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Resonant Error Fields and Their Relation to Fully Penetrated Locked Modes in Ohmic Plasmas in DIII-D[1] R.J. LA HAYE, E.J. STRAIT, GA, C. PAZ-SOLDAN, ORISE — Relatively small resonant (m/n=2/1) static error fields are shielded in Ohmic plasmas by the natural rotation at the electron diamagnetic drift frequency. However, the drag can lower rotation such that a bifurcation results going from nearly complete shielding to full penetration, i.e., a locked mode island that can induce disruption [1]. Understanding is of importance for the initial plasma operation of ITER without supplementary heating. Error field correction (EFC) is done on DIII-D with either the n=1 C-coil (no handedness) or the n=1 I-coil (more resonant hand). Despite EFC which allows significantly lower plasma density (figure of merit) before penetration occurs, the resulting saturated islands have similar large size; they differ only in phase after typically being pulled in the electron diamagnetic drift direction as they grow to saturation. The data are explained by a change-of-state of the classical tearing index from stable before penetration starts to non-linearly marginal. Comparison to an island evolution model will be presented.

[1] R.J. La Haye et al., "Model for Effect of Non-Resonant Error Field on Resonant Error Field Locking in Ohmic Plasmas in DIII-D," Bull. Am. Phys. Soc. 57, 141, (2012)

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