

Abstract Submitted
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A Transformer with Unequal Mutual Inductances XIAODONG

LIU, Department of Radiology, Washington University in St. Louis, MO 63110, USA, YU LIANG, Department of Computer Science, Michigan State University, MI 48823, USA, QICHANG LIANG, China Institute of Atomic Energy, Beijing 102413, China — We designed a new kind of transformer which is composed of a circular parallel plate capacitor and a toroidal solenoid. The toroidal solenoid is placed in the middle of the parallel plate capacitor. The circular parallel plate capacitor is used as the primary coil and the toroidal solenoid is used as the secondary coil. The toroidal solenoid could enclose air or magnetic material inside the solenoid. Numerical calculations and analyses show that this transformer has unique characteristics of unequal mutual inductances due to the displacement current. The displacement current between the plates of the capacitor contributes to the mutual inductance from the capacitor to the solenoid, while the gap between the plates reduces the mutual inductance from the solenoid to the capacitor. The mutual inductance from the solenoid to the capacitor is always less than that from the capacitor to the solenoid. This is the first transformer in the world which has unequal mutual inductances. It is anticipated that this specific device has potential applications in power transmission at radio frequency.

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