VNA Measurement Issues

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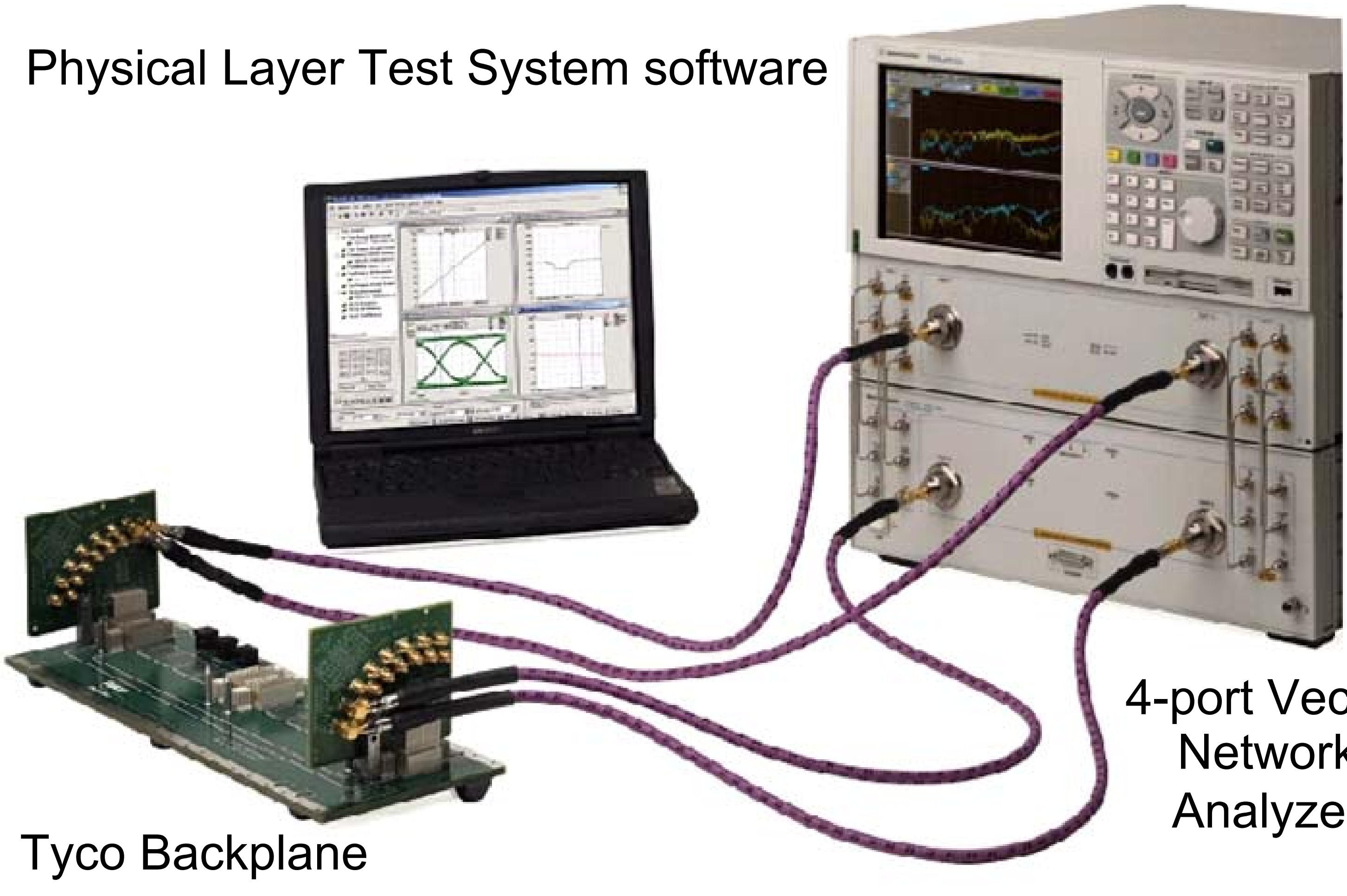
Measuring The Channel



Differential Measurements

			Differential Signal		Common Signal	
			Port 1	Port 2	Port 1	Port 2
Response	Differential Signal	Port 1	S_{DD11}	S_{DD12}	S_{DC11}	S_{DC12}
		Port 2	S_{DD21}	S_{DD22}	S_{DC21}	S_{DC22}
	Common Signal	Port 1	S_{CD11}	S_{CD12}	S_{CC11}	S_{CC12}
		Port 2	S_{CD21}	S_{CD22}	S_{CC21}	S_{CC22}

