



# **IEEE P802.3cd 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet Task Force**

## **Backplane Measurements using Draft 1.0 COM Parameters**

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**Amphenol  
FCi**

# Purpose

- To characterize the performance of backplane measurements using the COM parameters in Draft 1.0.
- To gauge if the parameters are suitable in determining 50 Gb/s performance or if they still need work.
- To address an issue with the lack of BGA footprints and measured channels.

# Channel Details

Link #	Total Length (in)	Daughter Cards			Backplane		
		Length (in)	Material	Impedance (ohms)	Length (in)	Material	Impedance (ohms)
Link 1	32.25	6	Megtron 6	95	20.25	Megtron 6	95
Link 2	32.25	6	Megtron 6	95	20.25	Megtron 6	95
Link 3	32.25	6	Megtron 6	95	20.25	Megtron 6	95
Link 4	38.75	6	Megtron 6	95	26.75	<i>Megtron 6</i>	95
Link 5	38.75	6	Megtron 6	95	26.75	<i>Megtron 7</i>	95
Link 6	38.75	6	Megtron 6	95	26.75	<i>Tachyon-100G</i>	95

**The only difference between links 1-3 is the connectors and their footprints.  
The only difference between links 4-6 is the backplane PCB material.**

# COM Summary

Link #	COM (dB)	Fitted IL @ 13.28 GHz (dB)	ICN (mV)
Link 1	0	28.3	4.29
Link 2	-1.04	29.6	4.52
Link 3	2.28	26.1	2.66
Link 4	2.91	29.9	1.39
Link 5	3.53	28.2	1.39
Link 6	3.06	30.1	1.31

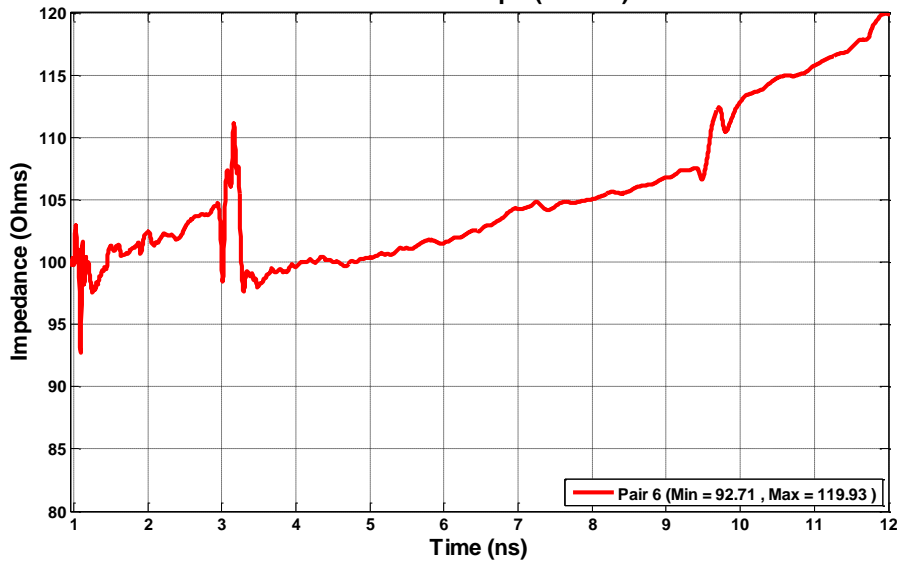
Links 1-3 are using lowing performing connectors and are not intended for 50G systems; shown for reference only.

Links 4-6 all use the same connector; only the backplane PCB materials is different.

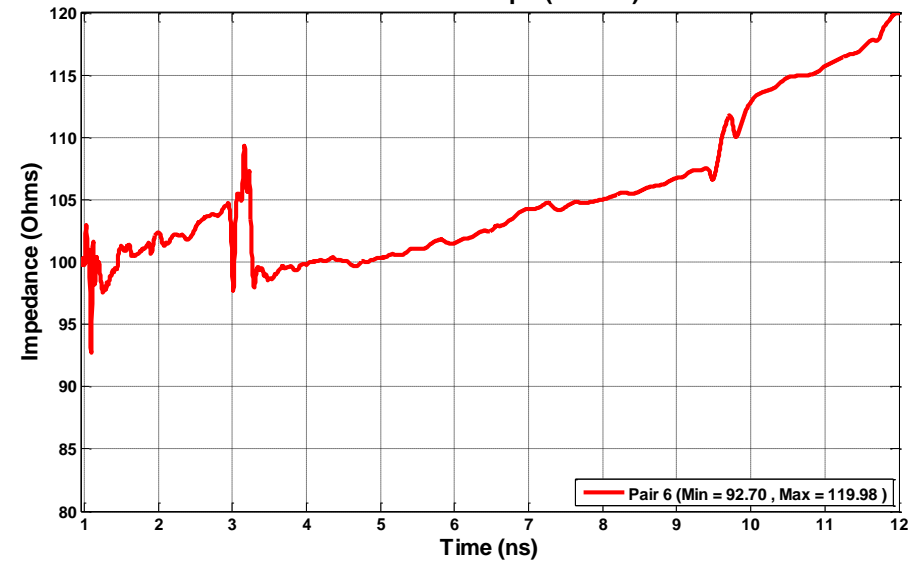
All channels include 8 NEXT and 7 FEXT aggressors

