# TV White Space Interference/Coexistence Management

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# Topics

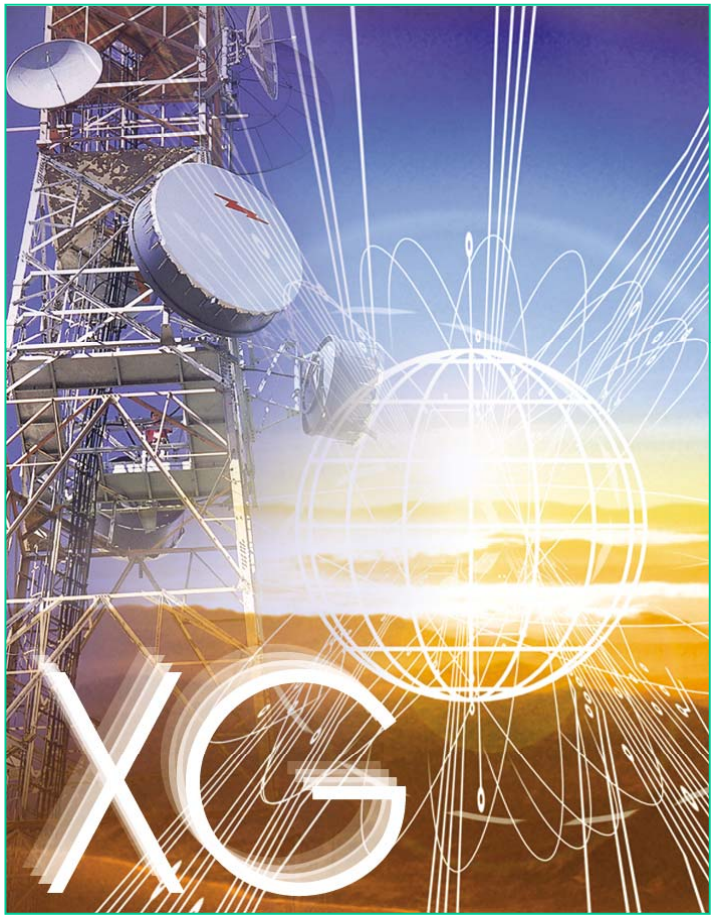
- Thoughts on coexistance
- iQ.link®XG
- iQ.clear®XG

# Thoughts on Coexistance

- White Space database will provide lists of available channels based upon FCC criteria
  - Ultimately, analysis may be performed in the device
  - Database will then provide only data to the device
- Either database or device can perform coexistance analyses
- Possible coexistance analyses
  - Refine list of available channels
  - Near real-time frequency planning among local devices

