New System Analysis Methodology

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Source:

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San Francisco, CA, USA

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IEEE C802.16m-07/124

Purpose:
Adopt the text and changes proposed in IEEE C802.16m-07/124 into the Evaluation Methodology Document

New System Evaluation Methodology

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Realistic Models for System Analysis

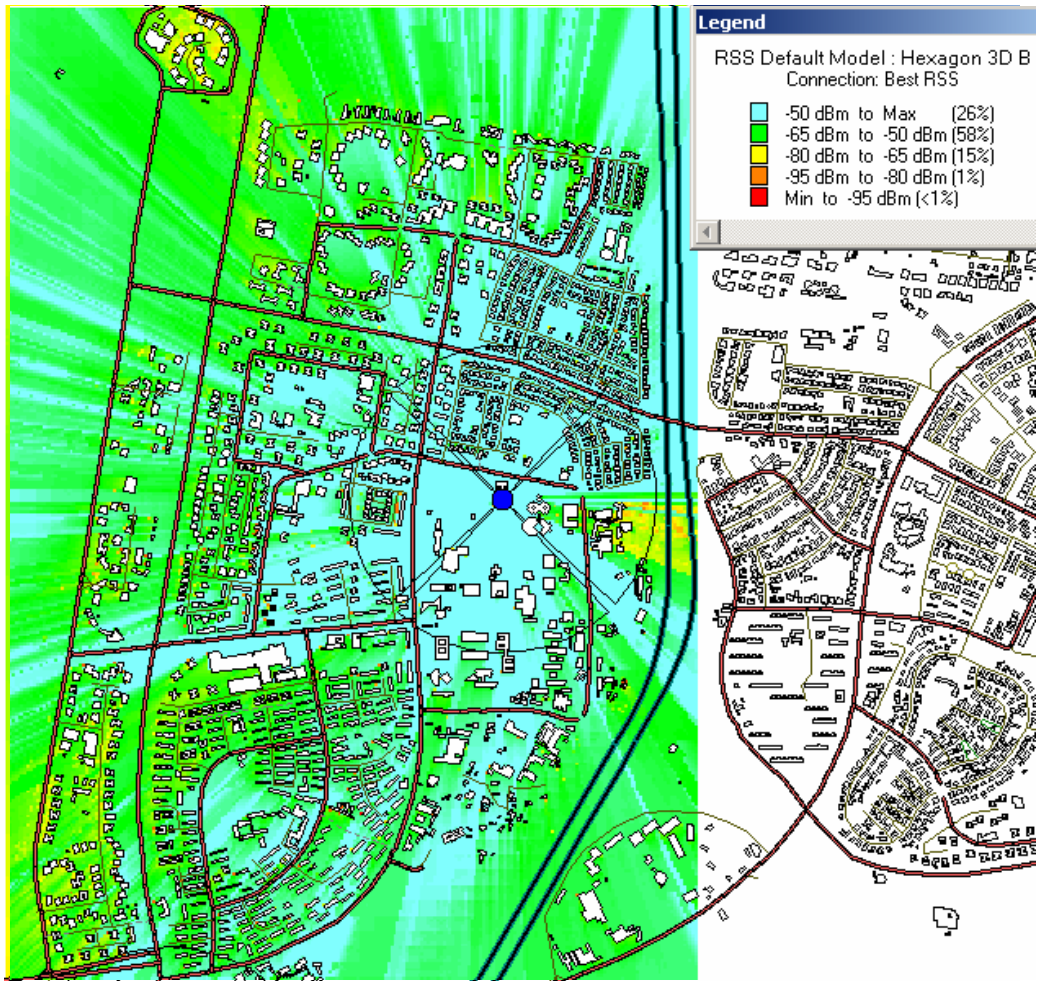
- The 19 wrap around hexagonal cell model is very useful:
  - Symmetric
  - Manageable
  - Used by other bodies
- Path loss and shadowing models suggested for path loss are:
  - Easy to calculate
  - Statistically represents path losses
  - Reproducible

But it is not Realistic!

Real Scenarios

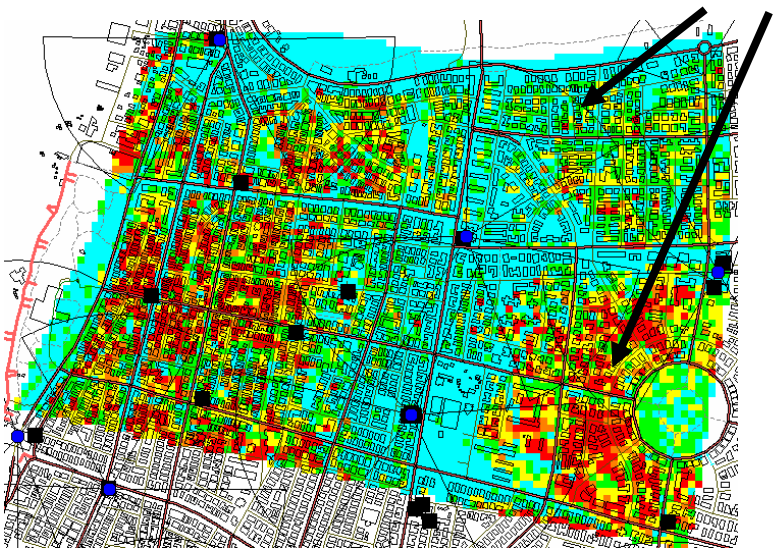
- Cells are not hexagonal
- Cells are not equal
- Cells are not contiguous
- Traffic is not uniform
- Empricial models are pessimistic for propagation but optimistic for interference
- The world is 3D

Realistic Shadowing Effect



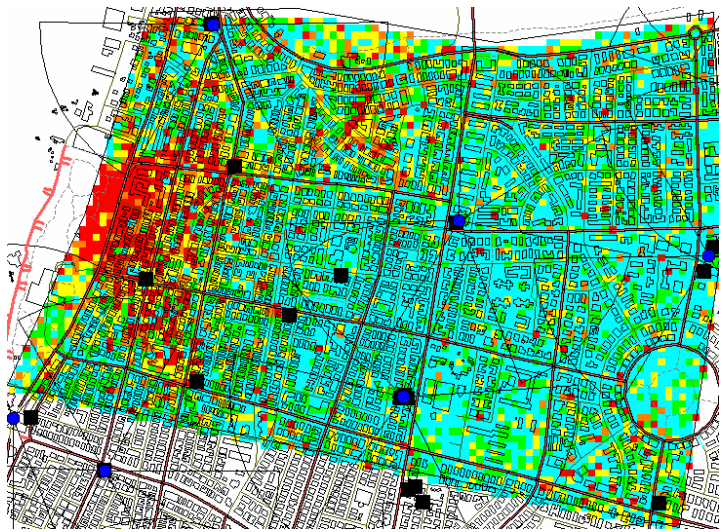
Physical Vs. Empirical Model

known interfered areas in current GSM network



Range			Color	Distribution
Min	to	50%		12.571 %
50%	to	60%		4.948 %
60%	to	75%		18.336 %
75%	to	85%		20.489 %
85%	to	Max		43.653 %

