6 - 26 Development of A 2.45 GHz Intense ECR Ion Source for C-ADS

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At IMP, the CW 35 keV, 20 mA ECR ion source for China Accelerator Driven Sub-Critical System (C-ADS) is being developed by Ion Source Group. ADS project mainly consists of a sub-critical reactor coupled to a high power proton Linac which is operated with CW mode through spallation target. In order to comply with proton accelerator requests, a 2.45 GHz ion source design has been performed. As a key component of the driver Linac, the performance of the ion source is of utmost important in whole beam injection system. In order to maximize the transmission of extracted ion beam through RFQ, a low energy beam transport line is used to focus ion beam to the RFQ entrance and achieve optical matching to the RFQ.

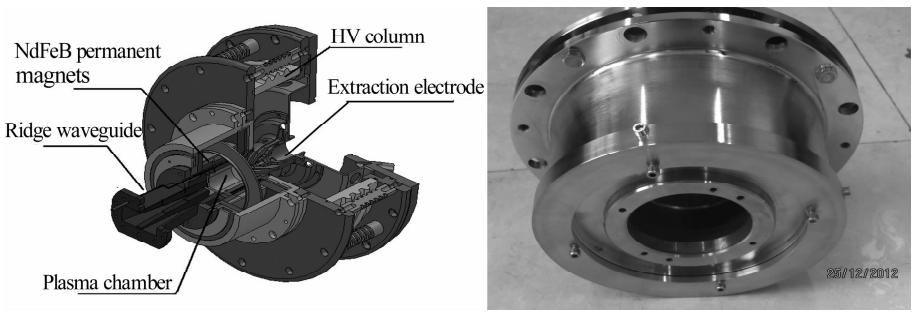

Fig. 1 2.45 GHz ECR proton source.

The schematic picture of the proton source and four-electrode extraction system is shown in Fig. 1. The experimental setup consists of microwave injection system, ion source body, four-electrode extraction system and diagnostic system. The 2.45 GHz microwave feeding system includes microwave generator (can be operated with CW or pulsed modes), a circulator, a rectangular waveguide, a three-stub tuner, DC-Break, a matching waveguide and a microwave window. The maximum power of the 2.45 GHz magnetron which can deliver the ion source is 0.9 kW. The rectangular waveguide is a standard rectangular BJ26 or BJ32 waveguide which is connected to the matching waveguide. And the matching waveguide is connected with the plasma discharge chamber. 2.45 GHz generator is isolated from 35 keV source high voltage potential by a DC-Break. The window which is used to seal the vacuum, minimize the reflected power, enhance the plasma density and coupling efficiency is made of BN and AlN. The hydrogen plasma is produced when the microwave energy is launched to the plasma chamber. Recently, more and more research group used an all-permanent magnet configuration for an ion source development. The magnetic field is produced by sets of high-performance NdFeB rings, which have a higher temperature coefficient, a larger remanence and coercive force. $(BH)_{max}$ is also flexible and stable enough to form the magnetic distribution we desire.