

CX4 Template Proposal

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New Template Proposal – Motivation

- Recently presented simulation results (by Howard in Portsmouth and Dimitry in Ottawa) indicate very clear that lower nominal pre-emphasis value (around 30%) comparing to current value (50%):
 - Provides better performance margin for short and long cables
 - Above is very consistent over variety of cable lengths and equalizers
 - Less sensitive to Return Loss and Cross Talk noise
 - Allows greater design flexibility

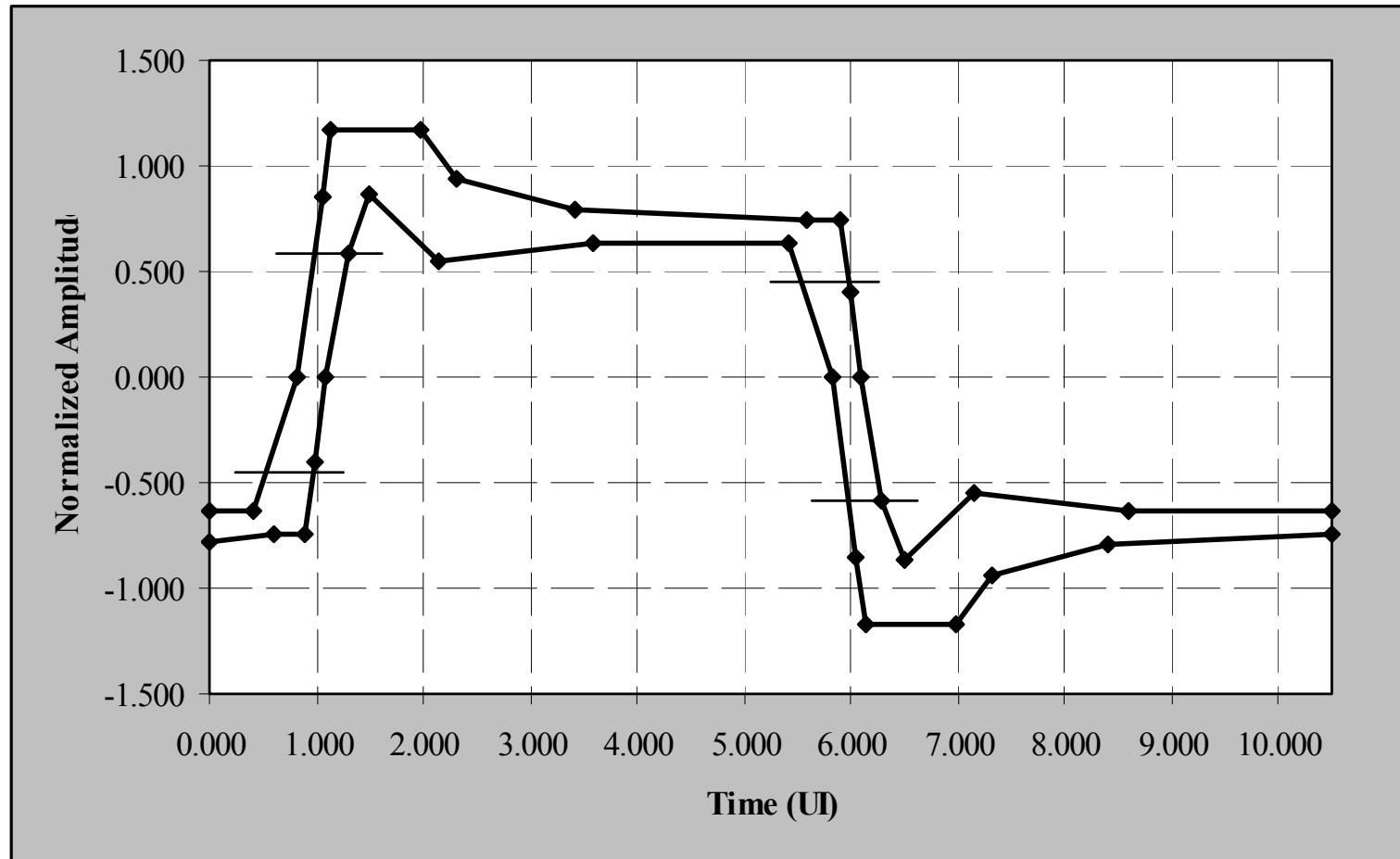
New Template Proposal – Objectives:

- Nominal pre-emphasis is 31%
- Voltage swing same as for previous template proposal
 - To accommodate 60-130ps Trf, worst-case Return Loss
- Should be symmetrical
- Should have wrap around continuous

Proposed Template (Pre=31%)

Time (UI)	Upper limit	Time (UI)	Lower limit
0.000	-0.640	0.000	-0.776
0.409	-0.640	0.591	-0.740
0.828	0.000	0.897	-0.740
1.050	0.856	0.997	-0.406
1.134	1.175	1.094	0.000
1.975	1.175	1.294	0.586
2.309	0.940	1.491	0.870
3.409	0.790	2.141	0.546
5.591	0.740	3.591	0.640
5.897	0.740	5.409	0.640
5.997	0.406	5.828	0.000
6.094	0.000	6.050	-0.856
6.294	-0.586	6.134	-1.175
6.491	-0.870	6.975	-1.175
7.141	-0.546	7.309	-0.940
8.591	-0.640	8.500	-0.790
10.500	-0.640	10.500	-0.746

