Status of OSU Opto-pack

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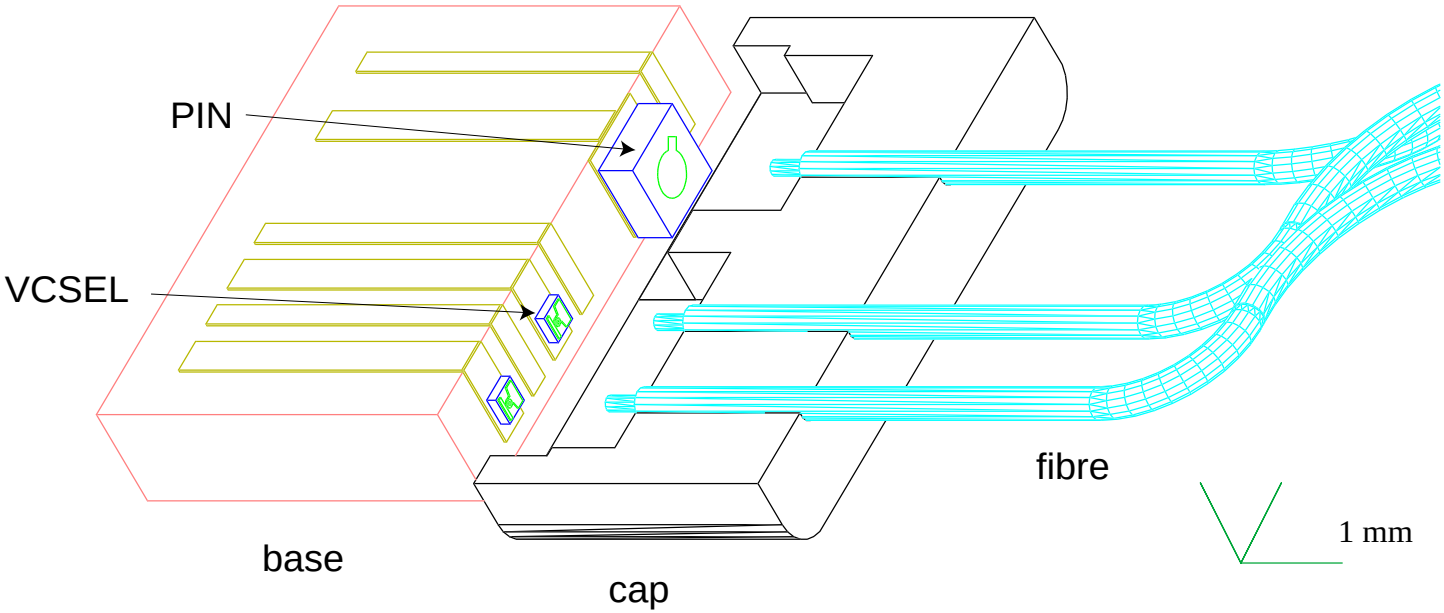
Outline

