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Meta-instrument

An opto-mechanical platform for imaging near-field optical instruments

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Meta-Instrument: An Opto-Mechanical Platform for Imaging Near-Field Optical Instruments



Roy Bijster^{1,2}, Rodolf Herfst², Wimar Klop², Ronald Hagen³, Hamed Sadeghian²

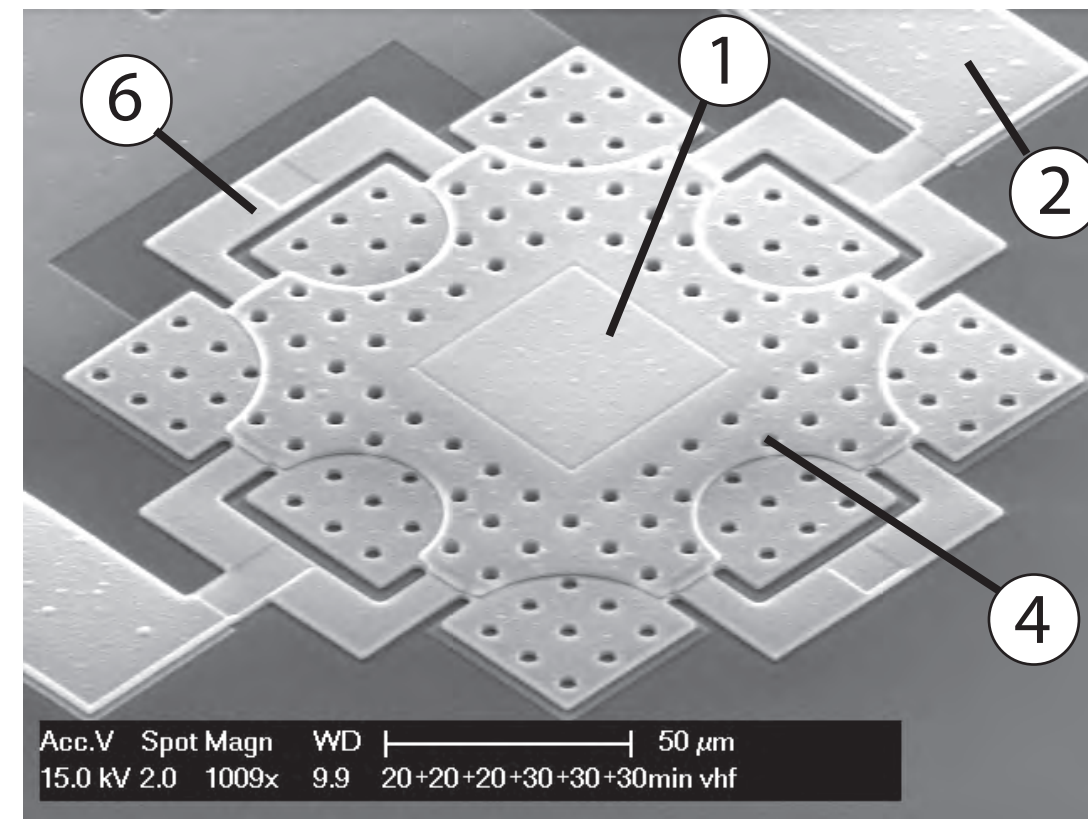
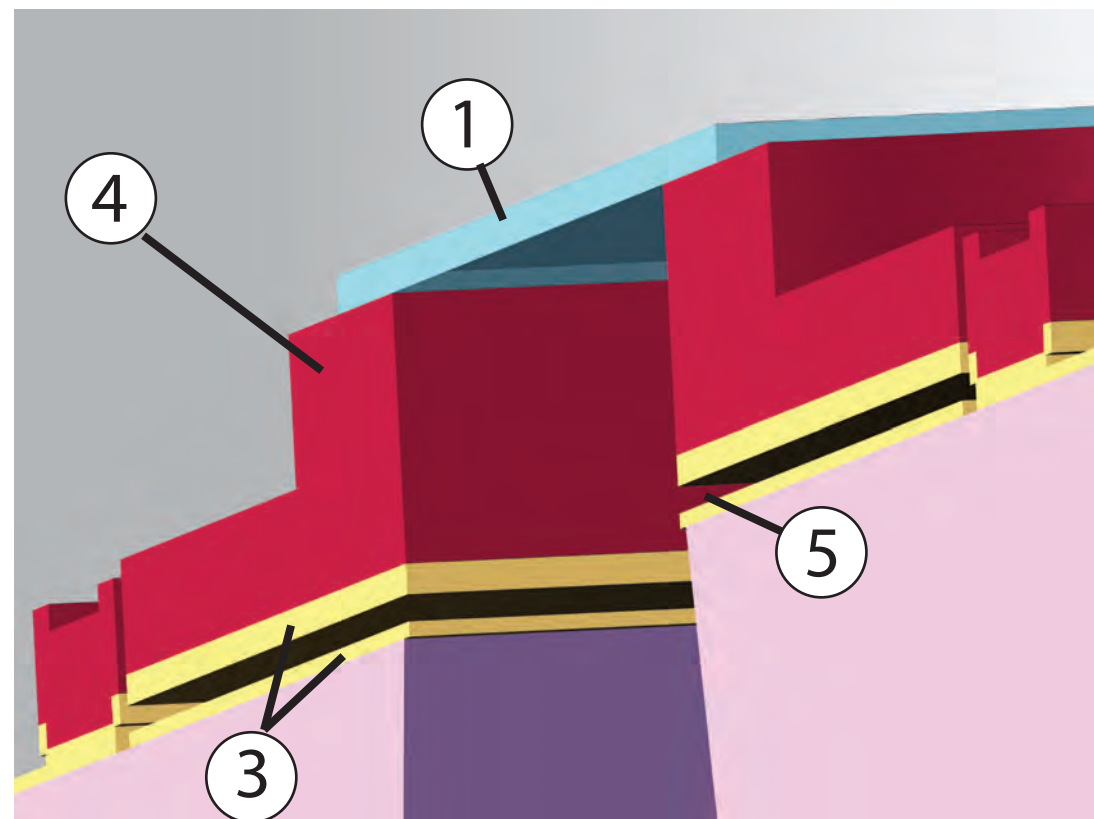
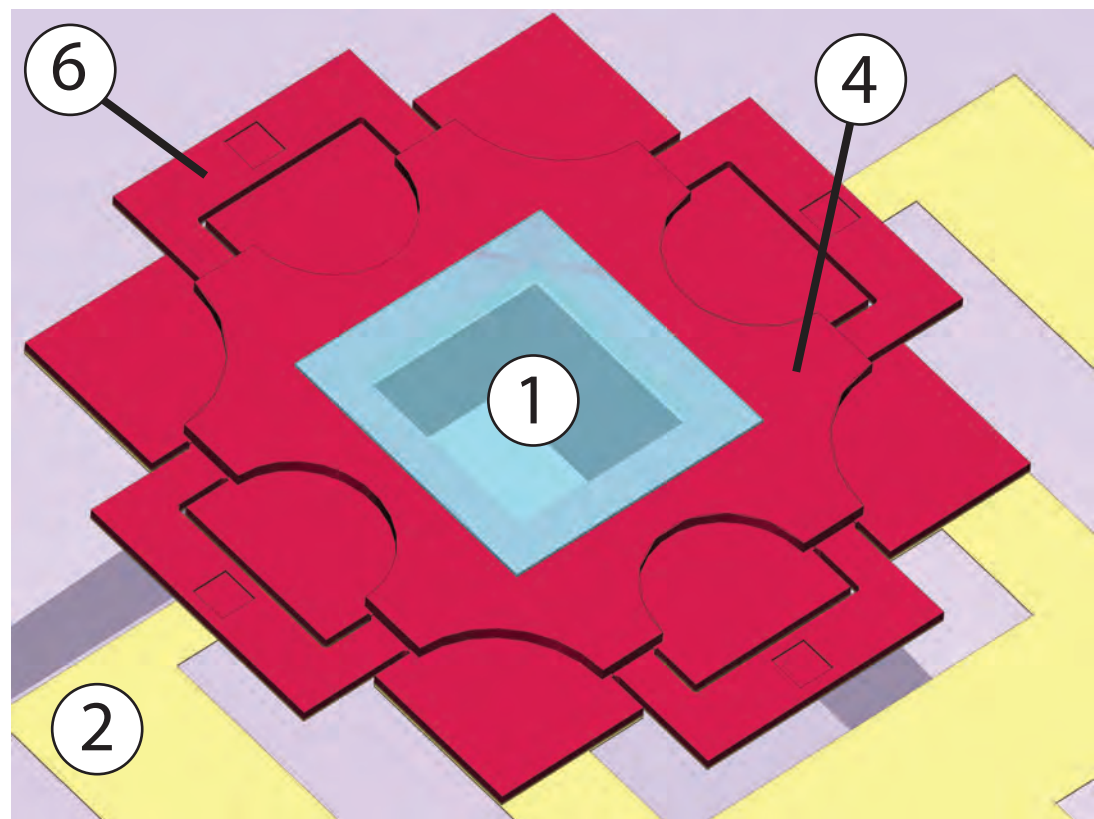
