



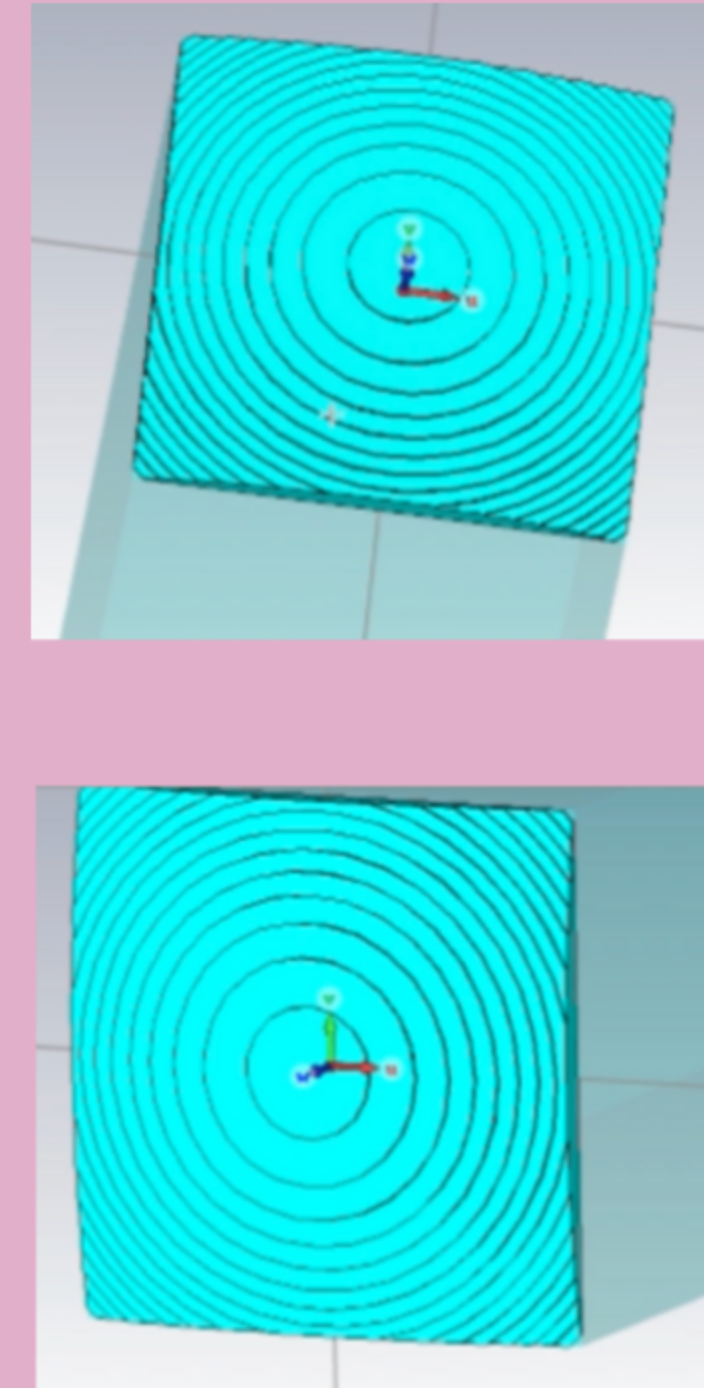
Etched Focusing Lens for Photodiode Array

