Universität Rostock
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IMAGING QUANTUM SYSTEMS
INTERNATIONAL GRADUATE SCHOOL

The International Research Training Group
“**Imaging of Quantum Systems**”

cordially invites you to a guest lecture by

Prof. Shabir Barzanjeh

(University of Calgary)

entitled

Nonlinearity as a Quantum Resource for Sensing and Imaging

The lecture will take place
on Tuesday, 7 July 2026, at 3:00 p. m.
in HS III (Albert-Einstein-Straße 24)

Mathematisch-Naturwissenschaftliche Fakultät, Institut für Physik

www.iqs.uni-rostock.de

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Abstract:

Nonlinearity is an important quantum resource for generating entanglement and squeezing, two key ingredients in quantum technologies. This presentation highlights recent progress by our team in using nonlinear processes to produce nonclassical states for quantum sensing applications. I will discuss three-wave and four-wave mixing in integrated quantum circuits, focusing on their role in developing robust sources of entanglement and squeezing.

I will also present our work toward practical quantum scanners for imaging and sensing. In particular, we study imaging methods for layered samples under extremely low illumination, where classical techniques become ineffective or risk damaging the sample. By combining quantum sensing with advanced machine learning, we aim to reconstruct clearer images faster, improve measurement accuracy, and enable real-time analysis

Short Bio:

Prof. Dr. Shabir Barzanjeh
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Dr. Shabir Barzanjeh is an Associate Professor whose research centers on quantum sensing and measurement using hybrid quantum systems. His work combines experimental and theoretical approaches to engineer nanofabricated electrical, mechanical, and photonic circuits for high-sensitivity detection and signal transduction. He developed deep expertise in superconducting circuit QED during his time at RWTH Aachen University and later held a Marie Skłodowska-Curie Fellowship at Institute of Science and Technology Austria.

A central theme of his research is the use of nonclassical states of light and hybrid quantum interactions to enhance sensing performance beyond classical limits. He proposed a microwave-to-optical photon conversion scheme based on mechanical resonators, enabling coherent links between frequency domains and opening new paths for distributed quantum sensing and quantum networks. His work also includes the development of quantum imaging and scanning platforms, as well as quantum-limited microwave amplifiers for precision measurements.