

Convenient wireless charging for home use

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A new wireless charging technology opens the door to developing charging stations for consumer use. Credit: Aalto University

A new wireless charging system can charge devices placed anywhere within a ring around it. Existing systems transfer power in a specific direction or to a specific position. By providing a donut-shaped charging field, the new system offers a more convenient and reliable design for consumer use.

The main challenge in creating an omnidirectional charger has been that the strength of the charging field changes with location. This means that devices will charge inefficiently if they are in the wrong spot or aren't

oriented correctly. One approach to solve this is to create a charging field using several transmitter coils connected to several power sources, but this increases the complexity of the transmitter, making the system impractical. Other systems use feedback to properly orient the charging field, but the control systems are also complicated and expensive.

Researchers at Aalto University developed the new system to address these challenges. "We set out to create a simple, low-cost system using only a single [power source](#)," says Nam Ha-Van, the postdoctoral researcher who led the study.

The key to the new design is a cylindrical power coil. The wire at the top of the coil is wound in the opposite direction to the wire at the bottom of the coil, with a z-shaped bridge connecting them. Since the current flows through these windings in opposite directions, they produce complementary magnetic fields. One field flows out from the middle of the cylindrical coil, around the top winding, and back in through the top; the other flows out from the middle, around the bottom coil, and back in through the bottom.

This results in an even magnetic field around the middle of the charging [coil](#). Receivers placed anywhere within that area charge efficiently, regardless of their position or orientation. "This was just a proof of concept," says Yining Liu, a doctoral candidate. "Now we can work to improve the efficiency—maybe to around 90% – and also the power."

Based on simulations of the electromagnetic field around a consumer device, the researchers found that the level of exposure conformed to the requirements in safety regulations. However, further safety studies will be required before the technology can be used.

The new design complements recent work from the same research group which made it possible to transfer [power](#) to multiple, moving receivers in

a charging area. The two technologies address different dimensions of the challenge of wireless charging: freedom of movement for industrial applications and free placement for consumer, tabletop devices.

The results have been published in *IEEE Transactions on Industrial Electronics*.

More information: Nam Van Ha et al, Cylindrical Transmitting Coil for Two-Dimensional Omnidirectional Wireless Power Transfer, *IEEE Transactions on Industrial Electronics* (2022). [DOI: 10.1109/TIE.2022.3151961](https://doi.org/10.1109/TIE.2022.3151961)

Provided by Aalto University

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