Contribution ID: **58** Type: **Oral**

Oral_19: Diagnostic integration concepts for DEMO –The reflectometry example

Wednesday, 8 September 2021 15:00 (30 minutes)

Integration studies of diagnostics in fusion grade devices (e.g. ITER, DEMO) aim to provide concepts and technical solutions for installation of diagnostic components that can perform the required measurements in a nuclear harsh environment while providing an optimized interface with the baseline tokamak systems and services and offering high levels of reliability and lifetime.
The challenges to overcome are relatively large in view of the unavoidable intrusion into otherwise optimised tokamak systems (blanket, divertor, vessel, etc.). For instance, the simple notion of apertures for plasma access (e.g. spectroscopy or reflectometry diagnostics) would imply reduction of the final Tritium breading ratio. Or the installation of in-vessel diagnostic components would require traversing safety and vacuum boundaries. Finding solutions for integrating diagnostics poses more stringent requirements on components performance to not become a weak point in the system and imposing higher maintenance rates. Assessment of risks, failure modes and criticality analysis, and remote handling compatibility are examples of constraints that emerge from fusion power plant requirements that need to be included on the diagnostic design. Open options on machine baseline systems also strongly affects the diagnostic design. In particular, the selection of one or other blanket type has implications on shielding effectiveness, immediately translated in different diagnostic cooling requirements, which influences not only mechanically but functionally the choice of diagnostic designs.
In this presentation we discuss the status of the reflectometry diagnostic illustrating the steps on the measurement optimization and integration concept in DEMO. Studying concepts that minimise the disturbance to the plant systems requires an early parallel development of the interfaces between diagnostic and the baseline systems and services in order to elaborate a more realistic analysis (mechanical, thermal, functional, etc.) and deliver a robust diagnostic system.

Primary author: MALAQUIAS, Artur (Instituto Superior Técnico)

Co-authors: LUIS, Raul (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); SILVA, António (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); NIETIADI, Yohanes (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); BELO, Jorge (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); VALE, Alberto (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); RECHENA, Diogo (Instituto de Plasma e Fusão Nuclear, Instituto Superior Tecnico, Universidade de Lisboa); BIEL, Wolfgang (Institute of Energy- and Climate Research, Forschungszentrum Jülich GmbH, Jülich, Germany); SANTOS, Jorge (Instituto de Plasmas e Fusão Nuclear - Instituto Superior Técnico); SILVA, Filipe (Instituto de Plasmas e Fusão Nuclear - Instituto Superior Técnico); RICARDO, Emanuel (Instituto de Plasmas e Fusão Nuclear - Instituto Superior Técnico)

Presenter: MALAQUIAS, Artur (Instituto Superior Técnico)