

## Photon Detector Calibration/Monitoring System

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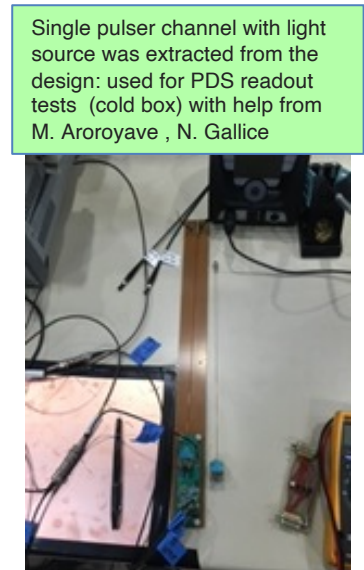
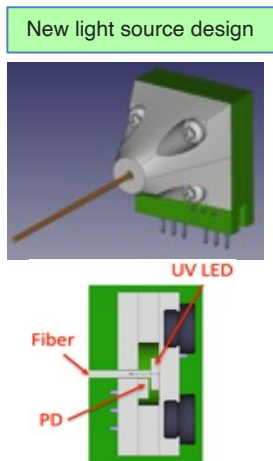
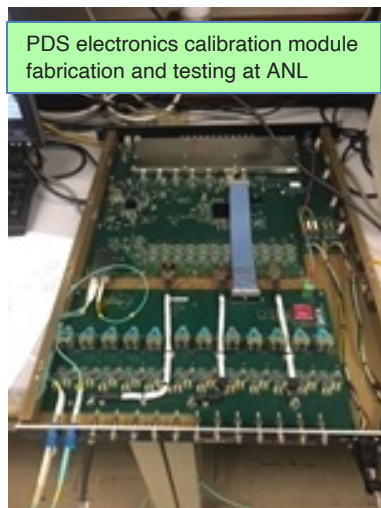
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# CALIBRATION SYSTEM HIGHLIGHTS

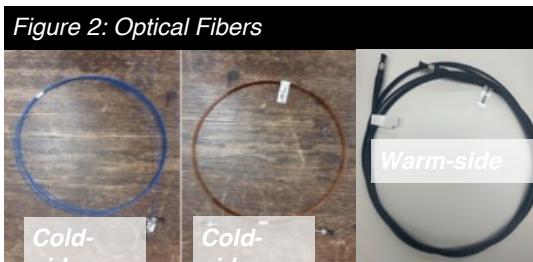
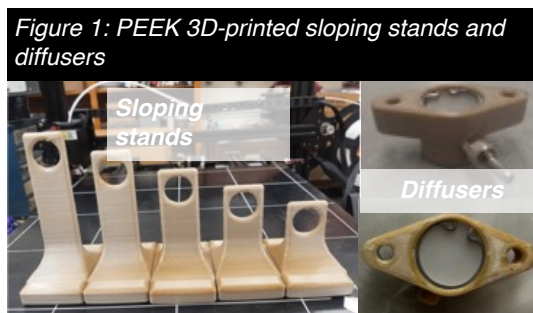
- Major effort to design and fabricate new calibration electronics module for operation in ProtoDUNE-II
  - 12 channel module fabricated and integrated at CERN Summer 2022
  - Five-channel prototype ready and tested in 2021/22.



- Successful in integration with the lab network and slow controls (with Giovanna, Xavier et al.), with the DUNE DAQ and timing (with M. Kirby, D. Cussans et al.) where we now have several working configurations tested and ready for the ProtoDUNE-II operation.
  - System operates through the CERN network via DUNE DAQ, and triggers on DUNE timing at ProtoDUNE
  - Provides two calibration light wavelengths: 270 nm and 367 nm, among other features
  - May polish these configurations in the future, include the monitoring feedback (reference photo-diode) to the output.

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- Successful delivery to CERN 16 light diffusers and 6 sloping stands, both 3D-printed in PEEK (Fig. 1).
- Successful delivery to CERN 52 optical fibers for cold-side, and 16 optical fibers for warm-side (Tefzel and Polymide). (Fig. 2)
- 3D-printed light diffusers installed on CPA in coordination with ANL (Fig.3).
- Development of detailed QA/QC procedure (Fig 4).
- Detailed installation plan for ProtoDUNE II HD UV Light Calibration System (Fig. 5).
- Optical fibers and light diffusers under use in HD and VD cold box tests at CERN.
- **Next Steps:** Installation of optical fibers above the CPA up to the PDS flange.



**Figure 5: Installation Guide**

**ProtoDUNE II Light Calibration System Installation Guide**  
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Figure 3: Beam Right Side Installation (image courtesy of Steve Magill)



Figure 4: QA/QC assemble at SDSMT

Fiber Information		Fiber Length		Fiber Length		Fiber Length		Fiber Length		Fiber Length	
Date Manufactured	Fiber Core	Fiber Length before (cm)	Fiber Length after (cm)	Fiber Length before (cm)	Fiber Length after (cm)	Fiber Length before (cm)	Fiber Length after (cm)	Fiber Length before (cm)	Fiber Length after (cm)	Voltage (V)	Current (mA)
PROQUEST	1000001	146	146	146	146	146	146	146	146	1.100	2.000
POLYMER	1000002	146	146	146	146	146	146	146	146	1.100	2.000
POLYMER	1000003	146	146	146	146	146	146	146	146	1.100	2.000
POLYMER	1000004	146	146	146	146	146	146	146	146	1.100	2.000
POLYMER	1000005	146	146	146	146	146	146	146	146	1.100	2.000
POLYMER	1000006	146	146	146	146	146	146	146	146	1.100	2.000