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PS1-02: Generation of Electron Excitations by Quantum Channeled Particle in Crystal

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In the channeled regime a particle loses its energy to generate the collective and single-particle excitations in the crystal at the same time with the emission of photons. This process is accompanied with transitions of particle from one transverse energy discrete state into another. A theory of energy losses and the corresponding excitation of the crystal for the quantum channeled particle is constructed. The theory generalized for the account of the peculiar properties of the electron Green function for the finite zone width electron-phonon (EP) system, the electron-hole nonequivalence, chemical potential variation with doping, and electron correlations in the vertex function is used for the study the generation of plasmons and electron excitations by channeled particle in the crystal. The frequency, temperature and doping dependent complex mass renormalization , complex chemical potential renormalization , density of electron states have been used to calculate the electron Green function in the excited crystal. The existence of a fixed energy of the plasmon as well as the dependence of the energy levels of the transverse motion of a relativistic particle on the energy make the inevitable situation in which, for some values of transverse energy of the particle the plasmon frequency coincides with the transition frequency of a particle between any two levels of transverse motion in the rest frame of the fast particle. In this case, the particle plasmon generation can strongly perturb the transverse motion of the particle. The usual assumption that the energy loss has little effect on the motion of a particle should be incorrect. Therefore, in this report the probability of generating a plasmon in the case of channel-plasmon resonance is calculated. Such a response leads to the appearance of sharp peaks in the curve of energy loss on the particle energy , fixing that one can directly measure the distance between the transverse levels of cross-motion. The transition probabilities with the change of the quantum level of the transverse motion are investigated.

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