Center for Frontiers in Nuclear Science

Stony Brook University

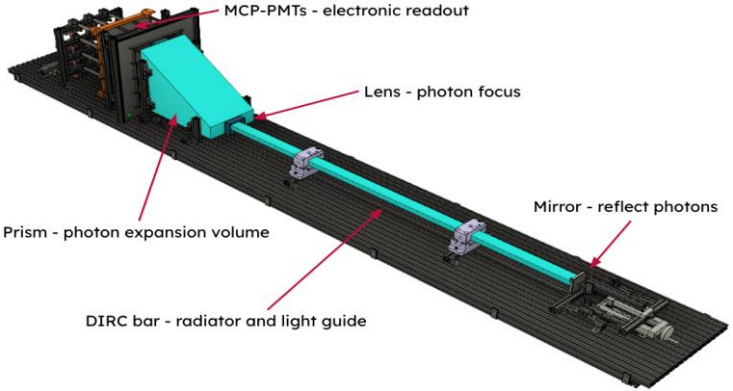
DIRC
Cosmic **R**ay **T**elescope

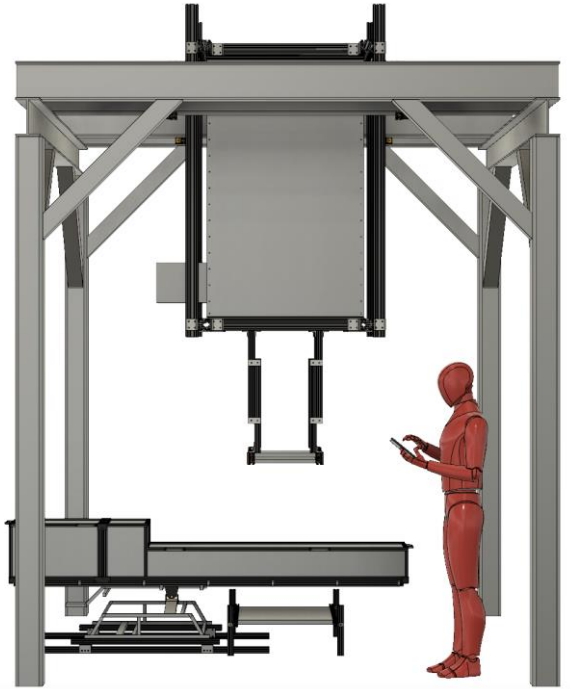
NATHAN SHANKMAN
JAYDEEP DATTA

STONY BROOK UNIVERSITY DEPARTMENT OF PHYSICS AND ASTRONOMY
CENTER FOR FRONTIERS IN NUCLEAR SCIENCE

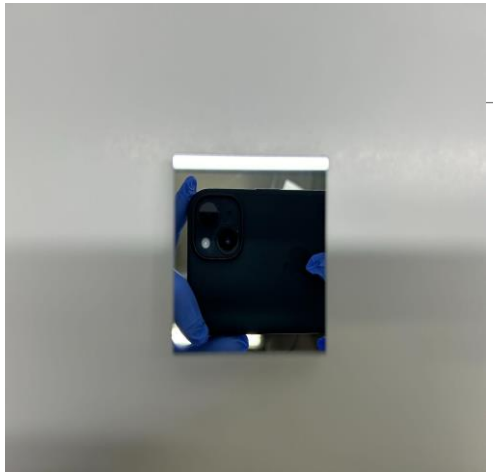
Cosmic Ray Telescope (CRT)

- CO_2 Cherenkov Momentum Threshold Tagger
- Particle trackers
- Timing detector
- DIRC materials & Dark box
- Readout
- Motion Platform

