Proposed improvements to jitter specification text

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For comment 399

Change 92.8.3.6 as follows:

92.8.3.6 Transmitter output jitter

Start with the material that's common to several jitter metrics. May need a sentence of introduction, e.g. "Four measured of jitter are defined as follows."

Need to put the jitters in some memorable order, e.g. alphabetical or the order that they appear in Table 92–5.

92.8.3.6.1 Even-odd jitter

Even-odd jitter is measured from the two symbols in the middle of a sequence of no fewer than 8 symbols of alternating polarity. If PRBS9 is the test pattern, a suitable sequence may be found starting at either bit 161 or bit 383 where bits 1 to 9 are the run of 9 ones. A correct measurement of even-odd jitter requires that the period of the test pattern is an even number of symbols. When the base pattern period is an odd number of symbols, such as PRBS9, the test pattern for the purpose of even-odd jitter measurement must be two periods of the base pattern.

Even-odd jitter is defined to be half of the magnitude of the difference between the mean width of the positive pulse and the mean width of the negative pulse. The reference voltage for pulse width measurements is the mid-point between the positive pulse amplitude and the negative pulse amplitude. The pulse amplitude is defined to be the mean amplitude of the pulse within the central 20% of the nominal unit interval.

Even-odd jitter shall be less than or equal to 0.035 UI regardless of the transmit equalization setting.

NOTE—Even-odd jitter has been referred to as duty cycle distortion by other Physical Layer specifications for operation over electrical backplane or twinaxial copper cable assemblies (see 72.7.1.9). The term even-odd jitter is introduced to distinguish it from the duty cycle distortion referred to by Physical Layer specifications for operation over fiber optic cabling.

92.8.3.6.2 Total jitter (TJ)

The total jitter (TJ) of a signal is defined as the range (the difference between the lowest and highest values) of sampling times around the signal transitions for which the BER at these sampling times is greater than or equal to 10^{-12}. TJ may be measured directly, or estimated by fitting the measured jitter distribution to the dual-Dirac mathematical model used for effective random jitter (RJ).

92.8.3.6.3 Data dependent jitter (DDJ)

Data dependent jitter (DDJ) is ~~characterized using~~defined by the procedure ~~defined~~ given in 85.8.3.8.

Total jitter excluding data dependent jitter is the difference between TJ and DDJ and shall be less than or equal to 0.28 UI regardless of the transmit equalization setting.

Editor's note (to be removed prior to final publication):

Clause 85 was not clear on what was meant by "excluding" DDJ from TJ. In this draft, it has been interpreted to be the value of TJ as defined above minus the value of DDJ as defined in 85.8.3.8.

92.8.3.6.4 Effective random jitter (RJ)

The effective random jitter (RJ) of a signal is defined to be the difference between the TJ and effective deterministic jitter (DJ). Effective DJ is derived from a fit of the measured jitter distribution to a dual-Dirac mathematical model. The fit is computed as follows.

a) Measure the jitter J_n which is defined to be the range of sampling times around the signal transitions for which the BER at these sampling times is BER_n. Measure two values J_0 and J_1 where BER_0 is 10^{-9} and 10^{-5}.

Comment [PD1]: Use headings to make the document easier to use.

Comment [PD2]: Should not use 3 names for (almost) 1 thing. Symbol, bit or unit interval? Note Clause 91's use of "symbol" for 10 bits on the line, and there is no definition of "symbol"here.

Comment [PD3]: For a waveform like this, when I see "amplitude" I think of the swing. "Voltage" or maybe "level" might be better.

Comment [PD4]: Want the abbreviation to appear in the contents and bookmarks.

b) For each BER_n, determine the associated Q_n from the inverse normal cumulative ~~probability~~ distribution function adjusted for an assumed transition density of 0.5. For example, Q_n is 5.768~~7~~ if BER_n is 10^{-9} and Q_n is 3.944 if BER_n is 10^{-5}.

c) Calculate the effective DJ as $(Q_0J_1 - Q_1J_0) / (Q_0 - Q_1)$.

d) If TJ is found by the fitting method, the effective RJ is estimated by $Q_{min}(J0 - J1) / (Q0 - Q1)$, where Q_{min} is 6.839 for a specification BER of 10^{-12}.

The effective RJ shall be less than or equal to 0.15 UI regardless of the transmit equalization setting.

Editor's note (to be removed prior to final publication):

Clause 72 specifies that transmit equalization is off (preset) for the measurement of jitter. Clause 85 does not specify the conditions for jitter measurement and this is interpreted to mean that it applies for all transmit equalization settings. There has been some discussion as to which approach is appropriate.

The effect of a single-pole high-pass filter with a 3 dB frequency of 10 MHz is applied to the jitter. The test pattern for TJ and RJ measurements is either PRBS31 (see 83.5.10) or scrambled idle (see 82.2.10). The voltage threshold for the measurement of BER or crossing times is the mid-point (0 V) of the AC-coupled differential signal.

Comment [PD5]: This paragraph should go in the common section at the beginning.

Replace 93.8.7.1 with the following:

93.8.1.8 Transmitter output jitter

Even-odd jitter is defined in 92.8.3.8. Even-odd jitter shall be less than or equal to 0.035 UI regardless of the transmit equalization setting.

Total jitter is ~~characterized using the procedure~~ defined in 92.8.3.8. Data dependent jitter is ~~characterized using the procedure~~ defined in 85.8.3.8. The total jitter, excluding data dependent jitter, shall be less than or equal to 0.28 UI regardless of the transmit equalization setting.

~~The e~~Effective random jitter is ~~characterized using the procedure~~ defined in 92.8.3.8. The effective random jitter shall be less than or equal to 0.15 UI regardless of the transmit equalization setting.