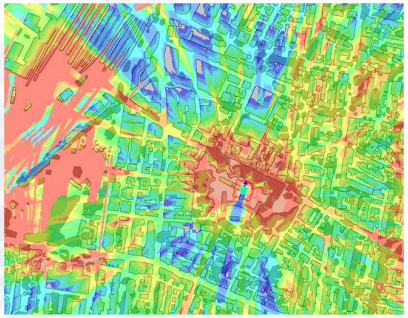
Принципы частотно-территориального планирования сетей DVB-H

Часть 5

Планирование DVB-H - аспекты связанные с использованием радиочастотного спектра

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



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

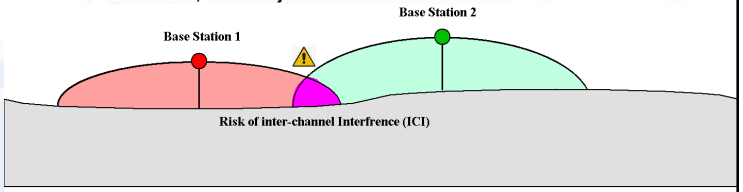
- **Single frequency network** (SFN) mode

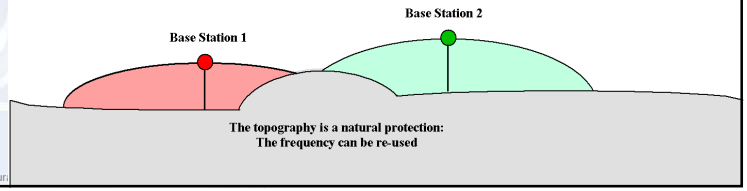
MFN: Frequency assignment

What is the goal ?

- **Minimize the interference areas between the sites working in MFN (Mulitple Frequency Network)**

- **Optimize the use of the spectrum by using the topography as a protection: in terms of coverage, the topography is a drawback, but in terms of interference, it is a major asset !**

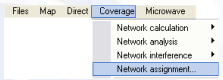


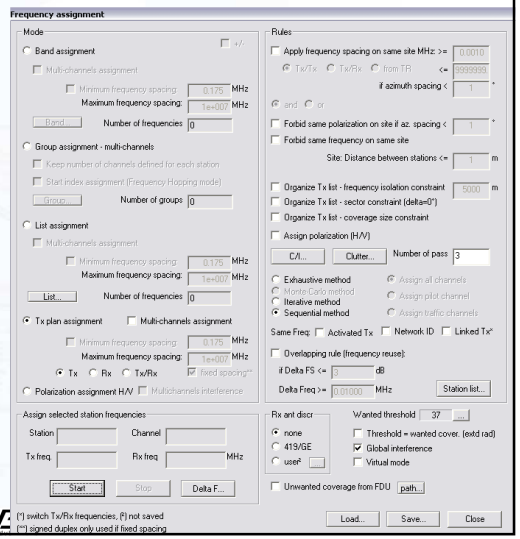


MFN: Frequency assignment

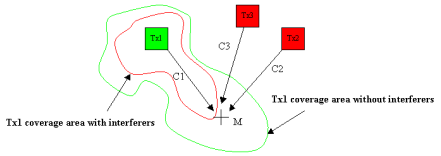
The frequencies of an MFN network can be assigned according to :

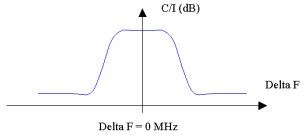
- **a freq. band**
- **a freq list**
- **a freq. Plan**





MFN: Interference analysis





The **Nuisance field strength** (NFS) delivered by Tx2 at the receiver's location relatively to Tx1 is defined by the following formula :

NFS (dBµV/m) = C2 (dBµV/m) + C/I $_{Required}$ (dB) – RXAPA (dB) - XPD (dB)

Single interferer mode :

Tx1 is considered as interfered at the point M if

- C1 (dBµV/m) > Threshold (dBµV/m)

and

- C1 (dBµV/m) < Max $_{j\neq1}$ (NFS) (dBµV/m)

Summed interferers mode :

Tx1 is considered as interfered at the point M if :

- C1 (dBµV/m) > Threshold (dBµV/m)

and

- C1 (dBµV/m) < Sum $_{j\neq1}$ (NFS) (dBµV/m)

