

2014 National Campaign on Disruption Avoidance & Mitigation

National Campaign experiments are carried out on one more major US fusion facilities with the goal of inviting broad participation by the US community. This enables experts from across the US fusion community to take advantage of capabilities unique to each facility. Three National Campaign experiments on Disruption Avoidance and Mitigation are currently planned for 2014/2015, with the BPO Disruption Task Group playing a coordinating role.

1. Study 3D and 0D aspects of locked mode mitigation

Motivation: The majority of ITER disruptions will likely originate from LM, but mitigation studies are rarely done with “sick” plasma. Does the pre-existence of a tearing mode alter the 3-D radiation pattern during mitigation? How does timing & injector location relative to LM O-point or X-point affect 0-D mitigation?

Experiment: Create tearing mode (NTM or resistive). Mitigate at various times during growth and at point of locking, measuring 0-D mitigation metrics. Rotate LM to various phases relative to injector before mitigation & measure radiation asymmetry & 0D mitigation metrics.

Participating tokamaks: DIII-D (2014), C-Mod (2014), NSTX-U (2015)

2. Measure effect of extrinsic asymmetry (poloidal location of injector) on VDE mitigation

Motivation: ITER would like to know if there is substantial disadvantage to VDE mitigation if only upper injectors are available for upward and downward VDEs. Initial experiments were made on DIII-D in 2013, but technical resulted in many downward and only 2 upward VDE's, making position dependence somewhat ambiguous.

Experiment: Induce upward & downward VDEs. Mitigate at various dt relative to unmitigated thermal quench. Measure resulting heat fluxes, forces, halo currents, etc..

Participating tokamaks: DIII-D (2014), NSTX-U (2015)

3. Disruption avoidance & H-mode recovery after locked-mode

Motivation: In ITER (or reactor), ending a discharge, even benignly, is an expensive proposition. This experiment aims to fully recover H-mode operation after a locked mode is formed.

Experiment: Create NTM & locked mode. Use 3D field spin-up to avoid disruption, ECH to kill mode, and attempt asynchronous return to standard operation.

Participating tokamaks: DIII-D (2014), NSTX-U (2015)