DC Powered Jumping Ring

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The classroom Jumping Ring demonstration is nearly always performed using alternating current (AC), in which the ring jumps or flies off the extended iron core when the switch is closed. The ring jumps higher when cooled with liquid nitrogen (LN2). We have performed experiments using DC to power the solenoid and find similarities and significant differences from the AC case. In particular, the ring does not fly off the core, but rises a short distance then falls back. If the ring jumps high enough, the rising and the falling motion of the ring does not follow simple vertical motion of a projectile. This indicates that there are additional forces on the ring in each part of its motion. Four possible stages of the motion of the ring with DC are identified, which result from the ring current changing directions during the jump in response to a changing magnetic flux through the moving ring.