8th Asia-Pacific Conference on Plasma Physics, 3-8 Nov, 2024 at Malacca

The new ITER baseline research plan

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The ITER baseline has been revised to ensure a robust achievement of Project's goals, while addressing past challenges including delays caused by the Covid-19 pandemic, technical challenges in completing first-of-a-kind components and in nuclear licensing. The new ITER baseline includes modifications in configuration of the tokamak device and its ancillaries to minimize previously identified risks, such as: change in plasma facing material for the first wall from beryllium (Be) to tungsten (W), modification of the heating and current drive mix and power, and phased installation of water-cooled components for the first wall.

Following the revision of the ITER baseline, the ITER research plan has been recently re-elaborated to provide a robust operational path to the Project's fusion production goals and technical objectives. The new ITER baseline research plan includes three main phases, Start of Research Operation (SRO), First Deuterium-Tritium (DT-1) and Second Deuterium-Tritium (DT-2) phases. In the SRO phase, the initial phase of operation will be carried out with an inertially cooled wall and access to deuterium plasma H-modes will be carried out using dominant electron heating (with up to 40 MW ECH and 10 MW ICH) leading to low neutron production. Demonstration of the full technical capabilities of the tokamak at full field and current, thus including effective disruption mitigation at full magnetic energy, is also planned as an important milestone. This phase will be followed by the DT-1 phase with a large increase in the heating and current drive mix and power (60-67 MW ECH, 33 MW NBI and up to 20 MW ICH). This phase focuses on the achievement of the Project's $Q = 10$ goal with fusion power production of 500 MW and burn durations of at least 300 s producing $\leq 1\%$ of the final neutron fluence objective for ITER. This experimental phase will provide a wealth of scientific results on burning plasmas as well as key information on the technical performance of the ITER systems and therefore to be used as licensing input for DT-2. The DT-2 phase (with an optional upgrade of NBI power to 50 MW) will progressively demonstrate $Q \geq 5$ long-pulse and steady-state operation with 1000s and 3000s of burn duration respectively. These scenarios, together with other scenarios of the ITER Members' interests, will be considered as potential candidates for plasma scenarios in fusion power plants. Technologies for breeding tritium in fusion power plants will be also addressed through the ITER test blanket module (TBM) program throughout the DT-1 and DT-2 phases. Open R&D issues for the new ITER baseline research plan will be described together with experimental, modelling and validation activities required to address them.