Breast tissue phantom used at microwave frequency range

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Abstract **Breast cancer is the most common type of cancer in women in developing and developed countries. Research is ongoing to continually improve cancer treatment success and elimination of side effects. Research has often used tissue phantoms that simulate those of the actual tissue. Article we designed a phantom breast and phantom tumour, which can be used for measurements in the microwave frequency range.**

Keywords **Cancer, breast, phantom, microwave range.**

I. INTRODUCTION

Cancer is a disease of the cells in the body. The body is made up from millions of tiny cells. There are many different types of cell in the body, and there are many different types of cancer which arise from different types of cell. What all types of cancer have in common is that the cancer cells are abnormal and multiply out of control [1], [2].

A malignant tumour is a lump or growth of tissue made up from cancer cells which continue to multiply. Malignant tumours invade into nearby tissues and organs, which can cause damage [1], [2].

Breast cancer is cancer that forms in the cells of the breasts. Breast cancer can occur in both men and women, but it's far more common in women. Around one in nine women develop breast cancer at some stage in their life [1], [2].

Breast cancer develops from a cancerous cell which develops in the lining of a duct or lobule in one of the breasts [1], [2].

II. CANCER TREATMENT

For the treatment of cancer was used in several therapies - surgery, radiotherapy, chemotherapy and hyperthermia. According to the National Institutes of Health (NIH) hyperthermia (also called thermal therapy or thermotherapy) is defined as a type of cancer treatment in which body tissue is exposed to high temperatures (up to 106*'F), to damage and kill cancer cells, or to make cancer cells more sensitive to the effects of radiation and certain anticancer drugs. Hyperthermia (HT) is used as an adjunct therapy to radiotherapy and/or chemotherapy to increase their effectiveness [3].

Hyperthermia is used in the treatment of cancer, the containment of the growth and the reduction of tumors, because cancer cells are more sensitive to the increase in temperature as the healthy tissue cells. It can be used in the treatment of cancer in different parts of the body, including the brain, thyroid gland, lung, breast and the like [3].

Frequency electromagnetic hyperthermia is one of the methods in which the temperature increases the area of tissue occurs by applying a high-energy magnetic radiation with short waves and microwaves [3].

III. HUMAN BREAST PHANTOM

In research instead of biological tissues are used phantom tissues. Phantoms mimic their dielectric properties of biological tissue properties. Basic dielectric properties are permittivity, loss tangent and conductivity. There are many types of phantoms [4].

We are focused on creating phantom breast and phantom tumor in this article. Composition and the amount of each phantom are in Table 1 [4].

TABLE I
INGREDIENT AND THE AMOUNT OF PHANTOM [4]

Composition	Breast phantom	Tumour phantom
Deionized tridistilled water (ml)	50	100
Agarose (g)	4,5	1,5
Corn oil (ml)	150	-
Neutral detergent (ml)	30	-
Ethanol (ml)	-	1,0
NaCl (g)	-	1,5

We used method of mixing, which is published in [4].

IV. CONCLUSION

We designed phantom breast and phantom tumour. There are phantoms described composition and method for mixing. These phantoms can now be used for measurements in the microwave range. We can measure the relative permittivity, conductivity and loss tangent. These values are the same or at least similar to the real values of individual components.

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