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10.44 Conceptual Design of the ITER Tangential Neutral Spectrometer

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Among the major goals of ITER project is the study of fast ions and alpha particles behavior. Fast ions with anisotropic velocity distribution functions (VDF) can be created by additional plasma heating such as NBI and ICRH. A charge-exchange atoms and neutrons spectrometer with tangential lines of sight (for short, Tangential Neutral Spectrometer, TNS) for ITER has been developed and is presented here. This system is dedicated to studies of fast ion V|| evolution, radial redistribution and loses as the result of plasma instabilities development. The TNS observes ITER's plasma along three horizontal chords that reach 1) plasma core, 2) ¼ of minor radius and 3) ½ of minor radius. Three detector modules with diamond detectors sensitive to both atoms and neutrons will be installed in ITER's equatorial port 8. In the H/He phase of ITER operation the TNS will provide fast charge-exchange atoms spectra. In the DT phase of ITER neutron fluxes will dominate the measurements and the system will provide collimated spectra of DT neutrons. Tangential and radial measurements will be interpreted to reconstruct fast ions 3D VDF. Performance of the TNS diagnostic at 100 ms timescales has been evaluated for both use-cases by means of DOUBLE-MC and MCNP codes.

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