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Toward a tearing resilient SPARC equilibrium[1] R. SWEENEY, MIT Plasma Science and Fusion Center, R.J. LA HAYE, C. PAZ-SOLDAN, General Atomics, N.C. LOGAN, Princeton Plasma Physics Laboratory, A.J. CREELY, Commonwealth Fusion Systems, D.T. GARNIER, R.S. GRANETZ, M. GREENWALD, J. IRBY, K. MONTES, C. REA, P. RODRIGUEZ-FERNANDEZ, R.A. TINGUELY, J. ZHU, MIT Plasma Science and Fusion Center, SPARC TEAM
— Careful minimization of error fields (EF) and tailoring of the current profile to improve neoclassical tearing mode (NTM) stability are planned to avoid tearing mode islands. EF thresholds for penetration and locking scale unfavorably with the toroidal field and favorably with the electron density such that the predicted critical overlap field in SPARC is comparable to that in ITER. The dominant external EF exhibits the common low field side response, but the second singular mode is substantial and is sensitive to high field side errors, which is uncommon and attributed to the low beta. All equilibrium field coils, joints, and leads are assessed for as-designed errors. In addition, a workflow assesses as-built errors and provides engineering tolerances on equilibrium field coils, and an EF correction coil set is designed. NTM stability benefits from the high field, such that the marginal poloidal beta, below which tearing stability is expected, can be achieved with a reasonable value of the classical stability index Δ'. A sensitivity study of Δ' varying about the design point is presented.

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