

### 3<sup>rd</sup> WORKSHOP IN QUANTUM COMMUNICATIONS AT THE INTERNATIONAL CONFERENCE ON TRANSPARENT OPTICAL NETWORKS - ICTON 2023



*From left to right: Laura Ortiz (UPM), Alberto J. Sebastián Lombraña (UPM), Sara Mantey (IT), Nuno Silva (IT), Maurício Ferreira (IT), Nelson Muga (IT), Gustavo Anjos (IT), Jaime Sáez de Buruaga (UPM)*

Two of QuantaGENOMICS' members, Instituto de Telecomunicações and the Universidad Politécnica de Madrid, co-organized the 3<sup>rd</sup> workshop on **Quantum Communications**, co-located with the International Conference on Transparent Optical Networks (ICTON 2023), which took place in Bucharest, the capital of Romania, from July 2nd to July 6th, 2023.

Some of the project's research results were presented in this workshop.

#### ABOUT THE PROJECT

QuantaGenomics is a QuantERA ERA-NET Cofund in Quantum Technologies project with a focus on the development of a quantum-enabled secure multiparty computation service for collaborative genomic medicine.

#### In this issue:

Participation in the International Conference on Transparent Optical Networks - ICTON 2023, 2nd General Assembly in Paris, Best Paper Award, PhD Thesis Defense - Daniel Pereira, Current Scientific Activities and Publications.

# THE SECOND GENERAL ASSEMBLY IN PARIS

The second in-person **QuantaGenomics General Assembly** was held on 8th June 2023 and took place in Paris, at the **Sorbonne Université**, and was attended by the majority of the partners. The event aimed to join teammates and partners to **discuss the running tasks** and activities, in addition to defining the following steps according to the work plan for each stage. The representatives had the opportunity to **share with their colleagues the work status, discuss new ideas, and plan further activities.**



## PH.D. THESIS DEFENSE

Daniel Pereira, researcher of the QuantaGENOMICS Project (Instituto de Telecomunicações), obtained recently the **Ph.D. degree**. On the 13th of July 2023, Daniel presented your doctoral thesis named **"Analysis and Optimization of Continuous Variables Quantum Cryptographic Systems"** and supervised by Professor Dr. Armando Nolasco Pinto and Dr. Nuno Silva.

**Analysis and Optimization of Continuous Variables Quantum Cryptographic Systems**

PhD in Electrical Engineering  
Department of Electronics, Telecommunications and Informatics

Daniel Pereira (danielpereira@ua.pt)

**Supervisors**  
Professor Doutor Armando Nolasco Pinto (UA / IT)  
Doutor Nuno Alexandre Peixoto Silva (IT)

July 13th, 2023

Currently, Daniel Pereira joined the Quantum Group of the Austrian Institute of Technology (AIT), in Vienna.

## BEST PAPER AWARD: SPIE SENSORS + IMAGING CONFERENCE IN AMSTERDAM

Margarida Ribau Almeida, Ph.D. student and researcher at the Quantum Communications Group (Instituto de Telecomunicações), won the best paper award presentation in the category "Emerging Imaging and Sensing Technologies for Security and Defence" at SPIE Sensors + Imaging International Symposia, held on 3-6 September 2023 in Amsterdam, Netherlands. The paper "Modulation variance optimization in discrete modulated CV-OKD systems" was written by Margarida Almeida, Armando Nolasco Pinto and Nuno Silva.



# CURRENT SCIENTIFIC ACTIVITIES

To the current date, two non-technical and two technical work packages (WPs) have been executed by the consortium: WP1 - Project Management, WP5 - Dissemination and Exploitation, WP2 - Quantum Foundation for SMC, and WP3 - Laboratory Validation. The WP4, Integration in a Classical Optical SDN Network, will start on December 2023.

WP1 is providing the proper administrative and scientific management of the project, e.g. day-to-day operational administrative and contractual tasks of the project and establishing the interface and interaction with the QuantERA office.

WP5 has ensured the dissemination of the project, including the presentation of the project activities, objectives, and results in scientific events and national and International conferences, as well as journal publications.

