

Getting in Tune: Researchers Solve Tuning Problem For Wireless Power Transfer Systems

Researchers have shown that it is possible to transmit power wirelessly by using magnetic resonance. Even minor changes in how the transmitter or receiver is tuned, however, can result in faulty power transmission.

Researchers from North Carolina State University have developed a new way to fine-tune wireless power transfer (WPT) receivers, making the systems more efficient and functional. WPT systems hold promise for charging electric vehicles, electronic devices and other technologies.

A new prototype developed at NC State addresses the problem by automatically – and precisely – re-tuning the receivers in WPT systems. The researchers focused on receivers because methods already exist that allow researchers to use electronics to precisely tune the transmitters.

“We’re optimistic that this technology moves us one step closer to realizing functional WPT systems that can be used in real-world circumstances,” says Dr. Srdjan Lukic, an assistant professor of electrical and computer engineering at NC State and co-author of a paper on the research.

WPT systems work by transmitting magnetic waves on a specific frequency from a transmitter to a receiver. These magnetic waves interact with a coil in the receiver to induce an electric current. If the coil is tuned so that its [resonant frequency](#) [1] matches the frequency of the magnetic waves, the current it produces is amplified. However, if the receiver and the transmitter are out of tune, the system becomes inefficient and doesn’t transfer a significant amount of power. The receiver coil still picks up a trace amount of current, but it is not amplified.

This is a problem because many factors can affect the tuning of a receiver or transmitter, such as temperature or proximity to other magnetic objects. In other words, a hot summer day could wreak havoc on the tuning of a receiver.

Lukic and NC State Ph.D. student Zeljko Pantic developed an electronic prototype that incorporates additional circuitry into the receiver that does two things: it injects small amounts of reactive power into the receiver coil as needed to maintain its original resonant frequency; and, if the transmitter’s tuning changes, the prototype can read the trace amount of current being transmitted and adjust the receiver’s tuning accordingly.

“Because we are using electronics to inject reactive power into the receiver coil, we can be extremely precise when tuning the receiver,” Lukic says. “This degree of fine-tuning maximizes the efficiency of the WPT system.

“The next step is to try incorporating this work into technology that can be used to

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wirelessly charge electric vehicles.”

The paper, “[Framework and Topology for Active Tuning of Parallel Compensated Receivers in Power Transfer Systems](#) [2],” is published online in *IEEE Transactions on Power Electronics* and was supported by the Advanced Transportation Energy Center at NC State. The paper was co-authored by Pantic and Lukic.

[NC State](#) [3]

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Links:

[1] <http://hyperphysics.phy-astr.gsu.edu/hbase/sound/reson.html>

[2] http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&tp=&arnumber=6194339&contentType=Early+Access+Articles&searchWithin%3Dp_Authors%3A.QT.Pantic%2C+Z..QT.%26searchField%3DSearch_All

[3] <http://news.ncsu.edu/releases/wms-lukic-wireless-power/>