P-PAL: Passively-Powered Adaptively-Located Flexible Hybrid Sensors

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

PARC & Energy ETC
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P-PAL

Team

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- Leading research institution practicing open innovation
- Deep expertise in printed and flexible electronics
- Broad capability in electronics, algorithms, sensor systems, and RF

energy etc

- Building controls system integrator
- Provides cloud-based, supplier-agnostic BMS software
- Manages a variety of facilities including PARC

P-PAL

Buildings generally have just **one** temperature sensor per zone

Up to 30% energy savings are available with more building sensors: up to 1,800 Tbtu/yr

BUT

Hardware, installation, and commissioning costs of wired sensors are prohibitive

AND

Wireless sensors have limited power availability

P-PAL is a self-commissioning, remotely-powered wireless sensor system

Siemens, 2012, "Building Automation – impact on energy efficiency."

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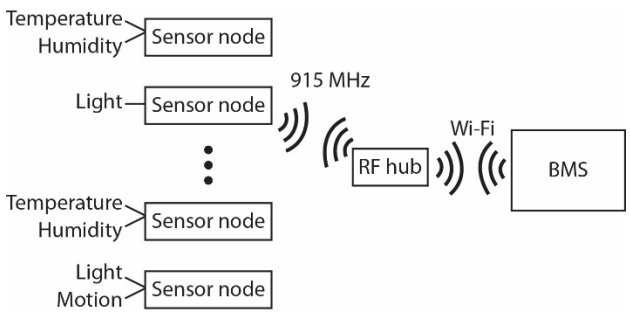
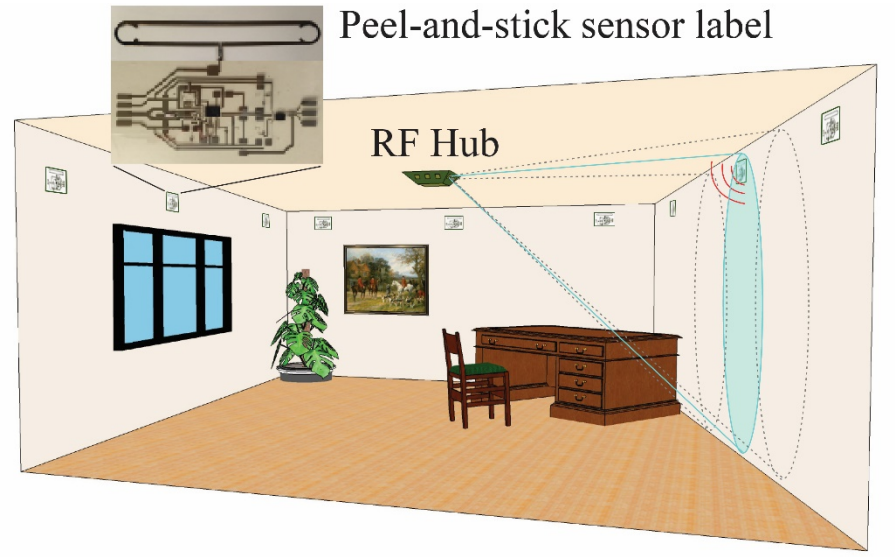
Technology Solution

- Easy-to-install peel-and-stick sensor labels
- Muti-modal sensing: temperature, humidity, light, occupancy, air quality
- Self-locating
- Interoperable with many building management systems





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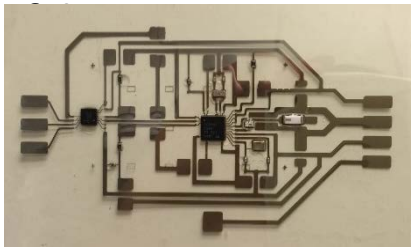
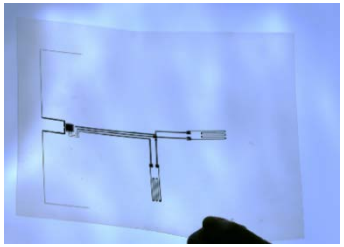
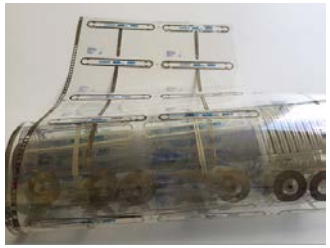
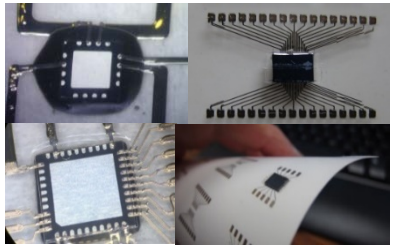
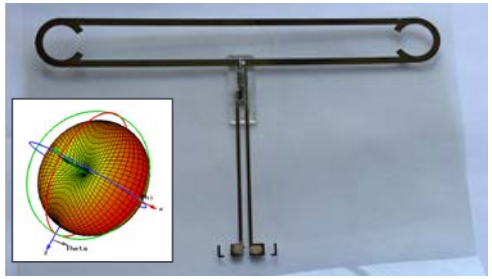
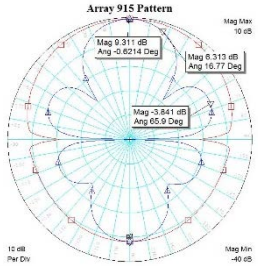
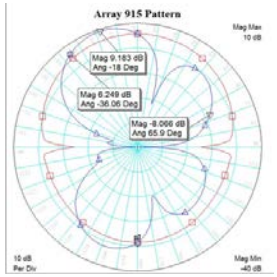
Advantage, Differentiation, and Impact

- Low cost ($10/node), flexible form factor through flexible hybrid electronics (FHE)

- Wireless, self-commissioning, peel-and-stick sensor nodes for easy installation



- Integration into the BMS at PARC's facility for prototype validation

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Thank You

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