

Configuring a Mach-Zehnder Interferometer to Measure Refractive Index of Pockel Cells

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Abstract

Over the summer, I interned at nLIGHT and worked with the HD3D team. This team is constructing a camera for 3D imaging. A necessary part to their model of camera is the pockel cell. My project was to configure a Mach-Zehnder interferometer which the team could then use to measure the refractive index of these pockel cells.

Results

The collected data came in the form of qualitative observations. Pictures show the fringe patterns of the interferometer. These patterns, seen in Figure 2, were created as a result of the two beams interfering with each other upon re-joining at the second beamsplitter.

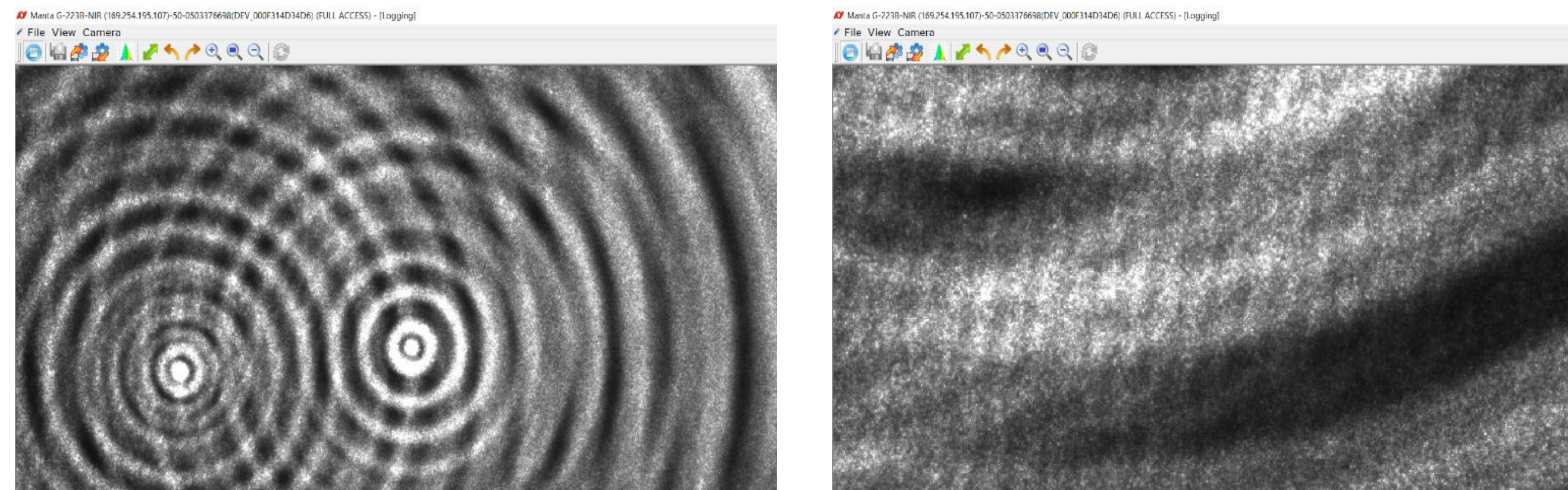


Figure 2: Interference fringes captured by the Manta camera and displayed on the Vimba Viewer software.

