Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary Information for

Microfluidic finger-actuated mixer for ultrasensitive electrochemical measurements of protein biomarkers for point-of-care testing

Benjamin Utzinger,[a] Desh D. Dixit [a] and Peter B. Lillehoj*[ab]

[a] Department of Mechanical Engineering, Rice University, 6100 Main St., Houston, TX, 77005, USA

[b] Department of Bioengineering, Rice University, 6500 Main St., Houston, TX, 77030, USA

*Corresponding author: lillehoj@rice.edu

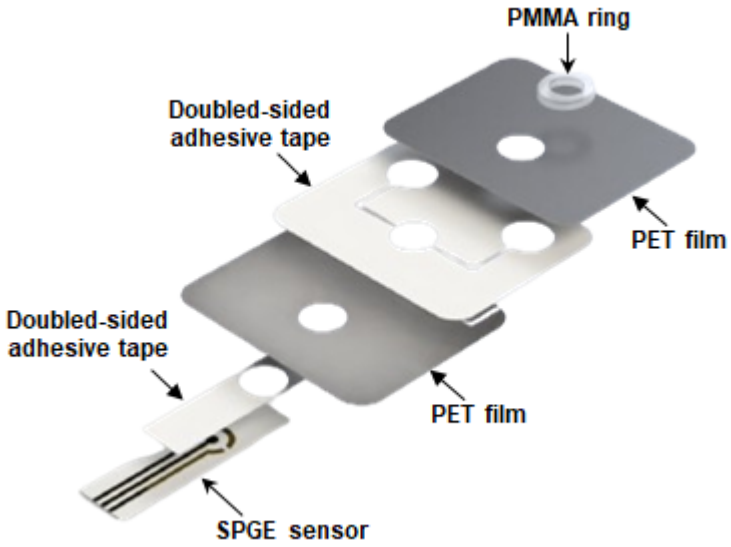

Figure S1. Exploded view of the microfluidic immunosensor chip.

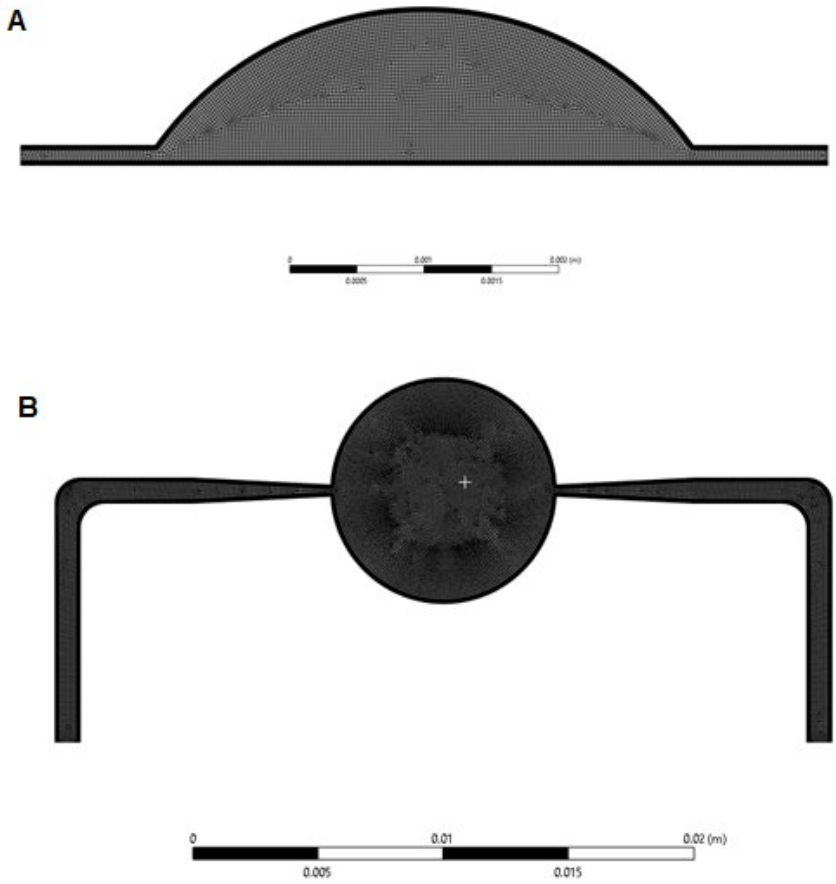

Figure S2. Mesh configurations for the numerical simulations. Mesh configuration for the side view (A) and top view (B) simulations.

