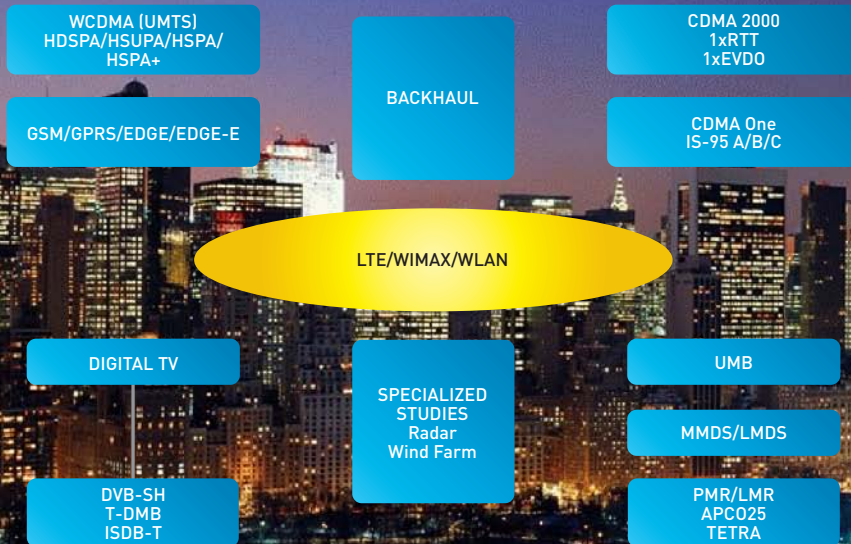


CelPlan Design Solutions



- Providing solutions to the wireless industry since 1992
- Employee owned
- 500+ employees
- Leader in 3G / 4G designs and solutions
- Innovative software applications and value added consultancy.
- Published technical experience and methodologies
- Highly experienced staff
- Hundreds of implemented designs
- Headquarters in Reston, VA, USA
- Other global offices in North America, South America, Europe, Africa and Middle East

Universal Integrated Wireless Planning, Optimization and Performance Software

Built-in GIS Capabilities

- ◆ Simultaneous use of multi-resolution databases for topography and morphology
- ◆ 2D and 3D visualization over tool accessed web satellite imagery
- ◆ Unique site visit feature, providing 360° view with antenna tilt consideration

Superior RF Predictions

- ◆ Includes traditional and advanced propagation models with fractional morphology consideration along the path
- ◆ Superior propagation models including Korowajczuk 2D and 3D
- ◆ Simultaneous predictions for multiple receiver heights

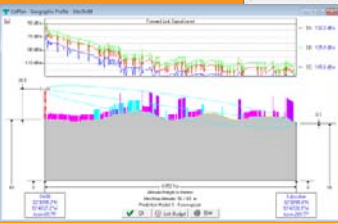
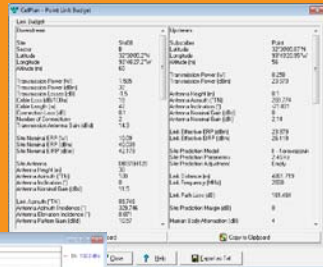
Detailed Multi-Technology Emulation

- ◆ Adaptive Modulation and Coding Schemes
- ◆ MIMO for different antenna correlations
- ◆ Unique fading prediction per pixel
- ◆ SNIR margin per pixel according to predicted fading and BER



CelPlan has rapidly established itself as an innovative leader in providing the most advanced engineering solutions for the wireless industry. CelPlan brings a powerful and sophisticated portfolio of engineering capabilities to bear on the design and development of 3G and 4G networks

GSM/GPRS/EDGE/EDGE-E



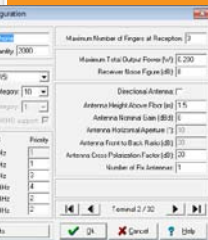
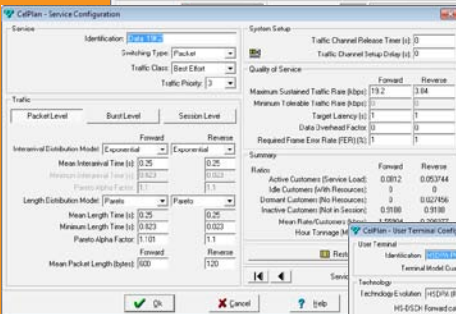
WCDMA (UMTS)/ HDSPA/HSUPA/ HSPA/ HSPA+

