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Novel Hairpin Geometries for High-Field Low-Density Plasma Ablation Experiments

On university-scale pulsed power drivers (of typically ~1 MA peak current), it is difficult to produce stripline experiments with current densities and magnetic fields relevant to the design of the next generation pulsed power machines. In this poster, we present a novel approach that is being tested on the MAGPIE driver at Imperial College. This approach, called the "hairpin", uses small wires of circular cross-section bent into slightly inductive loops; it is advantageous for several reasons. First, it is far easier to work with small-diameter wires than very thin planar foils, so manufacturing costs are dramatically reduced. Second, the curvature of the wire cross-section provides significant field enhancement at the apex of the curve, allowing access to even higher magnetic and electric field strengths at larger A-K gap widths. Lastly, the size (and, correspondingly, the inductance) of the loop can easily be varied, allowing precise control over the electric field strength at similar current levels when fired on a stiff driver like MAGPIE. Several simulations of different hairpin designs are presented using the COMSOL multiphysics software, and recommendations are made for a future experimental campaign on MAGPIE.