# Differential Impedance

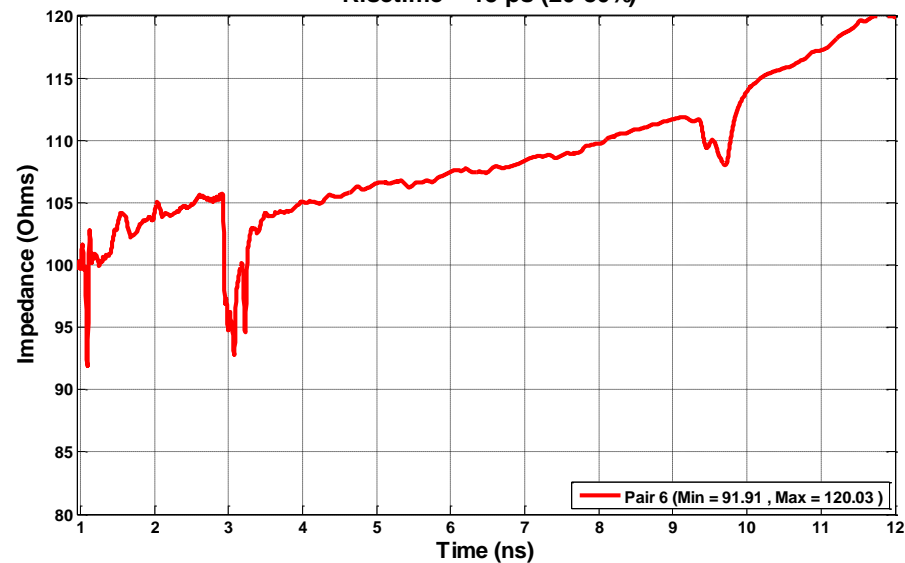
Link 1 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)



Link 2 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)

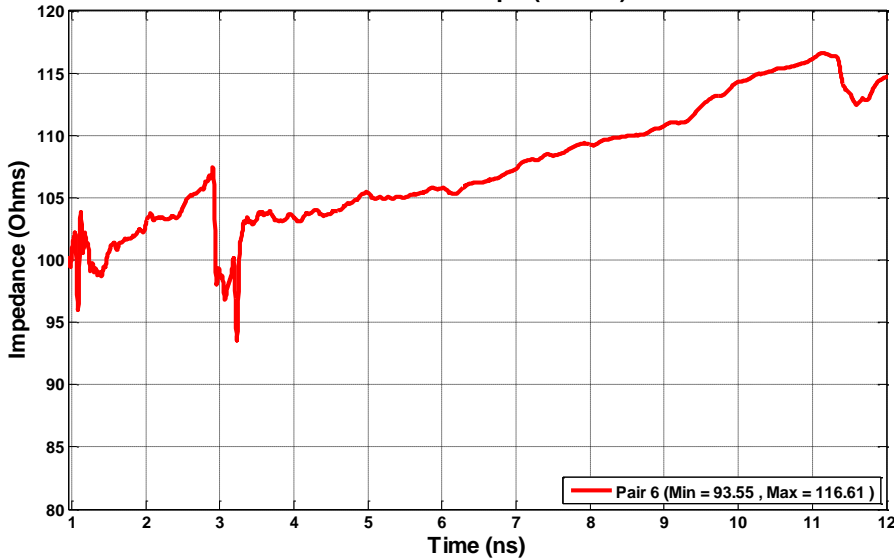


Link 3 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)

