Electronic Supplementary Material (ESI) for Lab on a Chip

Electronic supplementary information

Frequency Discretization in Dielectrophoretic Assisted Cell Sorting Arrays to Isolate Neural Cells

Javier L. Prieto,*[a] Jente Lu,[a,b] Jamison L. Nourse, [b] Lisa A. Flanagan [b] and Abraham P. Lee [a,c]

a. Department of Biomedical Engineering. University of California, Irvine, CA 92697, USA. E-mail: aplee@uci.edu

b. Department of Neurology, University of California, Irvine, CA 92697, USA

c. Department of Mechanical and Aerospace Engineering. University of California, Irvine, CA 92697, USA.

I. Design of castellated electrodes

Even though a castellated configuration is not symmetrical with respect to the two directions of interest we can compare the component of the DEP force in both directions at the point of maximum electric field (I) (see figure E1b). In this case the corners of the electrode protrusions are staggered at a 45 degree angle which allows the component of the DEP force to be similar both when the cell is being trapped and when the cells are being collected (see figure E1c). Since the distribution is similar in all electrode corners we can assume that the overall distribution of the array is similar in both directions.

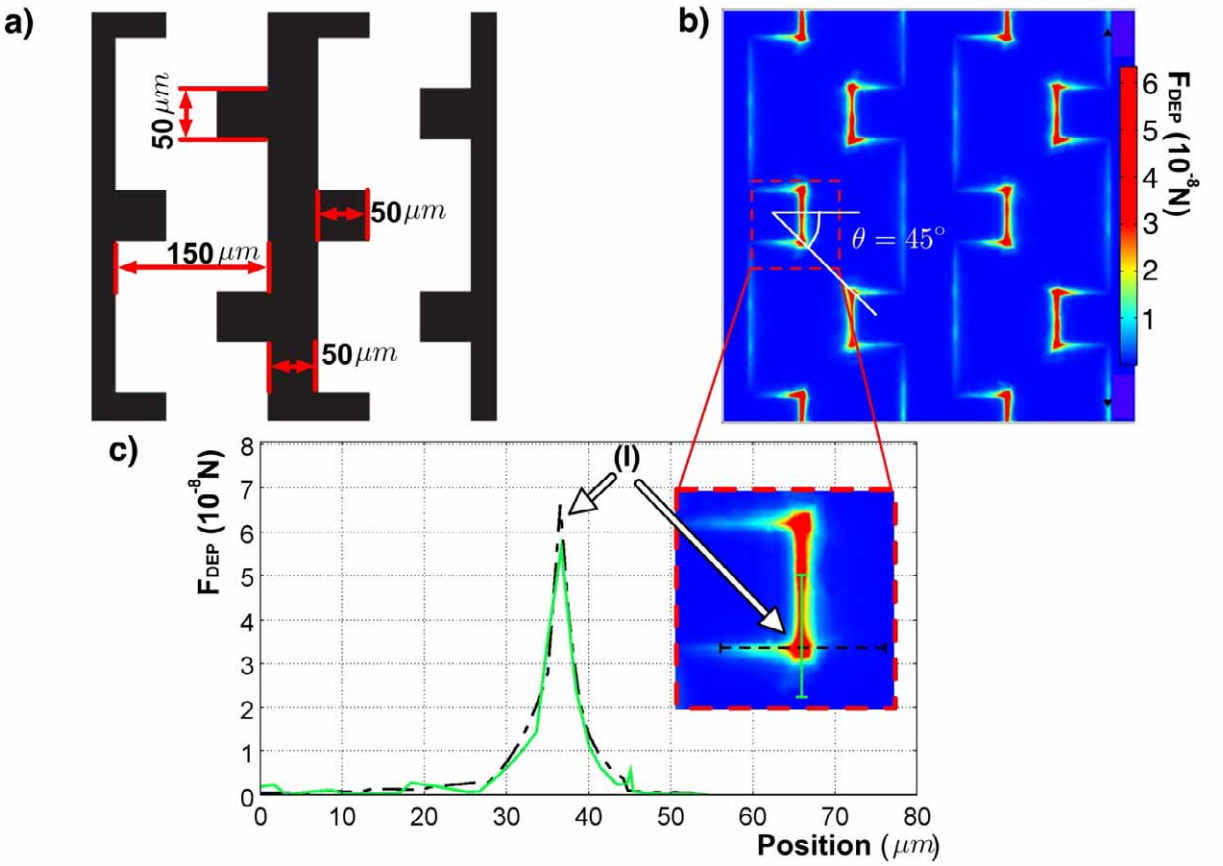

Figure E1: (a) Castellated electrodes with 50x50 mm protrusions and 150 mm separation between electrode stems. (b) Simulated distribution of the DEP force magnitude on a section of the castellated electrodes. The points of maximum force are the corners and the edge along the electrode protrusions. (c) Plot of simulated DEP force magnitude at the bottom of the channel for the two perpendicular directions shown in the inset. (inset) Perpendicular directions for initial flow and collection flow. In a band-trap configuration it is important for the forces in (I) in these directions to be similar.

II. Sorting results

To determine sorting efficiency sorted samples were grown on laminin coated coverslips for 24 hours to allow neurite outgrowth prior to fixing the sample. These also ensured that all results are taken from viable cells. We quantified three different experiments (see table E1) by counting the number of nuclei (Hoechst stain) and MAP2 positive cells.

	MAP2 +			Hoechst			% MAP2 +			Fold			Avg. Fold
	N=1	N=2	N=3	N=1	N=2	N=3	N=1	N=2	N=3	N=1	N=2	N=3	
Control	170	384	279	482	1178	1069	35.3	32.6	26.1	1	1	1	1
0-150 kHz	94	312	241	905	1078	1370	10.4	28.9	17.6	0.29	0.89	0.67	0.62
400kHz-5Hz	103	110	351	254	264	740	40.6	41.7	47.4	1.15	1.28	1.82	1.41
0-5000 kHz	177	176	273	780	825	851	22.7	21.3	32.1	0.64	0.65	1.23	0.84

Table E1: Cell counts and fold increase results for three different experiments