Electronic Supplementary Information

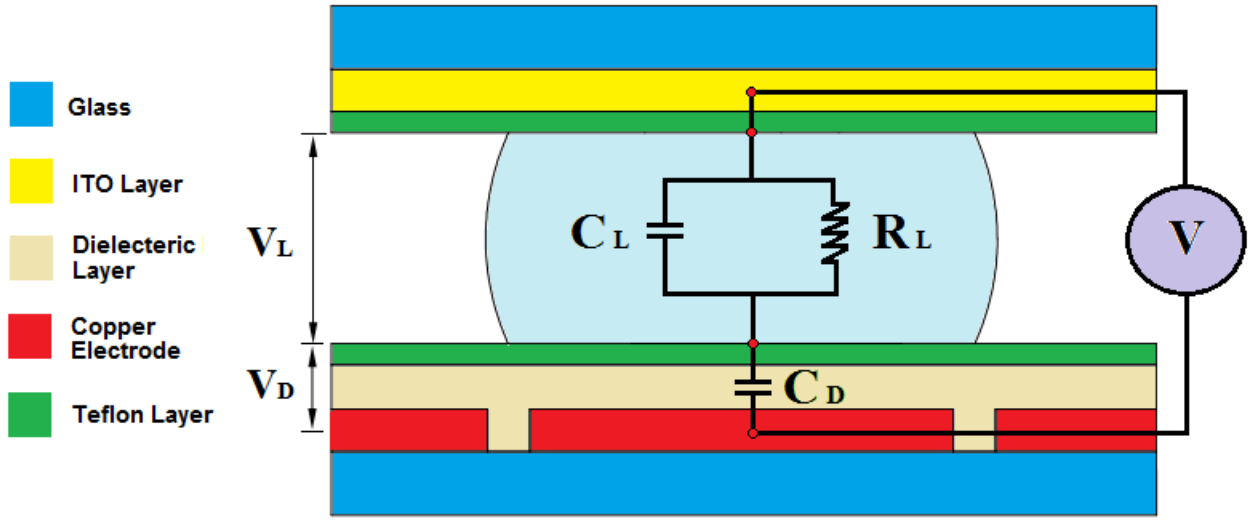


Fig. S1 A simplified equivalent circuit of a droplet on a dielectric layer

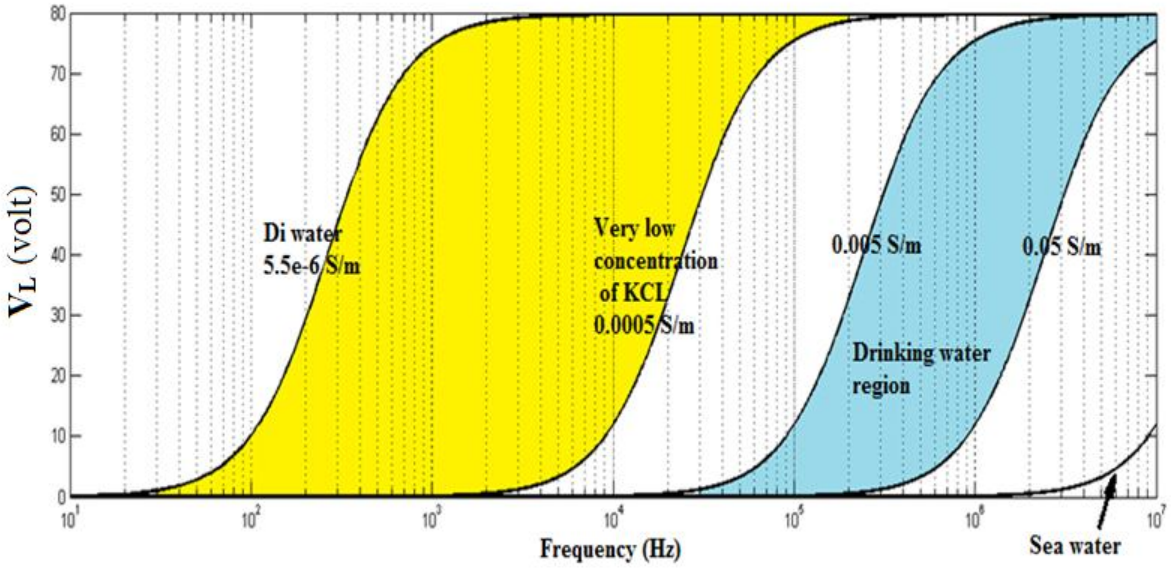


Fig. S2 Voltage drop across the liquid droplet for different droplet conductivity and different applied frequency

