



Results from Opto-Boards Irradiation

B. Cote, K.K. Gan, H. Kagan, C. Martin, Z. Pollock, S. Smith, B. Tar, C. Tandoi
The Ohio State University

November 6, 2018



Outline

- Introduction
- Degradation of Optical Power with Irradiation
- Result from Post-Mortem
- Plan for the next Irradiation
- Future Plan



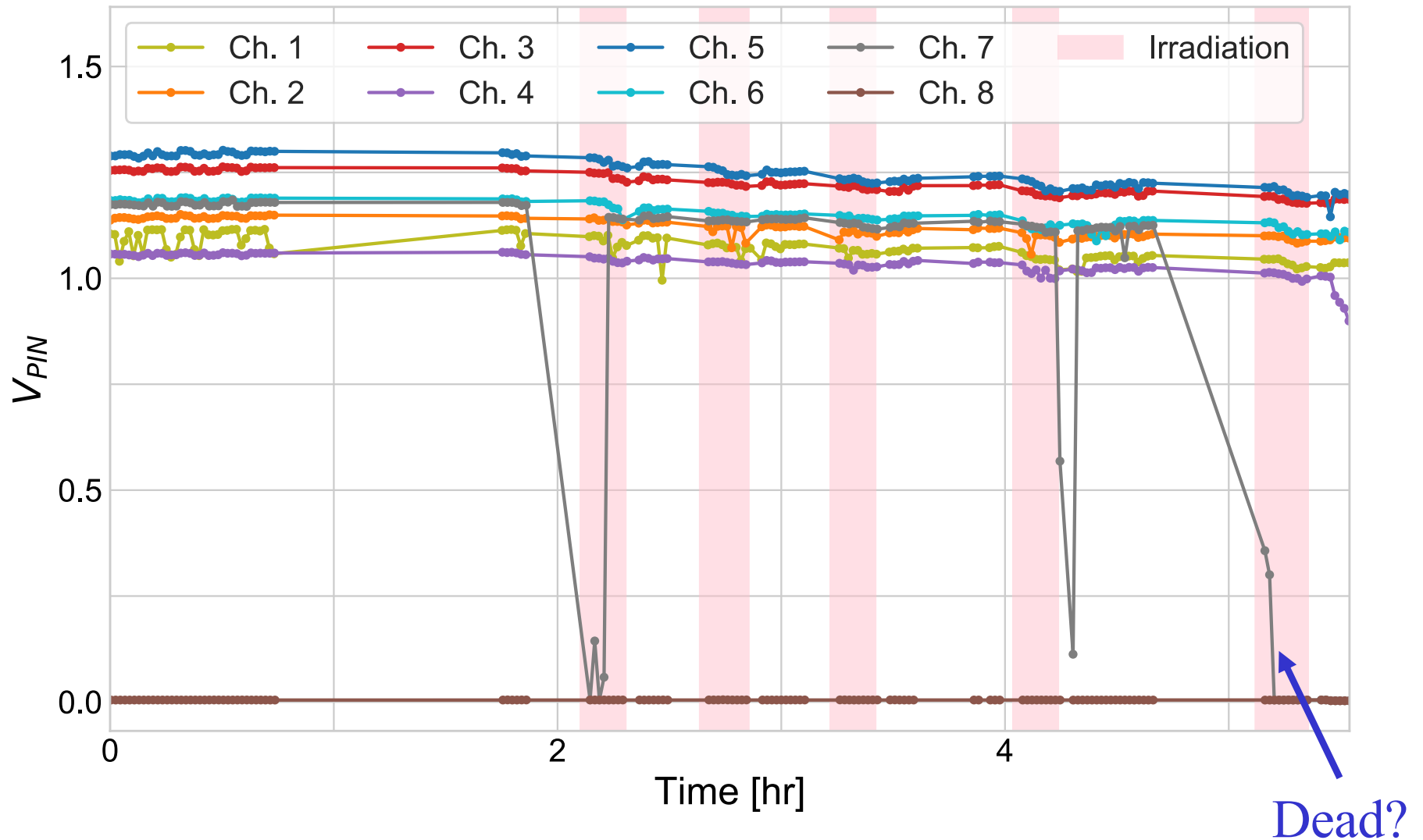
Introduction

- Initial plan:
 - 4 opto-boards each from Finisar, ULM, II-VI
 - One month delay in delivery II-VI VCSEL and Opto-board PCB
