

ABSTRACT

The Multiple Input Multiple Output (MIMO) technology on antennas enables the very effective and efficient communication. However, there is a weakness in the MIMO antenna, which is required for high isolation between patches and unrelatively large size for applications on portable devices. There are several methods that can be used to solve this problem. One of them is the method of defected Ground Structure (DGS) which is quite popular because it is considered easy to design.

In this research, antennas that have been analyzed was a single-patch rectangular antenna and MIMO 2 x 2 rectangular patch antenna with 3,65 GHz of the resonance frequency. This antenna will be edit to DGS or defected ground structure which is defect on the ground plane. Effect of the four different shapes of DGS will be compared one to the other. The material of substrate is FR4 Epoxy with a relative permittivity is 4,4 and 1,6 mm thickness and also Cooper as a patch with a thickness of 0.035 mm.

The use of the multi-ring with slots DGS shape generates miniaturization of 64,062% for single patches and 73.538% for MIMO of the antenna's from the conventional dimension. The VSWR value for resonance frequency obtained from the complementary split ring resonator. This is proportional to the return loss value. For the mutual coupling parameters of the MIMO antenna, the DGS with complementary split ring resonator shape provides excellent effect by able to maintain a good isolation up to $\lambda/54$ of separation between element of the antenna. This shape of the DGS also gives a wider bandwidth than the other shape. It's reaching up to 5.51% from the lower frequency 2.47 GHz to the upper frequency 2.61 GHz. For the antenna gain parameters, the higher gain is owned by dumbbell shape DGS on both single patch and MIMO 2 x 2. The values of axial ratio for the defected ground structure antennas of the CSRR and U shapes are change from linear to the ellipse while the multi ring with a slot from linear to circular and the dumbbell shape didn't give the effect on Single antenna and MIMO antenna polarization. For radiation patterns all DGS shape is unidirectional except on multi ring with slot, the radiation pattern is bidirectional.

Key words: *MIMO Antenna, Defected Ground Structure, Dumbbell Shape, Complementary Split Ring Resonator, U-Shape, Multi Rings With Slot*