

New Results on ATLAS Pixel Opto-Link

K.K. Gan

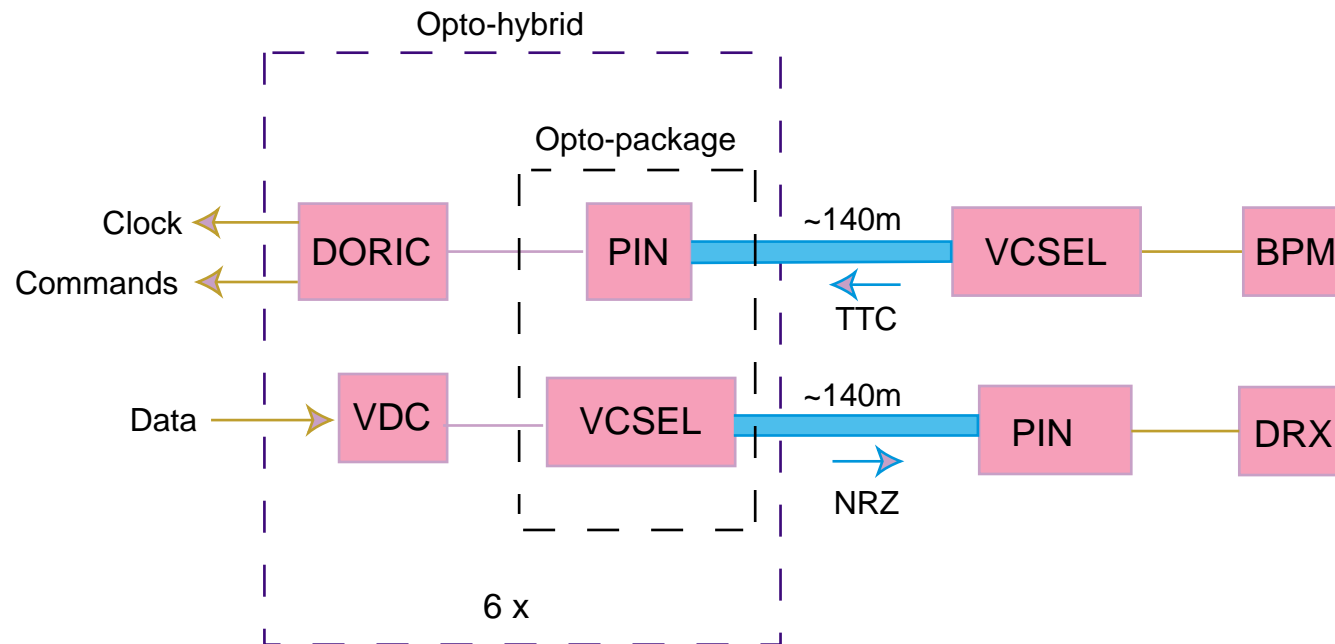
The Ohio State University

July 13, 2001

Outline

- Introduction
- Result on opto-pack prototypes
- Result on opto-electronics prototypes
- Summary

