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Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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Photonic quantum technologies: From foundations to applications

Stefanie Barz
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Abstract

The first quantum revolution allowed us to understand what already existed. It deeply changed our view of the world – it challenged classical physics and our perception of reality. Now, we are in the middle of the second quantum revolution. Isolating and controlling single quantum states has become the basis of a plethora of new technologies – “quantum 2.0” technologies.

In this talk, I will focus on photonic systems and show what role single photons can play in quantum technologies. Starting from very fundamental experiments at the very basis of quantum physics – interference at the few-photon level – I will proceed to explain how to perform quantum tasks with single photons. With the particular example of quantum networks, I will show how photonic quantum systems allow us to gain an advantage over classical systems.

I will show where the challenges of the future lie and how bridging the gap between engineering and physical sciences will allow us to address them – and thus advance quantum research both on the fundamental and the applied side. My talk will also underline that quantum research is a concerted, joint effort of physicists, computer scientists, and engineers. The future is quantum.