



**SOUTH
DAKOTA
MINES**

Optical Fibers Update

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OUTLINE

QA/QC of the optical fibers from GoPower (40m length and 62.5um core)

- General Inspection
- Transparency Test
- Power Test

Assembly of optical fiber bundle for Module 0

- Shipment to CERN

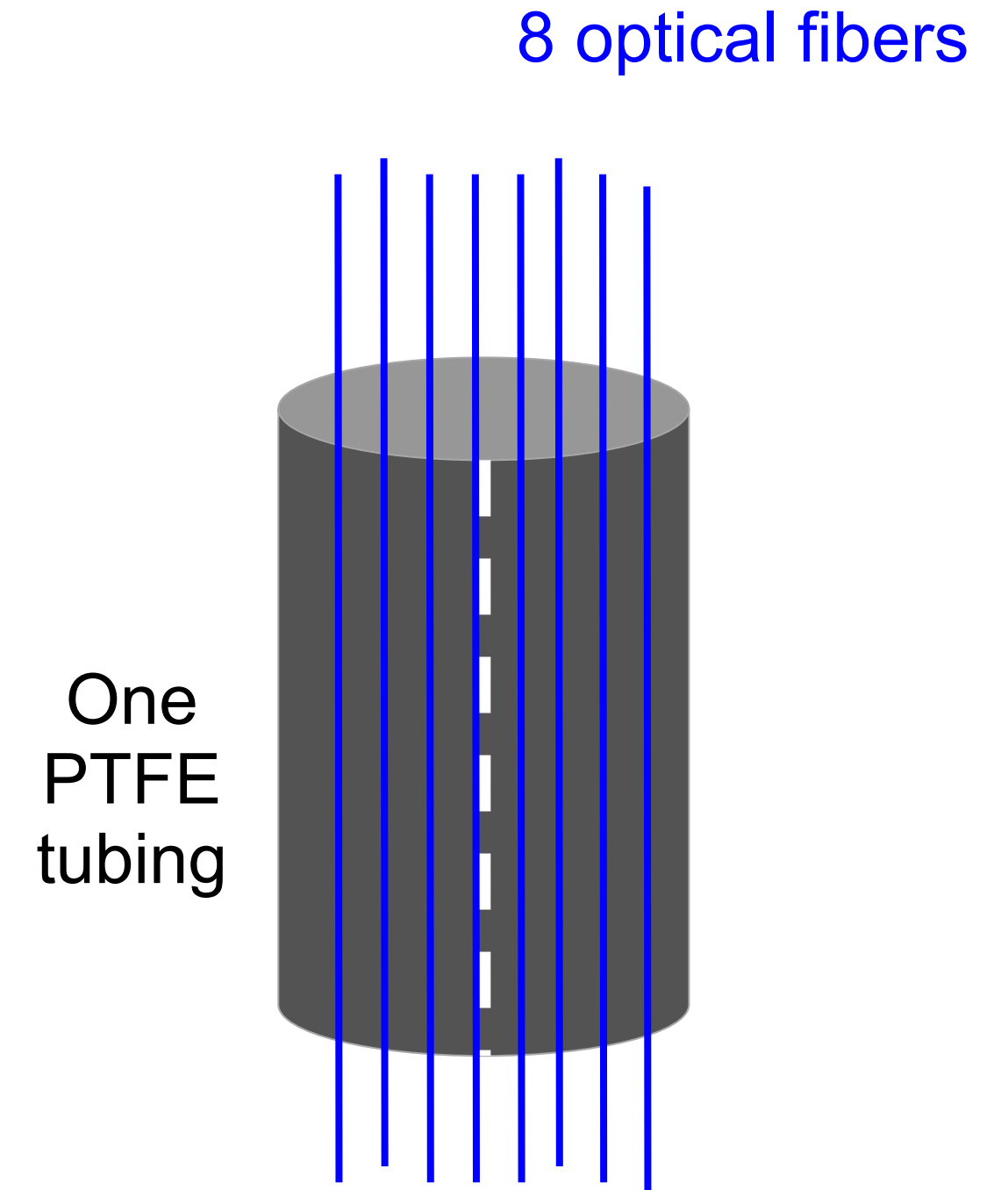
General Description

We assembled a total of 8 PTFE black tubing with 8 fibers in each tube (see figure).

We performed a quality control for **64 optical fibers from GoPower** (see table). Three test were run:

