10GBASE-KR Transmitter Compliance Methodology Proposal and Modifications to the Startup protocol

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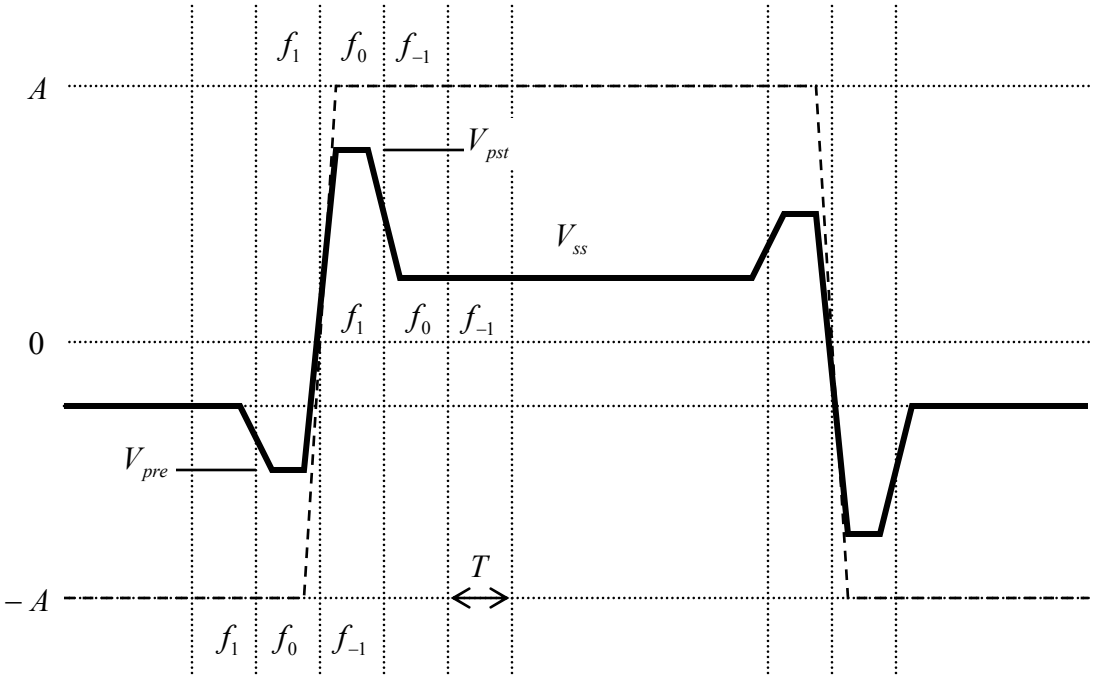
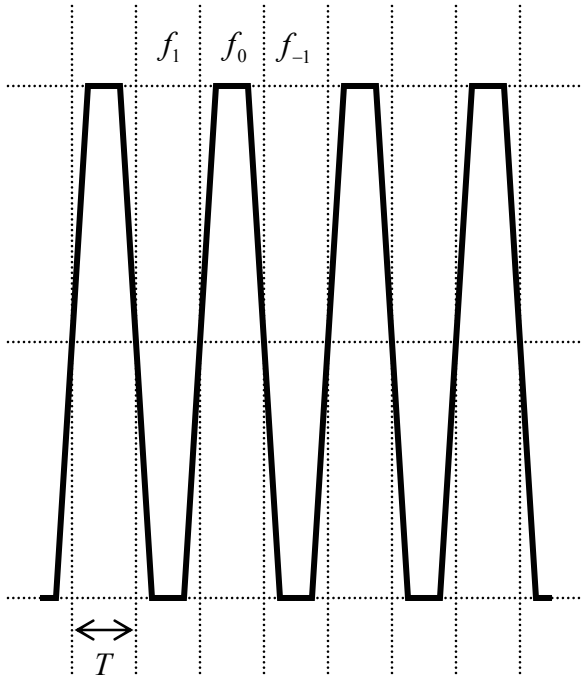
Scope and Purpose

