Challenges of Diagnostics integration in DTT

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Demonstration of viable power exhaust solutions for fusion reactors is the goal of the Divertor Test Tokamak (DTT) facility [1]. Flexibility and integration are the guidelines of the DTT project in order to test various power exhaust scenarios in presence of reactor relevant confined plasmas. In this framework the design of a complex set of diagnostics is being addressed facing the challenges imposed by advanced performance plasmas, harsh environment and topological constraints. Once identified the scientific and functional requirements of each system the path towards the realization of the diagnostic components has to tackle several interface issues including remote handling compatibility, presence of high magnetic fields, large thermal fluxes, stray electron cyclotron radiation and severe levels of neutron and gammas radiation, particularly dangerous for optical components and electronics. In addition, a demanding level of integration between the various systems and subsystems requires the assistance of known methodologies of functional analysis to guarantee the multiple functions of plasma control, physics research and machine protection.

[1] DTT Interim Design Report, ENEA, 2019, ISBN 978-88-8286-378-4, https://www.dtt-project.enea.it/downloads/DTT_IDR_2019_WEB.pdf