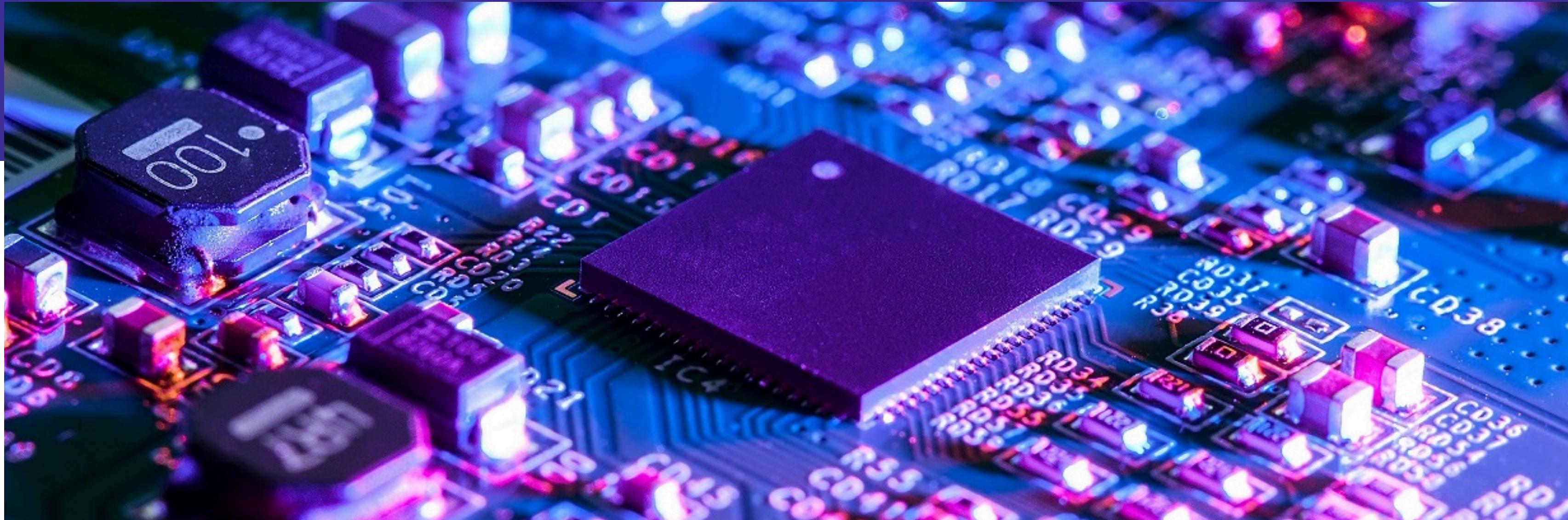


B2L Loss Study at UH Testbench

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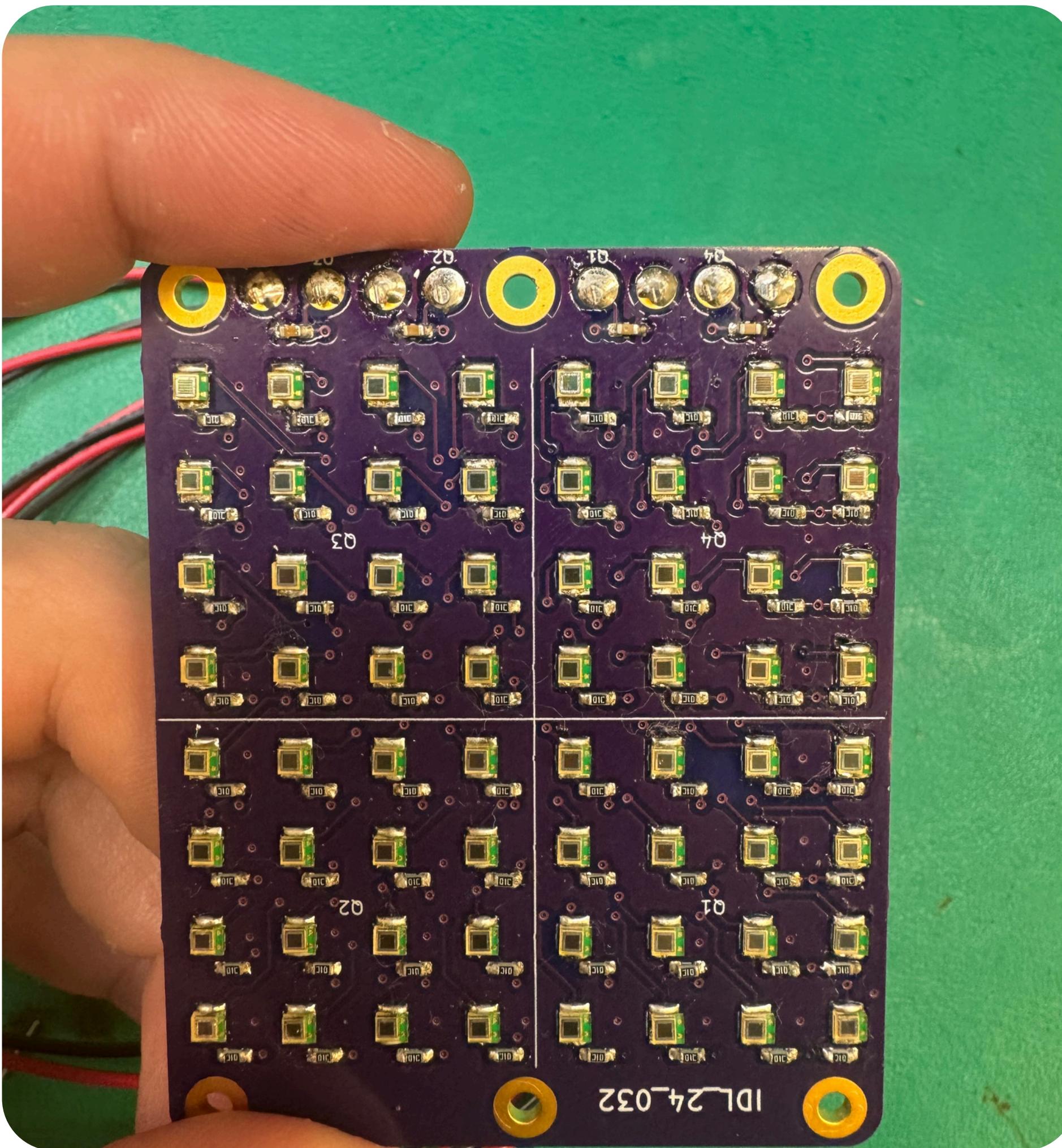
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Introduction

- Connected TOP boardstack at UH to PCIE40:
 - Hoping to reproduce B2Link Loss.
 - Once the issue is identified, we can make plans to fix it.
 - Have not experienced any B2 Link Loss with the current setup.
- This setup also enables performance comparisons between SiPMs and MCP-PMTs:
 - Signal gain.
 - Dark current rate as a function of temperature.
- Using the setup to study AI/ML based feature extraction.

