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A New Biasing Method for Variance Reduction of Compton Events in GEANT4

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In this talk, we present a new biasing method which is used to reduce the variance of low and high angle Compton scattered events from a pencil beam of X-rays interacting with a sample. The method is used to provide more accurate scatter kernels at lower computational cost than is achievable using standard GEANT4 biasing methods.
A scatter kernel is the point spread function described by the scattering of x-rays from a pencil beam through interaction with a sample. These kernels are used in medical image processing to provide a digital correction of scatter which has been shown to outperform traditional methods of physical scatter rejection using an anti-scatter grid (ASG).
In order to provide an accurate estimate of the scatter, low variance kernels must be generated in GEANT4. Due to the low probability of high angle scatter, the computational cost of producing such kernels is high. This new Compton biasing method has been proven to give both a reduction in variance and a lower computational cost.

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