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Influence of incoherent scattering on stochastic deflection of high-energy negative particle beams in bent crystals

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An investigation on stochastic deflection of high-energy negatively charged particles in a bent crystal was carried out. On the basis of analytical calculation and numerical simulation it was shown that it exists a maximum angle at which most of the beam is deflected. The existence of a maximum, which is taken in the correspondence of the optimal radius of curvature, is a novelty with respect to the case of positively charged particles, for which the deflection angle can be freely increased by increasing the crystal length. This difference has to be ascribed to the stronger contribution of incoherent scattering affecting the dynamics of negative particles that move closer to atomic nuclei and electrons. We therefore identified the ideal parameters for the exploitation of axial confinement for negatively charged particle beam manipulation in future high-energy accelerators, e.g., ILC or muon colliders. The report is supported by the State Fund for Fundamental Research (project No F64/17-2016).

Summary

An investigation on stochastic deflection of high-energy negatively charged particles in a bent crystal was carried out.

Primary author: Dr KIRILLIN, Igor (Akhiezer Institute for Theoretical Physics of NSC KIPT)

Co-authors: Dr MAZZOLARI, Andrea (FE); Dr BANDIERA, LAURA (FE); Prof. SHUL'GA, Nikolai (Akhiezer Institute for Theoretical Physics of NSC KIPT); Prof. GUIDI, Vincenzo (FE)

Presenter: Prof. SHUL'GA, Nikolai (Akhiezer Institute for Theoretical Physics of NSC KIPT)

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