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Fractionation of Exosomes and DNA using Size-Based Separation at the Nanoscale BENJAMIN WUNSCH, JOSHUA SMITH, IBM Research Labs, CHAO WANG, Arizona State University, STACEY GIFFORD, MARKUS BRINK, ROBERT BRUCE, GUSTAVO SOLOVITZKY, IBM Research Labs, ROBERT AUSTIN, Princeton Unversity, YANN ASTIER, IBM Research Labs — Exosomes, a key target of liquid biopsies, are nano-vesicles found in nearly all biological fluids. Exosomes are secreted by eukaryotic and prokaryotic cells alike, and contain information about their originating cells, including surface proteins, cytoplasmic proteins, and nucleic acids. One challenge in studying exosome morphology is the difficulty of sorting exosomes by size and surface markers. Common separation techniques for exosomes include ultracentrifugation and ultrafiltration, for preparation of large volume samples, but these techniques often show contamination and significant heterogeneity between preparations. To date, deterministic lateral displacement (DLD) pillar arrays in silicon have proven an efficient technology to sort, separate, and enrich micron-scale particles including human parasites, eukaryotic cells, blood cells, and circulating tumor cells in blood; however, the DLD technology has never been translated to the true nanoscale, where it could function on bio-colloids such as exosomes. We have fabricated nanoscale DLD (nanoDLD) arrays capable of rapidly sorting colloids down to 20 nm in continuous flow, and demonstrated size sorting of individual exosome vesicles and dsDNA polymers, opening the potential for on-chip biomolecule separation and diagnosti

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