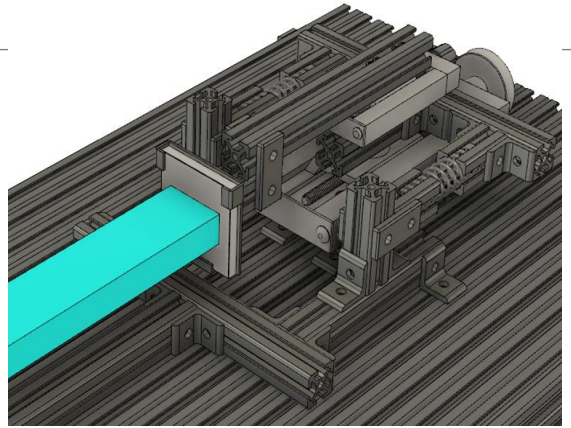


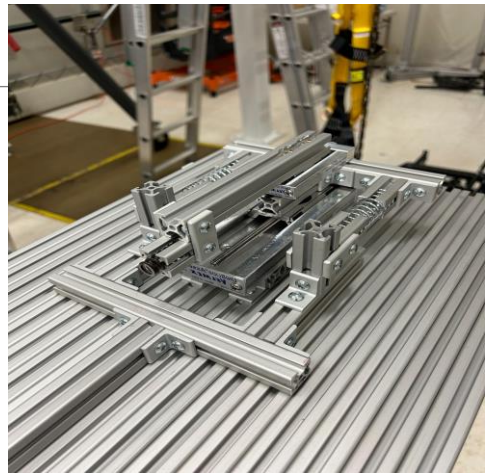


Mirror and Linear actuators



UV enhanced mirror





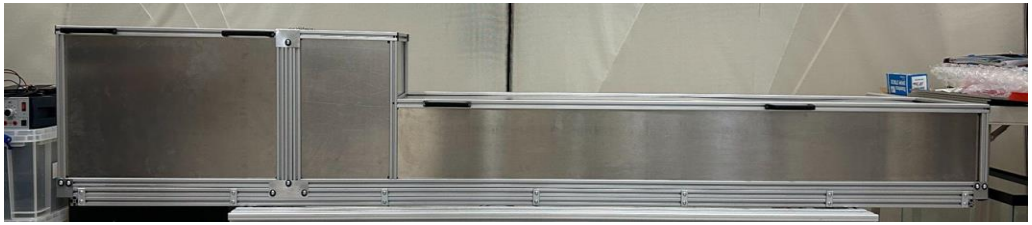
Linear actuator, CAD and in reality

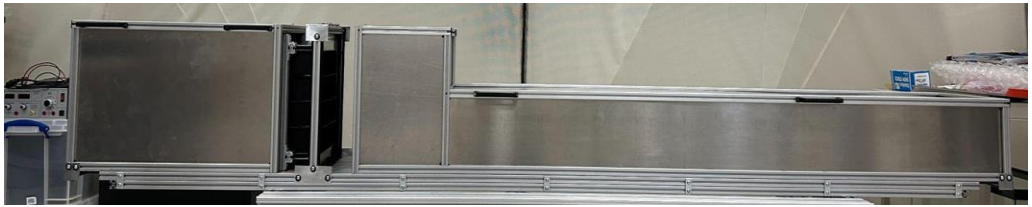
- UV enhanced mirror to reflect the Cherenkov photons
- Linear actuators to move the mirror and the bar

Support for Bar and Expansion volume

- Horse shoe holders for the bars
- 3D printed support structure for horse shoe holders
- Peek pins to hold the expansion volume

