

# **CX4 Transmit Jitter Spec**

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# Jitter Specs: XAUI vs. CX4-WP3.1

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	Max Jitter Spec (UI)	
	XAUI	CX4-WP3.1
TJ	0.35	0.35
DJ	0.17	0.17
RJ	No spec <sup>1</sup>	0.18

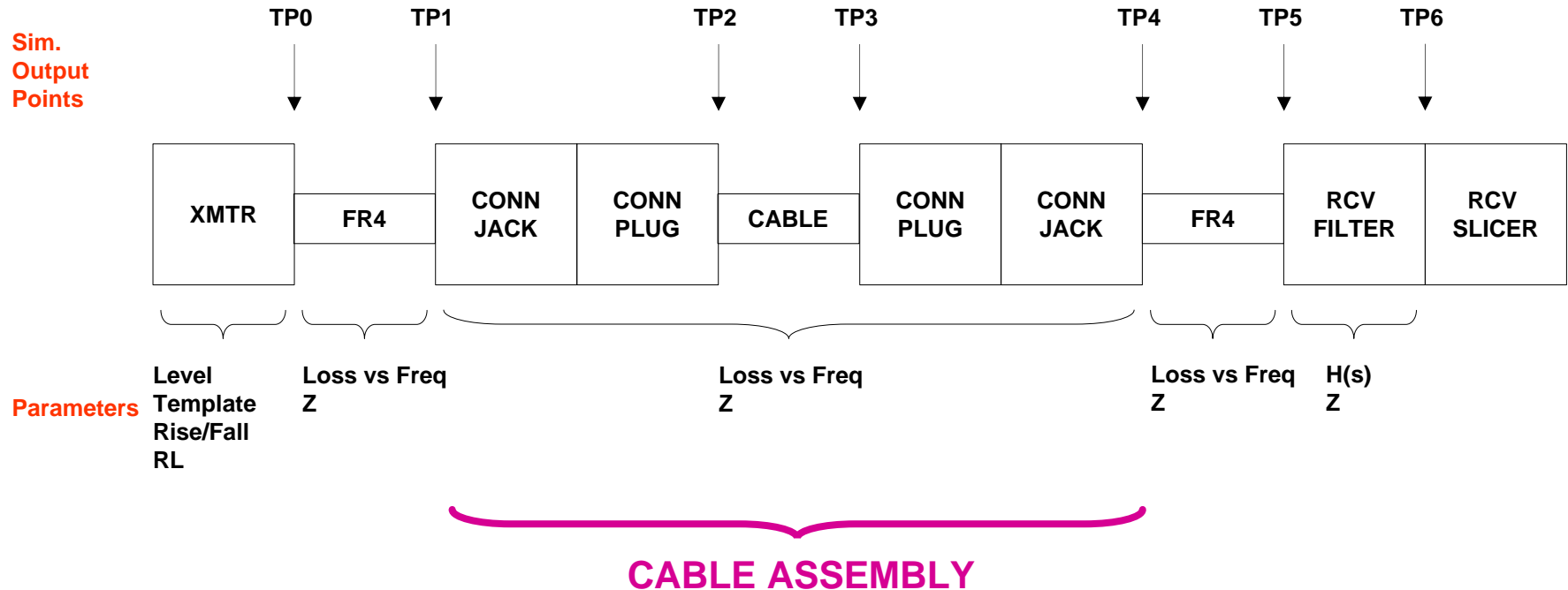
<sup>1</sup> Because there is no stated RJ spec for XAUI, then  $RJ = TJ - DJ$ , which means  $0.18 < RJ < 0.35$  depending on amount of DJ

# Issue with CX4-WP3.1 Jitter Spec

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- Max RJ spec tightened in CX4-WP3.1 relative to XAUI
  - ◆ For CX4-WP3.1,  $RJ < 0.18 \text{ UI}$
  - ◆ For XAUI,  $0.18 < RJ < 0.35 \text{ UI}$ , depending on amount of DJ
  - ◆ Existing XAUI designs may not meet CX4-WP3.1 specs for RJ, even though that XAUI design may still meet total jitter limit
- Question:
  - ◆ Does changing the RJ jitter spec from XAUI to CX4-WP3.1 limits matter?