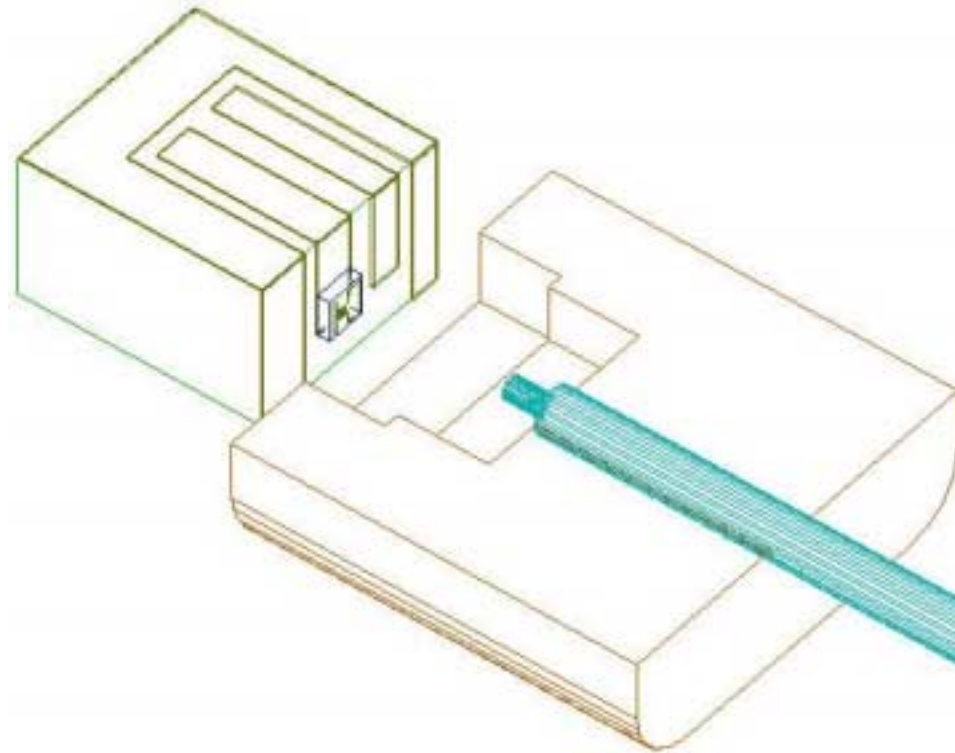
Pixel Opto-Link



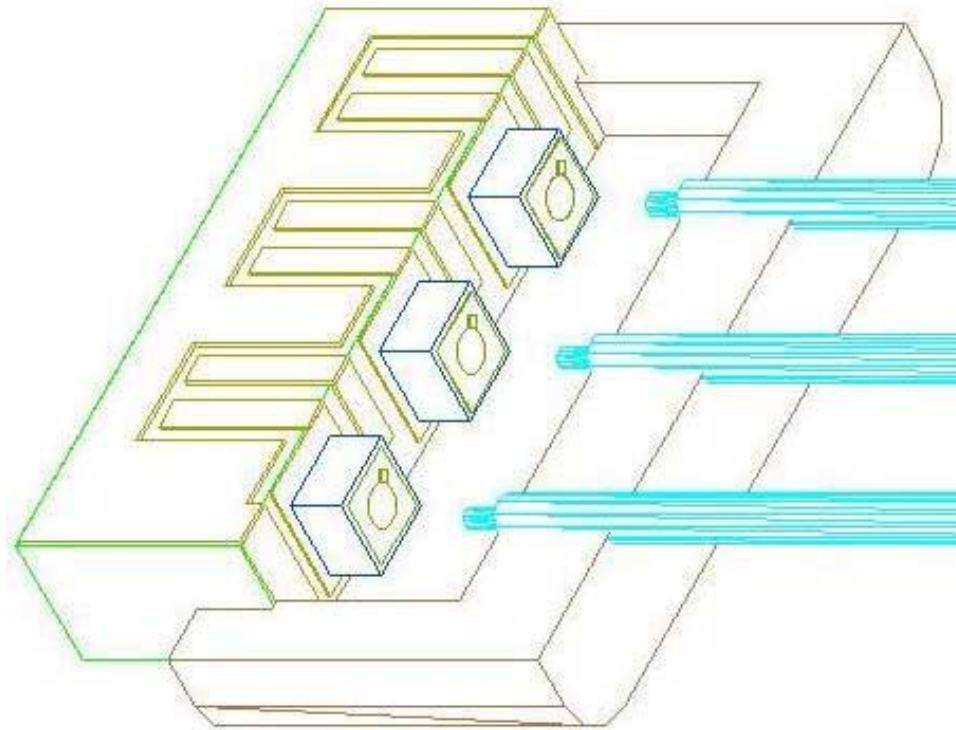
OSU Opto-Pack Design

- connector concept design
 - ☆ use precisely fabricated cap and base for alignment
 - ☆ simple two-piece design for mass production
- cap
 - ☆ holes for fibers
 - ☆ use Ultem (polyetherimide) for radiation tolerance (10 Grad)
- base
 - ☆ alumina with gold traces for wire bonding, VCSEL and PIN placements

