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Experimental Investigation of RF Driver Equivalent Impedance in the Inductively Coupled SPIDER Ion Source

SPIDER experiment includes an RF inductively coupled plasma source working at 0.3Pa of gas pressure (H/D) where plasma is generated and heated by 8 RF drivers, fed by 4 RF circuits. A single RF circuit is composed of 2 driver connected in series, attached to a capacitive matching network, fed by 200 kW 1 MHz RF oscillator through a coaxial transmission line. The knowledge of driver impedance in different experimental conditions is a valuable window for knowing the characteristics of generated plasma. To provide this opportunity in SPIDER is a difficult task since the experiment is not compatible with a direct measurement of driver impedance in plasma operation and needs to rely on suitable electrical model of the RF circuit using as input measurements at the generator. The paper reports on the progress of the development of a detailed model of the RF circuit and provides a preliminary set of results of driver impedance for various operating conditions such as RF power, gas pressure etc.

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