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Monday, 9. March 2015, 11:00h

Title: "The physics of nanowire superconducting single photon detectors"

Abstract:
Nanowire superconducting single photon detectors (SSPDs) are of great technological importance for many applications such as quantum cryptography, interplanetary communication and cancer research. They have low dark counts, high detection efficiency (>90%) and operate in the near-infrared. Yet, their working mechanism is poorly understood.

In this talk, I will give an overview of our work on this problem. I will demonstrate that the working mechanism of such detectors relies on a combination of quasiparticle diffusion and vortex entry. This result enables us to explain several properties of these devices, in particular the temperature dependence of the detector response, which was a long-standing open problem in this field.

Moreover, I will demonstrate that the efficiency of the detector depends on where along the cross-section of the wire the photon is absorbed. This position-dependent internal detection efficiency has a typical length scale of some tens of nm. This property is crucial for near-field applications of these devices.

These results, combined with a numerical model developed at the university of Zurich, place the field of SSPD physics on a quantitative basis. They therefore open the way to ab-initio design of these detectors.