 - ⇒ 4 Finisar and 4 ULM opto-boards were fabricated for irradiation
 - ◆ 64 Finisar and 64 ULM VCSEL channels
 - ◆ 32 Finisar and 32 ULM PIN channels
 - ◆ First fabrication of opto-board since March 2014
 - ◆ No time for QA/thermal cycle/burn-in
 - Target dose with 24 GeV protons: 3×10^{12} p/cm² for 200 fb⁻¹
 - ◆ IBL dose assumed with 50% safety factor
 - ◆ dose at none-IBL location: 5 x lower
 - ◆ Irradiated in five periods



Optical Power vs. Dose

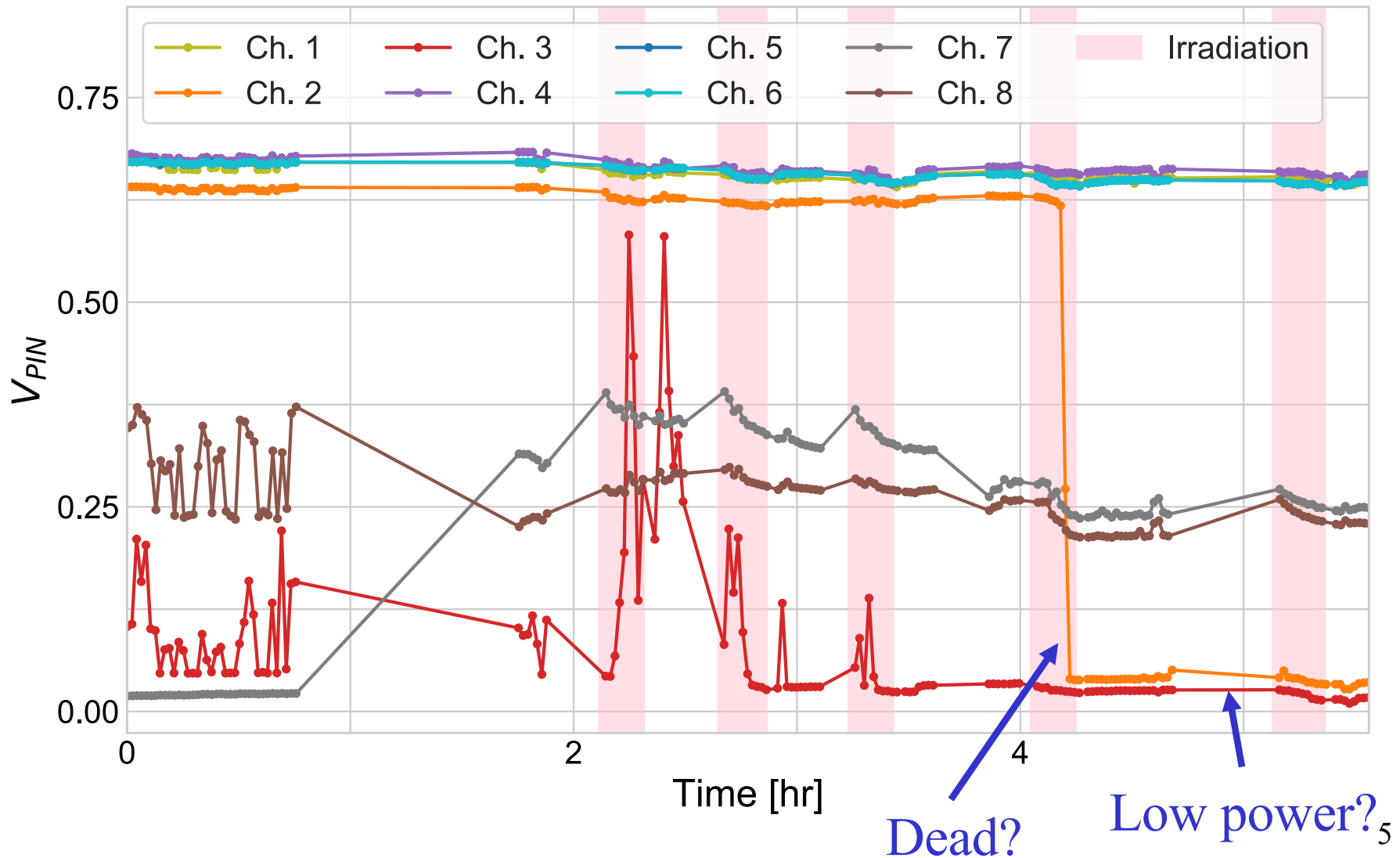
Finisar (Board 1)





