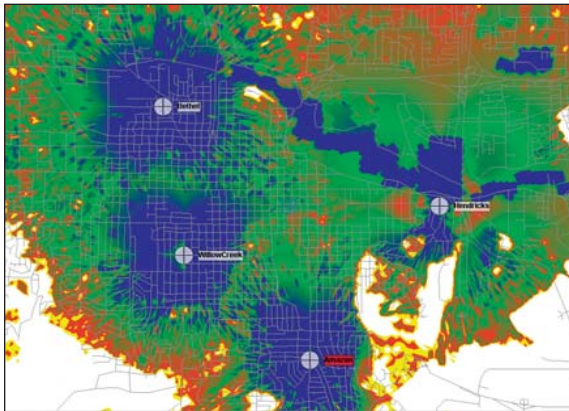


The power of smart planning

EDX® SignalPro® is the principal building block of EDX's comprehensive line of wireless network engineering tools. It offers all of the study types you need to design a basic wireless network, including area studies, link/point-to-point studies and route studies. EDX SignalPro also incorporates the finest telecom-specific mapping features, meticulous equipment data storage capabilities and convenient utility functions.

Basic EDX SignalPro can be extended to become a carrier-class, network design tool by attaching the EDX network design and indoor modules, specialized query toolkits and data management products. This building block approach gives you the ability to create the right tool for your specific needs – putting the Power of Planning to work for you.



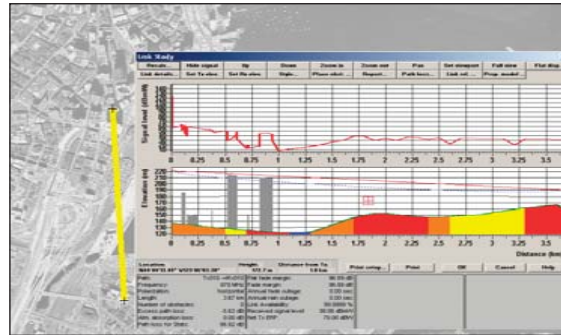
Area Study calculated with physical/deterministic propagation model

Studies

Propagation Models

EDX SignalPro is a rigorous wireless network engineering tool. At the core of the tool, you'll find a comprehensive set of RF propagation prediction models, appropriate for systems from 30 MHz to 60 GHz. EDX SignalPro lets you select from an extensive set of over 20 published propagation models, customize the coefficients of selected empirical models, or create your own proprietary propagation models with an external dynamic link library. All models have adjustable environmental and reliability parameters. Further, you can select a unique model for every base station sector in your study, or use a single model for the entire study. Additional model options are available in EDX's Add-On Modules and via connectivity to integrated tools such as Siradel's VolcanoLAB.

For refined accuracy, the physical/deterministic models can consider the attenuation and height values of underlying clutter databases at the receive location or at each study point.



Point-to-Point Link Study showing buildings and clutter types

Area/Coverage Studies

A comprehensive selection of over 18 area study types:

- Shadowing/Line of Sight
- Path Loss
- Field Strength
- Received Power
- Downlink Signal Levels
- Uplink Signal Levels
- TIA TSB-88 Reliability
- C/(I+N) & Aggregate C/(I+N)
- Group-To-Group Interference
- Bit Error Rate
- Percent Service Availability
- Number of Available Servers
- Simulcast Delay Spread
- Height Required For LoS

Additional studies are found in the Network Design Module.

Unmatched Area Study Capabilities

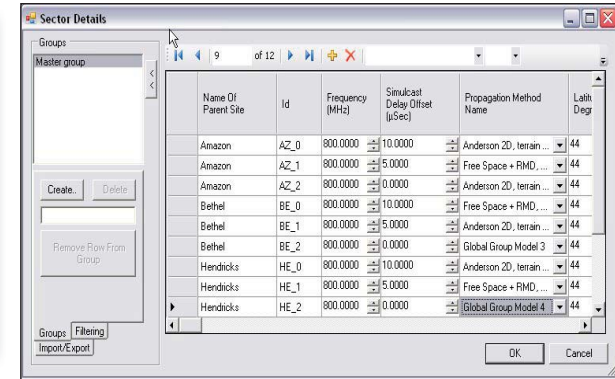
For any EDX project, you can set up as many area studies as you like - each based on unique parameters and considering the same or different transmitter Groups. With the click of one button, EDX SignalPro will simultaneously calculate all studies. Easy mapping controls then allow you to view one at a time, layered together with transparencies, or tiled/cascaded on your monitor. For Boolean "and/or" comparisons of two existing studies, "Hybrid" studies assist you in customizing area studies for your unique needs.

Full Point-to-Point Path Analysis

Calculate a full microwave path analysis including path profile, rain/fade outages, percent availability, dispersive fade margin, antenna diversity reception, and cross-link interference. All links are bi-directional, and provide plots to show sensitivity for variation in the k-factor. You can edit your link on the path profile display -- add trees, buildings, or terrain modifications, and an interactive view displays real time link analysis as antenna heights are changed.

Route Studies

Use a route study to calculate and store detailed propagation properties along a 2D or 3D route, providing map view and text report information unique to each point of the study, including Most Likely Server, Received Signal Strength, etc. Routes contain a series of specific points that can be easily created with the included EDX drawing tools.



An intuitive interface for managing, grouping and importing/exporting site/sector radio parameters

Features

Intuitive Project Management

The Project Wizard helps you to rapidly set up a project from a selection of system-specific templates. EDX SignalPro will instantly display a map view with relevant GIS data for your chosen area, which can be selected by simply entering a city name.

A project management tree lets you see all the components of your project at a glance. Click on any component of the tree to expand and edit details.

Convenient Equipment Controls

Intuitive toolbar buttons and menus make it easy to add and manage your network equipment. Templates can be set up for convenience and the EDX Vendor Partner's equipment specifications can be accessed by brand name from the available equipment library.

Equipment can be quickly accessed for editing and project grouping with convenient right-click commands or menus. Groups are easy to create manually, by rectangle selection, or with convenient selection filters that include "and/or" searches. Global edits can be made to entire groups or sub-groups for quick changes, or equipment details can be quickly imported/exported to Excel and external databases.

EDX SignalPro gives you the most detailed equipment definition parameters available. Antenna patterns for isotropic, directional and leaky coax are supported with co-polarized and cross-polarized directional transmit and receive antenna considerations. For more accurate interference analysis, you can also describe the Power Spectral Density and receive filters for your equipment. Parameters are flexible enough to accommodate any technology for fixed, nomadic and mobile networks.

Open Software Architecture

Component Object Model (COM) and XML interfaces provide easy ways to import, export, and share transmitter, link, and CPE details with other applications. This also provides for external control of the tool beyond the included GUI, customizing EDX SignalPro for your specific needs.

