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Using 3-D shaping to manipulate ITG turbulence saturation in stellarators[1] C. C. HEGNA, P. W. TERRY, University of Wisconsin-Madison — A frontier research area for stellarator design is to develop methods to alter turbulent transport. In this work, efforts are developed to understand how 3-D shaping can be used to affect turbulent transport saturation physics. To accomplish this goal, we utilize a paradigm for turbulent saturation that relies on zonal flow mediated transfer of energy from linear instability to damped eigenmodes. A simplified 3-field fluid model for ion temperature gradient turbulence is developed that allows for the presence of general 3-D geometry. The crucial nonlinear physics is associated with the triplet interaction of a linear instability, a zonal flow and a damped mode. The most vigorous interaction occurs when the three-wave frequency mismatch of these three modes is minimized, connoting a large nonlinear interaction time with saturated turbulence levels proportional to the three-wave frequency mismatch. Initial studies will be geared toward how 3-D geometry can be used to minimize this frequency mismatch.

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