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FECR: A 28~45 GHz Next Generation Ion Source and Its First Results

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Driven by the fast development of heavy ion linacs and next generation heavy ion accelerators, higher performance high intensity highly-charged heavy ion beams are strongly needed. The next generation ECR ion sources operated at 45~56 GHz have the potential to produce highly charged ion beams with the intensities by several folds of those for the 3rd generation ECR ion sources. A 4th generation ECR (Electron Cyclotron Resonance) ion source FECR (First 4th generation ECR ion source) has been developed at IMP recently. Aiming to be operated with the microwave power of 20 kW at 28~45 GHz, FECR is expected to be equipped with a fully superconducting Nb3Sn magnet and conventional parts durable for high power ECR plasma heating and optimum for intense beam production and extraction. For the complexity of strong stresses during the Nb3Sn coils assembly, a hybrid superconducting ECR ion source FECR whose magnet is composed by Nb3Sn solenoids and NbTi sextupole coils as a prototype of the next generation ECR ion source has been developed. The preliminary test of FECR at 28 + 45 GHz has enabled the production of 360 eμA Bi35+ and >600 eμA Bi31+. This paper will present the development of FECR ion source and its first plasma with 45 GHz microwave power heating.

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