Contribution ID: **44** Type: **Poster**

A Study of Gd-based Parallel Plate Avalanche Counter for Thermal Neutrons by MC Simulation

In this work, we demonstrate the feasibility and characteristics of a single-gap parallel plate avalanche counter (PPAC) as low energy neutrons detector based on the Gd-converter coating. The incident low energy neutrons upon falling on the Gd-converter surface, produce internal conversion electrons, which are evaluated and detected. For estimating the performance of the Gd-based PPAC, a simulation test has been taken using GEANT4 Monte Carlo code. In this work, we demonstrate the feasibility and characteristics of a single-gap parallel plate avalanche counter (PPAC) as low energy neutrons detector based on the Gd-converter coating. The incident low energy neutrons upon falling on the Gd-converter surface, produce internal conversion electrons, which are evaluated and detected. For estimating the performance of the Gd-based PPAC, a simulation test has been taken using GEANT4 Monte Carlo code. The detector's response as a function of incident neutron energies in the range of En= 25 meV to En=100 meV, has been evaluated with two different physics lists e.g., the QGSP_BIC_HP and the QGSP_BERT_HP. Using the QGSP_BIC_HP physics list and with 5 μm converter thickness, the detection efficiencies of 11.8%, 18.48% and 30.28% have been achieved for the forward-, backward- and as a total converter-based PPAC response, respectively. On the other hand, considering the same converter thickness and detector configurations, with the QGSP_BERT_HP physics list the efficiencies were 12.19%, 18.62% and 30.81% respectively. A brief discussion on the results is also performed.

quote your primary experiment

PPAC, Themal Neutrons

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Track Classification: Gaseous Detectors