

Opto-Board

WBS 1.1.1.4

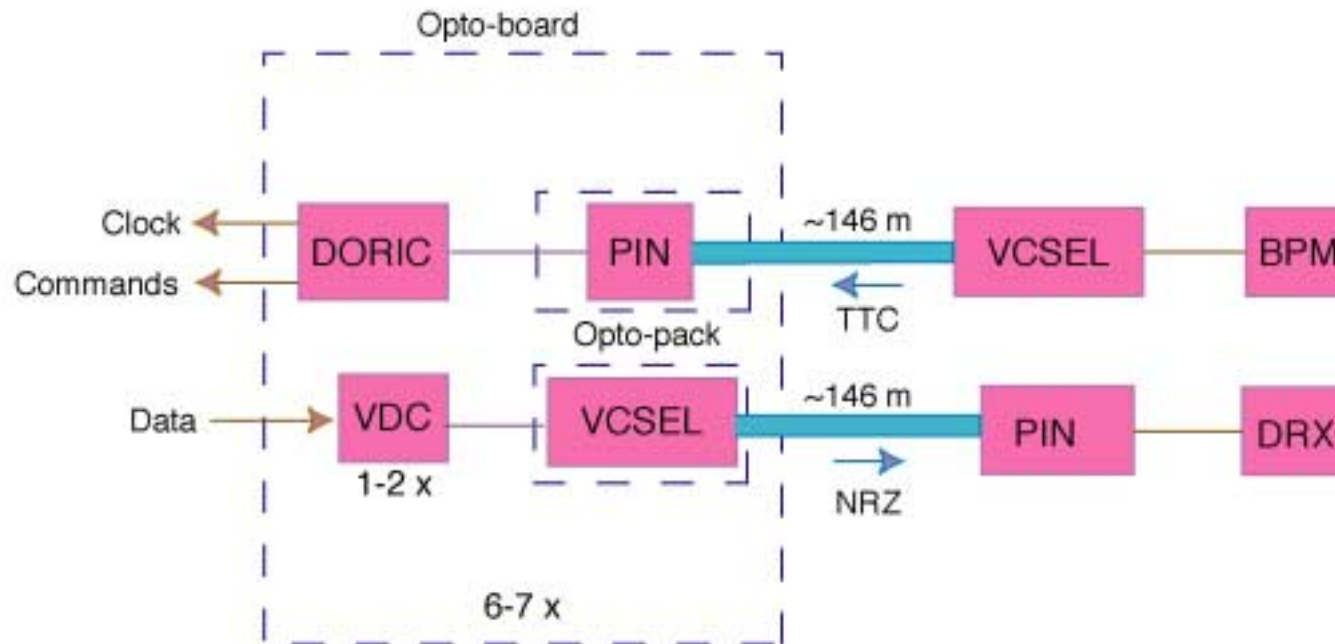
K.K. Gan

The Ohio State University

Outline

- Introduction
- Opto-board design
- Cost and schedule summary
- Conclusions

ATLAS Pixel Opto-link



OSU Responsibilities

- design and testing of VDC and DORIC
 - ☆ testing 50% of final production
- design, fabrication, and testing of opto-boards
 - ☆ fabrication and testing of disk sector in final production

OSU ATLAS Personnel

- Faculty
K.K. Gan, Harris Kagan, Richard Kass
- Post-docs
Mike Zoeller
- Graduate Students
Kregg Arms, Rouben Ter-Antonian
- Engineers
Mark Johnson, Chuck Rush
- Technicians
Jim Burns, Shane Smith, Bob Wells

