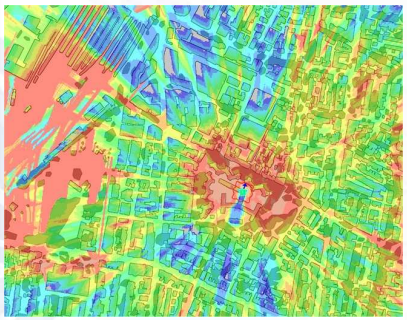
Принципы частотно-территориального планирования сетей DVB-H

Часть 2

Компоненты сети DVB-H

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



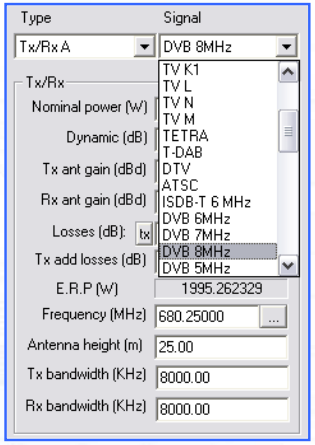
The DVB-H transmitter

The main technical parameters of the transmitter(s) can be entered in the planning tool:

- Nominal power
- Gain of the antennas (dBd or dBi)
- Feeder and connector losses

→ERP or EIRP

-Frequency
-Antenna height
-Channel BW



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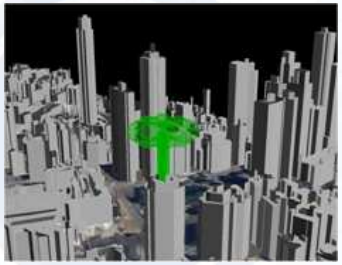
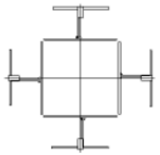
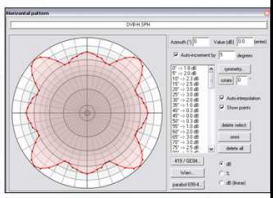
The DVB-H transmitter

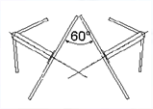
The radiation pattern of the transmitter can be defined. Antennas systems from panels can be modelled. The required parameters are:

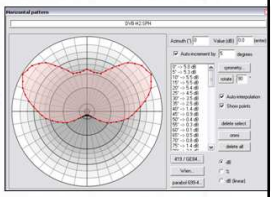
- The HRP
- The azimut
- The VRP
- The tilt
- The polarization (H, V, M, C)



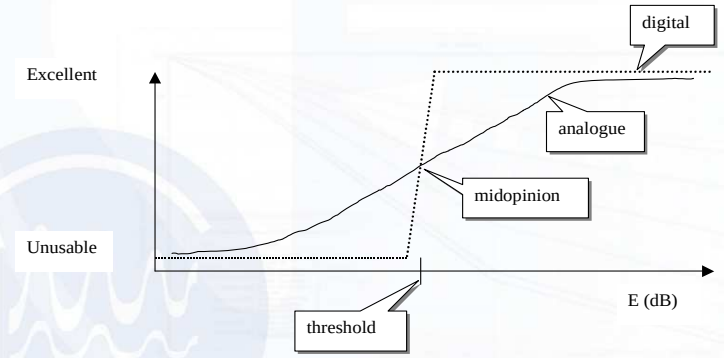








The DVB-H reciever: reception criteria DVB vs analogue



The DVB-H reciever

The ETSI specifies different **classes of reception**:

Class of reception	Situation	Characteristics
Class C	Mobile Outdoor (or roof-top)	1.5m above ground level up to 130 km/h
Class A	Portable outdoor pedestrian	1.5m above ground level 3 km/h
Classe D	Mobile in-car	1.5m above ground level up to 130 km/h
Class B		
B1	Portable light indoor	1.5m above ground level 3 km/h lightly shielded building
B2	Portable deep indoor	1.5m above ground level 3 km/h highly shielded building

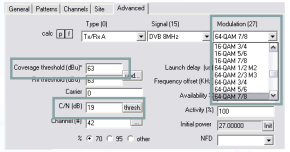
The BMCO specifies different **usage scenarios**:

