

# VITESSE<sup>®</sup>

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## *07-326r0 SAS2 Phy Interoperability Empirical Data*

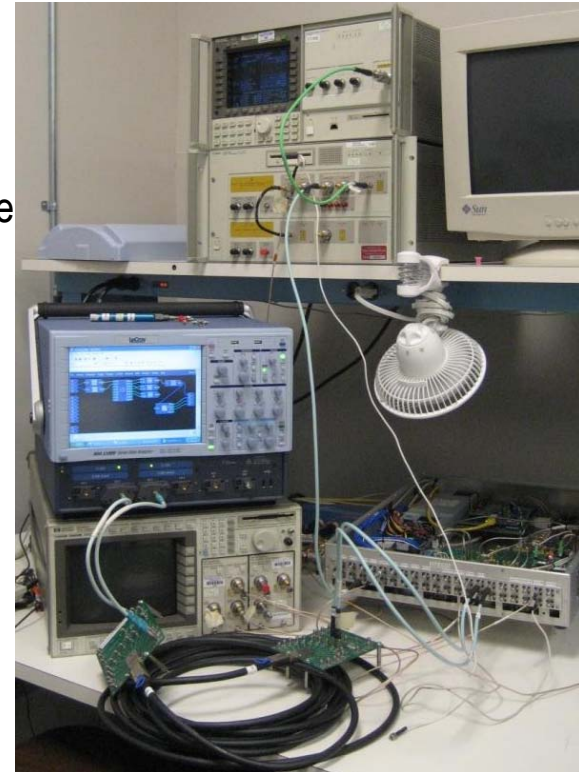
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07/10/2007

# Outline

- ▶ Analyze Interoperability Based on SAS2 Devices and Physical Channel
- ▶ Present Empirical Data to Support Original Proposal
- ▶ References
  - ▶ 06-419R1 SAS-2 reference transmitter and receiver specification proposal
  - ▶ 07-068R8 SAS-2 6gbps PHY specification

# Devices Used And Setup

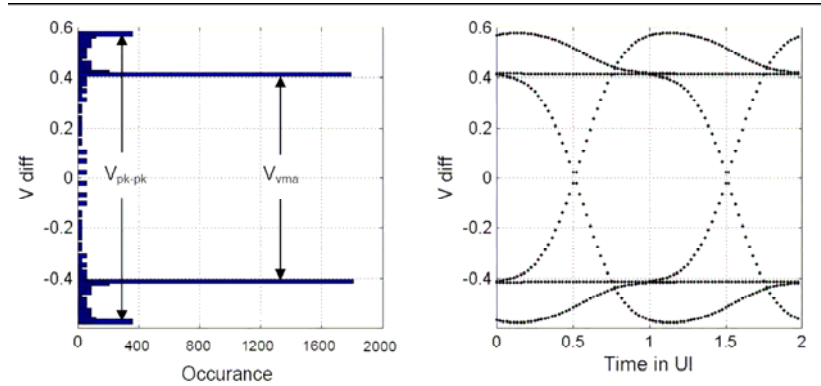
- ▶ Used a Vitesse SAS 2 Phy as Transmitter
  - ▶ Used Variable De-Emphasis and Amplitude
- ▶ Used a 10m Molex MiniSAS Cable
- ▶ Used a LeCroy SDA11000 With Built in DFE as the Receiver
  - ▶ Used 0-5 tap DFE



# Transmitter Settings

- ▶ D30.3 Pattern Used for Transmitter De-Emphasis Measurement
  - ▶ Used Transmitter Device Equalization Measurement Methodology from T10/07-063

