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Nonlinear driven resonance in magnetic self-organization and the feasibility of a spheromak reactor[1] XIANZHU TANG, Los Alamos National Laboratory, ALLEN BOOZER, Columbia University — A Taylor relaxed plasma ($\mathbf{j} = k\mathbf{B}$ with k a constant) under external magnetic helicity injection encounters resonances in spatial frequencies of its force-free eigenmodes. Such driven resonance underlies the physics of magnetic self-organization and determines the flux amplification in laboratory helicity injection applications. Here we show that for partially relaxed plasmas where the deviation from the fully relaxed Taylor state, for example, a flux-dependent k, is a function of the normalized flux χ/χ_a with χ_a the poloidal flux at the magnetic axis, a modified driven resonance persists even if $k(\chi)$ has an order-unity variation across the flux surfaces. We will also explain why experimentally accessing such nonlinear resonance appears to hold the key for a potential spheromak reactor. Ref. X.Z.Tang, Phys. Rev. Lett. **98**, 175001 (2007).

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