

Supplementary Information

Figures regarding to numerical simulation results in Comsol Multiphysics v4.3.

The potential applied on the electrode in the sample channel is 9V throughout the simulation. The basic setup and assumptions in COMSOL is as introduced in page 3 in the manuscript.

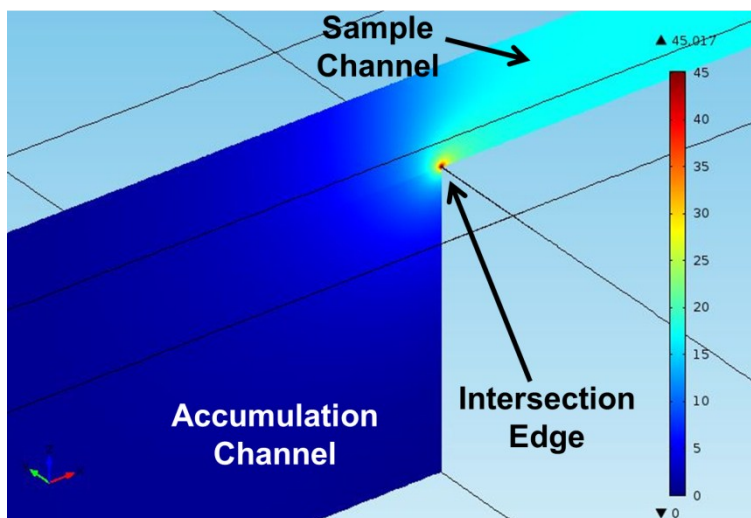


Figure S1: the electric field intensity at a cross-sectional plane at the intersection. The plane locates in the middle of the sample channel, with a distance of $50\mu\text{m}$ to both side channel walls (the width of sample channel is $100\mu\text{m}$). The peak electric field intensity on this plane is 0.45kV/cm and forms at the intersection edge area. The electric field generated in the sample channel is nearly 10 times than in the accumulation channel.

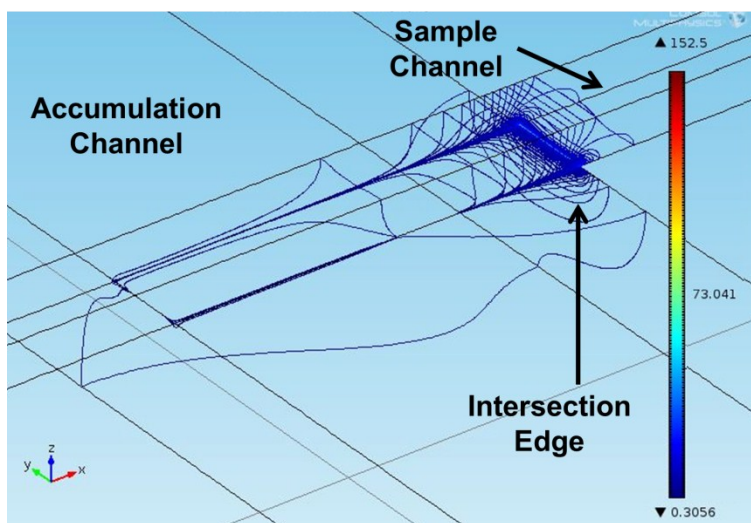


Figure S2: the electric field contours at the intersection. Because the difference between each line is fixed as 0.5kV/m , denser contours indicate a higher gradient of electric field. The highest electric field gradient is formed at the intersection corner points.

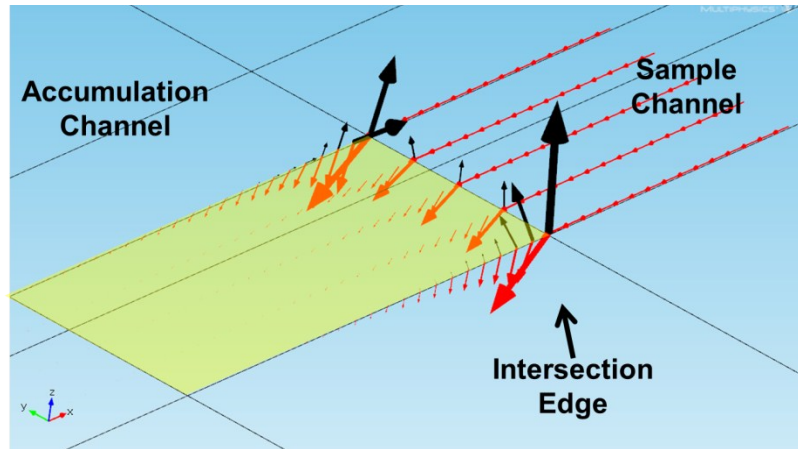


Figure S3: directions of EP force (red arrows) and DEP force (black arrows) in a plane $1\mu\text{m}$ above the bottom of sample channel. The yellow area represents the intersection region. The EP force directs from the sample channel to the accumulation channel, while the DEP force directs from the accumulation channel to the sample channel.