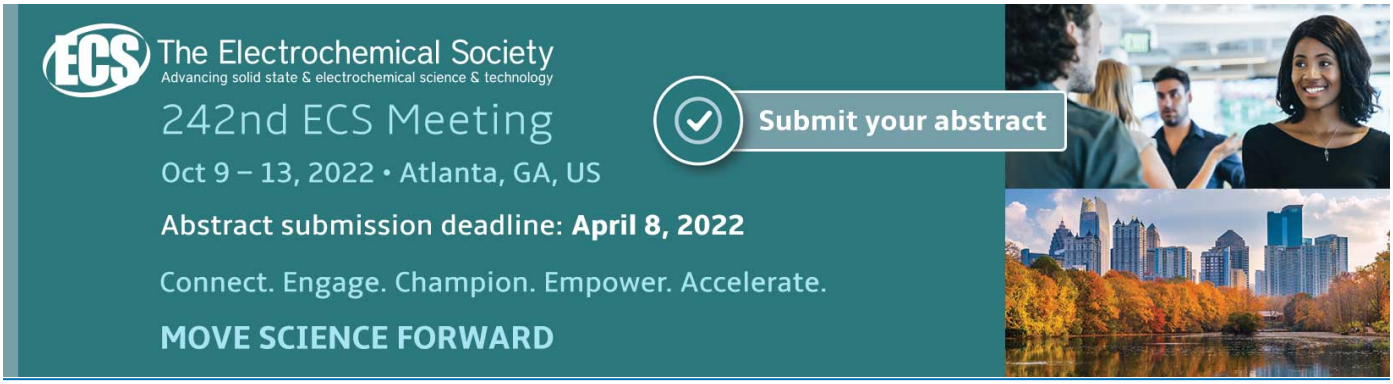
SAR Performance of Rectangular Microstrip Antenna for Breast Cancer Hyperthermia Treatment with Different Period of Treatment Procedure



SAR Performance of Rectangular Microstrip Antenna for Breast Cancer Hyperthermia Treatment with Different Period of Treatment Procedure

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Abstract. Cancer treatment using hyperthermia techniques recently become the interest among researchers in investigating and improving certain deficiencies of the treatment since this treatment has the potential to denaturate cancer into necrotic tissue. Hyperthermia uses high heat from 41℃ to 45℃ at a certain period of time. It is difficult to control the focus position distance of heat distribution on the treated tissue. Therefore, this paper presents the rectangular microstrip as hyperthermia applicator, which deliver the heat on the targeted treated breast cancer tissue with different period of time in order to obtain sufficient heat or SAR distribution. Sim4LifeLight software simulator is used to design, simulate and generate the specific absorption rate (SAR) distribution on the treated tissue. Three frequencies of 434MHz, 915MHz and 2450MHz are used to be compared. Based on the results, 2450MHz shows better performance than the other two frequencies. However, there is a certain limitation, such as skin burn and unwanted hotspots, that need to be further improved. The cancer is sufficiently heating at different operating frequencies at different periods of procedures.

1. Introduction

Statistics from International Agency for Research on Cancer (IARC) in December 2020 shows that breast cancer is the highest occurs cancer case throughout the world [1]. From World Health Organization (WHO) web page, it is reported a large number of breast cancer patients detected, where 1 out of 5 people globally will develop cancer, and it will increase further every year [1][2]. Breast cancer is the most prevalent occurring cancer among women [3]. According to the WHO, 2 million women were diagnosed with cancer in 2018, and the numbers have been increased to 2.3 million in 2020 [3][4][5]. Furthermore, breast cancer caused 627,000 deaths globally in 2018, and the numbers were raised to 685,000 fatalities in 2020 [3][4][5]. The increasing numbers of women been diagnosed with breast cancer, as well as the high mortality rate among breast cancer patients, making it the biggest concern among the researcher, scientists and society in identifying various treatments for killing cancers, and one that have been discussed a lot is the hyperthermia procedure.