

THE EXACT INVESTIGATION OF THE EFFECTS OF AIR GAP AND FINITE GROUND PLANE ON PERFORMANCE OF THE RECTANGULAR DIELECTRIC RESONATOR ANTENNAS

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Different arrangements can be used to excite the resonator such as coaxial probe, microstrip line, slot-coupled transmission line and co-planar waveguide. The probe fed dielectric resonator antenna is most suggested, while the resonator is situated on a metallic ground plane and fed by a coaxial probe extending above the ground plane along the edge of the resonator.

DRAs are normally used with the support of a ground plane. The radiation and impedance properties therefore depend not only on their physical dimensions and dielectric properties, but also on the mechanism of feeding such as size of the ground plane and the gap in the structure.

First, we obtain the Green function of the rectangular dielectric resonator antennas with fed-probe that has air gap between dielectric and ground plane and supported by the finite ground plane. Thus, the electric field in all regions will be found as a function of the frequency, the dimensions of dielectric resonator, the gap between dielectric and ground plane, the size of ground plane, length of the probe and the gap between probe and dielectric. Then, we find the electric field according to the distribution of current on the probe, and verify our solution with other one found by software package such as HFSS. This verification has shown a good agreement between these two types of solutions. After this hard work, we investigate the effects of each variables that stated above such as air gap and the size of finite ground plane on the radiation performance of the RDRA including resonance frequency, input impedance, pattern and side-lobe level. Also our results have a good agreement with the published experimental work.

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