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Electromagnetic Activation of Capillary Switches BERNIE MALOUIN, ROHAN DAYAL, LEILA PARSA, AMIR HIRSA, Rensselaer Polytechnic Institute — By designing coupled droplet pairs with the appropriate length scale to promote surface tension as the dominant force, one can create bi-stable capillary switches. This bi-stability can be triggered by pressure pulses, surface chemistry, electroosmosis, or body forces. To exploit the latter, we designed a capillary switch with electromagnetic activation. The resulting setup consists of a sub-millimeter tube, overfilled with a ferrofluid, surrounded by a wire coil to generate a magnetic field. Evidence of this capillary switching will be presented along with some theoretical basis in fluid- and electro-dynamics. The approach may also be used to investigate other transport phenomena in electromagnetically-coupled microfluidic systems, including the relative effects of translational motion of the ferrofluid (both particles and solvent molecules) versus the rotational effects of the individual magnetic grains. These individually addressable capillary switches offer intriguing applications including high-speed adaptive optics, actuators at the microscale, and possible PCB integration.

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