



Non-stop High-speed Interconnect for Digital Microfluid Biochip Integration

Chibuike A. Chikezie¹, Xingguo Xiong², Prabir Patra³

Abstract: Digital microfluidic biochip (DMFB) allows for manipulation of microfluid for Lab-on-Chip (LoC) application in digital dimension. This has proven to be effective for disease diagnosis and treatments. In order to achieve more functionalities, large scale integration of DMFBs is necessary. It is anticipated that tens to hundreds and thousands of DMFBs will be integrated into a single chip in the future. To speed up the droplet handling, faster and effective interconnects between DMFBs are very desirable and important. Currently droplets are moved from one electrode to next electrode step by step, which is very slow. This paper proposed the design and the simulation of a non-stop high speed interconnect for DMFBs. The non-stop interconnect allows the droplet to be moved between electrodes without stop, which saves time and make the droplet manipulation more efficient. COMSOL Multiphysics is used to study and demonstrate the behavior of the non-stop high-speed interconnect between DMFBs. Laminar Two Phase flow and Level set method was used in the simulation. This proposed non-stop high speed interconnect between DMFBs will make the LoC faster and act as a better and more effective connection for DMFBs.

Keywords: Digital MicroFluidic Biochip (DMFB), Non-stop high-speed interconnect, DMFB integration, Lab-on-a-Chip (LoC), Microfluid

¹ Department of Biomedical Engineering, University of Bridgeport, 221 University Avenue, Bridgeport, CT 06604. Email: cchikezi@my.bridgeport.edu

² Department of Electrical and Computer Engineering, University of Bridgeport, 221 University Avenue, Bridgeport, CT 06604. Email: xxiong@bridgeport.edu

³ Department of Biomedical Engineering, University of Bridgeport, 221 University Avenue, Bridgeport, CT 06604. Email: ppatra@my.bridgeport.edu