# ELECTROMAGNETIC IMAGING OF BIOLOGICAL BODY (SOFTWARE DEVELOPMENT)

**Thesis is presented in partial fulfillment for the award of the Bachelor of Engineering ( Hons.) ( Electrical )**
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# ABSTRACT

-During the past 10 years, many papers have been published about solving inverse scattering matrix problems and complex permittivities of biological body.To estimate complex permittivities requires the inversion of scattering matrix which relates polarization currents inside the body to scattered electric fields outside the body. This paper developed a computational efficiency method for block diagonalization of scattering matrix using one, two and three plane of symmetry for solving the complex permittivities of 3-D inhomogenous biological body. In this project, we describe a computer using FORTRAN 77 for calculation.

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# CHAPTER 1

## 1. 0 INTRODUCTION

Estimation of complex permitttivities of biological body in vivo may be useful for many applications. Electromagnetic imaging, if feasible , would be advantageous as compared to X-rays, use of radioactive isotopes, etc on account of relative safety of nonionizing radiation[1]. Knowledge of the spatial distribution of complex permittivities ($\varepsilon^*$s) could be useful in individualising the electromagnetic hyperthermia regimens for cancer theraphy. Electromagnetic imaging is of interest for broader nonbiological application as well, e.g. for non-destructive testing, geophysical exploration, etc.

A short dipole(2h=0.1 $\lambda_s$ =2cm , where $\lambda_s$ is the wavelength in the surrounding medium) is used as a transmitter and is located in the front or back side of the body. Frequencies in the range of 50 - 450 MHz have been selected because they give significant depths of penetration in biological bodies. We have arrived at three important conclusions about[1] estimation of $\varepsilon^*$s of biological bodies :

1. Errors in estimates of $\varepsilon^* s$ for a biological body are reduced significantly by using saline/water as the surrounding medium rather than air, because of better matching of energy to the biological body.

2. In estimating of $\varepsilon^*$s of the human chest, the rest of the body can be ignored because of the near-fields nature of the illumination sources, particularly if saline/water is used as the surrounding medium.