MFN: Interference analysis

The MFN network interference analysis is based upon :

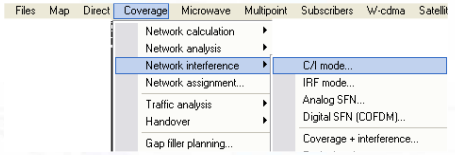
- The signal type of the victim

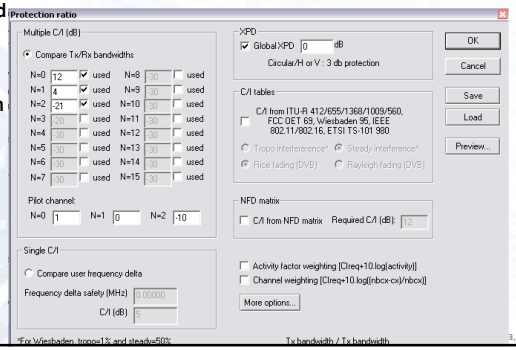
- The signal type of the unwanted signal

- the co-channel protection ratio

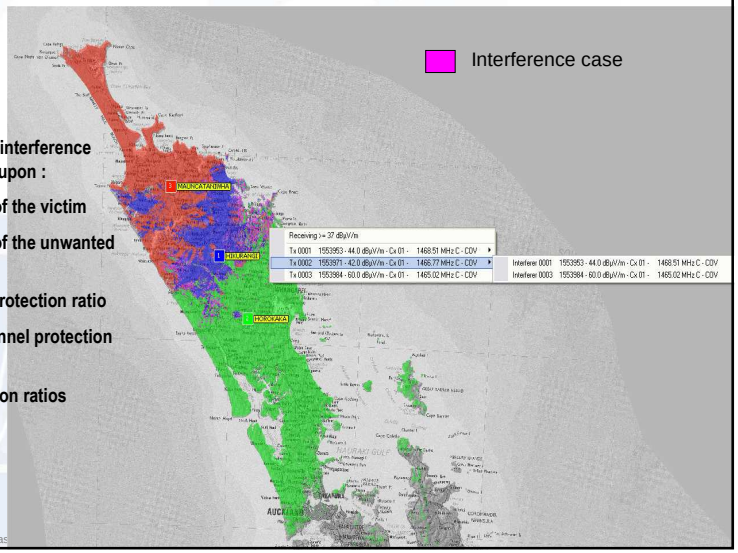
- the adjacent channel protection ratio

- ITU/EBU protection ratios





MFN: Interference analysis

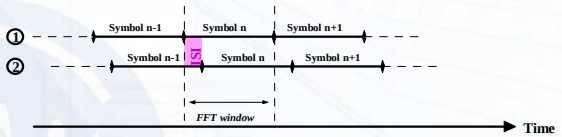


The MFN network interference analysis is based upon :

- **The signal type of the victim**
- **The signal type of the unwanted signal**
- **the co-channel protection ratio**
- **the adjacent channel protection ratio**
- **ITU/EBU protection ratios**

SFN: Interference analysis

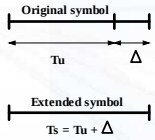
In OFDM, the information is carried via a large number of individual carriers in a frequency multiplex. Each carrier transports only a relatively small amount of information, and high data capacities are achieved by using a large number of carriers within a frequency multiplex. Each carrier has a fixed phase and amplitude for a certain time duration, during which a small portion of the information is carried. This unit of data is called a **symbol**; the time it lasts is called the **symbol duration**. After that time period, the modulation is changed and the next symbol carries the next portion of information.



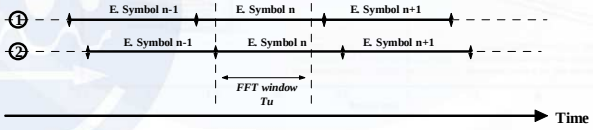
In an environment where several useful signals (either from multipath echoes or from other transmitters in an SFN) are available to the receiver, things become more complex. Usually, the signals arrive at different times at the receiver which, in the absence of a guard interval, makes correct synchronization to all the signals impossible.

SFN: Interference analysis

In order to overcome the inter-symbol interference problem, part of the symbol is copied from the beginning of the symbol to the end, increasing its duration by a certain amount of time called the guard interval Δ.

