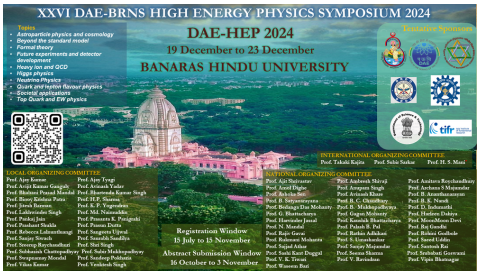

Contribution ID: **83** Type: **Oral**

Development of experimental setup and enhanced analytical methodologies to study cosmic γ-ray flux variations during total solar eclipses

During the past quarter century, there have been many attempts to observe a possible inverted Gaussian-shaped decrease during total solar eclipses, coinciding lowest point with totality [1], but these attempts have ended with contradictory results. Here, we introduce an experimental setup optimized for cosmic γ-ray collection, minimizing terrestrial interference. Leveraging four large-volume NaI(Tl) scintillation detectors, we collected the γ-ray flux data during the total solar eclipse of 22 July 2009 from two geographically distinct locations: Indore and Siliguri [2]. The setups were elevated substantially above the ground to reduce terrestrial γ-rays, utilizing the detectors to measure flux before, during, and after the eclipse visible at the sites. However, varying levels of radon daughters in rain during the eclipse period complicated the spectral analysis. We developed a RooFit-based method combining exponential and Gaussian functions to generate unified energy spectra that effectively handles different time segments and rain impacts [3]. Subsequently, we have incorporated a novel approach to isolate the true background from the rain-affected terrestrial background that reduced the rain-affected γ-ray flux data more than half in magnitude. With improvement in experimental set up, data modelling and fresh perspective for data analysis, the present study establishes a foundational approach crucial for future total solar eclipse experiments.

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Field of contribution

Experiment

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Track Classification: Future experiments and detector development