

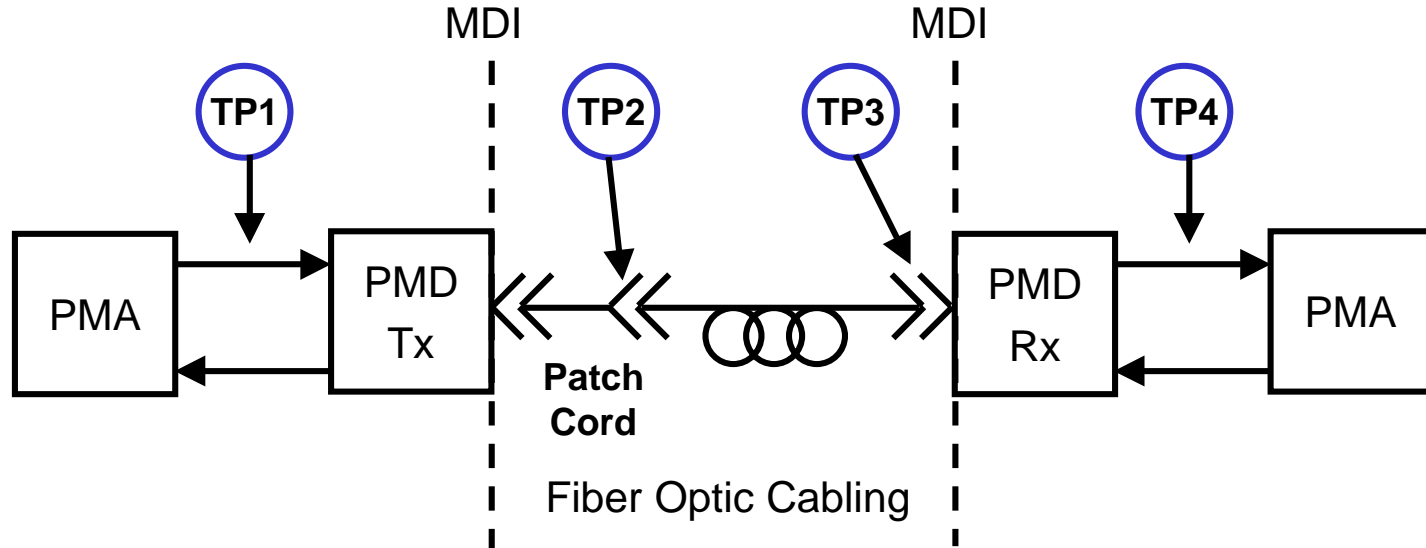
A decorative border consisting of multiple parallel lines in the colors of a rainbow (red, orange, yellow, green, blue, purple) runs along the left and bottom edges of the slide. A black triangle is positioned at the bottom-left corner, pointing towards the center.

Jitter strategy?

