Tracker Optical Link Upgrade R&D Status

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Outline

- Introduction
- Bandwidth of micro-twisted pairs
- Results on VCSELs
- Summary

Pixel Opto-Link Architecture

- transmit signal at 80 Mb/s
- opto-link production is decoupled from module production
  - transmit signal to/from module with micro-twisted pairs
- use PIN/VCSEL arrays couple to robust fiber ribbon
- use several meters of rad-hard/low-bandwidth SIMM fiber spliced to rad-tolerant/medium-bandwidth GRIN fiber

⇨ simplify opto-board production

⇨ upgrade based on pixel link is widely viewed as logical choice

R&D Issues for SLHC

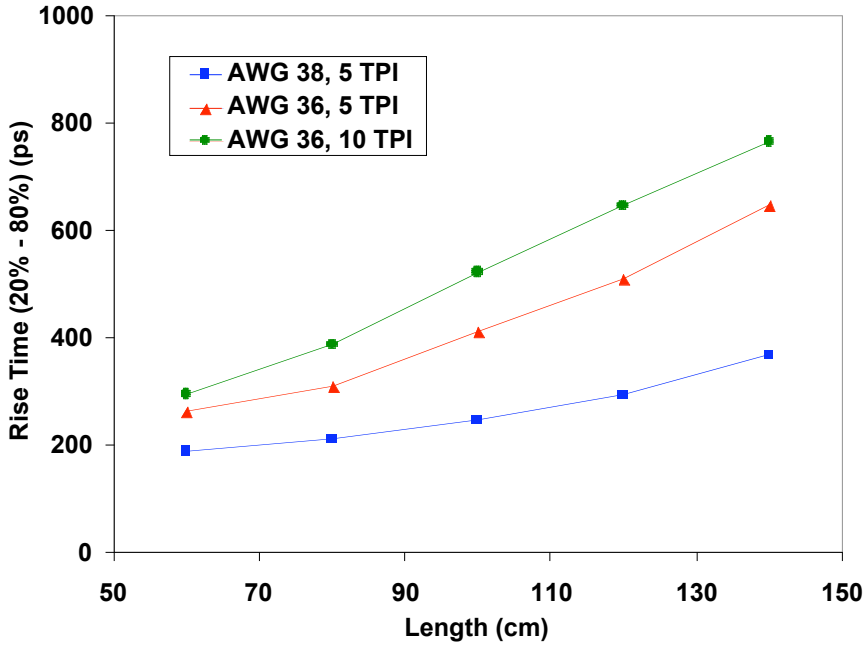
- bandwidth of ~ 640 Mb/s is needed
  - can micro-twisted pair transmit at this speed?
  - can spliced SIMM/GRAN fiber transmit at this speed?
- can PIN/VCSEL array survive to SLHC dosage?
  - characterize arrays before and after irradiation

High-Speed Opto Test System

- crude test system was used to measure bandwidths of micro-twisted pairs/fibers for UCSC meeting in November
- prototype test system with in-house PCB has been fabricated for measurements presented at this meeting
  - test system was also distributed to Oklahoma State
- test system with commercial PCB will be fabricated soon
  - will be distributed to Oklahoma/Oklahoma State
  - will be used for bandwidth measurement, VCSEL/PIN characterization, driver/receiver chip testing, irradiation

