Contribution ID: **103** Type: **Oral Presentation**

An application of optical tweezers in the measurement of picoNewton forces

Tuesday, 4 July 2017 15:20 (20 minutes)

Optical tweezing is an established technique that has been developed for manipulating micron sized objects. These applications include cell sorting, studying intracellular dynamics, applying specific forces to trapped particles as well as quantitative measurement of intracellular forces, for example measuring the force exerted by molecular motors inside a living cell. Trapping occurs when the light is tightly focused with a high numerical aperture objective lens onto the object of interest. This technique makes it possible to remotely investigate mechanical properties of a sample. This work focuses on the application of the optical tweezers in force measurements using a custom optical tweezers setup built to be integrated into a nonlinear microscopy setup. This presentation discusses the construction of the tweezers setup, the calibration processes and force measurement studies. A diode laser (975 nm) is used to trap micron sized silica particles. Calibration of the force constant of the optical tweezers setup was done using silica beads and a quadrant position detector. Preliminary results in determining the forces exerted by myosin motor proteins pulling vesicles along actin filaments inside an onion (Allium cepa L.) cell will be presented and discussed.

Apply to be
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Yes

Level for award
 (Hons, MSc,
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MSc

Main supervisor (name and email)
and his / her institution

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Would you like to
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No

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Session Classification: Photonics

Track Classification: Track C - Photonics