SAS 6 Gbps Proposal Based on OIF CEI 6G

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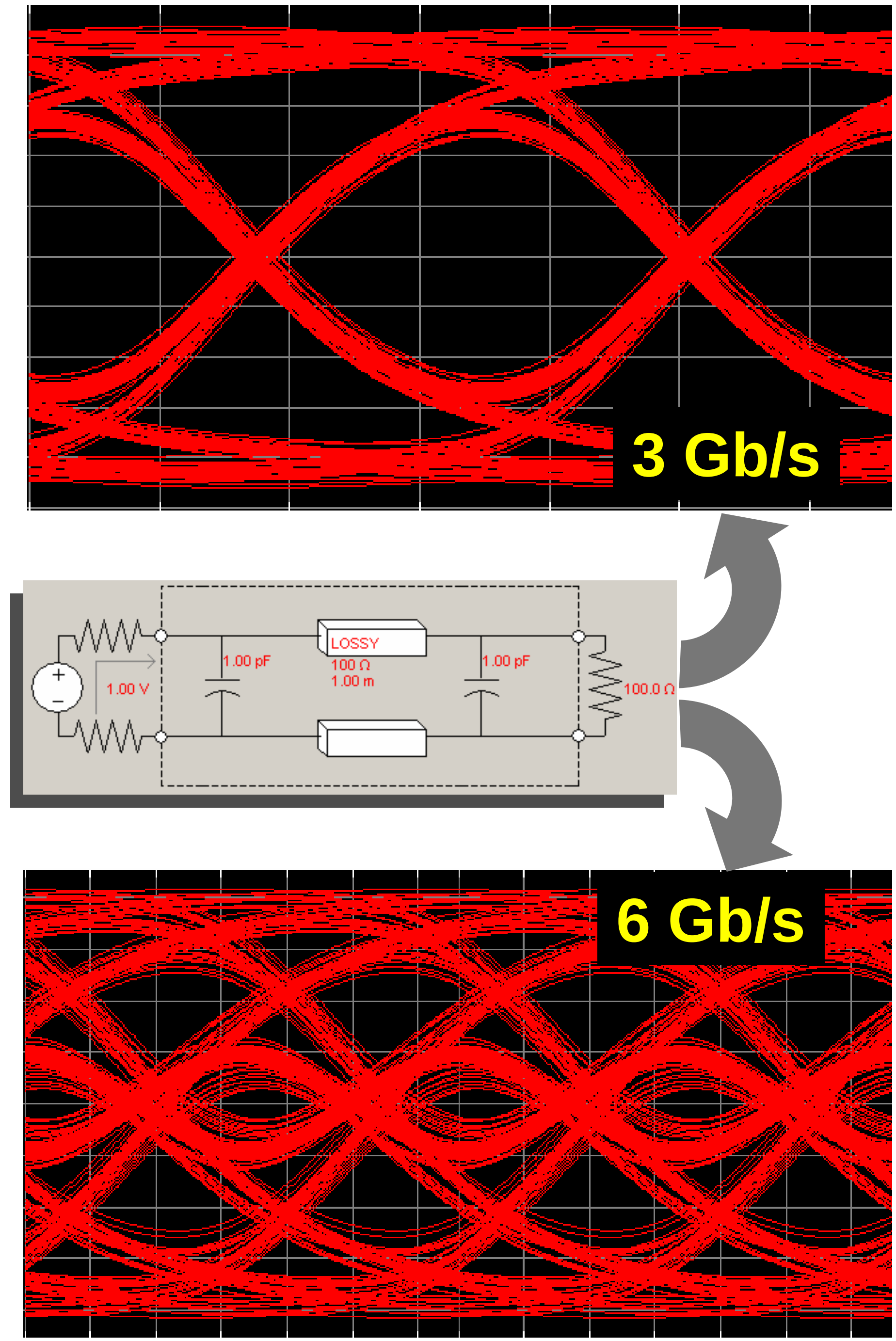
Q: Why not simply adjust the 3Gb/s spec values to create the 6Gb/s specification?

