Centre for Quantum Photonics

Fri, 2016-07-22 18:33 - Lorraine McManus [1] **Website:** http://www.bristol.ac.uk/physics/research/quantum/ [2]

Research Type: Theory
Experiment

Our goal in the Centre for Quantum Photonics is to explore fundamental aspects of quantum mechanics, as well as work towards future photonic quantum technologies by generating, manipulating and measuring single photons as well as the quantum systems that emit these photons.

The Centre spans the School of Physics and Department of Electrical and Electronic Engineering in the Faculties of Science and Engineering, and the Centre for Nanoscience and Quantum Information.

Quantum Communication
We focus on quantum entanglement as the main route to quantum communications in order to exceed the powers of existing classical techniques.
In light of applications such as quantum cryptography and quantum teleportation, we understand the significance of the extension of quantum-entanglement-based protocols to global distances, not least because it has resulted in considerable practical interest.
We have been able to experimentally demonstrate entanglement-based quantum key distribution over 144 km. This is achieved by measuring a photon locally at the Canary Island of La Palma while a second is sent over an optical free-space link to Tenerife, where the Optical Ground Station of the European Space Agency acts as the receiver.
This exceeds previous free-space experiments by more than an order of magnitude in distance, and is an essential step towards future satellite-based quantum communication and experimental tests of the limits of quantum physics.
A major research interest in this field is Quantum Key Distribution (QKD), which we developed in partnership with Nokia.

Quantum Sensing & Metrology
Quantum entanglement enables higher precision estimates than would otherwise be possible and we have demonstrated an optical phase measurement with an entangled four-photon interference visibility greater than the threshold required to beat the standard quantum limit – the limit attainable without entanglement.
These results lead the way to new high-precision measurement applications.
Research interests within the field of quantum sensing and metrology include:
Quantum Metrology
Quantum Measurement and Control
Quantum Imaging

Quantum Computing

Quantum information and computation investigates fascinating issues at the foundations of computer science and quantum mechanics. The group have been integral to research at the heart of developing a quantum computer which operates at an exponentially faster rate than classical computers.
Research interests within the field of quantum information and computation include:
Optical Quantum Computing [3]
Integrated Quantum Photonics [4]
Solid State-Photonic Quantum Information Science [5]
Quantum in the Cloud [6]
Leader: Jeremy O'Brien

Location

University of Bristol H H Wills Physics Laboratory
Bristol BS8 1TL United Kingdom
Phone: 1173940024
51° 27' 31.5072" N, 2° 36' 8.2296" W
See map: Google Maps [7]

- Quantum Communication [8]
- Quantum Control [9]
- Quantum Engineering [10]
- Quantum Computation [11]
- Quantum Information Theory [12]
- Quantum Metrology, Sensing and Imaging [13]
- Quantum Simulation [14]

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