- Introduction
- Opto-package prototypes
- Opto-hybrid board
- Plans

OSU Opto-pack



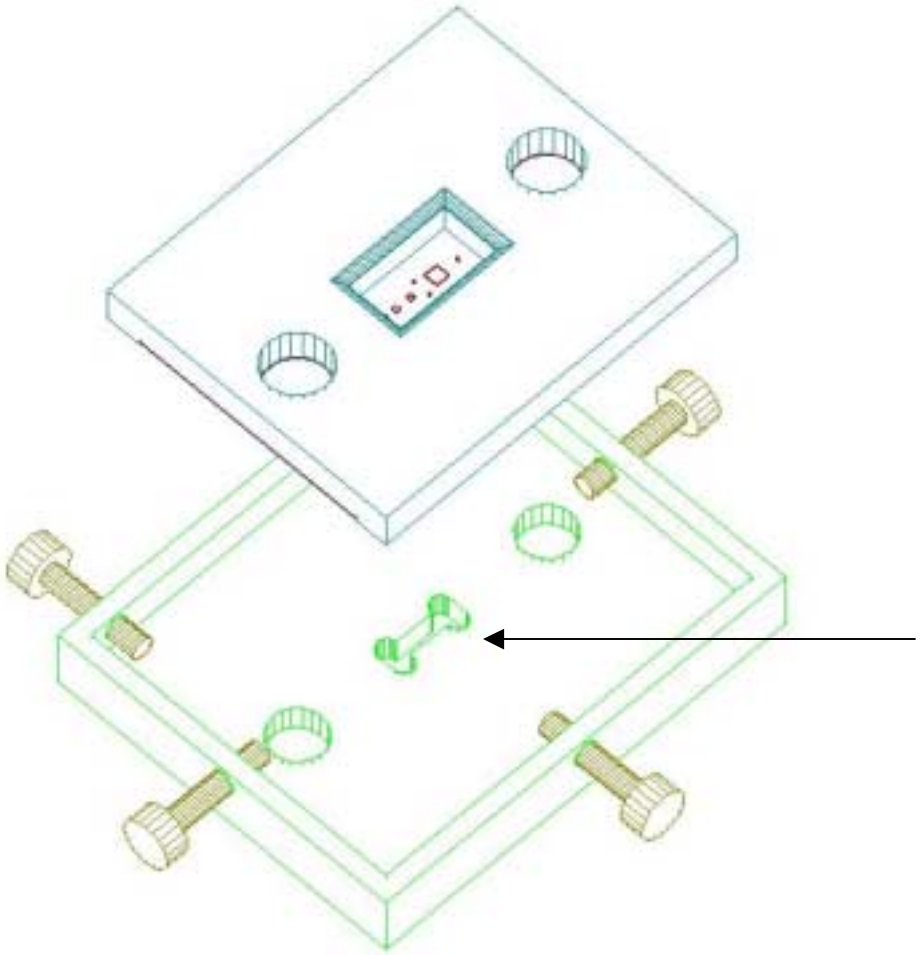
New Base Fabrication Procedure

- Hybrid-Tek:
  - ☆ ground alumina sheet to proper thickness and cut into strips
  - ☆ deposit 3D traces
- American Dicing:
  - ☆ dice strips into 9 bases
  - ⇨ base width precision: ~10 μm

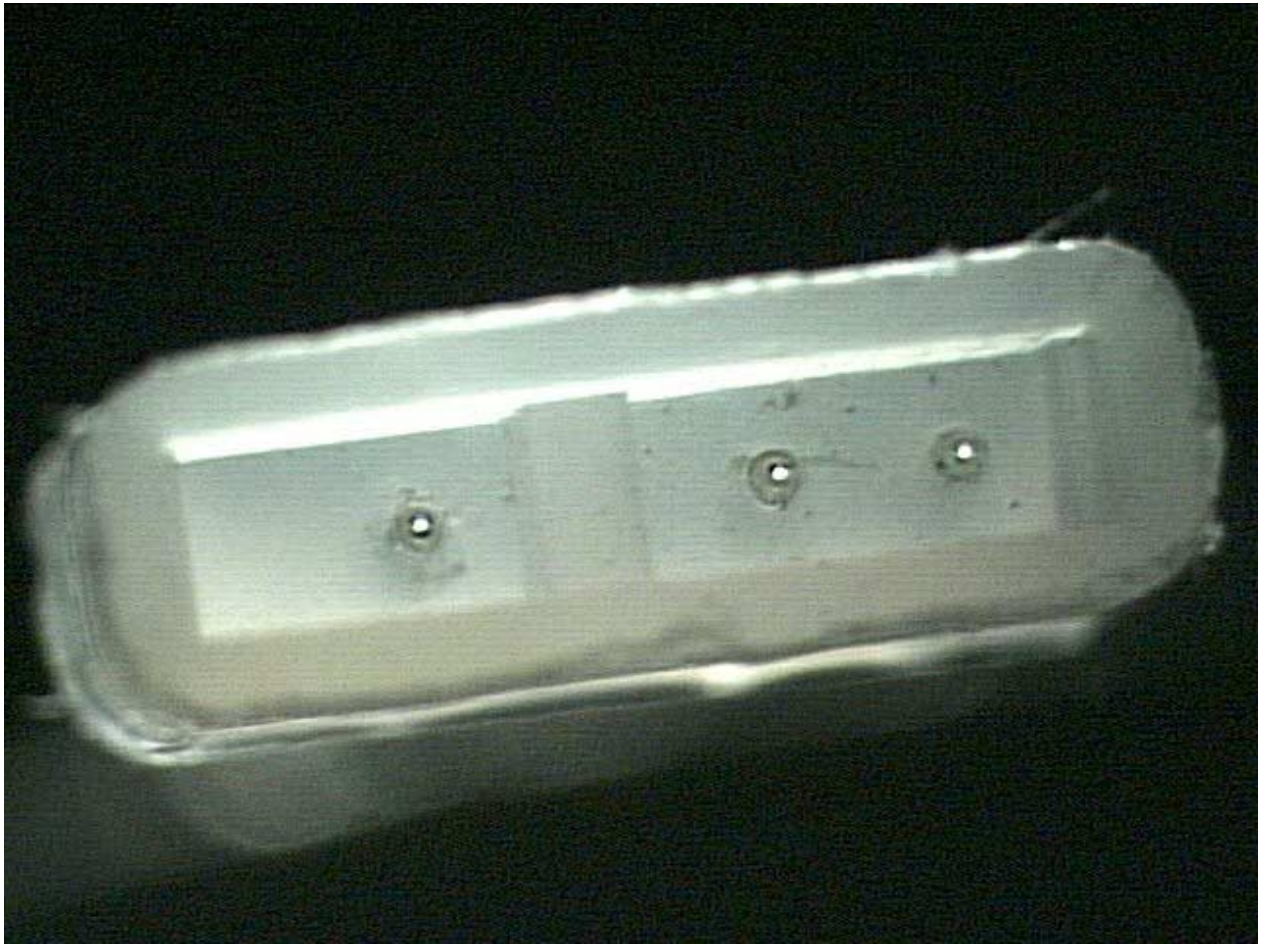
New Die Placement Jig Design

- need multiple trials to produce precise die placement jig
- requirements on die placement jig:
  - ☆ precise pocket for base
  - ☆ precise location for VCSEL pockets
- ⇨ fabricate jig in two pieces:
  - ☆ precise pocket for base
  - ☆ precise distance between VCSEL pockets
  - ⇨ adjust the two pieces until VCSEL pockets are in right location w.r.t. base pocket

