

Apply Letter

of Zhongqi Xiu

Driven by my passion for optics, I joined the Quantum Information Lab on the advice of a senior alumnus to explore Fiber Cavity QED. In my first project, I tackled the complex task of cooling and controlling atoms within a fiber cavity. This required our new team to build several optical systems from the ground up, including designing the paths for cooling, detecting, and repumping light, as well as sourcing and assembling an advanced vacuum system. With the persistent support of my mentor and dedicated fellow students, I spent six months meticulously selecting a vacuum pump and designing the cavity using specialized software. Managing such a significant project for the first time not only honed my technical skills but also deepened my appreciation for the meticulous process of scientific research. Achieving a vacuum level of 10^{-11} Torr was a triumphant milestone, paving the way for our cold atom injection and trapping experiments.

Despite initial setbacks in coupling light and aligning fibers, and grappling with an unstable vacuum system that hindered atom cooling, two weeks of relentless fine-tuning finally paid off. Detecting strong fluorescence signals and capturing clear CCD images of single atoms inside the cavity was a moment of pure exhilaration, affirming that I had found my true calling. This breakthrough solidified my passion for optics and reinforced my determination to contribute to the advancement of quantum optics. Driven by the excitement of exploring new frontiers and the satisfaction of overcoming experimental challenges, I am more committed than ever to dedicating my professional career to unraveling the mysteries of light and its quantum properties.

Seeking to deepen my interdisciplinary expertise in optics, I joined Rice University's SCOPE Lab as a visiting scholar in the summer of 2024. Under Prof. Shengxi Huang and Wenjing Wu, I explored single-photon emission in transition metal dichalcogenides. Leveraging my fiber cavity lab experience, I quickly adapted to optical characterization techniques like photoluminescence and Raman spectroscopy. Despite initial unfamiliarity with two-dimensional materials and nanofabrication, extensive literature review and theoretical study enabled me to contribute innovative ideas and procedural adjustments. Additionally, I developed user-friendly data processing applications that streamlined figure generation for our team. This experience solidified my foundation in optics and reinforced my commitment to advancing optical engineering through interdisciplinary research.

Hence, I would be honored to apply to the Duke graduate program and join your research lab as a PhD student. I envision leveraging Duke's robust funding and collaborative environment to push the boundaries of optical engineering, blending my technical prowess with creative problem-solving. My diverse experiences and unwavering dedication fuel my ambition to contribute meaningfully to the scientific world while staying true to my unique blend of interests and skills.