Optical Power vs. Dose

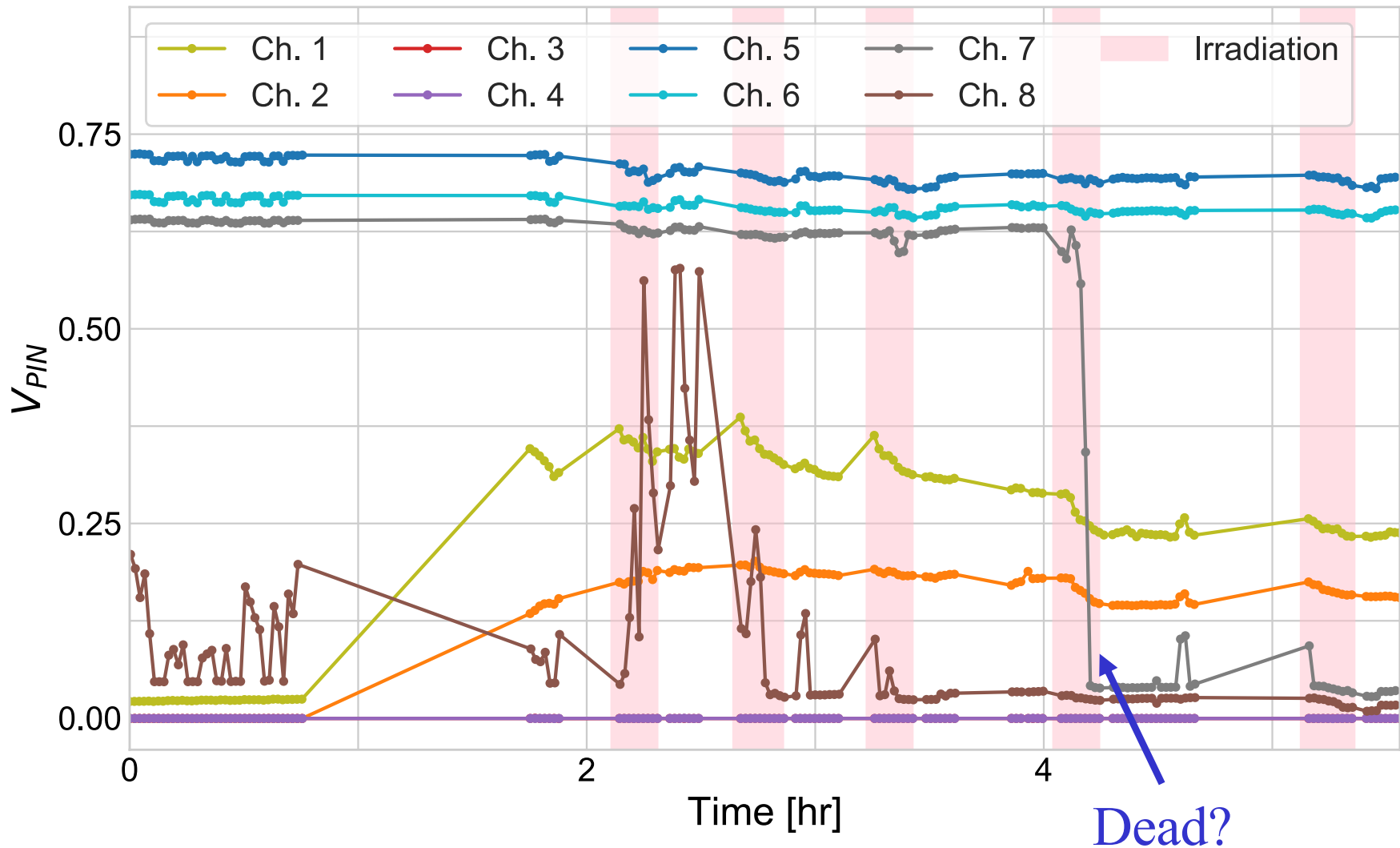
ULM (Board 7)