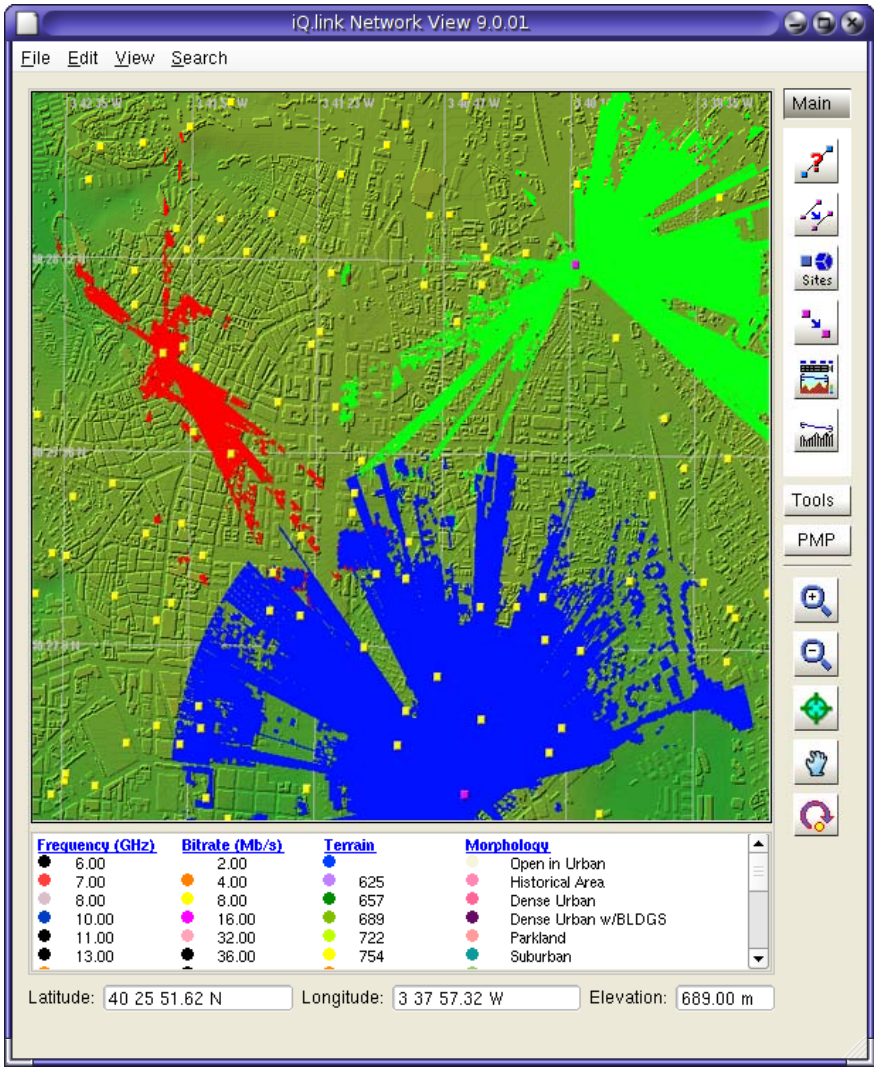
# iQ.link®XG

- Next generation microwave fixed network / backhaul planning software tool:
  - Line of sight analysis to make sure links are clear of any obstacles
  - Availability & performance assessment to build reliable links
  - Comprehensive Interference analysis to make efficient use of the spectrum and avoid interference
  - Secure management of microwave link network data (sites, links, radios, antennas, waveguides, attenuators, etc..)
  - Full microwave spectrum support for backhaul and fixed access in a broad range of wireless systems including Cellular, PCS, GSM, UMTS,TETRA, 3G, WiMax, LTE and more.
  - Availability and performance assessment using the latest ITU models



# iQ.link®XG – Network View

- Graphical top-down view of network topology
- Display Terrain, Morphology, Building, Vector
- Supports numerous GIS formats
- LOS Analysis
- PMP Coverage & C/I
- Panning, zooming

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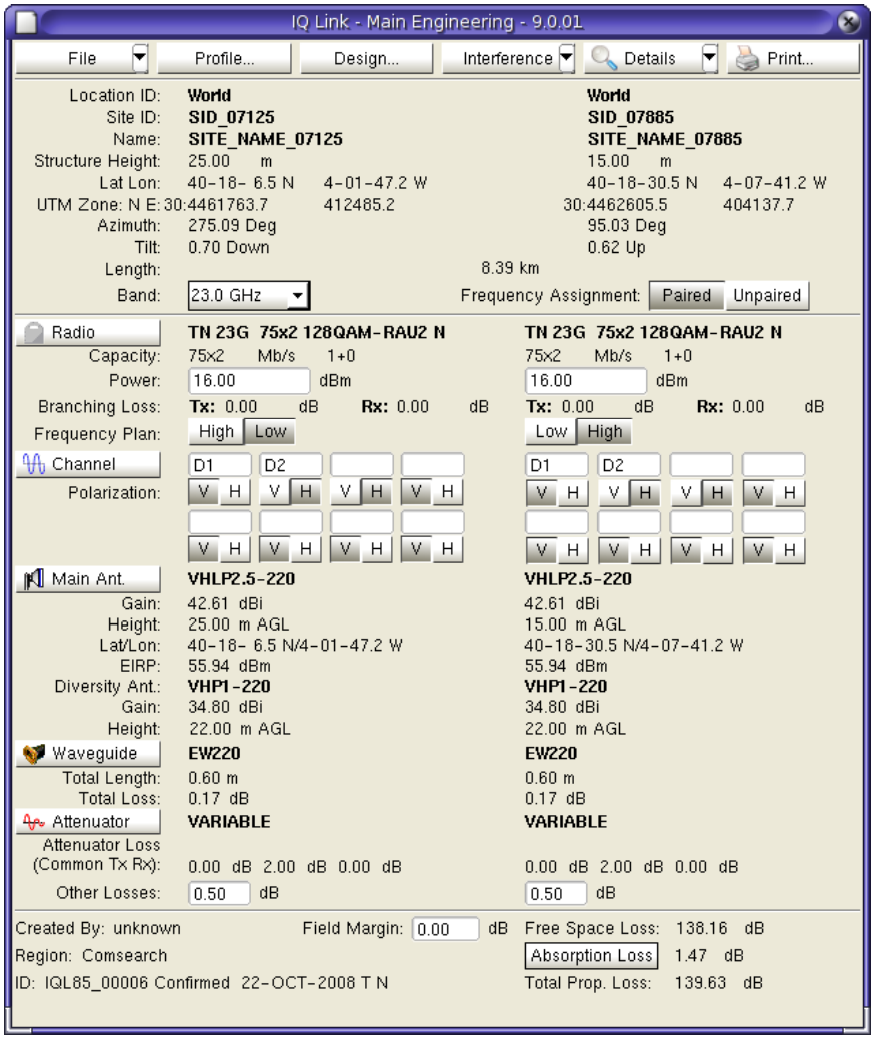
# iQ.link®XG – Link Budget

- Quick link budget:
  - Sites (multiple, global coordinate systems supported)
  - Radios
  - Frequencies
  - Antennas
  - Waveguides
  - Attenuators

- Links may be saved as working designs (nominal), primary designs or confirmed (password protected, on-air) links.

