TECHNISCHE UNIVERSITÄT DRESDEN

Bereich Mathematik und Naturwissenschaften Fakultät Physik

PHYSIKALISCHES KOLLOQUIUM

Vortrag: **Jun.-Prof. Dr. Sebastian Klembt**
Chair for Applied Physics,
Julius-Maximilians-University Würzburg &
Würzburg-Dresden Cluster of Excellence ct.qmat

Thema: **Topological photonics and topological lasers with coupled vertical resonators**

Zeit und Ort: Dienstag, 16.11.2021, 16:40 Uhr / hybrid in REC C213 (begrenzte Kapazität) und Zoom

A) REC C213 (begrenzte Kapazität – max. 36): Teilnahme nur mit Anmeldung in folgender Dudle-Liste:
https://dudle.inf.tu-dresden.de/PK-Klembt-16-11
B) Zoom-Meeting: Meeting-ID: 843 7053 1078 / Kenncode: i#^t!$q7
https://tu-dresden.zoom.us/j/84370531078?pwd=L2I0MVlBRjFHbVd0Y2dsb1l4UUYyUT09

Leitung: Prof. Dr. Matthias Vojta

Kurzfassung: Topological Photonics is an emerging and novel field of research, adapting concepts from condensed matter physics to photonic systems adding new degrees of freedom. After the first demonstrations of topological photonic insulators, the field has moved on to study and exploit the inherent non-hermiticity of photonic systems and the interplay with their topological nature. In my talk I will discuss novel photonic lattice devices resulting from the coupling of individual vertical III-V semiconductor microresonators, forming what can be more broadly described as synthetic matter. Here, so-called exciton-polaritons – hybrid states of light and matter – can emerge in the strong coupling regime. By choosing precise lattice geometries we are able to tailor optical band structures realizing novel photonic lattice devices. Here, the specific geometry as well as the hybrid light-matter nature allow for ways to break time-reversal symmetry and implement topologically non-trivial systems. We were able to experimentally demonstrate the first exciton-polariton topological insulator, manifesting in chiral, topologically protected edge modes. In order to study topological effects in combination with optical non-linearities, so-called topological lasers have been envisaged and realized. They exploit topological effects to efficiently couple and phase-lock extended arrays of lasers to behave like one single coherent laser. The major drawback so far is that the emission appears in the plane of the topologically protected light propagation, thus hindering light extraction. Here, we have presented

the first experimental demonstration of a topological insulator vertical cavity laser array, using the so-called crystalline topological insulator model. Starting for the above-mentioned examples, I will give an overview of the field of topological optical lattices and lasers and give an outlook on emerging novel materials beyond III-V semiconductors, such as organic materials, transition metal dichalcogenides and perovskites.

Biographie: Born in Kiel; Grew up in Bremen where I started studying Physics; Physics Diploma in Bremen and at ETH Zürich with Prof. Bertram Batlogg (2003-2009), PhD in Bremen with Prof. Detlef Hommel (2009-2013), Postdoc in Grenoble at Institut Neel (2013-2015), Group leader, MSCA Fellow and Akademischer Rat in Würzburg (since 2015), since Nov. 2020 Juniorprofessor (ct.qmat Cluster-Professor) in Würzburg.