WinProp

Propagation Modeling: Scenario Packages (Page 1/2)

Product		Scenario Package						Description
		PRO-R	PRO-U	PRO-I	PRO-C	PRO-T	PRO-V	
Databases								
Topography: Pixel data		✓	✓		✓			Pixel maps with elevation data (DEM, DTM,...)
Land Usage (Clutter): Pixel data		✓						Pixel maps with classes for land usage
Urban Buildings: Pixel data		✓						Pixel maps with heights of buildings (relative to ground or absolute to sea)
Urban Buildings: Vector data			✓		✓			Polygonal cylinders with flat roof tops, incl. individual material properties
Indoor Walls: 3D Vector data				✓	✓	✓	✓	Arbitrary shaped and oriented planar 3D objects, incl. individual material
Time variant objects (planar 3D objects)							✓	Time variant (velocity, time steps, rotation, translation,...)
Propagation Models								
Empirical	Hata-Okumura	✓						Prediction of signal level (path loss, power, field strength) No obstacles between Transmitter (Tx) and Receiver (Rx) considered.
	Two Ray Model: Empirical	✓						
	One Slope Model			✓	✓	✓	✓	
Vertical Plane / Direct Ray	Two Ray Model: Deterministic	✓	✓					Prediction of signal level (path loss, power, field strength) and LOS/NLOS Obstacles in vertical plane between Tx and Rx considered (attenuation due to diffractions (topography, clutter, buildings) or penetrations (indoor walls).
	Knife-Edge Diffraction Model	✓						
	COST 231 Walfisch-Ikegami		✓		✓			
	COST 231 Multi Wall & Motley-Keenan			✓	✓	✓	✓	
3D Single Path	3D Dominant Path Model (DPM)	✓	✓	✓	✓	✓	✓	Prediction of signal level, propagation paths, and LOS/NLOS.
3D Multiple Paths	3D Standard Ray Tracing (SRT)			✓		✓	✓	Prediction of signal level (path loss, power, field strength), delay and angular spread, delay and angular profile, propagation paths, and LOS/NLOS.
	3D Intelligent Ray Tracing (IRT)		✓	✓	✓			
Interfaces								
Application Programming Interface (API)		optional	optional	optional	optional	optional	optional	API to integrate module in customer's software. Additional costs for API.
Implementation of customer models		✓						Implementation of customer's propagation models in WinProp
Transmitter Types								
Isotropic Radiator (without antenna pattern)		✓	✓	✓	✓	✓	✓	
Directional Antenna (2x2D or 3D antenna pattern)		✓	✓	✓	✓	✓	✓	Supported File formats for pattern: 3D WinProp (AMan), 2x2D *.msi or ASCII
Leaky Feeder Cable				✓		✓	✓	Specification of coupling loss and attenuation of cable
Satellite Transmitters		✓	✓	✓	✓		✓	Either geo-stationary or moving satellites (broadcasting and navigation)
Time-variant transmitters							✓	Transmitter can be mounted at a non-stationary object in the database

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		PRO-R	PRO-U	PRO-I	PRO-C	PRO-T	PRO-V	
Prediction Mode								
Horizontal prediction plane(s)	Relative prediction height(s)	✓	✓	✓	✓	✓	✓	Relative to ground
	Absolute prediction height	✓						Absolute height to sea level
	Multiple prediction heights (inside buildings)			✓	✓	✓		Only in Empirical/Direct Ray/DPM/SRT mode. Not supported in IRT mode.
Arbitrary prediction	Arbitrarily oriented prediction planes			✓				Planes oriented arbitrarily in the scenario
	Multiple prediction points	✓	✓	✓	✓	✓		List with multiple prediction points (individual and arbitrary heights)
Time variant scenarios							✓	Additionally prediction of Doppler Shift, etc.
Database Converters								
Pixel: Database converters (Topo & Clutter): (CONV-T & -L)		✓	✓					Topo & Clutter: ASCII Grid, MSI Planet // Topo: USGS.....
Pixel → Vector: Pixel → Vector Data Converters (CONV-P)			✓	✓	✓			Conversion of Bitmaps (*.bmp), JPEG (*.lpg), TIFF (*.tif) to vector data
Vector: Urban Vector Buildings: Basic Set (CONV-U)			✓		✓			MapInfo (ASCII), Arcview Shapefile
Vector: Indoor Vector Objects: CAD Set (CONV-I)				✓	✓	✓		AutoCAD *.dwg, *.dxf
Vector: Indoor Vector Objects: Car Set							✓	Nastran, STL (Binary, ASCII), Wavefront
Export of network/transmitter data and simulation results								
Export of transmitter data and settings		✓	✓	✓	✓	✓	✓	Supported file formats: ASCII Lines
Export of simulation results		✓	✓	✓	✓	✓	✓	Supported file formats: ASCII Grid / DXF / Geo Bitmap (*.bmp. *.jpg, *.tiff)
Software Tools								
ProMan: Propagation and Network Planning Tool		✓	✓	✓	✓	✓	✓	GUI to edit project parameters, visualize prediction results,....
AMan: Antenna Editor (without MASC)		✓	✓	✓	✓	✓	✓	GUI to edit, convert, and visualize antenna patterns
WallMan: 3D CAD and GIS Editor (WALL-B)			✓	✓	✓	✓	✓	GUI to work with 3D CAD and GIS data (Basic module)
WallMan: 3D CAD editor for planar objects (WALL-I)				✓	✓	✓	✓	GUI to work with 3D CAD data with planar objects
WallMan: 3D CAD editor for polygonal cylinders (WALL-U)			✓		✓		✓	GUI to work with 3D GIS data with polygonal cylinders
WallMan: 3D CAD editor for time-variant objects (WALL-V)							✓	GUI to work with 3D CAD data with time-variant properties
TuMan: 3D CAD editor for tunnels (WALL-T)						✓		GUI to work with tunnel data (cross sections and trajectories)
Requirements								
Packages required to use selected scenario		-	-	-	PRO U/I	PRO-I	PRO-I	
Price								
Category (Credits)		●●●	●●●	●●	●●	●	●●	

