# Opto-Board Prototyping Plan

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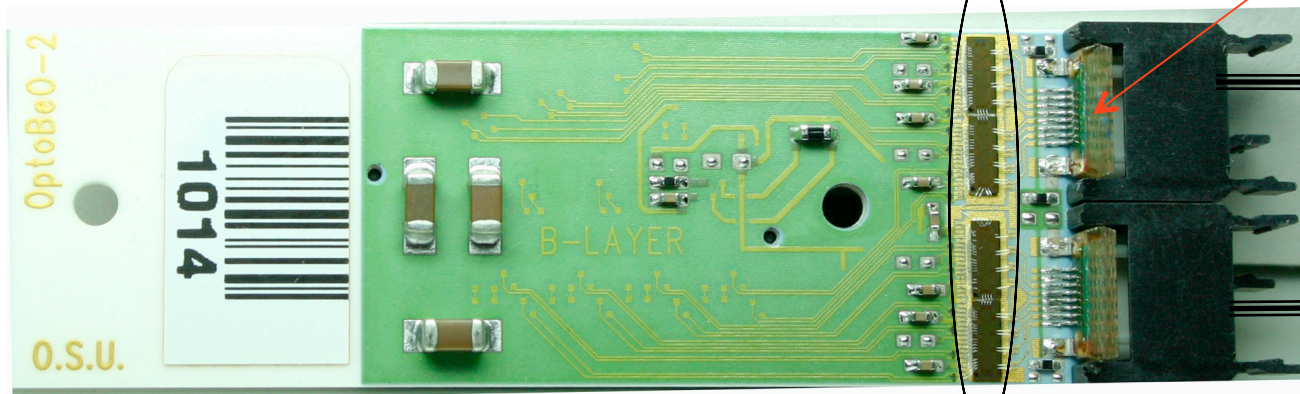
# Outline

- Introduction

- Plan

- What if…

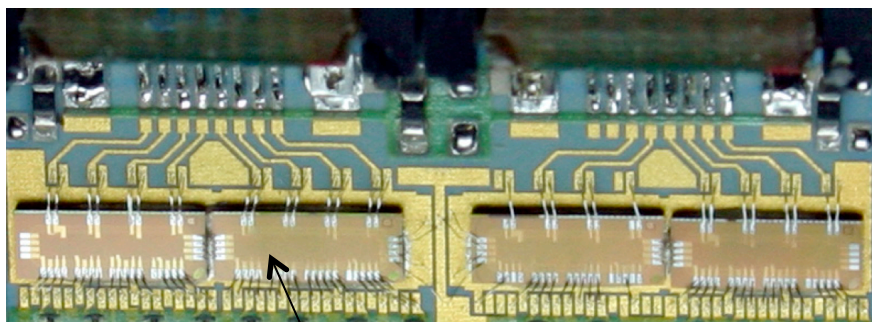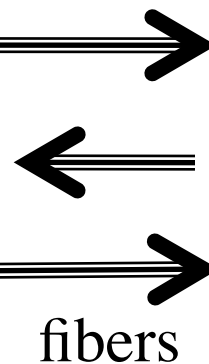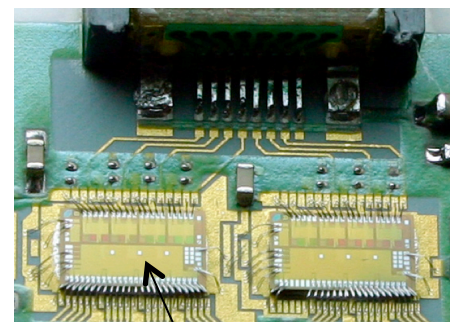- Summary

# Introduction

VCSEL Opto-pack

2 cm

fibers

VCSEL Driver Chip (VDC)

PIN Receiver (DORIC)

# Near-Term Plan

- opto-board has been fabricated:
  - ✔ two BeO opto-packs with AOC 5 Gb/s VCSEL array
  - ✘ one PCB opto-pack with Taiwan PIN array
  - ◆ will operate DORIC as it is (40 MHz)
    - ❑ will study decode clock/data after 4-6 meters of type0 cable
    - ❑ will measure bit error rate
  - ◆ will operate VDC at 160 Mb/s
    - ❑ receive LVDS signal after 4-6 meters of type0 cable
    - ❑ will study optical signal
  - ◆ report the result in June IBL meeting
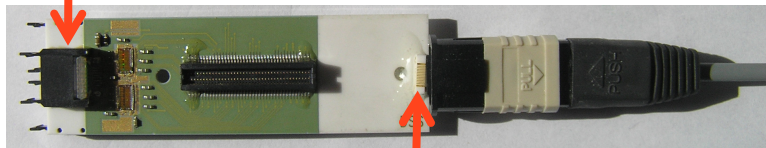


