# DESIGN OF Z-PINCH BASED, JET-TARGET COLLISION EXPERIMENTS FOR LABORATORY ASTROPHYSICS USING 3D MHD MODELLING

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The ablating plasma and precursor plasma flow obtained in conical wire array Z-pinches on the 1MA, 240ns rise-time MAGPIE facility provides a mechanism for generating radiatively cooled plasma jets with velocities of several hundred km/sec which can be sustained for several hundred nano-seconds. Such laboratory jets have been shown to provide a directly scalable representation of the radiatively cooled jets found in many young stellar objects during the post-launch phase where the jets are propagating through and interacting with the inter-stellar medium. Several features of the astrophysical jet-target interaction can be examined using such laboratory astrophysics experiments. These include the characteristic structure and emission of shocks launched into the background medium and the non-linear evolution of flow driven instabilities.

Extending the parameter range of conical wire arrays to currents substantially higher than 1MA, will enable us to access flows with far higher Reynolds and Peclet numbers. This will provide both data which will stretch our ability to model turbulence in compressible high energy density flows and a more accurate representation of the astrophysical systems of interest. Similarly driving the conical arrays for longer periods will allow the flow driven instabilities within the jet-target interaction region to reach a more highly developed non-linear evolution.

Using the 3D resistive MHD code Gorgon we have undertaken a thorough examination of our ability to reproduce the behavior of conical wire array experiments on the MAGPIE facility. We have then extrapolated conical array simulations to higher currents on the refurbished Z facility and longer risetimes on the Sphinx generator at Centre d'Etudes de Gramat. These simulations are then used to provide initial conditions for jet-target interaction studies in order to be able to design the optimal target configurations for future experiments.

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