

# Spectrum Management System for Developing Countries (SMS4DC)

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## **INTERFERENCE MITIGATION**



## **INTERFERENCE DEFINITION / TYPES**

150

frequency (MHz)

170

180

160

80

60

E (dB(µVm<sup>-1</sup>))

The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.



- **Power sources (50 Hz):** due to leakage, arcing neon signs (continual arc) fluorescent light fixtures.
- **Co-channel:** same frequency various power levels strongest signal captures receiver.
- Adjacent Channel: is interference caused by extraneous power from a signal in an adjacent channel. ACI may be caused by inadequate filtering
  Intermodulation: unrelated frequency mixes with another signal generating a signal on or close to the receive frequency.
  Harmonic signals are usually unwanted signals which are exact multiples of the operating frequency.
- **Out of band emissions** Out-of-band emission is emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process.



## **IMPORTANT PARAMETERS**

#### Protection ratio, *PR*

The required difference in dB between the level of the wanted signal and the level of the interfering signal to achieve the required quality of reception.

#### Minimum field strength (C/N)(db)

It is a minimum field strength level which is necessary to fulfil the signal quality for coverage.

#### Wanted field strength (Ew)

The required field strength of a wanted signal to achieve the required quality of reception, considering multiple interfering signals and their corresponding protection ratios .**Ew>En** 

#### Nuisance field strength( En)

The equivalent required field strength of a wanted signal to achieve the required quality of reception, considering a single interfering signal and its corresponding protection ratio.

#### **En= Ei(interference field strength)+ PR**









## SOUND BROADCASTING STATION

#### **BC - BC (FM sound broadcasting stations):**

Is to calculate aggregated interference level of interferer BC stations on a directional receiver of wanted BC station.

By selecting of BC2BC item the list of all FM sound broadcasting station is presented as in figure 1.1 below. After selecting a wanted bc station Dialog box of Interference Parameters is opened to set search conditions for victim BC stations figure 1.2.



### SOUND BROADCASTING STATION











## **TV BROADCASTING**

**BT2BT**: Item to calculate aggregated interference level of interferer BT stations on a receiver of wanted BT station, The procedure of BT to BT interference calculation is same as BC to BC.





## **TV BROACASTING**

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### **TV BROACASTING**





### **TVBROACASTING**

Usable field strength on receivers of wanted TV broadcasting station inside a selected area

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## **POINT TO POINT INTERFERENCE**

FX2FX (link):

Item to calculate interference of stations of different point – to – point hops on each other by consideration antenna radiation patterns and XPD in accordance with ITU-R

P.452 recommendation.

This item contains two sub-items "Interference to" and "Interference from" enabling user to calculate the caused interference by wanted hop transmitter on receivers of other hops or the caused interference of other hops transmitter on wanted hop receiver, respectively.

Choosing one of the sub items under this item opens the spreadsheet of available links, then by selecting one of the wanted link an set the parameters and by finalizing interferer (or victim) link selection. Then the calculation result is displayed including The wanted hop information and interference calculation results.



## **POINT TO POINT INTERFERENCE**









## POINT TO POINT INTERFERENCE

Interference occurrence is highlighted by red text background

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## **FIXED STATIONS INTERFERENCE**

"FX2FX (station): ietm to calcule the interference of fixed station on each other in accordance of ITU-R recommandation P.452.

This item contains two sub items "Interference to" and "Interference from" by choosing one of the sub items under this item opens the spreadsheet of available fixed stations.

Then select one of the stations and set the parameters and by finalizing interferer (or victim) link selection. Then the calculation result is displayed including The wanted hop information and interference calculation results

#### List of available fixed stations





## **FIXED STATIONS INTERFERENCE**

Set Parameter dialog box and fixed stations meeting relevant conditions

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#### **FIXED STATIONS INTERFERENCE** Dialog box of interference of wanted fixed TX on victim fixed receiver

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The item "FXM" in "Interference" menu implemented for calculation of interference produced/experienced by stations in land mobile service (any frequency) and fixed service (below 1GHz) on each other.

FXM consist of the following subitems:

- Interference to (Free Space and P.1546)
- Interference from (Free Space and P.1546)

List of fixed (below 1GHz), and land mobile base stations





Set Parameter dialog box for setting searching condition and Spreadsheet list of found fixed, base and mobile stations using free space propagation model





Result of interference calculation of wanted TXon victim RXsusing free space propagation model

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P1546 propagation model parameters and result of interference calculation of wanted TX on victim RXs (below 1GHz)

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