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P4.002 Characterization of the input beam to RFQ of the Linear IFMIF Prototype Accelerator (LIPAc)

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The Linear IFMIF (International Fusion Materials Irradiation Facility) Prototype Accelerator (LIPAc) is a key activity to demonstrate the validity of the low energy section of an IFMIF deuteron accelerator up to 9 MeV with a beam current of 125 mA in CW. For the successful acceleration of the high power beam, the input beam to the 5 MeV LIPAc RFQ should be fully characterized and controlled to achieve the good performance and stability. H⁺ beam with half energy (50 keV) and half current (70 mA) but same perveance with respect to the nominal D⁺ beam for the LIPAc injector is used at the initial phase of the beam injection into the RFQ. The objective is to characterize the performance of the RFQ, prove the ability of the MEBT to match the beam to the nominal SRF Linac beam parameters and test the beam diagnostics that will be used later on to characterize the beam characteristics in CW with less beam power and without the risk of the activation induced by a D⁺ beam. Furthermore, at the very beginning of the commissioning, it is requested to inject the pulsed beam with the current of 10 mA or less for check-out of each component. This paper describes the latest results obtained through the efforts to characterize the pulsed H⁺ beam with 50 keV energy at various beam current, 10 – 70 mA. After the maintenance of the accelerator column of the ECR ion source performed in 2017, the quality of the extracted beam was much improved than before, and the normalized rms emittance is less than 0.15 pi.mm.mrad which is about half of the acceptance value. The plan to achieve the stable CW beam with the same quality based on the present experimental results is also presented.

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