RS-RS, and RS-MS LOS Multihop Path Loss Model

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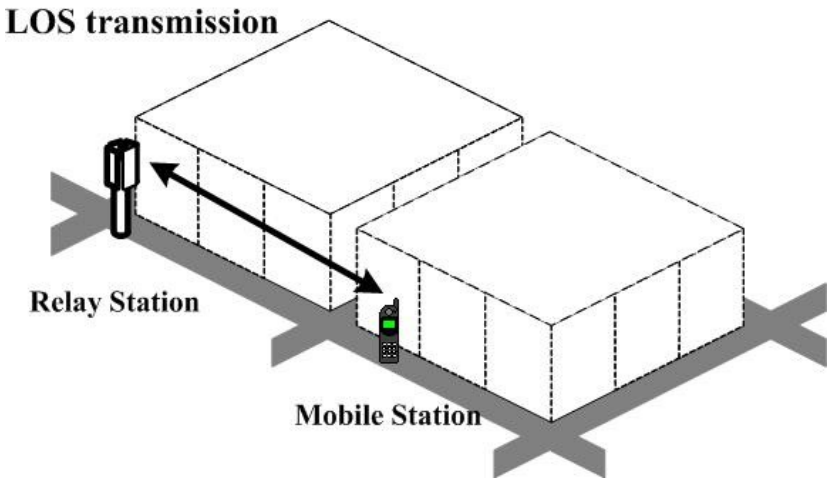
Purpose:
To further clarify the LOS path model for RS-RS and RS-MS with a comparison to WINNER model

Introduction

- In this contribution, a comparison is made of path loss models for the RS-RS, or RS-MS link in a multihop network, where both ends of the link are below rooftop and are located on the same street



RS-MS (LOS)

RS & MS below rooftop and on same street (1)

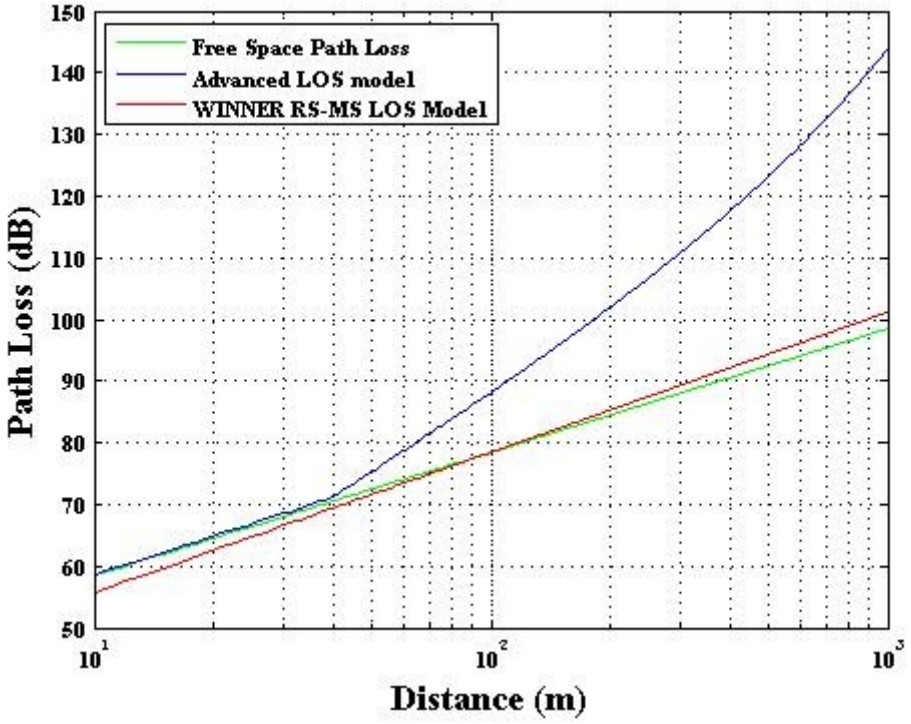
The proposed channel model from [2] (taken from [1]) is:-

$$P\ dB \quad 41 \quad 22.7 \log d \quad 20 \log \frac{f\ GHz}{5}$$

- Several measured results presented in the literature have shown that, for the given scenario, the path loss is close to a two ray model, which has a breakpoint which is dependant on the Tx and Rx antenna heights.
- A preferred model is the advanced LOS model reported in [3], and incorporated in the models proposed in [4].
  - This includes the effect of traffic through an 'effective road height', which decreases the breakpoint distance, and it includes the effect of decreasing probability of LOS with distance through an exponential 'visibility factor'.
- The advanced LOS model has been shown to agree well with measurements at different frequencies in [3].

RS-MS (LOS)

RS & MS below rooftop and on same street (2)



- The plots show a comparison of the WINNER path loss model and the advanced LOS model.
- The WINNER model is essentially the same as the free space path loss.
- The advanced LOS model is very different from free space loss due to the breakpoint and the visibility factor. The model is derived from measurements reported in [3]. For the case shown:

  RS height = 4m
  MS height = 1.5m
  Effective road height = 1m

Summary

- Proposed WINNER model is essentially the same as free space path loss
  - Not consistent with published measured results, which suggest a two-slope model with a breakpoint
- Recommend advanced LOS model [4]
  - Includes effect of traffic through ‘effective road height’
  - Includes decreasing LOS probability with distance through an exponential visibility factor

References

[1] 'Final report on link level and system level channel models', IST-2003-507581 WINNER, D5.4 v.1.4, Nov. 18th, 2005

[2] 'Channel Models and Performance Metrics for IEEE 802.16j Relay Task Group', D.Chen, I-Kang Fu, M.Hart, W.C.Wong, IEEE C802.16j-06/020, 1/5/2006

[3] 'Advanced LOS Path Loss Model in Microcellular Mobile Communications', Y.Oda, K.Tsunekawa, M.Hata, IEEE Trans VT-49, No.6, Nov. 2000, pp.2121-2125

[4] 'Below Rooftop Path Loss Model', Dean Kitchener et al., IEEE C802.16j-06/010, 1/5/2006