For collaborative engineering design teams, EDX SignalPro includes advanced import/export capabilities for sharing repository data over a network, including connectivity to databases such as Oracle[®].

Link “Rubber Band” to Server

Link server lines show dynamic “rubber band” connections to 1st, 2nd, & 3rd most likely servers as you move the mouse in area studies.

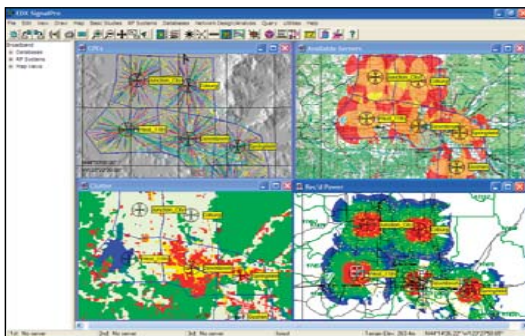
Comparisons of Measured and Predicted Signal Levels

Drive test data can be imported, displayed, and used to tune sector-specific models. You can also get the most value from your database investments with EDX SignalPro by using measurement data to adjust the attenuation values of your underlying clutter databases for location-specific accuracy. Adjustments can be sector-specific.

Database Support

Open, flexible format compatibility makes it easy to use data from many sources, thereby giving you maximum control of your database investment - including quality and cost.

Mapping



EDX SignalPro multiple map views of area-wide, point-to-multipoint studies and project directory tree

Multiple Map Display

Multiple map views conveniently show your project studies and GIS map data simultaneously. Views can also be saved as common image files such as KML, KMZ, JPG, BMP, GIF, TIF and others.

Customizable Status Bar

A customizable status bar allows you to control the dynamic information you want to view. It can include study results, terrain elevation, building height, and clutter category.

Map Display

Display the equipment on your map view with options such as cell range, directional antenna beam width and traffic loading. Include a constant floating image on your map view, such as your company logo. Easy undo & redo functions allow you to view previous map views. Windows[®] standard navigation commands give you intuitive control for panning, zooming and accessing right-click commands/menus.

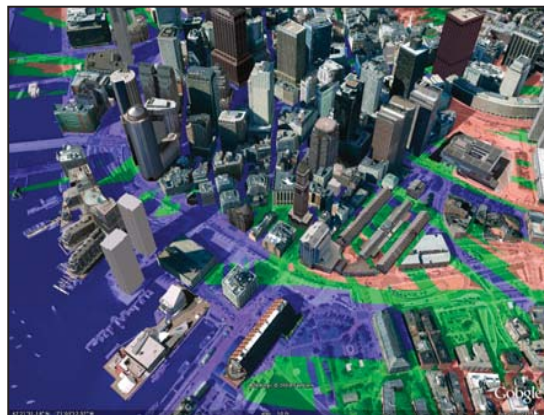
Utilities

Efficient Calculations

EDX tools support multithreading for multiprocessor PCs when using the physical/deterministic propagation models. Multiprocessor gains are also utilized for creating area study grids. Further, you can easily recalculate and redisplay all project studies with a single mouse click. This feature is ideal for assessing the total impact of a changed system parameter on all aspects of the system analysis.

Easy to Integrate with Other Mapping Tools

If you use Google[™] Earth, MapInfo[®] or Arc View[®], EDX SignalPro can automatically generate study results in a compatible format, such as KML, KMZ, MIG, MID/MIF or SHP/DBF. Map views can also be exported as Geo-coded TAB/TIF files. Further, EDX SignalPro imports MIF/MID and ArcView[®] DBF/ SHP files as map layers. Key attributes of the included equipment are accessible within Google Earth, giving the ability to drill down to details for more powerful data sharing.



Received Power Study displayed in 3D in Google Earth

Clutter Use for Fast 3D Modeling

EDX SignalPro provides an innovative way to effectively model a 3D environment. A Clutter Carving[™] technique is used to provide a realistic description of the street canyon propagation environment in which the network operates. The technique provides network designers with the ability to build a reasonable location-specific model of the environment without purchasing building/structure databases. Just a few simple steps:

- Add relevant height values of terrain, based on underlying clutter categories
- Overlay the resulting 3D clutter model with GIS data, such as streets/major roads/highways/interstates
- Assign the width of the “carve”, specific to each GIS category. The GIS data “carves” into the 3D model, back to the terrain height accordingly.

Query Capabilities

Extensive abilities to query your project include query libraries accessible by other applications as well as the ability to right-click on any point to view multiple layers of propagation analysis and GIS information. You can also select entire areas for query analysis.

Utility Functions

Utility functions are easily accessible for coordinate conversion, distance and bearing calculations, ERP calculations, intermodulation calculations and creating and plotting antenna patterns. Address matching to geographic coordinates is available.

Modules

Make EDX SignalPro Even More Powerful

Add on to EDX SignalPro with specialized modules and toolkits that add even more powerful functionality for design and optimization of your wireless network including:

- **Network Design Module** – ideal for carrier class networks
- **SignalMX[®] Module** - ideal for mesh networks
- **Microcell/Indoor Module** – a unique tool for indoor & outdoor – includes ray-tracing
- **SignalProof[™]** – a web enabled toolkit to automate subscriber pre-qualification
- **Building Editor** – making it easy to manage building databases



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The Network Design Module, an add-on module to EDX® SignalPro®, gives you a feature-rich, carrier-class, wireless network planning tool. It is ideal for all stages of network design – from initial deployment through network maturity, with special emphasis on automatic processes, traffic, and interference considerations.

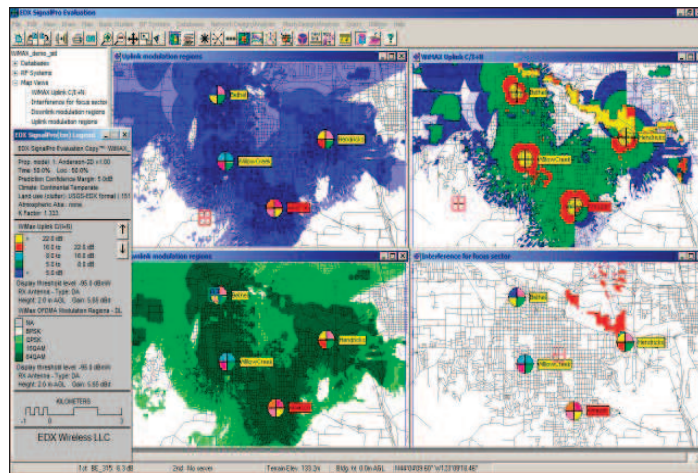
Included in the Network Design Module is a specific feature set for designing WiMAX Systems. The Network Design Module also includes specific feature sets for LTE Systems, other Mobile and Nomadic Systems, Multipoint Systems and WCDMA/UMTS Systems. This document only covers the features that are specific to WiMAX systems.