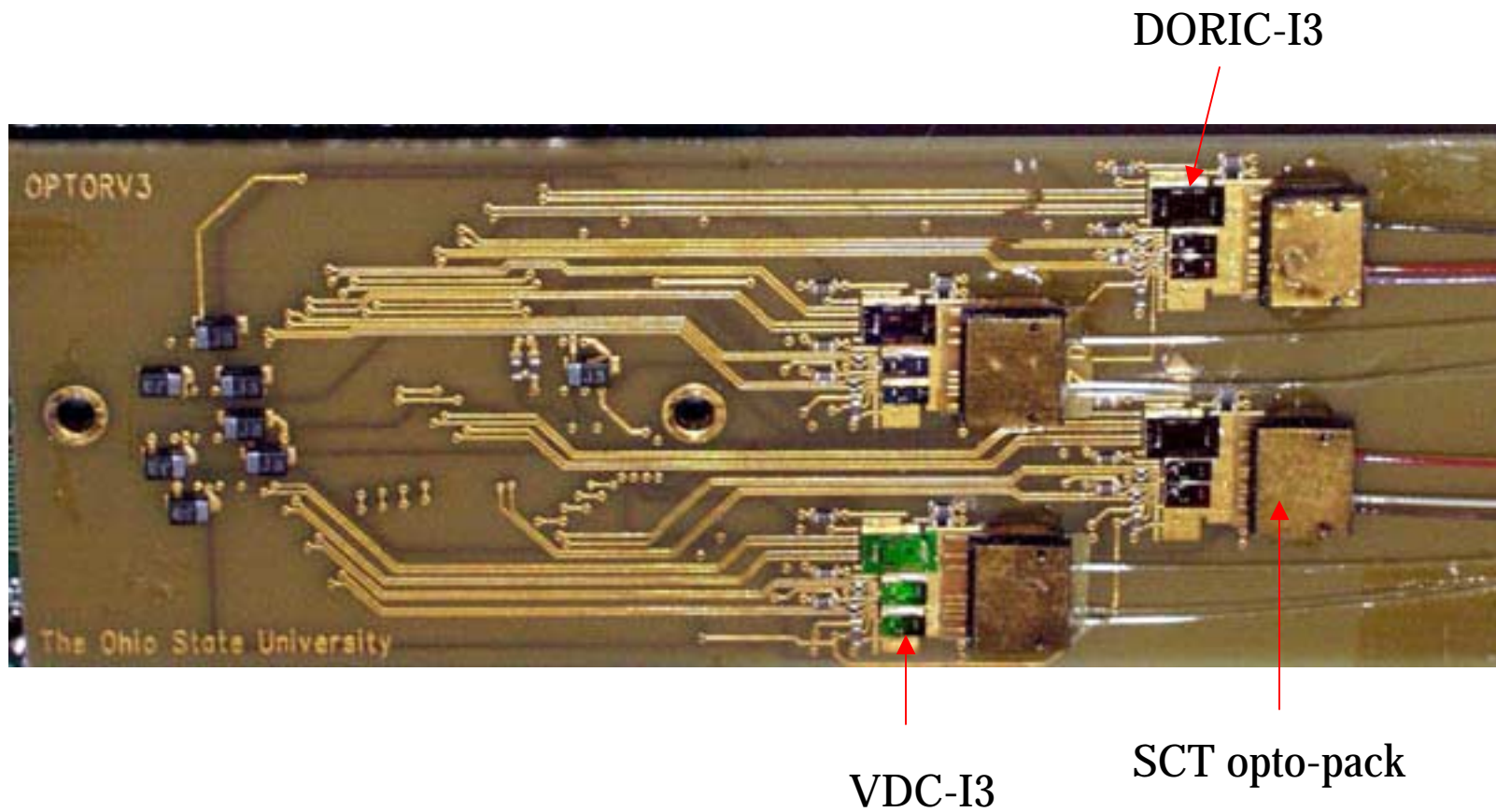
Opto-Board

- converts: **optical signal** ↔ **electrical signal**
- contains 6-7 optical links:
 - ☆ layers 1 and 2 optical link:
 - ◆ DORIC, VDC, PIN/VCSEL (opto-pack)
 - ☆ B layer optical link:
 - ◆ DORIC, 2 VDC, PIN/2 VCSEL (opto-pack)
- use BeO for heat management but prototype initially in FR4 for fast turnaround and cost saving

