

Nanodevices for emission and detection of single photons

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With the aim of implementing quantum networks, we develop nanoscale devices to generate quantum states of light with semiconductor quantum dots, single photon detectors based on superconducting nanowires and integrated photonic circuits to filter, route and detect single photons.

The generation of single photons can readily be performed with single quantum dots. We demonstrate very high single photon purity, exceeding 99.99% generated at 795 nm [1] allowing for interfacing with rubidium vapors. To enable long distance quantum communication, we also develop quantum dot devices able to emit at telecom frequencies [2].

To allow for complex architectures, on-chip integration is required. We demonstrate filtering and routing of single photons with tunable ring resonators on a chip and discuss the scalability of this approach [3].

Generation and manipulation of quantum states of light would be useless without single photon detectors. We are therefore developing high-performance single photon detectors based on superconducting nanowires and will present state-of-the-art performance in terms of detection efficiency, low dark counts and time resolution.

References

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