Characterization of Lithium Niobate Ridge Waveguides

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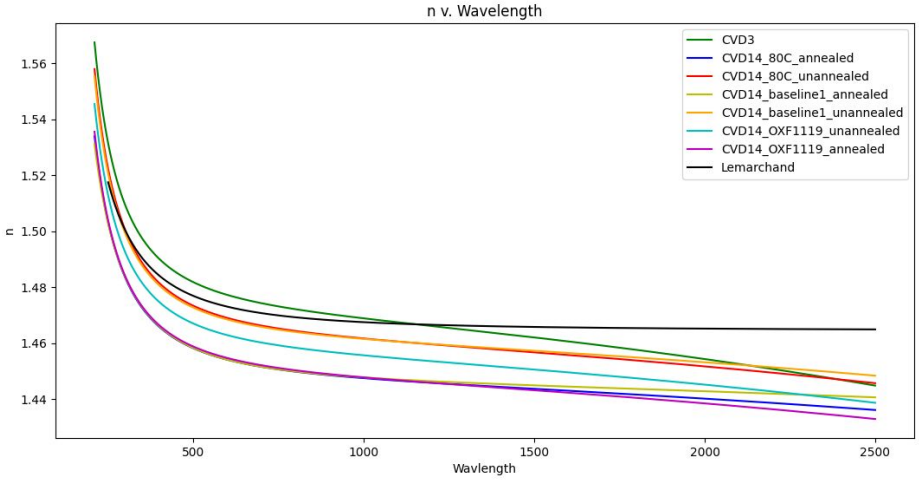
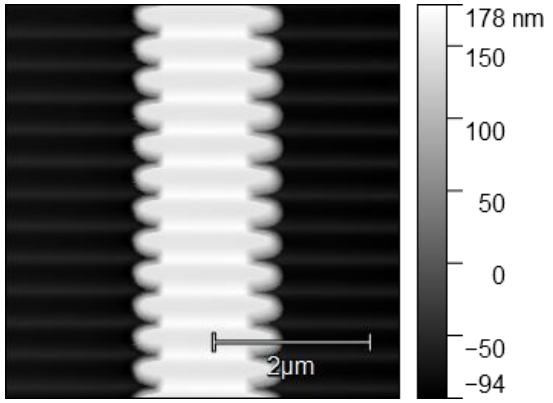
Photons are great candidates for communication. They provide technology that is low loss and robust to environmental noise. However the amount of information loss for each unit of distance the data is sent is different depending on the wavelength of the light used. Lower wavelengths, in the visible range, tend to be higher loss, whereas higher wavelengths (around 1500nm) are low loss. The solution to this is using dispersive ridge waveguides - literally paths for light - etched into an important optical material called Lithium Niobate. These waveguides change the frequency of the light, making it low loss.
These waveguides are extremely small, on the order of single microns. Their effectiveness is also very sensitive to small changes in the width, size, depth, and angle of the waveguide, as well as the effective refractive index and relative thickness across the chip.
My project is to use various characterization devices and methods in order to measure samples, with the goal of finding any correlations between the etching and cleaning conditions and the measured geometry and refractive indices of the lithium niobate ridge waveguides.





Top Image: Refractive Index vs. Wavelength of SiO2 under several cleaning conditions
Bottom Image: Atomic Force Microscope image of ridge waveguide

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Erin McGee is a rising sophomore at Stevens Institute of Technology majoring in physics, from Ringoes, New Jersey. This summer she worked with the Lončar group at Harvard University on nanophotonic waveguides. Academically, her interests include quantum physics, photonics, astronomy, climate science, biology, and science writing. Her hobbies include running, hiking, and reading. After college, she plans on pursuing a PhD in Applied Physics and potentially being a Professor. During the REU program, she developed not only a better knowledge of physics, but important skills for research, including persistence and attention to detail. She'd like to thank her mentors and everyone in the lab for being so welcoming, supportive and helpful with the work this summer, as well as her family and friends for helping her make this opportunity possible.

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