



Accelerated Lifetime Test Of Opto-Boards

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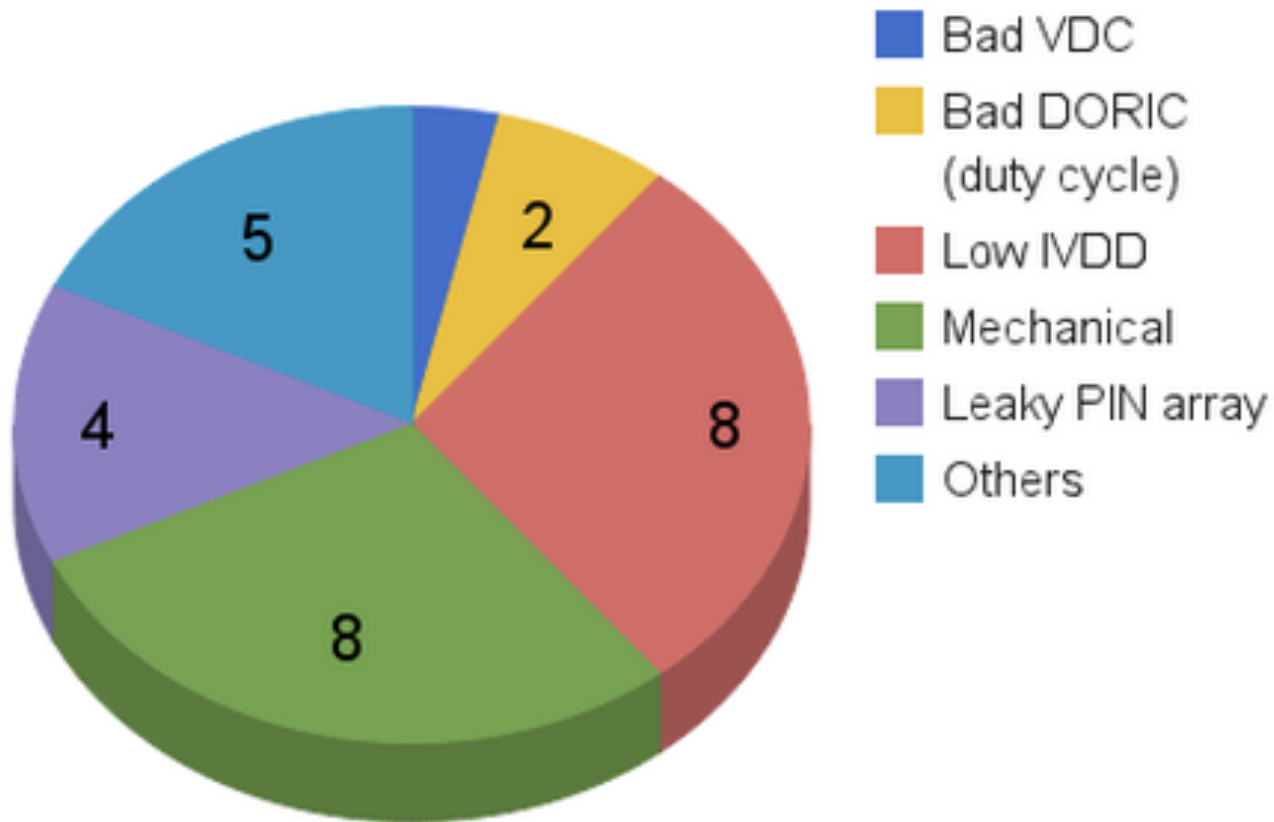
Oct 16, 2014