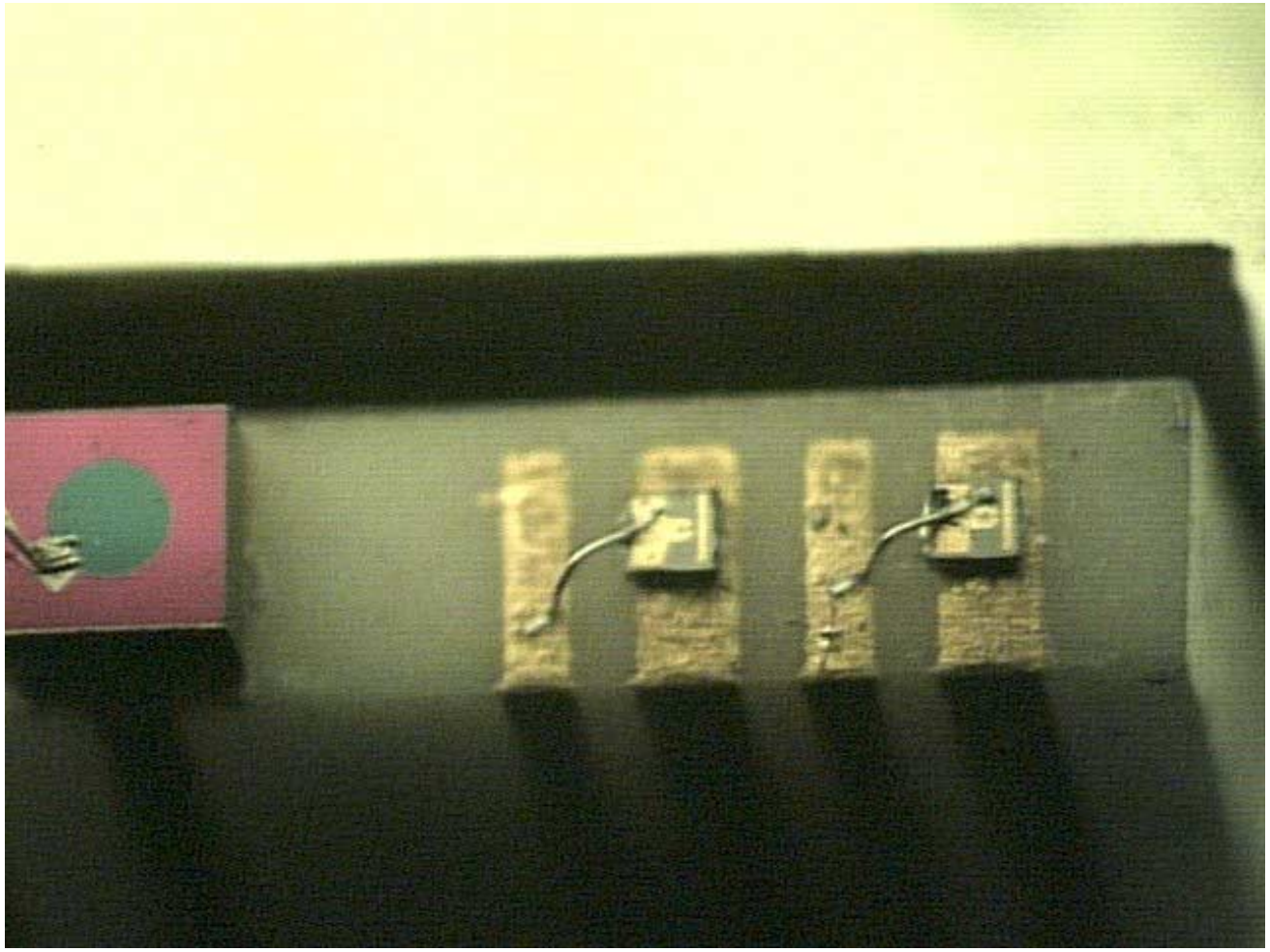
New Die Placement Jig



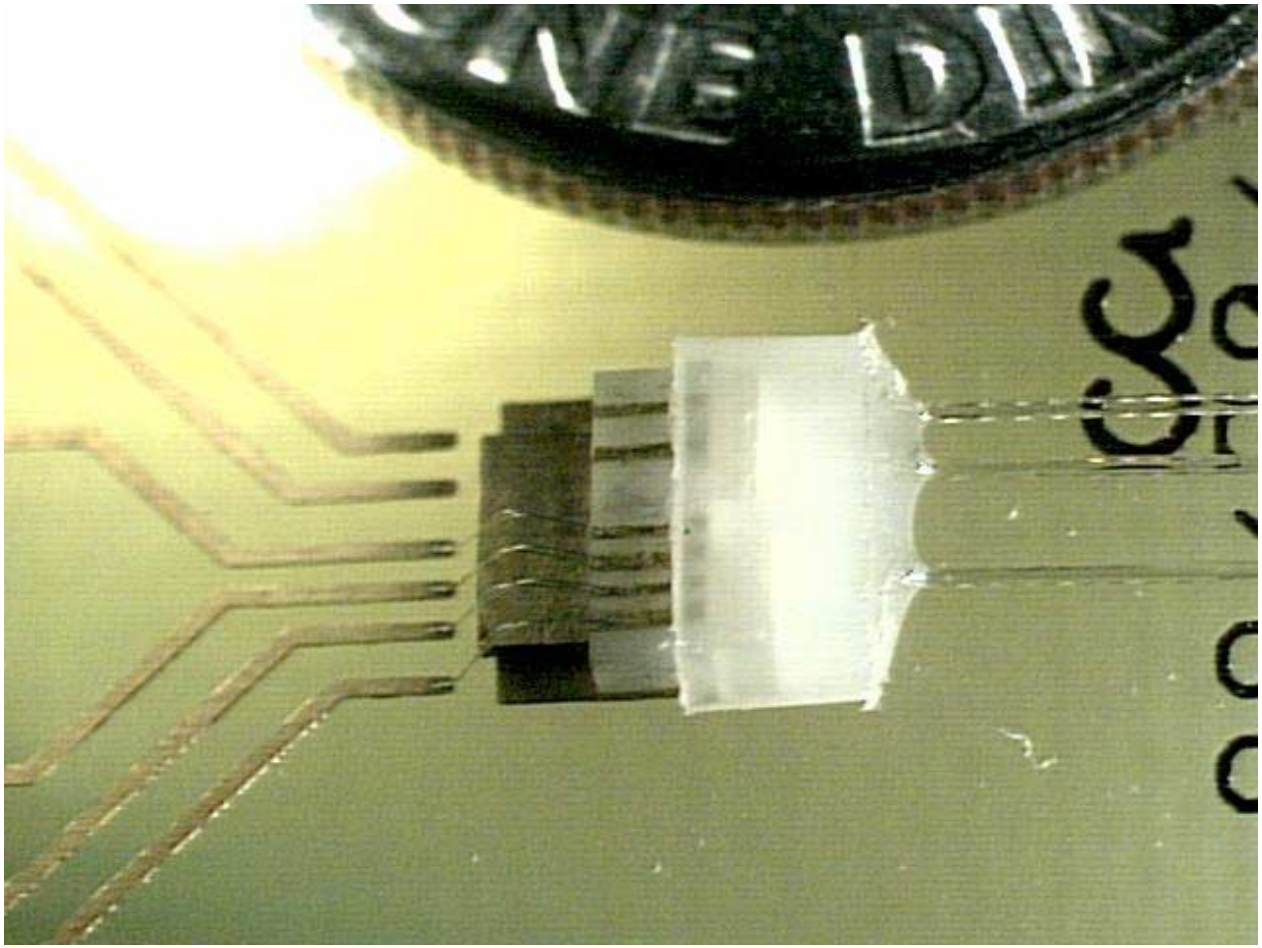
Cap with Precisely Fabricated Cavity



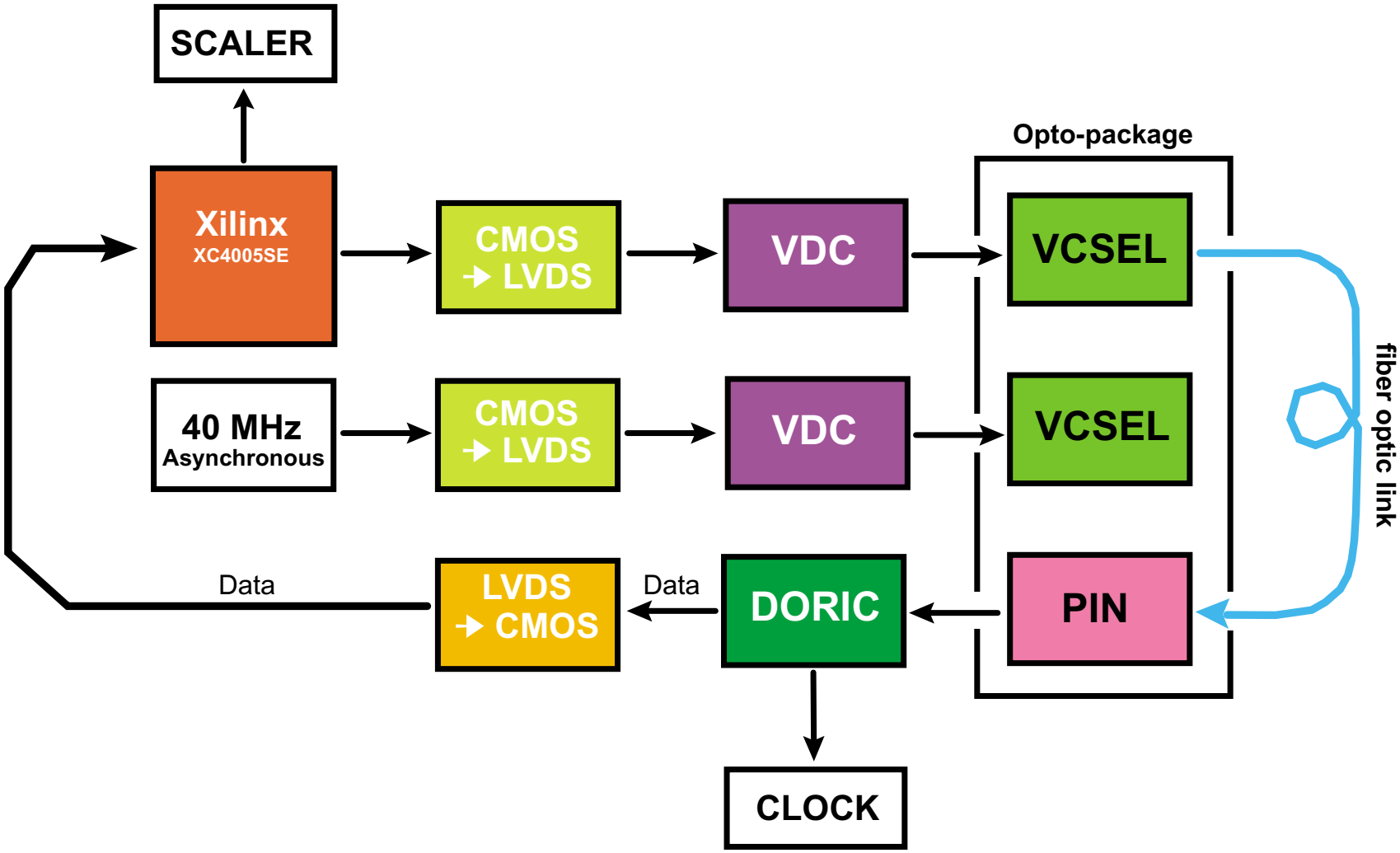
Base with PIN and VCSELs



