

Proposal for resolution of comments #118 and #47

Below find an attempt at reconciling Comment #118 and comment #47 with the current (D2.2) section 92.8.3.10.2 :. #47 is relatively simple as it is just one-line equation correction.

#118 includes several ideas.

None of these change the methodology.

Rather, the changes concern things as e.g. the number of bins and bin selection.

Because of this limit in scope the should be acceptable, the issue is only the fact that several ideas are included in the comment so several changes have to be considered.

Some of the ideas are accepted (e.g. removing the lower bound on the bin spacing), one is accepted only as a mention of an alternative method (doing jitter peak instead of a jitter bathtub), some are pruned (e.g. where several ways of bin selection are proposed, one is accepted),

In summary, three views of the changes proposed as the resolution of #118 and #47 are given below:

(a) D2.2's 92.8.3.10.2 shown revised as per slightly altered comment #118 and the comment #47, with revision markups shown

(b) D2.2's 92.8.3.10.2 shown revised as per slightly altered comment #118, with revision markups NOT shown

(c) Comment #118 "Suggested Remedy" marked up.

Note: comment resolution commentary in *yellow italics*

92.8.3.10.2 Effective bounded uncorrelated jitter and effective random jitter

Effective bounded uncorrelated jitter and effect random jitter are measured on each of two specific transitions in a PRBS9 pattern (see 83.5.10). The two transitions occur in the sequence of five zeros and four ones and nine ones and five zeros, respectively. The sequences are located at bits 10 to 18 and 1 to 14, respectively, where bits 1 to 9 are the run of nine ones.

The jitter components are determined according to the following method.

- a) Acquire a horizontal histogram with at least 20,000 samples of a transition measured at the zero crossing point, with resolution ~~no coarser than 20 fs~~ ~~between 5 and 50 fs~~ per bin, and with vertical size of the histogram box no more than 1 % of the signal VMA (see 86A.5.3.5).
- b) Space two copies of the acquired histogram at 1 UI from mean to mean and develop a cumulative distribution function (CDF) in the Q-space (a ~~Q-space bathtub~~). *(Equally valid approach is to develop a CDF to the left and to the right of the histogram's mean, so creating a jitter peak instead of a jitter bathtub).*
- c) On each side of the ~~bathtub~~ *Q-space CDF*, select the horizontal bin with the highest Q value with at least ~~50-20 hits samples~~ and the adjacent ~~consecutive 4 bins with lower Q for a collection of 5 bins~~ *bins containing no more than 500 samples.* *Q as a function of time/jitter (resulting in slope m and intercept b) , Q = m * t + b*
- d) On each side of the ~~CDF distribution bathtub~~, determine an ~~LMS~~ *straight-line fit* to the ~~5~~ selected bins of the forms in Equation (92-11) and Equation (92-12) ~~for the left and right sides of the bathtub, respectively.~~
- e) Calculate the values of ~~DJDD-effective bounded uncorrelated jitter~~ ~~BUJDD~~ and ~~effective random jitter~~ ~~RJDD~~ according to Equation (92-13) and Equation (92-14), respectively.
- f) ~~Equate effective bounded uncorrelated jitter and effective random jitter to DJDD and RJDD, respectively~~

$Q_{left} = m_{left} \square \text{jitter}_L + b_{left}$	(92-11)
$Q_{right} = m_{right} \square \text{jitter}_L + b_{right}$	(92-12)
effective bounded uncorrelated jitter = $1 - \frac{(b_{right}/m_{right} - b_{left}/m_{left})m_{left} - b_{left} - m_{right} - b_{right}}{m_{right} - m_{left}}$	(92-13)
effective random jitter = $2 / (m_{right} - m_{left})$	(92-14)

Effective bounded uncorrelated jitter shall be less than or equal to 0.1 UI peak-to-peak regardless of the transmit equalization setting.
The effective random jitter shall be less than or equal to 0.01 UI RMS regardless of the transmit equalization setting.

This is the end of the revised 92.8.3.10.2 show with revision markup.

(b) Same text, but w/o revision markup, follows:

92.8.3.10.2 Effective bounded uncorrelated jitter and effective random jitter

Effective bounded uncorrelated jitter and effect random jitter are measured on each of two specific transitions in a PRBS9 pattern (see 83.5.10). The two transitions occur in the sequence of five zeros and four ones and nine ones and five zeros, respectively. The sequences are located at bits 10 to 18 and 1 to 14, respectively, where bits 1 to 9 are the run of nine ones.

