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Study of Mg ion fragmentation cross-sections for shielding purposes using GEANT4

The spectrum of high energy ions (HZE) is very broad in space and contributes the most to the accumulation of the radiation dose to the shielding infrastructure of the space mission. The partial fragmentation cross-sections (PFXS) and linear energy deposition are two very significant factors to estimate the dose deposition and risk possibilities due to space radiation exposure when preparing a space exploration. In this study, the PFXS are calculated for 24Mg ions of energy 370 MeV/n and ˜470 MeV/n in carbon (C) material. The study utilized the QMD and the INCL++ physics model for simulation to compute the PFXS by the three-dimensional Monte Carlo toolkit Geant4. The comparative analysis is carried out between the simulated outcome of Geant4, the experimental data, and the results generated by the PHITS code system. It is noted that the QMD model offers the best agreement for PFXS with an odd-even effect for fragments of C target. The INCL++ regenerate results with an inline agreement and with a few percent of deviation depending on which fragment and projectile energy is considered.

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