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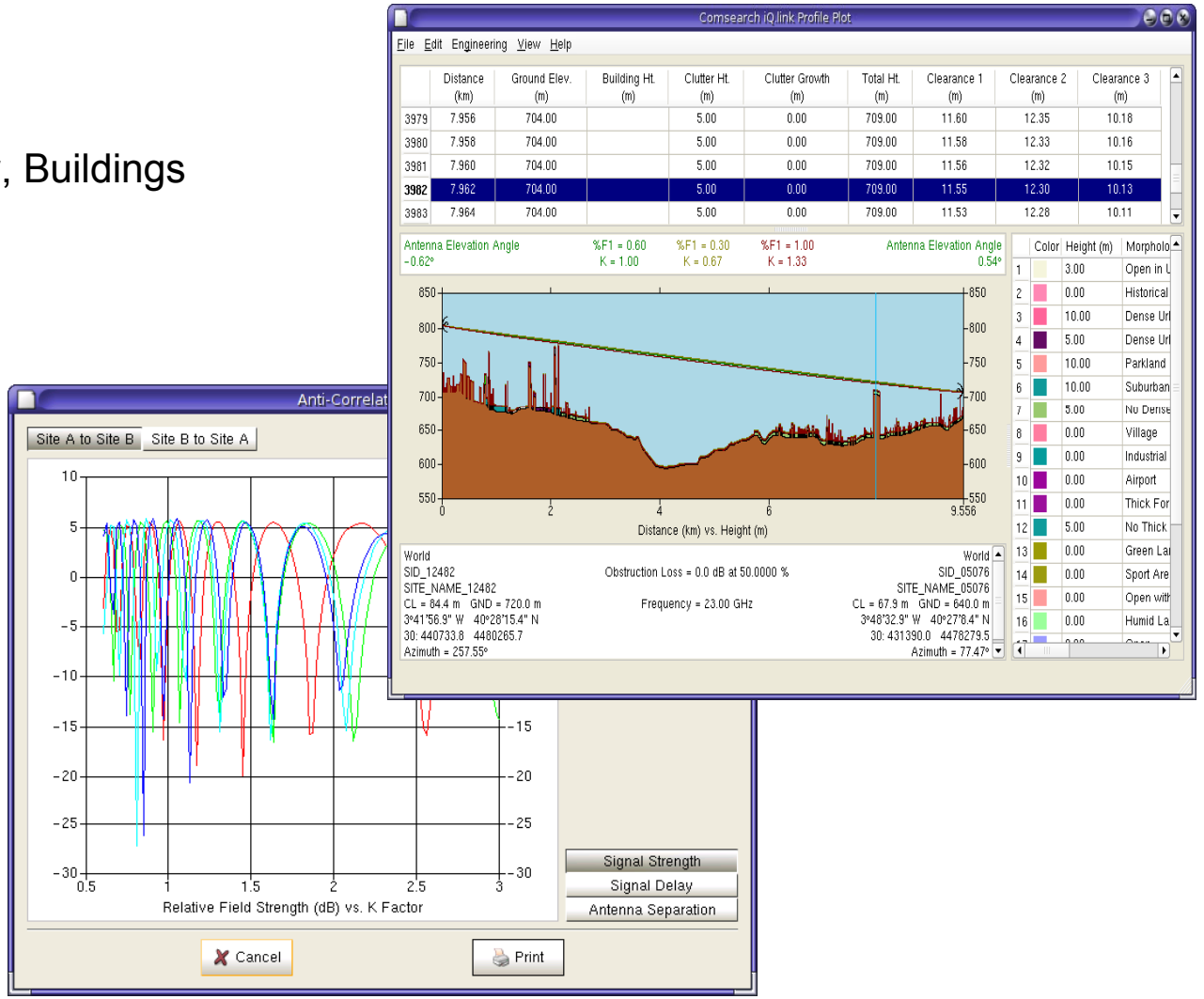
# iQ.link®XG – Profile