The Dark box

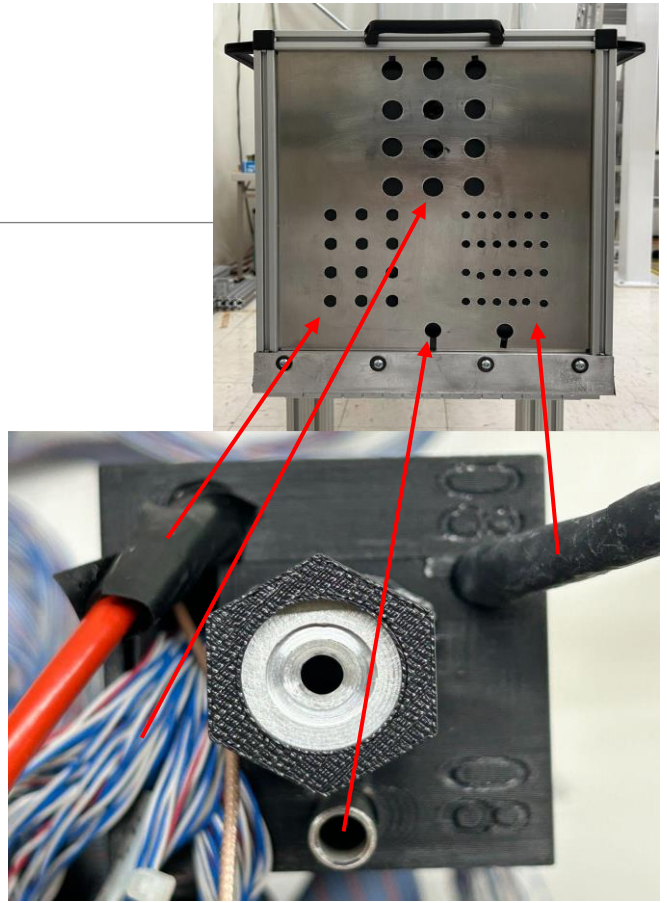




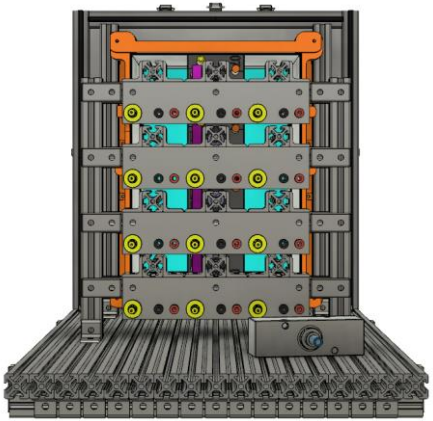
- The general design for the dark box consists of two lids and a base.
- The two lids, one for the readout and one for the bar/prism setup.
- The box needs to be light-tight

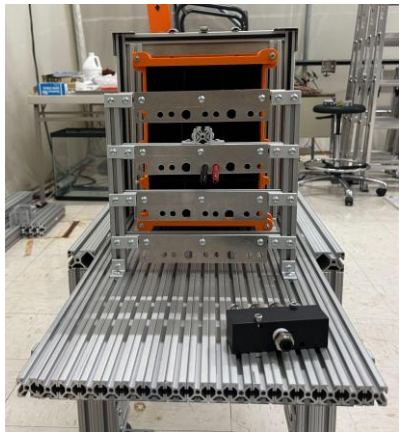
Outer Panel

- Each MCP-PMT has
  - HV supply
  - LV supply for pre-amplifier
  - Signal cables
  - Cooling
  - Holes to press against the expansion volume.
- The outer panel is made to have provision for 12 MCP-PMTs



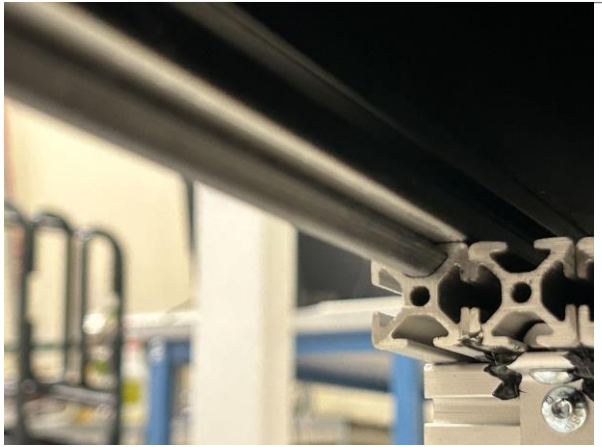
Inner panel

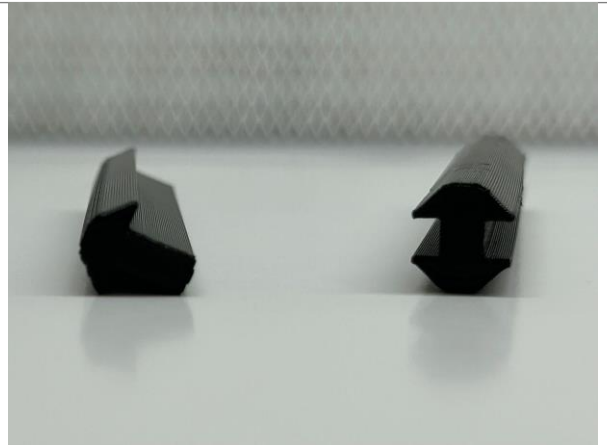




- Inner panel holds the wiring and cables from the MCP-PMT
- The panel mount connectors will avoid any accidental pull on the MCP-PMT

