Christina Spaegele | ☎ (857)-320-8796 | ✉ spaegele@g.harvard.edu

Education Summary

Harvard University, Cambridge, USA
- ▷ PhD Applied physics, nanophotonics track (2019–2024, current GPA 3.96/4),
- ▷ M.Sc. Applied physics (2022), B.Sc. thesis (2018)
- ▷ Mini-MBA (Harvard GSAS Business Club) (Summer 2022)

Ruprecht-Karls University, Heidelberg, Germany
- ▷ B.Sc Physics, minor computational science (2015–2019, 'summa cum laude')

Gymnasium Bad Waldsee, Germany (A-levels 2015, 'summa cum laude')

Research Interests

Nanophotonics, integrated electro-optical devices for light-matter interaction control and quantum technologies
Two dimensional materials, photonic integration

Publication Summary

7+ journal articles
9+ peer-reviewed conference proceedings,
1 patent

Selected Research Milestones

Metasurface-based optical cavities:
▷ Demonstrated the first metasurface-enabled advanced laser cavities (e.g., external wavelength-tunable cavity lasers with arbitrary output control)
▷ Demonstrated metasurfaces overcoming small angle limitations for large-angle multi functionality
Topological photonics using metasurfaces:
▷ Demonstrated the first topologically protected complete polarization singularity
2D materials and phase change materials:
▷ Developed a versatile platform to arbitrarily control polaritons at the nanoscale, enabling a whole range of deeply sub-wavelength polaritonic devices and circuits

Professional experience

- ▷ Meta Reality Labs, research intern, Optical waveguide design team (Summer 2023)
  - ▷ Developing waveguides for augmented reality applications
  - ▷ Internship resulted in a proof of life demo to META CEO after 12 weeks
- ▷ Robert Bosch GmbH, intern, Technical strategy department Electric/Electronics-systems (Summer 2019)
  - ▷ Optimizing future EE-architectures in vehicles using evolutionary algorithms
  - ▷ Improvement of an optimization software via Java coding
  - ▷ Supporting the preparation and execution of EE-architecture workshops
- ▷ Fritz Haber Institute, Berlin (Max Planck Society) (Summer 2014)
  - ▷ participating in chemical catalysts research

Selected Honors and Awards

- ▷ **EECS Rising Star 2022**: Selected for workshop based on competitive application.
- ▷ **Meta PhD Fellowship** (Tuition + $83k) (Finalist 2021, Awardee 2022)
- ▷ Certificate of distinction in teaching, Harvard University (2021)
- ▷ German Academic Foundation Scholarship (2015-2019) (awarded to top 0.5 % German students nationwide)
- ▷ Glemser Foundation for future excellence Scholarship (2015)
- ▷ Multiple university entrance diploma valedictorian awards (2015): FERRY-PORSCHE award for extraordinary performances in mathematics and physics/engineering, German Physical Society (DPG) award, German Mathematical Society (DMV) award, German Chemical Society (GDCh) award, Foundation Humanismus Heute (Latin) award

Publications

Google scholar profile, * = denotes equal contribution.

8. Mason, S., Meretska, M. L., Spaegele, C., Ossiander, M., and Capasso, F. (2023). Metasurface-controlled holographic microcavities. arXiv preprint arXiv:2310.11348.

7. Spaegele, C.M., Tamagnone, M., Lim, S.W.D., Ossiander, M., Meretska, M.L. and Capasso, F., 2023. Topologically protected optical polarization singularities in four-dimensional space. **Science Advances**, 9(24), p.eadh0369.

6. Lim, S.W.D., Park, J.S., Kazakov, D., Spägele, C.M., Dorrah, A.H., Meretska, M.L. and Capasso, F., 2023. Point singularity array with metasurfaces. **Nature Communications**, 14(1), p.3237.

5. Ossiander, M., Meretska, M.L., Rourke, S., Spägele, C., Yin, X., Benea-Chelmus, I.C. and Capasso, F., 2023. Metasurface-stabilized optical microcavities. **Nature Communications**, 14(1), p.1114.

4. Spaegele, C., Capasso, F. and Tamagnone, M., 2022. Open Optical Cavities based on Metasurfaces. **Reviews of Electromagnetics**, 1., **invited comment**

3. Spägele, C., Tamagnone, M., Kazakov, D., Ossiander, M., Piccardo, M. and Capasso, F., 2021. Multifunctional wide-angle optics and lasing based on supercell metasurfaces. **Nature communications**, 12(1), p.3787.

2. Chaudhary, K.*, Tamagnone, M.*, Yin, X.*, Spägele, C.M.*, Oscurato, S.L., Li, J., Persch, C., Li, R., Rubin, N.A., Jauregui, L.A. and Watanabe, K., 2019. Polariton nanophotonics using phase-change materials. **Nature communications**, 10(1), p.4487.

