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Confinement properties of tokamak plasmas with extended regions of low magnetic shear J. P. GRAVES, W. A. COOPER, A. KLEINER, M. RAGHUNATHAN, E. NETO, T. NICOLAS, S LANTHALER, H. PATTEN, Ecole Polytechnique Federale de Lausanne (EPFL), Swiss Plasma Center (SPC), CH-1015 Lausanne, D. PFEFFERLE, Princeton Plasma Physics Laboratory (PPPL), Princeton NJ, 08543-0451, USA, D. BRUNETTI, Istituto di Fisica del Plasma 'P. Caldirola' CNR, Milano, Italy, H. LUTJENS, Centre de Physique Theorique - Ecole Polytechnique, CNRS, Palaiseau, France — Extended regions of low magnetic shear can be advantageous to tokamak plasmas. But the core and edge can be susceptible to non-resonant ideal fluctuations due to the weakened restoring force associated with magnetic field line bending. This contribution shows how saturated non-linear phenomenology, such as 1/1 Long Lived Modes, and Edge Harmonic Oscillations associated with QH-modes, can be modelled accurately using the non-linear stability code XTOR, the free boundary 3D equilibrium code VMEC, and non-linear analytic theory. That the equilibrium approach is valid is particularly valuable because it enables advanced particle confinement studies to be undertaken in the ordinarily difficult environment of strongly 3D magnetic fields. The VENUS-LEVIS code exploits the Fourier description of the VMEC equilibrium fields, such that full Lorenzian and guiding centre approximated differential operators in curvilinear angular coordinates can be evaluated analytically. Consequently, the confinement properties of minority ions such as energetic particles and high Z impurities can be calculated accurately over slowing down timescales in experimentally relevant 3D plasmas.

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