VCSEL Opto-Pack



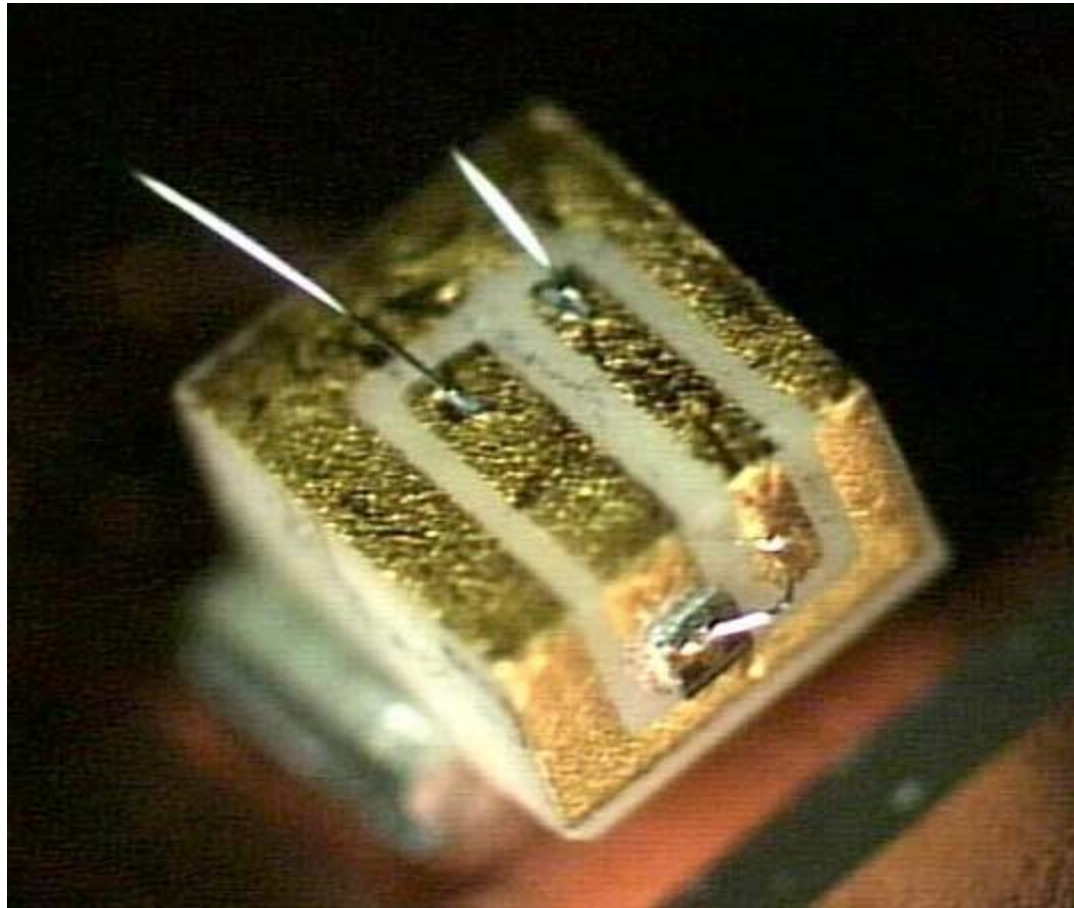
PIN Opto-Pack



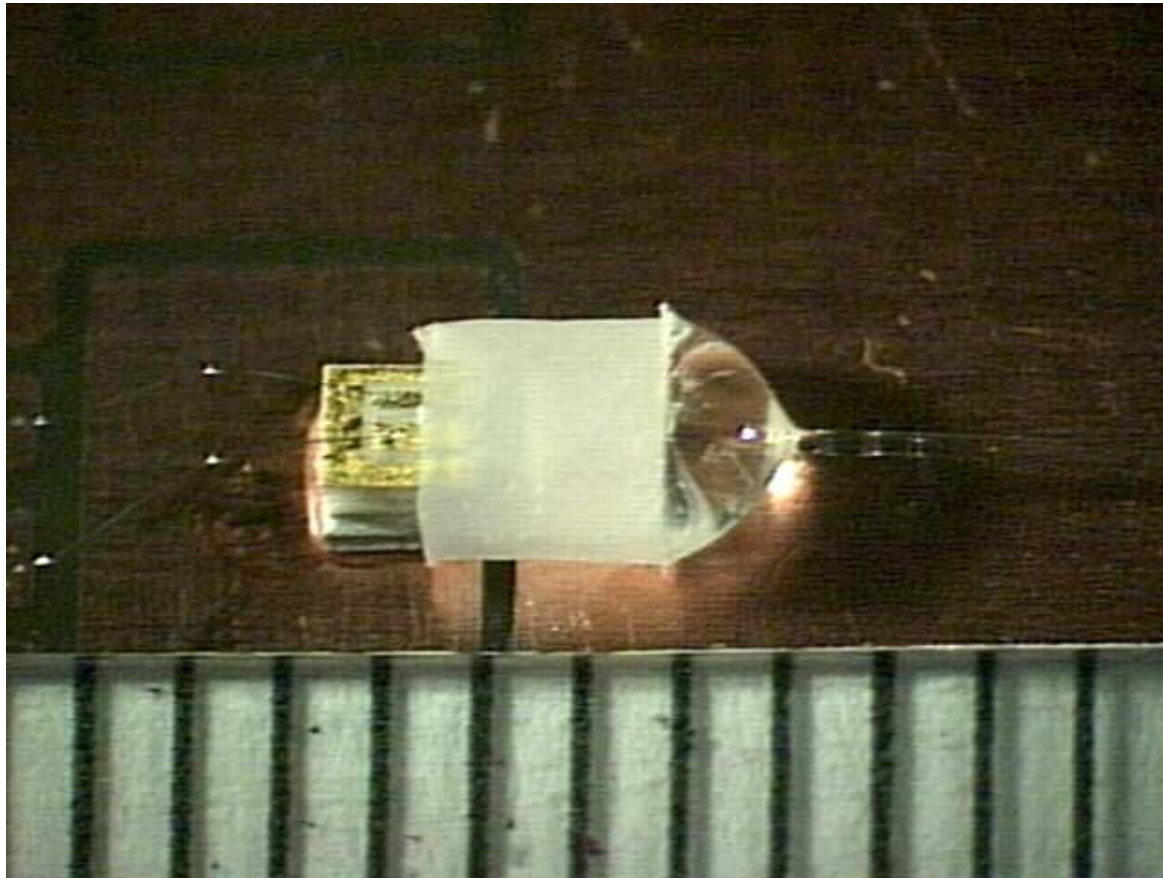
