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Generating a Dipole Momentum Source with a Non-Uniform AC field: A New Long-Range Electro-kinetic Micro-Pump Design JASON GORDON, ZACHARY GAGNON, HSUEH-CHIA CHANG, University of Notre Dame — An AC electrokinetic funnel flow is generated by a planar micro-coil resister design capable of sustaining 3500V without Faradaic reactions. The final line of the serpentine coil exhibits a transverse electro-osmotic slip velocity exceeding 1 cm/sec. Due to side boundaries, a large back pressure is established in the slip direction to produce an intense vortex cylinder. As the coil design stipulates a vortex circulation that is longitudinally non-uniform, the longitudinal gradient in the back pressure drives a secondary flow to transform the vortex flow into a funnel flow. This funnel flow resembles a dipole momentum line source with large field-line penetration and can be used to effectively transport fluid at the microscale. Unlike all previous electrode-based AC electrokinetic micropump designs, fluid motion is not confined to the polarized electrode surface, which allows one to generate long-range pumping without having to employ large-scale electrode arrays that span the entire length of the microchannel.

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