Short Baseline Near Detector Assembly Tour

Diana Mendez
Detector design

Anode

Fieldcage

Cathode

Photon detection system

Photon detection system (PDS) box

4 m

5 m
Detector assembly

**Assembly transport frame** built to assemble detector at the Do building and then transport it to its final location (SBN-ND building).

It is surrounded by a **clean tent** to protect components sensitive to UV and blue light and to keep assembly clean.
Detector assembly

Most of the **cathode** panels are now installed

**Anode** modules already onsite and ready to be installed
Detector assembly

Field cage installation test

PDS box with PMTs

X-ARAPUCA
Backup
Detector design

Time Projection Chamber

- Single phase LArTPC
- 112 tons active mass
- 5m x 4m x 4m active volume
- One central cathode plane assembly (CPA)
  - Divides detector in two drift windows
- Two anode plane assemblies (APAs)
  - 3 wire planes (vertical, +/- 60 to the vertical)
  - Wire pitch and plane spacing = 3mm
- Field cage to maintain 500 V/cm drift field
Detector design

Photon Detection System

• Modular detection system behind APAs
• 24 photon detection system (PDS) modules
  • 5 PMTs, 80% total with wavelength shifter (WLS)
  • 8 X-ARAPUCA photon traps instrumented with silicon photomultipliers (SiPMs), 50% with WLS
• Reflective foils behind CPA mesh.

 Cosmic Ray Tagger

• Every side of the detector will be covered by planes of extruded scintillator strips
• Marginal background removal with overburden compared to beam background. No overburden planned.
Detector assembly

Status

Assembly slowed down due to COVID restrictions but is ramping up.

- CPA frame installed 2 weeks ago
- CPA mesh panels currently being installed
- **APA** planes are already on-site, mechanically and electrically coupled
- **Cold electronics (CE)** on-site and tested ready for installation
- **Field cage** tests ongoing
- PMTs passed reception test at Fermilab
- X-ARAPUCA production ongoing
Detector installation

**Status**

- **Warm outer vessel** already installed in the SBN-ND building.
- **Cryogenics** installation ongoing
  - Installation of cryostat membrane starting this August, all the materials on-site
  - Fabrication of cryostat top at CERN completed. It’ll be shipped to Fermilab by the end of summer.
Summary

The Short Baseline Neutrino program at Fermilab has sterile neutrino oscillations, new physics searches and technology development as main goals

• The Short Baseline Near Detector, SBND, will constrain the unoscillated flux for sterile neutrino searches

• The detector will record the largest sample of neutrino-Argon interactions than any past or present experiment.

• It will provide precise cross-section measurements and inform MC generators.

• SBND will be ready for cold commissioning by the end of 2022
TPC assembly

1) Install APAs and CPA

2) Install Field cage

3) Install cold electronics

4) Install photon detection system

5) Move to SBN-ND detector hall!

Nicola McConkey