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Heating and in-vessel upgrades of the TCV tokamak

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Two sets of upgrades are being implemented on the TCV tokamak. The first set involves the installation of neutral beam injection (NBI) and new Electron Cyclotron (EC) power sources, to heat the ions and vary the electron to ion temperature ratio, for ITER relevant β values. A tangential 15-30keV, 1MW, 2s NBI is operational on TCV since 2015. A second 1MW, ~50keV beam, also tangential but opposite to the first beam, is foreseen to approach β limits, vary the momentum input and investigate suprathreshold ion physics. On the EC side, two 0.75MW gyrotrons at the 2nd harmonic have been installed. The next step, presently ongoing, entails two 1MW dual-frequency gyrotrons (2nd and 3rd harmonics). The total heating power for high-density plasmas will increase from 1.25MW to 5.25MW. The main element of the second set is an in-vessel structure to form a divertor chamber, reach high neutral density and impurity compression and access reactor relevant regimes for a wide range of divertor configurations. Graphite gas baffles will be installed to separate the main chamber from the divertor. The first set of baffles consists of 32 tiles on the high-field side (HFS) and 64 tiles on the low-field side (LFS). The LFS tiles' dimensions will be varied to modify the divertor closure. Control of the plasma, neutral and impurity densities, and of the He compression in the divertor will be achieved by a combination of toroidally distributed gas injection valves, impurity seeding, and cryo-condensation pumps. Significant developments will be undertaken in plasma diagnostics, to characterize the divertor plasma, measure power and particle deposition at the strike points, and monitor the detachment process. The possibility of installing dedicated high temperature superconducting coils, to expand the range of divertor configurations and improve their control, will be discussed.

Presenter: Dr FASOLI, Ambrogio (Swiss Plasma Center, EPFL)**Session Classification:** P1**Track Classification:** Experimental Fusion Devices and Supporting Facilities