alamouti coding** is a transmitter diversity method that improves coverage in small-scale single-frequency networks.
- **Constellation Rotation** provides additional robustness for low order constellations.
- **Extended interleaving**, including bit, cell, time and frequency interleaving.
- **Future Extension Frames (FEF**) allow the standard to be compatibly enhanced in the future.

As a result, DVB-T2 can offer a much higher data rate than DVB-T ***OR*** a much more robust signal. For comparison, the two bottom rows show the maximum data rate at a fixed C/N ratio and the required C/N ratio at a fixed (useful) data rate.

	DVB-T	**DVB-T2** (new/improved options in **bold**)
FEC	Convolutional Coding+Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH 1/2, **3/5**, 2/3, 3/4, **4/5**, 5/6
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, **256QAM**
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, **19/128**, 1/8, **19/256**, 1/16, 1/32, **1/128**
FFT Size	2k, 8k	**1k**, 2k, **4k**, 8k, **16k, 32k**
Scattered Pilots	8% of total	**1%, 2%, 4%**, 8% of total
Continual Pilots	2.0% of total	**0.4%-2.4%** (0.4%-0.8% in 8K-32K)
Bandwidth	6, 7, 8 MHz	**1.7, 5**, 6, 7, 8, **10** MHz
Typical data rate (UK)	24 Mbit/s	**40 Mbit/s**
Max. data rate (@20 dB C/N)	31.7 Mbit/s (using 8 MHz)	**45.5 Mbit/s** (using 8 MHz)
Required C/N ratio (@24 Mbit/s)	16.7 dB	**10.8 dB**

T2-Lite

T2-Lite was the first additional transmission profile type to make use of the FEF approach. It was introduced in July 2011 to support mobile and portable TV and to reduce implementation costs. The new profile was defined as a subset of DVB-T2 with two additional LDPC code rates. Because only elements relevant for mobile and portable reception have been included in the T2-Lite subset and the data rate is restricted to 4 Mbit/s per PLP, the implementation (chipset) complexity has been reduced by 50%. The FEF mechanism allows T2-Lite and T2-base to be transmitted in one RF channel, even when the two profiles use different FFT sizes or guard intervals.

Market Deployment

Like DVB-T, DVB-T2 targets not just roof-top and set-top antennas, but also PCs, laptops, in-car receivers, radios, smartphones, dongles, and a whole range of other innovative receiving devices. In countries where DVB-T services are already on air, DVB-T and DVB-T2 services are likely to coexist side-by-side for some time, but many green-field countries that had not yet deployed DTT services, jumped directly to DVB-T2. A future-proof solution!

Almost all TV sets sold in DVB countries now have integrated DVB-T2 tuners and DVB-T2 receiver prices have rapidly dropped.

The first DVB-T2 service was launched in the UK in March 2010. Sweden and Finland followed shortly and almost every European country now has advanced plans to switch from DVB-T to T2. In Africa DVB-T2 pay-TV services were launched in Zambia, Namibia, Nigeria, Kenya and Uganda, and many other countries on the continent have followed since with both pay-TV services and free-to-air platforms. The Middle East, India and the Asia-Pacific region also have selected DVB-T2 for the rollout of DTT services. South America has a small number of T2-only countries, but even where another system has been adopted, such as in Argentina, DVB-T2 pay-TV services can be found.

To date, 146 countries have adopted or deployed DVB-T and/or DVB-T2. A true global standard!

Next Steps

The DVB-T2 specification is stable. It will be updated to support second generation DVB-EWS (Emergency Warning System) functionality in a fully backwards-compatible way. DVB's Commercial and Technical Modules will continue to monitor developments in terrestrial television markets and technology.

Links

www.dvb.org/standards	DVB-T and DVB-T2 standards and implementation guidelines
www.dvb.org/worldwide	Regularly updated information on the deployment of DTT around the world