Принципы частотно-территориального планирования сетей DVB-H
Часть 3
Типы цифровых карт для частотно-территориального планирования
Семинар ЭФГ МСЗ «Переход от аналогового к цифровому вещанию» г. Москва, Россия, 9-11 декабря 2008 г.

DVB-H Radio-planning: Cartographic data

Principles of cartography
Geodesy: representing the Earth
Cartographic data as a calculation basis for DVB-H Radio-planning
Production/update of cartographic data

Different cartographic datasets for different DVB-H planning exercises
Low resolution data
Medium resolution data
High resolution data
The Earth can be represented by the equipotential of the electro-magnetic field. This shape is not a perfect sphere. Locating a point using XYZ coordinates only is not accurate enough.

The Earth is therefore represented by a mathematical entity called ellipsoid. There are as many possible ellipsoids as areas in the world! The chosen ellipsoid and its location according to the centre of the Earth is called a datum.
For radio-planning and ray-tracing purposes, it is necessary to project the datum on a flat shape. U.T.M. is one of the most common projection all over the world.

Cartographic data: **geodesy in a nutshell**

Calculation basis:
- Terrain data
- Ground occupancy

**Cartographic data: files used by a planning tool**
Graphical display:
- Topographic maps
- Aerial/satellite imagery
- Vector files

Geo-marketing analysis:
- Population map per county
- Population per building block

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Cartographic data: where does the data come from?

- Contour line interpolation
- Correlation from aerial/satellite imagery
- Remote sensing
- Digital photogrammetry

Are copyrighted cartographic data viewers, that cannot be used as a production source for cartographic data/professional radio-planning.
Cartographic data: Is there a need to update the data?

Medium resolution cartography

- Resolution: 20/30m
- Features the urban data as aggregates
- Roll-out every 10 years, except MAJOR modifications over the Aera Of Interest

High resolution cartography

- Resolution: 5m or better
- Each building is outlined with its height
- Manual correction in the planning tool itself, or roll-out every 4 years

Cartographic data: What kind of data for what kind of DVB-H planning exercise?

Low resolution cartographic data

Medium resolution cartographic data

High resolution cartographic data

One basic rule:
- from 30 MHz to 3 GHz
- Optimum planning resolution
  \[ \text{Optimum planning resolution} = \frac{\text{Wave length (m) x 50}}{15.000 \times \text{Freq (MHz)}} \]
Calculation basis:
• Terrain data
• Ground occupancy

Cartographic data for macro-scale DVB-H planning

Predictable effects
- Rough coverage of the macro-sites
- Highlight the major coverage holes
- SFN networks: Configure the launch delays in order to avoid SFN/COFDM interference
- MFN networks: Assign the frequencies in order to avoid both intra-network or inter-network (migration from analogue) interference

Applicable propagation model (section 2)
- Deterministic with appropriate planning margins
- Empirical with appropriate model tuning based upon a DVB measurement campaign in the Area Of Interest
Cartographic data for macro-scale DVB-H planning

**Assets**
- Covers large areas
- Reasonable results if proper planning margins are taken (QC)

**Drawbacks**
- The urban propagation is simulated using offsets
- The building penetration is simulated by applying an additional offset
- The in-building and small coverage holes cannot be highlighted: the planning of gap-fillers or transponders cannot be done accurately

Cartographic data for micro-scale DVB-H planning

**Typical content**
- DTM at 2m
- True-Orthophoto
- Building height
- Clutter file
- Population per building block
Predictable effects
- Detailed DVB coverage
- Canyon effect with constructive/destructive C-OFDM signals
- Diffusion effect for in the in-building penetration
- Multi-path effect
- Power delay spread

Applicable propagation model
- Deterministic
- Empirical with appropriate model tuning based upon a DVB measurement campaign in the Area Of Interest
- 3D ray tracing

Assets
- Very good accuracy
- The building penetration can be evaluated according to its shape, height and type

Drawbacks
- Requires HR cartographic data
- Dedicated to smaller AOI (CBD for instance)
- Slower and more expensive
Что следует?
Часть 4: Расчёт и анализ покрытия DVB-H