

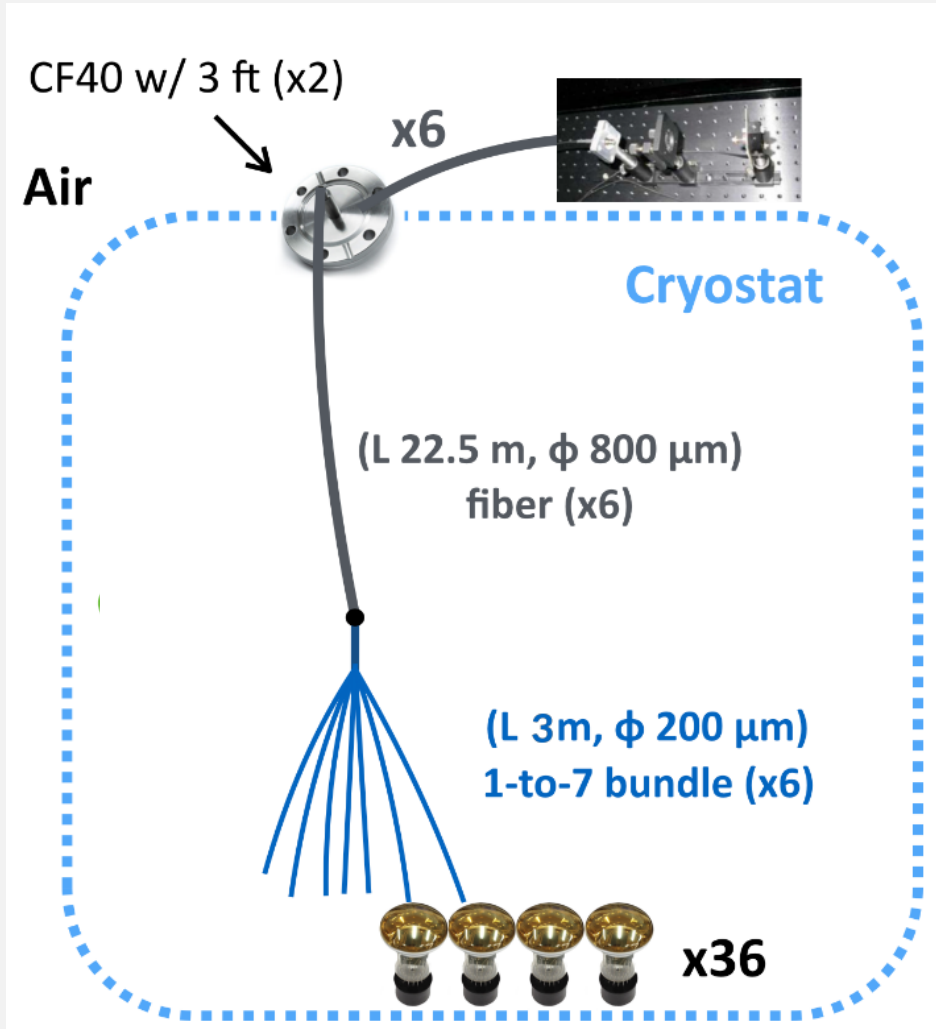
# DATA TAKING REQUIREMENTS FOR THE LIGHT CALIBRATION SYSTEM

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Light Readout Requirements Meeting ProtoDUNE-DP

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# LIGHT CALIBRATION SYSTEM OVERVIEW

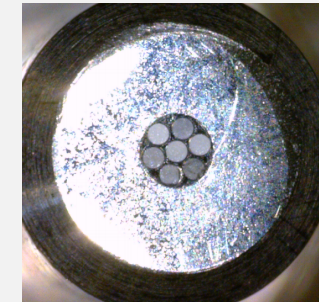


## Goal:

- Determine PMT gain (SPE)
- Study PMT stability

## Components:

- Black box with **light source** (6 Kaputschinsky LEDs) outside of cryostat
- 6 fibers (Thorlabs) to cryostat
- 2 CF40, each with 3 optical FT
- Inside the cryostat (6x):
  - 22.5 m fiber
  - 3 m 1-to-7 bundle (Thorlabs) -> **1 fiber per PMT**



# LIGHT SOURCE

- **Kaputschinsky PCBs:** LED driver
- **Power supply**
- **Beaglebone control unit**
  - Trigger: 3.3 V TTL signal provided by driver device to ensure sufficient current
  - LED power supply control for varying the intensity
  - ADC (built in) to record reference sensor (SiPM) signal
    - > Possible to split the signal to have it digitized with one value by the Beaglebone ADC and the whole waveform with the standard electronics although the SiPM is not close to the PMT electronics
  - LED pulsed between 100 Hz and 10 kHz

**TTL Trigger to be provided to the DAQ**

# CALIBRATION METHOD

## Two calibration modes:

1. Determine PMT gain (SPE)
  - Needs to be able to take data (charge) at SPE level
  - If light is not completely homogeneous among PMTs, different runs for PMT-sets will be needed.
2. Study PMT stability
  - Configurable higher amount of light

# CALIBRATION RUNS REQUIREMENTS

## Dedicated calibration runs with a dedicated software

- > **Software:** provides on-line visualization and automated gain calculation
- > **Trigger:** provided by the light source
- > **Digitization:** finer sampling than acquisition is possible
- > **Charge:** integrated charge can be enough, not need to save waveforms.
- > **Data size:** approximately 5000 events per PMT per light intensity setting needed.
- > **Time:** acquisition may limit it, 5000 events at 100 Hz
- > **Frequency:** calibration required every time we bias the PMTs, at the beginning twice a day, later could be reduced