

PHD OFFER:

SPIN TRANSFER TORQUE MAGNETIC FIELD SENSING

PhD degree @ University Grenoble Alpes

@ ricardo.sousa@cea.fr 17 rue des Martyrs, 38000 Grenoble FRANCE
www.spintec.fr ricardo-sousa-707b248 0000-0001-8903-3359



PROJECT

Context

Spin transfer torque (STT) in perpendicular anisotropy magnetic tunnel junctions is the basis of current MRAM technology in foundry mass production.

- The same nonvolatile storage technology can be used for magnetic field detection, as proposed in a scheme patented by Spintec
- PhD scholarship selected for funding by the France 2030 program as part of the PEPR SPIN project

PhD Thesis

Project explores this novel sensing approach, departing from and improving on conventional magnetoresistive sensors.

- Nanofabrication of low power consumption sensors 50 nm in diameter, versus 1-10µm of conventional TMR sensors
- Investigate smart sensing modes with programmable trade-off between sensitivity and linear range during operation
- Scientific understanding of STT stochasticity as noise source limiting sensor detectivity and resolution
- Explore industry applications for robotics, automation and high-resolution magnetic field monitoring

PROFILE

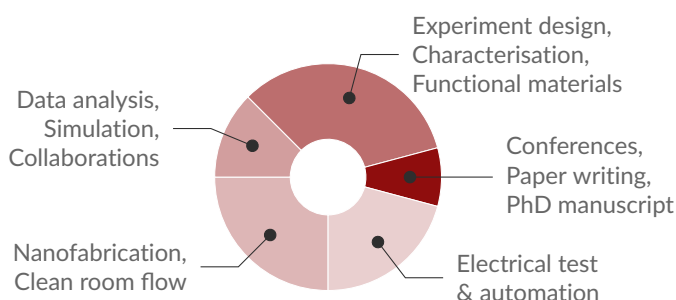
University education: Master degree

- Physics, Engineering, Material Science or related fields
- Background in solid-state physics or magnetism
- Strong interest in experimental physics
- Understanding of electrical circuits

Valued skills

- Clean room nanofabrication interest or experience
- Computational methods and simulations
- Present research at conference / workshops
- Collaborative team work

RESEARCH PLAN



APPLICATION

@ Contact : ricardo.sousa@cea.fr

Documents

- CV and cover letter
- Diplomas, grade transcripts
- References or recommendations
- Any further information about research activities, publications and English proficiency

Deadline

Now - Sep. 2024
Position will close with qualified candidate

PhD start

Oct. - Dec. 2024

OFFER

PhD duration

- 3 year program and scholarship
- Gross monthly salary: ~2400 €

Employer contribution

- Local public transportation
- Canteen lunch
- Other social benefits apply

Travel

- Conference funding
- Paid vacation

KEYWORDS

Determination Curiosity Innovation

Spintronics Magnetic sensor technology

Python AI Data models C++

ABOUT SPINTEC

SPINTEC benefits from an ideal local environment with a large spectrum of opportunities:

- Cutting-edge scientific and technological cleanroom (PTA) and nano-characterization (PFNC) platforms.
- Scientific collaborations with CEA-LETI, Néel Institute, and European Infrastructures ESRF and ILL (Giant Campus).
- Grenoble is an international city in the center of the French Alps, offering cultural and sports activities throughout the year.
- A fifth of Grenoble's population works in research, innovation, or higher education.

REFERENCES

Journal Articles

- H. Nicolas, R. C. Sousa, A. Mora-Hernández, *et al.*, "Conditioning circuits for nanoscale perpendicular spin transfer torque magnetic tunnel junctions as magnetic sensors," *IEEE Sensors Journal*, vol. 23, no. 6, pp. 5670–5680, 2023. DOI: 10.1109/JSEN.2023.3241967.
- A. A. Timopheev, R. Sousa, M. Chshiev, L. D. Buda-Prejbeanu, and B. Dieny, "Respective influence of in-plane and out-of-plane spin-transfer torques in magnetization switching of perpendicular magnetic tunnel junctions," *Phys. Rev. B*, vol. 92, p. 104 430, 10 Sep. 2015. DOI: 10.1103/PhysRevB.92.104430.

Patent

- R. Sousa and I.-L. Prejbeanu, "Procédé de mesure d'un champ magnétique extérieur par au moins un point mémoire magnétique," FR, WO2022043292A1, Mar. 2022.

TEAM COLLABORATORS

B. Dieny  0000-0002-0575-5301

I.L. Prejbeanu  0000-0001-6577-032X

L. Buda-Prejbeanu  0000-0002-6105-151X

K. Garello  0000-0003-0236-322X