Cap with Precisely Fabricated Cavity



Base with VCSEL

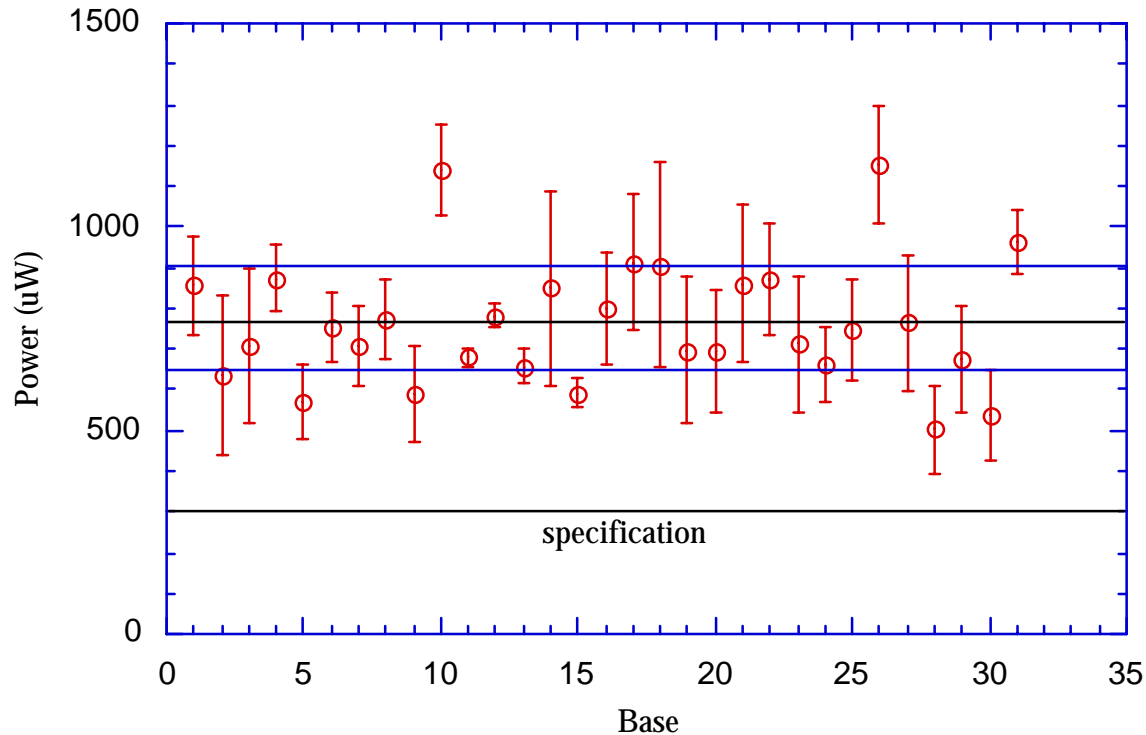


Completed VCSEL Opto-Pack



