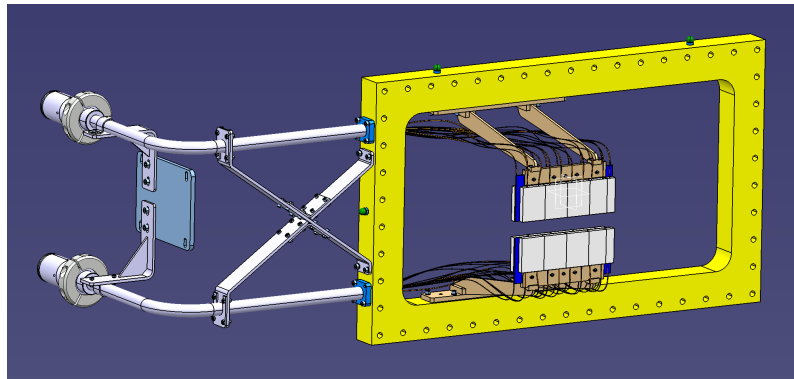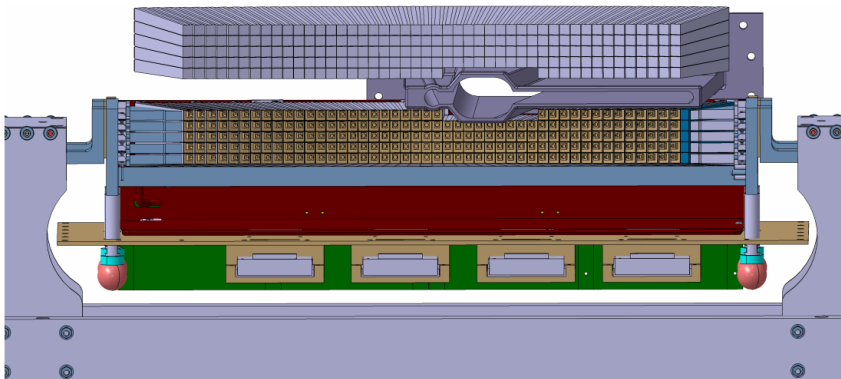# Preparations for the HPS 2021 run:
ECal and Hodoscope

N. Baltzell and Rafayel Paremuzyan

ECal

- Re-established controls, everything powered up normal (cooling, HV/LV)

- Replaced one HV channel's soldered bundle with terminal block for easy preamp replacement and HV reliability

- Tested spare preamps, replaced 6 that failed or were intermittent during the 2019 run

- Lowered bottom half for HPS move back onto beamline

- DAQ testing now, LED runs

- Cosmic stand setup pending beamline logistics, minimum 1 week of data for a cosmic gain calibration


Last run we had cooling issues, affected by underperforming chiller and high ambient temperatures in alcove. Mitigated by forced air from duct from AC into alcove, and better ECAL insulation, need to resurrect those mitigations. Chillers were tested/serviced.

ECal Beam Commissing

- Similar to previous runs
- Start with DAQ gains/pedestals from cosmic/no-beam
- Verify rates with current, (no-)target, part of beamline commissioning
- Take pedestal runs at nominal or multiple luminosities (15 minutes each)
- Adjust thresholds, as low as reasonably possible
- FEE runs for gain calibration
  - Tune prescaling regions, starting from MC projections
    - manually adjust to maximize coverage
  - Acquire ~1 hour FEE data at nominal conditions

