📢 Postdoctoral Research Position: Ultrafast Terahertz Modulation in Spintronic Emitters

The *Institut d'Électronique, de Microélectronique et de Nanotechnologie (IEMN)* is seeking a **Postdoctoral Researcher** to contribute to an ambitious project on **ultrafast terahertz (THz) modulation in spintronic emitters**, supported by the national **PEPR "SPIN"** program and specifically its **TOAST** moonshot project.

🔬 **Project Overview:** The project aims to push the boundaries of THz technology by developing a **new generation of spin-based heterostructures** capable of efficiently generating, manipulating, and modulating ultrabroadband THz radiation — addressing the limitations of current THz sources.

The core innovation lies in the **ultrafast modulation** of the emitted THz polarization in **spintronic emitters** — structures that exploit **spin-orbit interactions** in layered ferromagnetic/heavy-metal materials. These emitters convert ultrafast laser pulses into broadband THz radiation through **spin-to-charge conversion**, offering **broadband emission (>5 THz)**, **polarization control**, and **wavelength flexibility**.

Building on recent breakthroughs, this project introduces **magneto-elastic and anisotropic materials** into these stacks, enabling **spin reorientation transitions (SRT)** that provide unprecedented **magnetic sensitivity** and **dynamic control** over the emitted THz signal. The goal is to integrate these emitters into **surface acoustic wave (SAW)** devices, inducing high-frequency mechanical strain to achieve **GHz-range THz signal modulation** — a critical advancement for next-gen THz communication systems and spectroscopy.

Key scientific targets include:

- **Accessing the 5-12 THz spectrum** — a range largely inaccessible to conventional THz emitters.
- **High-speed modulation** driven by magneto-elastic effects and surface acoustic waves.
- **Efficient spin-charge conversion** via optimized 3d/5d metal multilayers enhanced by resonating structures.

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- **Custom polarization control** for flexible emitter functionality in communication and sensing.

This project stands at the intersection of **spintronics**, **THz photonics**, and **magneto-acoustic materials**, promising to advance **ultrafast THz devices** for applications as wide ranging as wireless communications, non-destructive testing, and biomedical imaging.

💡 Key Responsibilities:

- Design, fabricate, and characterize spintronic THz emitters with engineered magneto-elastic properties.
- Develop advanced thin-film stacks and study their spin-charge conversion efficiency.
- Integrate emitters with SAW devices for GHz-frequency strain modulation.
- Perform time-domain and frequency-domain THz spectroscopy to assess modulation performance.
- Collaborate with national and international partners within the TOAST consortium

🎯 Candidate Profile:

- PhD in Physics, Materials Science, Electrical Engineering, or related fields.
- Strong background in spintronics, magnetism, nanofabrication, or THz technology.
- Experience with thin-film deposition, acoustic devices, or ultrafast optics is highly desirable.
- Analytical mindset with a passion for experimental work and interdisciplinary research.

🏠 What We Offer:

- A dynamic, multidisciplinary research environment at IEMN, a leading European nanotechnology institute.
- Access to state-of-the-art nanofabrication, photonics, and THz characterization facilities.

- Collaboration with top-tier French and international research labs (TOAST consortium partners).
- Opportunities for career growth through high-impact publications, patents, and conference participation.

📌 **Location:** Villeneuve d'Ascq, France 🗓️ **Duration:** 1-year contract, renewable based on performance and funding. 💶 **Salary:** Competitive, based on experience (aligned with CNRS scales).

📩 **How to Apply:** Send your CV, cover letter, and contact info for 2 references to: 👉 *Nicolas.Tiercelin@iemn.fr* and *Mathias.Vanwolleghem@iemn.fr*

📧 **Application Deadline:** Open until filled.

Join us to redefine the future of terahertz technology — where **spintronics** meets **ultrafast photonics**! 🚀

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