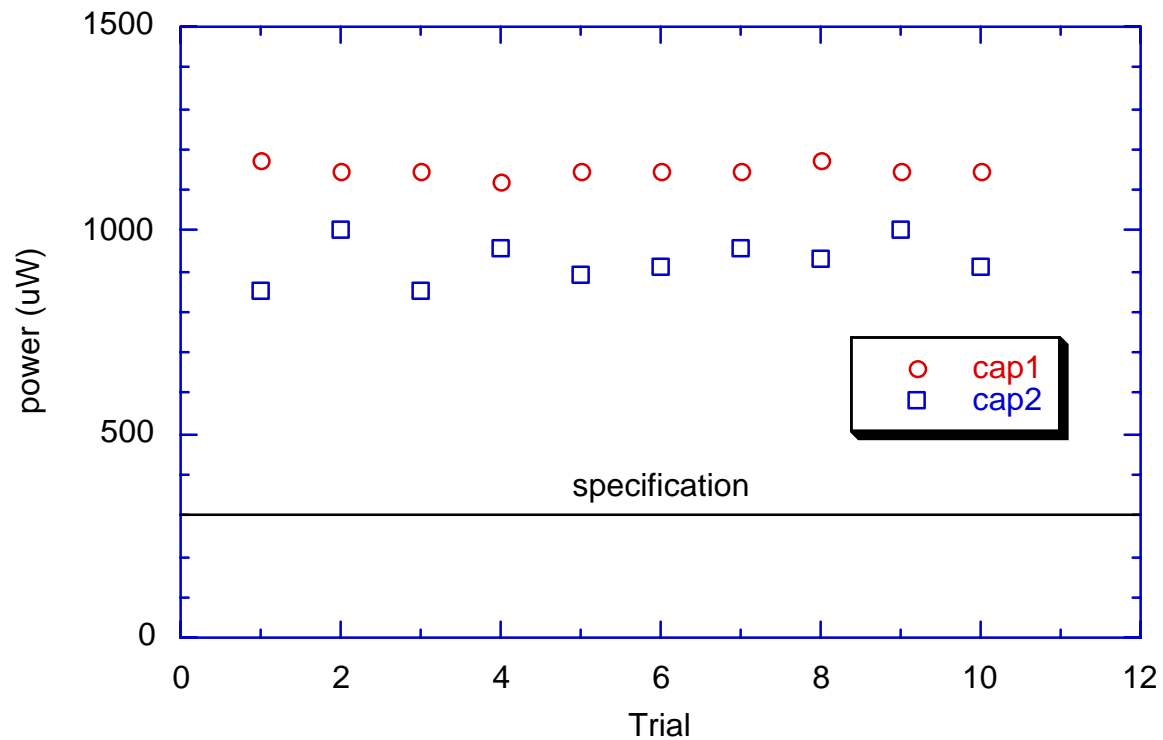
1 mm

Coupled VCSEL Power @ 10 mA



- all VCSEL opto-packs have coupled power well above spec.

