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Design and preliminary characterization of a micro-scale dense plasma focus WILLIAM POLLARD, BENJAMIN CARPENTER, ANDREW DUGGLEBY, DAVID STAACK, Texas A&M University — Experimental results are presented for a sub-millimeter dense plasma focus (DPF). Reducing the DPF from cm to μm sizes should allow for unique applications such as portable neutron based detectors. With smaller size efficiency is expected to increase, but total neutron emission will be lower. Challenges will be maintaining various scaling parameters and generating sub-ns rise time voltage pulses. Scaling suggests higher pressure operation though there may be limitations at high pressure in confinement due to increased collisions. Two DPF devices have been designed: a 100 μm radius and a 750 μm radius anode. A pulse generating system capable of up to 4 J/pulse with peak voltages of 20 kV and controllable voltage rise rates up to 20 kV/ns has also been assembled and tested. The DPF device will operate at pressures of 10-1000 Torr in hydrogen though initial experiments with the 750 μm indicate that trace air contamination significantly affects the pinch process and a UHV chamber is being assembled. Voltage, current, imaging, nanosecond time resolved optical emission spectroscopy and x-ray detection measurements have been used to diagnose the DPF device.

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