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Channeling and Channeling Radiation from Imperfect Crystals with Dislocations and Anharmonic Interactions

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The phenomenon of electron and positron channeling in a crystal affected by various imperfections has been investigated. We have continued our work on the quantum aspects of the positron channeling in a crystal bent by dislocations where the effects of longitudinal motion of the particle are also considered along with the transverse motion. These calculations are now extended to include anharmonic terms in the continuum potential and specific cases of stacking faults, dislocations and strains in the crystals are considered in the context of channeling radiations emitted by relativistic charged particles. The principle motivation of these investigations is to understand basic science influencing the emission of electromagnetic radiation from charged particles constrained to propagate through crystallographic channels in a realistic and imperfect medium. To this end we have also considered the applications of channeling radiation technique to situations like platelets as an application of results on stacking faults and periodically bent crystals as application of results on dislocations. Finally, we also extend the calculations to periodically bent crystals for applications in crystalline undulator problem.

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