The Antiproton Ion Collider at FAIR *

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For the FAIR Project at Darmstadt an antiproton-ion collider has been proposed to independently determine rms radii for protons and neutrons in stable and short lived nuclei by means of antiproton absorption at medium energies. The experiment makes use of the electron ion collider complex to store, cool and collide antiprotons of 30 MeV energy with 740 AMeV ions in the NESR [1]. Radioactive nuclei are produced by projectile fragmentation and projectile fission of 1.5A GeV primary beams and separated in the Super FRS. The separated beams are transferred to the collector ring (CR) and cooled at 740 AMeV and transported via the RESR to NESR. The total absorption cross-section for antiprotons on the stored ions with mass A will be measured by detecting the loss of stored ions by means of the Schottky method. Cross sections for the absorption on protons and neutrons, respectively, will be measured by the detection of residual nuclei with A-1 either by the Schottky method or by detecting them in recoil detectors after the first dipole stage of the NESR following the interaction zone. With a measurement of the A-1 fragment momentum distribution, one can test the momentum wave functions of the annihilated neutrons and protons, respectively. Furthermore by changing the incident ion energy the tails of neutron and proton distribution can be measured. Theoretical calculations show that the absorption cross sections are in first order directly proportional to the mean square radii. In this contribution the physics case will be outlined and the experimental technique together with the theoretical predictions will be presented.

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[1] P. Kienle, Nucl. Instr. Meth. B 214 (2004) 193.