abstract is replacing DPP17-2017-000092.

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Comprehensive Assessment of Damage Effects during Transient Events in ITER[1] AHMED HASSANEIN, VALERYI SIZYUK, Purdue Univ — During abnormal operations in tokamaks, the incident particle and heat fluxes during disruptions and ELMs are quickly generate a secondary plasma composed mainly from divertor plate materials. This mini-plasma will then absorb the incoming disruptive plasma and convert its energy to intense radiation fluxes to nearby components. HEIGHTS simulations showed significant increase of radiation fluxes and components heat load for high-Z (i.e., tungsten) generated secondary plasma. These radiations can seriously damage hidden components such as umbrella tubes and dome structure. In fact, simulation showed that during longer disruption times the evolving mini-plasma can damage parts of Be first wall. We have enhanced previous HEIGHTS models and implemented efficient models for photon and particle transport in evolving secondary plasma during transients. HEIGHTS now simulates full 3D detail ITER geometry to assess various damage of these components during plasma instabilities. HEIGHTS predicted again, for the first time, details of heat loads and temperatures evolution of divertor and nearby components including first wall. Current ITER divertor design needs to be modified to withstand the damage produced from disruptions. A single unmitigated disruption event can cause serious damage to components that were not directly exposed to disruptions including dome, stainless steel tubes, and parts of Be first wall.

[1]Supported by National Science Foundation, PIRE Project

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Date submitted: 06 Jul 2017 Electronic form version 1.4