10GBASE-W receiver clock tolerance

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Clause 51 clock specification

- In the current version of Clause 51, the Tx clock for 10GBASE-W is required to have a tolerance of ± 20 ppm
- The Rx clock, however, must consider a clock with a tolerance of ± 100 ppm as valid

Table 51–8—Transmit source clock specification

Parameter	Description	Value
$f_{PMA\_TXCLK\_SRC}$	PMA_TXCLK_SRC frequency 10GBASE-W 10GBASE-R	 622.08 MHz ± 20 ppm 644.53125 MHz ± 100 ppm

Table 51–12—Receiver clock specification

PMA_SI	Parameter	Description	Value
valid	$f_{PMA\_RX\_CLK}$	PMA_RX_CLK frequency 10GBASE-W 10GBASE-R	 622.08 MHz ± 100 ppm 644.53125 MHz ± 100 ppm
invalid	$f_{PMA\_RX\_CLK}$	PMA_RX_CLK frequency 10GBASE-W 10GBASE-R	 622.08 MHz ± 2500 ppm 644.53125 MHz ± 2500 ppm

Clause 52 clock specification

- In the current version of Clause 52, the Tx clock for 10GBASE-SW/LW/EW is required to have a tolerance of ± 20 ppm
- The Rx, however, must accept a clock with a tolerance of ± 100 ppm

Table 52–7—10GBASE-S transmit characteristics

Description	10GBASE-SW	10GBASE-SR	Unit
Signaling speed (nominal)	9.95328	10.3125	GBd
Signaling speed variation from nominal (max)	± 20	± 100	ppm

Table 52–9—10GBASE-S receive characteristics

Description	10GBASE-S	Unit
Signaling speed (nominal) 10GBASE-SR 10GBASE-SW	 10.3125 9.95328	GBd
Signaling speed variation from nominal (max)	± 100	ppm

Consequences

- So the Rx must accept a wider clock tolerance than the Tx is allowed to transmit. So what? What harm does this do?
- The initial reason for using the WAN PHY was to provide compatibility with SONET/SDH infrastructure which could readily accept a transmitted 10GBASE-W ± 20 ppm signal. Following the definition of the OTN (G.709) and equipment deployment, a common application in OTN networks is to map each 10GBASE-W signal asynchronously into an ODU2 such that 4 of them can then be multiplexed into an ODU3 40G signal for transport across the network. The 10GBASE-W receiver clock tolerance needs to be less than ± 45 ppm to meet the requirement of the ODU2 mapping. Specifying the 10GBASE-W receiver clock tolerance to be the same as the transmitter at ± 20 ppm would satisfy that need.

Resolution

- The proposed resolution of this issue is to:
  - Change the tolerance for a valid 10GBASE-W Rx clock in Table 51-12 to be ± 20 ppm
  - Change the *signalling speed variation from nominal* for 10GBASE-SW in Table 52-9, 10GBASE-LW in Table 52-13, and 10GBASE-EW in Table 52-17 to be ± 20 ppm

- This should not cause any interoperability issues as any receiver that is compliant with the ± 100 ppm specification will also be compliant with ± 20 ppm and any received signal that has a clock outside the ± 20 ppm limit is not compliant with the transmitter specification.

Thanks!