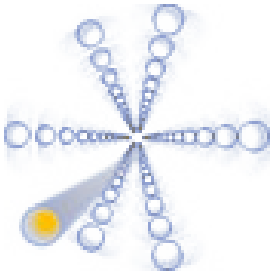

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Deflection of Positively Charged Heavy Particles by the Crystal Miscut Surface

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Let consider the beam of high-energy heavy particles (protons, ions or nuclei) propagates along crystal surface. Let suppose simultaneously the planar channeling conditions [1] are fulfilled for some crystallographic planes and these planes are forming the small angle with the crystal surface. This angle is namely so-called miscut angle [2]. It was shown the averaged potential approximation could be applied to describe the motion of particles when the beam hits the crystal surface at small glancing angle if the surface coincides with the crystallographic plane [3]. The particle can be reflected by the surface potential barrier or it penetrates into the crystal bulk where it moves in quasichanneling or channeling regime.

On the other hand when miscut angle exists the surface layer could be considered terrace-shaped: it consists of the number of planes that have successively decreasing length. Hence, the field of the surface layer consists of acute channel fields: when the particle penetrates into the crystal field first it will interact with the field of the single plane and after that it can interact with the channel field. It worth noting the deflection at the initial single-plane site could be large enough and particle will not reach the channel. If particle reaches the channel it will be further channeled or quasichanneled [4]. The miscut surface brings the possibility of multiple terrace deflection when the particle is successively deflected by several single-plane fields. This effect results in the deflection angle exceeding the deflection angle due to the interaction with the single planar barrier.

The theory of beam deflection by the terrace crystal field formed by the miscut surface was developed. The phenomenology of both channeling and quasichanneling has been applied to describe new features of the beam deflection. The computer experiment results on the beam deflection by the crystal miscut surface are presented. The analysis predicts efficient beam deflection by the acute crystal end due to repelling miscut potential. Results could be interesting in view of the beam collimation by crystals.

References

1. D.S. Gemmel, Rev. Mod. Phys. 46 (1974) 129.
2. K. Elsener et al, Nucl. Instrum. Methods B 119 (1996) 215.
3. D. Danailov, Nucl. Instrum. Methods B 264 (2007) 29.
4. A. A. Babaev and S. B. Dabagov, Deflection of proton beam by crystal miscut surface, LNF INFN preprint INFN-14-05/LNF (2014) http://www.lnf.infn.it/sis/preprint/detail.php?id=5337.

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