



Building New Opto-boards by 2012?

K.K. Gan
The Ohio State University

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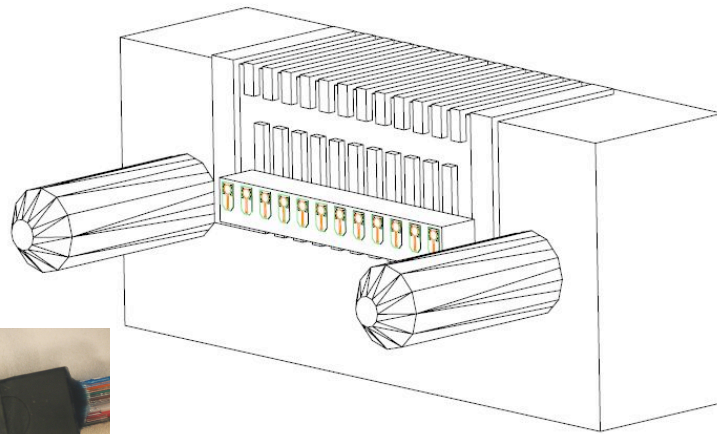


Opto-Boards Design/Prototype

- Current opto-board can be improved:
 - ◆ custom connector is fragile/difficult to mount/dismount
 - ⇒ use MTP commercial connector
 - ◆ cold solder is a major contributor to broken links
 - ⇒ replace FR-4 base with BeO for VCSEL/PIN array
 - ⇒ better heat removal/more reliable connection with wire bonds
 - ◆ opto-board will be wider but shorter
 - much less mechanical constraint for mounting on PP1
 - need to see if this will fit in the new quarter service panel (QSP) assuming opto-boards will be mounted at same location



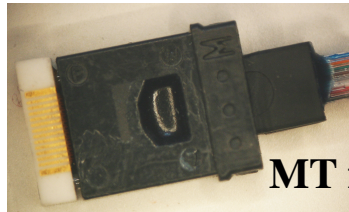
Opto-Packs



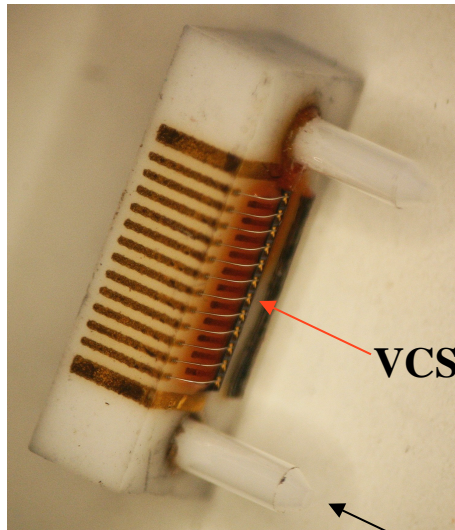
OSU

BeO

1 cm



MT ferrule



VCSEL array

Ceramic guide pin

K.K. Gan



opto package

array opto chip

guide pin



base PCB



Lead frame

Taiwan



Opto-Board Dimension

2 cm

OptoBe0-2

1014

O.S.U.

B-LAYER

fibers

VCSEL Opto-pack

4.9 cm

New



Compressed Fabrication Schedule

- 3 weeks to redesign a new opto-board
- 8 weeks to fabricate prototype BeO boards by vendor
- 2 weeks for passive components mounting
- 2 weeks to fabricate/test new boards
- 8 weeks to fabricate production BeO boards by vendor
- 2 weeks for passive components mounting
- 272 opto-boards are needed
 - Previously ~300 opto-boards were fabricated at Ohio State/Siegen
 - ◆ Ohio State achieved the goal of producing 10 boards/week
 - ◆ easy to achieve this goal with new opto-pack/opto-board design
- Assuming 15 boards/week:
 - 45 weeks to produce 300 boards
 - design cannot start without understanding the mechanical



