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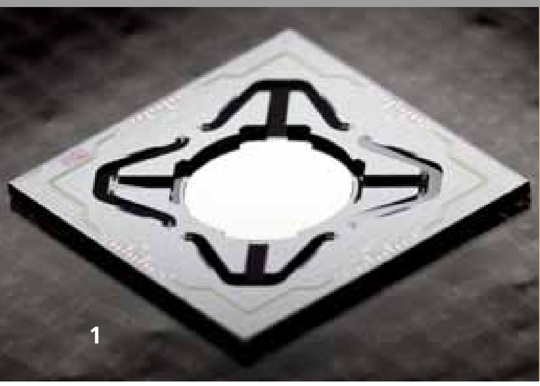

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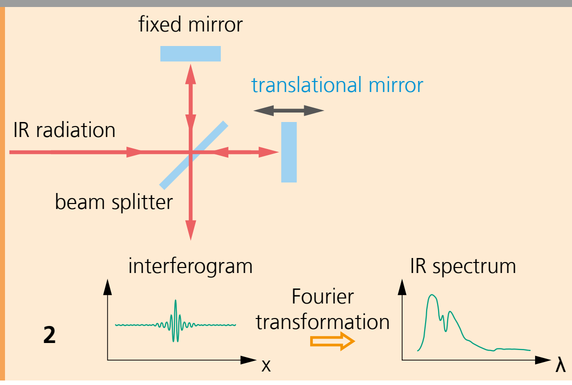

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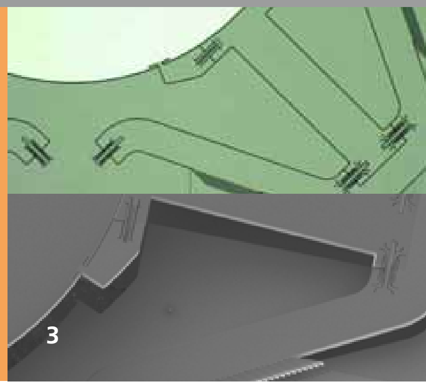

3

1 *Photograph of a MEMS mirror with a mechanical deflection of 400 µm.*

2 *Set-up of Fourier Transform Spectrometer.*

3 *Photographs of mirror suspension; un-deflected (top) and SEM at 400 µm deflection (bottom).*

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TRANSLATORY MEMS MIRROR WITH EXTRAORDINARY LARGE STROKE (PUMP MODE)

Optical metrology systems like Fourier Transform Spectrometers or confocal microscopes require fast modulation of the optical path length to shorten measurement times. Conventional solutions with complex driving mechanics for the deflectable mirrors show high sensitivity against vibrations and shock. As a result they often are suitable for laboratory operation, only. Application of translational mirrors for optical path length modulation allows to overcome this disadvantage. In addition to high vibration and shock insensitivity, the advantage of high frequency operation and potential low fabrication cost for medium and high volumes enables the development of robust, fast and highly miniaturized metrology systems for industrial applications. So far, however, the small stroke of MEMS devices was a limiting factor for many applications. Now, a translatory MOEMS actuator with extraordinary large stroke – especially developed for fast optical path length modulation in miniaturized FTIR spectrometers – is presented by Fraunhofer IPMS. A precise translational out-of-plane oscillation at 500 Hz with large stroke of up to 1 mm and large mirror plate of 19.6 mm² aperture is realized by means of a new MEMS design.

The novel translatory MOEMS mirror was specially designed to enable a miniaturized MEMS based FTIR spectrometer with improved system performance of 5 cm^{-1} spectral resolution (λ = 2.5…16 µm), SNR > 1000 and fast operation of ≥ 500 scans / sec. It consists of four symmetric pantograph suspensions in contrast to two pantographs used for a first MEMS design, where only ±140 µm amplitude could be achieved.

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