SAND2020-1330PE

Gamma Reaction History on Sandia's Z Machine

Kevin Yates[1], Yongho Kim[1], Hans Herrmann[1], Kevin Meaney[1], Justin Jorgenson[1], Brian Albright[1], Gordon Chandler[2], Pat Lake[2], Michael Jones[2], John McKenney[2], Chris Ball[2], Decker Spencer[2], Morris Kaufman[3], James Corcoran[3], Kevin McGillivray[3], Ken Moy[3]

[1]*Los Alamos National Laboratory*
[2]*Sandia National Laboratory*
[3]*Nevada National Security Site*
Corresponding Author Email: kyates@lanl.gov

Recently, the Gamma Reaction History (GRH) diagnostic from the OMEGA laser facility was modified and fielded on Sandia's Z machine to demonstrate the ability to measure gamma ray reaction history. The introduction of tritium into the z-pinch experiments provides the necessary gammas for analysis of the reaction history. We will outline the proposed experiments which include mixtures of deuterium (99%) and tritium (1%) as well as deuterium (50%) and helium 3 (50%) with the ultimate goal of diagnosing and understanding the evolution of the fusion plasma on Z. D^3He also has a steep dependence on ion temperature, making the reactivity ratio between DT and D^3He a sensitive ion temperature indicator. D^3He is also highly sensitive to non-thermal beam reactions and can provide an indication of the degree of thermalization of the fusion plasmas. X-ray backgrounds are currently being assessed with the GRH as well as the Aerogel Cherenkov Detectors (ACD) to determine the feasibility of measuring DT and D^3He gammas above the background.

Los Alamos National Laboratory is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA000001.

Sandia National Laboratories is a multi-mission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.