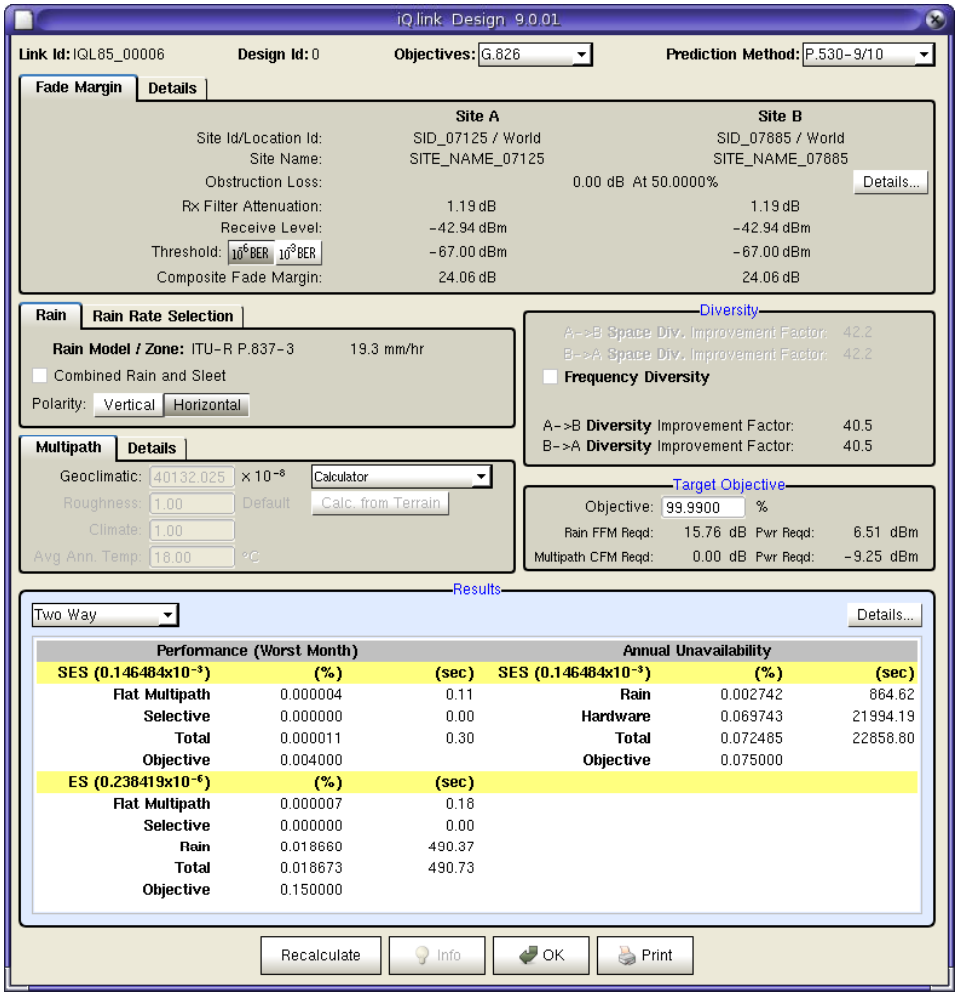
- Line of Sight analysis
  - Terrain, Morphology, Buildings

- Auto optimization of antenna heights
- Reflection analysis
- Anti-Correlation



# iQ.link®XG – Design

- Availability and performance using latest ITU Models
  - Rain Attenuation (Crane and ITU)
  - Multipath (Vigants, Glauner and ITU)
  - Space Diversity optimization
  - Frequency Diversity
  - XPIC
  - ATPC
  - Adaptive Modulation

