



UNIVERSITÀ
DEGLI STUDI
DI TRIESTE



Dipartimento di

Fisica

Dipartimento d'Eccellenza 2023-2027

Trieste Quantum Seminar Series

Friday December 19th 2025, at 11:00

Sala Sancrotti, Edificio Q2

Area Science Park, Strada Statale 14 km 163.5, Basovizza

Prof. Marco Lucamarini

School of Physics, Engineering, and Technology,
York Centre for Quantum Technologies,
University of York, UK

Quantum Communication Technology: State of the Art and Challenges Ahead



Abstract: Quantum communication technologies are rapidly evolving from theoretical concepts to engineered systems capable of securing information with the laws of physics rather than mathematical complexity. In this talk, I will introduce the basic principles of quantum communication and quantum key distribution (QKD), explain why quantum mechanics guarantees their security, and discuss the main challenges to real-world implementation, including transmission distance and system reliability. I will then review recent breakthroughs such as twin-field QKD, which has extended secure communication beyond 1000 km of optical fibre, and highlight ongoing developments in satellite links, quantum repeaters, and next-generation optical fibres. Finally, I will outline how these advances are shaping the future quantum internet and positioning Europe at the forefront of this technological revolution.

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