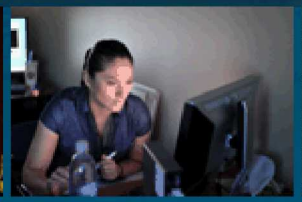
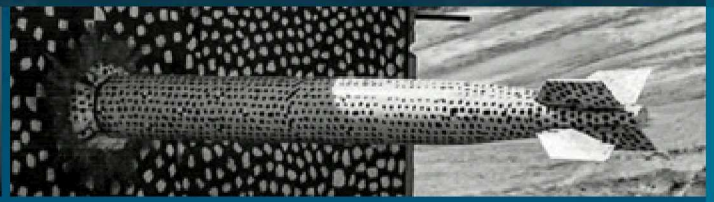
SAND2020-1682C

Fiber-based interferometer for optical field reconstruction





PRESENTED BY

Aaron M. Katzenmeyer

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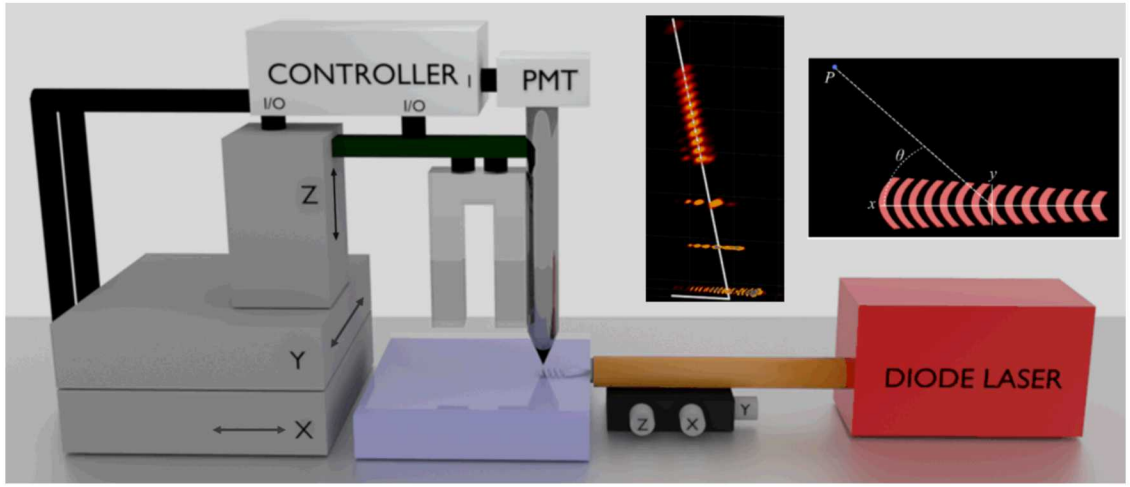
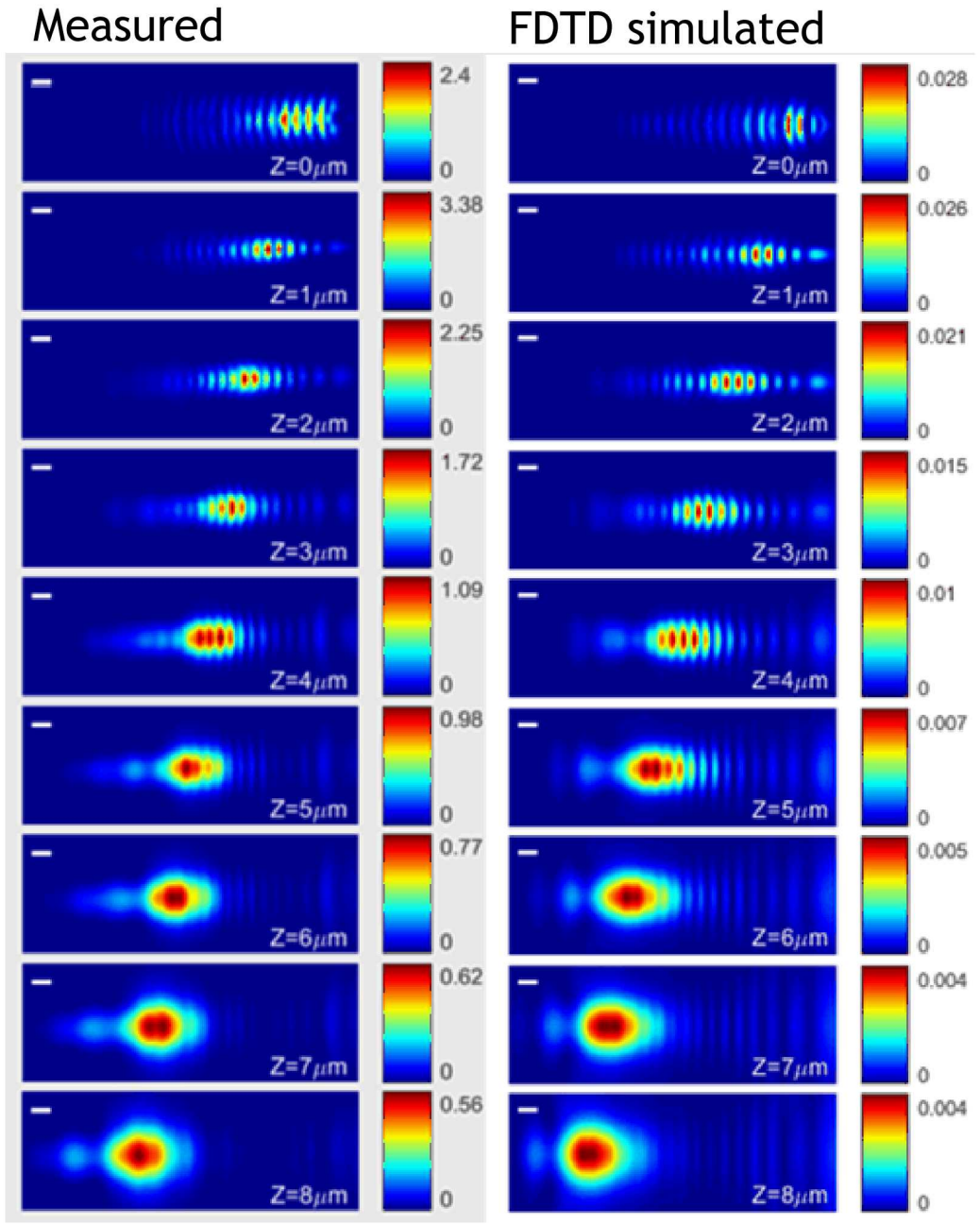
Motivation

