WinProp™

Wave Propagation and Radio Network Planning
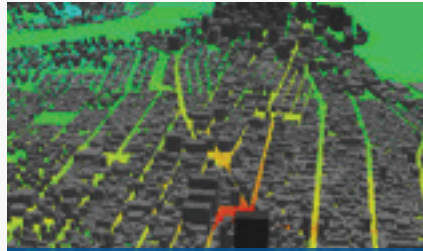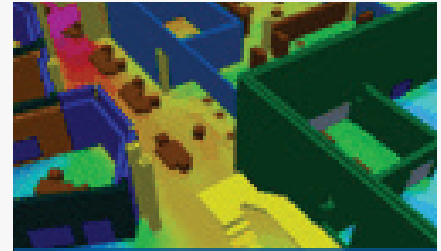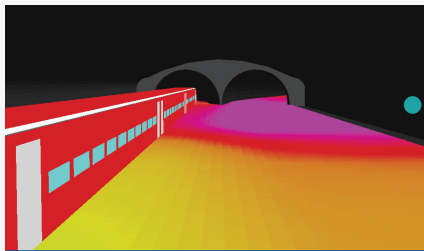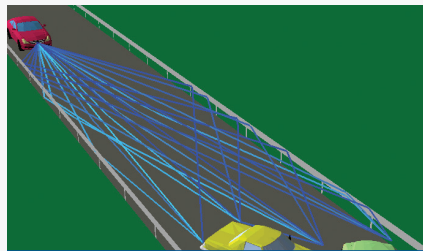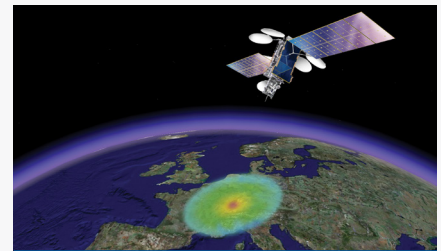

Rural & Residential

Urban & Suburban

Indoor & Campus

Tunnel & Underground

Vehicular & Time-Variant

GEO & LEO Satellites

WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, WinProp's innovative wave propagation models combine accuracy with short computation time.

Product Highlights

- Interface to import simulated antenna patterns from FEKO into WinProp
- Innovative, either empirical or ray optical/deterministic wave propagation models combining high accuracy and short computation times
- Wide range of scenarios and map data supported, even allowing combination of different scenarios for hybrid analyses
- Network planning modules available for most standards (cellular incl. LTE and beyond, W-LAN, etc.)
- The flexible WinProp API allows the integration of the wave propagation models and network planning modules into other software tools

Learn more:
altairhyperworks.com/winprop

Scenarios and Applications

WinProp's highly accurate and very fast empirical and deterministic propagation models are available for a wide range of scenarios:

- Rural & Residential
- Urban & Suburban
- Indoor & Campus
- Tunnel & Underground
- Vehicular & Time-Variant
- Satellites GEO, LEO

WinProp supports arbitrary transmitters including cellular and broadcasting sites, satellites, repeaters, and leaky feeder cables.

Databases

Depending on the scenario, predictions are based on topographical (pixel), clutter (pixel - with or without heights & clearance), urban building (pixel or vector), and/or 3D planar objects/walls (vector) databases.

For a prediction, different types of databases can be used simultaneously and transitions between the databases are computed automatically.
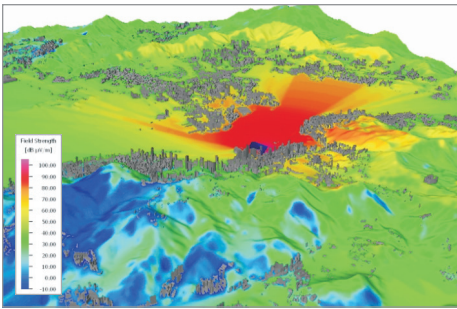
Graphical editors, CAD tools, and various converters are available for all types of databases.

Propagation Models

WinProp's powerful propagation engines include empirical and semi-empirical models (calibration with measurements possible), rigorous 3D ray tracing models as well as the unique Dominant Path Model (DPM).

Besides the prediction of the path loss, the delay and angular spread can also be computed, as well as LOS/NLOS, directional channel impulse response, angular profile and propagation paths.
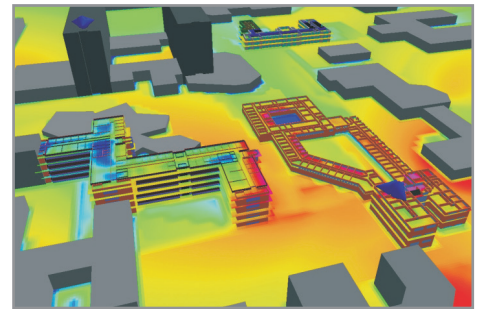
Coverage based on urban buildings and topography
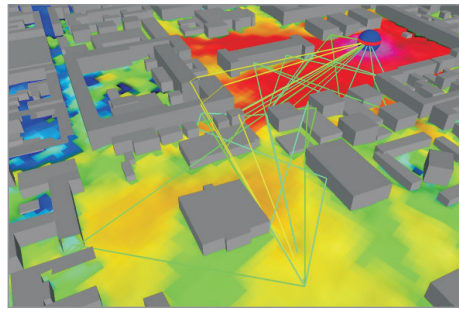

Display of urban propagation paths

Combined urban and indoor scenario with multi-floor buildings

WinProp API and Engines

The WinProp application programming interface (API) is available for both the wave propagation engines and the network planning modules. The very simple handling of the API allows customers to integrate the wave propagation models (as well as the network planning engines) into their own or any 3rd party software tool.

