

Two PhD positions

Location:

- **PhD 1:** EPFL, Lausanne, Switzerland
- **PhD 2:** HUG/UNIGE, Geneva, Switzerland

Starting/Duration: Early 2026 / 4 years

Advanced systems & methods for non-invasive therapies of brain disorders using deep-brain ultrasound neuromodulation and ultra-sensitive MRI

Project's background

Transcranial low-intensity focused ultrasound (**LIFU**) is gaining momentum as an emerging alternative for **non-invasive brain stimulation**. Unlike other techniques that deliver electrical or magnetic signals to the brain, LIFU uses inaudible sound waves. LIFU can provide a **high penetration depth** (10-15 cm), **precision** (~mm), and **selectivity** (it can modulate deep brain activity without directly affecting the cortex). Numerous studies have demonstrated that LIFU is a safe neuromodulation technique that can effectively excite and inhibit neural activity. This can have significant implications for neurological and neuropsychiatric diseases. Today, LIFU is not yet a clinically available tool, presenting a unique opportunity to accelerate translation by proposing novel solutions to address the remaining challenges, including but not limited to understanding neural effects, ultrasound targeting, safety limits, and optimal treatment parameters. We aim to address unmet needs by developing **novel hardware systems and methods for personalized theranostics** (therapy and diagnostics), leveraging combined LIFU and ultra-high-field (UHF) MRI—an ultra-sensitive technique for in vivo probing of neural activity and metabolism.

Your tasks:

We are seeking **two exceptional PhD candidates** to work on two projects funded by the Swiss National Science Foundation (SNSF).

Project 1: Innovative hardware systems for in vivo, multi-focal, LIFU deep brain neuromodulation and simultaneous whole-brain ultra-high field MRI at 7T.

Your task will be related to: RF coil/antenna and RF electronics design, RF field optimization, ultrasound array design, phantom design, 3D mechanical design, RF/ultrasound experimental validation, RF/acoustic field simulations, and RF/ultrasound safety.

Project 2: Novel methods for real-time LIFU safety monitoring and rapid, through-skull ultrasound targeting free of ionizing radiation.

Your tasks will be related to: RF/ultrasound safety, RF/acoustic field simulations, ultrasound beam characterization using hydrophones, temperature measurements using fiberoptic probes, phantom design, MR image segmentation and processing, development of fast algorithms for ultrasound targeting, RF pulse

sequence optimization: ultra-short echo time pulse sequences, acoustic radiation force imaging (ARFI), and MR thermometry.

As a PhD Student, you will be expected to:

- Have full responsibility for your own dissertation
- Research in close collaboration with industry partners
- Experiment design and execution
- Analyze and interpret experimental results
- Write scientific articles for publication in peer-reviewed journals
- Present at international conferences
- Participate in education and supervise student projects

Your profile

We are seeking creative and self-motivated candidates who demonstrate a high level of perseverance and commitment, and who want to push the boundaries of non-invasive brain stimulation and UHF-MRI. In particular, we are looking for the following skills and experience:

- A master's (MSc) degree or a similar degree with an equivalent academic level in electrical/RF/microwave/mechanical/biomedical engineering, electronics, medical physics, physics, or related field
- Readiness to work on hybrid tasks: hardware development (RF coil design), in silico modeling (electromagnetic, acoustic, thermal), experimental physics (phantom design and ultrasound beam characterization, RF field mapping), MR pulse sequence programming, and image reconstruction.
- Previous exposure to ultrasound engineering (transducer design, ultrasound focusing, ultrasound beam characterization) is a big plus
- Prior exposure to medical imaging and/or neuroimaging is a plus
- Excellent skills in English (oral and written) are required. Knowledge of French is a plus
- Rigorous work habits, a curious and critical mind, and a good sense of initiative
- **Specifically for Project 1:** A genuine interest in designing, constructing, and evaluating novel hardware technologies is a must. Previously demonstrated experience in hardware-related projects is an advantage
- **Specifically for Project 2:** A genuine interest and related experience in working at the interface of experimental physics and MRI pulse sequence design/optimization and MRI image reconstruction. Prior experience in programming (ideally in Matlab and C++/Python) is an advantage

We offer

- Up to 4-year funding provided by the SNSF
- A multidisciplinary, challenging, and potentially highly impactful project
- Access to cutting-edge technology and state-of-the-art resources (e.g. 7T clinical MRI scanner Terra.X at Fondation Campus Biotech Geneva)
- A dynamic, interdisciplinary, and international team of very motivated people
- A link to thriving biomedical imaging and neuroscience communities in Lausanne and Geneva

Supervisors

The EPFL student (**PhD1**) will be supervised by **Dr. Daniel Wenz** (EPFL) and **Prof. Dimitrios Karampinos** (EPFL). PhD1 will be an affiliate member of the CIBM and a member of the EPFL's Laboratory of Magnetic Resonance Imaging Systems and Methods (MRISM). Short-listed candidates will be requested to apply to a specific [EPFL Doctoral Program](#), i.e. EDEE or EDPY, to qualify for a PhD at EPFL. Please note that this is a separate application process necessary to be eligible to complete your PhD at EPFL.

The UNIGE student (**PhD2**) will be supervised by **Dr. Daniel Wenz** (EPFL) and **Prof. Rares Salomir** (HUG/UNIGE). PhD2 will be an affiliate member of the CIBM and a member of UNIGE's Image Guided Interventions Laboratory. Short-listed candidates will be requested to apply to [the UNIGE Doctoral Program in Life Sciences, Physics of Biology](#), to qualify for a PhD at UNIGE. Please note that this is a separate application process necessary to be eligible to complete your PhD at UNIGE.

Collaborators

- **University of Utah, US** - Henrik Odéen,
- **EPFL** - Lijing Xin, Bruno Herbelin.
- **HUG** - Felix Kurz, Paul Constanthin.

How to apply

Please visit [the EPFL career website](#), click “Apply now,” and upload the following documents:

- A motivation letter (highlighting your interest in one of the two projects)
- Your detailed CV
- Contact information
- The names and contact information of up to 3 references willing to write a recommendation letter

Application deadline: 10/12/2025

Contract Start Date: 01/01/2026 (earliest possible)

Activity Rate Min: 100,00

Activity Rate Max: 100,00

Contract Type: PhD Student

Duration: 4 years

Reference: 1831

Direct link to the job ad on the EPFL career website (identical as above): <https://careers.epfl.ch/job/Lausanne-Two-PhD-positions-ultrasound-neuromodulation-and-magnetic-resonance-imaging/1163664755/>

For more information, please contact **Dr. Daniel Wenz** (daniel.wenz@epfl.ch).

About CIBM

The CIBM Center for Biomedical Imaging was founded in 2004 and is the result of a major research and teaching initiative of the partners in the Science-Vie-Société (SVS) project between the Ecole Polytechnique Fédérale de Lausanne (EPFL), the Université de Lausanne (UNIL), Université de Genève (UNIGE), the Hôpitaux Universitaires de Genève (HUG) and the Centre Hospitalier Universitaire Vaudois (CHUV), with the generous support from the Fondation Leenaards and Fondation Louis-Jeantet.

CIBM brings together highly qualified, diverse, complementary and multidisciplinary groups of people with common interest in biomedical imaging.

We welcome you to join the CIBM Community.

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