Istituto Nazionale di Fisica Nucleare

IQCI

INFN quantum cryptography initiative

RL – Massimo Borghi

Informazioni generali

Sezioni Coinvolte:

Roma- A. Salamon (Coord. Naz.)
Pavia 1 - M. Borghi
Pavia 2 - V. Bellani
Bari - C. Lupo
LNN - M. Campostrini
Perugia - P. Piergentili
Pisa - S. Spinella
TIFPA- T. Velha
Torino- J. Forneris

Anagrafica di Pavia (1) 2025:

Massimo Borghi	0.4
Daniele Bajoni	0.2
Matteo Galli	0.2
Marco Liscidini	0.2

Durata del progetto:

2025-2027

FTE 2025 sezione PV 1 : 1 FTE

Activities 2025

The IQCI project aims to deploy a complete polarization encoded Quantum Key Distribution system in a real telecommunication environment.

The basic building blocks needed for a fully integrated QKD system will be designed and produced. In particular the research activity will be focused on engineering the integrated photon sources and detectors, along with the optical elements for the control and transmission of the generated states.

The activity carried out by Pavia (1) will focus on the design and characterization of novel photon sources based on nonlinear optical processes in integrated devices realized in several material platforms such as Silicon, Silicon Nitride and AlGaAs. Sources will be specifically developed for high-rate and low QBER QKD protocols by exploiting hyperentangled states in different degrees of freedom, including time-bin, frequency-bin, and polarization.

Richieste 2025

Budget

- Consumo 5
- Inventariabile
- Altri servizi
- Missioni 5

totale 10 KEuro

Servizi

- non necessari

Istituto Nazionale di Fisica Nucleare

IQCI

INFN quantum cryptography initiative

RL – Vittorio Bellani

Informazioni generali

Sezioni Coinvolte:

Roma- A. Salamon (Coord. Naz.)
Pavia - V. Bellani
Bari - C. Lupo
LNN - M. Campostrini
Perugia - P. Piergentili
Pisa - S. Spinella
TIFPA- T. Velha
Torino - J. Forneris

Durata del progetto:

2025-2027

Anagrafica di Pavia 2025:

Bellani Vittorio	0.5
Boffelli Massimo	0.2
Demontis Valeria	0.4
Domenic Prete	0.4
Lacava Cosimo	0.4
Rossella Francesco	0.2
Vitali Valerio	0.4

FTE 2025 sezione PV : 2.5 FTE

Activities 2025

The IQCI project aims to deploy a complete polarization encoded Quantum Key Distribution system in a real telecommunication environment.

The basic building blocks needed for a fully integrated QKD system will be designed and produced. In particular the research activity will be focused on the ingegnerization of integrated single photon source and detectors, on polarization controllers and on the design of transmitter and receiver chip for decoy state BB84 protocols. Dedicated Superconductive Nanowires Photon Number Resolving detectors will be designed and tested.

One (1D) and two-dimensional (2D) van der Waals materials can function as single-photon light sources and single electron devices for implementation in cryptography. For advanced data encryption, quantum random number generators (QRNGs) utilizing random telegraph noise (RTN) from 1D and 2D materials and devices provide high randomness and low power consumption. Low dimensional materials, like van der Waal materials and nanowires create stable, high-throughput QRNGs, perfect for one-time passwords. Additionally, perovskites offer highly secure, fast, and integrable QRNGs, generating random numbers, making them suitable for encryption and quantum information tasks with potential for future quantum technologies.

Richieste 2025

Budget

- Consumo 6

  (AFM and KPFM tips, substrate, TMD crystal, lab spares chemicals, optics electronics, …)
- Inventariabile
- Altri servizi
- Missioni 6

totale 12 KEU

Servizi

- - -