Test Equipment & Measurement Plan

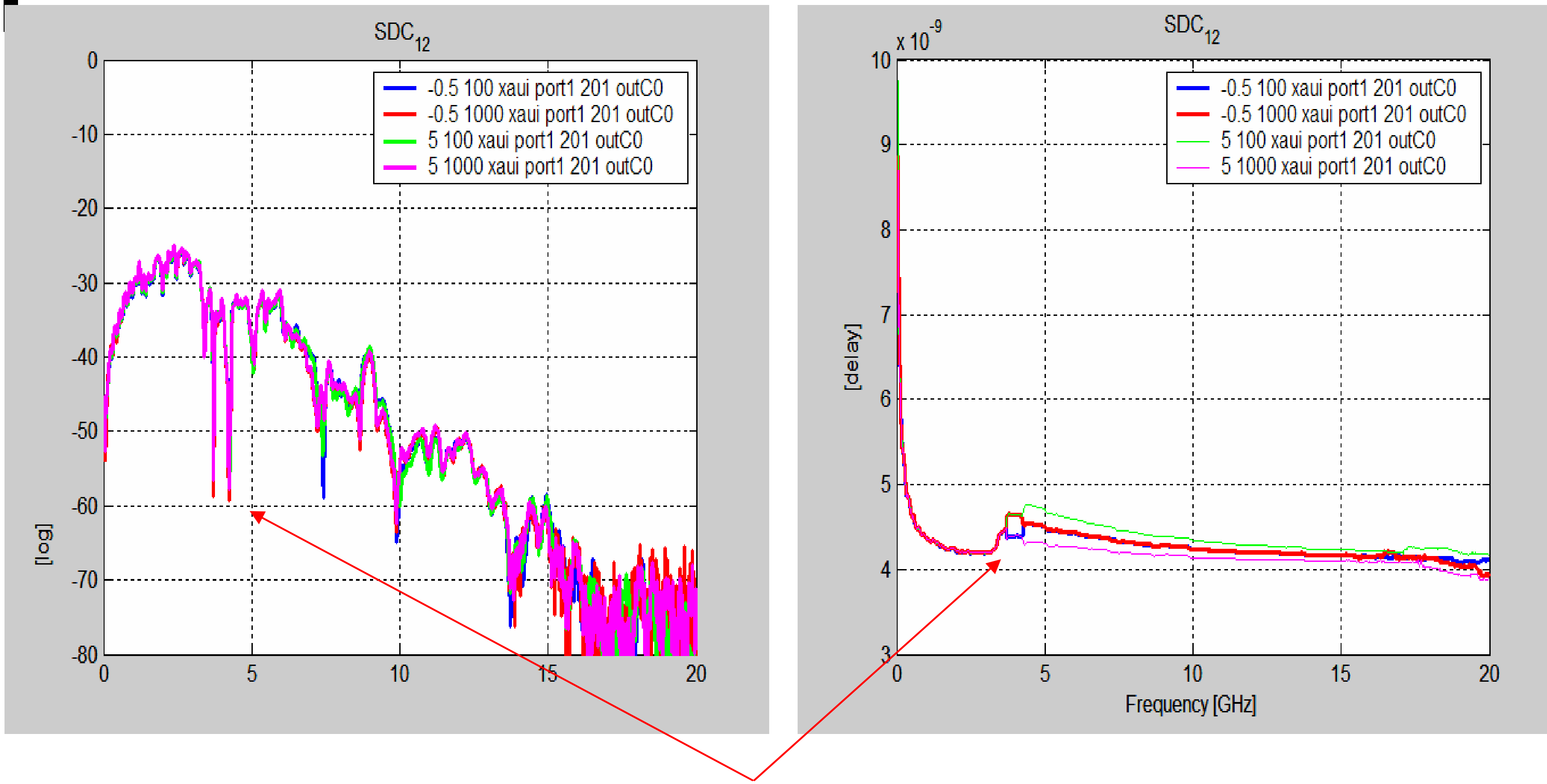
- All measurements taken by UNH
  - Agilent 8720ES with N4418A test set ---
  - Also known as the Agilent N1951A 20GHz Physical Layer Test System (S/N US0020201)
  - Cals are SOLT (short open load thru) to 26GHz cal set into 50ohm loads at the end of SMA cables.
  - No de-embedding of the line cards was attempted/included at all.
  - 4 sets of calibrations
    - -0.5 dB launched power, IF – 100 Hz
    - -0.5 dB launched power, IF – 1000 Hz
    - 5 dB launched power, IF – 100 Hz
    - 5 dB launched power, IF – 1000 Hz
- XAUI backplane and line cards, 20” & 34”
  - OutC0 – bottom / bottom
  - OutC3 – top / top

