# Numerical study of conical wire arrays on MAGPIE

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Although important improvements have been achieved in the comprehension of astrophysical jets, several questions remain open, including jet formation, propagation in an external medium and survival to potentially disruptive instabilities [1]. Jets produced in laboratory are scalable to astrophysical conditions. In particular, jets produced by conical wire arrays are especially suitable to study the interaction of the jet with an ambient medium [3]. In this framework we produced laboratory jets on the MAGPIE pulsed power generator at Imperial College, London using different setups: conical and radial wire arrays [3] and radial foils. The recent upgrade of MAGPIE and other pulsed power facilities (notably the “Z” machine in Sandia, USA) will allow the study of new physical regimes for jets. The work presented here aims to carefully model such experiments in order to understand the physics and help the design of new experimental setups and diagnostics. Direct numerical simulations are employed for the modeling, using the three-dimensional (3D) resistive magneto-hydro-dynamic (MHD) code GORGON [8]. We will present the results of a numerical parametric study of conical wire arrays on MAGPIE and relate the physical properties of the jet to the geometrical parameters of the array (radius, length, aperture angle and number of wires). To complete the study and to validate the numerical code, we will compare the simulations with new data from MAGPIE experiments. Finally, we will present preliminary modeling of the planned proton-probing magnetic field diagnostics, based on the new CERBERUS laser at Imperial College.

References

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