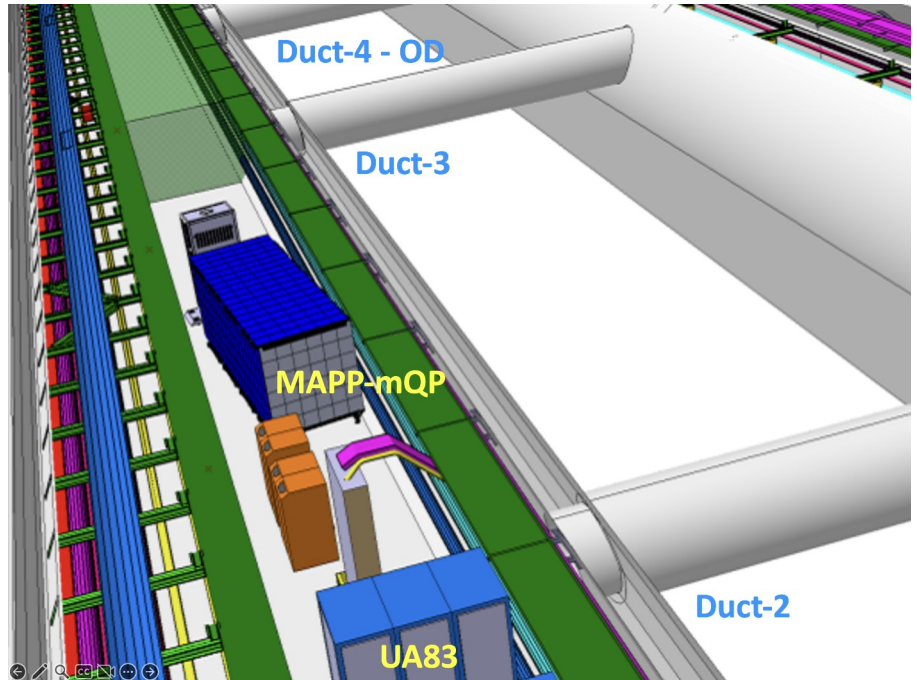


ALabama Scintillator Outrigger (ALSO) Status and Outlook

Igor Ostrovskiy, 10 Sep 2024

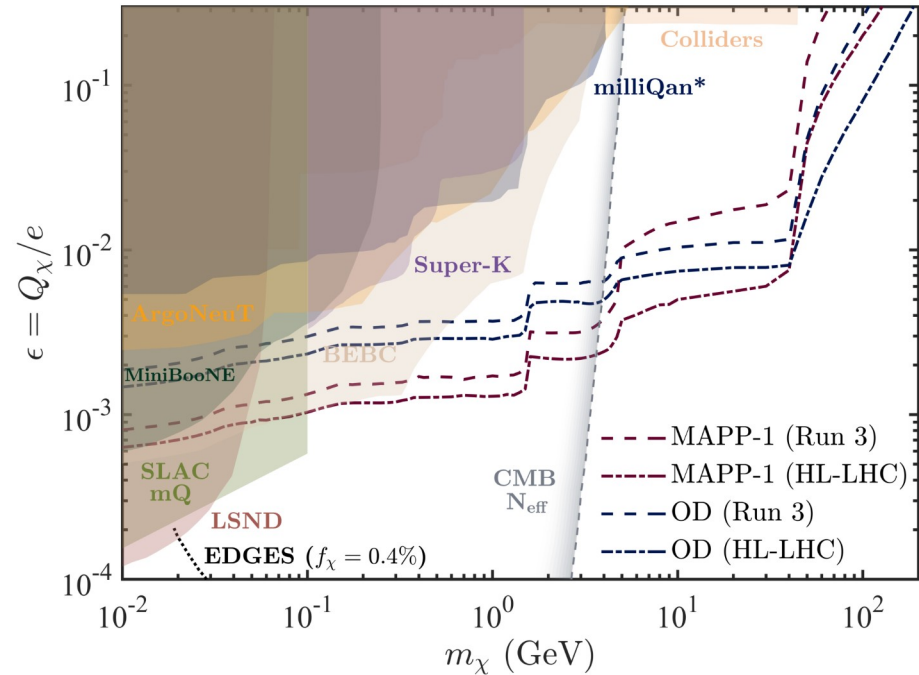
MAPP-1 Outrigger Detector

- An additional MAPP-1 sub-detector to be placed in the Duct-4 on the side of UA83, roughly 120 m from IP8