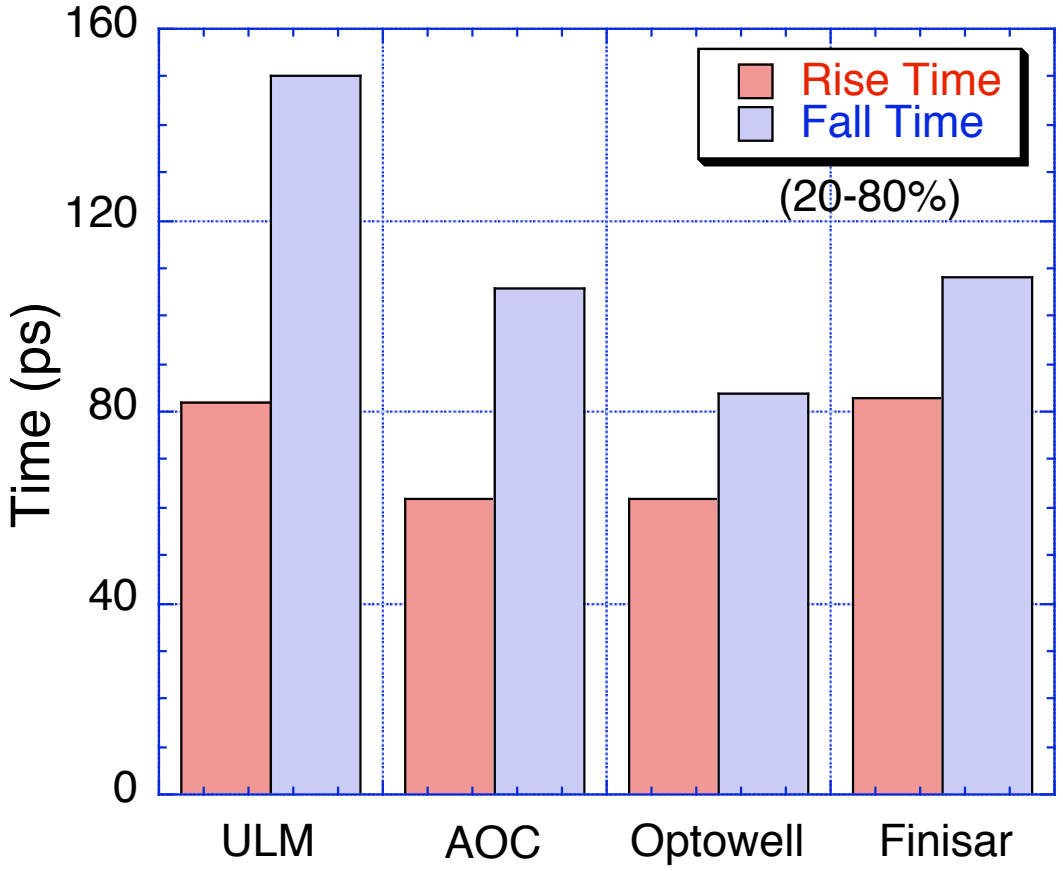
Bandwidth of Micro-Twisted Pairs

- bandwidth of 3 micro-twisted wires were compared:
  - 38 AWG/100 μm, 5 turns/in (current pixel Type0 wire)
  - 36 AWG/127 μm, 5 turns/in
  - 38 AWG/127 μm, 10 turns/in



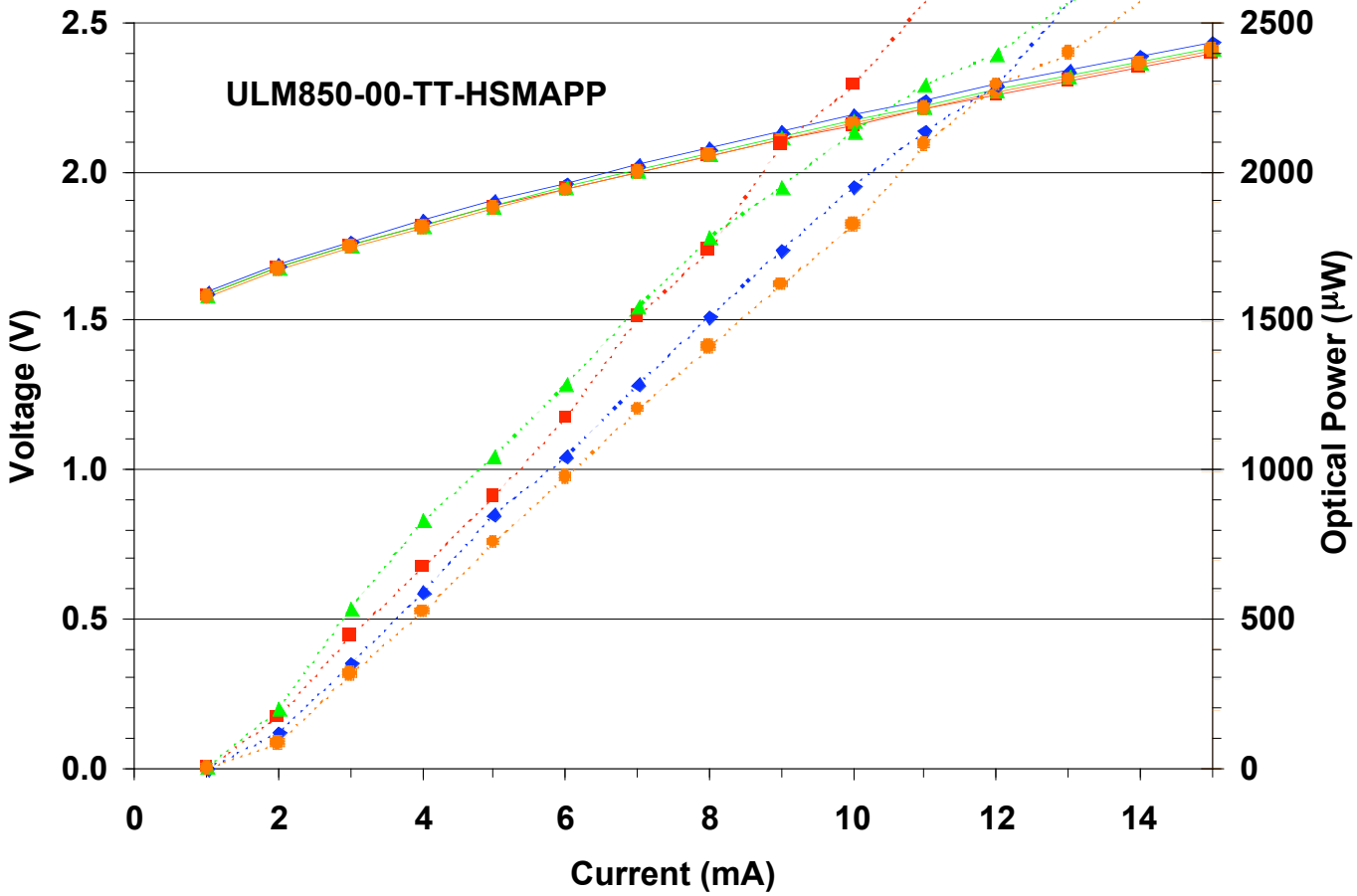
- current Type0 is the best!

