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EX/P8-03: Density Limit Experiments on FTU

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One of the main problems in tokamak fusion devices concerns the capability to operate at high plasma density, that is observed to be limited by the appearance of catastrophic events causing loss of plasma confinement. The commonly used empirical scaling law for the density limit is the Greenwald limit, predicting that the maximum achievable line averaged density along a central chord depends only on the average plasma current. The aim of this work is to present the results of dedicated density limit experiments performed on the Frascati Tokamak Upgrade (FTU) in which the high density domain was explored in a wide range of values of plasma current ($I = 500 - 900$ kA) and toroidal magnetic field ($B = 4 - 8$ T). These experiments confirm the edge nature of the density limit as a Greenwald like scaling holds for the maximum achievable line averaged density along a peripheral chord. However, when the central line-averaged is considered, the dependence of the density peaking on the edge safety factor, associated to the presence of MARFEs, give rise to a new density limit scaling law in which the central line-averaged density is solely dependent on the toroidal magnetic field. The behaviour of the density limit with the magnetic field in presence of pellet injection and with strong lithium coated wall will be studied in FTU in the next future, possibly including lower magnetic field discharges.

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