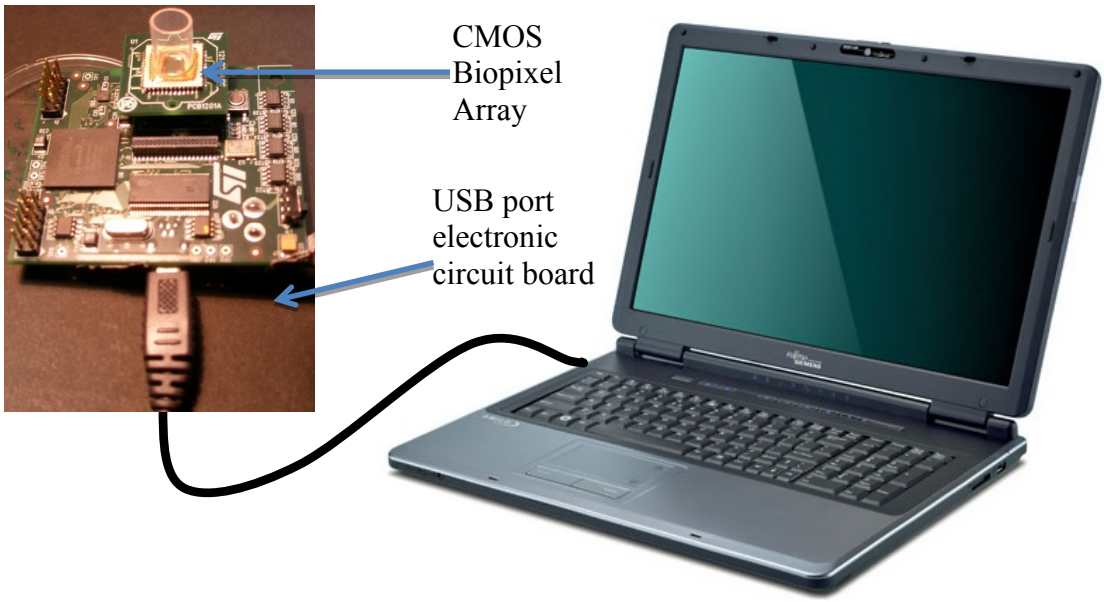
Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary Information.

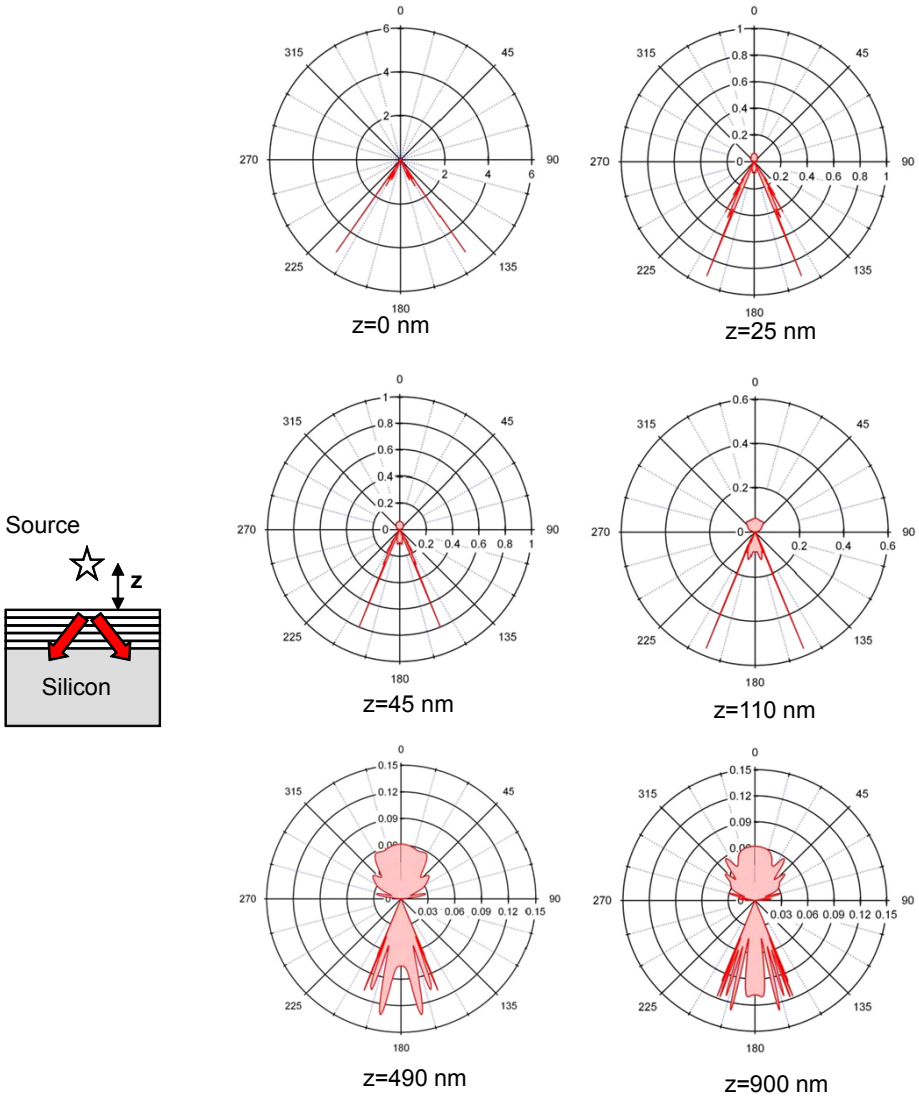
Experimental set up showing a CMOS bio-pixel array chip inserted into the USB port electronic circuit board connect to a laptop is shown in SI Fig. 1. A light excluding box is used to house the electronic circuit board to ensure external photons do not reach the bio-pixel array.



