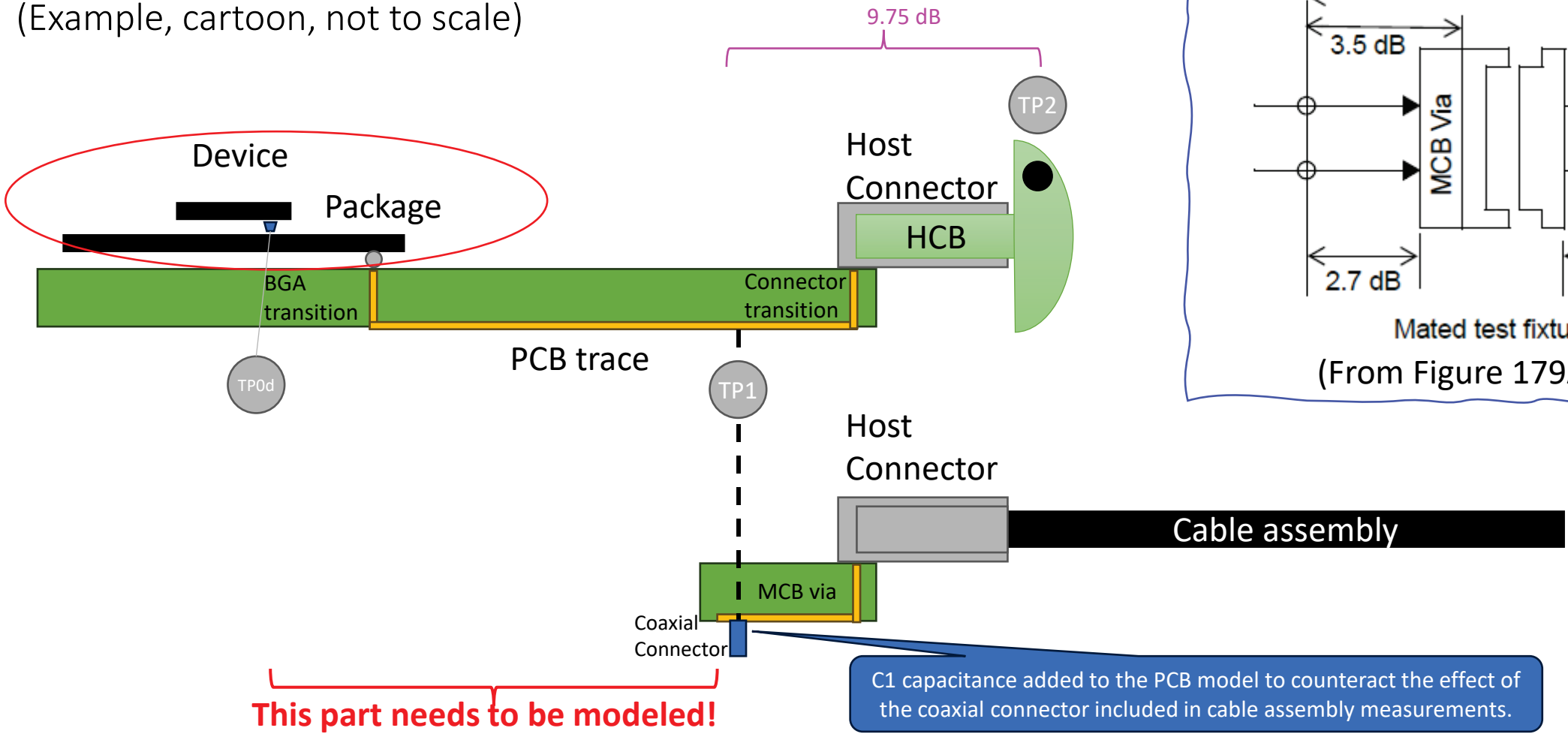
CR and C2M host channel model parameters

