683rd Wilhelm-Else Heraeus Seminar: Physics and Applications of Superconducting Nanowire Single Photon Detectors

By Tim Bartley (scientific organiser), Junior Professor, Paderborn University, Germany

February 1, 2019 (HE115). Due to their high efficiency, high speed, and low noise, superconducting nanowire single photon detectors have established themselves at the forefront of modern photonics, particularly in the emerging quantum technology sector. Different applications require each of these properties to be optimised to varying degrees, therefore a very strong interaction is needed between scientists studying the fundamental working principles and photonic engineers who develop technology using these devices. To that end, 74 participants representing 17 countries worldwide met at the wonderful Physikzentrum, Bad Honnef, Germany, to take part in the 683rd WE-Heraeus Seminar on the Physics and Applications of Superconducting Nanowire Single Photon detectors. Held over five days from the 12th November 2018, this seminar provided a great platform for stimulating talks, plenary discussions and an excellent opportunity from scientists at all levels to present and discuss their work with the community.

The aim of this meeting was to unite specialists in the theory and experiments covering three main areas, including fundamental working principles of SNSPDs, new materials, and applications. Of particular interest was the range of work covering the timing jitter of these devices, which has recently been shown to be in the picosecond range. These results have now allowed a direct comparison with the theory of the underlying detection mechanism, which show excellent qualitative agreement. Establishing the fundamental limits of jitter of these devices are directly linked to applications requiring precise timing resolution, particularly laser ranging (LIDAR) and reflectometry techniques (OTDR). Further applications include using these detectors' low noise properties their ability to constructed in arrays, for example in long-range space communication, low light level imaging, as well as the search for dark matter. The latter application in particular requires a careful understanding of the dark-count mechanisms, which emerged as an increasingly important area of research. By far the most established application area for these detectors is quantum technology, and many of these applications involved highly interdisciplinary techniques were presented, such as interfacing with quantum dots, nanophotonic structures and integrated in waveguides.

The attendance of almost all of the leading figures in the field, form North America, Asia and Europe lead to lively and fruitful discussions, as well as the opportunity to develop new ideas to drive the field onwards. That so many were able to come and enjoy the stimulating environment of the Physikzentrum is down to the extremely generous support of the Wilhelm-Else Heraeus Foundation, as well as the local organising staff, which enabled an extremely successful meeting. My personal thanks also go to the scientific co-organisers: Carsten Schuck (University of Munster), Döndü Sahin (University of Bristol), Alexander Korneev (Moscow State Pedogogical University).