Integrated photonics
- High functionality
- Low power
- Creates characterization challenges

Information in Light
- Amplitude
- Phase
- Polarization
- Frequency





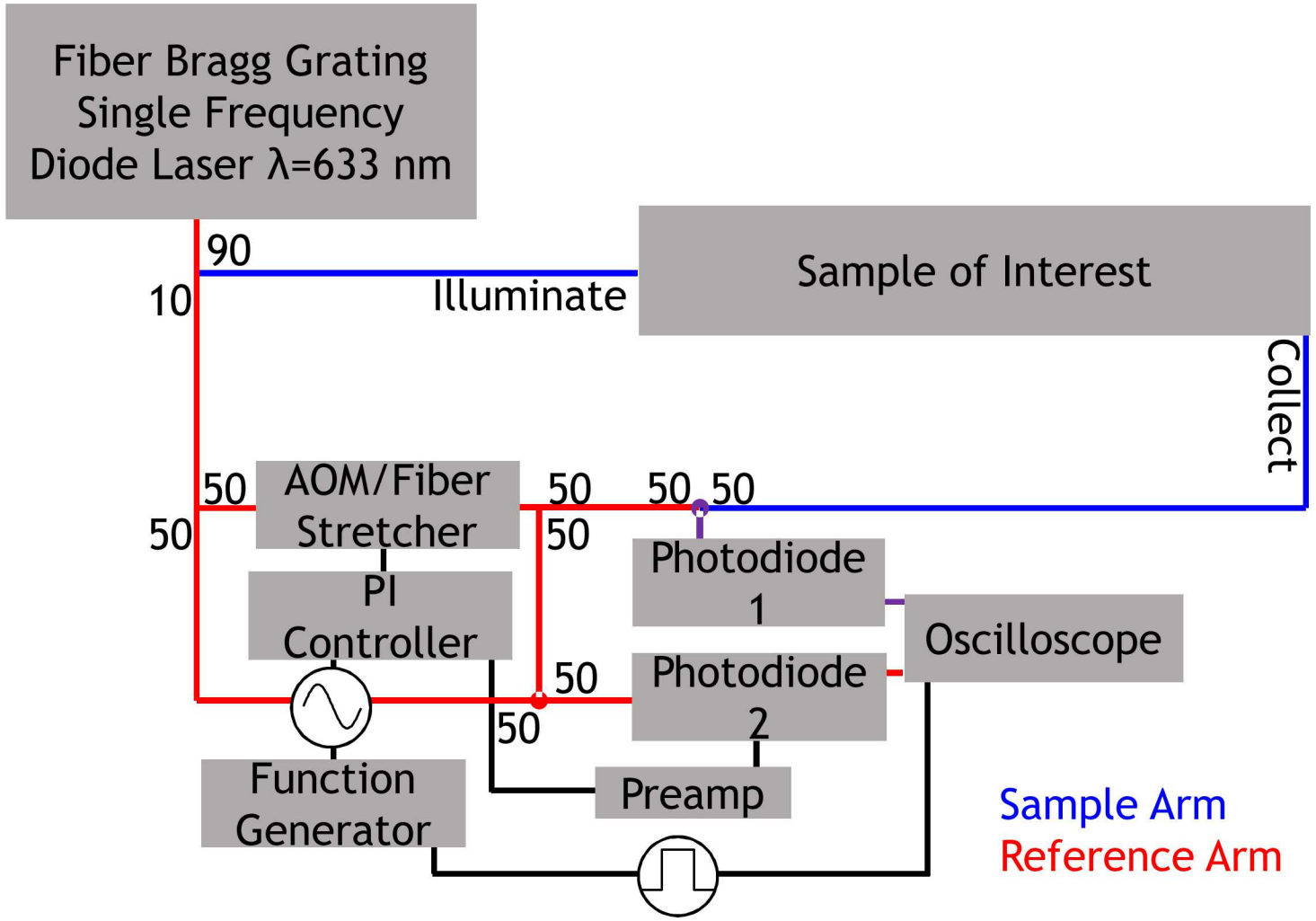
Katzenmeyer et al. *IEEE Photon. J.* **9**, 2701009 (2017)

