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Quantum Features of Relativistic Particle Scattering and Radiation in Crystals

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Classical trajectory simulations, widely used in crystals at high energies, have never been supported by a rigorous quantum treatment. To do this, both the notion of optic curved ray eiconal and Wigner function proved to be necessary. We reveal that, being essentially quantum in nature, incoherent scattering of relativistic elementary particles in crystal is correctly described by both the modified Mott cross-section at the large momentum transfers and r.m.s. scattering angle at the the small ones. We also address both the inclusion of incoherent radiation to the algorithm of Baier-Katkov formula numerical integration and suppression of the same by coherent scattering.

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