

LArIAT Weekly Meeting

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Outline:

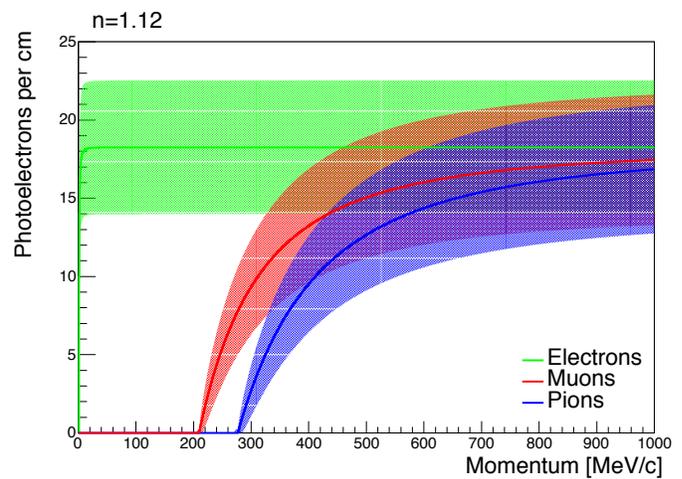
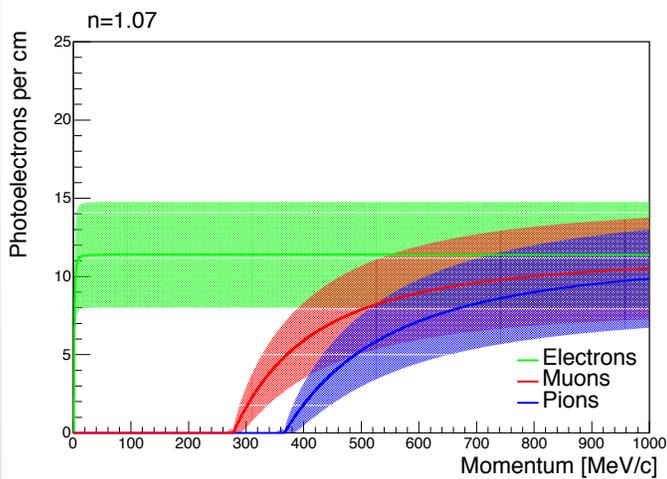
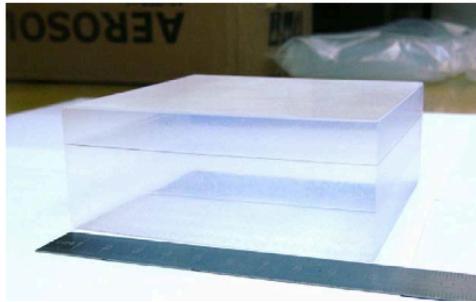
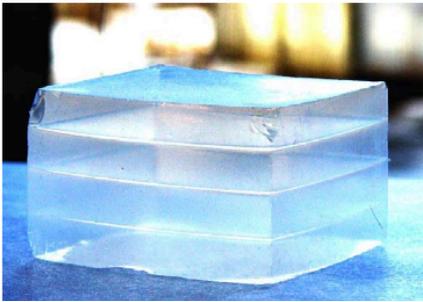
September 16, 2014

- Motivations
- Current prototype
- PMT calibration
- Tests with cosmic muons
- Future work



