

Carbon Scattering Spectrometer for Intense Gamma-ray Sources

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Abstract

In this work, a carbon scattering spectrometer was designed to measure the spectrum of intense gamma-rays emitted from a partially processed sample of ^{99}Mo extracted from fission products. This sample contains additional impurity isotopes that need to be quantified and are to be measured in a hot cell at Missouri University Research Reactor (MURR) utilizing the Compton scattering technique with pinhole collimation. Optimization of this counting system includes the placement of the High Purity Germanium (HPGe) detector, the Compton scattering angle used, and the use of lead shielding (to reduce the background of scattered gamma-rays and to prevent personnel dose in the vicinity of the detection system). Parameters of the system were modified and optimized using the Monte Carlo code, MCNP6. For the isotopic source which would be measured, the spectrometer has an energy resolution of around 1 to 2% at each energy peak related to the different isotopes of interest and all isotopes of interest could be identified and quantified.