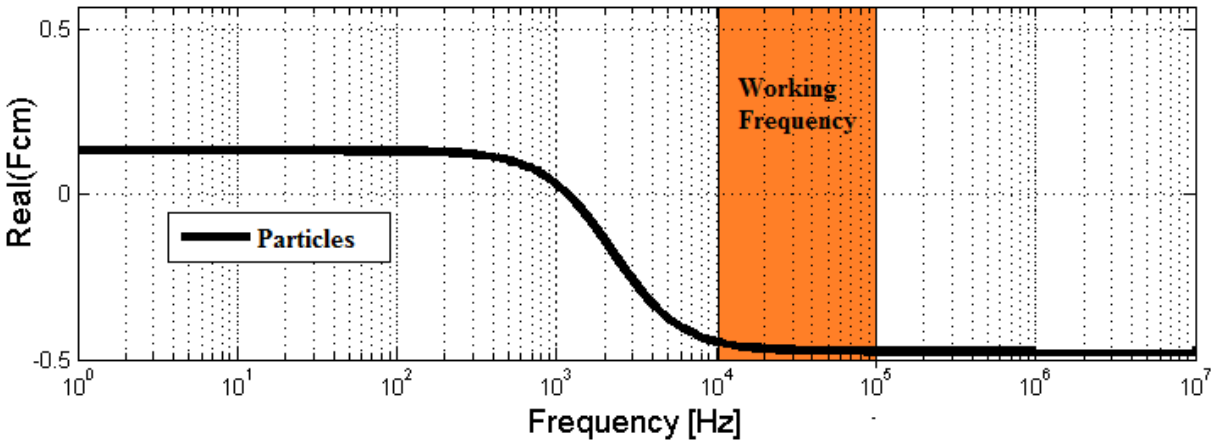


Fig. S3 Change in the f_{CM} factor with respect to the frequency

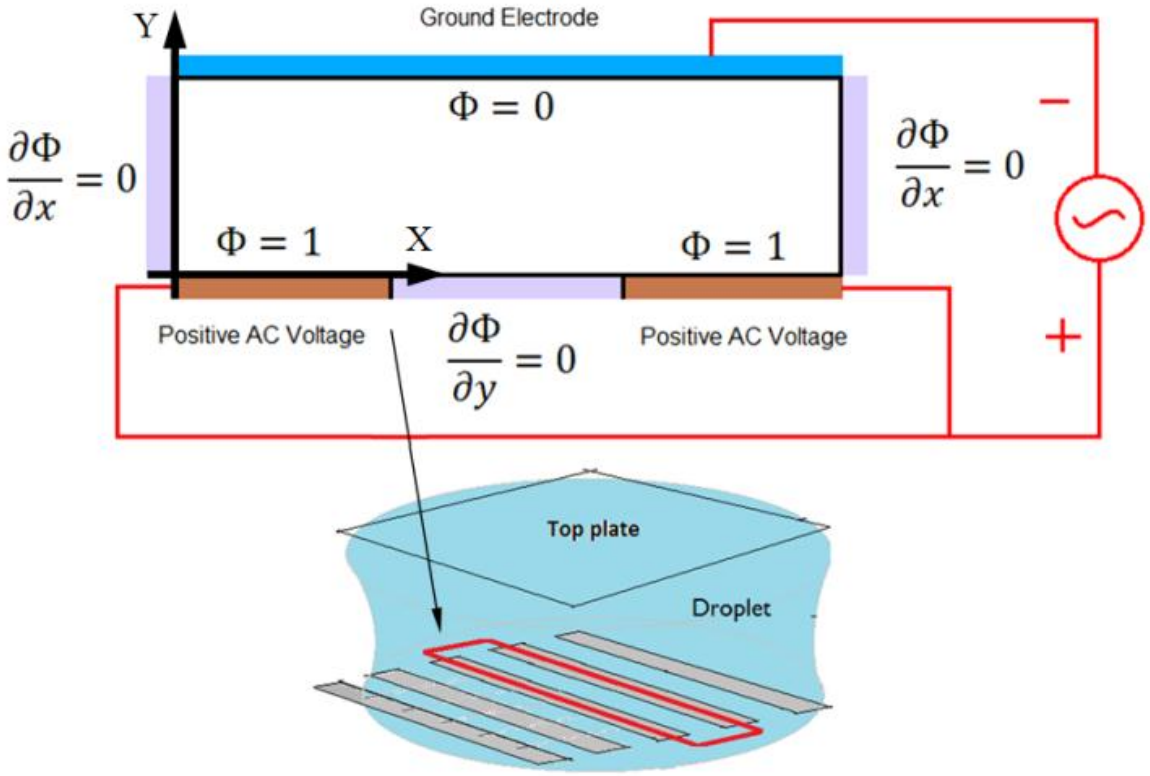
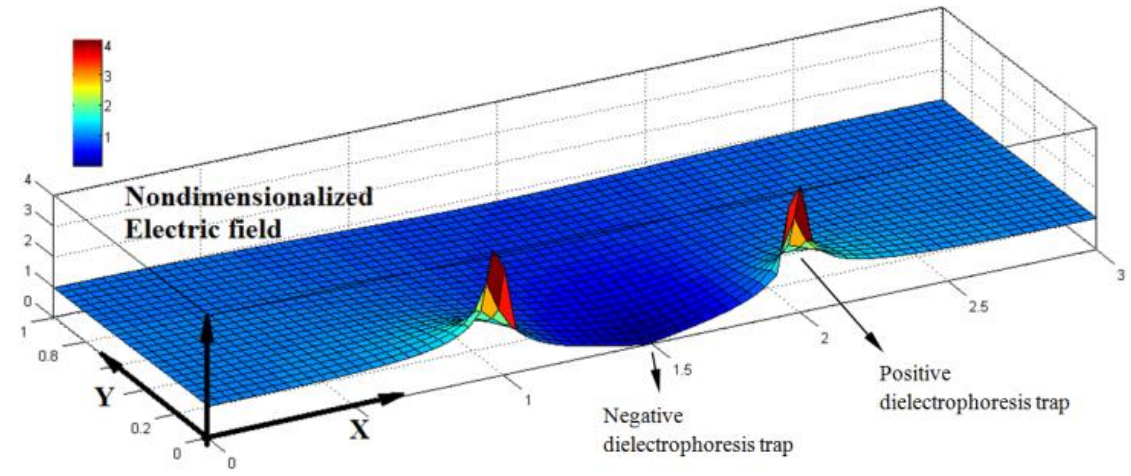
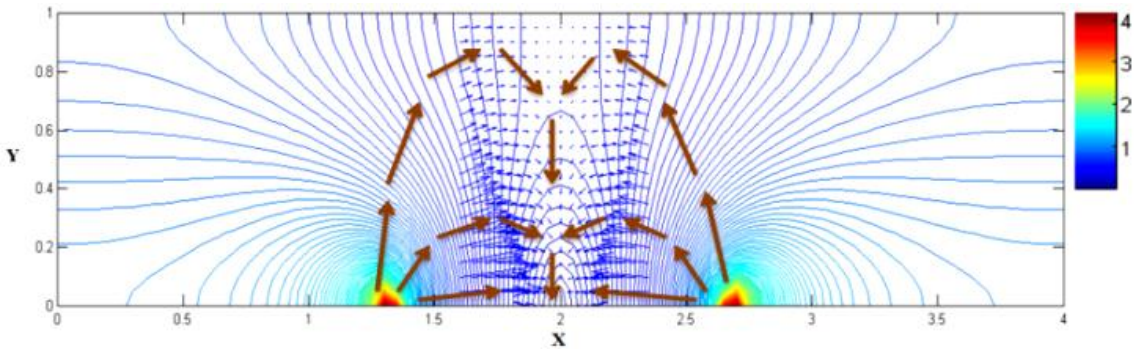


Fig. S4 Boundary conditions and positions of the electrodes



(a)



(b)

Fig. S5(a) Non-dimensional electric field in the domain is presented. The intensity of the electric field is maximum close to the edge of each electrode and is reduced to its minimum value at the middle of the gap (i.e., trap zone) between the two electrodes. **(b)** Non-dimensionalized electric field contour lines and negative dielectrophoresis force field between two electrodes are presented.