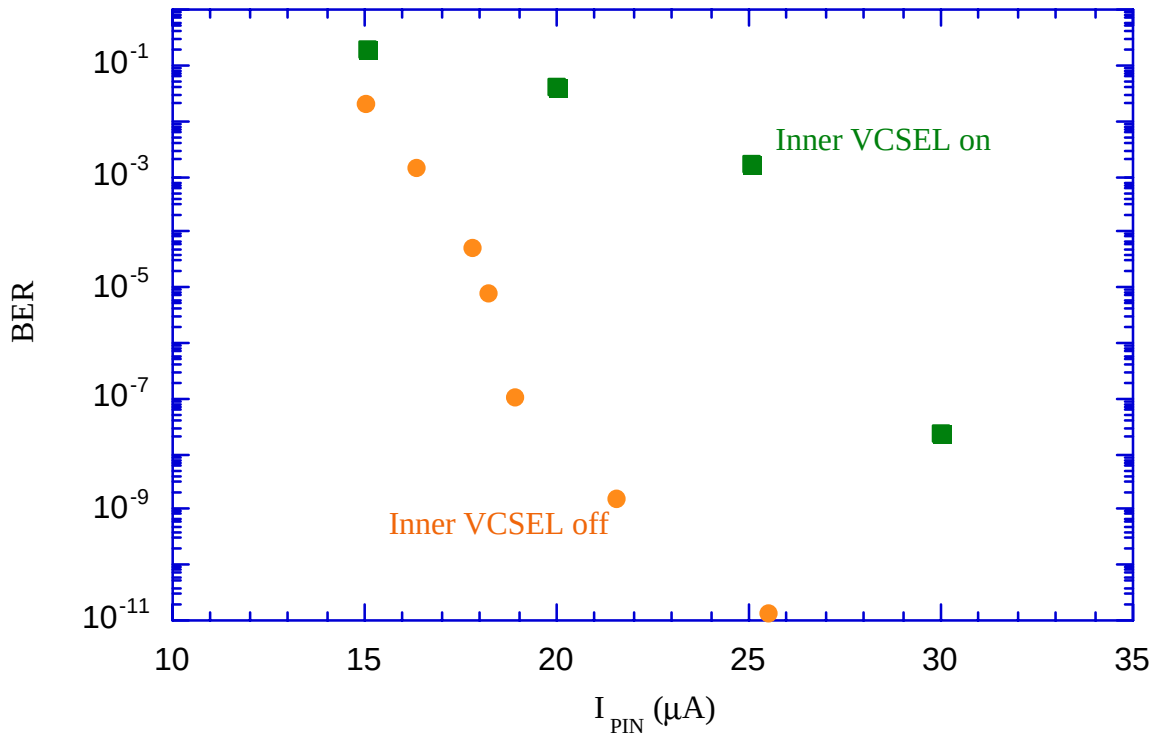
Completed Opto-package



BER/Crosstalk Measurement with DORIC and VDC

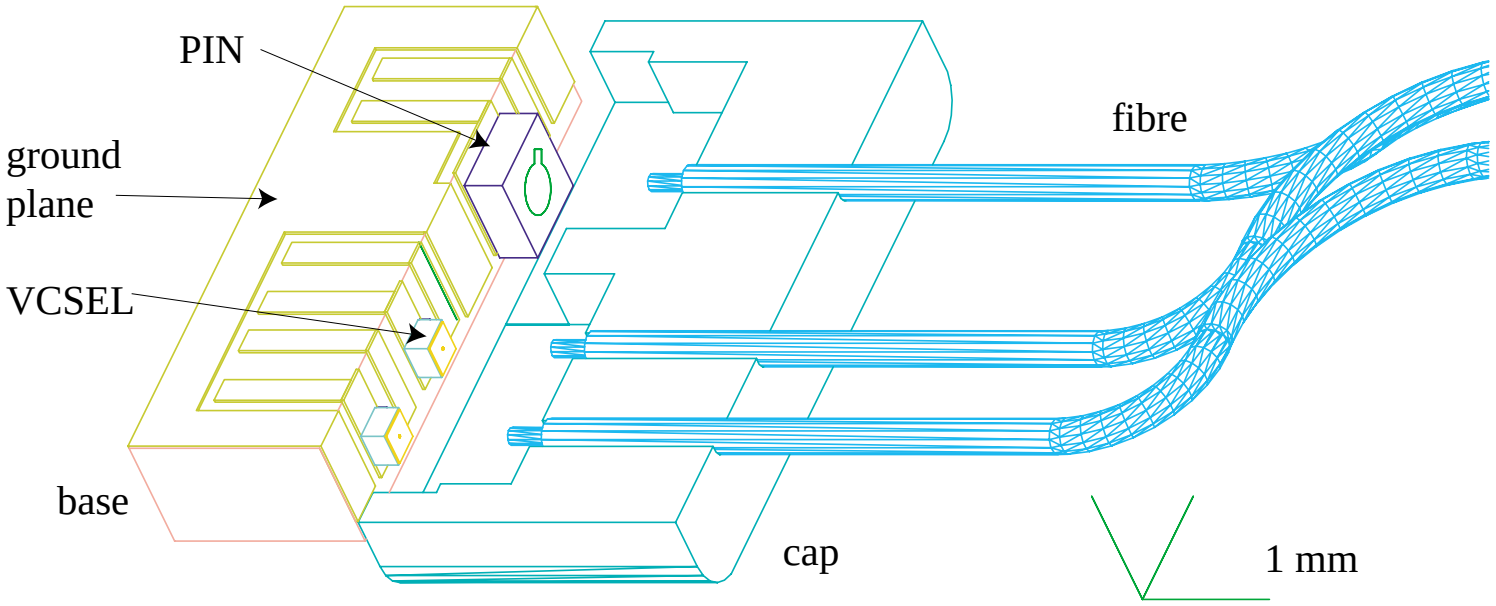


Binary Error Rate

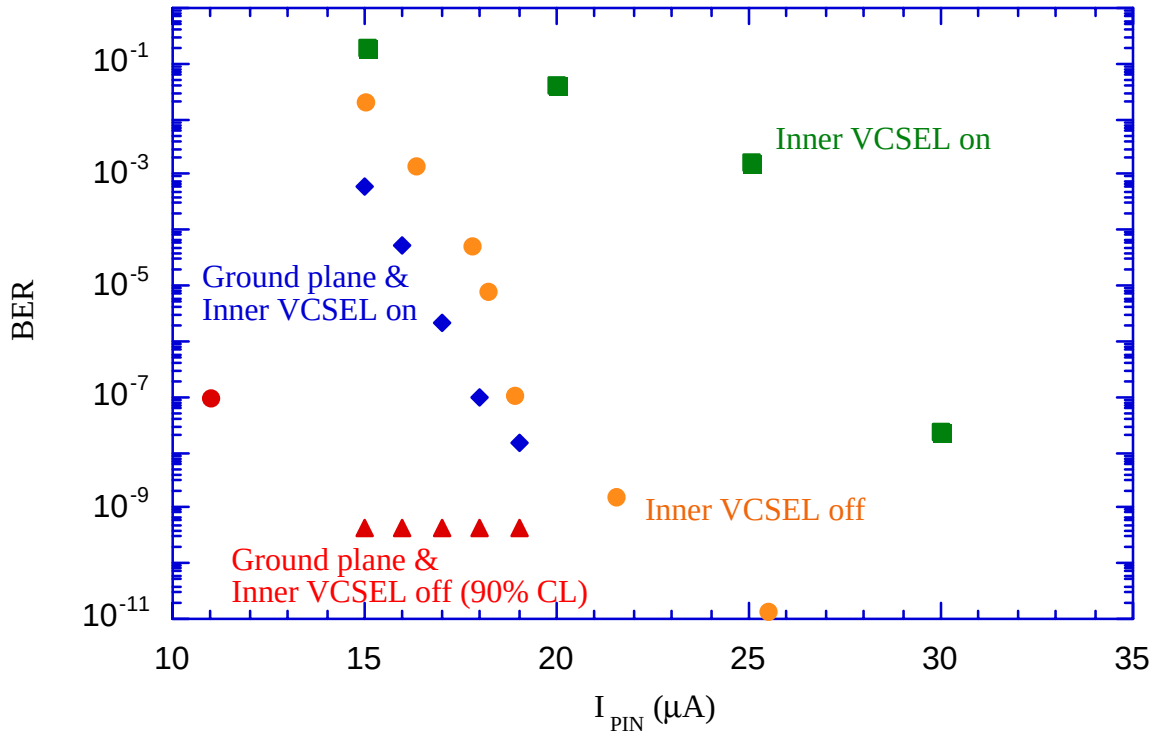


