POLE-RESIDUE ANALYSIS OF A NOTCHED UWB ELLIPTICAL DIPOLE TAG

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In this presentation we investigate the use of a modified planar elliptical dipole as a scattering body with multi-bit data encoded in its scattering properties, in essence a chip-less RFID. Being able to synthesize an electromagnetically unique structure, thus encoding data accessible only to sophisticated electromagnetic analysis could prove invaluable for counterfeiting and piracy prevention. Conventional chipped RFIDs are well known and thus potentially not effective in dissuading counterfeiters. The means to analyze and replicate a tag relying purely on scattering would be beyond the abilities of most counterfeiters. Additionally, chip-less RFID tags promise considerably lower power requirements due to not having circuitry requiring a minimum power threshold for operation. Preliminary calculations indicate that a chip-less RFID based on the planar elliptical dipole would need 40 dBm less power than a conventional chipped RFID.

The basis for the scatterer is to take the antenna form of the planar elliptical dipole and convert it to a scattering body by shorting the feed point. Frequency notches, and the resulting RCS were previously investigated for the purposes of encoding data by Rahmat-Samii and Manteghi. The work presented is a further refinement of this initial work. Using methods based on the Singularity Expansion Method (SEM), the poles-residue representation of the scattered fields is extracted from simulated data. Physical parameters are related to electromagnetic scattering properties by noting the behavior of the poles and residues as the physical parameters are varied. The ultimate goal is to correlate a physical structure to electromagnetic behaviors in such a way as to be able to synthesize an electromagnetically unique structure, in essence an electromagnetic fingerprint.