Re-evaluation of Tx specifications and COM.

Mike Dudek QLogic

Tao Hu QLogic

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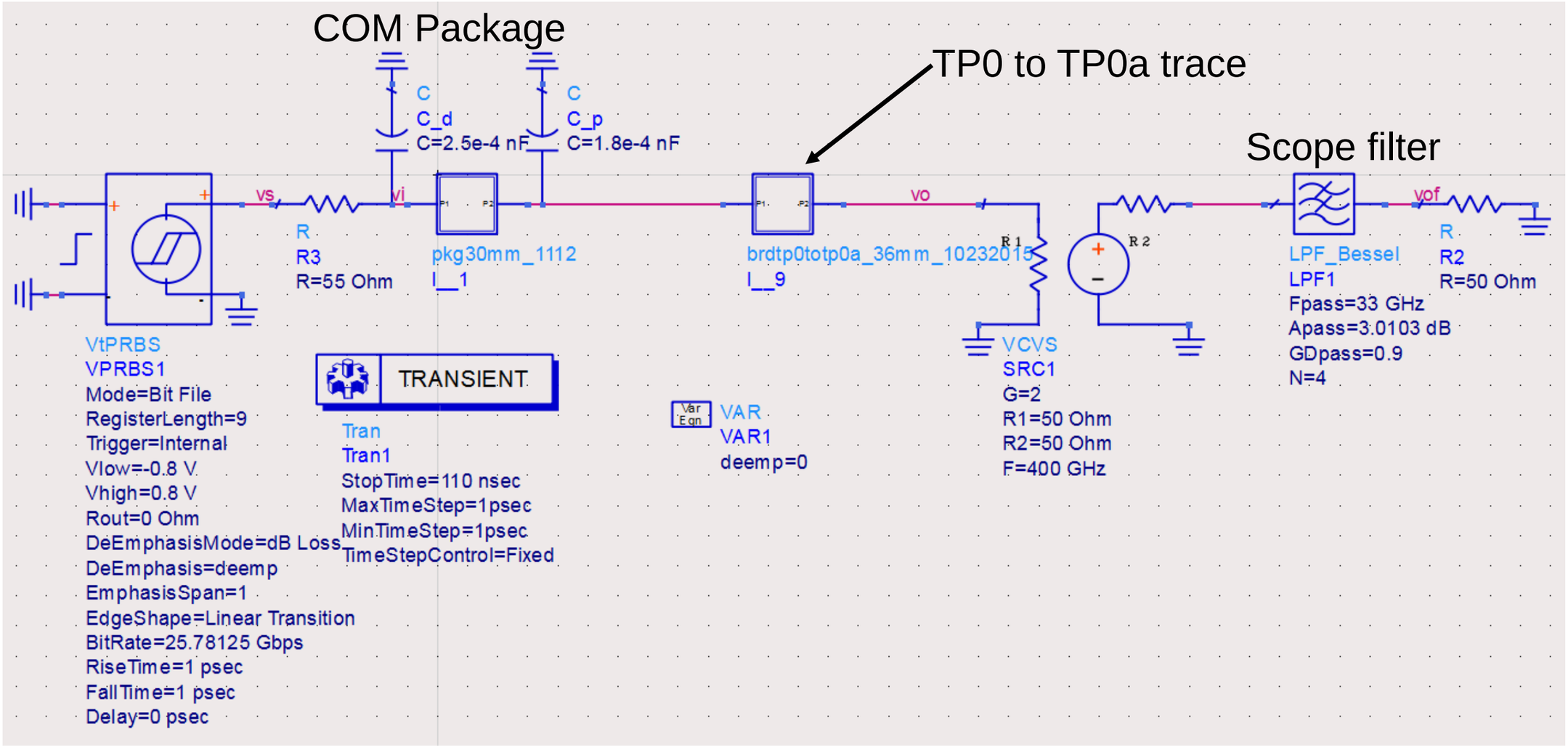
Introduction