Simple Pockels cell modulator

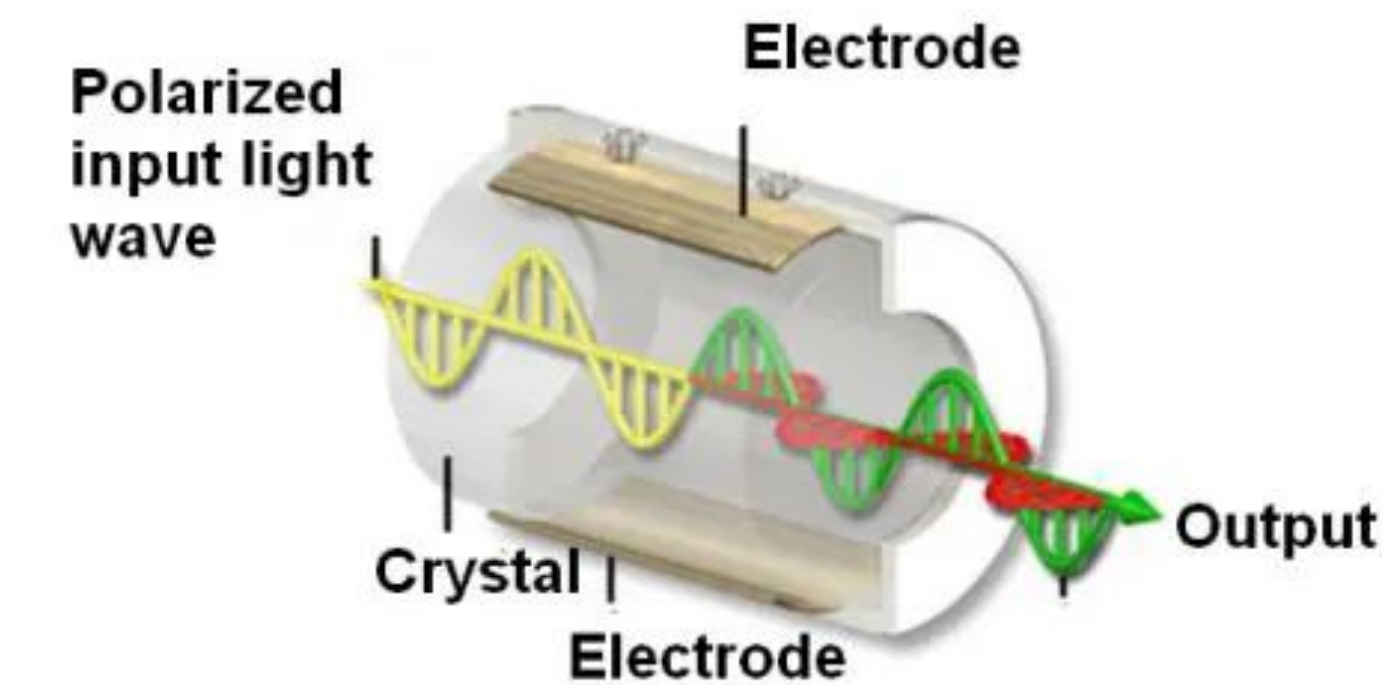


Figure 4: Diagram of a pockel cell.

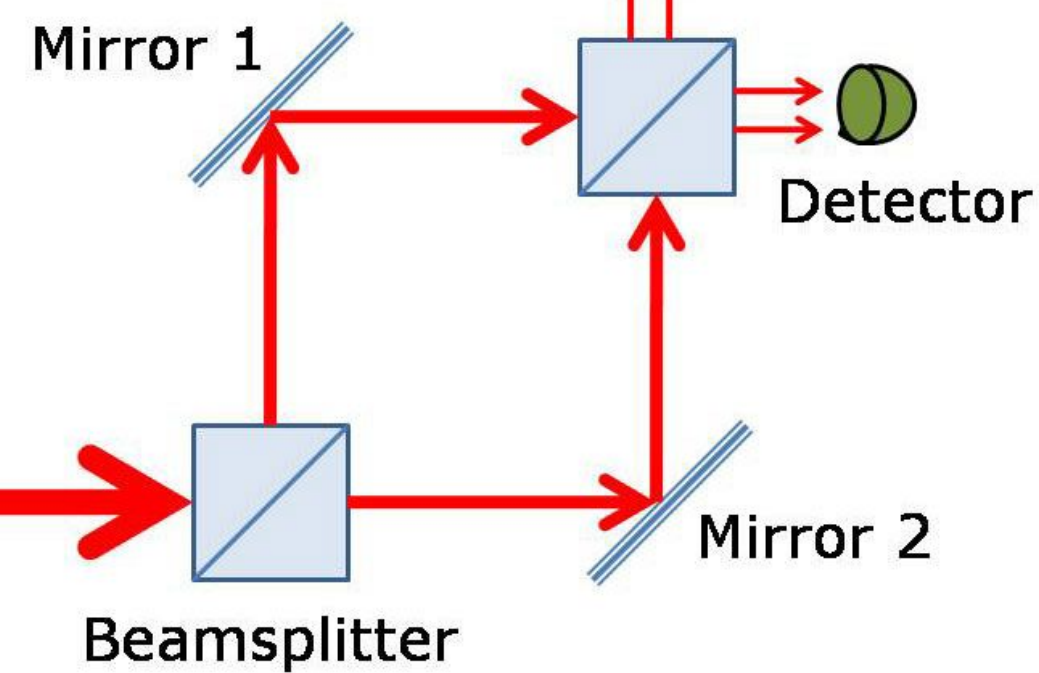


Figure 1: General diagram of a Mach-Zehnder interferometer.

