

# **CX4 Transmit Template Update**

**Dallas, TX  
Mar. 10-13, 2003**

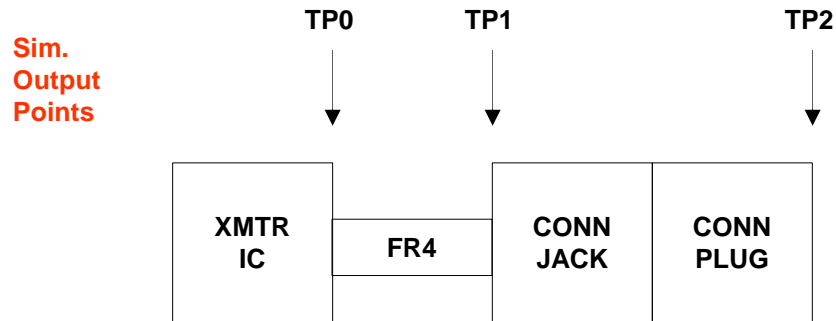
**Steve Dreyer, Intel  
Don Alderrou, Intel  
Schelto vanDoorn, Intel**

# Objective

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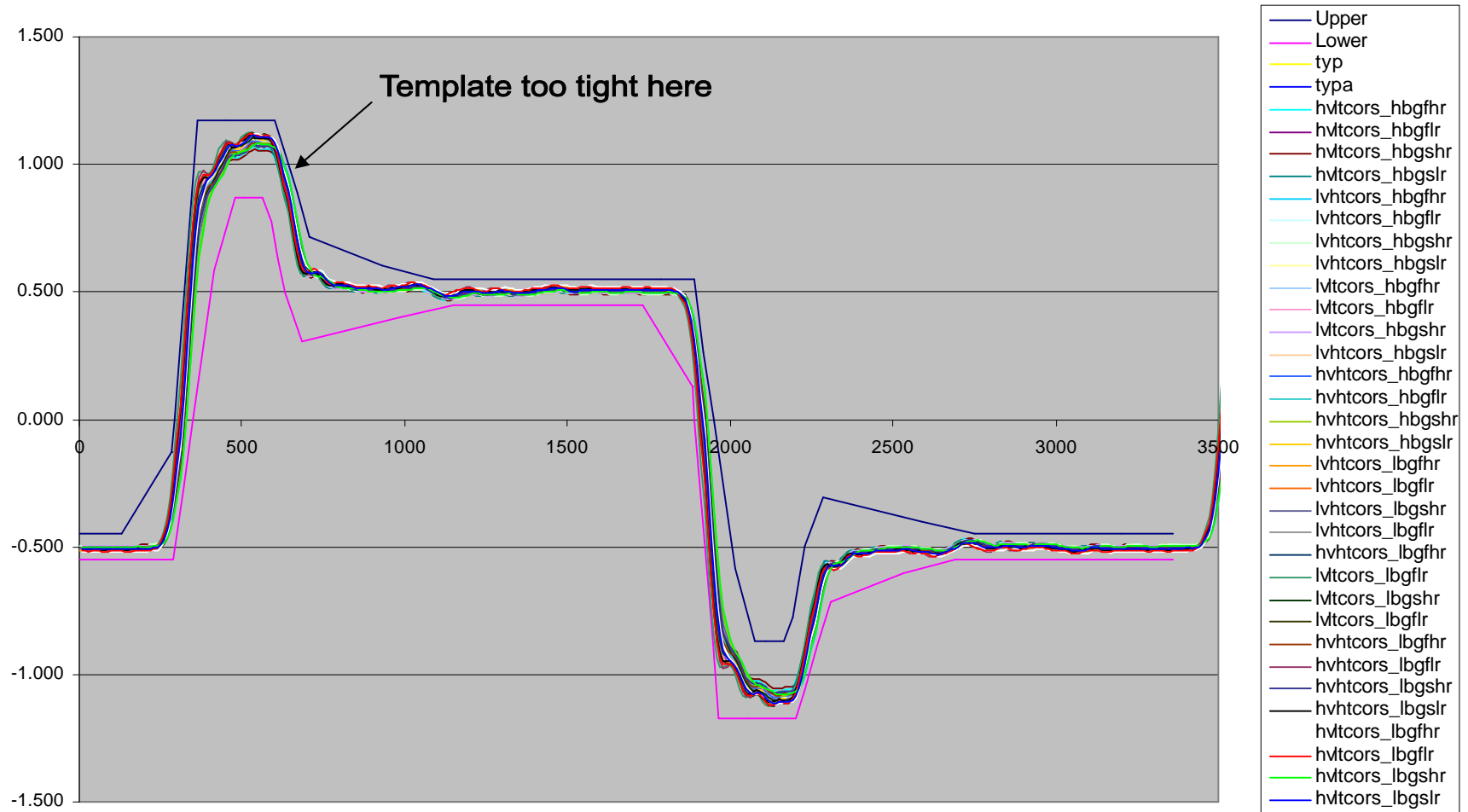
- Validate CX4-WP3.1 template
  - ◆ Do transmit waveform simulations in both 90nm & 130nm process with transistor level circuits over all skews
  - ◆ Compare simulated waveforms to template