160 Mb/s at 5 m
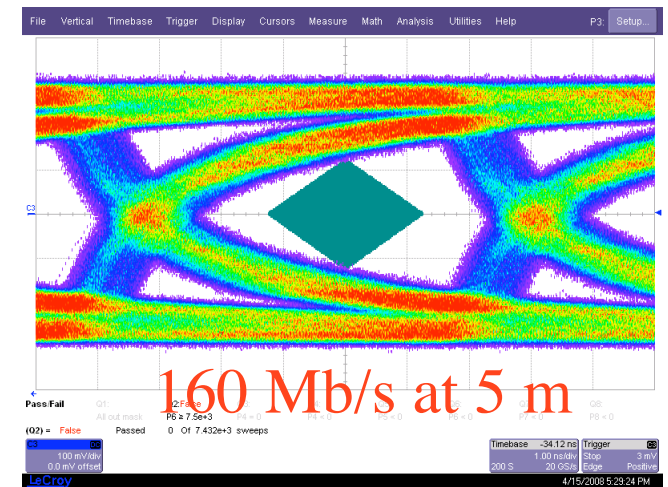
# Plan in Autumn

- prototype opto-board in FR-4:
    - use a smaller connector
        - current 80-pin JAE connector supports two VCSEL arrays
    - optimize for BeO opto-pack
    - allow for mounting of MPO connector
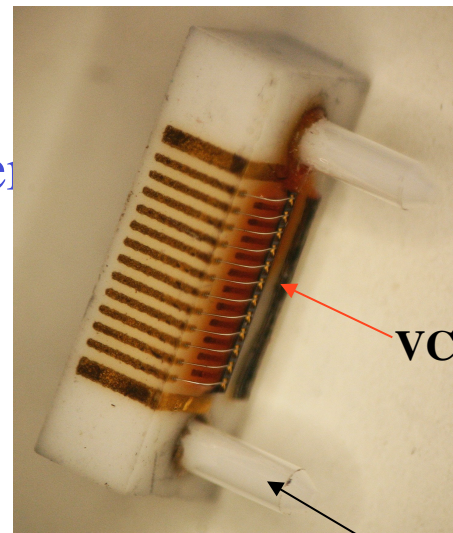    - ⇨ new opto-board will be wider but shorter

**VCSEL array**

**Ceramic guide pin**

LHC housing    MPO

Opto-pack

Opto-pack

BeO    MPO    fiber

< 2 cm
FR4

# VCSEL/PIN Arrays

- propose to use AOC 5 Gb/s VCSEL/Optowell PIN arrays
    - ◆ arrays are fabricated in 4 and 12 channels
    - ✗ S-link bandwidth is 8 x (4 x 40 Mb/s)
    - ⇨ can only use 8 of the 12 channels in an array
      otherwise we could build 1/3 less opto-boards!

# Clock Multiplier

- Two clock multipliers (4 x 160 MHz and 16 x 4 MHz) in 130 nm layout were submitted in March 2008
  - ✔ no significant degradation observed after irradiation
  - ✘ take µs to recover from SEU in PIN coupled to DORIC
    - ◆ observation confirmed with simulation
  - ✘ need power cycling after chip latched up with an SEU
    - ◆ effect not reproduced in simulation but discovered a fault in implementing SEU tolerance circuitry

# Alternatives...

- if there are problems uncovered in the next few months
  - ⇨ alternative design:
    - ◆ DORIC operating at 80 MHz
      - ⇨ no significant degradation observed in irradiated 130 nm prototype chip
    - ◆ VDC operating at 160 Mb/s
      - ⇨ irradiated 130 nm prototype chip is working
    - ◆ build a more robust opto-links:
      - ■ implement redundancy to bypass broken PIN/VCSEL
      - ■ individual control of VCSEL currents

# Summary

- first feasibility test by summer

- first prototype by early 2010

- alternative (and better) design available…