ICFO

SEMINAR: Quantum information science with swift electrons

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Seminar Room

About 15 years ago, experiments in electron microscopes showed that free electrons could interact quantum-mechanically with light, and since then this novel effect has contributed greatly to our understanding of materials and physical phenomena at the nanoscale. Given its apparent connections with quantum optics, we thought it would be interesting to explore this new field from the perspective of quantum information and technology.
In this talk I will review recent progress along this line of research: we have developed the capabilities to accurately control and measure the quantum state of swift electrons [1], we have used them to produce non-classical states of light [2], and more recently we have been able to generate quantum entanglement between electrons and single photons and reconstruct their joint quantum state as a whole [3].
These experiments offer a somewhat different view of quantum optics when compared with conventional approaches based on photonics, atoms, and molecules, and we expect their applications to look rather different too. In the near term, our research efforts are directed towards the generation of quantum entanglement between electrons, and implementations of quantum-enhanced imaging and sensing schemes in electron microscopes.

Hosted by: Prof. Dr. Javier Garcia de Abajo