

Creating a Multi-Modal Near Infrared Photoacoustic-Fluorescence Microscopy System for *in vivo* Imaging

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Introduction

- Photoacoustic Microscopy (PAM) allows for:
 - Increased penetration depth
 - Imaging specificity based on excitation wavelength
- Near Infrared (NIR) wavelengths
 - Increased imaging depth due to minimal absorbance^[1]
- Recent studies use infrared fluorescent proteins (iRFP) as
 - An NIR contrast agent^[2,3]
 - A genetically encoded cellular fluorescent indicator^[4]

By creating a multi-functioning microscopy system, efficiency within imaging techniques and the total scanning time for biological samples can will be reduced.

Multi-Modal Combiner

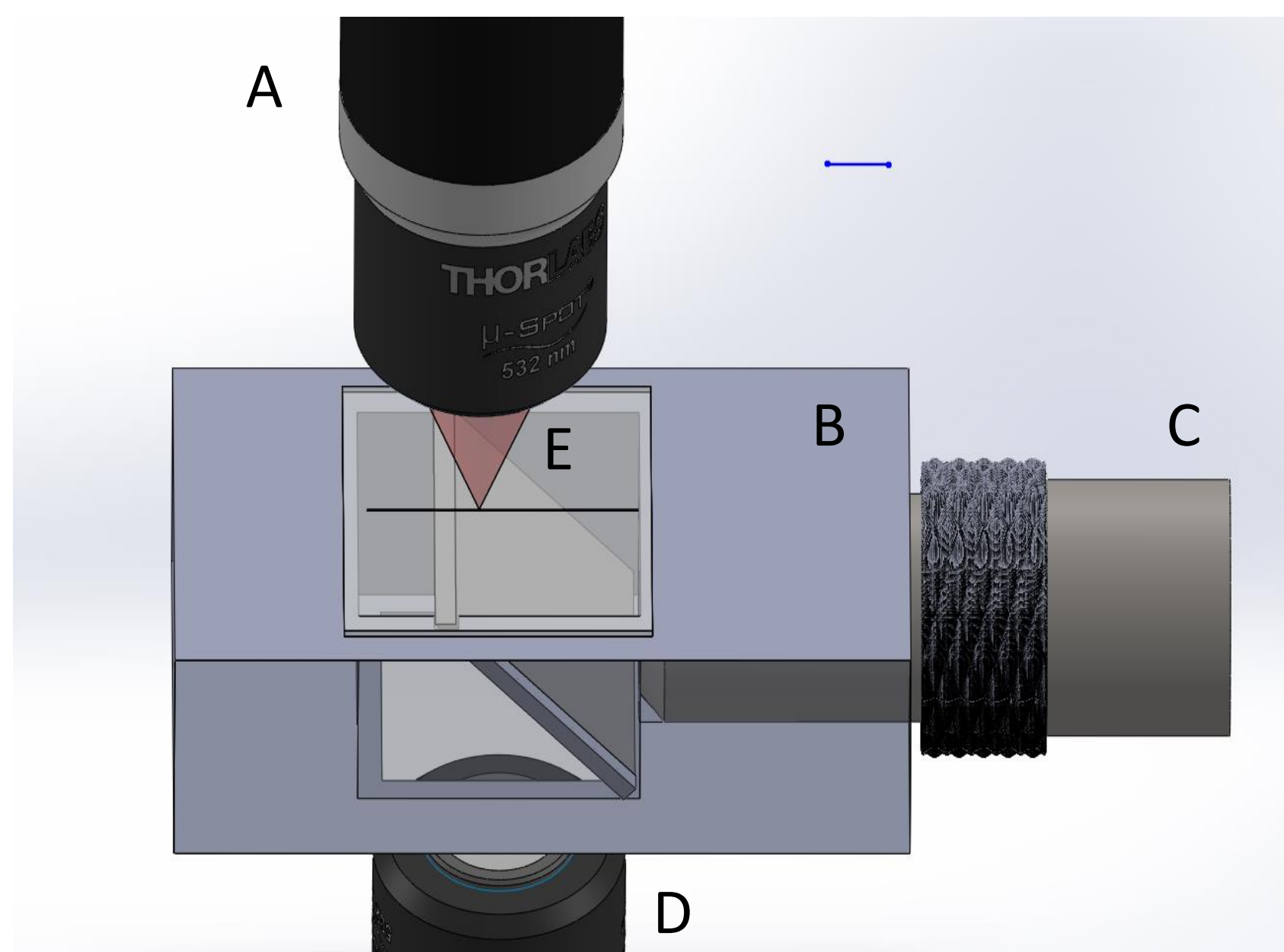
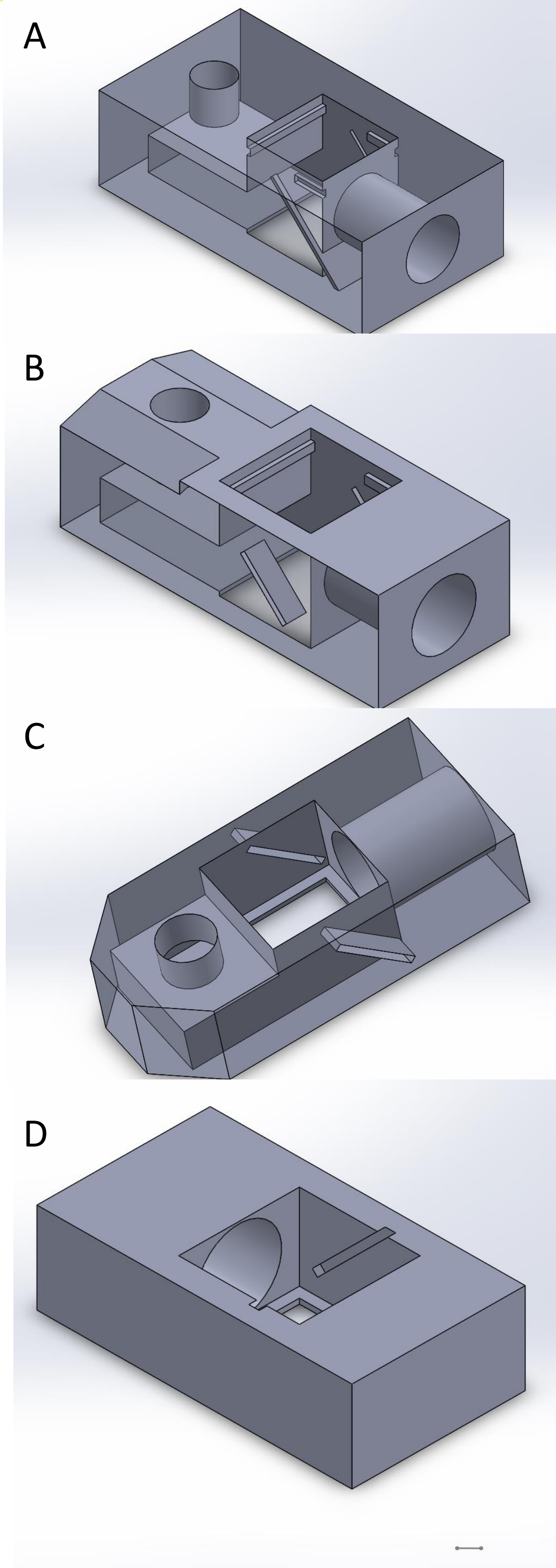


Figure 1: A SOLIDWORKS reconstruction of the dual-modal system. The components shown include: (A) the photoacoustic objective, (B) the 3D printed combiner, (C) the focused ultrasound transducer, (D) the fluorescent microscope objective, and (E) the focused NIR beam. Scale bar 5mm