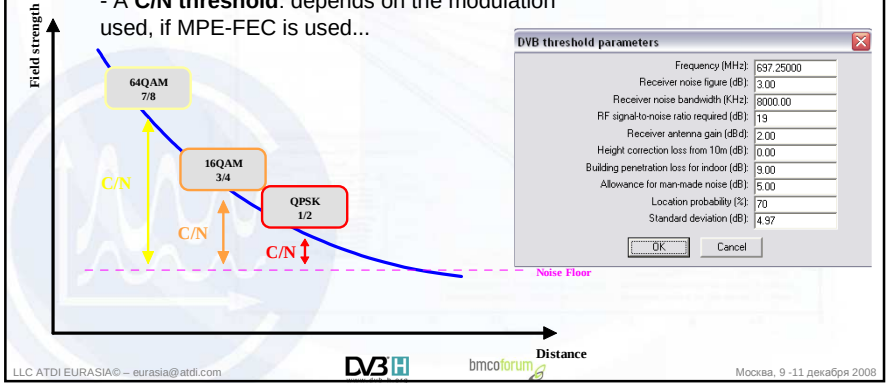
Usage scenario		Quality of coverage	
		Acceptable	Good
Class C	Mobile Roof-top	BMCO 1	BMCO 2
Class A	Portable Outdoor pedestrian	BMCO 1	BMCO 2
Class D	Mobile In-car	BMCO 3	BMCO 4
Class B1	Portable light indoor	BMCO 3	BMCO 4
Class B2	Portable deep indoor	BMCO 4	BMCO 5

The DVB-H reciever: reception criteria

The reception of a DVB-H handset can be modelled using two kinds of thresholds:

- A **field strength threshold** C: depends on the propagation environment
- A **C/N threshold**: depends on the modulation used, if MPE-FEC is used...





The link between the transmitter and the reciever

The computation of the **coverage threshold** Emed can be obtained by the following equation:

$$Emed = F + 10\log_{10}(k\,T_0\,B) + C/N - G + 107.2 + 20\log_{10}(f) + Lo + Lp + QC$$

F: receiver noise figure. It assumed to be 6dB in DVB-H UHF
k: Boltzann's constant (1.38 10^{-23} Ws/K)
T_0: Absolute temperature (290 K)
B: Receiver noise bandwidth in Hz

Channel (MHz)	5	6	7	8
Receiver bandwidth (Mhz)	4.75	5.71	6.66	7.61

C/N: Carrier to Noise ratio required b the system at the receiver input.
Examples are provided here-below (source: BMCO, 8 MHz BW in UHF, MPE FER 5%, max 120 Hz Doppler shift (186 km/h))

Modulation	QPSK ½	QPSK 2/3	16QAM ½	16QAM 2/3
MPE-FEC rate	¾	¾	¾	¾
Class A,B Based on trials (BMCO)	7.5 dB	10.5 dB	13.5 dB	16.5 dB
Class C,D TU6 channel model	8.5 dB	11.5 dB	14.5 dB	17.5 dB

The link between the transmitter and the reciever

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$$Emed = F + 10\log_{10}(k\,T_0\,B) + C/N - G + 107.2 + 20\log_{10}(f) + Lo + Lp + QC$$

G:antenna gain related to isotropic. Examples are provided here-below (@698 MHz frequency)

Class A, B, D Built-in antenna	Class A, B, D Attached antenna	Class C
-7 dBi	-3 dBi	-2 dBi

f: frequency of the signal in MHz
Lo: other losses including the man-made noise, the cables losses (class C), the implementation losses, pratical antenna pattern vs a theoretical pattern... This is estimated at 3dB for DVB-H in UHF.
Lp: vehicle and penetration losses in dB
QC: Quality of coverage margin in dB
(see section 2)

Class	Loss
C - Mobile Roof-top	
A - Portable outdoor pedestrian	
D - Mobile in-car	7 dB
B1 - Portable light indoor	11 dB
B2 - Portable deep indoor	17 dB

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The link between the transmitter and the reciever

The computation of the **C/N threshold** depends on the mode the DVB-H network is working:

- **Multiple frequency network** (MFN) mode

$$C_{server} / [N + PS (C_{uw1} - IRF_{uw1} + C_{uw2} - IRF_{uw2})] = C/N$$

- **Single frequency network** (SFN) mode

$$C_{server} + PS_{constructive\ servers} / [N + PS_{destructive\ servers} = C/N$$

Что следует?

Часть 3: Картографические данные для планирования сетей DVB-H