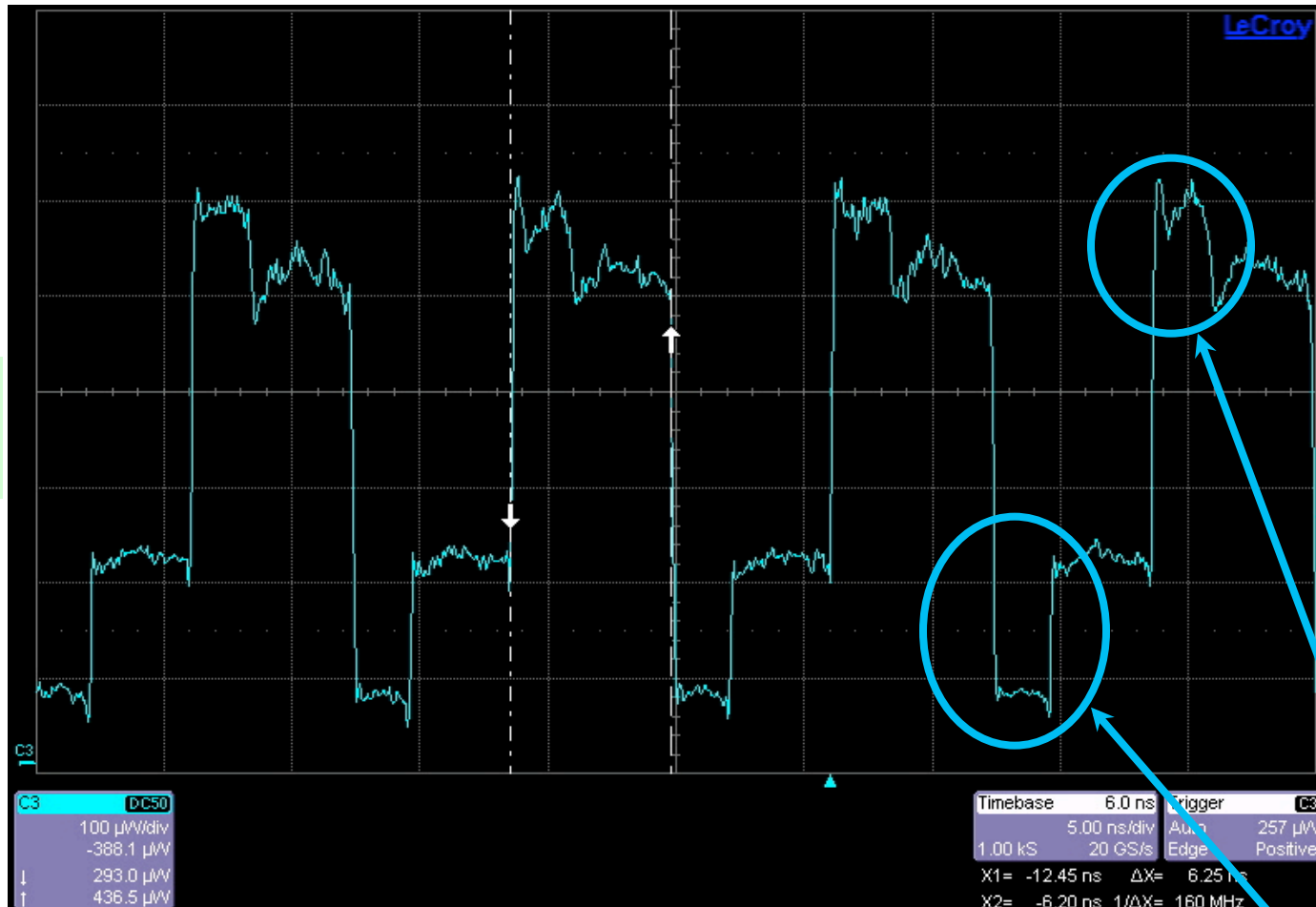
Other Possible Opto-Board Improvements

- New driver/receiver fabricated in 130 nm process as part of the R&D for IBL and SLHC
 - ◆ prototype in 4-channel arrays
 - ✓ redundancy to bypass broken PIN or VCSEL channel
 - ✓ individual VCSEL current control
 - ✓ power-on reset to set VCSEL current to several mA on power up
 - ✓ VCSEL driver can operate up to ~ 5 Gb/s with $\text{BER} < 5 \times 10^{-13}$
 - ✓ pre-emphasis in VCSEL driver for SLHC application
 - ✓ PIN receiver/decoder properly decodes signal with low threshold
 - ☹ not yet able to use command decoder from FE-I4 for the above programming
 - prototype chips will be irradiated tomorrow
 - ⇒ 12-channel version of above driver/receiver can be used in new opto-boards to improve reliability/operation



VCSEL Driver with Pre-Emphasis

Main
amplitude



Pre-emphasis

✓ Pre-emphasis working with tunable width and height



Summary

- New opto-boards can be fabricated in 45 weeks assuming that AOC VCSEL array is acceptable
 - ◆ design cannot start without understanding the mechanical constrain
 - ◆ difficult to take advantage of improved driver/receiver to improve reliability and operation