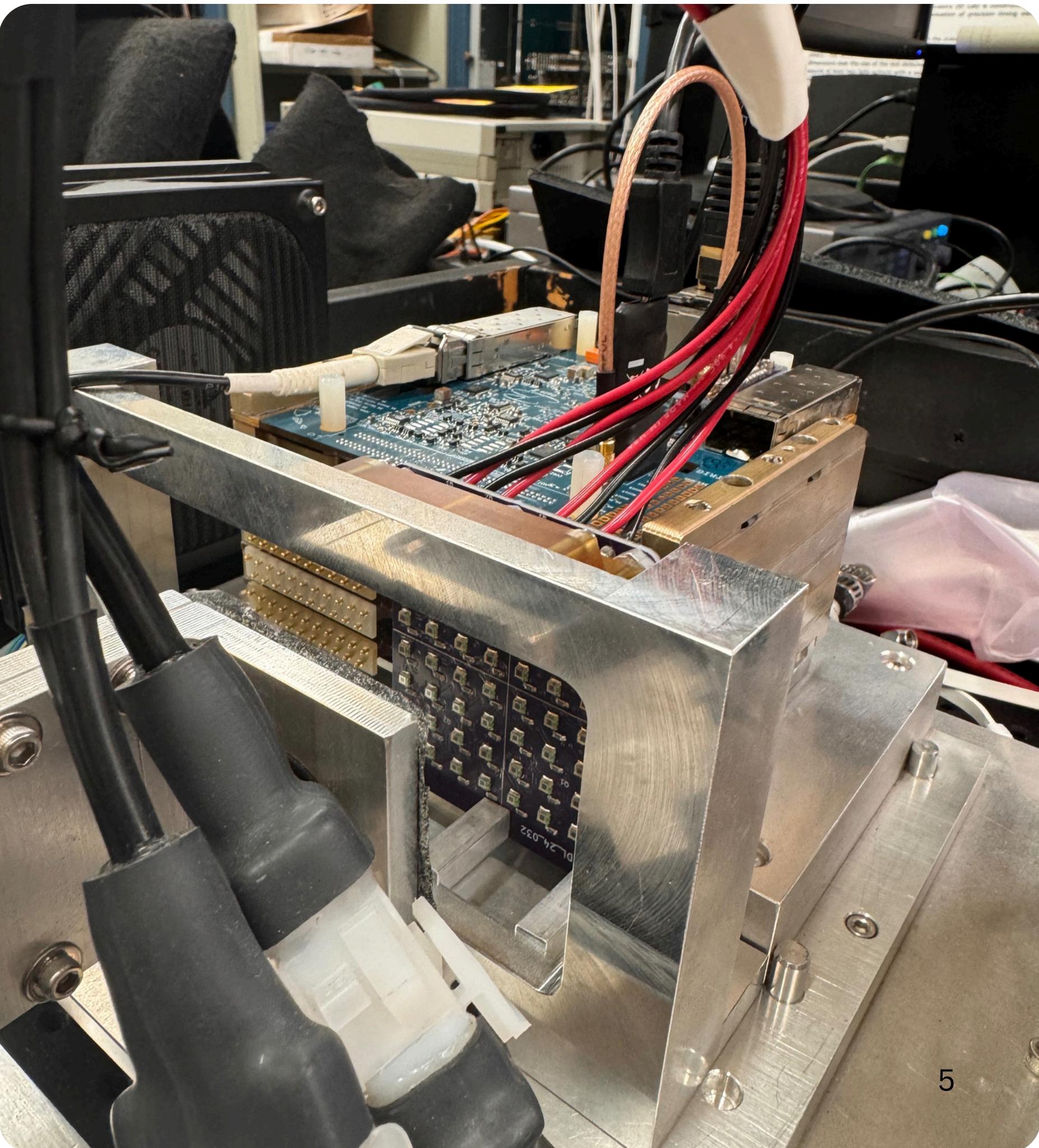
Design and Methods



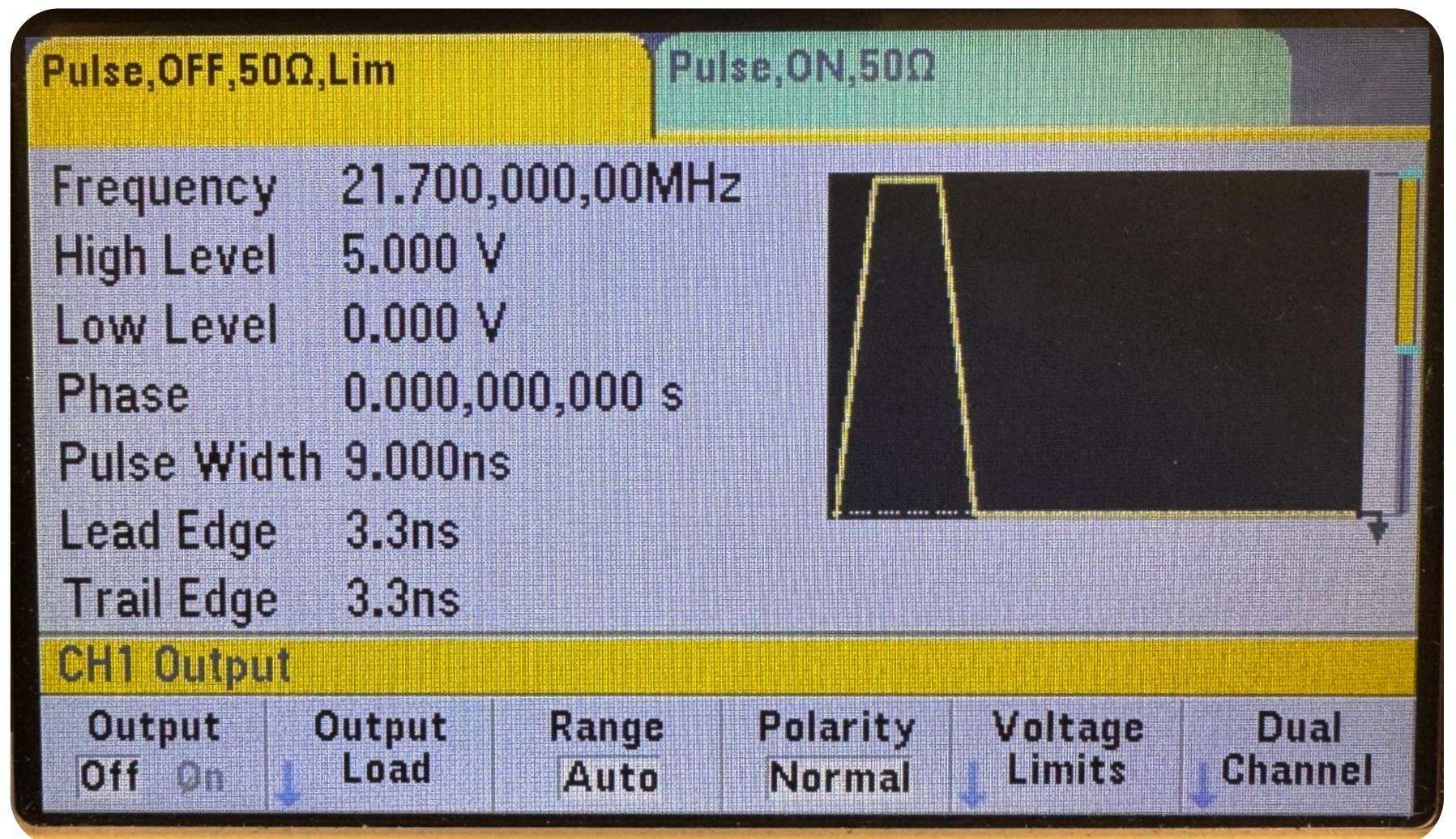
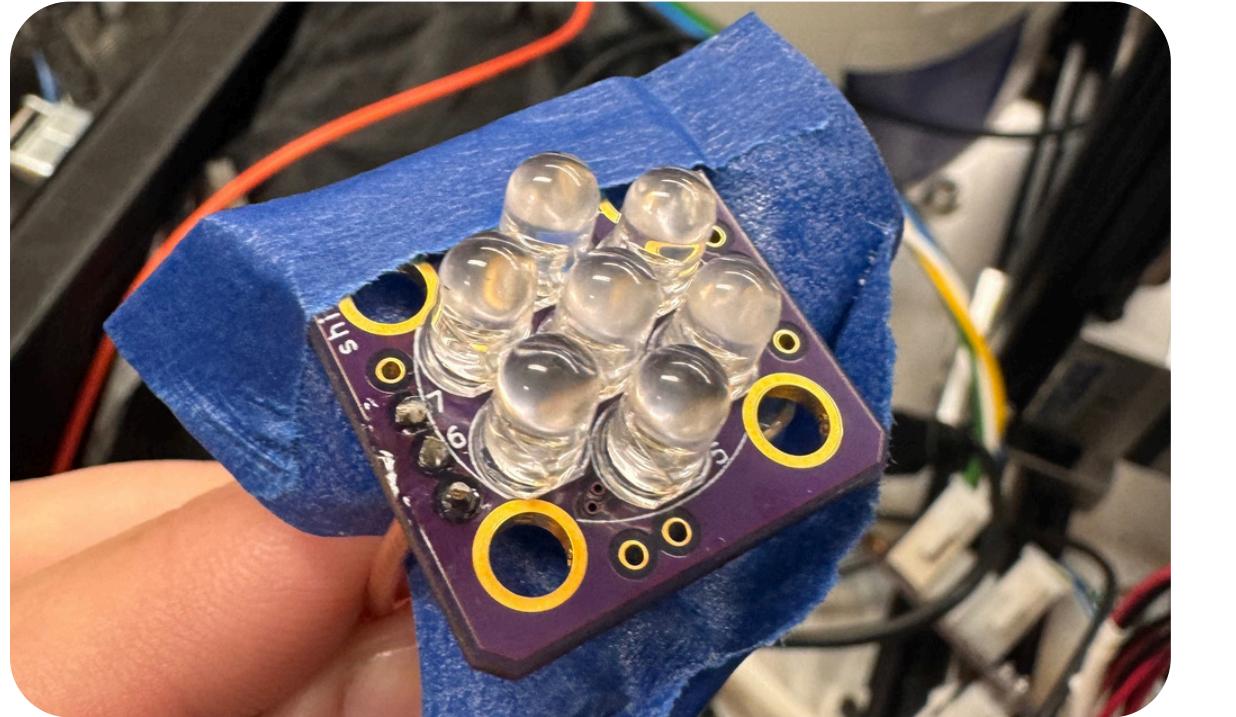
- Hamamatsu MPPC, S10362-11-100P, ~72V, ~2.4E+06 gain, and ~200k e/pixel/s at 25C.
- Designed with KiCad, tested with first version.
- 16 SiPM's per quadrant, 64 total.

