

## **Chipless RFID with Artificial Impedance Surfaces**

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Barcode is today the most popular method of labeling objects but it has significant limitations which could be potentially solved with the introduction of Radio Frequency Identification (RFID) technology. However, application of RFID to consumer low-value items is feasible only if tag price drops under one cent including the cost of fitting it in place.

Since the presence of the integrated circuit poses a lower bound to the cost of tags efforts have been put in the last few years for developing chipless RFID tags with no ICs, which means that the main cost of the tag is being removed. This can be achieved by using entirely passive structures which encodes the information in their electromagnetic footprint, either in the time domain (TD) or in the frequency domain (FD).

In FD tags data are usually encoded into the spectrum where a bit is associated with the presence or absence of a resonant peak at a predetermined frequency. Different configurations have been already proposed in the literature but up to now none of the available solutions allows the practical employment of this new technology. The reason of this lies in a number of problems including read range, operation on metallic structures and, above all, the need of an unpractical normalization procedure to clean up measured data from the noise due to the environment where the tag is located.

In this presentation we will report the results obtained by using periodic artificial impedance surfaces (AIS) based tags. The AIS surface consists of a Frequency Selective Surface (FSS) with an suitably chosen unit cell geometry printed on top of a grounded substrate. These tags show some advantages with respect to available designs. In addition, the theory developed for the analysis of AIS surfaces provides a reliable basis in the design and in the understanding of such resonators. We will show tag designs based on different encoding mechanism such as power absorption, phase, cross-polar conversion encoding. We will also face the issue of the normalization procedure by proposing a solution to this unavoidable problem.