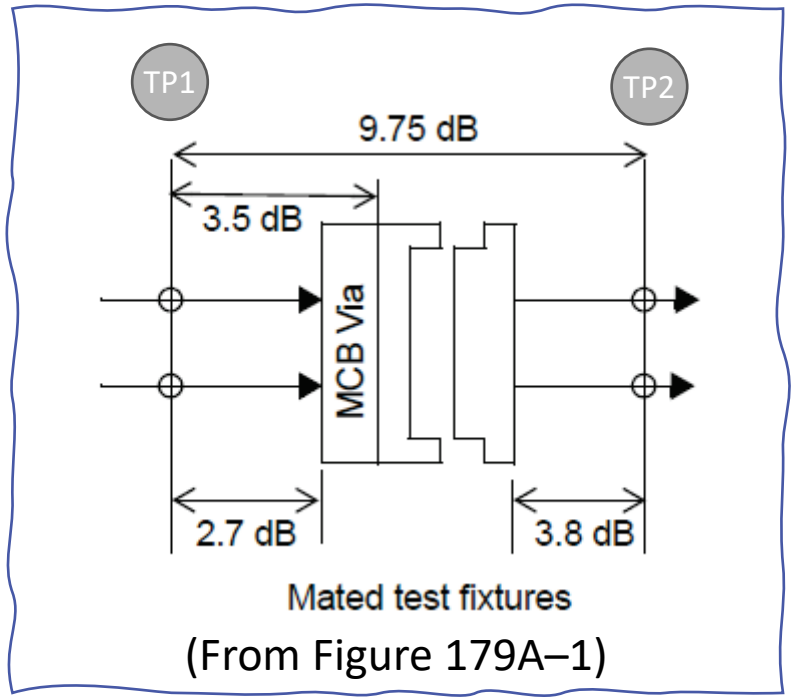
Comments #92, #83

Adee Ran, Cisco

What's in the host, what's not

(Example, cartoon, not to scale)





Adopted CR host channel and MTF ILdd

Table 179A–1—Recommended differential insertion loss limits at 53.125 GHz

Host class	Host channels	TP0d to TP2 or TP3 to TP5d
	Range (dB)	Max (dB)
Host-Low (HL)	4.45-8.95	12.75
Host-Nominal (HN)	4.45-13.95	17.75
Host-High (HH)	4.45-18.5	22.75

Should be 18.95

CR Host class	Max ILdd (TP0d-TP1 or TP4-TP5d)
HL	12.75-9.75=3
HN	17.75-9.75=8
HH	22.75-9.75=13