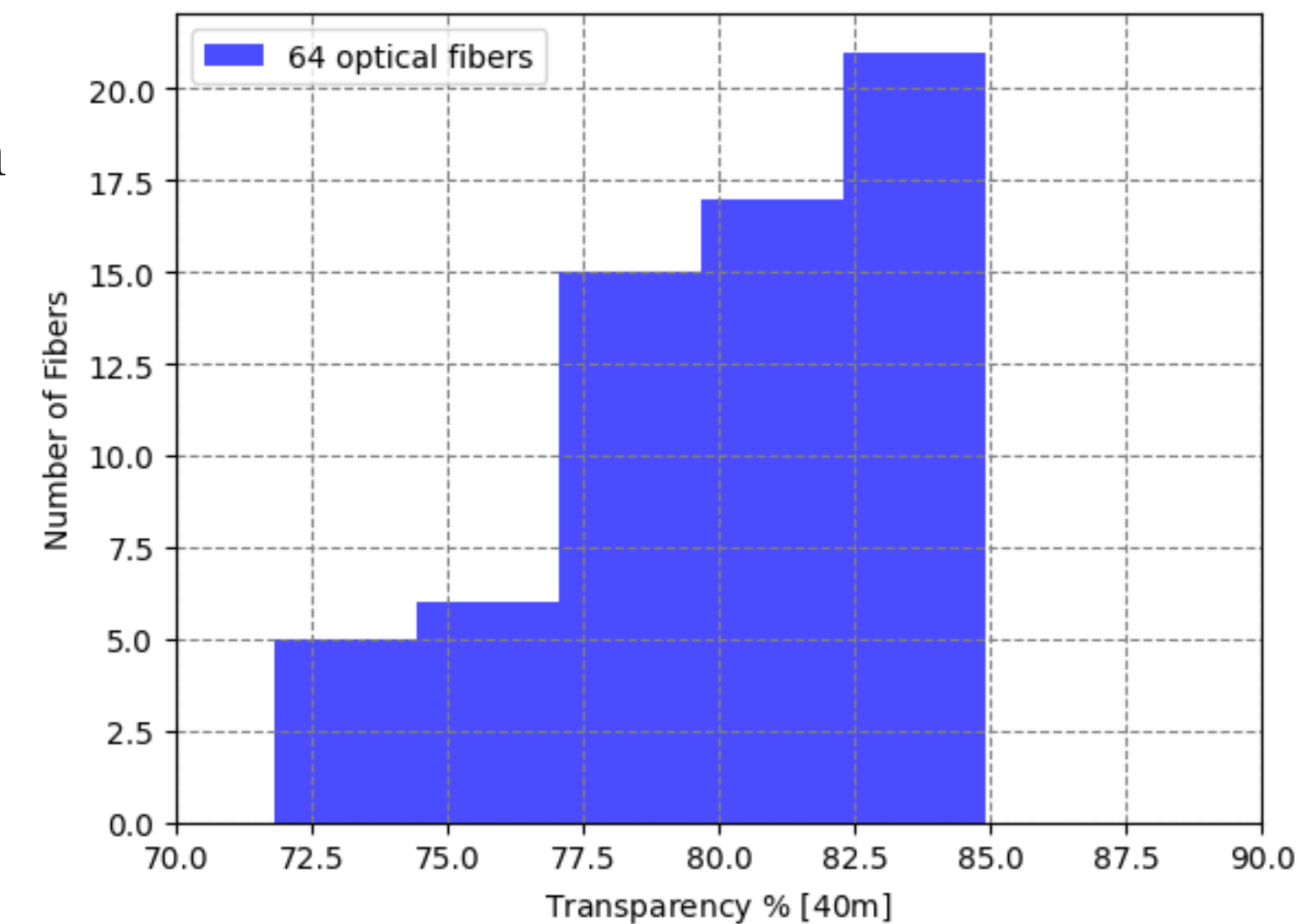
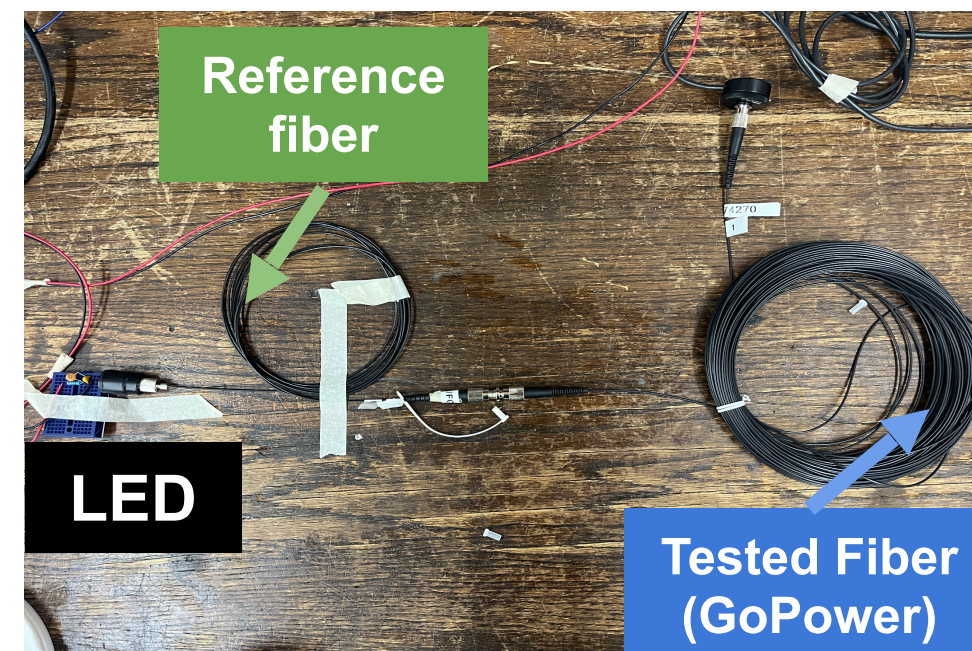
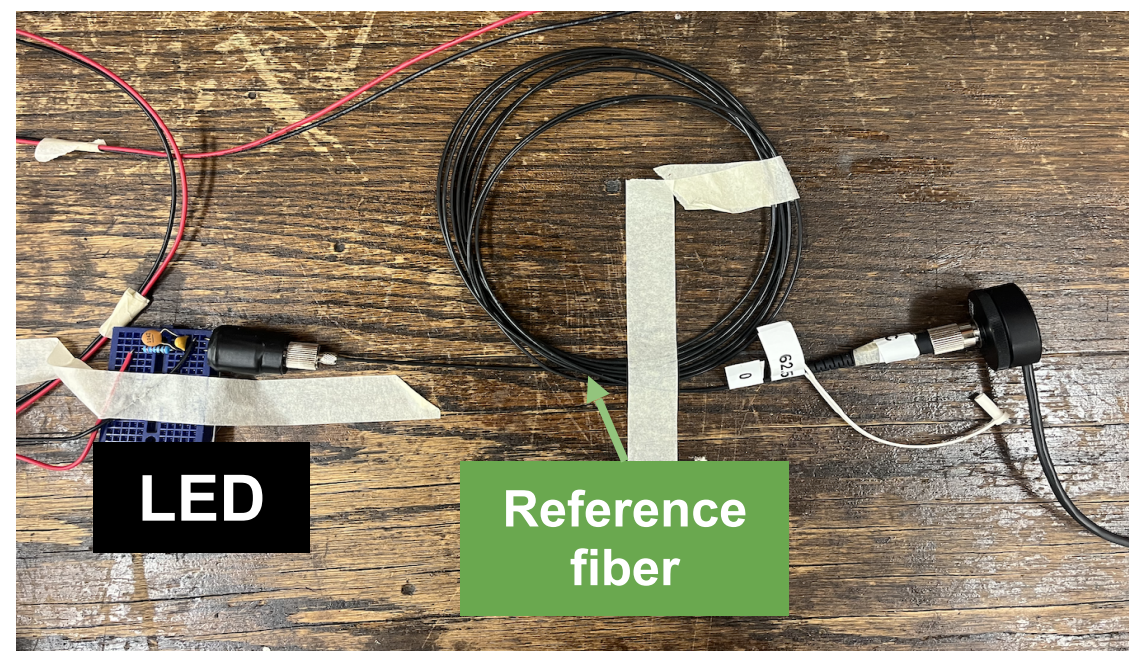
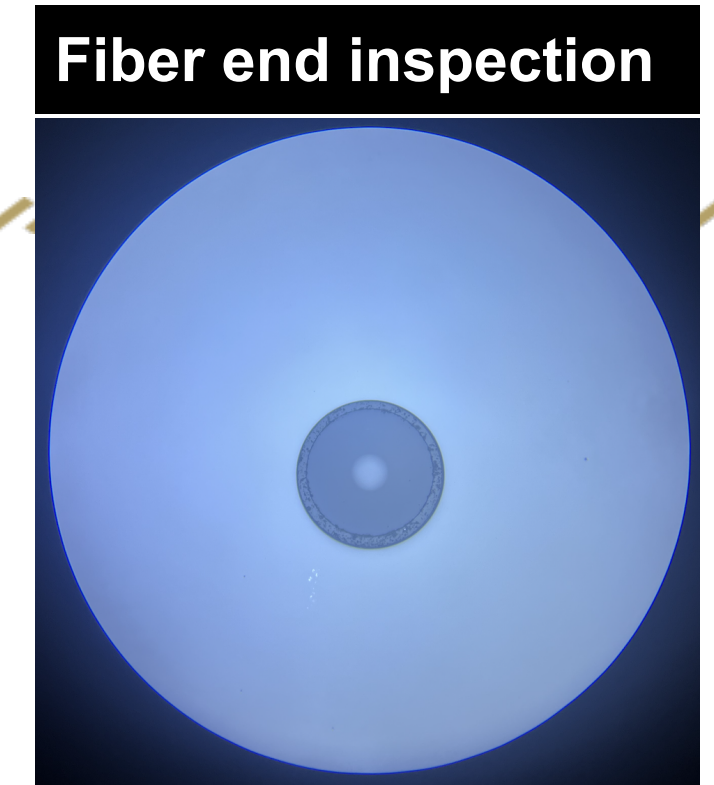
1. General Inspection: Visual inspection of fiber ends and jacket surface
2. Transparency test
3. Power test

| MH-GoPower optical fibers | |
|-----------------------------|---------|
| Core diameter | 62.5 um |
| Cladding diameter | 200 um |
| Coating diameter | 230 um |
| Buffer diameter | 500 um |
| Black Jacket outer diameter | 1.5 mm |

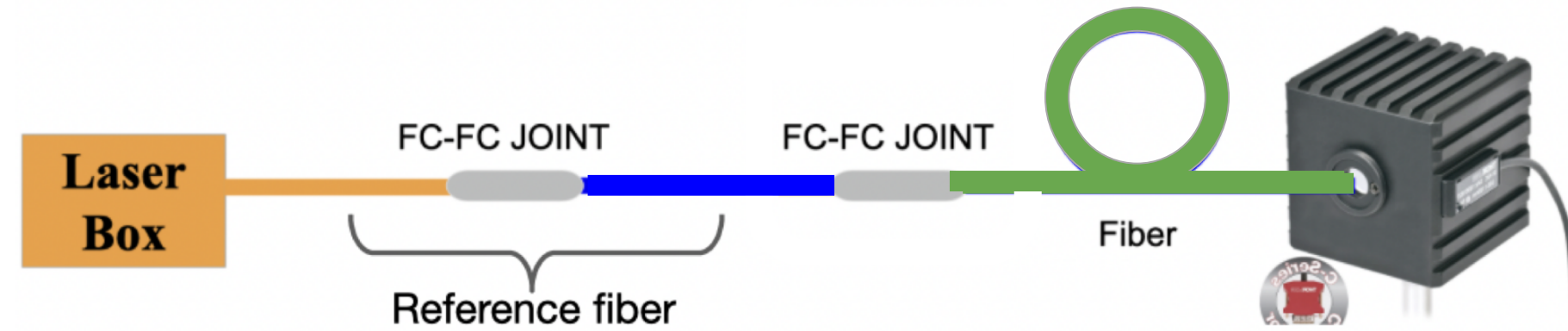


General inspection and Transparency test

1. General Inspection: The 64 optical fibers of 62.5um core passed the inspection
2. Transparency test
 - For the transparency test we used 810nm LED
 - We measured the attenuation between :
 - Reference fiber (62.5 um core)
 - Reference fiber + tested fiber (62.5 um core GoPower fibers of 40m length)



Power Test



For the power test we used a input power of $\sim 0.6W$ by the laser box. Then we measured the power in two points:

