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Multiple Compton Scattering as a Function of Detector Size
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— As photons penetrate detector matter, various kinds of interactions take place. One important kind is Compton scattering, a process by which an incoming photon inelastically collides with an electron thus resulting in a photon with a lower energy. This less energetic photon may escape the detector, or may continue its propagation through the detector matter and undergo more Compton scattering events before escaping. In the output spectrum, the region of multiple scattered photons (MSC) is distinct from those of single scattered photons (Compton continuum) and photoelectric absorption (photopeak). Such distinction is qualitatively discussed in the literature without quantitative treatment. Hence, the goal of this study is to gain quantitative insight on MSC. Specifically, this study aims to investigate the behavior of MSC as a function of detector size. A simulation code is prepared using the Geant toolkit. Results of the simulation reveal a decrease in the spectral MCS region with increase of detector size. Moreover, the results show an increase in the average number of pre-escape multiple Compton collisions undergone by photons with the increase of detector size. These findings agree with theory.

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