CellPlan - Link Quality

DOH	SF	Max DVSF Codes	Max DVSF Codes per UE	QoS Scheme	Mod Bits/Symb	Mod Bits/Symb	Effective Coding Rate	PHY bit rate (kbps)	PHY bit rate max DVSF (kbps)	MAC data rate (kbps)	MAC data rate max DVSF (kbps)	Max TB bits per 10 ms
DOH3.4	512	496	1	1	QPSK	2	0.227	15	15	3.4	3.4	34
DOH3.8	256	240	1	1	QPSK	2	0.227	30	30	6.8	6.8	68
DOH12.2	128	124	1	1	QPSK	2	0.203	60	60	12.2	12.2	122
DOH28.8	64	62	1	1	QPSK	2	0.24	120	120	24.8	24.8	248
DOH32	64	62	1	1	QPSK	2	0.267	120	120	32	32	320
DOH37.6	32	31	1	1	QPSK	2	0.24	240	240	37.6	37.6	376
DOH64	32	31	1	1	QPSK	2	0.267	240	240	64	64	640
DOH128	16	15	1	1	QPSK	2	0.267	480	480	128	128	1280
DOH144	16	15	1	1	QPSK	2	0.3	480	480	144	144	1440
DOH384	8	7	1	1	QPSK	2	0.4	960	960	384	384	3840
DOH768	4	3	1	1	QPSK	2	0.4	1920	1920	768	768	7680
DOH1536	4	3	1	1	QPSK	2	0.4	1920	1920	1536	1536	15360
DOH2304	4	3	1	1	QPSK	2	0.4	1920	1920	3072	3072	30720

CellPlan - Service Class

Class	Identification	Service	Terminal	Environment	Traffic	Traffic Profile	Scaling Factor	Subscribers	Service	Color
1	Voice Outdoor	Voice 3C	UMTS Phone	Outdoor	3	1	1.000	1000	30.000	
2	Voice In-Car	Voice 3C	UMTS Phone	In-Car	3	1	0.001	2000	63.000	
3	Data 128 kbit/s	Data 128k	UMTS PDA	In-Car	3	1	0.001	500	60.0	
4	Data 384 kbit/s	Data 384k	UMTS PC	Indoor	3	1	0.001	1000	40	
5	Data 768 kbit/s	Data 768k	UMTS PC	Indoor	3	1	0.001	500	40	
6	Data 1536 kbit/s	Data 1536k	UMTS PDA	Indoor	3	1	0.001	500	40	
7	Data 1536 kbit/s	Data 1536k	UMTS PC	Indoor	3	1	0.001	500	40	
8	Class 8	Service 8	Terminal 8	Environment 8	3	1	0	0	0	
9	Class 9	Service 9	Terminal 9	Environment 9	3	1	0	0	0	
10	Class 10	Service 10	Terminal 10	Environment 10	3	1	0	0	0	
11	Class 11	Service 11	Terminal 11	Environment 11	3	1	0	0	0	
12	Class 12	Service 12	Terminal 12	Environment 12	3	1	0	0	0	
13	Class 13	Service 13	Terminal 13	Environment 13	3	1	0	0	0	
14	Class 14	Service 14	Terminal 14	Environment 14	3	1	0	0	0	
15	Class 15	Service 15	Terminal 15	Environment 15	3	1	0	0	0	
16	Class 16	Service 16	Terminal 16	Environment 16	3	1	0	0	0	
					Total			7000	225.00	



Automatic Cell Planning And Location

- Automatic cell location based on traffic, backhaul, cost and ROI

Cell Footprint Enhancement

- Footprint optimization considers interference, traffic and handoff constraints
- Optimization based in adjustments of antenna type, height, azimuth, tilt, and transmit power level.