- Present consensus items from Transmit compliance and Link Startup protocol
- Move that consensus items be accepted into the draft standard

Transmit Equalizer Signal Shaping





$$V_{pre} = A(-f_1 - f_0 + f_{-1})$$

$$V_{pst} = A(-f_1 + f_0 + f_{-1})$$

$$V_{ss} = A(f_1 + f_0 + f_{-1})$$

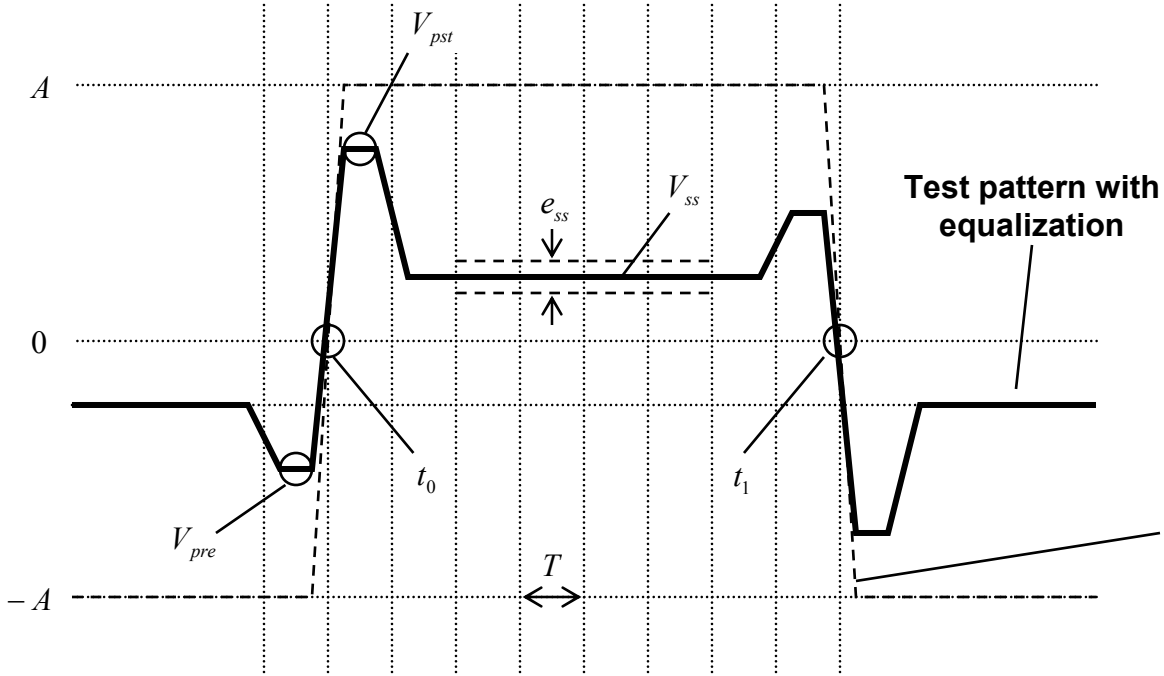
$$-f_1 + f_0 - f_{-1} = 1$$

NOTE:
By convention, f_1 and f_{-1} are always negative and f_0 is always positive.

Notes

- Use “equalizer off” setting and clause 49 waveform to validate rise time, jitter, and amplitude requirements.
- May also want to check peak-peak output amplitude with 1010… pattern (n = 1).

Proposed Specification Methodology: Equalization Ratio Testing (ERT)