# Model for Simulation

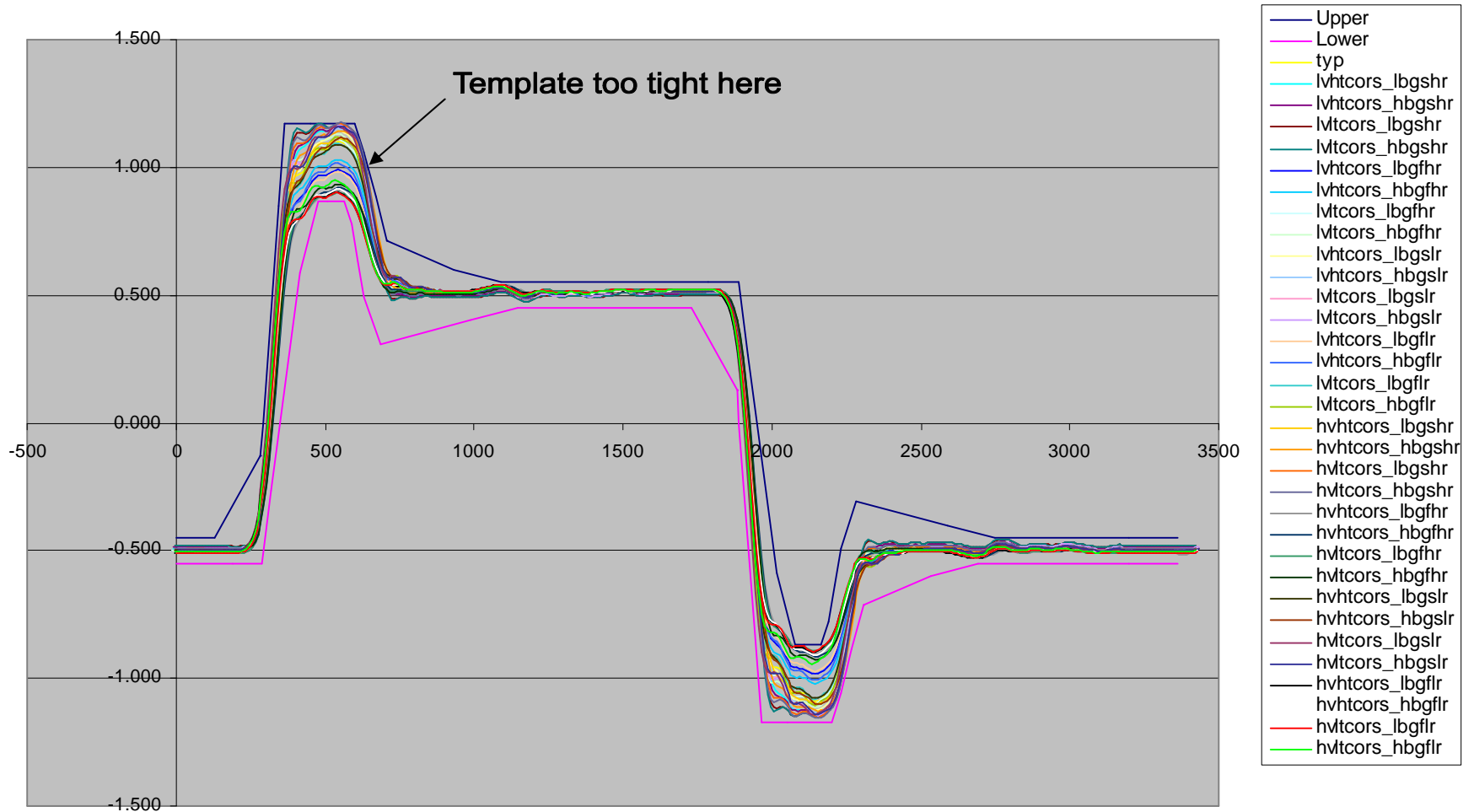


Block	Parameter	Worst Case
XMTR IC	Level & Template	Simulated IC transmit driver from transistor level schematic, results done with 32 combinations of process, temp, supply skews.
FR4	Loss vs. Freq	2" trace: $s_{21} = 20 \cdot \log_{10}(e) \cdot [(a_1 \cdot v f + a_2 \cdot f + a_3 \cdot f^2)] \cdot (1/10)$ $a_1 = 6.5E-6$ $a_2 = 2.0E-10$ $a_3 = 3.3E-20$ $e=2.718.....$
	Z	100 +/-10% ohms
Conn Jack + Conn Plug (Mated Pair)	Loss	LOSS = 0.5dB