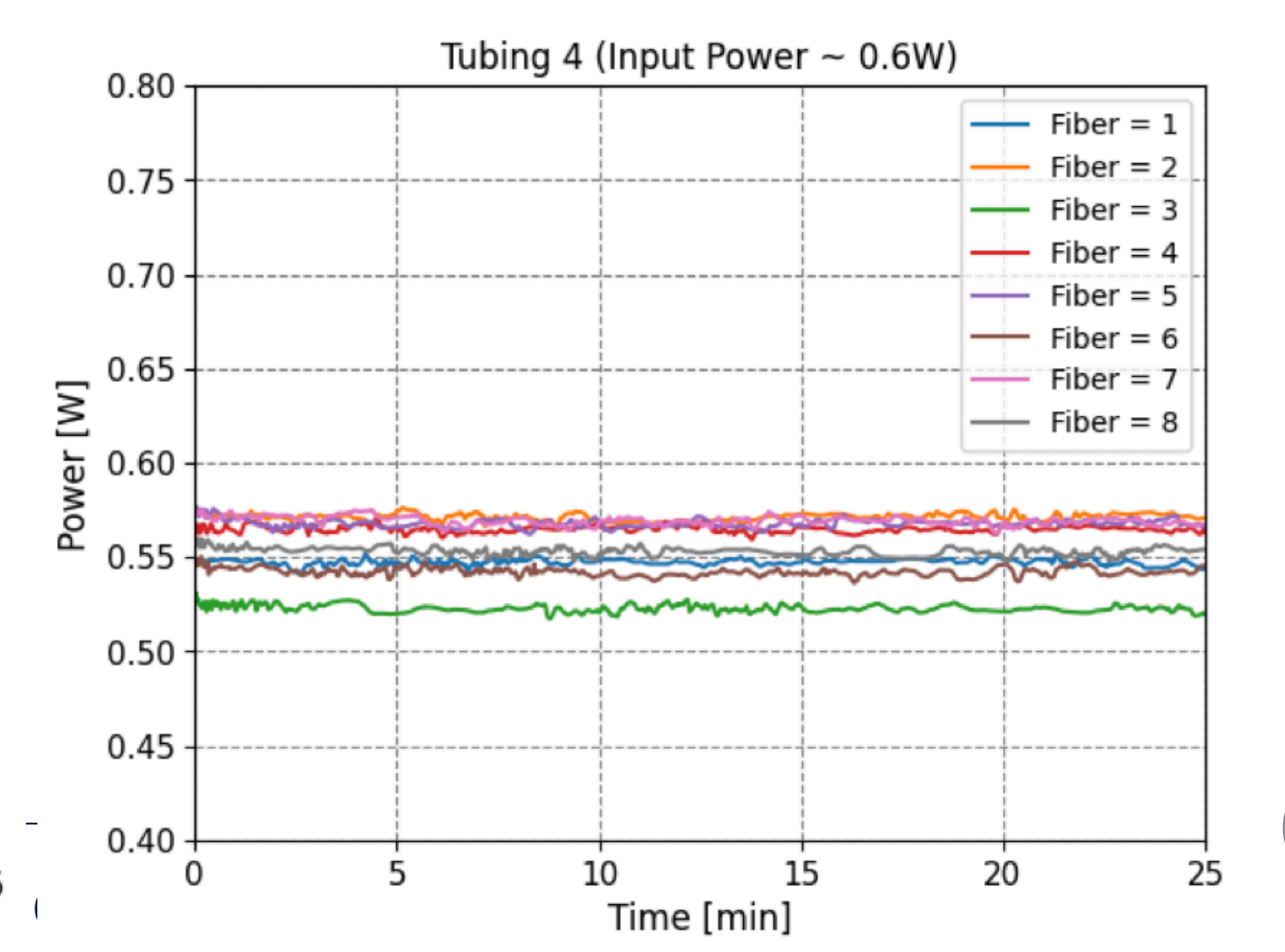
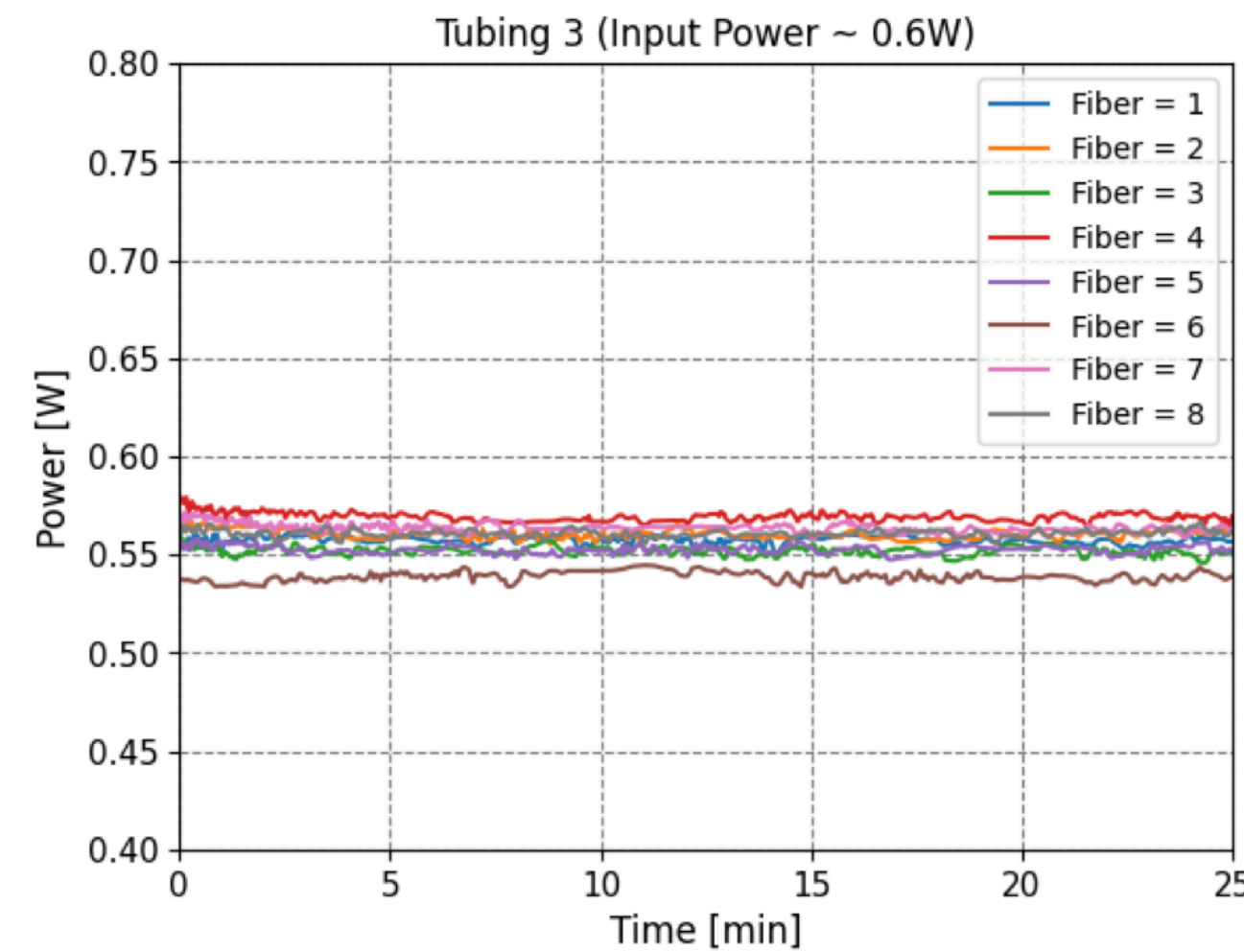
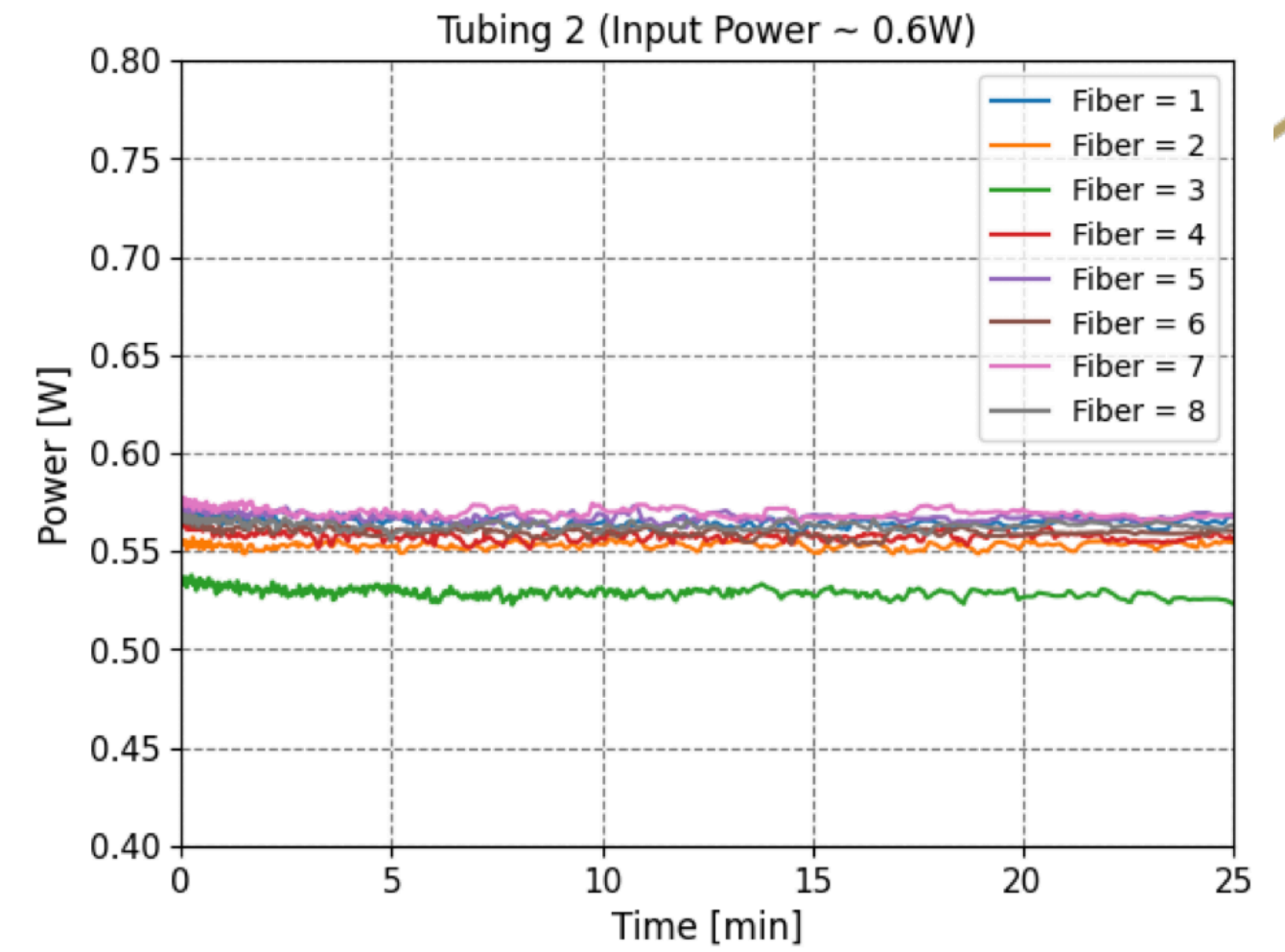
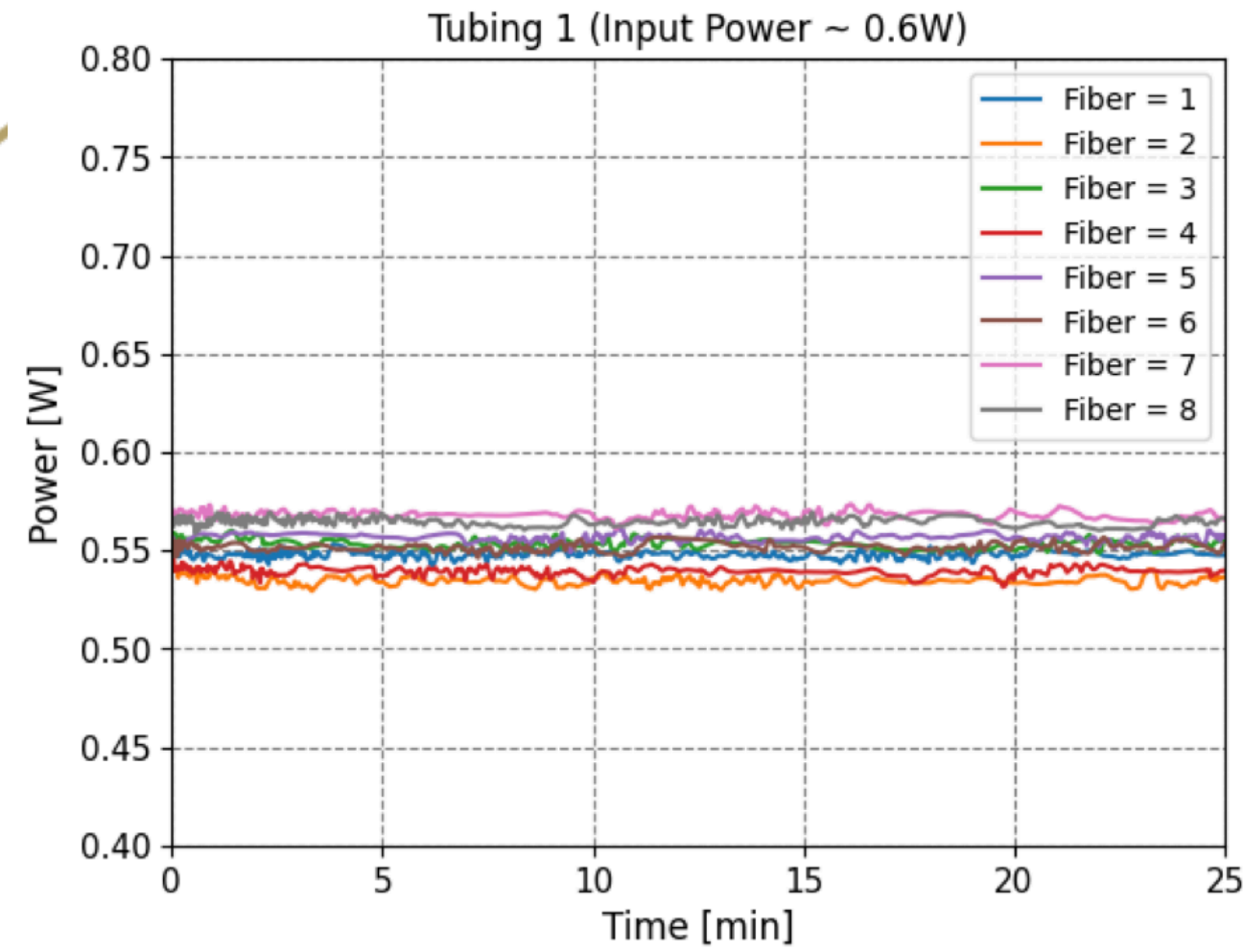
1. Power on the reference fiber (laser box fiber + fiber of 40m)
2. Power on the reference fiber + GoPower optical fiber of 40m

