QScale

Tue, 2012-03-27 07:21 - Lukas Theussl **Full Name:** Quantum technologies for extending the range of quantum communications
Coordinator: Dr. Julien Laurat

Location

Laboratoire Kastler Brossel 212, rue de Bercy
F-75012 Paris France
48° 50' 44.862" N, 2° 22' 15.5064" E
Website:
http://www.chistera.eu/projects/qscale

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The QScale project focuses on the development of advanced quantum communication technologies, specifically of quantum repeater architectures, which represent a major and timely challenge for the field of quantum information science and technology.

Quantum repeaters are needed in order to overcome losses and errors in the transmission of quantum data. It allows the distribution of entanglement at arbitrary large distances, which is a universal resource for quantum information applications, including quantum cryptography and quantum teleportation.

The first part of the project is devoted to photonic components, i.e. the development of entangled photonic sources compatible with quantum memories, and of continuous-variable quantum light pulses, including non-Gaussian fields for hybrid quantum repeater architectures.

In the second part, efficient coupling between light and material systems will be implemented. It will allow the reversible mapping of quantum photonic information into and out of the memory device or the synchronized emission of single-photons from remote systems. Several materials, including cold and ultra-cold atomic ensembles, trapped-ion strings and rare-earth ion doped crystals will be studied.

The third part will integrate these outcomes. It will address effective storage of entanglement in the devices developed previously, assessing their ability to operate as nodes of quantum repeaters. It will also pave the way towards deterministic entanglement swapping. The various photonic carriers and material memory systems investigated above will be compared.

Finally, procedures and architectures for quantum repeater systems based on the previous elements will be examined and investigated, including novel hybrid schemes and new deterministic operations. Their implementation with the devices developed in the project will be assessed.

At present quantum repeaters constitute a well-identified milestone on the quantum technology road maps, so the proposed project is a high-risk but also high-pay-off one.

Further information: http://chistera-qscale.eu

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