

Rudimentary Host PCB channel model for 10GBASE-T LOM

IEEE P802.3bq 40GBASE-T Task Force
Channel Modeling Ad Hoc

David Chalupsky, Intel
Ray Schmelzer, Intel

Update
September, 27 2013

Revision History

Date	Description
August 26, 2013	Original posting of s16p file (10GBaseT_PCB_channel_models.zip). Overview presented at Sept'13 meeting of 802.3bq in York. (Original presentation remains on meeting website.)
September 27, 2013	Error corrected in PSNEXT calculation used for plot in overview (this presentation). No change to s16p file.

Overview

- **Motivation:**
 - Provide 10GBASE-T host trace models as a starting point for 40GBASE-T modeling
 - Future PCB design requirements could be more stringent, but this is representative of the current state of high volume server design
- **Status:**
 - Rudimentary s16p model available
 - 2” and 8” length
 - Several trace geometry variations

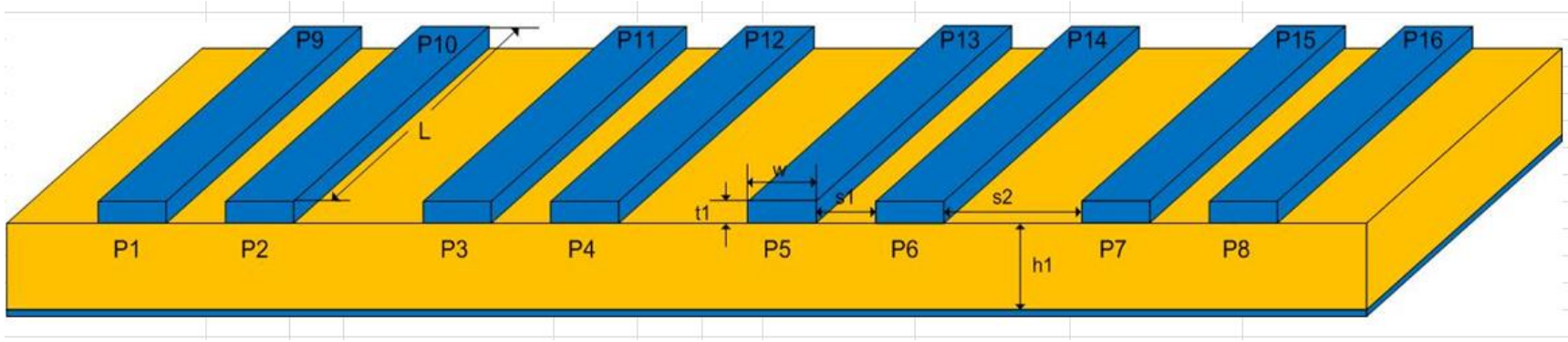
Model Development Path

- PCB stack up and material representative of 2012 high volume server reference board
- Test channel boards built and measured
- Correlated to HSFF models
- Multiple variations modeled in HFSS

What Works, What Doesn't

- Model is a good representation of
 - Insertion loss
 - Crosstalk
- Model is optimistic on return loss
 - Only nominal impedance
 - No vias
- Future work
 - Impedance variation, 90ohm, 110ohm.
 - Include internal layer routing and vias

