

**Centre for Mechanical Engineering, Materials and Processes****CEMMPRE****PROPOSTA DE PLANO DE DOUTORAMENTO/DOCTORAL PLAN PROPOSAL****(a ser redigido em Inglês / to be filled in English)****ORIENTADOR(A)/SUPERVISOR:** JAIME BATISTA DOS SANTOS**GRUPO/GROUP:** A-MECHANICAL AND INTELLIGENT MANUFACTURING**ORIENTADOR(A)/SUPERVISOR:** RICARDO SERRA**GRUPO/GROUP:** B- MATERIALS AND PROCESSES**LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK:** Laboratório de Tecnologia dos Materiais e Ultrassons, Departamento de Engenharia Electrotécnica e Computadores - FCTUC).**TÍTULO DO PLANO DE DOUTORAMENTO/TITLE OF THE DOCTORAL PLAN:** EVALUATION OF UNHEALTHY TISSUES BY USING MICROWAVES**RESUMO/SUMMARY (max. 300 words total)****Objetivo/Objectives:**

Most medical imaging, i.e., X-ray and  $\gamma$ -ray have harmful effects in the human body tissues. Nowadays, researchers are seeking for alternative and healthier ways to diagnose illnesses that could reduce significantly the threatening to lives and health of patients. Here, it is proposed an imaging method using microwave, which is based on the radiated wave to the target and reflection from it. The received signal has information about the target, which is called here reverse scattering. There are several applications for reverse scattering, like, image reconstruction, tomography, detection of moving objects, acoustic, study of earth and aerospace layers and non-destructive tests.

In this doctoral plan proposal, the goal is to design an appropriate array for microwave imaging. To achieve high-resolution, an array antenna will be used and it will be designed for a minimal number of antennas. Moreover, the frequency-dependent dielectric response of the biological matter forming the body organs will be considered in the analysis. In this way, the antenna design will be very close to the real state. The design of the antenna will be based on the Vivaldi antennas working around the

frequency of 2.45 GHz. This is the frequency range that ISM authorized for medical applications and does not require permission.

**Resultados Esperados/Expected Results:**

1. New innovative antenna structure to increase accuracy and reduce the Specific Absorption Rate (SAR) for abnormal tissue detection.
2. Develop novel 3D image reconstruction algorithm for Microwave Tomography (MWT)
3. Validation of the algorithms using a realistic breast phantom in the experiment.
4. Comparison of results with current technologies.

<b>Programa Doutoral/Doctoral Program</b>	<b>Ordenação por ordem de preferência/Sorting in order of preference</b>
<b>Engenharia Mecânica/Mechanical Engineering</b>	<b>3</b>
<b>Engenharia Química/Chemical Engineering</b>	<b>2</b>
<b>Engenharia Biomédica/Biomedical Engineering</b>	<b>1</b>
<b>Biociências/Biosciences</b>	<b>4</b>