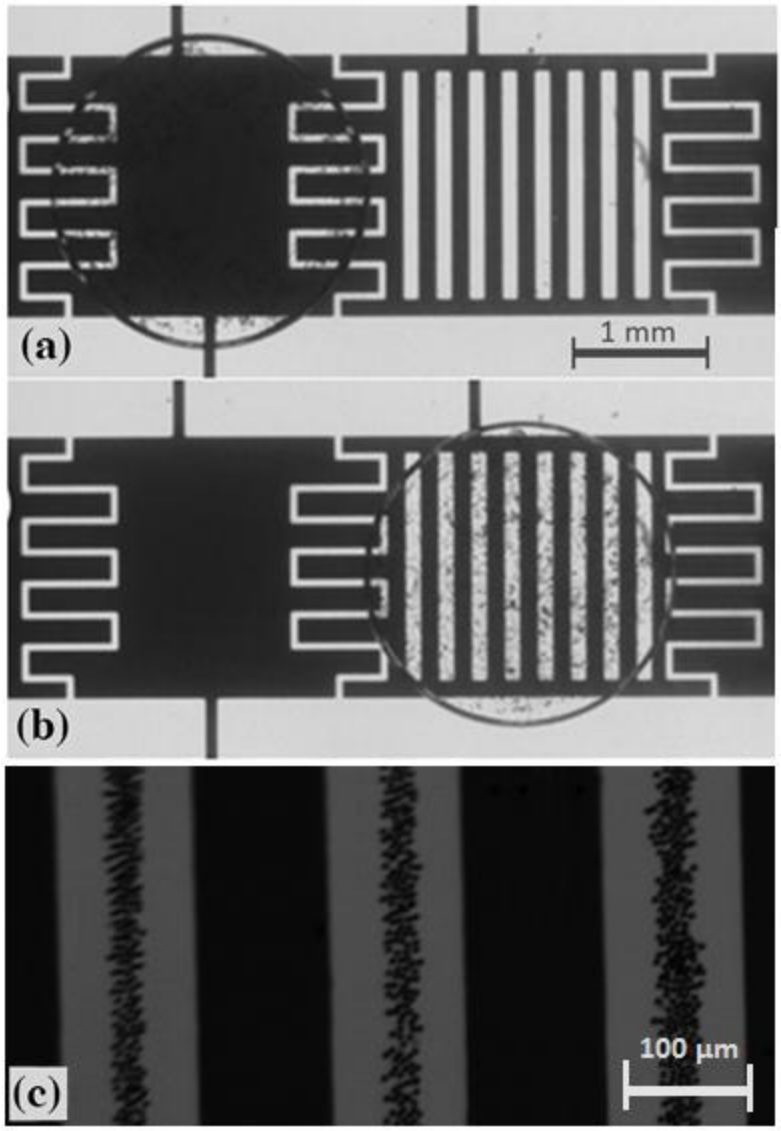


Fig. S6 Manipulation of droplet using EWOD and trapping particles due to nDEP

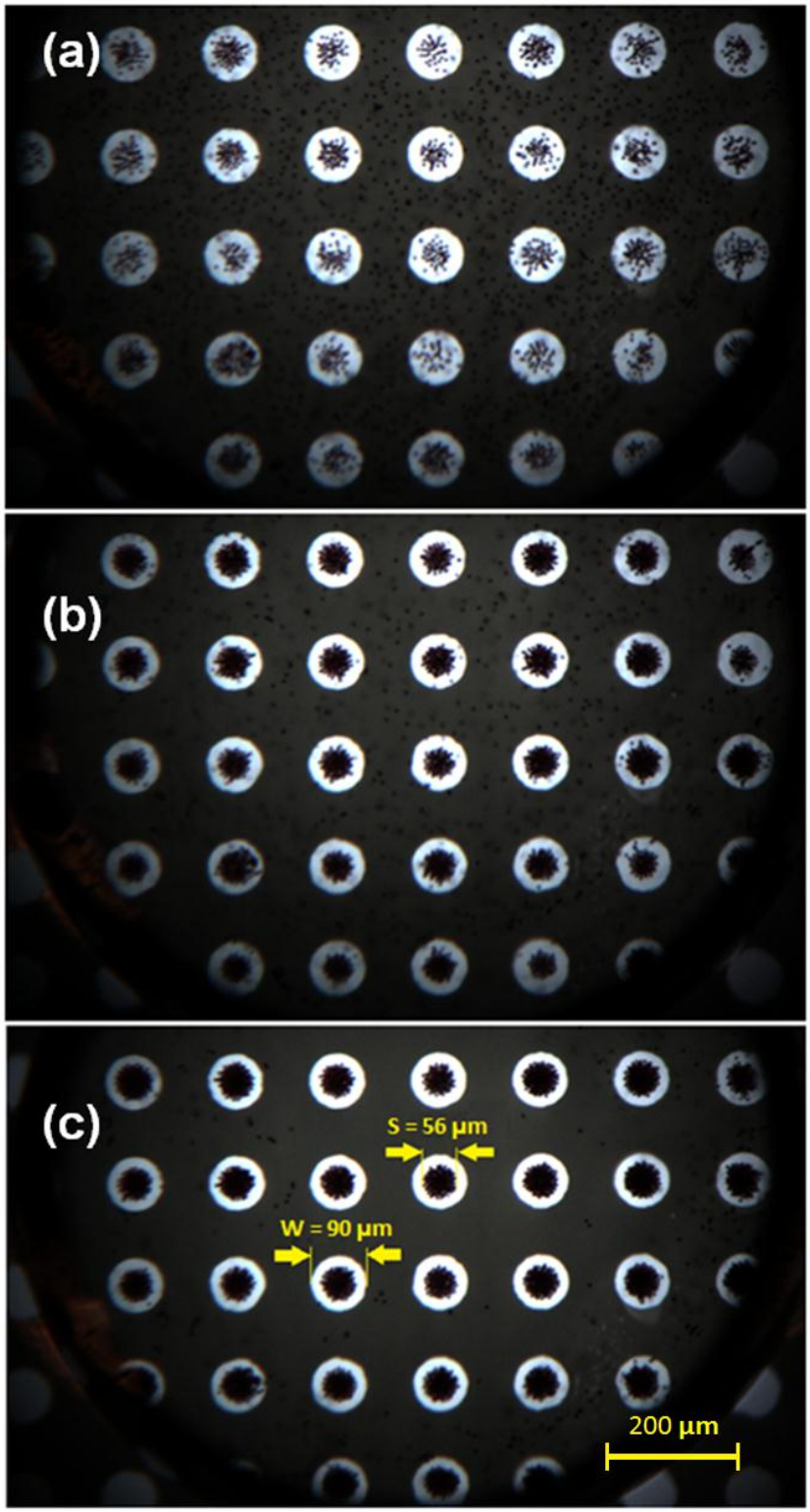


Fig. S7 Particle trapping on circular-shape traps after applying voltage for **(a)** 5 sec., **(b)** 30sec., and **(c)** 5 min.