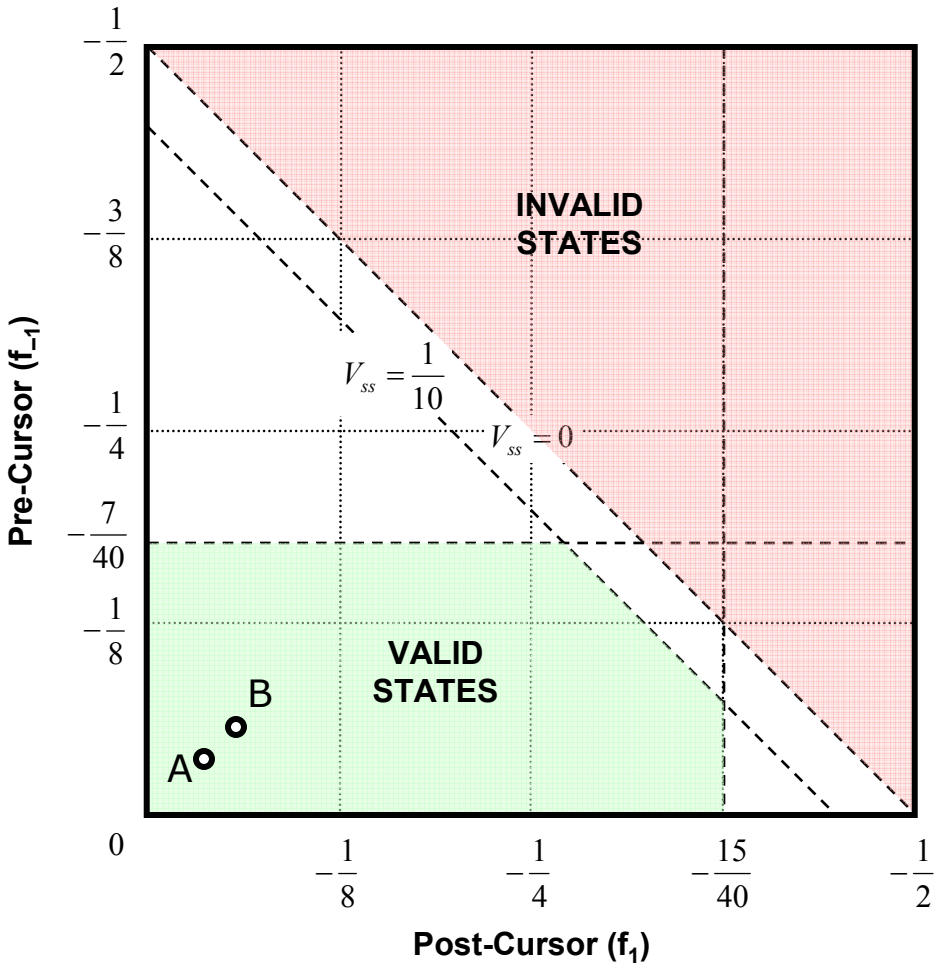
Definitions

A = peak transmit differential output amplitude
T = symbol period
t_0 = zero-crossing point of the rising edge of the AC-coupled signal
t_1 = zero-crossing point of the falling edge of the AC-coupled signal
V_{pre} = peak voltage measured in the interval t_0-T to t_0
V_{pst} = peak voltage measured in the interval t_0 to t_0+T
V_{ss} = steady-state voltage measured as the average voltage in the interval t_0+2T to t_1-2T
e_{ss} = steady-state error measured as the deviation from V_{ss} in the interval t_0+2T to t_1-2T

Motion

- Motion to accept the Equalization Ratio Test (ERT) methodology described on slides 3 through 5 of this presentation.

Transmit Equalizer Solution Space



Measure V_{pre} and V_{pst}, using the ERT method at each point.

