P-MBU1: Single molecule reader for high-throughput bioanalysis

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A combination of conventional fluorescence epi-microscopy, high-sensitive CCD-camera and high-precision sample-stage was used to scan large areas of biological samples (lipid bilayer marked with Cy5 and HEP2 cells). Due to synchronized movement of the sample and charge-collection process on the CCD chip (TDI mode), high photon-efficiency and short scanning-times were achieved (11 minutes for a 5 x 5 mm² area). For maintaining proper focusing within each scan a piezo-driven closed-loop focus-hold-system was implemented. With the instrument single dye molecules can be imaged at diffraction limited resolution, as exemplified in a supported lipid bilayer containing low amounts of fluorescent lipids. Signal to noise ratios of up to 37 have been obtained in this measurements. Further enhancements of our setup include multi-color excitation via total internal reflection fluorescence microscopy (TIRFM), multi-color detection, two axes scanning and the implementation of image-processing software to select objects for further high speed imaging.

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