Contribution ID: **31** Type: **Poster**

Study of the relationship between the source complexity and the beam divergence and homogeneity in SPIDER

Thursday, 6 October 2022 09:53 (5 minutes)

The large size and complexity of ITER negative ion source prototype play a key role in determining the homogeneity of the multi-beamlet negative ion beam current and divergence.
Visible tomography, which has already proved capable of characterizing the isolated beamlet properties with high temporal and spatial resolutions, can be exploited to study the beam dependence on source parameters along the entire beam profile.
In SPIDER, the plasma is generated by four pairs of radio-frequency drivers operating simultaneously and then it expands in the expansion region, where a dedicated magnetic filter field reduces the destruction probability of negative ions. To increase the production of negative ions, cesium is evaporated in the plasma source and distributed over the Plasma Grid (i.e. the first grid of the three-grid accelerator which faces the plasma) by the plasma itself. The plasma properties are studied from the drivers to the expansion region by spectroscopic measurements and they are correlated with the beam behavior. The non-homogeneous plasma density profile is related to the non-homogeneous distribution of cesium on the Plasma Grid, and thus to the uneven availability of negative ions along the beam vertical profile. This is accentuated by the 3D dynamics of the plasma drift due to the combined effects of the electrical and magnetic filter fields, which are critical in reducing respectively the co-extracted electron current and the electron temperature close to the extraction region.
The performances of SPIDER large-size negative ion beam are presented and explained in terms of plasma source behavior, also suggesting some possible improvements to ameliorate the beam properties for future Heating Neutral Beams.

Primary author: UGOLETTI, Margherita

Co-authors: ZANIOL, Barbara (Consorzio RFX); Dr SERIANNI, Gianluigi (Consorzio RFX); SARTORI, emanuele (unipd); Dr AGOSTINI, matteo

Presenter: UGOLETTI, Margherita

Session Classification: Poster Session 2

Track Classification: 2. H–and D–sources for fusion, accelerators and other applications