

# Photon Detector/Cryostat Interfaces and Installation

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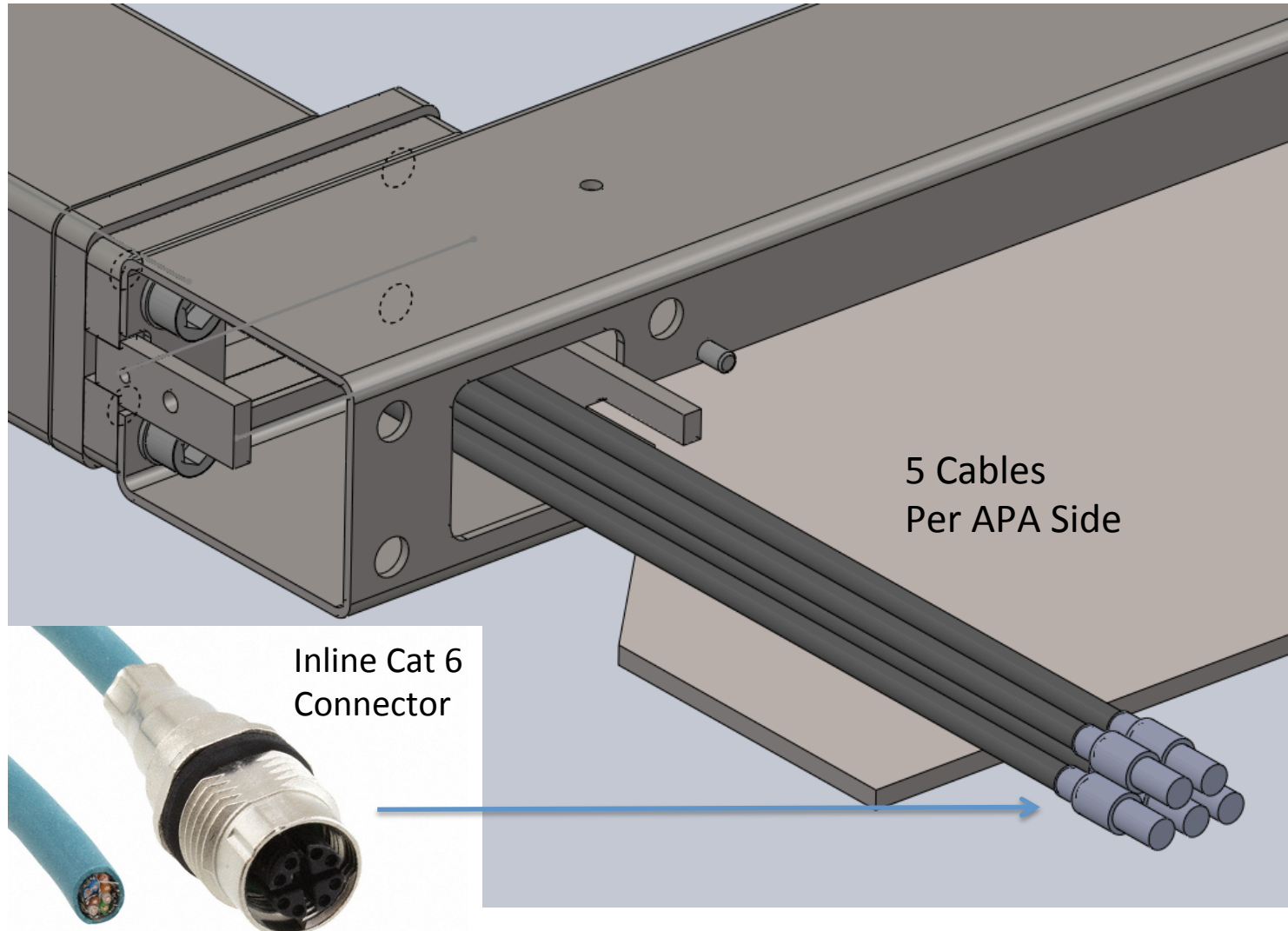
# Outline

- PD Interfaces with Cryostat including
  - Signal cables
  - Calibration system
- Cryostat Environmental Requirements
  - Filtered light
  - Humidity
  - Dust
- Cable Trays and Racks, Power Requirements