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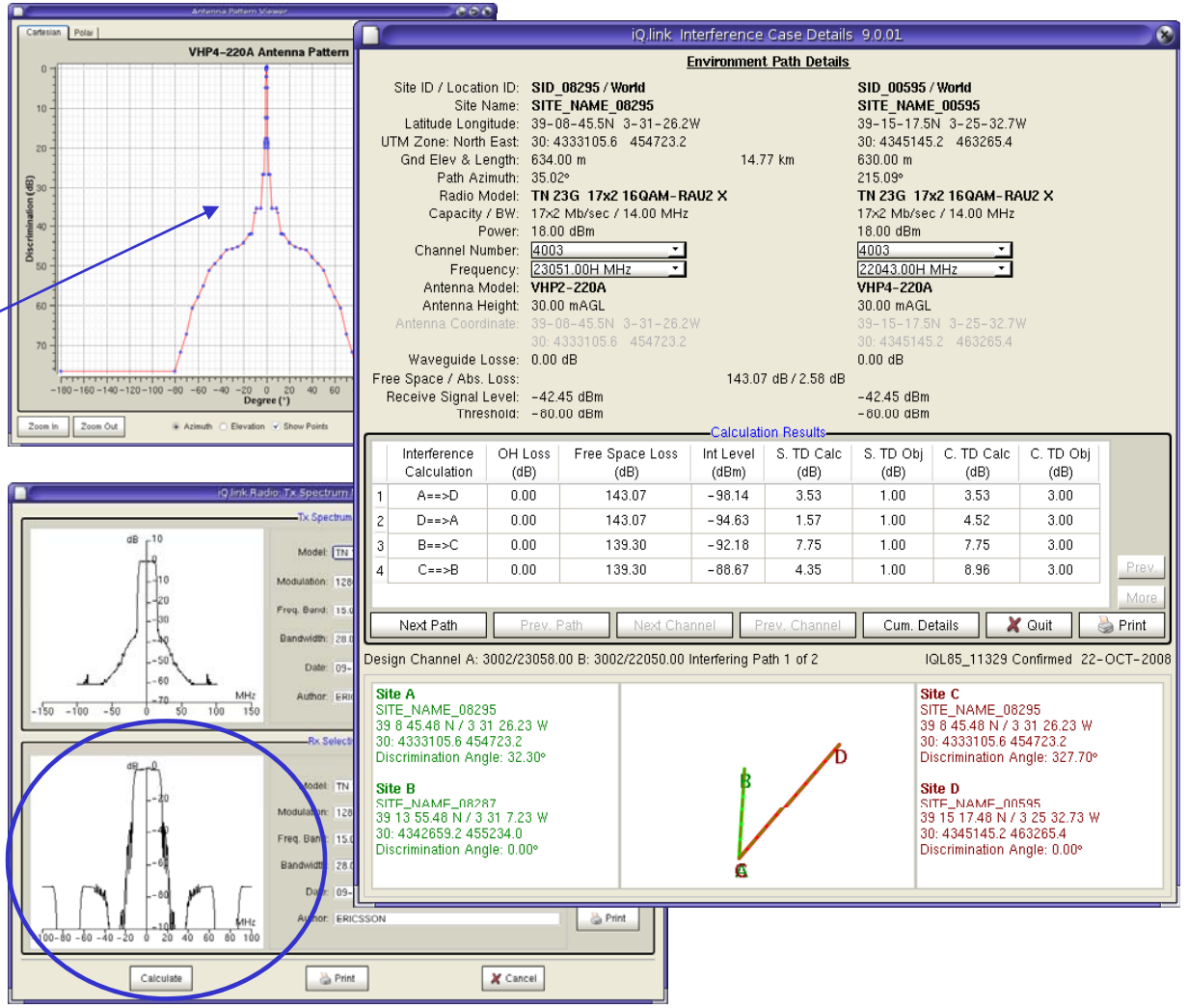
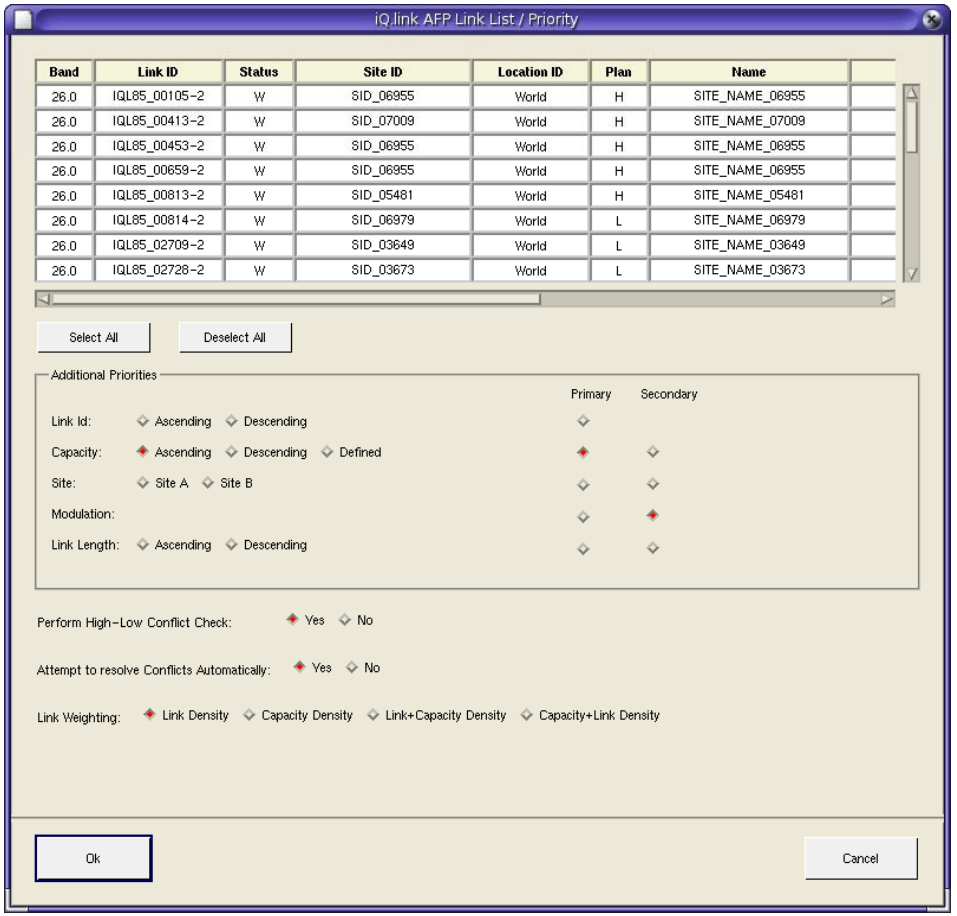
# iQ.link®XG – Interference Analysis

