Cellular Expert Radio Links module features

Tasks	Features
Network data management	Site, sector, construction, customer, repeater management: • Add • Edit • Move • Copy • Delete • Site re-use patterns for nominal planning
Point-to-point analysis	Free space path loss: ITU-R P.525-2 Fresnel zone ellipsoids: ITU-R P.526-11 Path clearance: ITU-R P.530-13 Specific attenuation: ITU-R P.676-8 using input from ITU-R P.837-5, ITU-R P.838-3 and ITU-R P.839-3 Rain attenuation: ITU-R P.530-13 Diffraction algorithms: Single knife-edge (ITU-R P.526-11) Deygout (ITU-R P.526-11) Average (ITU-R P.530-13) Path loss models: Line-of-sight Hata Diffraction Macro Adaptive SUI Reflection analysis Multipath analysis Anti-correlation analysis Antenna height optimization Reporting

Radio equipment data management	Antenna, feeders, combiners, modulation performance tables, carriers, radios, spectrum masks management: • Add • Edit • Copy • Delete • Create/Edit antenna pattern • Vertical antenna pattern every 1° • Horizontal antenna pattern every 1° • 3D pattern creation, display, export • Import/Export of antennas Parabolic and sector antenna editors: • Tabular radiation pattern representation with inplace editing • Graphical radiation pattern representation in linear and logarithmic scales • Modulation performance editor • Tabular and graphical representations of the BER vs. signal-to-noise ratio dependencies, approximation by formula • Defined curves for BPSK, QPSK, DQPSK, M-FSK, M-QAM modulations • Carriers list editor • Frequency plans for simplex and duplex channels • Tabular and graphical representations of frequency carriers • Spectrum mask editor • Spectrum density mask editing • Automatic mask generation for predefined bandwidth • Tabular and graphical representations of spectrum masks • MIMO configuration
Radio link management	Creating Editing Deleting Visualization
Radio link budget analysis	Point-to-point systems radio relay lines Point-to-multipoint systems: • Fixed WiMAX • LMDS • MMDS • WLL
Radio link performance analysis	ITU-T G.821 recommendation targets Parameters: ESR, SESR, unavailable time ratio; Local grade portion (ITU-R F.697-2) Medium grade portion (ITU-R F.696-2) High grade portion (ITU-R F.557-4) ITU-T G.826 recommendation targets Parameters: ESR, SESR, BBER

	National portion (ITU-R F.1189-1): • Access network • Short haul network • Long haul network International portion (ITU-R F.1092-1): • Terminating countries • Intermediate countries ITU-T G.827 recommendation targets Parameters: UATR
Radio Links Interference Analysis	• Interference level prediction • Net filter discrimination • C/I protection ratios for co- and adjacent-channels • Fade margin loss objectives
Automatic Radio Link Frequency Planning	Selects the minimum number of carriers required to serve selected radio links within given interference threshold
Prediction Model tuning	Evaluation of prediction accuracy Hata model: • 9999 model parameters adjustment • Macro model parameters adjustment • Clutter loss offset determination for each type of clutter Walfish – Ikegami model tuning SUI model tuning Line of sight model: • One slope model tuning • Dual slope model tuning
Propagation Models: HATA	Basic algorithm: Okumura-Hata equitation Type: Point-to-multipoint Frequency: ~ 150 MHz - 2 GHz Distance: up to 100 km Hata Model Parameters: • Standard (ETR 364, COST 231 and ITU-R P.529-3) • Macro Model • 9999 Model (Ericsson) Effective Antenna Height methods: • Absolute • Profile • Average

	• Relative • Slope Diffraction • Single knife-edge (ITU-R P.526-11) • Deygout (ITU-R P.526-11) • Spherical Earth (ITU-R P.526-11) • Average (ITU-R P.530-13)
Line of Sight	Basic algorithm: ITU-R P.452-14 Type: Point-to-point and Point-to-multipoint Frequency: about 700 MHz - 40 GHz Distance: up to 100 - 150 km Percentage of Time: 0.001 to 50. Specific attenuation: ITU-R P.676-8 using input from ITU-R P.837-5, ITU-R P.838-3 and ITU-R P.839-3. Diffraction: Deygout method of ITU-R P.526-11 Rain attenuation: ITU-R P.530-13
Walfish-Ikegami	Basic algorithm: COST 231 Model (ETR 364, COST 231 Final Report) Type: Point-to-area (multipoint) Frequency: about 800 MHz - 2 GHz Distance: up to 5 km
SUI	Basic algorithm: IEEE 802.16 Type: Point-to-area (multipoint) Frequency: about 2 GHz - 5 GHz Distance: up to 70 km
Best Server calculation	N^{th} best servers coverage, number of servers coverage N^{th} best servers field strength coverage
Prediction Model tuning	Evaluation of prediction accuracy Hata model: • 9999 model parameters adjustment • Macro model parameters adjustment • Clutter loss offset determination for each type of clutter Walfish – Ikegami model tuning SUI model tuning Line of sight model: • One slope model tuning • Dual slope model tuning
Automation	• Automated task processing • Parallel calculations on multicore processors

Visibility calculation	Line of Sight Path clearance Fresnel zone clearance Minimum antenna height