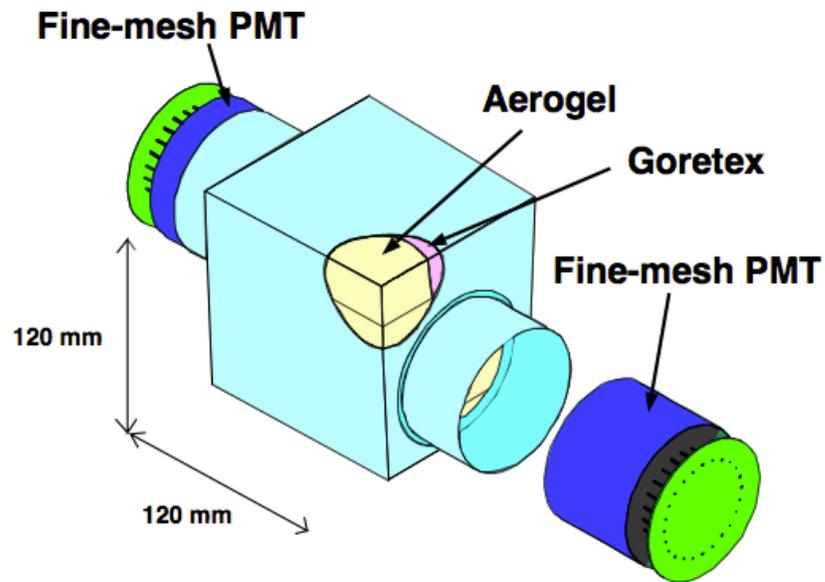
Motivation

- Building and testing a beam Cherenkov detector using aerogels.
- Using aerogel to separate pions and muons from there momentum range, given by the Cherenkov radiation light.
- May also be useful for time of flight



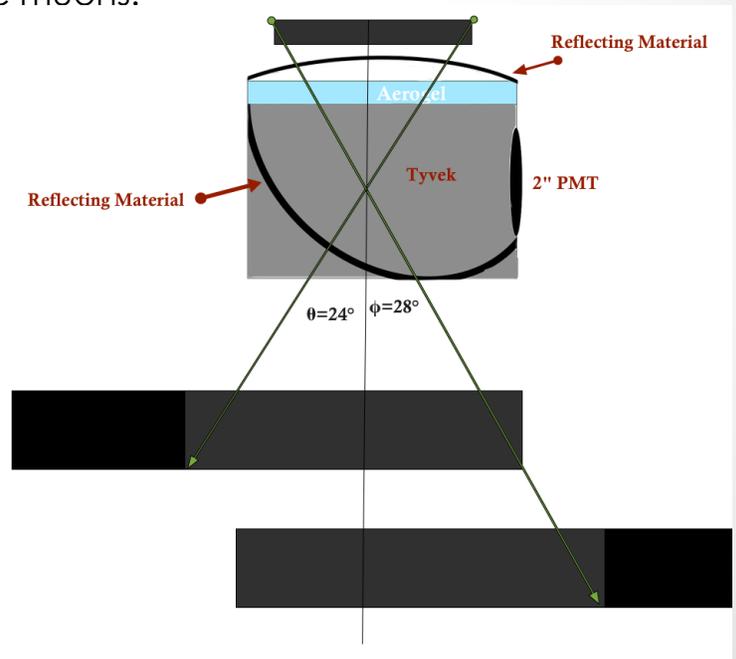
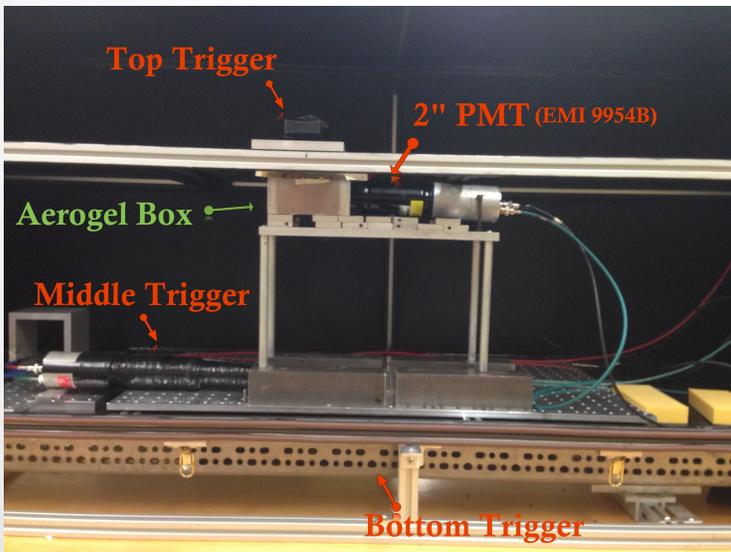
MICE(Muon Ionization Cooling Experiment) Setup

