



Contribution ID: 409

Type: Poster

A new radiographic source using a plasma opening switch and plasma-filled rod-pinch diode

Wednesday 21 June 2017 13:30 (1h 30m)

We are testing a new radiographic source that uses a Marx bank with a one microsecond discharge time, coupled through a plasma opening switch (POS) to a plasma-filled rod-pinch diode (PFRP). The Hawk generator at NRL contains four Marx banks connected in parallel with an erected voltage of 640 kV and an output current of 700 kA with 1.2 microsecond quarter period into a short circuited 600 nH load. A POS configuration developed on Hawk in the 1990s [1] is utilized to conduct (in vacuum) for 900 ns then rapidly open, switching a fraction of the current to a downstream PFRP load [2]. The POS on Hawk works best when the center conductor is negative, generating up to -2 MV, therefore the PFRP must be operated in negative polarity also. The PFRP utilizes a cable-gun plasma source located inside the center conductor to inject plasma in the axial direction through a tube toward an on-axis 1 mm diameter rod that is connected to a grounded end plate. The injected PFRP plasma envelops the rod, with higher density near the rod tip and lower density near the end plate. The switched current is conducted through the PFRP plasma which pinches onto the rod and zippers toward the tip, quickly forming an electron beam that is focused at the tip, creating an x-ray source that could be useful for flash radiography. Several geometry variations have been tested to determine the potential of this novel type of radiographic source.

1. P. J. Goodrich, et al., in Proc. IEEE Pulsed Power Conf., 511 (1993).
2. B. V. Weber, et al., IEEE Trans Plasma Sci. 36, 443 (2008).

Author: WEBER, Bruce (U.S. Naval Research Laboratory)

Co-authors: ENGELBRECHT, J. T. (Plasma Physics Division, Naval Research Laboratory); GOUDE, David (AWE); SINCLAIR, Mark (AWE)

Presenter: WEBER, Bruce (U.S. Naval Research Laboratory)

Session Classification: Poster session III - Particle Beam and Accelerator Technologies

Track Classification: Particle Beam and Accelerator Technologies