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Characterization of the SPIDER Cs oven prototype in the CAesium Test Stand for the ITER HNB negative ion sources

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The ITER Heating Neutral Beam (HNB) injector is required to deliver 16.7 MW power into the plasma from a neutralised beam of H-/D- negative ions, produced by an RF source and accelerated up to 1 MeV. To enhance the H-/D- production, the surface of the acceleration system grid facing the source (the plasma grid) will be coated with Cs to reduce its work function. Cs will be routinely evaporated in the source by means of specific ovens embedded in the source. Controlling and monitoring the evaporation rate of Cs inside the source will be fundamental to get the desired performances on the ITER HNB.

In order to properly design the source of the ITER HNB and to identify the best operation practices for it, the prototype RF negative ion source SPIDER has been developed and built in the Neutral Beam Test Facility at Consorzio RFX. In SPIDER, liquid Cs based ovens will be used to inject Cs vapours inside the source. The CAesium Test Stand (CATS) has been specifically designed and set up for testing, commissioning, and characterizing Cs ovens in vacuum, but also to study the Cs evaporation and deposition onto surfaces. A SPIDER Cs oven prototype has been manufactured and tested in CATS in order to characterize its thermal behavior, by means of thermocouples and thermal camera, and its Cs flux, by means of Surface Ionization Detector and Laser Absorption Spectroscopy.

The paper will present the CATS set up with a description of the layout and main features. The paper will also show the experimental results on the characterization of the Cs oven prototype for SPIDER.

Co-authors: Dr RIZZOLO, Andrea (Consorzio RFX); Dr BARBISAN, Marco (Consorzio RFX); Dr CAPOBIANCO, Roberto (Consorzio RFX); Dr DE MURI, Michela (Consorzio RFX); Dr FADONE, Michele (Consorzio RFX); Dr GHIRALDELLI, Raffaele (Consorzio RFX); Dr LATERZA, Bruno (Consorzio RFX); Dr MARCHIORI, Giuseppe (Consorzio RFX); Dr MARCUZZI, Diego (Consorzio RFX); Dr MIGLIORATO, Luisa (Consorzio RFX); Dr MOLON, Federico (Consorzio RFX); Dr RAVAROTTO, Diego (Consorzio RFX); Dr RIZZIERI, Roberto (Consorzio RFX); Dr ROSSETTO, Federico (Consorzio RFX); SARTORI, Emanuele (Consorzio RFX); Dr SERIANNI, Gianluigi (Padova, Italy); Dr VELTRI, Pierluigi (Consorzio RFX)

Presenter: Dr RIZZOLO, Andrea (Consorzio RFX)

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