SI Fig. 1 Experimental set up showing a CMOS bio-pixel array chip inserted into the USB port electronic circuit board connect to a laptop. The circuit board is housed within a light excluding box.

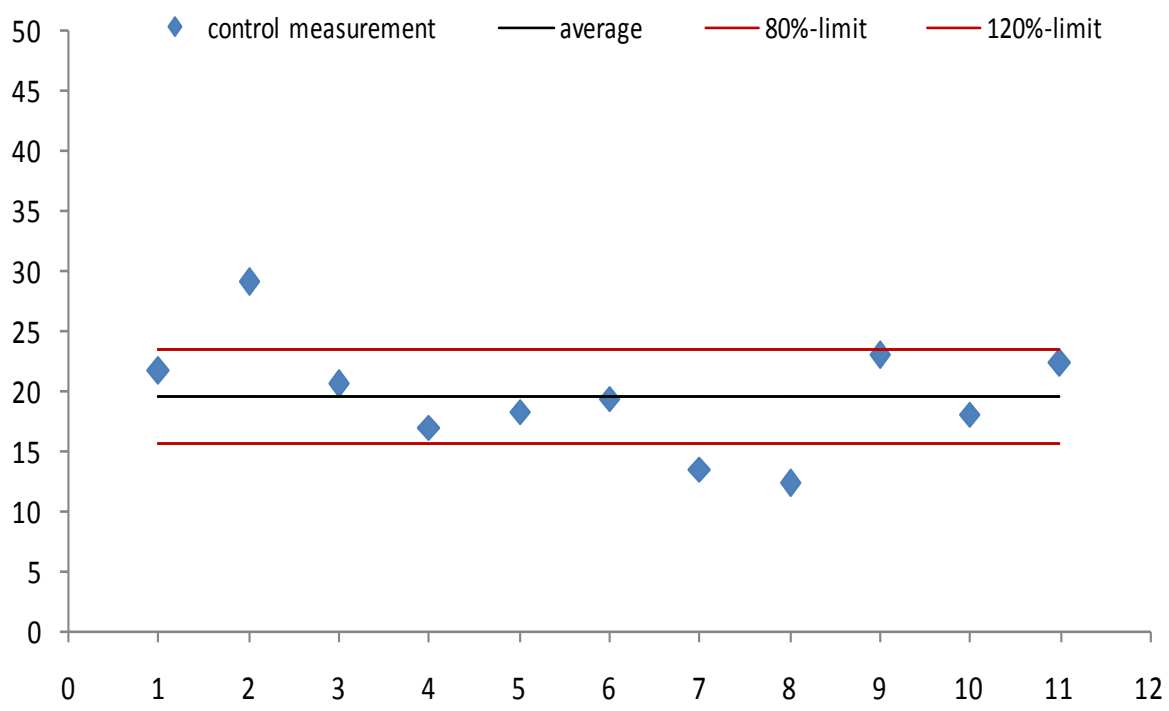
SI Fig.2 shows that when the source is located on the surface (z=0nm), most of the emitted power is found along two directions (145° and 215°) corresponding to substrate radiative modes that are trapped into the substrate. The power density per unit solid angle reaches 6 (arbitrary units) for these directions. When the source is placed at z=55 nm above the surface the radiation pattern still shows two maxima in the substrate radiative modes but the power density decreases to 0.8. At the same time a significant amount of energy appears in the radiative modes along directions 0° and 180°.

At z=490 nm most of the energy is now concentrated into the radiative mode and the power density per unit solid angle is of the order of 0.1 reveals that an HRP molecule located at z=0nm emits ten times more power into the silicon substrate than in water. Furthermore this power emitted toward the substrate corresponds to 90% of the total emitted power. As the emitter is located further from the water/silicon interface the power emitted into the substrate decreases but still reaches 75% when the emitter is located 490nm above the silicon surface. These results confirm that the CMOS bio-pixel array sensor can efficiently and sensitively accommodate a wide range of protein sizes.