Studies

Specialized Area-Wide Studies

In addition to the basic studies in EDX SignalPro, the Network Design Module offers technology-specific studies for mobile and nomadic systems:

- C/(I+N) Ratio Using Channel Assignments
- Uplink & Downlink Adaptive Modulation Data Rate
- Uplink & Downlink WiMAX OFDMA Modulation Regions
- WiMAX Uplink C/(I+N)
- WiMAX C/(I+N) Areas for Focus Sector, Activity Based
- Second Most Likely Server
- Handoff Regions



WiMAX modulation maps and related interference studies

User-Defined Area Studies

In addition to the simple Hybrid Studies found in basic EDX SignalPro, you can design your own area study analysis via an external DLL using a customized or proprietary study algorithm. This advanced network design feature enables you to tailor the software as needed.

Dynamic System Studies

With the dynamic characteristics of OFDMA systems, it is uniquely challenging to determine if your network plans are rigorous enough to withstand the expected traffic demand on your network. EDX has several approaches to help you evaluate your network designs.

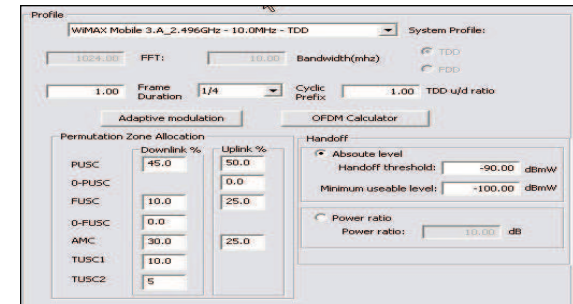
Monte Carlo: To analyze the dynamic performance of WiMAX systems, a Monte Carlo simulation technique helps to determine uplink characteristics of your planned system.

Stochastics: Based on uplink capacity reports generated for each sector, an area study displays the probability of achieving traffic demand at each point in your study grid. Additionally, a received signal versus interference distribution profile is generated that shows you how many study points are interfering at each signal level. This graph shows you how many of the expected grid points are experiencing high interference conditions so that you can model multiple iterations, resulting in a network designed with interference integrity.

Features

System Operating Parameters

A comprehensive set of WiMAX standard profiles templates are included for easy project initialization. In addition, you have full control over system parameters including handoff thresholds, permutation zone allocation, FFT, channel bandwidth, frame duration, cyclic prefix and TDD ratios with uplink and downlink defined separately where appropriate. Designing your system is straightforward, efficient, and intuitive.



Overlay Systems

It is easy to set up and study overlay systems with mixtures of different technologies at each cell sector. With simple right-click commands, sectors can be grouped together and activated/de-activated for traffic planning, frequency planning, and analysis in multi-technology systems. When all the settings are defined, EDX SignalPro can simultaneously calculate and display selected studies for all systems within the project.

Preamble Code Planning

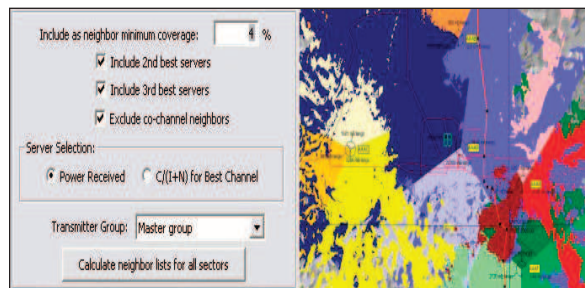
Specific to WiMAX and LTE systems, automatic preamble code planning features assign PN codes to each selected sector, taking into account the potential for interference. Codes can also be put “in reserve” to provide for future network growth.

Automatic Frequency Planning

For WiMAX systems, you can do demand-based automatic frequency planning with included standard channel plan templates or imported channel plans. Select EDX’s simulated annealing algorithm for optimum channel assignments or utilize your own algorithm via an external DLL. There are customizable QoS and capacity objectives, as well as consideration for already locked channel assignments. For complete flexibility and in support of overlaid systems, frequency planning can be done to all sectors, or a selected group of sectors.

Features (cont.)

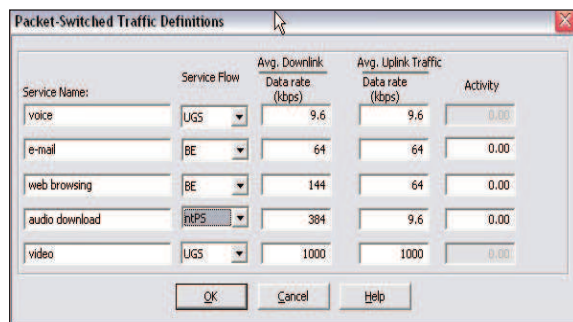
Neighbor list calculations are included based on received power most likely servers (up to the 3rd), best channel most likely server (interference sensitive), channel plans and handoff criteria.



Neighbor list settings

Traffic Loading

Automatically calculate traffic loading on individual sectors based on real service areas and a selection of multiple service types. You can generate a report on sector loading or use the information for channel assignment calculations. For packet-switched traffic distributions, the estimated traffic is based on your definition of multiple service mixes such as voice, e-mail, web browsing, audio streaming, and video streaming. The traffic distribution is weighted on relevant market criteria such as traffic, land use/clutter databases, or by uniform distribution.



MIMO settings for uplink and downlink

MIMO/Adaptive Type	eNodeB/UE antenna config	Downlink Coverage Gain (dB)	Uplink Coverage Gain (dB)	Downlink Interference Reduction (dB)	Uplink Interference Reduction (dB)	Downlink Data Throughput Multiplier	Uplink Data Throughput Multiplier
MIMO-A (Space-Time Coding)	2x1 (MISO)	3.00	3.00	0.00	0.00	1.00	1.00
MIMO-A (Space-Time Coding)	2x2	6.00	6.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	2x2	3.00	3.00	0.00	0.00	1.90	1.00
MIMO-A (Space-Time Coding)	4x2	9.00	3.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	4x2	6.00	3.00	0.00	0.00	1.90	1.00
SDMA/Adaptive (FDD)	4x2	8.00	9.00	10.00	15.00	1.50	2.00
SDMA/Adaptive (TDD)	4x2	9.00	9.00	15.00	15.00	3.00	3.00
MIMO-A (Space-Time Coding)	4x4	12.00	6.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	4x4	6.00	6.00	0.00	0.00	3.80	1.00
SDMA/Adaptive (FDD)	8x1	8.00	9.00	15.00	20.00	1.50	2.00
SDMA/Adaptive (TDD)	8x1	9.00	9.00	20.00	20.00	3.00	3.00
SDMA/Adaptive (FDD)	8x2	11.00	12.00	15.00	20.00	2.00	2.50
SDMA/Adaptive (TDD)	8x2	12.00	12.00	20.00	20.00	4.00	4.00
SDMA/Adaptive (FDD)	Custom	0.00	0.00	0.00	0.00	0.00	0.00
SDMA/Adaptive (TDD)	Custom	0.00	0.00	0.00	0.00	0.00	0.00

WiMAX Capacity Analysis

In order to address capacity analysis for multiple service levels and scheduling techniques, the uplink and downlink capacity analysis considers the following characteristics.