Air Interfaces and Applications

In WinProp various air interfaces and applications are pre-defined:
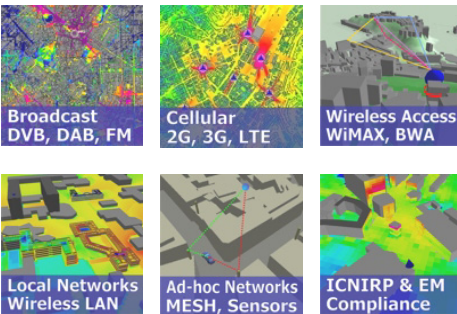
Additionally the user can define individual properties of the air interface to adapt it to the requirements. Besides the network planning, the ICNIRP and EM compliance can be analyzed with WinProp.

Computation and Simulation

Depending on the application WinProp offers static, Monte-Carlo, and dynamic network simulators. WinProp allows the planning of coverage and capacity as well as network simulations (performance of algorithms, analysis of delays, etc.). The user can define the (location dependent) traffic for circuit and for packet switched services (including the statistical distributions, mobility, etc.).

Coverage

Different transmission modes can be defined (bandwidth, MCS, data rate, SNIR target, signal threshold, Tx power,...) and the coverage maps (cell assignment, best server, active set, channel quality, Rx power in DL & UL, SNIR,...) are computed individually for each transmission mode. Link adaptation is considered and depends on the channel quality predicted with the propagation models. Maximum received power as well as maximum achievable data rates are predicted accurately for each location in the coverage area.

Capacity

WinProp computes the capacity (throughput, maximum data rates, packet delays, QoS,...) of the different radio links and cells in the network based on the coverage analysis and the traffic assumptions.

Capacity limitations and over-loaded cells can be detected easily and networks can be optimized to provide both high capacity and throughput. Capacity improvements due to MIMO and/or beamforming are modeled accurately because of the sophisticated deterministic propagation models. Arbitrary antenna configurations (linear, circular,...) are possible and their impact on the radio channel - determined during the propagation analysis - is considered in the network planning.

FEKO and WinProp Interaction

Electromagnetic simulation can be used to design the antennas as well as compute the radiation characteristic in terms of a 3D antenna pattern. For this purpose the various solvers included in FEKO can be applied. The resulting 3D antenna patterns describe the antenna characteristic in the far field and can be superposed to the 3D radio channels computed with the WinProp wave propagation models.

There is an interface to import and process the FEKO 3D antenna patterns in WinProp. For the acceleration of these simulations the complex objects, like vehicles, can be substituted by their radar cross sections (bi-static RCS as computed in FEKO).
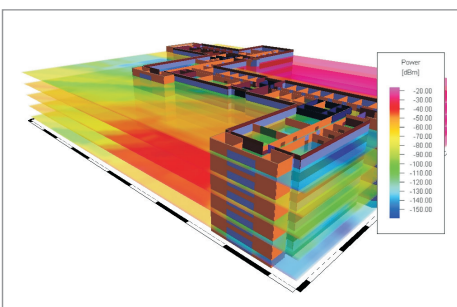
Prediction on multiple floors in an office building
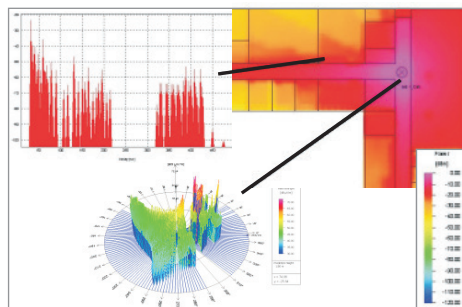
Channel impulse response and spatial channel profile for two indoor locations
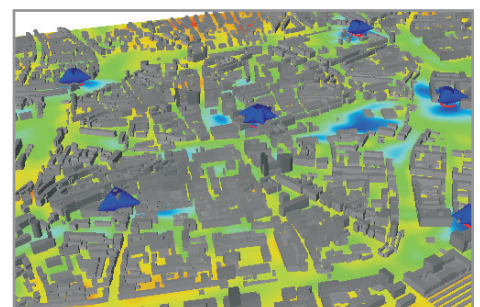
Radio planning for an urban network with 3-sector sites

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