- The MICE group used two PMTs per aerogel block
- We are currently using two types of aerogel borrowed from the MICE group
 - HY-80 with $n = 1.07$
 - HY-120 with $n = 1.12$



Current Prototype with 2" PMT

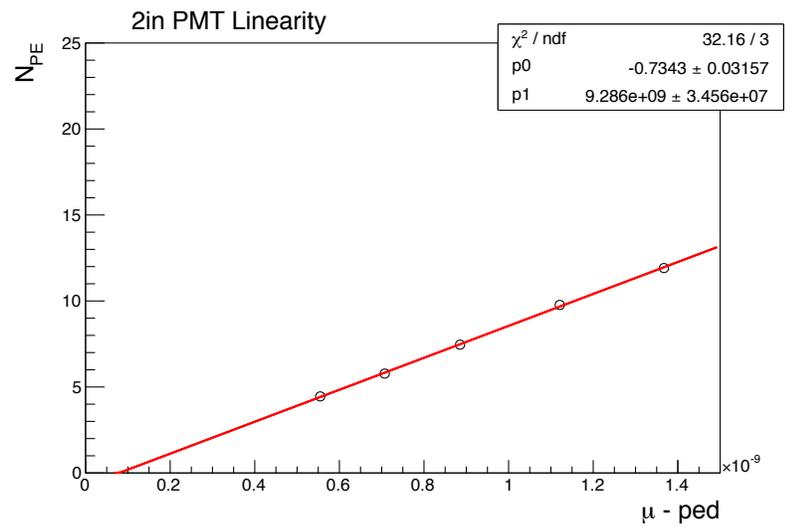
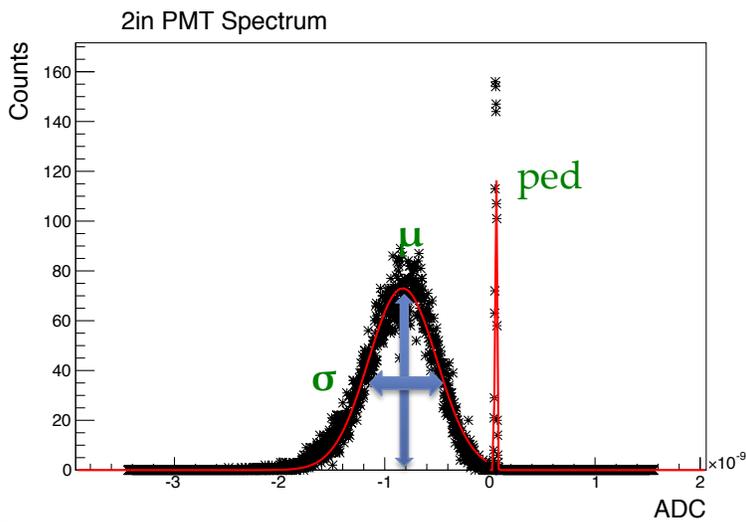
- Idea is to collect all of the light produced in the aerogel in our PMT(s)
- Currently triggering with 3 scintillator counters.
- Scintillator counters are set up so that muons have to go through aerogel.
- Aerogel is set below the scintillator counters inside a box lined with Tyvek and ReflectTech (94% reflectivity) that is optimized for light to travel to a 2" PMT.
- We are testing our prototype using cosmic muons.



