MAGNETOPHORETIC RARE CELL ISOLATION. Megan A. Hayes1,3, Tim C. Chen1,3, Tivona E. Dodamgoda2,

Akila Wijesinghe1,3, Subash Wickramasinghe1,3 & Dharmakeerthi Nawarathna1,3, 1Electrical & Computer Engineering

Program, 2Deep Creek High School, Chesapeake, VA, USA, 3Old Dominion University, Norfolk, VA, USA. Magnetophoretic cell isolation represents a promising technique for the efficient and selective extraction of circulating tumor cells (CTCs) from blood samples. CTCs, shed from tumors into the bloodstream, play a crucial role in cancer metastasis and are of significant interest for early cancer diagnosis, monitoring disease progression, and guiding treatment decisions. Magnetophoresis employs magnetic fields and magnetic field gradients to manipulate the motion of the magnetically labeled CTCs, facilitating their isolation from other blood cells. Rapid isolation and enumeration of CTC with very high accuracy is currently tricky. This study focuses on developing a low-cost point-of-care CTC isolation device. The device architecture resembles a chromatography column where the sample is pushed vertically while magnetic traps trap magnetically labeled particles within the device. Trapped magnetic particles are retrieved by turning off the magnetic field. Using commercially available ferromagnetic spheres, we have studied the design of micromagnetic traps within the device. These magnetic traps are magnetized using commercially available high strength Neodymium macro magnets to produce very high magnetic field gradients. Initial studies used commercially available magnetic and polystyrene bead mixtures and optimized the device architecture and traps. In this talk, we will discuss the device design, including high-strength magnetic traps, sample flow analysis, and preliminary results. Author contact: Dharmakeerthi Nawarathna, dnawarat@odu.edu.