A total of 64 optical fibers were tested

Power Test

Results of the power test for:

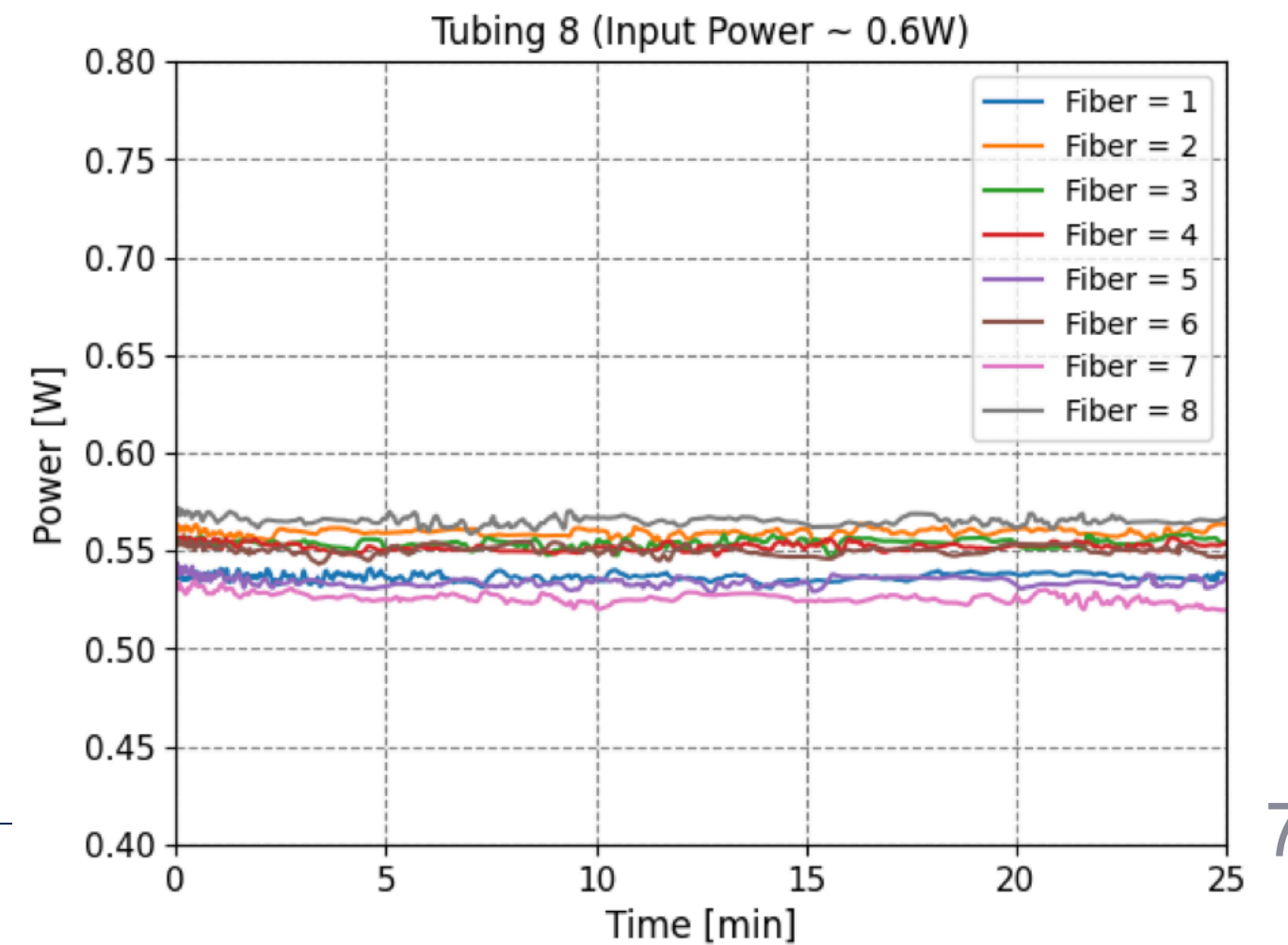
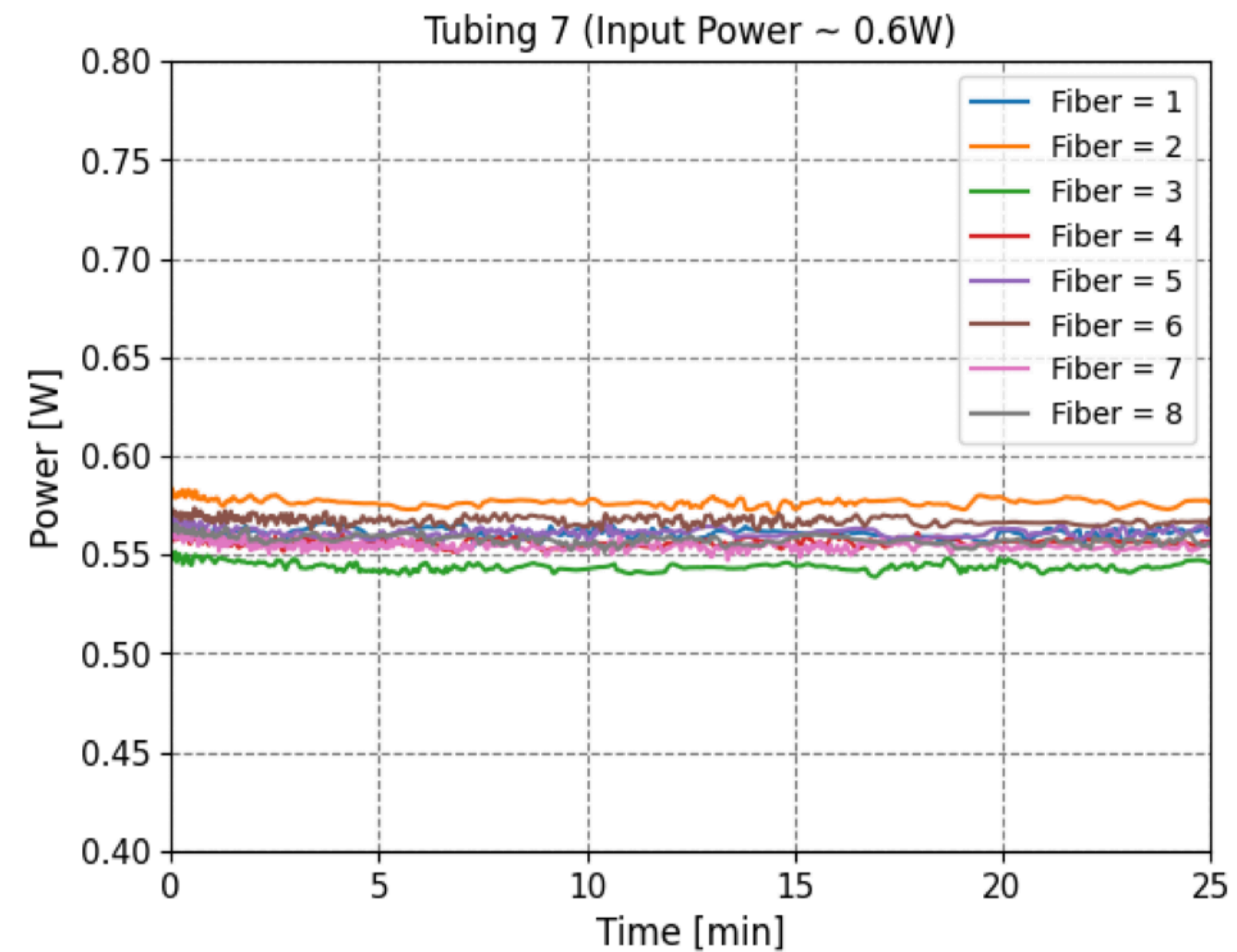