Troubleshooting

- Connected TOP boardstack to PCIE40.
 - Had issues configuring the FPGA.
 - Harsh was able to fix it, we can program and configure the boardstack .
 - Firmware version:
2022bSEM 84 93 78 23
- Was able to collect dummy data.

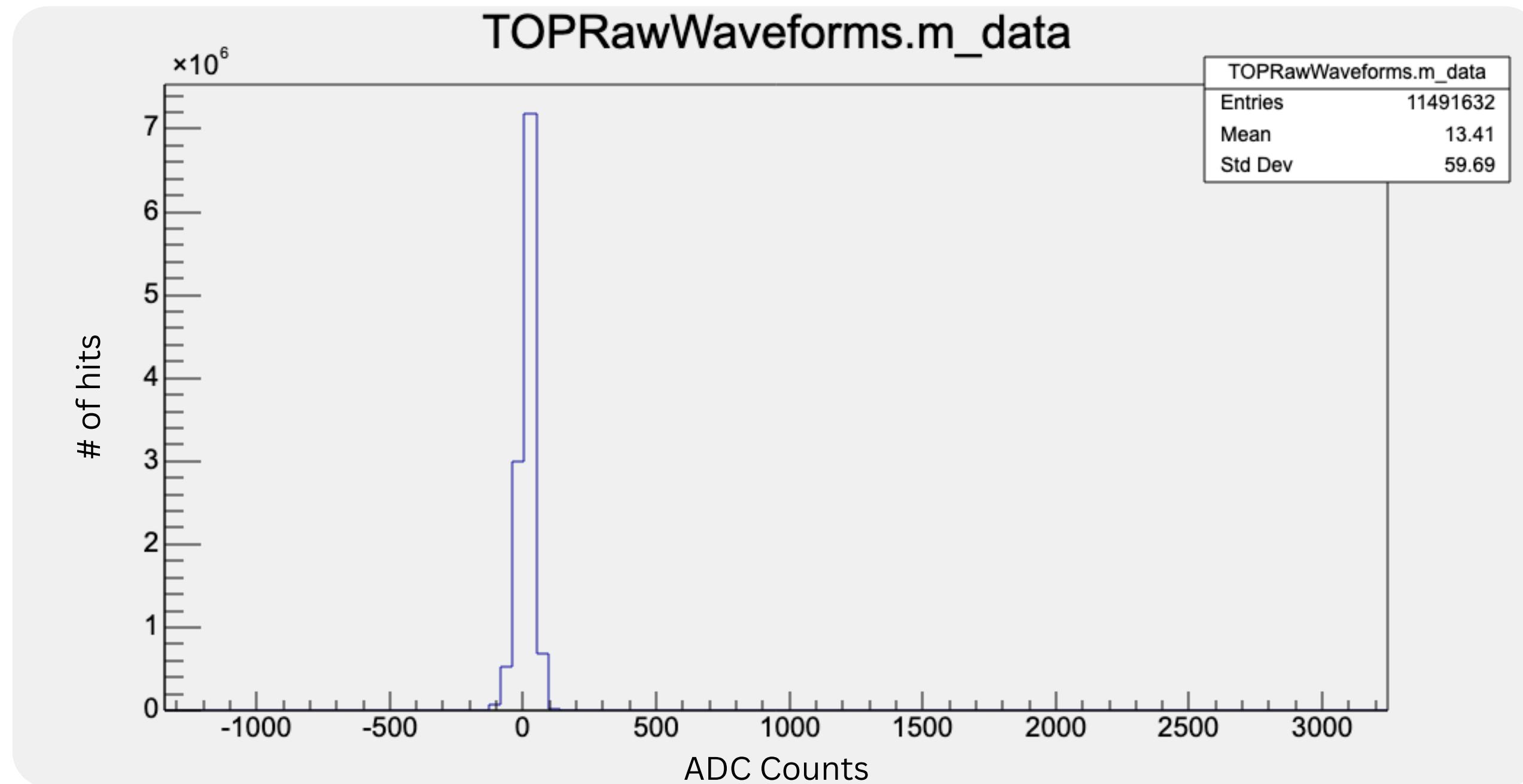


Testing



- Matt made a PCB which holds 7 LEDs
 - Pulse width of 9ns at a frequency of 21.7Mhz.
 - Frequency is set so it hits every window.
- Collected data using ~16 SiPMs with the LED PCB. 6

Testing Cont.



