Job Description for Position: CNIT1

The *Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Laboratory of the University of Napoli Federico II, Italy*, is seeking to appoint a high-calibre doctoral candidate to join the Marie Skłodowska-Curie Doctoral Network 'Wireless Networks at Optical Speed with Deterministic Performance' (TeraWireless).

About the TeraWireless project

Future networks will support several applications that require extending fiber-optic quality of experience to wireless links. This means connectivity at extremely high data rates with deterministic performance (guaranteed requirements in terms of reliability and time response). Virtual avatar presence, traffic control, autonomous driving, remote health monitoring, cyber physical systems for intelligent transportation, industrial automation are only a few examples of anticipated use cases. Owing to the large amount of available bandwidth, the European Telecommunications Standards Institute has identified terahertz (THz) as a key technology for future wireless networks. TeraWireless is the first EU training-through-research industrial doctoral network of doctoral candidates and senior supervisors fully committed to lay the theoretical, algorithmic, and architectural foundations for enabling THz systems at optical speed with deterministic performance. TeraWireless will 1) put forth the innovative ultra-MIMO (multiple-input multiple-output) technology for increasing the data rate and link reliability through spatial multiplexing and superdirective beamforming, and will pioneer the development of electromagnetic and communication models for evaluating its performance in low-scattering THz channels, where multipath propagation cannot be exploited, by integrating sensing, localization, communication capabilities; 2) leverage the emerging concept of semantic and goal-oriented communications by folding message semantics and goals of communication within communication layers; 3) develop innovative physics-based ML solutions for energy-efficient, robust, reliable, and explainable-by-design implementations; 4) make available to the research community the EU's and world's first open-access and open-source simulation environment - integrating ray tracing, link-level, and system-level features - for evaluating and optimizing THz large-scale deterministic networks at optical speed.

Position title: CNIT1 - Spectral and energy-efficient design for Ultra Massive MIMO THz systems

Research project: CNIT-1 will develop radio resource allocation schemes that account for the power consumption of practical THz hardware by design, e.g., analog-to-digital converters and power amplifiers, and the unique features of Ultra Massive MIMO. Global and multi-objective optimization theory will be used to characterize the spectral-energy efficiency tradeoff of Ultra Massive MIMO THz via the Pareto front, as a function of the system radio resources (transmit power, active antennas, beamforming vectors) and to develop efficient algorithms for integration in TeraWireless simulator. The activity will consider realistic models for mutual coupling among antenna elements and THz channels.

Objectives: Determine the ultimate fundamental performance limits of Ultra Massive MIMO THz systems, by means of mathematical optimization, communication theory, information theory.

Location of workplace: CNIT Laboratory based at the University of Napoli, Via Claudio 21, 80125, Napoli, Italy, under the joint supervision of Profs. Domenico Ciuonzo and Alessio Zappone.

PhD enrolment: The selected applicant will be enrolled into a Ph.D. program at the University of Napoli Federico II to conduct the planned research activities.

Working Time: Full-time.

Duration: Fixed-term (3 years).

Salary: in agreement with the MSCA-DN financial regulations, including living, mobility, and family allowances (https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-2-msca-actions_horizon-2021-2022_en.pdf).

Secondment: CNIT1 will spend a research stay of 18 months at an industrial partner of the TeraWireless project. The planned secondment for CNIT1 is at the Nokia center based in Paris, France.

Job requirements

1) An undergraduate degree and a postgraduate Master's degree (or equivalent) in information engineering, electronic or electrical engineering, mathematics, or a physical sciences subject.
2) Solid background on communication theory, wireless communications, and signal processing.
3) Excellent mathematical skills and background (optimization theory is a plus).
4) High proficiency in Matlab, or similar programming software.
5) Excellent written and verbal communication, including presentation skills.
6) Highly proficient English language skills.
7) Excellent organizational skills, attention to details 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) Willingness to travel and work across Europe.

Duties and 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 the TeraWireless project.
3) Present and publish research in both academic and non-academic audiences.
4) Attend and participate in academic and non-academic conferences, events and seminars.
5) Attend and participate in 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 program, including attending and participating in program committee meetings.
9) Actively contribute to the public engagement and outreach activities of the project.

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

Eligibility requirements

- The applicant must be a doctoral candidate (i.e. not already in possession of a doctoral degree at the date of the recruitment).
- At the time of recruitment, the researcher must not have resided or carried out their main activity (work, studies, etc.) in the country of their recruiting organization 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.

Selection Process

The selection and recruitment process 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 will be considered:

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

The application deadline is **16 June 2025**. All applications will be analyzed after the application deadline, and the shortlisted candidates will be invited to a teleconference interview. At the end of the selection process, all the applicants will be informed of the outcome of their application by return email.

Disclaimer

By applying for this position, the applicant:

1) give their consent to circulate their application and personal data within the members of the consortium.
2) declare to fulfil the eligibility requirements defined by above.
3) agree to spend a secondment of 18 months in an industrial partner of the TeraWireless consortium.
4) agree that they will comply with the planned Ph.D. enrollment.

How to Apply

Each application must include the following material:

a) Curriculum vitae setting out the educational qualifications as well as any additional scientific achievements and publications. The CV must clearly indicate the applicant's vitae name, surname, gender, date of birth, nationality, country of residence in the last three years).
b) Evidence of English proficiency.
c) Copy of Bachelor's and Master's certificates.
d) Copy of Bachelor's and Master's transcripts.
e) Any additional material useful for the assessment of the candidate (e.g., recommendation letters, research project/statement in agreement with the requirements specified in previous text).

All material must be included in one compiled pdf file. The file should be named indicating the surname of the applicant and (in order of preference) the three preferred positions for which the applicant is applying, i.e. Surname_Position1_Position2_Position3.pdf (e.g. Surname_CNIT1_CS2_UPRC1) The file should be uploaded through the TeraWireless recruitment website https://www.terawireless.eu/job-positions.

Further Information

For more information, please contact Profs. Domenico Ciuonzo (domenico.ciuonzo@unina.it) and Alessio Zappone (alessio.zappone@unicas.it).

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