Absorption Spectroscopy of Pulsed Power Driven Metal Plasmas

PATRICK KNAPP, SERGEI PIKUZ, TANIA SHELKOVENKO, ADAM CAHILL, JOHN GREENLY, DAVID HAMMER, Cornell University, Laboratory of Plasma Studies — We present here the use of the continuum radiation from X-pinch-produced point x-ray sources for absorption spectroscopy as a new diagnostic to investigate the properties of aluminum plasmas created by pulsed power machines at 500 kA and 1 MA. This technique is being developed to provide a path towards determining time and space resolved plasma parameters (charge state, temperature and density) under conditions that are inaccessible to traditional x-ray spectroscopic diagnostics. The diagnostic apparatus, setup and characterization will be described, including estimates of spatial and spectral resolution. Preliminary results from exploding wires and wire array z-pinches are shown and compared with synthetic spectra. The technique is also applied to the dense core of exploding wires, which is known to exist in a multiphase state and has previously eluded quantitative study. This research is supported by the NNSA SSAA program under DOE Cooperative Agreement DE-FC03-02NA00057.

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