KARAOCE: KID array and adaptive optics for characterizing exoplanets

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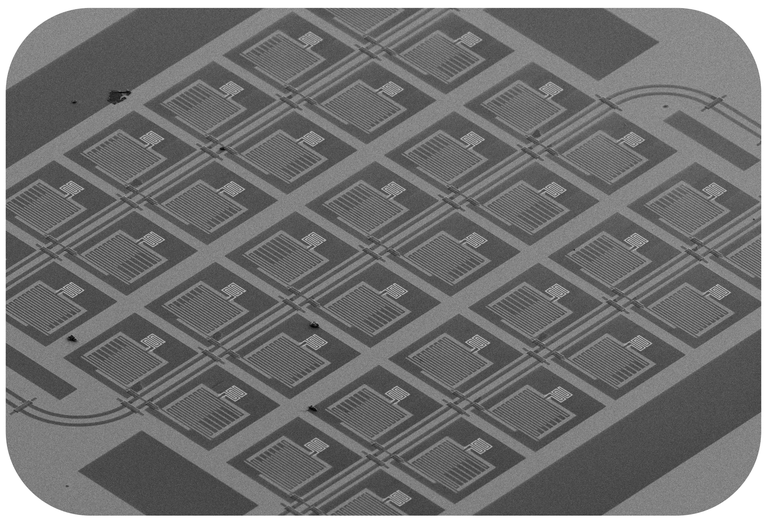
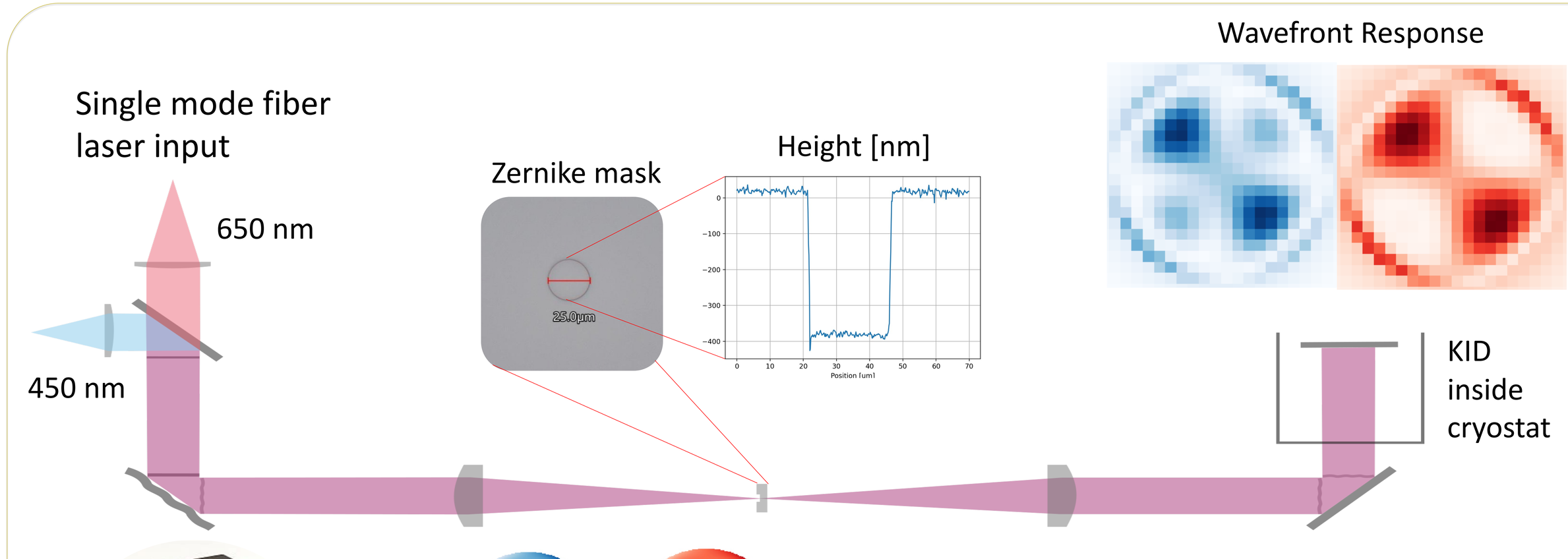
Exoplanet Direct Imaging

- Extremely Large Telescopes need ***Extremely Accurate Wavefront Sensing***
- Extract more wavefront information from every photon with energy resolvability and noiseless detection



Kinetic Inductance Detectors (KIDs)

- *Inherent* wavelength resolution (UV-VIS-IR)
  - ➔ ***Enables wavelength diversity!***
- *0 read noise* (photon counting)
- *0 dark noise* (cryogenic)



First KID-light expected fall 2024

KID-based wavefront sensor demonstration: KARAOCE

Sense wavefront aberrations using two wavelengths

- *MKID* (20x20; 150 μm pitch; in-house fabricated)
- *Zernike* wavefront sensor mask (in-house fabricated)
- 97-actuator *deformable mirror* (ALPAO DM97-15)

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