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10.3 Effect of multi-ion source injection on motional Stark effect diagnostic

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Many tokamak devices utilize high-power neutral beams for various beam-based active spectroscopic diagnostics such as motional Stark effect (MSE). For higher heating performance, it is customary for the neutral beam injection (NBI) to be made with a multiple number of ion sources, which often times conflicts the environment that the active spectroscopic systems desire. This is mainly because the atomic and molecular emissions taking place from the interactions with multiple beams, or from different flux surfaces, are collected through the front optics at the same time, resulting in systematic errors in the measured quantities. In this work, the effect of the multiple ion source injections on the pitch angle measurements by the MSE diagnostic is quantitatively studied based on both numerical modeling and measurements made from the plasma discharges for the Korea Superconducting Tokamak Advanced Research. The sensitivity of the pitch angle against various combinations of the acceleration voltages of the ion sources is evaluated, yielding the optimum configuration of the beam injection that can maximize the heating efficiency with an acceptable level of the systematic offset in the MSE measurements. This work is supported by the Ministry of Science and ICT in Korea.

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