- Per-exposure and Cumulative analysis
- Easily choose frequencies free from interference
- Determine threshold degradation if interference occurs
- Uses detailed antenna radiation pattern envelops (Azimuth & Elevation)
- Maintain efficient use of the spectrum
- Uses detailed radio interference criteria. Inter-manufacturer objectives can be calculated with Tx Spectrum & Rx Selectivity or ETSI-TR101854 (Annex F)



# iQ.link®XG – Automatic Frequency Planning

- Batch interference analysis of large numbers of links
- Automatically resolve H/L conflicts
- User-defined link priorities

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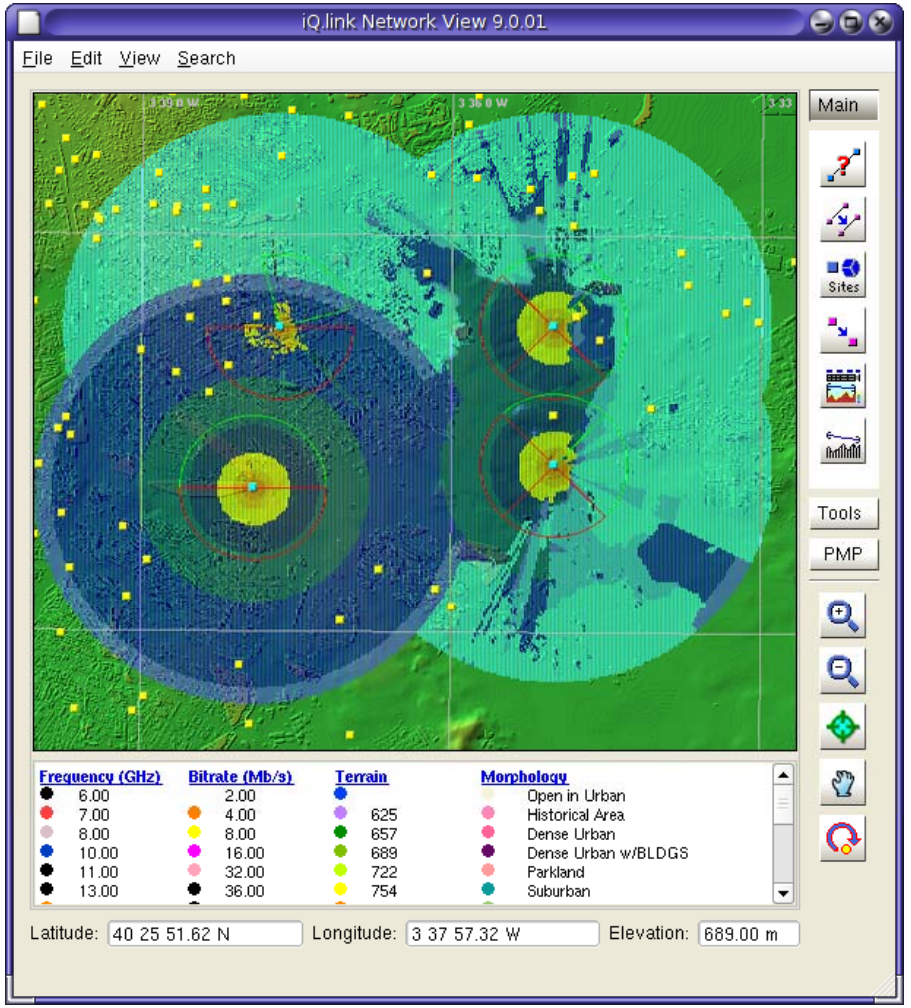
# iQ.link®XG – Point to Multipoint

- Design of Fixed PMP links
- Analysis between PTP and PMP
- Omni and sectored antennas
- Coverage and C/I
- Automatic subscriber connection

