Miniaturization of Metamaterial Elements and Electrically Small Split Ring Resonator Antennas

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The metamaterial medium, which is composed of split ring resonators (SRR) and wires, can show dramatically different characteristics than ordinary mediums. The SRRs show resonant behavior at wavelengths that are typically 10 times larger than their size. It is shown that by using the SRRs one can obtain electrically small resonant antennas. Moreover, by increasing the inductance and capacitance of the element, without changing its volume, we can obtain resonant behavior at wavelengths that are 100 times larger than its size. These new magnetic elements constitute a way to obtain rather small antennas and new composite metamaterials that might have better resolving power than the current ones.