OFDMA adaptive modulation types in use, including required C/I+N, and data rate (user data rate after FEC) for each type

Multiple user profile demands and activity levels, based on average data demand and activity factor percent

RF spectrum bandwidth

FFT size

Cyclic prefix

Frame length

Uplink/downlink ratio

Sub-channelization

Geographic location of users, can be weighted with clutter or demographic data

Adaptive Antennas

EDX's analyses can consider the details of adaptive "smart" antenna C/I ratio improvements for transmitters and receivers using EDX's innovative adaptive antenna Application Programming Interface. Also, a streamlined adaptive antenna function allows easier simulation of smart antennas based on basic operational characteristics such as gain versus primary beam azimuth offset. Spatial Diversity Multiple Access, Space-Time Coding and Spatial Multiplexing systems are supported.

Technologies

OFDMA And MIMO-A/B Settings

EDX SignalPro provides you with flexible and integrated study results for all 4G broadband technologies. Throughout the tool, there is significant attention to interference factors, as reflected in the consideration of adaptive modulation schemes and advanced technology settings.

MIMO technology is supported with straightforward equipment settings that define uplink and downlink characteristics of Space-Time Coding, Spatial Multiplexing and SDMA/Adaptive FDD and TDD. These settings can be applied globally within a study or selected independently for each sector. For the most detailed analysis, the Network Design Module also offers the ability to define the behavior of adaptive antenna algorithms with an API, and the Microcell/Indoor Module includes ray-tracing propagation models that predict multipath conditions.

Supported Technologies

The following technologies are supported in any frequency band:

OFDM/OFDMA (WiMAX, WiBro)
MediaFLO™



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The Network Design Module, an add-on module to EDX® SignalPro®, gives you a feature-rich, carrier-class, wireless network planning tool. It is ideal for all stages of network design – from initial deployment through network maturity, with special emphasis on automatic processes, traffic, and interference considerations.

Included in the Network Design Module is a specific feature set for designing LTE Systems. The Network Design Module also includes specific feature sets for WiMAX Systems, GSM, CDMA-1X, Multipoint Systems and WCDMA/UMTS Systems. This document only covers the features that are specific to LTE systems.

Studies

Specialized Area-Wide Studies

In addition to the basic studies in EDX SignalPro, the Network Design Module offers LTE-specific studies for mobile and nomadic systems:

- Uplink and Downlink C/(I+N) Ratios Using Channel Assignments
- Uplink (SC-FDMA) & Downlink (OFDMA) Adaptive Modulation Data Rate
- Uplink & Downlink LTE Modulation and CQI Regions
- LTE Uplink C/(I+N) using Stochastic and Monte Carlo Simulations
- UE Power when using Power Control
- Fractional Frequency Reuse (FFR) R1/R3 zones
- Inter-Cell and Inter-RAT Handoff Regions

User-Defined Area Studies

In addition to the simple Hybrid Studies found in basic EDX SignalPro, you can design your own area study analysis via an external DLL using a customized or proprietary study algorithm. This advanced network design feature enables you to tailor the software as needed.

Dynamic System Studies

With the dynamic characteristics of OFDMA systems, it is uniquely challenging to determine if your network plans are rigorous enough to withstand the expected traffic demand on your network. EDX has several approaches to help you evaluate your network designs.

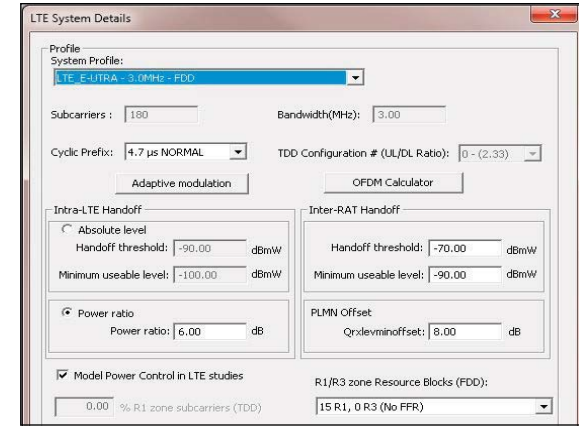
Monte Carlo: To analyze the dynamic performance of LTE systems, a Monte Carlo simulation technique helps to determine uplink characteristics of your planned system based on channel assignments and subscriber traffic loading.

Stochastics: Based on uplink capacity reports generated for each sector, the Stochastics area study displays the probability of achieving traffic demand at each point in your study grid. The predictions are based on the likelihood of the required Resource Blocks having sufficient CQI to support subscriber traffic. Additionally, a received signal versus interference distribution profile is generated that shows you how many study points are interfering at each signal level. This graph shows you how many of the expected grid points are experiencing high interference conditions so that you can model multiple iterations, resulting in a network designed with interference integrity. The uplink interference statistical distribution for each sector obtained from the Stochastics study can be used to determine the predicted uplink interference level for each LTE sector.

Features

System Operating Parameters

A comprehensive set of LTE standard profile templates are included for easy project initialization. In addition, you have full control over system parameters including Intra-LTE and Inter-RAT handoff thresholds, channel bandwidth, cyclic prefix FFR (Fractional Frequency Reuse) and TDD uplink/downlink ratios. Designing your system is easy, efficient, and intuitive.



LTE system profile settings

Overlay Systems

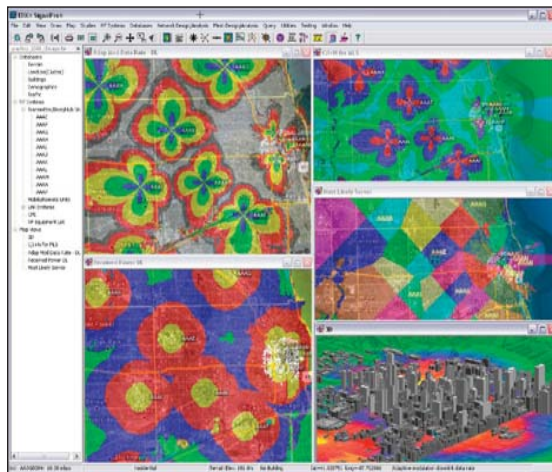
It is easy to set up and study overlay systems with mixtures of different technologies at each cell sector. With easy right-click commands, sectors can be grouped together and activated/de-activated for traffic planning, frequency planning, and analysis in multi-technology systems. EDX SignalPro can simultaneously calculate and display selected studies for all systems within the project.

