

MicroQuaD-Material science

Microscopy with Multielement
Quantum Detectors

PUBLIC SUMMARY

Many applications ranging from communication to diagnostics and sensing require single photon detection with high efficiency, high count rates and high time resolution. In recent years, the development of superconducting nanowire single photon detector (SNSPD) as a new type of ultra-sensitive single-photon detectors has strongly advanced the progress made in several scientific areas such as optical quantum technologies.

However, their general deployment in other areas of research is still restricted due to the single mode optical interface of these detectors. It is our goal in the MicroQuaD project to overcome this limitation, since SNSPDs in combination with (confocal) microscope systems would enable new research opportunities in, e.g., life sciences or material sciences.

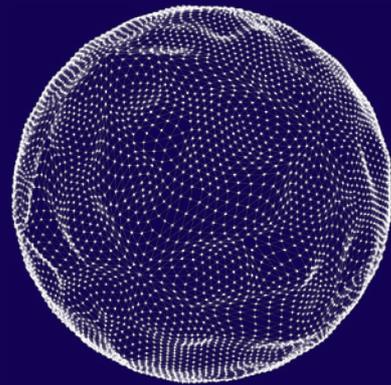
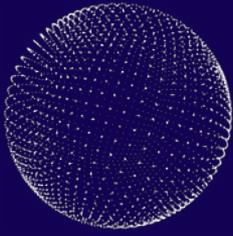
The MicroQuaD project will combine the expertise of two SMEs: Picoquant (PQ) and Single Quantum (SQ) to introduce the first commercial SNSPD-based microscopy system, allowing for ultra-fast and precise time-resolved measurements of fluorescence emission in the visible and the NIR wavelength range at a currently unmatched performance.

Two novel developments will be the key to make this possible: fast Multimode SNSPDs in combination with high resolution TCSPC electronics. The group at the Royal Institute of Technology (KTH) contributes its expertise in designing and operating confocal optical microscopes operating at the single photon level and its activities in solid state physics as well as in biomedical imaging.

The two SMEs will address the following challenges to be able to offer their customers the most advanced tools for their most demanding applications:

- PQ customers look for microscope-based lifetime imaging systems with the highest spatial and temporal resolution and sensitivity (especially in the NIR).
- SQ customers are asking for multimode SNSPDs (not commercially available yet).
- A synergetic co-development between our complementary SMEs is the most efficient way to bring the intended high-end products to the market. It will add extra value to our customers and will put us far ahead of competition.

We will demonstrate this technology for Life sciences and Materials research by imaging of cells transplanted to anterior chamber of eye or to brain as well as solar cells, CMOS circuits and on high-bandgap semiconductors.



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