



REAL-TIME MICROWAVE OIL DETECTION SYSTEM AND ENVIRONMENTAL MONITORING

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HIGHLIGHTS

- Fully Autonomous Floating Operation
- High-Sensitivity Microwave Resonator
- Integrated Low-Cost Architecture

OPPORTUNITY

Hydrocarbon leaks in lakes, rivers, and coastal waters inflict massive ecological damage. Yet, traditional detection methods like satellite imaging, manual sampling, and lab testing are slow, weather-dependent, and labor-intensive. Standard microwave testing usually requires bulky, expensive equipment wired up in a laboratory, making real-time monitoring impractical. To solve this, researchers at the University of Alberta built a real-time, self-contained, floating microwave platform that operates directly on the water's surface to detect oil spills autonomously; this solution offers:

- **Real-Time Early Warning System:** Delivers continuous surface monitoring and instantaneous wireless alerts to support early intervention and spill containment.
- **Field-Deployable:** Operates using low-power onboard electronics and integrated battery power for extended field deployments.
- **Scalable Network Infrastructure:** Designed for distributed multi-node sensor networks across rivers, lakes, ports, and industrial water systems.

Researchers developed a fully functional prototype and evaluated it in a laboratory setting. Comprehensive testing across various water matrices and oil types demonstrated negligible baseline interference (<50 MHz), while an ultra-thin ~140 μm film produced prominent resonant shifts over 500 MHz, triggering immediate telemetry to remote stations in under 500 milliseconds.



COMPETITIVE ADVANTAGE

- **Superior Dielectric Discrimination:** Utilizes microwave resonance tracking to reliably isolate hydrocarbon dielectric perturbations from typical natural water background chemistry.
- **Instantaneous Response Time:** Automatically processes reflection coefficient shifts in situ and transmits actionable telemetry to remote base stations or cloud portals in under 500 milliseconds.
- **All-Weather, Continuous Operation:** It can operate in lighting, fog, or water surface turbidity, resolving critical limitations of traditional systems.

IP STATUS

- Patent pending

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MORE INFORMATION

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