$$DE_{dB} = 20 \text{Log}_{10} \left( \frac{V_{pk-pk}}{V_{vma}} \right)$$

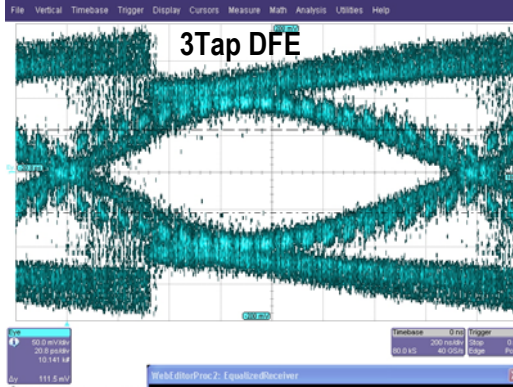
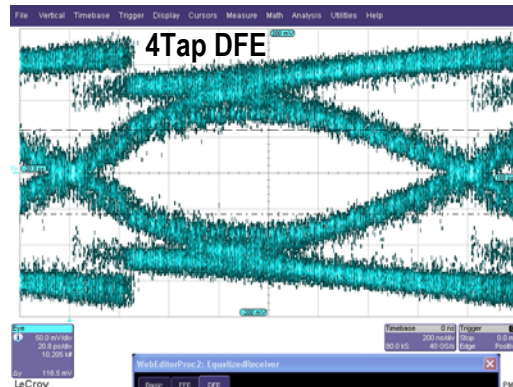
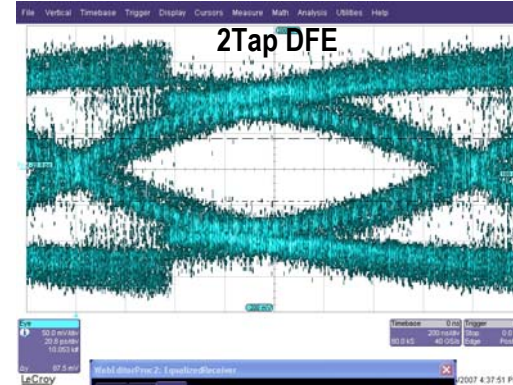
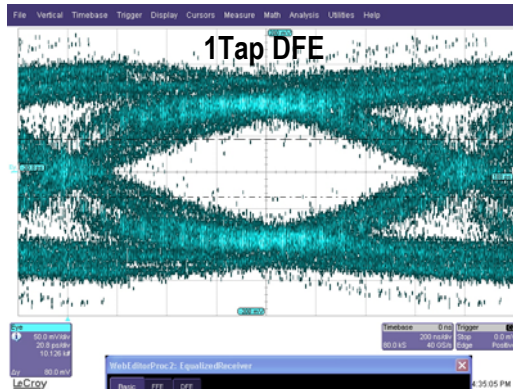


- ▶ Transmitter Device Settings Used for Data Collection

$V_{pk-pk}$ (mV)	$V_{vma}$ (mV)	De-Emphasis (dB)
800	600	2.50
950	600	3.99

# Measured Data

- ▶ Vitesse Transmitter Launch Signal with 2.5dB De-Emphasis and 600mV  $V_{vma}$
- ▶ SASCJT Pattern Captured at the End of 10m MiniSAS Cable
  - ▶ Equalized with LeCroy DFE

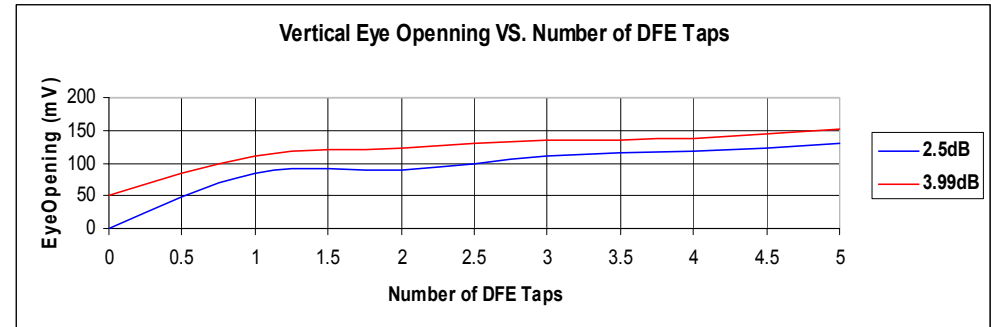




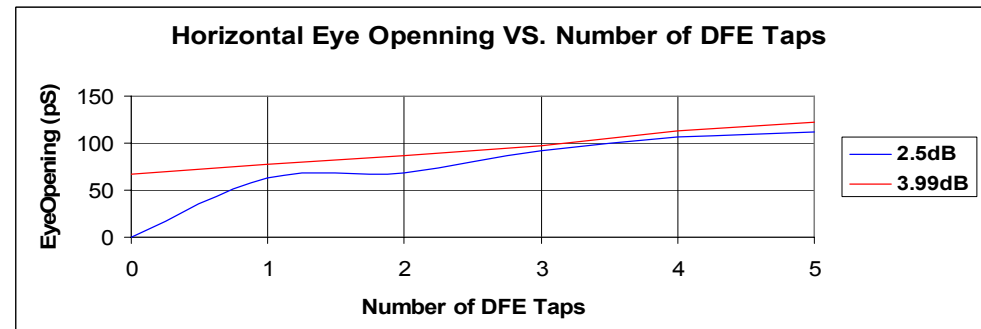
## Equalized Signal Presented in Tabular form and Graph

- ▶ 3Tap DFE Resulted in 27% Vertical Eye Opening Improvement Over 2Tap DFE (For TX DE = 2.5dB)
- ▶ 3Tap DFE Resulted in 33% Horizontal Eye Opening Improvement Over 2Tap DFE (For TX DE = 2.5dB)

DFE-Tap	Vertical Eye Opening	
	mV for TX DE = 2.5dB	mV for TX DE = 3.99dB
0	0	50
1	85	112
2	88	122
3	112	135
4	117	138
5	130	153



DFE-Tap	Horizontal Eye Opening	
	mV for TX DE = 2.5dB	mV for TX DE = 3.99dB
0	0	66
1	63	77
2	69	87
3	92	97
4	106	113
5	112	122



# Summary

- ▶ Receivers with 3Tap DFE offers significant link margin improvement over 2Tap.
- ▶ Proposal
  - ▶ Use 3tap DFE