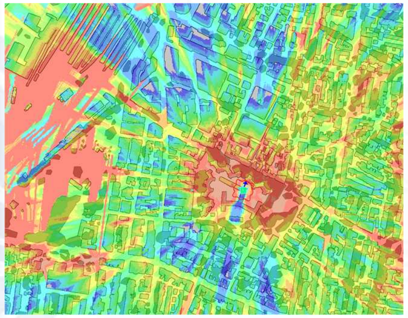
Принципы частотно-территориального планирования сетей DVB-H

Часть 1

Основы DVB-H

Семинар БРЭ МСЭ: «Переход от аналогового к цифровому вещанию»
г. Москва, Россия, 9-11 декабря 2008 г.



DVB-H: the history

The Digital Video Broadcast (DVB) project included research work related to mobile DVB reception in 1998, during the introduction of commercial digital TV services in Europe.

The *Motivate* project concluded in 2000 that mobile reception of DVB-T is possible, but requests dedicated networks in order to fulfil the robustness requirements of a “network anywhere” mobile service with regards to a fixed DVB-T service on the rooftops only.

The *Multimedia Car Platform* project introduced spatial diversity in addition to the frequency and time diversities provided by the DVB-T transmission layer. The reception improvement allows a mobile receiver to access DVB-T signals broadcast for fixed receivers. DVB-T Mobile broadcast services have then be deployed in countries such as Singapore, Taiwan or Germany (Berlin).

But...

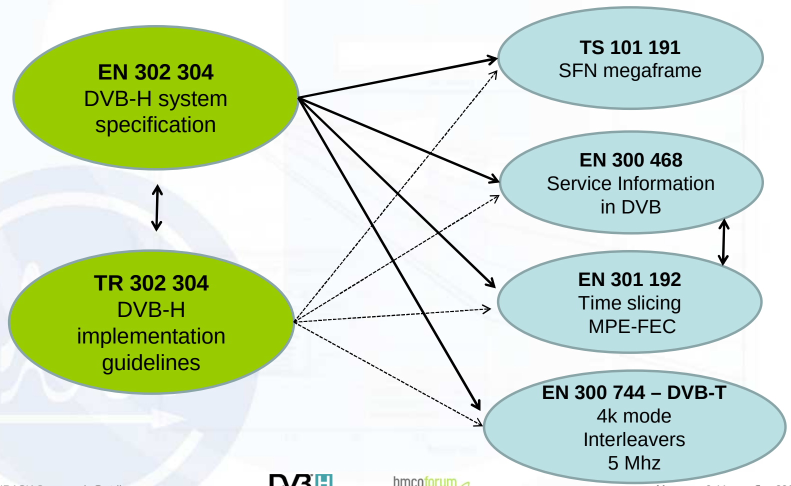
DVB-H: the history

The DVB community was asked to provide technical specifications to provide rich multimedia content to mobile handled terminals. DVB-T showed its limitations:

- The requirements of battery powered recievers are to be met: the possibility to repeatedly power off some part of the reception chain to increase the battery usage duration should be included
- Nomadicity would have to be ensured (**Outdoor and indoor coverage** on large areas requesting a smooth migration from/to new transmission cells)
- Mobility would have to be ensured (provision of service for handelds at **variable speeds**).
- Mobile multipath and high levels of man-made noise issues have to be overcome.

The DVB-H transmission system was standardized and validated by the ETSI in 2004 (EN 302 304).

The DVB-H standards



The DVB-H: a mobile broadcasting multimedia platform among others

Most of the mobile broadcasting technologies are C-OFDM based (see section2). Among which are:

- **DAB** (UK, Australia...), 1.7 MHz BW approx, VHF and 1.5 GHz L-Band
- **DVB-T mobile** (as seen earlier), 6-7-8 MHz, UHF
- **DVB-H** (Europe, America, Australia, Philippines...), 5-6-7-8 MHz, UHF and 1.5 GHz L-Band
- **DVB-SH**, dual BW, S-Band
- **T-DMB** (Korea, France) in combination with **S-DMB** (Korea), 1.7 MHz BW approx, VHF/L-Band and 2.5 GHz
- **ISDB-T** (Japan), 6-7-8 MHz, UHF
- **MediaFLO** (Qualcom – USA), 5-6-7-8 MHz, UHF and L-Band
- **TDtv** (UK, not C-OFDM), 5 MHz BW, around the 2 GHz
- **DRM**, up to 120 Mhz
- **Mobile WiMax** (MBS mode)

DVB-H vs DVB-T

- Based on DVB-T, backwards fully compatible
- Gives additional features to support **Handheld portable and mobile reception**
  - battery saving
  - mobility with high data rates, single antenna reception, SFN networks
  - impulse noise tolerance
  - increased general robustness
  - support for seamless handover

The above have been achieved by adding options

- Time-slicing for power saving
- MPE-FEC for additional robustness and mobility
- 4k mode for mobility and network design flexibility
- plus additional minor changes, e.g., in signalling

- DVB-H is meant for **IP-based services via MPE insertion**
- DVB-H can share DVB-T multiplex with MPEG2 services
- Portable/indoor coverage should be built to the network for fully exploit the DVB-H possibilities businesswise

