



e-conversion



# Special Schottky Seminar

**Tuesday, October 25, 2022**

**2:30-3:30 pm**

**WSI, Seminar room S 101**

<https://tum-conf.zoom.us/j/66116903839>

Meeting ID: 661 1690 3839

Passcode: 566921

## **“Tip-enhanced and pico-cavity nanoimaging of quantum dynamics at elementary length and time scales”**

Any realistic operation of quantum technologies will require counteracting the effects of dissipation and dephasing. In particular the wide range of solid-state systems are subject to many coupled internal degrees of freedom, structural heterogeneities, and coupling to the environment leading to the premature loss of coherence. Understanding and ultimately controlling the coupled quantum dynamics requires imaging the elementary excitations on their natural time and length scales. To achieve this goal, we developed different modalities of spatio-temporal optical nanoimaging. In corresponding ultrafast movies, we resolve the fundamental quantum dynamics down to the few-femtosecond regime with nanometer spatial resolution to resolve competing electron and phononic processes in perovskites, molecular, and 2D materials. I will then extend the discussion to new forms of photon-matter hybrid states that emerge from confining light on the nano- to atomic scale, with imaging in tip-enhanced strong coupling of single emitters, to new regimes of nonlocal and quantum nonlinear nano-optics. On the fundamental level, this work will deepen the understanding of what limits coherence in any many-body solid-state environment - a universal question underlying all solid-state quantum technologies.

Markus Raschke is professor at the Department of Physics and JILA at the University of Colorado at Boulder. His research is on the development and application of nano-scale nonlinear and ultrafast spectroscopy to control the light-matter interaction on the nanoscale. These techniques allow for imaging structure and dynamics of molecular and quantum matter with nanometer spatial resolution. He received his PhD in 2000 from the Max-Planck Institute of Quantum Optics and the Technical University in Munich, Germany. Following research appointments at the University of California at Berkeley, and the Max-Born-Institute in Berlin, he became faculty member at the University of Washington in 2006, before moving to Boulder in 2010. He is fellow of the Optical Society of America, the American Physical Society, the American Association for the Advancement of Science, and the Explorers Club.

**Prof. Markus B. Raschke**  
**Department of Physics and JILA**  
**University of Colorado, Boulder**  
**USA**