High Intensity High Charge State Ion Beam Production with an Evaporative Cooling Magnet ECRIS

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LECR4 (Lanzhou ECR ion source No.4) is a room temperature electron cyclotron resonance ion source, designed to produce high current, high charge state ion beams for the SSC-LINAC injector (a new injector for Sector Separated Cyclotron) at the Institute of Modern Physics. LECR4 also serves as a PoP machine for the application of evaporative cooling technology in accelerator field. To achieve those goals, LECR4 ECR ion source has been optimized for the operation at 18 GHz, with the optimal axial confinement mirror fields of 2.5 T and 1.3 T and 1.0-1.1 T radial field on the plasma chamber wall. In February 2014, the first analyzed beam was extracted. During 2014, LECR4 ion source was commissioned at 18 GHz microwave of 1.6 kW with an injection pumping free system. To further study the influence of injection pumping system to the production of medium and high charge state ion beams, in March 2015, an injection system with pumping system was installed, and some optimum results were produced, such as 2110 euA of O\textsuperscript{6+}, 560 euA of O\textsuperscript{7+}, 580 euA of Ar\textsuperscript{11+}, and so on. The comparison will be discussed in the paper.