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Lab-on-chip for liquid biopsy (LoC-LB) based on dielectrophoresis

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Abstract: This short communication presents the proof-of-concept of a novel dielectrophoretic lab-on-chip for identifying/separating circulating tumor cells for purposes of liquid biopsy. The device consists of a polydimethylsiloxane layer, containing a microchannel, bonded on a glass substrate that holds two sets of planar interdigitated transducer electrodes. The lab-on-chip is operated at a frequency that enables dielectrophoretic force to sort cells, based on type, along the lateral direction. The operating frequency ensures attraction force toward the electrodes on cancer cells and repulsion force toward the center of the microchannel on other cells. Initial tests for demonstrating proof-of-concept have successfully identified/separated green fluorescent protein-labelled MDA-MB-231 breast cancer cells from a mixture of the same and regular blood cells suspended in low conductivity sucrose/dextrose medium.