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Characterization of D^+ species in the 2.45 GHz ECRIS for 14-MeV neutron production

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The Institute for Plasma Research has set up a 14-MeV neutron generator facility. The stability, quality, and repeatability of the D^+ ion beam are critical parameters for ensuring the reliable operation of the neutron generator. Hence, a 2.45 GHz ECR ion source has been installed to produce the deuterium beam. The primary D beam characteristics are assessed by varying extraction voltage, microwave power, gas flow, and solenoid current of the ECRIS. By optimizing these parameters, the maximum design beam current is achieved. The D ion beam contains various species, including D^+, D_2^+, D_3^+, and impurities. Accurate measurement of the D^+ content within the D ion beam is the key parameter for a neutron generator. Multiple experiments were conducted to determine the D^+ species and optimise the ECRIS parameters for maximum production of D^+ species. Two beam current measurement devices, the DCCT and the Faraday Cup, were installed in the beamline to measure the total deuterium beam current and D^+ beam current, respectively. Notably, the variation in the D^+ fraction primarily depends on the operating parameters of the ECRIS, such as extraction voltage, microwave power and gas flow. This paper presents the results of the D^+ ion current as a function of extraction voltage, microwave power, and gas flow rate. Understanding and characterizing the D^+ species are essential steps toward achieving stable and efficient neutron production in fusion applications.

Footnotes

Funding Agency

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