Hodoscope: issues during 2019 run

- Too high rate
- Even without beam it picked up too much rate from different light sources in the Vacuum chamber
- Before 2019 run gains were calculated with pretty high HV (around 880V), however PMTs could not hold this HV with such high rate.
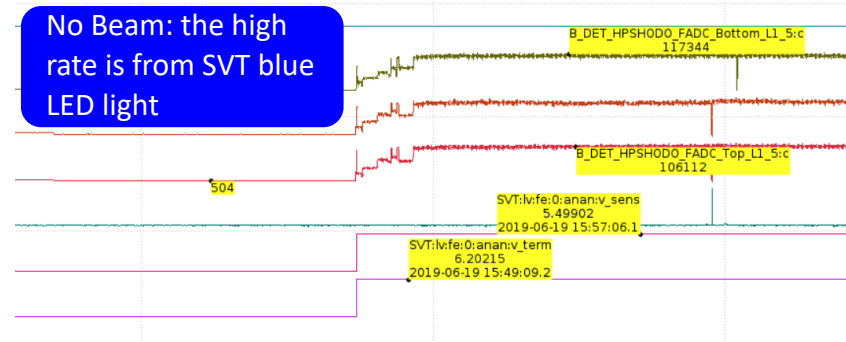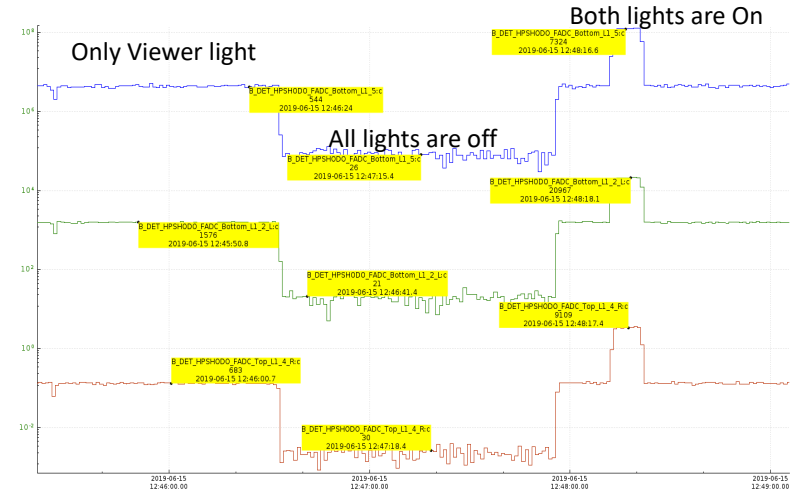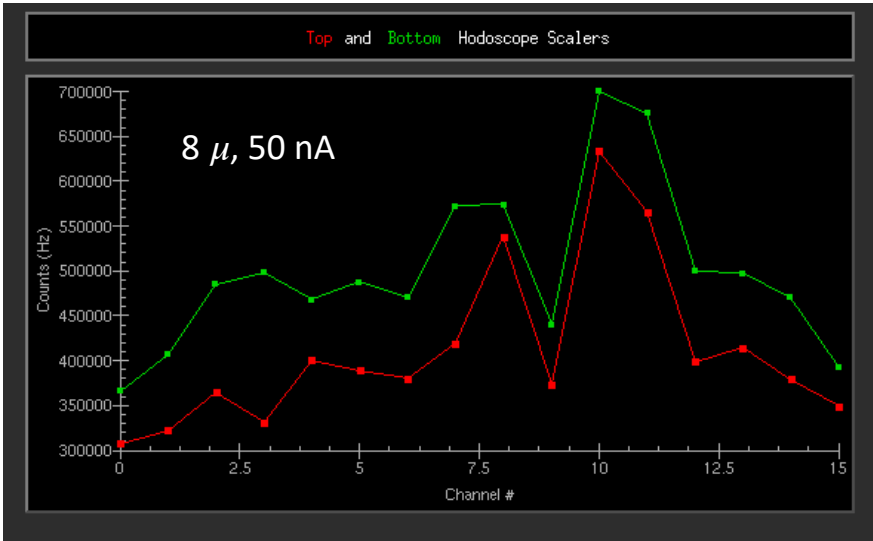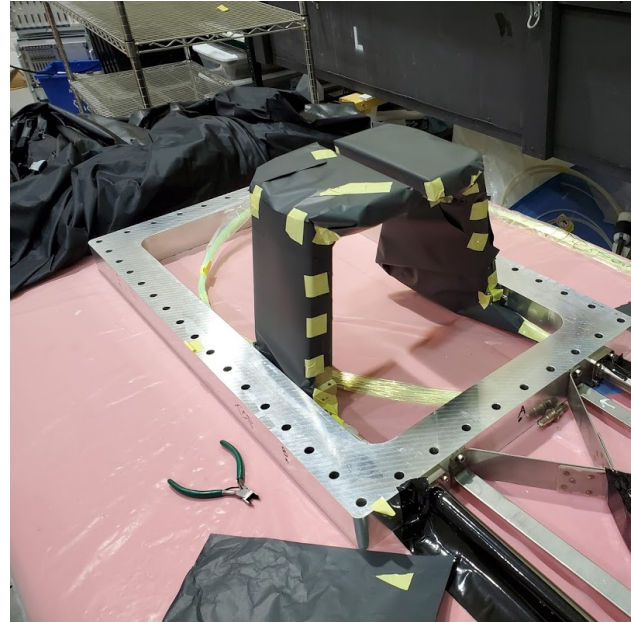
Making fibers light tight

