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Control of sheared flow stabilized Z-pinch plasma properties with electrode geometry[1] ELLIOT CLAVEAU, URI SHUMLAK, BRIAN NELSON, TOBIN WEBER, ANTON STEPANOV, YUE ZHANG, ELEANOR FORBES, University of Washington, HARRY MCLEAN, DREW HIGGINSON, JAMES MITRANI, Lawrence Livermore National Laboratory — The FuZE device produces a 0.3 cm radius by 50 cm long Z-pinch between the end of the inner electrode of a coaxial plasma gun (cathode) and an end wall (anode) 50 cm away. The plasma column is stabilized for thousands of instability growth time by an embedded radially-sheared axial plasma flow. The mechanisms that affect sheared flow are investigated. MACH2 MHD simulations show that abrupt transitions from the coaxial accelerator to the Z-pinch create less favorable flow profiles while gradual transitions promote adiabatic compression and favorable shear. Different coaxial accelerator nose cone geometries are tested and their effects on flow and pinch properties are analyzed. End wall geometries are also tested. The transparency is increased by changing the center hole design to a spoked design. It is found that the end wall influence on the upstream Z-pinch is minimal. The plasma is frozen in the magnetic field, preventing the increased transparency from allowing plasma to escape the assembly region, which acts as a flux conserver. However, plasma can be transiently allowed to exhaust with increased ram pressure. The ram pressure can be increased by changing the input energy, controlled by the bank voltage, and changing the injected density, controlled by the gas valves.

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