

ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

DET - Brain medical microwave imaging

Funded By	Dipartimento DET
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Context of the research activity	The PhD topic will be the development of microwave devices for brain imaging to stroke detection and to explore Alzheimer's disease diagnostics
Objectives	<p>Medical Microwave Imaging (MMWI) is an alternative type of medical imaging which has shown promising results in a handful medical applications for the past 20+ years. It is an attractive imaging modality due to its non-invasiveness, use of non-ionizing radiation, low power and comparatively low-cost, when comparing to other imaging modalities. Additionally, MMWI has potentially low installation, operation, and maintenance costs. All these characteristics make MMWI an attractive imaging modality for screening of several diseases or conditions. MMWI uses microwave radiation to generate images based on the different dielectric properties of biological tissues (in the case of tomography microwave imaging) or dielectric contrast between biological tissues (in the case of radar microwave imaging).</p> <p>Here, MMWI will be applied to the brain for stroke detection and to explore Alzheimer's disease diagnostics. To this end, the research activities will consist first of studying the dielectric properties of brain tissues, in particular the cerebral spinal fluid. Then, new methodologies for the existing prototypes, developed by the Wavision Research Group at the Dept. of Electronics and Telecommunications, Politecnico di Torino, will be explored, specifically to improve the performance of tomography algorithms by using e.g. radar information as prior information and innovative augmented Machine-Learning calibration techniques.</p> <p>The PhD research activities will be within the European Project "3BATWIN - Bone, Brain, Breast and Axillary Medical Microwave Imaging Twinning" (call HORIZON-WIDERA 2023-ACCESS 02-01 - Twinning Bottom-Up)</p>
Skills and competencies for the development of	<ul style="list-style-type: none"> - Expertise in electromagnetic (EM) modelling and simulation - Expertise in microwave imaging techniques - Capabilities in programming with e.g. C/C++, Matlab and Python

**development of
the activity**

- Knowledge of 3D EM softwares as e.g. CST