Host Channel/PCB Model Parameters for P802.3dj: Addressing Comment # 537

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Background and Objectives

- Comment # 537 against 802.3dj D1.1 specification was made to address the Host channel /PCB model parameter TBDs

CI 179   SC 179.11.7.1   P 360   L 8   # 537

Li, Mike   Intel

Comment Type   TR   Comment Status X

Table 179–17—PCB model parameter values TBDs

SuggestedRemedy

Replace them with the filled table provided in the "PCB_models_parameters" sheet. A presentation "lim_3dj_01_2409" will be requested to explain how those values are derived.

Proposed Response   Response Status O

Table 179–17—PCB model parameters and values

Parameter	Value		Units
γ_0	TBD	0	1/mm
a_1	TBD	5.95e-4	$\text{ns}^{1/2}/\text{mm}$
a_2	TBD	2.6e-5	ns/mm
τ	TBD	5.79e-3	ns/mm
C_0	TBD	2.9e-5	nF
C_1	TBD	1.0e-5	nF
Z_c	TBD	92.5	Ω
R_0		50	Ω

TBD filling

- This presentation provides the details on how host channel/PCB model parameters were derived

Introduction

- Host channel/PCB model and parameter definitions

178A.1.4.3 Host channel

Editor's Note (to be removed prior to final publication):

A host channel model has not yet been adopted. The model described in Clause 162 is used as a placeholder.

The host channel model is shown in Figure 178A–5 and is a function of the parameters summarized in Table 178A–5. It is the cascade connection of a first shunt capacitor C_0, a transmission line, and a second shunt capacitor C_1.
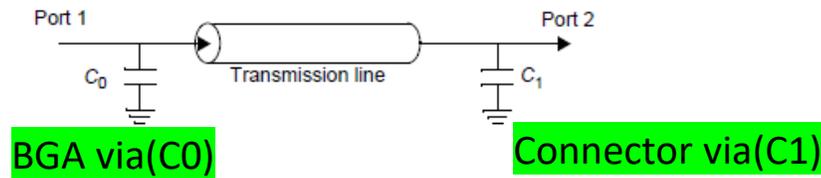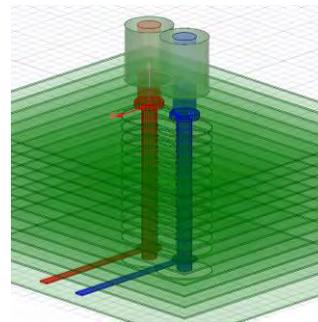
BGA via(C0)

Connector via(C1)

Figure 178A–5—Host channel model

Table 178A–5—Summary of host channel parameters

Parameter	Symbol	Units
Single-ended package capacitance at port 1 BGA via(C0)	C_0	nF
Host transmission line parameter, γ_0	$\gamma_0^{(h)}$	1/mm
Host transmission line parameter, a_1	$a_1^{(h)}$	$ns^{1/2}$/mm
Host transmission line parameter, a_2	$a_2^{(h)}$	ns/mm
Host transmission line parameter, τ	$\tau^{(h)}$	ns/mm
Host transmission line differential characteristic impedance	$Z_c^{(h)}$	Ω
Host transmission line length	$z_p^{(h)}$	mm
Single-ended package capacitance at port 2 Connector via(C1)	C_1	nF

A PKG BGA via illustration (including stub)
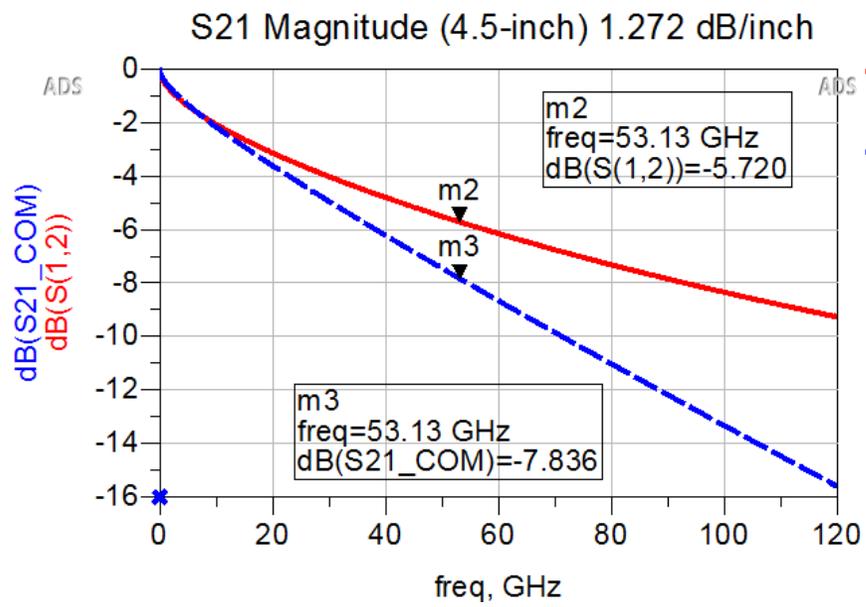
A Host Channel Design Example