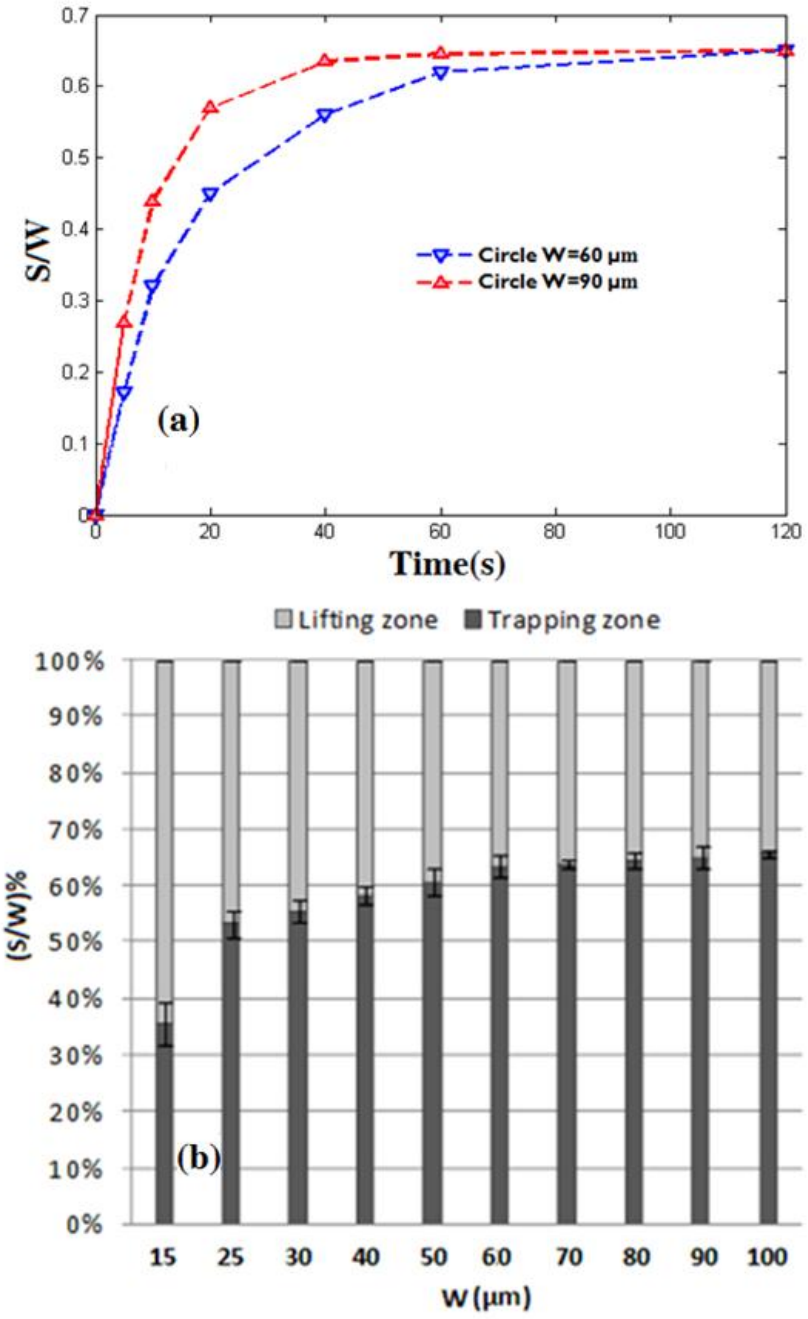


Fig. S8 (a) Transient change in the covered area for circular-shape space, **(b)** Experimental comparison between trapping and lifting zones for the circular shape trap spaces.

