Laser nanomanipulation of a single molecular motor

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We will show the possibility to manipulate and visualize mechanical events of a single molecular motor at the nanometer scale. Single motor steps are detectable thanks to an engineering effort on the active and passive stability of a custom made microscope, integrated with a multiple optical trap manipulator. The technical solutions to achieve such a stability will be described. An experiment on a single molecular motor will be presented, where the stiffness, the working stroke and the kinetics of the motor are measured and connected to the efficiency and the structure of the single biomolecule. Pushing forward the technology, recent advancements on the experimental apparatus will be shown by presenting measurements where a mechanical load of a few picoNewtons is applied on the motor with a time response below 100 microsecond and one nanometer accuracy on the space positioning. Finally, a very recent implementation of the apparatus with a very high sensitivity fluorescence detection, aimed to connect the mechanics to the spatial conformational variation of the motor and able to achieve a colocalisation accuracy of one nanometer on one molecule fluorescence, will be shown.