RADIATION OF THE MAGNETO-CRYSTALLINE UNDULATOR

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The radiation at grazing incidence of relativistic positively charged particles on the crystal surface in the presence of magnetic field is studied theoretically. The magnetic field is supposed to be parallel to the surface and orthogonal to the velocity of particles. Dependent on the initial conditions the particle can be captured in the channeling mode and perform periodic oscillations near the surface of the crystal. The appropriate initial conditions for the transverse energy of the particle are found. The spectrum, angular distribution and polarization of radiation are calculated. The emission spectrum of a single particle is discrete and it extends up to very large numbers of harmonics. If the magnetic field is much weaker than the electric field of atoms, the frequency range of radiation of the particle beam does not depend on magnetic field and is defined only by the energy of the particles and by the surface averaged potential, though the frequency of the first harmonic is defined solely by the magnetic field. The photon energy at the cut-off edge of the spectrum in case of positrons is of order $10\gamma^{3/2}$ (eV), where γ is the particle relativistic factor. The main part of radiation is concentrated in a narrow cone in the direction of initial velocity of the particles and is polarized largely in the plane orthogonal to the surface of the crystal.

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