Luan Banh, Melvin Lin, Isaac Pizarro, Zhixuan Yu



The Problem

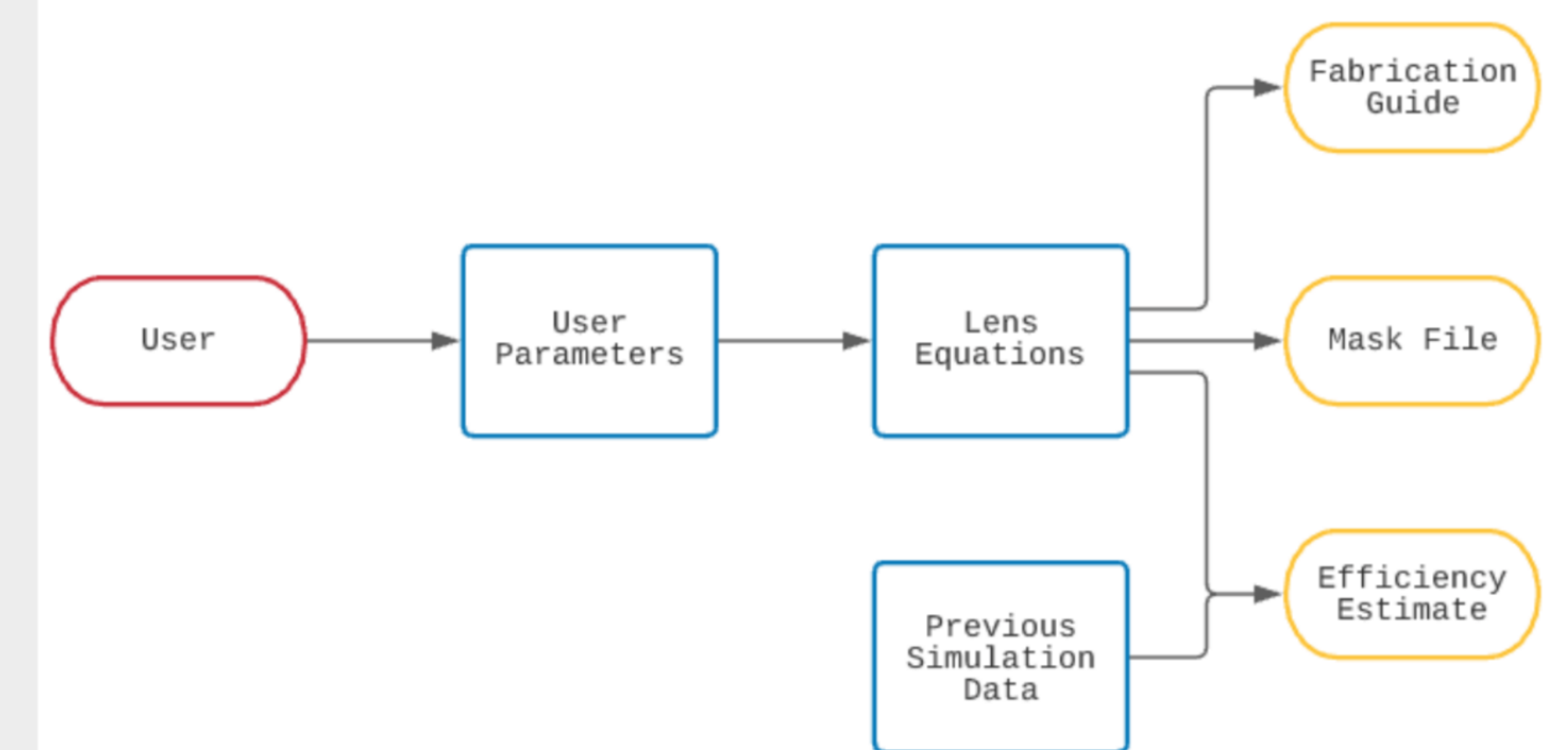
Our sponsor use avalanche photodiodes with high photon detection efficiencies. These photodiodes have small active areas that reduce the overall signal output. Because the photodiodes require the microlenses to be attached by hand, this results in a high production cost. To solve this issue, we designed a multi-level diffractive lens (MDL) as a low cost alternative.