- **This was originally presented to the 25G ad-hoc on 12/16/15**
- **This supports comment # i-55 against draft 3.0**
- **The specification methodology for the Copper Cable and backplane clauses creates a closed budget by specifying the cable/backplane with COM and calibrating the Rx Interference Tolerance test with COM.**
- **This relies however on**
  - The specifications for the Tx matching (or being more stringent) than the Tx that is used in COM in the cable/backplane test.
  - The Tx used in COM for the Interference Tolerance test calibration matching the Tx that is used in the actual Interference Tolerance test. This is not the subject of this presentation.
- **This presentation investigates the performance of the Tx used in COM at TP0a and TP2, compares this with the specifications at these points and discusses ways to bring them closer together.**
- **Note some of these affects have already been addressed resulting in some differences between COM parameters used for the CA-25G-N in 802.3by and those in 802.3bj and for the CA-25G-S and CA-25G-L (see Mellitz_040815_25GE_adhoc).**

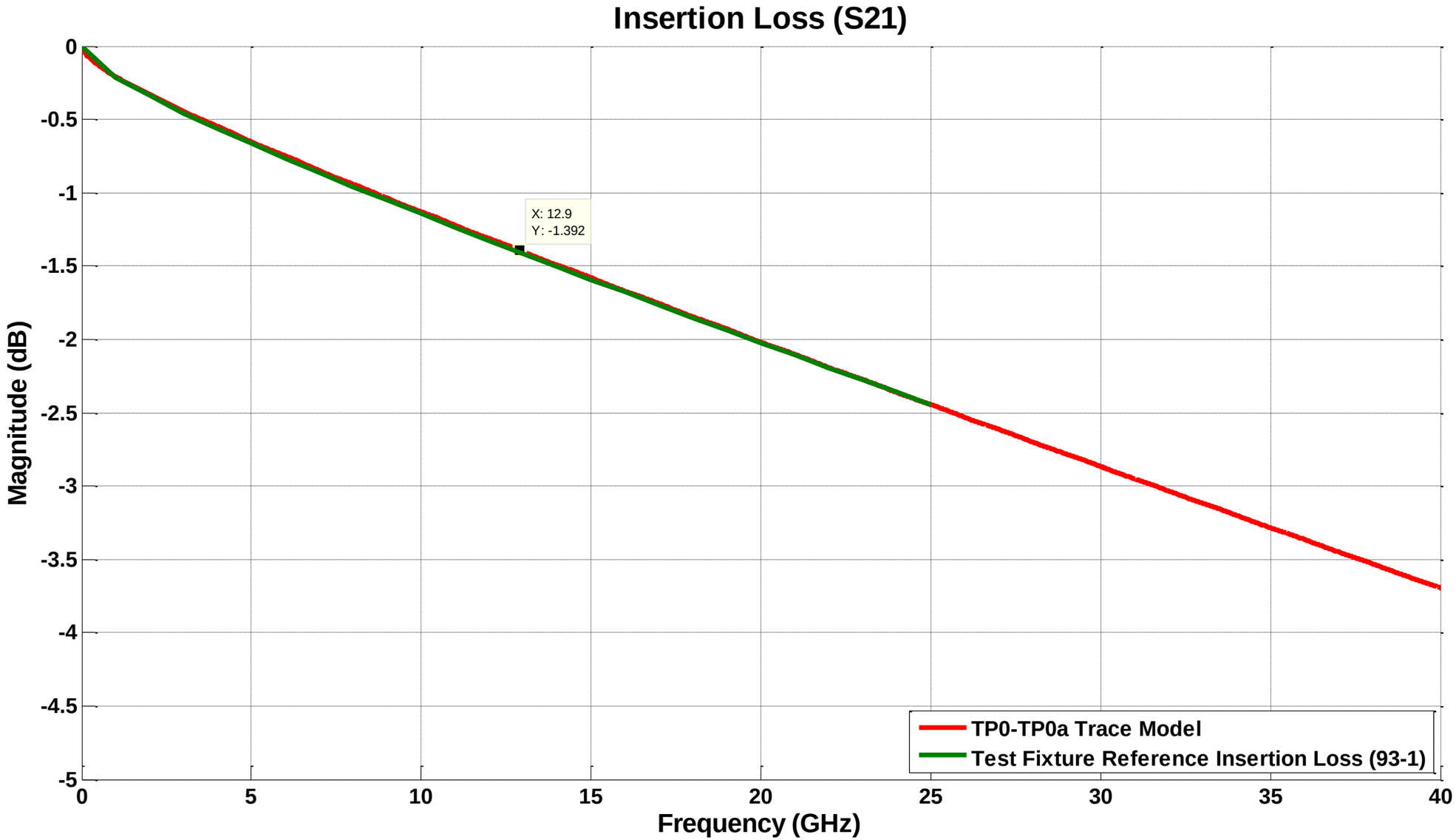
Methodology

- The COM channel up to the Tx test points was duplicated as close as possible in ADS
- The output waveform at the test point was generated using an ADS Tx with the amplitude matching the amplitude used in COM and using a very fast risetime as is used in COM.
- The resulting waveform was then analyzed using the Tx test methodology to determine the Tx parameters which are compared with the Tx specifications.
- The process was repeated with slower risetimes.

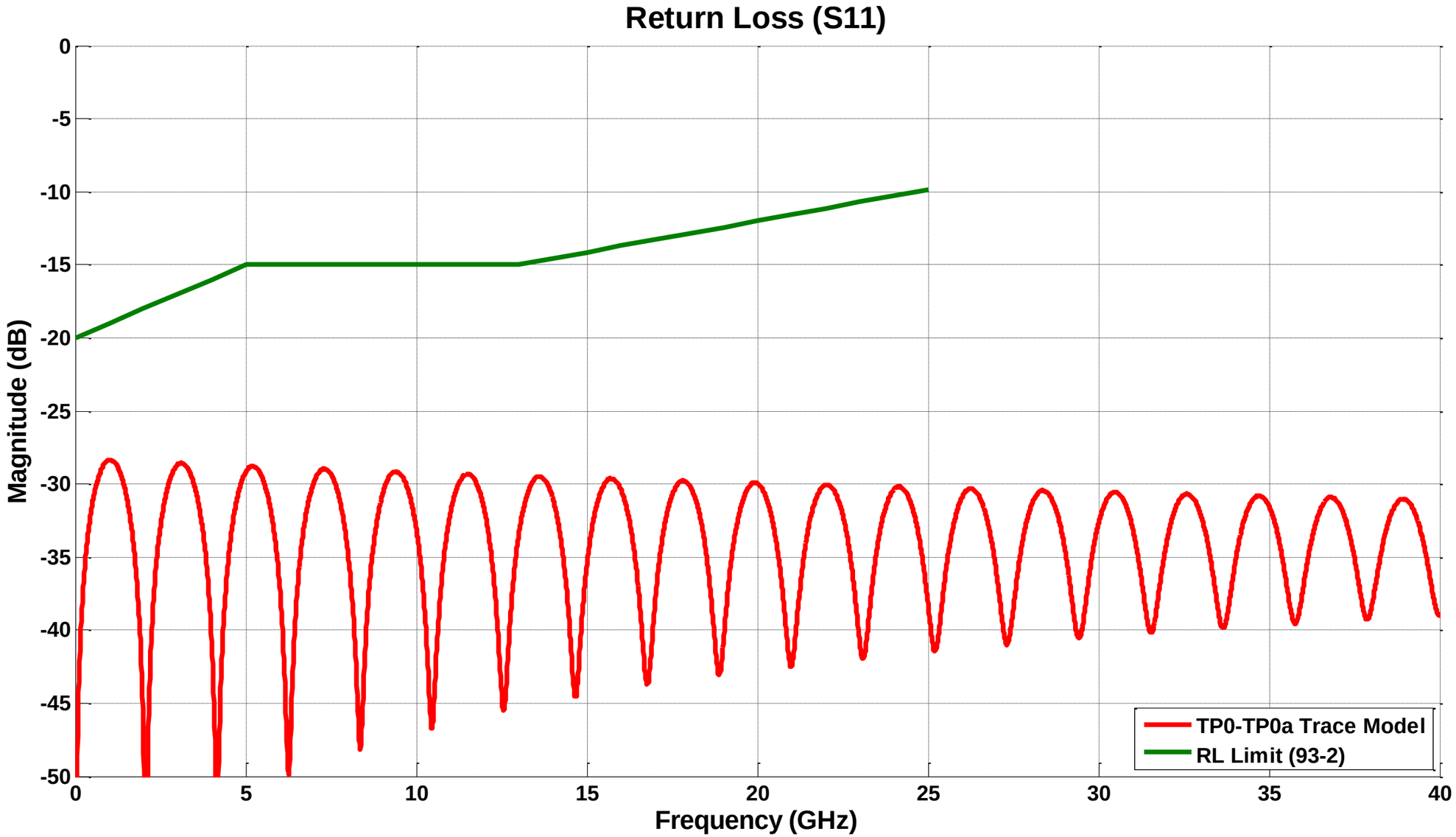
Channel Block Diagram for simulation at TP0a