Summary of Failed Boards

- 28 out of the 421 opto-boards failed to pass the QA

Failed Opto-Boards





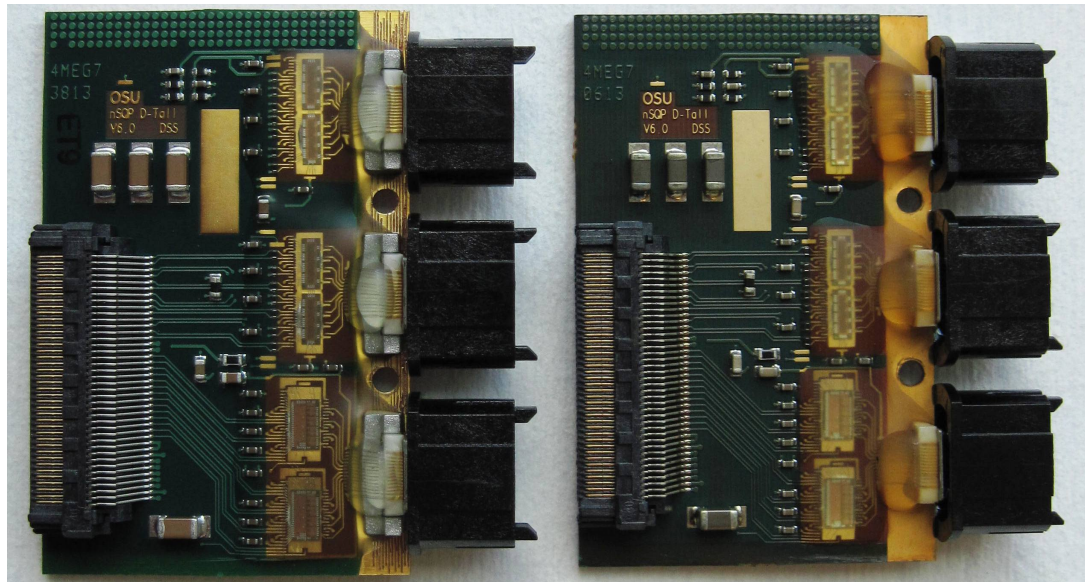
Failure Analysis

- Several of the 421 boards have problems after burn-in/thermal cycles:
 - ◆ 1 VDC: cannot adjust drive current
 - ◆ 8 VCSEL arrays have low power
 - 3 failed for thermal cycle outside Finisar spec: -25 C
 - ⇒ thermal cycle: 0-50 C
 - 5 arrays not properly glued to BeO substrate
 - ◆ 4 leaky PIN arrays



Accelerated Lifetime Test

- Industry standard: opto-boards should survive for 1,000 hours at 85°C/85% relative humidity
 - ◆ operate each VCSEL channel with 10 mA (pk-pk)
 - ◆ perform weekly measurements
 - VCSEL optical power
 - PIN dark current
 - supply current
 - operate with no error in all channels