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Network Planning: Air Interface Packages (Page 1/2)

Product	Network Planning Package (Air Interface)								Description
	NET-B	NET-D	NET-L	NET-O	NET-T	NET-C	NET-G	NET-E	
Air Interfaces									
Broadcasting (Analogue, FM, etc.).	✓							✓	
OFDM Broadcasting (DVB-H, DVB-SH, DVB-T, …)		✓							NET-D can be adapted to other OFDM broadcasting interfaces (DAB)
GSM / GPRS / EDGE (arbitrary TDMA air interfaces)					✓			✓	Can be adapted by the user to any other TDMA air interface
UMTS-FDD (WCDMA) incl. HSPA						✓		✓	A dynamic system simulator is additionally available (NET-W)
UMTS-TDD / TD-SCDMA						✓		✓	
CDMA-2000 incl. EV-DO						✓		✓	
W-LAN IEEE 802.11 a/b/g/n (WiFi)			✓	✓				✓	
W-LAN IEEE 802.11 b (WiFi)			✓			✓			
WiMAX 802.16-2004 (Fixed) & 802.16e (Mobile)				✓				✓	IEEE 802.16-2004 (Fixed WiMAX) and IEEE 802.16 e (Mobile WiMAX)
LTE				✓				✓	
TETRA					✓			✓	
GPS / Galileo							✓		
Extensions									
MIMO Technology			✓	✓					
Distributed Antenna Systems			✓	✓	✓	✓		✓	Multiple antennas radiating the same signal => superposition, etc.
Satellite transmitters	✓	✓					✓		Only if satellite transmitters are supported in propagation scenario
Leaky feeder cables	✓		✓	✓	✓	✓		✓	Only if leaky feeder cables are supported in propagation scenario
Number of transmissions modes	0	No limit	No limit	No limit	No limit	No limit	0	No limit	Multiple transmission modes with individual parameters
Simulator									
Static Network Planning	✓	✓	✓	✓	✓	✓	✓	✓	Interference due to cell load independent from traffic in cells
Dynamic Network Simulation									Only available for WCDMA incl. HSPA (ask for details)
Consideration of Interference									
Downlink: Cell Load (Relative Tx power)			✓	✓	✓	✓			Relative percentage of max. available power used for interference
Uplink: Noise Rise			✓	✓	✓	✓			Can be specified for each cell individually
Definition of location specific interference			✓	✓	✓	✓			Cell load and noise rise defined location depending via clutter classes
Consideration of polarization for interference			✓	✓	✓	✓			Different linear polarizations of signals influence interference
Interference due to multi path propagation		✓							Only possible in combination with ray-optical propagation model
Adjacent Channel Interference			(✓)	(✓)	(✓)	(✓)			Will be available in Q4-2011

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Network Planning: Air Interface Packages (Page 2/2)

