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Development and Test of Germanium Bent Crystals for Channeling Applications.

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Most of the experimental knowledge about channeling and related phenomena in bent crystals has been gathered with Si, thanks to its high crystalline quality and mature micro-machining technology. Silicon is not optimized as far as it concerns the interaction strength with beams since of its relatively low z-number. We recently demonstrated that germanium can be a concrete alternative. It is nowadays produced in high quality wafer and its machining can be improved by accurate technological development.

We recently demonstrated the fabrication of Ge strips optimized for 400 GeV proton deflection [1]. Planar channeling and volume reflection for (110) and (111) planes at various curvatures and axial channeling along [110] was measured by dedicated experiment at H8-SPS [2,3]. We evidenced that strips can perform very close to the limit of a perfect crystal allowing for better efficiency than Si especially at high curvature [3].

In the framework of ICE-RAD INFN project we are developing crystalline bending devices optimized for GeV electrons. We already reach relevant results with Si quasi mosaic crystals [4], and we are now engaging the development of quasi mosaic Ge devices. This is a challenge since negative particles and low energy force the machining procedure to micron scale. We show the production of 15 micron Ge slabs with a record primary curvature radius of 6mm, thanks to the development of innovative fabrication and bending procedures.

[1] S. Carturan, D. De Salvador, O. Lytovchenko, A. Mazzolari, G. Maggioni, M. Giarola, G. Mariotto, A. Carnera, G. Della Mea, V. Guidi. MATERIALS CHEMISTRY AND PHYSICS, 641- 651, 132; (2012).

[2] D. De Salvador; Bagli E; Lytovchenko O; Mazzolari A; Carturan S; Della Mea G; Guidi V; Bazzan M; Argiolas N; A. Carnera; Bolognini D; Hasan S; Prest M; Vallazza E. APPLIED PHYSICS LETTERS, 234102, 98; (2011).

[3] D. De Salvador, G. Maggioni, S. Carturan, M. Bazzan, N. Argiolas, A. Carnera, M. Dalla Palma, G. Della Mea, E. Bagli, A. Mazzolari, L. Bandiera, V. Guidi, D. Lietti, A. Berra, G. Guffanti, M. Prest, E. Vallazza. JOURNAL OF APPLIED PHYSICS, 154902, 114; (2013).

[4] A. Mazzolari, E. Bagli, L. Bandiera, V. Guidi, H. Backe, W. Lauth, V. Tikhomirov, A. Berra, D. Lietti, M. Prest, E. Vallazza, D. De Salvador. PHYSICAL REVIEW LETTERS, 135503, 112; (2014).

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