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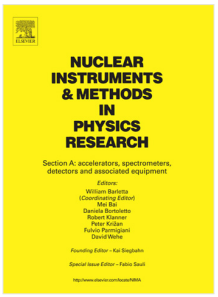

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Testing FLUKA on neutron activation of Si and Ge at nuclear research reactor using gamma spectroscopy

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Abstract

Samples of two characteristic semiconductor sensor materials, silicon and germanium, have been irradiated with neutrons produced at the RP-10 Nuclear Research Reactor at 4.5 MW. Their radionuclides photon spectra have been measured with high resolution gamma spectroscopy, quantifying four radioisotopes (^{28}Al, ^{29}Al for Si and ^{75}Ge and ^{77}Ge for Ge). We have compared the radionuclides production and their emission spectrum data with Monte Carlo simulation results from FLUKA. Thus we have tested FLUKA's low energy neutron library (ENDF/B-VIIR) and decay photon scoring with respect to the activation of these semiconductors. We conclude that FLUKA is capable of predicting relative photon peak amplitudes, with gamma intensities greater than 1%, of produced radionuclides with an average uncertainty of 13%. This work allows us to estimate the corresponding systematic error on neutron activation simulation studies of these sensor materials.

Keywords: FLUKA, neutron irradiation, nuclear reactor, silicon, germanium

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