Abstract Submitted
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Electromotive force and current in a superconducting solenoid with limited length induced by a bar magnet and a monopole[1] LIANXI MA, Blinn College - Bryan — The magnetic flux Φ_B, electromotive force, EMF, and current I_{in}, induced by a moving magnetic bar and an imaginary magnetic monopole in a superconducting solenoid of multiple turns and length L, are numerically calculated. The magnetic field of the bar magnet is approximated with the magnetic field along z axis of a solenoid with length l and radius a and current I, while the magnetic field of the monopole is supposed to be inversely proportional to r^2. Calculations show that, for a bar magnet, Φ_B and I_{in} essentially saturate when the bar moves inside superconducting solenoid, so EMF is zero while I_{in} is constant. EMF is only induced when the bar enters and exits the solenoid and I_{in} is zero after the bar leaves the solenoid. For a magnetic monopole, Φ_B is discontinuous (from positive maximum to negative maximum) when the it moves through each turn of the superconducting solenoid, but EMF caused by $d\Phi_B/dt$ is continuous while the EMF induced by the a moving monopole is a delta function (moving monopole produces a ring-shaped E field). The total EMF_{Tot} in solenoid is the superposition of EMF of each turn of coil and the plateau appears. The current I_{in} continues to grow while the monopole leaves the solenoid.

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