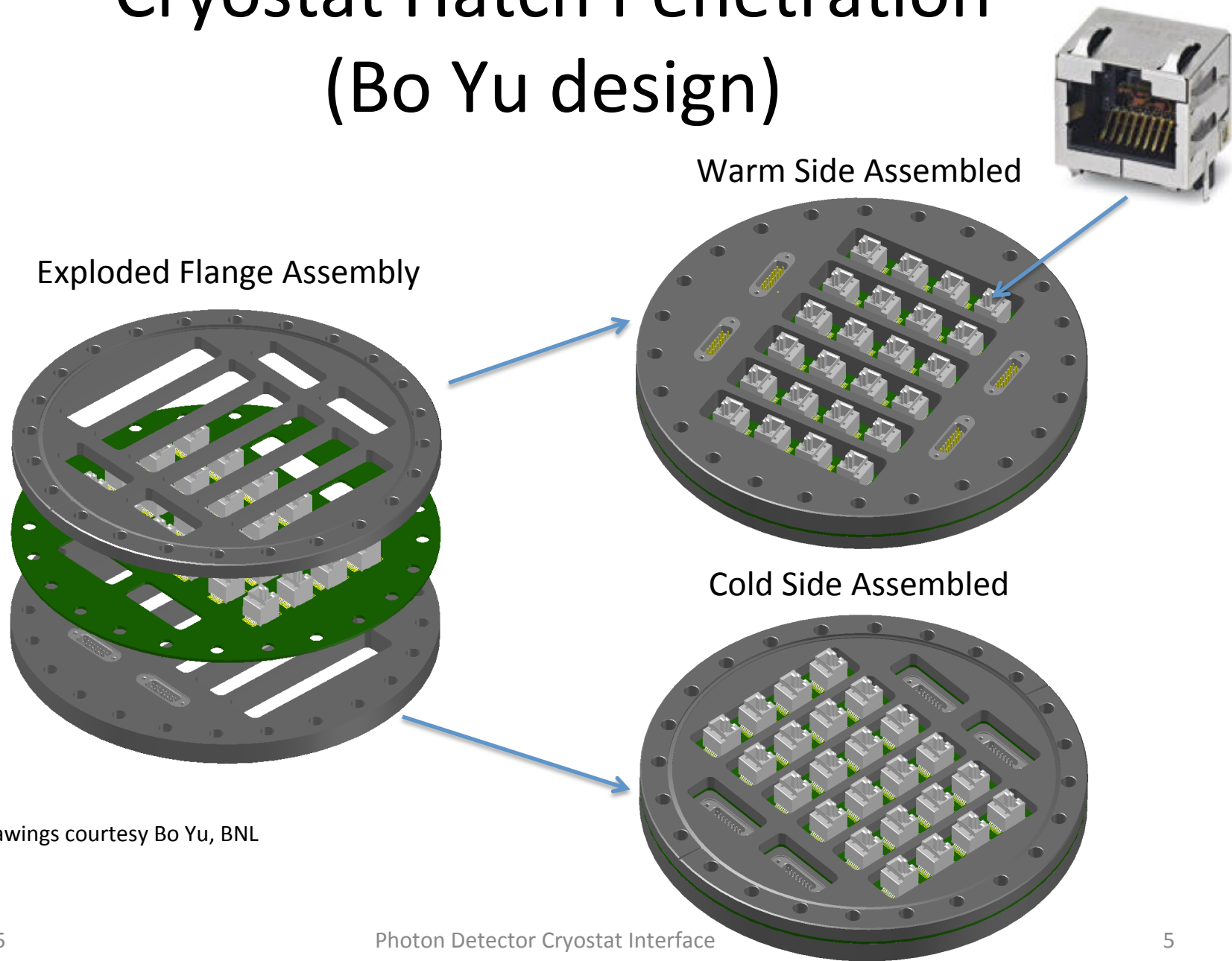
# PD Signal Cables

- Each PD is read out by a single 4-twisted-pair cat 6 cable
  - PD cables are split into 3 sections:
    - Short haul- From PD to electronics end of APA tube
    - Long haul- From end of APA tube to cryostat hatch
    - External- From outside of cryostat to readout electronics (SSP)
- Each APA contains 10 PDs
  - Total of 10 cat-6 cables per APA
  - 5 cables per side tube of each APA
- All 10 cables from one APA are routed to a single cryostat hatch penetration, sharing the cold electronics cable trays (shielded?)
- There are a total of 60 PD cables (6 APAs)