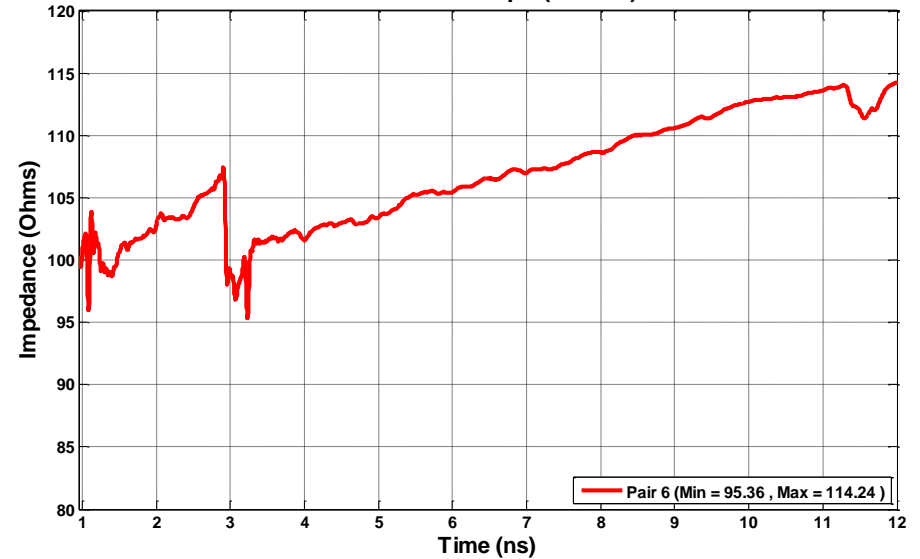


# Differential Impedance

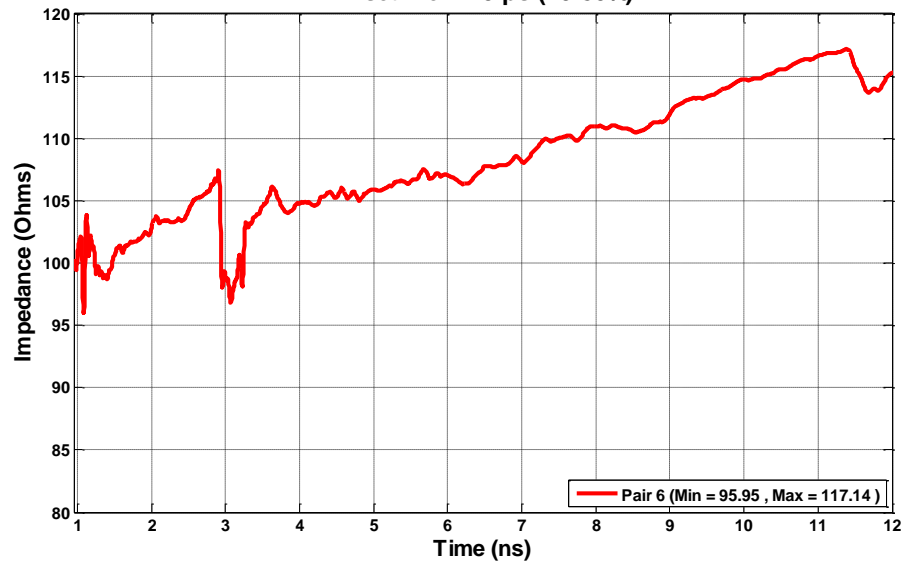
Link 4 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)