Piers Dawe

Agilent Technologies

Test points 1/2



TP2, TP3 always accessible and standardised
TP1, TP4 often optional

May be specified by MSAs, especially electrical specs

When discussing an electrical link, basically just two test points

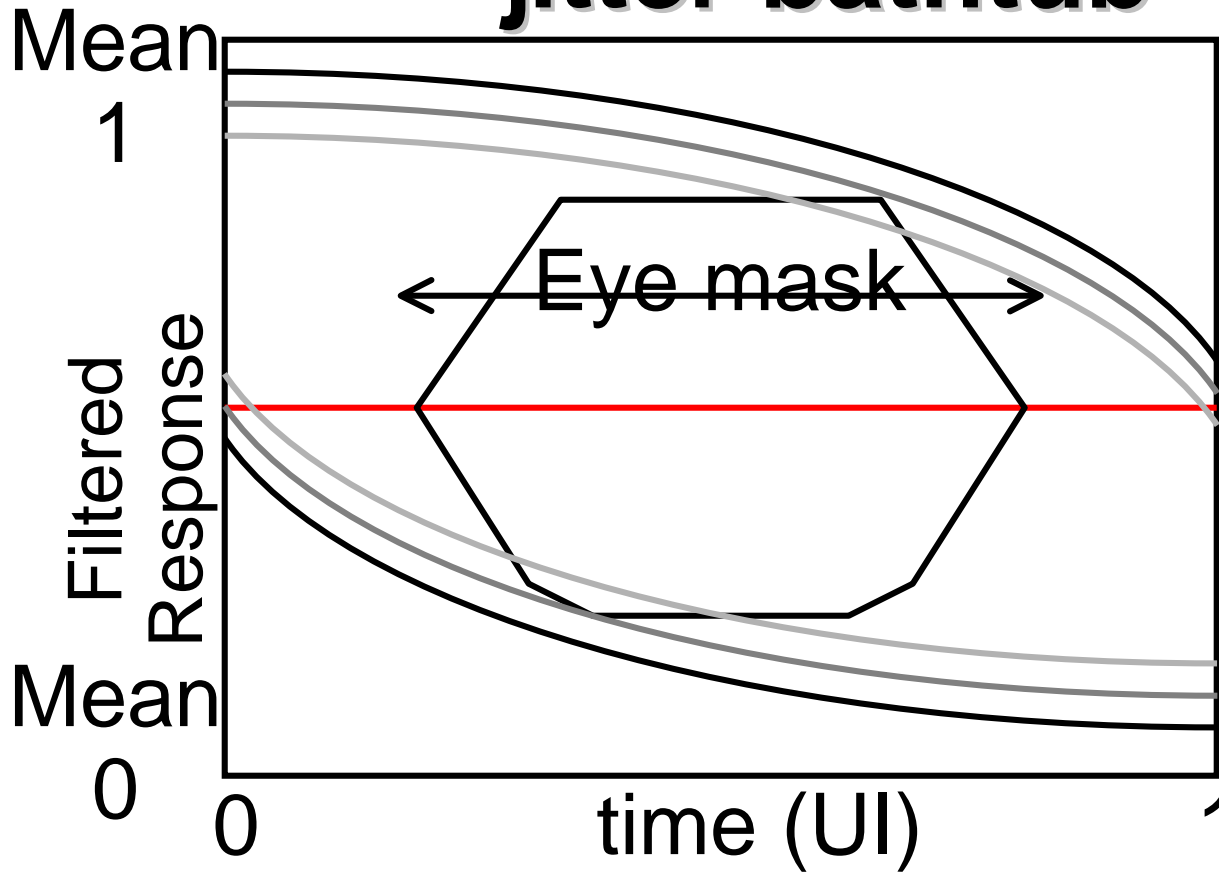
Test points 2/2

- TP1 (Output of PMA aka SERDES)
Input to (un-retimed) optical transmitter
- TP2 ~ Output of optical transmitter
Input to fiber optic channel
- TP3 or virtual TP3
Output of fiber optic channel
Input to optical receiver
May be used to measure Tx or Rx
- TP4 Output of (un-retimed) optical transmitter
(Input to PMA or SERDES)
- TP1, TP4 are optional in 1GE, not specified in 10GE

Measurements

- “Deterministic” (per FC-PH) or “High probability (W)” jitter
- “Random” (per FC-PH) or “sigma” jitter
- Total jitter (10^{-n} BER)
- Can measure each with BERT
- Jitter bathtub method
 - Well described in 802.3ae 53.8
- Eye mask
 - Uses oscilloscope, measures high probability events: “2 to 3 sigma”
- Transmitter Penalty, Dispersion Penalty or Transmitter and Dispersion Penalty (TDP)
- Risetime, RIN, optical spectral, any more?

