Recent Results from the HIT-SI Experiment

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The Helicity Injected Torus with Steady Inductive helicity injection (HIT-SI) experiment uses a set of inductively driven helicity injectors to apply non-axisymmetric current drive on the edge of the plasma, driving an axisymmetric spheromak equilibrium in a central confinement volume. These helicity injectors are semi-toroidal plasmas connected to the edge of the central region, which by driving oscillating current and flux can provide constant-sign helicity injection. While the original HIT-SI device featured two helicity injectors located on the top and bottom of the device to drive toroidally $n=1$ perturbations, current operations are focused on the HIT-SI3 configuration which features three injectors all located on the top. HIT-SI3 allows the study of the role the toroidal mode structure of the perturbation has on the plasma by allowing combinations of $n=1$, 2, and 3, achieved through changing the relative temporal phasing of the injectors. Both experimental [1] and computational [2] studies have been performed and find that while most of the non-axisymmetric activity is correlated with the injectors, some transient plasma-generated activity is additionally seen. Additionally, the variety in perturbation mode spectra allowed validation on the simulations ability to capture the experimental configuration.

[1] A.C. Hossack et al, Nucl. Fusion **57**, 076026 (2017)

[2] K.D. Morgan et al, *Under Review at Phys. Plasmas*

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