# PD Cables Exiting APA Frame



# Cryostat Hatch Penetration (Bo Yu design)



Exploded Flange Assembly

Warm Side Assembled

Cold Side Assembled

Drawings courtesy Bo Yu, BNL

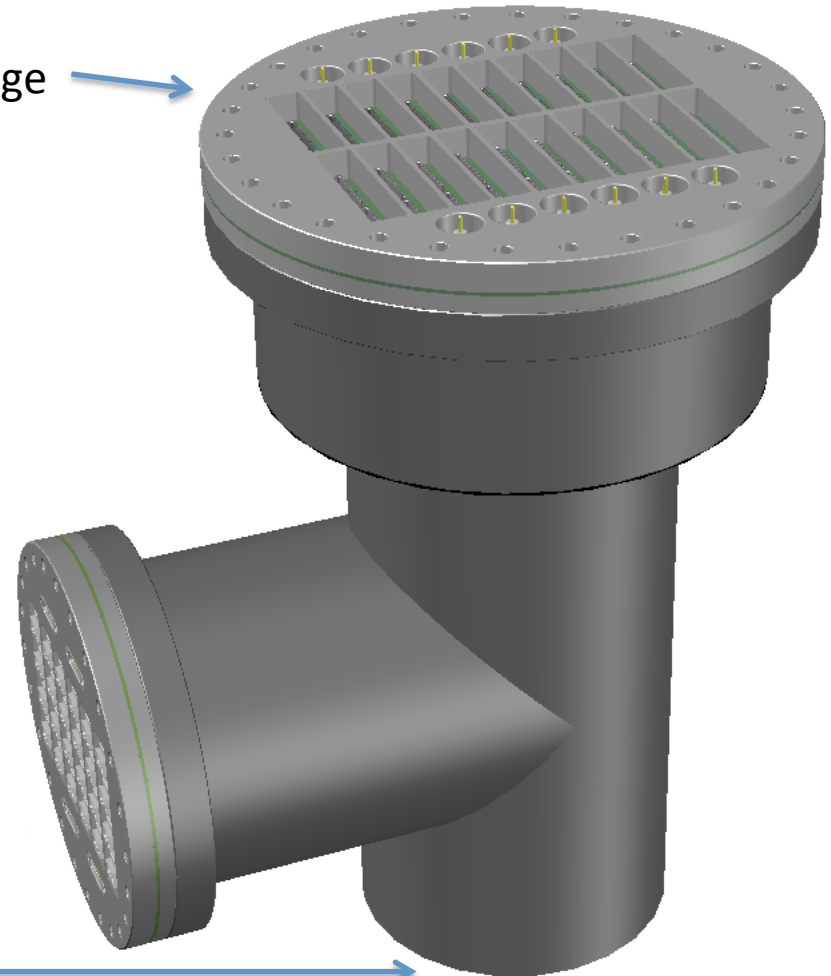
# PD Cable Penetration Flange

Cold Electronics Flange

10" CF flange for the PD cables  
from up to TWO APAs plus 4  
DB15 connectors (1 APA for  
ProtoDUNE)