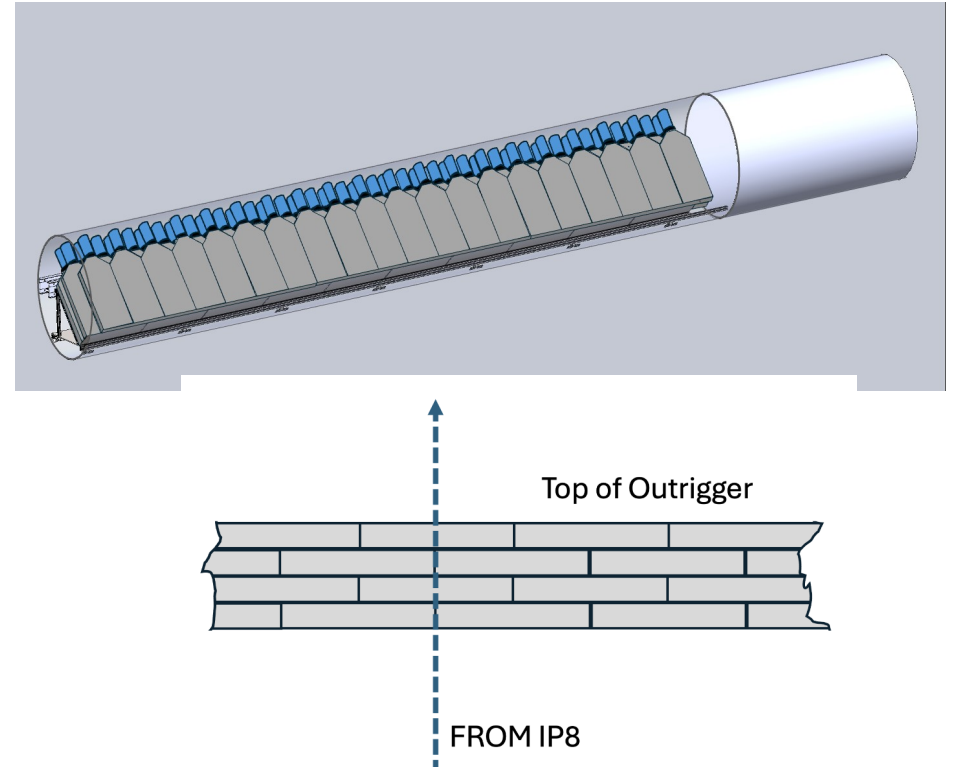
MAPP-1 Outrigger Detector

- Aimed to extend sensitivity to m_{CP} with higher masses, compared to MAPP-1 alone



MAPP-1 Outrigger Detector

- Designed as a 4-layer scintillator array with a total of 80 scintillator slabs read out by PMTs
- Slabs arranged in a brick-like fashion to reduce “normally ionizing” backgrounds
- 1 m iron shielding on the tunnel side of the Duct to reduce beam backgrounds



Allocated resources

- Hardware:
 - Scintillator and PMTs for 60/80 units funded by an NSF award to the Alabama group. Scintillator for the rest loaned by the Alabama's EXO-200 group
 - Remaining 20/80 PMTs come as donation to Alberta
 - Electronics is the same as in MAPP-1, funded by MoEDAL M&O funds, Alberta's NSERC and DUP awards
 - Duct's shielding is provided by CERN
- Personnel
 - Alabama has 1 postdoc (S. Behera) permanently stationed at CERN, who will work on installation and serve as DEXSO, supported by the NSF award. Group's PI plans to spend the Spring 2025 semester at CERN. 1 GRA and 1 UG funds to support work on preparing components at home
 - Alberta's NSERC award supports mechanical and electronics engineers, and technical coordinator (R. Soluk) who will be working on installation and serve as EXSO. Jack Lindon will serve as DEXSO (30% on MoEDAL, full-time on-site)
 - We are coordinating with the Francois Butin on shielding matters

Preparations at Alabama

- Procured enough BC-408 plastic scintillator and 2-in Hamamatsu PMTs to instrument 60 scintillator units + 2 spares
- With the help of Dr. Soluk who visited the lab end of July, the slabs are cleaned, wrapped, and instrumented with calibration LEDs and PMTs glued in

Preparations at Alabama

R.Soluk



Alabama students:

B. Davis

A. Upreti



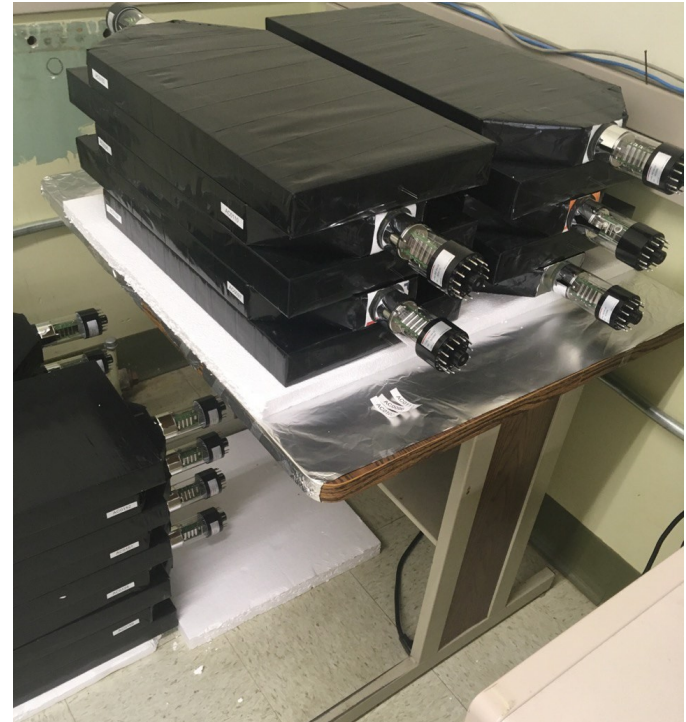
A. Dandapat

U. Ullah



Remaining tasks at Alabama

- Prepare a shipping crate
- Wrap PMTs
- Manufacture PMTs bases (divider+CW gen) once design is available

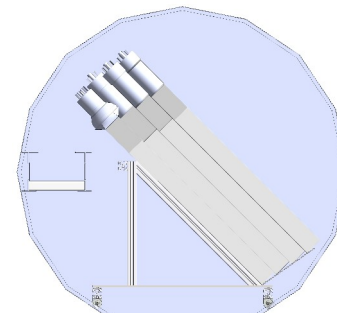


Towards the 4th layer

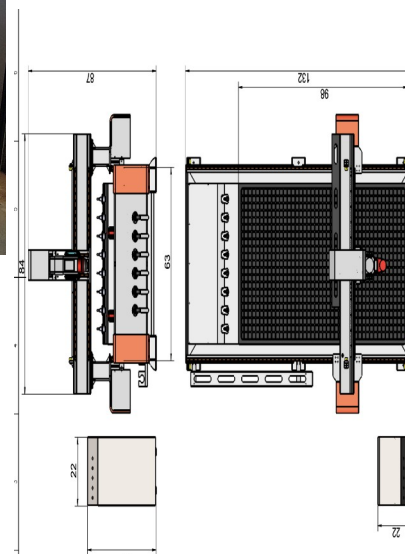
- Alberta has enough 3.5-in PMTs to instrument 20 more units needed to complete the 4th layer of the detector
- Alabama loaned to Alberta enough scintillator material (from ended EXO-200 experiment)
- Alberta is gearing to machine the plastic to shape using a dedicated tool
- The units for the 4th layer are expected to be completed by the end of the year



Shipment of EXO-200 scintillator panels from Alabama to Alberta



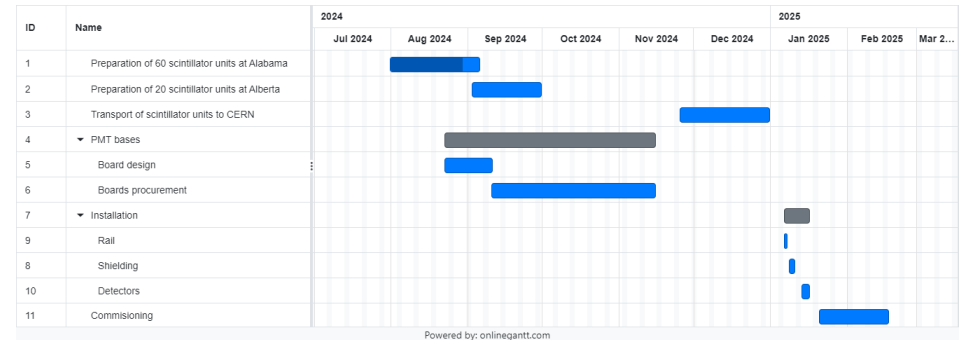
4th layer will utilize larger, 3.5-in PMTs



Schematic of a cutter machine at Alberta

Towards the installation

- Assuming the Outrigger is approved sometime this Fall, the components will be shipped to CERN end of the year
- Installation is planned for early 2025 during the EYETS
- The installation (including shielding) should be complete in under two weeks. Commissioning with cosmics and LEDs to follow



Notes on Safety

- EXSO and at least one DEXSO will participate in the installation
- At least one DEXSO is full-time on MoEDAL-MAPP and permanently stationed at CERN; Second DEXSO is 30% MoEDAL-MAPP, full-time at CERN
- PMT are powered by LV, use CW to ramp up on board
- Placement inside concrete duct with iron shielding on one end reduces fire risk. Aluminum plates to close the other end
- Safety features foreseen
 - Smoke, temperature, voltage trip alarms; video monitoring