Proposed Template (Pre=31%)



Template

features and check conditions

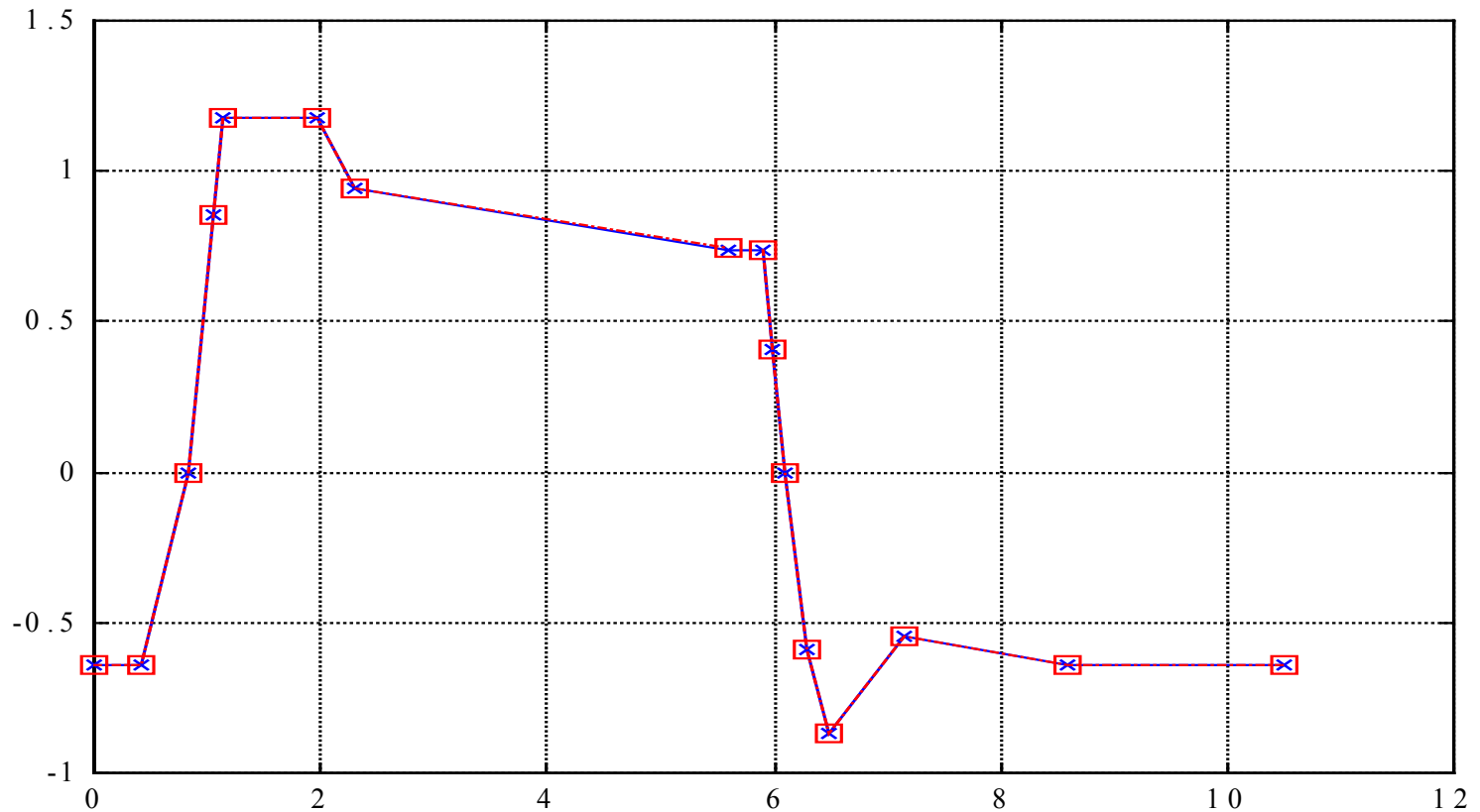
- Nominal Pre-Emphasis value = 31%
- Pre-emphasis range: +/- 10%
 - same as was used in previous template proposal (*in mV*)
 - $V_{h_max} = 1.175$, $V_{l_max} = 0.87$ after normalization procedure
- Symmetrical and wrap around
- Transmitter Rise/Fall Time
 - 60ps, 100ps, 130ps
- No PCB – worst case scenario

New template proposal - wrap around check



New template proposal – symmetry check

Overlaying lower limit on upper limit - perfect fit



Template normalization

Operation	Comment
$V_{lowp} = \text{mean}(A(53:85));$	640ps between 800ps and 1760ps
$V_{lown} = \text{mean}(A(\text{end}-32:\text{end}));$	640ps between 2400ps and 3360ps
$V_{off} = (V_{lowp} + V_{lown})/2;$	calculate offset
$V_{norm} = (V_{lowp} - V_{lown})/2;$	calculate normalization factor
$\text{waveform} = (1 - \text{pre_nominal}) * (A - V_{off}) / V_{norm}$	normalize the template response

A is the Average template measurement (168 samples)

Pre-Emphasis range check