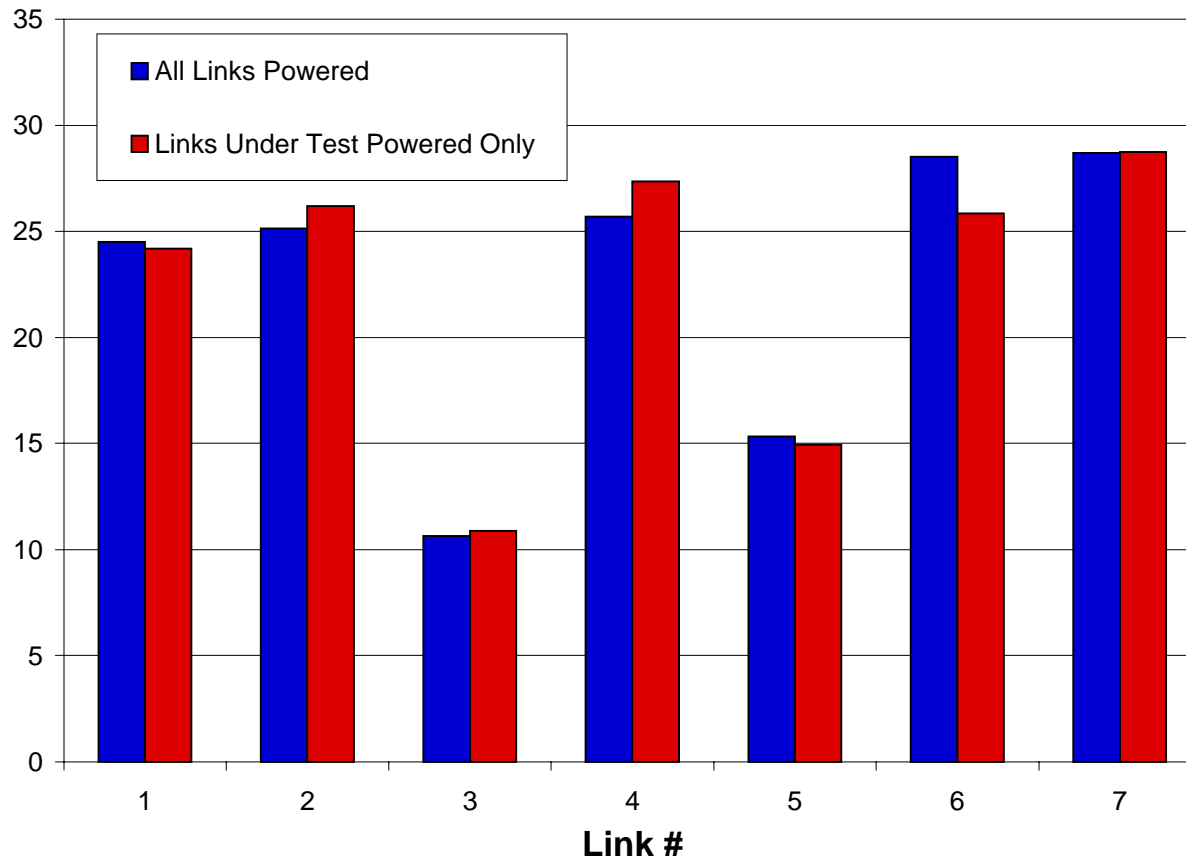
Opto-Board Prototypes

- opto-board prototype I:
 - ☆ designed for DORIC/VDC-D2
- opto-board prototype II:
 - ☆ designed for DORIC/VDC-I1
- opto-board prototype III:
 - ☆ designed for DORIC- I2/4-channel VDC-I2
 - ☆ contain 7 opto-links for use in barrel and disk
 - ☆ use SCT style opto-packs
 - ☆ use 80-pin connector

