# 58.8.14 Laser On/Off timing measurement

## 58.8.14.1 Definitions

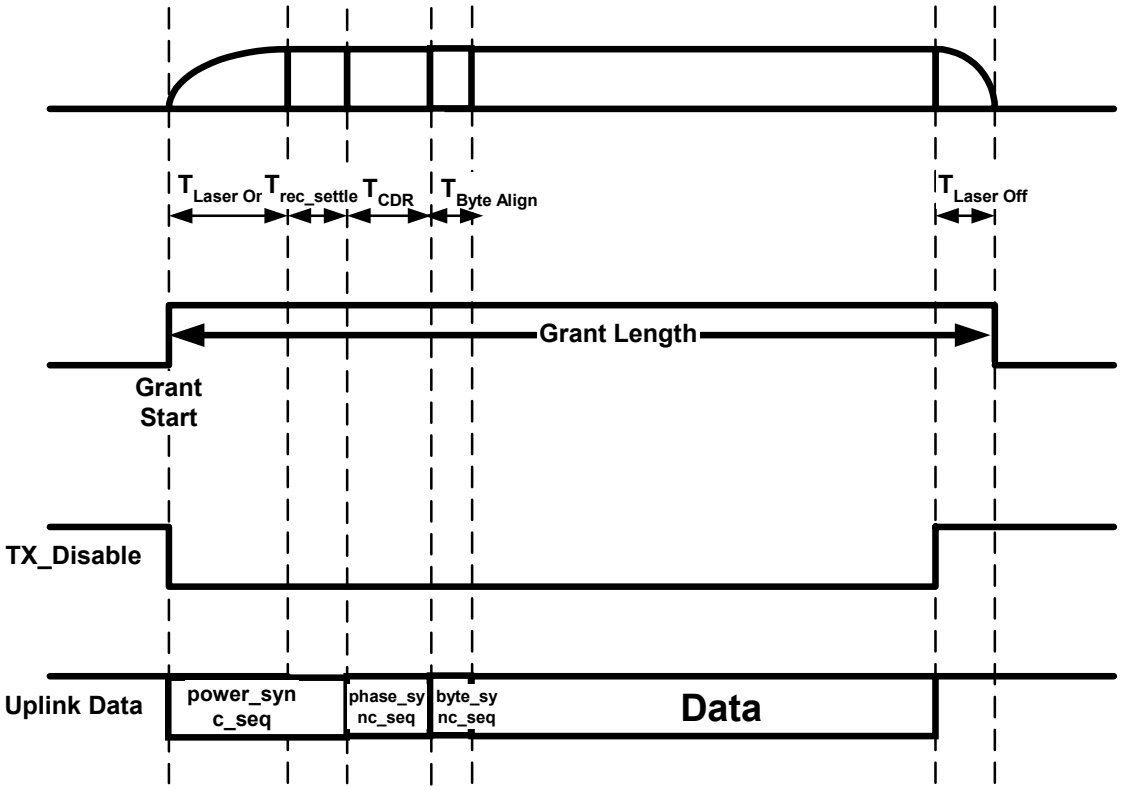


**Figure 58-5: EPON timing parameter definition**

Denote $T_{laser\_on}$ as the time beginning from the falling edge of the TX_disable line to the ONU PMD and ending at the time that the optical signal at TP2 of the ONU PMD reaches (90%, or with in ±1dB?) of its specified steady state parameters as defined in table 58-5, 58-6 for 1000BASE-PX10-U and 58-8, 58-9 for 1000BASE-PX20-U (Average launch power, wavelength, RMS spectral width, transmitter and dispersion penalty, optical return loss tolerance, jitter, RINxOMA, extinction ratio, and eye diagram opening). $T_{laser\_on}$ is presented in Figure 58-5. The data transmitted may be any valid 8B/10B symbols.
The Standard defines a maximal value for $T_{laser\_on}$. The measured value should be less than that number.

Denote $T_{laser\_off}$ as the time beginning from the rising edge of the TX_disable line to the ONU PMD and ending at the time that the optical signal at TP2 of the ONU PMD reaches (10%, or with in ±1dB?) above its specified Average launch power of OFF transmitter, as defined in table 58-5, 58-6 for 1000BASE-PX10-U and 58-8, 58-9 for

1000BASE-PX20-U. $T_{laser\_off}$ is presented in Figure 58-5. The data transmitted may be any valid 8B/10B symbols.