MKE-526



HATA

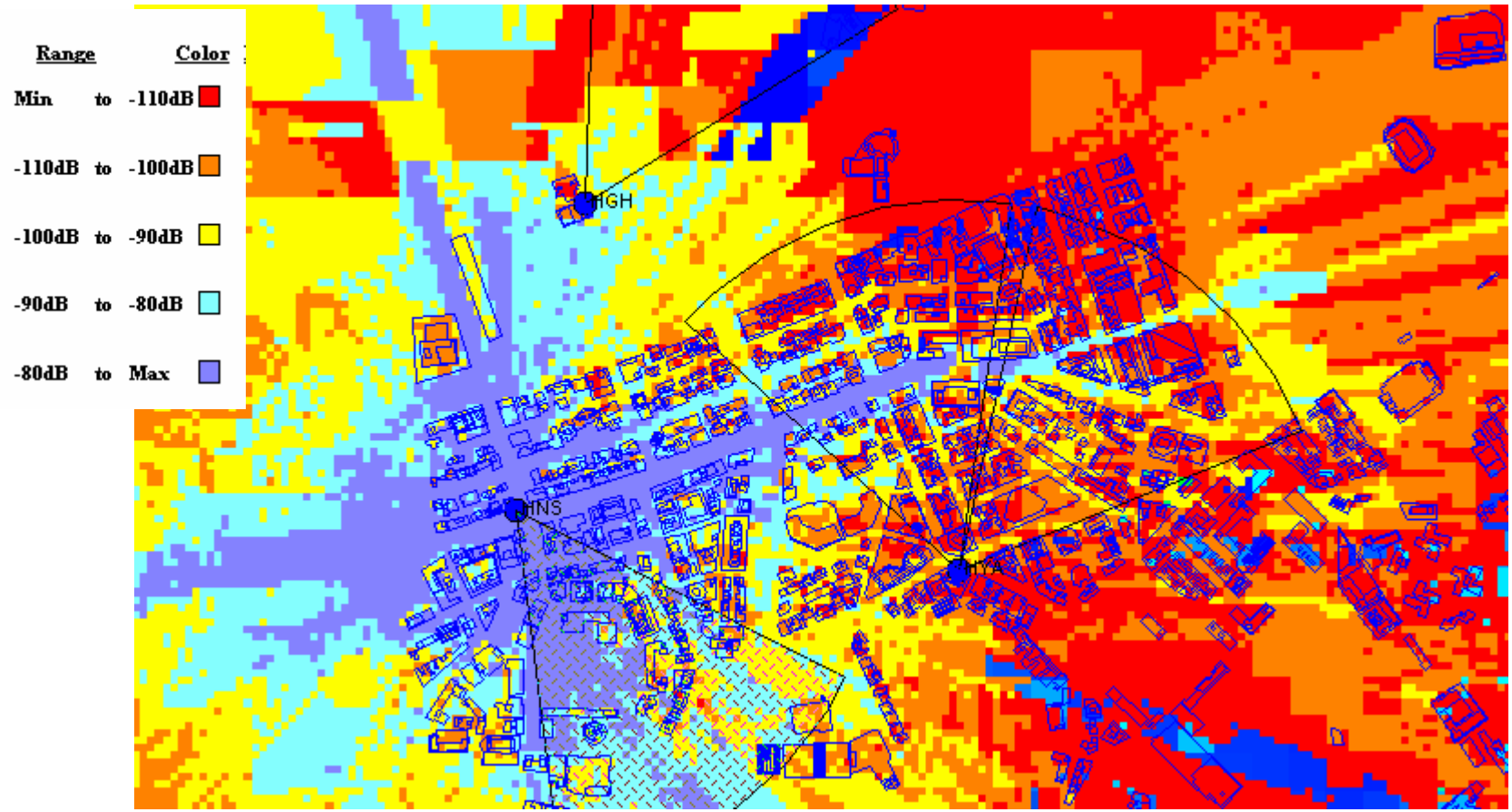
Range			Color	Distribution
Min	to	50%		7.275 %
50%	to	60%		5.452 %
60%	to	75%		15.176 %
75%	to	85%		18.232 %
85%	to	Max		53.863 %