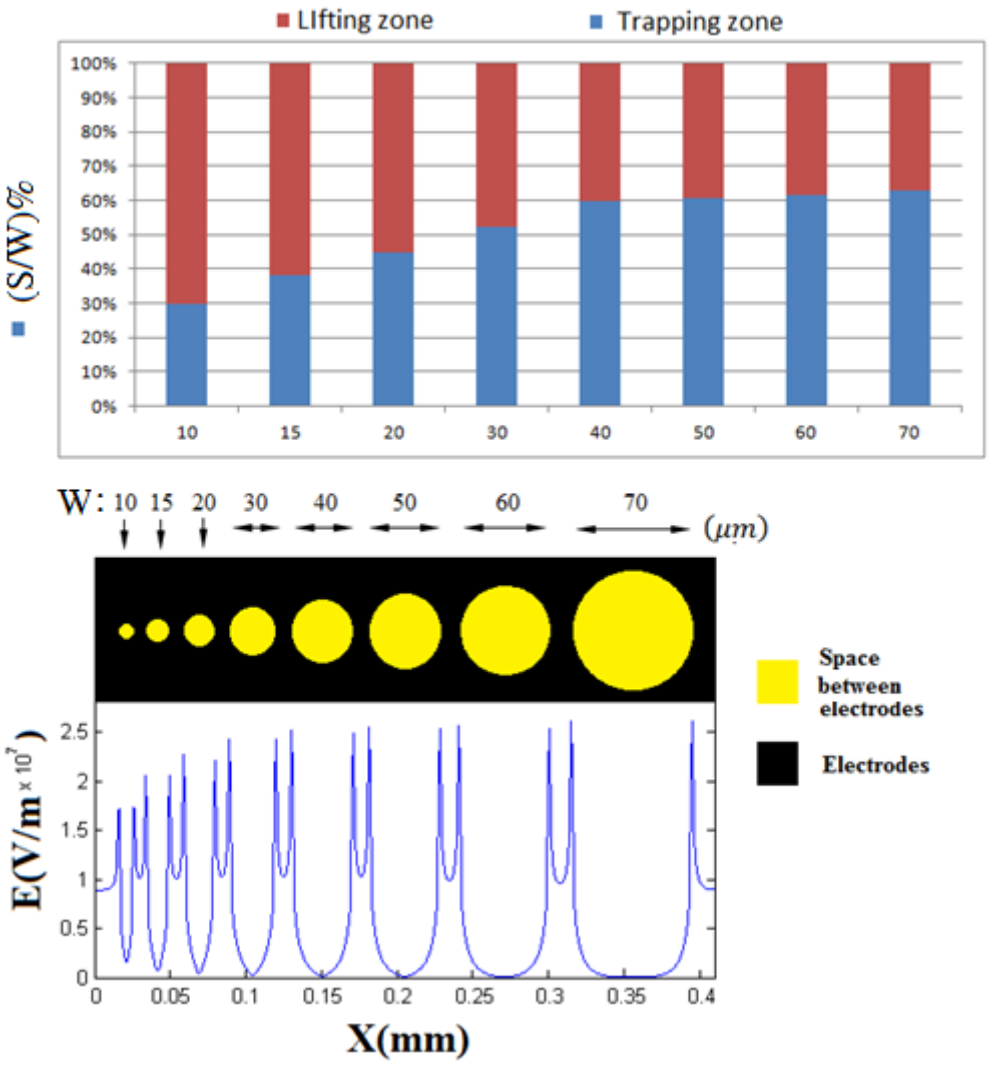


Fig. S9 Trapping and lifting zone percentages obtained numerically for different circular-shape trap sizes are shown. Electric field profile for different trap sizes are presented

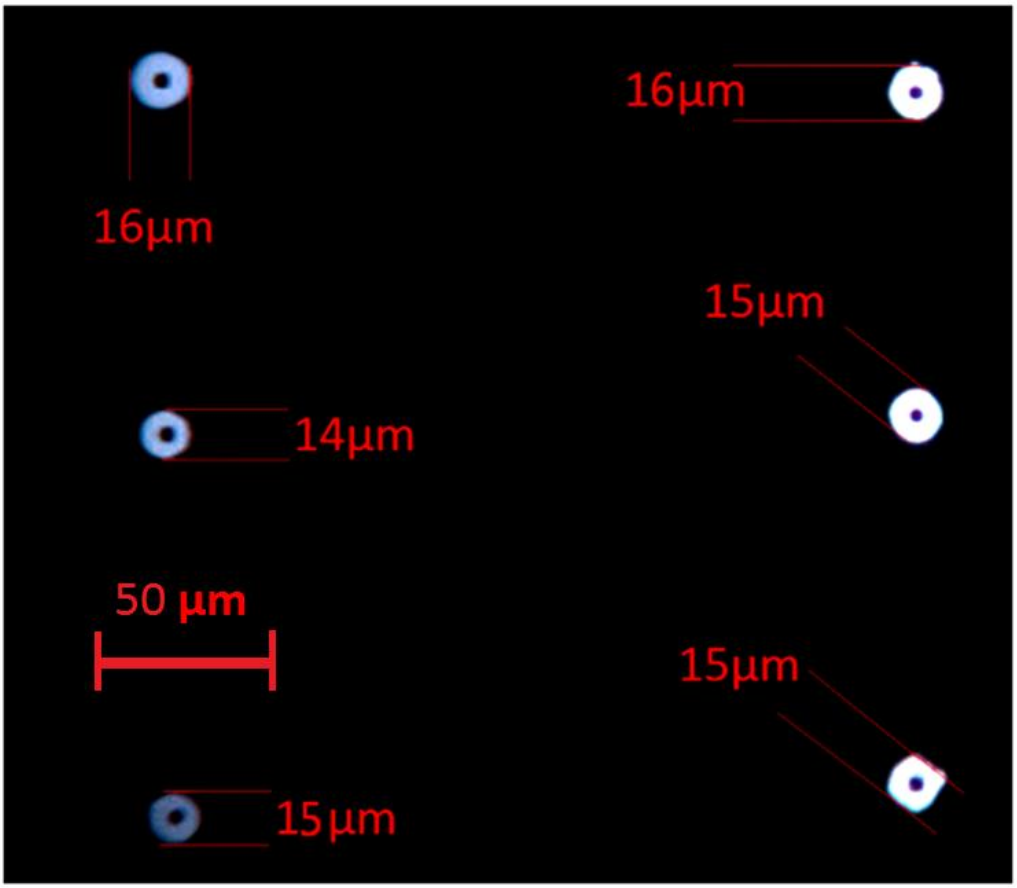


Fig. S10 Single particle trapping:5 µm polystyrene beads are trapped in circular traps of 15±1 µm