Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Comments on "Multi-hop System Evaluation Methodology (Channel Model and Performance Metric)"**
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Re:	Response to a call for contribution for the Relay TG, see C802.16j-06/006.pdf
Abstract	This document comments on C802.16j-06/040, "Multi-hop System Evaluation Methodology (Channel Model and Performance Metric)", and recommends various channel modeling scenarios for evaluation methodology.
Purpose	System evaluation methodology including Channel Model, and comments for contribution to the C802.16j-06/040.
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Comments on “Multi-hop System Evaluation Methodology”

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1. Comment-1: section 1.1 [1]

Following the simulation methodology outlined in Fig 1 [1], would the simulation components be:

- Provided by the member companies, conforming to a consistent model, or
- Developed independently.

In the latter case, a detailed description of the requirements and specifications for simulation modeling must be mutually agreed upon for : .

- link level simulations, and
- system level simulations.

For system level modelling, the following need to be defined :

- Definition of the ‘realistic traffic’.
    - Would the realistic traffic modelling be done for the central cell only, or for all the neighbouring cells as well.
- Choice of system simulation package e.g. OpNet, QualNet, MatLab etc.

2. Comment-2: section 2.1 [1]

- Simulation scenarios of BS-RS, irrespective of the LoS or NLoS link, need to conform to QoS criterion to guarantee the link quality.
- The deployment of the Fixed RS will depend upon the following characteristics:
    - Location/environment
    - Height of the antenna
    - User density
- For Nomadic and Mobile RS, an independent (or inter-dependant) set of parameters need to be defined.
- For consistency amongst various 802.16j’s sub-groups, it is recommended :
    - to follow the definition of usage scenario/model [2] for all channel modeling cases,
    - all figures existing in the document [2] should be changed accordingly.
- Furthermore, all the figures should be more general, instead of depicting a very specific scenario.

Please use the following table (Table-1) as reference model for each scenario. And, based on our analysis and review, WINNER model [3] appears to be more suitable for meeting the requirements of a relay-based system.

Table-1: Recommended channel model based on scenarios and conditions

Scenarios	Link and conditions			Recommended Channel Model	Criteria	Note
BS-MS(16e)	LoS			WINNER C1 (LoS) model [3]		Meet requirements of standards
	NLoS			WINNER C2 (NLoS) model [3] (M) WINNER C1 (NLoS) model [3] (O)		
MMR_BS-MS	LoS			WINNER B1 (LoS) model [3]		Relay enabled
	NLoS			WINNER B1 (NLoS) model [3]		
Fixed Relay	MMR_BS-RS		LoS	WINNER B5a [3] (O) SUI Model [4] (M)	QoS criterion to guarantee the link of BS-RS	Please refer to Figure 1 in [2]
			NLoS	WINNER B1 model [3] (O) SUI Model [4] (M)		
	RS-MS			Same as MMR_BS-MS (both LoS and NLoS)		
Nomadic Relay	Indoor	MMR_BS-RS	LoS	Same as BS-RS link (fixed relay – LoS)	QoS criterion to guarantee the link of BS-RS	Please refer to Figure 2 & 3 in [2]
			NLoS	WINNER B4 model [3] – low speed WINNER C4 model [3] – high speed		
		RS-MS	LoS	WINNER B3 (LoS) model [3] - Large space WINNER A1 model (LoS) [3]		
			NLos	WINNER B3 (NLoS) model [3] - Large space WINNER A1 model (NLoS) [3]		
	Outdoor	MMR_BS-RS	LoS	Same as BS-RS link (fixed relay – LoS)		
			NLoS	Same as BS-RS link (fixed relay – NLoS)		
		RS-MS		Same as RS-MS link (fixed relay)		
Mobile Relay	MMR_BS-RS	LoS		WINNER B1 model (LoS) [3] - low speed Should be micro-cell high and low speed model (needs new model), though 16e claims to be supporting high mobility upto 150 km/hr. It is recommended to use ITU Vehicular model [5] for high speed.		Please refer to Figure 4 in [2]
		NLoS		WINNER B1 model (NLoS) [3] - low speed Should be micro-cell high and low		

				speed model (needs new model), though 16e claims to be supporting high mobility upto 150 km/hr. It is recommended to use ITU Vehicular model [5] for high speed.		
	RS-MS	MS carried by RS (e.g. bus, train, etc)	LoS	WINNER A1 model (LoS) [3] - Indoor small space		
			NLoS	WINNER A1 model (NLoS) [3] - Indoor small space		
		RS, MS motions independently (e.g. man-carried RS)	LoS	WINNER B1 model (LoS) [3] - Outdoor space [NOTE]: Same channel model as MMR_BS-MS		
			NLoS	WINNER B1 model (NLoS) [3] – Outdoor space [NOTE] : Same channel model as MMR_BS-MS		

Note :

(M) – Mandatory

(O) - Optional

3. Comment-3: section 2.1.13 [1]

- Antenna patterns should be general. These can be defined as sectorised antenna, directional antenna and omni antenna for system study, wherever needed.
- Refer to Usage Model document [2].

4. Comment-4: section 3 [1]

- For traffic models, they should all meet those in IEEE802.16-2004 and IEEE802.16e-2005.
- Relay should have the capability to support all those traffic models. However, the deployment of the relay stations should not have any impact on the traffic models.
- Is there even a need to discuss traffic models in this document?

5. Comment-5: section 4 [1]

We propose the following into the performance metric :

4.1.6 End-to-end delay

Delay defined between traffic source and traffic destination

4.1.7 Blocking probability

This can be given based on the type of access requested

4.1.8 Drop probability

Handover, coverage holes

4.1.9 Packet loss statistics

6. References

[1] IEEE C802.16j-6/040, “Multi-hop System Evaluation Methodology (Channel Model and Performance Metric)” May, 2006

[2] IEEE C802.16j-6/ UMAHtemp_r5.doc, “Harmonized Contribution on 802.16j (Mobile Multihop Relay) Usage Models – Revision R5” July, 2006

[3] IST-2003-507581 WINNER, D5.4 v 1.4, “Final Report on Link Level and System Level Channel Model”,

[4] IEEE C802.16a-03/01, “Channel Models for Fixed Wireless Access” June, 2003

[5] ITU-R Recommendation M.1225: “Guidelines for Evaluation of Radio Transmission Technologies for IMT-2000, 1997”