Probability Legend

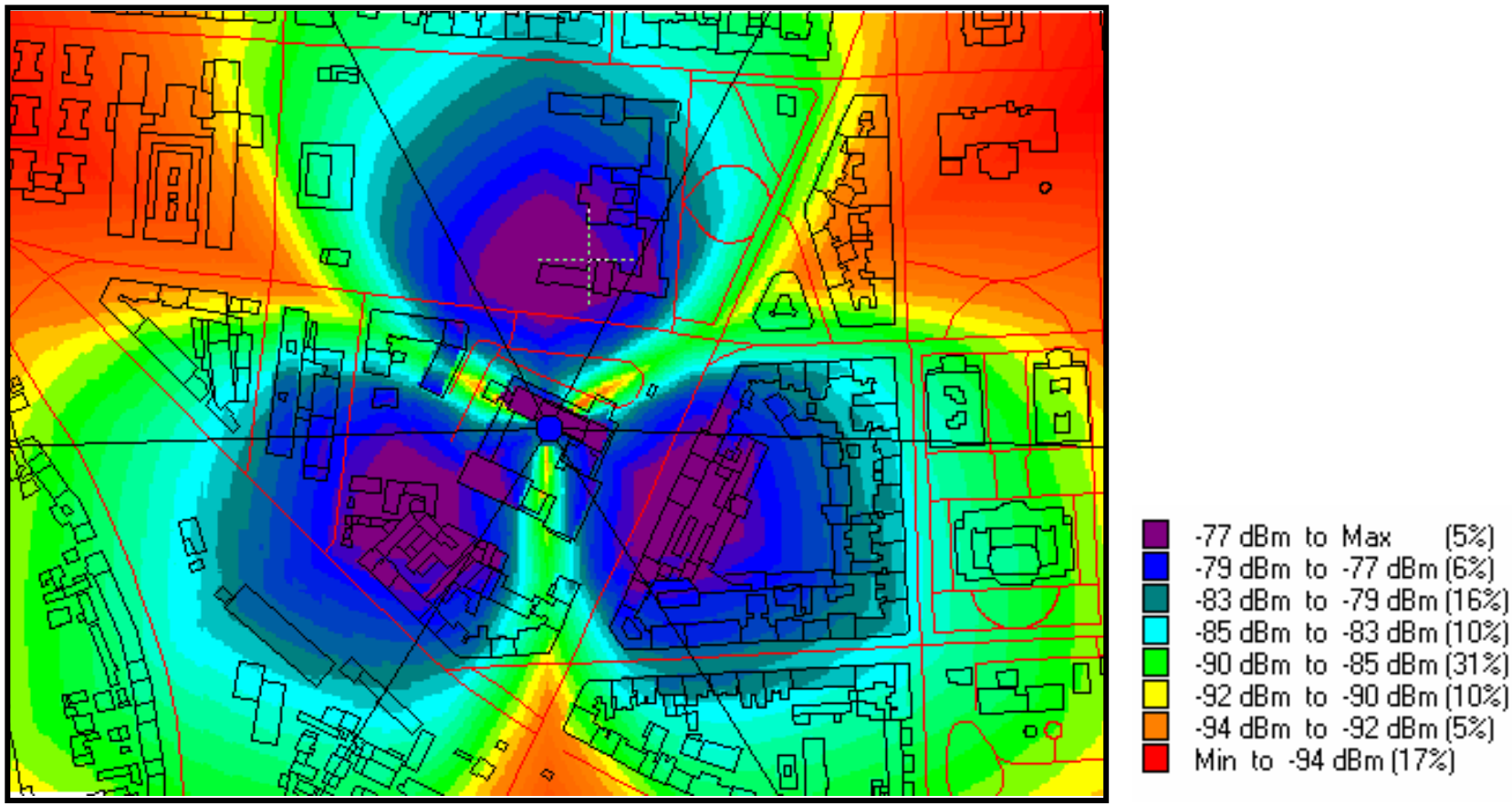
Using Link Matrix

Connection: Best Pilot C/I

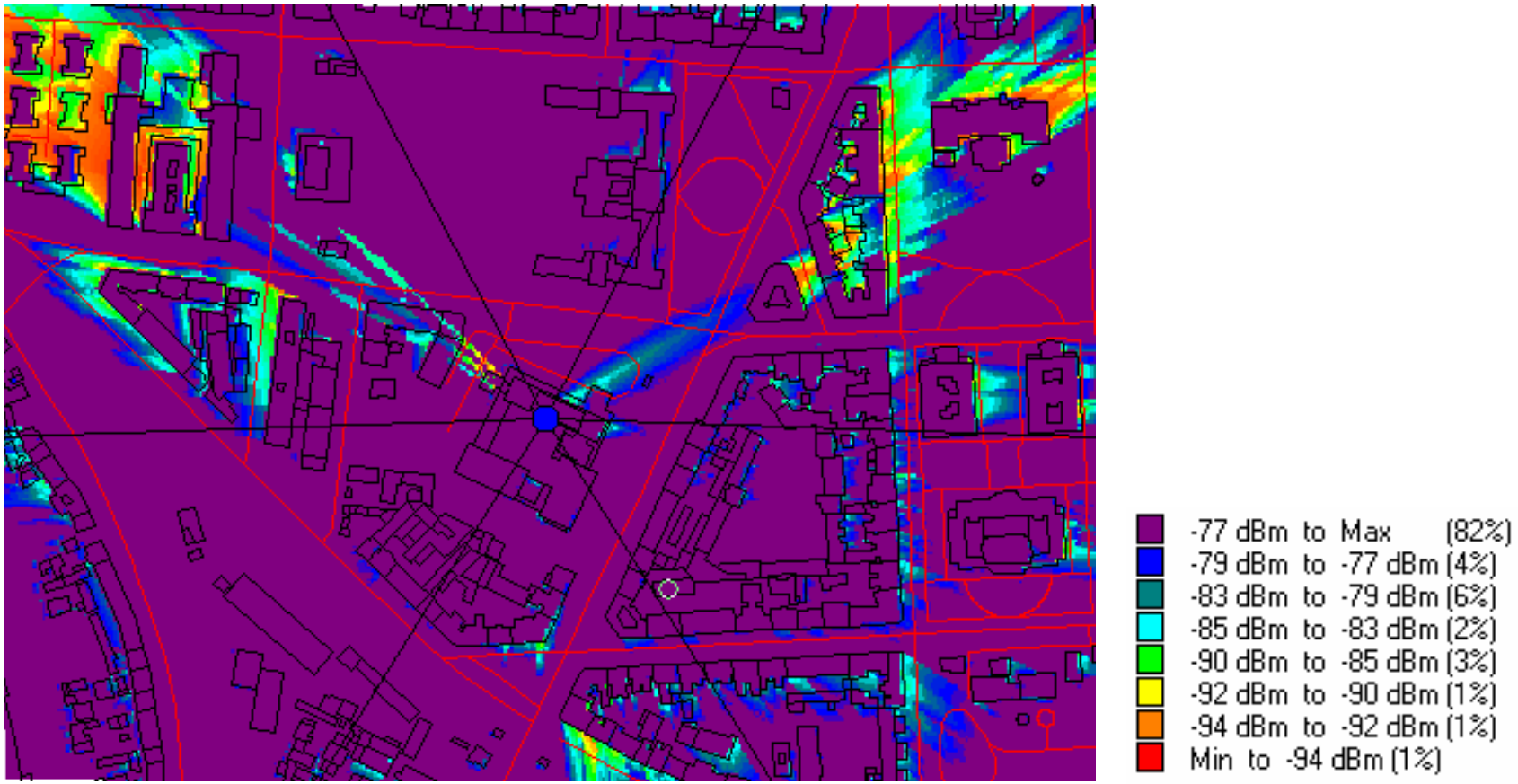
Waveguide Effect



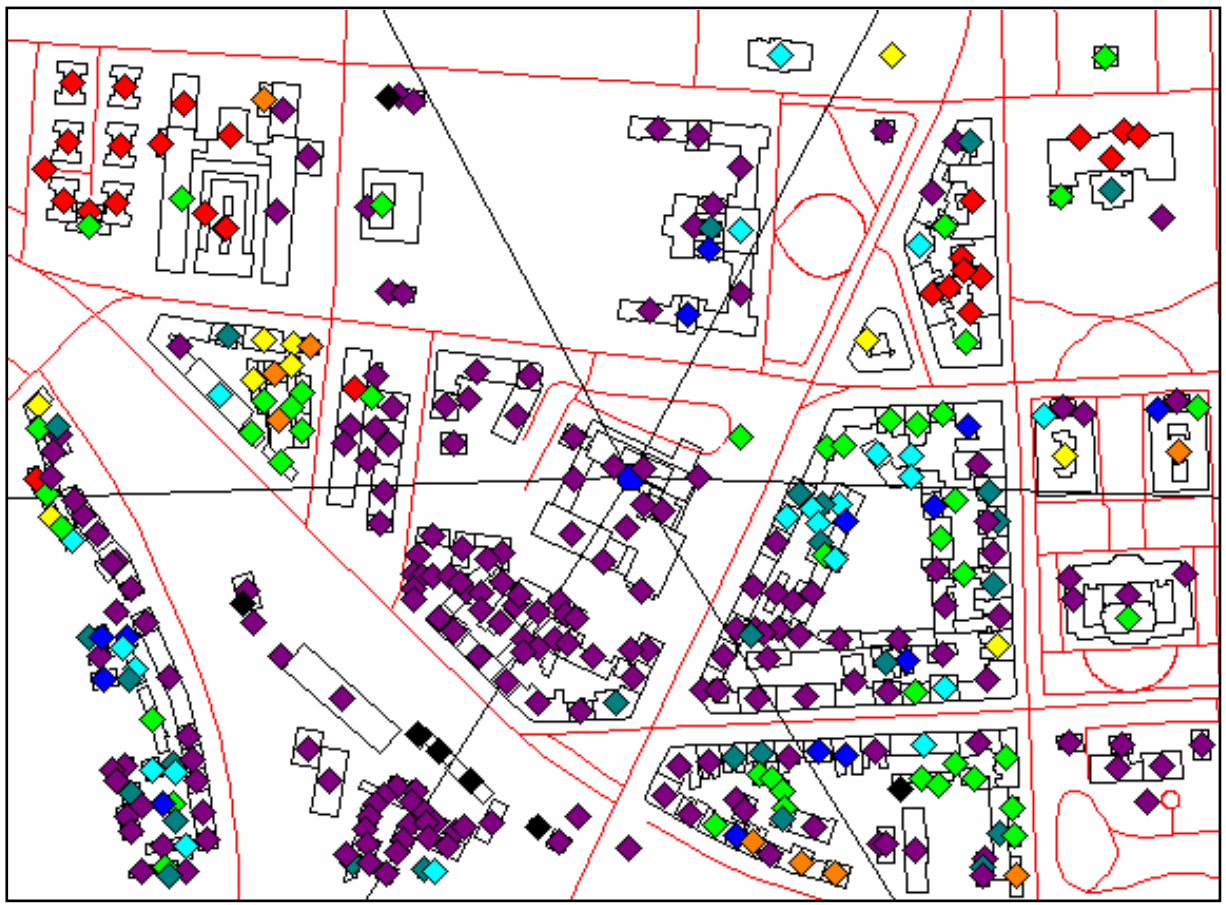
COST-HATA MODEL



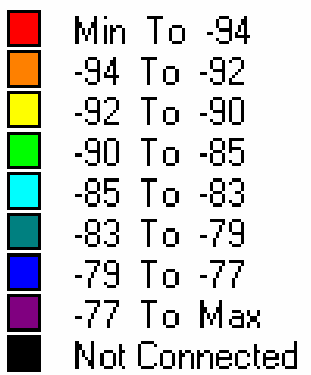
Physical Model - Outdoor



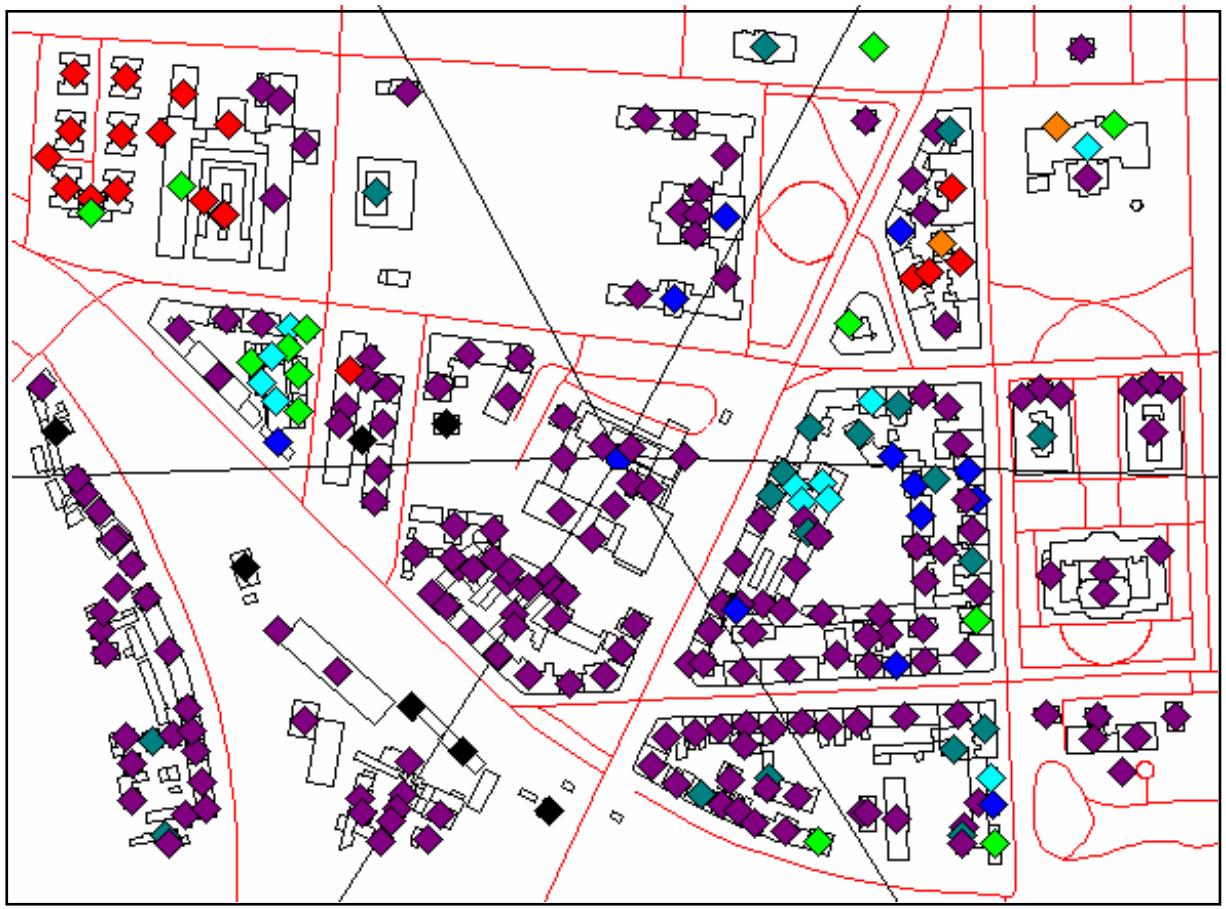
Physical Model - Indoor



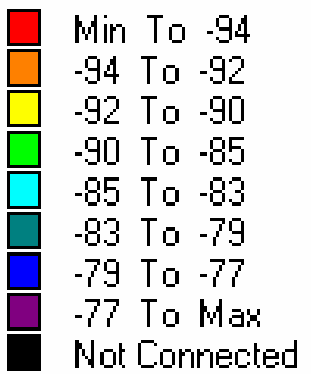
Ground Floor



