

The DFE Eye Diagram

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Version 1.0

IEEE 802.3dj May Meeting

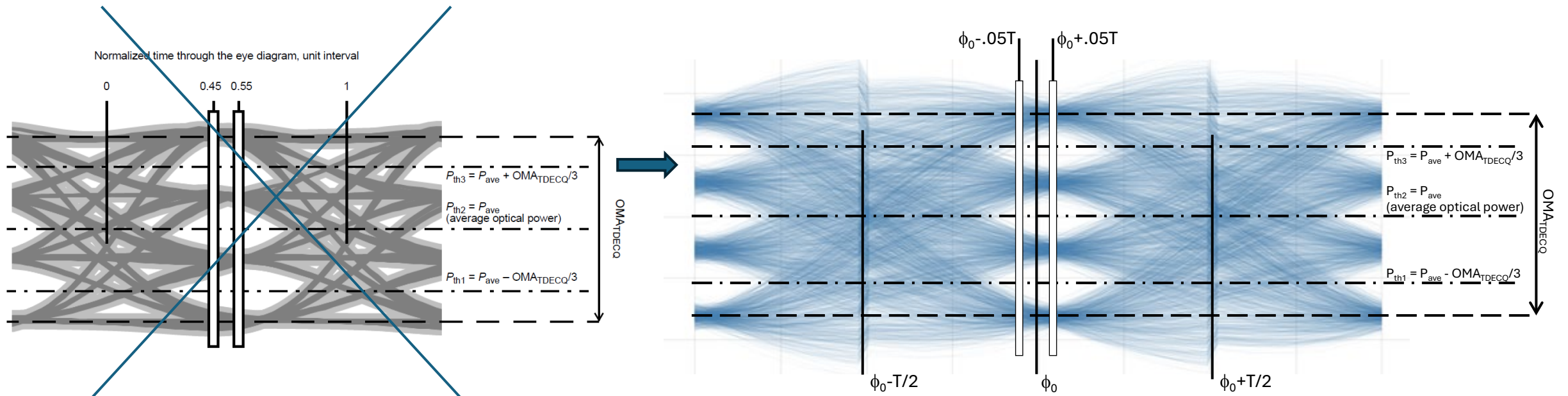
27 April 2026

Comments Addressed: I-394

Supporters

- Mike Dudek, Marvell
- Chris Cole, Coherent
- Adee Ran, Cisco

Proposed Changes to Figure 180-11



- New figure shows the “batwings” associated with the DFE and the relation to the sampling phase ϕ_0 at which the taps are optimized.

Thank You

Backup (Presented Earlier)

Explaining the Eye Diagram

Comment I-463 (Dawe), I-180 (Healy), I-393 (Swenson), I-224(Maniloff)