The Standard defines a maximal value for $T_{laser\_off}$. The measured value should be less than that number.

## 58.8.14.2 Test specification

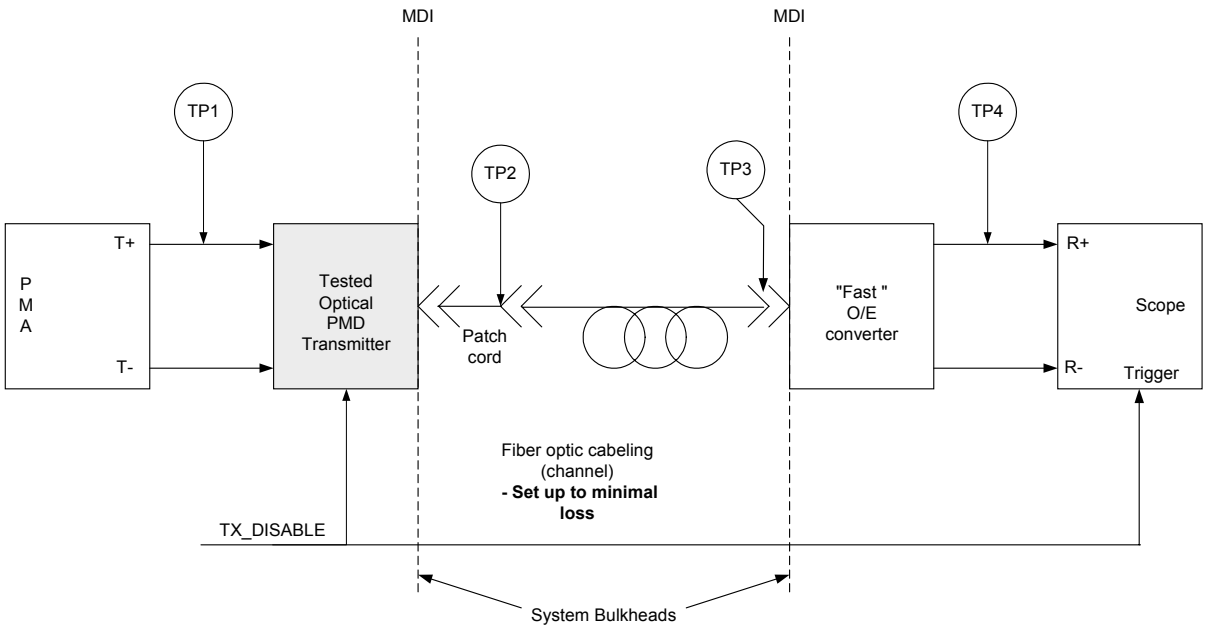


**Figure 58-6: ONU PMD Laser on/off time measurement setup**

The test setup for measuring $T_{laser\_on}$ and $T_{laser\_off}$ is described in figure 58-6. An O/E converter is used to convert the optical signal at TP3 to an electrical signal at TP4 where it is assumed that the response time of the converter is considerably shorter that the $T_{laser\_on}$ value under measurement A scope, with a variable delay, can measure the time from the TX_DISABLE trigger to the time the optical signal reaches all its specified conditions.

The delay to the scope trigger is adjusted until the point that the received signal meets all its specified conditions. This is the $T_{laser\_on}$ in question.

A non-rigorous way to describe this test setup would be: for a PMD with a declared $T_{laser\_on}$ and $T_{laser\_off}$ , measure all PMD optical parameter after $T_{laser\_on}$ and $T_{laser\_off}$ from the TX_DISABLE trigger, reassuring conformance to (90%, or with in ±1dB?) from the specified steady state values. Notice that only the steady state optical OFF power must be conformed when measuring $T_{laser\_off}$ time, since that is the only relevant parameter.

# 58.8.15 Receiver Settling timing measurement

## 58.8.15.1 Definitions

Denote $T_{Receiver\_settling}$ as the time beginning from the time that the optical power in the receiver at TP3 reaches the conditions specified in 38.6.11, 60.8.11.2 and ending at the time that the electrical signal after the PMD at TP4, reaches (90%, or with in ±1dB?) from its specified steady state parameters (Average power, jitter). $T_{Receiver\_settling}$ is presented in Figure 58-5. The data transmitted may be any valid 8B/10B symbols (or a specific power synchronization sequence). The optical signal at TP3, at the beginning of the locking, may have any valid 8B/10B pattern, Rx power level, jitter, or frequency shift matching the standard specifications.

