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(G*) Measuring the Refractive Index of Aerogel Tiles using Optical Coherence Tomography for the HELIX Experiment

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The High Energy Light Isotope eXperiment (HELIX), a multistage balloon-borne detector, aims to measure the composition of light cosmic-ray isotopes up to 10 GeV/n. One of the primary scientific objectives of HELIX is to study the propagation of cosmic rays in our galaxy by measuring the ratio of Be₁₀ and Be₉ fluxes. The detector's first stage, which will measure cosmic rays with energies up to 3 GeV/n, is scheduled to launch in the summer of 2024 from Kiruna, Sweden. To obtain information about the isotopic composition, the detector must measure particle properties, such as mass, energy, charge, and velocity with high precision.

For particles that exceed 1 GeV/n, HELIX will utilize a Ring Imaging Cherenkov (RICH) detector to measure the velocity of incident particles. The RICH detector employs 10cm x10cm x1cm aerogel tiles with a refractive index of 1.15 as a radiator. To distinguish between the mass isotopes of Beryllium, a 2.5% mass resolution is required. This requirement mandates a comprehensive understanding of the refractive index as a function of the aerogel tile's position.

This presentation proposes a novel method to measure the refractive index of aerogel tiles based on Optical Coherence Tomography (OCT). The OCT method uses an interferometer to obtain micrometer-level depth resolution. In this talk, I will present the results of measuring the refractive index of aerogel with the OCT method.

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