

## Ferrofluid-based variable inductor

### Abstract

This paper reports a planar variable inductor that utilizes ferrofluid as the movable magnetic core. Ferrofluid is displaced over the planar inductor using the magnetic field provided by another coil aligned to the inductor, varying permeability distribution on the inductor to control its inductance. The repelling motion of ferrofluid from the inductor is uniquely enabled by superimposing a bias field on the varying magnetic field. The continuous modulation of inductance is experimentally demonstrated with the fabricated device. A 16% inductance variation is obtained at the full removal of the fluid from the inductor with a driving current of 1.2 A provided to the actuation coil. Frequency tuning is also demonstrated using a passive resonant tank constructed with the developed device.