LTE Cell ID and Cell Group ID Planning

User-programmable Cell ID and Cell Group ID naming conventions provide either automatic or manual assignment while keeping track of previously assigned values and blocked value ranges - making it easy to correlate with other KPI and network measurement evaluative data.

Traffic Loading

Automatically calculate traffic loading on individual sectors based on defined service areas and a selection of multiple service types. You can generate a report on sector loading or use the information for channel assignment calculations. For packet-switched traffic distributions, the estimated traffic is based on your definition of multiple service mixes such as voice, e-mail, web browsing, audio streaming, and video streaming. The traffic distribution is weighted on relevant market criteria such as demographic, traffic, and land use/clutter databases or by uniform distribution.

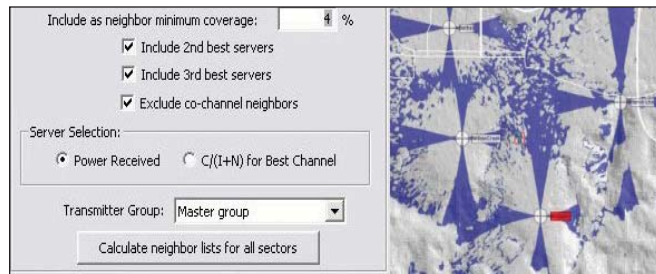


LTE-specific studies simultaneously displayed

Features (cont.)

Neighbor List

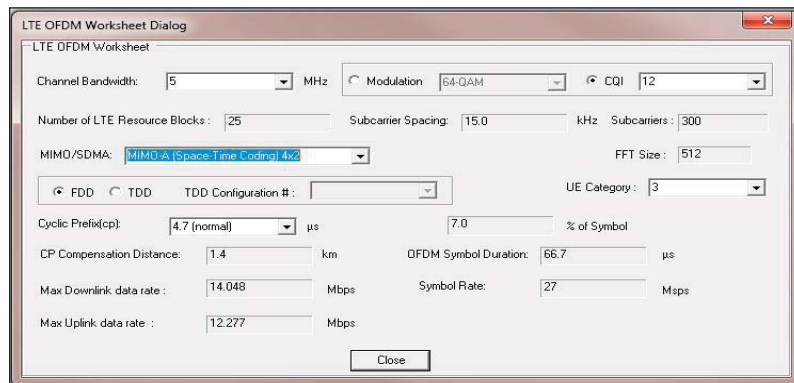
Neighbor list calculations are included and can be based on received power most likely servers or best channel most likely server (interference sensitive).



Neighbor list settings

Automatic Frequency Planning

For LTE systems, you can do demand-based automatic frequency planning with included standard channel plan templates or imported channel plans. Select EDX's simulated annealing algorithm for optimum channel assignments or use your own algorithm via an external DLL. Automatic frequency planning will first assign high traffic demand sectors based on calculated or measured traffic data. There are customizable QoS and capacity objectives, as well as consideration for already locked channel assignments. For complete flexibility and in support of overlaid systems, frequency planning can be done to all sectors, or a selected group of sectors.



MIMO settings for uplink and downlink

MIMO/Adaptive Type	eNodeB/UE antenna config	Downlink Coverage Gain (dB)	Uplink Coverage Gain (dB)	Downlink Interference Reduction (dB)	Uplink Interference Reduction (dB)	Downlink Data Throughput Multiplier	Uplink Data Throughput Multiplier
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MIMO-A (Space-Time Coding)	2x2	6.00	6.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	2x2	3.00	3.00	0.00	0.00	1.90	1.00
MIMO-A (Space-Time Coding)	4x2	9.00	3.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	4x2	6.00	3.00	0.00	0.00	1.90	1.00
SDMA/Adaptive (FDD)	4x2	8.00	9.00	10.00	15.00	1.50	2.00
SDMA/Adaptive (TDD)	4x2	9.00	9.00	15.00	15.00	3.00	3.00
MIMO-A (Space-Time Coding)	4x4	12.00	6.00	0.00	0.00	1.00	1.00
MIMO-B (Spatial Multiplexing)	4x4	6.00	6.00	0.00	0.00	3.80	1.00
SDMA/Adaptive (FDD)	8x1	8.00	9.00	15.00	20.00	1.50	2.00
SDMA/Adaptive (TDD)	8x1	9.00	9.00	20.00	20.00	3.00	3.00
SDMA/Adaptive (FDD)	8x2	11.00	12.00	15.00	20.00	2.00	2.50
SDMA/Adaptive (TDD)	8x2	12.00	12.00	20.00	20.00	4.00	4.00
SDMA/Adaptive (FDD)	Custom	0.00	0.00	0.00	0.00	0.00	0.00
SDMA/Adaptive (TDD)	Custom	0.00	0.00	0.00	0.00	0.00	0.00

LTE Capacity Analysis

In order to address capacity analysis for multiple service levels and scheduling techniques, the uplink and downlink capacity analysis considers the following characteristics.

- OFDMA/SC-FDMA adaptive modulation and coding rates in use, including required C(I+N), and data rate (user data rate after FEC) for each CQI level
- Multiple user profile demands and activity levels, based on average data demand and activity factor percent
- RF spectrum bandwidth
- Cyclic prefix
- TDD and FFR Configurations
- Geographic location of users can be weighted with clutter or demographic data

LTE OFDM Worksheet calculates system performance based on user-specified parameters

Technologies

OFDMA/SC-FDMA and MIMO-A/B Settings

EDX SignalPro provides you with flexible and integrated study results for all 4G broadband technologies. Throughout the tool, there is significant attention to interference factors, as reflected in the consideration of adaptive modulation schemes and advanced technology settings.

MIMO technology is supported with straightforward equipment settings that define uplink and downlink characteristics of Space-Time Coding (MIMO-A), Spatial Multiplexing (MIMO-B) and SDMA Adaptive Antenna Systems (AAS) FDD and TDD. These settings can be applied globally within a study or selected independently for each sector. For the most detailed analysis, the Microcell/Indoor Module includes ray-tracing propagation models for analysis within dense urban areas.



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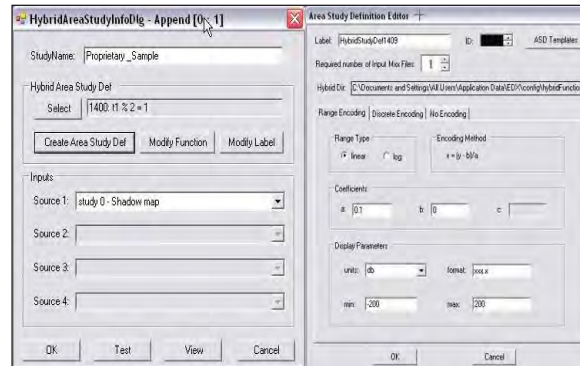
Included in the Network Design Module is a specific feature set for designing Mobile and Nomadic Systems. The Network Design Module also includes specific feature sets for WiMAX/LTE Systems, Multipoint Systems and WCDMA/UMTS Systems. This document only covers the features that are specific to mobile and nomadic systems, including cellular, WiMAX and Wi-Fi.

