

### **Description of the supporting movies**

**Media 1:** A fibroblast cell is inserted in a Polymethylmethacrylate (PMMA) microfluidic channel coated with Polylysine in order to favourite the mechanism of cell adhesion. After waiting for cell adhesion a flow of RBCs is injected inside the channel and a sequence of  $L=150$  holograms is recorded. Media 1 shows the acquired hologram sequence, from which it is apparent the degradation introduced by the RBCs hindering the visualization of the cell.

**Media 2:** Amplitude reconstruction of the cell adhering on the PMMA channel, seen through a volume of flowing RBCs. Media 2 shows the ML improvement achievable by incoherent combination of multiple hologram reconstructions. Despite the harsh noise conditions a very clear amplitude map of the cell can be obtained.