



# Encircled WPT Field Cancellation

TECHNOLOGY NUMBER: 2022-286

Technology ID

2022-286

**Category**

Hardware

Engineering & Physical Sciences  
Semiconductors, MEMS, and  
Electronics

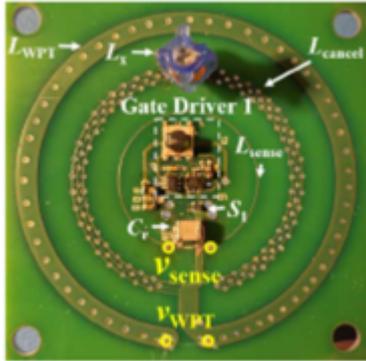
**Inventor**

Al-Thaddeus Avestruz  
Xin Zan

**Further information**

Joohee Kim  
[jooheek@umich.edu](mailto:jooheek@umich.edu)

**[View online](#)**



**OVERVIEW**

A method that minimizes the magnetic field for encircled wireless power transfer (WPT) coils

- Provides a means by to improve field miniaturization and decrease field cancellation
- Combines WPT and cancelling coils together, arranged with opposite-phase currents

**BACKGROUND**

Wireless power transfer is a technology that enables the transmission of electrical power from a power source to an electronic device without the need for physical wires or connectors. This technology works by using an electromagnetic field to transfer power wirelessly between two objects, typically a transmitter and a receiver. Wireless power transfer has become increasingly popular in recent years, particularly in applications such as electric vehicles, mobile devices, wearable or implantable medical devices, and internet of things (IoT) devices. The technology offers several advantages, including increased convenience and flexibility, reduced clutter, and improved safety, in as much as there is no risk of electric shock from exposed wires. However, wireless power transfer also has some limitations, such as decreased efficiency when compared to wired connections as well as the need for compatible devices to use the technology. Additionally, the wireless power transfer (WPT) coils that encircle these applications correlate with sensitivity to magnetic fields, especially at higher frequencies, leading to field cancellation. Existing measures that try to correct for field cancellation may prove complex and inefficient, so a need exists for improved methods to manage field cancellation.

**INNOVATION**

Researchers have invented a method that minimizes the magnetic field for the encircled coils in wireless power transfer (WPT) coils using a two-coil structure, allowing for field miniaturization

while diminishing field cancellation. The WPT and cancelling coils are driven together by a single current-mode class D power converter with opposite-phase currents to optimize the field cancellation within the coils. The current magnitude of the canceling coil is independently determined and fixed using the same driver for the WPT coil. Additionally, a thin sensing coil encircling the circuits is used to measure the magnetic flux. Using this cancelling method, the magnetic field for the encircled circuits can be reduced by 99% in hardware when compared to existing approaches that lack cancellation. Overall, this invention successfully optimizes methods for very high frequency WPT systems that achieve miniaturization and effectively prevent field cancellation.

## **PATENT APPLICATION**

Number:18/123,507

Status:Filed