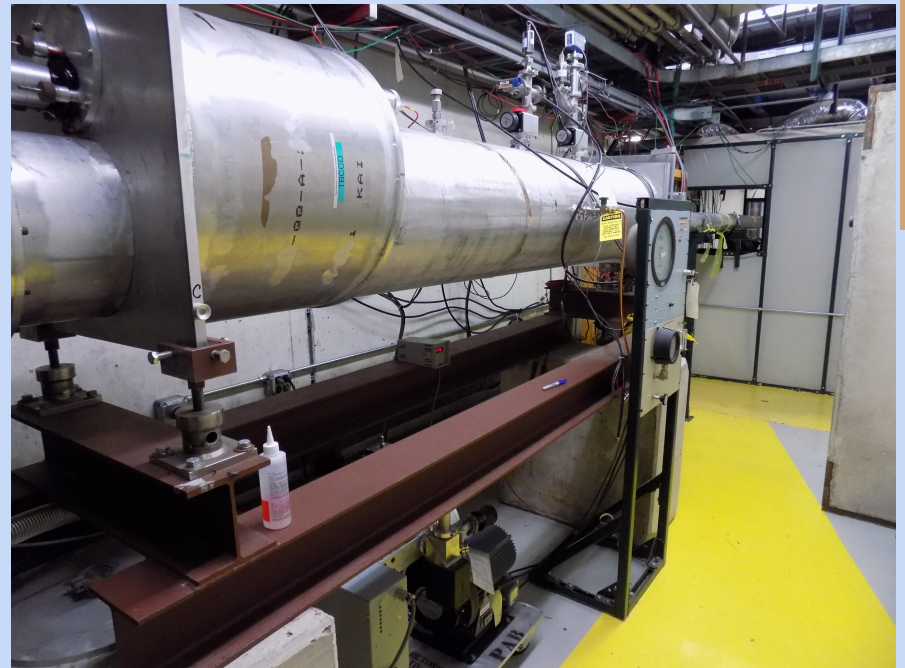


# Optimizing the otsDAQ System for the Cherenkov Detector

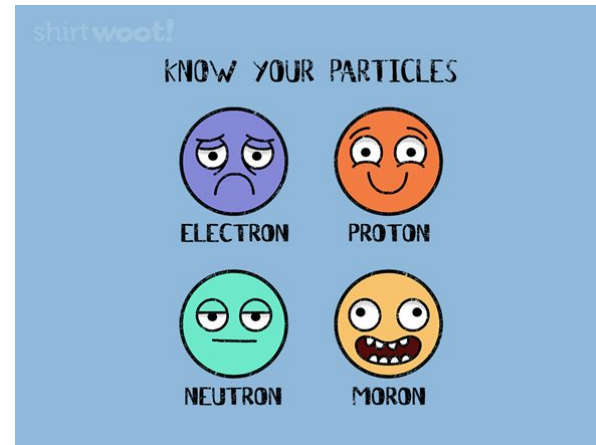


By: Abimbola Oluwade

Supervisors: Evan Niner & Mandy Rominsky (Test Beam Facility)

# Fermilab Test Beam Facility

At FTBF, scientists around the world come to conduct test on their particle detectors. FTBF is the only facility in the United States that provides high-energy beams to scientists for detector tests. While testing, it is important for users to have an idea of what particle was delivered (Particle ID) since it aids the understanding of the actual, detector experiment.



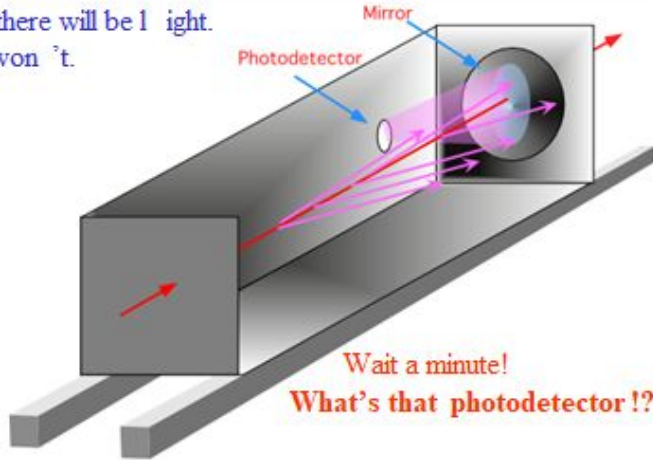
# How do we Identify Particles?

Particle ID is done with the Cherenkov detector in the MTest section of FTBF. The device works on the basis of Cherenkov radiation.

