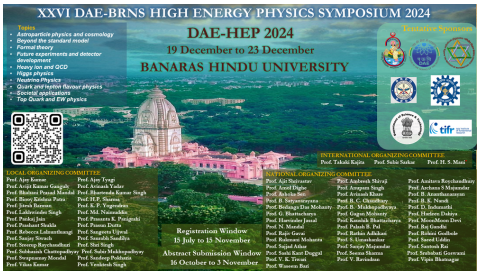

Contribution ID: **500** Type: **Oral**

Identification of Nuclear waste using Muon Scattering Tomography

Imaging methods based on the absorption or scattering of atmospheric muons, collectively called "muon tomography"have many potential applications. Study of identification of Nuclear waste using multiple Coulomb scattering of cosmic ray muons is presented. Scattering angles for different radioactive materials used as fuel in nuclear reactors in India.

How can Cosmic ray muons be used to identify high Z-materials using muon scattering tomography? To solve the problem, dimension of fuel assembly of Advanced Heavy Water Reactor(AHWR) is used for Geant4 simulation and scattering angle is calculated for materials that are used for its fuel assembly.

The geometry of the muon detector is simulated using GEANT4 contains three plastic scintillators on top and bottom of a nuclear waste material cubic box shielded by concrete and stainless steel in cylindrical geometry. Recognition of the incoming vector is the difference between the hit locations in the second top detector layer and the third top detector, while the subtraction from the hit position in the second bottom scintillator yields the latter vector [1]. Identification of material depends upon the muon scattering angle with the matter. ThO2 rods with enriched U233 and Pu244 are inserted in the cylinder whose outermost layer is made of stainless steel which is useful for AWHR designed in BARC, Mumbai [2].

Scattering angles are tabulated compared with A.I. Topuz data for nuclear waste materials. As for U233 scattering angles is calculated 169.037 63.498 at 1.25 GeV energy which is compared with the scattering angle of reference data 168.248 92.783. Energy range of cosmic ray muons that are used in simulation is 8 bins partitioned by 1.25 GeV to 4.75 GeV energy with a step of 0.5 GeV for Cs133, U233, and Th232 that are released as nuclear waste from nuclear reactors.

References:

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[2] Garg, Kajal, and Sonali Bhatnagar. "Identification of nuclear wastage with the help of scintillation detectors." Pramana 95.1 (2021): 12.

Field of contribution

Experiment

Author: Dr BHATNAGAR, SONALI (DAYALBAGH EDUCATIONAL INSTITUTE DAYALBAGK AGRA INDIA)

Co-author: SINGH, Hemant (DAYALBAGH EDUCATIONAL INSTITUTE DAYALBAGH AGRA)

Presenter: SINGH, Hemant (DAYALBAGH EDUCATIONAL INSTITUTE DAYALBAGH AGRA)

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