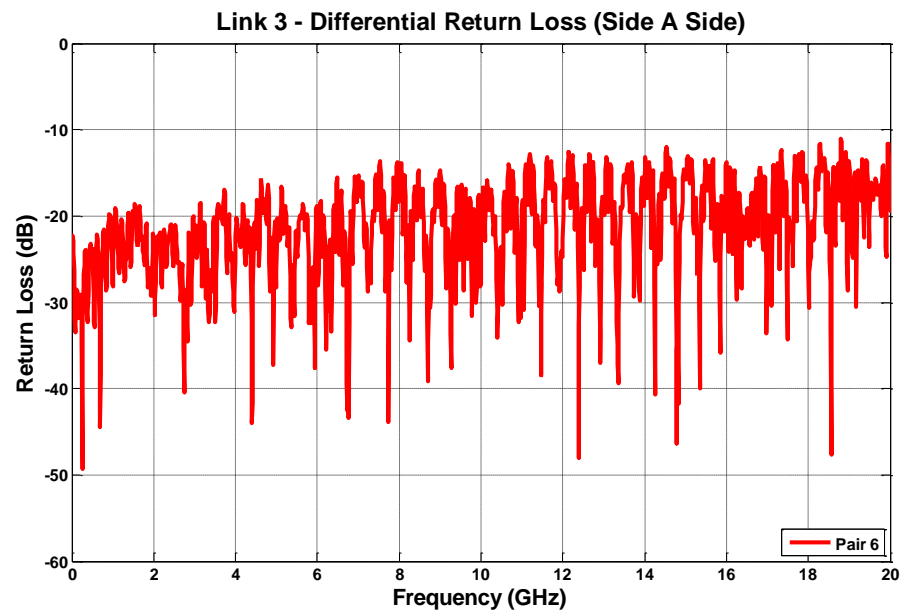
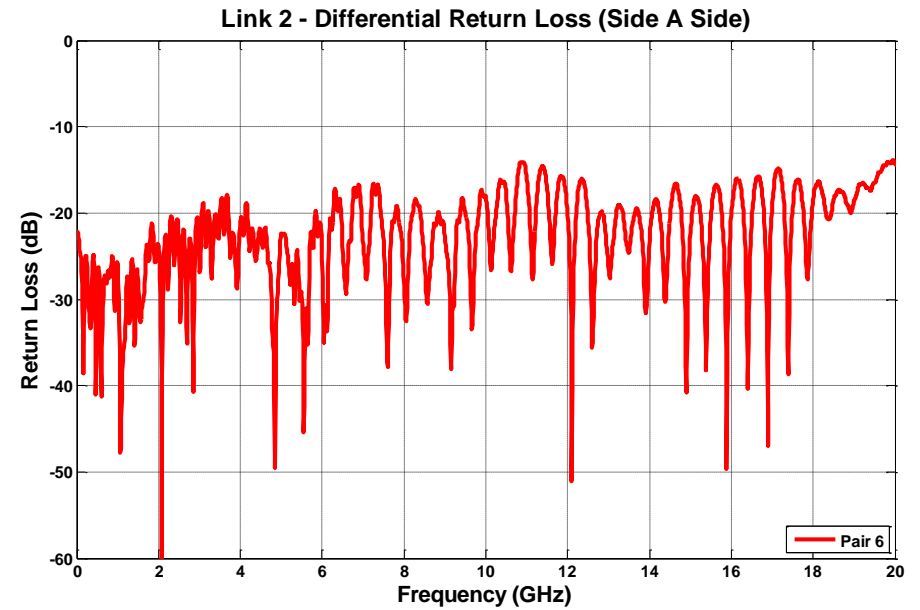
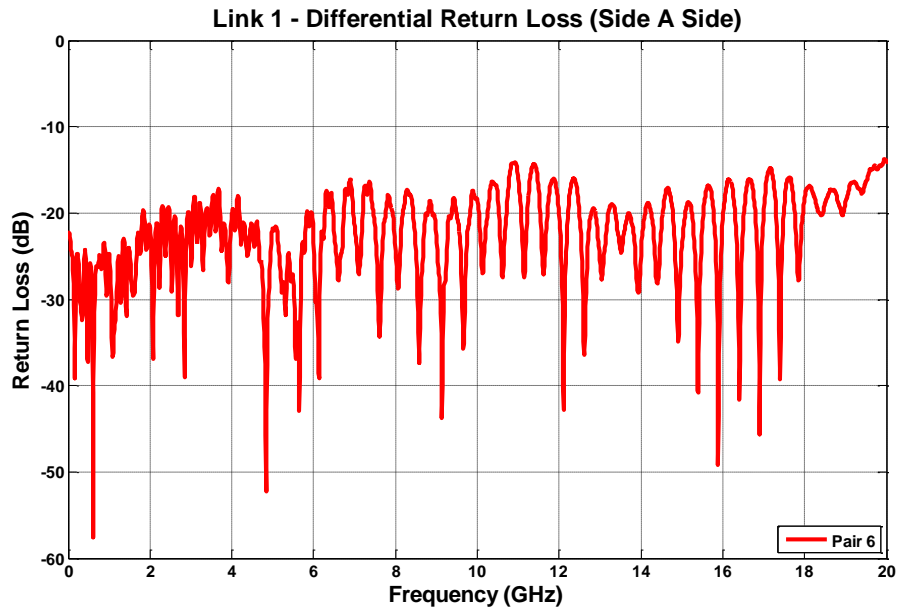
Link 5 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)



