



**Microwave
Components
Group**
Public University of Navarre

upna
Universidad Pública de Navarra
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Smart Cities

Reference: (ESR #2) PhD on Microwave and Millimeter-Wave Components aiming for an Easy Fabrication / Marie Skłodowska-Curie Innovative Training Network H2020-MSCA-ITN-2018 on Advanced Technologies for Future European Satellite Applications (TESLA)

(A) General description of the PhD

The Microwave Components Group (MCG) of the Electrical, Electronic and Communications Department at The Public University of Navarre (UPNA) is seeking to appoint excellent PhD students to join the Marie Skłodowska-Curie Innovative Training Network H2020-MSCA-ITN-2018 on Advanced Technologies for future European Satellite Applications (TESLA).

Space is a key asset for Europe. Europe's citizens enjoy the benefits, from jobs and economic growth, to public services, efficient communications and security provided by space systems. To respond to global challenges, Europe must continue to have a prominent role in space at a time when other world's powers are rapidly developing their space capabilities. Since satellite payload RF components and systems are essential for delivering mission objectives and supporting ground equipment and telecommunication systems, new technologies and techniques are required to respond to emerging satellite applications and technology challenges.

To this end, TESLA ITN will create a vibrant, multidisciplinary training-through-research environment uniquely equipped to develop the Advanced Technologies for Future European Satellite Applications. It will recruit, train and supervise 15 Early-Stage Researchers (ESRs), who will collaborate with senior staff in academic and industrial sectors to conduct top-notch research into new and enabling technologies for satellite flexible payloads, big constellation systems and Internet of Space, satellite high-speed communications and remote sensing, as well as large satellite platforms.

TESLA will also implement a unique cross-disciplinary and cross-sectorial training program, underpinned by the recent vision for Europe on open innovation, open science and open to the world, with the objectives to train the next generation of creative, entrepreneurial and innovative satellite communication developers, to provide all network ESRs broad training in transferable skills to enhance their career perspectives in both the academic and non-academic sectors, and to ensure that all network ESRs have the opportunity to complete a full PhD degree program. This will enhance the European space economy and business through the provision of highly skilled and mobile researchers. Moreover, young researchers will be involved in extensive public engagement and outreach activities for a wider economic and social impact.

Other universities join UPNA in this Marie Skłodowska-Curie Innovative Training Network H2020-MSCA-ITN-2018 on Advanced Technologies for future European Satellite Applications: Heriot-Watt University (UK) –coordinator-, Universitat Politècnica de València (ES), Christian-Albrechts-Universität zu Kiel (GE), Kungliga Tekniska Högskolan (SE), Technische Universität Graz (AT), Università Degli Studi di Perugia (IT), and Université de Limoges (FR). With the support of leading space companies and institutions such as TESAT, Spinner, Harp Technologies, SERMS, RFMicrotech, Joanneum Research, Lithoz, Airbus Defence and Space, VAL Space Consortium – ESA, Aurorasat, and CTTC.

(B) Specific objectives of the PhD

The main objective of this Ph. D. Thesis is to develop new design techniques for microwave and millimeter-wave passive components for satellite applications. The new design techniques will produce prototypes robust against fabrication tolerances and consequently with high fabrication yield. Several key points of



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the passive component design will be studied in depth like the approximation functions employed and the elements used to implement the required impedance steps (local reflection coefficients). The introduction of transmission zeros will be also considered. Together with the rectangular waveguide, technologies like Groove Gap Waveguide or other alternative implementations will be used for the millimeter-wave designs.

F. Teberio, P. Soto, I. Arregui, T. Lopetegui, S. Cogollos, I. Arnedo¹, P. Martin-Iglesias, V. Boria, and M. A. G. Laso, "Waveguide Band-Pass Filter with Reduced Sensitivity to Fabrication Tolerances for Q-Band Payloads", 2017 IEEE MTT-S International Microwave Symposium (IMS), Hawaii, HI, 2017, pp. 1464-1467.

F. Teberio, J. M. Percas, I. Arregui, P. Martin-Iglesias, T. Lopetegui, M. A. G. Laso, and I. Arnedo, "Rectangular Waveguide Filters With Meandered Topology", IEEE Transactions on Microwave Theory and Techniques, vol. 66, no. 8, pp. 3632-3643, August 2018.

(C) Expected results of the PhD

Several prototypes of passive components for satellite applications will be manufactured using milling and additive manufacturing techniques. The prototypes will fulfil advanced electrical specifications for satellite communications.

(D) Description of the host institution, UPNA

The Public University of Navarra, www.unavarra.es, is located in the North of Spain with excellent connections with major cities in Spain and abroad. It is one of Spain's leading universities in terms of teaching, research and transfer (2017 ISSUE ranking, BBVA-IVIE). The university's commitment to teaching and the European Higher Education Area is shown by a wide offer of 22 Bachelor degrees (including 18 Bachelor degrees in foreign languages and 10 with specialization itineraries), 3 joint Bachelor degrees, 9 international programs, 26 Master degrees (5 of which permit access to regulated-by-law professions), 13 PhD programs and other 28 own titles and courses accredited by UPNA.

In its drive for competitiveness, UPNA has created 4 research institutes with more than 270 researchers: the Institute of Smart Cities (ISC), the Institute for Advanced Materials (InaMat), the Institute for Advanced Research in Business and Economics (Inarbe), and the Institute for Innovation and Sustainable Development in Food Chain (IS-Food). The university forms also part of Navarrabiomed (joint center with the Government of Navarra's Department of Health) and the Institute of Agrobiotechnology (joint center, alongside the Spanish National Research Council and the Government of Navarra).

UPNA is internationally well known by the quality of its research on telecommunications and, specifically, microwave engineering, where the PhD students have access to world-class laboratories and professors highly-ranked by external examiners.

[Find out more info about students' services and life on campus.](#)

(E) Planned secondments

The role is based at UPNA with secondments to other project partners in the EU. During the course of the PhD, the following short stays abroad are **tentatively** planned: University of Perugia, Italy (around 4 months) and Airbus, UK (around 2 months). The student will also attend workshops and summer schools organized by other partners.