Effect of Ground Plane Size and Geometry on Frequency Reconfigurable Antenna Electrical Performance

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A monopole antenna consists of two salient components, the antenna and the ground plane. The focus of antenna design is often on the geometry of the antenna, while the ground plane is made large enough to satisfy an infinite ground approximation. An infinite ground plane implementation is not always practical, however. As the package sizes of modern devices decrease, an accountably infinite ground plane is impossible to achieve at the desired operating frequency and still satisfy ancillary form factor requirements. Further complications arise when a frequency reconfigurable antenna is desired. The electrical size of the ground plane varies as the frequency reconfigurable antenna is tuned. As the tuning range of frequency reconfigurable antennas expands with modern reconfigurable designs, the electrical size of the ground plane varies more substantially over the tuning range, and the ground plane becomes an increasingly important part of the antenna design. As the electrical size of the ground plane decreases, it has an increased effect on the impedance match and resultantly the tuning range of the reconfigurable antenna.

In this work, the effect of ground plane size and geometry on the tuning range and other electrical characteristics of a frequency reconfigurable antenna have been investigated. A reconfigurable antenna previously developed that achieved a very wide tuning range with an electrically large ground plane is used as the antenna in the study (M. W. Young, S. Yong, and J. T. Bernhard, "Design of a miniaturized frequency reconfigurable antenna with single bias dual varactor tuning", *2012 Antenna Applications Symposium*). A number of ground plane configurations are analyzed with the reconfigurable antenna to understand the effect ground plane size and geometry has on frequency reconfigurable antenna tuning range and electrical performance. Although a specific frequency reconfigurable antenna is investigated, generalized conclusions are developed that are applicable to other frequency reconfigurable designs.