Stack Up

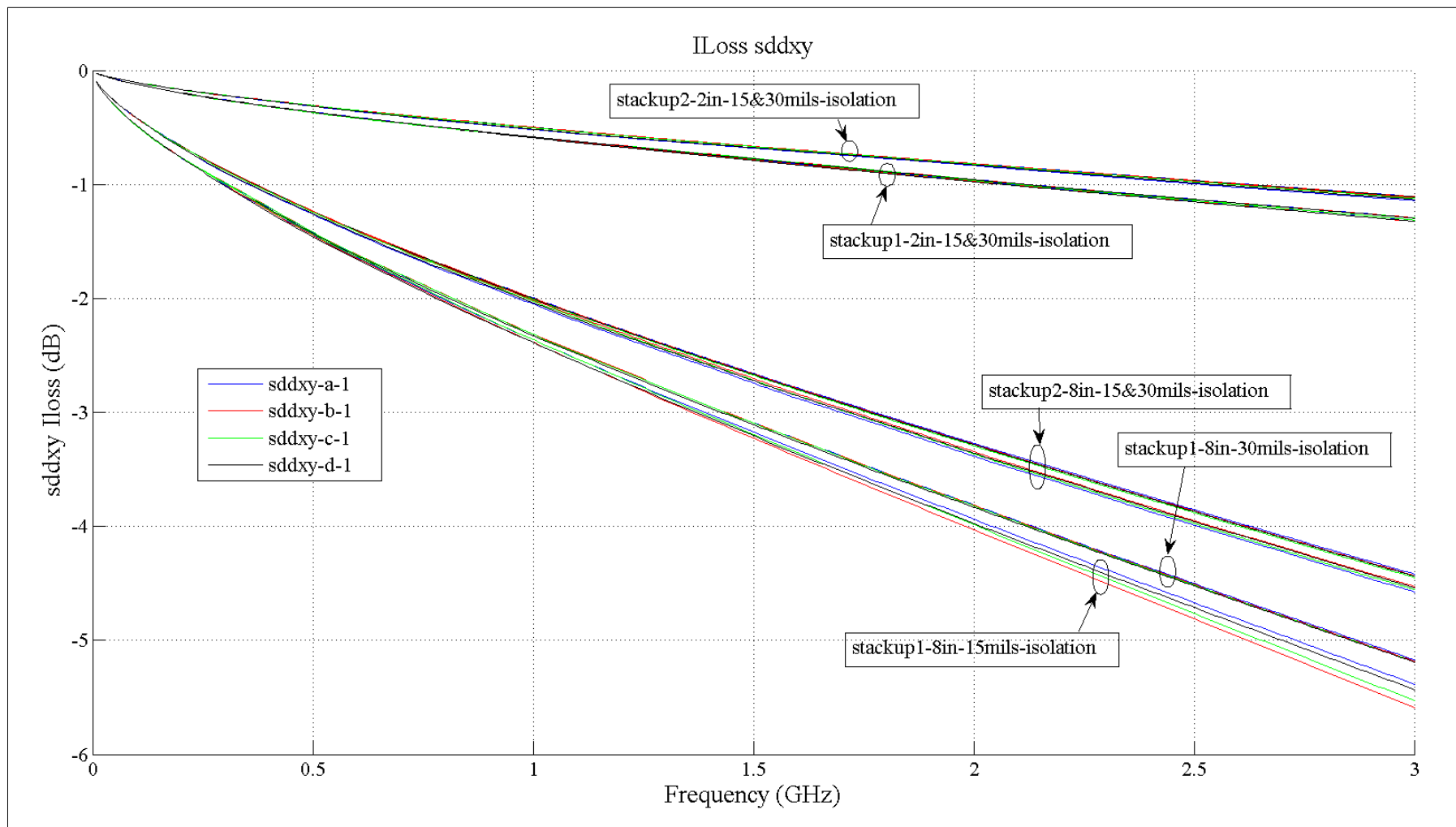


Stack-up 1		Stack-up 2	
w (mils)	4	w (mils)	4
h1 (mils)	2.7	h1 (mils)	3.5
s1 (mils)	11	s1 (mils)	5.1
t1 (mils)	2	t1 (mils)	2
dk	4.04	dk	4.04
df	0.02	df	0.02
s2 (mils)	varied	s2 (mils)	varied
calculated Zdiff (ohms)	99.6	calculated Zdiff (ohms)	100.2
calculated Zcomm (ohms)	27.3	calculated Zcomm (ohms)	34.1