Studies

Specialized Area-Wide Studies

In addition to the basic studies in EDX SignalPro, the Network Design Module offers technology-specific studies for mobile and nomadic systems:

- C/(I+N) Ratio Using Channel Assignments
- Uplink & Downlink Adaptive Modulation Data Rate
- Uplink & Downlink WiMAX OFDMA Modulation Regions
- WiMAX Uplink C/(I+N)
- WiMAX C/(I+N) Areas for Focus Sector, Activity Based
- Probability of Achieving Traffic Demand
- Second Most Likely Server
- Non-CDMA Handoff Regions
- CDMA Handoffs
- CDMA Best Server Based on Pilot or Traffic
- CDMA Reverse Link BER
- Available Non-CDMA Channels
- Strongest CDMA Pilot Ec/Io
- CDMA Forward/Rev. Link Eb/No
- No. of CDMA Pilots Above T_{add}
- No. of CDMA Mobiles Support for Target Eb/No
- CDMA PN Offset Conflicts
- CDMA Forward/Rev. Link ERP for Target Eb/No
- CDMA Forward/Rev. Link FER
- GSM Worst-case Channel RxQual
- GSM Frame Erasure Rate (FER)
- GSM Bit Error Rate (BER)
- GSM RxLev
- GSM RxQual for Control & Traffic
- AMR Code Rate
- GPRS Block Error Rate (BLER)
- GPRS Maximum Mobile Data Rate
- EDGE Maximum Mobile Data Rate
- IxRTT Maximum Data Rate
- Blocking Rate with Predicted or Measured Traffic



Hybrid Study Settings for Customization

User-Defined Area Studies

In addition to the simple Hybrid Studies found in basic EDX SignalPro, you can design your own area study analysis via an external DLL using a customized or proprietary study algorithm. This advanced network design feature enables you to tailor the software as needed.

Monte Carlo Analysis

A CDMA Monte Carlo analysis helps you determine loading and performance. Random mobile placement is controlled by selected traffic distribution. Loading limits are determined by total mobiles or soft-blocking and disconnect rates. Adaptive antenna descriptions are considered in the analysis.

Features

System Operating Parameters

You have full control over system parameters including handoff thresholds, channel spacing, link band edges, and traffic settings, appropriate for all technologies. Designing your system is straightforward, efficient, and intuitive.

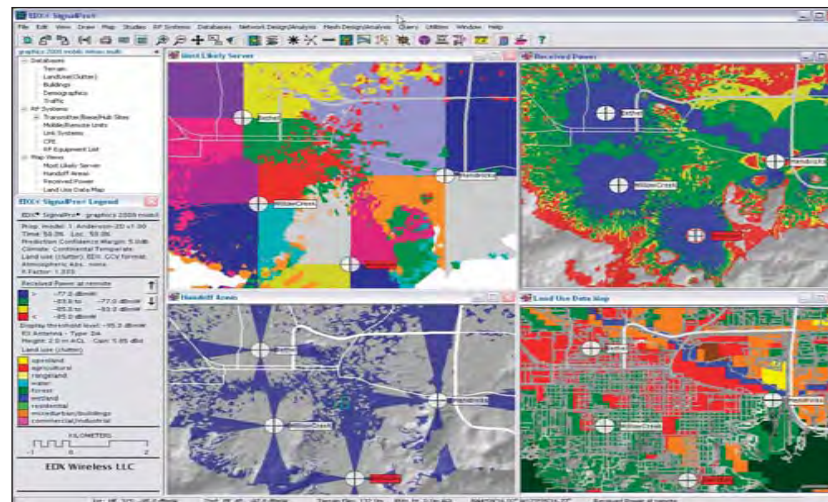
Overlay Systems

It is easy to set up and study overlay systems with mixtures of different technologies at each cell sector. With simple right-click commands, sectors can be grouped together and activated/de-activated for easy traffic planning, frequency planning and analysis in multi-technology systems. When all the settings are defined, EDX SignalPro can simultaneously calculate and display selected studies for all systems within the project.

Automatic Frequency Planning

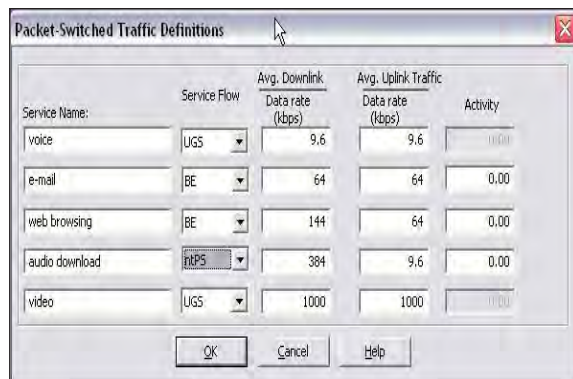
For all mobile and nomadic systems, the Network Design Module offers demand-based automatic frequency planning with included standard channel plan templates or imported channel plans. Select EDX's simulated annealing algorithm for optimum channel assignments or utilize your own algorithm via an external DLL. Automatic frequency planning will first assign high traffic demand sectors based on calculated or measured traffic data.

There are customizable QoS and capacity objectives, as well as consideration for already locked channel assignments. For complete flexibility and in support of overlaid systems, frequency planning can be done to all sectors, or a selected group of sectors.



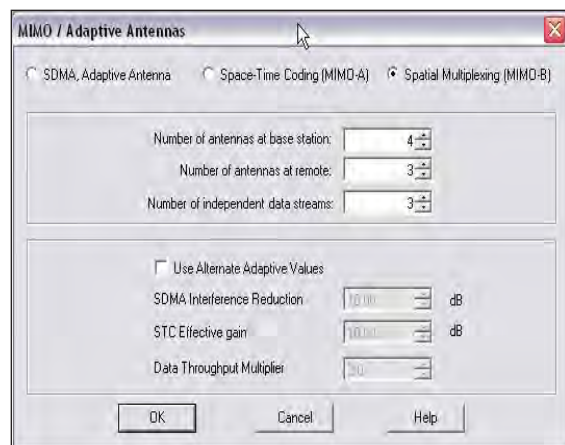
Mobile System Studies (MLS, Received Power and Hand-off) and Land Use Data Map in a Single View

Features (cont.)



