Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Numerical Simulation and Design of Dense Hypervelocity Plasma Jets for Fusion Applications[1] MICHAEL W. PHILLIPS, F. DOUGLAS WITHERSPOON, HyperV Technologies Corp. — We report on the results of design studies to determine optimal configurations for coaxial pulsed plasma jets. Dense hypervelocity plasma jets have a variety of promising uses including momentum injection, plasma refueling, and as drivers for magnetized target fusion. Previous studies showed that the tendency of coaxial plasma guns to develop a blow-by instability can be effectively offset by shaping the accelerating section. A plasma jet incorporating these concepts was designed and built by HyperV Technologies Corp. for the Maryland MCX experiment. Further studies of the next generation of plasma jets will be reported. Numerical simulations were performed using the Mach2 2 $^1/_2$-D MHD code. To maximize performance, each stage of the pulse discharge, including armature formation, acceleration and detachment from the inner electrode, must be optimized. Plasma jet designs have been found that are predicted to perform well over a range of parameters and that are capable of accelerating plasma masses exceeding 200 μg to greater than 200 km/s without onset of the blow-by instability.

[1]Work supported by the U.S. Dept. of Energy Office of Fusion Energy Sciences

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Date submitted: 19 Jul 2006 Electronic form version 1.4