



**Theoretical and Physical Chemistry Institute
National Hellenic Research Foundation**

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LECTURE

“Generation, manipulation and detection of single photons”

Prof. Val Zwiller

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Royal Institute of Technology,
Stockholm, Sweden**

Wednesday, April 3, 2024, 14:00

Seminar room, ground floor, NHRF

Generation, manipulation and detection of single photons

Val Zwiller

*Quantum Nanophotonics, dept. of Applied Physics, Royal Institute of Technology,
Stockholm, Sweden*

We develop quantum devices to enable the implementation of quantum technologies based on controlling light at the single photon level. Future quantum communication and sensing will require high-performance quantum devices able to generate and detect light one photon at a time. Schemes to manipulate light on-chip, based on integrated photonics are carried out in our group. Our single photon sources based on semiconductor quantum dots can generate single photons as well as entangled photon pairs at telecom wavelengths to enable implementation of long distance quantum communication. We operate a quantum network made of deployed optical fibers in the Stockholm area and demonstrate single photon transmission and quantum key generation over 34 km.

Single photon detectors with high detection efficiency, low noise and high time resolution are major enabling techniques, our spinoff company Single Quantum develops superconducting nanowire single photon detectors with applications in quantum communication, integrated quantum circuits as well as for lidar and quantum microscopy. We will discuss these applications along with the specific detector requirements for technologies based on single photon detection. Further improvements in terms of time resolution, photon number resolution and extended detection ranges will also be discussed.