Rise/Fall Time of VCSELs



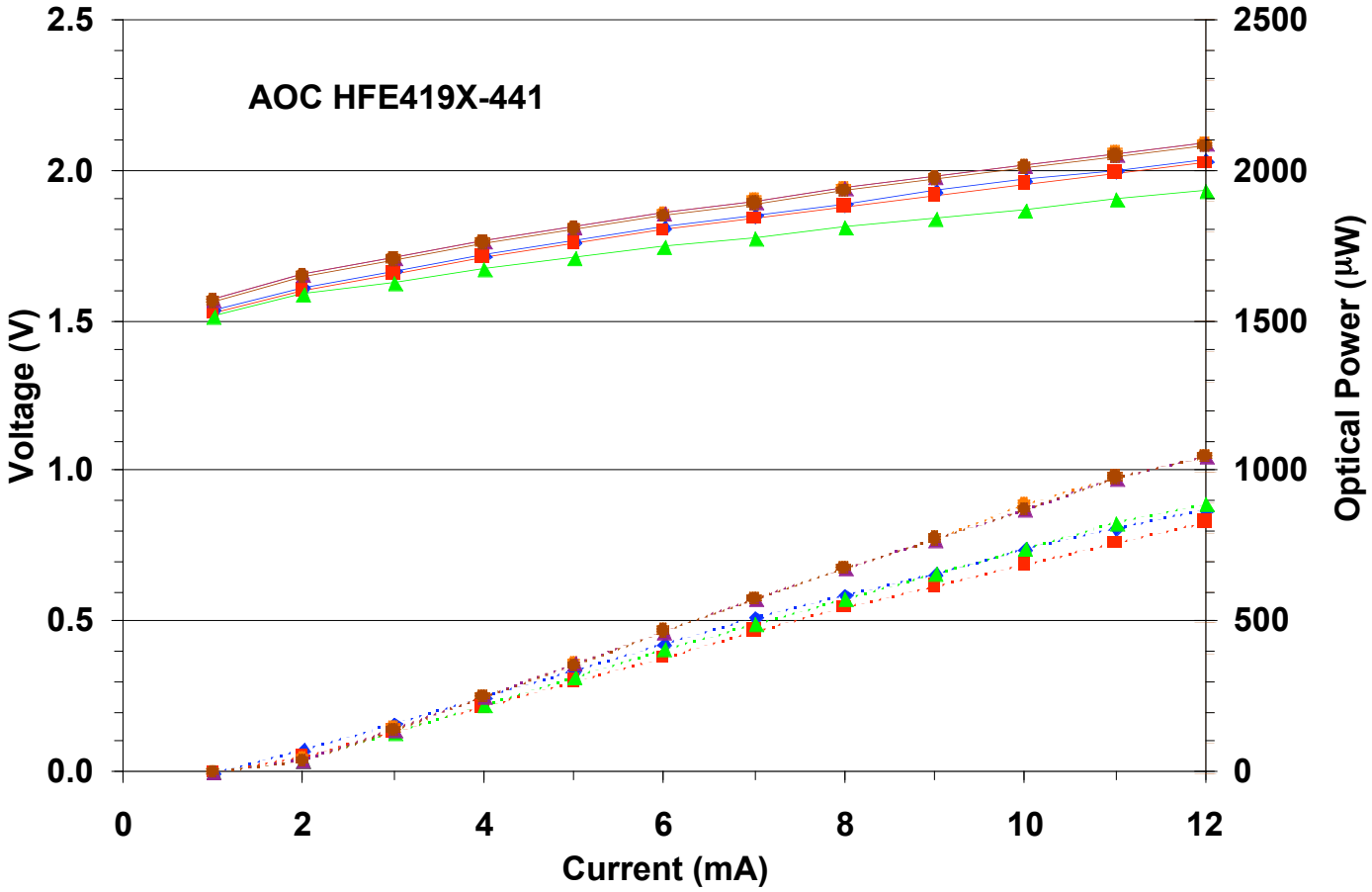
- all VCSELs have similar rise time
- ULM has somewhat slower fall time