Fiber Interferometer

Enables extraction of amplitude and phase as a function of polarization

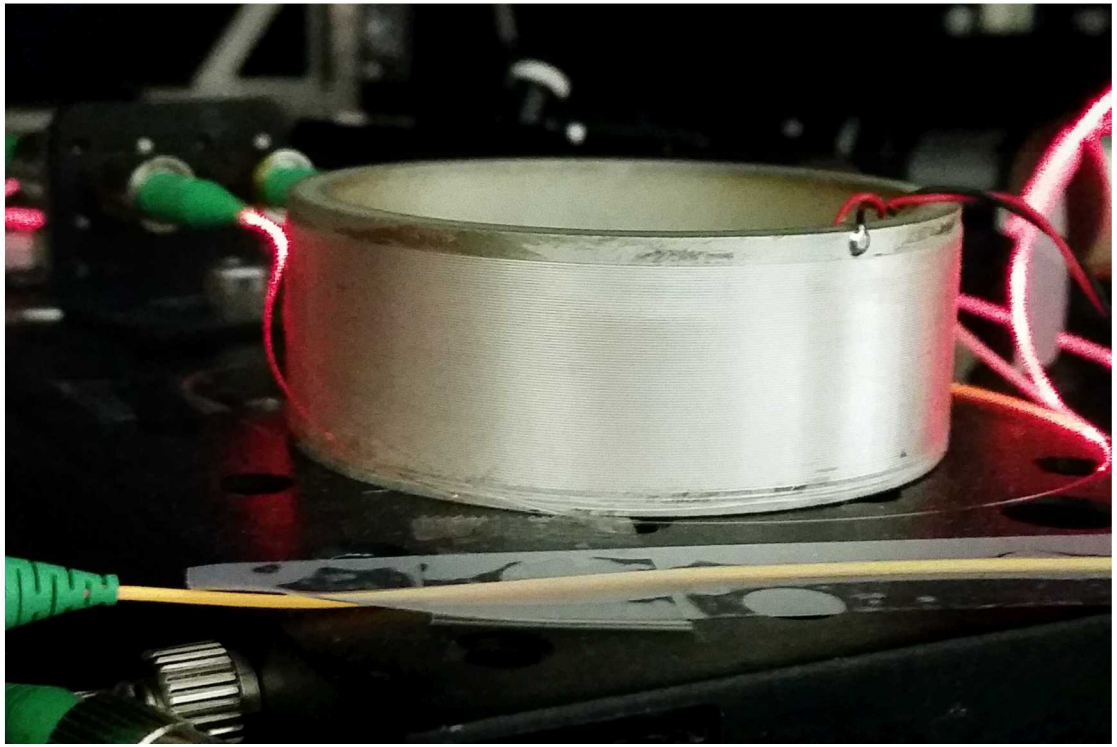
- Compare unknown to reference arm

Compact but introduces phase drift

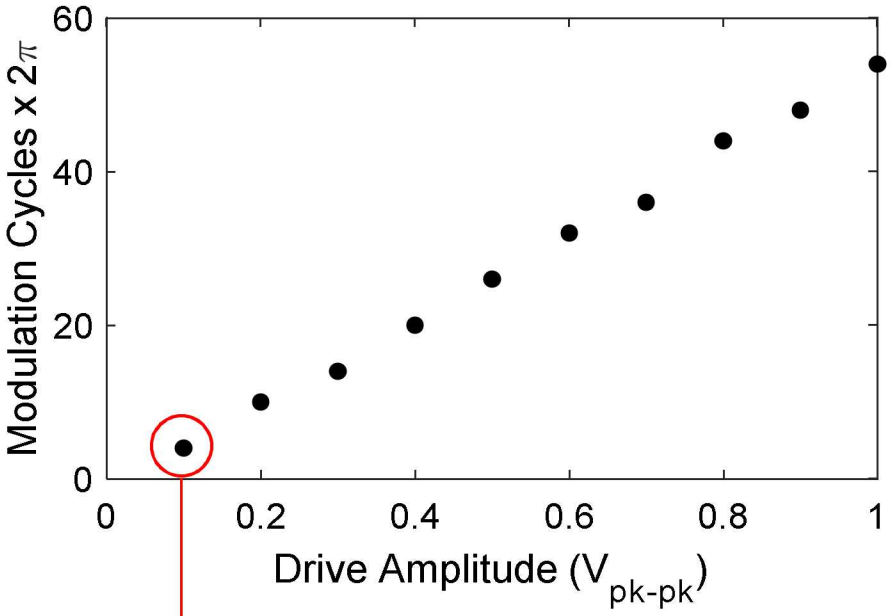