# Simulation Results @ TP2, 90nm Process

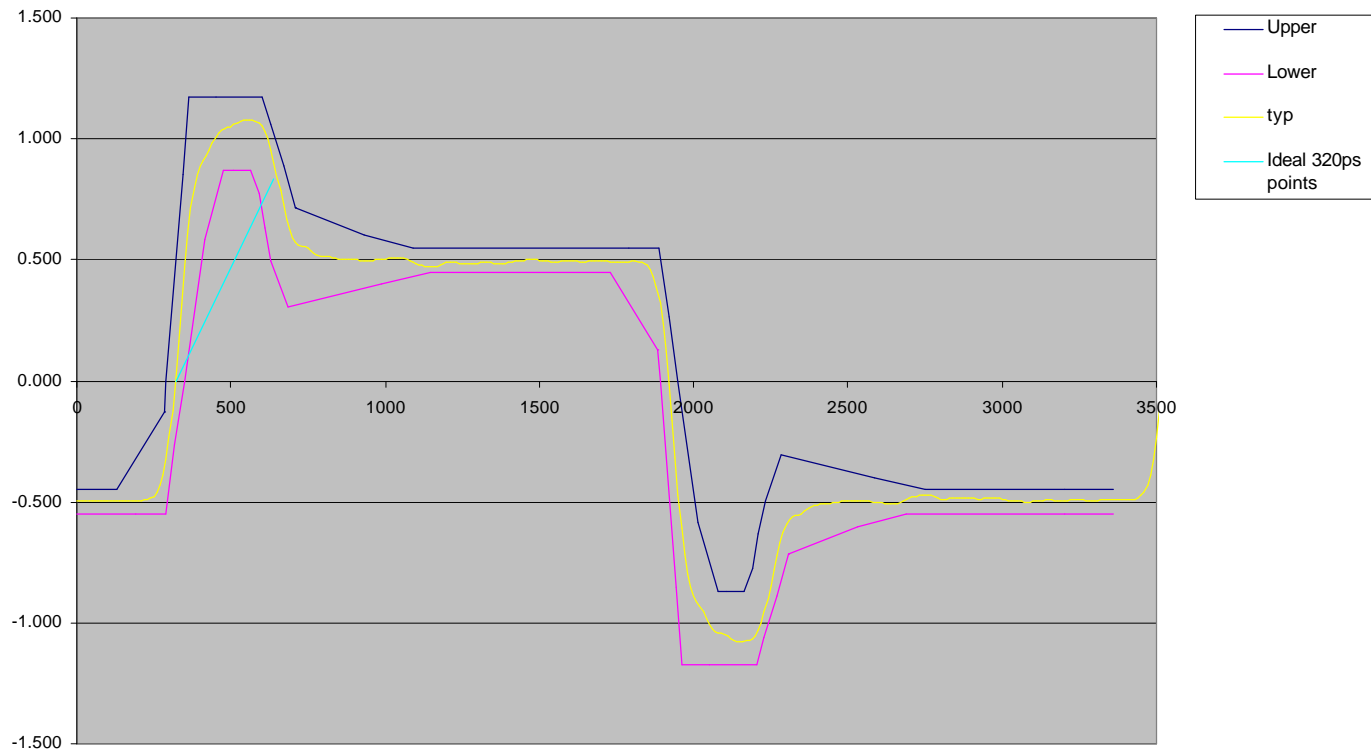


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# Template Centering

- Below, a line is drawn between  $t=320\text{ps}$  and  $t=640\text{ps}$  ideal points. Typ simulated 90nm waveform also shown.



