Contribution ID: **330** Type: **Oral Presentation**

Realizing topological relativistic dynamics with slow-light polaritons

Tuesday, 5 July 2022 11:30 (15 minutes)

We present a relatively unexplored direction for analogue quantum simulation based on the interaction between light and neutral atom ensembles at room temperature. The phenomenon of electromagnetically induced transparency (EIT) changes the properties of light interacting with an atomic media coherently. One result is the creation of collective excitations known as dark-state polaritons (DSPs). While one can create these DSPs in three-level lambda-configured systems, a versatile “tripod” scheme creates interacting DSPs. Furthermore, interactions between different tripod-DSPs can be described by Dirac-like Hamiltonians and are called spinor slow light (SSL) setups. We conducted SSL experiments in a room temperature 87Rb ensemble. Using a probe field and two counter-propagating control fields, we create two counter-propagating tripod DSPs. Storage experiments can then be used to retrieve the 1+1 Dirac dynamics. A topological model closely related to the Dirac Hamiltonian is the Jackiw-Rebbi model. By adding a spatially varying magnetic field, we can change the two-photon detuning and mimic a mass-term needed for the model. The oscillation dynamics are increasingly suppressed as the magnetic field gradient increases. We benchmark the experimental results by comparing the outcomes with numerical and theoretical simulations of the SSL dynamics.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

N/A

Primary authors: JORDAAN, Bertus (NMISA); Dr NAMAZI, Mehdi (Qunnect Inc); Prof. NOH, Changsuk (Korea Institute for Advanced Study); Prof. ANGELAKIS, Dimitris G. (National University of Singapore, Technical University of Crete); Prof. FIGUEROA, Eden (Stony Brook University)

Presenter: JORDAAN, Bertus (NMISA)

Session Classification: Photonics

Track Classification: Track C - Photonics