Cell Resource Optimization

- Automated optimization of neighbor list, handover threshold/hysteresis, frequency channels and resource codes

Network Performance Evaluation

- Calculation of area and traffic KPIs per service class
- Comparison of SLAs and KPIs

Advanced Backhaul Design

- Integrated solution with planning tool
- Complies to latest ITU specifications

Stand Alone and Enterprise Solution

- Flexible solution allows for stand-alone usage or integration with enterprise RDBs
- Multiple Processors multi-threading

Self Organizing Network Capability (SON)

- Solution Customizable for SON applications

Unrivalled R&D Capability

- In-depth technology knowledge
- Extensive research for tool specifications published in technical books

GSM/GPRS/EDGE/EDGE-E

- Multiple Band Networks
- Channel, HSN, MAIO, MAL planning
- Hierarchical Cell Structure
- QoS Performance
- Frequency hopping
- Unique Dynamic Traffic Simulation
- DTX, AMR
- Multi-layer outage based Interference Matrix

WCDMA (UMTS)/HDSPA/HSUPA/HSPA/HSPA+

- Multi band and multi carrier support
- Supports all releases from R99
- Multi service class modeling (voice and data)
- Automatic footprint planning
- User profiles
- Unique dynamic traffic simulation
- User Terminal
- RRM emulation
- Environment
- Scheduler emulation
- Multi height traffic distribution
- Detailed traffic simulation statistics
- Detailed Service specification
- TD-SCDMA
- Eb/No per data rate, fading type and BLER

LTE

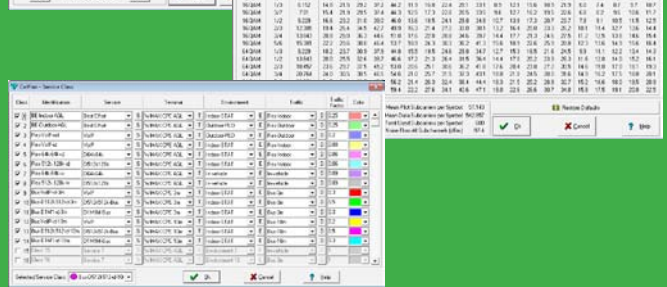
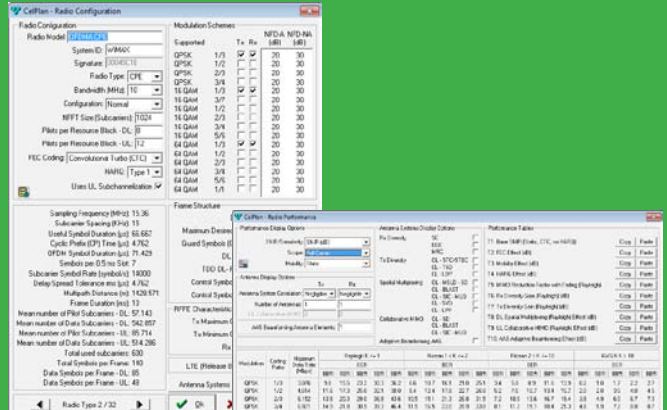
- ◆ OFDMA (DL) SC-FDMA (UL)
- ◆ TDD and FDD
- ◆ SU-MIMO, MU-MIMO, AMS
- ◆ Detailed data traffic characterization
 - ◆ Traffic per terminal type and application
- ◆ Unique dynamic traffic simulation
 - ◆ RRM emulation
 - ◆ Scheduler emulation
- ◆ Detailed traffic simulation statistics
- ◆ Key Performance Indicators per class
- ◆ Fractional frequency reuse planning
- ◆ Subscriber database and simulation
- ◆ Multi-height raster traffic per service class
- ◆ SNIR margin per pixel according to fading and BER

