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Commissioning of the ECR Ion Source of the High Intensity Proton Injector of the Facility for Anti Proton and Ion Research at CEA-Saclay

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The Irfu/SACM at Saclay is in charge of developing and building the ion source and the low energy line or the proton linac of the FAIR accelerator complex (Facility for Antiproton and Ion Research) located at GSI (Darmstadt) in Germany. The FAIR Facility will deliver stable and rare isotope beams covering a huge range of intensities and beam energies for experiments in the fields of atomic physics, plasma physics, nuclear physics, hadron physics, nuclear matter physics, material physics and biophysics. A significant part of the experimental program at FAIR is dedicated to antiproton physics that requires an ultimate number 7×10^{10} cooled pbar/h.

The high-intensity proton beam that is necessary for antiproton production will be delivered by a dedicated 75 mA/70 MeV proton linac. A 2.45 GHz microwave ion source will deliver a 100 mA H^+ beam pulsed at 4 Hz with an energy of 95 keV. A dual solenoids Low Energy Beam Transport line (LEBT) allows the injection of the proton beam into the radio frequency quadrupole (RFQ) within an acceptance of 0.3π mm.mrad (norm. rms). An electrostatic chopper system located between the second solenoid and the RFQ is used to cut the beam macro pulse from the source to inject 36 μ s long beam pulses into the RFQ. At present time, a Ladder-RFQ are under construction at the University of Frankfurt.

This article reports the first beam measurements obtained since mid of 2016. Proton beams have been extracted from the ECR ion source and analyzed just after the extraction column on a dedicated diagnostic chamber. Emittance measurements, as well as extracted current and beam proportion analysis have been performed in different configurations of ion source parameters, such as magnetic field profile, RF power, gas injection or extraction voltage.

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