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## Overview of Cs evaporation control and monitoring in the ITER negative ion source prototype SPIDER

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SPIDER is the full-scale prototype of the ITER Heating Neutral Beam (HNB) ion source. In order to reach the current density requirements, the production of H-/D- ions is greatly enhanced by covering the source's converter surfaces with caesium, which lowers their work function. In particular, a sufficient and uniform Cs coating is required at the Plasma Grid (PG), the first electrode of the multi-grid accelerator facing the plasma. SPIDER is equipped with 3 Cs ovens located at the rear part of the source.

This contribution presents the control and monitoring of Cs evaporation in SPIDER during the 2024 and 2025 experimental campaigns during which only  $\frac{1}{4}$  of the ion source was operated, resulting in unusual caesiation conditions. The use of Cs enabled the extracted negative-ion current density to reach values up to 210 A/m<sup>2</sup> with extracted electron-to-ion ratios of the order of 1. The estimations of Cs consumption from simulations made with the AVOCADO code are compared to the consumption measured during the campaigns, and the data obtained from Laser Absorption Spectroscopy (LAS) and Optical Emission Spectroscopy (OES) are analyzed to obtain information on the uniformity of Cs flux at the PG and Cs dynamics.

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