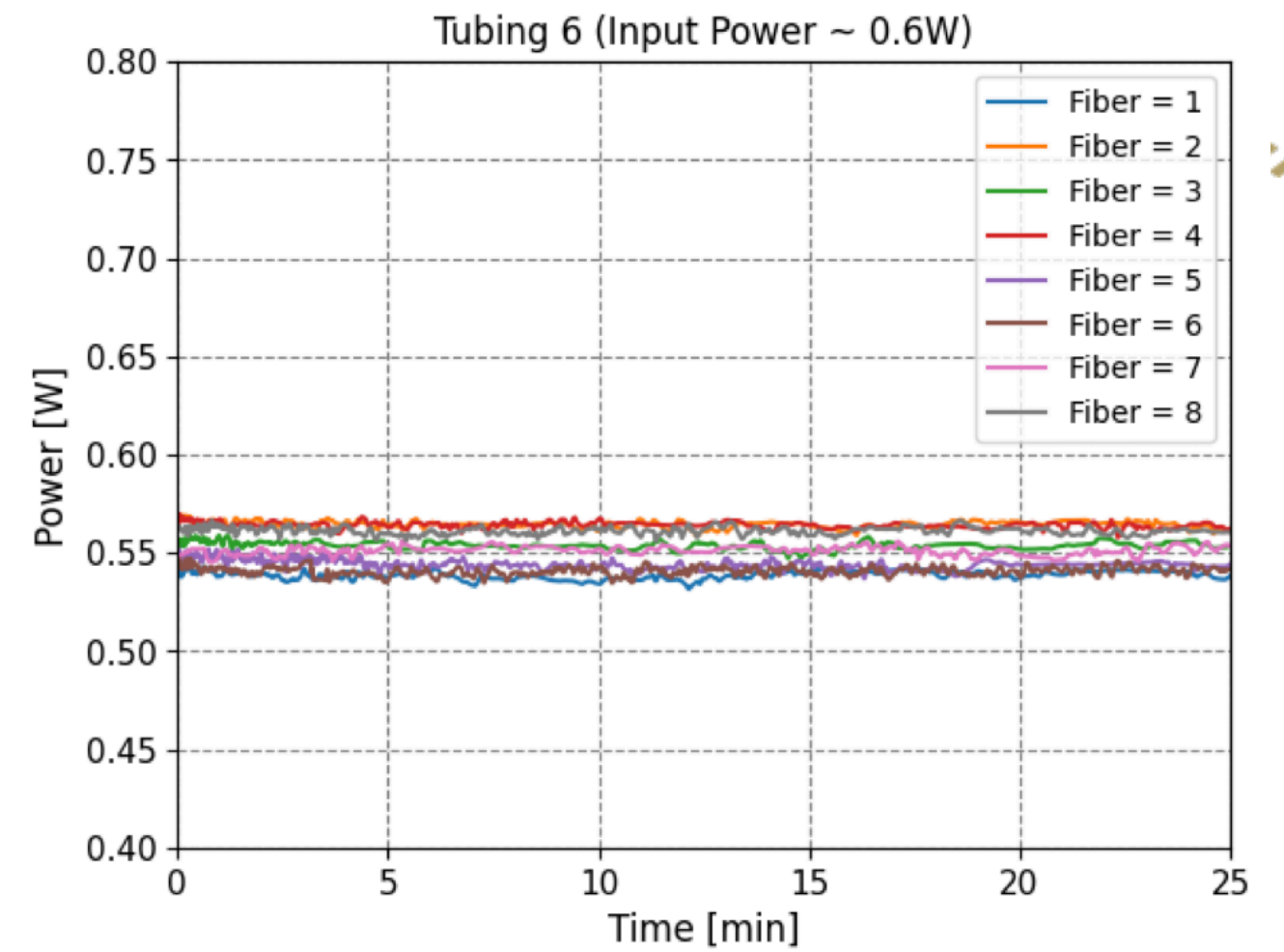
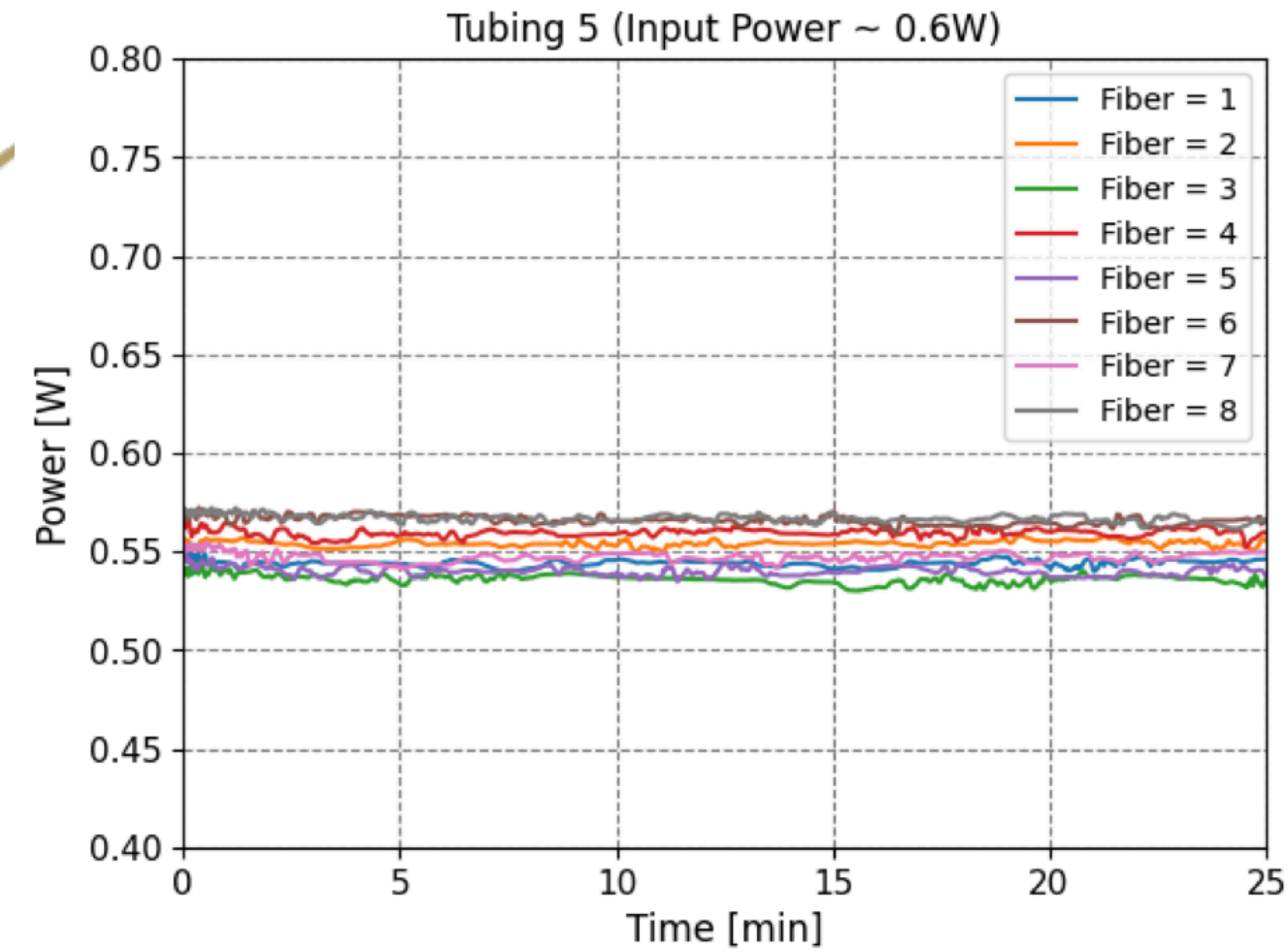
- Tubing 1 (8 fibers)
- Tubing 2 (8 fibers)
- Tubing 3 (8 fibers)
- Tubing 4 (8 fibers)