Coupled VCSEL Power vs Usage



- caps can be used multiple times

Summary on OSU Opto-pack Prototype

- VCSEL opto-packs have good coupled power
- PIN opto-packs have good responsivity
- remountable caps offer maximum flexibility in opto-board assembly and repair
- Taiwan opto-pack has been chosen as baseline
 - ◆ potentially 10-15% higher coupled power
 - ◆ take advantage of additional resource

Opto-electronics

- VCSEL Driver Chip (VDC):
 - ☆ convert LVDS signal into single-ended signal appropriate to drive VCSEL
- Digital Opto-Receiver Integrated Circuit (DORIC):
 - ☆ decode clock and command signals from PIN diode

Opto-electronics Team

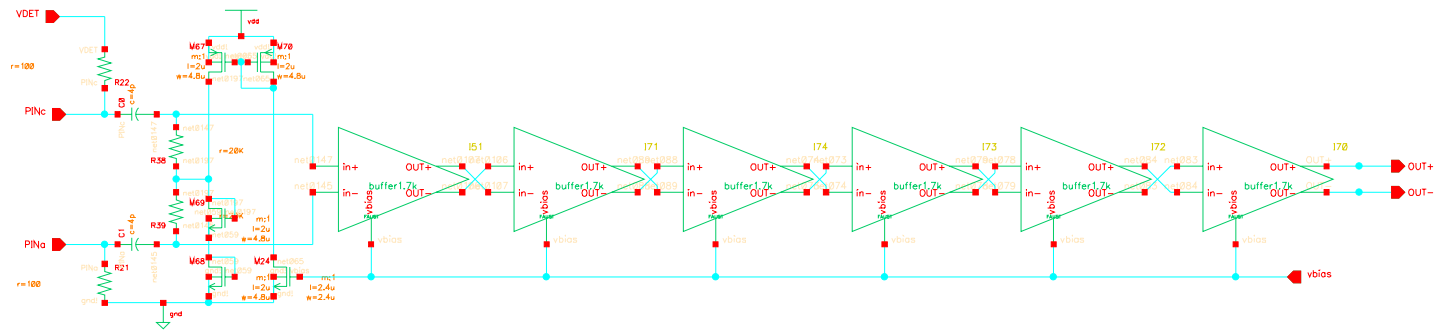
- The Ohio State University:
 - ☆ Kregg Arms, K.K. Gan, Mark Johnson, Harris Kagan, Richard Kass, Chuck Rush, Michael Zoeller
- Siegen University:
 - ☆ Michael Kraemer, Joachim Hausmann, Martin Holder, Michal Ziolkowski

Opto-electronics Prototypes

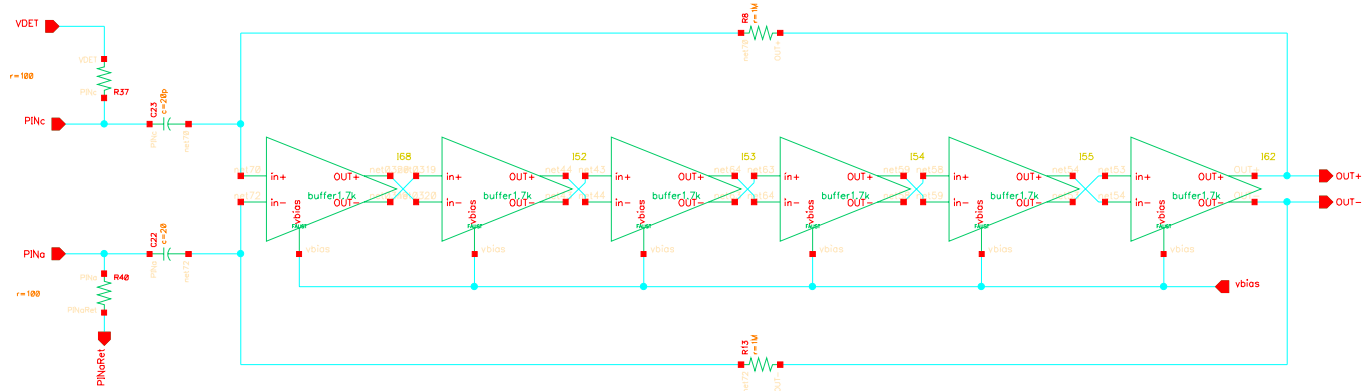
- 1st 0.8 μ m DMILL submission:
 - ☆ VDC works but DORIC failed due to underestimate of parasitic capacitance
- 2nd 0.8 μ m DMILL submission:
 - ☆ VDC and DORIC both works
 - ◆ some DORIC need to be run at high PIN current threshold due to offset between two differential pre-amp inputs
 - ◆ some VDC and DORIC survive up to ~50 Mrad
- 3rd 0.8 μ m DMILL submitted in May
- 1st 0.25 μ m IBM submission:
 - ☆ VDC and DORIC both works
 - ◆ insufficient offset corrections
 - ◆ irradiation planned in September
- 2nd 0.25 μ m IBM planned in August

