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Mechanism for destabilization of ideal ballooning modes in a 3D tokamak.[1] T B COTE, C C HEGNA, Univ of Wisconsin, Madison, M WILLENSDORFER, E STRUMBERGER, W SUTTROP, H ZOHM, Max Planck Institute for Plasma Physics, ASDEX UPGRADE TEAM — Recent observations on ASDEX-Upgrade have shown toroidally localized MHD activity in the presence of applied 3D fields[1]. In this study, we investigate the physical mechanisms that determine this result with an emphasis on 3D shaping. Experimentally relevant 3D VMEC equilibria are analyzed to determine stability in the edge pedestal region, and the ballooning mode is found to localized at specific field-lines corresponding to minima in the local magnetic shear. 3D distortion of the flux surfaces cause significant change in the normal torsion, a key component of the local shear, and act as the primary mechanism for ballooning destabilization on certain field-lines. The degree of localized ballooning instability is shown to scale with the amplitude of the 3D displacement through its effect on the local shear. [1] M. Willlensdorfer et al., submitted to Physics Review Letters, 2017.

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