

## **Investigation of dielectric properties for various size potential abnormality of breast tissues using non-ionizing microwave technique**

### **ABSTRACT**

Microwave imaging is a possible non-ionizing technique to complement existing ionizing mammogram that relies on significant contrast between dielectric properties of cancerous and normal tissues. Early detection of abnormalities in breast anatomy could be the warning sign to breast cancer. This allows the early intervention of treatment, hence increasing the surviving rate of the breast cancer patients. In this paper, a breast phantom of CIRS Model 010A contains various known tissues and sizes are studied. For the purpose of comparison to healthy tissue, the mimic tissues of calcification and the mixture of glandular and adipose were identified as potential abnormality tissues. A measurement of scattering parameter signals has been taken at several points on a breast surface phantom using one-port open-ended coaxial probe. The obtained signals permit the extraction of the dielectric properties of the tissues where the microwave dielectric permittivity and loss factor were obtained. These parameters were compared among the breast tissue types. The results of normal and possible abnormality breast tissues are presented at 2.4 GHz, the narrowband frequency related to microwave biomedical applications. The effective permittivity and loss factor (thus, conductivity) were higher with the size of the possible abnormal grains, masses and more fibrous glands. In conclusion, the dielectric permittivity and conductivity measured via microwave technique have potential ability to detect early possible abnormalities.

**Keyword:** Microwave technique; Dielectric properties; Permittivity; Conductivity; Abnormality; Early detection; Breast cancer