I-L and I-V Characteristics



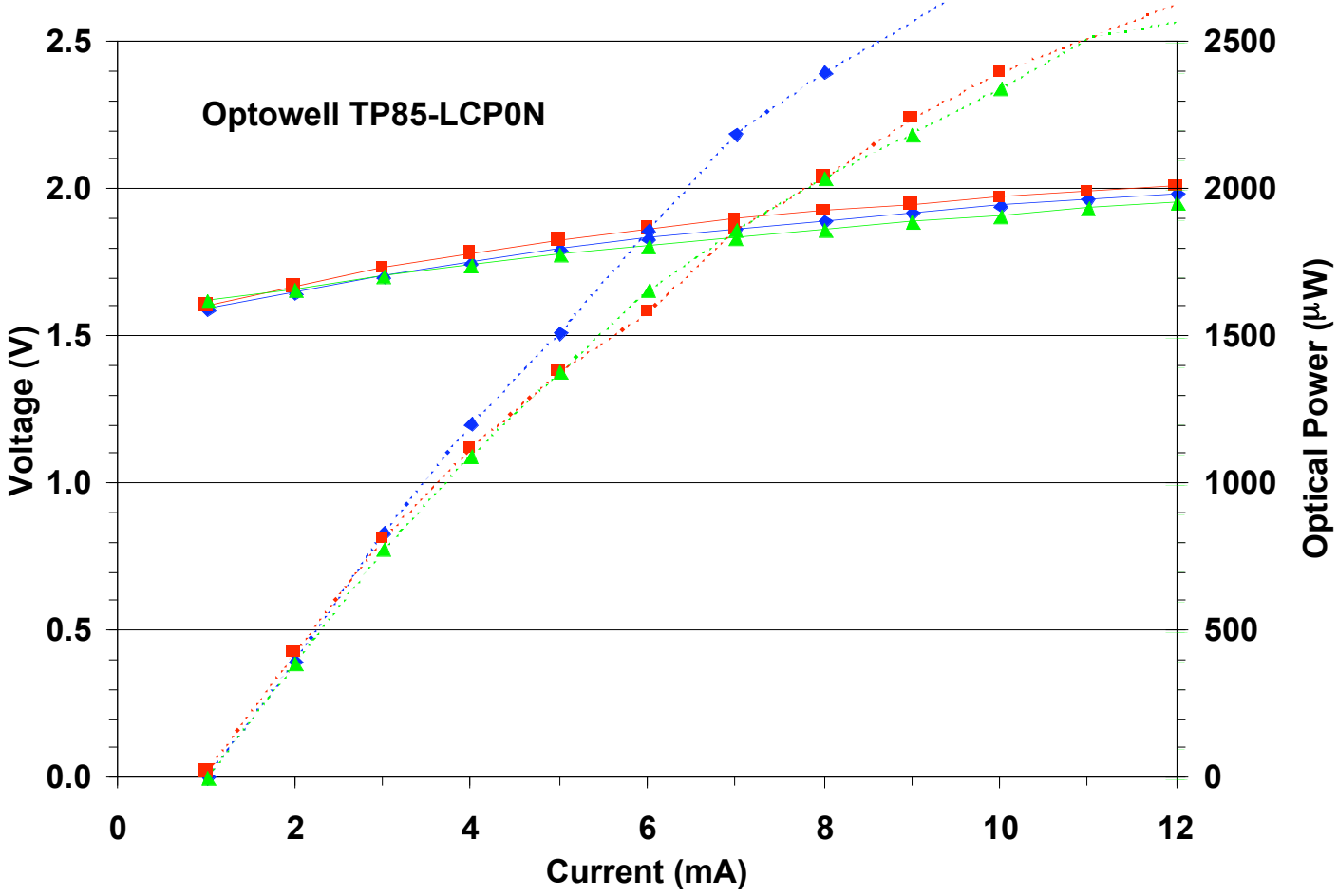
- somewhat high voltage needed to drive VCSEL
- very good optical power

