

# Meeting Minutes

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**Group:** IEEE P802.3bn Channel Model Ad Hoc committee.

**Event:** Teleconference

**Date:** 11 Oct 2012 from 1:00 PM to 2:00 PM EDT

**Summary:** Second meeting of the Channel Model Ad Hoc committee. After reviewing IEEE Patent policy and holding a call for patents participants reviewed the Ad Hoc mission statement, tools, discussed form and content of the channel model, and agreed on action points and plans for next meeting.

## Opening

The group reviewed IEEE Patent Policy and made Call for Patents.  
The group reviewed the agenda.

## Mission Statement

Reviewed the purpose and scope of the Ad Hoc and agreed to those presented.

## Tools

The group discussed the idea of using Excel and / or MatLab. It was noted that GNU has a freeware version of MatLab that is freely available ([GNU Octave](#)) and it was suggested that any model developed in MatLab should be verified and contributed on GNU Octave. It was agreed that Excel could be used for parameter tables.

## E-mail contribution

The group reviewed the tables (reproduced below) contributed by Hal Roberts (Calix). Saifur Rahman (Comcast) provided the explanation. Several additional parameters were suggested; participants were requested to e-mail these, along with a definition of the parameter to Duane Remein (Huawei) who agreed to compile a list of parameters. Bill Powell (Alcatel-Lucent) and Saifur Rahman agree to contribute to definitions of the parameters in this list.

There was some discussion on documenting how these parameters should be applied in the channel model (a "How to Use" document) but there was not agreement on how to do this at this time. There was also discussion on documenting how the parameters relate to the EPoC PHY and its performance but again, there was not agreement on how to do this.

Again there was discussion about inclusion of common impairments in the channel model. But again, there was no agreement on this point. Interested participants are encouraged to bring a presentation to the group on this topic.

Channel Parameter (Impairment)	Example Downstream	Example Upstream	Associated Mitigating OFDM Parameters
MER	35dB	25dB	QAM Level (QPSK to 1024-QAM), FEC Level
Phase Noise	Variance <0.02	Variance <0.04	Subcarrier Bandwidth, Carrier Tracking Loop bandwidth
Microreflections	-20 dBc @ $\leq 1.5 \mu\text{sec}$ , -30 dBc @ $> 1.5 \mu\text{sec}$ -10 dBc @ $\leq 0.5 \mu\text{sec}$ , -15 dBc @ $\leq 1.0 \mu\text{sec}$	-10 dBc @ $\leq 0.5 \mu\text{sec}$ , -20 dBc @ $\leq 1.0 \mu\text{sec}$ -30 dBc @ $> 1.0 \mu\text{sec}$	Cyclic Prefix duration, Subcarrier Bandwidth
Group Delay Ripple	<75ns/6MHz	<200ns/MHz	Cyclic Prefix duration, Subcarrier Bandwidth
Impulse Noise	Not longer than 25 $\mu\text{sec}$ at a 10 Hz average rate at an amplitude of 0dB/1MHz OFDM	Not longer than 10 $\mu\text{sec}$ at a 1 kHz average rate for most cases	FEC Level, Interleaver?
Carrier to Discrete Interference (sum total of discrete interferers within 1MHz)	>36dB/1MHz OFDM signal	>10dB/1MHz OFDM signal	Wavelets vs OFDM, Subcarrier Bandwidth
Carrier Offset	?	?	Frequency Synchronization and Tracking Loops
Amplitude Ripple	<0.5dB/MHz	<0.5dB/MHz	Should subcarriers have different QAM?
Non Linear Amplifier -	2dB	4dB	QAM Level (QPSK to

Output Backoff (OBO)			1024-QAM)
Etc	?	?	Etc.