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# iQ.clear®XG

- Next generation spectrum sharing and interference analysis software tool to help plan the rollout of new wireless systems in encumbered spectrum
  - Import or automatically create cell layouts
  - User-defined interference parameters
  - Comprehensive interference analyses
    - Mobile system to microwave
    - Spectrum recommendation
    - Collocation
    - Microwave mobile system
  - Fully compliant with TIA Bulletin TSB-10F

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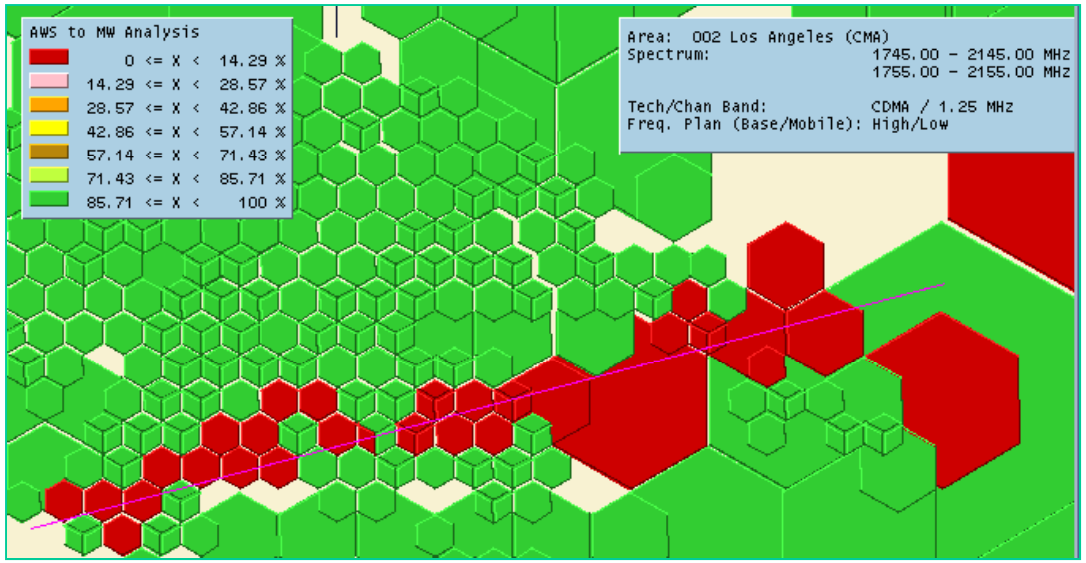
# iQ.clear®XG – Cell Layout

- For pre-auction planning and spectrum valuation, the user can create two types of cell layouts:
  - A Uniform layout with a uniform radius across the market
  - A Traffic Based layout with cells dimensioned depending on the population to be covered using census data within the tool.
- For deployment, cells can be imported from various RF planning tools.

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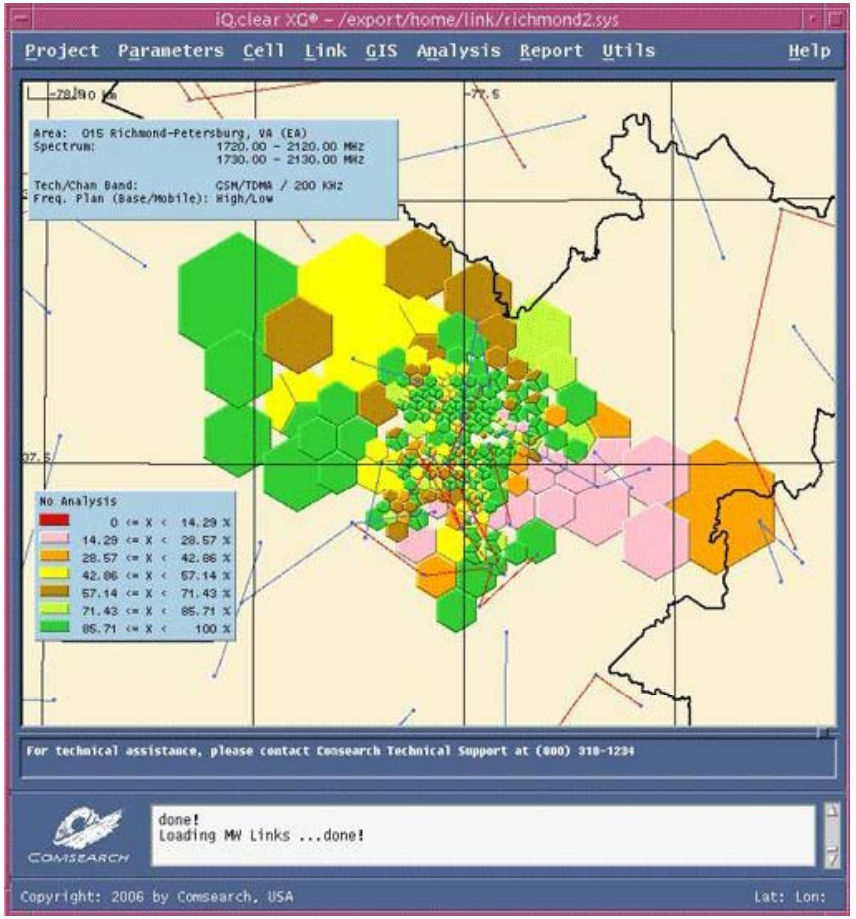
# iQ.clear®XG – Interference Analysis

