

# Job Description

## MetaWireless Early Stage Researchers

### Institute of Telecommunications

#### Vienna, Technische Universität Wien, Austria

The Institute of Telecommunications at the Technische Universität Wien in Vienna, Austria is seeking to appoint one high-calibre Early Stage Researcher (ESRs) to join the Marie Skłodowska-Curie Innovative Training Network on ‘**Future Wireless Communications Empowered by Reconfigurable Intelligent Meta-Surfaces** (MetaWireless)’.

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| <b>Position</b>      | Early Stage Researcher   |
|                      | TUW-1: System modeling of signal propagation in RIS-empowered wireless networks (RIS = reconfigurable intelligent surfaces)  |
| <b>Location:</b>     | Institute of Telecommunications, Gusshausstr. 25/e389, 1040 Wien, Austria  |
| <b>Working Time:</b> | Full Time  |
| <b>Duration:</b>     | Fixed-Term (3 years)   |
| <b>Salary:</b>       | In agreement with the MSCA-ITN financial regulations ( <a href="http://ec.europa.eu/research/participants/data/ref/h2020/other/guides_for_applicants/h2020-guide-appl-msca-itn_en.pdf">http://ec.europa.eu/research/participants/data/ref/h2020/other/guides_for_applicants/h2020-guide-appl-msca-itn_en.pdf</a> - Section 5, page 27) |

## About MetaWireless

Wireless connectivity has become a pillar of our society. The growth of wireless traffic is relentless, forecast to reach a staggering worldwide aggregate of 5,016 exabytes by 2030, along with bit rates of 1 Tb/s and new services related to sensing, localization, low-latency, and ultra-reliability. While the performance of wireless networks has improved phenomenally over the last decades, progress is by now pushing against fundamental limits and the mechanisms that have sustained these huge improvements are starting to falter. New evolutionary leaps are called for in order to ensure that the aforementioned forecasts can become a reality. To date, every wireless system has abided by the premise that the propagation radio channel is fixed by nature and cannot be tampered with, but only compensated through ever more sophisticated transmission/reception schemes. A potential evolutionary leap for 6G-and-beyond networks is to break free from the postulate that channels are uncontrollable factors. Serving such a vision, MetaWireless pursues the disruptive idea of designing wireless networks by treating the environment itself as a quantity to be controlled and optimized. Precisely, the manipulation of the wireless environment can be made possible by incorporating reconfigurable intelligent surfaces. These are planar structures, made of meta-materials and electromagnetically discontinuous, which do not adhere to conventional reflection and diffraction laws; rather, they can modify in a controllable fashion the phase and wavefront of impinging radio waves. If deployed to coat objects, walls, or building facades, they could allow customizing in real time the electromagnetic response of environments. Making this vision a reality requires the training of a new generation of researchers and a multidisciplinary effort involving wireless communications, physics, electromagnetic theory, and computational learning, which are the ingredients that define the MetaWireless project.

## The Role

The position will be hosted by the Institute of Telecommunications, which is located in the heart of Vienna, Austria and will be enrolled on the PhD programme of the Technische Universität Wien, Austria. A thesis on “system modelling of *signal propagation in RIS-empowered wireless networks*” under the supervision of Prof. Dr.-Ing. Markus Rupp is expected and will benefit, in addition, of a secondment period at other partners of the MetaWireless project.

Further information about the Ph.D. project can be found in the following table.

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| <b>Position:</b> TUW-1   |
| <b>Title:</b> System level modeling of signal propagation in RIS-empowered wireless networks.  |
| <p>Scientific context: Current wireless networks are designed based on communication-theoretic frameworks that optimize the transmitter/receiver behaviour given a wireless channel, but in RIS-based networks the transmission paths are optimized. To quantify the performance of RISs in wireless networks, a system-level simulator that integrates the re-engineered WiSE ray tracing module with realistic network topologies, city maps, and standard-compliant modulation schemes and transmission protocols is necessary but, as of today, not available yet. This ESR project is focused on re-engineering the open-access Vienna System-Level Simulator developed by TUW to make it suitable for analyzing and optimizing RIS-based wireless networks. This is a major research effort from the programming standpoint, and requires the collaboration of experts in programming, physics, radio propagation, wireless communications, and networks. New software modules will be developed that integrate the “WiSE” ray tracing module, the three-dimensional indoor and outdoor EMS’s network planning tool that features three-dimensional maps of realistic network topologies and geographic datasets, along with the empirical channel models obtained from first RIS-based hardware platforms, and the innovative analytical models of radio propagation and manufactured RISs supplied by the other projects of the ESRs. The MetaWireless simulator will be available through an open-access/open-source license to the entire research community, and will be accessible and free for download from the project website. A user manual and an installation guide will be provided. The application of RIS in various challenging transmission scenarios is to explore and possibly exact analytical frameworks are to develop.</p> |
| <b>Objectives:</b> Identifying fundamental conditions under which the RISs improve transmission conditions in which typically large objects hamper transmission.   |
| <b>Expected results:</b> Identification of typical transmission scenarios (mostly urban, but also tunnels) in which RIS transmissions may help.  |
| <b>Acquire knowledge:</b> System level descriptions that is electromagnetic and wave propagation behaviour to be described in mathematical terms suitable for system level abstractions.   |
| <b>Planned secondment(s):</b> Dr. Lutu (TELEFONICA INVESTIGACION Y DESARROLLO SA, Spain, Madrid), for 6 months   |
| <b>Ph.D. enrolment:</b> TU Wien (Austria)  |

## Duties & Responsibilities

1. Undertake postgraduate research in support of the agreed doctoral research project.
2. Work closely with the academic supervisors to ensure the compatibility of the individual project with the overall goals of MetaWireless.
3. Present and publish research in both academic and non-academic audiences.
4. Attend and participate to academic and non-academic conferences, events and seminars.
5. Attend and participate to all training events and supervisory meetings.
6. Be seconded to other network partners as necessary to fulfil the grant obligations.
7. Prepare progress reports and similar documents on research for funding bodies, as required.
8. Contribute to the delivery and management of the wider programme, including attending and participating in programme committee meetings.
9. Actively contribute to the public engagement and outreach activities as described in the grant agreement.