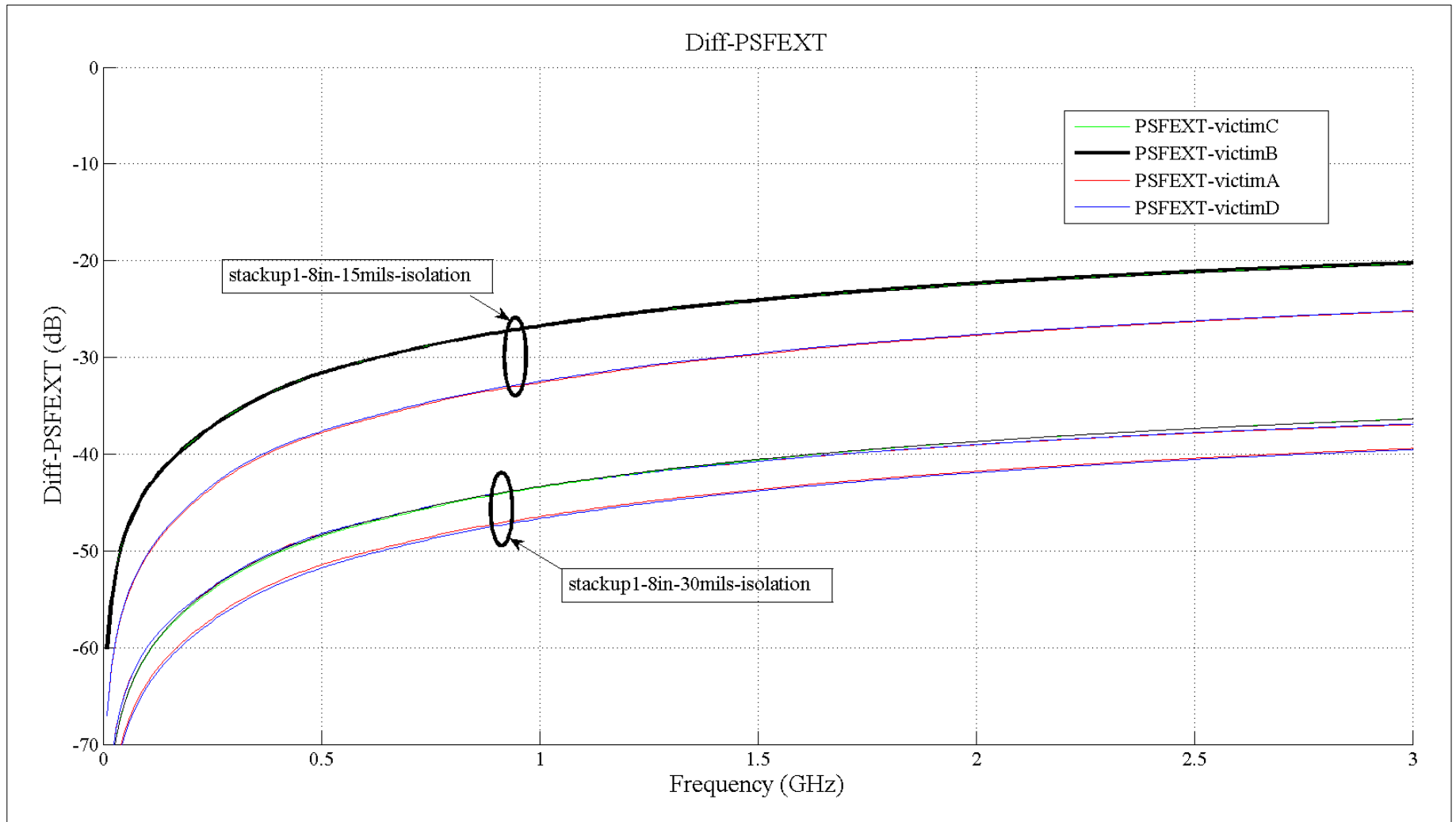
Various configurations:

- 2" & 8" length
- Separation from 15-30mils
- 1um copper roughness

Insertion Loss

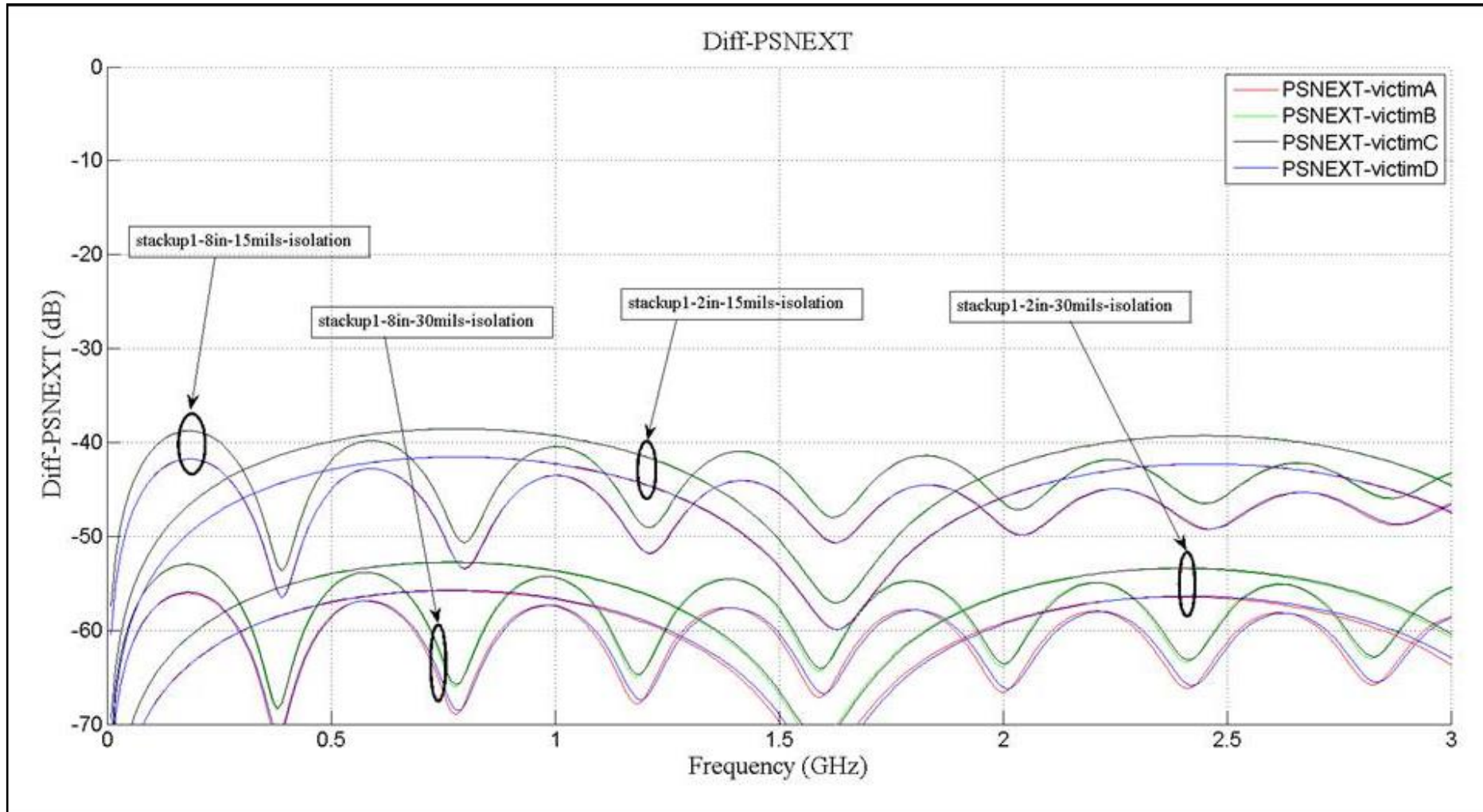


Power Sum Diff FEXT



Power Sum Diff NEX

(updated 9/27/13)



Data Summary

- Worst cases for this nominal impedance simulation set:
 - PSFEXT; stackup1_8in_15mils_isolation (chB,chC)
 - PSNEXT; stackup1_8in_15mils_isolation
 - Iloss; stackup1_8in_15mils_isolation

Thank You!