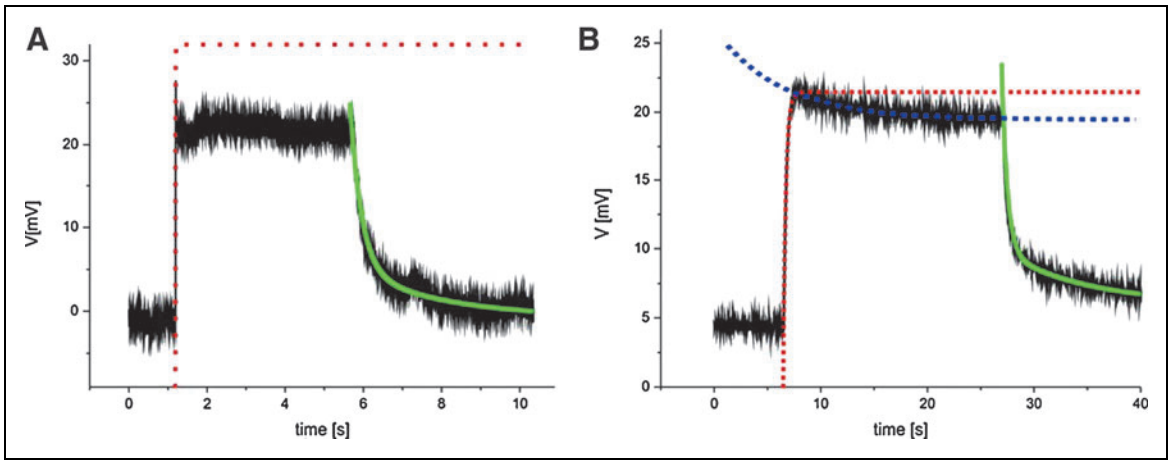

Supplementary Fig. S4. Current clamp recording of light-induced membrane potential change of HEK293 cells expressing the ChR2 cation channel. **(A)** Patch clamp, sampling rate 10 kHz. **(B)** DAIMM, sampling rate 100 Hz. A standard exponential function $f(t) = \sum_{i=1}^{n} A_i e^{-\frac{t}{\tau i}}$ was used to fit the traces. Fit curves represent the open time (τ_{on}, red dotted curve), adaption time (τ_{ad}, blue dotted line), and closing time (τ_{off}, green line), respectively.

The time-resolution of the chlorinated single-spike Ag microelectrode was lower than that of a solution-filled patch-microelectrode **(A)**. In patch clamp experiments, the characteristic peak voltage raised with a time constant of $\tau_{on} = 5$ ms, whereas in dielectrophoretically-accessed intracellular membrane–potential measurement (DAIMM) experiments, $\tau_{on} = 200$ ms. There are several possible reasons for that. As the time constant is a function of series resistance and system capacitance, the lowered time resolution of DAIMM is partly due to the higher electrode impedance and polarization. Furthermore, the peak voltage is reduced and rises with higher time constants, when the light intensity for channel activation is reduced. As τ_{off} is almost independent from light intensity, it is not astonishing that the slower τ_{off} was comparable in both methods (228 and 245 ms, for patch-clamp and DAIMM, respectively). Interestingly, in DAIMM a second time constant, $\tau_{ad} = 6$ s, appeared, which may be caused by the adaptation of the electrode potential inside the cell. This slow component is also present in the closing time of DAIMM measurements, which can be fitted by biexponentional function.