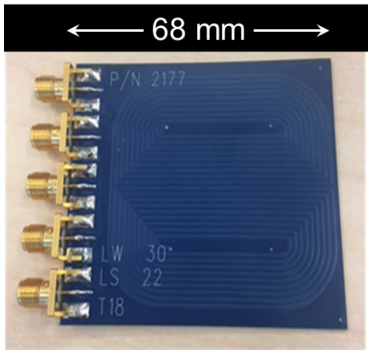
MAGNETIC SMART TAGGING AND SENSING PLATFORM

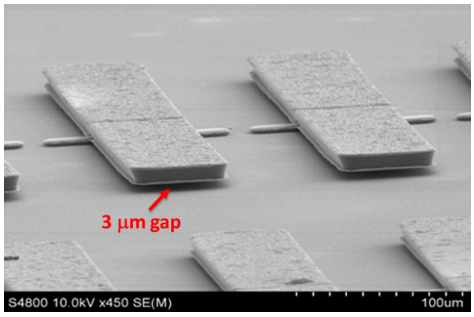
US Patent 10,132,699; 10,510,945; and 10,260,969
SD 13278, 13989
Technology Readiness Level: 4
Key elements have been demonstrated in a laboratory environment

A chip-scale, magnetic smart tagging and sensing platform with enhanced performance for the accurate tracking, sensing, and monitoring of assets

The accurate tracking and sensing of assets is an area of growing interest across diverse industries and environments. Radio-frequency identification (RFID) technologies face key limitations in settings with RF-based communications and medical devices, such as pacemakers. RFIDs can also suffer detuning by metallic objects or proximity to water and cannot be used underground, in metal structures, or other extreme conditions. Magnetoelastic-based tags are a promising alternative to conventional solutions; however, to date they have lacked the functionality and cost-effectiveness needed for more widespread adoption.



AC Planar Antenna



On-Chip Resonators

Sandia researchers have developed a chip-scale, magnetic smart tagging and sensing platform with enhanced performance for the accurate tracking, sensing, and monitoring of assets. The wireless, passive platform is comprised of multi-frequency/multi-amplitude unique identifiers (UIDs) and sensors which use magnetic-based resonator arrays. The resonator arrays vibrate when excited with low-frequency alternating current (AC) magnetic fields, creating a complex, unique, and non-reproducible signature that is immune to long-range communications interference and tampering. The arrays are also tailorable for the multi-modal sensing of environmental features such as pressure, strain, and temperature. Detection is accomplished with built-in transceivers or hand-held or floor mounted transceivers.

TECHNICAL BENEFITS

- Small form factor with enhanced functionality and anti-counterfeit properties
- Transmits complex, non-reproducible signals
- Immune to long-range interference and tampering
- Reduced manufacturing cost
- Passive- no battery required with zero standby power consumed

INDUSTRIES & APPLICATIONS

- Defense and security
- Extreme environments
- Electrical grid and energy infrastructure
- In-situ monitoring, sensing, and flaw detection
- Transportation
- Supply chain and logistics

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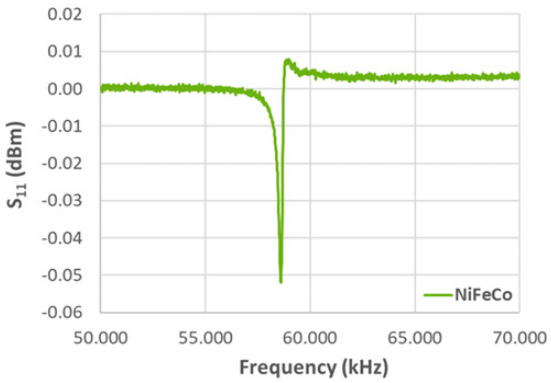
ADDITIONAL FIGURES



S_{11} loop antenna measurement of NiFeCo resonance

ADDITIONAL DETAILS

Demonstrated proof of technology readiness level (TRL) includes working centimeter-scale NiFeCo resonators, planar integrated circuit board antennas, and initial attempts at millimeter-scale, fully released, microfabricated on-chip resonators.

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