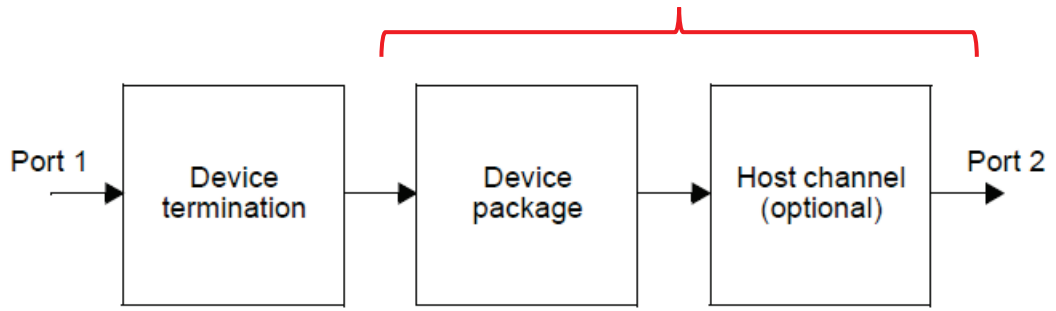


Figure 178A–2—Transmitter S-parameter model

Adopted C2M host channel and MTF ILdd

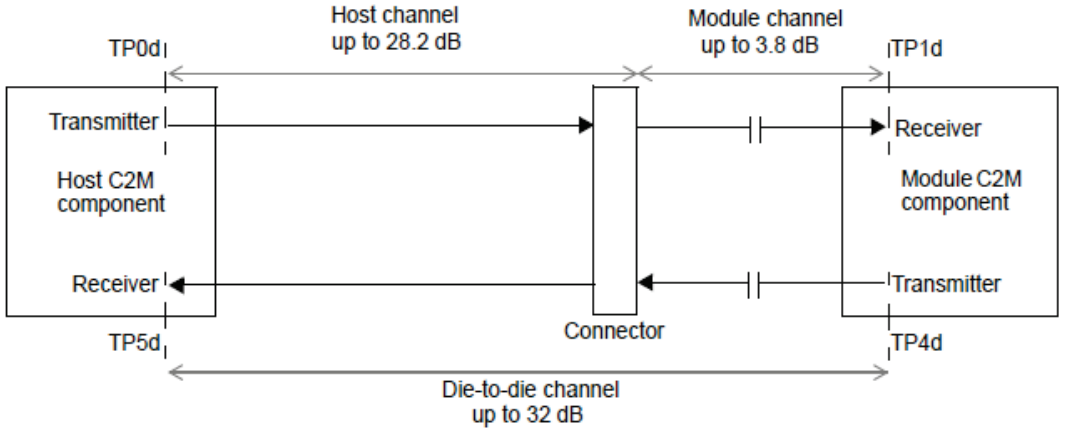


Figure 176D–6—Reference insertion loss budget at 53.125 GHz

C2M Host class	Max ILdd (TP0d-TP1 or TP4-TP5d)
(there is only one)	32-9.75=22.25

The response to comment #115 included the statements:
"Based on the straw polls, there is consensus to use 32 dB as the TP0d to TP1a budget.
Per ghiasi_3dj_03a_2409, the module ILdd allocation is 3.8 dB, same as the HCB.
Therefore, TP0d to TP1d is also 32 dB."

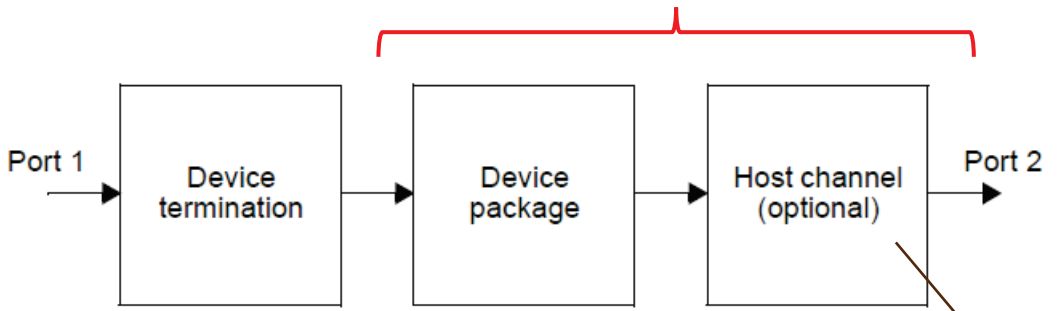


Figure 178A–2—Transmitter S-parameter model

Note: This "Host channel" is not the same as the "Host channel" in the diagram on the top left. A different name could be considered.

Host channel model and parameters

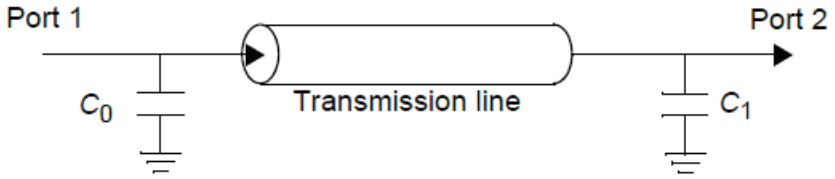


Figure 178A–5—Host channel model

Parameters adopted based on comment #537:

Table 179–16

Host channel model			
Single-ended package capacitance at port 1	C_0	2.9×10^{-5}	nF
Transmission line parameter γ_0	$\gamma_0^{(h)}$	0	1/mm
Transmission line parameter a_1	$a_1^{(h)}$	5.95×10^{-4}	$ns^{1/2}$/mm
Transmission line parameter a_2	$a_2^{(h)}$	2.6×10^{-5}	ns/mm
Transmission line parameter τ	$\tau^{(h)}$	5.79×10^{-3}	ns/mm
Transmission line characteristic impedance	$Z_c^{(h)}$	92.5	Ω
Transmission line length	$z_p^{(h)}$	See Table 179–18	mm
Single-ended package capacitance at port 2	C_1	1×10^{-5}	nF

Table 176D–5

Host channel model			
Single-ended package capacitance at port 1	C_0	2.9×10^{-5}	nF
Transmission line parameter γ_0	$\gamma_0^{(h)}$	0	1/mm
Transmission line parameter a_1	$a_1^{(h)}$	5.95×10^{-4}	$ns^{1/2}$/mm
Transmission line parameter a_2	$a_2^{(h)}$	2.6×10^{-5}	ns/mm
Transmission line parameter τ	$\tau^{(h)}$	5.97×10^{-3}	ns/mm
Transmission line characteristic impedance	$Z_c^{(h)}$	92.5	Ω
Transmission line length	$z_p^{(h)}$	TBD	mm
Single-ended package capacitance at port 2	C_1	1×10^{-5}	nF

This “Host channel” row could be renamed to differentiate it from the host channel shown in Figure 176D-6.