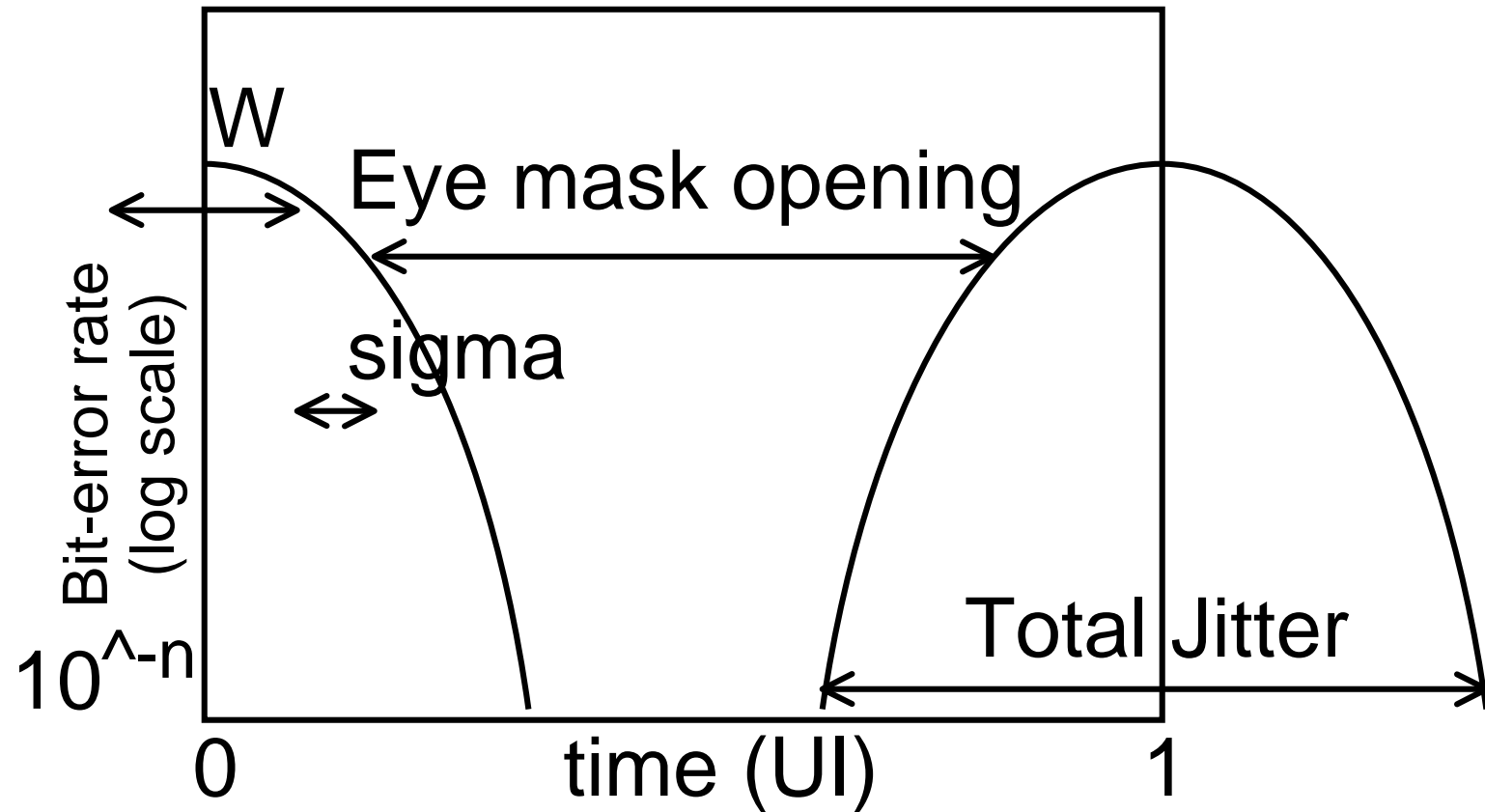
Relation between eye mask and jitter bathtub



Jitter bathtub by scanning at mean level

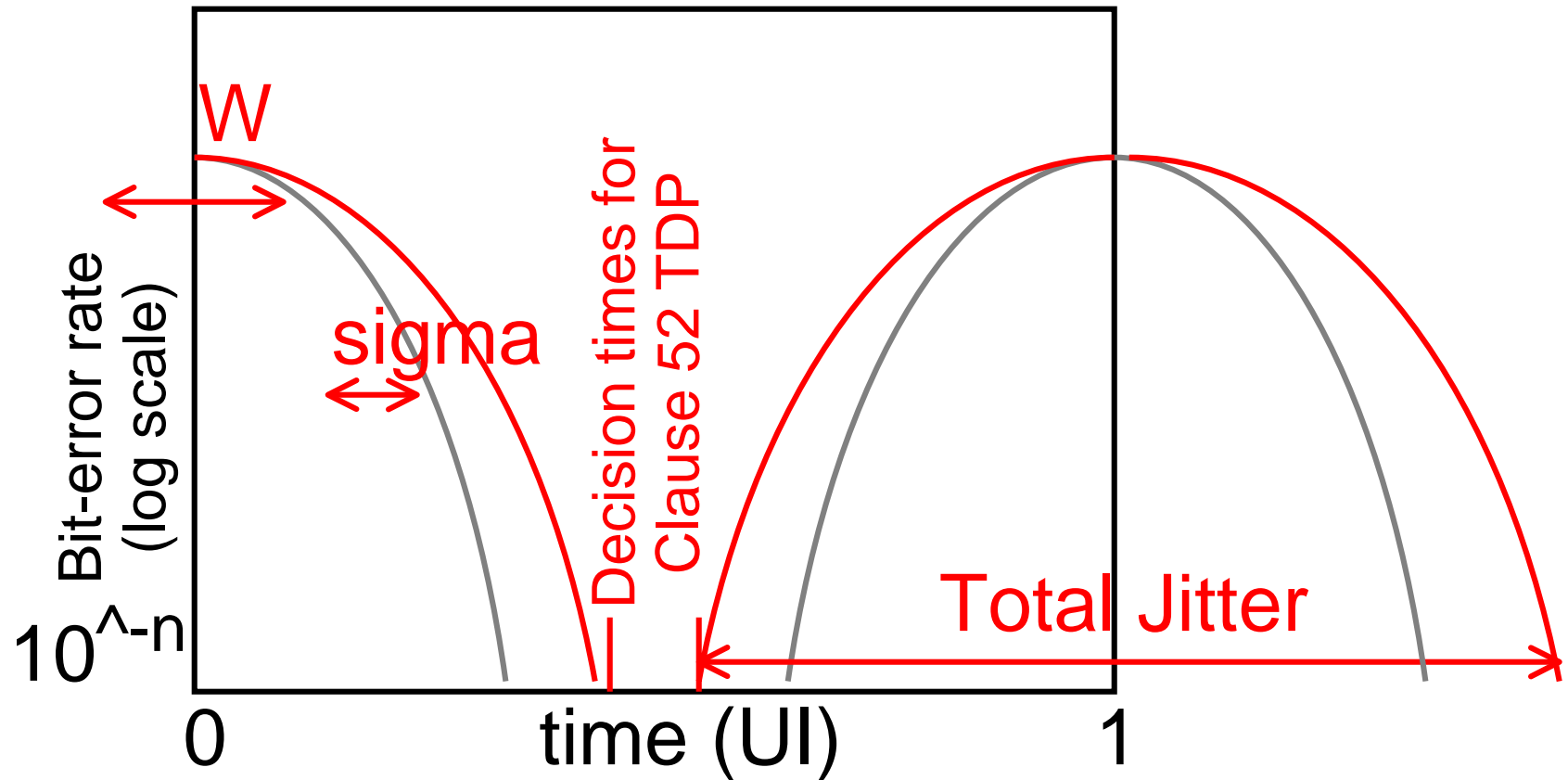
- Eye mask measured with scope
- Bathtub measured with BERT