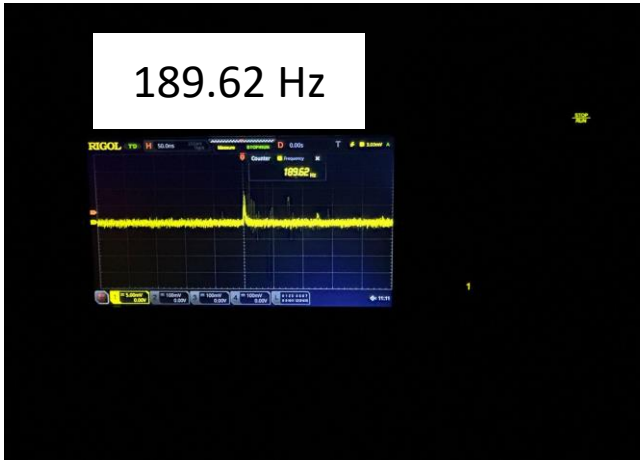
Sealing of the box

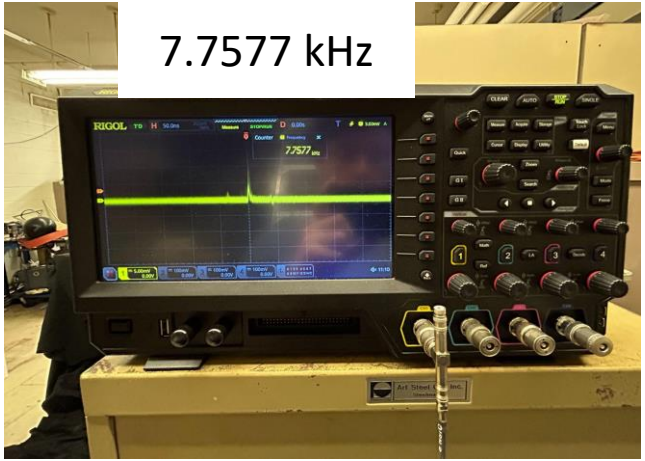




- Black sealant was applied to seal corners, base and sides
- Tedlar papers to cover the inside the box.
- Used 3D printed black strips as well as aluminum panel covers for the gaps between lids and base

Testing of the box



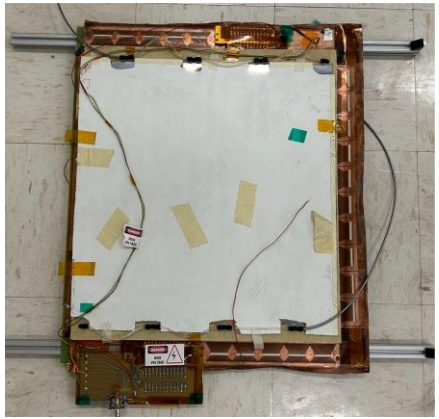


- Used an MCP-PMT as a light sensor for light leak test
- With the lights off we had a frequency of about 200 Hz
- Lights on we had a frequency of about 8 kHz.
- Need to find and seal the box

Motion test

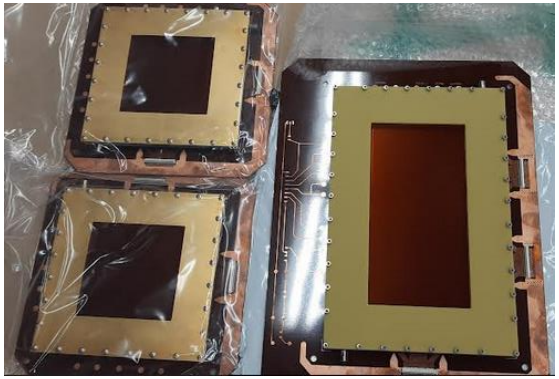
- The box will rest on a motion platform which we will use to rotate the bar to various angles in the pitch and roll degrees of freedom.
- This will allow us to test incident muons at different angles of entry.

