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To cite this article: Hadi Jumaat *et al* 2019 *J. Phys.: Conf. Ser.* **1372** 012004

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A Review of Frequency Selection and Antenna Arrangement System for Microwave Imaging in Early Breast Cancer Detection

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Abstract. Microwave imaging technique is one of the developing techniques that having attention by researcher around the world in early breast cancer monitoring due it is non-ionizing and the potential for cost saving and simpler system as compared to the current imaging techniques. The frequency selection is crucial in this application due to no bandwidth proven best. However, the amount of antenna is said affected the image resolution. This paper is an attempt to review the frequency selection and the antenna arrangement system in the past decades works for future antenna development in early breast cancer detection.

1. Introduction

According to the breast cancer mortality statistic [1], it is in the stressing situation to the world and moves toward becoming test to the specialists in exploring the fix, particularly in early breast cancer detection method. As result, in the past two decades the techniques in early malignant growth discovery have evolve; mammography, tomography, thermography, ultrasound and microwave imaging [2]–[6]. Microwave imaging is potential to become alternative technique besides X-ray mammography and magnetic resonance imaging (MRI) in early breast cancer detection due to the non-ionizing radiation, safer, potential for cost saving and simpler system [7].

The microwave imaging adopted the techniques on dielectric contrast by reconstructed the data obtained from transmitter and receiver whereby object is located between the transceiver. Then, the reconstructed data produce the contrast of malignant tumour and benign tissue. The tissues identified clearly since water density in malignant tumour is more than the normal breast tissue. At present, no bandwidth proven best for microwave imaging [7]. The frequency selection is crucial in antenna design since all equations involve in antenna shaping is depending on the operating frequencies. Thus, literature on frequency selection has been held with considering the works by signal processing field to justify the suitable frequency range for next work on designing antenna for microwave imaging on early breast cancer detection application. Some of the works basically using a point radiator representing antennas suggested at 1 GHz to 3 GHz in detecting the malignant tumour [8]. Besides that, a few researchers in antenna design field in [9]–[12] have been highlighted the potential of UWB frequency range in microwave imaging for breast cancer monitoring range from 1.3 GHz up to 20 GHz. Furthermore, a work highlighted in [7] is using 3.2 GHz to 5.7 GHz operating frequency with consideration of details

