

# 2<sup>nd</sup> 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 television (DTT) system, offering more robustness, flexibility and at least 50% more efficiency than any other DTT system. It supports SD, HD, UHD, mobile TV, or any combination thereof.

### Background

DVB-T is the most widely adopted and deployed DTT standard. Since its publication in 1997, over 70 countries have deployed DVB-T services and 70 countries have now adopted or deployed DVB-T2. This well-established standard benefits from massive economies of scale and very low receiver prices.

Due to the European analogue switch-off and increasing scarcity of spectrum, DVB drew up Commercial Requirements for a more spectrum-efficient and updated standard. DVB-T2 easily fulfils 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, <b>3/5</b> , 2/3, 3/4, <b>4/5</b> , 5/6
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, <b>256QAM</b>
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, <b>19/128</b> , 1/8, <b>19/256</b> , 1/16, 1/32, <b>1/128</b>
FFT Size	2k, 8k	<b>1k</b> , 2k, <b>4k</b> , 8k, <b>16k</b> , <b>32k</b>
Scattered Pilots	8% of total	<b>1%</b> , <b>2%</b> , <b>4%</b> , 8% of total
Continual Pilots	2.0% of total	<b>0.4%-2.4%</b> (0.4%-0.8% in 8K-32K)
Bandwidth	6, 7, 8 MHz	<b>1.7</b> , <b>5</b> , 6, 7, 8, <b>10</b> MHz
Typical data rate (UK)	24 Mbit/s	<b>40 Mbit/s</b>
Max. data rate (@20 dB C/N)	31.7 Mbit/s (using 8 MHz)	<b>45.5 Mbit/s</b> (using 8 MHz)
Required C/N ratio (@24 Mbit/s)	16.7 dB	<b>10.8 dB</b>

## T2-Lite

T2-Lite is the first additional transmission profile type that makes 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 is 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

As with DVB-T, the new standard targets not just roof-top and set-top antennas, but also PCs, laptops, in-car receivers, radios, smart phones, 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 to come, but in green-field countries that have not yet deployed DTT services, there is a unique opportunity to leapfrog directly to DVB-T2 instead of first deploying DVB-T. A future-proof solution!

A multitude of DVB-T2 set-top boxes and integrated TV receivers are now available and prices have already dropped to around 25 USD. The price difference between comparable DVB-T and T2 integrated TV sets is already negligible.

The first country that deployed DVB-T2 is the UK, where DVB-T2 services were launched in March 2010, next to an existing DVB-T service. 2010 and 2011 also saw the launch of DVB-T2 services in Italy, Sweden, and Finland, all of which will be nationwide in the short term. Outside of Europe DVB-T2 pay-TV services were launched in Zambia, Namibia, Nigeria, Kenya and Uganda and many more are expected to follow soon. Trials are currently taking place across the globe and more countries are considering DVB-T2 services.

### Deployed (25)

Austria  
Belgium  
Croatia  
Denmark  
Finland  
Ghana  
Italy  
Kenya  
Kyrgyzstan  
Malawi  
Mongolia  
Namibia  
New Zealand  
Nigeria  
Russia  
Saudi Arabia  
Serbia  
Suriname  
Sweden  
Tanzania  
Uganda  
UK  
Vietnam  
Zambia  
Zimbabwe

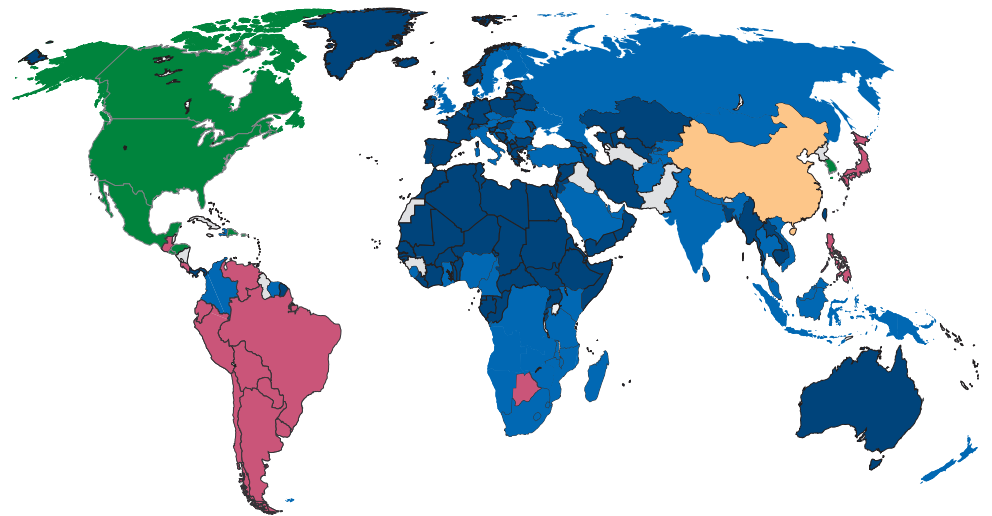
### Adopted (35)

Afghanistan  
Angola  
Azerbaijan  
Brunei  
Cameroon  
Colombia  
Czech Republic  
DR Congo  
Haiti  
India  
Indonesia  
Kuwait  
Lesotho  
Madagascar  
Malawi  
Malaysia  
Mauritius  
Montenegro  
Mozambique  
Myanmar  
Nepal  
Papua New Guinea  
Qatar  
Seychelles  
Singapore  
Slovakia  
South Africa  
Sri Lanka  
Swaziland  
Tajikistan  
Thailand  
Togo  
Turkey  
Ukraine  
United Arab Emirates

### Trials (10)

Belarus  
Estonia  
France  
Germany  
Kazakhstan  
Poland  
Slovenia  
Spain  
Switzerland  
USA

**TOTAL (70)**



© 2014 DVB Project

DVB-T

DVB-T2

ATSC

ISDB-T

DTMB

Digital Terrestrial Television Systems. Blue indicates countries that have adopted or deployed DVB-T and DVB-T2. June 2014  
Copyright 2013 DVB Project. DVB and the DVB logo marks are registered trademarks of the DVB Project.

Get the latest deployment details and high resolution map on :  
[www.dvb.org/worldwide](http://www.dvb.org/worldwide)