120D.3.1.1 Output jitter

J4, J_{RMS} and Even-odd jitter are defined by measurements of 12 specific transitions in a PRBS13Q pattern (see 120.5.11.2.1) in order to exclude correlated jitter. The 12 transitions represent all possible combinations of four identical symbols followed by two different identical symbols as shown in Table 120D–2. The sequences are located by the symbol indices given in the table where symbols 1 to 7 are the run of seven 3s

The threshold used to define each transition is given in Table 120D–2 where V_0, V_1, V_2, and V_3 are as defined in 120D.3.1.2.

The jitter is measured with a clock recovery unit (CRU) with a corner frequency of 4 MHz and a slope of 20 dB/decade. Jitter measurements are performed with transmitters on all lanes enabled and using identical transmitter equalizer settings. Transmitters on lanes not under test transmit PRBS31Q, or a valid 200GBASE-R or 400GBASE-R signal. PRBS31Q is described in 120.5.11.2.2.

The J4, J_{RMS}, and Even-odd jitter specifications shall be met regardless of the transmit equalization setting.

120D.3.1.1.1 J4 and J_{RMS} jitter

For each transition i, 1<=i<=12, of the transitions specified in Table 120D-2, obtain a set $S_i = \{t_i(1), t_i(2), ...\}$ of transition times modulo the period of the pattern. The size of all sets should be chosen to enable calculation of J4 (as defined below) with sufficient accuracy.

Calculate the average of each set S_i, $Tavg_i$, and subtract it from all elements of that set, to create a set $S0_i = \{t_i(1) - Tavg_i, t_i(2) - Tavg_i, ...\}$.

Combine the sets $S0_i$, i=1 to 12, to create an estimated probability distribution $f_J(t)$.

J4 is defined as the time interval that includes all but 10^{-4} of $f_J(t)$, from the 0.005th to the 99.995th percentile of $f_J(t)$.

J_{RMS} is defined as the standard deviation of $f_J(t)$.

120D.3.1.1.2 Even-odd Jitter

For one of the 12 specific transitions in PRBS13Q in Table 120D–2:

Trigger once in 3 repeats of the PRBS13Q test pattern

Obtain the mean time (T3) for this transition in the first PRBS13Q.

Obtain the mean time (T4) for the same transition in the second PRBS13Q.

The difference between the two means (T4 - T3), is the estimated period of the repeating pattern.

For each of the 12 specific transitions in PRBS13Q in Table 120D–2:

1) Trigger once in 2 repeats of the PRBS13Q test pattern.

   Obtain the mean time (T1) for the specific transition in the first PRBS13Q.

   Obtain the mean time (T2) for the same transition in the second PRBS13Q.

2) Calculate even-odd jitter for this transition as $|(T2 – T1) – (T4 – T3)|$.

Even-odd jitter EOJ is the maximum of the 12 measurements.

NOTE 1 – Both of (T2 - T1) and (T4 - T3) are about 8191UI, which is much larger than the EOJ value. Hence, each of T1 through T4 should have high precision.

NOTE 2 —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 used here to distinguish it from the duty cycle distortion referred to by Physical Layer specifications for operation over fiber optic cabling.