Proposed changes to Annex 120G

(possible response to comment #41)

Adam Healey

Broadcom Inc.

October 2020 (r2)

Suggested changes to 120G.5.2, page 241, line 23 (Alt. 1)

- Replace step h) with new steps h) through q) as shown below.

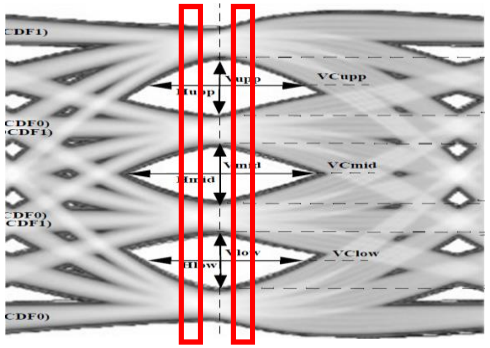
h) Define TCL to be t_s – TBD1 UI. Compute Vmid, Vupp, Vlow, VCmid, VCupp, VClow from the eye diagram using 120E.4.2 steps 4) through 6) with the exception that the CDF of the signal voltage is accumulated over the time interval TCL +/− TBD2 UI and not “within 0.025 UI of time TCmid”. Label these values VLmid, VLupp, VLlow, VCLmid, VCLupp, and VCLlow respectively.

i) Define TCR to be t_s + TBD1 UI. Compute Vmid, Vupp, Vlow, VCmid, VCupp, VClow from the eye diagram using 120E.4.2 steps 4) through 6) with the exception that the CDF of the signal voltage is accumulated over the time interval TCR +/− TBD2 UI and not “within 0.025 UI of time TCmid”. Label these values VRmid, VRupp, VRlow, VCRmid, VCRupp, and VCRlow respectively.

j) Define Vmid to be min(VLmid, VRmid) − abs(VCLmid − VCRmid)

k) Define Vupp to be min(VLupp, VRupp) − abs(VCLupp − VCRupp)

l) Define Vlow to be min(VLlow, VRlow) − abs(VCLlow − VCRlow)



“Alt. 1” continued

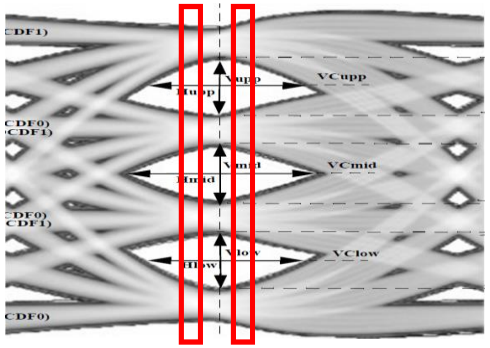
m) Define VCmid to be (VCLmid + VCRmid)/2

n) Define VCupp to be (VCLupp + VCRupp)/2

o) Define VClow to be (VCLlow + VCRlow)/2

p) The eye height is defined as the minimum of Vmid, Vupp, and Vlow.

q) Compute the vertical eye closure using Equation (120E–4) and the values computed in steps j) through o) with the exception that VM3, VM2, VM1, and VM0 are the average values over the time interval t_s +/− TBD2 UI and not “within 0.025 UI of time TCmid”.



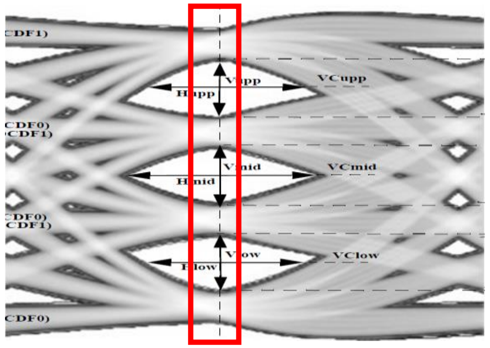
Suggested changes to 120G.5.2, page 241, line 23 (Alt. 2)

- Replace step h) with new steps h) through j) as shown below.

  h) Compute Vmid, Vupp, Vlow, VCmid, VCupp, VClow from the eye diagram using 120E.4.2 steps 4) through 6) with the exception that the CDF of the signal voltage is accumulated over the time interval t_s +/− TBD UI and not “within 0.025 UI of time TCmid”.

  i) The eye height is the minimum of Vmid, Vupp, and Vlow.

  j) Compute the vertical eye closure using Equation (120E–4) and the values computed in step h) with the exception that VM3, VM2, VM1, and VM0 are the average values over the time interval t_s +/− TBD UI and not “within 0.025 UI of time TCmid”.



