

# Radio Planning – Focus on TETRA

## Overview

This document is intended to the RNP/RNO engineers specialized in the TETRA technology working in the organizations such as the Public Safety, Transportation, Utilities, Government, Military, PAMR, Commercial & industry, Oil & Gas, Telecom equipment suppliers and system integrators.

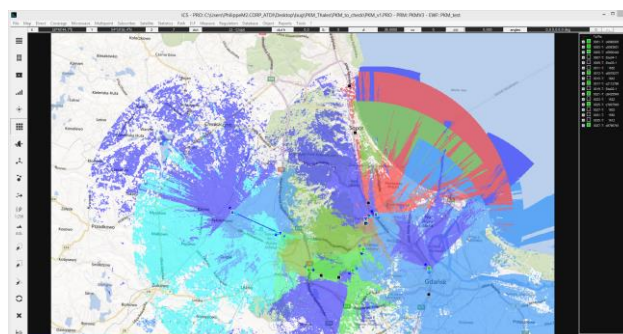
TETRA Mobile network planning can be roughly grouped into four main groups of tasks that partly interact with each other:

- Site planning & acquisition;
- Radio network planning;
- Transmission planning;
- Optimization and KPIs enhancement

The set of features available in the ATDI planning tools has been specifically developed to meet all the needs required during all the stages of the deployment and optimization process. Furthermore, since TETRA continues to be evolved and enhanced with the development of new standards (TEDS/LTE Advanced), the planning tool is supporting all the latest releases available in the market. Of course all the existing trunked radio systems (TETRAPOL, DMR, APCO-25, MPT 1327, and PMR) are also fully supported by the tool.

### The most complete and cost-effective radio planning and optimization tool:

- No extra module required;
- Multi technology capabilities (from a few kHz until 450GHz);
- Support of multiple frequency bands, channels and equipment configurations without any restriction;
- Free cartographic maps (until 25m resolution) including digital terrain model and clutter layer, Bing and Google images) are provided with the tool;
- More than 50 propagation models (including deterministic models and Okumura-Hata / COST 231);
- Antenna database integrated in the tool (MSI format) coming from most of the equipment manufacturers.

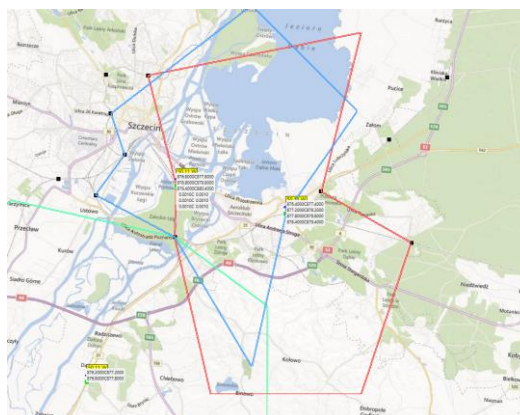


Best server coverage

## Site planning & acquisition

Set of features dedicated to the planning and acquisition (not exhaustive):

- Load of existing network data or new candidate locations (via .CSV file);
- Site database containing technical and administrative information (address, owner, cost, power connectivity, height, etc.);
- Possibility to rank potential candidate sites according to backhaul availability/ site costs or according to the different stages of the rollout;
- Automatic site selection of the best candidates according to a predefined target coverage over a specified area (vector, clutter...)
- Automatic site searching according to a predefined target coverage.



Site selection to cover a predefined area

# The most complete and cost-effective radio planning and optimization tool

## Radio Network planning

Provides a complete RNP solution for TETRA (standard and TETRA-LTE) network.

### Network modelling:

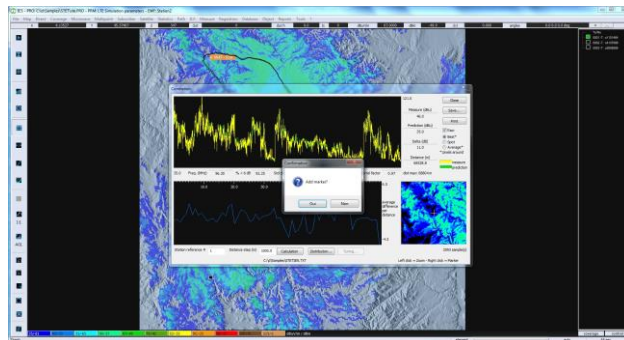
- TDMA, OFDMA, OFDA, SC-FDMA
- FDD/TDD
- Modelling of heterogeneous networks (2G to 4G) : Macro BTS, Micro, Pico, Indoor, Femtocell, Broadband stations (e-nodeB, WiMAX, Wi-Fi), repeaters;
- Land stations and air stations (airplane, helicopter, UAVs) modeling;
- Antenna types: Standard antenna, Tx Div, MIMO (SM/SD), AAS (Adaptive Antenna Switch), Beamforming.

### Network Planning and analysis:

- Uplink and downlink coverage simulations
- RSSI , RSRP, RSRQ, PDSCH (LTE);
- Composite, best server (1<sup>st</sup>, 2<sup>nd</sup>, ...), overlapping, number of servers, etc.
- DL/UL Peak throughput map (LTE);
- Capacity to plan indoor networks based on scanned 2D plans and Shapefiles;
- Automatic Cell Planning – ACP;
- Automatic Code planning (BSIC);
- Automatic PCI planning (LTE);
- Automatic Prospective planning (for repeater deployment);
- Automatic Neighbor List generation;
- Automatic traffic dimensioning;
- Automatic Frequency Planning (AFP);
- Interference analysis with support of TRX type-based (e.g., BCCH, TCH) quality;
- DL and UL interference analysis for TETRA/LTE (RSRQ, SNIR PDSCH, PBBCH, etc;) based on traffic load and overhead systems of the e-nodeBs;
- Measures (correlation, automatic tuning, import and others);

## Transmission/Backhaul planning

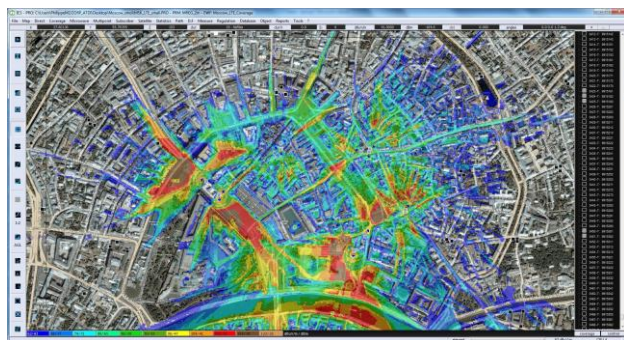
Provides a complete backhaul planning solution for Microwave Links, Satellite and Optical fiber.



Correlation Measure/Simulation

## Optimization and KPIs enhancement

- Traffic analysis including calculation of KPIs such as blocking rate QoS (2G and LTE);
- Network parameter optimizing in order to increase coverage and capacity;
- Antenna parameter optimization (height, azimuth, tilt...);
- Special ACP function dedicated to highways, roads and rail tracks (for TETRA/LTE) for automatic site selection and azimuth optimizing;
- Site optimization including priorities and objectives (coverage, overlapping, ...);
- SON (Self Optimization Network) features for TETRA-LTE networks;
- PCI Check/Optimization;
- ICIC considerations (Inter-cell Interference Coordination).



Network coverage in urban area