CDAUI-8 chip-to-chip transmitter output jitter requirements

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IEEE P802.3bs 400 GbE Task Force
November 2015

Concerns with the baseline method

- Fitting a measured jitter distribution to a dual-Dirac model usually maps bounded uncorrelated jitter (CDJ) to random jitter (CRJ)
  - Limit on CRJ becomes onerous
  - Limit on CDJ is less meaningful
- Measurement of jitter using a clock pattern is convenient but may miss some components of the jitter
- Refer to healey_3bs_01_0915.pdf for additional background material

Proposal

- Continue with premise that this is a specification of uncorrelated jitter

- Measure jitter from a pseudo-random PAM4 test sequence
  - Long enough to be “interesting”
  - Short enough to be processed by “reasonable” instruments
  - Suggest QPRBS13 or similar

- Measure uncorrelated jitter from all transitions in the test sequence
  - Remove correlated jitter, e.g., data-dependent jitter (DDJ)
  - Define jitter to be the difference between the observed threshold crossing time of a transition and the mean threshold crossing time of that transition
  - Accumulate a histogram of measured jitter values
  - The number of jitter values measured should be “sufficiently large to yield consistent measurement results”

Proposal, continued

- The following can be derived from the jitter histogram
  - “Jn” is the time interval that includes all but 1E−n of the distribution
  - “n” is becoming large enough so that this may be measured directly
  - The RMS value of the jitter (also can be measured directly)

- What to specify?
  - “Jn” where “n” is log10(DER0)
  - Also want to constrain bounded uncorrelated (high-probability) jitter
  - This can be done via a limit on “J2” or on the RMS value of the jitter

- If “Jn” cannot be directly measured, then it should be permissible to find its value via extrapolation from a fit to a dual-Dirac model
  - This will tend to over-estimate the “Jn” value

Mapping COM parameters to jitter limits

- Maximum Jn = $2*(A_{DD}+Qn*\sigma_{RJ})$
- Qn = sqrt(2)*erfcinv(DER0)
  - Assumes jitter distribution integrates to 1
- Maximum J_{RMS} = sqrt($A_{DD}^2+\sigma_{RJ}^2$) (could be replaced by J2)

Example:

Category	Parameter	Value	Units
COM parameters	A_{DD}	20	mUI
	σ_{RJ}	10	mUI
	DER0	1E−6	—
Transmitter output jitter limits	J2, max.	92	mUI
	J6, max.	138	mUI
	J_{RMS}, max.	23	mUI

Open items (for further study)

- Definition of the jitter measurement filter
- Definition of PAM4 transition thresholds

Backup slides

“Isolated” transition positions in QPRBS13

Transition	Sequence	PAM4 symbol index
0-1	{0, 0, 0, 1, 1, 1}	2272, 3326
0-2	{0, 0, 0, 2, 2, 2}	6144, 6969
0-3	{0, 0, 0, 3, 3, 3, 3} {0, 0, 0, 0, 3, 3, 3}	7421 4171
1-2	{1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2}	8187
1-3	{1, 1, 1, 3, 3, 3}	224, 6017
2-3	{2, 2, 2, 3, 3, 3, 3} {2, 2, 2, 2, 3, 3, 3}	4615 2500
3-2	{3, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2, 2}	4091
3-1	{3, 3, 3, 3, 1, 1, 1} {3, 3, 3, 1, 1, 1, 1}	715 3750
3-0	{3, 3, 3, 0, 0, 0}	5818, 6370
2-1	{2, 2, 2, 1, 1, 1}	2535, 6596
2-0	{2, 2, 2, 2, 2, 0, 0, 0, 0, 0, 0}	7735
1-0	{1, 1, 1, 0, 0, 0}	2275, 2538

- QPRBS13[-CEI] pattern as modified by healey_3bs_01_1115.pdf
- Based on PRBS13 generator seeded with ones