- Was able to unpack the sequential ROOT file.
 - Image shows distribution of waveforms in every channel.
 - Has a larger spread than the dummy data, so we are confident in the results.

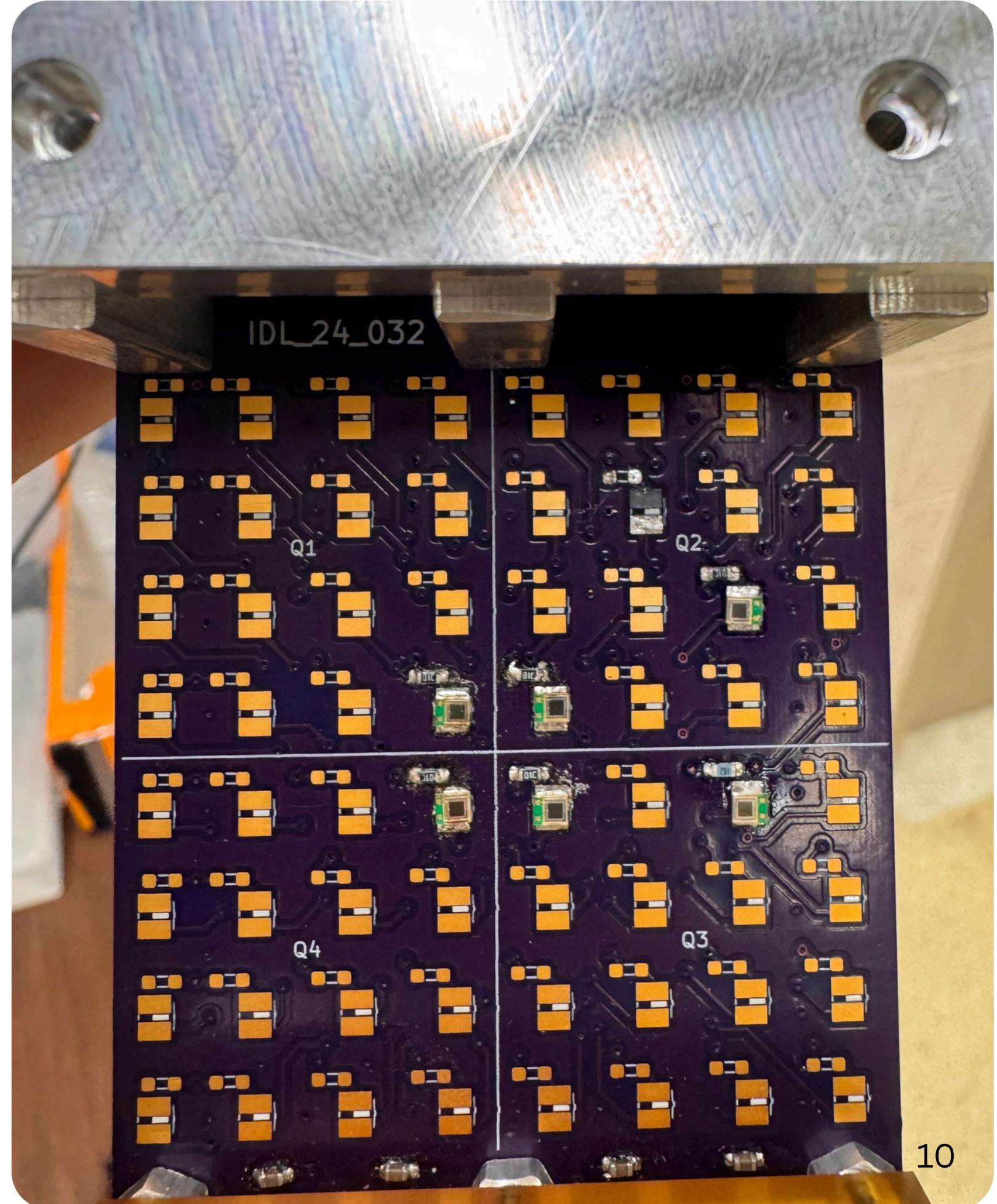
Future Tests

- Will add more LED PCBs to saturate all 64 SiPMs.
 - If this does not create B2L Loss, will look at other sources.
- Develop a python script to extract the waveforms from channels which received hits.
- Will conduct a feasibility study on AI/ML based feature extraction.

