Abstract Submitted
for the 4CF10 Meeting of
The American Physical Society

Solid-State Nanopore Recognition and Measurement using Shannon Entropy TYLER WOJCIK, DIEGO KRAPF, Colorado State University — Solid state nanopores are structures defined in silicon based membranes that can be fabricated using the electron beam of a transmission electron microscope. These structures can be used to electrically detect individual DNA molecules and they may potentially be used for rapid genomic sequencing. Current nanofabrication methods are manual and time-consuming and thus they do not allow for the fabrication of large scale nanopore arrays. One of the requirements in the development of an automated fabrication process is the electron microscope image processing to recognize and measure nanopore dimension in real time. Unfortunately image segmentation using pixel intensities does not yield good results due to the similar intensities inside and outside nanopore structures. Here we present a method for nanopore edge detection that uses Shannon entropy to overcome these difficulties. Texture-defined edges are determined by first calculating the Shannon entropy using a two-dimensional kernel. The image is then contrast-enhanced and a single Gaussian filter is applied to eliminate edge noise and produce a more pronounced feature. At last we segment the image and the texture-defined original edges are determined. The dimensions of nanopores as small as 2 nm are then directly measured.

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Date submitted: 10 Sep 2010 Electronic form version 1.4