

# ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

## MUR DM 118 - Development of diagnostic imaging techniques in the Terahertz (THz) band for medical applications

<b>Funded By</b>	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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<b>Context of the research activity</b>	Development of diagnostic imaging techniques in the Terahertz (THz) band for medical applications  Progetto finanziato nell'ambito del PNRR – DM 118/2023 - CUP E14D23001730006
<b>Objectives</b>	<p>Terahertz (THz) radiation or sub-millimeter waves are electromagnetic waves that occupy the portion of the spectrum between infrared and microwaves, with frequencies between 300 GHz and 3 THz. They are non-ionizing and non-invasive radiations, with good resolution capabilities and moderate penetration. These characteristics make them suitable for inspecting human tissue with high precision.</p> <p>The goal of the Ph.D. programme is to study the application of THz radiations in medical diagnostic imaging particularly in superficial soft tissue where most tumors occur. THz radiation methods can provide more accurate detection of the malignant tissue boundary and depth of invasion than conventional imaging modalities such as computed tomography, magnetic resonance imaging, and ultrasound. This is because most solid tumors start on the surface of soft tissue and conventional techniques are not optimal for imaging these tissues. Furthermore, above 300 GHz, many materials exhibit very different behavior than their counterpart in the (more commonly used) microwaves. Precisely for this reason, THz imaging could generate new high-impact analysis methodologies.</p>

The PhD activities will be in close collaboration with Dr. Giuseppe Virone of the Institute of Electronics, Computer and Telecommunications Engineering (IEIT) of the National Research Center (CNR). The CNR-IEIT will provide, for the PhD experimental activities, measurement instrumentation for guided and free-space scattering operating up to 750 GHz.

**Skills and competencies for the development of the activity**

- Expertise in using electromagnetic (EM) laboratory instrumentations
- Capabilities in programming with C/C++ and/or Matlab and/or Fortran
- Knowledge of 3D EM softwares such as CST Studio Suite