More suggested changes to 120G.5.2

- Page 239, line 3 and page 241, line 26: Strike “, eye width ,”.
- Page 239, line 9:

  Eye height~~, eye width,~~ and vertical eye closure parameters~~, as illustrated by Figure 120E–13,~~ are defined by the following procedure.

  [*Note: Figure 120E–13 does not illustrate eye height and vertical eye closure.*]
- Page 241, line 6:

  Perform the following ~~five~~ steps for each valid combination…

  [*Note: There are more than 5 steps but it is not necessary to count them.*]

More suggested changes

- Remove ESMW rows from the following tables

  Table 120G–1—Host output characteristics at TP1a

  Table 120G–3—Module output characteristics (at TP4)

  Table 120G–6—Host stressed input parameters

  Table 120G–9—Module stressed input parameters

- Add an editor’s note stating that the eye height and vertical eye closure limits need to be confirmed due to changes in the measurement method defined in 120G.5.2.

Suggested changes to 120G.3.3.2.1

- Page 233, line 40

  The near-end and far-end eye height~~, eye width,~~ and vertical eye closure are set to the target values in Table 120G–6…

- Page 233, line 45

  ... to result in the eye height for all three eyes ~~and eye width for the smallest eye~~ given in Table 120G–6 with the setting of the CTLE that minimizes the ~~value of~~ vertical eye closure.

- Table 120G–6—Host stressed input parameters

  Remove “Far-end eye width” row

Suggested changes to 120G.3.4.1.1

- Page 237, line 12

  … to result in the eye height for all three eyes ~~and eye width for the smallest eye~~ given in Figure 120G–9

- Page 237, line 13

  … using the reference receiver with the setting that ~~maximizes the product of eye height and eye width~~minimizes the vertical eye closure.

- Page 237, line 17

  Eye height ~~and eye width~~ at TP1a ~~are~~is then adjusted in the same way as described for the high-loss case except that ...