Traffic Loading

Automatically calculate traffic loading on individual sectors based on real service areas and a selection of multiple service types. You can generate a report on sector loading or use the information for channel assignment calculations. For packet-switched traffic distributions, the estimated traffic is based on your definition of multiple service mixes such as voice, e-mail, web browsing, audio streaming, and video streaming. The traffic distribution is weighted on relevant market criteria such as demographic, traffic, and land use/clutter databases or by uniform distribution.

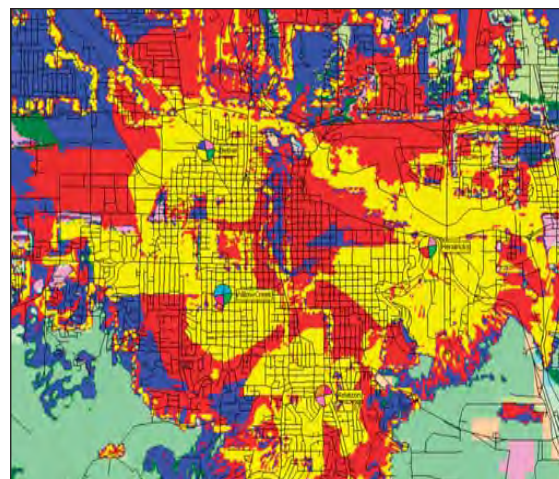


Adaptive Antennas

EDX's analyses can consider the details of adaptive "smart" antenna C/I ratio improvements for transmitters and receivers using EDX's innovative antenna Application Programming Interface. Also, a streamlined adaptive antenna function allows easier simulation of smart antennas based on basic operational characteristics such as gain versus primary beam azimuth offset. Spatial Diversity Multiple Access, Space-Time Coding and Spatial Multiplexing systems are supported.

Propagation Model Tuning

In addition to EDX SignalPro's selection of basic empirical and deterministic/physical propagation models, the Network Design Module includes sector-adjustable models that can be tuned automatically with drive test measurement data or by manual adjustments to existing coefficients. Each sector can be uniquely tuned, and tuned models can be saved and recalled for other sectors. Additionally, each sector can have unique land use/clutter attenuation value settings. Also, point-slope models can be created with drive test data, and an external DLL link provides access to external propagation models.



Adaptive Modulation Type in Use

Neighbor List

Neighbor list calculations are included based on received power most likely server, best channel most likely server, and channel plans.

Technologies

802.XX

EDX SignalPro will provide you with the most refined and integrated study results for all 802.XX technologies. Throughout the tool, there is significant attention to interference factors, as reflected in the consideration of adaptive modulation schemes and advanced technology settings. MIMO is addressed in detail through the consideration of adaptive antennas and ray-tracing propagation models (available in the Microcell/Indoor Module), as well as with straightforward techniques.

CDMA

Model CDMA breathing with the Network Design Module by using the CDMA "based-on-traffic" studies. These specialized studies determine the most likely server from a weighted average of E_b/N_0 and E_c/I_0 . Repeater sectors and donor sectors can be associated and considered in studies dependent on Most Likely Server and the CDMA handoff studies. Comprehensive CDMA PN offset planning makes assignments to avoid co-offset and adjacent offset conflicts using real sector service areas. For CDMA systems, you can accommodate RAKE receivers with user-defined adjustments.

Supported Technologies

The following technologies are supported in any frequency band:

- OFDM/OFDMA (WiMAX, WiBro, LTE)
- MediaFLO™
- TD-SCDMA
- CDMA (IS-95/IXRTT/EV-DO)
- GSM/GPRS/EDGE
- IDEN®



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The power of smart planning

The Network Design Module, an add-on module to EDX® SignalPro®, gives you a feature-rich, carrier-class, wireless network planning tool. It is ideal for all stages of network design – from initial deployment through network maturity, with special emphasis on automatic processes and capacity and interference issues.

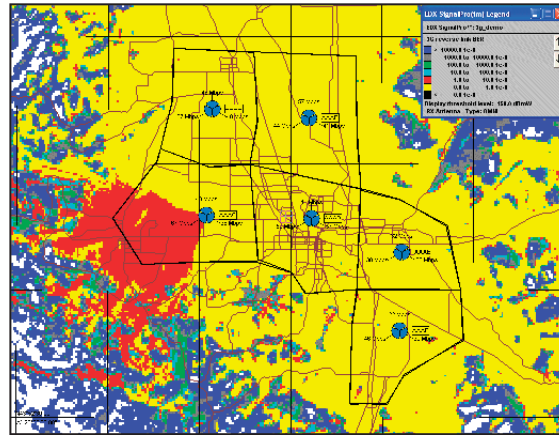
Included in the Network Design Module is a specific feature set for designing WCDMA/UMTS Systems. The Network Design Module also includes specific feature sets for Multipoint Systems and Mobile and Nomadic Systems. This document only covers the features that are specific to WCDMA/UMTS systems.

Studies

Specialized Area-Wide Studies

In addition to the basic studies in EDX SignalPro®, the Network Design Module offers technology-specific studies for WCDMA & UMTS systems:

- Available Data Rates Based on Channel Quality and Eb/No
- Best and Second Best Server Based on Pilot Ec/Io or Traffic
- Handoff (Hard, Soft, Soft+Softer, 3-Way to 6-Way Soft)
- Forward & Reverse Link Eb/No
- Reverse Link BER
- Reverse Mobile Power
- Sector Scrambling Conflict Analysis (Signal Ratio & Time Delay)
- Neighbor List Generation.
- PN Offset (Scrambling Code)

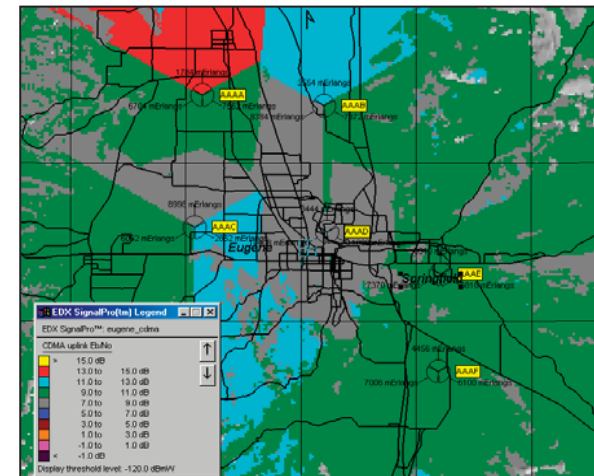


Traffic Loading

Calculate traffic loading on individual sectors based on real service areas and a selection of multiple service types. You can generate a report on sector loading or use the information for channel assignment calculations.

