Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Recent progress on tokamak disruption simulations for mitigation design[1] XIANZHU TANG, Los Alamos National Laboratory, TOKAMAK DISRUPTION SIMULATION (TDS) SCIDAC TEAM — Tokamak Disruption Simulation (TDS) SciDAC project aims to understand the transport physics that govern the thermal quench and current quench of a major disruption, which can hopefully inform experimental design for effective mitigation. Two primary design targets for mitigation are to (1) bring down the plasma power load to divertors during thermal quench, and (2) avoid runaway electrons or control their energy during current quench. Approaches that are effective for one objective can induce negative consequence for the other, an example is radiative cooling by high-Z impurities that spreads the power load onto the first wall, but which can drive more robust runaway formation. Here we give an overview on the recent progress made by the TDS SciDAC team on (1) magnetic dynamics that trigger thermal quench and current profile relaxation, (2) Ohmic-to-runaway current transfer, (3) radiative cooling in the presence of a runaway population, (4) interaction between runaways and externally injected waves, and (5) current-carrying plasma scrape-off. An emphasis will be placed on the options and physics constraints for potential disruption mitigation approaches.

[1]This work was supported by the Office of Fusion Energy Sciences and Office of Advanced Scientific Computing Research through the SciDAC program.

Xianzhu Tang
Los Alamos National Laboratory

Date submitted: 03 Jul 2019 Electronic form version 1.4