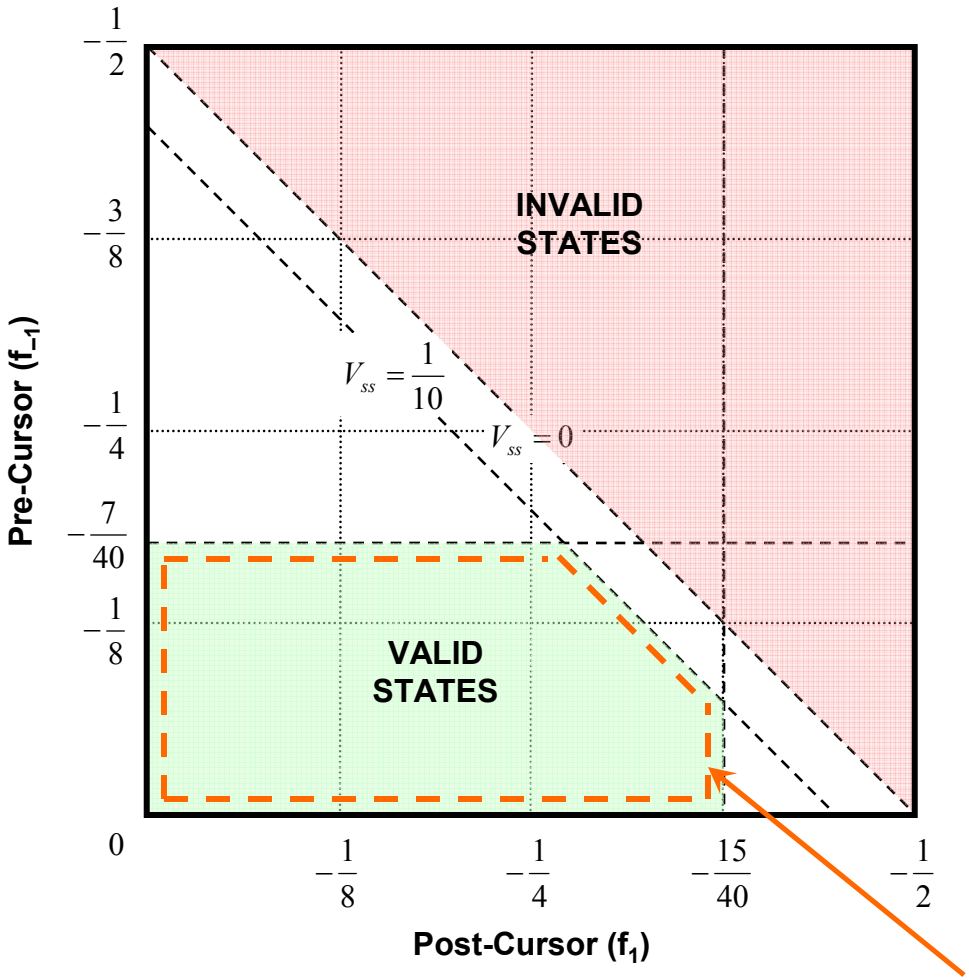
Use the Delta between the V_{pre} and V_{pst} measurements at two adjacent points. Delta between any two points is defined as

$$0 < D_{pre} \le stepsize + tolerance$$
$$0 < D_{pst} \le stepsize + tolerance$$
$$where:$$
$$stepsize = 0.025$$
$$tolerance = 0.0125$$

$$D_{pre} = \frac{-V_{pre}(n) + V_{pre}(n-1)}{V_{pst}(n) - V_{pre}(n)}$$

$$D_{pst} = \frac{-V_{pst}(n) + V_{pst}(n-1)}{V_{pst}(n) - V_{pre}(n)}$$

Transmit Equalizer Compliance Testing Space



Boundary tested for compliance

Measure D_{pre} and D_{pst}, using the ERT method at each point. Transmitter must be guaranteed to cover the entire range for precursor and postcursor.

1) Test all settings of precursor (f_{-1})
Example:
f_{-1} : 8 steps from 0 to −7/40 (0.175)
step size = 0.025
tolerance = 0.0125

2) Test all settings of post cursor (f_1)
Example:
f_1 : 16 steps from 0 to −15/40 (0.375)
step size = 0.025
tolerance = 0.0125

3) Test V_{ss} : Transmitter must guarantee that minimum value is restricted to no less than 1/10 A. Assuming A=400mV peak diff, V_{ss} = 40mV peak diff.
This can be accomplished by testing the V_{ss} =1/10 line in step size increments and guaranteeing overflow for any setting that can cause V_{ss} < 1/10.

Motion

- Motion to accept the Transmit Equalizer Solution Space and test methology as described on slides 7 and 8.

