Experimentelle Physik 2

# Seminar Festkörperphysik (CMP Seminar)

Aktuelle Probleme der Festkörperphysik für Studenten und Mitarbeiter
020236 Kolloquium/Seminar SS 25
Vorlesungszeit: 10.04.2025 – 24.07.2025

**Thursday, 03.07.2025**
**12:10 – P1-01-306**

## Continuous Variable Quantum Optics in Semiconductor Spectroscopy and Photonics

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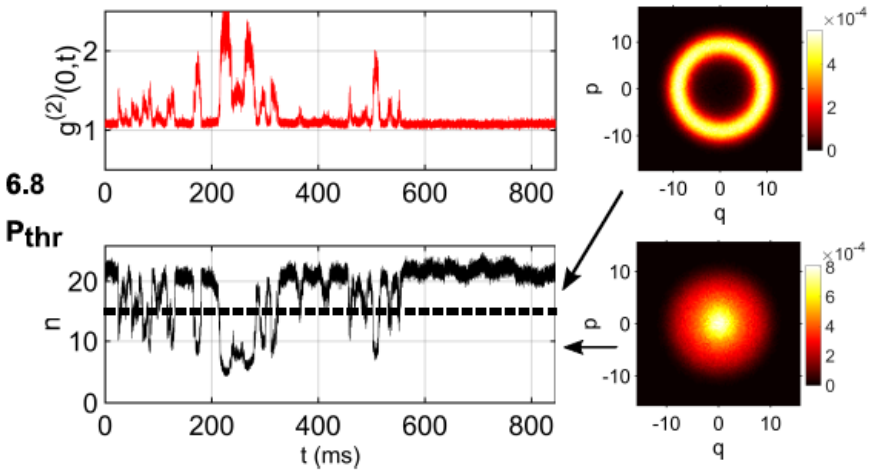
Homodyne detection is a powerful technique heavily used in continuous variable quantum optics. So far, semiconductor spectroscopy for quantum technologies has focused on discrete variable measurements, such as photon counting for obtaining the semiconductor emission photon statistics in terms of $g^{(2)}$, while homodyne detection has rarely been applied as a spectroscopy tool.

Here, we demonstrate that combining multichannel homodyne detection with pulsed local oscillators at 76 MHz and state of the art digitizers with sampling rates around 5 Gs/s open up the possibility to measure $g^{(2)}(0)$ in less than a millisecond for common semiconductor lasers. Simultaneously we achieve the sub-picosecond temporal resolution necessary to resolve the ultrafast processes in semiconductors and tailor the mode structure of the local oscillator to utilize it as a spectroscopic tool.




We will demonstrate novel insights into the dynamics of polariton condensates in tailored potential landscapes in terms of their quantum coherence when crossing the condensation threshold. We conclude by discussing how continuous real-time measurements of $g^{(2)}$ and phase space distributions may be achieved.