Jitter bathtub and related measures 1/2



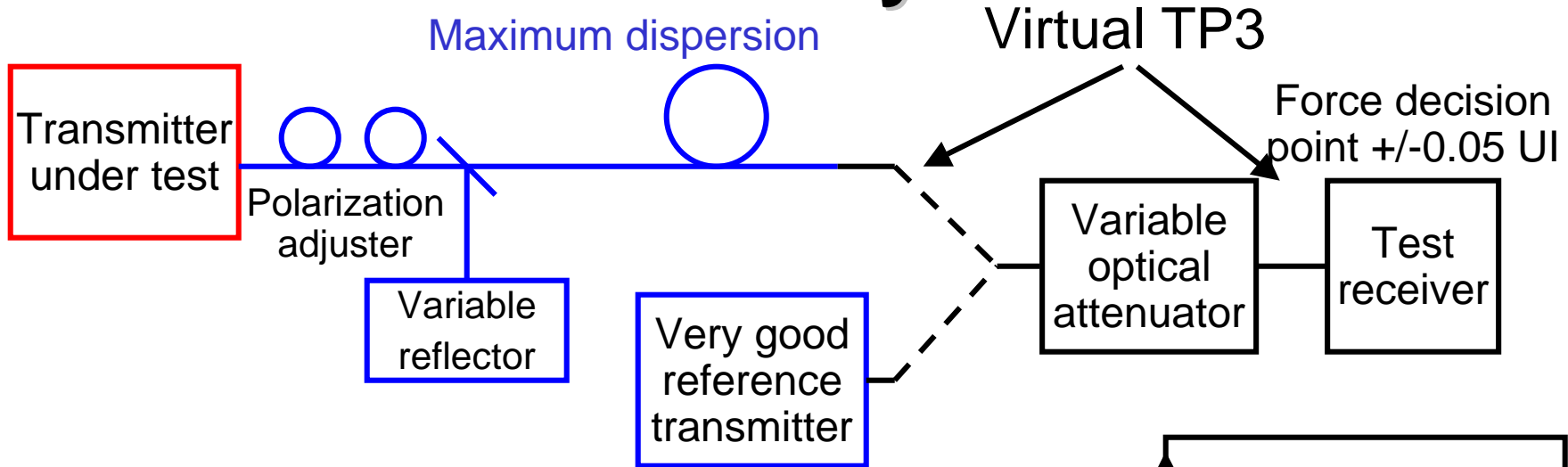
Clause 53 WWDM? and clause 47, XAUI jitter bathtubs measured with low noise instrument