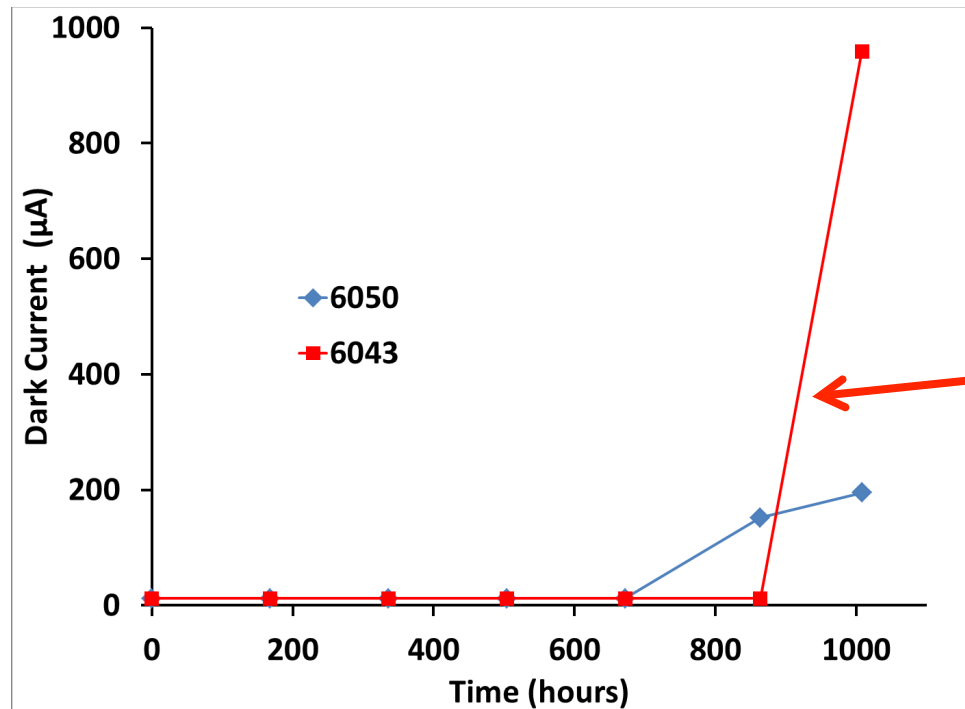


After 1,500 hours
at 85°C/85% RH



Accelerated Lifetime Test-Phase I

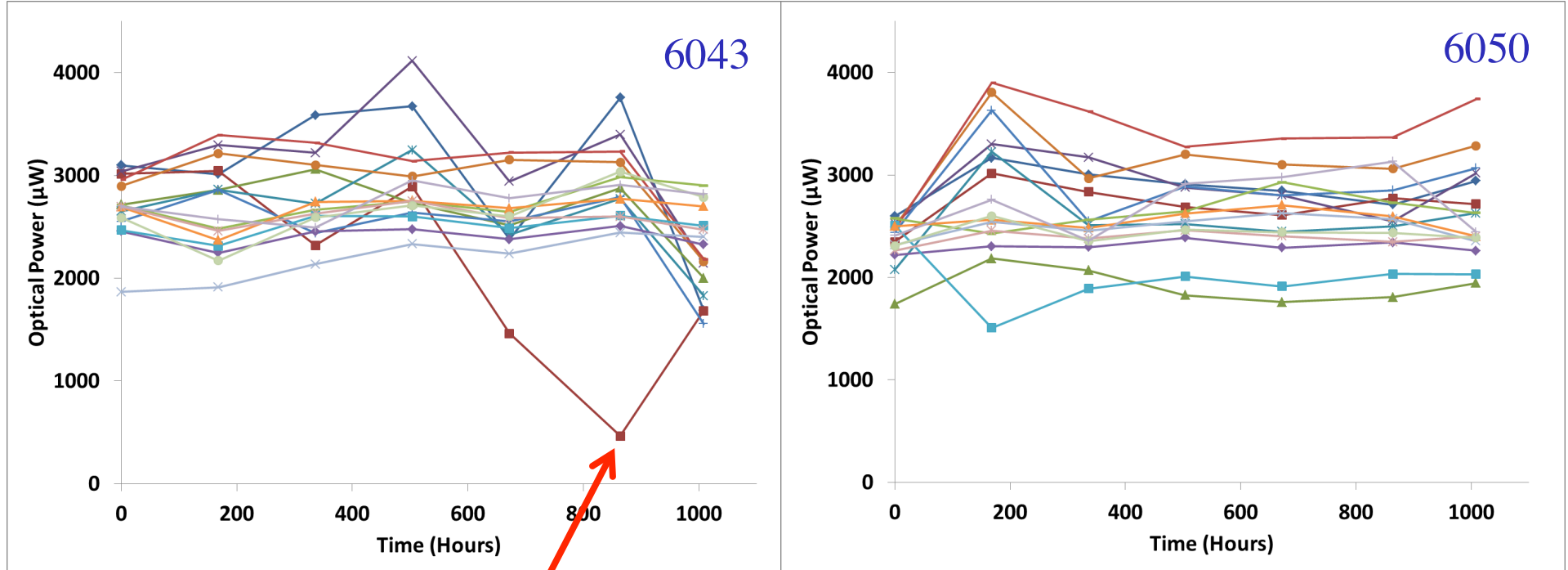
- Started the test with two IBL boards on Feb. 2014
- ◆ All VCSEL channels survived
- ◆ Both PIN arrays became leaky before 1,000 hours
 - PIN biased at 10 V
 - ULM photonics: recommend operate at 5 V even though spec. sheet lists bias as up to 10 V