Drawing courtesy Bo Yu, BNL

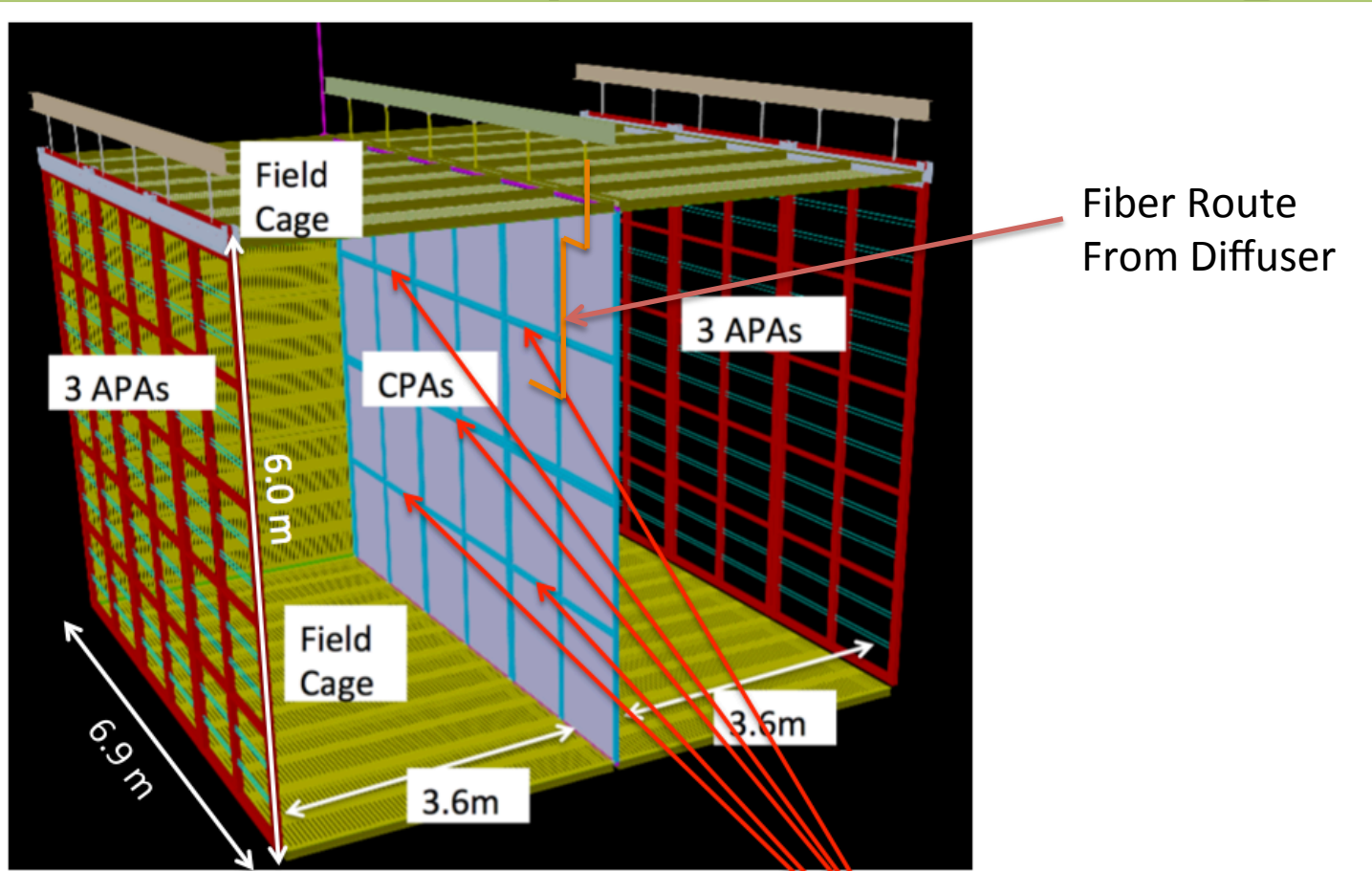
8" pipe for the cryostat nozzle



# Calibration System

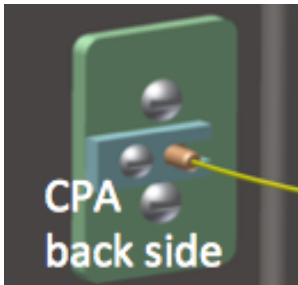
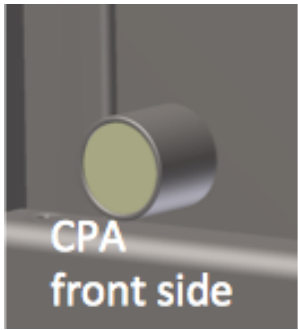
- The illumination system used by the calibration system requires 10 light diffusers, supplied with light via 10 fiber optic cables
- The diffusers are mounted to the CPA, 5 per side of the CPA.
- Calibration fibers are routed along the CPA frame to the calibration cryostat hatch centered over the CPA.
- 12 SMA905 stainless steel multimode ferrule connectors (<http://www.thorlabs.com/thorproduct.cfm?partnumber=10770A>) penetrate a 4.625" flange in the calibration hatch

