

POST-HOLE CONVOLUTE STUDIES ON THE Z MACHINE AT SNL AND MAIZE AT U OF M

Matthew R. Gomez, Ronald M. Gilgenbach, Jacob C. Zier,
David M. French, Sonal Patel, Y. Y. Lau
Plasma, Pulsed Power, and Microwave Lab,
Nuclear Engineering and Radiological Sciences Department,
University of Michigan – Ann Arbor, MI 48109USA

Michael Cuneo, Mike Lopez, Michael Mazarakis,
James Bailey, Greg Rochau, Pat Lake
Sandia National Labs, Albuquerque, NM 87185USA

Post-hole convolutes are used to combine the current from several magnetically insulated transmission lines into one anode-cathode gap. The post-hole convolute geometry produces a complex magnetic field, which can contain several magnetic nulls. Electron flow in the post-hole region can cross the anode-cathode gap, which can produce plasma and lead to further current losses.

A streaked spectroscopy diagnostic has recently been set up to observe plasma emission at Sandia's Z Machine. The diagnostic is fiber-optically coupled to the experimental hardware, allowing the diagnostic to measure light in the visible spectrum (~ 400 nm to ~ 700 nm). Hardware has been designed to observe the light emitted by the plasma forming in the post hole region. Experimental shots are planned for late winter / early spring. Single post-hole convolute experiments on the 1 MA Michigan Accelerator for Inductive Z-pinch Experiments (MAIZE) are also being conducted. These experiments utilize a static load, which allows 10's of shots per hour. The current flowing into and out of the convolute is monitored in order to determine the current lost in the post hole region. Visible spectroscopy of the plasma formed will be used to infer a temperature. Different components of the convolute are made from different materials allowing the plasma source to be observed spectroscopically. Laser imaging will be used to determine the electron density and closure velocity of the plasma.

MAGIC PIC 3D simulations of the post-hole convolute fielded on MAIZE predicted plasma formation at a magnetic null in the convolute. Light emission was observed experimentally from the predicted region using an open pinhole camera. Results from experiments as well as simulations will be presented.

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