

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

Document Number:

IEEE C802.16j-06/064

Date Submitted:

2006-07-03

Source:

Dean Kitchener, Mark Naden
Nortel
London Road
Harlow, Essex, CM17 9NA

Voice: +44 1279 403118

Fax: +44 1279 402100

E-mail: deank@nortel.com

Wen Tong, Peiying Zhu,
Gamini Senarnath, Hang Zhang, David Steer, Derek Yu
Nortel, 3500 Carling Avenue

Voice: 613 7631315

Email: wentong@nortel.com

613 7658089

pyzhu@nortel.com

Venue:

IEEE 802.16 Session #44, San Diego, USA

Base Document: C80216j-06_040:” Multi-hop System Evaluation Methodology (Channel Model and Performance Metric)”

Purpose:

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

Notice:

This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release:

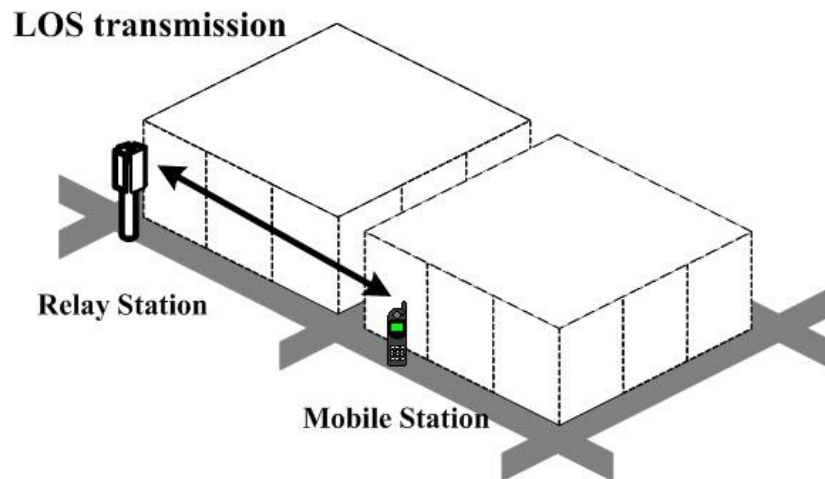
The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

IEEE 802.16 Patent Policy:

The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <<http://ieee802.org/16/ipr/patents/policy.html>>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <<mailto:chair@wirelessman.org>> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <<http://ieee802.org/16/ipr/patents/notices>>.

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)

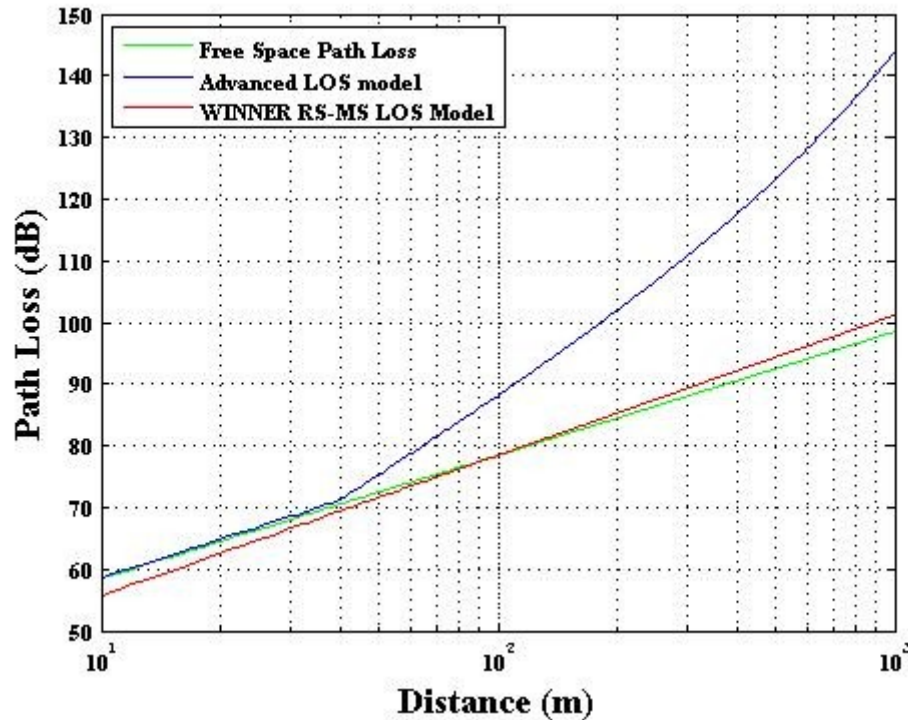
The proposed channel model from [2] (taken from [1]) is:-

$$P \text{ dB} = 41 - 22.7 \log d - 20 \log \frac{f \text{ GHz}}{5}$$

- 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