

# Wireless Interrogation of SAW Sensors in Operating Jet Engines at Extreme Temperatures

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Topical areas:

- . Wireless tracking in harsh environments
- . Recent developments for SAW sensors

Sensors capable of long-term wireless operation in harsh environments are desired in fields like aerospace, gas and petroleum exploration, industrial process control and power generation. The University of Maine (UMaine), and its spin-off company Environetix Technologies Corporation, have been pioneering wireless harsh environment sensors that are able to operate at temperatures of excess of 800°C for extended periods of time, targeting jet engines health monitoring applications.

The surface acoustic wave (SAW) langasite (LGS) sensors developed at UMaine utilize high-temperature Pt/Rh/ZrO<sub>2</sub> thin-film electrodes, which have demonstrated survivability at 800°C for over 5 months. An interrogation method was implemented to simultaneously address multiple sensors by a single interrogating unit. Additionally, new technology was developed in order to attach the sensors to a variety of surfaces, such as ceramics and Inconel-based turbine blades, under harsh environments that include temperatures over 600°C and centrifugal forces above 55,000 g.

This presentation will address the latest wireless tests of SAW sensor on an integral bladed rotor (IBR) of a JetCat engine. This jet engine was operated up to a rotational speed of 65,000 rpm and temperatures above 600°C. The IBR temperature was continuously acquired wirelessly from the integrated SAW sensor and antenna.

The demonstrated technology is anticipated to play an important role in monitoring physical parameters of operating jet engines under various types of conditions, providing valuable information in order to test and evaluate the engine performance.