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Crystal collimator systems for high energy frontier

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The advantages of crystal collimators over amorphous ones increase with particle energy increasing, as the coherent scattering effects are enhanced at smaller particle incidence angles with respect to crystal planes and strings typical of higher particle energies. The crystal-assisted collimation approach explored up to the present relies on particle channeling and volume reflection effects in the field of crystal planes. This scheme suffers both a limited probability of particle capture into channeling regime and a small volume reflection angle. We suggest promote particle capture into channeling regime by fabricating of a cut (an empty plane layer) beneath the crystal surface [1]. However channeling imposes quite extreme requirements on crystal quality, alignment and radiation hardness at high energies. Therefore we also suggest increase a particle deflection angle fivefold or even more by applying the effect of multiple volume reflection (MVR) in a single-piece crystal [2], which can be additionally promoted by joint use with channeling in the field of some skew crystal plane [3]. The MVR effect can be also used to reduce the leakage from secondary collimators. Also particle scattering enhancement by atomic strings, which can be used in both correlated and uncorrelated modes, become quite promising as the typical particle deflection angles decrease with their energy. Both the MVR and particle scattering by atomic strings ease the requirements on both crystal alignment and quality.

1. V.V. Tikhomirov. A technique to improve crystal channelling efficiency of charged particles // JINST 2007, doi:10.1088/1748-0221/2/08/P08006;
2. V.V. Tikhomirov. Multiple Volume Reflection from Different Planes inside One Bent Crystal // Phys. Lett. B. 2007. V. 655. N. 5-6. P. 217-222,
3. V.V. Tikhomirov, A.I. Sytov Multiple Volume Reflection as an Origin of Significant Scattering Intensity and Radiation Power Increase // NIM B. 2013. Vol. 309. P. 109-114.

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