PhotonHub Demo Centre

Course 01
Quantum Communication applications

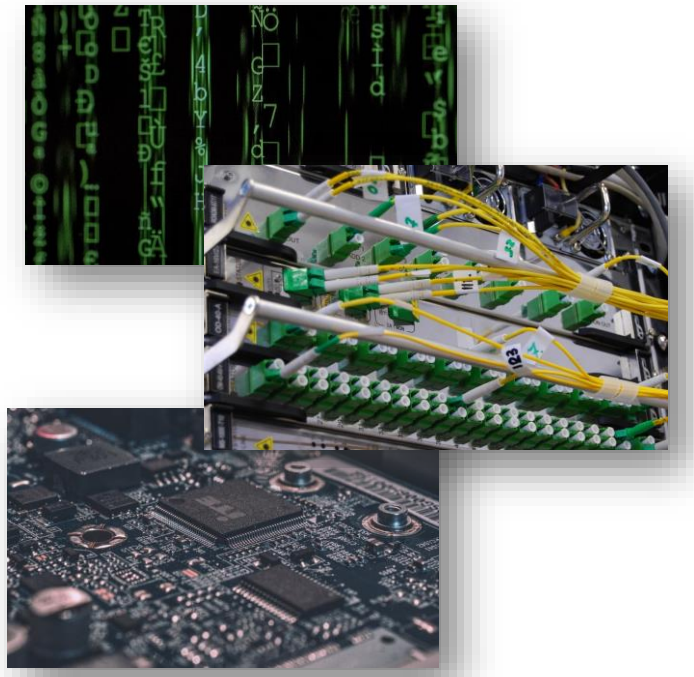
Course Provider

National Research Council – National Institute of Optics (CNR-INO),
Headquarters of Arcetri (Florence),
Italy

Course Overview

The Demo Centre on Quantum Communication applications will be focused on the application perspectives of QKD in cybersecurity. It will be divided in four main parts:

1) Interactive introduction to the basic concepts of Quantum Communication;
2) Quantum Key Distribution (QKD) and infield implementations, including a practical demonstration of QKD in collaboration with Quantum Telecommunication Italy (QTI);
3) Cybersecurity industrial application examples in collaboration with Quantum Telecommunication Italy (QTI)



Course Programme

9.00 – Welcome and presentation of PhotonHub Europe

9.30 – Introduction tutorial on Quantum Communication

10.15 – Coffee break

10.45 – Tutorial on Quantum Key Distribution

11.30 – State of the art on Quantum Key Distribution

12.15 – Lunch

13:30 – Deterministic single photon sources

14:15 – Free space Quantum Key Distribution

14:45 – Coffee break

15.15 – Quantum Key Distribution – BB84 (hands-on demo)

16.15 – Remote demo QKD – QTI

17:15 – Open Q&A

17:45 – Greetings & conclusion

Target Audience

The course targets a broad audience and mainly producers oriented to produce/exploit novel photonic technologies for security and communication.

Basic knowledge of quantum mechanics will not be required but knowing in advance the attendees' background will help us to opportunely adapt the course.

Expected Outcomes

1) Understanding the basic concepts of Quantum Communication and QKD (interactive activity);
2) Demonstration of QKD over a fiber link (hands-on activity);
3) Demonstration of QKD over a free-space link(hands-on activity);
4) Understanding of QKD Applications

Course Trainers

Course Director: Dr. Natalia Bruno

Course Manager: Daniela Selisca

Trainers:

