Contribution ID: **83** Type: **Poster**

Negative ion beam extraction in an RF hydrogen plasma with Cs seeding

Monday, 16 September 2019 17:50 (5 minutes)

The development of a negative ion beam source has been in progress in KOREA as part of ITER technology R&D programme. The RF negative ion beam source is one of the key parts of ITER neutral beam injection (NBI) system. In particular, the use of Cs leads to a remarkable enhancement of negative ion production and thus enables the extraction of high current negative ion beams. The final performance goal of our source is 200 keV / 0.5 A (the current density of 13 mA/cm^2) negative ion beam extraction. To achieve such high current density negative ion beams, the optimization of the use of Cs is necessary. In this regard, the preliminary beam extraction experiment with Cs seeding has been started recently.

The beam source can be divided mainly into three parts: an RF inductively coupled plasma (ICP) source, an expansion chamber and a three-grid beam acceleration system. Firstly, the 2 MHz RF ICP source is a typical AlN dielectric cylinder surrounded by a 6-turn helical antenna. Inside the AlN cylinder, a thin Cu Faraday shield is located for the protection of AlN from the heat load by plasma. Secondly, the expansion chamber is equipped with a permanent magnet filter to prevent the high energy electrons from destroying the negative ions in the extraction region. The Cs delivery system is also installed in the upper part of the expansion chamber, composed of a Cs dispenser oven and the Surface Ionization Detector (SID) for the Cs evaporation rate measurement. The Cs dispenser containing 20 mg of Cs manufactured by SAES Getters S.p.A. is utilized. Lastly, the three-grid beam extraction and acceleration system consists of a plasma grid (PG) facing the plasma, an extraction grid (EG) and an acceleration grid (AG). Each grid has 5 x 5 apertures of 14 mm diameter. The total beam extraction area is about 38.5 cm^2.

In the experiment, it was confirmed that higher beam currents could be obtained by using the Cs than those of without Cs. However, the beam optics were not so good than expected. The negative ion production from the Cs-deposited PG surfaces seems not fully optimized yet. The performance characteristics of the beam source based on the experimental data are presented and the issues are discussed.

Primary authors: Dr PARK, Min (Korea Atomic Energy Research Institute); Dr NA, Byung Keun (National Fusion Research Institute (NFRI)); Dr KIM, Tae-seong (Korea Atomic Energy Research Institute (KAERI)); Dr JEONG, Seung Ho (Korea Atomic Energy Research Institute (KAERI))

Presenter: Dr PARK, Min (Korea Atomic Energy Research Institute)

Session Classification: Poster

Track Classification: Applications