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Developing steady state ELM-absent H-mode scenarios with advanced divertor configuration in EAST tokamak

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The divertor properties of a two nearby magnetic poloidal nulls (2-NDN) configuration have been recently investigated in steady state (Vloop<0) H-mode plasmas, (H98=1), Edge Localized Modes (ELM) absent, on EAST tokamak. Due to the location of Poloidal Field (PF) coils and target plates in EAST, the secondary null could be moved around from the primary one to form a magnetic configuration that features either a contracting or flaring geometry near the plate. An increase of the connection length by ~30% and flux expansion in the outer strike point (SP) region by a factor of ~3 with respect the single null (SN) case, in all the upper 2-NDN discharges have been achieved. A reduction of peak heat loads, of the same order of flux expansion increase, on the upper full W divertor targets, both in L-mode and H-mode discharges, has been observed consistently with theory predictions and predictive 2D edge simulations. In all the 2-NDN steady-state discharge the ELMs activity was quiescent, indicating a possible non-linear interaction between the downstream magnetic topology and the upstream kinetic gradients. Another potential explanation of the quiescent ELMs could be linked with the role of electrostatic edge coherent mode (ECM) which resides in the pedestal region and whom topological structure could be affected by variation of the local connection length. The ECM contribution to ELMs behavior on 2-NDN scenario is presently under investigation.

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Author: Prof. CALABRO, Giuseppe (University of Tuscia)

Co-author: Dr VIANELLO, Nicola

Presenter: Dr VIANELLO, Nicola

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