Hoping to reduce the high rate on hodoscope by light tightening Hodoscope fibers.
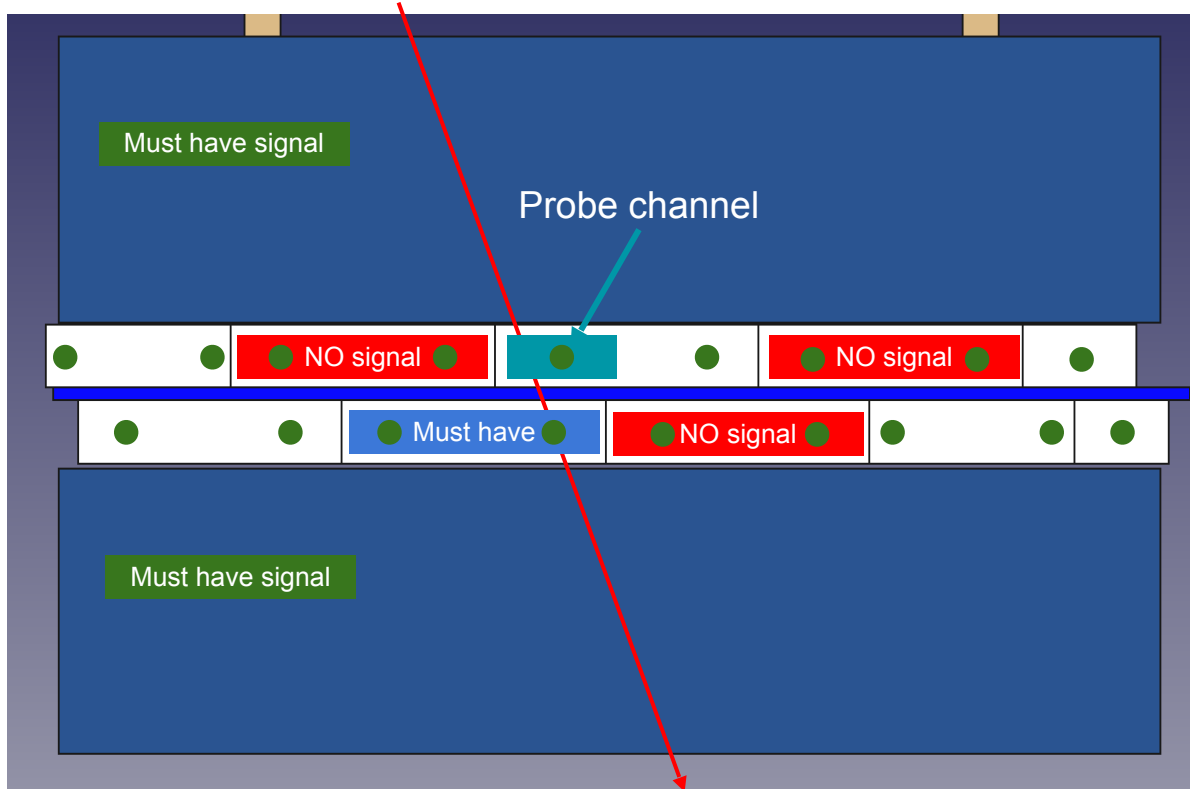
Fibers were exposed during the 2019 run
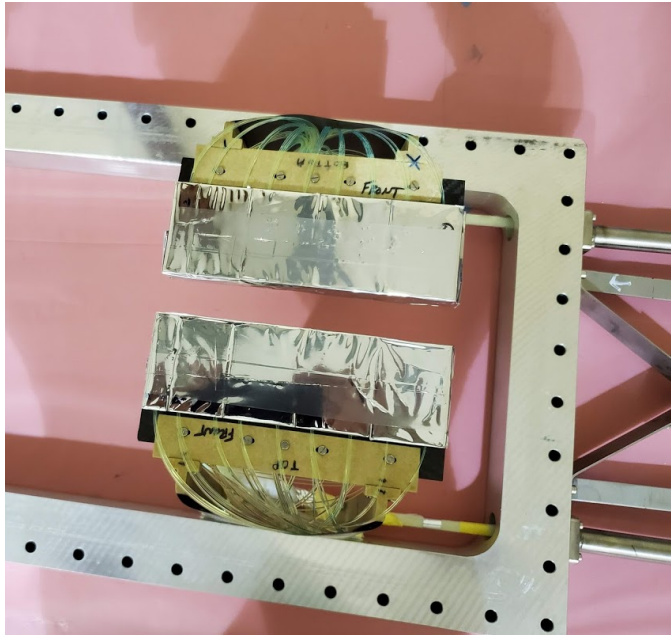
Fibers were light tightened with a thin tedlar sheet.

