Li Haitao

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Education Background

2014.07-2018.06 (Bachelor Degree) **Suzhou City University**

Optoelectronic Information Science and Engineering

Majors: General Physics; Optical Information Processing; Laser Principles; Optical Course; higher mathematics.

2018.07-2020.09 (Master) **Soochow University** **Physics**

Majors: Advanced Quantum Mechanics; Electromagnetic Field Theory; Plasma Physics; Materials and Testing.

Research area: Electromagnetic meta-materials; RF/Microwave devices.

2020.07-2023.09 (Doctor Degree) **Soochow University** **Physics-Optics**

Majors: Condensed Matter Physics; Advanced Statistical Physics.

Research area: Electromagnetic meta-materials; Acoustic/Elastic Wave Metamaterials; Topological Photonics/Semimetals

2023.08-2023.11 (Visiting Scholar) **HKUST (GuangZhou)** **AMAT**

Research group: Xiaoxiao Wu's Lab.

Research experience

① Conical diffraction from type-II Dirac point at metasurfaces.

- Analytical calculation of effective Hamiltonian model;
- Numerical simulation (COMSOL RF module);
- Experimentally characterizing the distribution of electromagnetic fields and achieving the expected experimental results (conical diffraction), analyzing data;
- Write the manuscript and publish it in SCI journals.

② Research on the topological phase transition of the type-III Dirac nodal line.

- Investigate computationally relevant tight-binding models;
- Numerical simulation to calculate the band structure (CST);
- Prepare experimental samples by using the PCB theory
- Characterize the band structure of the samples experimentally, analyze and compare the experimental and simulation data, and achieve the expected topological phase transition and the corresponding topological interface states;
- Write the manuscript and publish it in SCI journals.

Research experience

③ Research on a digital SIW-slot antenna array with FPGA implementation of beamforming.

- Simulate the antenna pattern and radiation gain;
- Prepare the antenna and test its performance indicators in a microwave anechoic chamber, analyze the experimental and simulation data;
- Write the manuscript and publish it in SCI journals.

④ Research on the type-II of Dirac point in elastic wave metamaterials.

- Analytically calculate the relevant tight-binding Hamiltonian model;
- Numerically simulate the calculation (COSMOL);
- Set up an experimental platform for elastic waves and test its displacement field, analyze the experimental and simulation data.

Internship Experience

Shenzhen Fantwave Corporation

- RF antenna design and the related testing learning;
- Learning of various functions of microwave vector network analyzer;
- Learning to use microwave resonant cavity and testing the dielectric constant of the sample through the resonant cavity;
- Independently designing a rectangular resonant cavity based on rectangular waveguide coupler feeding and testing, and the test results show a high quality factor (Q value);
- Independently designing a scanning platform based on a microwave vector network analyzer and completing the assembly and debugging of the prototype.

Award

2018 Third-class scholarship in the master's program at Soochow University.

2019 Second-class scholarship in the master's program at Soochow University; Outstanding member of the Graduate Student Association.

2020 First-class scholarship for academic achievement in the doctoral program at Soochow University.

2021 Second-class scholarship for academic achievement in the doctoral program at Soochow University.

2022 Second-class scholarship for academic achievement in the doctoral program at Soochow University.

Published Paper

Haitao Li, Chuandeng Hu*, Jian-Hua Jiang, Jinbo Wu, Weijia Wen and Bo Hou*, Photonic Type-III Nodal Loop and Topological Phase Transitions at Bilayer Metasurfaces. *Front. Mater.* **9**, 909381(2022)

Published Paper

- **Haitao Li**, Shanshan Li, Bo Hou*, Xianli Zhang, Weijia Wen* & Chuandeng Hu* , A digital SIW-slot antenna array with FPGA implementation of beamforming. *Sci. Rep.* **12**(1), 8927(2022)
- **Haitao Li**, Chuandeng Hu*, Xiaoxi Zhou, Weixin Lu, Bo Hou* and Weijia Wen , Conical diffraction from type-II Dirac point at metasurfaces. *EPL* **130**, 17007(2020)
- Jiapeng Zhang, **Haitao Li**, Tao Xu, Junjie Wu, Shenglin Zhou, Zhihong Hang, Xiaohua Zhang, Zhaohui Yang, Homogeneous silver nanoparticles decorated 3D carbon nanotube sponges as flexible high-performance electromagnetic shielding composite materials. *CARBON* **165**, 404-411(2020)
- Xinyang Pan, **Haitao Li**, Hou B*, et.al, Nodal degeneracy of guided modes in uniaxial crystal slabs. *Front. Phys.* **10**, 1095669 (2023)

Certifications

College English Test: Level-6
College Japanese Test: Level-4

Scientific Research Skills

- Software Skills: Proficient in using software such as MATLAB, Mathematica, etc. for analytical calculations, coding for data analysis and visualization of experimental or simulated data. Skilled in LabVIEW programming for controlling multiple test instruments for combined testing and data acquisition.
- Simulation Skills: Proficient in using finite element simulation software such as COMSOL (RF module, wave optics module, acoustics module, solid module, etc.), CST, etc. to perform:
  ① Electromagnetic metamaterial design and simulation, including band structure design, topological semimetals (first/second type of Dirac semimetals) design and simulation, and electromagnetic field simulation on metamaterial surfaces.
  ② Microwave device design and simulation, including the design and optimization of microwave rectangular resonant cavities (single/dual needle), the design and S-parameter analysis of circular resonant cavities, the design and simulation of microwave probes, TRL de-embedding kit design and simulation, and various filter designs.
  ③ Design and simulation of array-fed planar antennas, skilled in simulating chip components for application in RF devices to achieve various effects.
  ④ Simulation of surface band structures, surface stress analysis, surface displacement field, and velocity field analysis of elastic wave metamaterials.
- Experimental Skills:
  ① Proficient in using various brands (HP; Keysight; R&S) and models (R&SZNL series, Keysight PNA series, etc.) of microwave vector network analyzers for calibration, tuning, and testing of various RF/microwave devices (resonant cavities, rectangular waveguides, filters, various horn antennas, microwave power dividers).
  ② Skilled in characterizing the electromagnetic properties of materials, including relative permittivity, relative permeability, electromagnetic shielding effectiveness (EMI SE), and electromagnetic loss.
  ③ Proficient in using multi-axis electromagnetic wave scanning platforms (LabVIEW programming) to test the surface electromagnetic field distribution of samples.
  ④ Proficient in using lock-in amplifiers, laser vibrometers (Polytec Vibroflex) to measure surface displacement field distribution of elastic waves.
  ⑤ Proficient in using microwave anechoic chambers to test antenna far-field/near-field gain, directional patterns, and radiation efficiency.