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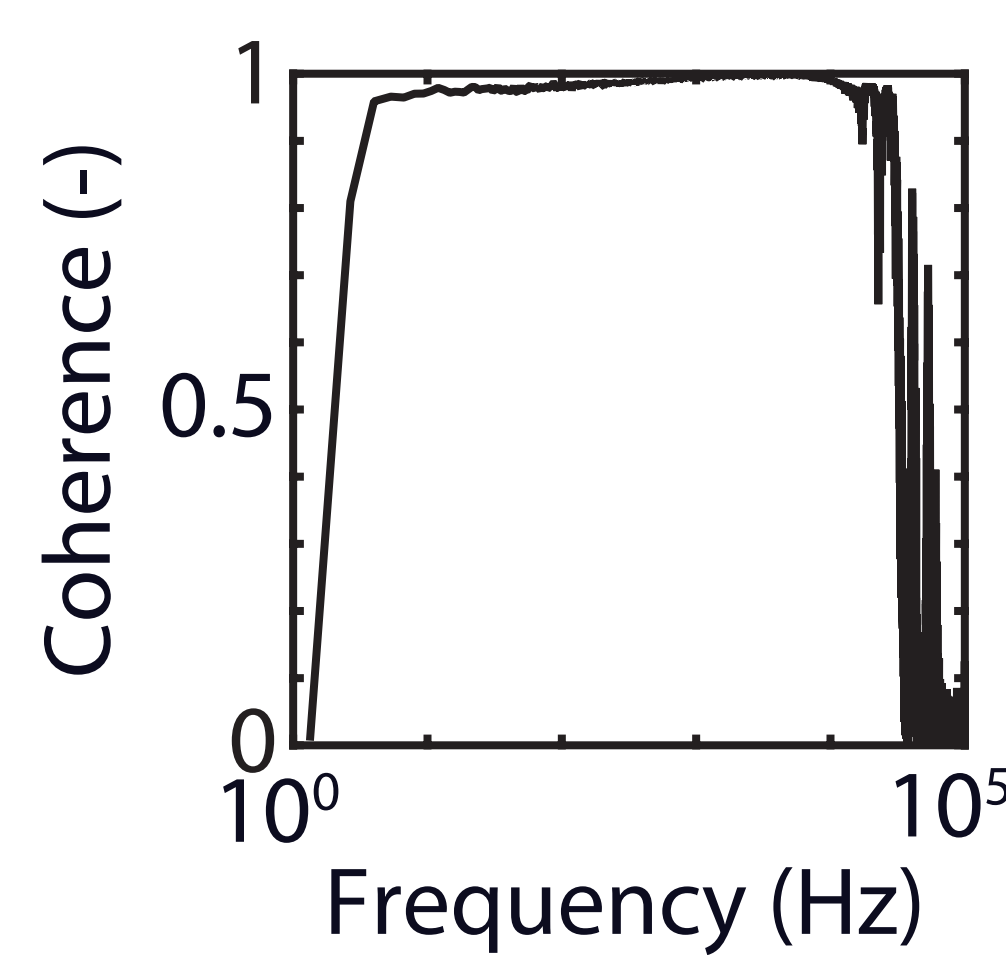
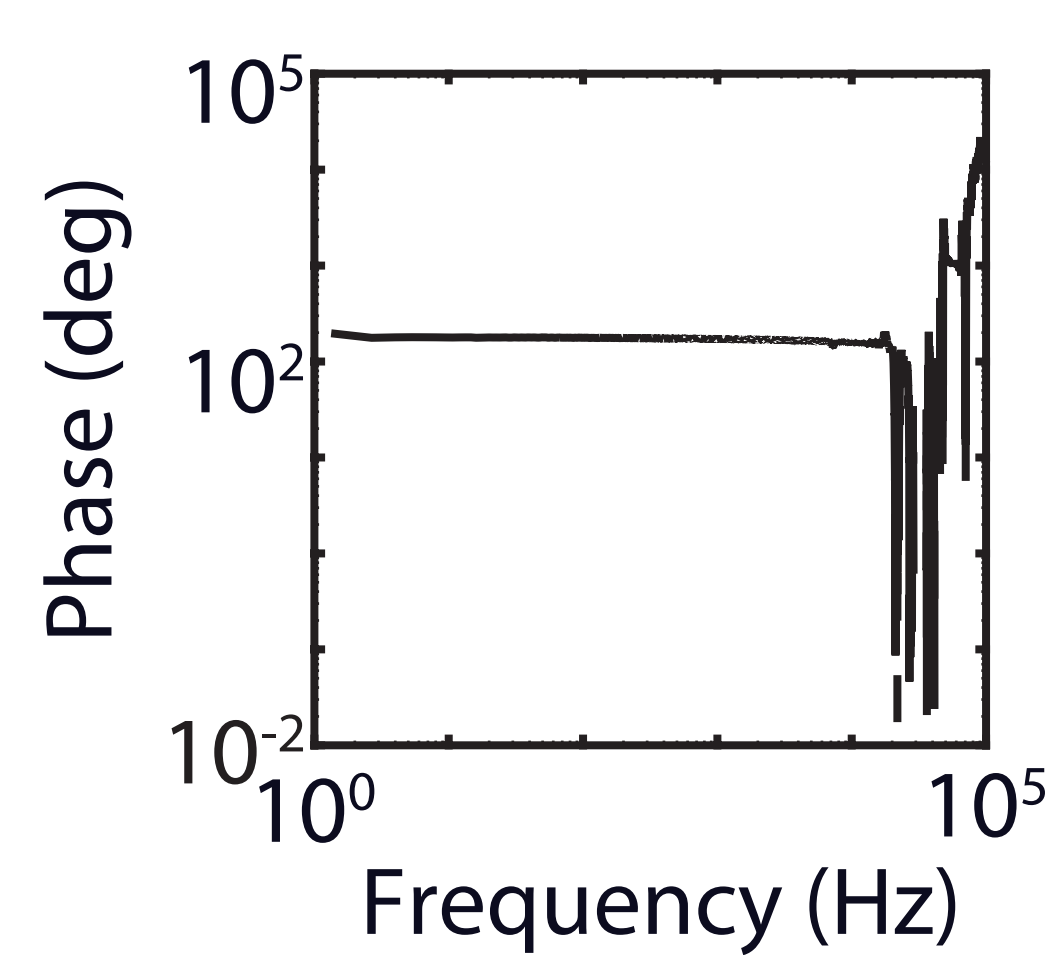
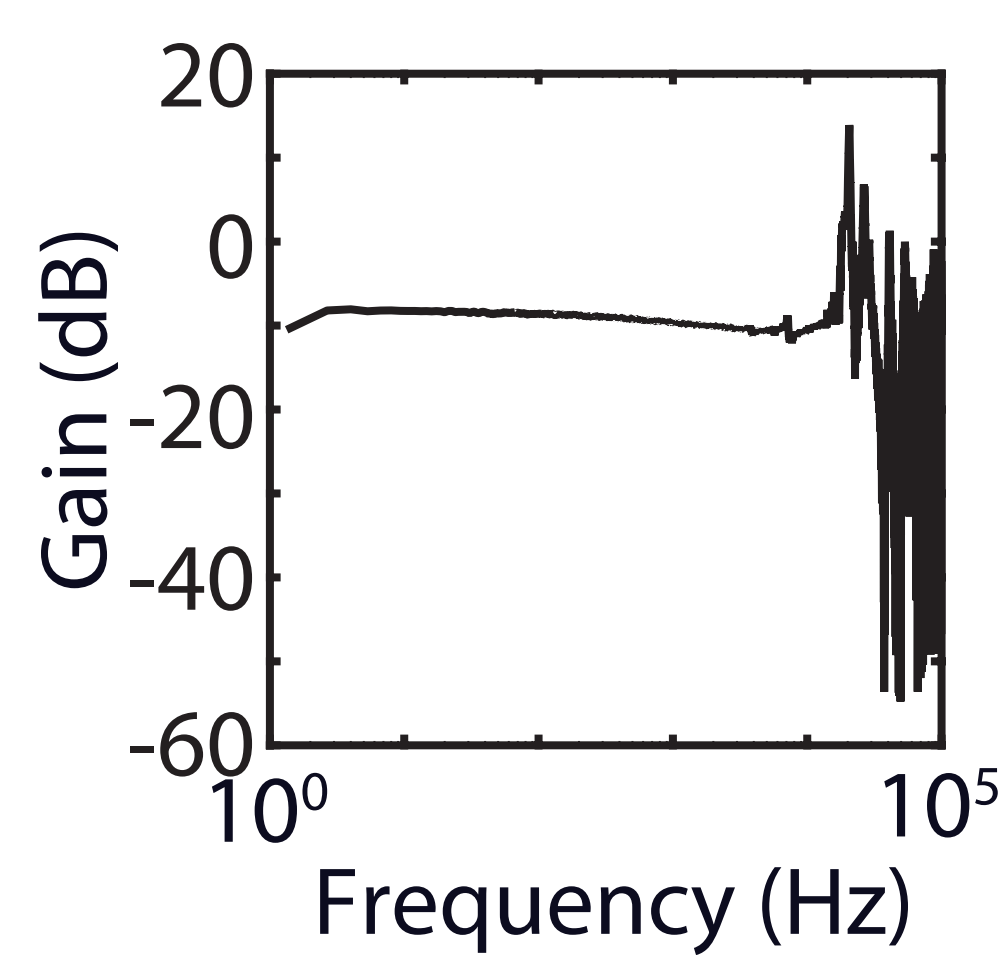
