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The SPES-Charge Breeder and its beam line at INFN-LNL

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The Selective Production of Exotic Species (SPES) facility is under construction at INFN-LNL : aim of this project is the production, ionization and post-acceleration of radioactive ions to perform forefront research in nuclear physics. Radioactive species will be produced by fissions induced by a proton beam impinging on an UCx target: the proton beam will be delivered by a normal conducting cyclotron (built by the Best Company) with a maximum energy of 70 MeV and 0.7 mA of maximum current. The radioactive species will be ionized in the so called Target-Ion-Source system, extracted as a $1+$ beam, cooled in RFQ cooler and purified by the isobars contaminants through an High Resolution Mass Spectrometer. In order to allow post acceleration with the superconducting linac ALPI at INFN-LNL (up to 10 MeV/u for $A/q=7$), an ECR-based charge breeding (CB) technique was chosen: in particular the SPES-CB will be developed by the LPSC Grenoble on the basis of the Phoenix booster. The SPES-CB will be equipped with a complete test bench totally integrated with the SPES beam line: in particular, in order to avoid beam contaminations induced by the impurities present inside the SPES-CB and to have high transmission for a beam of very low intensity, special attention was paid not only on the transport efficiency but also to the resolution of the spectrometer downstream the charge breeder. To this scope, a Medium Resolution Mass Spectrometer (MRMS) was designed on the basis of the one employed for CARIBU at ANL. In the following paper the technical aspects connected with SPES-CB, its beam line and the transport of highly charged radioactive ions will be described.

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