Special Seminar

Friday, June 17, 2022
1 pm
ZNN, Seminar room EG 0.001
also ONLINE via ZOOM
https://tum-conf.zoom.us/j/62438932419
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"Properties and dynamics of exciton polaritons in atomically-thin WS_2 crystals at room temperature"

Monolayer transition metal dichalcogenide crystals (TMDCs) hold great promise for semiconductor optoelectronics because their bound electron-hole pairs (excitons) are stable at room temperature and interact strongly with light. When TMDCs are embedded in an optical microcavity, their excitons can hybridise with cavity photons to form exciton polaritons (polaritons herein), which could be useful for enabling future applications. However, integrating monolayer TMDCs into these photonic structures remains a challenge since they are notoriously fragile and their excitonic properties are extremely sensitive to many nanofabrication techniques.
In this seminar, I will present our approaches for making high-quality monolayer WS2 based planar microcavities that host polaritons at room temperature. Strikingly, the WS2 polaritons can experience strong motional narrowing, which enables them to propagate ballistically over tens of micrometers in the "thermal" regime paving the path towards dissipationless information technologies based on TMDCs. Further, I will demonstrate how we can spatially confine the polaritons and why it significantly enhances their partial coherence and ground state population. Finally, I will show that we can invert the polariton dispersion by reducing the light-matter interactions in the WS2 crystal due to dissipative coupling (the hidden component of light-matter interactions), which leads to opposing directions of the polariton group velocities and momenta.

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