# PD Calibration System Mounting



Drawings courtesy Zelimir Djurcic, ANL

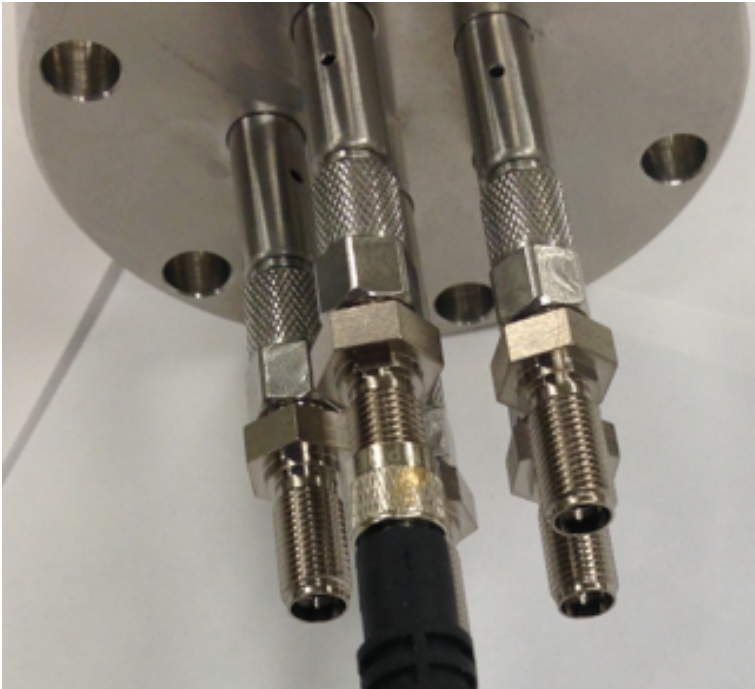
UV diffuser locations, to illuminate the left APA (similar arrangement would be realized on the opposite side of the CPA, to illuminate the right APA).



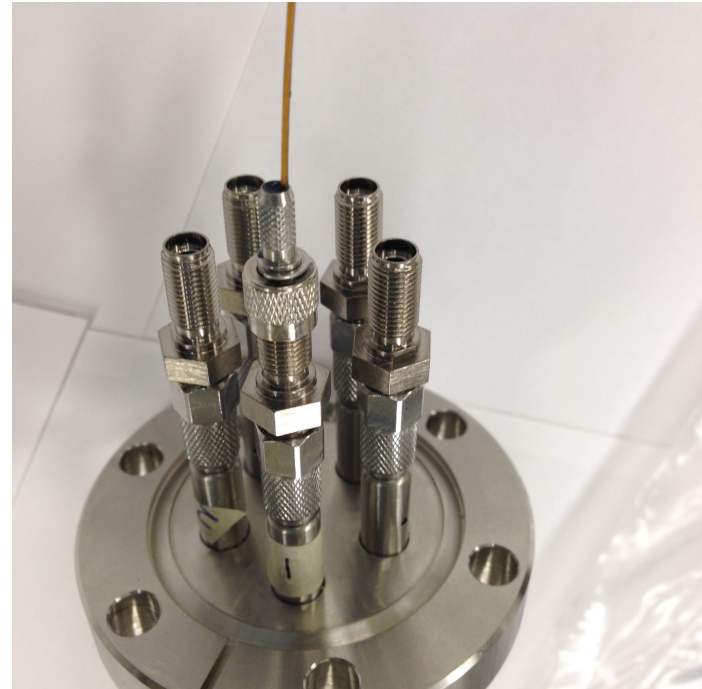


# Calibration Fiber Penetration Flange

Warm Side (Jacketed Fiber)



Cold Side (Bare Fiber)



Note: 5-fiber version of flange (for 35T) shown  
12 feedthroughs will fit on 4-5/8" flange

# Cryostat Environmental Requirements

- Filtered Lighting: If the PDs are to be exposed to ambient light for any length of time the light must be filtered to eliminate UV light <400nm. Suggested filters include:
  - <http://www.gamonline.com> T1510 - UV Shield
  - TAPR50-T8-4 UV Light Filters 24/case from: <http://www.ergomart.com/>
- Humidity: PDs are shipped in a dry nitrogen environment. Humidity must be controlled for periods of long exposure. The exact specification is being investigated, but provision will be required to control the humidity inside the cryostat during installation.
- Dust: During periods of long exposure, filtered air supplies should be used to keep the environment inside the cryostat equivalent to a class 100,000 clean room or better.

# Electronic Rack Space and Power

- Each PD is read out using four readout modules (SSP) 1U tall and requiring 1A of 230VAC (6 SSP total).
  - Effort should be made to locate the SSP as close as reasonably possible to the cryostat hatch to minimize cable runs
- The calibration system requires 2 calibration modules each 1U tall, and requiring 1A of 230VAC.
  - These modules should be located as close as reasonably possible to the calibration cryostat hatch.