Grenoble INP - UGA is a member of international engineering and management education and research networks. It is widely recognized in national and international rankings.

8 schools + 39 laboratories
8300 students
1 300 teaching, research, administrative and technical staff

Grenoble INP - UGA is a renowned public institution of higher education and research, and a major player in the Grenoble ecosystem. It is the engineering and management institute of Grenoble Alpes University, and plays a leading role in the scientific and industrial community.

Researcher in Radio Frequency Systems

<table>
<thead>
<tr>
<th>Job ad reference</th>
<th>2023-RESEARCHRFSYST-LCIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research field</td>
<td>RF, Radar, backscattering communications</td>
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<tr>
<td>Host laboratory</td>
<td>LCIS-Univ. Grenoble Alpes, Grenoble INP Website: <a href="https://lcis.fr/">https://lcis.fr/</a></td>
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<tr>
<td>Requested profile</td>
<td>First stage researcher (R1)</td>
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<tr>
<td>Location</td>
<td>Valence, France</td>
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<tr>
<td>Date of recruitment / contract term</td>
<td>15/01/2024 (12 months)</td>
</tr>
<tr>
<td>Contacts</td>
<td><a href="mailto:etienne.perret@grenoble-inp.fr">etienne.perret@grenoble-inp.fr</a></td>
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</tbody>
</table>

Grenoble INP - UGA is a leading public institution accredited with the French label “Initiative d’excellence”. It offers innovative engineering and management programs, with an increasing internationalization of its course offers. The courses are grounded in sound scientific knowledge and linked to digital, industrial, organizational, environmental and energy transitions. The Engineering and Management Institute of Grenoble Alpes brings together more than 1300 staff members (teacher-researchers, lecturers, administrative and technical staff) and 8300 students, located on 8 sites (Grenoble INP - Ense3, Grenoble INP - Ensimag, Grenoble INP - Esisar, Grenoble INP - Génie industriel GI, Grenoble INP - Pagora, Grenoble INP - Phelma, Polytech Grenoble, Grenoble IAE and the INP Prepa). Grenoble INP is also a highly-ranked institution of higher education and research, leading the way in the fields of engineering and management on an international scale. It is a member of a large number of international academic and research networks. It is part of the European University UNITE!.

As part of Grenoble Alpes University, Grenoble INP has associated guardianship of 39 national and international research laboratories and of technological platforms. The research conducted there benefits both its socioeconomic partners and its students. Grenoble INP is at the heart of the following scientific fields: physics, energy, mechanics and materials; digital; micronanoelectronics, embedded systems; industry of the future, production systems, environment; management and business sciences.

Grenoble INP - UGA is an equal opportunity employer committed to sustainability. Grenoble INP-UGA celebrates diversity and equity and is committed to creating an inclusive environment for all employees. All qualified applications will be considered without discrimination of any kind.
The research developed within the ORSYS (Optoelectronic and RF Systems) group considers signals and technologies for RF, including Wireless systems. Main projects focus on the design, optimization and characterization, as well as practical implementation. The ORSYS staff members have large expertise in applied Electromagnetism, and RF domains, as well as the integration and miniaturization of systems for communication and sensing. RFID and UWB technologies are among the most studied solutions. More recently metamaterials and nanotechnologies, due to their enabling properties, are part of our research projects.

The group has acquired many research facilities such as professional platforms for RF and Electromagnetic simulation in addition to several RF test and measurement setups including anechoic chamber.

The successful applicant will be joining the ORSYS group to work under the supervision of Prof. Etienne Perret, ERC grant holder, and the research aims associated to his ERC project untitled “Analysis and synthesis of wideband scattered signals from finite-size targets – aspect-independent RF analog footprint” (ScattererID - https://www.scattererid.eu/) to develop the future of the chipless RFID technology.

Job description:

Project summary:

The need for information identification and capture is a matter of prime importance in modern societies. Every sectors of society rely on the identification of data exchanged, the updating of the data recorded on a tag and the measurement of physical parameters. The ability to make objects interact with one another or with humans is an important factor in many applications, all the more so if this interaction can occur without human presence. The way to reduce power consumption, improve the communication quality-of-service and enhance connectivity has become key issues for lots of industries. Researchers need to consider the multiple factors simultaneously to design state-of-the-art RF devices for the next generation of identification services.

One important direction is to develop low-power, low cost tags for wireless identification and sensing. Lots of improvements have been done today on communication systems based on electronic devices where an integrated circuit is at the heart of the whole system. The democratisation of these chipped based systems like the RFID one will give rise to environmental issues in the future. However, these improvements pave the way for the development of new concepts based on approaches where the presence of the chip is not mandatory.

These approaches are based on radar or reflectometry principles; these are non-invasive techniques but they require specific theoretical and practical developments. The difficulty is to be able to retrieve a small signal coming from a totally passive label placed in an unknown and movable environment. The objective of this project is to introduce the paradigm of RF communication system based on chipless labels, i.e. tags without any chip, bringing an ID, able to communicate with radio waves and having extremely low costs. This project aims at showing that it is possible to associate the paper based chipless label ID with other features like the ability to write and rewrite the ID, or a sensor function.
**Main goals:**

Working directly with Professor Etienne Perret, your main task will be to carry out research into RF backscattering. For the past 5 years, Etienne Perret has been working on a European ERC Consolidator Grant project on the subject of chipless RFID (https://www.scattererid.eu/). On the strength of this experience and the research results obtained (more than 25 articles in leading journals, 30 conference papers, etc.), the aim is now the incorporation of metamaterials into chipless RFID tags.

Metamaterials, composite media engineered to exhibit distinctive electromagnetic properties, are composed of subwavelength building blocks. These provide precise control over optical fields and have applications spanning from optics, photonics, energy, medicine, to communications. Metamaterial integration into chipless RFID tags has yielded promising results in several areas. Metamaterials have enabled these tags to store and transmit significantly more data than their conventional counterparts.

Designs like split-ring resonators (SRRs) and complementary SRRs permit multiple resonant frequencies, encoding more bits of information within a single tag, thereby increasing data capacity. Additionally, metamaterials can enhance the read range of chipless RFID tags. Optimizing metamaterial structures can augment the tag’s scattering cross-section, making it more responsive to the reader’s signal, extending the read range, and facilitating effective tag identification and data retrieval even at greater distances.

**Keywords**: Radio systems, RF design, Radar approaches, chipless RFID, Metamaterials.

**Software**: CST, HFSS, Matlab

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**Specific requirements or conditions**

Proficiency in English is required. In addition, international experience will be a decisive asset.

**Position assigned to a restricted area: NO**

(Device for the protection of the scientific and technical potential of the nation, conditioning the appointment of the researcher to the authorization of the Defense Security Officer).

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**How to apply**

Applications must be sent to: etienne.perret@grenoble-inp.fr

Application deadline: 04/12/2023