Accelerated Lifetime Test-Phase I

- VCSEL optical power OK up to 1,008 hours in 85°C/85% RH

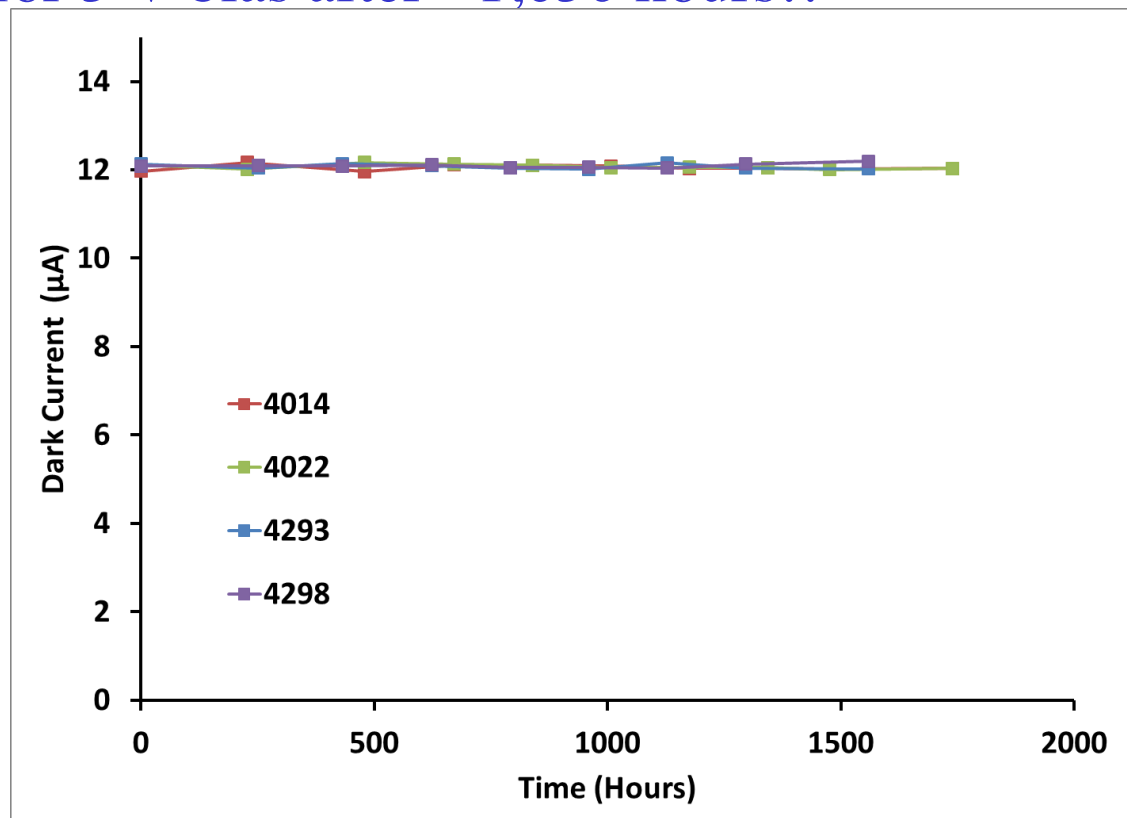


Dirty VCSEL



Accelerated Lifetime Test-Phase II

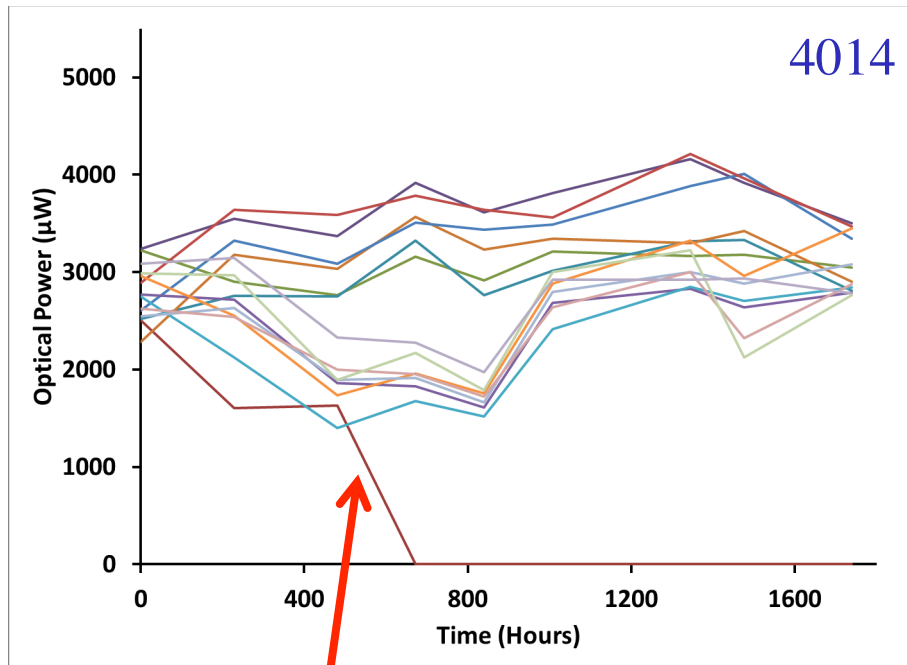
- June/July: started four D opto-boards in 85°C/85% RH
 - ◆ 2 boards fabricated in 6/2013: optical power OK after 1,740 hours
 - ◆ 2 boards fabricated in 12/2013: optical power OK after 1,560 hours
 - ◆ PIN arrays biased at 10 V in ~4 days of burn-in/thermal cycle
 - No leaky PIN arrays for 5 V bias after ~1,650 hours!!





