

Energy deposition distribution in GGG crystal spaghetti calorimeter during NICA experiments

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Using the Monte Carlo method (GEANT4), energy deposit distributions were obtained for incident gamma photons with energy from 256 MeV up to 8192 MeV interacting with the various parts of the spaghetti calorimeter (SPACAL). The SPACAL consists of nine scintillation single crystal gallium-gadolinium garnet (GGG) rods with dimensions $3 \times 3 \times 100 \text{ mm}^3$ forming a 3×3 array surrounded by tungsten. The distribution of energy deposit on the boundary of the connection and in the crosshairs of cells were also considered. Distributions were obtained for the central crystal, the ring of eight crystals surrounding the central crystal, and over all the crystals.

As a result, the amount of energy that remains in the crystal surrounded by tungsten equal to 34% of the energy released in a pure GGG scintillator when a photons hit the crystal. Released energy in photon tungsten interaction lies in range from 1.65% to 4.5% and depends on incident point position.

The high light yield of GGG crystal 3×3 array detector allows for performing measurements in nuclotron-based ion collider facility (NICA) experiments at the Joint Institute for Nuclear Research (JINR).

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