Summary of Observed Differences

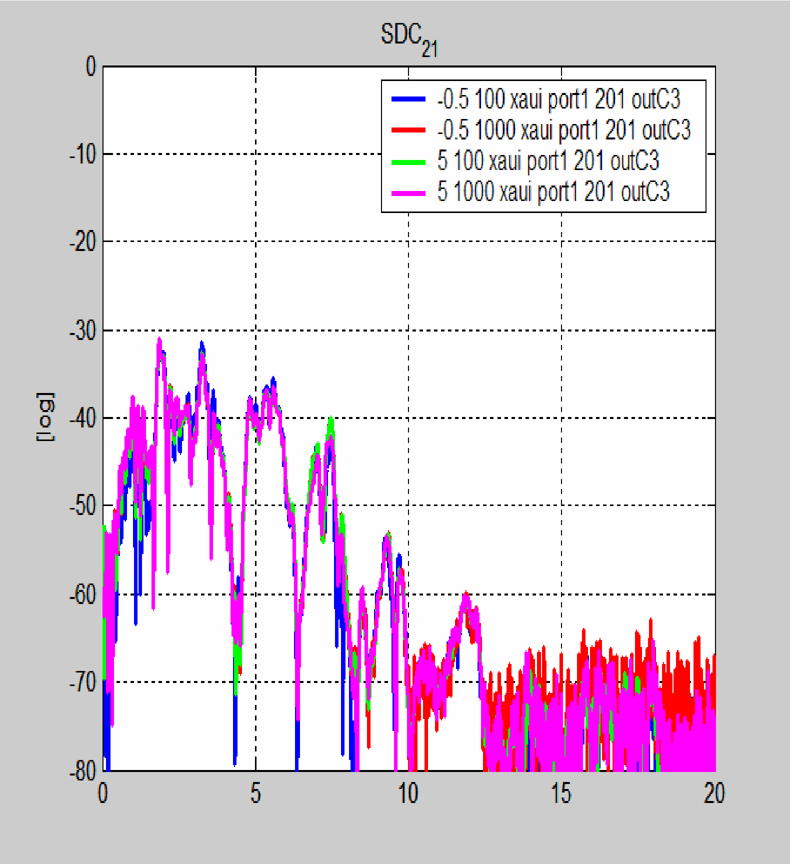
SDD11	OutC0_20	no	SDD12	OutC0_20	no	SDC11	OutC0_20	yes, no	SDC12	OutC0_20	no, yes
	OutC3_20	no		OutC3_20	no, yes		OutC3_20	no, yes		OutC3_20	yes
	OutC0_34	no, yes		OutC0_34	no		OutC0_34	yes		OutC0_34	no
	OutC3_34	no		OutC3_34	no		OutC3_34	no, yes		OutC3_34	no, yes
SDD21	OutC0_20	no	SDD22	OutC0_20	no	SDC21	OutC0_20	yes	SDC22	OutC0_20	no
	OutC3_20	no,yes		OutC3_20	no		OutC3_20	yes		OutC3_20	no
	OutC0_34	no		OutC0_34	no		OutC0_34	no		OutC0_34	no, yes
	OutC3_34	no		OutC3_34	no		OutC3_34	no yes		OutC3_34	no
SCD11	OutC0_20	yes, no	SCD12	OutC0_20	yes, no	SCC11	OutC0_20	yes	SCC12	OutC0_20	yes
	OutC3_20	no		OutC3_20	yes		OutC3_20	no		OutC3_20	no
	OutC0_34	yes		OutC0_34	no		OutC0_34	yes		OutC0_34	no
	OutC3_34	no, yes		OutC3_34	no, yes		OutC3_34	no		OutC3_34	no
SCD21	OutC0_20	no, yes	SCD22	OutC0_20	no	SCC21	OutC0_20	yes	SCC22	OutC0_20	no
	OutC3_20	yes		OutC3_20	no		OutC3_20	no		OutC3_20	no
	OutC0_34	no		OutC0_34	no		OutC0_34	no		OutC0_34	no, yes
	OutC3_34	no, yes		OutC3_34	no yes		OutC3_34	no		OutC3_34	no