- Table 120G–9—Module stressed input parameters

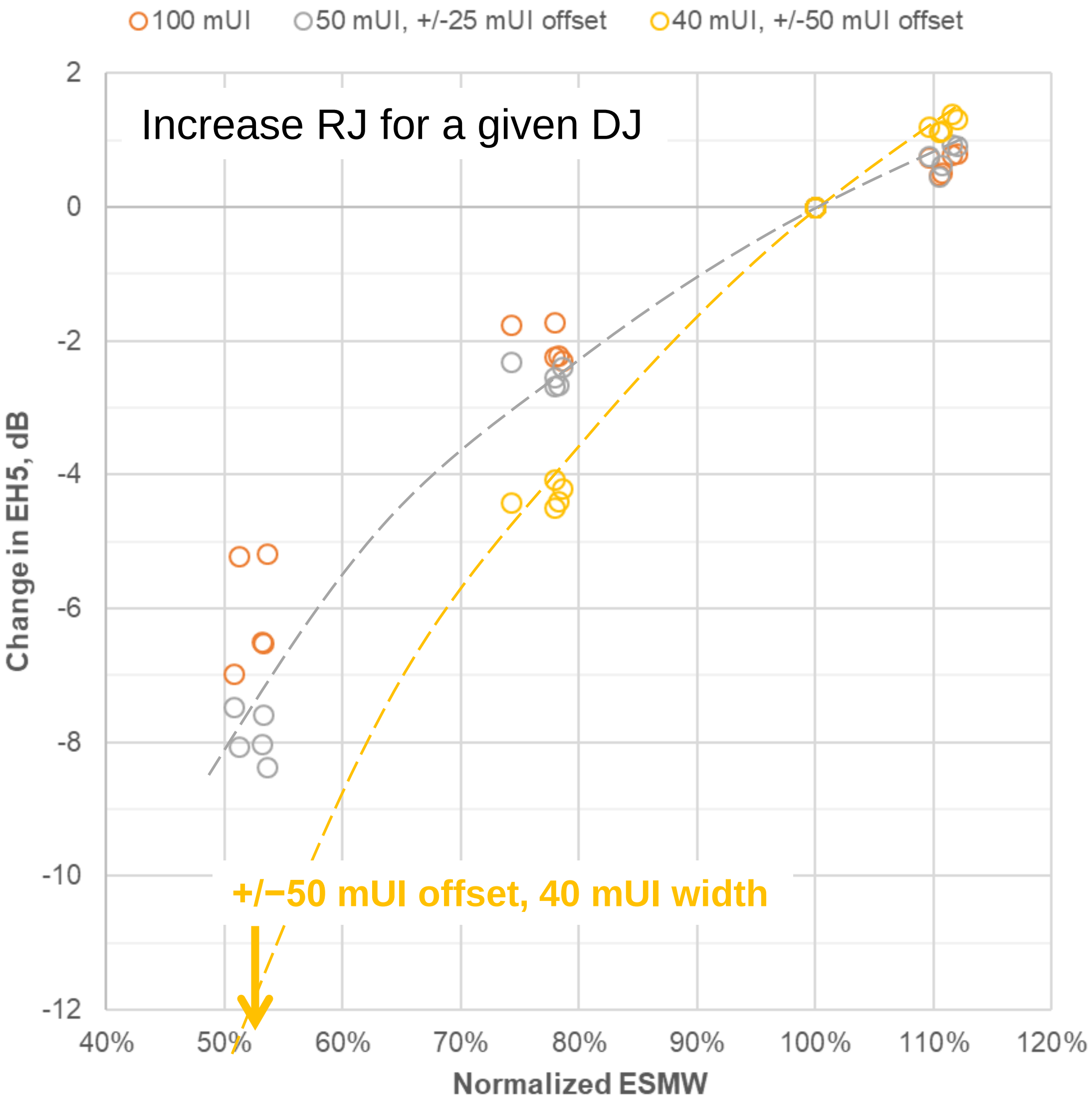
  Remove “Far-end eye width” row

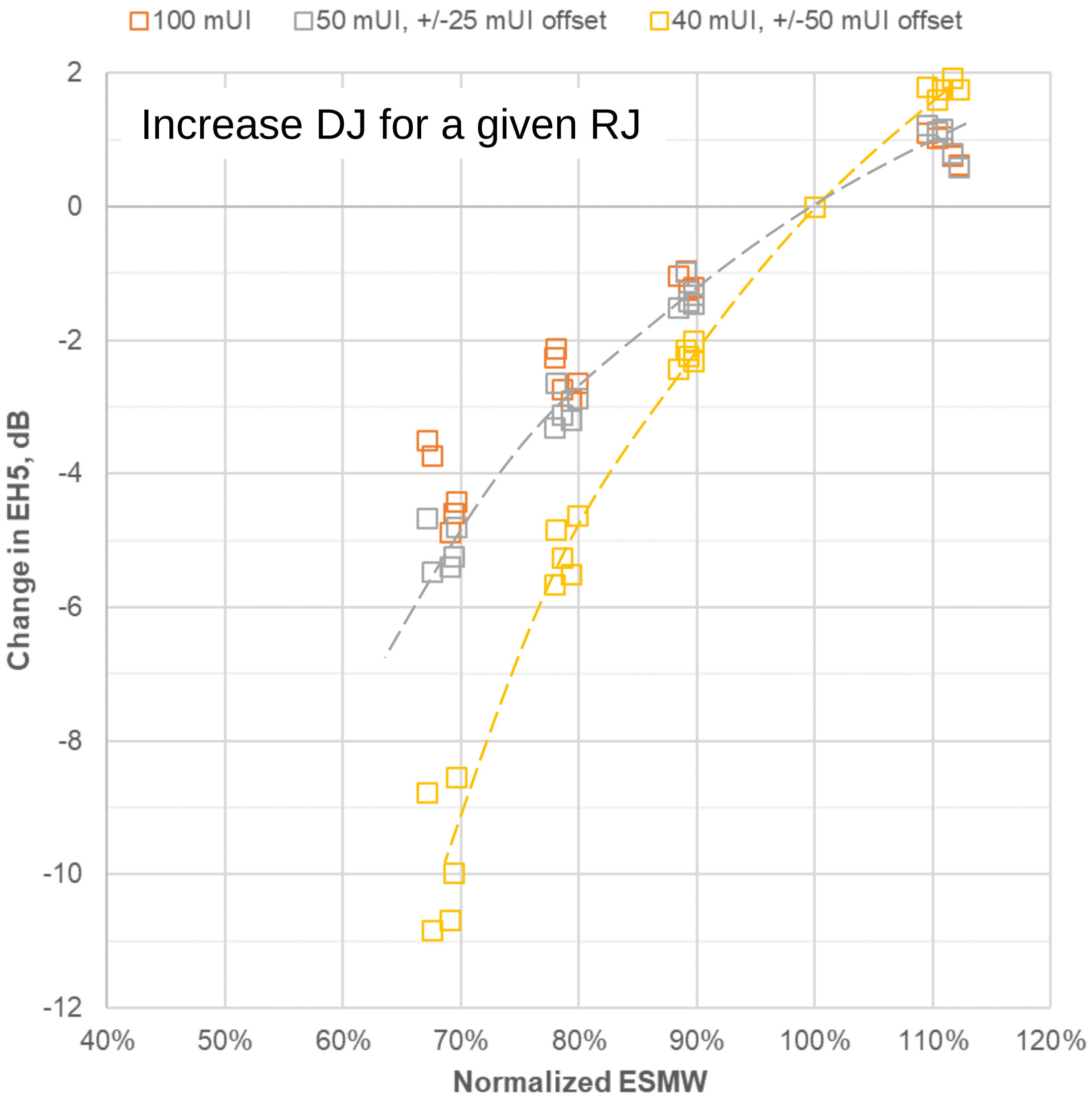
Simulation results

Description of experiment

- Examine how eye height relates to horizontal margin
- Eye height is measured with wider histograms or additional time offsets
  - “Alt. 2” with TBD = 100 mUI histogram width
  - “Alt. 1” with TBD1 = +/−25 mUI time offsets and TBD2 = 50 mUI histogram width
  - “Alt. 1” with TBD1 = +/−50 mUI time offsets and TBD2 = 40 mUI histogram width
- Results are derived from PRBS13Q waveforms (not COM estimates)
- Five waveforms tested spanning low and high-loss channels
- Jitter is added to reduce the horizontal margin
- Results indicate that all three options exhibit similar trends, only the rate of eye height reduction with decreasing horizontal margin changes
- Note that vertical eye closure increases at the same rate (in dB) that eye height decreases

EH5 vs. ESMW for various window widths and offsets





Addressing “tilted” eyes

Background information for “Alt. 1”

From 120E.4.2

- VLupp = VLupp1 − VLupp0
- VRupp = VRupp1 − VRupp0 would have a similar value for “tilted” eye
- VCLupp = (VLupp1 + VLupp0)/2 and VCRupp = (VRupp1 + VRupp0)/2 will differ

Simple adjustment to penalize “tilted” eye

- Vupp was proposed to be min(VLupp, VRupp)
- Can subtract abs(VCLupp − VCRupp) to penalize “tilted” eyes
- The result is twice the minimum distance from the 1e−5 contour to a fixed threshold