



UNIVERSITÀ DI PAVIA
Dipartimento di Fisica

Avviso di Seminario

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**LONG-DISTANCE QUANTUM COMMUNICATIONS –
HOW FUNDAMENTAL SCIENCE TESTS LEAD TO
SATELLITE-BASED QUANTUM NETWORKS**

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Abstract: Quantum information processing and quantum communication are novel protocols that originate from the very fundamental and philosophical questions on superposition and entanglement raised since the early days of quantum mechanics. Strikingly, these new protocols offer capabilities beyond communication task possible with classical physics. One very important example is the secure key exchange based on the transmission of individual quantum signals between communication partners. The big vision and frontier in the field of quantum communication research is the development of a Quantum Internet, which establishes entanglement between many different users and devices. Extending today's internet, the Quantum Internet will readily transfer quantum bits, rather than classical bits, between users near and far and over multiple different channels and could be used for secure communications, quantum computer networks and metrological applications. I will discuss recent advances on implementations and tools useful for generating and distributing photonic quantum entanglement over robust channels including. Time-bin encoding and reference-frame-free protocols. I will also present an overview of the upcoming Canadian quantum communication satellite QEYSSAT.