Design considerations for NSTX-U high-Z divertor upgrade and future liquid metal PFCs

MICHAEL JAWORSKI, K. TRESEMER, A. BROOKS, S. GERHARDT, R. KAITA, J. MENARD, J. NICHOLS, M. ONO, R. MAINGI, Princeton Plasma Physics Laboratory, P. RINDT, N. LOPES-CARDOZO, TU/Eindhoven, T. GRAY, Oak Ridge National Laboratory — A clear comparison between plasma-facing components composed of high-Z solid metals versus low-Z liquid lithium fusion device is sought to experimentally demonstrate integrated, high-performance scenarios in the spherical tokamak configuration. The NSTX-U is beginning a staged upgrade of the in-vessel PFCs to high-Z metal to accomplish this experimental program. The first high-Z divertor upgrade will consist of the installation of a continuous toroidal row of molybdenum tiles in the outboard divertor of the machine. The experimental program is designed to test the heat-flux handling capabilities of these bulk metal tiles and assess the impact of the high-Z tiles on plasma operations. Incremental upgrades toward flowing liquid lithium systems are also envisioned with one possible embodiment being pre-filled, liquid lithium, self-replenishing PFCs. Design and analysis of the base tiles and pre-filled target tiles will be presented.

¹Work supported by US-DOE contract #DE-AC02-09CH11466.

Michael Jaworski
Princeton Plasma Physics Laboratory