

# KIDS TALK

## “Topological States in Photonic Systems”

Speaker: Fabian Letscher, AG Fleischhauer

Abstract: Topological states, as found in the quantum Hall effect, have many interesting properties. They allow a quantized current and edge states robust against disorder. Moreover, in the fractional quantum Hall effect (FQHE), exotic excitations occur, which are neither bosons nor fermions. These exotic excitations, which are called anyons, are the building block of a topological quantum computer [1].

Over many decades, topological states were limited to solid state systems. However, partly due to the small intrinsic length scales of solid state systems, achieving full coherent control is a challenge. A new avenue is to use photonic systems as well as ultracold gases, where artificial gauge fields have recently been implemented.

In the first part of the talk, we will discuss a possible way to realize noninteracting topological states in photonic waveguide structure. To this end, we make use of the analogy between the Schrödinger equation and the propagation of electromagnetic waves in waveguide structures. In the second part of the talk, we discuss on the basis of [2] an interacting lattice system similar to the FQHE. We show, how the nontrivial ground state can be grown using a combination of a topological pump and a coherent pump.

[1] Nayak C., Simon, S. H., Stern, A., Freedman, M. & Das Sarma, S.: Non-Abelian Anyons and Topological Quantum Computation Rev. Mod. Phys. 80, 1083 (2008)

[2] Grusdt F., Letscher, F., Hafezi, M. & Fleischhauer, M. Topological Growing of Laughlin States in Synthetic Gauge Fields PRL 113, 155301 (2014)

When: Friday, January 16<sup>th</sup>, 10:00 am

Where: Room 46-387/388

All undergraduate and graduate students as well as postdocs are welcome and encouraged to join our discussion!

\*\*\*\*\* **COFFEE, TEA AND COOKIES** WILL BE SERVED \*\*\*\*\*

For subscription to kids mailinglist, questions, comments or suggestions:  
[landowski@physik.uni-kl.de](mailto:landowski@physik.uni-kl.de)