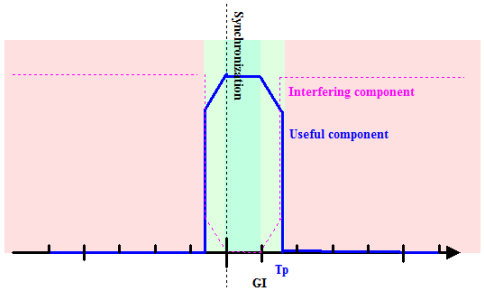


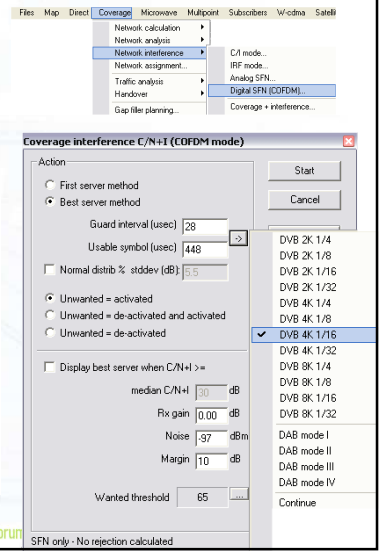
The new increased symbol duration is denoted by *Ts* and the original symbol duration is often called the **useful symbol duration** *Tu*. The duration of the FFT window during which the symbol is evaluated is kept at the original value *Tu*. The orthogonally relationship is kept with the original symbol duration *Tu*, not the extended *Ts*.



SFN: Interference analysis

In the case of DVB-H, because of the pilot carriers that are needed for coherent demodulation, the total loss of constructive signal components occurs beyond a relative delay **Tp**.

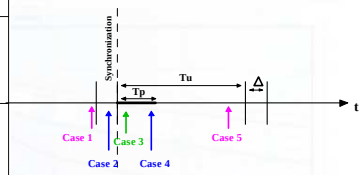




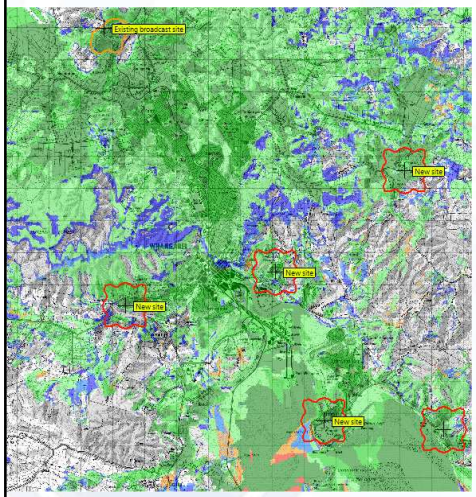
SFN: Interference analysis

$C=\sum_i Wi\,Ci$ $\quad I=\sum_i (1-Wi)\,Ci$

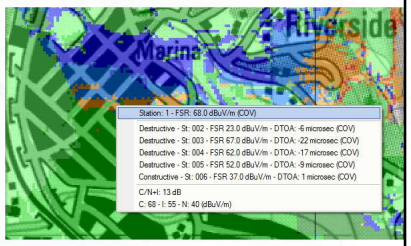
Case 1 Full destructive field strength	$Wi=0$ if $t \le \Delta - Tp$
Case 2 Partial constructive field strength Partial destructive field strength	$Wi=\left(\frac{Tu+t}{Tu}\right)^2$ if $\Delta - Tp < t \le 0$
Case 3 Full constructive Field strenth	$Wi=1$ if $0 < t < \Delta$
Case 4 Partial constructive field strength Partial destructive field strength	$Wi=\left(\frac{(Tu+\Delta)-t}{Tu}\right)^2$ if $\Delta < t \le Tp$
Case 5 Full destructive field strength	$Wi=0$ if $Tp < t$



SFN: Interference analysis



>= dB	>=dBuV/m/C	Label
-100	auto	Below the C/N
11	auto	11dB C/N 0dB above
14	auto	14dB C/N 3dB above
17	auto	17dB C/N 6dB above
21	auto	21dB C/N 10dB abov
31	auto	31dB C/N 20dB abov
41	auto	41dB C/N 30dB abov



Что следует?
Часть 6
Аспекты миграции от существующих систем к DVB-H