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Study of Orientation Effects in the Passage of High-Energy Particles through Straight and Bent Crystals

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Crystalline materials differ from amorphous ones in the presence of periodicity in the arrangement of atoms. This periodicity leads to the possibility of observing orientation effects when high-energy charged particles pass through crystals. Such effects become possible when the angle between the particle's momentum and the crystalline atomic axis or plane becomes small. In this case, the particle coherently scatters on neighboring atoms of the crystal, leading to an enhancement of the effective interaction potential. If the crystal is bent, such coherent scattering allows to deflect fast charged particles from their original direction of motion. This makes bent crystals an effective tool for solving tasks such as particle extraction from cyclic accelerators and improving the collimation of charged particle beams in accelerators. This report presents the results of studies on orientation effects when fast charged particles pass through crystals.

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