- Host BGA via->PCB-> Connector via
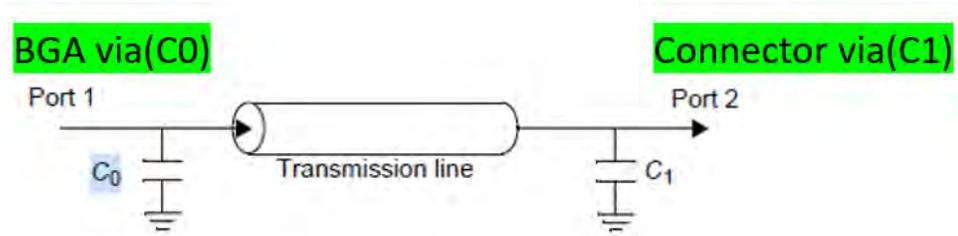
A 6.5dB Host Channel Design Example
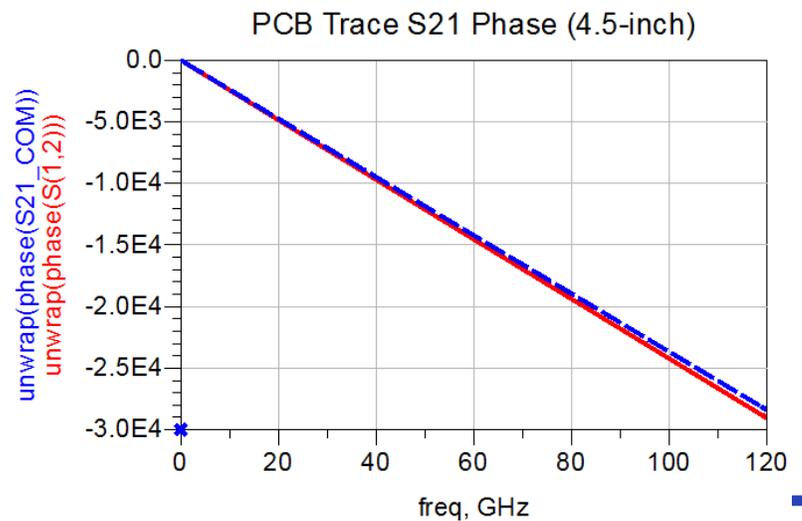

Component	Insertion Loss Port 1-Port 2 (dB) @ 53.125GHz
BGA via	0.6 dB
Host PCB Trace	1.272 dB/inch
Connector via	0.172 dB
Host Channel Length	4.5 inch
Total	6.5 dB

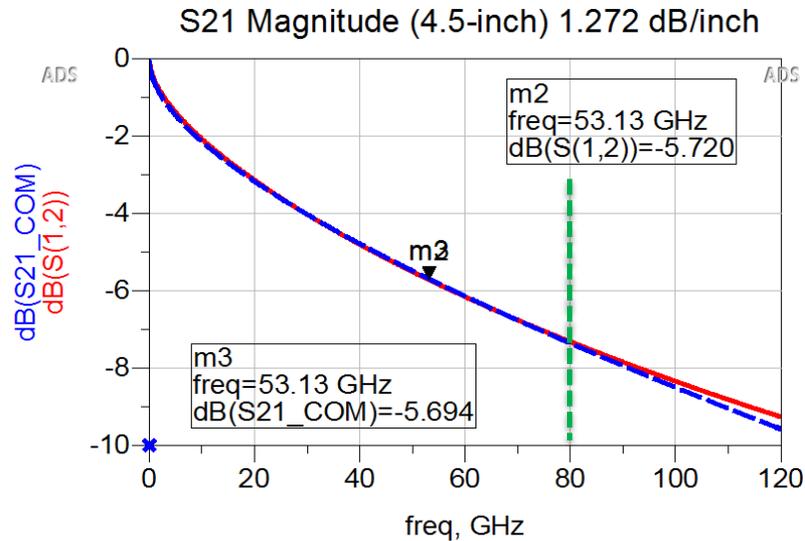# Start From 802.3ck 100G/L Host Channel Model Parameters: PCB Trace