- Template not centered at  $t=640\text{ps}$
- Even though typ simulated waveform is near ideal time point, it is still too close to template boundary

# Problem & Solution

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- Problem
  - ◆ On CX4-WP3.1, template not centered for typical waveform in ~560ps-710ps region
  - ◆ Simulated results too close to upper bound
- Solution
  - ◆ Move four upper limit points in 602-709ps region over 30ps as follows:

CX4-WP1 Spec Points		Proposed Spec Points	
602 ps	1.175	632 ps	1.175
629 ps	1.060	659 ps	1.060
669 ps	0.888	699 ps	0.888
709 ps	0.715	739 ps	0.715

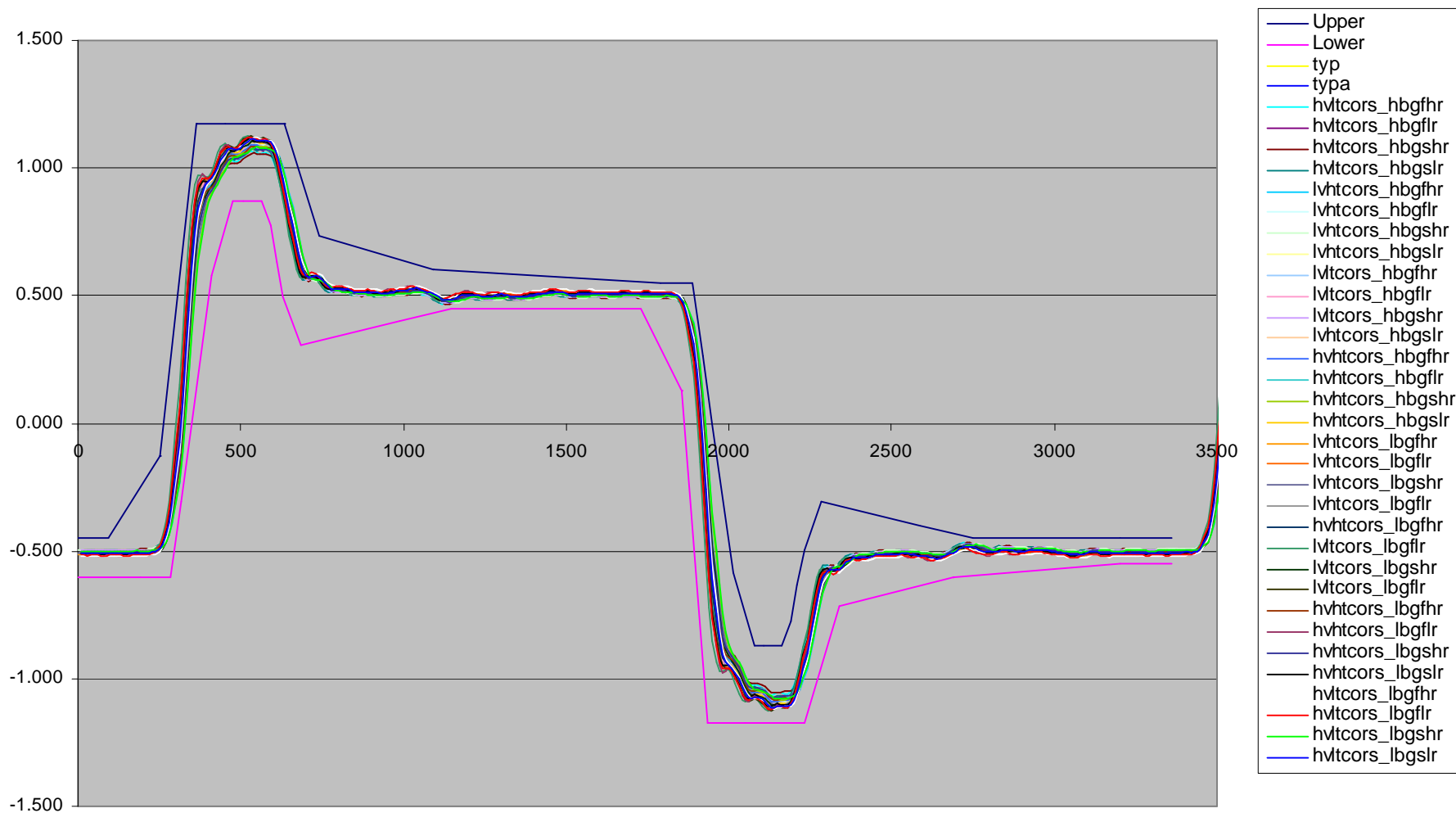
- ◆ Do same for bottom half of waveform
- ◆ Now let's do simulations to validate

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# Plot Previous 90nm Simulation Results w/Zeev Roth's New Proposed Template



# Conclusion & Proposal

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- Conclusions
  - ◆ CX4-WP3.1 template not centered for typical waveforms in ~560ps-710ps region, simulated results very close to upper bound
  - ◆ If four points in CX4-WP3.1 template are moved per P. 6 recommendation, then:
    - Centers template
    - Provides adequate margin for designers
    - Area under the curve changes ~1.3%, effect on far end minimal
    - Consistent with Zeev Roth's proposed template changes
- Proposal
  - ◆ Change template per P. 6.