WiMAX/WiFi Design Module

The WiMAX/WiFi Design Module, when added to EDX SignalPro, is a fully featured, comprehensive 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 this module are specific feature sets for designing Fixed and Mobile WiMAX and WiFi networks.

**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 design is rigorous enough to withstand expected traffic demand. EDX provides a stochastic based method to help you evaluate your design.

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.

**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. This can be used to analyze the impact of WiFi offloading of 3G/4G data.

**Preamble Code Planning**

Specific to WiMAX systems, automatic preamble code planning assigns ID 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**

You can perform 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. 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.

**STUDIES**

- **Specialized Area-Wide Studies**
  - Uplink & Downlink Adaptive Modulation Data Rate
  - Uplink & Downlink WiMAX OFDMA Modulation Regions
  - WiMAX Average and Maximum Uplink C/(I+N)
  - C/(I+N) based on strongest server or best channel
  - Handoff Regions

- **FEATURES**

  **System Operating Parameters**
  - A comprehensive set of IEEE 802.16 WiMAX and 802.11 WiFi standard profile 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.
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**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 percentage
- RF channel bandwidth
- FFT size
- Cyclic prefix
- Frame length
- Uplink/downlink ratio
- Sub-channelization
- Geographic location of users, that can be weighted with clutter or demographic data

**OFDMA and MIMO-A/B 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.

**Fixed WiMAX Design**
Included in the WiMAX/WiFi Module is a feature set for designing Fixed WiMAX Multipoint Systems. This feature adds the ability to perform real-world point-to-multipoint analysis with hub stations serving a set of Customer Premise Equipment (CPE), each with independently defined RF parameters and geographical locations. Multipoint Design capabilities include automatic serving hub and channel assignment.

The Point-to-Multipoint feature set supports an extensive range of studies including:

- Received signal levels downlink and uplink for each CPE
- Interference levels at Base and CPE receiver fade margins downlink and uplink for each CPE
- Link availability analysis for each CPE, both downlink and uplink. Analysis includes fade and rain outage effects
- Minimum CPE antenna height for LOS
- Downlink and Uplink C/(I+N)
- Downlink and Uplink Adaptive modulation data rate
- BER

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

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.

Packet-Switched Traffic Definitions

Multipoint Fixed WiMAX Adaptive Modulation data rate study for each CPE