Limiting output jitter in optical PMDs

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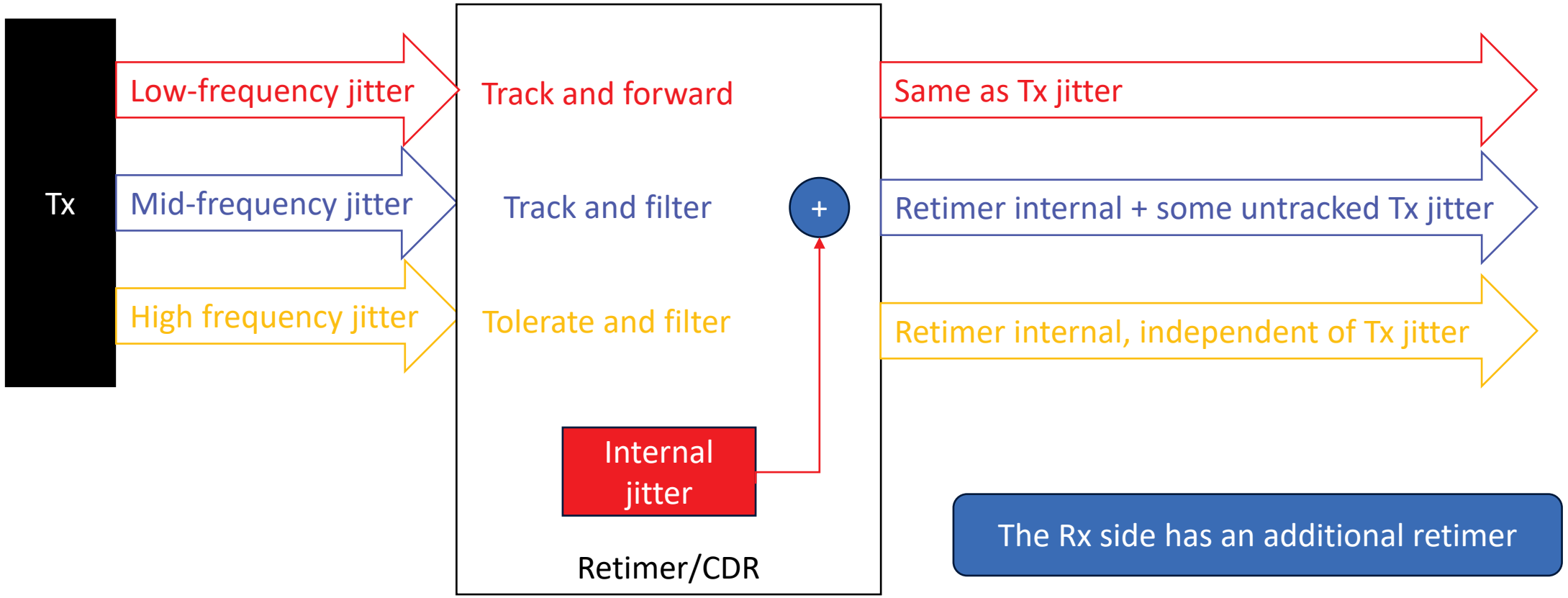
Background

- Jitter is a key parameter in our specifications
- Receiver/input jitter tolerance is specified for most PMDs and all AUIs
- Transmitter/output jitter is controlled in different ways
  - In electrical PMDs and AUI-C2C it is a specified parameter, measured separately from other metrics
  - We have recently adopted jitter specifications for 200 Gb/s per lane AUI-C2M
    - In previous generations of AUI-C2M it has not been a specified parameter – jitter was assumed to be covered by EH/EW metrics
  - In optical (IM-DD) PMDs there is no explicit jitter specification
    - Assumed to be covered by TDECQ

Simplistic view of jitter sources in a system



Concerns

- The optical output jitter is unspecified
  - We can’t assume it is protected by the AUI-C2M specification – because there may be no AUI-C2M
- Jitter from the optical output is expected to be tolerated by the receiving module
  - But some of that jitter will be tracked and forwarded to the host on the AUI-C2M
- The Rx side module has AUI-C2M output jitter specifications…
  - But its optical input signal is driven by the remote PMD’s output, where jitter is unspecified
  - If the PMD output has high low-frequency jitter, it will be tracked
  - The module electrical output may fail jitter specs
- Even if the module Rx does not have an Rx sensitivity problem, its jitter can cause challenges in the AUI-C2M receiver (host ASIC)
- The lack of PMD jitter specification is a system issue

Does TDECQ control jitter?

- Short answer: No
- Optical signals have high bandwidth so the eye is typically quite open horizontally – jitter effect on TDECQ is small
- TDECQ is specified to a SER of 4.8e-4 on each histogram
  - About 2000 samples
  - For all 8 histograms, 16K samples are the minimum
  - SSPRQ length is 65535 UI – 4 times of the minimum
- A couple of SSPRQ patterns provide enough samples for TDECQ measurement, but it’s an insufficient data set for measuring jitter
- Even if multiple periods of SSPRQ are captures (which is not required), the vertical distribution will be dominated by effects other than jitter

Can we specify jitter at the PMD output ?

- The jitter method used in electrical interfaces can be used with an optical signal too
  - Measure $J3u_{03}$, $JRMS_{03}$, possibly also EOJ_{03}
- Can be measured from SSPRQ (although its period is longer than PRBS13Q)
  - Within the same test suite
- Slopes on the optical signal are higher so several edges can be measured on the same pattern – to speed up the measurement

Summary

- Jitter is a system issue, not just in the electrical or optical domain
- PMD output jitter is not controlled well with the previous specifications
- Jitter can be measured on the optical PMD output with existing methods
- It is proposed to add jitter specifications to optical PMDs, similar to those of electrical PMDs

That’s all

Questions?