³Department of Optics, Netherlands Organisation for Applied Scientific Research TNO

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Nanopositioning MEMS device (1) Transparent window, (2) Electronic leads, (3) Electrodes, (4) Moving plate (SiC), (5) Air gap of 500 nm, (6) Leaf springs

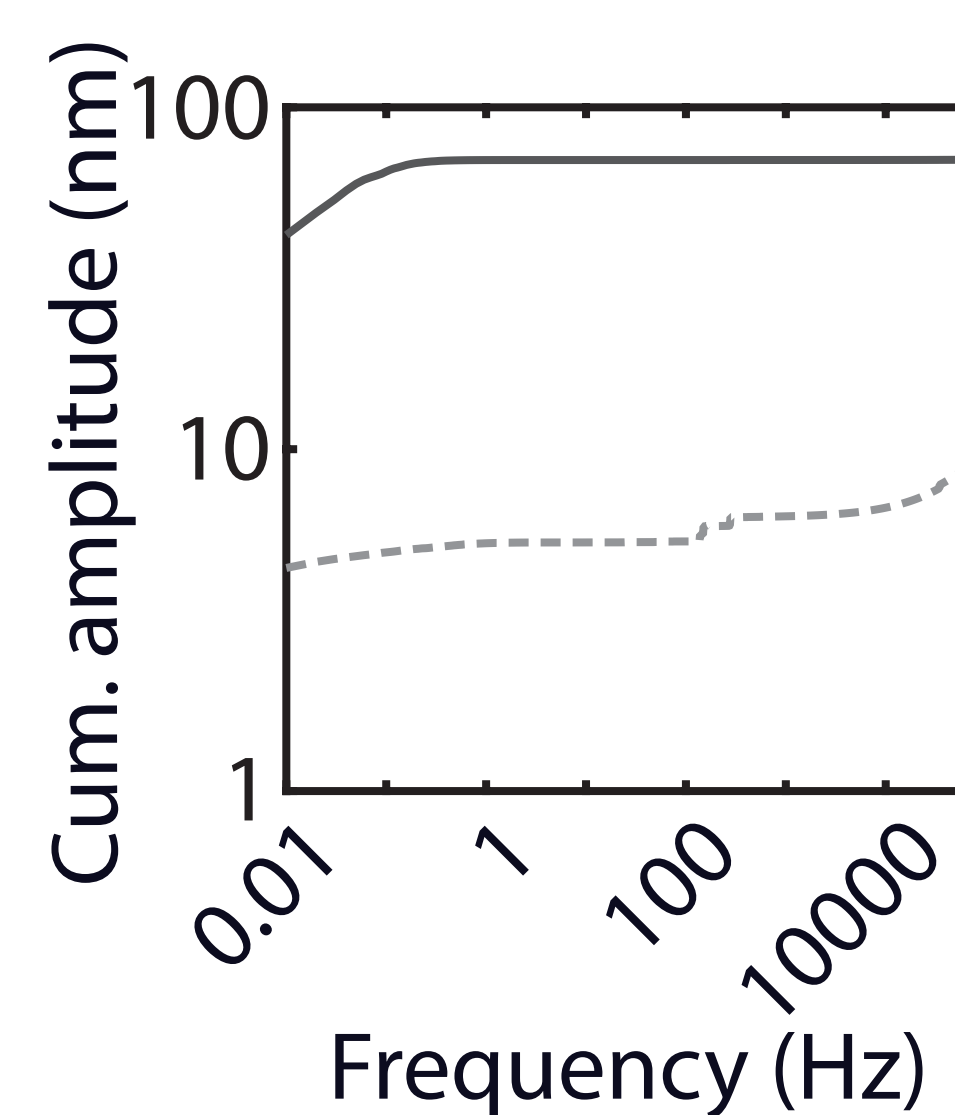
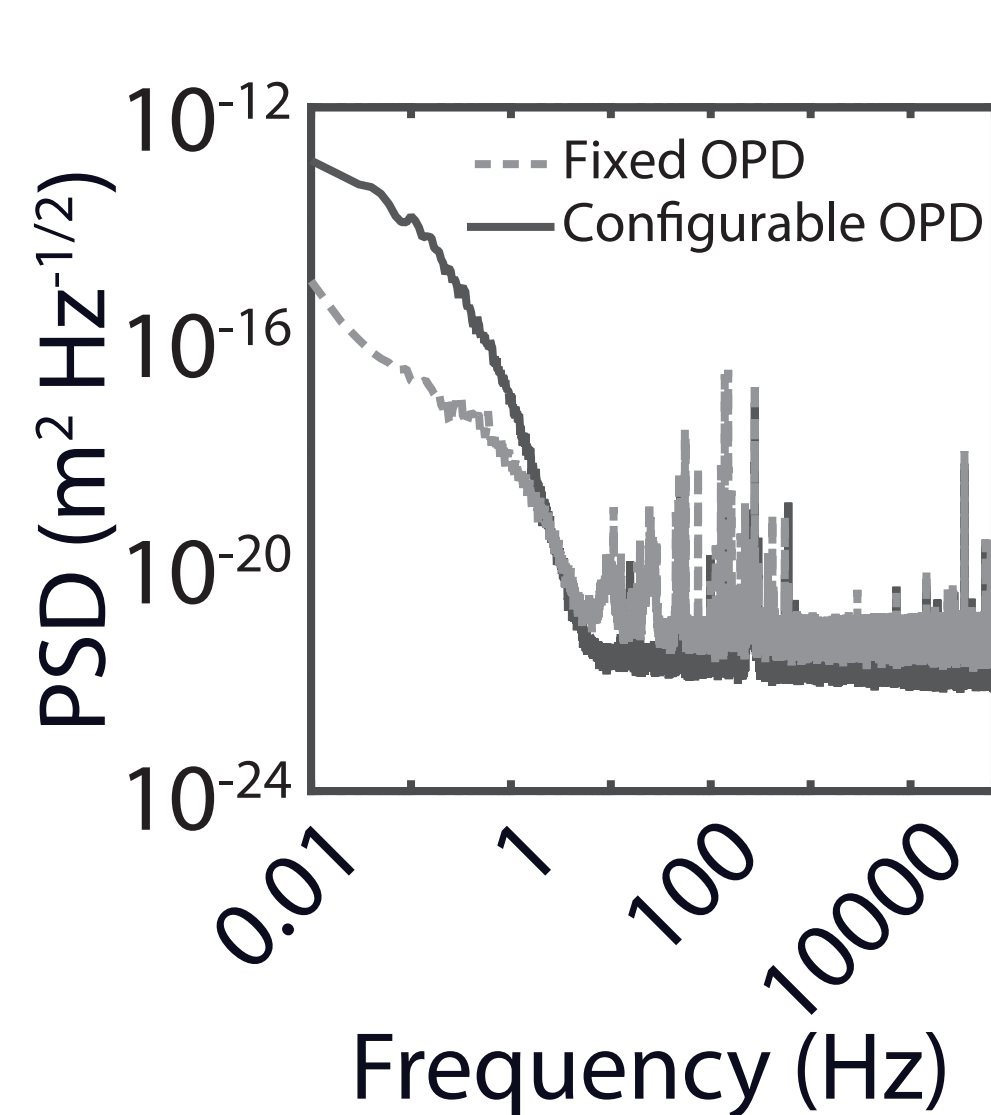


Fine positioning stage The stage and interferometers show a large signal coherence up to 10 kHz. This allows for a high bandwidth tracking of the sample.