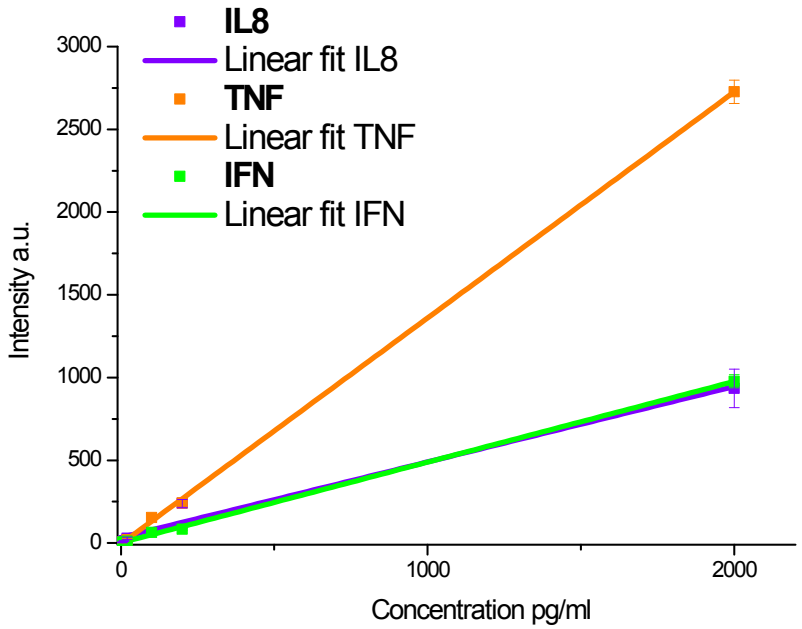
SI Fig. 2 Radiation pattern of a HRP molecule located at various z altitudes above a CMOS sensor. The power density per unit solid angle is displayed in arbitrary units.

SI Fig. 3 shows a plot of signal variation from the statistical average for 11 pixels. The CMOS-bio pixel array was re-used several times after cleaning with solvents and washing to remove all biological and chemical materials.



SI Fig. 3 Bio-pixel to Bio-pixel signal variation from the statistical average for a control sample.

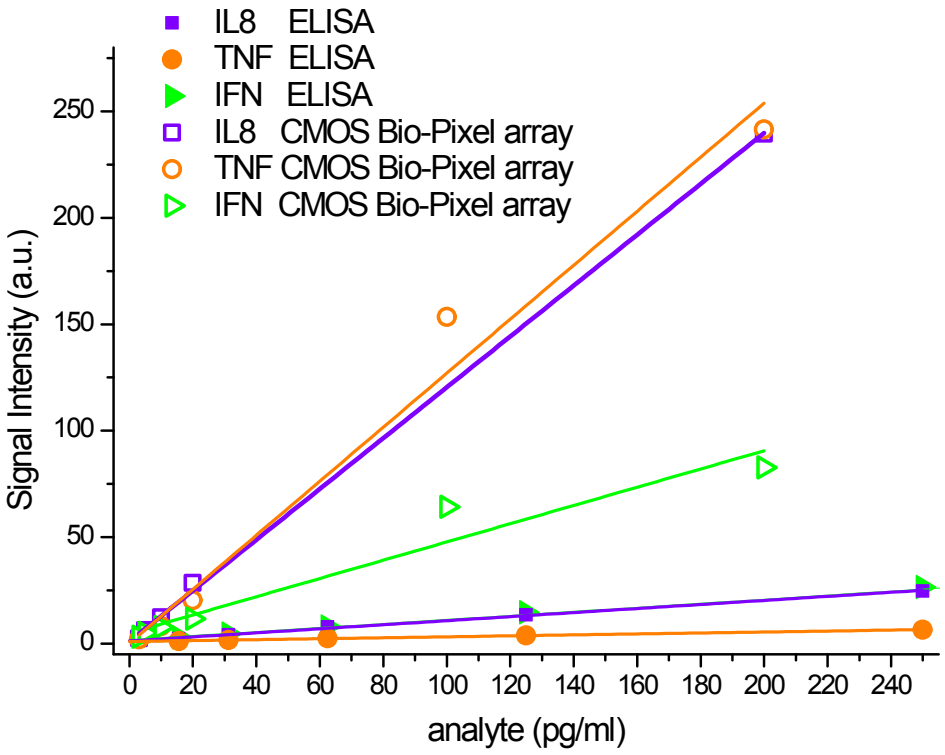
The linearity of the 3 plex assay for the detection of cytokines IL8, TNF and IFN is shown in Fig. 4. This shows the high linearity with the data points lying within the error bars which denote the standard deviation.



SI Fig. 4 Linear region of 3-plex detection of cytokines IL8, TNF and IFN.

Comparison of the Bio-pixel array 3-plex of cytokines IL8, TNF and IFN and Chemiluminescent ELISA as measured on a spectroscopic plate reader is shown in SI Fig. 5. Note spectrocopic plate reader

measurements were only recordable at concentrations as low as 15 pg/ml compared to the Bio-pixel array for which measurements were recorded at concentrations as low as 3 pg/ml. A distinct increase in signal intensity is observed for the Bio-pixel array compared with the pectrocopic plate reader measurements.



SI Fig. 5 Comparison of the Bio-pixel array 3-plex of cytokines IL8, TNF and IFN and Chemiluminescent ELISA as measured on a spectroscopic plate reader.