Requirements

1. Design a MDL and its relative mask
2. Have the design fabricated and obtain a working prototype lens
3. Develop a program that will take in user input and automatically generate lens design
4. Look into other possible lens designs that might enhance performance

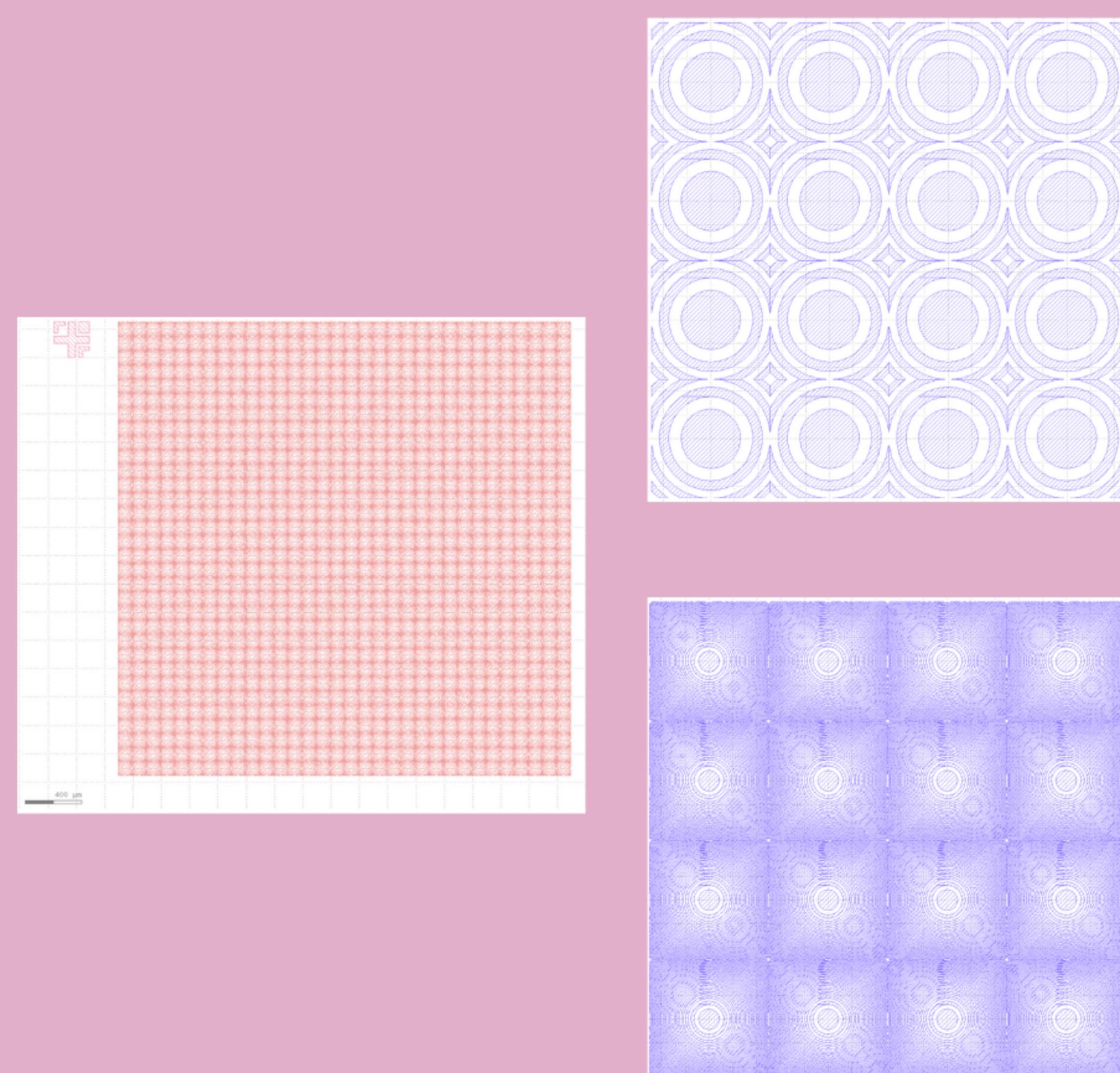
System Diagram



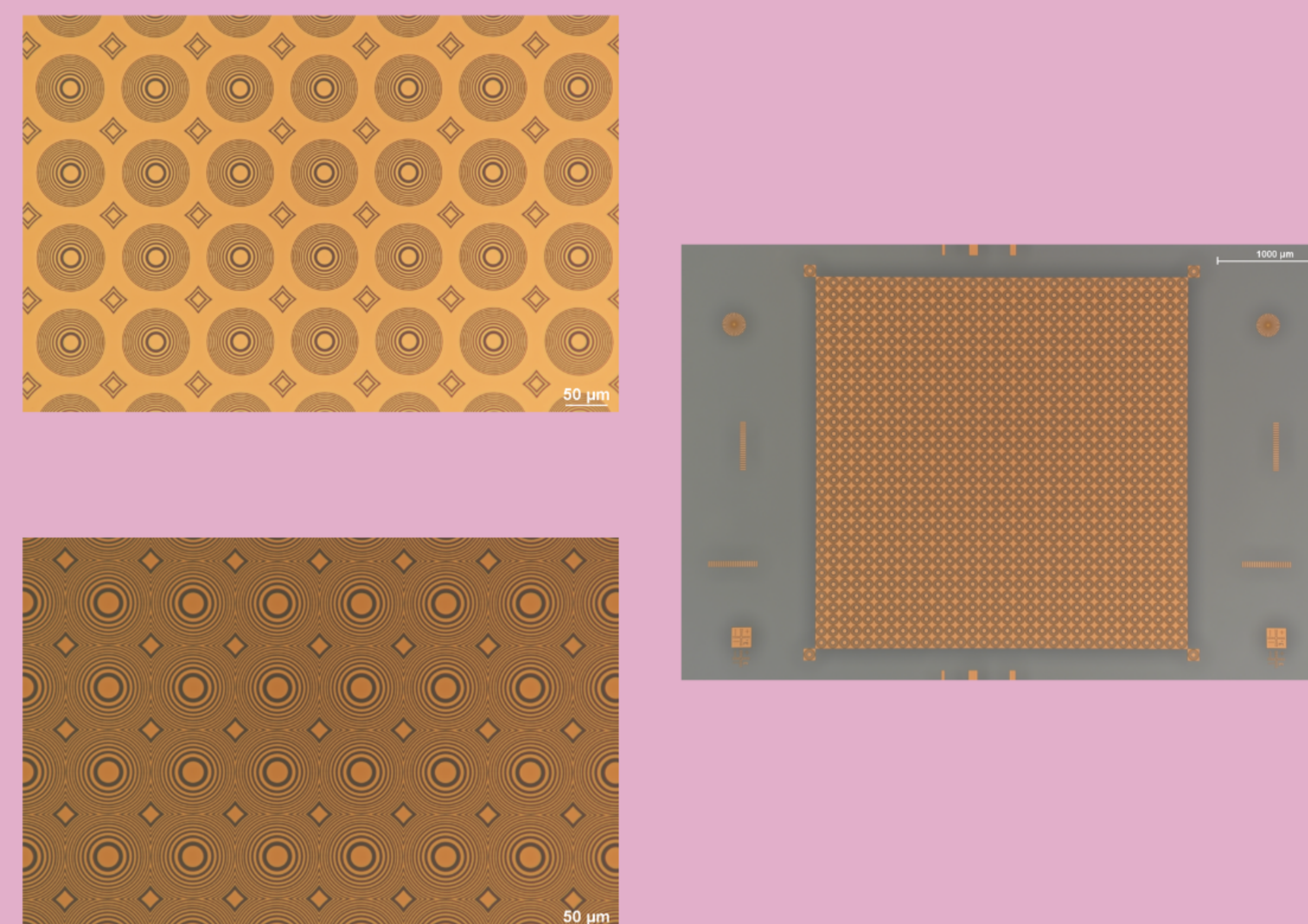
Results

We accomplished making an MDL design, masks, and a program that can output mask files. Due to the pandemic, the MDL design is still in the fabrication process. The program is a python script that runs in the KLayout API. It generates a directory of files that includes information to fabricate the MDL designs.

Design



Photolithography Mask



Challenges

1. Fabrication process was slowed due to COVID-19 guidelines
2. Remote working environment influences communication and task completion times
3. Rescoping the project to make it more achievable

Next Steps

1. Estimate design efficiency based on previous simulation data
2. Add user interface for the program for better user experience
3. Explore the ideas of metasurface materials for lens design
4. Implement machine learning into the design process for a more efficient design