



### Participation in the REPMUS & NATO Dynamic Messenger 2023 (DYMS23) exercises



From left to right: Margarida Almeida (IT), Catarina Bastos (Deimos), Coronel Paulo Santos (Gabinete Nacional de Segurança), Nuno Ávila (Deimos), Daniel Pôças (IT).

#### Field Demonstration

Three of our partners, Quantum Communications Group (Instituto de Telecomunicações - Aveiro), Elecnor Deimos, and Gabinete Nacional de Segurança (GNS), participated in a field demonstration of a cutting-edge quantum-link CV-QKD system developed in the laboratory to exchange confidential information between a command center and a docked navy frigate. The REPMUS & NATO Dynamic Messenger 2023 (DYMS23) exercises were organized by the Portuguese Navy at the Operational Experimentation Center in Troia, Portugal.

#### In this issue:

Participation in the REPMUS & NATO DYMS23 exercises; FCCN, IPTelecom, and Warpcorn implement Secure Communication Infrastructure; EuroQCI - Spain; Roll-Up; Our partners, Brochure, and Upcoming Communications Activities.

#### About the project

- > The Portuguese Quantum Communication Infrastructure (PTQCI) project is the first land segment of the European Quantum Communication Infrastructure (EuroQCI) in Portugal and is the first step towards the integration in the European infrastructure.
- > PTQCI should enable the deployment of highlysecure services based on Quantum KeyDistribution (QKD).



## Demonstration

# FCCN, IPTelecom, and Warpcom implemented a Secure Communication Link based on Quantum Technologies



*Secure Communication Link connecting two points, on a 14-kilometer route, in Lisbon.*

FCCN, IPTelecom and Warpcom, partners in the Portuguese Quantum Communications Infrastructure - PTQCI project, joined forces to implement a modern secure communications link, through a system that combines a quantum cryptographic technology with network and security solutions, connecting two points, on a 14-kilometer route, in Lisbon.

A Quantum Key Distribution (QKD) system was used to perform the activity to guarantee the security of the generation of cipher keys between two points. The exercise highlights the importance of the technology for data protection and encryption and for strengthening the communication infrastructure in Portugal.

"This demonstration is not only evidence of

technological progress but also a materialization of collaborative innovation. It demonstrates what can be developed when experts in the field come together to open new frontiers in data security and quantum technology", says Bruno Gonçalves, from Warpcom.

The FCCN, IPTelecom, and Warpcom teams have plans to follow the implementation of quantum network technology in a national context, through integration tests with different QKD system solutions from different traditional network and security manufacturers.

The demonstration was carried out within the scope of the Portuguese Quantum Communications Infrastructure - PTQCI project with the support of the EuroQCI program.

## Participation

### EuroQCI - Spain

On November 28th, Catarina Bastos from Deimos participated in the "Quantum Communication Innovation Forum", an event organized by the EuroQCI-Spain consortium.

The PTQCI project was discussed at the "EuroQCI National Projects" roundtable, in the "European Quantum Communications Ecosystem" session, at the BAT B Accelerator Tower in Bilbao, Spain.



*Quantum Communications Innovation Forum, in Bilbao, Spain.*

## Communication Materials

# PORTUGUESE QUANTUM COMMUNICATION INFRASTRUCTURE

## PTQCI PROJECT ROLL-UP

This roll-up was developed as a support material to present the PTQCI project in presentations, meetings, events, and conferences. The main goal is to demonstrate the project's purpose, the practical applications, the use cases, and the activities to be developed during the project's lifetime.

Download the roll-up [here!](#)



**PTQCI**  
PORTUGUESE QUANTUM COMMUNICATION INFRASTRUCTURE

### ABOUT THE PROJECT

The Portuguese Quantum Communication Infrastructure (PTQCI) project is the first land segment of the **European Quantum Communication Infrastructure (EuroQCI)** in Portugal and is the first step towards the integration of the European infrastructure.

PTQCI should enable the deployment of a **highly secure, scalable, and resilient network based on Quantum Key Distribution (QKD)** between different public authorities in Lisbon, as well as a testbed network involving academic and private stakeholders, and plan its expansion to other sites in Portugal and Spain, and connection to space assets.

PTQCI will safeguard sensitive data and critical infrastructures by integrating quantum-based cryptographic systems into existing communication infrastructures.

PTQCI is part of a roadmap for deploying national secure communication infrastructures and technology provision, and builds on previous milestones achieved, and currently in implementation by the core team on the past few years:

- Advanced theoretical and practical experiments with **quantum key distribution (QKD)** and **cryptographic protocols** leading to the successful demonstration of a quantum secure link between two PT military sites using exclusively national technology (QCRIFT, 2021).
- PT leadership of a major project under EDIPD and supported by MoD and industry from Spain, Italy, and Austria aiming at integrating and combining Software Defined Networks (SDN) and QKD technologies on top of legacy optical networks to build a highly secure, scalable, and resilient network control architecture for advanced operational services and develop national cipher machines (DISCRETION, 2021).
- The implementation of the **NATO Cyber Academy Hub** in Lisbon to which the activities of DISCRETION are connected, and the participation of Portugal in the **Space component of EQCI through PSPACE**.

### OBJECTIVES

- To standardize and deploy an SDN enabled by QKD over existing fiber infrastructures, making use of European components and PT-designed cipher machines with the objective of sharing secure information between different governmental/public institutions in Portugal.
- To demonstrate secure communications between public authorities and Defence buildings, preparing the expansion of the network to farther locations in Portugal, in particular to a favourable location where an Optical Ground Station (OGS) shall be implemented to allow the connection between ground and space segment of EQCI.
- To implement in parallel a testbed network to test new technologies preparing the roadmap of PTQCI, using free space links, 5G/IoT, and considering different use cases.
- To enable training and educational activities, for instance promoting the use of this infrastructure by the European Cyber Academia and Innovation Hub (EU CAIH) providing a vital contribution to strengthening national, NATO, and EU's capability to defend against the threats of the digital world.