Davide Bacco

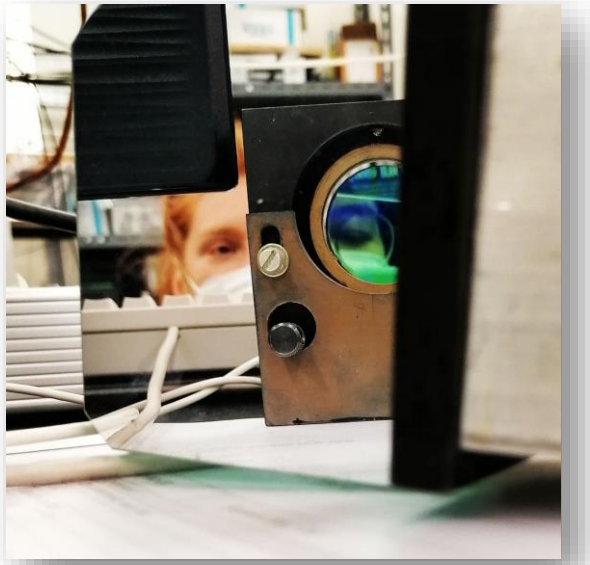
Natalia Bruno

Sebastiano Cocchi

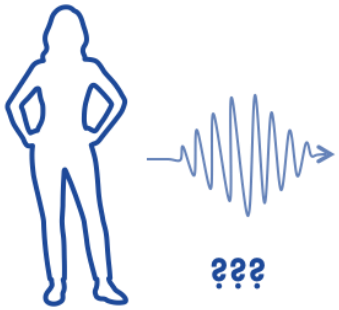
Maja Colautti

Claudia De Lazzari

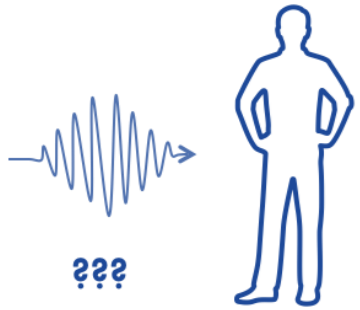
Tecla Gabbrielli



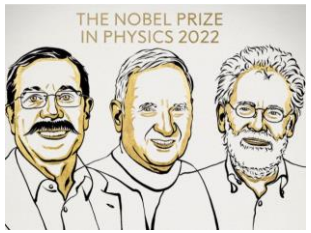
Course Demonstrators



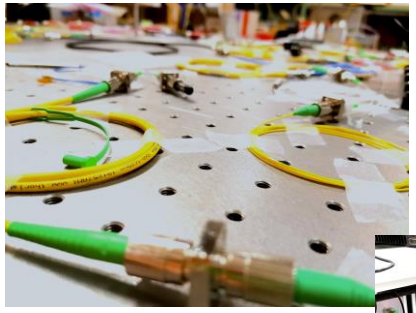
$$\frac{1}{\sqrt{2}}|0\rangle|1\rangle + \frac{1}{\sqrt{2}}|1\rangle|0\rangle$$

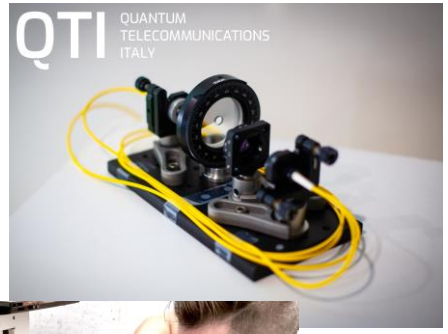


Quantum Communication



QKD Demo 1: BB84





QKD Demo 1: Fibre based QKD system

Course Location, Schedule & Cost

Villa 'Il Gioiello' (aka as Villa Galileo)

Via Pian dei Giullari 4 – Firenze

https://en.wikipedia.org/wiki/Villa_Il_Gioiello

CNR-INO
ISTITUTO NAZIONALE DI OTTICA
CONSIGLIO NAZIONALE DELLE RICERCHE

- Course Schedule (29 February 2024)
- Number of people (Groups of 5-10 people per course)
- Course Cost : **250 € per person - 150 € for early registrations**

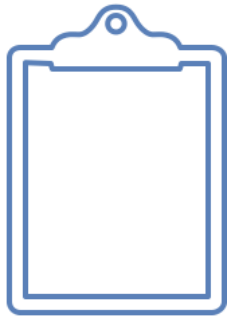
  including catering for lunch and coffee breaks and project consumables, e.g. course material

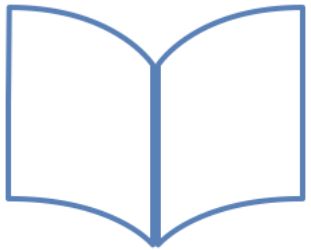
Further Information

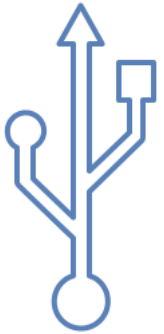
- Natalia.Bruno@ino.cnr.it
- www.quantumcommunications.ino.cnr.it
- www.ino.it

Course Material (technical hand-outs)

- **Course slides provided in pdf**
- **Course bibliography**







Keywords

Quantum Communication, Quantum Network, Cryptography, Photonics, Photon source, Lasers Entanglement, Secure Communication, Quantum Key Distribution, Communication, Ground to Space Communication, Security

Technology & application areas

Applications: Information & Communications, Smart Cities & Smart Living

"**Digital Infrastructure**" (Visible Light Communication systems, Quantum Key Distribution systems, Single photon sources for Quantum Communication, Quantum Key Distribution systems (fibre & free-space), Entangled-photon sources for quantum enhanced technologies, Single photon sources for Quantum Communication) and "**Safety, security, space and defence**" (Entanglement-assisted communication systems)

Technologies: Free-Space Photonic Components & Systems, Glass & Polymer Specialty Fiber & Fiber Devices