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(U*) (POS-15) Construction of optical tools for investigating active matter

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The purpose of this poster is to show and discuss aspects of the construction and calibration of a new optical tweezers as well as an FCS setup. Optical tweezers use electromagnetic gradient forces together with radiation pressure to trap microscopic particles within a focused laser beam, and move them as required, making the tool suitable for applications in biological physics at microscopic scales. The Kilfoil lab has previously used optical tweezers to carry out active microrheology on a model system of entangled DNA and an ATP-powered DNA-disentangling enzyme; in combination with particle tracking to measure total position fluctuations, to distinguish the cumulative enzyme-driven non-thermal motions from the thermal motions. Now, we have incorporated components including an acousto-optical deflector for beam steering and a piezoelectric microscope stage for stage driving (with potential to turn the optical trap into a force clamp). This new version of the optical tweezers will be used in our active matter experiments on the same system (which models the cell nucleus), by combining both active microrheology and particle tracking. Another tool that can measure position fluctuations of system components even more mobile than microscopic beads (such as the enzyme itself) is fluorescence correlation spectroscopy (FCS). We are constructing an FCS setup for assisting in such soft and biological material studies.

Keyword-1

Optical tweezers

Keyword-2

FCS

Keyword-3

Biophysics

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