# Channel Model for Simulation



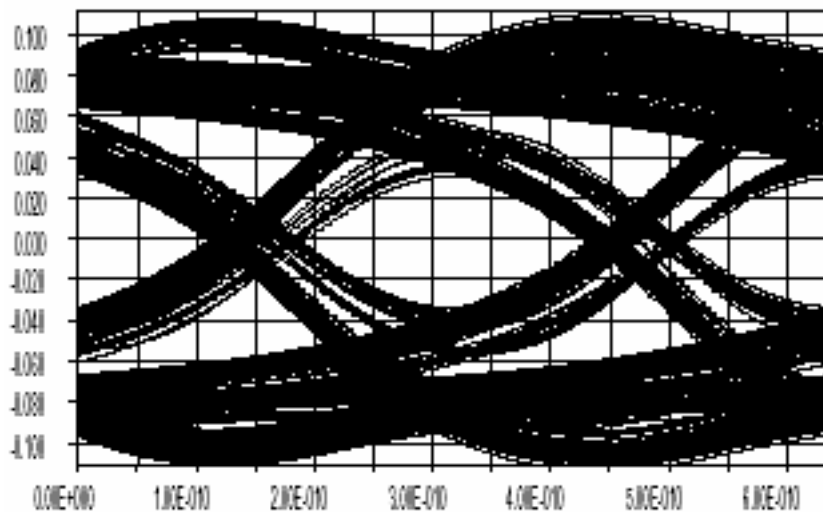
# Parameters for Channel Model Simulation

Block	Parameter	Worst Case
XMTR	Level	1V
	Template	Typical CX4-WP3.1 waveform
	Rise/Fall	80pS
	RL	100 ohms
FR4	Loss vs. Freq	2" trace: $s_{21} = 20 \cdot \log_{10}(e) \cdot [(a_1 \cdot vf + a_2 \cdot f + a_3 \cdot f^2)] \cdot (1/10)$ $a_1 = 6.5E-6$ $a_2 = 2.0E-10$ $a_3 = 3.3E-20$ $e = 2.718 \dots$
	Z	100 ohms
Cable Assbly	Loss vs Freq	$LOSS = a \cdot vf + b \cdot f + c \cdot (1/vf) + d$ $a = 2.629E-01$ $b = 3.408E-03$ $c = 1.276E+01$ $d = 0.5$
	Z	100 ohms
Rcv Filter	H(s)	$(s+z_1)/(s+p_1)$ $z_1 = (1.56GHz) \cdot (1/2)$ $p_1 = (1.56GHz) \cdot (2/3)$
	RL	100 ohms