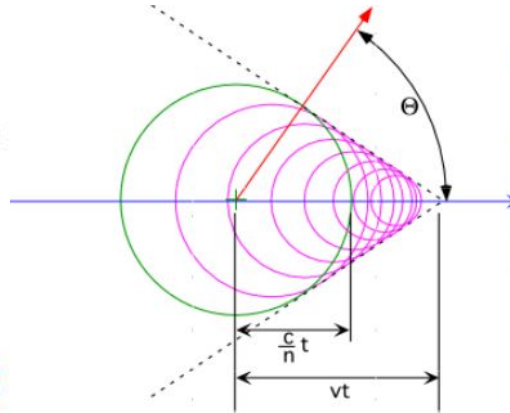


Particle Detectors ...  
Cherenkov Counter

If  $v/c > 1/n$ , there will be light.  
If not, there won't.



Wait a minute!  
What's that photodetector!?



Cherenkov Effect:

Turns ON when particle speed is greater than light speed in the medium:  $v = \square c > c/n$



# Identification Methods

- The light produced is reflected/focused by a mirror and detected in a photodetector called Photo-Multiplier Tube (PMT).
- Once the angle of the light cone is known, the velocity of the particle can be found. Since the momentum is usually known, the mass of the particle, thus the particle, can be identified e.g muons, pions, kaons, protons & electrons
- The velocity of the particle is dependent on the refractive index and pressure of the gas in the detector (Nitrogen).

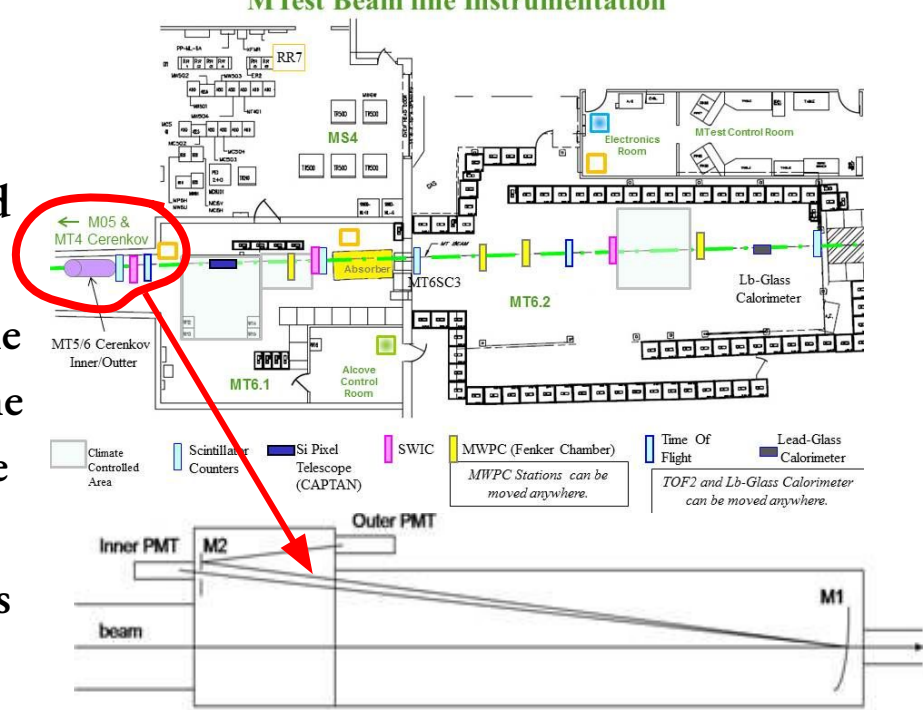
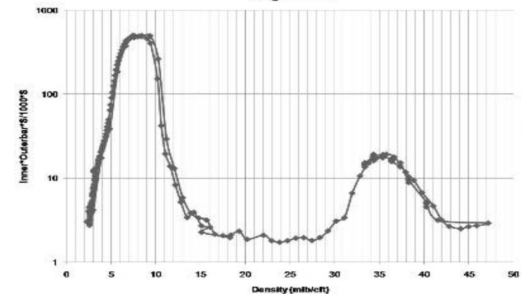


Fig. 9. 32 GeV/C Density Curve after Mirror Alignment



Cherenkov Angle  $\Rightarrow$  Velocity  $\Rightarrow$   
 Mass  $\Rightarrow$  Type of Particle

# Cherenkov DAQ System

The ots Data Acquisition System collects raw data from the PMTs of the Cherenkov Detector. The system plots graphs that help identify the different particles. The framework, however, is still under improvement.

Improvement goals/Project:

- Add functionalities to the otsDAQ to analyze and make performance plots for the Cherenkov detector
- Check & Account for the time-lag between the actual beam arrival and the data collection
- Testing of the system and documentation

.....more details to come in about 9 weeks 😁