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Name : Hajar Ja'afar

Title : Design of Plasma Antenna for Reconfigurable Beam Steering Technique

Supervisor : Associate Prof. Dr. Mohd Tarmizi Ali **(MS)**
Dr. Ahmad Nazri Dagang **(CS)**
Dr. Mohd Khairul Mohd Salleh **(CS)**

The industrial potential of plasma technology is well known and excellent demonstrated in several processes of microwave technology, which incorporate some use of an ionized medium. In vast majority of approaches, the plasma, or ionized volume, simply replaced a solid conductor. Highly ionized plasma is essentially a good conductor, and therefore plasma filaments can serve as transmission line elements for guiding waves, or antenna surfaces for radiation. Plasma antenna is a kind of antenna that radiate electromagnetic wave (EM) energy based on ionized gas instead of metallic conductor in antenna design. In this research work, the development using plasma medium as a conductor element instead of metal medium is investigated. Three new design antenna by using plasma concepts were proposed; namely cylindrical monopole plasma antenna using electrode-less discharge tube, monopole plasma antenna using fluorescent tube and reconfigurable plasma antenna array. The research described in this project introduces the analysis of cylindrical monopole plasma antenna. Three types of gases with three different pressure which are Argon gas, Neon gas and Hg-Ar gas (mixture of Argon gas and mercury vapor) with pressure at 0.5 Torr, 5 Torr and 15 Torr respectively is used in this research to observe the interaction between plasma medium and radio frequency (RF) signal. The containers that use to fill the gas are namely electrode-less discharge tube. The technique that used in this experiment to generate plasma is using Dielectric Barrier Discharge (DBD). The monopole plasma antenna using fluorescent tube is designed at frequency 2.4 GHz which is aim in wireless application. The commercially fluorescent lamp is used as a plasma antenna. Coupling technique was used in this design. In the reconfigurable plasma antenna array, the behavior of the reconfigurable antenna array system using plasma medium has been investigated and discuss with respect to the beam shaping characteristics. The reconfigurable plasma antenna array is capable of scanning the radiation pattern over 360°. These results confirm that the main beam directions can be directed in the following directions depending on the states of switches which are 0°, 30°, 60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 300° and 330°. The simulated and measured results are presented and compared, to demonstrate the performance of the proposed antennas.