Discussion / Conclusion

- ❑ I ran into several issues during configuration including incorrect polarization of optics and the beam interfering with itself prior to recombination.
- ❑ Ultimately, proper interference patterns were located and the HD3D team will be able to test pockel cells, allowing them to refine the camera design.
- ❑ Advancements in interferometry and 3D imaging likely will majorly influence the field of optics.
- ❑ If HD3D's camera proves successful, the imaging team at nLIGHT will only grow and offer a new sector of business to the company.

Materials and Methods

- ❑ **Configuration:** Semi-silvered and 830nm mirrors were used with non-polarizing beamsplitters to superimpose the two beams.
- ❑ **Data Collection:** A Manta camera and Vimba Viewer software allowed viewing of the interference patterns created by the two beams.

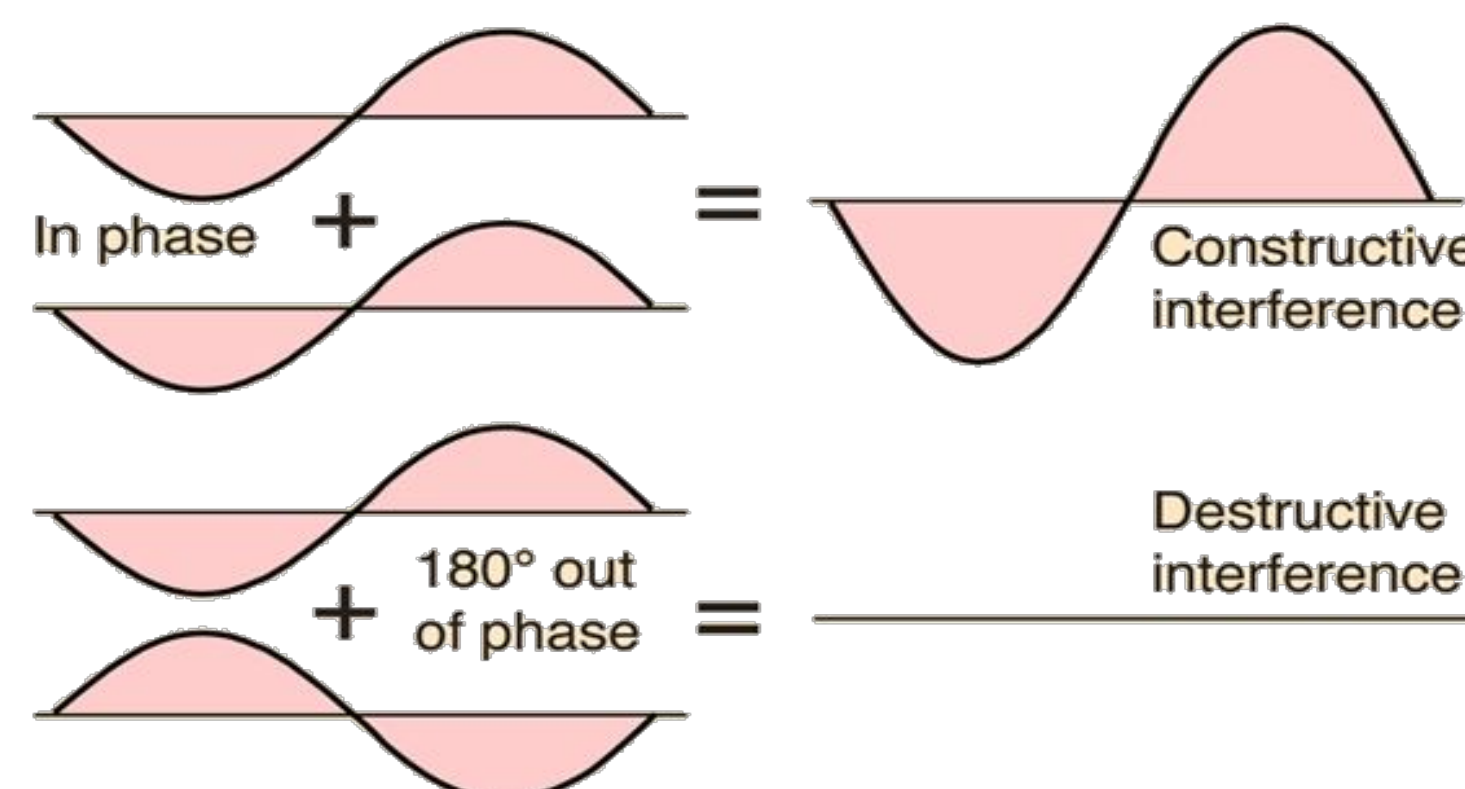


Figure 3: Visual of how interference of waves works.

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