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Hodoscope calibration with cosmic

From the trigger point of view it is convenient to put the same threshold cut for all tiles

Gains are chosen such that signal from each distribution to be peaked at 1000 (An almost arbitrary unit)

Hodoscope commissioning with the beam

Choose the right HV settings for PMTs as a function of beam current (assuming target will not be changed).

For each PMT Chose three different HV values, and measure the PMT current as a function of the Beam current.

Chose highest HV settings which will have the PMT at the production beam current doesn't exceed 5% of the idling current.

30-60 min of stable beam time should be enough for this measurement.
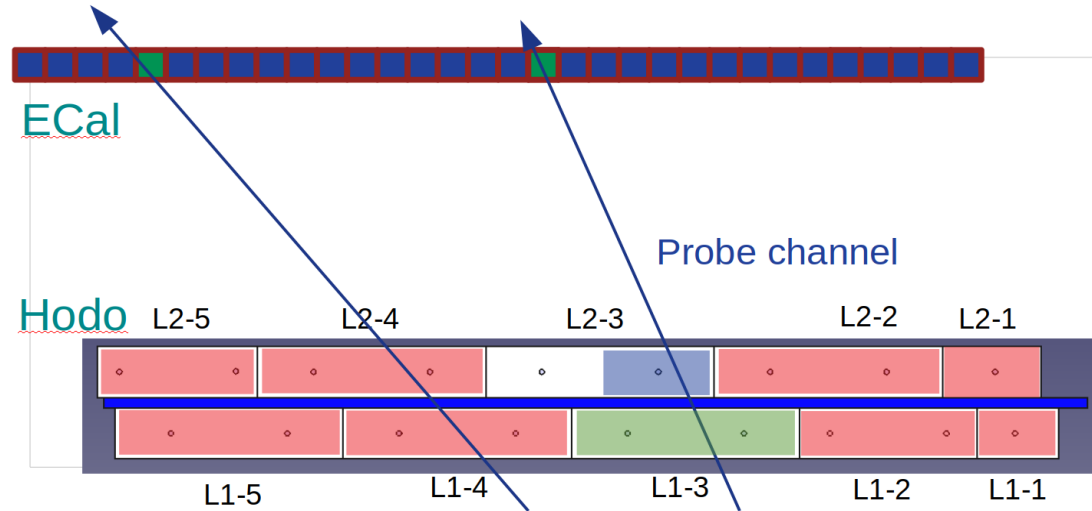