- Select a specific frequency block, technology , and bandwidth to be used in the analysis
  - 200 kHz GSM
  - 1.25 MHz, 3.75 MHz, or 5 MHz CDMA
- Define the parameters for the project including transmit power, antenna type, antenna height, maximum antenna gain, downtilt angle, EIRP, number of mobiles, and mobile distribution method
- Specify interference criteria parameters for both AWS and microwave systems including propagation model and link reliability.
- Propagation models include
  - Free Space Loss
  - OH-Loss
  - TR14.11
  - Extended Hata

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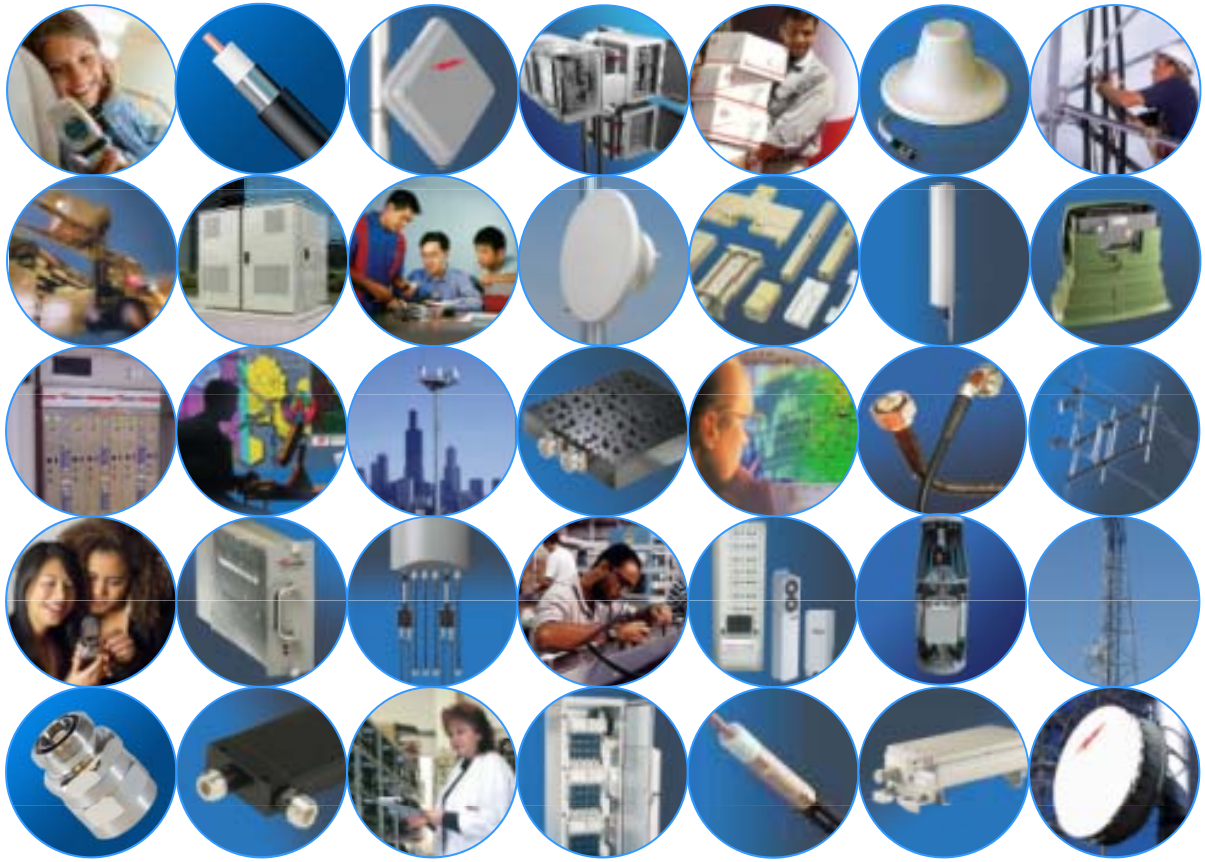
# Questions?



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