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Force detection technique for molecular experiments in living cells using gradient optical traps ARNAU FARRE, CAROL LOPEZ-QUESADA, JOSEP MAS, ESTELA MARTIN-BADOSA, MARIO MONTES-USATEGUI, Optical Trapping Lab - Grup de Biofotonica, Universitat de Barcelona — The powerful results in the molecular and cellular domain that are currently obtained using optical tweezers are leading to an increasing interest in this biophysical tool. This technique uses a highly focused laser beam to noninvasively trap and manipulate microscopic particles. Moreover, once calibrated, it can be used to accurately measure the forces and positions involved in many different molecular processes. Our research interest revolves around the study of the mechanics of cytoplasmic streaming in tobacco cells. Unfortunately, standard force detection techniques are not suitable for experiments in living cells. Golgi apparatuses that need to be used as handles to interact with motor proteins propelling them along the cytoskeletal filaments are not spherical, and the cytoplasm is an optically nonhomogeneous medium. In that case, the experiment does not meet the requirements for current force calibration methods, so forces cannot be accurately measured. Here, we show a new force detection technique for gradient optical traps based on the measurement of the change in momentum of the photons of a trapping beam. This method allows the study of molecular processes in living samples, and the use of beams and particles with arbitrary shapes.

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