A: Because the virtually closed eye at 6G requires a fundamentally different approach

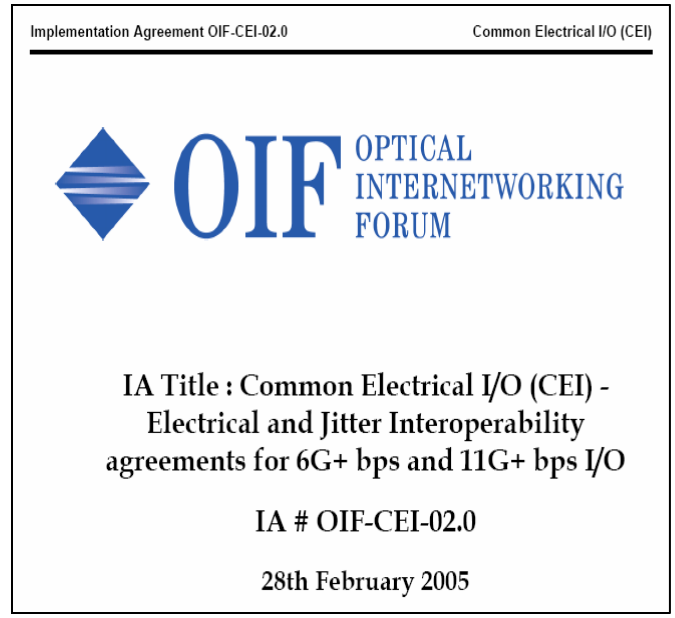


Objectives

- To propose a framework based on the structure of the OIF CEI
- To begin to identify elements common between OIF CEI and SAS 1.0
- To begin to identify elements *not* common
  - To justify these differences as desirable or necessary due to the higher speed

Introduction (1 of 3)

- Where it's going: OIF CEI is becoming the basis for a number of standards
- Where it's from: OIF CEI appears to have evolved from a number of existing standards
  - As witness, the snippet of OIF CEI "genetic code" to the right obviously came from Fibre Channel or SAS

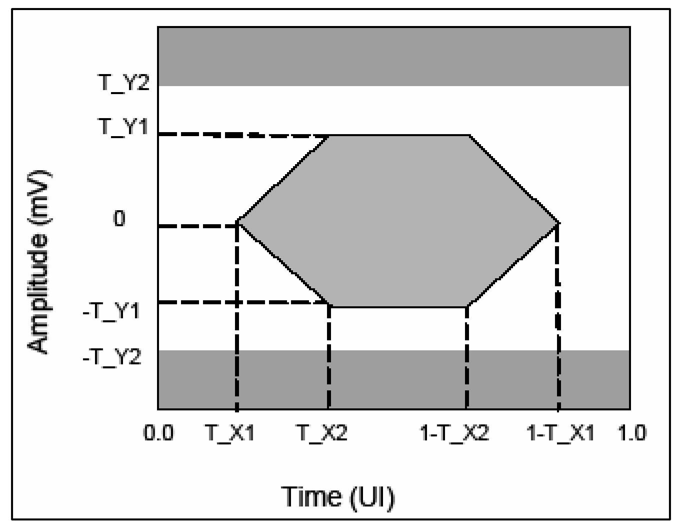

Implementation Agreement OIF-CEI-02.0 Common Electrical I/O (CEI)

OIF OPTICAL INTERNETWORKING FORUM

IA Title : Common Electrical I/O (CEI) - Electrical and Jitter Interoperability agreements for 6G+ bps and 11G+ bps I/O

IA # OIF-CEI-02.0

28th February 2005



Introduction (2 of 3)

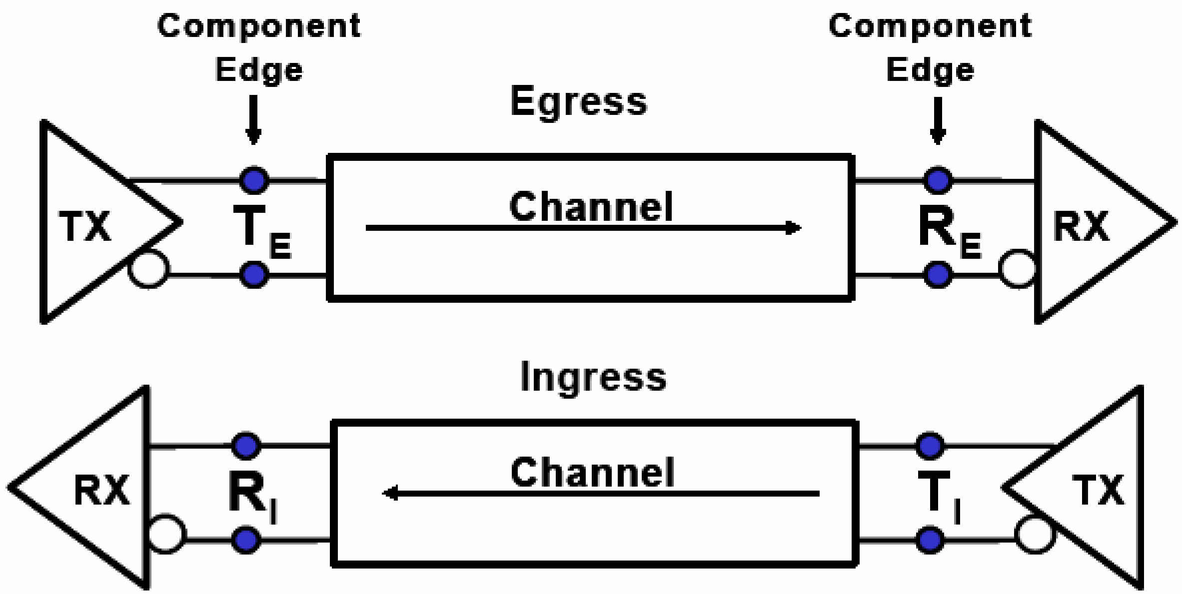
OIF CEI 2.0 has an impressive (to me anyway) collection of theoretical and practical appendices