The Standard defines a maximal value for $T_{Receiver\_settling}$. The measured value should be less than that number.

## 58.8.15.2 Test specification

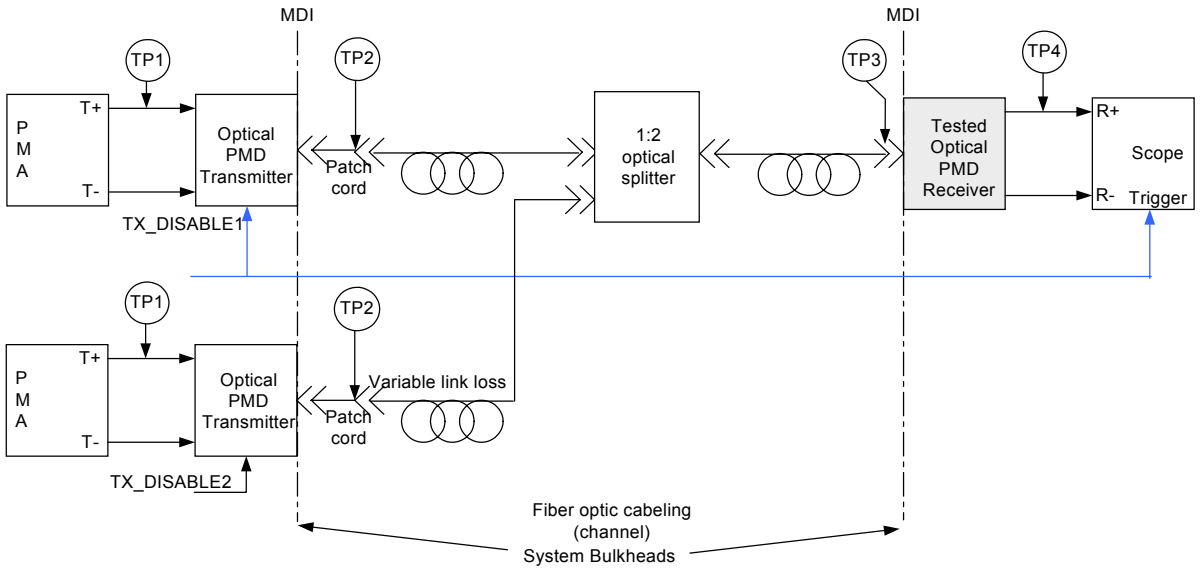


**Figure 58-7: Receiver settling time measurement setup**

Figure 58-7 illustrates the tests setup for the OLT PMD receiver (uplink) $T_{Receiver\_settling}$ time. The optical PMD transmitter has well known parameters, with a fixed known $T_{laser\_on}$ time. After $T_{laser\_on}$ time the parameters of the reference transmitter, at TP2 and therefore at TP3, reach to ±1dB from their steady state values

as specified in table 58-5, 58-6 for 1000BASE-PX10-U and 58-8, 58-9 for 1000BASE-PX20-U.

Measuring $T_{Receiver\_settling}$ time as the time from the TX_DISABLE assertion, minus the known $T_{laser\_on}$ time, to the time the electrical signal at TP4 reaches to (90% or ±1dB) from its specified steady state conditions.

Conformance should be assured for an optical signal at TP3 with any level of its specified parameters before the TX_DISABLE assertion. Especially the $T_{Receiver\_settling}$ time must be met in the following scenarios:

Switching from a 'weak' (minimal received power at TP3) ONU to a 'strong' (maximal received power at TP3) ONU, with minimal guard band between.

- Switching from a 'strong' ONU to a 'weak' ONU, with minimal guard band between.

- Switching from noise level, with maximal duration interval, to 'strong' ONU power level.

A non-rigorous way to describe this test setup would be (using a transmitter with a known $T_{laser\_on}$):

For a tested PMD receiver with a declared $T_{Receiver\_settling}$ time, measure all PMD receiver electrical parameters at TP4 after $T_{Receiver\_settling}$ from the TX_DISABLE trigger minus the reference transmitter $T_{laser\_on}$, reassuring conformance to (90%, or with in ±1dB?) from their specified steady state values.