2" PMT calibration

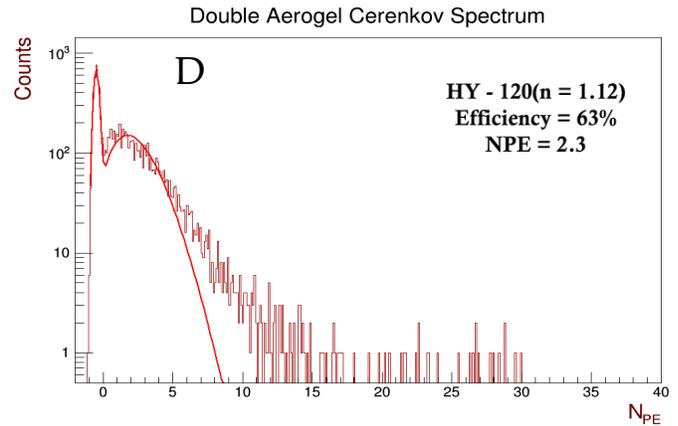
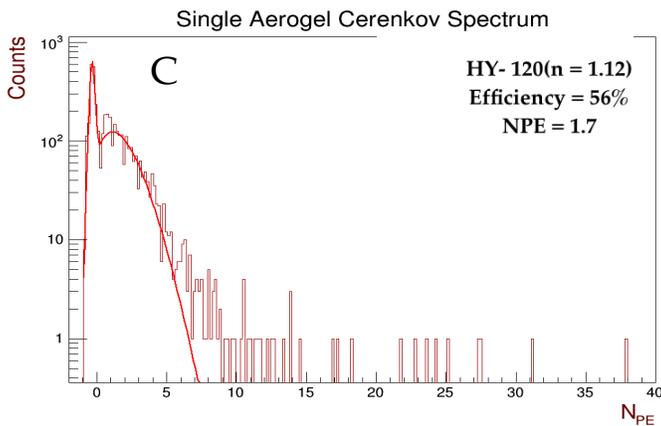
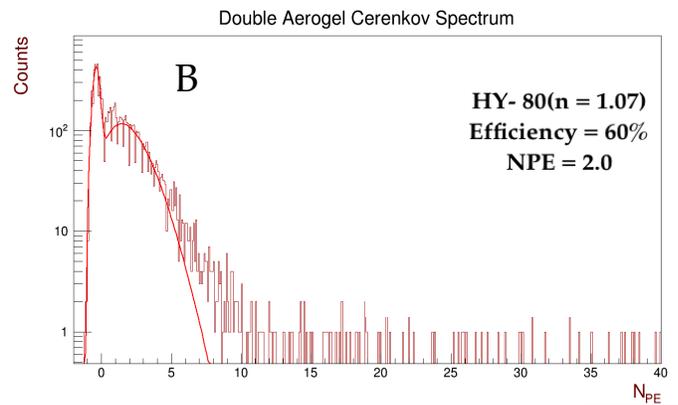
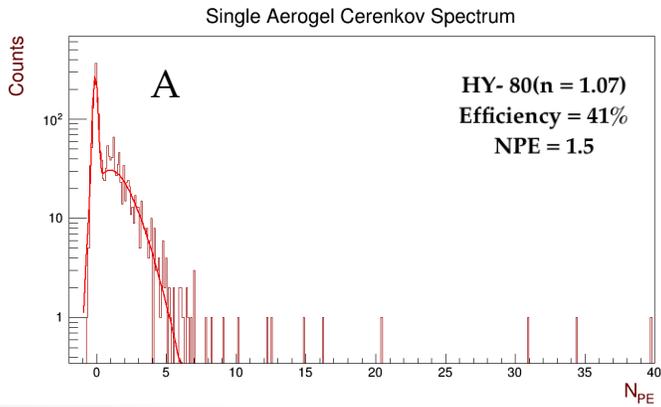
- Calibrated PMTs using LED pulses.
- This allows us to translate from ADC counts to NPE.

$$n_0 \sim \left(\frac{\mu - ped}{\sigma_{om}} \right)^2$$



Tests with cosmic muons

- Cherenkov spectra gathered from HY-80 and HY-120
 - with single and double thick layers of each aerogel type (1 cm thick)
- Seeing 1.5 – 2.3 NPE on average depending on the configuration



Summary

- Constructed prototype Cherenkov aerogel detector.
- Testing using cosmic muons our lab at UT Austin.
- Calibrated PMTs to work with these detectors.
- Currently seeing too few NPE to justify moving forward with large scale detector.
 - Plan to calibrate and test a larger 5" PMT
 - Also plan to test even thicker aerogel configurations

References

- E.H.Bellamy et al. NIM A339 (1994) 468-476
- P.Adamson et al. NuMI-L-661 (2000)
- R.Godang et al. MUC-NOT-COOL-EXP-304