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A Multiple Z-Pinch Configuration for the Generation of High-Density, Magnetized Plasmas ALFONSO G. TARDITI, NPL Associates, Inc. — The z-pinch is arguably the most straightforward and economical approach for the generation and confinement of hot plasmas, with a long history of theoretical investigations and experimental developments. While most of the past studies were focused on countering the natural tendency of z-pinches to develop instabilities, this study attempts to take advantage of those unstable regimes to form a quasi-stable plasma, with higher density and temperature, possibly of interest for a fusion reactor concept. For this purpose, a configuration with four z-pinch discharges, with axis parallel to each other and symmetrically positioned, is considered. Electrodes for the generation of the discharges and magnetic coils are arranged to favor the formation of concave discharge patterns. The mutual attraction from the co-streaming discharge currents enhances this pattern, leading to bent plasma streams, all nearing towards the axis. This configuration is intended to excite and sustain a "kink" unstable mode for each z-pinch, eventually producing either plasmoid structures, detached from each discharge, or sustained kink patterns: both these cases appear to lead to plasmas merging in the central region. The feasibility of this approach in creating a higher density, hotter, meta-stable plasma regime is investigated computationally, addressing both the kink excitation phase and the dynamics of the converging plasma columns.

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