As job descriptions cannot be exhaustive, the ESR may be required to undertake other duties, which are broadly in line with the above duties and responsibilities.

## Person Specification

1. An undergraduate degree and a postgraduate Master's degree (or equivalent) in electronic or electrical engineering, mathematics, electromagnetics, or a physical sciences subject.
2. Excellent mathematical skills and background.
3. High proficiency in Matlab (object oriented programming).
4. Solid background on wireless communications (antennas, propagation, proficiency in simulator experience is a plus).
5. Excellent written and verbal communication, including presentation skills.
6. Highly proficient English language skills.
7. Excellent organisational skills, attention to detail and the ability to meet deadlines.
8. Ability to think logically, create solutions and make informed decisions.
9. Willingness to work collaboratively in a research environment.
10. A strong commitment to his/her own continuous professional development.
11. Willingness to travel and work across Europe.

## Eligibility Requirements

All candidates must meet the following requirements to be considered for this post:

- a) Early-Stage Researchers (ESRs) shall at the time of recruitment by the host organisation be in the first four years (full-time equivalent research experience) of their research careers and not yet have been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when a researcher obtained the degree which would formally entitle him or her to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the researcher is recruited.
- b) At the time of recruitment by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than 12 months in the three years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays are not taken into account.

## How to Apply

Applications must be submitted, to the attention of Dr. Markus Rupp, according to the following procedure:

- 1) Registration and submission of the application material to the MetaWireless recruitment website (<https://h2020-msca-itn-metawireless.cnit.it/jobs/> ).
- 2) Registration and submission of the application material to the recruitment website of the Institute of Telecommunications at TU Wien (<https://www.nt.tuwien.ac.at/vacancies/> ).

Informal enquires for further information about the positions can be send to Dr. Markus Rupp ([markus.rupp@tuwien.ac.at](mailto:markus.rupp@tuwien.ac.at)).

Note 1: Registrations and submissions need to be done to both websites.

Note 2: By registering on either of the two websites mentioned above, the applicants agree that the members of the MetaWireless project can access their personal data and application material.

Each application must include the following material:

- a) A cover letter explaining the motivation for applying for the post.

- b) A curriculum vitae setting out the educational qualifications as well as any additional scientific achievements and publications.
- c) Evidence of English proficiency.
- d) Copy of Bachelor's and Master's certificates.
- e) Copy of Bachelor's and Master's transcripts.
- f) Any additional material useful for the assessment of the candidate (e.g., recommendation letters, research project in agreement with the requirements specified in previous text).

## Selection Process

The selection and recruitment processes of the ESRs will be in accordance with the European Charter and Code of Conduct for the Recruitment of Researchers. The recruitment process will be open, transparent, impartial, equitable, and merit-based. There will be no overt/covert discrimination based on race, gender, sexual orientation, religion or belief, disability or age. To this end, the following selection criteria for the recruitment of the ESRs will be considered:

- 1) Curriculum vitae
- 2) Academic performance (diplomas, university transcripts, etc.)
- 3) Research and industrial experience
- 4) Awards and fellowships
- 5) Publications
- 6) Research, leadership, and creativity potential
- 7) English knowledge
- 8) Other relevant items based on the specific candidate

The recruitment process will adhere to the guidelines described in the Grant Agreement of the MetaWireless project. At the network's level, the recruitment will be coordinated by the Recruitment Committee of the project in order to guarantee gender- and sector-balance. At the TU Wien level, the recruitment will be coordinated by the host Institute of Telecommunications. More precisely, the recruitment and selection of the ESRs will be executed by the Scientist-in-Charge of the MetaWireless project for the TU (Dr. Markus Rupp), by the Head of the Institute as well as the Responsible of the Human Resources.

The application deadline for the post is on **1 April 2021**. Each application will be acknowledged electronically (e.g., by return email) and a unique ID number will be assigned to it. The applications will be analysed after the application deadline, and the shortlisted candidates will be invited to a teleconference interview. The selected candidates will be recruited during the period **1 May 2021- 30 November 2021**. At the end of the selection process, all the applicants will be informed of the outcome of their application by return email.

## Further Information

For more information about the post, please contact Dr. Markus Rupp ([markus.rupp@tuwien.ac.at](mailto:markus.rupp@tuwien.ac.at)).

## Disclaimer

By applying for this position, the applicants give their consent to circulate their application within the members of the consortium.

By applying for this position, the applicants declare to fulfil the eligibility requirements defined by the MSCA.

By applying for this position, the applicants agree that they will comply with the secondment plan.

By applying for this position, the applicants agree that they will comply with the planned Ph.D. enrolment.