- some cross talks between PIN and VCSEL
  - ⇨ add ground plane between traces

New Opto-pack with Ground Plane



Binary Error Rate with Ground Plane

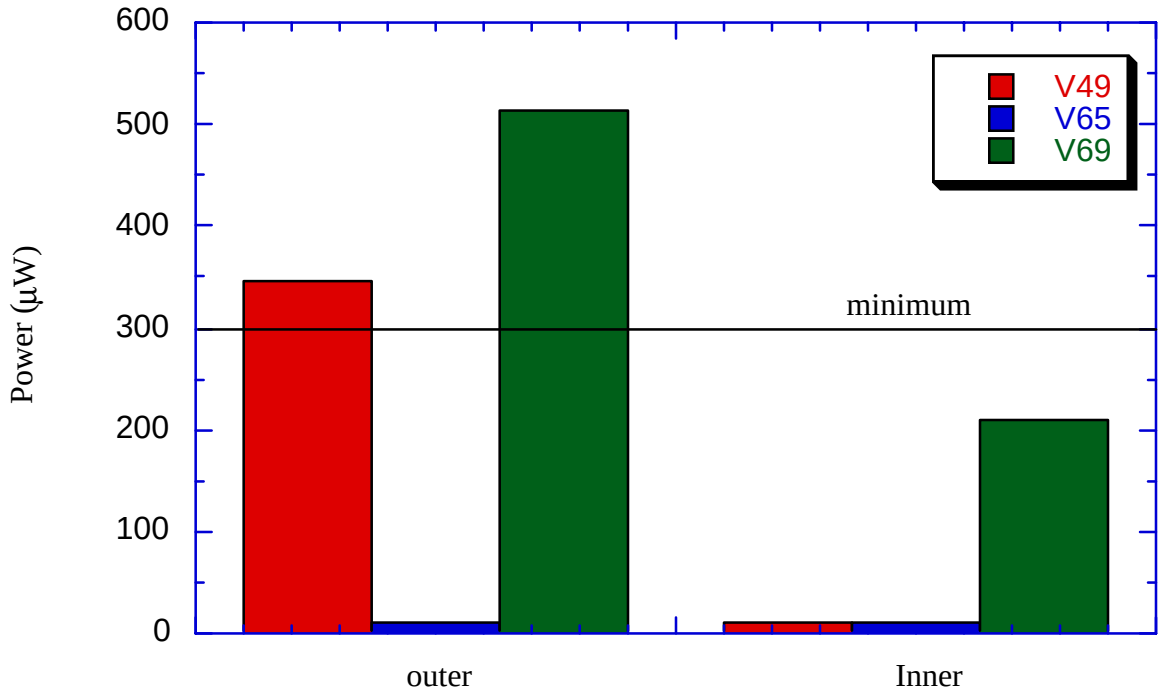


- no cross talks above 20 μA

Prototype Result

- produced 11 packages
- VCSELs have fast rise and fall time: < 1 ns
- PINs have good responsitivity: 0.5 A/W
- coupled power > 300 μW in both VCSELs simultaneously
  for 9 packages with different combinations of bases and caps
  - ⇨ demonstrated feasibility of fabricating high precision caps and bases
- no cross-talk between VCSEL and PIN above 20 μA

