

Supplementary information

A low-cost 2D fluorescence detection system for μm -sized beads on-chip

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Composition of the fluorescence detection unit

The widely available PHR-803T pickup is used in the Xbox360. It can be purchased via <http://www.psxboy.com>. There is no technical information about this optical pickup, since it is Original Equipment Manufacturer (OEM). For this reason, reverse engineering on the optical pickup was done, before the optical pickup could be used.

Parts of the optical pickup are used in the fluorescence detection system, such as the focusing system, laser diodes and lenses (see figure S1). However the photodetector of the pickup cannot be used for the fluorescent measurements due to insufficient detection sensitivity at the emitted wavelength. Therefore a semiconductor photomultiplier (Hamamatsu S10362-11-100U, Hamamatsu Photonics GmbH, Herrsching am Ammersee, Germany) has been used, which is smaller in size, more sensitive and cheaper than conventional photomultipliers. In front of this photomultiplier some additional optical components are placed that are not integrated in the optical pickup as shown in figure 1. The fluorescent light from the pickup first encounters the first beamsplitter (Thorlabs MD416, Thorlabs GmbH, Dachau/Munich, Germany), followed by the second beamsplitter (Thorlabs 480, Thorlabs GmbH, Dachau/Munich, Germany) that transmits only light with a wavelength larger than 480 nm. After this beamsplitter both the transmitted and the reflected light each pass a bandpassfilter, are converged by a Plano-Convex lens (NT47-872-INK, Edmund Optics Ltd, York, UK) and both intensities are finally measured with two semiconductor photomultipliers. The bandpassfilters used for the transmitted and reflected light are the Thorlabs MF525-39 and the Thorlabs FB450-40 (both Thorlabs GmbH, Dachau/Munich, Germany) respectively.

Samples

As medium FerticultTM Flushing medium, which is a chemically balanced salt solution, HEPES buffered with 0.4% HSA was used, purchased from Fertipro NV (Beernem, Belgium). Two sizes of fluorescent beads were used: PeakFlowTM Blue flow cytometry beads (P-14826) with a diameter of 6 μm and PeakFlowTM Blue flow cytometry beads (P-14825) with a diameter of 2.5 μm , which were obtained from Invitrogen (Paisley, UK). Both beads have an excitation wavelength between 350-370 nm and an emission wavelength of 450 nm. As non-fluorescent beads Polybead Polystyrene Blue Dyed beads were used, obtained from Polysciences Inc (Warrington, Pennsylvania, USA), having a diameter of 6 μm .

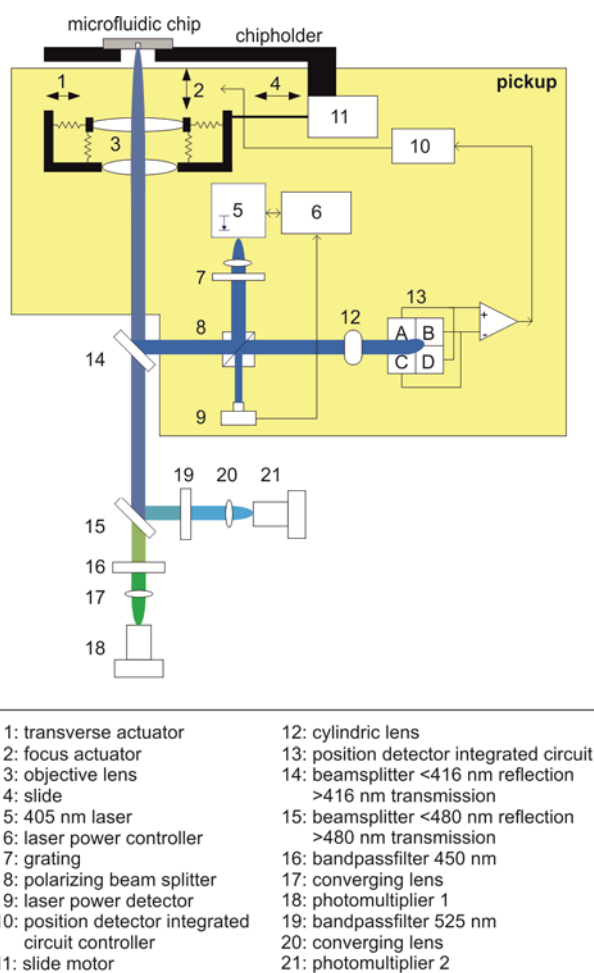


Fig. S1 Schematic overview of the fluorescence detection system built around the PHR-803T HD-DVD pickup