Spatial Channel Modeling in 3GPP2 TSG-C

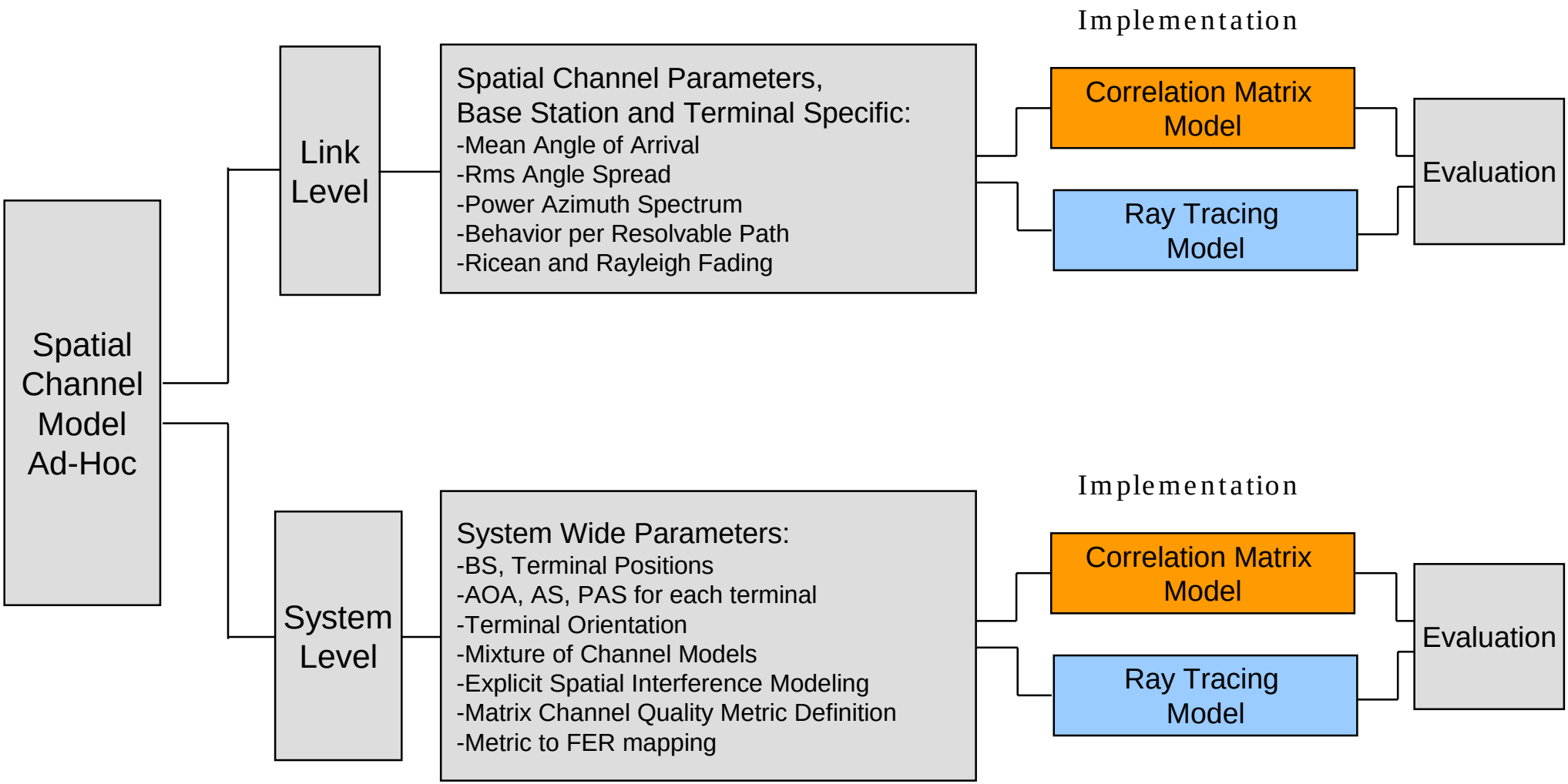
Spatial Channel Modeling

- **WG5 Spatial Channel Model Ad-Hoc created to:**
  - **Define spatial channel characteristics and simulation methodology**
  - **Establish the framework under which to evaluate multi-antenna component technologies in 1x-EVDV**

- **Contributions to the Ad-Hoc focus on definitions that accommodate a broad range of antenna technologies:**
  - **Multiple Input Multiple Output (MIMO)**
  - **Multiple Input Single Output (MISO)**
  - **Single Input Multiple Output (SIMO)**
  - **Diversity and Beamforming based techniques**

- **Ad-Hoc's activities are currently in progress.**

Spatial Channel Model Ad-Hoc Activities



Link Level Specifications

Channel Model	Multi-path Model	# of Fingers	Speed (kmph)	Fading	BS Angle Spread (deg)	Power Azimuth Spectrum(PAS)	Mean Angle of Arrival (deg)
Model A	Pedestrian A	1	3	Jakes	5	Laplacian	20
							50
Model B	Pedestrian B	3	10	Jakes	5	Laplacian	20
							50
Model C	Vehicular A	2	30	Jakes	5	Laplacian	20
							50
Model D	Pedestrian A	1	120	Jakes	5	Laplacian	20
							50
Model E	Single path	1	0, f_D=1.5 Hz	Rician Factor K = 10 dB	5	Laplacian & Rician	20
							50
Model F	Single path	1	3	Rayleigh iid	N.A.	N.A.	N.A.

