Fengyu Liu

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Education

University of Maryland, A. James Clark School of Engineering, College Park, MD, USA

Ph.D. in Electrical and Computer Engineering. Expected: May 2024

GPA: 4.00/4.00

Nankai University, School of Physics, Tianjin, P. R. China

B.S. in Physics, graduated from Poling honor program, June 2019.

GPA: 3.81/4.00 (90.56/100)

Research Experience

Graduate Research Assistant, Department of Electrical and Computer Engineering & Institute for Research in Electronics and Applied Physics, University of Maryland (August 2019 – Present)

Superviser: Prof. Yanne Chembo

(1) Researched quantum dynamics of bi-photon generation in nonlinear cavity to manage and control the high-dimension entangled photons in quantum optical fiber networks.

(2) Simulated the Kerr optical frequency combs in ultra-high Q whispering-gallery-mode resonators with modal field model and spatiotemporal Lugiato-Lefever model in MATLAB. Calculated possible stable solutions and studied the bifurcations between them in order to guide the design of experiments and applications. Investigated their subharmonic instabilities and explored the phenomenon as well.

(3) Generated very high spectral purity microwaves with Kerr optical frequency combs, analyzed the effects of different kinds of fluctuations on phase noise of the microwaves and found methods to eliminate them.

Undergraduate Researcher, School of Applied & Engineering Physics, Cornell Unicersity (June 2017 – Sept. 2017 & July 2018 – March 2019)

Superviser: Prof. Gennady Shvets

(1) Explored photonic crystals with different structures but similar symmetries to quantum valley Hall topological insulators. Modeled them using finite-element-method solvers (e.g., COMSOL Multiphysics) and developed numerical methods for calculating Berry curvature and Chern numbers.

(2) Developed numerical simulations for calculating electromagnetic(EM) properties of Metagate-Tuned Graphene. Constructed Fermi Arcs by gradually changing the symmetry of the Metagate array and introducing spatially varying loss to the system.

(3) Computed cavity modes near photonic topological insulators & electric conductor interface. Implemented a discrete approach to calculate the coupling coefficient by processing the EM field data.

Undergraduate Researcher, School of Physics & Teda Applied Physics Institute, Nankai University (May 2016 – June 2018)

Superviser: Prof. Zhigang Chen & Prof. Daohong Song

(1) Collaborated with experimentalists to design optical waveguides with topologically protected one-way modes.

(2) Simulated the propagation of light in photonic lattice waveguides using beam propagation method (BPM) and calculated the properties of their edge states (e.g., Chern numbers) with MATLAB and C++.

Skills

Computer Skills

Programming Languages: Python, C/C++, MATLAB, LaTeX

Software: COMSOL Multiphysics, Mathematica, TensorFlow, Caffe

Language

English (Fluent), Chinese-Mandarin (Native)

Selected Coursework

Statistical Pattern Recognition (A); Random Processes in Communication and Control (A); Advanced Numerical Optimization (A); Chaotic Dynamics (A+); Complex Systems in Engineering (A+); Electromagnetic Theory I/II (A+/A); Solid State Electronics (A); Semiconductor Devices and Technology (A+); Quantum Electronics I (A+)

Scholarships and Honors

Dean's Fellowship, University of Maryland, Aug. 2019

Gong Neng Scholarship, Nankai University, Sep. 2016, 2017 & 2018

TIPCCAS Outstanding Undergraduate Scholarship, Chinese Academy of Sciences, May 2017

Po-ling Scholarship for Freshmen, Nankai University, Oct. 2015

Publications

Yandong Li, Yang Yu, **Fengyu Liu**, et al., "Topology-controlled photonic cavity based on the near-conservation of the valley degree of freedom." Physical Review Letters 125.21 (2020): 213902.

Guoping Lin, **Fengyu Liu**, Aurelien Coillet, et al., "Subharmonic instabilities in Kerr microcombs." Optics Letters 48.3 (2023): 578-581.

Fengyu Liu, and Yanne Chembo, "Exact Solution for the Density Operator of Quantum Microcombs." Under review at Physical Review Letters.

Fengyu Liu, Curtis Menyuk, and Yanne Chembo, "Stochastic analysis of Kerr optical frequency combs with additive Gaussian white noise – Optical and microwave phase noise." Under review at Communications Physics.