## B. ReDeSign Channel Model

Channel Parameter	IEEE 802.14 <sup>12</sup>	ReDeSign Model	
		Basic	Additional
Echo	Power (dB)    Delay(ns) -11            0-200 -14            200-400 -17            400-800 -23            800-1200 -32            1200-2500 -40            2500-15000	Power (dB)    Delay(ns) -11            0-200 -14            200-400 -17            400-800 -23            800-1200 -32            1200-2500 -40            2500-15000	IEEE 802.14 • -3 dB • -6 dB
GDV Components	25 ns / 6 MHz	50 ns / 10 MHz	
Gaussian noise	Thermal noise	Thermal noise (Network design parameter)	Gaussian-distributed IM products (Network design parameter)
Narrowband beats (Intermodulation)	not included		<ul style="list-style-type: none"> <li>Bandwidth about 15 KHz</li> <li>Located at 0 and +/- offset frequency from the carriers</li> <li>Variable signal level of 24 dB above the noise level</li> </ul>
Impulse noise	<ul style="list-style-type: none"> <li>360 events per second</li> <li>Peak width 1µs</li> <li>Peak level 40 dB<sub>ref</sub></li> <li>Spread in frequency domain</li> </ul>		<ul style="list-style-type: none"> <li>Randomly generated</li> <li>Peak width 1/band width</li> <li>PDF as shown in Figure 47</li> <li>3 10<sup>3</sup> events @ &gt;7σ per sec.</li> <li>Spread in frequency domain</li> </ul>

<sup>12</sup> The table only provides rough descriptions of the parameters. For a complete description, the reader is referred to Ref. 1      Thomas J. Kolze, HFC Channel Model Submission, IEEE 802.14a/98-12, May 1998 Ref. 1

Burst noise	<ul style="list-style-type: none"> <li>1 per minute</li> <li>30 µs duration</li> <li>Peak level +20 dB above signal level</li> </ul>		Incidental events composed of: Trains of impulses <ul style="list-style-type: none"> <li>1 per 5 minutes</li> <li>Peak width 1/band width</li> <li>signal level 20 – 30 dB<sub>noise</sub></li> <li>inter arrival about 2 µs</li> <li>2000 µs duration</li> <li>Spread in frequency domain</li> </ul>
Narrow band interferer	<ul style="list-style-type: none"> <li>100 kHz carrier</li> <li>-15 dB<sub>c</sub></li> </ul>	+10 dB above the noise level	
Adjacent channel interference	Defined by neighbouring transmission system (PAL, DVB-C ro DVB-C2)	Defined by neighbouring transmission system (PAL, DVB-C ro DVB-C2)	
Hum	2,5 %	-47 dBc	
Phase noise (at HE output)	1 kHz -44 dBc 10 kHz -86 dBc 100 kHz -106 dBc 1000 kHz -116 dBc	Not included	Not included

## Action Items

Item	Date	Assigned to	Status	Description	Response/Update
1	121004	D Remein	C	Add Scope slide to mission statement.	See slide 10 in IEEE p802bn Channel Model ad hoc 121011
2	121004	D Remein	C	Add separate slide on Tools	See slide 11 in IEEE p802bn Channel Model ad hoc 121011
3	121004	D Remein	C	Enquire of CableLabs® about obtaining a copy of the previous work on a cable channel model (circa 1994)	See <a href="http://www.cablelabs.com/downloads/digital_transmission.pdf">http://www.cablelabs.com/downloads/digital_transmission.pdf</a> (provided by Joe Solomon)
4	121004	S Rahman	O	Distribute the channel model input form developed by the informal group.	Expected ~10/10
5	121004	S Rahman	O	Distribute the channel model output information collected by the informal group.	Expected ~10/17
6	121004	L Montreuil	C	Distribute link to prior work done for DVB C2 published in 2008 (assuming this is public).	See D08 Report on cable channel models at <a href="http://www.ict-redesign.eu/fileadmin/documents/ReDeSign-D08_Report_on_Cable_Channel_Model.pdf">http://www.ict-redesign.eu/fileadmin/documents/ReDeSign-D08_Report_on_Cable_Channel_Model.pdf</a>
7	121010	D Remein	O	Start Parameter List	
8	121010	S Rahman / B Powell	O	Provide definitions of parameters	

## Detailed presentation material:

All presentations will be available at [the p802.3bn private web site](#).

## Attendees:

<b>Name</b>	<b>Affiliation</b>
Blake, Victor	Victorblake
ElBakoury, Hesham	Futurewei
Farmer, Jim	Aurora
Hajduczenia, Marek	ZTE
Hewavithana, Thushara	Intel
Hou, Victor	Broadcom
Ivry, Raanan	Widepass
Laubach, Mark	Broadcom
Montreuil, Leo	Broadcom
Powell, Bill	Alcatel-Lucent
Rahman, Saifur	Comcast
Ravikiran Rajagopal	Intel
Remein, Duane	Huawei
Shellhammer, Steve	Qualcomm
Solomon, Joe	Comcast
Staniec, Tom	Cohere Networks
Varanese, Nicola	Qualcomm

Recorded by Duane Remein