

Submersible printed split-ring resonator -based sensor for thin-film detection and permittivity characterization

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Abstract— A split-ring resonator (SRR)-based sensor for the detection of solid thickness and relative permittivity characterization of solid and liquid materials is proposed. The structure is composed of two SRRs hosted in a microstrip transmission line. The sensing principle is based on the detection of the notch introduced by the resonators in the transmission coefficient. Hence, a frequency shift of the notch is related to a change in the effective permittivity of the structure when the sensor is covered with any solid or liquid material. A complete characterization of the sensor, for the three proposed applications, is performed through simulations. Finally, all simulated results are corroborated with measurements. The proposed sensor is implemented in single-layer printed technology, resulting in a low-cost and low-complexity solution. It presents real-time response and high sensitivity. Moreover, it is fully submersible and reusable.

Index Terms— Effective permittivity, resonator, sensor, splitting resonator (SRR), submersible sensor.

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