Battery-free Electrochemical Gas Sensing in RF Energy-Rich Environments
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Wireless Ambient Radio Powered Sensing Platform

- Designed for any environment rich in UHF RF energy
- Low power sensing and communication
- Energy optimized out-of-band 2.4 GHz radio link
- Application: Toxic gas detection using new thin film sensor
- RF source-versatile: various sources may be used within a single sensor network

System Overview
A power management circuit enables the device when adequate charge is available on a storage capacitor. The microcontroller begins its workload, monitoring the supply voltage to prevent a brown-out event. To limit the size of the storage capacitor needed, the workload is split into several components, and a sleep state is entered between each stage of the workload.

“Wild” Energy: TV Harvesting
RF energy from a television transmitter near the University of Washington campus has been used as a power source for the gas sensing node.

“Planted” Energy: UHF RFID Harvesting
An example of an environment rich in RF energy: The RFID ecosystem at the University of Washington’s Paul Allen Center. Over 50 UHF RFID readers cover 8000 m² of office space.

Verification

Potential Application

A network of these battery-free sensors could be utilized in a perimeter monitoring type application. For instance, in a chemical manufacturing facility, sensing nodes could be placed on the fenceline and could monitor levels of toxic gases that might be inadvertently released from the facility.