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Extended Abstract

Superconducting Nanowire Devices for Light Detection at the Single-Photon Level †

Stephan Steinhauer [1,*], Samuel Gyger [1], Ali W. Elshaari [1], Julien Zichi [1], Iman Esmaeil Zadeh [2], Jin Chang [2], Johannes W. N. Los [3], Nima Kalhor [3], Sander Dorenbos [3] and Val Zwiller [1,*]

[1] Department of Applied Physics, Royal Institute of Technology (KTH), SE-106 91 Stockholm, Sweden; gyger@kth.se (S.G.); elshaari@kth.se (A.W.E.); zichi@kth.se (J.Z.)
[2] Optics Research Group, ImPhys Department, Faculty of Applied Sciences, Delft University of Technology, Lorentzweg 1, 2628 CJ Delft, The Netherlands; I.EsmaeilZadeh@tudelft.nl (I.E.Z.); J.Chang-1@tudelft.nl (J.C.)
[3] Single Quantum B.V., 2628 CH Delft, The Netherlands; niels@singlequantum.com (J.W.N.L.); nima@singlequantum.com (N.K.); sander@singlequantum.com (S.D.)
* Correspondence: ssteinh@kth.se (S.S.); zwiller@kth.se (V.Z.)
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Superconducting nanowire single photon detectors (SNSPDs) have become a mature technology for single-photon detection with excellent performance [1]. In particular, these devices have wide wavelength sensitivity from the visible to the mid-infrared range and combine high detection efficiency, low dark count rate and high time resolution [2]. Furthermore, SNSPDs can be coupled to waveguides in photonic integrated circuits, which makes them ideally suited for scalable large-scale integration [3,4]. We will present our progress on performance improvements of SNSPDs and their integration on different material platforms. The fabrication of SNSPDs relied on the deposition of NbTiN thin films combined with electron beam lithography and reactive ion etching. Magnetron reactive co-sputtering at room temperature was employed to obtain nanocrystalline NbTiN thin films [5] with thicknesses around 10 nm. Thin film properties on different substrates relevant for photonic integrated circuits such as silicon nitride, lithium niobate, aluminum nitride and gallium arsenide will be compared and the realization of SNSPDs will be demonstrated. While showing the robustness of our thin film deposition method for the fabrication of superconducting devices, we will discuss challenges and prospects for optimization. Eventually, functionalities and applications related to nanophotonics and quantum optics will be outlined.

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