WP2 has been initiated by the activities of Task 2.1, whose main objective was to identify a set of quantum resources and cryptographic primitives to support fast and practical Secure Multiparty Computing (SMC). This task is led by SU and had the participation of three other partners, IT, INRIA and ICFO. The task has been completed and the work is now focused on the implementation of secure SMC services and related security analysis, Task 2.2 and Task 2.3, respectively.

Activities in WP3 continued with the aim of validating protocols in the laboratory. Divided into three tasks, the partners are working on the implementation of the above-mentioned protocols following different approaches: on DVs, CVs and quantum entanglement. This task is led by ICFO with the participation of two other partners, IT and SU.

## PUBLICATIONS

### Papers in International Journals:

- Margarida Almeida, Daniel Pereira, Margarida Facção, Armando N. Pinto and Nuno A. Silva, "Reconciliation Efficiency Impact on Discrete Modulated CV-QKD Systems Key Rates", *Journal of Lightwave Technology*, Vol. 41, pp. 6134, (2023). Doi: [10.1109/JLT.2023.3280076](https://doi.org/10.1109/JLT.2023.3280076).
- Daniel Pereira, Margarida Almeida, Armando N. Pinto and Nuno A. Silva, "Impact of Transmitter Imbalances on the Security of Continuous Variables Quantum Key Distribution", *EPJ Quantum Technology*, 2023. DOI: [10.21203](https://doi.org/10.21203).

### PhD Thesis:

- Daniel Pereira: "Analysis and Optimization of Continuous Variables Quantum Cryptographic Systems". University of Aveiro, (07/2023).

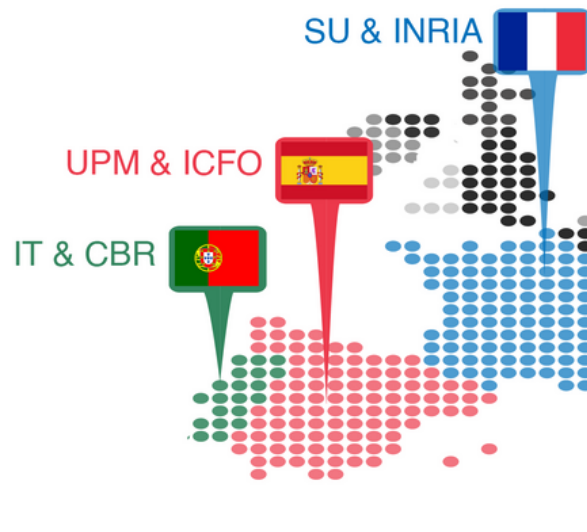
### Conferences:

- A. Innocenzi, V. Yacoub, P. Lefebvre, A. B. Grilo, E. Diamanti, "Experimental implementation of simulation secure quantum oblivious transfer", GDR TeQ Colloquium, Montpellier, France, 22-24 November 2023.
- Margarida Almeida, Armando Nolasco Pinto and Nuno Silva, "Modulation variance optimization in

discrete modulated CV-QKD systems", *SPIE Sensors + Imaging International Symposia*, Netherlands, 2023.

- Mário Silva, Ricardo Faleiro, Paulo Mateus, Emmanuel Zambrini Cruzeiro, "A coherence-based game and applications to semi-device-independent quantum key distribution", *TQC23, Aveiro*, 2023.
- Lorenzo Catani, Ricardo Faleiro, Pierre-Emmanuel Emeriau, Shane Mansfield, Anna Pappa, "Connecting XOR and XOR\* games", *TQC23, Aveiro*, 2023.
- Armando N. Pinto, Manuel B. Santos, Nuno A. Silva, Nelson J. Muga, and Paulo Mateus, "Oblivious keys for secure multiparty computation obtained from a CV-QKD", *ICTON 2023, Bucarest, Romania* 2023.
- Sara T. Mantey, Nuno A. Silva, A. N. Pinto, N. J. Muga, "AI-Assisted Polarization Basis Alignment for Quantum Key Distribution System Receivers", *ICTON 2023, Bucarest, Romania* 2023.
- Armando N. Pinto, Nelson J. Muga, Nuno A. Silva, Manuel B. Santos, Paulo Mateus, A. C. Gomes, Mário Grãos, J.P. Brito, Laura Ortiz, Vicente Martin, "Quantum Secure Multiparty Computation to Support Genomic Medicine", *Quantum Mater*, Madrid, Spain 2023.

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