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Status of the Electron Cyclotron Resonance Ion Sources (ECRIS) at iThemba Labs

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Content :

Heavy ion beams at iThemba LABS have been produced in a 10GHz Minimafos electron cyclotron resonance ion source (ECRIS) for the past two decades. The typical values for the injection and extraction coil current are in the range of 1000A. The operating pressure is about 10-6 mbar depending of the ion produced. The Minimafios ECRIS allow the use of supporting gas like helium, oxygen etc. It accommodate up to from 10KV up to 20KV extraction voltage. For electron enhancement a biased disc at -50V was introduced at the injection side of the plasma chamber. Examples of beams which have been produced using the Minimafios are: H, He, B, C, N, O, Ar, Ne, Al, Si, Cl, Zn, Kr, I, Xe, Li.The increase in demand for new ion species and high intensity beams from the nuclear physics community has led to a decision to procure a new 2nd generation ECRIS. The procured source is a room temperature ECRIS based on the Grenoble Test Source (GTS) design. It uses two microwave frequencies, 14.5GHz and 18GHz to deliver positive ions. It was made to accommodate to oven. The axial field can be varied between 0.5T and 1.2T using three solenoid coils and a radial field of 1.3T achieved by using FeNdB permanent magnet. The source has been assembled and is being commissioned at iThemba LABS. The Hahn-Meitner-Institute (HMI) in Berlin donated their 14.5GHz ECRIS4 to iThemba LABS where it is presently operational. This source consist of a water-cooled plasma chamber (length 18cm, diameter 7cm) surrounded by feNdB permanent magnets which produce a hexapole field of 1T at the wall of the chamber for plasma confinement. Two solenoid coils produce an axial field which confines the plasma axially. The field on axis typically varies from 0.4 to 1.1T. The microwave power is coupled into the source via a wave guide. It generator can deliver up to 2KW of microwave power. Furthermore, iThemba LABS is one of the few laboratories which produce nuclear polarized proton beams using the so-called polarized ion source. In this report the status of the four ion sources will be presented.

Level (Hons, MSc, PhD, other)? :

Physicist

Consider for a student award (Yes / No)? :

No

Short Paper :

yes

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