Cosmic muon tracking



GEM, 50 cm x 50 cm

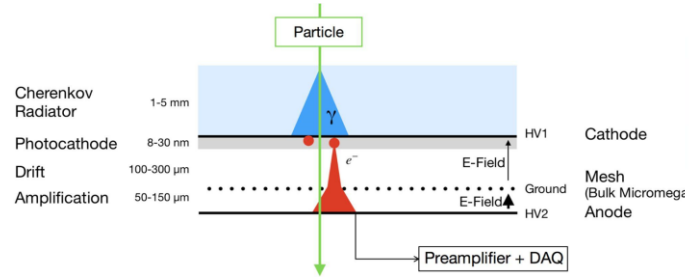
Borrowed from UVa



μ-RWELLs 10 cm x 10 cm, 20 cm x 10 cm

Cosmic muon tracker

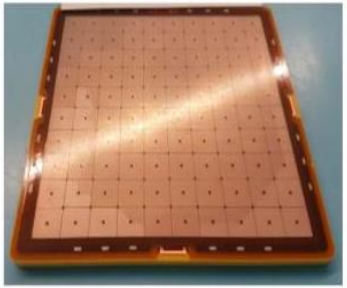
Timing detector for CRT

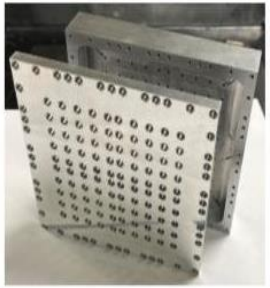


Multi channel digitizer SAMPIC (D. Breton, CEA Saclay)

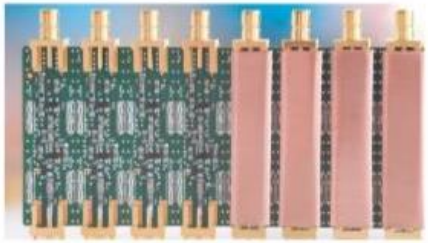
https://indico.cern.ch/event/396441/contributions/1836629/attachments/794757/1089389/02_SAMPIC_Prague.pdf

Large 100-pad prototypes (Micromegas & µRWELL)





Multi-channel custom-made pre-amplifier (M. Kovacic, U. of Zagreb)



- CERN testbeam preliminary result ~23 ps
- K. Gnanvo, A.Pandey et al. will help us with the initial setup and running