Link 6 - Differential Impedance (from Side A Side)  
Risetime = 15 ps (20-80%)

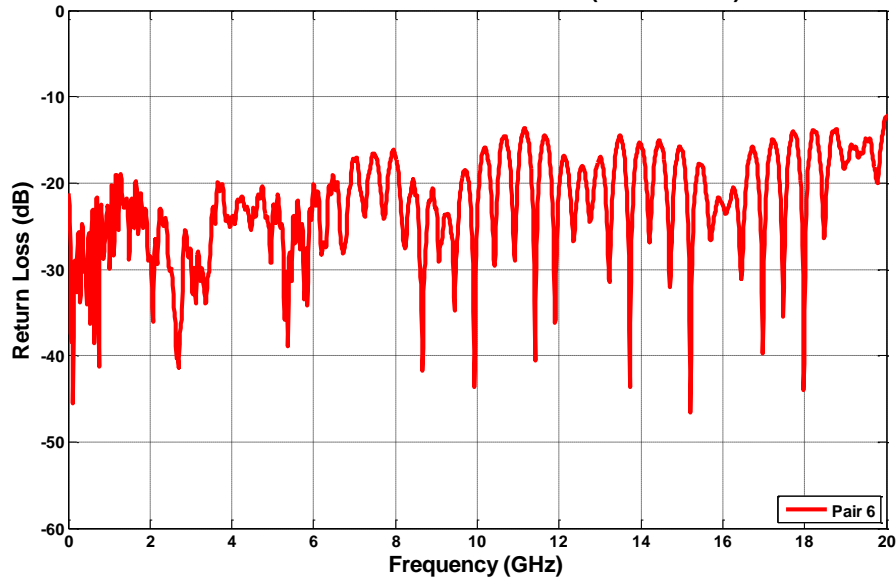


# Differential Return Loss

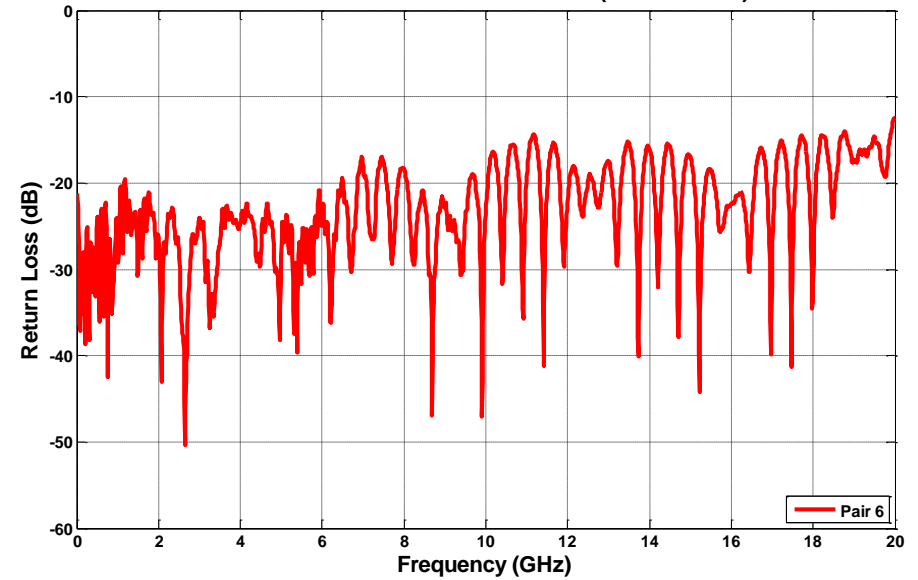


# Differential Return Loss

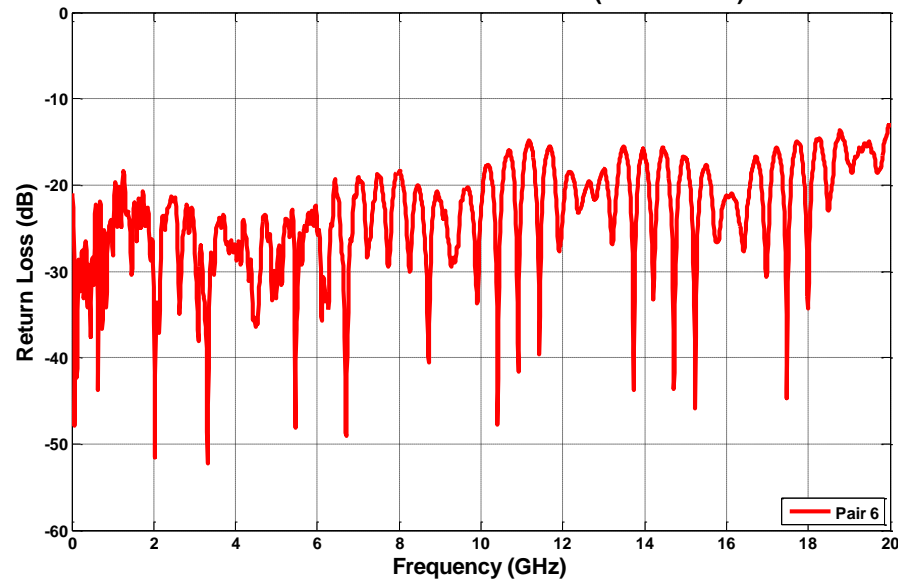
Link 4 - Differential Return Loss (Side A Side)



Link 5 - Differential Return Loss (Side A Side)



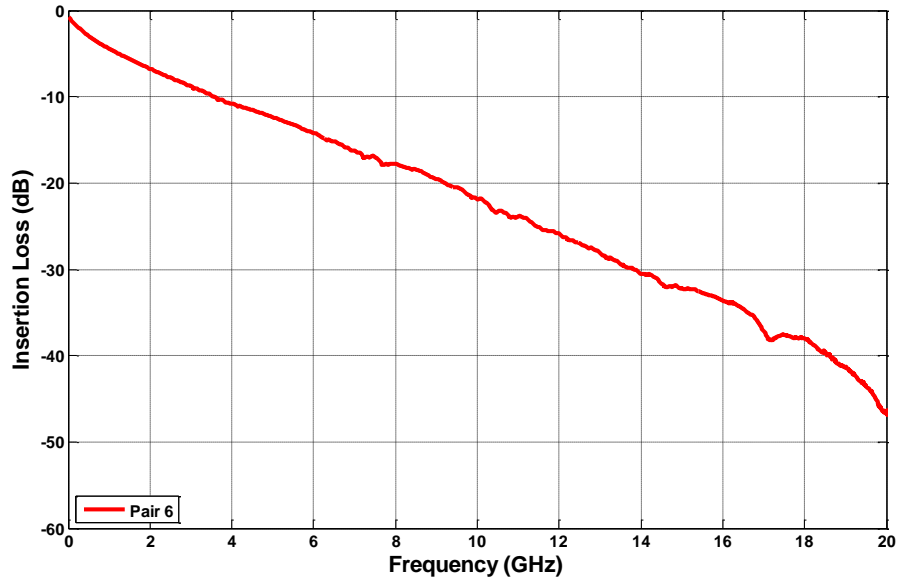
Link 6 - Differential Return Loss (Side A Side)