I-L and I-V Characteristics



- very good optical power
- candidate for irradiation study

I-L and I-V Characteristics



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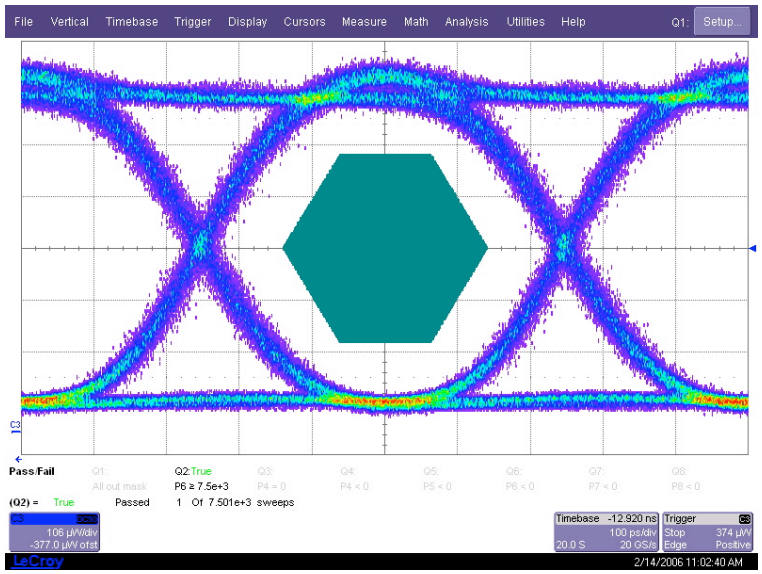
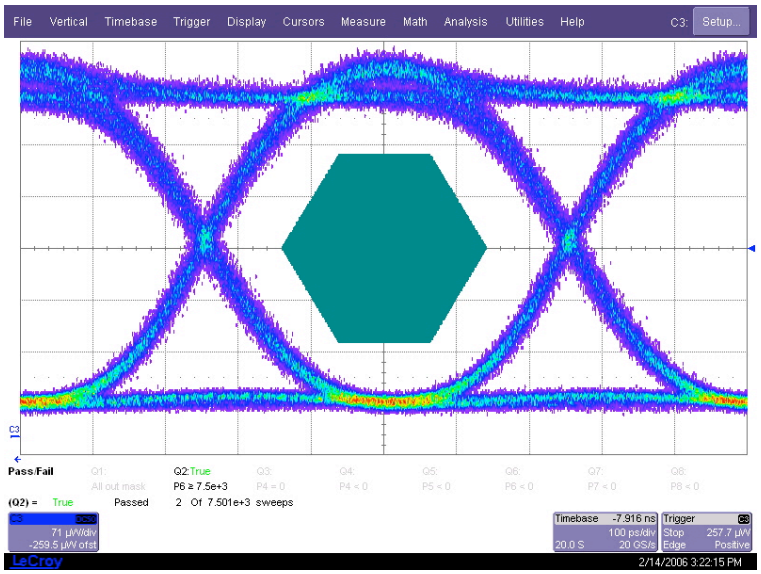
Bandwidth of Spliced Fiber

20 m fiber



2 Gb/s

29 m spliced fiber



- transmission up to 2 Gb/s looks adequate

Summary

- prototype high-speed opto test system bas been fabricated
- two VCSEL candidates identified for irradiation
- Type0 cable is satisfactory for transmission up to 1 Gb/s
- spliced fiber is sufficient up to 2 Gb/s