Building New Opto-boards by 2012?

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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

MT ferrule

VCSEL array

Ceramic guide pin

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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 constraint
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 BER < 5x10^{-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

✔ Pre-emphasis working with tunable width and height

160 Mb/s
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