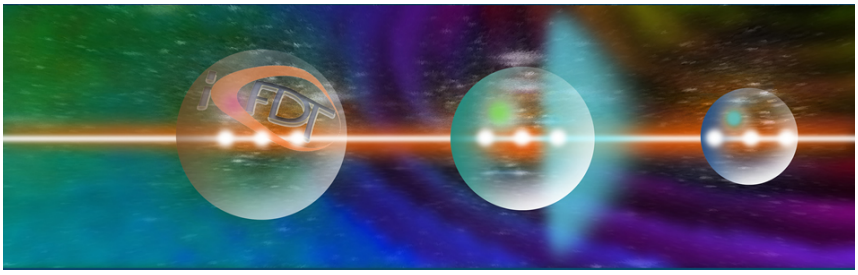

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Design and development of the ITER Plasma Position Reflectometry system

Friday, 5 October 2018 17:40 (20 minutes)

The ITER Plasma Position Reflectometry (PPR) diagnostic is planned to be used to measure the plasma edge density profile at or near four pre-defined locations distributed both poloidally and toroidally in the ITER vacuum vessel. The measured density profile will then be provided in real-time to the Plasma Control System, which will use it to derive a supplementary contribution to the magnetic measurements by tracking the position of the magnetic separatrix (or any other pre-defined density layer), whose movement, for known regimes of operation, can signal the approach of the plasma to the first-wall. During long discharges, the information from the PPR can also be used to correct any potential drifts of the magnetic measurements. Also, as already demonstrated in ASDEX Upgrade, the PPR can be used for plasma control purposes independently of the magnetic diagnostics. The system consists of five O-mode FM-CW reflectometers covering the edge plasma up to 7x1019 m-3. Overall, each reflectometer consists of three major sub-systems: (i) the front-ends, located both in-vessel and in port-plugs; (ii) the ex-vessel waveguides, which include the secondary confinement barriers located in the transitions between the traversed zones; and (iii) the back-end microwave electronics and digital sub-systems. The front-ends consist of the antennas and transmission lines up to the double vacuum windows, which are part of the first confinement barrier and define the interface with the ex-vessel part of the systems. The ex-vessel waveguides route the microwave signals between the tokamak and the diagnostic areas, where the back-ends are located. The design of the PPR system is about to enter the preliminary engineering design phase, which will last until the preliminary design review. In this talk, we present the current design status of the PPR system as well as the development work performed so far, including the design optimisation of critical components and the manufacturing and testing of prototypes for design evaluation and risk mitigation.

Summary

The design of the PPR system is about to enter the preliminary engineering design phase, which will last until the preliminary design review. In this talk, we present the current design status of the PPR system as well as the development work performed so far, including the design optimisation of critical components and the manufacturing and testing of prototypes for design evaluation and risk mitigation.

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