Taiwan Opto-packs



- no opto-pack has both VCSEL power above 300 μW
- problem is under investigation

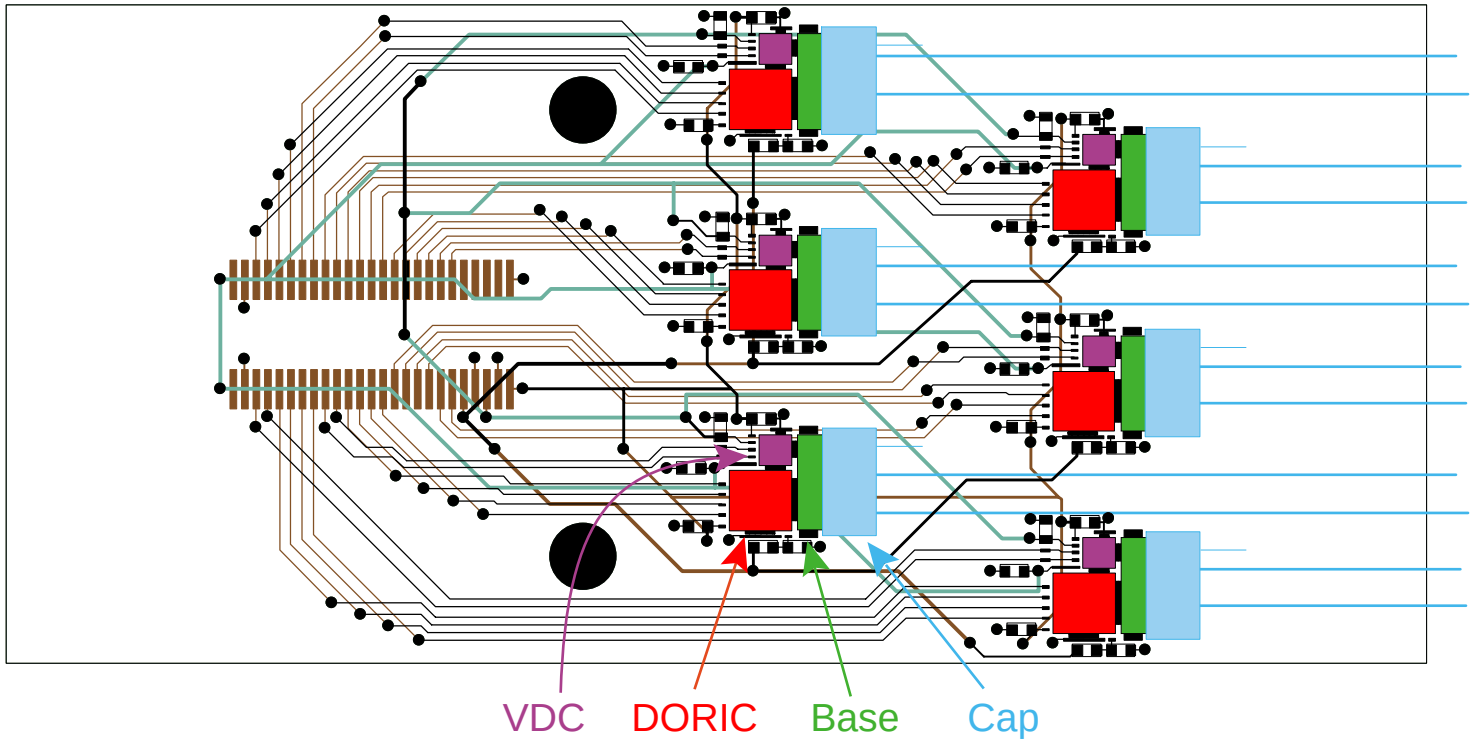
Disk Opto-hybrid Board

- contains 6 sets of opto-pack, VDC, and DORIC
- electrical signal to/from module channel through 50-pin connector
- layout for opto-hybrid board is ready
  - ☆ first submission will use FR-4 for cost saving
  - ☆ 2nd and 3rd prototypes will use BeO
  - ☆ board width is 2.9 cm c.f. spec. of 2.0 cm
  - ⇨ need to fabricate opto-packs with VCSEL and PIN only
  - ⇨ multi-channel VDC and DORIC
- layout for board to test opto-hybrid board is in progress
- board is compatible with Taiwan opto-pack

Power Consumption

- For VDD = 3.3 V:
  - ☆ VDC: 18 mA
  - ☆ DORIC: 27 mA
  - ⇨ total power = 0.9 W
  - ⇨ use BeO with two 0-80 screws ($\phi \sim 2$ mm) for mechanical support and heat transfer?

Opto-hybrid



Plans

- continued progress in fabrication of opto-packs
  - ☆ opto-packs have low cross talk
- prototype opto-hybrid board ready for fabrication
  - ☆ opto-pack, VDC and DORIC needs redesign due to space constrains