Power Test

Results of the power test for:

- Tubing 5 (8 fibers)
- Tubing 6 (8 fibers)
- Tubing 7 (8 fibers)
- Tubing 8 (8 fibers)

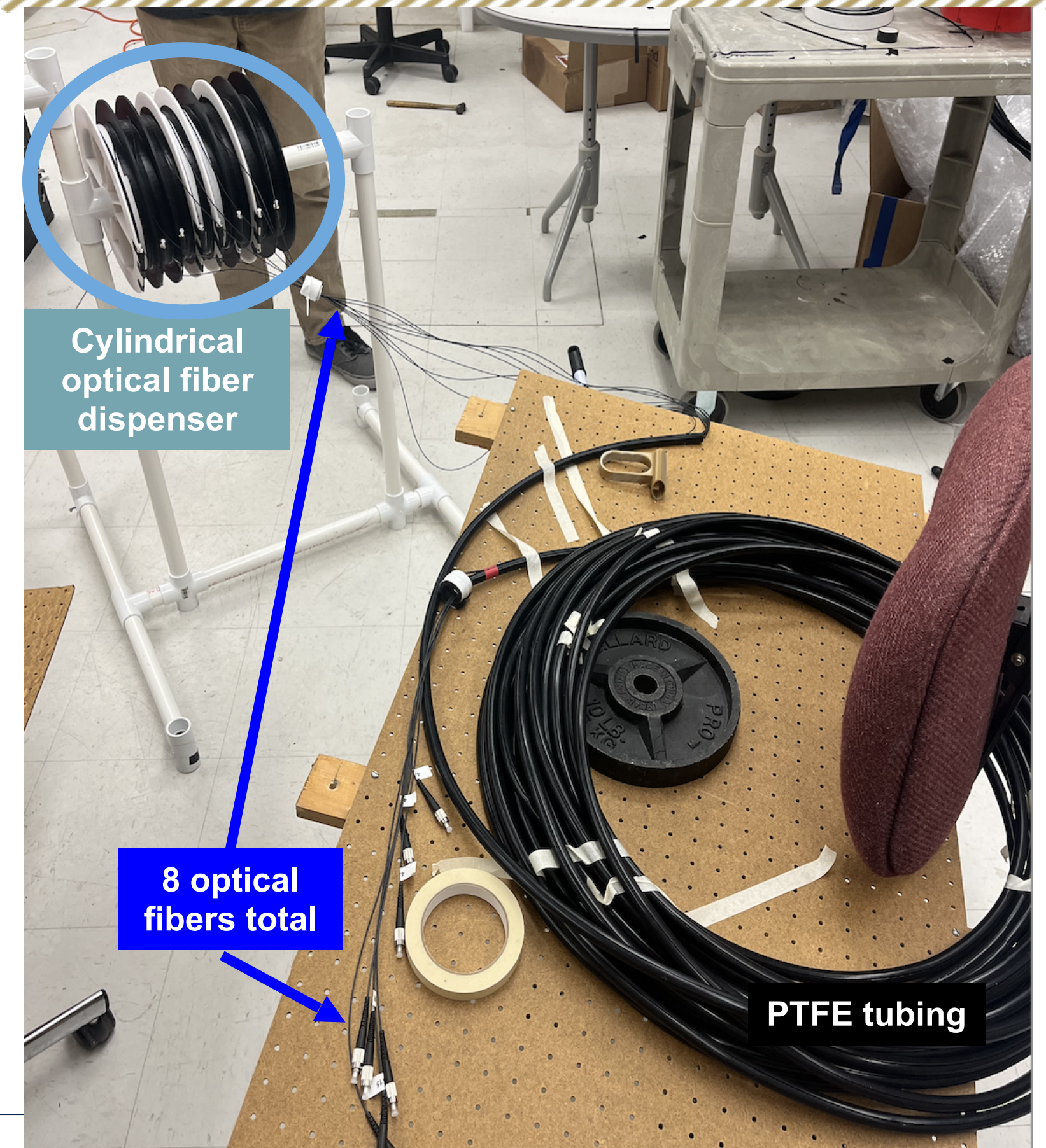


Assembly of fiber bundle for Module 0

In total we assembled 8 PTFE tubing with 8 fibers in each tube. The following procedure was followed

1. Sliced the length of the 8 PTFE tubing (100ft each tube).
2. Loaded a total of 8 cylindrical fiber dispenser with 8 fibers.
3. We used a “large zipper” to insert the fibers inside the tubes.
4. Unique label for each fiber (PoF, SoF and Spares)
 - Example: SoF(T1-F1), PoF(T1-F8), S(SoF-T1-F4)

Note: PTFE cutter, zipper, and cylindrical fiber dispensers were designed and 3D printed at the lab.

