RICH DETECTOR AND SIMULATIONS OF AEROGEL TILES

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Introduction
A Hybrid Ring-imaging Cherenkov Detector (RICH), located in Hall-B at Jefferson Lab, is used to identify, charged subatomic particles such as pions and kaons in the 3 to 8 GeV/c momentum range. RICH uses the momentum of resulting jet particles from electron scattering on a fixed target. These particles traverse a radiator called, Aerogel in this case. Aerogel is a dielectric material made up of silica and residues of metal oxides. Placing a beam of charged pions at 6 GeV behind the aerogel will produce Cherenkov radiation in the UV to visible range. When a charged particle travels through the aerogel at a very high speed, the particles inside become dipoles. This polarization stretches the shape of the particles and if the incoming particle is moving faster than the speed of light in the medium, Cherenkov radiation is produced. My work consisted on the partition of the aerogel tiles for the RICH detector, and the study of emitted Cherenkov radiation and wave length dependency. This process is important for event reconstructions that will help with particle identification.

RICH Detector
Using GEMC, a simulation program, to recreate the experiment done with the RICH detector at Jefferson lab. Cherenkov radiation was created from the aerogel with a 6 GeV charged pion beam. After applying the different properties for each tile, the simulation could be ran to get a more accurate prediction. The next step will be connect the simulation to the database which contains all the properties of the tiles. The use of same properties in simulation and reconstruction is crucial for particle identification. Soon, my work will extend to refining other components of the detector, mirrors are an example.

Simulating Aerogel
Each Aerogel tile had to be given their own set of properties, such as absorption length and index of refraction.

Conclusion
After applying the different properties for each tile, the simulation could be ran to get a more accurate prediction. The next step will be connect the simulation to the database which contains all the properties of the tiles. The use of same properties in simulation and reconstruction is crucial for particle identification. Soon, my work will extend to refining other components of the detector, mirrors are an example.