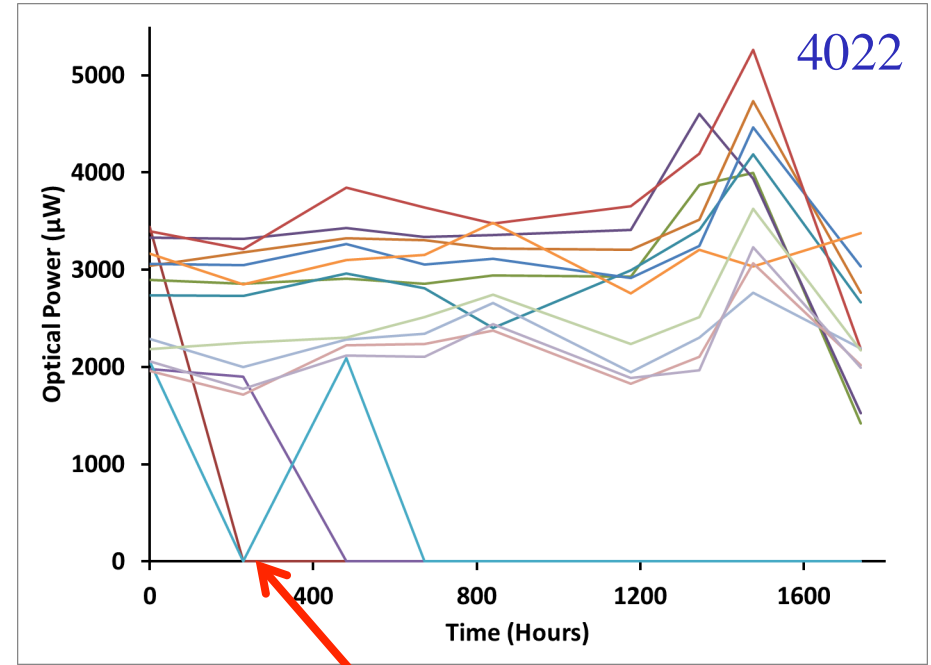
Accelerated Lifetime Test-Phase II

- VCSEL optical power OK up to 1,740 hours in 85°C/85% RH



Wirebond broken during cleaning

K.K. Gan



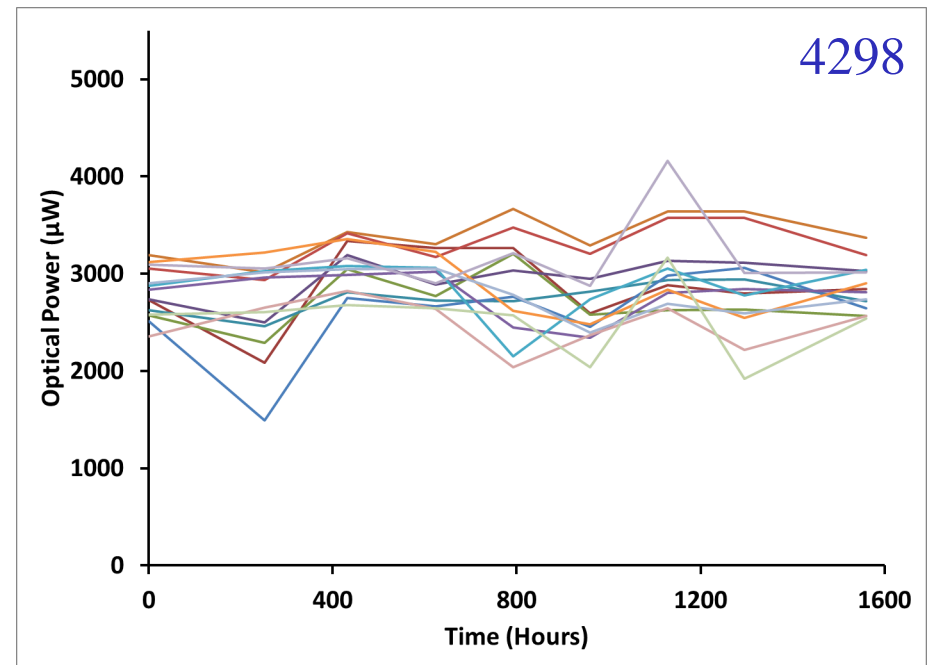
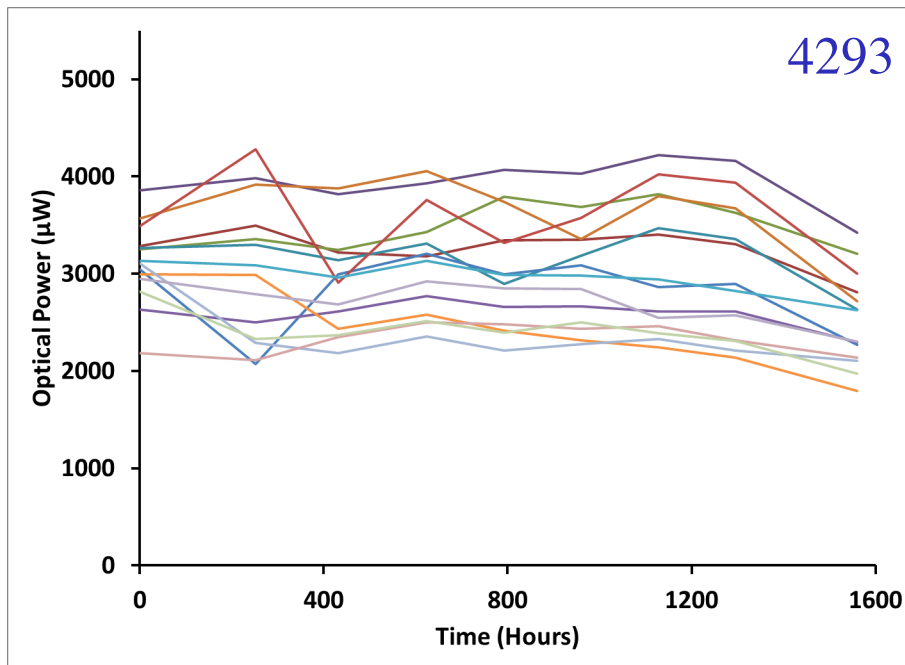
Board dropped

Pixel Week



Accelerated Lifetime Test-Phase II

- VCSEL optical power OK up to 1,560 hours in 85°C/85% RH





Summary

- production opto-boards passed accelerated lifetime test
 - ◆ 10 V bias degrades PIN array lifetime!
- planning to begin long term 50°C/50% RH study next