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P5.3012 Tomographic reconstruction of the visible emission of NIO1 negative ion beam

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Neutral beam injectors (NBIs) are one of the most important additional heating devices both in present and in future nuclear fusion experiments. In order to heat the plasma at the high temperatures required, several critical aspects need to be fulfilled in the design of future NBI. In particular, one issue is the maximization of the spatial uniformity of the extracted beam, which is a strict requirement for ITER NBI [1]. This information can be achieved by the tomographic reconstruction of the beam emission profile, using a sufficient number of suitably arranged cameras.
The aim of this contribution is to present the tomographic diagnostic of the extracted beam of the NIO1 experiment [2], which is a small-size radio-frequency driven negative ion source. The tomographic system is composed of three visible cameras and the inversion is obtained by the simultaneous algebraic reconstruction technique [3]. The surface of the beam cross-section is divided into pixels and the employed algorithm reconstructs the emissivity profile of each pixel. The reconstruction of the experimental data is capable of showing the 3x3 matrix of the extracted beamlets in different experimental conditions using a 40x40 pixel matrix. Using the information collected by this non-invasive diagnostic, it is possible to characterize the main beam properties, such as the beam uniformity and aiming. Moreover, a correlation between the source physics and the extracted beam behaviour is performed.
Furthermore, an estimation of the divergence is achieved by reconstructing the beam profile at different positions along its propagation direction.

References
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