Opto-Board Prototype III



PIN Current Threshold of DORIC-I3

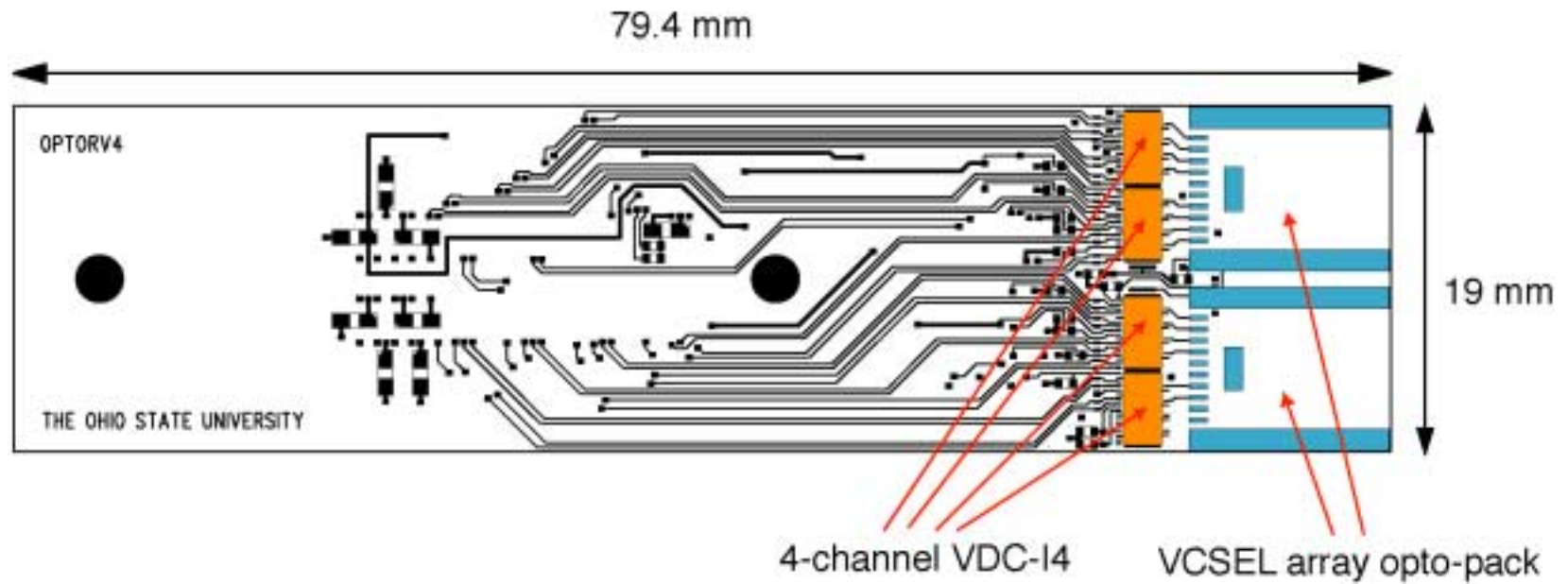


- PIN current threshold for no bit errors below SCT spec.
- no degradation in thresholds when all links are active

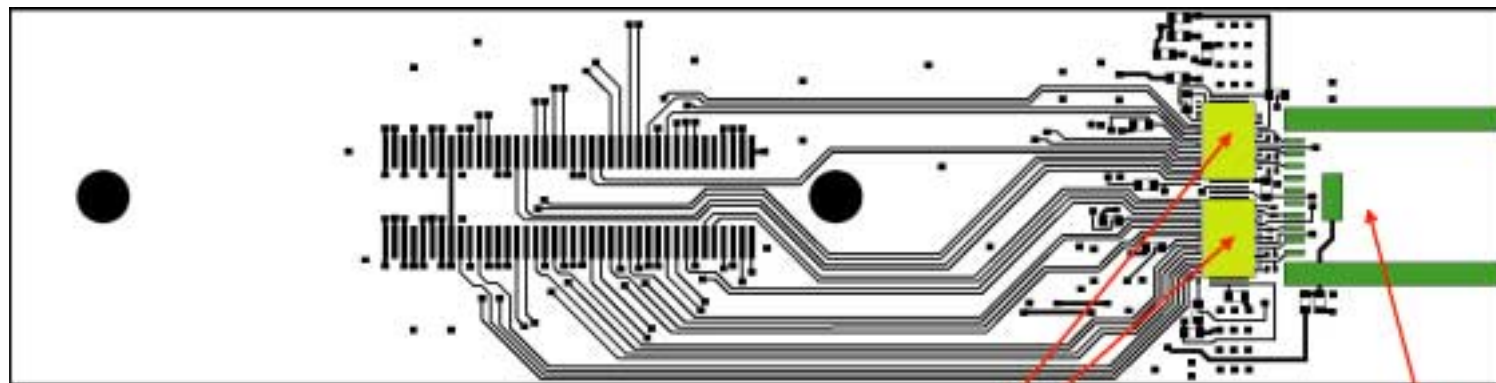
Opto-Board Prototype IV

- design for 4-channel DORIC- I4 and VDC-I4
- contain 7 opto-links for use in barrel and disk
- use 8-channel PIN/VCSEL array opto-packs
- use 80-pin connector
- last FR4 prototype before using BeO
- delivered this week

Opto-Board Prototype IV (Top)