1. Tamagnone, M., Chaudhary, K., Spaegele, C.M., Zhu, A., Meretska, M., Li, J., Edgar, J.H., Ambrosio, A. and Capasso, F., 2019. High quality factor polariton resonators using van der Waals materials. arXiv preprint arXiv:1905.02177.

Conference proceedings

12. Spaegele, C.M., Tamagnone, M., Lim, S.W.D., Ossiander, M., Meretska, M. and Capasso, F., 2023, May. Topologically protected polarization singularities in four dimensions. In CLEO 2023.

11. Park, J.S., Vaillancourt, K., Lim, S.W.D., Spaegele, C.M. and Capasso, F., 2023, May. All-dielectric, visible wavelength focusing metalens with planar surface for mechanical robustness. In CLEO 2023.

10. Martin, L., Gao, H., Makarova, O., Leitao, N., Zhu, Q.Z., Zhou, H., Spaegele, C., Machielse, B., Cremer, J., Walsworth, R. and Capasso, F., 2023. Nanoscale control and readout of nitrogen vacancy ensembles for imaging and many-body physics. Bulletin of the American Physical Society.

9. Ossiander, M., Meretska, M.L., Rourke, S., Spägele, C., Yin, X., Benea-Chelmus, I.C. and Capasso, F., 2022, May. Optical Microcavities Stabilized using Dielectric Metasurfaces. In CLEO 2022.

8. Makarova, O., Martin, L., Spaegele, C., Zhou, H., Leitao, N., Zhu, Q.Z., Machielse, B., Cremer, J., Maskara, N., Park, H. and Walsworth, R., 2022. Towards non-equilibrium spin dynamics with spin spirals in dense ensembles of NV centers. In APS March Meeting Abstracts (Vol. 2022, pp. K34-009).

7. Spaegele, C., Tamagnone, M., Kazakov, D., Ossiander, M., Piccardo, M. and Capasso, F., 2021, August. External cavity lasers based on wide-angle multifunctional metasurfaces. In Metamaterials, Metadevices, and Metasystems 2021 (Vol. 11795, p. 1179519). SPIE.

6. Spägele, C.M., Tamagnone, M., Kazakov, D., Ossiander, M., Piccardo, M. and Capasso, F., 2021, May. Non-local multifunctional metasurfaces and their external cavity laser application. In CLEO 2021.

5. Spägele, C.M., Tamagnone, M., Kazakov, D., Piccardo, M. and Capasso, F., 2020, May. Metasurface-based external cavity diode laser. In CLEO 2020.

4. Tamagnone, M., Meretska, M., Chaudhary, K., Spagele, C.M., Zhu, A., Li, J., Edgar, J.H., Ambrosio, A. and Capasso, F., 2020, May. High Q-factor resonators and nanoantennas based on phonon polaritons in van der Waals materials. In CLEO 2020.

3. Spägele, C.M., Yin, X., Tamagnone, M., Chaudhary, K., Oscurato, S.L., Li, J., Li, R., Rubin, N., Jauregui, L.A., Kim, P. , Edgar, J.H., Ambrosio, A., and Capasso, F., 2019, May. Reconfigurable Polaritonics using Phase Change Materials,. In Spring conference German Physics Society 2020.

2. Tamagnone, M., Chaudhary, K., Yin, X., Spagele, C., Li, J., Oscurato, S., Rubin, N.A., Jauregui, L., Kim, P., Edgar, J.H., Ambrosio, A., and Capasso, F., 2019, May. Polariton Meta-Optics with Phase-Change Materials. In CLEO 2019.

1. Yin, X., Spägele, C.M., Tamagnone, M., Chaudhary, K., Oscurato, S.L., Li, J., Li, R., Rubin, N., Jauregui, L.A., Kim, P. , Edgar, J.H., Ambrosio, A., and Capasso, F., 2019, May. Reconfigurable mid-infrared optical elements using phase change materials. In CLEO 2019.

Computational skills

▷ **Photonic simulations:** Lumerical, Reticolo, Meep, S4
▷ **Scientific computing, optimization, and machine learning:** Python, Matlab, Comsol, Tensorflow, Java, C++, Mathematica

Technical skills

▷ **4+ years of nanofabrication, processing, and characterization experience** with extensive knowledge of optical and electron beam lithography, ALD and PVD deposition processes, dry and wet etching for nanoelectronic and nanophotonic devices, optical and e-beam lithography, CMP, imaging using SEM, TEM, NSOM, AFM, and FiB.

Language abilities

▷ English (fluent)
▷ German (native speaker)
▷ French (B1)
▷ Italian (A1)
▷ Latin (Advanced proficiency certificate)

Outreach / Extracurricular activities

▷ Mentor for college students, Women in STEM (WISTEM) (since 2021)
▷ Active member of 'Studenten bilden Schüler e.V.' (tutoring and coaching program for Syrian refugees, 2016-2019)
▷ Professional volleyball player (2010-2014): perspective youth national team Germany, state team Württemberg, team captain Bad Waldsee, medal of honor city Bad Waldsee (2011-2015)