Contribution ID: **343** Type: **Oral**

Pulsed power performance of the Z machine: ten years after the upgrade

Monday 19 June 2017 15:30 (15 minutes)

The Z machine is a 36-module, multi-megavolt, low impedance driver for high-energy-density physics experiments. In 2007, a major rebuild doubled the stored energy and increased the peak current that could be delivered. The upgraded system can drive 27 MA through dynamic plasma loads with 110 nanosecond time to peak current. The Z pulsed power system is expected to be prepared for a full-energy experiment every day, with a negligible chance of failure and ±2 ns timing precision. To maintain that schedule with 20 MJ stored, it becomes essential to minimize failures that can damage hardware. We will show the results of several improvements made to the system that reduce spurious breakdowns and improve precision. In most cases, controlling electric fields is key, both to reliable insulation and to precision switching. The upgraded Z pulsed power system was originally intended to operate with 5 MV peak voltage in the pulse-forming section. Recent operation has been well above 6 MV. Critical items in the pulsed power system are the DC-charged Marx generators, oil-water barriers, laser-triggered gas switches, and the vacuum insulator. We will show major improvements to the laser-triggered gas switches, and the water-insulated pulse forming lines. Work on understanding and improving the vacuum insulator is ongoing. The goal of the present round of improvements is to enable operation with 25% more energy while maintaining the present reliability and precision.

Sandia National Laboratories is a multi-mission laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Author: SAVAGE, Mark (Sandia National Laboratories)

Co-authors: AUSTIN, Kevin; HUTSEL, Brian (Sandia National Laboratories); KAMM, Ryan (Sandia National Laboratories); MCKEE, Randy (Sandia National Laboratories); STYGAR, William (Sandia National Laboratories); WAKELAND, Peter (Sandia National Laboratories); WHITE, William (Sandia National Laboratories)

Presenter: SAVAGE, Mark (Sandia National Laboratories)

Session Classification: Oral session 4 - Fusion Research, Large High-Current and High-Energy Systems - Session Chair : Sergey Garanin

Track Classification: High-Energy Density Physics and Technology