

A Study on the Different Components of a Typical Back-Scattered Chipless RFID Tag Reflection

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Abstract : Chipless RFID system is a wireless system for tracking and identification which use passive tags for encoding data. The advantage of using chipless RFID tag is having a planar tag which is printable on different low-cost materials like paper and plastic. The printed tag can be attached to different items in the labelling level. Since the price of chipless RFID tag can be as low as a fraction of a cent, this technology has the potential to compete with the conventional optical barcode labels. However, due to the passive structure of the tag, data processing of the reflection signal is a crucial challenge. The captured reflected signal from a tag attached to an item consists of different components which are the reflection from the reader antenna, the reflection from the item, the tag structural mode RCS component and the antenna mode RCS of the tag. All these components are summed up in both time and frequency domains. The effect of reflection from the item and the structural mode RCS component can distort/saturate the frequency domain signal and cause difficulties in extracting the desired component which is the antenna mode RCS. Therefore, it is required to study the reflection of the tag in both time and frequency domains to have a better understanding of the nature of the captured chipless RFID signal. The other benefits of this study can be to find an optimised encoding technique in tag design level and to find the best processing algorithm the chipless RFID signal in decoding level. In this paper, the reflection from a typical backscattered chipless RFID tag with six resonances is analysed, and different components of the signal are separated in both time and frequency domains. Moreover, the time domain signal corresponding to each resonator of the tag is studied. The data for this processing was captured from simulation in CST Microwave Studio 2017. The outcome of this study is understanding different components of a measured signal in a chipless RFID system and a discovering a research gap which is a need to find an optimum detection algorithm for tag ID extraction.

Keywords : antenna mode RCS, chipless RFID tag, resonance, structural mode RCS

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