

Invitation to IQST Seminar

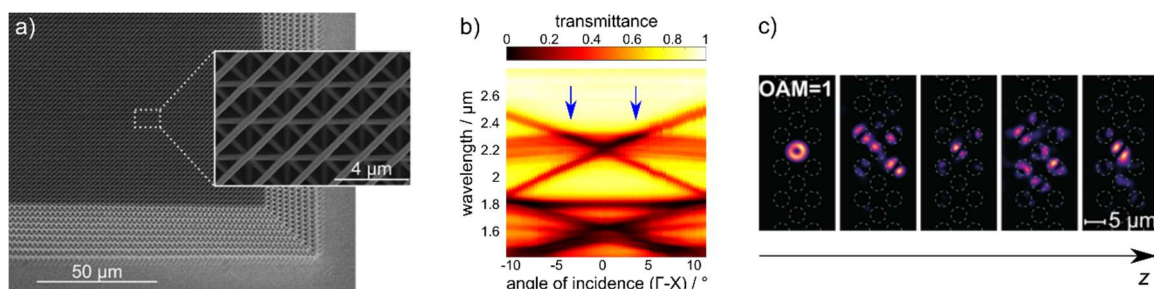
on Thursday, June 23, 2022 at 1pm
University of Stuttgart
Pfaffenwaldring 57, Room 3.531

Christina Jörg
Pennsylvania State University

Topological photonics in 3D micro-printed systems

Topological insulators are a new class of materials whose electronic properties do not fit into the usual categories of metals, insulators or semiconductors. Instead, topological insulators behave as insulators in their bulk (interior), but have conducting surface or edge states. Their discovery followed the observation of the quantum Hall effect, where electrons can flow with extreme robustness to defects and disorder. This was linked to a topological invariant, the Chern number, which predicts that current flows via one-way scatter-free edge states. More recently, it was shown that such states are not unique to electronic systems, but rather can be observed in the photonic domain as well. In photonics, such protected states promise ways for robust transport of light, enhancing data transfer, on-chip sources and optical devices broadly.

In this talk I will present my work on topological photonics in waveguide arrays and photonic crystals, fabricated by multi-photon lithography. Due to the great flexibility of the fabrication method, other components, e.g. nonlinear materials and quantum emitters, can potentially be integrated. Therefore, these systems serve as quantum simulators for fundamental research, but also provide a unique chance to transfer topological effects to photonic applications and form the basis for new physics that has not been envisioned in the electronic domain. I will give an outlook on proposed future work to include nonlinearity and interactions in photonic topological systems.



a) SEM image of a chiral woodpile photonic crystal showing topological features (Weyl points) in its band structure, measured in (b). c) Aharonov-Bohm caging of light carrying orbital angular momentum (OAM) in a waveguide array.