Model	Finger1 (dB)	Delay	Finger2 (dB)	Delay (Tc)	Finger3 (dB)	Delay (Tc)	*FURP (dB)
Ped-A	-0.06	0.0					-18.8606
Ped-B	-1.64	0.0	-7.8	1.23	-11.7	2.83	-10.9151
Veh-A	-0.9	0.0	-10.3	1.23			-10.2759

Link Level Specifications (cont.)

Channel Parameters	Terminal	
Model	T1	T2
Angle Spread, rms in degrees (AS)	90	50
Mean Angle of Arrival, degrees (AOA)	22.5	67.5

- **Per path delay spatial parameters are identical (not finalized)**
- **Polarization modeling currently under study**
- **Resulting Models are defined with antenna spacings as free variables**
- **Channel Realizations can be conducted with Correlation Matrix or Ray-Tracing methods. Techniques defined but not single methodology adopted yet.**
- **Simulation calibration procedures not defined yet**

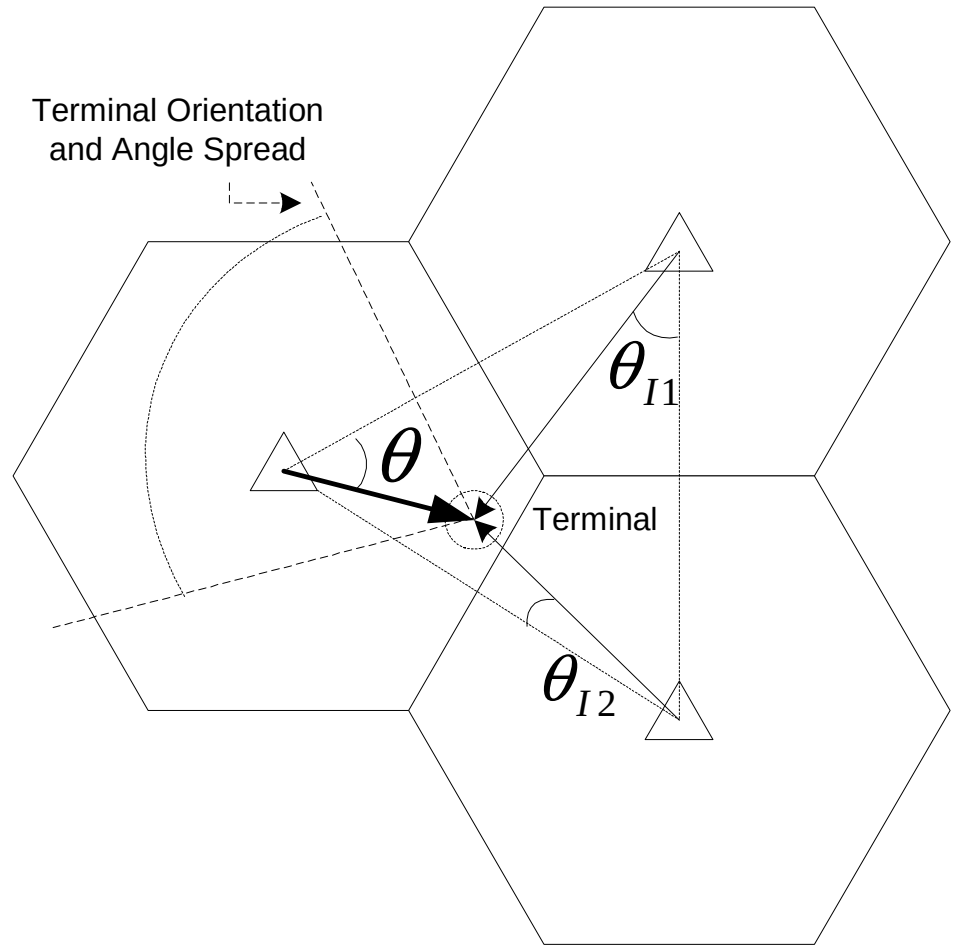
* FURP: Fractional Unrecovered Power

System Level Spatial Channel Modeling

- **Objective: Define Methodology for System Wide performance evaluation of multi-antenna schemes.**
- **System-Specific Spatial Parameters defined:**
  - **Incorporate all scalar channel assumptions and channel model mixture from Evaluation Methodology Assumptions (WG5)**
  - **Mobile - Base Station positions**
  - **Angle of Arrivals at BS, MS relative to broadside**
  - **Random MS orientation**
  - **Per path delay spatial parameters as defined in link level assumptions**
  - **Explicit modeling of Forward Link interference (in terms of AS, AOA)**
  - **Determination of Forward Vector/Matrix Channel Quality using appropriate metric (currently open issue).**
    - » **Metric Specific to MIMO/MISO/SIMO technique used at the terminal**
    - » **Metric accounts for in-cell and out-of-cell interference**
    - » **Each multi-antenna component proposal must be accompanied by its system metric definitions**
    - » **Proposals must include metric to FER mappings for system level performance evaluation**

System Level Spatial Channel Modeling (cont.)

- **Correlation Matrix or Ray-Tracing method for system level analysis have been defined. No single method adopted yet.**
- **Spatial Interference Characteristics have been shown to be non-uniform, requiring explicit interference modeling.**



Goals

- **Define spatial channel models for link & system level analysis that are:**
  - **Representative of realistic environments**
  - **Easily repeatable, and computationally mild**

Possible 3GPP-3GPP2 Commonality

- **Would it make sense to have a common 3GPP2-3GPP channel model?**
- **A common 3GPP2 - 3GPP channel model would:**
  - **Enable cross-verification of proposed technologies**
  - **Make performance results directly comparable**
  - **Broaden the acceptance of antenna technologies through the use of common simulation framework**
  - **Accelerate the standardization of proposed schemes**