# Overview of ITPA Diagnostics R&D: recent Activities in Support of ITER

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Diagnostic systems are essential for safe machine protection, reliable machine operation and comprehensive understanding of burning plasma behavior in ITER [1]. In order to achieve the above aims, more than fifty sub-systems will be developed for measurement of plasma and plasma facing components in the harsh ITER environment, e.g. higher neutron/-ray irradiation and lower accessibility/maintainability compared to that of existing fusion devices.

The International Tokamak Physics Activity (ITPA) Topical Group (TG) on Diagnostics has been conducting continuous R&D activities to support improved ITER diagnostic performance. In this paper, highlights of some of the recent TG activities are overviewed like mitigation of degradation of first mirrors in optical systems, cleaning techniques for impurity deposition on mirrors; investigation and modelling of in-vessel stray-light to reduce its impact on diagnostics; evaluation of radiation effects on various diagnostic components; development of neutron flux diagnostics for fusion power measurement, Laser-Induced Breakdown Spectroscopy (LIBS), which is to measure D/T concentration in the ITER first wall and to constraint H trapping modelling codes including comparative study between picoseconds versus nanoseconds LIBS; integrated data analyses to provide useful data for real-time control, synthetic diagnostics development in the framework of ITER Integrated Modelling & Analysis Suite (IMAS) etc…

The TG activity is mainly directed to High Priority research areas (HP) and Joint Experiments for Diagnostics (JEX-DIAG) under a framework between ITPA and the Implementing Agreement on Co-Operation of Tokamak Programs of the International Energy Agency (IEA). Detailed description of the on going work will be given.

**References**

[1] D. Brower et al.,, Proc. 27th IAEA Fusion Energy Conference, India (2018)