

The spectral basis of optimal error field correction on DIII-D

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Abstract. Experimental optimum error field correction (EFC) currents found in a wide breadth of dedicated experiments on DIII-D are shown to be consistent with the currents required to null the poloidal harmonics of the vacuum field which drive the kink mode near the plasma edge. This allows the identification of empirical metrics which predict optimal EFC currents with accuracy comparable to that of first-principles modeling which includes the ideal plasma response. While further metric refinements are desirable, this work suggests optimal EFC currents can be effectively fed-forward based purely on knowledge of the vacuum error field and basic equilibrium properties which are routinely calculated in real-time.

PACS numbers: 52.30.Cv, 52.35.Py, 52.55.Tn, 52.55.Fa