Questions?

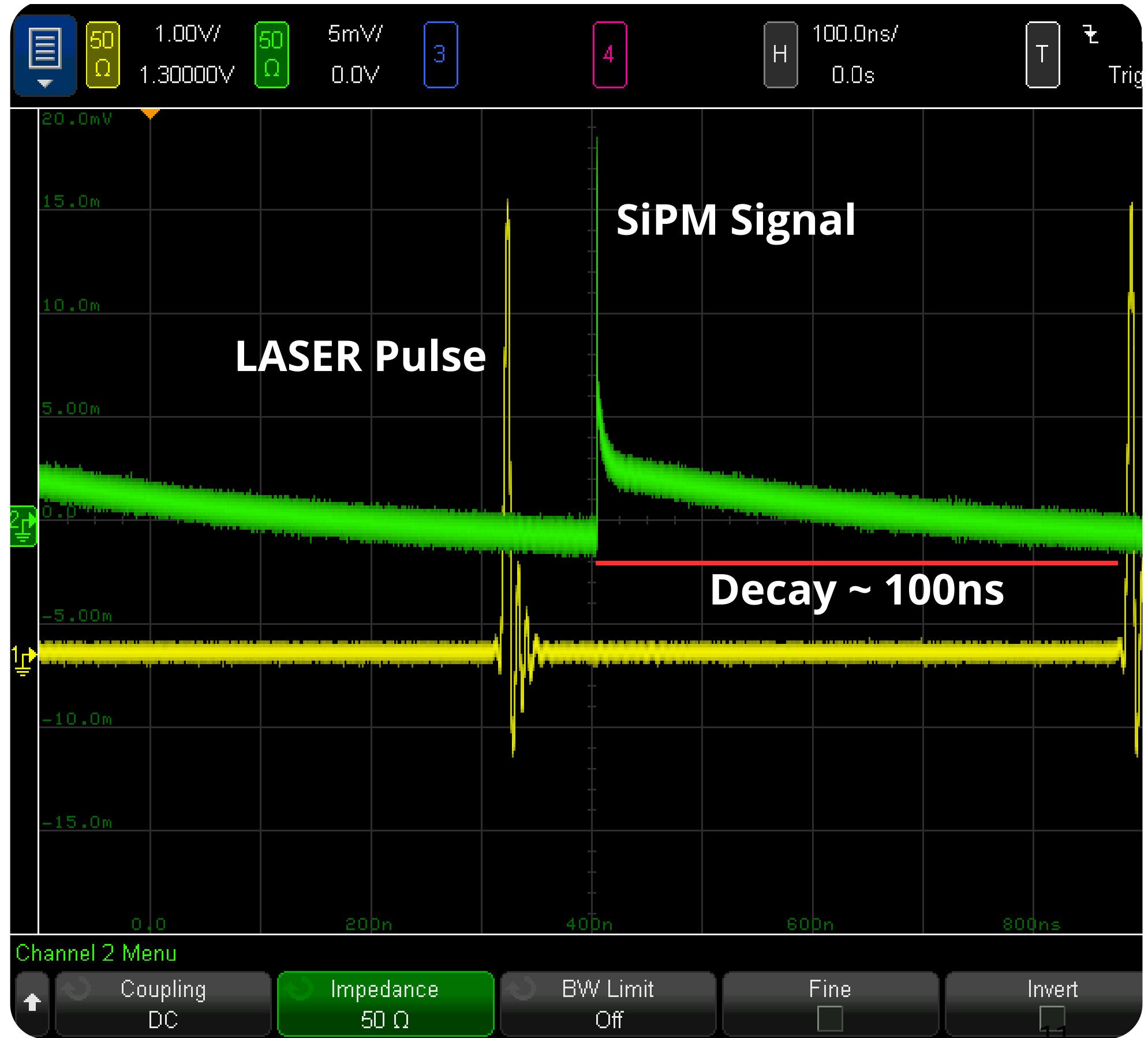
Troubleshooting

- Initially tested with 4 SiPM's.
 - Blew them, installed more but incorrectly.
- Installed 4 more correctly, and it worked.
- Used direct LASER source for testing (next slide).



