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Wireless Power Transfer via Complex Load Bandpass Filter Synthesized Magnetic Resonant Coupling

An innovative bandpass filter synthesis method enables compact, controllable, and efficient two-coil resonant structures for advanced wireless power transfer to consumer and medical electronics.

Wireless power transfer (WPT) technologies are increasing in popularity as they address key limitations, including miniaturization, cost, and safety, associated with tethered- and battery-powered consumer and medical electronics. Recently, the development of magnetic resonance coupling (MRC) has gained momentum as a promising WPT method due to its capability of operating at much longer distances than traditional inductive methods, while maintaining higher end-to-end power transfer efficiency than far-field radiative techniques. However, practical implementation of MRC remains challenging.

Researchers at Purdue University have developed an alternative method to achieving WPT via MRC based on bandpass filter (BPF) synthesis. In contrast with conventional four coil MRC, BPF synthesized MRC shrinks to only a two-coil resonant structure. This is accomplished via impedance transformation, resulting in a more compact and controllable system. This technology allows for efficient and practical wireless powering for a wide array of technologies, ranging from consumer electronics to miniaturized implantable medical devices and sensor nodes.

Advantages:

-Requires only two inductively coupled coils instead of four

-Capable of simple adaptive tuning

-More practical, less complex equations

Potential Applications:

-Battery industry

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-Wireless power

-Consumer electronics

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