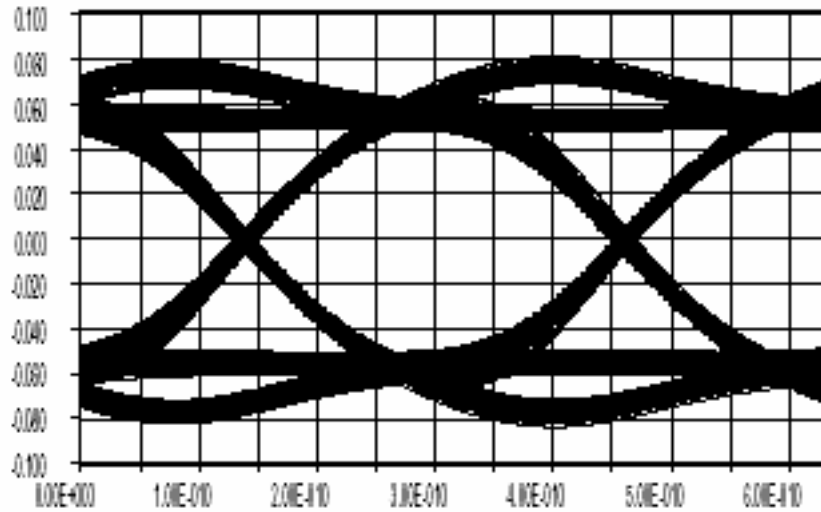
# Simulation with RJ=0, DJ=0

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TP5



TP6

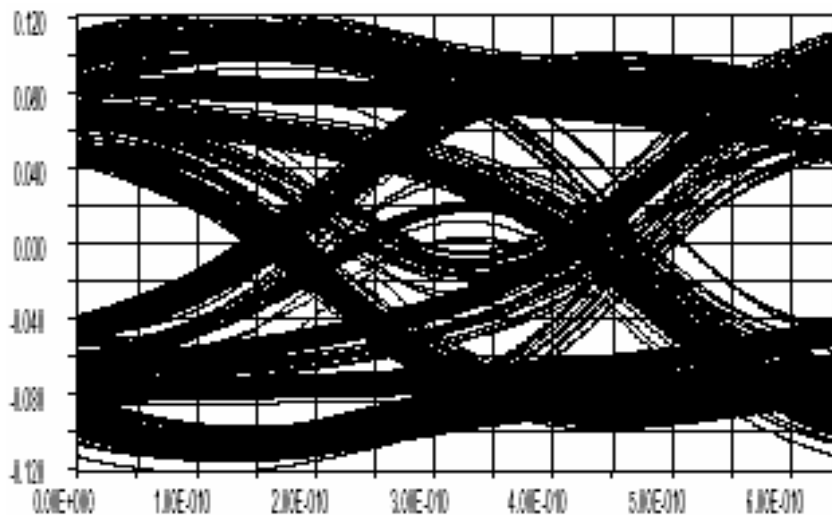


Horizontal Eye Opening ~290ps

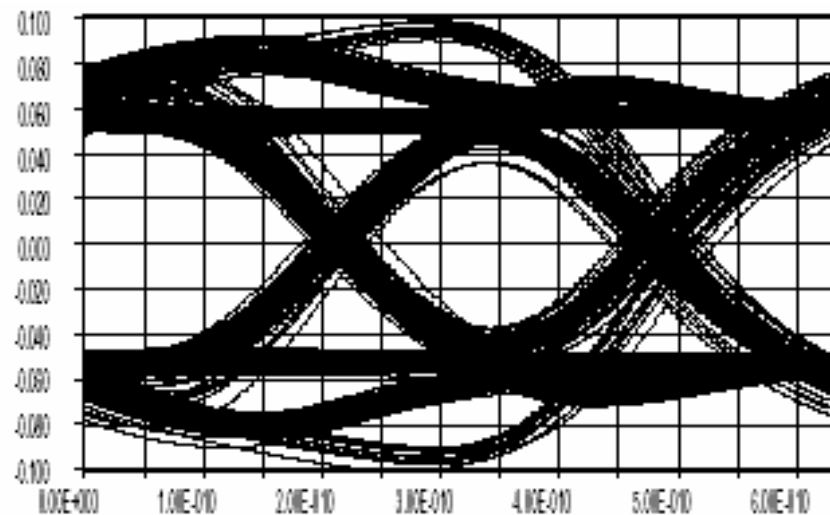
# Simulation with DJ=0.17, RJ=0.18

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TP5



TP6

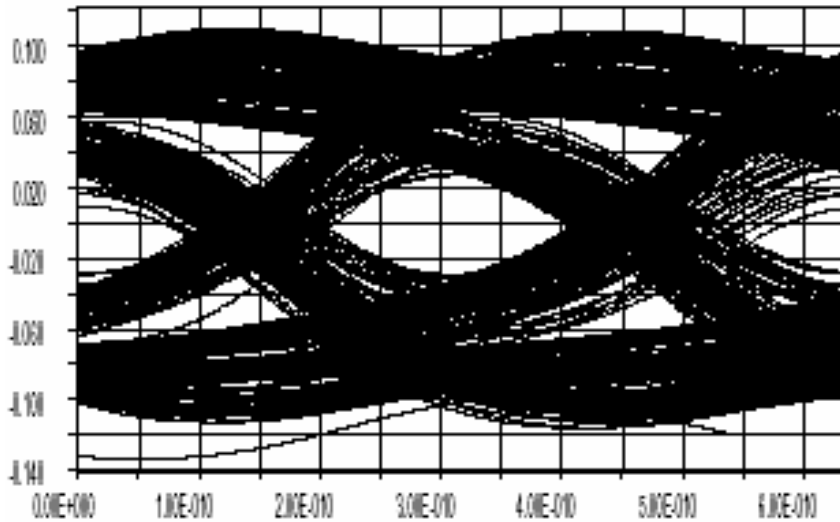


Horizontal Eye Opening  $\sim 200\text{ps}$

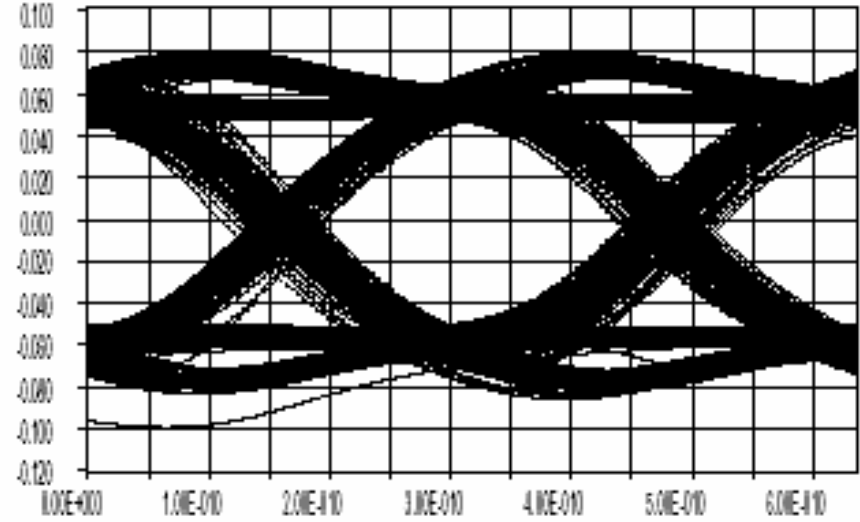
# Simulation with RJ=0.35

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TP5



TP6



Horizontal Eye Opening ~230ps



# Conclusion & Proposal

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- Conclusion:
  - ◆ Simulations of  $RJ=0.35UI$  vs.  $RJ=0.18UI + DJ=0.17UI$  yields similar eye pattern results
    - Limiting RJ per CX4-WP3.1 spec doesn't increase eye opening
    - Allowing RJ to consume all of the total jitter budget per XAUI spec doesn't degrade eye opening
  
- Proposal:
  - ◆ Keep transmit jitter specs for CX4 same as XAUI (except spec at TP2)