

Photonics

Emulating photonic mesh lattices in coupled optical fiber loops

Julia Görsch, and Andrea Steinfurth

University of Rostock, Institute for Physics, Experimental Solid-State Optics

Date: Wednesday, October 25, 2023**Time: 2:30pm – 4:00pm****In-person: EEB 132**

Abstract: The advancements in technology in the field of photonics allow for a precise control over the properties of light and its propagation. This makes experimental photonic platforms highly attractive not only for studying optical phenomena, but also for emulating effects from different fields of physics. By doing so, the underlying physical effect is isolated and transferred to a highly controllable but simplified environment. To make such photonic platforms even more versatile, the concept of synthetic dimensionality has been used as powerful tool to replace spatial dimensions with other degrees of freedom of the system. One of such experimental optical platforms is the coupled optical fiber loop setup, which encodes the spatial dimensions in time to emulate an optical mesh lattice. In this talk we will introduce this particular platform, its working principle, and how it can be adapted to support a large variety of different mesh lattices. The phenomena accessible for investigation on such lattices include topics such as non-Hermitian systems, topological effects, disordered systems, and nonlinear behavior, just to name a few. In the second part of this talk, two examples of recent research are presented in more detail. Firstly, non-Hermitian tailoring was used to observe constant-intensity waves as well as non-Hermitian induced transparency. Secondly, the non-Hermitian skin effect enabled the creation of a topological funnel for light. We will conclude with a brief overview of other topics that have been experimentally realized with the coupled optical fiber loop setup.

Julia Görsch:

- Master's degree in 2023 at University of Rostock, Institute of Physics
- PhD student since 2023 at University of Rostock, Institute of Physics, Experimental Solid-State Optics, Supervisor: Prof. Alexander Szameit

Andrea Steinfurth:

- Master's degree in 2020 at University of Rostock, Institute of Physics
- PhD student since 2020 at University of Rostock, Institute of Physics, Experimental Solid-State Optics, Supervisor: Prof. Alexander Szameit

Hosted by: Mercedeh Khajavikhan; Michelle Povinelli, Constantine Sideris; Hossein Hashemi; Wade Hsu; Mengjie Yu; Wei Wu; Tony Levi; Alan E. Willner; Andrea Martin Armani