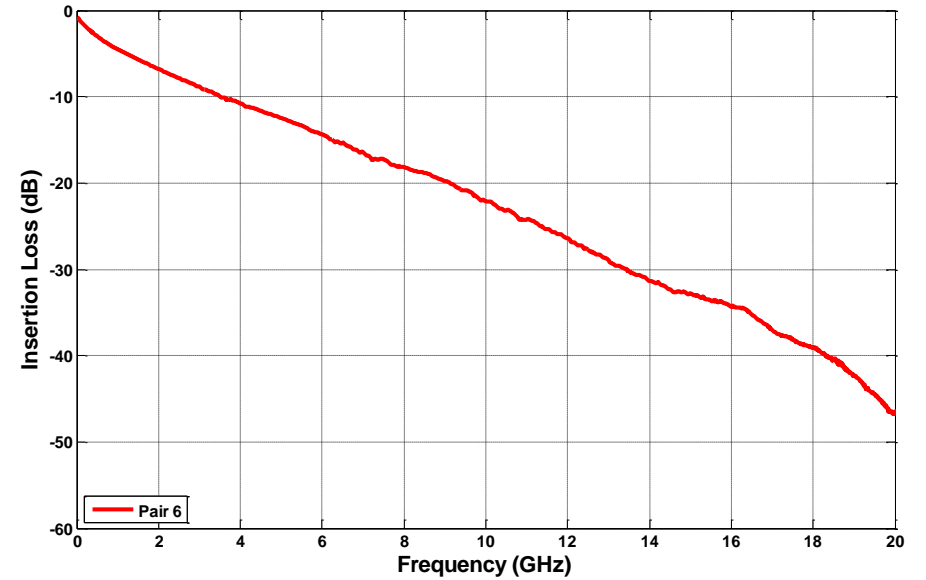


# Differential Insertion Loss

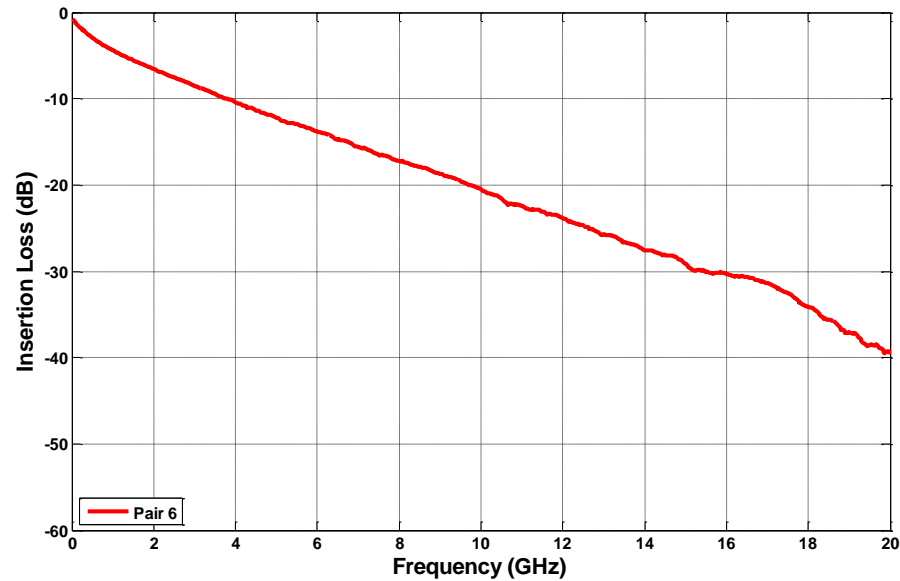
Link 1 - Differential Insertion Loss



Link 2 - Differential Insertion Loss

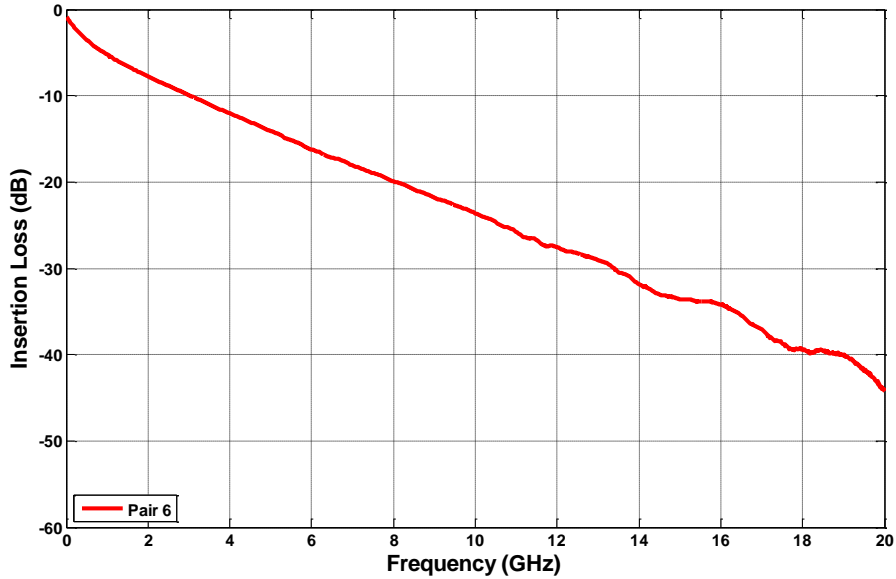


Link 3 - Differential Insertion Loss

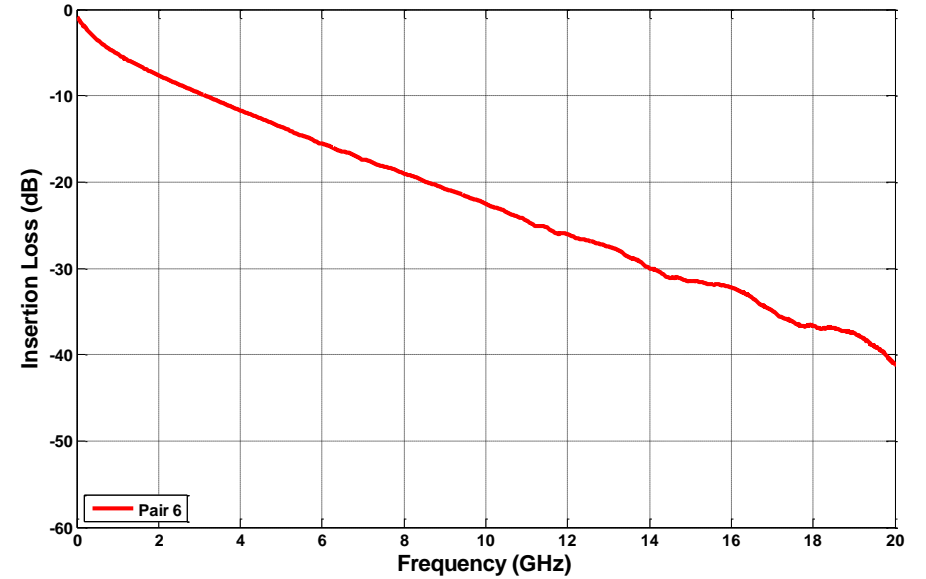


# Differential Insertion Loss

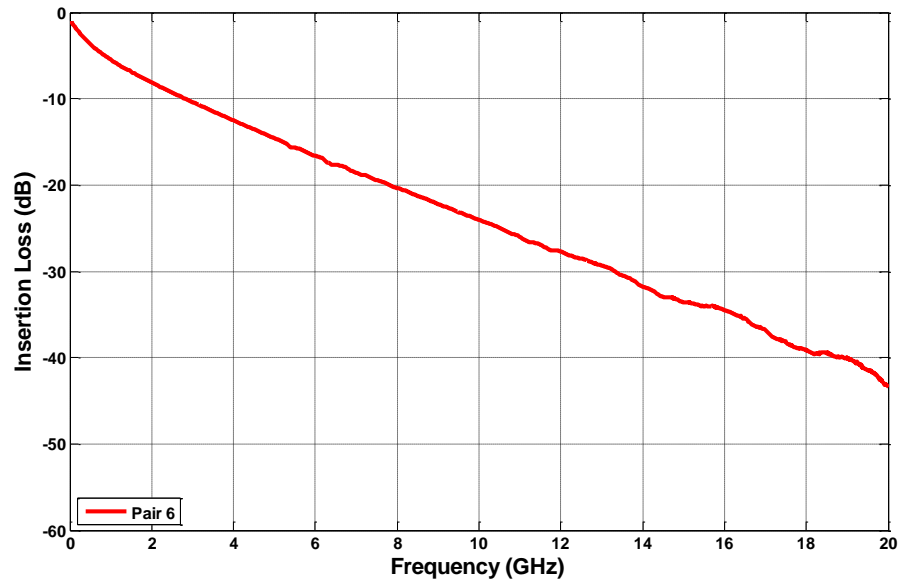
Link 4 - Differential Insertion Loss



Link 5 - Differential Insertion Loss

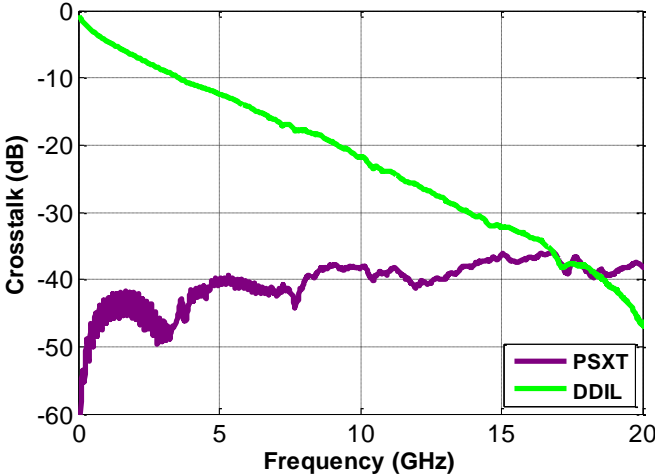


Link 6 - Differential Insertion Loss

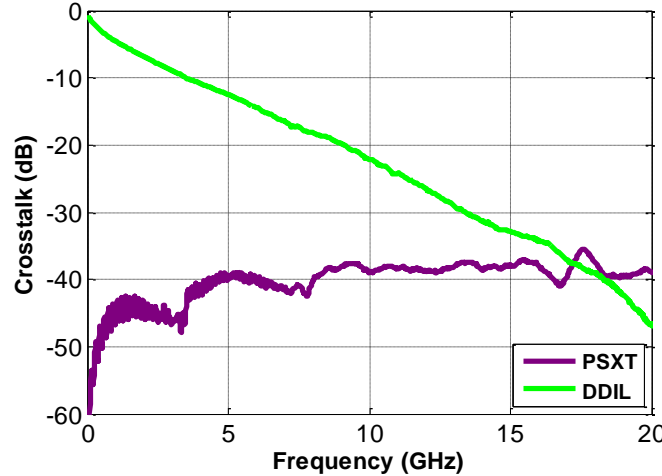


# Power-Summed Crosstalk

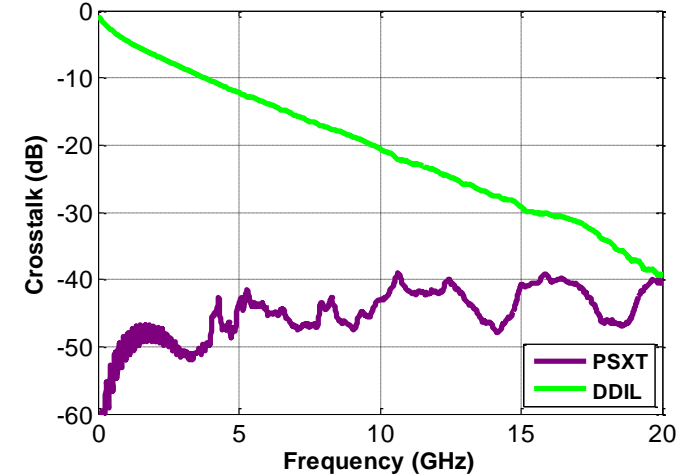
Link 1 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



