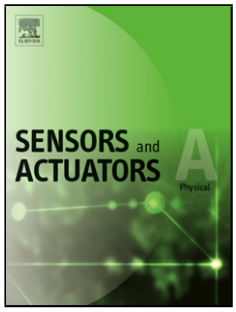

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Passive and Chipless Packaged Transducer for Wireless Pressure Measurement

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Highlights

- Passive, chipless and wireless sensors are a promising solution for the remote measurement of physical quantities in harsh environment (e.g. extreme temperature and/or pressure, high toxicity, high nuclear radiation level etc.)
- Electromagnetic transducers based on microstrip configuration for pressure sensing allows the use of a packaging without damage on the RF parameters of the transducer.
- Fabrication process with high resistivity silicon membrane and low-loss photoresist cavity gives sufficient hermeticity for hour last pressure monitoring.
- Instead of taking into account the real deflection of the membrane, electromagnetic simulations based on a planar deflection of the membrane over the resonator constitutes a good approximation to simulate the sensor performances with overpressures, if the membrane deflection value is taken where the electromagnetic coupling is maximum. These results were confirmed by experimental measurements.
- Sensors developed here show a working overpressure range between 0 and 2.3bars and can be used for remote detection by a radar.

Abstract:

A new microwave fully passive, chipless and packaged sensor for wireless pressure monitoring in harsh environments (such as, extreme temperature, radioactive and/or toxic environments) is proposed in this paper. The sensor consists of a planar microstrip resonator, which is electromagnetically coupled with a high resistivity and thin silicon membrane. Prototypes have been designed and fabricated using a photoresist intermediate layer for the silicon membrane bonding. The electromagnetic simulation of the system is also performed in order to predict the transducer performances. Measurement results using the packaged sensor are provided to experimentally validate the simulation results and the manufacturing process.