Data

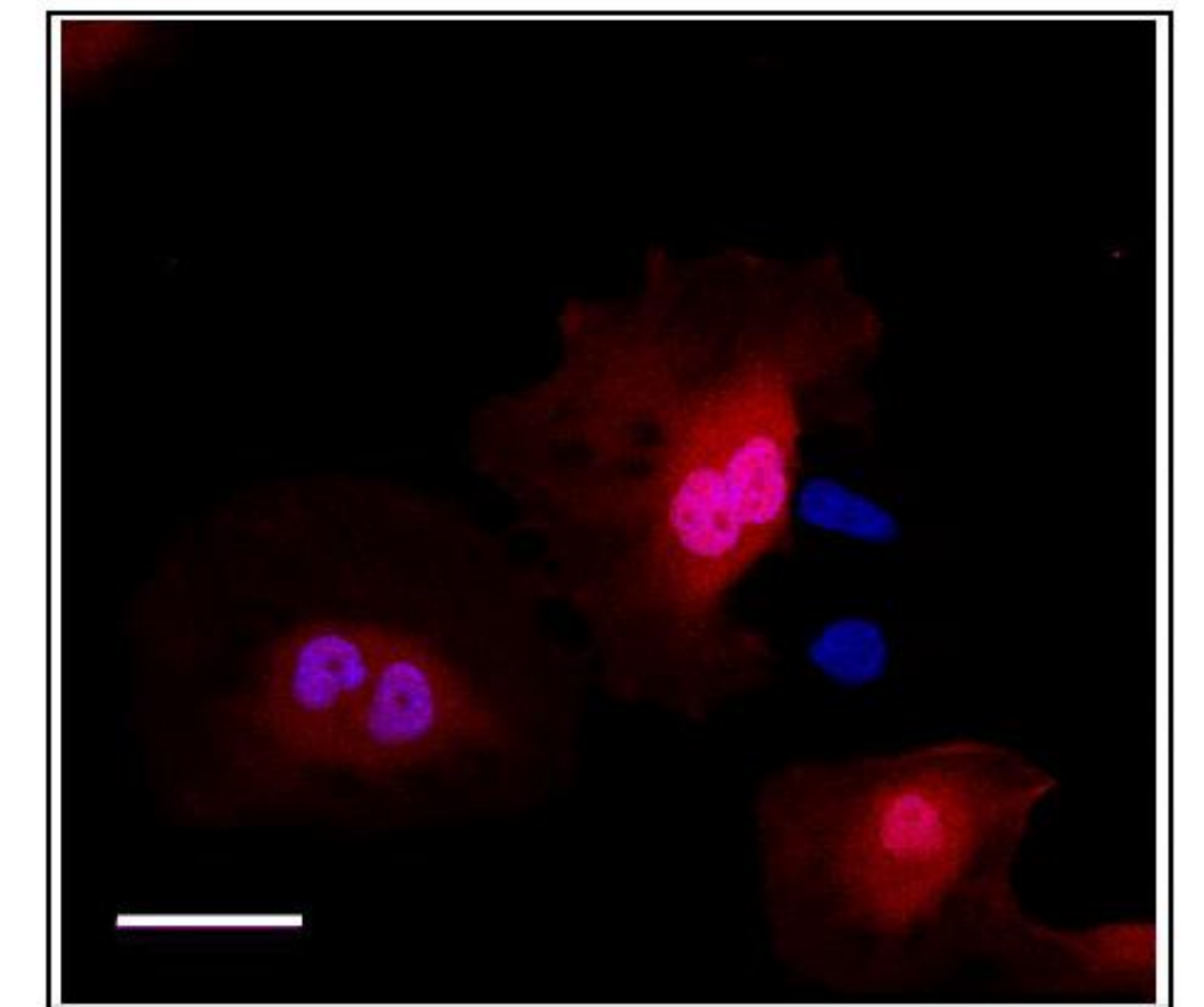
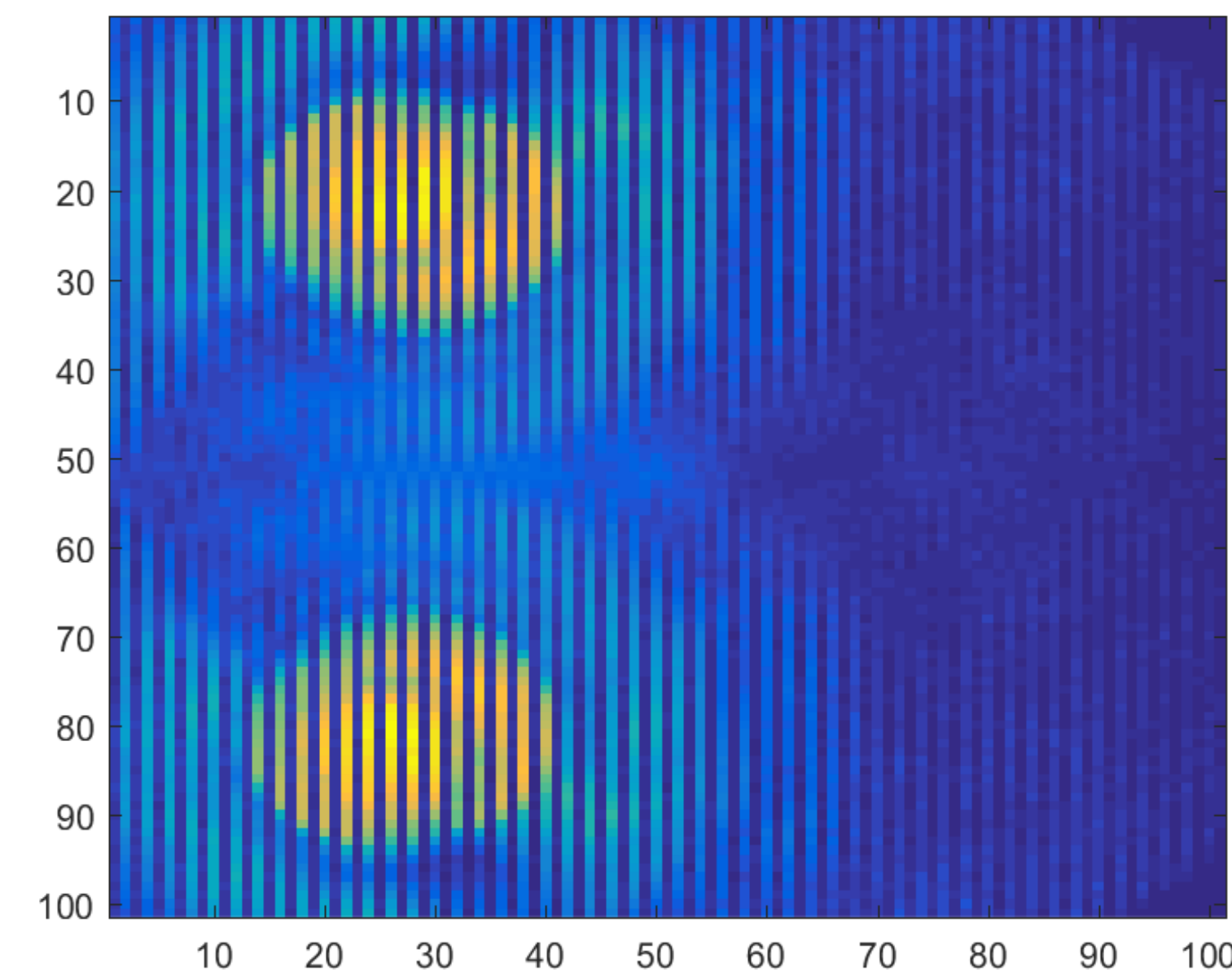


Figure 3: The reconstruction of the ultrasonic transducer face used for photoacoustic microscopy (Left). iRFP (Red) expressing HeLa cells stained with DAPI (Blue). Scale bar 50 μ m.

Conclusion

In this work I have created a multi-modal microscopy system. This combiner underwent many iterations to get to this stage, and will likely continue to be optimized through its use. Future work for this project entails the utilization of this photoacoustic fluorescence platform with a variety of biological materials that emit NIR wavelengths, to understand the full capabilities of this system.

References:

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