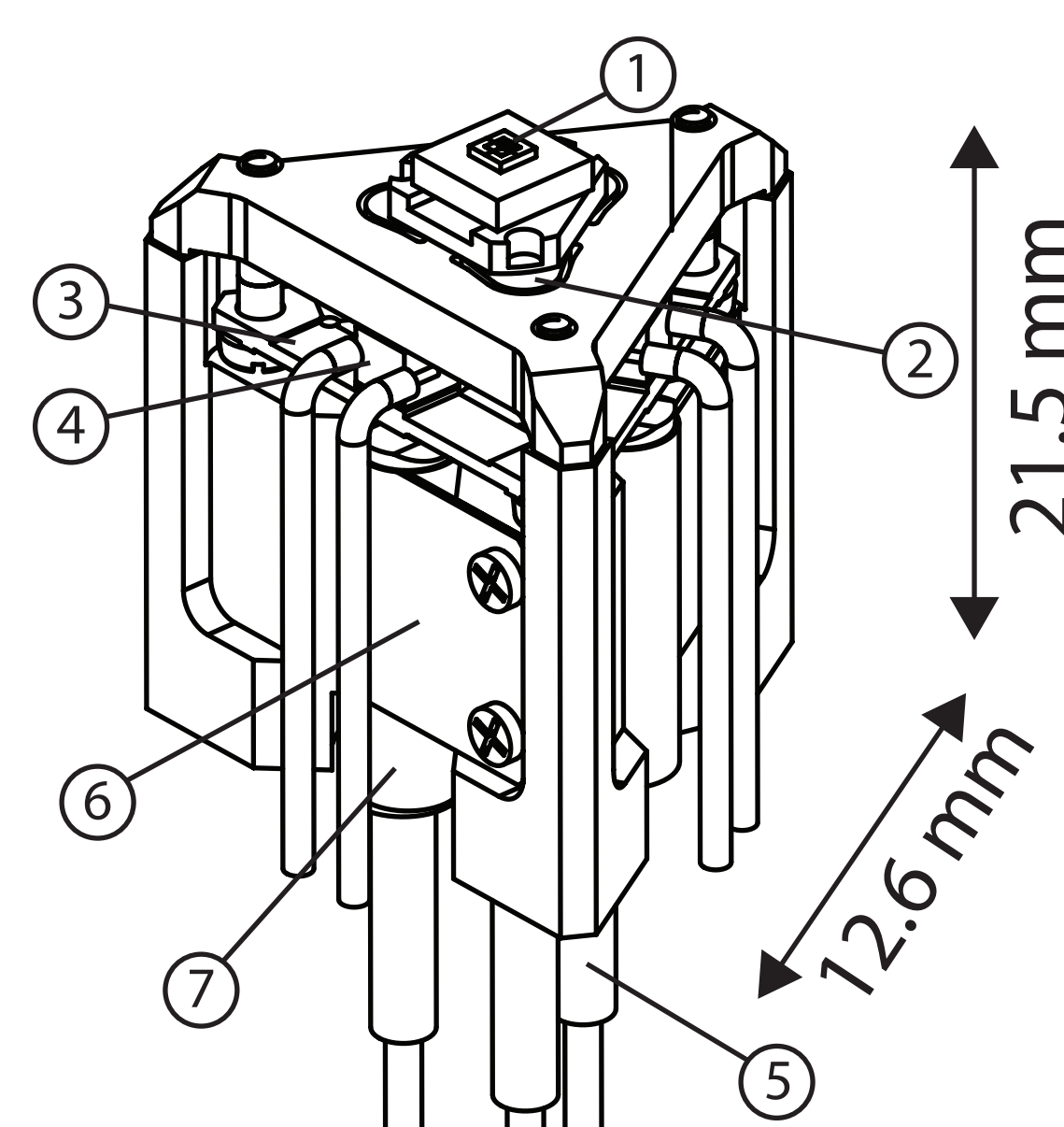
Fiber interferometers as distance sensors

Measure the motion of the finepositioning stage. By stabilizing the temperature of the optical path difference, the noise is reduced from 70 nm r.m.s. to 10 nm r.m.s. over 70 kHz.



Second generation

- (1) MEMS nanopositioning device
- (2) Mirror surfaces for interferometers
- (3) Leaf spring that preloads piezo element
- (4) Piezo element for fine positioning
- (5) Fiber interferometer
- (6) Leaf spring that clamps the carbon rod
- (7) Carbon rod of the coarse positioning



Combined fine and coarse positioning

The new linear actuator can be used for fine positioning and coarse stepping at 0.32 $\mu\text{m}/\text{step}$ and velocities up to 3.2 mm/s.

