Design Optimization of Waveguide Applicator for Microwave Hyperthermia Cancer Treatment

P. Kumar [1], S. Kalra[1], A. Marwaha[1]

[1]Department of Electronics and Communication Engineering, Sant Longowal Institute of Engineering Technology Longowal, Punjab, India

Abstract

The optimized design of a waveguide applicator has been proposed in the present work for superficial microwave hyperthermia using COMSOL Multiphysics 3.5a. Microwave hyperthermia is a promising method of cancer treatment used to increase the temperature of a part of or the whole body is raised above normal for a defined period of time. Body tissue is exposed to high temperatures, using external and internal heating devices. Non-Invasive or external hyperthermia is used to treat tumors that are in or just below the skin (superficial), whereas invasive applicators are located around or near the appropriate region within the body, and energy is focused in the tumor to increase its temperature. Non-invasive hyperthermia systems using waveguide applicators are less traumatic to patients which also minimize the risk of mixing abnormal cells with healthy tissues. The dimensions of the waveguide can be optimally selected to focus the energy more specifically over the tumor region. The 3D modeling of the waveguide applicator is performed using different dielectrics and the performance is verified by analyzing the resistive heating and temperature distributions in muscle like phantom.