S21 Magnitude (4.5-inch) 1.272 dB/inch

— HFSS Design
- - - COM model

m2
freq=53.13 GHz
dB(S(1,2))=-5.720

m3
freq=53.13 GHz
dB(S21_COM)=-7.836

PCB Trace S21 Phase (4.5-inch)

802.3ck Host Channel Model Parameters

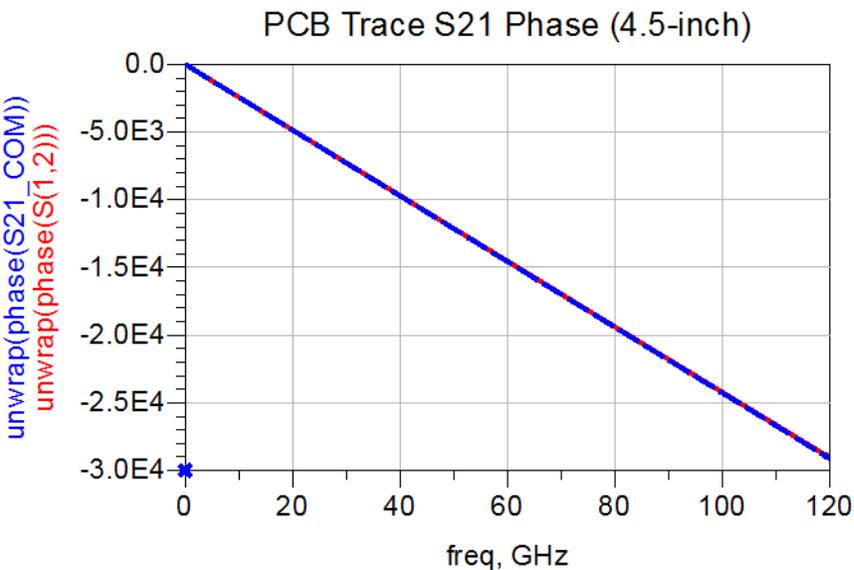| Parameter	Value	Units
γ_0	0	1/mm
a_1	3.8206×10^{-4}	$\text{ns}^{1/2}/\text{mm}$
a_2	9.5909×10^{-5}	ns/mm
τ	5.79×10^{-3}	ns/mm
C_0	2.9×10^{-5}	nF
C_1	1.9×10^{-5}	nF
Z_c	100	Ω
R_0	50	Ω

Adjust Host Channel Model Parameters to Match the 200G/L Design (I): PCB Trace

S21 Magnitude (4.5-inch) 1.272 dB/inch

m2
freq=53.13 GHz
dB(S(1,2))=-5.720

m3
freq=53.13 GHz
dB(S21_COM)=-5.694

— HFSS Design
----- COM model

PCB Trace S21 Phase (4.5-inch)

Parameter	Value		Units
γ_0		0	1/mm
a_1	5.95e-4 $>$	3.8206×10^{-4}	$ns^{1/2}/mm$
a_2	2.6e-5 $<$	9.5909×10^{-5}	ns/mm
τ	5.79e-3 $=$	5.79×10^{-3}	ns/mm
C_0		2.9×10^{-5}	nF
C_1		1.9×10^{-5}	nF
Z_c	92.5 $<$	100	Ω
R_0		50	Ω

