Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Simulation of the Vapor Shield Effect on Plasma Facing Materials under Tokomak-Like Disruption Conditions NOUF ALMOUSA, MOHAMED BOURHAM, North Carolina State University — Hard disruptions are expected in large tokomaks, where plasma-facing components (PFCs) receive radiant high heat fluxes resulting in surface melting and evaporation. The boundary layer at the ablating/melting surfaces absorbs a fraction of the heat flux and a vapor shield effect protects the PFCs from further erosion. The energy transmission factor through the vapor shield f_{vs} is modeled in a 1-D, time dependent code to calculate the erosion under disruption-like conditions of 55 GW/m^2 over 150 μs. The f_{vs} value was found to be strongly dependent on materials properties, plasma pressure, and density, but weakly dependent on the plasma internal and kinetic energies. Calculations of f_{vs} at each time step and mesh point are used to predict the ablated mass. The code predictions are used to estimate the erosion rate and erosion thickness for varies PFMs. It has been found that high-Z PFMs suffer higher ablation rate as compared to low-Z PFMs. However, the erosion in units of material thickness indicates that the erosion thickness of the highest Z PFMs (tungsten) is less than that of the lowest Z PFMs (beryllium). Detailed comparisons of the erosion behavior and properties of PFMs are presented.

Nouf Almousa
North Carolina State University

Date submitted: 30 May 2014 Electronic form version 1.4