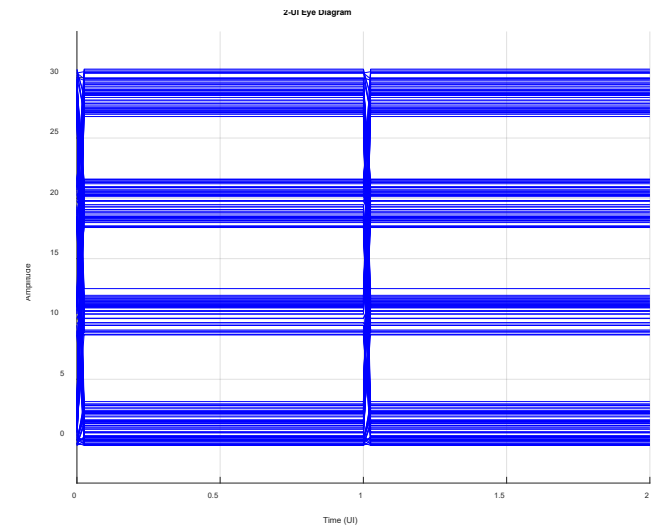
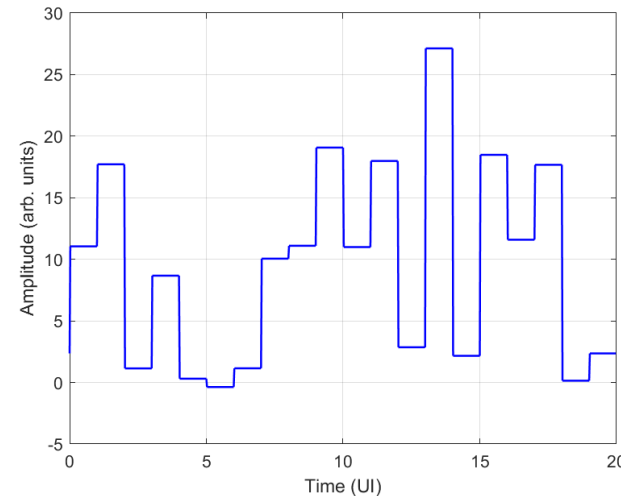
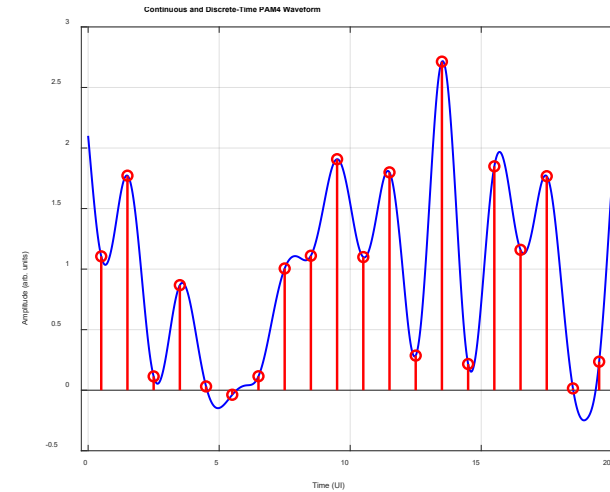
Suggested resolution: Propose a wording that is mutually acceptable to these commenters.

Comments I-394 (Swenson), I-396 (Swenson)

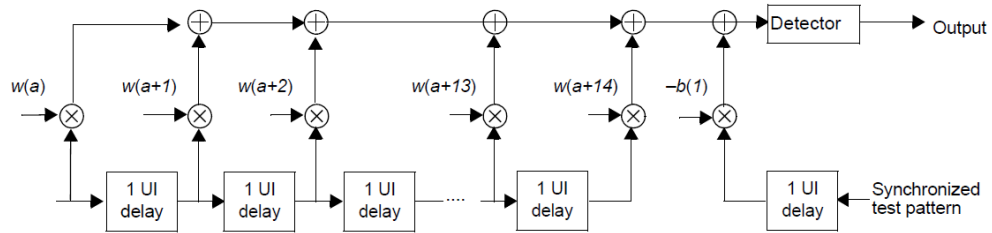
Suggested remedy: Delete the eye diagram. Or if we keep it, add the “bat-wings”.

What is the origin of the eye diagram?

- A discrete-time equalizer has no eye diagram
 - A discrete-time signal is not defined in between samples
- Or you could say it has a “boring” eye diagram if you maintain that the signal stays constant between samples

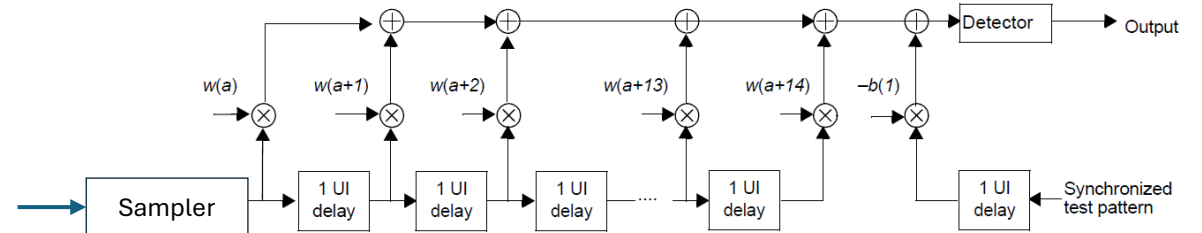


Two Options



NOTE—The variable a is an integer in the range -3 to 0

Figure 180–10—TDECQ reference equalizer functional model



NOTE—The variable a is an integer in the range -3 to 0

Figure 180–10—TDECQ reference equalizer functional model

- 1) Continuous time equalizer

- Taps are adjusted based on 1UI - spaced samples
- Components shown are ideal (infinite bandwidth)

