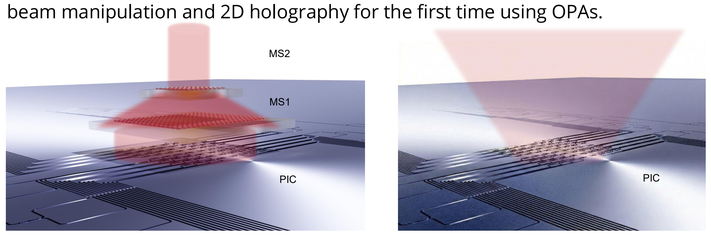
Remote Wavefront Aggregation via Spatially Decoupled Integrated Photonics and Metasurface Doublets

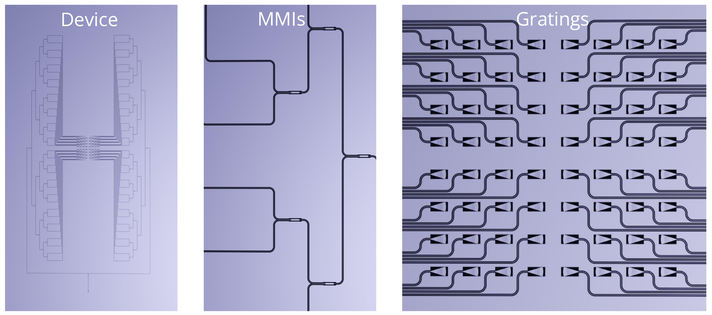
STUDENTS: VIRAT TARA

We demonstrate

We demonstrate a hybrid system for dynamic wavefront shaping comprising an optical phased array and two static metasurfaces. We use **metasurfaces (MS1 & 2)** to reduce the pixel pitch of **photonic integrated circuit (PIC)** based optical phased array (OPA) from **150 µm to 50 µm**. This enables us to perform both beam manipulation and 2D holography for the first time using OPAs.

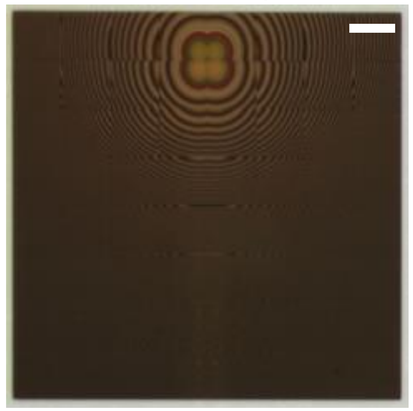


Photonic Integrated Circuit (PIC)

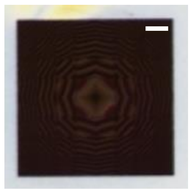


Fabricated Metasurfaces (MS) & PIC

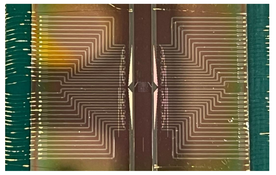
MS1 (scale: 150µm)



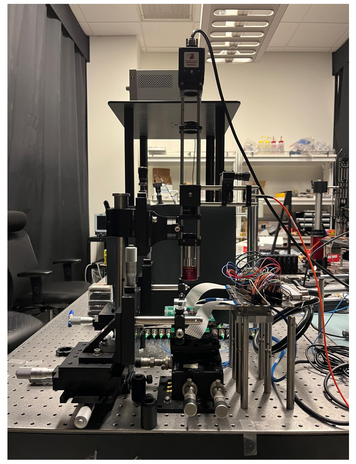
MS2 (scale: 50µm)

