PhD Position – Real Time THz Imaging of materials

University de Pau et des Pays de l'Adour (France)

Duration: 36 months.
Location: LFCR (Laboratoire des Fluides Complexes et leurs Réservoirs), Université de Pau et des Pays de l'Adour (Pau, France).
Beginning: Before February 2026 is advisable.
Net Salary: Around 1800 euros net per month.
Diploma: It is desirable anyone holding diploma in Electronic Engineering, Geophysics, Physics or related fields (under 30 years). Also Master degree in related fields is accepted. The candidate must hold 5 Years of studied.
Profile: We are seeking a highly motivated and interdisciplinary doctoral candidate with a strong interest in applied physics, signal processing, and instrumentation for a cutting-edge research project focused on terahertz (THz) radar technologies.
Language: English and/or French is recommended.
Application to: CV + Motivation letter to Federico Sanjuan (federico.sanjuan@univ-pau.fr).
PhD advisors: Federico Sanjuan (https://fr.linkedin.com/in/federicosanjuan) , Jean-Paul Guillet (https://terahertz.fr/) and Matias Vera (https://www.researchgate.net/scientific-contributions/Matias-Vera-2108135173).

Project Overview

This PhD position is part of the interdisciplinary **TERANANOPORES** project, funded by the Nouvelle-Aquitaine region. The aim is to develop cost effective, compact radar systems for monitoring porosity evolution and fracture formation in various materials using terahertz (THz) electromagnetic waves.
The project brings together four leading research laboratories:

- LFCR – https://lfc.univ-pau.fr/fr/index.html
- IMS – https://www.ims-bordeaux.fr/
- IRCER – https://www.ircer.fr/
- CSC – https://csc.conicet.gov.ar/

As well as the socioeconomic partner: CTTC https://www.cttc.fr/
Also, the candidate

This collaboration offers the PhD candidate a rich interdisciplinary environment and extensive professional networking opportunities across academic and industrial domains.

Scientific Context and Objectives

The project focuses on monitoring changes in porosity and fracture formation in materials using terahertz (THz) electromagnetic waves. The proposed method employs compact and cost effective high-frequency modulated continuous wave (FMCW) radar systems, enabling the tracking of changes in materials caused by injecting fluids, gas or temperature changes.

Specifically, measuring porosity and fractures in rocks with terahertz measurement systems, which are expensive (> €40k) and non-compact, has only been validated statically (no monitoring) by F. Sanjuan and J-P Guillet [1-3]. The objective is to replicate these static results with the cost effective FMCW radars, and also make the monitoring.

Candidate Profile

We are looking for a highly motivated, interdisciplinary candidate interested in applied physics, radar systems, signal processing, and instrumentation. Candidates should meet the following criteria:

Required Qualifications:

- Programming skills
- Understanding of signal processing
- Hands-on experience with experimental setups or instrumentation

Desirable Skills

- Familiarity with FMCW radars or THz systems
- Mechanical design and prototyping (CAD experience is a plus)
- Interest or experience in material characterization techniques (e.g., pycnometry)
- Willingness to travel for collaborative experiments (e.g., IMS in Bordeaux)

PhD Activities

- Develop and implement real-time signal processing and AI tools for imaging material changes
- Design and adapt mechanical parts for radar system integration
- Conduct experimental campaigns to validate code and hardware performance
- Perform cross-validation using commercial THz systems and auxiliary methods
- Collaborate with partner laboratories and contribute to scientific publications and patents

Scientific Impact

This project offers the opportunity to contribute to cutting-edge research at the interface of photonics, material science, and data science, while addressing real industrial challenges.

Interested?

This is a unique opportunity to join a dynamic, international team working on next-generation THz sensing technologies. For more information, contact:

federico.sanjuan@univ-pau.fr
jean-paul.guillet@u-bordeaux.fr

1. Sanjuan, F., Fauquet, F., Fasentieux, B., Mounaix, P., & Guillet, J. P. (2023). Feasibility of Using a 300 GHz Radar to Detect Fractures and Lithological Changes in Rocks. Remote Sensing, 15(10), 2605.
2. Patent filed (F. Sanjuan): Terahertz imaging of estimated porosity. N° DU DÉPÔT : IDDN1 .FR2 .0013 .2400204 .0005 .S6 .P7 .20248 .0009 .1000010 / DATE DU DÉPÔT : 13/06/2024
3. Patent filed: Dispositif et procédé de génération d'images de porosité d'un échantillon. INVENTEURS : F. Sanjuan /J-P Guillet .Numéro d'enregistrement : FR2501528. Lieu de dépôt : 92 INPI - Dépôt électronique. Date de la demande : 13/02/2025. Référence client : B2402140FR. Type de brevet : Brevet français