ANALYSIS OF WAVE ABSORBING MATERIALS

Final Project Report is presented in partial fulfillment for the award of the Bachelor Electrical Engineering (Hons) of
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ABSTRACT

This thesis presents an analytical approach of designing Wave Absorbing Non-Magnetic Materials (WANMMs) through implementation of the lossy line transmission technique in which the study of the relationship between the reflection coefficient of the material and the oblique angles of incidence are considered. These materials are made of several dielectric layers, usually on top of a conducting layers. Matching characteristics of this method are investigated in detail from many kind of experimental data. The total absorption of the electromagnetic energy is done in the last lossy layer, whereas the other layers are used to match the wave impedance of the WANMMs to that of the incidence media for the oblique angle of incidence only at different microwave frequencies. These materials will be useful for the wall in laboratories and other office buildings to prevent the internal reflection. It may be a substitution to the chambers which use the thick anaechoic material.

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1. INTRODUCTION

1.1 General

With the advancement of communication in information-oriented modern society, various forms of interference, which are now termed as electromagnetic wave pollution, are encountered due to unwanted electromagnetic waves. In recent development, several electronics and wireless equipment such as personal communication equipment, wireless LAN and etc. which operating frequencies ranging from 2.5Ghz to 60Ghz will be much used in the future. For example, the 'ghost' phenomenon on television sets is caused by waves reflected off the tall buildings, and malfunctions of electronic equipment are often caused by electromagnetic waves from outside source.

Therefore the protection against the interference by the radiation of electromagnetic wave from that mentioned above is required. Many absorbers with quarterwave types have been developed and published for the past few years. This paper presents the study of the relationship between the reflection coefficient, operated frequency and the oblique angle of incidence , the design in which examples of the wide band thin materials are trially made and the modelisation of multilayer materials in free space using selected softwares.

As mentioned earlier, these WANMMs are important as a kind of shield which protect scattered Rf energy which occur as a result from angles that normally applied greater than 30 degrees from normal incidence. This scattered energy has the potential for being a source