0.25 AND 3.5 N/m MEMS INFORMATION

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INFORMATION ABOUT THE NEW 0.25 AND 3.5 N/M MEMS PROBES

Optics11 Life developed new types of MEMS probes with a cantilever stiffness of 0.25 and 3.5 N/m. These new 0.25N/m MEMS probes are **more resilient** and **thermally more stable** due to more robust assembly and new geometry which is similar to the 0.025N/m probes introduced last year. Furthermore, they allowed us to miniaturize probes for **measurements inside 96 microplates** (see Pavone probes on the Webshop). The stiffness of the new MEMS probes is 0.25±0.07 and 3.5±0.7 N/m. The 0.25 and 3.5 N/m probes with the tips of radius R=3, 10, 25, 50 μm will replace the current 0.5 N/m and 5N/m ribbon-cantilever probes. The larger radius probes of R=100 and 250 μm will still be made with the ribbon cantilever until further notice. The last time buy date for 0.5 and 5 N/m probes is the **10th of December 2021,** and the last shipment date is the **3rd of June 2022**. If you prefer to receive these probes before the last time buy date, please note it in your probe order.

See below the list of changes with 0.25 and 3.5 N/m MEMS probes:

- The wavelength scan has more fringes due to a higher gap between the fiber and cantilever. We recommend increasing laser power to improve the signal-to-noise ratio. See the explanation on the next page.

- The geometrical factor value is higher due to the change in geometry: the tip is further away from the fiber. As with 0.5 and 5 N/m probes, the cantilever might get stuck to the fiber. See the next page for how to troubleshoot it and other useful tips for the calibration procedure.

- Calibration of MEMS probes should be done on Teflon substrate, especially when measuring in the air due to the presence of electrostatic forces. Teflon substrate will be sent with the probes. If you haven't received one yet, please request one at support@optics11.com.

- "Find surface" procedure for open-loop stages (step rather than the continuous motion) might show vibrations on the cantilever because of the change in its resonance frequency. Decrease step size or increase the sensitivity (threshold) if the system stops the find surface procedure too early.

- If you use closed-loop indentation (Indentation- or Load-control), there won't be any changes in deformation rate (indentation-speed) or maximum indentation-depth or load because closed-loop operation measurements do not depend on the probe stiffness. If you use the open-loop indentation (Displacement-control), the sample will be measured at a lower deformation rate (indentation-speed) and will reach a lower indentation-depth or load with 0.25 and 3.5 N/m probes than it would when using the same displacement profile but stiffer probe (0.5 and 5 N/m). You can adjust the displacement profile accordingly by increasing piezo speed and displacement.

TIPS AND TRICKS

Laser power adjustment

The larger cavity of the MEMS results in a lower intensity of the signal. To increase the signal-to-noise ratio one can increase laser power. On the OP1550 interferometer LCD screen, you will find the set laser power of 6.31 mW which is the minimum. You can increase it to the maximum laser power of 25.12 mW. Then, proceed to the normal calibration procedure. As a result, you will see that the resulting gain setting after the wavelength scan is lower than the one it was with the minimum laser power. See the example here: https://youtu.be/coKxhkDsS6Q. If the measurements are done in air, decrease the laser power from the maximum one to a lower one as the signal intensity in the air is much higher and maximum laser power might result in saturation of the signal, which would result in a flat line after wavelength scan.

Geometrical factor

When measuring in liquid (e.g., water, culture medium), you can verify your calibrated geometrical factor by dividing the value given on the probe box by the refracted index of the medium (e.g., n=1.33). In case the geometrical factor is not as expected:

- Check if the probe was in contact with the substrate during calibration.
- Clean the probe and substrate with isopropanol (1-2 ml for 0.5-1 min) followed by rinsing in water to remove any residue.
- Check the demodulation circle and overlap between piezo and cantilever signals after calibration by indenting on the substrate from contact by the same distance as used for calibration (usually 3000 nm).
- Check if the probe has a tip under the microscope.

Cantilever stuck to the detection fiber

The cantilever of the 0.25 and 3.5 N/m MEMS can get stuck to the detection fiber similarly to 0.5 and 5 N/m probes. This results in a signal loss as there is no gap between the cantilever and the fiber. If it happens after calibration, the demodulation circle becomes very small or even a dot while the probe is submerged in the medium. The cantilever is easy to release from the detection fiber by 1) lifting it up, out of medium and back in, 2) running some medium over it, or 3) drying the probe, e.g., touching the side of the MEMS with an edge of the tissue (Figure 1), and then gently touch the cantilever from underneath. Make sure to see the part you are touching and stabilize your hands during this step.

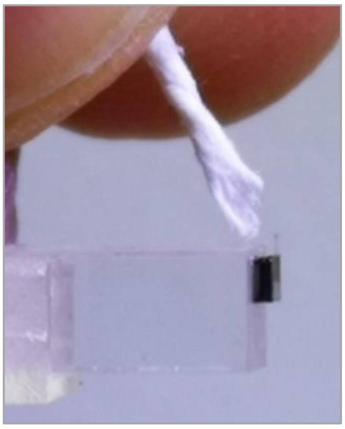

Figure 1: Probe drying.

If you have any questions, you can reach us by email: support@optics11.com.