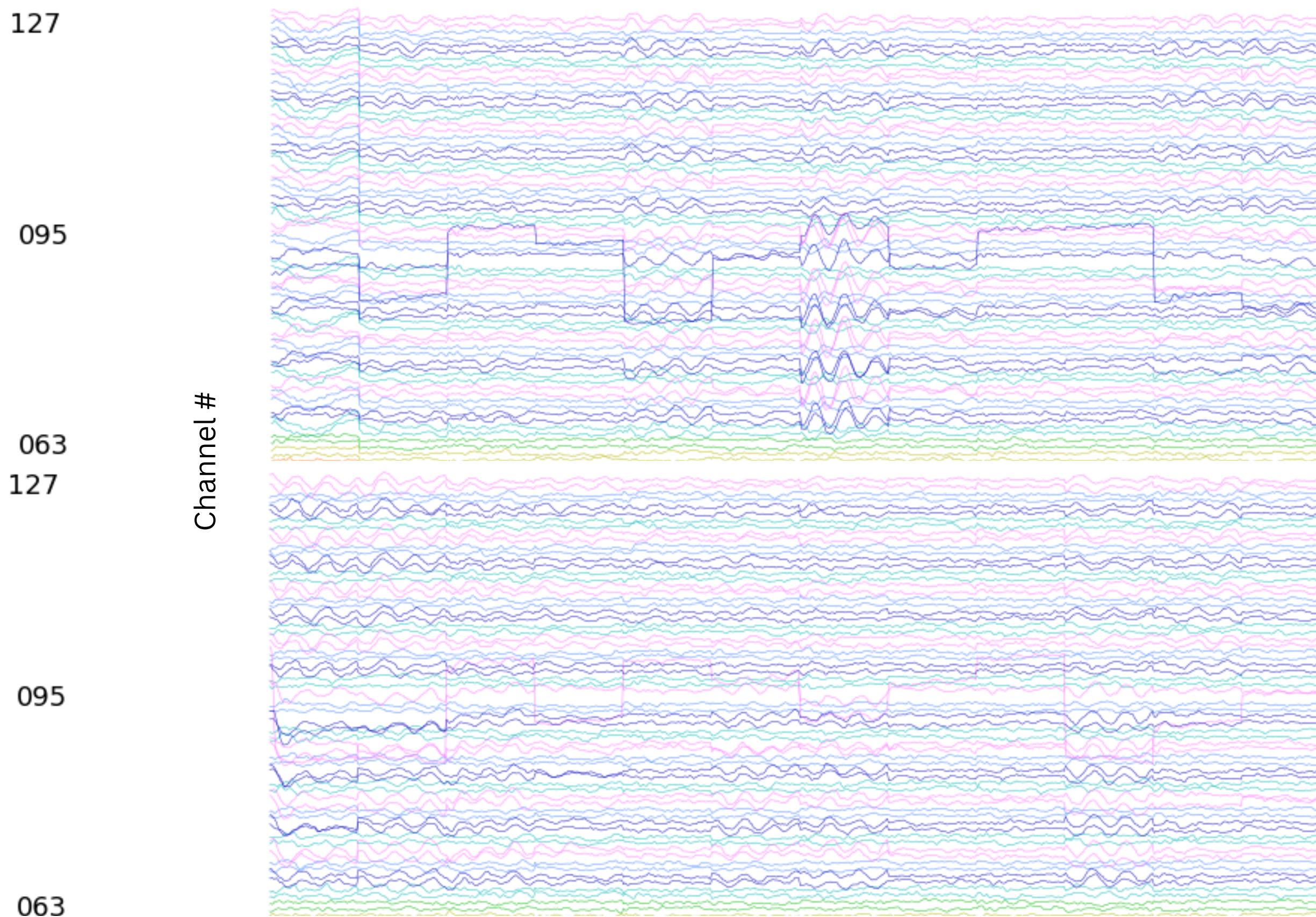
Testing Cont.

- Square-like waves due to the decay of the signal.
 - Signal ~8ns, very sharp peak, but decay ~100ns.
- Idea is to sync to the board stack to see full signal.



Testing Cont.

- Writing a python script to plot waveforms for each channel.
- Image is an example of what we'd see.



Testing Cont.

- Synced the function generator to the revolution input on the timing box.
 - Was able to see the same pulse each time, for each channel.
- Very long due to the decay time, we think, and are still troubleshooting this.

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