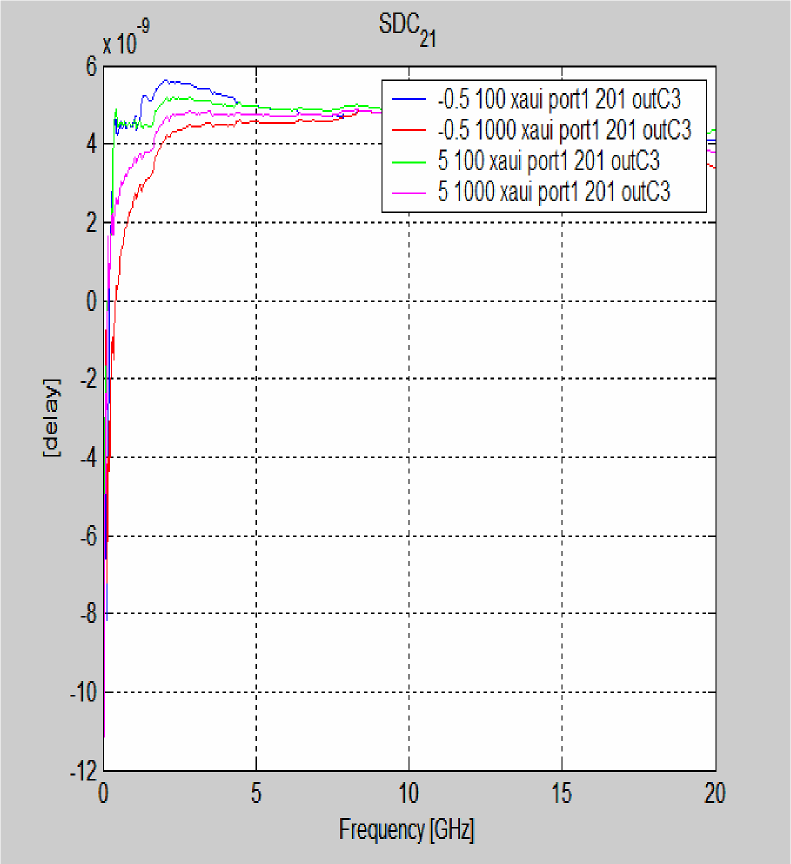
- First # - magnitude
- Second # - phase

20 Inch OutC0 – SDC12



20 Inch OutC3 – SDC21





Measuring a Backplane

- VNA’s designed for microwave structures
- Backplanes are not really microwave structures
- Suspect that deep sharp nulls (20 to 40 dB nulls have been observed) are challenging. Per Agilent –
  - " When measuring complex channels that have many physical features (ie connectors, vias, and SMA's on backplanes), the channels have naturally occurring resonance structures that create frequency domain nulls (those suck outs we saw in your data). Those frequency domain nulls have extremely low magnitude levels (like -80dB) that create challenges for even the most sophisticated phase detector architectures. Therefore, care must be taken when interpreting measurements from frequency domain instrumentation like a Vector Network Analyzer. As always, discussing suspect measurement results with applications experts is recommended before making definitive conclusions.“
- Still investigating further

S-Parameter Measurements

- Consider specifying key VNA setup items
  - Maximum frequency / step size (ongoing)
  - IF Bandwidth
  - Launch Power
- Per Agilent,
  - For the best tradeoffs between measurement throughput and dynamic range, the IF BW should be set to 300 Hz.
  - For Launch Power
    - Accept the default nominal network analyzer test port output power, or
    - Select the highest available LEVELED output power (anticipated that this would be in the -17 to +5 dBm range).
- For reference on s-parameter measurements, see Agilent PLTS Data Sheet #5989-0271EN.
- For reference on proper connector care, see Agilent TDR User's Guide, #54753-97015, "The Care and Handling of Precision Connectors," Section 2.2.