Product		Network Planning Package (Air Interface)								Description
		NET-B	NET-D	NET-L	NET-O	NET-T	NET-C	NET-G	NET-E	
Simulation Modes										
Simulation of horizontal grids on multiple heights		✓	✓	✓	✓	✓	✓	✓	✓	One height (all scenarios) or multiple heights (only indoor scenarios)
CNP simulation (outdoor & multiple indoor heights)		✓	✓	✓	✓	✓	✓	✓	✓	CNP urban/indoor simulations (requires PRO-C)
Point to Multi-Point Mode				✓	✓	✓	✓			Simulations for individual points
Time-variant scenarios										Network Planning not yet available for time-variant scenarios
Predicted Results										
Cell Assignment and Consideration of downlink transmission	Best server / Cell layout	✓	✓	✓	✓	✓	✓	✓		Results are depending on selected algorithm for cell assignment
	Neighbor cell list			✓	✓	✓	✓			Neighbor cell list (based on cell assignment)
	Max. received power	✓	✓	✓	✓	✓	✓	✓		Max. received power in downlink (e.g. used for cell assignment)
	Number received carriers / sites	✓	✓	✓	✓	✓	✓	✓		Number of received carriers / sites /cells in cell assignment
	Superposition of carriers	✓	✓							Superposition of identical carriers (power sum (uncorrelated))
	SNIR	✓	✓							SNIR for each carrier and for best server at each pixel
	Soft / Softer handover regions						✓			Type of handover (hard, soft, softer) incl. size of active set
	Exposure & Superposition								✓	EMC exposure, superposition of all carriers in freq. band,…
Downlink & Uplink trans-mission modes	Min. required Tx power			✓	✓	✓	✓			Min. required MS and BS Tx power required for transmission mode
	Max. received Rx power			✓	✓	✓	✓			Max. received MS and BS Rx power required for transmission mode
	SNIR (Downlink)			✓	✓	✓	✓			Max. available SNIR for transmission mode (in downlink)
	Reception probability (DL)			✓	✓	✓	✓			Percentage for coverage incl. fast fading (Rayleigh fading).
For all trans-mission modes	Nr. of MIMO streams (DL, UL)			✓	✓	✓	✓			Number of received MIMO streams (in MIMO networks)
	Throughput / Bit Rates (DL,UL)			✓	✓	✓	✓			Highest achievable bit rates available for pixel (downlink, uplink)
Definition of Mobile Stations (MS) / User Equipment (UE) / Subscriber Stations										
Antenna Pattern										Individual antenna pattern for each MS (only in point-to-multipoint)
MS properties for each transmission mode		same	same	individ.	individ.	individ.	individ.	same	-	Same or individual MS properties for each transmission mode
Definition of Base Stations (BS) / Access Points / Satellites / Cells										
Number of carriers to be assigned to a cell		No limit	No limit	No limit	No limit	No limit	1	1	No limit	Nr of carriers influences nr of radio links. No carrier assignment.
Noise figure / Cable losses / etc.			✓	✓	✓	✓	✓		✓	Default for all BS in network or individual for each BS
Price										
Category (Credits)		◇	◇◇	◇◇	◇◇◇	◇◇	◇◇◇	◇	◇	

Product	Description	Required Modules	Category (Credits)
ConMan	**Connectivity Simulator for MESH and sensor networks** Based on propagation predictions (with one of the PRO modules). Computes the connectivity between the nodes and displays signal levels and delays.	Arbitrary PRO module	◇◇
MobileMan	**Evaluation of prediction results including the antenna pattern at the mobile station** Based on propagation predictions (with one of the PRO modules). The user can specify the antenna pattern of the mobile station (incl. elevation and azimuth) and a trajectory for the movement of the mobile station. The antenna pattern will be rotated in azimuth according to the trajectory. MobileMan computes the signal level along the trajectory and applies the antenna pattern to all rays (multiple propagation paths) received at the selected locations.	Arbitrary PRO module	•
MIMOMan	**Signal evaluation for MIMO systems** Based on propagation predictions (with one of the PRO modules). The user can specify the MIMO antennas at the base station and at the mobile station (incl. azimuth and elevation). Different n x m MIMO antennas (linear antenna arrays, separation of antennas, orientation of antennas, etc.) can be defined. A trajectory for the mobile station can be defined to simulate the movement in a scenario. MIMOMan computes the signal level along the trajectory and applies the antenna pattern to all rays (multiple propagation paths) received at the selected locations.	Arbitrary PRO module	••
MASC	**Multiple Antenna Scenario Configuration** Computation of the combined antenna pattern for multiple antennas mounted at a tower or in front of a wall. Phase shifters for each antennas as well as power splitters can be defined. The material properties of tower, wall, and mounting elements can be defined. Computation includes reflected rays (at tower and wall) and the transmission losses due to mounting elements and radoms.	AMan	•
StreetMan	**Definition of roads and streets** GUI to define streets and roads with multiple lanes and guardrails. Convenient definition of curves, etc. Export in vector data format to import the scenarios into WallMan (for further processing).	WallMan	•
SiMan	**Simulation of multiple cars in time-variant scenarios** GUI for simulation of scenarios with multiple cars and non-stationary transmitters and receivers. Substitution of complex cars with (multiple) RCS objects (RCS = bistatic radar cross sections). Computation of signal levels and delays (spatial channel impulse responses) incl. Doppler shift for each ray. Computation based on 3D Standard Ray Tracing and Fresnel coefficients (for reflection/transmission) and GTD/UTD (for diffractions).		••