Jitter bathtub and related measures 2/2



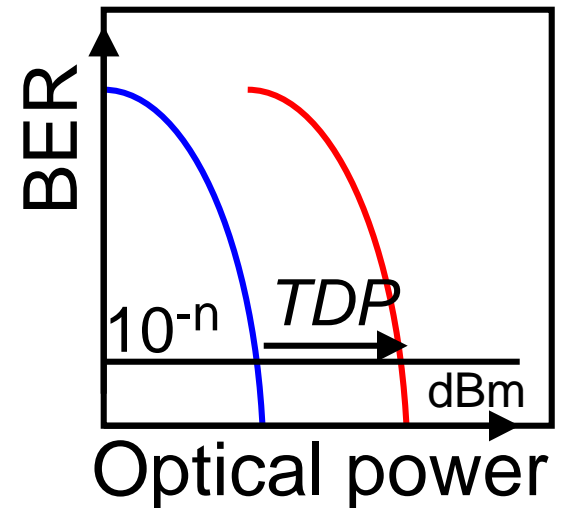
1GE (clause 38) TP4 jitter specs and 10GE serial (clause 52) TDP include receiver noise

TDP: Transmitter and Dispersion Penalty



Test a transmitter by substitution against a very good one
Screens for total of most relevant effects

high probability e.g. ISI, jitter "W"
low probability e.g. RIN, BLW, jitter "sigma"



Measurements at TP1

- Total jitter
 - Normative in 1GE and XAUI (feeds clause 53, WWDM?)
- “Deterministic” or “High probability W” jitter
 - Informative in 1GE, normative in XAUI
- Eye mask
 - Normative in 1GE, 10GE serial, WWDM and XAUI

Measurements at TP2

- Total jitter
 - Normative in 1GE & XAUI (and clause 53, WWDM ?)
- “Deterministic” or “High probability W” jitter
 - Informative in 1GE, normative in XAUI (& clause 53, WWDM ?)
- Eye mask
 - Normative in 1GE, 10GE serial and WWDM
- Risetime
 - Normative in 1GE, not used in ITU/SONET or 10GE
- Dispersion penalty
 - Normative in some ITU/SONET recommendations
 - Also involves TP3 measurement

Measurements at TP3 or virtual TP3

- Sensitivity
 - Normative in almost all standards, informative in 10GE
- Stressed sensitivity
 - Informative in 1GE, normative in 10GE
- Total jitter
 - Normative in 1GE and clause 53, WWDM
 - 0.5 dB above sensitivity
- “Deterministic” or “High probability W” jitter
 - Normative in clause 53, WWDM
 - Informative in 1GE
- Transmitter and Dispersion penalty (TDP)
 - Normative in 10GE

Measurements at TP4

- Total jitter
 - Normative in 1GE and XAUI
- “Deterministic” or “High probability W” jitter
 - Normative in XAUI
 - Informative in 1GE

Proposed measurement set

- TP1
 - Recommendation or mandatory?
 - Mask or W
 - TJ
- TP2
 - Mask, TDP
- TP3
 - One normative of: sensitivity or stressed sensitivity with defined timing window
- TP4
 - Defined timing window = $1 - TJ$
- Is this all we need?

Discussion...

- Normative TP2,3 for all options
 - options:
 - Informative TP1,4 20
 - Normative 1234 8
 - Normative 2,3, say nothing at 1,4 4
- Motion for normative TP2,3 , informative TP1,4
 - Yes 21 No 3 Abstain 5

How to avoid connector wars 1/2

- p22 line 29 1.14 After "Table XX."
 - I suggest you follow Clause 52 and insert "A channel may contain additional connectors or other optical elements as long as the optical characteristics of the channel, such as attenuation, dispersion and reflections, meet the specifications."
- p24 line 5 1.15
 - We spent time in 802.3ae trying to get away from connector wars, discussions of whether pigtails were allowed and so on. We deleted "It also includes a connector plug at each end to connect to the MDI." I suggest you do so too.

How to avoid connector wars 1/2

- p24 line 39 1.15.2
 - Avoid connector wars, compare 52.14.2, delete "The 100BASE-LX is coupled to the fiber optic cabling through a connector plug into the MDI optical receptacle, as shown in YY."
- p24 lines 42-48 1.15.2.1-2
 - Suggested text modified as necessary from Clause 52:
"1.15.2.1 Connection insertion loss
The insertion loss is specified for a connection, which consists of a mated pair of optical connectors. The maximum link distances are calculated based on an allocation of xx dB total connection and splice loss at 1310 nm or 1550 nm as appropriate."