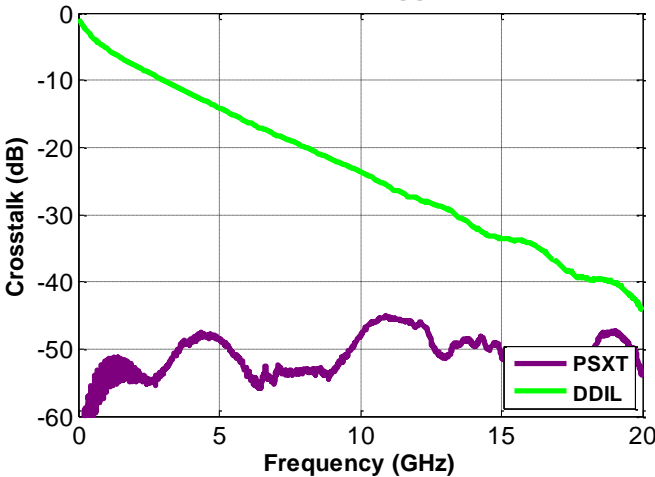
Link 2 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



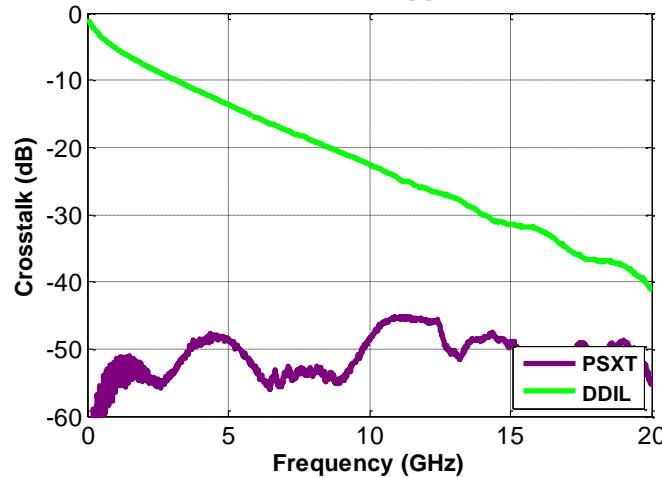
Link 3 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



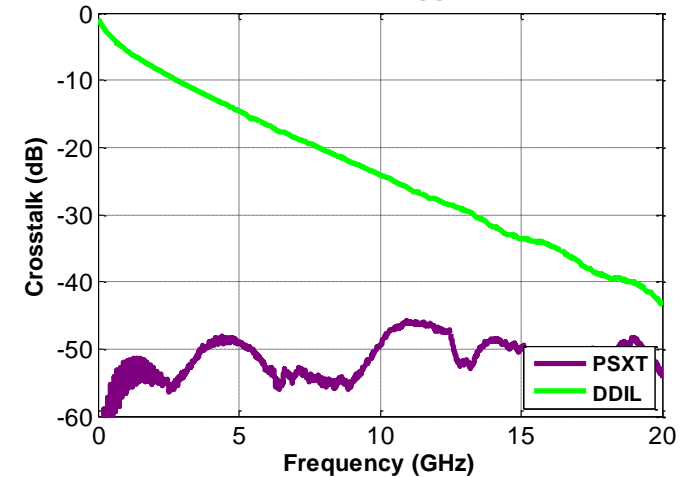
Link 4 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



Link 5 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



Link 6 - Power-Summed Crosstalk  
Pair 6 - Mixed Aggressors



# Conclusions

- Links 1-3 were not expected to pass and since they do not, the COM parameters are not overly optimistic.
- Links 4-6 were expected to pass and except for link 4 failing slightly, the COM parameters are not overly pessimistic.
  - Links 4-6 have been shown to work with real SERDES chips at 56 Gb/s which is why they were expected to pass.
- The COM parameters could be changed slightly in order to get link 4 to pass but otherwise no major changes are needed.
- However, since these were passive measurements, no BGA footprints are included. Therefore if BGA footprints need to be accounted for in measurements one of the two options should be implemented:
  - Option 1: The COM parameters need to be adjusted so there's more margin since the measurements don't have BGA footprints.
  - Option 2: A reference BGA footprint should also be included in the specification so that it can be concatenated with measured S-parameters and then the COM parameters should be adjusted accordingly.
  - I would prefer option 2.