2nd Generation Terrestrial

The World's Most Advanced Digital Terrestrial TV System

What is DVB-T2?

DVB-T2 is the world's most advanced digital terrestrial transmission system offering higher efficiency, robustness and flexibility. It introduces the latest modulation and coding techniques to enable highly efficient use of valuable terrestrial spectrum for the delivery of audio, video and data services to fixed, portable and mobile devices. These new techniques give DVB-T2 a 50% increase in efficiency over any other DTT system in the world. DVB-T2 is not designed to replace DVB-T in the short to medium term; rather the two standards will coexist in for many years.

Background

The most widely adopted and deployed standard for Digital Terrestrial Television (DTT) is DVB-T, published in March 1997. Services are on air in more than 40 countries with many more set to launch in the coming years. A mature and well-established standard, it benefits from economies of scale that lead to very low receiver prices and is flexible enough to enable a wide range of business models. (See separate DVB-T Fact Sheet.) Nonetheless, the approach of ASO (Analogue Switch-Off) in Europe and other developed DTT markets generated an impetus to update the standard, as had already been achieved with DVB-S2 for satellite broadcasting. There will be many competing demands for the spectrum that will be released at ASO. With DVB-T2 the DVB Project offers broadcasters a means of using that spectrum in the most efficient ways possible using state-of-the-art technology.

As with all DVB standards, the final specification is based on a carefully considered set of Commercial Requirements. Key requirements included an increase in capacity and improved robustness. The new standard was also required to be able to reuse currently existing receive antennas and downlinks.

The DVB-T2 specification was approved by the DVB Steering Board and published as a DVB BlueBook in the Summer of 2008. Work on the validation and verification of the new standard has continued within DVB and successful interoperability plug fests have been held in Turin in March 2009 and in Berlin in June 2010. The formal DVB-T2 specification was published by ETSI (European Telecommunications Standards Institute) in September 2009 (EN 302 755).

How does it work?

As with its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation, with a large number of sub-carriers delivering a robust signal. Also in common with DVB-T, the new specification offers a range of different modes making it a very flexible standard. In the realm of error correction, DVB-T2 uses the same coding that was selected for DVB-S2 and DVB-C2. LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding offers excellent performance in the presence of high noise levels and interference, resulting in a very robust signal.

Several options are available in areas such as the number of carriers, guard interval sizes and pilot signals, so that the overheads can be minimised for any target transmission channel. A new technique, called Rotated Constellations, provides significant additional robustness in difficult channels. Also, a Multi-PLP (Physical Layer Pipes) mechanism is provided to separately adjust the robustness of each delivered service within a channel to meet the required reception conditions (e.g. in-door antenna/roof-top antenna). This flexible mechanism also allows transmissions to be tailored such that a receiver can save power by decoding only a single service rather than the whole multiplex of services.

	DVB-T	**DVB-T2** (new/different options in red)
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, 19/256, 1/8, 19/128, 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	2.6% of total	0.35% of total

How does it work (cont'd)

DVB-T2 also specifies a transmitter diversity method, known as Alamouti coding, which improves coverage in small-scale single-frequency networks. Finally, DVB-T2 has defined a way that the standard can be compatibly enhanced in the future through the use of Future Extension Frames.

Compared to DVB-T, DVB-T2 can offer a much higher data rate *or* a much more robust signal. For example, in the UK a DVB-T channel typically has a data rate of 24 Mbit/s, whereas a DVB-T2 channel can carry 36 Mbit/s, while keeping the robustness equal. Two more examples of combinations of data rates and robustness levels are shown below:

	Spectrum Efficiency		**Robustness**	
	Useful data rate at fixed C/N ratio		Required C/N ratio at fixed useful data rate	
	C/N (dB)	**Data Rate (Mbit/s)**	**C/N (dB)**	**Data Rate (Mbit/s)**
DVB-T	20.2	29.0	16.7	22.1
DVB-T2	20.5	**47.8**	**8.9**	21.3

Market Deployment

In the years ahead, in countries where DVB-T services have become well-established, regulators will be keen to achieve full Analogue Switch-Off (ASO) and, in the process, release valuable UHF and VHF spectrum for other purposes. Some countries have already completed ASO. One option at ASO will be the introduction of new services using DVB-T2 technology. This could enable, for example, the roll out of new nationwide multiplexes offering multichannel HDTV services, or perhaps innovative new datacasting services. As with DVB-T, the new standard is certain to target not just roof-top and set-top antennas, but also PCs, laptops, in-car receivers, and a whole range of other innovative receiving devices.

In countries where DVB-T services are already on air the transition from DVB-T to DVB-T2 will need to be carefully managed, if such a transition happens. DVB-T and DVB-T2 services are likely to co-exist side-by-side for some time to come - and it's clear from the experiences in Australia (DVB-T, MPEG-2 video coding) and France (DVB-T, MPEG-4 video coding) that terrestrial HDTV services are perfectly viable without using DVB-T2. Having said that, it is inevitable that DVB-T2 equipment prices will fall in the coming years, thus making it a valid option for the launch of DTT services in countries where no such services exist.

The first country that deployed DVB-T2 is the UK, where ASO is well advanced. The regulator there, Ofcom, has authorised the conversion of one nationwide multiplex to DVB-T2 and the first transmissions of the new multichannel HDTV service began in December 2009. A multitude of DVB-T2 set-top boxes and integrated TV receivers from almost all consumer electronics companies are now available in the UK and prices are already dropping.

Next Steps for DVB-T2

Italy has seen a recent launch of DVB-T2 for pay-TV services. Early 2011, Sweden and Finland will start their DVB-T2 HD services, which will eventually be nationwide. Advanced trials are currently also taking place in Austria, Denmark, the Czech Republic and Germany. With the positive results of the UK launch, more and more other countries are considering the launching of services using DVB-T2 in the near future. Outside Europe, the first countries that are considering DVB-T2 are Australia and Singapore. With its market proven technology and falling prices, DVB-T2 is even being considered by green-field areas (without pre-existing digital TV networks) such as developing countries.

Work is continuing within DVB on the further validation and verification of all aspects of the new standard. A DVB-T2 Implementation Guidelines document has been published as a DVB BlueBook (A133) and is in the process of being published by ETSI.

Links

www.dvb.org	The main website of the DVB Project
www.etsi.org	All DVB standards are available for download directly from the ETSI website
www.digitag.org	DigiTAG aims to facilitate the implementation of DTT based on DVB standards

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