Improvement in Pre-amp Feedback

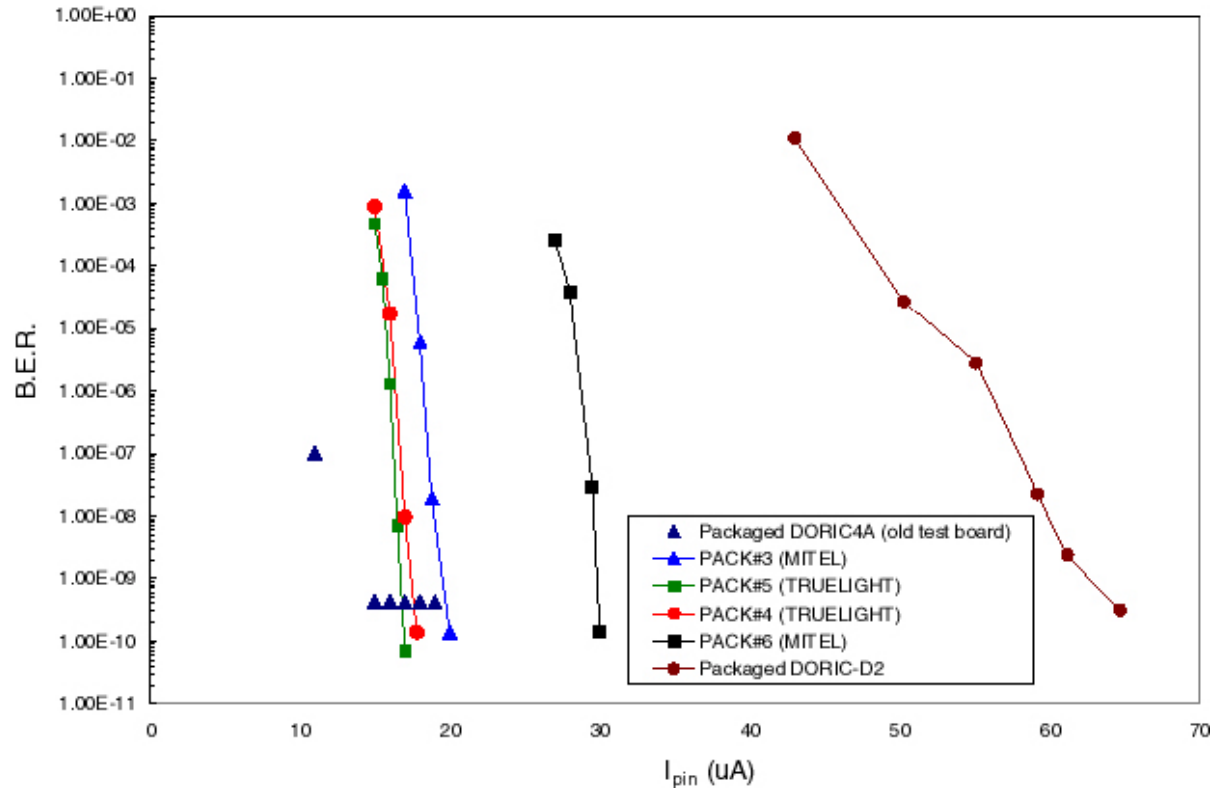
old



new



Bit Error Rate



- opto-link can run with no bit error at low PIN current

Summary

- VDC/DORIC works in both DMILL and IBM submissions
 - ◆ some DORICs need to be run at high PIN current due to pre-amp offset
 - ◆ radiation hardness of DMILL appears inadequate
- more DMILL and IBM submissions planned