### QUANTUM CRYPTOGRAPHY & QKD

Quantum cryptography uses the principles of quantum physics to provide data encryption, in contrast to traditional cryptography, which relies on mathematical conjectures and high-demanding computation.

Due to the intrinsic properties of quantum mechanics, quantum protocols allow for the detection of any eavesdropper.

The generation and distribution of quantum keys can significantly improve the quality of cryptography in general.

Quantum cryptography comprises the exchange of quantum states (carried by particles of light - photons) through standard telecom optical fibers or free space optical links.

Quantum key distribution (QKD) is a new paradigm for secure key exchange.

QKD uses quantum resources to exchange cryptographic keys without using asymmetric cryptographic algorithms. QKD is robust to quantum computer attacks. Moreover, QKD can distribute:

- symmetric keys: enabling future-proof secure communication services
- oblivious keys: enabling future-proof secure computing services.



### USE CASES

PTQCI's architecture will be defined to address the following use cases:

- Establishing secure communication between different sites from **PT Government and Civil Protection** (first segment of PTQCI).
- Establishing secure communications and links to **Azores and Madeira**.
- Establishing secure communication that crosses an infrastructure that is shared among **member states** (link to EQCI).

While the first use case will be implemented in PTQCI action, the second and third use cases will be addressed only up to the design stage.



### EuroQCI & PETRUS

The EuroQCI will be a secure quantum communication infrastructure spanning the whole EU, including its overseas territories.

PETRUS is the **Coordination & Support Action** for the national Quantum Communication Infrastructures to be rolled out in the **EU Member States** over the coming years and supports the Digital Europe Program projects that will form the basis for a European industrial ecosystem for secure quantum technologies.

<https://petrus-euroqci.eu/>

Build and deploy in the next decade a certified secure pan-European end-to-end QCI for **cybersecurity services**.

- QKD INFRASTRUCTURE
- TESTING OF CROSS-BORDER QCI LINKS

**DECLARATION ON A QUANTUM COMMUNICATION INFRASTRUCTURE FOR THE EU**

All 27 EU Member States have signed a declaration agreeing to work together to explore how to build a quantum communication infrastructure (QCI) across Europe, boosting European capabilities in quantum technologies, cybersecurity and industrial competitiveness.



## Let's meet our partners!



"We develop technologies that profit from the peculiarities of quantum theory to do new things or to improve the way we do things".

Quantum Communications Group - Instituto de Telecomunicações (Aveiro)

"We explore how quantum mechanics can touch the communications industry and feed innovation in our products".

Altice Labs



"We aim for the highest quantum communications levels of performance in Europe, and we integrate quantum key distribution in secure networks".

Elecnor Deimos Engenharia

## Communication Materials

### BROCHURE

### PTQCI PROJECT BROCHURE

This brochure was developed as a support material to present the PTQCI project.

The main goal is to share the flyers with the partners to collaborate with the dissemination of the project.

[Download the brochure here!](#)

**CONSORTIUM**

deimos, GNS, Instituto de telecomunicações, altice labs, warpcom, IP Telecom, TÉCNICO LISBOA, ISEL, FCCN, IPO, omidea, adyta

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ENABLING THE FUTURE SECURITY

The PTQCI will safeguard sensitive data and critical infrastructures by integrating quantum-based cryptographic systems into existing communication infrastructures

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EuroQCI

This project has received funding from the EU's Digital Europe Programme under the project "Portuguese Quantum Communication Infrastructure" (PTQCI, grant agreement No 101091730).

**ABOUT**

The Portuguese Quantum Communication Infrastructure (PTQCI) is the Portuguese first land segment of the European Quantum Communication Infrastructure (EuroQCI).

PTQCI should enable the deployment of high secure services based on Quantum Key Distribution (QKD).

**QUANTUM CRYPTOGRAPHY**

Quantum cryptography uses the principles of quantum physics to support cryptographic services.

**QKD**

Quantum key distribution (QKD) is a new paradigm for secure key exchange. QKD uses quantum resources to exchange cryptographic keys without using asymmetric cryptographic algorithms.

QKD is robust to quantum computer attacks. Moreover, QKD can distribute symmetric keys, enabling future-proof secure communication services, and oblivious keys, enabling future-proof secure computing services.

**OBJECTIVES**

- Designing, implementing, and testing an operational quantum network between public authorities.
- Implement in parallel a testbed network to test new technologies preparing the roadmap of PTQCI.
- Run a series of use cases to demonstrate the real potential of quantum technologies.
- Promote training and education activities in quantum technologies.

**USE CASES**

- RESEARCH
- SECURED HEALTH CARE INFORMATION
- AUTHORITIES
- DEFENSE & MILITARY
- KEY WRAPPING

PTQCI 1<sup>st</sup> network segment, Lisboa

Future segments

**EuroQCI** - The European Quantum Communication Infrastructure. The European Commission is working with all 27 EU Member States, and the European Space Agency (ESA), to design, develop, and deploy a pan-European quantum secure network composed of a terrestrial segment relying on fiber communications networks linking strategic sites at national and cross-border levels, and a space segment based on satellites.

**PETRUS** prepares for a fully functional and harmonized EuroQCI by covering all relevant fields, coordinating national QCIs, using EU-27 components, and adhering to European accreditation and certification policies.

## Upcoming Communication Activities

➤ **Institucional Video**

➤ **Podcast**

➤ **Project Stationary Materials**

➤ **Workshop: Quantum Communications Network**

PTQCI 1<sup>st</sup> network segment, Lisboa



## Consortium's partners



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