

UNIVERSITI TEKNOLOGI MARA

**DESIGN OF MONOPOLE PLASMA
ANTENNA USING FLUORESCENT
TUBE FOR WIRELESS
TRANSMISSION APPLICATIONS**

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of the requirements for the degree of
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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA . It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. This research report has been not submitted to any other academic institution or non-academic institutions for any degree or qualification.

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ABSTRACT

This thesis explains on the design of monopole plasma antenna using fluorescent tube and reviews the antenna performances in wireless transmission experiments. In this project a commercially available fluorescent tube is used as antenna. The gas inside the fluorescent tube is a mixture of argon and mercury vapor. When the gas is sufficiently ionized into plasma state, it becomes conductive and allows radio frequency signal to be transmitted and received. Based on this concept, the fluorescent lamp was proposed to become as monopole plasma antenna due to the commercial product. This study includes three antenna designs which are antenna Design 1, antenna Design 2 and antenna Design 3. Antenna Design 1 was developed using single fluorescent tube to operate at 4.3 GHz frequency band. This antenna has good performances which achieved $S_{11} < -10$ dB from 4.0 GHz to 4.6 GHz frequency band. The resonate frequency of $S_{11} = -18.1$ dB and achieved omnidirectional radiation pattern with simulated gain = 2.24 dB. The performance of gain and directivity of monopole plasma antenna Design 1 has been enhanced by adding a cylindrical parabolic reflector at the back side of focusing signal which has been proposed in antenna Design 2. The antenna Design 2 achieved $S_{11} < -10$ dB from 4.1 GHz to 4.7 GHz frequency band and resonated at -38 dB. The antenna showed the directional radiation pattern result and enhancement of gain which is 7.283 dB. Antenna 1 and 2 are designed for radio altimeter device which is a part of radar in navigational applications. Monopole plasma antenna Design 3 is developed to operate at 2.4 GHz frequency band which is suitable for Wi-Fi applications. This antenna was integrated with Access Point router installed inside the casing of the antenna. Therefore, this complete set of plasma antenna was upgraded to Wi-Fi system. The antenna Design 3 achieved $S_{11} < -10$ dB 2.23 dB to 2.58 dB frequency band. The results was resonate at -22.5 dB and showed the omnidirectional radiation pattern with gain = 1.948 dB. Overall, the 3 antenna designs were successfully showed good results and can be implemented in wireless transmission applications.

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