CDMA One/CDMA2000 1-xRTT/1xEVDO

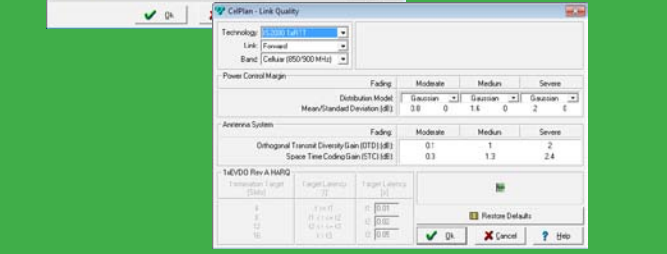
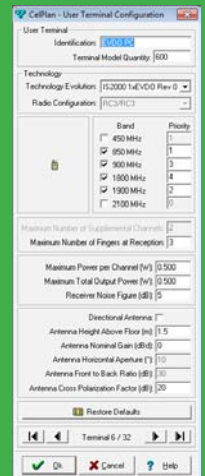
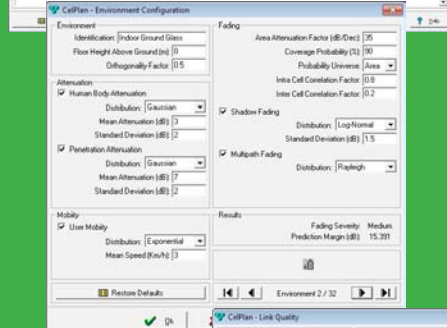
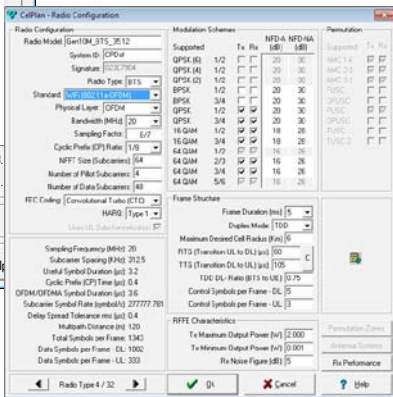
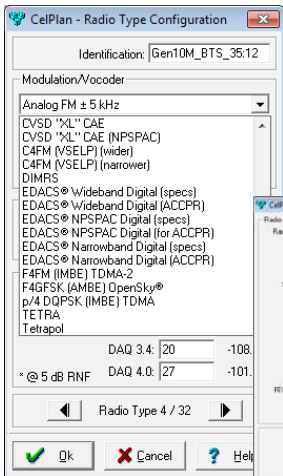
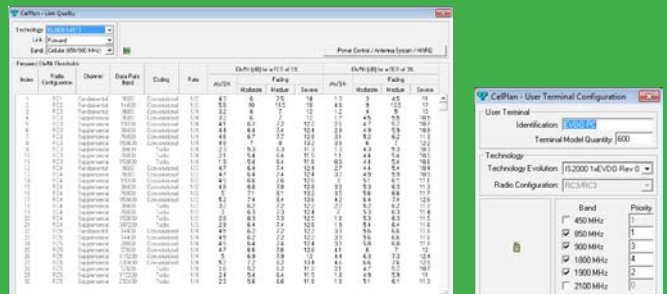
- ◆ IS-95, IS-2000 1xRTT
- ◆ IS-2000 EVDO Rev 0/A/B
- ◆ TD-SCDMA
- ◆ Multicarrier and Multiband operation
- ◆ Multiple radio configurations
- ◆ Multi technology planning
- ◆ Voice and several data traffic classes
- ◆ User simulation
 - ◆ Indoor
 - ◆ Outdoor
 - ◆ Multiple heights
- ◆ Unique dynamic traffic simulation
 - ◆ RRM emulation
 - ◆ Scheduler emulation
- ◆ Neighbor and PN-offset planning
- ◆ Automatic footprint enhancement

WLAN

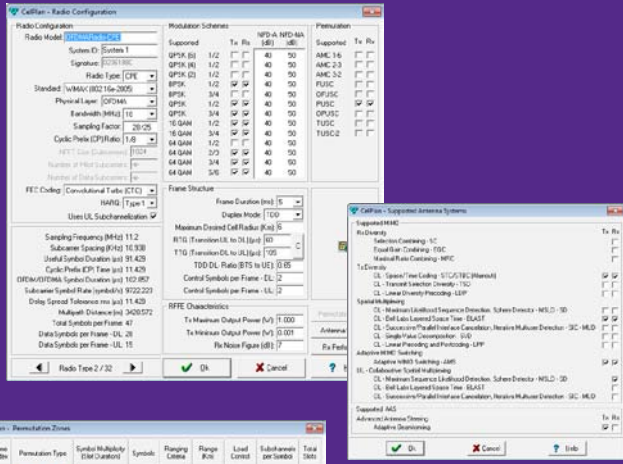
- ◆ Wi-Fi support
- ◆ General OFDM module



