

# Diagnostics and control for Steady State and Pulsed Tokamak DEMO – P7-8 FP ORSITTO



- The paper is devoted to a first assessment of the DEMO diagnostics systems and controls.
- Main questions are related to: i) the quantities to be measured in DEMO and the requirements on the measurements; ii) the present capability of the diagnostic and control technology, determining the most urgent gaps and iii) the program of R&D needed to fill the gaps.
- Moderated efforts in R&D and extrapolation from ITER technology can be dedicated to Infrared diagnostics (reflectometry, ECE, polarimetry) and Neutron diagnostics, important for Burn Control, MHD stability, basic machine protection. Metallic Hall sensors appear as candidate for magnetics.
- The necessity of testing methods for measurements of the first wall erosion in DEMO environment, is one of the important gaps to be filled by an R&D programme. This is true also for dust and tritium retention, *as well as bolometers*. Placing the magnetic sensors behind the blanket delays the detection of the signal, not changing its frequency content, is a strong limit to the control. The tungsten first mirror damage tests at DEMO relevant neutron fluences need to be carried out. Alpha particle measurements, central to ITER operation, must be reconsidered for DEMO.