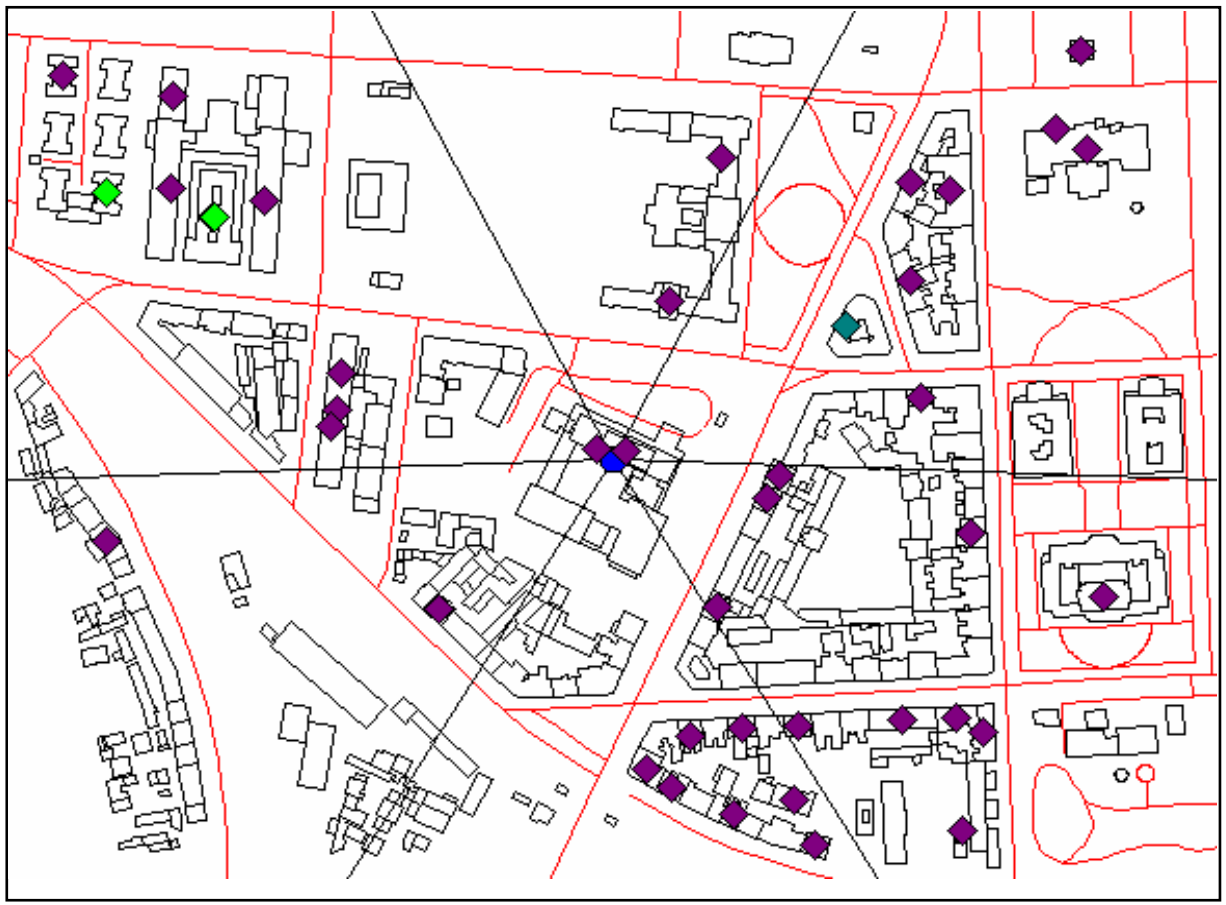
Physical Model - Indoor



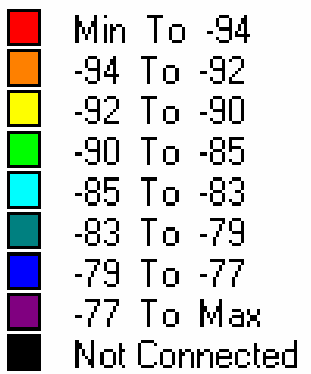
2nd Floor



Physical Model - Indoor



10th Floor



Evaluation Errors

- Disadvantage to range-capacity trade off vs. optimization to a given range
- Is a fixed interference cancellation a benefit?
- How applicable is fractional frequency re-use?
- What about antenna tilting?

Proposal for Additional Evaluation

- Add to system evaluation a real scenario for
  - sanity check
  - demonstration of “deployability”
- Select a couple of real regions including
  - Mixed terrain
  - Set of clutters
  - Non-uniform user traffic
  - An existing cellular system base station sites
- Use a high density grid of measurement points, indoor and outdoor
- Use pre-calculated path losses, using a PHYSICAL model (knife-edge…ray tracing)
- NO SHADOW FADING
- Plug and “play” in the existing simulation