CDMA One/CDMA2000 1-xRTT/1xEVDO

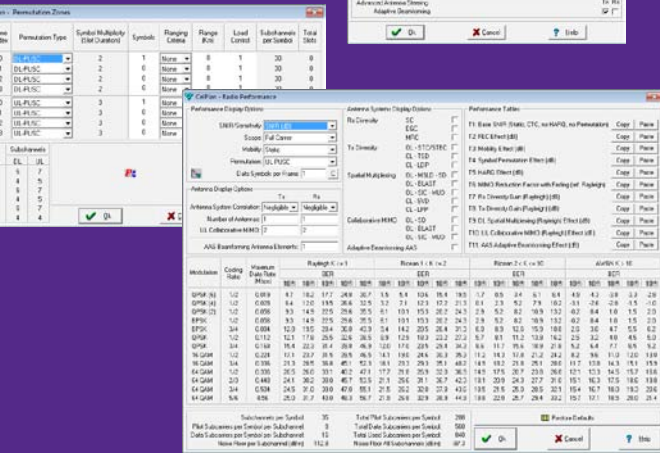


WIMAX



WIMAX

- ◆ OFDM (802.16d), OFDMA (802.16e)
- ◆ 1.75, 3.5, 5, 7, 8, 8.75, 10, 14, 15, 20 MHz
- ◆ Permutation support: PUSC, FUSC, OPUSC,
- ◆ OFUSC, TUSC, AMC
- ◆ Fractional reuse through Zone support
- ◆ All MIMO schemes supported
- ◆ Radio Performance considers
 - ◆ Multiple modulations and FEC
 - ◆ Mobility
 - ◆ Symbol permutations schemes
 - ◆ HARQ
- ◆ Fading calculation per pixel
- ◆ BER required per service
- ◆ Latency required per service
- ◆ MIMO
 - ◆ Spatial multiplexing
 - ◆ RX/ TX diversity (Alamouti)
 - ◆ UL collaborative MIMO
 - ◆ Beam-forming (AAS)
- ◆ KPI calculations (area and traffic)
- ◆ More than 20 performance predictions



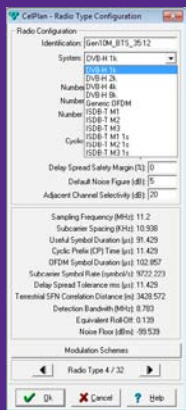
PMR/LMR

- ◆ More than 20 radio types supported (APCO25, TETRA)
- ◆ Interference analysis and optimization

MMDS/LMDS

- ◆ Regulatory footprint analysis
- ◆ Maximum height analysis

PMR/LMR



Digital TV

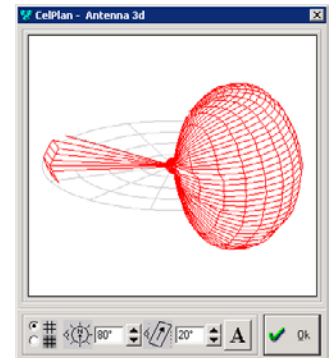
- ◆ S- DVBH
- ◆ ISDB

Backhaul

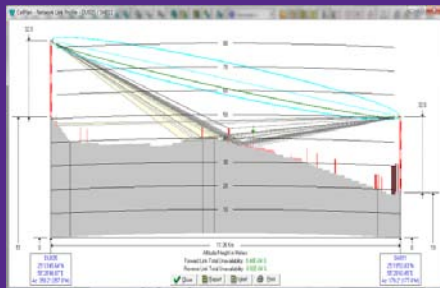
- ◆ Updated to the latest ITU standards
- ◆ Fully integrated with cellular networks

Specialized Studies

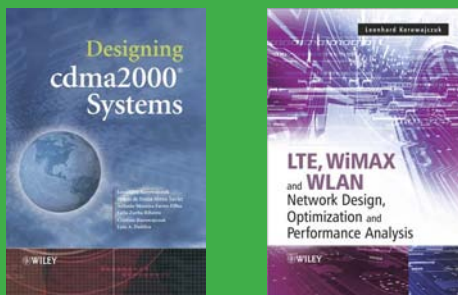
- ◆ Radar studies
- ◆ Wind Farm interference
- ◆ R&D in general
- ◆ Airport RF interference
- ◆ Airplane coverage from ground



MMDS/LMDS



Published Books



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