Optical Power vs. Dose

Finisar (Board 8)



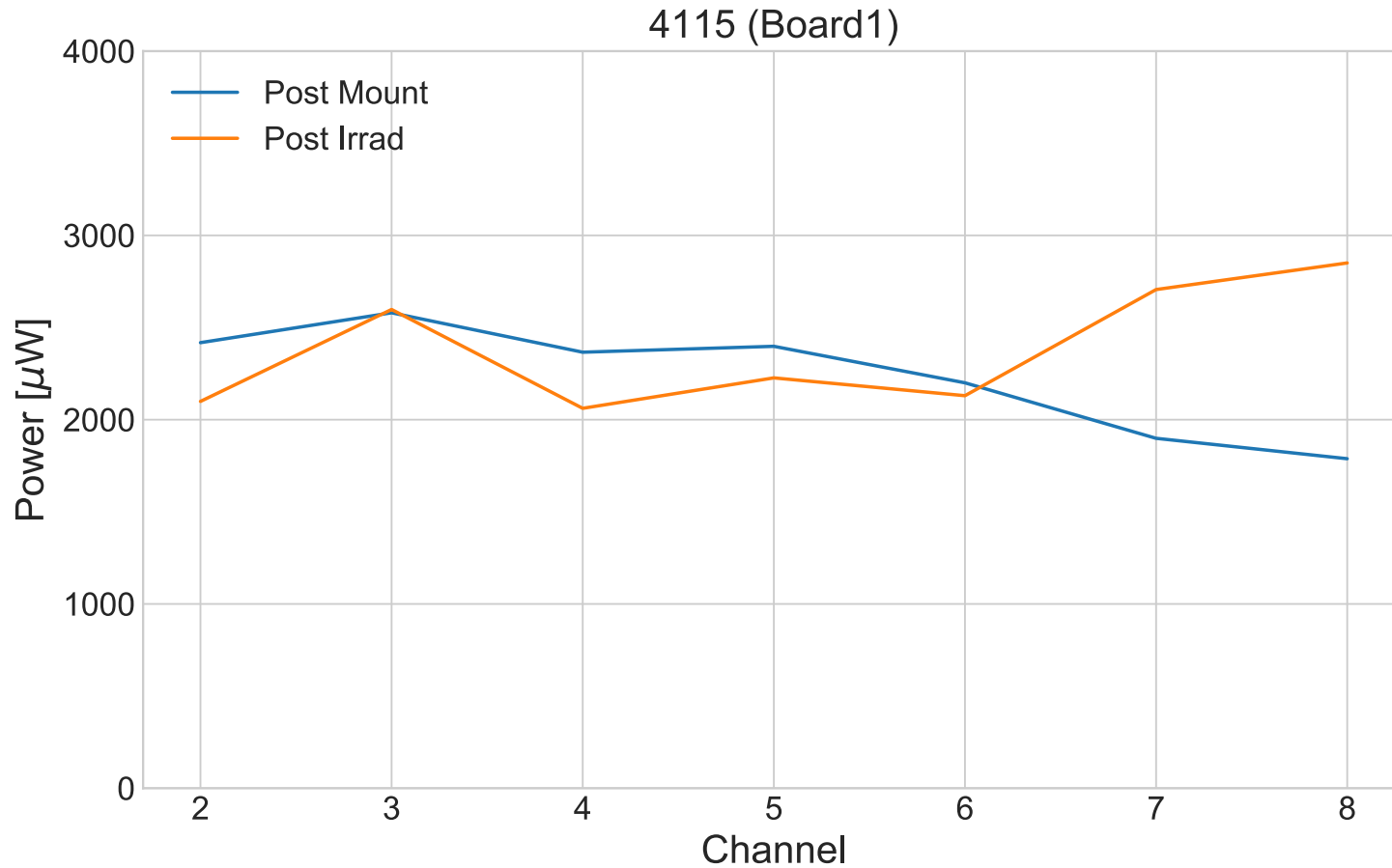


Summary of Irradiation

- Online monitor of 64 Finisar and 64 ULM VCSEL channels:
 - noisy: 11
 - low optical power: 8
 - no optical power: 11
 - dead: 3
- ⇒ post-mortem with opto-board test system at SR1