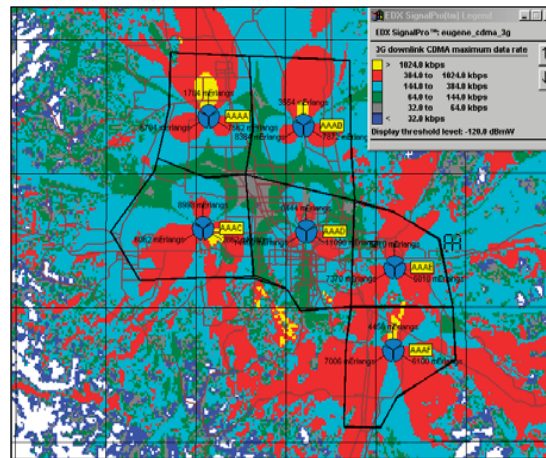
Packet-Switched Traffic

Perform packet-switched traffic distribution with individual control of multiple service mixes such as voice, e-mail, web browsing, audio streaming, and video streaming.



User-defined Area Studies

For complete flexibility, you can even design your own area study analysis via an external DLL using a customized or proprietary study algorithm. This advanced network design feature enables you to tailor EDX SignalPro as you need.



Monte Carlo Analysis

A Monte Carlo analysis helps you determine loading and performance. Random mobile placement is controlled by selected traffic distribution. Loading limits are determined by total mobiles or soft-blocking and disconnect rates. Adaptive antenna descriptions are even considered in the analysis.

You can use the standard static Monte Carlo analysis to determine system loading and performance. Loading limits are determined by total mobiles or soft-blocking rates. Mobiles are placed according to the selectable traffic distribution methods.

Features

System Operating Parameters

You have full control over system operating parameters including handoff and all relevant CDMA parameters. Designing your system is easy and intuitive.

Overlay Systems

It is easy to set up and study overlay systems with mixtures of different technologies at each cell sector. With easy right-click commands, sectors can be grouped together and activated/de-activated for easy traffic planning and analysis in multi-technology systems.

Automatic System Layout

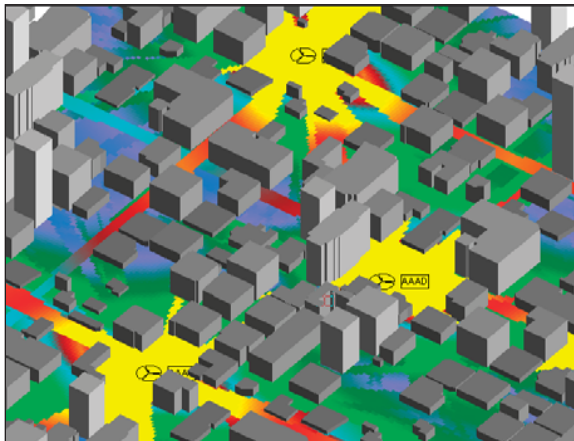
Automatically lay out your cell sites within your system using criteria such as fixed hexagon grids with adjustable cell service radius.

PN Offset

Comprehensive PN offset planning makes assignments to avoid co-offset and adjacent offset conflicts using real sector service areas.

EDX 3D Pathloss Surface

Unique EDX® 3D “Pathloss Surface” approach explicitly stores sector specific measured pathloss values instead of model prediction values.



Link Budgets

The Network Design Module is equipped with a quick and convenient link budget spreadsheet that assists in determining the cell service radius for a given service type (date rate) and service environment.

Area Type	voice	web browsing	high speed	AreaTypeLabel	AreaTypeLabel
Service Data Rate(bits/s)	8.4	36.0	320.0	1.0	1.0
ISD processing gain	400.0	40.0140	30.0	1040.0	1040.0
Mobile TX power(dBm)	27.0	27.0	27.0	1.0	1.0
Mobile antenna gain(dB)	0.10	0.10	0.10	1.0	1.0
Mobile C/I(dBm)	29.10	29.10	29.10	1.0	1.0
Base TX antenna gain(dB)	10.0	10.0	10.0	1.0	1.0
Base TX line loss(dB)	1.0	1.0	1.0	1.0	1.0
Base TX noise (dB)	1.0	1.0	1.0	1.0	1.0
Thermal noise (dBm)	-100.15889	-100.15889	-100.15889	-100.15889	-100.15889
Base noise(dB)	1.0	1.0	1.0	1.0	1.0
Freq. Pk use factor	1.0	1.0	1.0	1.0	1.0
Required EIRP(dB)	9.0	9.0	10.0	1.0	1.0
Antenna factor	0.0	0.0	0.0	1.0	1.0
Intersect APC factor	0.0	0.0	0.0	1.0	1.0
Coverage gain (dB)	0.0	0.0	0.0	1.0	1.0
Required Signal(dBm)	-120.17129	-120.16412	-111.9179	-142.0	-142.0
Fade margin(dB)	1.0	1.0	1.0	1.0	1.0
Building penetration loss(dB)	1.0	1.0	1.0	1.0	1.0
Maximum pathloss (dB)	156.10729	140.46912	135.0779	142.0	142.0
Cell capacity	0.44010	0.10141	0.09994	0.1004	0.1004
Chip rate (Mchips)	1.44				
1st Base height(m)	30.0				
1st mobile height(m)	1.5				
Frequency(MHz)	1920.0				
Antenna	0.0401				

Propagation Models

In addition to EDX SignalPro's selection of over 15 basic propagation models, the Network Design Module includes sector-specific models that can be “tuned” automatically or by manual adjustments to existing coefficients. Also, point-slope models can be created with test-drive data, and an external DLL link provides access to external propagation models.

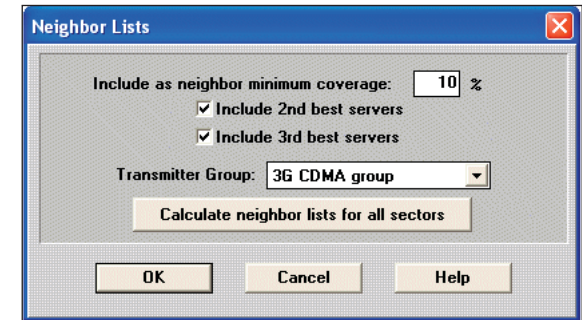
Antennas

Transmit and receive antennas can be specified as full 3D patterns. Polarization, mechanical beam tilt and beam tilt azimuth can be specified separately. Supports both co-polarized and cross-polarized directional receive antennas.

Adaptive Antennas

EDX's analysis can take into account adaptive “smart” antenna C/I ratio improvements for transmitters and receivers using EDX's exclusive adaptive antenna Application Programming Interface.

Technologies



Neighbor Lists

Neighbor list calculations are included based on most likely server and handoff criteria.

The following technologies are supported in any frequency band:

- W-CDMA
- CDMA 2000 (3XRTT)
- Evolving 3G technologies

Adaptive Modulation Types

Data rate and bit error rate studies consider adaptive modulations schemes for the most refined study results.



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