Fiber Stretcher

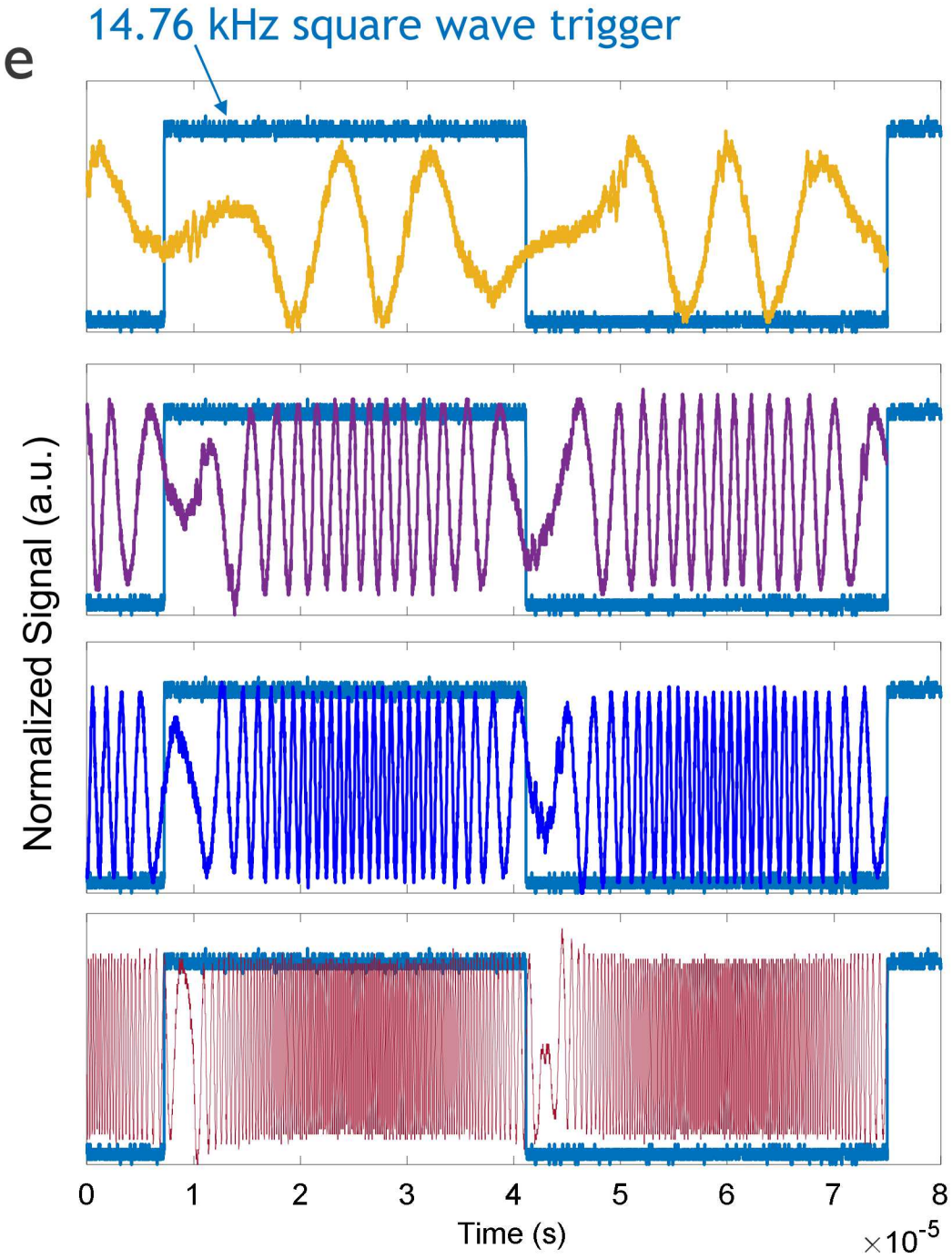
68 mm (OD) x 25 mm (height)
~15 kHz fundamental resonance
86 turns of fiber, single layer
18.3 m SM-630 fiber



Fiber Stretcher Performance



563 nW / 2π VS 1 W AOM



Piezo sine wave:

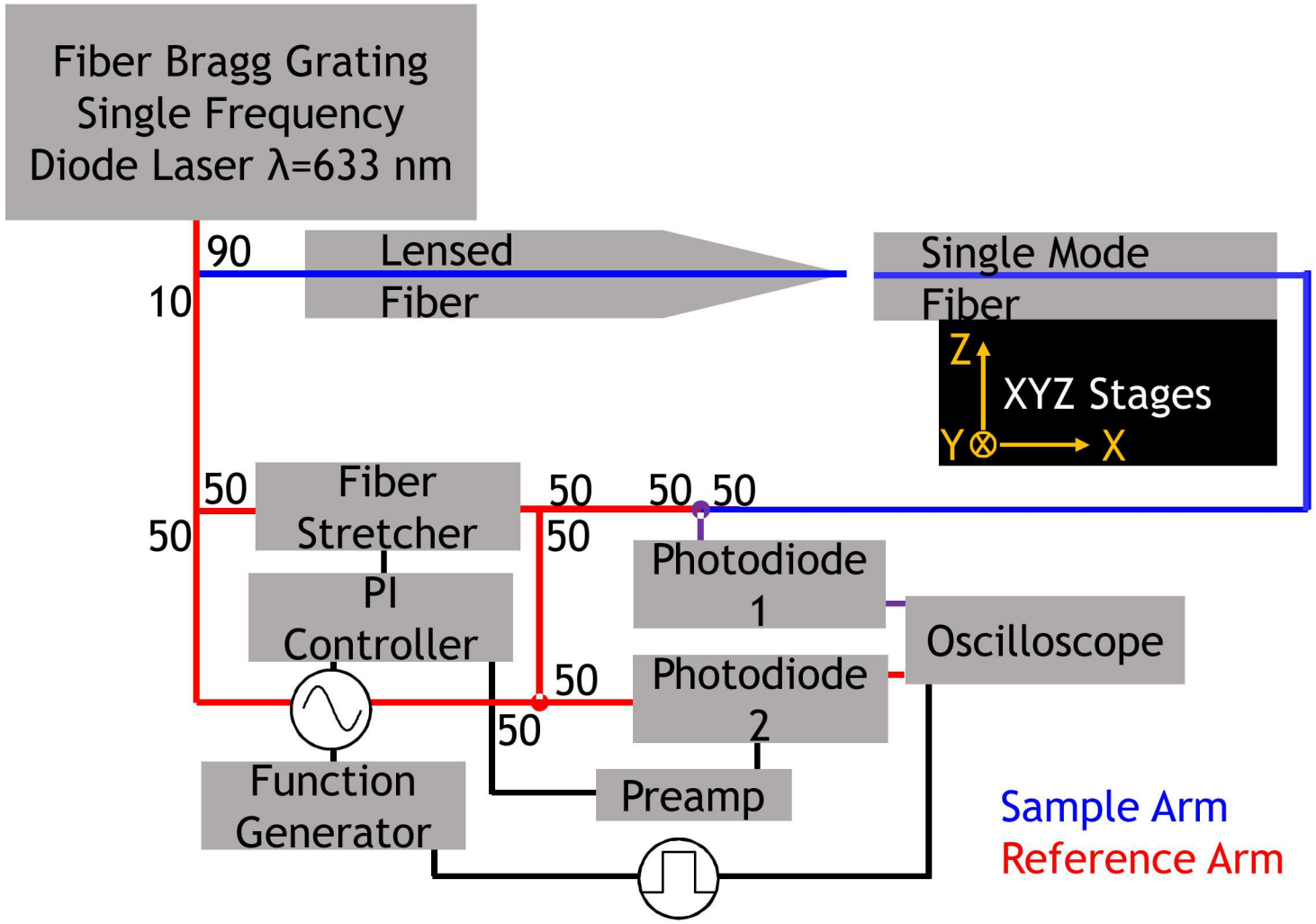
100 mV_{pk-pk}

500 mV_{pk-pk}

1 V_{pk-pk}

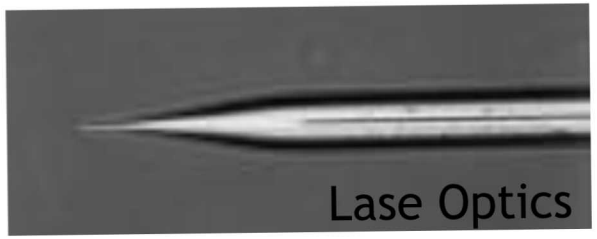
5 V_{pk-pk}

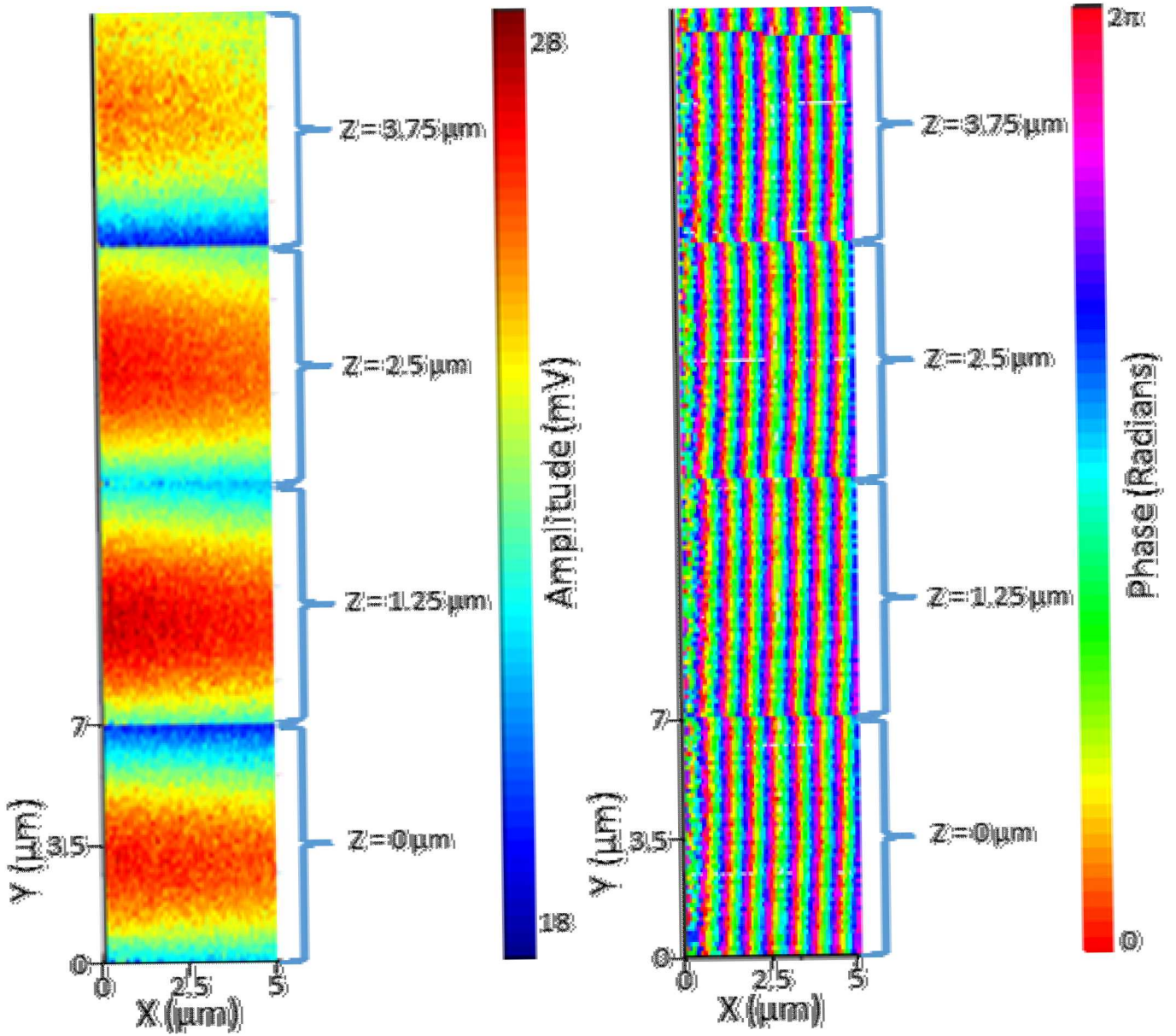
Lensed Fiber Measurement Setup



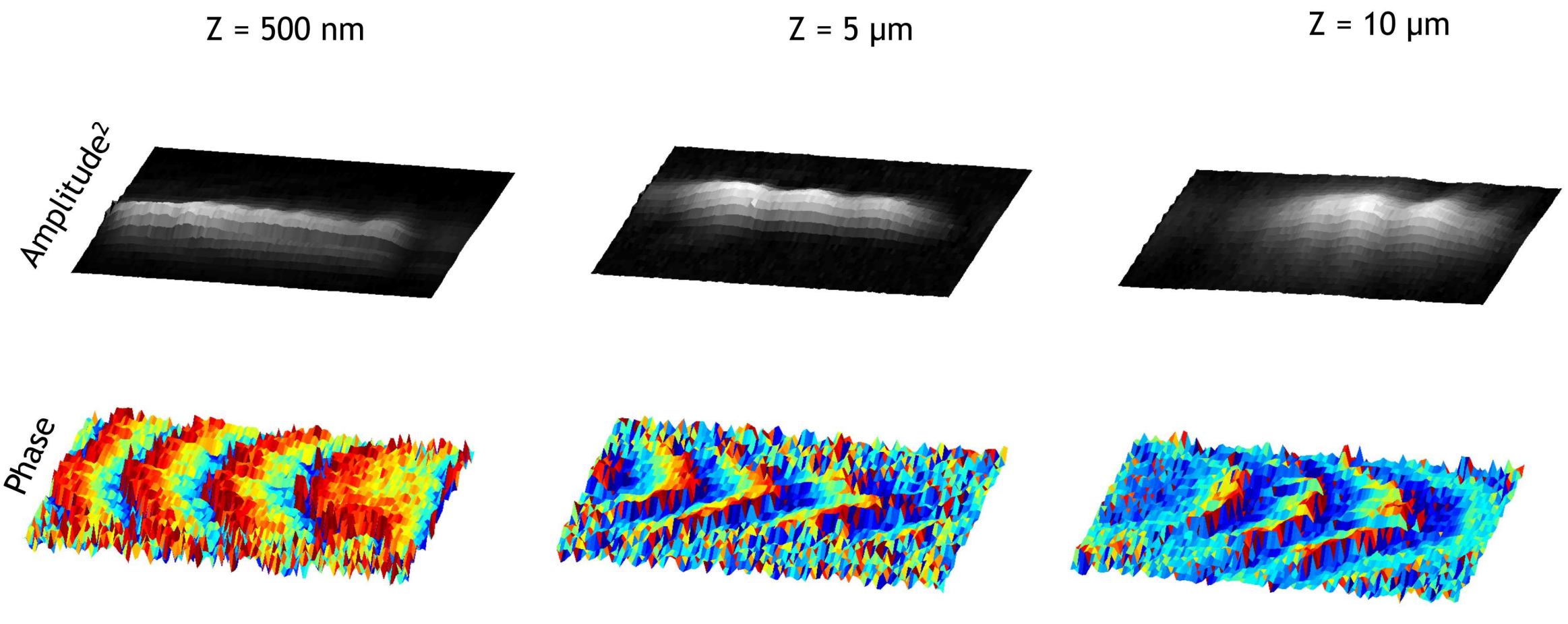
Lensed Fiber

1 +/- 0.1 µm spot size





SNOM Images - coherent



Summary

Fiber interferometers typically require phase stabilization/locking

Fiber stretcher

- Low voltage, low power route to lock phase of reference arm
- Frequency upconversion in phase modulation with respect drive signal
- Obviates need for AOM
  - Lower power of operation
  - Lower loss (no fiber to free-space to fiber coupling)

Amplitude, phase, polarization mapping feasible

- Drift in sample arm limiting factor