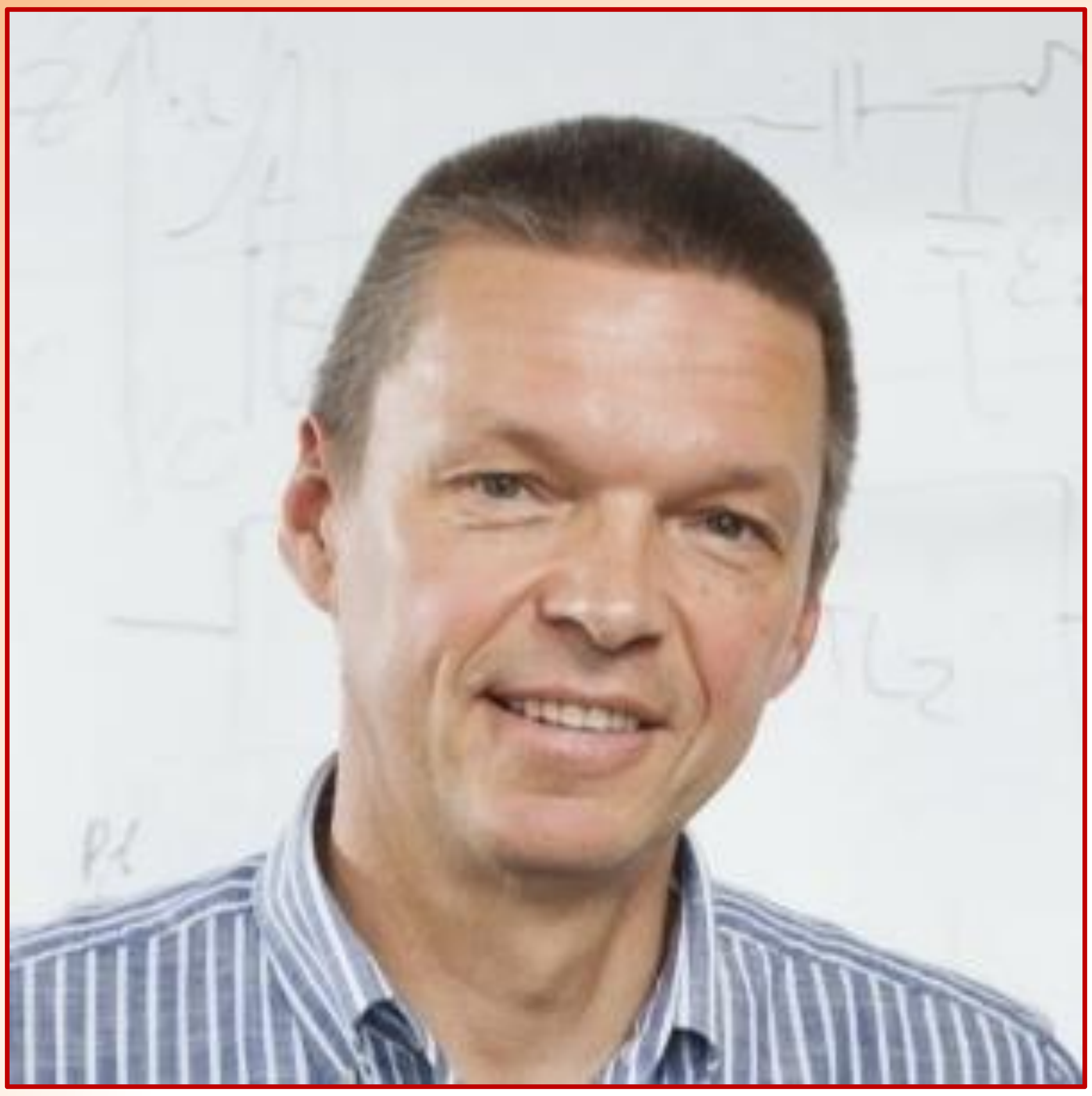
International Year of Quantum Science and Technology (IYQ)-2025, at TCG CREST (Kolkata, India)

INTERNATIONAL YEAR OF Quantum Science and Technology



Prof. Alexey Ustinov
Karlsruhe Institute of Technology (KIT), GERMANY

Date & Time:
20 May, 2025 @ 2:30 PM IST

Venue:
Classroom-2, TCG CREST

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Title: Identifying Material Defects in Quantum Circuits

Abstract

Material defects are currently recognized to be the main source of decoherence in superconducting circuits employed for modern quantum computers. In structurally disordered solids, atoms or groups of atoms are able to quantum mechanically tunnel between two nearly equivalent sites. These atomic tunneling systems have been previously identified as the cause of various low-temperature anomalies of bulk glasses and as a source of decoherence of quantum circuits where they are sparsely present in the disordered oxide barriers and on the surfaces of superconducting thin films. A tiny mechanical deformation of the circuit changes the energies of the atomic tunneling systems, which can be extracted from the microwave spectra of superconducting qubits and resonators. Tuning the properties of individual defects by applying mechanical strain and/or external electrical fields allow to study spectral properties, intrinsic relaxation and dephasing times, and detect mutual interactions between defects. Progress towards reliable large-scale quantum processors requires prevention of defects by improvements in device fabrication. On the other hand, quantum circuits also provide a novel and effective method for studying the physics of individual defects and origins of noise which limit circuit operation.

Organized by:
CQuERE (Centre for Quantum Engineering, Research and Education), TCG CREST, Kolkata, INDIA

For more details, please visit the website: http://www.tcgcrest.org/iyq2025
For any queries, feel free to contact us through the email: iyq.2025@tcgcrest.org