STUDY OF IMPLOSION DYNAMICS, THE X-RAY YIELD AND PLASMA INTERPENETRATION IN STAR WIRE ARRAYS WITH GATES IN THE INNER CYLINDER*

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Star wire arrays with two closely located wires ("gates") on the inner cylinder of star wire arrays were studied. The gate wires were used to study plasma interpenetration and reproduce transparent and non-transparent regimes of propagation of the imploding plasma through the gates. The non-transparent mode of collision is typical for regular star wire arrays and it was also observed in Al stars with gate wires of regular length. Gated star arrays demonstrate similar x-ray yield but slightly different delay of x-ray generation compared to regular stars. Double length wires were applied as gate wires to increase their inductance and resistance and to increase transparency for the imploding plasma. The wires of the gates were made of Al or high atomic number elements, while the rest of the arrays were regular length Al wires. An intermediate semi-transparent mode of collision was observed in Al stars with long Al gate wires. Arrays with long heavy-element gate wires demonstrated transparency to plasma passing through. Shadowgraphy at the wavelength of 266 nm showed that plasma moved through the gate wires. Double implosions, generating a double-peak keV X-ray pulse, were observed in star arrays when the gates were made of high atomic number elements. A new laser diagnostic beampath for vertical probing of the Z-pinch was built to test how wires could be used to redirect plasma flow. This setup was designed to test gated arrays and further configurations to create a rotating pinch. Results on plasma flow control obtained are discussed, and compared to numerical calculations.

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