Table 179–18—Host channel PCB length parameter $z_p^{(h)}$

Host class	Value		Units
	Signal path, transmitter or receiver	Aggressor path, transmitter	
HL	TBD	TBD	mm
HN	TBD	TBD	mm
HH	TBD	TBD	mm

Lengths (TBD) need to be adopted

Package model parameters

Table 179–16—Device, package, and PCB model parameters

Parameter	Symbol	Value	Units
Device model			
Single-ended device capacitance for stage 1	$C_d^{(1)}$	40×10^{-6}	nF
Single-ended device capacitance for stage 2	$C_d^{(2)}$	90×10^{-6}	nF
Single-ended device capacitance for stage 3	$C_d^{(3)}$	110×10^{-6}	nF
Single-ended device series inductance for stage 1	$L_s^{(1)}$	0.13	nH
Single-ended device series inductance for stage 2	$L_s^{(2)}$	0.15	nH
Single-ended device series inductance for stage 3	$L_s^{(3)}$	0.14	nH
Single-ended bump capacitance	C_b	30×10^{-6}	nF
Class A package model			
Transmission line parameter γ_0	γ_0	5×10^{-4}	1/mm
Transmission line parameter a_1	a_1	8.9×10^{-4}	$ns^{1/2}$/mm
Transmission line parameter a_2	a_2	2×10^{-4}	ns/mm
Transmission line parameter τ	τ	6.141×10^{-3}	ns/mm
Transmission line 1 length, Test 1	$z_p^{(1)}$	33	mm
Transmission line 1 length, Test 2	$z_p^{(1)}$	12	mm
Transmission line 1 characteristic impedance	$Z_c^{(1)}$	87.5	Ω
Transmission line 2 length	$z_p^{(2)}$	1.8	mm
Transmission line 2 characteristic impedance	$Z_c^{(2)}$	92.5	Ω
Class B package model			
Transmission line parameter γ_0	γ_0	5×10^{-4}	1/mm
Transmission line parameter a_1	a_1	6.5×10^{-4}	$ns^{1/2}$/mm
Transmission line parameter a_2	a_2	2.93×10^{-4}	ns/mm
Transmission line parameter τ	τ	6.141×10^{-3}	ns/mm
Transmission line 1 length, Test 1, Tx / Rx	$z_p^{(1)}$	45 / 44	mm
Transmission line 1 length, Test 2, Tx / Rx	$z_p^{(1)}$	30 / 29	mm
Transmission line 1 characteristic impedance	$Z_c^{(1)}$	87.5	Ω
Transmission line 2 length	$z_p^{(2)}$	2	mm
Transmission line 2 characteristic impedance	$Z_c^{(2)}$	95	Ω
Transmission line 3 length	$z_p^{(3)}$	1.3	mm
Transmission line 3 characteristic impedance	$Z_c^{(3)}$	100	Ω
Transmission line 4 length	$z_p^{(4)}$	1.5	mm
Transmission line 4 characteristic impedance	$Z_c^{(4)}$	78	Ω
Single-ended package capacitance at package-to-board interface	C_p	40×10^{-6}	nF

- For CR HL: assume a loss-optimized package (class A) with very short trace length, to enable some PCB loss
- For CR HH: assume radix-optimized package (class B) with long traces
- For CR HN: assume package class B with short traces
- For C2M: assume package class B with long traces