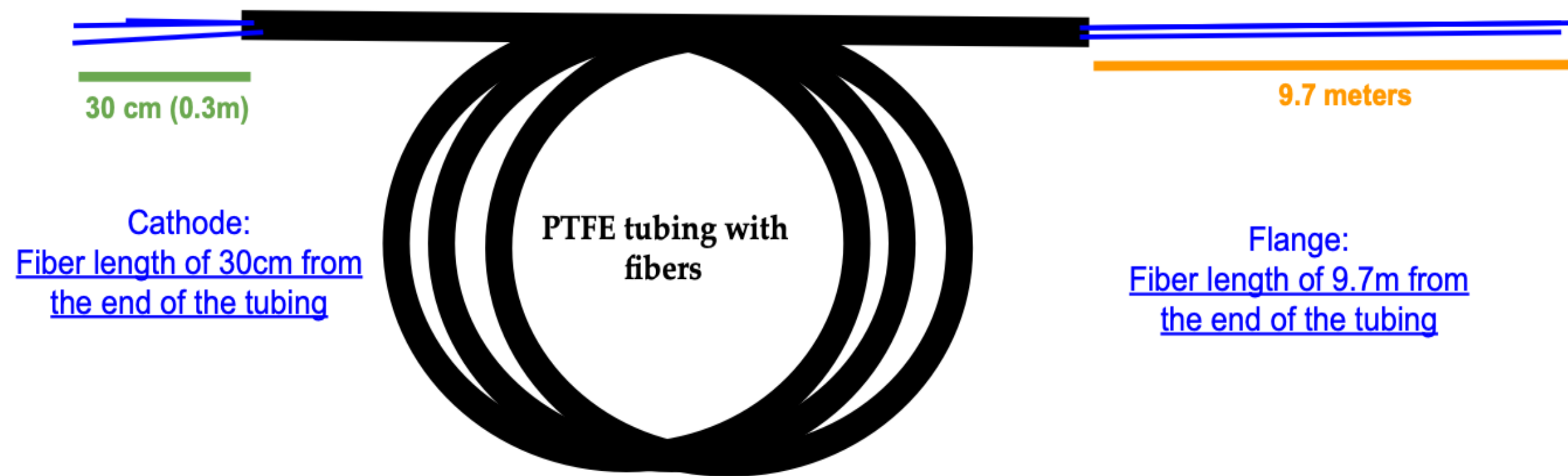




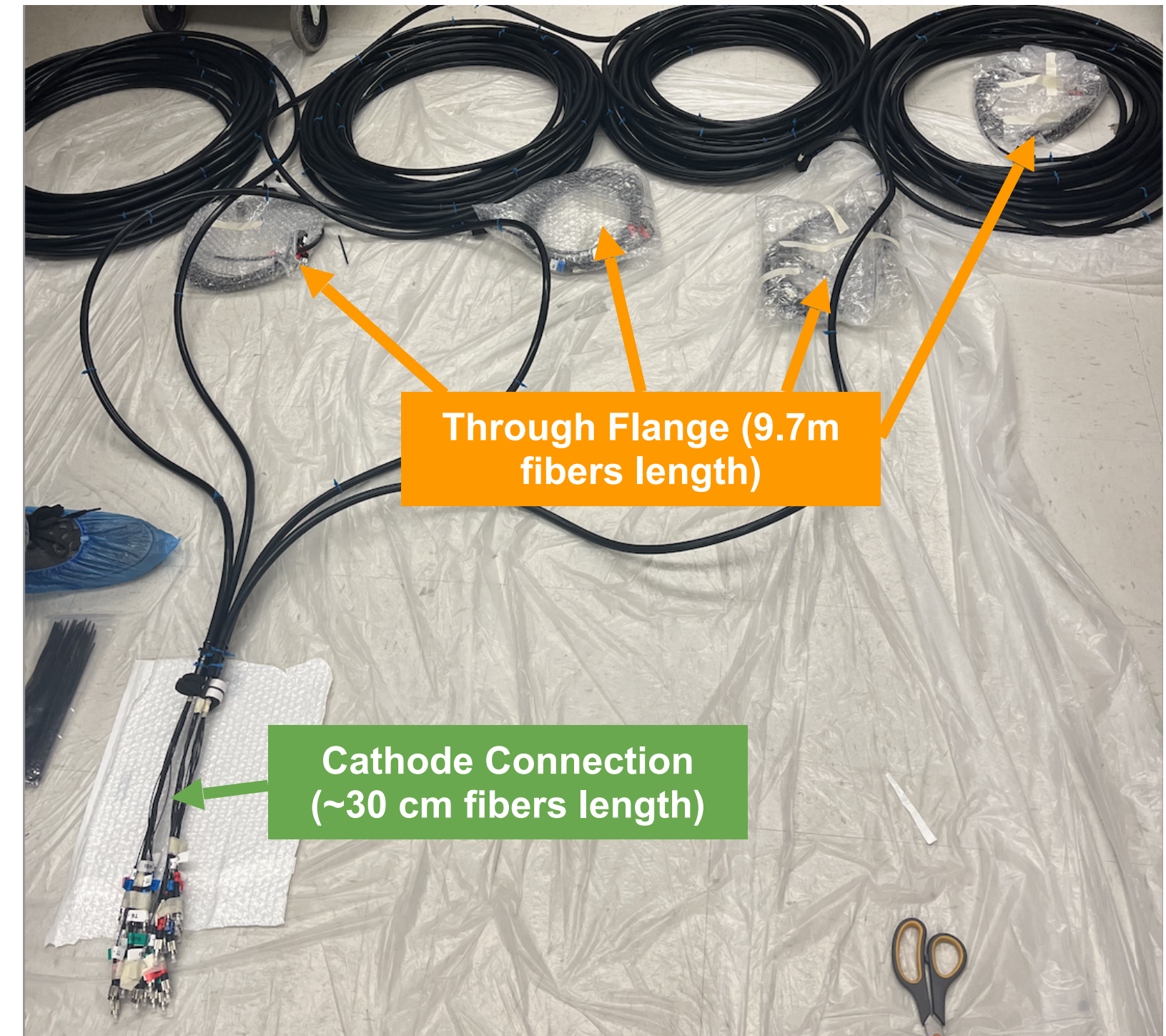
Assembly of fiber bundle for Module 0

Optical fiber length = 40m

PTFE tubing length = 100 ft (30m)



- The PTFE tubing was cleaned with isopropyl alcohol
- Optical fibers were cleaned just before to be inserted into the tubing
- Shoes covers were used during all the process

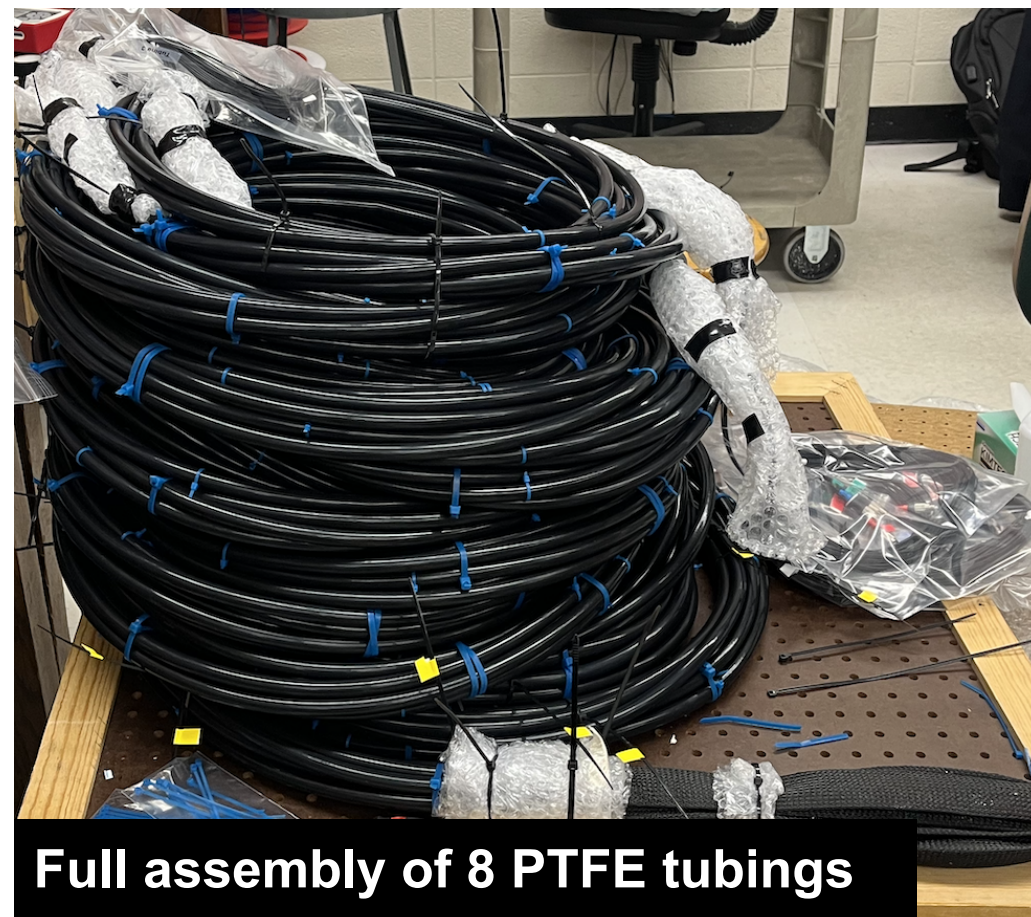


Assembly of fiber bundle for Module 0

The full assembly constitutes a single bundle of 8 PTFE tubings (8 optical fiber per tube).