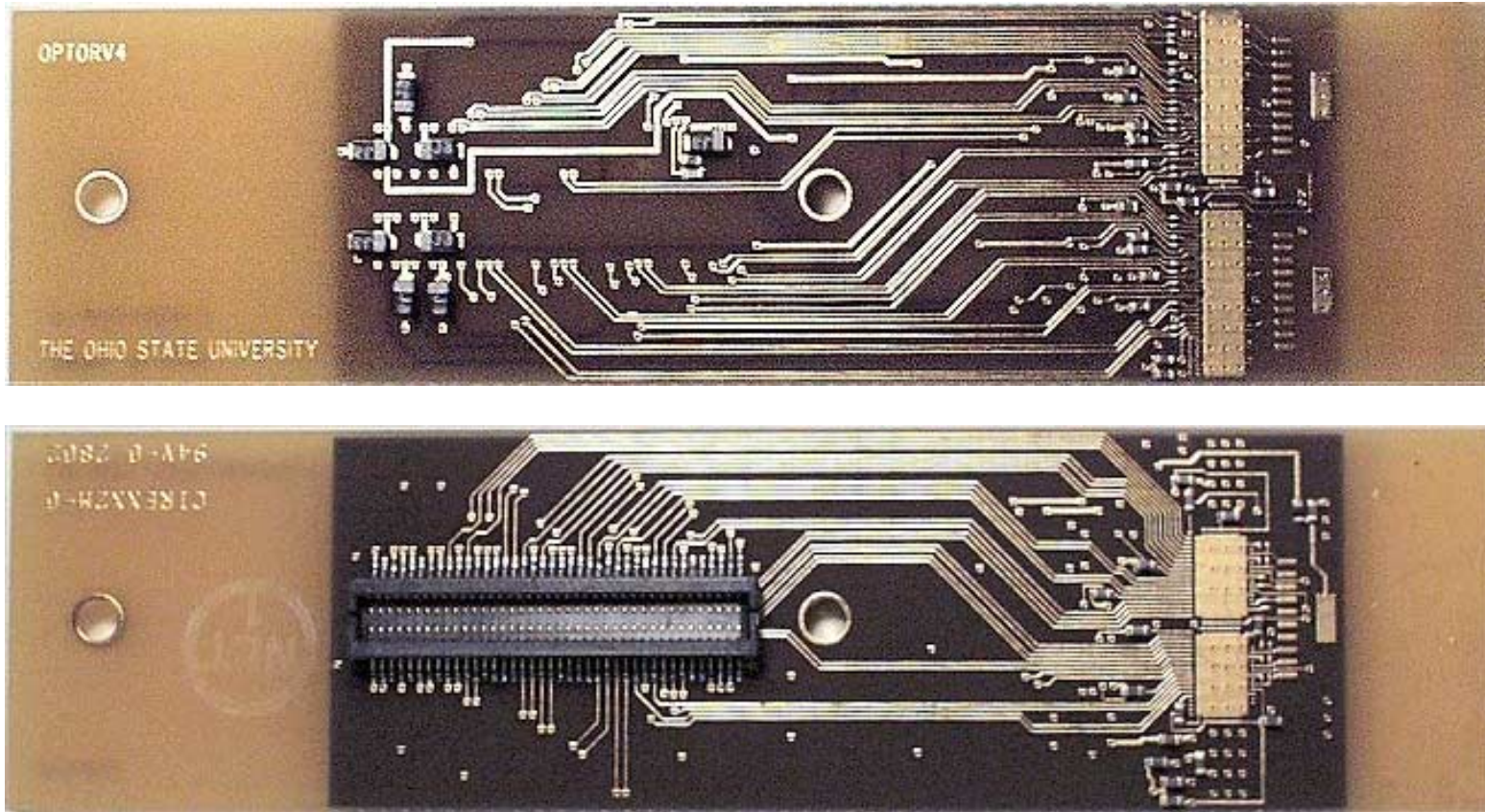
Opto-Board Prototype IV (Bottom)