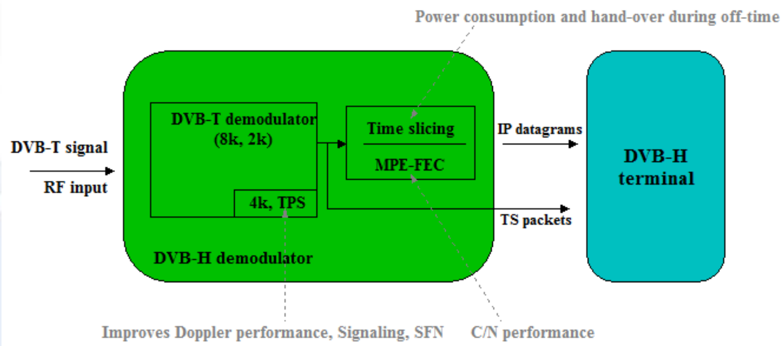
DVB-H vs DVB-T

Fixed service, at home → DVB-T

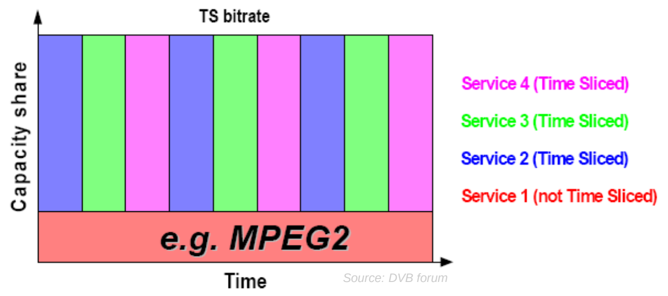
Outdoor /Indoor pedestrian/mobile service → DVB-H

Outdoor/In car mobile service → DVB-T or DVB-H

The DVB-H reciever

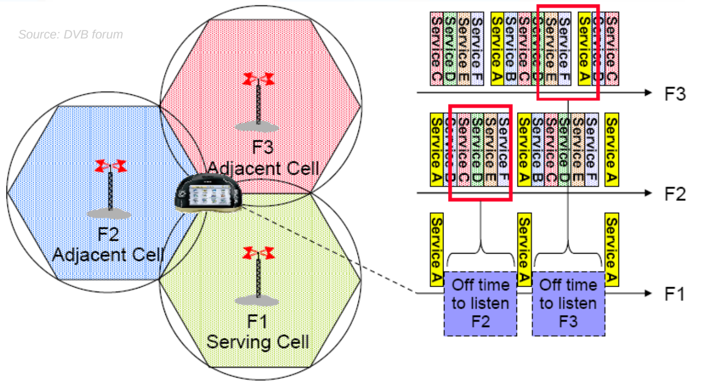


Time slicing and power consumption



Time sliced transmission methods allows to turn of the RF tuner and the demodulator for almost 80% of the time. During the “off” period, the video decoder uses the data stored during the demodulation period: the TV viewing is continuous. The MPEG transport stream method is common to all DVB PHY.

Time slicing and hand-over support



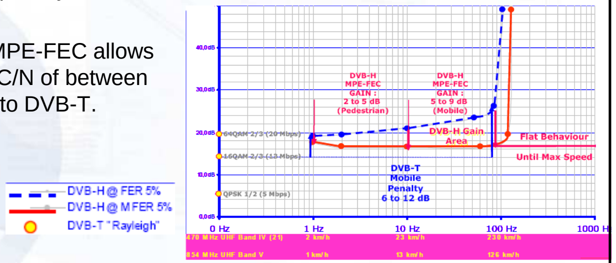
The neighbouring cells can be monitored during the “off-time”. Soft Handover maintaining the service is possible.

MPE-FEC

MPE forward error correction (MPE-FEC) is a protection technique for DVB-H in order to ensure a proper reception in mobility: this avoids very dense networks or the use of multi-antennas receivers (power consuming).

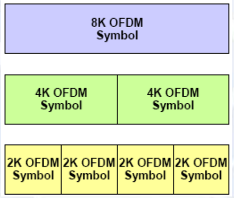
With MPE-FEC (optionnal), the IP datagrams in an “application data table” that is used to populate a more structured “RS data table” using a Reed-Salmon encoder . This encoding improves the probability of successful reception, as the error correction capability is enabled.

The activation of the MPE-FEC allows an improvment of the C/N of between 2 and 9 dB compared to DVB-T.



4k mode

With the 2K and 4K modes, the operator may select the option of an in-depth interleaver that interleaves the bits over four or two OFDM symbols, respectively, instead of native interleaver that interleaves the bits over one OFDM symbol. This approach brings the basic tolerance to impulse noise of these modes up to the level attainable with the 8K mode and also improves the robustness in mobile environment.



-The **8K mode** can be used both for single-transmitter operation, multiple frequency networks (MFNs), and for small, medium, and large SFNs. It provides a Doppler tolerance allowing for high-speed reception.
-The **4K mode** can be used both for single-transmitter operation and for small and medium SFNs. It provides a Doppler tolerance allowing for very high speed reception.
-The **2K mode** is suitable for single-transmitter operation and for small SFNs with limited transmitter distances. It provides a Doppler tolerance allowing for extremely high-speed reception.

Что следует?
Часть 2:
Компоненты сети DVB-H