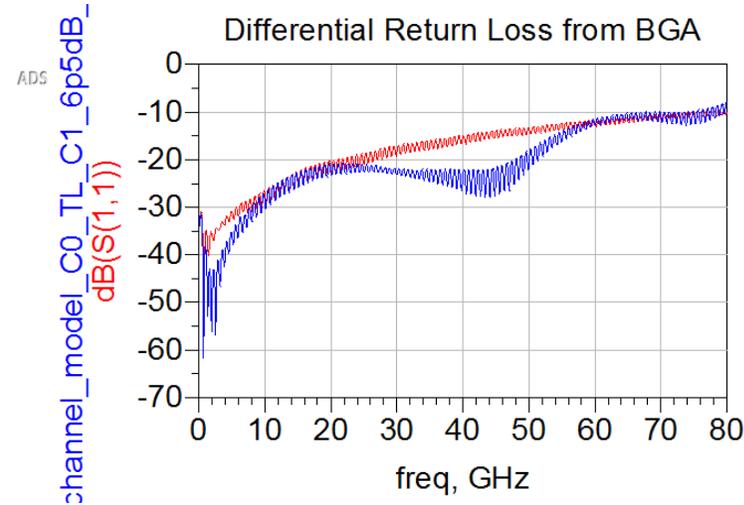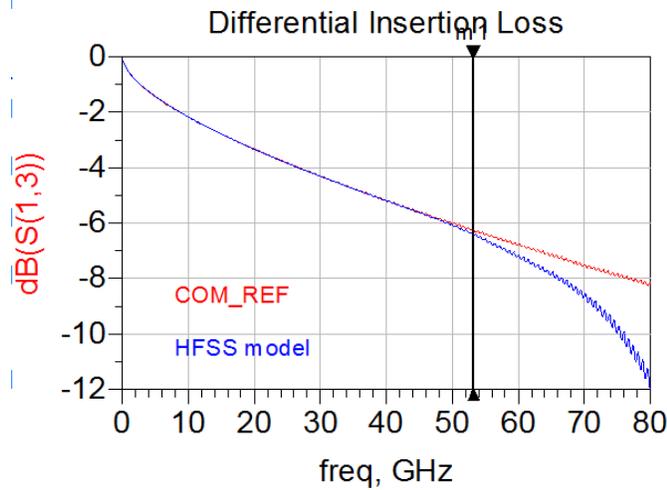# Adjust Host Channel Model Parameters to Match the 200G/L Design (II): BGA Via->PCB trace -> Connector Via
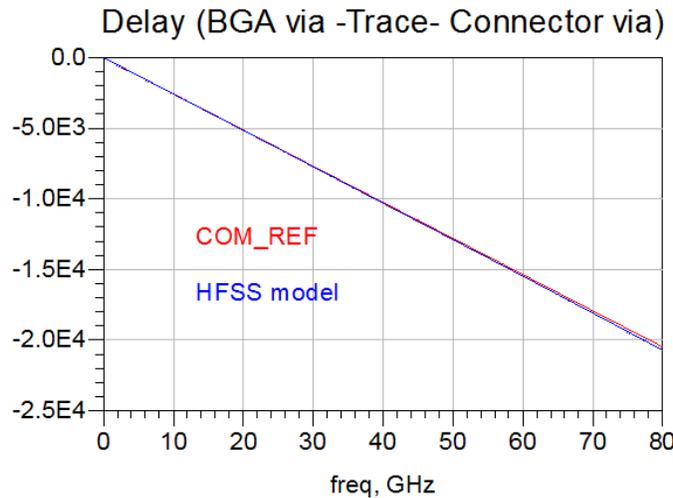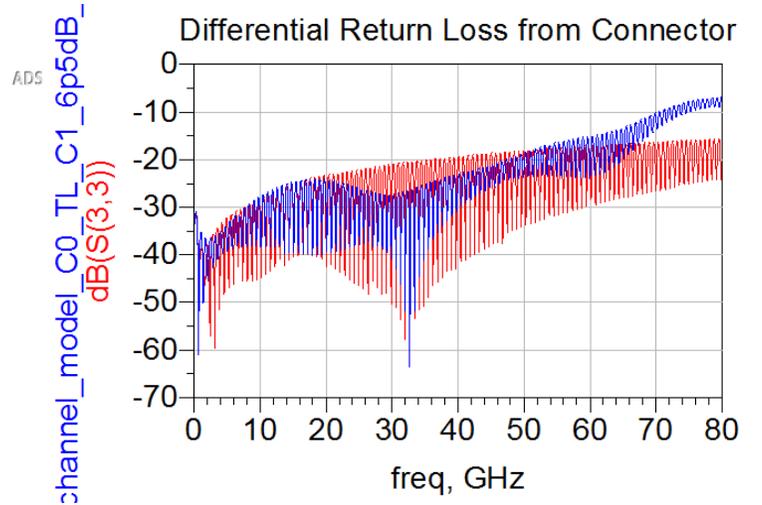
Differential Insertion Loss

Differential Return Loss from BGA

Differential Return Loss from Connector

Delay (BGA via -Trace- Connector via)

Parameter	Value		Units
γ_0		0	1/mm
a_1	5.95e-4 >	3.8206×10^{-4}	$ns^{1/2}/mm$
a_2	2.6e-5 <	9.5909×10^{-5}	ns/mm
τ	5.79e-3 =	5.79×10^{-3}	ns/mm
C_0	2.9e-5 =	2.9×10^{-5}	nF
C_1	1.0e-5 <	1.9×10^{-5}	nF
Z_c	92.5 <	100	Ω
R_0		50	Ω

Proposed Host Channel/PCB Model Parameters

Table 179–17—PCB model parameters and values

Parameter	Value		Units
γ_0	TBD	0	$1/\text{mm}$
a_1	TBD	5.95e-4	$\text{ns}^{1/2}/\text{mm}$
a_2	TBD	2.6e-5	ns/mm
τ	TBD	5.79e-3	ns/mm
C_0	TBD	2.9e-5	nF
C_1	TBD	1.0e-5	nF
Z_c	TBD	92.5	Ω
R_0	50		Ω

TBD filling

Thank You!