The jitter components are determined according to the following method.

- a) Acquire a horizontal histogram with at least 20,000 samples of a transition measured at the zero crossing point, with resolution no coarser than 20 fs per bin, and with vertical size of the histogram box no more than 1 % of the signal VMA (see 86A.5.3.5).
- b) Space two copies of the acquired histogram at 1 UI from mean to mean and develop a cumulative distribution function (CDF) in the Q-space (a Q-space bathtub). (Equally valid approach is to develop a CDF to the left and to the right of the histogram's mean, so creating a jitter peak instead of a jitter bathtub),
- c) On each side of the Q-space CDF select the horizontal bin with the highest Q value with at least 20 samples and the adjacent bins containing no more than 500 samples.
- d) On each side of the CDF distribution, determine a straight-line fit to the selected bins of the forms in Equation (92-11) and Equation (92-12).
- e) Calculate the values of effective bounded uncorrelated jitter and effective random jitter according to Equation (92-13) and Equation (92-14), respectively.

$Q_{left} = m_{left} \square t + b_{left}$	(92-11)
$Q_{right} = m_{right} \square t + b_{right}$	(92-12)
effective bounded uncorrelated jitter = $UI - (b_{right}/m_{right} - b_{left}/m_{left})$	(92-13)
effective random jitter = $2 / (m_{right} - m_{left})$	(92-14)

Effective bounded uncorrelated jitter shall be less than or equal to 0.1 UI peak-to-peak regardless of the transmit equalization setting.
The effective random jitter shall be less than or equal to 0.01 UI RMS regardless of the transmit equalization setting.

This is the end of the revised 92.8.3.10.2 show w/o revision markup.

(c) Below find the mark-up to the comment #118:

Replace lines 10 through 30 with:

a) Acquire a horizontal histogram with at least 20,000 samples of a transition measured at the zero crossing point ~~(or equivalent histogram)~~, with resolution no coarser bin width no more than 50-20 fs, and with the vertical size of the histogram box no more than 1 % of the signal VMA (see 86A.5.3.5).

Next section (b) left as the D2.2 was, with the comment #118 section (b) paraphrased in parenthesis as "Equally valid approach..."

b) ~~Create a cumulative distribution function (CDF) transformed to Q versus jitter (time) from the left side of the histogram to the mean and from the right side of the histogram to the mean~~

Next section (c) left as the D2.2 in that it is referring to a bathtub; but the comment #118 section (c) used for the limits recommended:

c) ~~Select regions on each side of the Q-space CDF with the highest Q value that corresponds to regions containing a statistically significant number of hits. For Example: On each side of the CDF, select a region where every point in the CDF has at least 20 hits and at most 500 hits.~~

~~Or, On each side of the Q-space CDF, select the horizontal bin with the highest Q value with at least 50 hits in the histogram and the adjacent consecutive 4 bins with higher Q values for a collection of 5 bins.~~

d) On each side of the ~~Q-space CDF~~CDF distribution, determine a straight-line fit to the selected ~~regions~~bins of the forms in Equation (92-11) and Equation (92-12) ~~for the left and right sides of the CDF, respectively.~~

e) Calculate the values of effective bounded uncorrelated jitter BUJ_{DD} and effective random jitter BUJ($\Delta\Delta$) and RJ($\Delta\Delta$) according to Equation (92-13) and Equation (92-14), respectively.

~~f) Equate effective bounded uncorrelated jitter and effective random jitter to BUJ($\Delta\Delta$) and RJ($\Delta\Delta$), respectively~~

$$Q_{\text{left}} = m_{\text{left}} \cdot t + b_{\text{left}} \quad (92-11)$$

$$Q_{\text{right}} = m_{\text{right}} \cdot t + b_{\text{right}} \quad (92-12)$$

~~BUJ_{DD} = $\frac{b_{\text{left}}}{m_{\text{left}}} - UI - \left(\frac{b_{\text{right}}}{m_{\text{right}}} - \frac{b_{\text{left}}}{m_{\text{left}}} \right)$ (that is, remove absolute value); subtract from UI; change polarity~~
(92-13)

~~RJ_{rms} = $\frac{1}{2} (m_{\text{right}} - m_{\text{left}})$ (that is, remove absolute value)~~ (92-14)

This is the end of the marked-up version of the comment #118