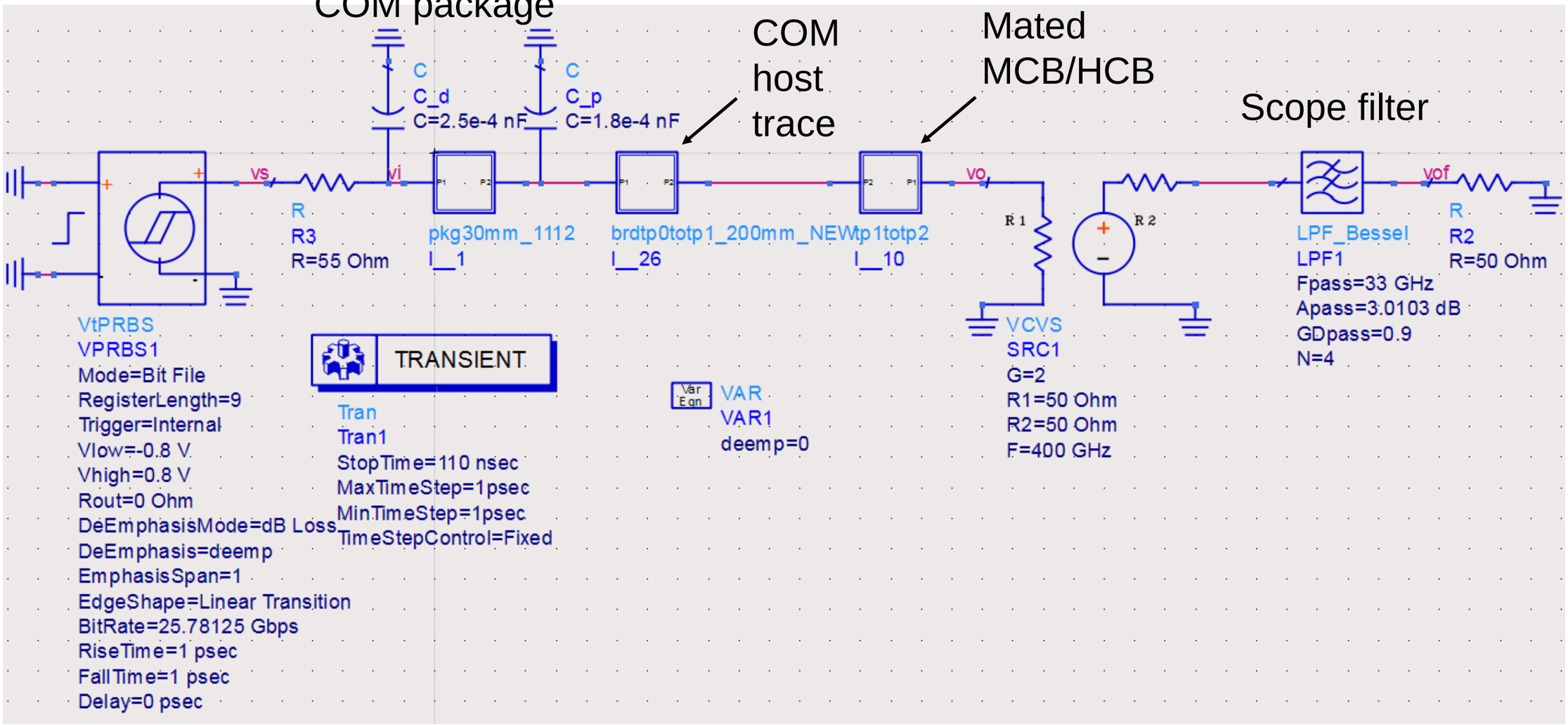
TP0 to TP0a Insertion loss



Tp0 to Tp0a Return loss

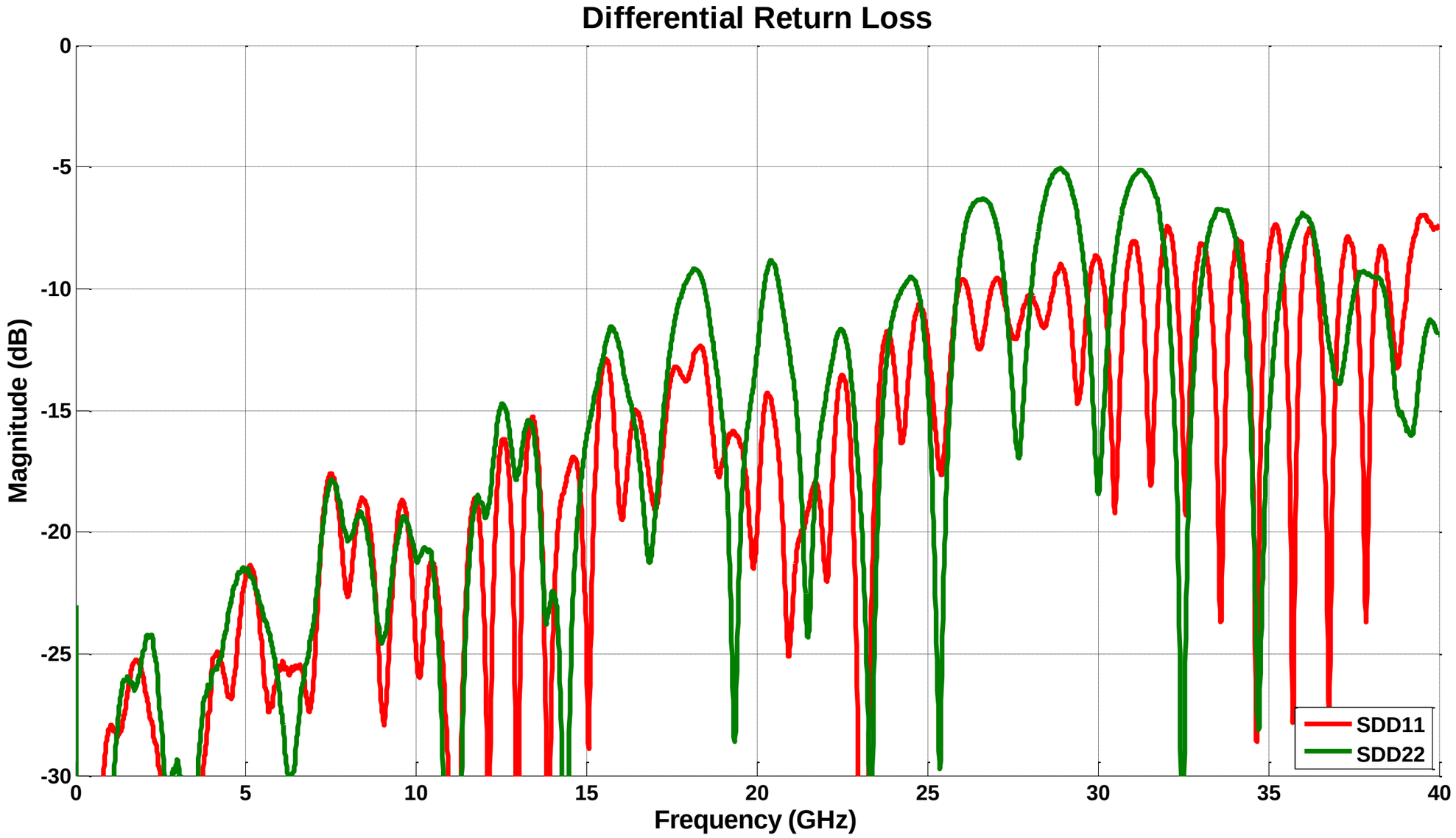


Channel Block Diagram for simulation at TP2



Tp1 to Tp2 Insertion loss (mated MCB/HCB)

Tp1 to Tp2 Return loss (mated MCB/HCB)



Results

	TP0a					TP2					
	Rise Time 1ps [20% to 80%]	Rise Time 8ps [20% to 80%]	Rise Time 12ps [20% to 80%]	Rise Time 20ps [20% to 80%]	SPEC (Table 93-4)	Rise Time 1ps [20% to 80%]	Rise Time 8ps [20% to 80%]	Rise Time 12ps [20% to 80%]	Rise Time 20ps [20% to 80%]	Units	SPEC (Table 92-6)
Host Board Length	Meet IL defined by Equation (93-1)					151				mm	
ADS PRBS Source Peak Voltage	0.8					0.8				V	
Sigmae	3.279	3.223	3.207	3.226		6.416	6.419	6.410	6.374	mV	