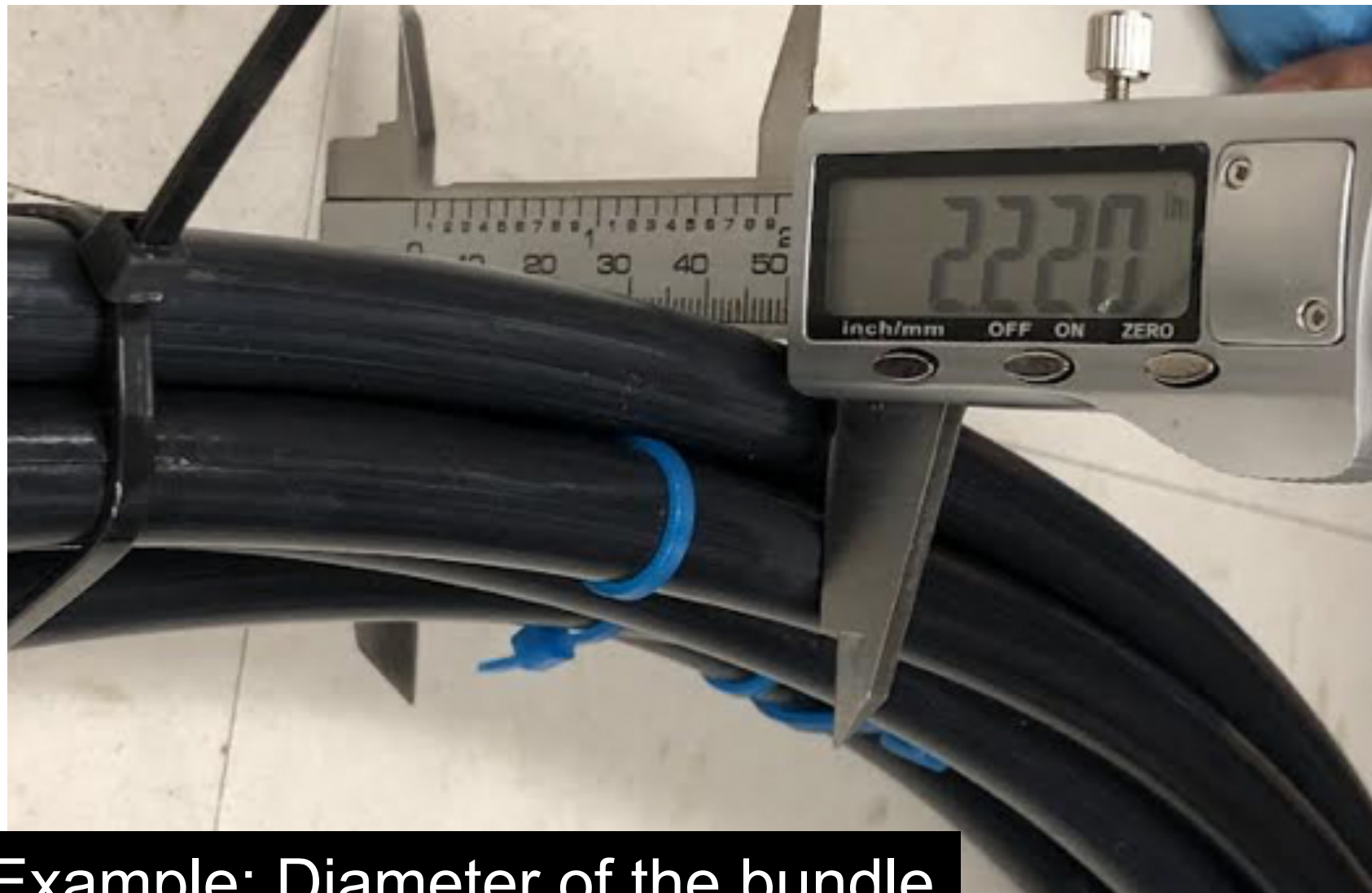
Tefzel zip ties were used to keep the bundle tight and secure.

- Full assembly preparation took us 2 weeks (full time)
- We measured transparency test after the bundle was assembled. **No changes noticed in transparency test**

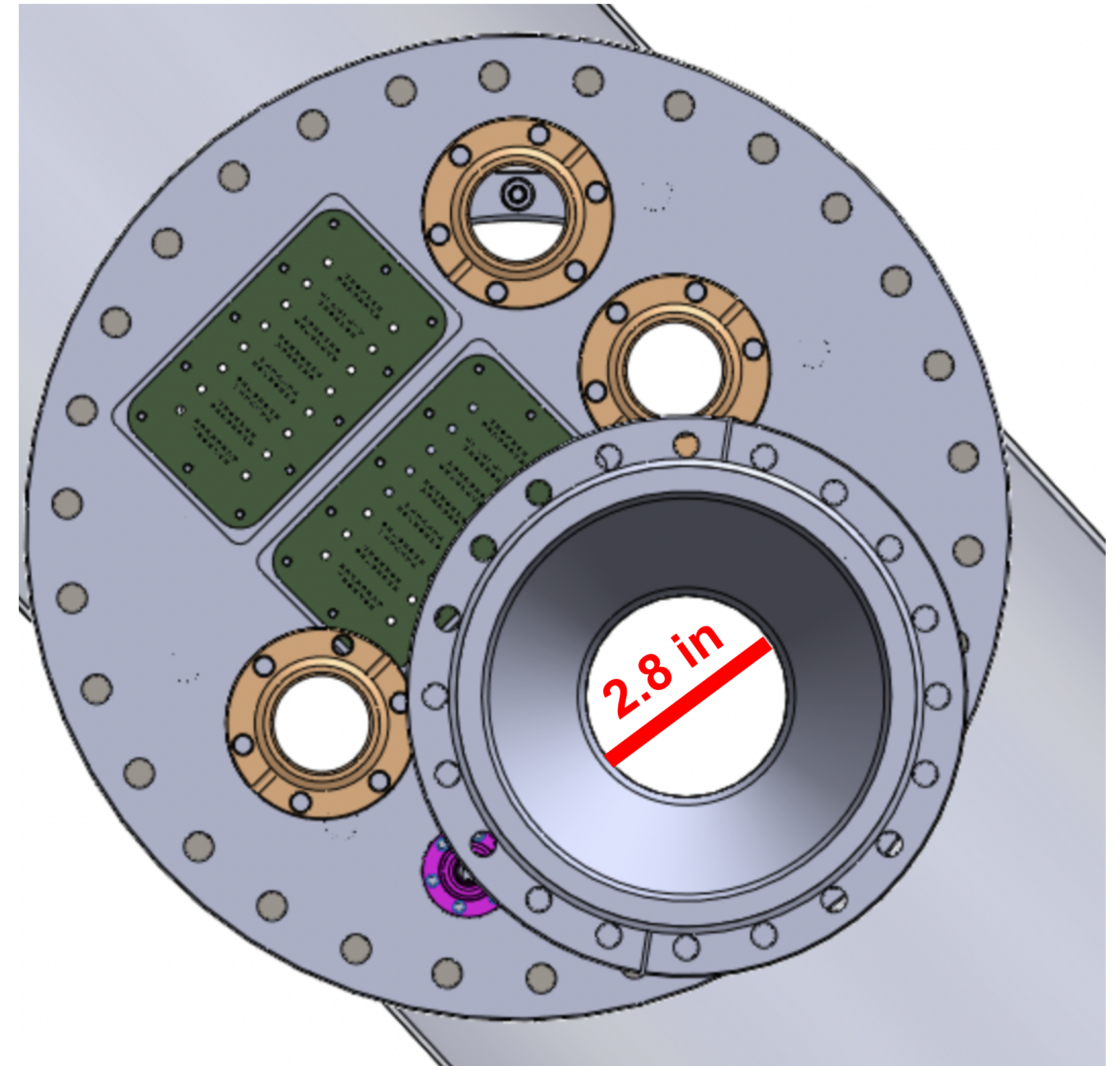


Bundle and Flange Size

The bundle of the 8 PTFE tubings will be able to fit through the flange.



Example: Diameter of the bundle



Summary

- We tested a total of 64 optical fibers of 62.5um core (general inspection, transparency test and power test)
 - All 64 optical fibers have passed our QA/QC tests
- We develop a procedure to insert 64 optical fibers inside to the 8 PTFE tubings
 - Multiple tools were designed and 3D printed
- We made a single bundle of 8 PTFE tubings
 - Shipped to CERN yesterday, expected to arrive next week (if no delays!)