Pedestal Stability Analysis on MAST in preparation for MAST-U

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In preparation for the upcoming MAST-U campaign, pedestal stability of spherical tokamaks has been revisited by investigating the edge limiting modes of MAST discharges [1,2]. As a step beyond previous studies, both ion and electron profiles are used for obtaining equilibria and a diverse set of pedestals is evaluated. Stability analysis with ELITE conveys that medium toroidal mode number peeling-ballooning modes are constraining the pedestal, with most unstable modes ranging from n=25 to n=45 [3]. This is in agreement with CGYRO analysis showing that kinetic ballooning modes are dominant in the edge region. The input parameters into the ELITE code, as the mesh size and poloidal mode window for each toroidal mode, are increased to match the current profile of spherical tokamaks, where due to the steep q profile at the edge a larger number of poloidal harmonics is excited for each toroidal mode. A comparison with discharges on DIII-D with matched shape and similar non-dimensional parameters indicates that the increased shear at lower aspect ratio stabilizes low n peeling modes.

[1] S Saarelma et al 2007 Plasma Phys. Control. Fusion **49** 31
[2] A Kirk et al 2009 Plasma Phys. Control. Fusion **51** 065016
[3] M Knolker et al 2021 Nuclear Fusion **61** 046041