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H- Ion Source RF Plasma Testing with 13.56 MHz and 27.12 MHz at the Spallation Neutron Source (SNS)

The baseline RF-driven H- ion source configuration at the Spallation Neutron Source (SNS) facility uses a continuous wave (CW) 600 W 13.56 MHz RF system to ignite and maintain a low-intensity plasma inside the ion source vacuum chamber. After the continuous low-intensity 13.56 MHz plasma has been established, a pulsed (typical 1 ms pulse width and 60 Hz pulse repetition rate) 80 kW 2 MHz RF system is used to increase the plasma intensity for the production of the pulsed H- ion beam. Incremental upgrades and improvements to the SNS ion source systems have resulted in the ability to reliably operate an H- ion source for SNS neutron production run cycles that can last up to four months. Conditions inside the SNS H- ion source change throughout a four-month run cycle due to changes in impurity levels, sputtering, and erosion. As the internal ion source conditions change during the run cycle, there can also be changes in plasma stability and the 13.56 MHz RF power level required to ignite the plasma. This paper presents the results of testing performed on the SNS Ion Source Test Stand (ISTS) system, where we looked at plasma ignition and plasma stability for H- ion sources of different ages using 13.56 MHz RF and 27.12 MHz RF.

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Yes

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