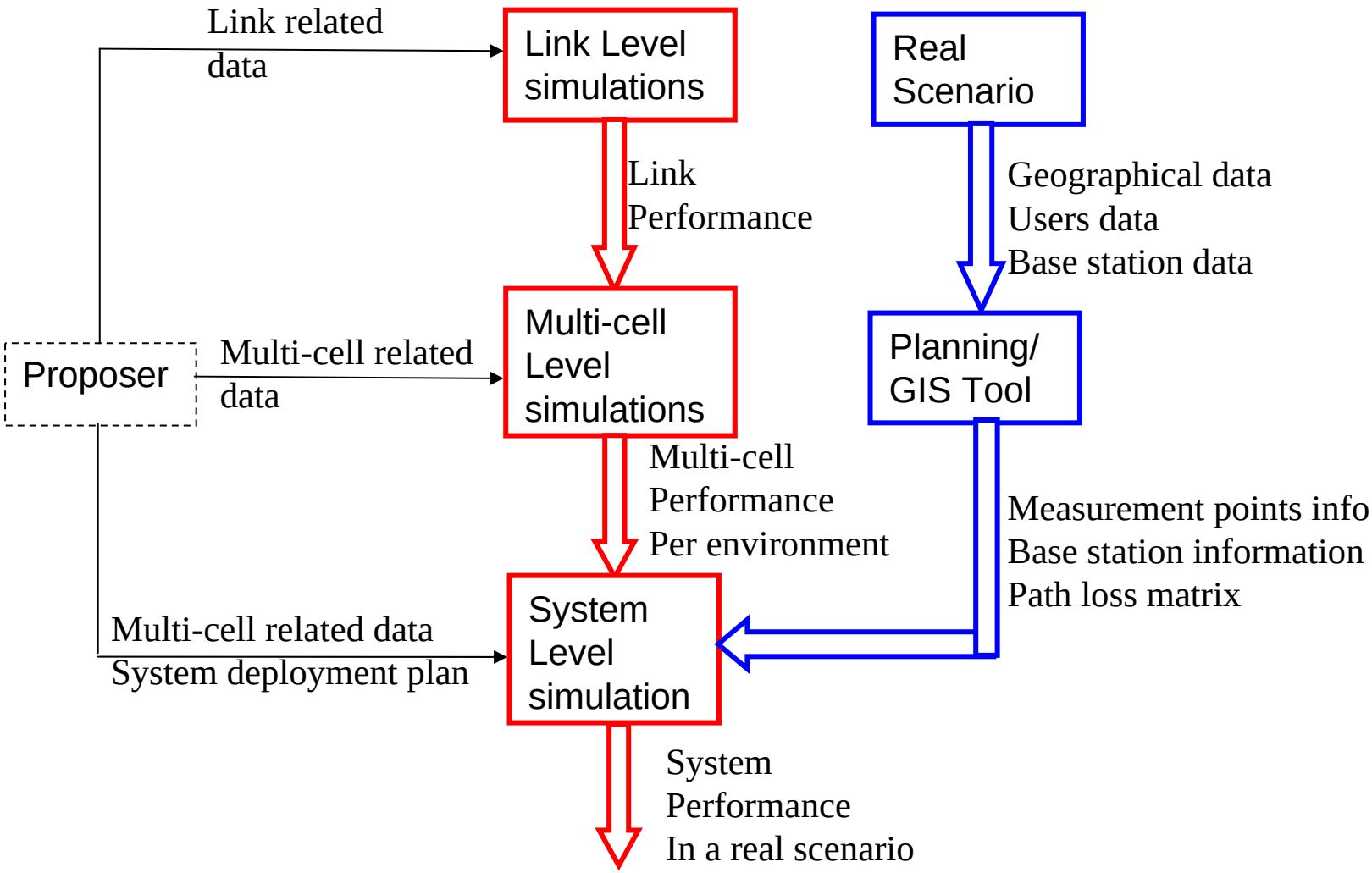
Physical (“deterministic”) models

- Mutliple knife Edge as per ITU-R P.526-10
  - Based on diffraction only
  - Finite screen widths for buildings
  - Deygout method for multiple knife-edge case

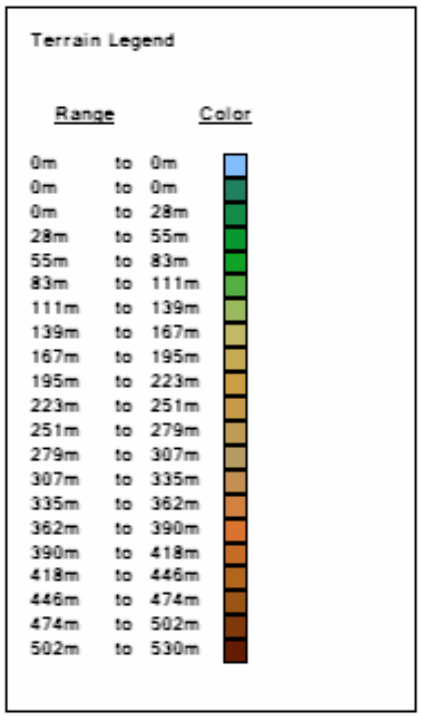
  Distinguishes between LOS and NLOS

  Replaces Path loss and shadow fading
- Ray tracing
  - Applicable for urban microcell scenarios
  - May replace cluster level randomization

