The cross-section dividing method and the simultaneous distribution between the deflection angle and the spatial displacement for charged particles penetrating through matters

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We have confirmed the Moliere expansion can be well explained through the dividing of the single-scattering cross-section, as the primary gaussian distribution generated by the high-frequent moderate scatterings and the subsequent additive correction terms generated by the low-frequent large-angle scatterings. This physical interpretation brought us the highly accurate and the highly efficient sampling sequence of track tracing for charged particle taking account of ionization loss.

Through the cross-section dividing method we have derived the method to obtain the simultaneous distribution for charged particles between the deflection angle and the spatial displacement, which is very important for natural and smooth track tracing of charged particles in Monte Carlo simulation. Tracing by primary Yang distribution and subsequent corrections by large-angle scattering is proposed to improve the usual tracings through mere mean spatial displacement predicted by Goudsmit-Saunderson-Lewis theory.