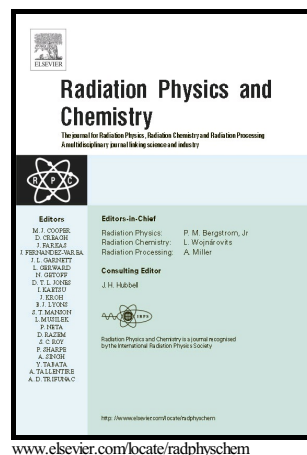


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Juan A. García-Alvarez, Nora L. Maidana, Vito R. Vanin, José M. Fernández-Varea



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Analytical response function for planar Ge detectors

Juan A. García-Alvarez^{a,b}, Nora L. Maidana^a, Vito R. Vanin^a,
José M. Fernández-Varea^{c,a}

^a*Instituto de Física, Universidade de São Paulo. Travessa R 187, Cidade Universitária,
CEP:05508:900 São Paulo, SP, Brazil*

^b*Instituto Superior de Tecnologías y Ciencias Aplicadas. Quinta de los Molinos,
Ave. Salvador Allende, Esq. Luaces, Plaza, CP:10600 La Habana, Cuba*

^c*Facultat de Física (ECM and ICC), Universitat de Barcelona. Diagonal 645,
E-08028 Barcelona, Spain*

Abstract

We model the response function (RF) of planar HPGe x-ray spectrometers for photon energies between around 10 keV and 100 keV. The RF is based on the proposal of Seltzer [*Nucl. Instrum. Meth.* **188** (1981) 133] and takes into account the full-energy absorption in the Ge active volume, the escape of Ge $K\alpha$ and $K\beta$ x-rays and the escape of photons after one Compton interaction. The relativistic impulse approximation is employed instead of the Klein–Nishina formula to describe incoherent photon scattering in the Ge crystal. We also incorporate a simple model for the continuous component of the spectrum produced by the escape of photo-electrons from the active volume. In our calculations we include external interaction contributions to the RF: *i*) the incoherent scattering effects caused by the detector’s Be window and *ii*) the spectrum produced by photo-electrons emitted in the Ge dead layer that reach the active volume. The analytical RF model is compared with pulse-height spectra simulated using the PENELOPE Monte Carlo code.

Keywords: X-ray spectrometry, planar HPGe detector, response function, Seltzer’s model, Monte Carlo simulation

Email address: jose@ecm.ub.edu (José M. Fernández-Varea)

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