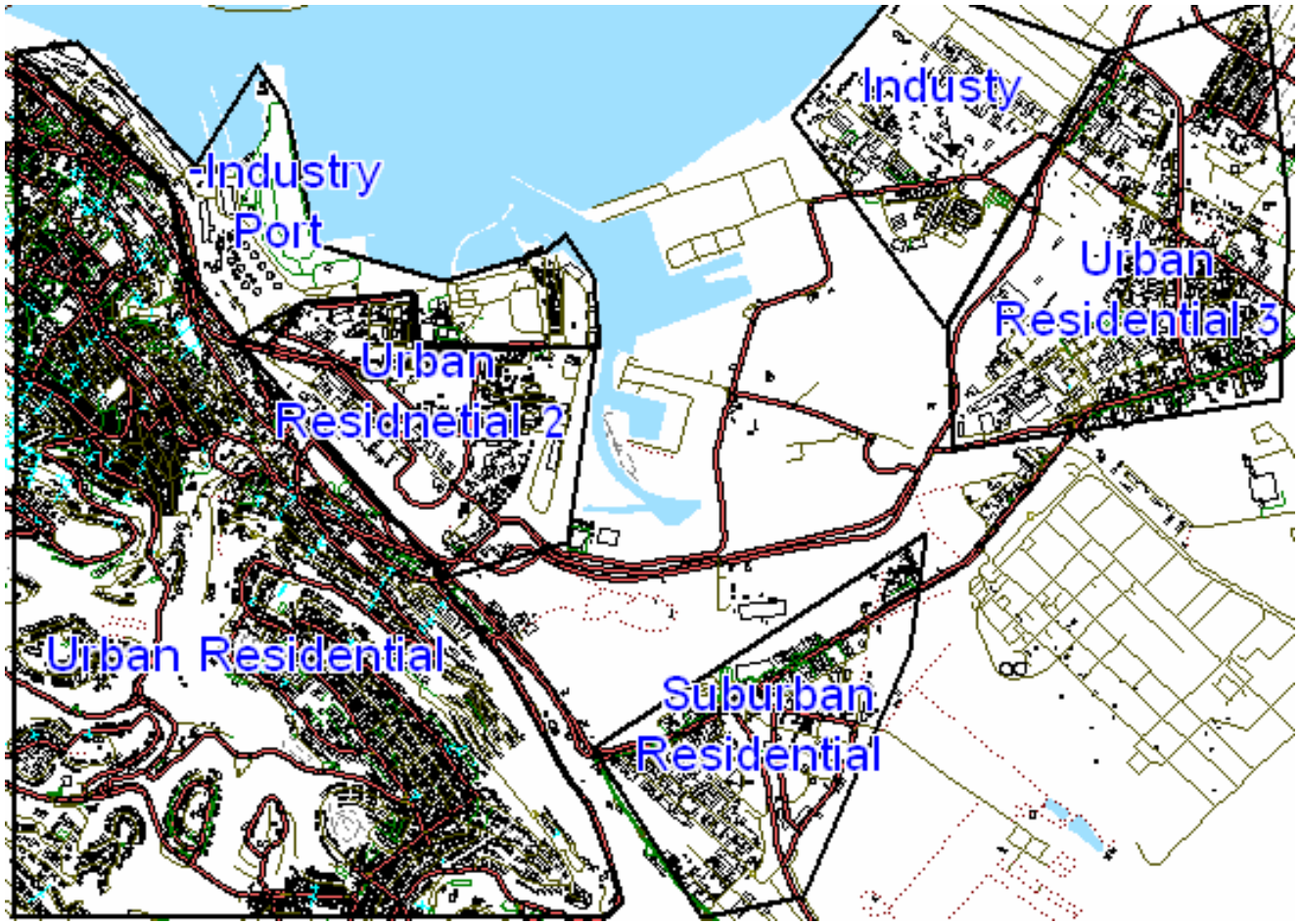
Evaluation Process



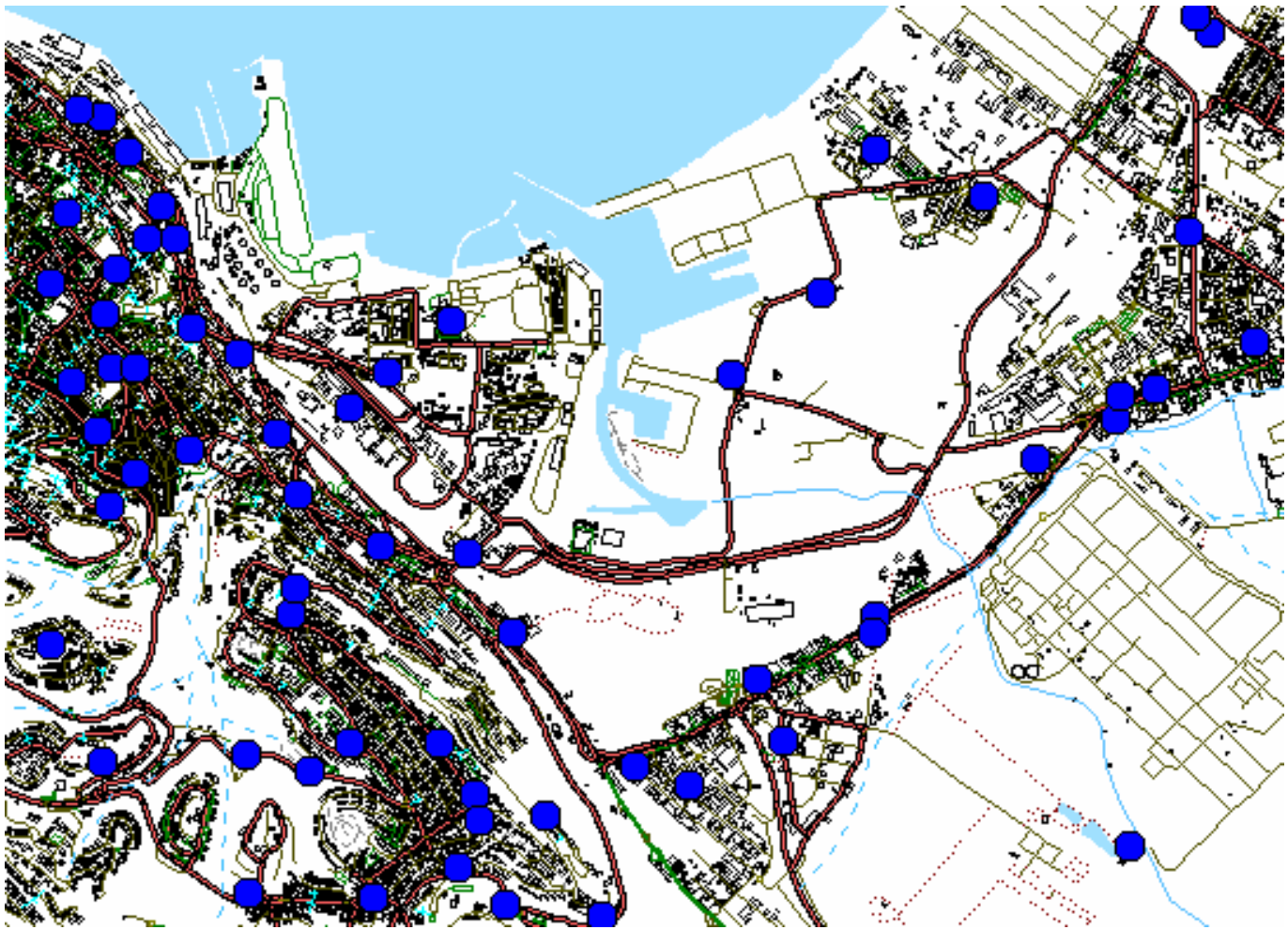
Terrain and Buildings



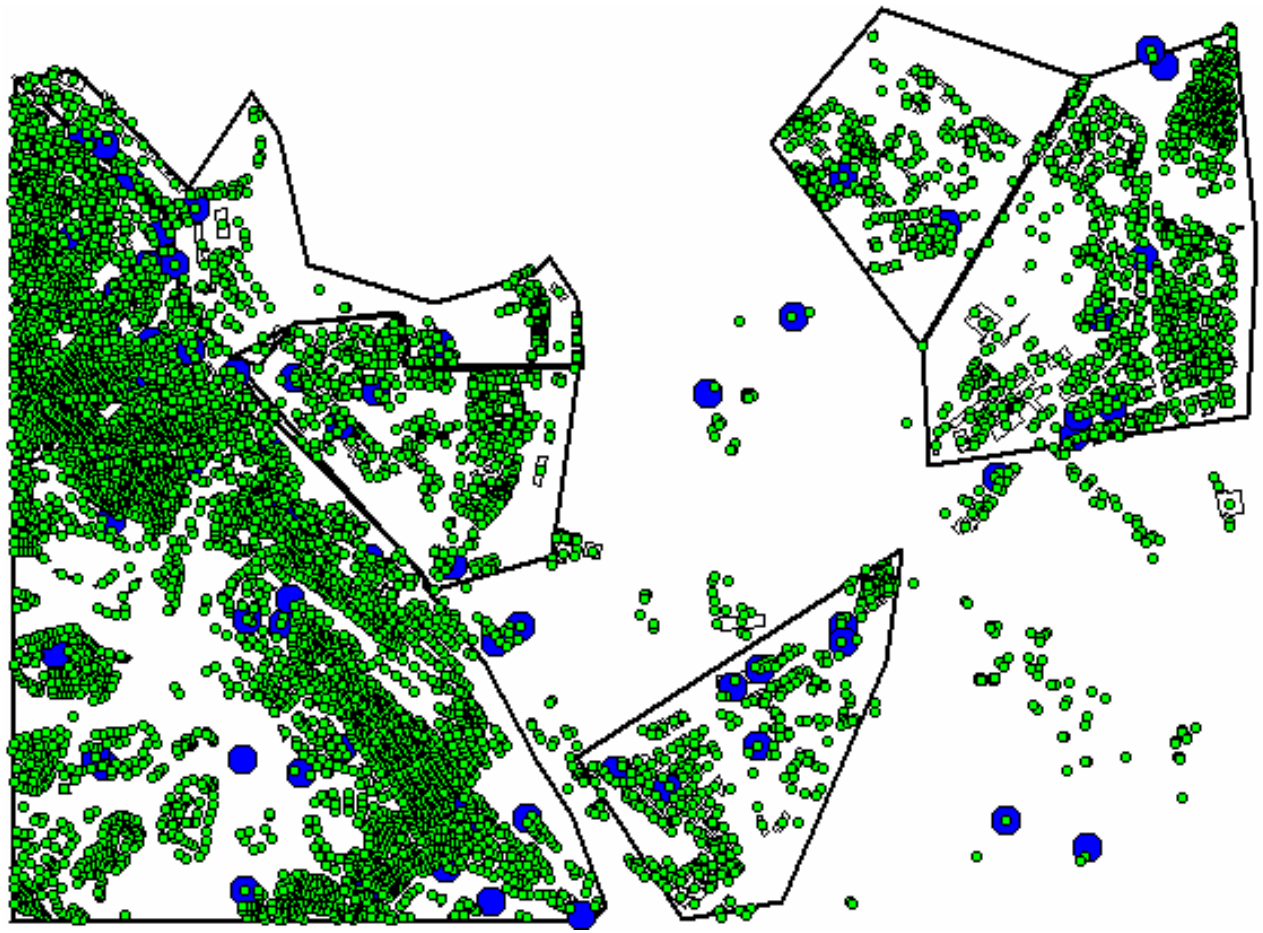
User and Traffic Density



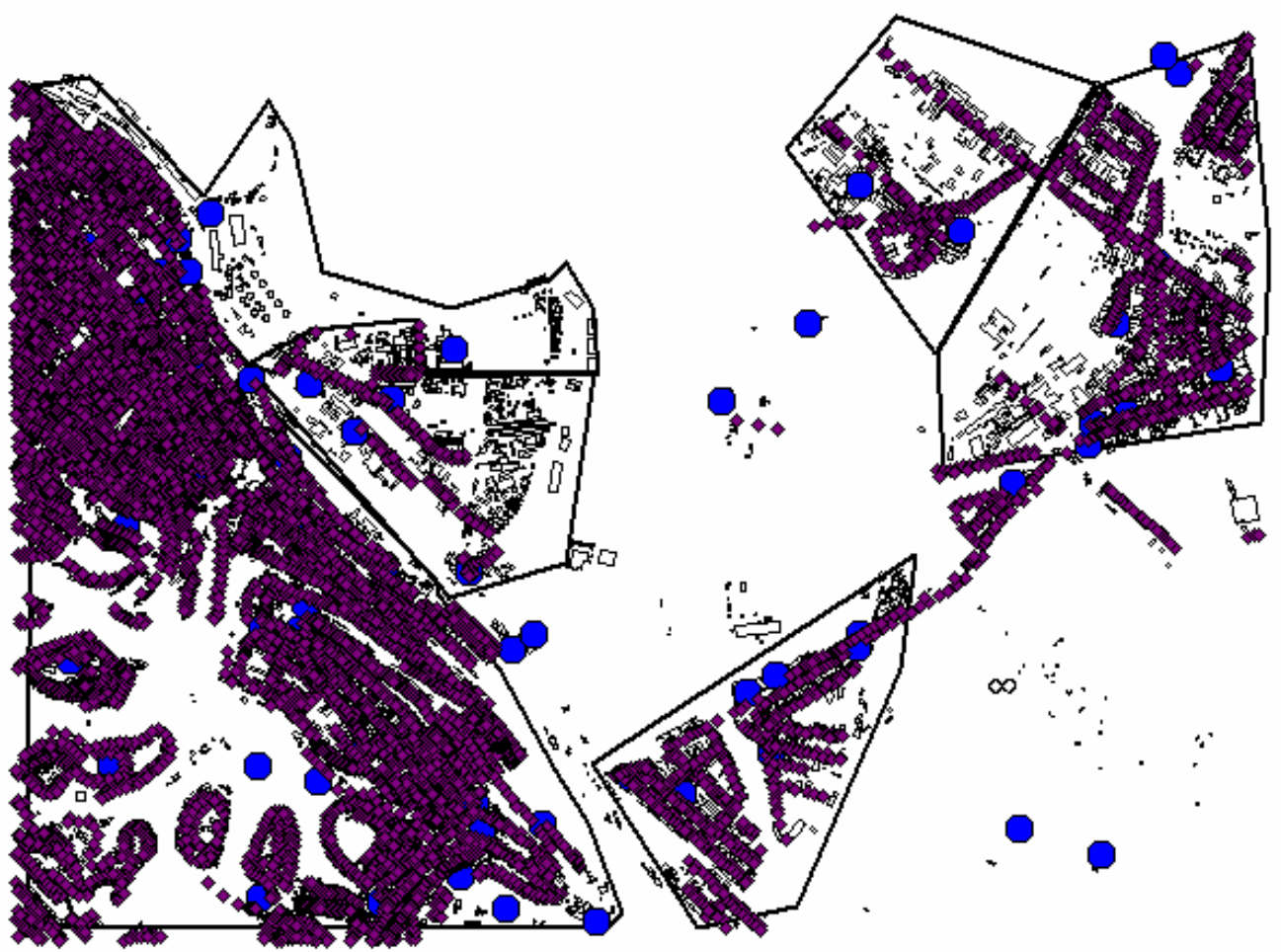
Base Station Locations



Indoor Measurement Points



Outdoor Measurement Points



Multi-cell vs. System level simulations

- MS drops are performed by selecting measurement points
- The number of MS's dropped is per user density data
- The path loss is pre-calculated
- No shadowing should be added to the pathloss
- Channel models are selected for each link individually
- Ray tracing results can be used as a basis for the channel model in urban micro-cellular cases.
- Mobile movement is simulated by selecting a track along actual streets and roads.
- Parameters are evaluated over the entire area

Proposed Text Changes

- Replace current “System Level Simulation” with “Multi-cell level simulation”
- Definition of a deterministic propagation models for system level simulation
- Explicit procedures for system level simulations
- Adding Annex J with scenario description and required data