4-channel DORIC-I4

PIN array opto-pack

Opto-Board Prototype IV

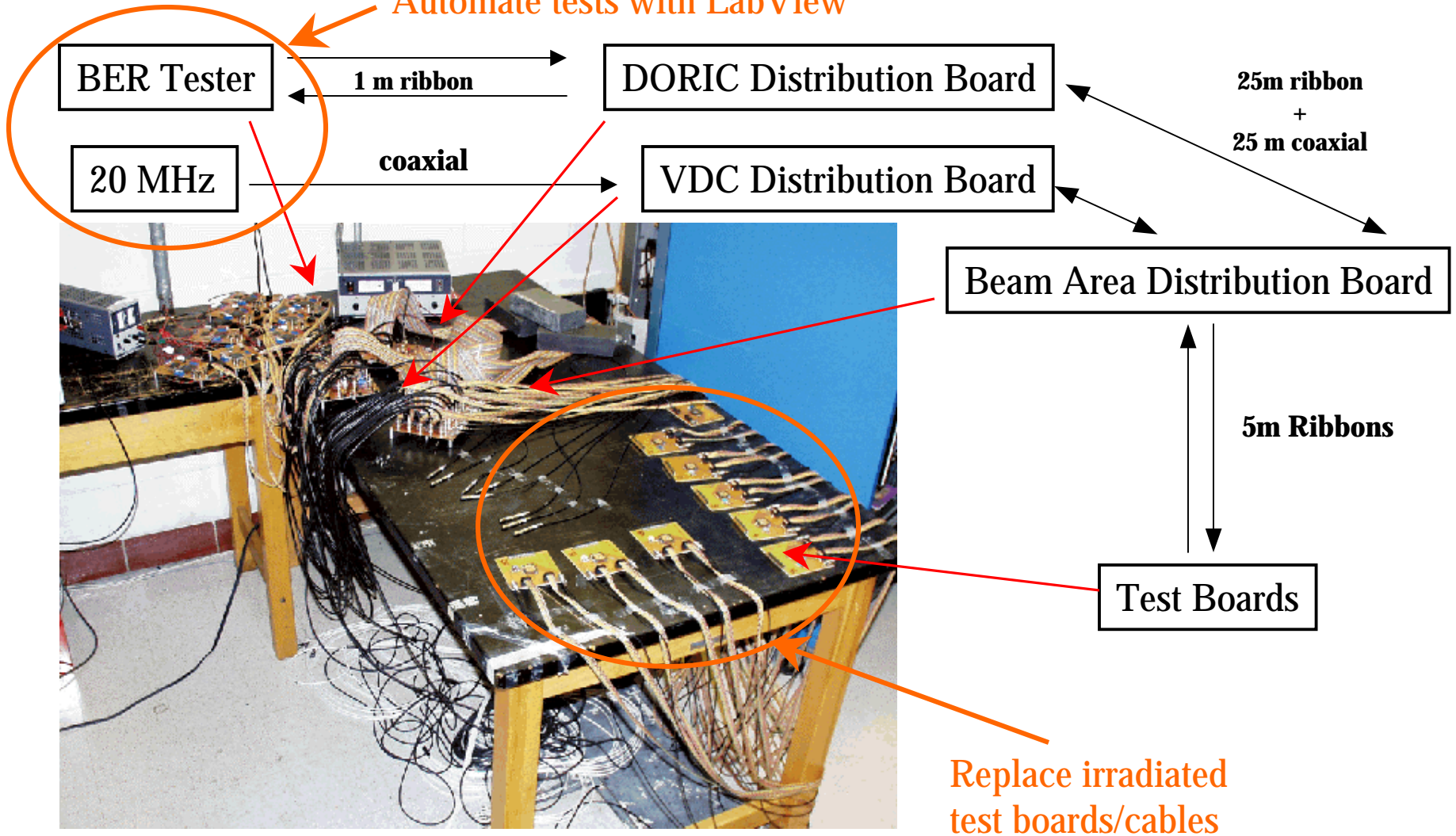


Opto-Link Proton Irradiation

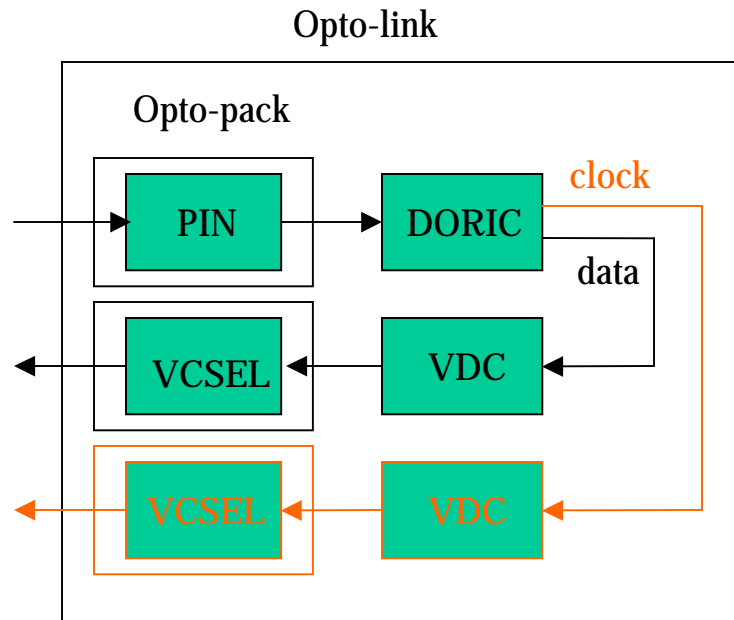
- April 2000:
 - ☆ designed and fabricated test boards for VDC-D1 irradiation
- April 2001:
 - ☆ designed and fabricated test systems:
 - ◆ packaged DORIC-D2 and VDC-D2 irradiation in cold box
 - ◆ optical link irradiation on shuttle
- September 2001:
 - ☆ designed and fabricated much improved test systems
- August 2002:
 - ☆ automate all measurements under LabView

