

## DC02

*Individual Research Project title-* **Non-coherent approaches for ultra-massive MIMO**

*Lead beneficiary (place of employment) –* **UNIVERSIDAD CARLOS III DE MADRID (UC3), CALLE MADRID 126, 28903 GETAFE (MADRID), Spain**

*Secondment at -* **KEYSIGHT TECHNOLOGIES** (location to be defined) and **NOKIA SOLUTIONS AND NETWORKS SP ZOO (NOP)**, UL RODZINY HISZPANSKICH 8, WARSZAWA 02-685, Poland

*Supervisory team -* Academic: Prof. Ana García Armada (UC3); Industrial: Mr. Francisco García (KEY-UK); Mentor: Dr. Lukasz Krzymien (NOP)

*Project tasks and objectives -* The goal of this project is to design transmitter and receiver algorithms for non-coherent ultra-massive MIMO communications, including the transmission and scheduling of the users. The channel estimation is then avoided, contributing to the feasibility of these schemes under low SNR and/or high time variability. The channel characteristics of the different frequency bands in which these systems may be deployed will be considered, since the transceiver design strongly depends on the spatial correlation. The optimization criteria are the error probability and effective data rate of each of the users and the number of simultaneous users in the same time-frequency resource. While the main focus is on eliminating the overhead of the radio interface for communications, the possibility of simultaneously realizing pilot-less sensing, using the non-coherently detected data as reference signals, will be explored.

*Expected Results -* New non-coherent constellations for pilot-less transmission and multiplexing of several users' information together with algorithms to be executed in the receiver for the detection of each signal. Performance analyzed in realistic conditions and best options prototyped for a proof of concept.

*Planned secondment(s) objectives -* to work on the prototype and perform measurements. And to include manufacturer's perspective about realistic implementation

*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 for Spain in: <https://www.oecdbetterlifeindex.org/countries/spain/>

Detailed information for UK in: <https://www.oecdbetterlifeindex.org/countries/united-kingdom/>

Detailed information for Poland in: <https://www.oecdbetterlifeindex.org/countries/poland/>

**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>

**KEYSIGHT TECHNOLOGIES** empowers innovators to explore, design, and bring world-changing technologies to life. As the industry's premier global innovation partner, Keysight's software-centric solutions serve engineers across the design and development environment, enabling them to deliver tomorrow's breakthroughs at speed and with reduced risk. Keysight leverages its strength as the world's leading test and measurement provider and today enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to help create the best product experiences. Whether you're looking to improve your design and development process, optimize and secure your network, or harness AI and digital twins to get a head start on technologies like 6G, AV and EV, IoT, or quantum computing — Keysight accelerates innovation across the workflow with intelligent insights built on the most accurate measurements. Our fusion of technology knowledge, measurement science expertise, and tailored solutions helps you forge ahead with confidence in our connected and dynamic world. Keysight Technologies (NYSE: KEYS) is an S&P 500 technology company, headquartered in Santa Rosa, California, with offices and manufacturing worldwide. Keysight owns 2,000+ patents and our ~15,000 employees work with nearly 32,000 customers worldwide to start technology revolutions. Keysight customers span the communications, industrial automation, aerospace and defense, automotive, energy, semiconductor, and general electronics markets.  
Website: <http://www.keysight.com>

**NOKIA SOLUTIONS AND NETWORKS** is a Finnish multinational telecommunications, information technology, and consumer electronics corporation, established in 1865. Nokia's main headquarters are in Espoo, Finland, in the greater Helsinki metropolitan area, but the company's actual roots are in the Tampere region of Pirkanmaa. In 2020, Nokia employed approximately 92,000 people across over 100 countries, did business in more than 130 countries, and reported annual revenues of around €23 billion. Nokia is a public limited company listed on the Helsinki Stock Exchange and New York Stock Exchange. It was the world's 415th-largest company measured by 2016 revenues, according to the Fortune Global 500, having peaked at 85th place in 2009. It is a component of the Euro Stoxx 50 stock market index.

Website: <https://www.nokia.com>

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