Introduction (3 of 3)

- OIF CEI 6G-SR (short reach) is a chip-to-chip spec which is insufficient for 6G SAS (up to 8")
- OIF CEI 6G-LR (long reach) is meant to include legacy backplanes (up to 1 meter)
  - Requires 5-tap DFE in reference RX
- This proposal will be a framework compromising between these two specs
  - All values are, of course, TBD

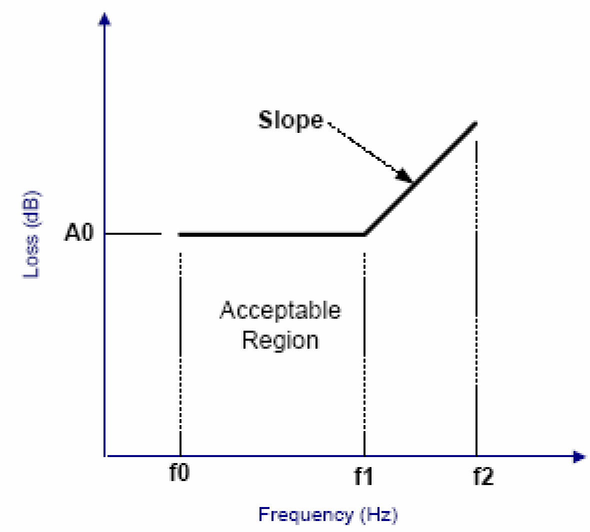
OIF CEI Reference Model

- Ingress/Egress distinction may be useful in specifying SAS ↔ SATA links
- "Component Edge" will likely be equated to "Separable Connector"



Transmitter

- 800-1200 mVppd (?)
- 1 tap (at least) of emphasis
  - Pre- or post-cursor
- Return Loss (SDD11):
  - "The differential return loss shall be better than A0 from f0 to f1 and better than A0 + Slope*log10(f/f1) where f is the frequency from f1 to f2. "
- Compliant TX: required eye after reference channel + reference RX



Receiver

- Return Loss (SDD11):
  - “The differential return loss shall be better than A0 from f0 to f1 and better than A0 + Slope*log10(f/f1) where f is the frequency from f1 to f2. ”
- Compliant RX: required eye after reference TX + reference channel
- “Reference receiver” offers an architecture known to work… *but CEI does not require use of that architecture*.

Some CEI-vs-SAS Issues (1 of 2)

- No framework for OOB specs
  - If OOB data rate does not increase, can keep same/similar electrical specs as SAS1
- Presently, no consideration for 8B10B coding in simulators (including StatEye)
  - Causes too-pessimistic eye closure
- Question about “worst case” RX return loss
  - Should it be minimum (vs. max) resistance?

Some CEI-vs-SAS Issues (2 of 2)

- TX compliance should make use of TCTF (aka “compliance channel”)
  - Allows testing specific to cable or PCB
  - TCTF definition could be expanded to include NEXT & FEXT (near-end & far-end cross talk)
  - Avoids difficulties of near end TX measurements (resonance, fixture effects,…)

Summary

- Methodology of OIF CEI fits the needs (mostly) of 6G SAS
  - Accommodates closed eyes at RX input
  - StatEye (publicly available) & similar proprietary tools support this methodology
- Likely need to interpolate 6G SAS spec between 6G-SR & 6G-LR (short & long reach)