

DC01

*Individual Research Project title- **Waveform design for joint communications and sensing***

*Lead beneficiary (place of employment) – **UNIVERSIDAD CARLOS III DE MADRID (UC3)**, CALLE MADRID 126, 28903 GETAFE (MADRID), Spain and **VODAFONE ESPANA SA (VF)**, AVENIDA DE AMERICA 115, MADRID 28042, Spain*

*Secondment at - **INSTITUTO DE TELECOMUNICAÇÕES (IT)**, CAMPUS UNIVERSITARIO DE SANTIAGO UNIVERSIDADE DE AVEIRO, GLORIA E VERA CRUZ, 3810 193, Portugal*

Supervisory team - Academic: Prof. M. Julia Fernández-Getino García (UC3); Industry: Mr. Carlos Ubeda (VF); Mentor: Prof. Rui Dinis (IT)

Project tasks and objectives - The goal is to design the waveform, pilot sequence and frame structure to jointly perform communications and sensing with the best possible trade-off performance of each of them. The PAPR, robustness to multipath delay spread and time variability will be considered in the design, having in mind the characteristics of the different frequency bands in which these systems may be deployed and the evolution of standards. The target is to minimize the error probability in the communications and simultaneously maximize the probability of detection with a bounded false alarm in the sensing and guaranteeing a required detecting and communications range. Constant envelope solutions will be proposed in order to counteract the path loss with a powerful amplification. The waveform will be implemented in the open platform “cellin-a-box” of Vodafone, where measurements will be obtained to develop and validate simulations.

Expected Results - New waveforms, including characterization of their parameters, pilot structure and frame. Performance analyzed in realistic conditions and best options prototyped for a proof of concept.

Planned secondment objectives - to explore the possibilities of using non-linear receivers

Eligibility - University master’s degree and be eligible to enroll in a PhD program. Knowledge in fields related to Telecommunications (or closely related disciplines) is appreciated. A high level of English language is required. International experience is appreciated. Research experience and good communication skills are appreciated. Not have resided or carried out their main activity (work, studies, etc.) in Spain for more than 12 months in the 36 months immediately before the recruitment date. Non EU-candidates should have preferably an EU working permit.

Evaluated criteria –

- Study records, including Bachelor and Master
- Work & research experience
- Motivation
- Letters of recommendation
- Positive attitude, previous mobility experience, good communication skills
- English proficiency and other languages

Preferred starting date - June 2024 (as soon as possible)

Trial period – 6 months

Target degree - PhD degree from UNIVERSIDAD CARLOS III DE MADRID

Approximate gross salary –

2 770 € for a fellow without family

3 270 € for a fellow with family (e.g., married/in recognized relationship/with children)

This gross salary is approximate. It has been derived from the funding provided by the Granting Authority by an adjustment based on the country's cost of living index, and worker-related costs for the beneficiaries (contracting entity), considering current legislation. Please note that these figures are estimate and subject to change based on prevailing circumstances.

Working and living conditions –

Detailed information about Spain: <https://www.oecdbetterlifeindex.org/countries/spain/>

Detailed information about Portugal: <https://www.oecdbetterlifeindex.org/countries/portugal/>

UNIVERSIDAD CARLOS III DE MADRID: It is ranked 35th in the world and 12th in Europe in the QS ranking of the 50 best universities in the world under 50 years old and is included in THE academic ranking of universities. The UC3M also stands out for the high employability of graduates, which reaches 90.6%
Webpage: <https://www.uc3m.es/home>

INSTITUTO DE TELECOMUNICAÇÕES: Instituto de Telecomunicações (IT) is a private, non-profit organization of public interest, and a State Associate Laboratory since 2001. IT is a partnership of six universities, one polytechnic institute and two companies involved in research and development in the field of Telecommunications:

- * Instituto Superior Técnico (IST);
- * University of Aveiro (UA);
- * University of Coimbra (UC);
- * University Institute of Lisbon (ISCTE);
- * University of Porto (UP);
- * University of Beira Interior (UBI);
- * Polytechnic Institute of Leiria (IPL);
- * Altice Labs (AL);
- * Nokia Solutions and Networks (NSN).

IT's mission is to create and disseminate scientific knowledge in the field of telecommunications. It is actively involved in fundamental and applied research in telecommunications, both at national and international level, and is committed to fostering higher education and training, by hosting and tutoring graduate and postgraduate students. Scientific expertise in IT spans across the following areas:

- * Wireless Technologies
- * Optics and Photonics
- * Information and Data Sciences
- * Networks and Services
- * Basic Sciences and Enabling Technologies

web site : <https://www.it.pt/>

VODAFONE ESPAÑA, It is the Spanish subsidiary of the British multinational company Vodafone. The operator uses the commercial brand "Vodafone", through which it offers telephone, internet and television services (Vodafone TV) in Spain. It was launched as a trademark in Spain, on 2001, after the acquisition of Airtel by Vodafone. The subsequent acquisitions of Tele2 Spain on 2007, and Ono on 2014.3 consolidated it as the second multimodal operator in the country, and the second in mobile telephony. The company has recently been sold to the British investment fund Zegona. <https://www.vodafone.es/>

Additional information:

Please check additional requirements for the PhD degree in UC3M:

https://www.uc3m.es/ss/Satellite/Doctorado/en/Detalle/Estudio_C/1371323806437/1371210298470/Signal_Processing_and_Communications_Engineering#access