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3P85 - Z Line-VISAR: Spatially Resolved Load Current Diagnostic at the Z Pulsed Power Facility*

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We report on the first operation of the Z-Line-VISAR (ZLV) diagnostic. The diagnostic is motivated by the desire to understand current delivery to loads at the Z Pulsed Power Facility. A team from Sandia and Lawrence Livermore National Laboratories collaborated to implement ZLV. The diagnostic measures the spatial and temporal dependence of the velocity at a surface near the load. From the measured velocity map, the distribution of magnetic drive pressure can be determined and compared with current loss models. With ZLV providing precision spatially resolved velocimetry, we strive to understand the timing and location of current losses near the load.

The primary components of the ZLV system are: 1.) two line-VISAR interferometers with streak cameras, 2.) an eight-channel Gated Optical Imager, 3.) illumination lasers, 4.) a 50-meter transport beam path to the load and 5.) an alignment system with cameras and motion control to remotely align everything.

High-quality ZLV data were obtained on the first shot attempt with radially and temporally resolved velocimetry in the range of a few km/s, over a 4mm field of view with a spatial resolution of ⁵0 um and sub-nanosecond temporal resolution. Comparisons to both the point probe data and to numerical models demonstrate that the ZLV diagnostic can measure spatially and temporally evolving current density near the load with high precision. This presentation will discuss the design and fielding of the ZLV diagnostic at Z. For information on ZLV analysis, please refer to Clayton Myers' presentation.

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