Pmax (Linear fit pulse peak)	0.292	0.286	0.279	0.257		0.169	0.167	0.164	0.155	V	
SNDR (@ Sigman = 0)	38.999	38.962	38.782	38.033	>=27dB	28.415	28.284	28.140	27.713	dB	>=26dB
Differential Peak to Peak Voltage	0.755	0.753	0.752	0.747	<=1.2V	0.676	0.675	0.674	0.672	V	<=1.2V
Vf (steady-state voltage)	0.363	0.363	0.363	0.363	0.4V=< Vf <=0.6V	0.339	0.339	0.339	0.339	V	0.34V=< Vf <=0.6V
Pmax/Vf	0.806	0.789	0.769	0.710	>=0.71	0.498	0.491	0.482	0.456	N/A	>=0.45
Sigman (for SNDR 27dB@TP0a for SNDR 26dB@TP2)	12.633	12.362	12.032	11.026		5.534	5.339	5.116	4.432	mV	
TXSNR (to achieve sigman above)	27.283	27.286	27.298	27.357		29.700	29.883	30.099	30.870	dB	

Conclusions and suggested change

- The Pmax/Vf ratio allowed by both the backplane and copper cable specifications at TP0a and at TP2 is significantly lower than provided by the COM transmitter which uses the very fast risetime, creating a hole in the spec.
- These specifications allow a 20ps on die risetime even with the worst case long package. This is unnecessarily relaxed.
- Suggested change is to increase the Pmax/Vf ratio from 0.71 to 0.78 at TP0a and from 0.45 to 0.49 at TP2. (equivalent to approx. 10ps die risetime with the worst case package).

Note.

- Clause 92 of 802.3bj Tx specs at TP2 required a higher value of Tx_SNDR than was effectively used in COM which somewhat compensates for this.
- For the CA-25G-N cable we have reduced the amount of noise (increased Tx-SNR) used in COM to get closer to the Tx noise that the Tx specs allows, removing that compensation.