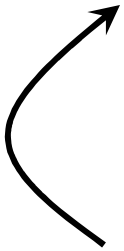
Current Concerns with Start-Up Protocol

- No indication of the transmitter state…
  - How does the receiver know that the requested transmitter update was received?
  - How does the receiver know if or when the requested transmitter update was implemented?
- Uncertainty related to tap range and resolution…
  - What if “increment” requests are sent for a tap that has hit the positive rail; how will the receiver know to give up?
- A handshake mechanism needs to be implemented

Handshake implementation

- TTU – Transmit Tap(s) Updated status
  - Feedback to the receiver that the update request was acted upon.
  - Independent feedback for each tap
  - Over/Under flow are intended to show that an update was requested, but the transmitter could not do it.

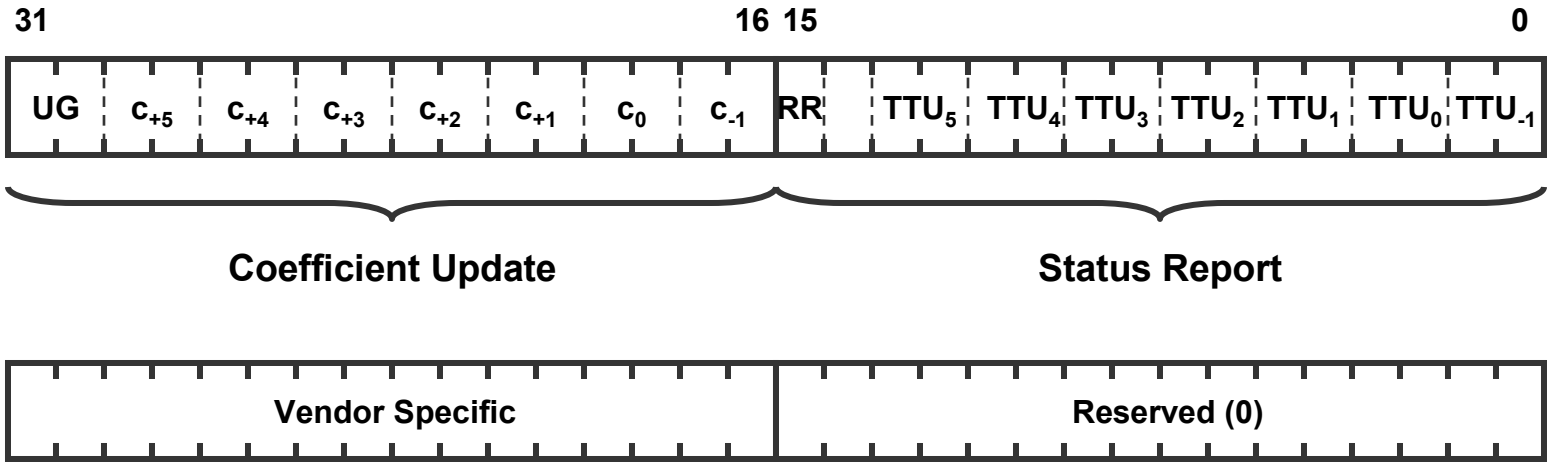
Action	Encoding
Not updated	00
Updated	01
Underflow	10
Overflow	11



- Receiver sends inc/dec/hold request to transmitter
- Transmitter sends TTU_n = 01 (“updated”) acknowledgement
- Receiver sends “hold” for all transmit taps and gathers statistics for next update
  - During this time Transmitter sends TTU_n = 00 (“not updated”)
- Receiver sends next inc/dec/hold request to transmitter

Proposed Changes to Control Channel

- Refer to brink_01_0105.pdf for details of the control channel implementation
- Reserved words are for future expansion or vendor specific implementations such as; power back off
- Total frame length should be preserved to be divisible by 16 and 20. Propose that this be remedied through work on the training pattern to be presented in the June Interim meeting by Moore and Brink.



Motion

- Motion to accept the updates to the startup protocol as described on slides 11 and 12 of this presentation.

End