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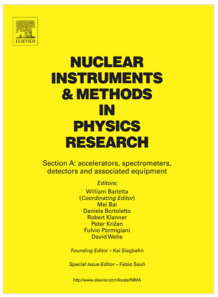

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Calibration of intrinsic peak efficiency of a high-purity germanium detector for X-ray energy of 5.48–302.85 keV

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Abstract

In indirectly driven inertial confinement fusion, a high-purity germanium detector is widely used in the calibration of various X-ray detectors as a quantitative spectrum detector for the irradiating X-ray. However, the intrinsic peak efficiency of the high-purity germanium detector, which is the foundation of its applications, has not been investigated in depth. In this work, an optimized data-processing method is developed to explore the intrinsic peak efficiency of the high-purity germanium detector, based on calibration experiments. The intrinsic peak efficiency of the detector is absolutely and accurately calibrated and simulated for X-ray energy in the range of 5.48–302.85 keV. The experimental and simulated results, which agree well, are analysed and explained in detail. The efficiency curve obtained from the data reveals the rise, flat, and fall characters. In addition, the impact of the absorption edge, which is located at 11.10 keV, on the efficiency curve was found and explained in terms of the escape of the excited Kα lines. This work will improve the calibration efficiency of

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