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Design and characterization of a passive temperature sensor based on a printed MIW delay line

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Abstract— A passive electromagnetic temperature sensor based on a magneto-inductive wave (MIW) delay line is presented. The working principle is the following: a reader sends a pulse in the time domain to the sensor, which produces a backscattered pulse whose amplitude depends on the temperature. The transductor element is a conventional thermistor, which is placed at the end of the MIW delay line. The system operates at 2.55 GHz and, thus, both the thermistor and the sensor are characterized at this frequency. In order to do that, a setup capable of controlling and measuring the temperature and the frequency or time responses is proposed. The fabricated sensor is measured at different temperatures obtaining good agreement with the simulations. The integrity of sensor response after heating is also proved. The proposed sensor is implemented in single-layer printed technology, resulting in a low-cost and low-complexity solution with reduced dimensions.

Index Terms— Metamaterials, MIW, temperature sensor, time domain, split-ring resonator (SRR).

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