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

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Experimental procedure

A 400mW at 532nm, fiber-coupled laser light acts as source for the Mach-Zehnder interferometer, whose main beam is directed into a customized inverted microscope equipped with an oil-immersion 100x objective, allowing bright-field imaging of the sample. The reference beam is recombined with the first generating digital holograms of the samples that are recorded by a 1024x1024 CCD camera, 6.45µm pixel size (AVT Technologies). Figure S1 shows a sketch of the experimental set-up.

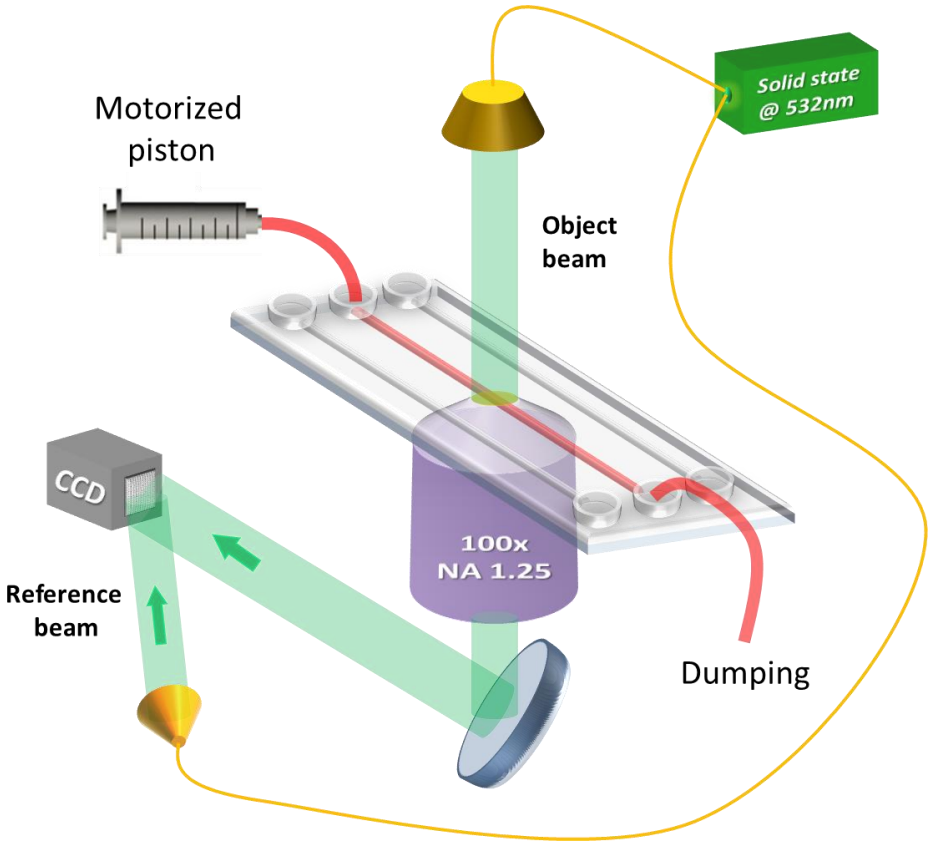

Fig. S1: Experimental set-up

All experiments are done with heparinized blood drawn within the hour before use. The sample was prepared as follows: approximately 3 mL of heparinized whole blood were withdrawn into a hematocrit tube. Blood was centrifuged at room temperature, for 15 minutes at 2500 rpm in order to separate it into its component parts (plasma, buffy coat and red blood cells at the bottom of the centrifuge tube). The pellet (≈1.5 mL) was collected and 100 µL of erythrocytes were diluted with a saline solution of 0.90% w/v of Sodium chloride (NaCl) in sterile water up to a final volume of 2 mL. The osmolarity of the medium was about 308 mOsm/L and it was isotonic with the membrane of red blood cells. No visible hemolysis occurred.

RBCs thus obtained are injected into a PMMA microfluidic channel (1000x200µm, width x heigth) using a syringe pump controlled by a micrometric translator. This permits a quite constant velocity of the flux and also a fair control on the velocity level.

SNR measure:

In order to quantify the noise reduction as an effect of the ML processing the noise contrast has been estimated as:

$$N_C = \frac{\sigma}{\mu}$$

where σ and μ respectively denote the standard deviation and the mean value measured over an homogeneous segment of the image, i.e. where a smooth trend of the gray levels is expected and any fluctuation around the mean value has to be attributed to the noise. Hence, the noise contrast can be used as a Signal to Noise Ratio estimator. In Fig. S2 the percentage of ML improvement with respect to the SL image is shown vs. the number of looks L (i.e. in Fig. S2 we plotted the function $100 - 100 * N_C(L) / N_C(L=1)$).

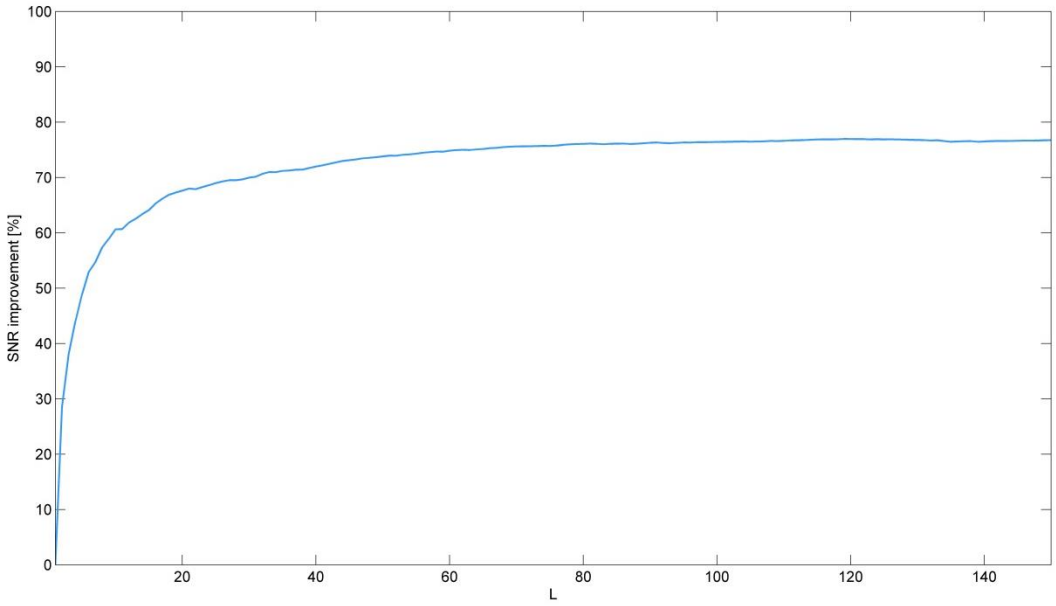

Fig S2: SNR improvement vs. the number of looks