Update on integration of vacuum coupled, spectroscopic and microwave diagnostics in ITER

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Developments in safety and operational rules and on machine design requires a continuous engineering assessment and development of the integration of diagnostic systems into ITER. Also, due to refinement of the requirements for plasma measurements, changes in the design and, in some cases, relocation of some diagnostic systems are needed in order to achieve an optimised arrangement.

The main drivers for modifications from previous arrangements[1] are: i) the elimination of cryostat doors and consequently the replacement of the secondary vacuum boundary, ii) individual systems layout changes (such as the reflectometry wave guides), iii) relocation of Motional Stark Effect (MSE) and Charge Exchange Recombination Spectroscopy (CXRS) optical systems, iv) integration of new systems (i.e. direct viewing X-ray Spectroscopy) and v) design of optical components to be integrated within the blanket volume.

In this paper we address the present status of diagnostic integration in equatorial ports #11, #9, #3 and upper ports #10, #9, #3. These contain a wide range of diagnostic - vacuum coupled, optical, spectroscopic and microwave - each one requiring integration that complies with quality assurance in terms of safety, interface with machine systems and building, operational requirements and maintenance.

Monte Carlo (3D) radiation and activation level calculations available for some port plugs indicate the need to apply extra shielding around some diagnostic components at the interspace and port cell areas. Shield material selection and solutions for implementation are being addressed. A maintenance and refurbishment strategy is reviewed for the new arrangements addressing also the handling of external shields around diagnostic components in the interspace area.

[1] A. Malaquias, *et al.*, Fusion Engineering and Design, Vol. 56-57, 889, 2001.