Simulations of High Energy Particle Collisions with Aerogel in a Ring Imaging Cherenkov (RICH) Detector

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Introduction
Simulations for high energy collisions with aerogel radiators for experiments at Thomas Jefferson Laboratory are being taken remotely here at Duquesne University. These aerogel radiators will be used in the RICH detector of the CLAS12 spectrometer.

Theory
Cherenkov Radiation is a form of electromagnetic radiation that is created when a particle travels faster than the phase velocity of light within a dielectric medium. This takes the shape of a cone of light extending out from the medium. The angle of the cone is determined by this equation:

\[
\cos \theta_c = \frac{1}{\beta n}
\]

Above are the dipoles of the aerogel for when the speed of the particle is less than the phase velocity of light (Left) and when it is greater than the phase velocity of light (Right).

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