## Flexible Microwave Antenna Applicator for Thermotherapy of the Breast

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Breast cancer has the rate of 12.4 percent among women in the United States, and conventional treatments such as chemotherapy and radiation therapy are providing sufficient results when only diagnosed and treated early enough. Therefore, efficiency of cancer treatments is growing in importance. Chemotherapy or radiation therapy paired with an adjunctive method such as thermotherapy increase the success rate. Hyperthermia is a thermotherapy technique used to increase the temperature of tissue to the degree between 41°C and 45°C by exposing electromagnetic energy through a microwave antenna (applicator). This temperature increase in the cancerous cells results in a decrease in the resistance of tissue and makes destroying the tumor easier. However, current hyperthermia systems require high power and long application time. Therefore, mild hyperthermia technique that is used to raise tissue temperature up to 2°C and reduces applied power level and application time compared to current systems is investigated in order to see the effects of low power on temperature increase inside the breast. For this purpose, a flexible microwave antenna applicator that consists of microwave antenna array designed and fabricated. PDMS is used as flexible material, so it can be easily shaped on the breast. The applicator placed on human-breast mimicking gel that contains skin, fat and fibroglandular layers. Fiberoptic sensors are used to observe temperature increase in the gel. One of sensors is located just under the applicator to measure the surface temperature. Other sensor is used to measure the temperature increase at 1cm, 2.5 cm, and 4cm by increasing applied power from 1W up to 5W (1W intervals) at 450MHz with limited application time (up to 10 minutes). Applicator design, performance and measurement results including return loss and temperature increases at each power level and different depths will be presented.