From 2019 run
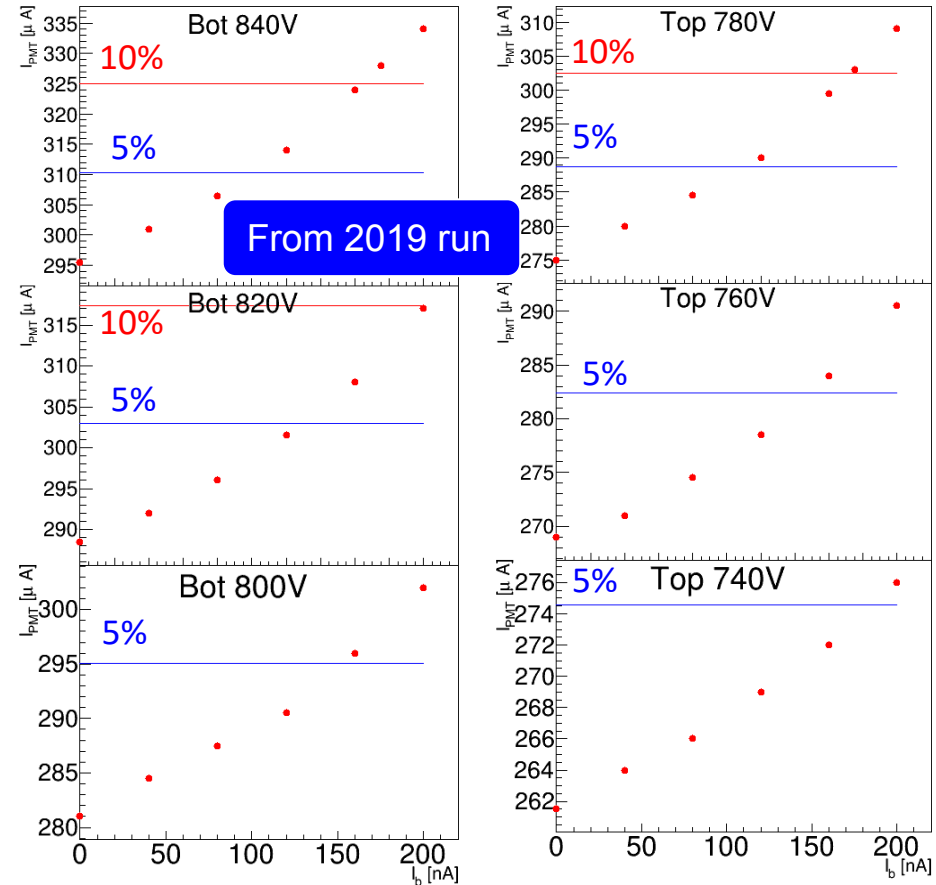
Gain calibration

As soon HVs are set, gains for each PMT channel

Idea is similar to the cosmic calibrations:

Using geometrical matching between positive track, ECal cluster, and a hit in the next layer, we constrained the trajectory of the positive track to pass close to the given fiber

- A Hit in the next layer, that geometrically matched to the probe channel, and absence of a hit in the rest of Hodo channels.
- A positive track
- A cluster in the positron side, that is geometrically matched to the Hodo tile

The "Gain" is defined a number, that brings the MIP peak value to 1000. Note: actual PMT gain is inversely proportional to this "Gains".

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Summary

- 2019 → 2021