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This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under Marie-Sklodowska Curie grant agreement No 101034285

UNIVERSITY: Public University of Navarre (UPNA) / Institute of Smart Cities (ISC)

WIT PROGRAMME´S RESEARCH LINE NAME:

RF/Microwave devices for satellite communications by 3D printing

DOCTORAL PROGRAMME: Doctorate in Communications Technology, Bioengineering and Renewable Energies: https://www.unavarra.es/escuela-doctorado/doctorate-programs/current-plan/engineering-and-architecture/doctorate-in-communications-technology-bioengineering-and-renewable-energies?languageId=1

COMPLETE DESCRIPTION OF THE RESEARCH LINE:

Additive Manufacturing (AM) or, in general, 3D printing, is as an enabling technology for RF/microwave satellite devices and Internet of Space (IoS). In the context of RF/microwave, some of the most promising AM techniques are fused deposition modeling (FDM) of polymers, polymer and ceramic stereo-lithography (SLA), and selective laser melting (SLM) of metals.

Regardless of the building material, there are some critical points that need to be solved in the coming years for 3D printing to become a realistic manufacturing method not only for satellite supporting structures, where AM is already present, but for functional RF/microwave components too. Geometry accuracy, surface roughness, high-power / high-temperature / mechanical performance and, in general, behaviour in space conditions, plating, etc. are just a few of the challenges that AM must face.

This ESR position is an opportunity for brilliant electrical engineers to contribute to the emerging field of 3D-printed RF/microwave parts for space developing low-cost, low-weight, high-power resistant components, just in time when

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hundreds/thousands of small satellites will have to be manufactured in the coming years for big data/sensor IoS constellations.

RESEARCH GROUP NAME:

Microwave Components Group (MCG)

COORDINATOR:

- Last and first name; link to the "Portal of scientific production":

  Laso, Miguel:

  https://academicos.unavarra.es/CawDOS//jsf/seleccionActividades/seleccionActividades.jsf?id_pers=2553&idioma=es&elmeucv=N

  Check Google Scholar for the most recent publications:

  https://scholar.google.es/citations?hl=es&user=am3uiMoAAAAJ&view_op=list_works&sortby=pubdate

- Department:

  Department of Electrical, Electronic, and Communications Engineering

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- Telephone number:
  +34 948 169 734

OTHER MEMBERS OF THE RESEARCH LINE:

José María Lopetegui Beregaña, MCG (ISC-UPNA)

Iván Arregui Padilla, MCG (ISC-UPNA)

Petronilo Martín Iglesias, European Space Agency (ESA)

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+ some postdocs, PhD, and MSc students

OTHER RESEARCH LINES OF THE GROUP:

The Microwave Components Group (MCG) at ISC/UPNA addresses not only the 3D printing of satellite parts but also other challenges of the future RF/microwave satellite components as identified by Prof. Laso in https://www.broadcastprome.com/news/satellite/shaping-the-future-of-rf-microwave-components/ . In particular:

-Advanced design techniques and synthesis of microwave filters

-High-power microwave filters

-Millimeter-wave and high-frequency filters

-Satellite multiplexers and passive components

ENTITIES INVOLVED IN THE GROUP RESEARCH LINES AND CONTACT PERSON:

- Academic entities:

-Universidad Politécnica de Valencia – Prof. Vicente Boria
-Heriot-Watt University (UK) – Prof. Jiasheng Hong
-Christian-Albrechts-Universitaet zu Kiel (GE) – Prof. Michael Höft
-Kungliga Tekniska Hoegskolan (SE) – Prof. Joachim Oberhammer
-Technische Universitaet Graz (AT) – Prof. Wolgang Bösch
-Universita Degli Studi di Perugia (IT) – Prof. Cristiano Tomassoni
-Universite de Limoges (FR) – Prof. Nicolas Delhote
-Universidad Politécnica de Madrid – Manuel Sierra
-Universidad de Vigo – Manuel García Sánchez

- Industrial entities:

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-TESAT – Dr. Siegbert Martin, CTO, Head of Development and Design
-Spinner – Dr. Hans-Ulrich Nickel, Head of RF Research & Development
-Harp Technologies – Janne Lahtinen, Managing Director
-SERMS – Antonio Alvino, Technical Director
-RFMicrotech – Dr Luca Pelliccia, Head of Microwave Filters R&D
-Joanneum Research – Prof. Wolfgang Pribyl
-Lithoz – Dr. Johannes Homa, CEO
-VAL Space Consortium – European Space Agency – Prof. Vicente Boria, Executive Commission President
-European Space Agency (ESA) – Petronilo Martín-Iglesias, RF Division
-CTTC – Dr. Gregory Etchegoyen, Director
-ANTERAL, Fernando Teberio, CTO
-MICROLAN, Javier Etxeberria, Director Gerente

JOINT SUPERVISION OF DOCTORAL THESIS WITH INTERNATIONAL UNIVERSITIES OR NON-ACADEMIC INSTITUTIONS:

-Universidad Politécnica de Valencia – Prof. Vicente Boria
-Heriot-Watt University (UK) – Prof. Jiasheng Hong
-Christian-Albrechts-Universitaet zu Kiel (GE) – Prof. Michael Höft
-Kungliga Tekniska Hoegskolan (SE) – Prof. Joachim Oberhammer
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-Universita Degli Studi di Perugia (IT) – Prof. Cristiano Tomassoni
-Universite de Limoges (FR) – Prof. Nicolas Delhote
-European Space Agency (ESA) – Petronilo Martín-Iglesias, RF Division

BRIEF GROUP OVERVIEW:

The Microwave Components Group (MCG) at ISC/UPNA develops space RF/microwave devices suitable for the additive manufacturing (3D printing) methods available in the market. MCG can make a full electrical, high-power, and temperature characterization of the parts in cooperation with its partners.

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Future large space-based satellite networks will deliver high data-rate services allowing for high-quality Internet connections all around the globe. Projects such as SpaceX Starlink or Airbus OneWeb also intend to provide a network that connects sensors globally enabling technologies for disruptive IoT applications, even in the most remote locations of our planet. In this new Internet of Space (IoS) era, these data and sensor networks make an intensive use of the space segment. The interconnected satellites can take the form of constellations of hundreds of low-cost low-orbit satellites, which would also allow resilient, reliable, and secure communications as well as a significant reduction of launch costs.

The common challenge for the future satellite applications is how to design reliable payloads of small size and weight, low-power consumption, low cost and excellent electrical performance. The research at MCG-UPNA has been contributing to this for more than 20 years now.

LINK OF THE GROUP TO THE "PORTAL OF SCIENTIFIC PRODUCTION"

MCG is part of the Optical Communications and Electronic Applications Group and of the Communications, Signals and Microwaves Group at UPNA-ISC. See more details at:

https://academicos.unavarra.es/CawDOS/jsf/principal/principal.jsf

PICTURES, LINKS…TO ACADEMIC OR INDUSTRIAL PARTNERS (IF ANY)

Pictures of some recently developed 3D-printed filters, including MCG-UPNA developments.

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REQUIREMENTS:

Academic requirements:

-Engineering

-Physics

Additional requirements:

All applicants should have the ability to think logically, create solutions and make informed decisions and the must also be able to communicate, read and write fluently in English. Excellent organizational skills and the ability to travel and work across Europe is also required.