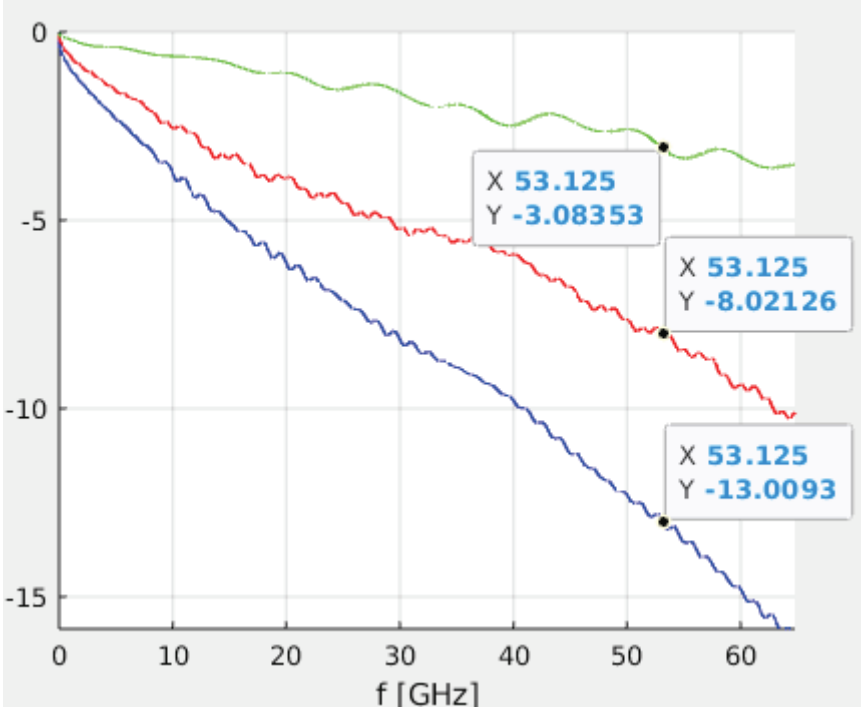
Trace lengths should be adjusted per case

Proposed CR host channel parameter values (comment #92)

Updated Table 179-18

Parameter	Host class			Units
	HL	HN	HH	
Package class	A	B	B	—
Package transmission line 1 length, $z_p^{(1)}$	8	15	45	mm
Host transmitter or receiver transmission line length, $z_p^{(h)}$	9	70	60	mm
Resulting ILdd [dB]	3	8	13	

(No “Test 1 / 2”)



Note: the “Host transmission line length” above may seem too short but remember this is just a model which complements the MCB included in the cable assembly measurement.
In practice, the host includes the loss allocated to the MCB. Also, package/PCB loss allocation may be different, and “host trace” may be implemented as twinax cable instead.

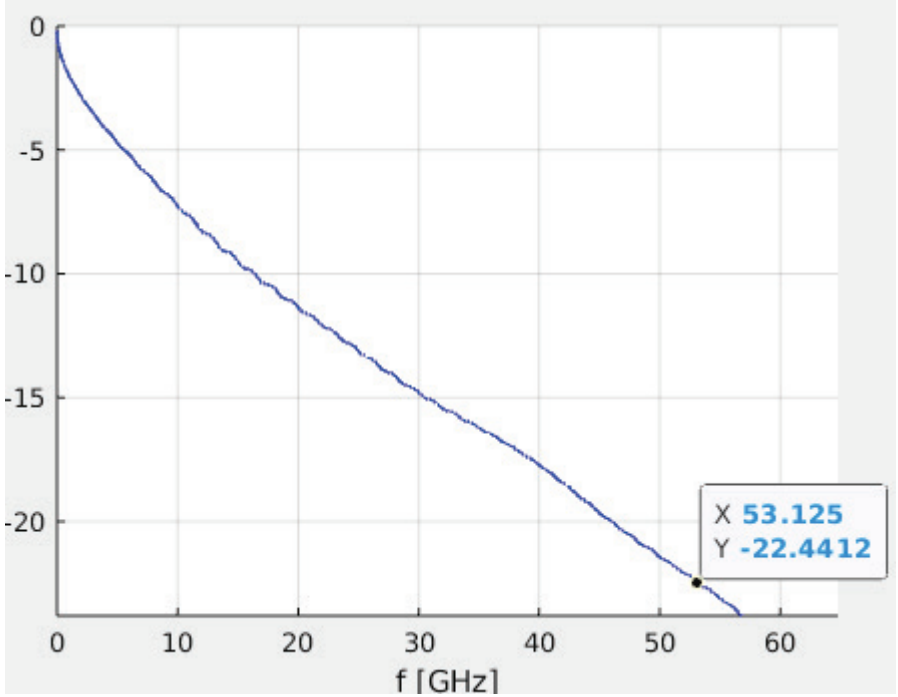
Proposed C2M host channel parameter values (comment #83)

Change Table 176D–5

Parameter	Value	Units
Package parameters	*[Keep class B parameters, delete class A parameters]*	—
Package transmission line 1 length, $z_p^{(1)}$	45	mm
Host transmitter or receiver transmission line length, $z_p^{(h)}$	250	mm

Resulting ILdd [dB]	22.44

(No “Test 1 / 2”)



That’s all

Questions?