# Digital Video Broadcasting

- Digital Video Broadcasting (DVB) is a suite of internationally accepted open standards for digital television.
- Many aspects of DVB are patented, including elements of the MPEG video coding and audio coding.
- **Satellite:** DVB-S, DVB-S2 and DVB-SH
- **Cable:** DVB-C, DVB-C2
- **Terrestial:** DVB-T, DVB-T2
- These standards define the physical layer and data link layer of the distribution system.

# Terrestial DVB multiplexes in UK

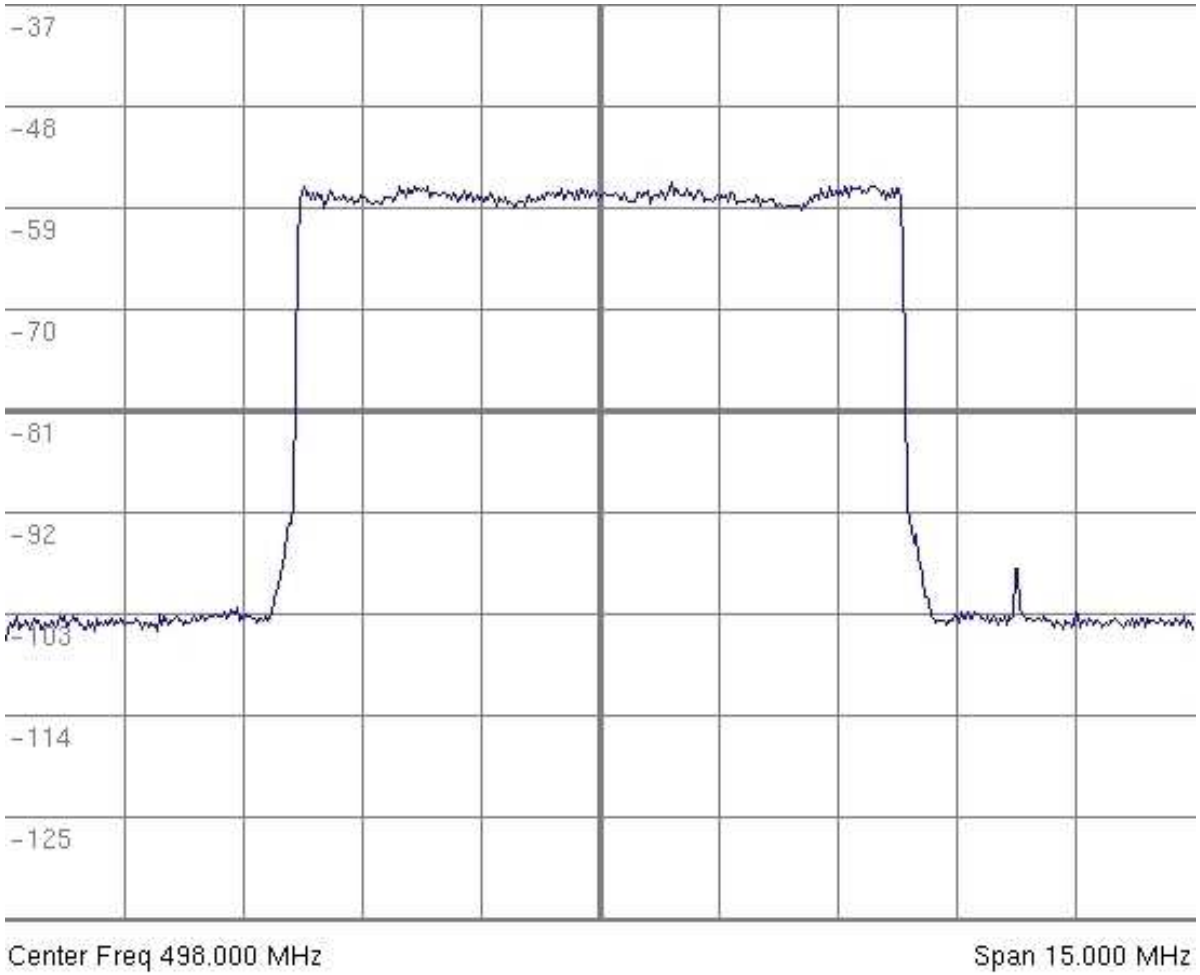
Post-switchover, the allocations are

| | | | | |
|---|---|---|---|---|
| BBC A | SD | DVB-T MPEG-2 | 16QAM | $24\,\mathrm{Mbit\,s^{-1}}$ |
| D3&4 | SD | DVB-T MPEG-2 | 16QAM | $24\,\mathrm{Mbit\,s^{-1}}$ |
| SDN | SD | DVB-T MPEG-2 | 16QAM | $24\,\mathrm{Mbit\,s^{-1}}$ |
| BBC B | HD | DVB-T2 MPEG-4 | 256QAM | $40\,\mathrm{Mbit\,s^{-1}}$ |
| ARQ A | SD | DVB-T MPEG-2 | 16QAM | $27\,\mathrm{Mbit\,s^{-1}}$ |
| ARQ B | SD | DVB-T MPEG-2 | 16QAM | $27\,\mathrm{Mbit\,s^{-1}}$ |
| COM7 | HD | DVB-T2 MPEG-4 | 256QAM | $40\,\mathrm{Mbit\,s^{-1}}$ |
| COM8 | HD | DVB-T2 MPEG-4 | 256QAM | $40\,\mathrm{Mbit\,s^{-1}}$ |
| LOCAL | SD | DVB-T MPEG-2 | QPSK | $9\,\mathrm{Mbit\,s^{-1}}$ |

# DVB-T specification

- transmits compressed digital audio, digital video and other data in an MPEG transport stream, using coded orthogonal frequency-division multiplexing (COFDM or OFDM) modulation. Guard interval $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, or $\frac{1}{32}$.
- The sequence of blocks is modulated according to the OFDM technique, using 1705 or 6817 carriers (2k or 8k DFT mode, respectively).
- Allowed bitrates for the transported data depend on a number of coding and modulation parameters: it can range from about $5\,\mathrm{Mbit\,s^{-1}}$ to $32\,\mathrm{Mbit\,s^{-1}}$
- mainly VHF $7\,\mathrm{MHz}$ and UHF $8\,\mathrm{MHz}$ channels
- The MPEG-TS is identified as a sequence of data packets (188 bytes).
- A first level of error correction: a Reed-Solomon RS (204, 188) block code.
- Convolutional interleaving is used to rearrange the transmitted data sequence.
