Core-edge integrated predictions of DTT scenarios from early phases to full power operations

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The Divertor Tokamak Test (DTT) facility is under construction in Frascati. The design phase has been supported by intensive scenario modelling, to allow optimization of the heating mix and to provide reference scenarios for diagnostic system design, MHD stability evaluations, estimates of neutron yields, calculations of fast particle losses, fuelling requirements, and other tasks. Consistency of the scenarios with the electromagnetic control systems has been assessed, as well as compatibility of the core performance with the scrape-off layer and divertor requirements. The possibility to operate with negative triangularity shapes has also been assessed, and experiments on TCV and ASDEX-Upgrade have been performed with the same shapes foreseen in DTT. The simulations cover all phases of the plasma discharge: current ramp-up, flat-top and ramp-down, using state-of-art physics-based transport models for temperatures, density, impurity species and current density.

Starting from the early phases when only a fraction of RF power and no NBI will be available, up to the full 45 MW power, this contribution will discuss the type of scenarios achievable and the transport physics issues that can be addressed in each phase. Negative triangularity has been shown to be a possible option to avoid ELMs and still maintaining good performance, in addition to strongly shaped and seeded positive triangularity scenarios. At full power, the possibility of achieving a Hybrid scenario will be discussed, to avoid the large sawteeth that characterize the q_{95}~3 baseline scenarios. Advanced Tokamak scenarios at high β can also be studied at half field and different power levels, providing complementary results to JT-60 SA.