TSG-RAN WG1 #85
Nanjing, China, May 23 – 27, 2016

R1-165348

Source: Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung
Agenda Item: 7.2.2
Document for: Discussion, Decision

WF on O2I spatial consistency

Background

- Spatial consistency modeling has been agreed in R1-163475/R1-161726, including the following proposals:
  - Proposal 2: Introduce spatial consistency to the LOS/NLOS and indoor/outdoor random variables in the 3GPP 3D channel model. LOS/NLOS state and indoor/outdoor state are determined by comparing the spatial consistent random variable with a distance dependent LOS probability or indoor probability.
  - Proposal 3: Make the indoor distance to be spatially consistent if it is agreed that indoor pathloss (PL_{in} in TR36.873) is a function of a uniform random indoor distance.
  - Proposal 4: If soft LOS/NLOS and soft indoor/outdoor state is modelled, introduce soft LOS/NLOS state and soft indoor/outdoor state to describe the transition regions between LOS/NLOS and indoor/outdoor. Example of the soft LOS/NLOS state and soft indoor/outdoor state can be found in the appendix.
  - The correlation distance for LoS state and indoor/outdoor state is [50m] for UMa and [50m] for UMi
- Some additional clarifications are needed to complete the parts related to O2I

Background

› Agreed O2I model

$$PL = PL_b + PL_{tw} + PL_{in} + N(0, \sigma_P)$$

	Path loss through external wall: PL_{tw} [dB]	Indoor loss: PL_{in} [dB]	Standard deviation: σ_P
Low-loss model	$5 - 10\log_{10}\left(0.3 \cdot 10^{-L_{glass}/10} + 0.7 \cdot 10^{-L_{concrete}/10}\right)$	$0.5d_{2D\text{-}in}$	7
High-loss model	$5 - 10\log_{10}\left(0.7 \cdot 10^{-L_{IRRglass}/10} + 0.3 \cdot 10^{-L_{concrete}/10}\right)$	$0.5d_{2D\text{-}in}$	7

Low loss/high loss

- Two different loss models (“building types”) have been introduced
  - These will occur with different probabilities P1 and P2
  - It seems obvious that closely located users will be in the same building type
- Proposal 1: Determine the “building type” using a spatially consistent random variable with correlation distance [50 m]
  - The building type is determined by comparing the random variable with P1 and P2

Indoor distance

- The indoor distance can be between 0-25 m
- It seems reasonable that the indoor distance should not vary faster than the physical distance between two UEs

- Proposal 2: Determine the indoor distance from a spatially consistent uniform random variable in the interval 0-25 m, with correlation distance [25 m]

Penetration loss variability

- The penetration loss variability σ_P represents variations within and between buildings of the same type
  - Users in nearby positions may experience different penetration loss due to window placement, wall materials, etc
  - For comparison, the correlation distance for the shadow fading in the O2I scenario is 7 m
- Proposal 3: Make the penetration loss variability σ_P a spatially consistent random variable with correlation distance [7m]

Summary

- Proposal 1: Determine the “building type” using a spatially consistent random variable with correlation distance [50 m]
  - The building type is determined by comparing the random variable with P1 and P2
- Proposal 2: Determine the indoor distance from a spatially consistent uniform random variable in the interval 0-25 m, with correlation distance [25 m]
- Proposal 3: Make the penetration loss variability σ_P a spatially consistent random variable with correlation distance [10m]