- A second level of error correction is given by a punctured convolutional code. There are five valid coding rates: 1/2, 2/3, 3/4, 5/6, and 7/8.
- Data sequence is interleaved again, to reduce burst errors.
- DVB-T offers three different modulation schemes (QPSK, 16QAM, 64QAM).

# Spectrum of a DVB-T signal in 8k mode



# DVB-T2 specification

- transmits compressed digital audio, video, and other data in physical layer pipes (PLPs), using OFDM modulation with concatenated channel coding and interleaving. The higher offered bit rate, with respect to its predecessor DVB-T, makes it a system suited for carrying HDTV signals on the terrestrial TV channel.
- COFDM modulation with QPSK, 16-QAM, 64-QAM, or 256-QAM constellations.
- OFDM modes are 1k, 2k, 4k, 8k, 16k, and 32k DFT. The symbol length for 32k mode is about 4 ms. Valid guard intervals range from $\frac{1}{4}$ to $\frac{1}{128}$.
- FEC is concatenated LDPC and BCH codes (as in DVB-S2 and DVB-C2), with rates 1/2, 3/5, 2/3, 3/4, 4/5, and 5/6
- each BBFRAME is converted into a FECFRAME by adding parity data. Normal FECFRAMEs are 64,800 bits long, whereas short FECFRAMEs are 16,200 bits long.
- DVB-T2 is specified for 1.7, 5, 6, 7, 8, and 10 MHz channel bandwidth.

# FEC in the DVB-S2 standard

- The rate 1/2 parity-check matrix (32400-by-64800) corresponds to an irregular LDPC code
- Rows have $7\times$1s per row, except for row 1 which has 6
- Columns 1–12960 have $8\times$1s per column, columns 12961–32400 have $3\times$1s per column and columns 32401–64800 form a lower triangular matrix. Only the elements on its main diagonal and the subdiagonal immediately below are 1s.
- Outer encoding: a BCH code, capable to correct 10 or 12 errors per FECFRAME, is used to compute parity data for the information data field. The BCH generator polynomial is of the 160th, 168th, or 192nd grade
- This LDPC code is used in conjunction with a BCH code in the Digital Video Broadcasting standard DVB-S2 to achieve a packet error rate below $10^{-7}$ at about 0.7 dB to 1 dB from the Shannon limit.