# Publications Template

| # | Research Title | Field | Abstract | Year of Publication Publishing | Publishing Link "URL" |
|---|---|---|---|---|---|
| 1 | Efficient focusing of microwave hyperthermia for small deep-seated breast tumors treatment using particle swarm optimization | Antenna optimization Biomedical engineering | Focused microwave hyperthermia is a technique with advantage of high accuracy and low side effects for breast tumor treatments. In this study, an efficient focusing technique for noninvasive microwave hyperthermia treatment for breast tumors is presented. Particle Swarm Optimization (PSO) is used to find the optimum excitations (phases and amplitudes) of a three dimension (3D) Micro-Strip Patch (MSP) antenna array operating at 2.45GHz. The antenna excitations are optimized to maximize the power loss density and the Specific Absorption Rate (SAR) at the tumor location, to reach the required hyperthermia temperature (above 42 _C) at the tumor location without causing hot spots in healthy tissues. The technique is tested on a challenging scenario of a 3D realistic breast model having a tumor less than 1 $cm_3$ volume and embedded in different locations deep in the glandular tissue of a very dense breast. The results confirmed the capability of the focusing technique. | 2021 | https://doi.org/10.1080/10255842.2020.1863379 |

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| **2** | Microwaves for breast cancer treatments | Antenna optimization Biomedical engineering | Hyperthermia is potentially an effective method for the treatment of cancer, especially<br><br>breast cancer tumors. One of the most attractive attributes of hyperthermia is the possibility of pro-<br>viding therapeutic benefit noninvasively, minimizing side effects. To be effective, a hyperthermia<br><br>treatment must selectively heat the cancerous tissue, elevating the temperature in the tumor without<br>exposing healthy tissue to excessive temperature elevations. In this paper, a suggested simple model<br><br>of Annular Phased Array (APA) using eight half wavelength linear dipoles is presented. New soft-<br>ware (COMSOL MULTIPHYSICS) is used to calculate the temperature distribution inside a model | 2015 | http://dx.doi.org/10.1016/j.aej.2015.06.012 |

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| | | | of a three layered breast (skin, breast tissue, and tumor). In addition, the effect of changing the amplitude and phases of the array elements on the temperature distributions and the conditions on the values of the phases are demonstrated in order to achieve the objective of hyperthermia for breast tumor treatment. | | |
| **3** | | | | | |