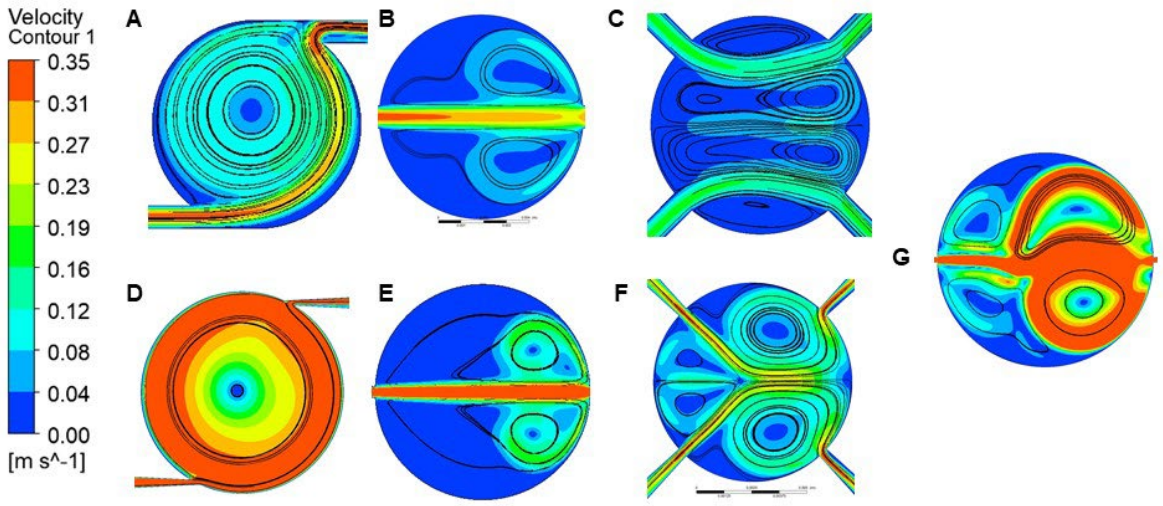

Figure S3. Optimization of the mixer design. Numerical simulation results of the streamlines and the velocity contour in the sample well 0.5 s after actuating the mixer having a (A) tangential design with one inlet and one outlet with constant-width channels, (B) radial design with one inlet and one outlet with constant-width channels, (C) radial design with two inlets and two outlets with constant-width channels, (D) tangential design with one inlet and one outlet with nozzles (contraction ratio = 2), (E) radial design with one inlet and one outlet with nozzles (contraction ratio = 2), (F) radial design with two inlets and two outlets with nozzles (contraction ratio = 2), and (G) radial design with one inlet and one outlet with nozzles (constriction ratio = 5).

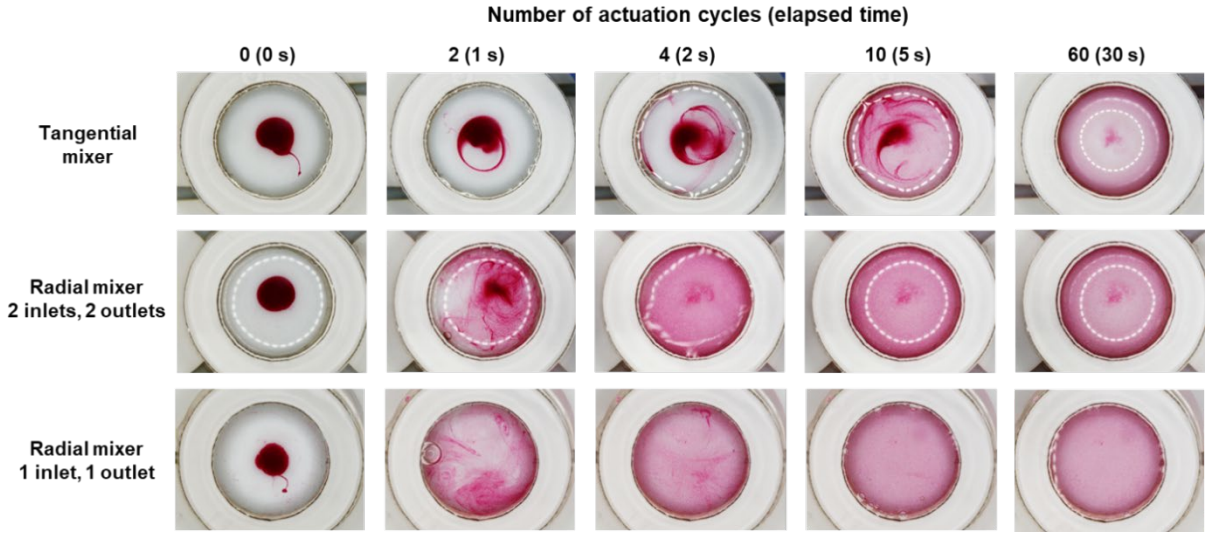

Figure S4. Characterization of the finger-actuated mixer for different mixer designs. Sequential still frame images showing the distribution of red polystyrene beads dispensed in a PBS droplet in the sample well of microfluidic chips (without the SPGE sensor) with different mixer designs actuated at ~2 Hz.

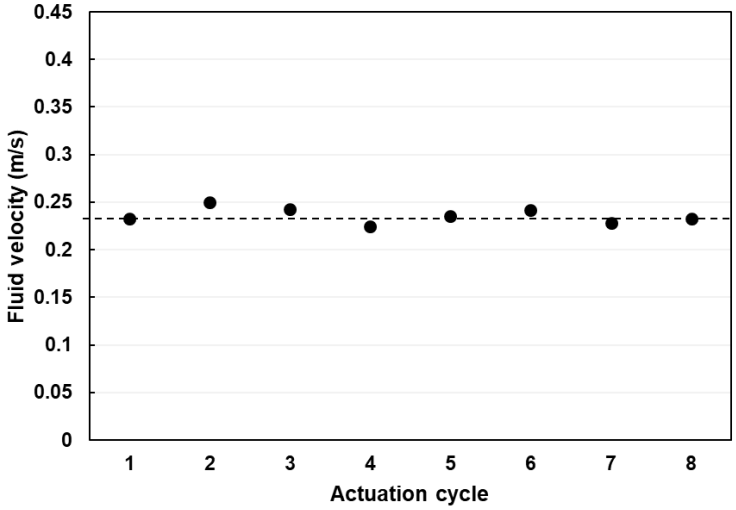

Figure S5. Fluid velocity generated in the channel for different actuation cycles using the radial mixer with a single inlet and outlet. The horizontal dashed line represents the mean velocity from all of the actuation cycles.