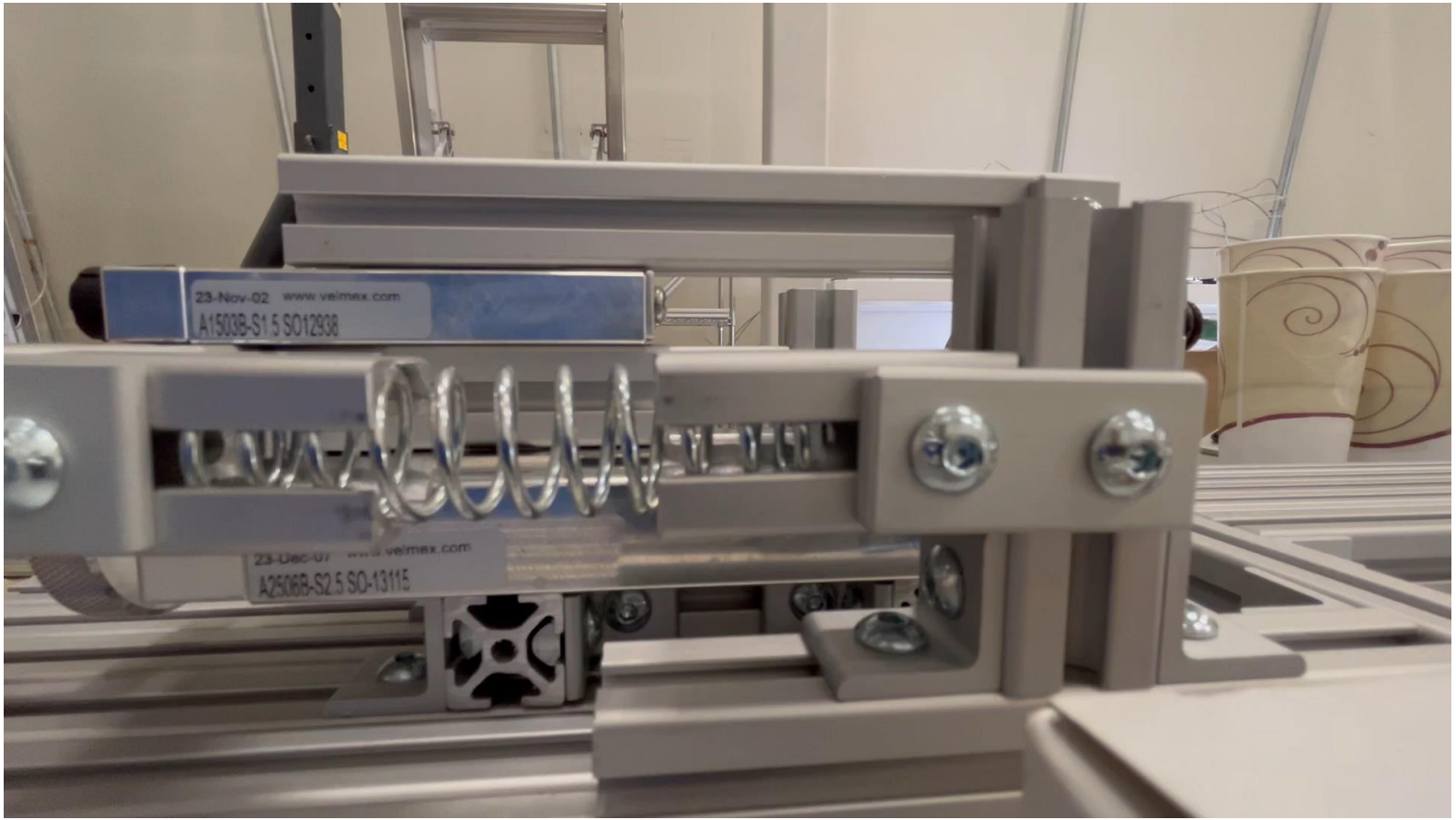
Taken from slides by A. Pandey, JLab

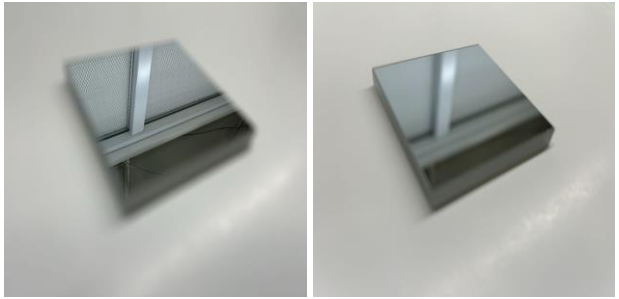
Cosmic Muon momentum tagger

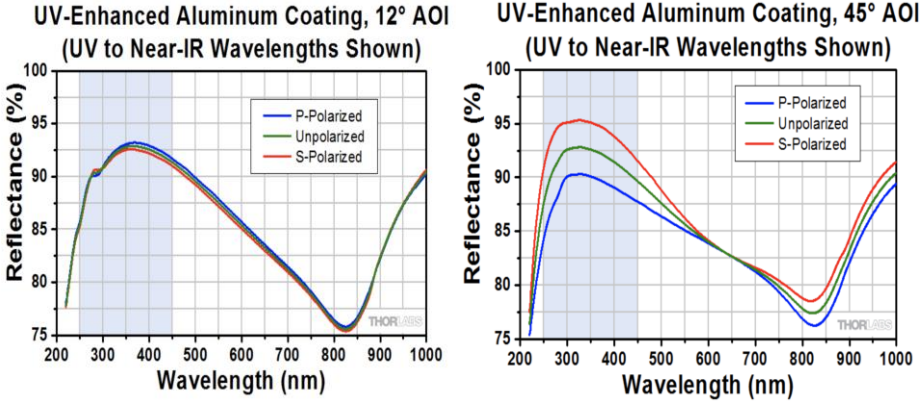
Future steps

- Configure the DAQ system to communicate with desktop.
- Improve light sealing
- Install Detectors
- Synchronization of different DAQ systems

Backup


23-Nov-02 www.velmax.com
A1503B-S1.5 SO12938
A2506B-S2.5 SO-13115




UV-Enhanced Aluminum Coating, 12° AOI
(UV to Near-IR Wavelengths Shown)
Reflectance (%)
Wavelength (nm)
P-Polarized
Unpolarized
S-Polarized
UV-Enhanced Aluminum Coating, 45° AOI
(UV to Near-IR Wavelengths Shown)
Reflectance (%)
Wavelength (nm)
P-Polarized
Unpolarized
S-Polarized