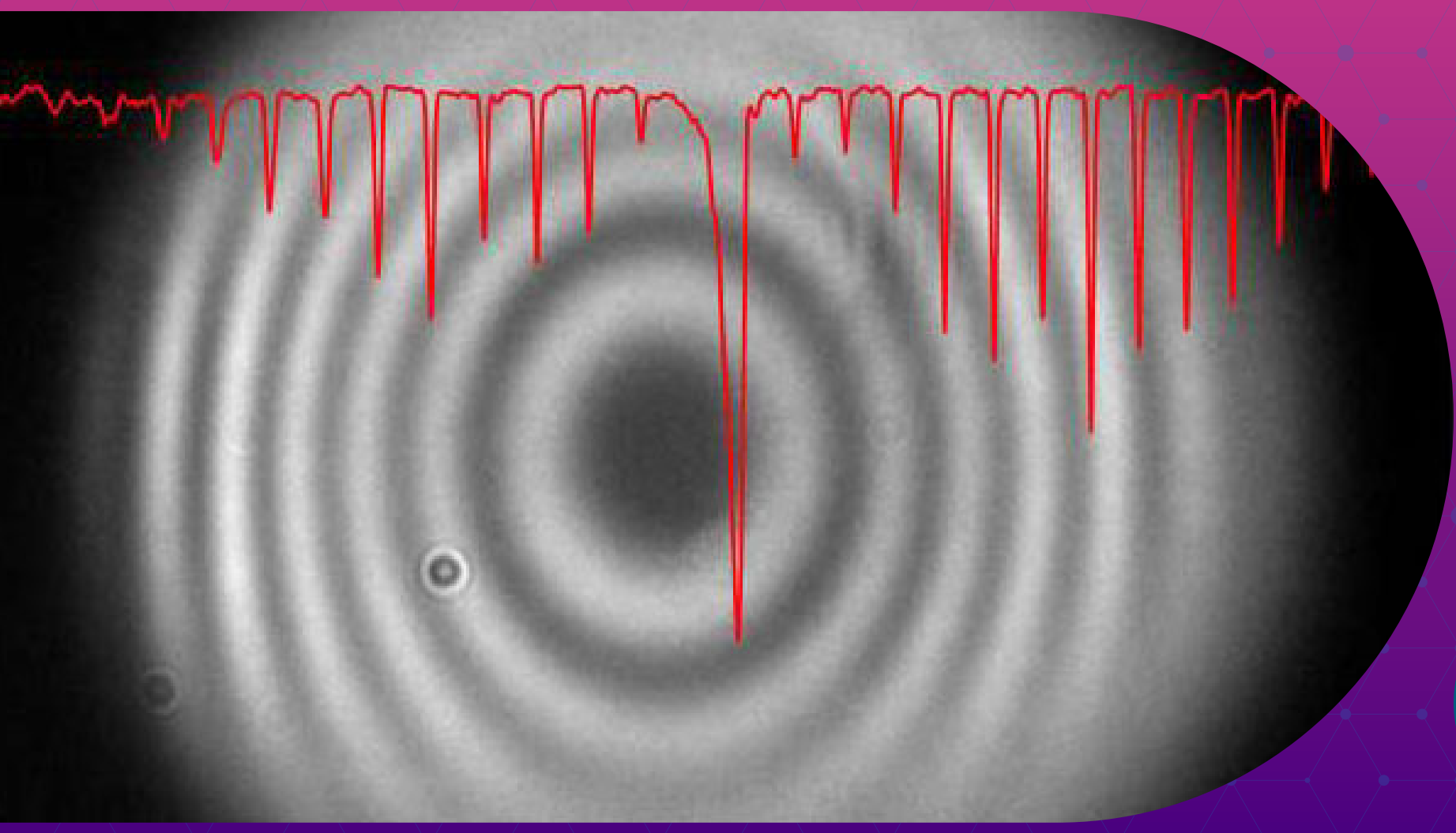
PHYSICSCOLLOQUIA2024



'For one-and-a-half centuries it was believed that the Abbe and Rayleigh diffraction limits based on classical wave dynamics set the ultimate boundaries of any imaging system. That believe was shattered by experimental work of Stefan Hell and co-workers starting in the mid 1990s, who decorated cells and macromolecules with fluorophores that can be selectively switched on and off. Meanwhile there is also firm evidence from quantum parameter estimation theory that in principle arbitrarily small distance between point emitters can be resolved with electromagnetic waves of finite wavelength. As a consequence, quantum-enhanced imaging is rapidly developing into a quantum technology where large and robust quantum advantages appear realistic in a relatively near-term future. In the talk I will review these developments and then present some of our own work on quantum-enhanced passive remote sensing of Earth via satellites. We demonstrate that enhancements of the spatial resolution by an order of magnitude or more are within reach of current technology for similar parameters as of the existing satellite mission "Soil Moisture and Ocean Salinity". Remaning challenges, both experimental and theoretical, will be addressed.

[1] Quantum-enhanced passive remote sensing, Emre Köse, Gerardo Adesso, and Daniel Braun, PRA 106, 012601 (2022)
[2] Superresolution imaging with multiparameter quantum metrology in passive remote sensing, Emre Köse and Daniel Braun, PRA 107, 032607 (2023)

Daniel Braun | Institut für Theoretische Physik-Eberhard Karls Universität Tübingen (DEU)

QUANTUM-ENHANCED IMAGING

ore 14:30 | **AULA A** | VIA CELORIA 16 MILANO

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