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14.47 Determination of the Fast-Ion Phase-Space Coverage for the FILD Spatial Array of the ASDEX Upgrade Tokamak

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In the ASDEX Upgrade tokamak, a spatial array of reciprocating fast-ion loss detectors (FILD[1]) is being completed with the imminent installation of a new system[2]. This array of five scintillator-based FILD systems provides time-resolved velocity-space measurements of escaping ions at five different positions in the tokamak probing a large phase-space volume. A new code, FILDSIM[3], has been developed to design the probes, identify their best location and determine their phase-space coverage as a function of the detector radial position and most important plasma parameters, e.g. plasma shape. In this work, the geometrical configuration (heat shielding, scintillator and collimator geometries) of each detector has been optimized using FILDSIM to provide maximum detection range and resolution within specific predefined ranges of particle energy and pitch angle. Full orbit simulations allow us to determine the fast-ion phase-space coverage of the array, as a function of the plasma shape, safety factor and including the realistic 3D machine geometry. FILD measurements at multiple locations are used to reconstruct the escaping ion phase-space.

[1]M Garcia-Munoz et al., RSI 80, 053503 (2009)

[2]J Ayllon-Guerola et al., RSI 87, 11E705 (2016)

[3]J Galdon-Quiroga et al., in preparation

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