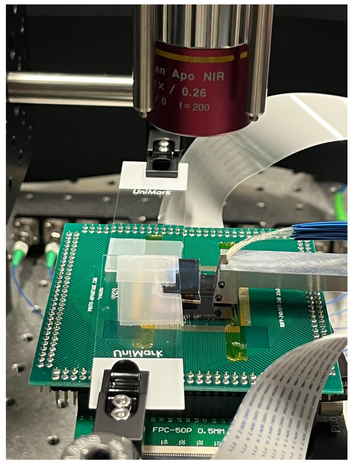


Wire bonded PIC with 64 heaters

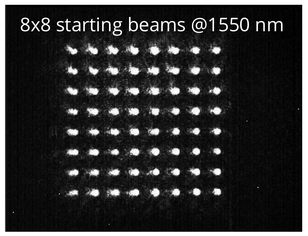


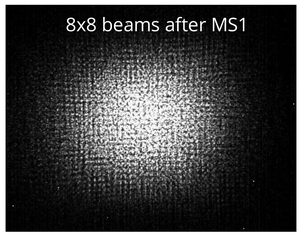
Setup

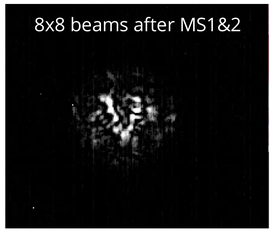


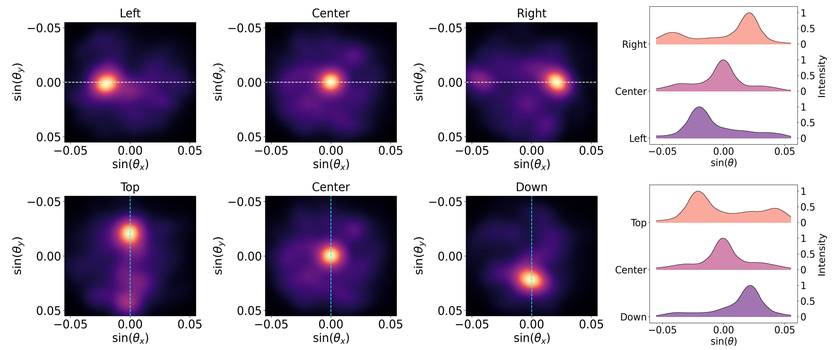


Optical measurements & Beam steering

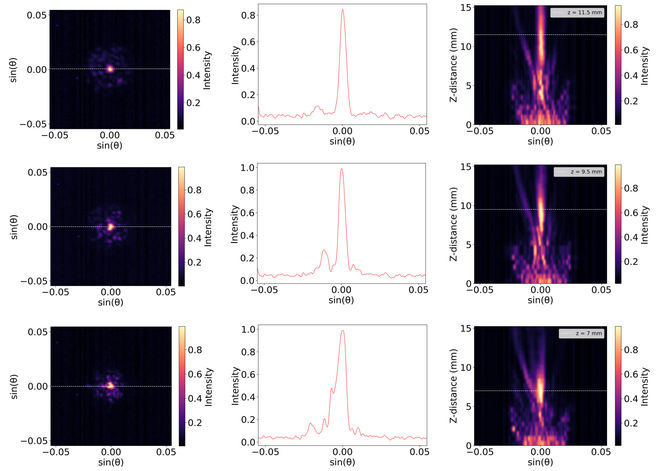


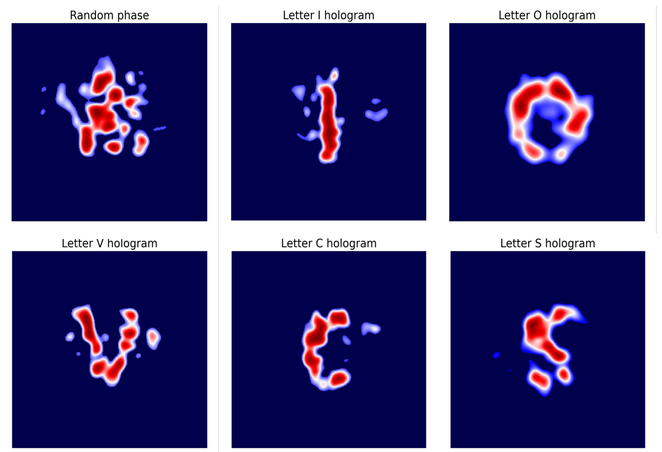






Varifocal Beam-forming & Holography





Future Work, References, and Acknowledgments

- In the future we plan to further reduce the pixel pitch of the PIC using higher numerical aperture (NA) metasurfaces.
- Other modulation techniques like Electro-optic modulation can be used to further increase the modulation speed and reduce the power consumption.

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