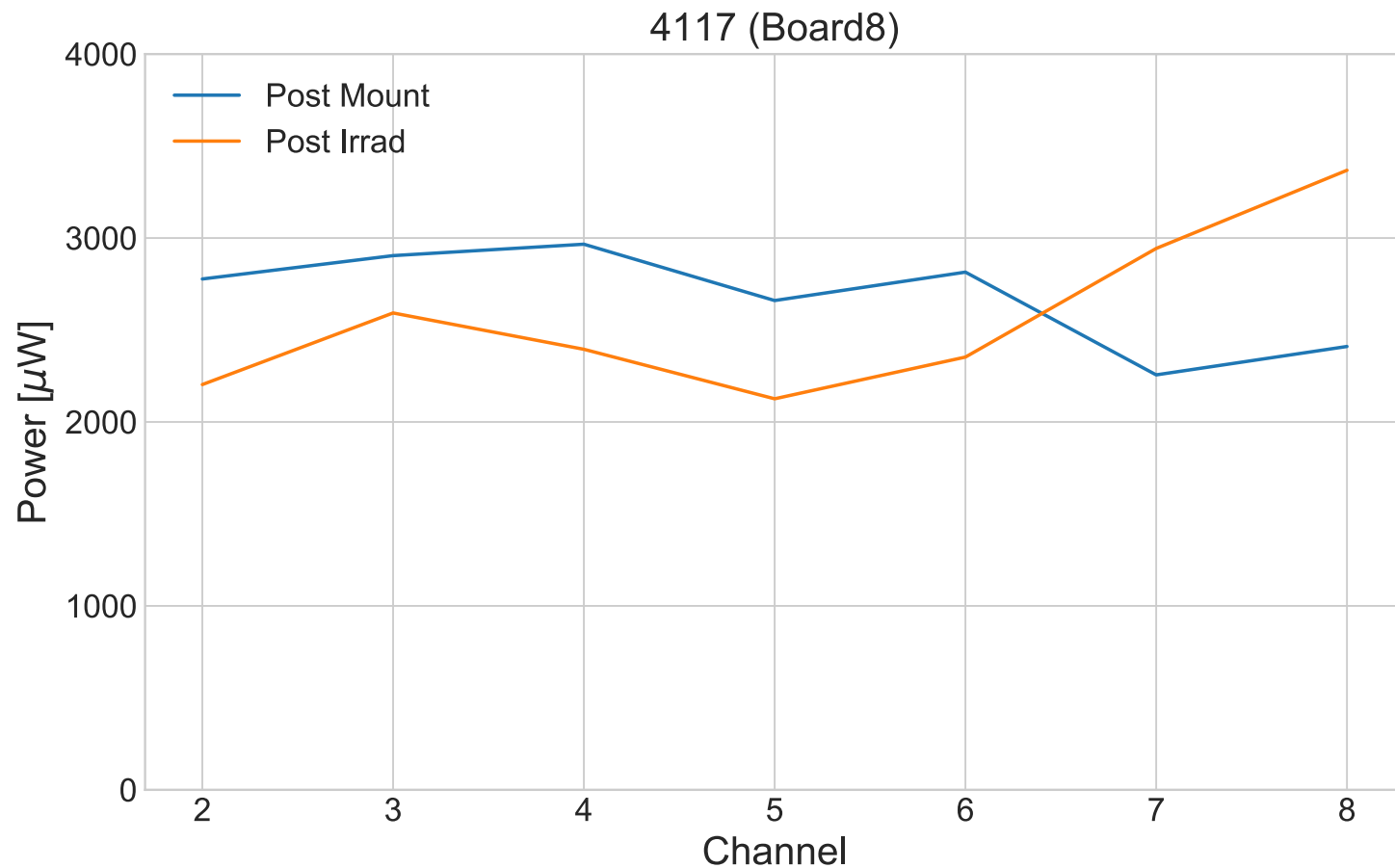
Optical Power of “Dead” Opto-Board



- Finisar: all channels are still operational with good optical power



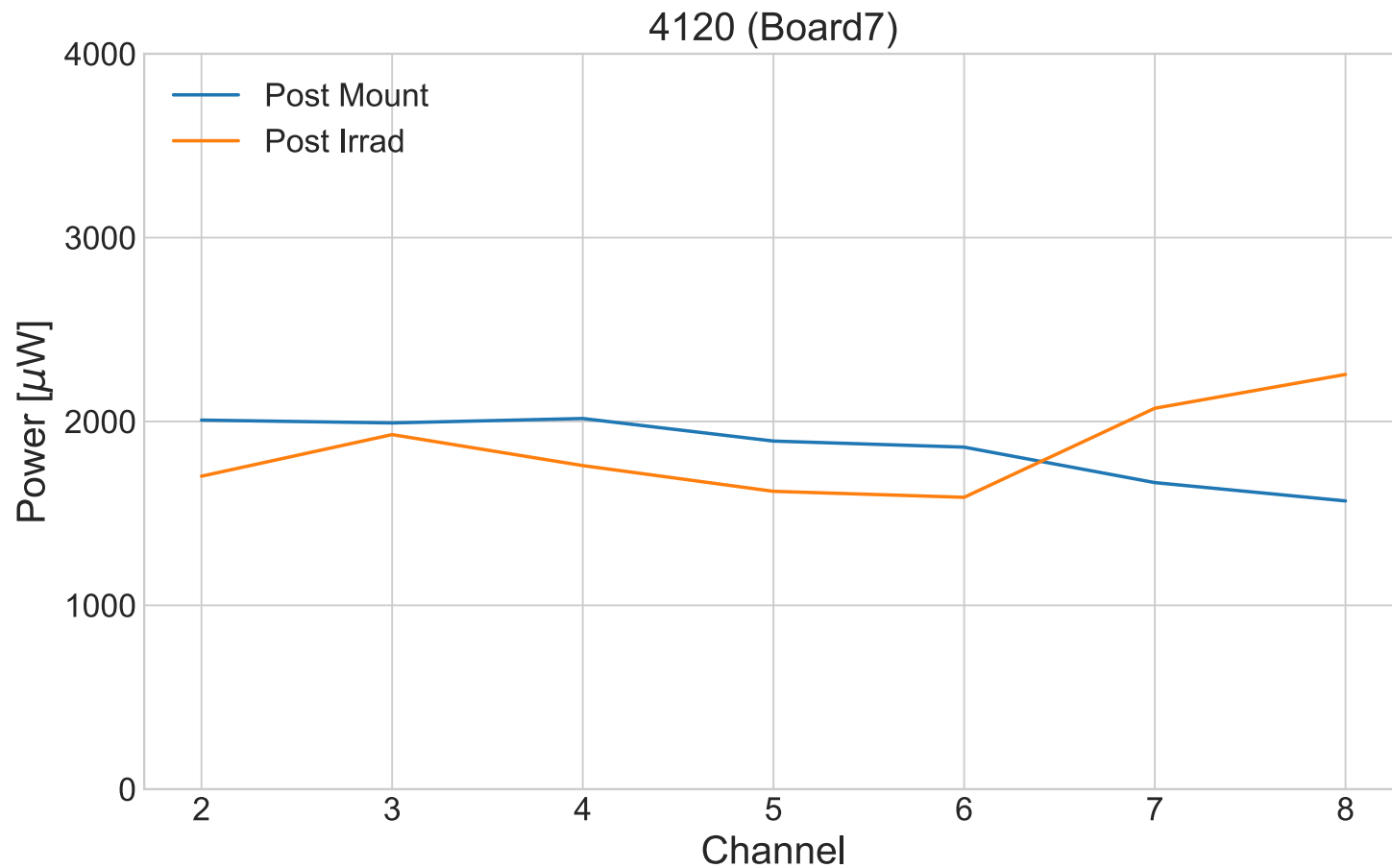
Optical Power of “Dead” Opto-Board



- Finisar: all channels are still operational with good optical power



Optical Power of “Dead” Opto-Board



- ULM: all channels are still operational with good optical power



Plan for Next Irradiation

- Another irradiation arranged thanks to:
 - Ludovico Pontecorvo/Federico Ravotti/Giuseppe Pezzullo
- 4 II-VI + 1 Finisar + 1 ULM opto-boards fabricated
 - irradiation will start on Wednesday
- Given the success with irradiation to IBL dose
 - ⇒ should we repeat the program?



Future Plan

- Complete design/fabrication of test system to study long term reliability of opto-boards with burst vs. continuous data transmission
- Fabricate 4 opto-boards of each flavor (Finisar, ULM, II-VI)
- Study of irradiated opto-boards returned to OSU after cool-down
- Review of results early next year to start production