- 2) Discrete time equalizer

- 1UI –spaced Sampler is at the input
- For a given tap setting, the phase of the sampler can be swept to produce the eye diagram

The DFE Eye Diagram

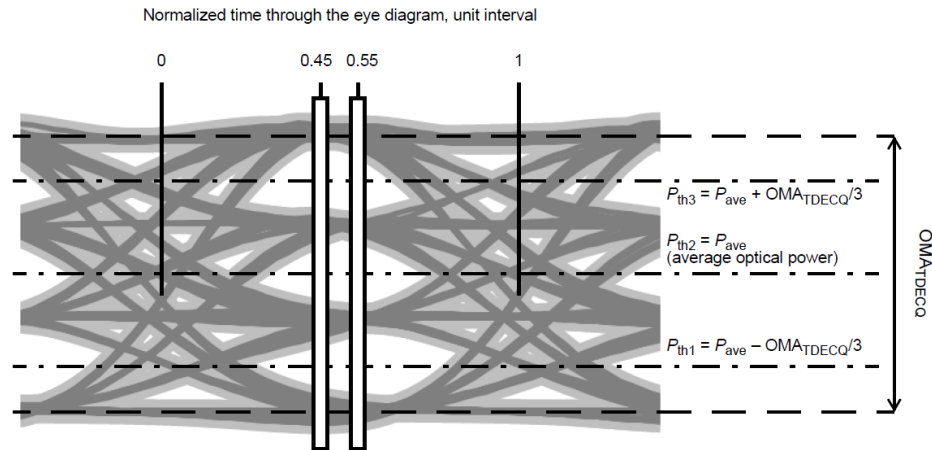
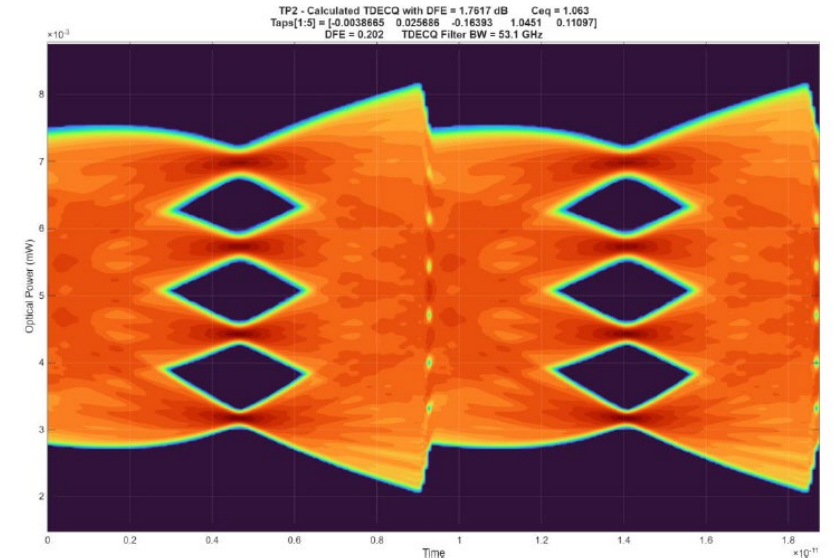


Figure 180-11—Illustration of the TDECQ measurement



Eye diagram courtesy Mark Kimber, Semtech

- However we define it, we need to include the “bat-wing” if we show the eye diagram
 - This is a unique feature of the DFE eye diagram. The amount added to the waveform is constant over 1UI.
- Timing: The value must change outside of the two histogram windows
 - Nominally 1/2 UI from the center eye opening is a good choice
 - We need to say something about this in the text
 - Perhaps “1/2 UI from the nominal point at which the TDECQ is measured”
 - This needs better description in the text and figure