



ESG-NetCOP

Network Configuration,
Optimisation and
Planning Tool

Microwave Planning

Planning Objectives

The evolution of mobile networks and the growing user demand for broadband data services lead to an increasing demand on the transmission network.

On the one hand, transmission networks must be optimised to cope with the increasing demands in terms of capacity, coverage and quality of service; on the other hand, the transmission network represents a significant amount of the total network costs, therefore operators must continuously regard their return on investment.

NetCOP planning tool suite addresses all these challenges. The microwave module helps to plan, design and optimise point-to-point and point-to-multipoint MW links in an easy, fast and efficient way. The microwave module can be used stand-alone or in combination with the TDM/ATM transport modules.

Line-Of-Sight (LOS) Analysis

The Line-Of-Sight analysis window draws the path profile between any two points of the terrain, showing the 1° and 2° Fresnel ellipsoids for different values of the earth radius factor.

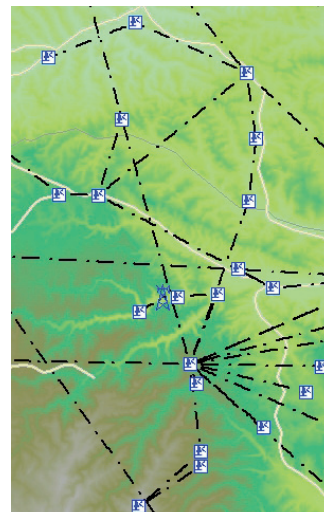
It also allows the path profile to be edited for different clearance criteria, correcting the terrain heights and taking additional obstacles such as windmills or smoke stacks into account.

Furthermore, its embedded algorithms enable:

- ▶ Calculation of the optimum antenna heights to achieve the clearance criteria for the selected frequency band.
- ▶ The Line-Of-Sight between a to be studied site and all its neighbouring sites; searching for the best candidate where a free LOS path exists, taking different

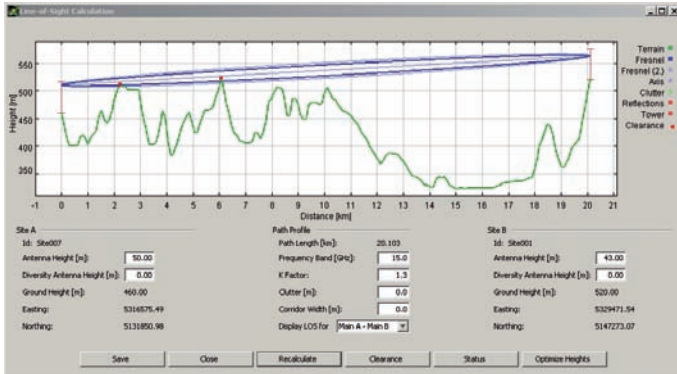
frequency bands and clearance criteria into account.

- ▶ To analyse the path profile, digital terrain model maps are used; in addition NetCOP is also able to display other maps like vector maps, obstacle maps and scanned maps.

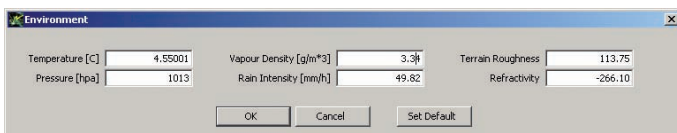


HIGHLIGHTS

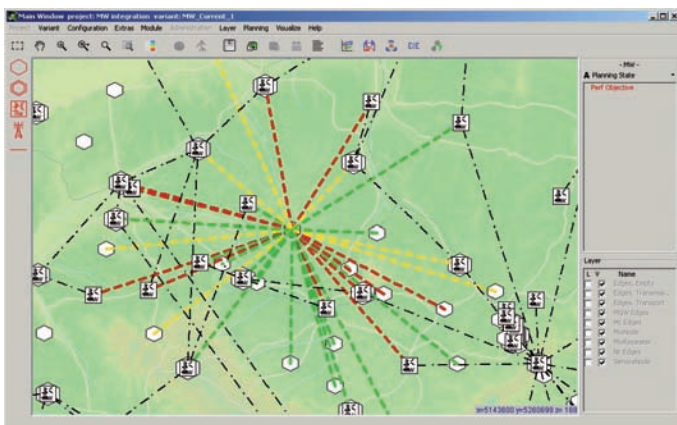
- ▶ Integrated tool for microwave and transport network planning
- ▶ Accurate Line-Of-Sight (LOS) analysis taking terrain profile, obstacles and clutter information into account
- ▶ Link budget and availability calculations for point-to-point and point-to-multipoint links
- ▶ Automatic calculation of the best microwave connection by evaluating LOS to all neighbours and link budget with different equipment configurations
- ▶ Interfaces with external databases, allowing engineering data to be shared between different project stakeholders



Path clearance analysis



Environment data



LOS prediction

Link Budget Calculation

The microwave planning module makes an accurate calculation of the link budget, featuring multi-path fading, atmospheric and rain attenuation for both point-to-point and point-to-multipoint microwave links. It supports the design of short-haul and medium/long-haul microwave links.

The link budgets are stored and can be edited by the user at any time, they can also be exported into different types of customisable reports (excel, txt) which can be used for different purposes (work orders, regulation authorities, etc).

The availability of a microwave link is calculated following the latest ITU-R P530 recommendations. For these calculations, the environmental and terrain properties, such as terrain roughness or rain intensity are automatically initialised from the latest ITU database to the values of the region.

The influence of space, frequency and angle diversity can be analysed separately or in combination with each other.

Within the tool, the capabilities of the network equipment, antennae and wave guides are defined through equipment releases. The user can se-

lect the radio relay, antenna and wave guide between different equipment releases.

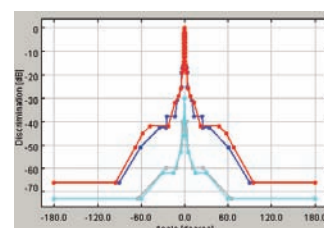
In addition, the microwave planning module can also calculate the interference level at every receiver, the threshold degradation due to interference and the resulting link availability.

Microwave Link Design

NetCOP offers a cross-layer optimisation algorithm which works across different modules (BSS/UTRAN, TDM/ATM, MW), studying different possibilities to connect a new NodeB or BTS to the network by means of a microwave link taking constraints like number of hops and costs into account.

The microwave module evaluates the line-of-sight between the new site and all possible neighbour sites, and then it calculates a hypothetical link budget, taking into account some constraints in terms of preferred MW equipment, frequency band, potential interferences, etc. In this way the planner can quickly decide to which site a stand-alone node has to be connected, select the radio equipment configuration, etc, without trying out all possibilities by himself.

End-to-end availability calculation for a circuit consisting of several hops can also be calculated. NetCOP calculates the overall circuit performance (SES and availability) as well as the contribution of the different hops within the circuit. The calculation is performed according to ITU performance objectives G.821 or G.826.



Benefits

- ▶ Time savings due to an integrated microwave and transport planning tool
- ▶ Visualisation of the clearance of the Fresnel ellipsoid for different parameters
- ▶ Accurate link budgets for many different radio relay configurations are calculated in a short time
- ▶ Customisable microwave link reports for the relevant authorities
- ▶ Automatic calculation of the best microwave connection
- ▶ Availability of microwave links is taken into account to calculate end-to-end availability of ATM and/or TDM circuits/demands