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The european FAZIA initiative: a high performance digital telescope array for heavy ion studies

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Fazia is a european collaboration aiming at building a new generation modular array for identification of charged particles in the framework of studies about nuclear collisions above the Coulomb barrier. The base module for the array is a Silicon-Silicon-CsI telescope where the silicon detectors are reverse mounted and scintillators are carefully selected to optimize ion identification via pulse shape. The electronics developed by the collaboration itself features high quality charge and current preamplifiers coupled to a fully digital front-end, mounted under vacuum next to the detectors. The internal front-end is connected via wideband optical links to the DAQ system. The first R&D phase, started few years ago, permitted firstly to determine the main limiting factors affecting ion identification, which are channeling effects [1] and doping non-uniformities in silicons [2] and secondly to identify solutions for improving performances. Original and novel solutions have been thus implemented and tested in prototypes, obtaining unprecedented ion identification capabilities [3-6]. Nowadays, in the second phase, a demonstrator is under construction consisting of about two hundred telescopes arranged in a compact and transportable configuration. The demonstrator is intended to show the discovery potential of such solutions in heavy-ion reaction mechanisms, in particular where the full Z and A identication is needed in a large range, as it is in radioactive-beam induced reactions or for detailed fragmentation studies at Fermi energies. As a matter of fact, some results on isospin dynamics exploiting the high-quality identification capabilities of the FAZIA telescopes have been already achieved [7].

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[3] L. Bardelli et al., Nucl. Instr. Meth. A 654, 272 (2011);
[4] S. Carboni et al., Nucl Instr Meth. A 664, 251 (2012);
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[6] G. Pasquali et al., Eur. Phys. J. A 48, 158 (2012);
[7] S. Barlini et al., Nucl-ex arXiv:1301.4364 .