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A robust and low-cost tunable matching network

Stanford researchers have designed a tunable matching network that is compact, fast, low-cost, robust, and simple to control.

Tunable two-port matching networks are critical to electronic systems. They optimize the transfer of signals between components, ensuring efficient power transfer and minimizing signal distortion. However, conventional tunable matching networks that use passive components are bulky and suffer from slow transient responses. Meanwhile, recently developed tunable matching networks that use passive components and active semiconductor switches are complex and costly.

Stanford researchers therefore developed a new design for tunable matching networks that are compact, fast, low-cost, robust, and simple to control. This design comprises a wide-range resistance matching network and a reactance neutralization network, allowing a varying load impedance to be matched to a fixed source impedance by frequency matching. Unlike previous designs, this strategy does not require adjustable passive components or semiconductor switches.

Stage of Development
Proposed design for a tunable matching network

Applications

- Plasma etching systems
- Wireless power transfer
- RF communication systems
- Medical devices (e.g., magnetic resonance imaging)
- RFID systems

Advantages

- Does not require adjustable passive components or semiconductor switches.
- Compact
- Fast response
- Robust and reliable
- Low-cost
- Simple structure and easy control

Publications

- Z. Ye, K. Surakitbovorn, C. Lin and J. Rivas-Davila, "Frequency-tuning Matching Network for Load-varying Applications," *2024 IEEE Applied Power Electronics Conference and Exposition (APEC),* Long Beach, CA, USA, 2024, pp. 1604-1607

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