Test Boards for Irradiation in Cold Box

Automate tests with LabView

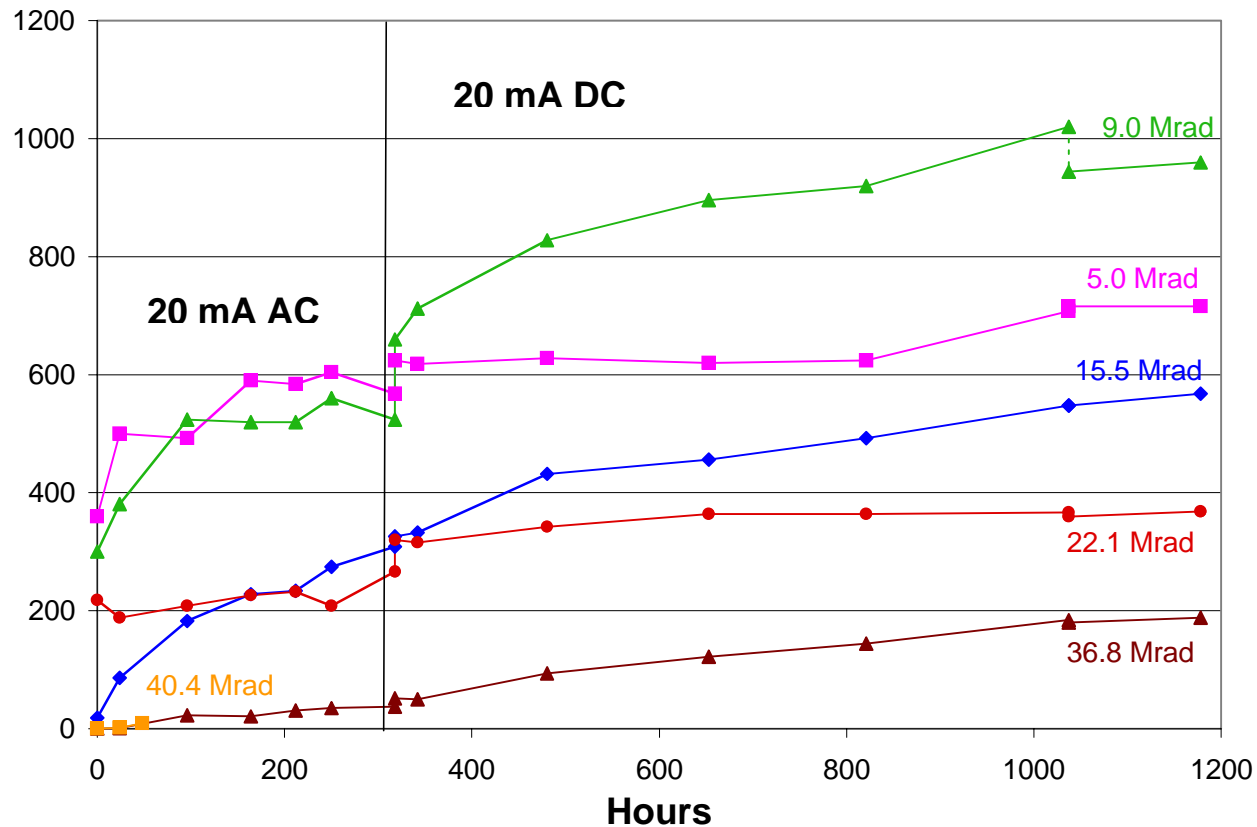


Irradiation in Shuttle



- decoded clock will now be checked
- ☆ double number of VCSEL tested

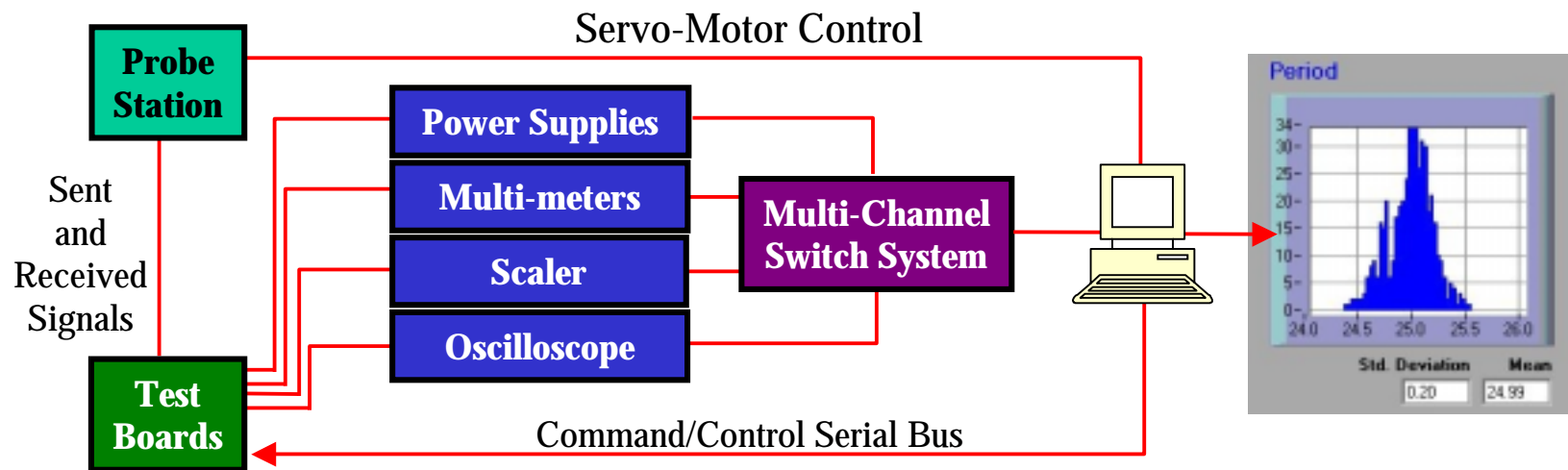
VCSEL Annealing



- need more statistics to verify that irradiated VCSEL meet spec.
- need longer and more frequent annealing
- AC and DC currents produce similar annealing

ASIC Testing

- automation using LabView implemented
- stand-alone test-boards redesigned for use with computer interface
- probe-card with LabView interface implemented for testing dice
 - ⇒ continual monitoring of tests for long periods (ie: irradiation)
 - ⇒ large statistical samples of measurements possible
 - ⇒ makes mass testing of ASICs feasible (500 dice to test)



Changes in ETC03

- fabricate test boards/automate testing of I2, I3, I4 in FY02
 - ☆ expect cost overrun of \$15K in FY02
- submit VDC/DORIC-4A with FE in FY03 (Nov/Dec)
- no fund allocated in FY03 for:
 - ☆ testing of VDC/DORIC-4A with FR4/BeO opto-boards
 - ☆ irradiation of VDC/DORIC-4A
 - ☆ fabricate test boards to work with DRX/BPM
 - ☆ technician for opto-board production
- WBS 1.1.1.4 FY03
 - ☆ ETC02: \$85 K
 - ☆ ETC03: \$85 K+\$15K+tech

Opto-Board Milestones

WBS	Task_Name	Baseline Date	ETC02 Date	ETC03 Date
1.1.1.4.1	Optical FDR	31-Jan-02	10-Oct-02	28-Feb-03
	Optical PRR	5-Mar-03	12-Jun-03	12-Jun-03
	Release initial MC for optical components	19-Mar-03		26-Jun-03
1.1.1.4.3	First optical boards	20-Aug-03		20-Nov-03
	Optical production complete	24-Dec-03		24-May-04

Summary

- opto-board prototype III operates with low noise/cross talk
- opto-board prototype IV fabricated
- expect to submit first BeO prototype in Fall 02
- automated opto-link lab and irradiation testing