

# Noise Reduction for DNA and Other Macromolecules Sequencing Using Oversampling and Cross-Correlations

Tech ID: 24369 / UC Case 2012-118-0

## BACKGROUND

Sequencing of macromolecules and especially of DNA is an extremely important area for biology, medicine and pharmacology. Developing realistic inexpensive methods for sequencing is becoming a crucial area for research and technological development. Current alternatives to standard PCR sequencing methods use serial physical property measurements. The key problem with these methods is that they are very susceptible to a large number of noise sources, which make their use problematic, perhaps impossible. Therefore development of a noise reduction scheme becomes imperative.

## TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a fast, accurate, and cost-efficient technique for significantly improving the signal-to-noise ratio in the next generation of solid state molecular detection and sequencing technology. To reduce the noise in a sequential measurement this patent-pending technology employs a phase locking methodology to reduce practically all of the noise which is not in the same frequency and phase ranges as the measurement. Using a multi-point cross-correlation technique, simulations of the proposed technology can detect transverse currents as molecules translocate a multilayered graphene-based nanopore architecture to recognize single biomolecules.

Although this technology has been simulated in synthetic nanochannels, the cross-correlation approach can be extended to any multiplexed DNA sequencing scheme that utilizes electron tunneling (e.g. scanning tunneling microscope). A detailed description of this technology is available in [Ahmed et. al. 2014](#) and [Boynton et. al. 2014](#).

## RELATED MATERIALS

- ▶ [Ahmed T, Haraldsen JT, Rehr JJ, Di Ventra M, Schuller I, Balatsky AV. Correlation dynamics and enhanced signals for the identification of serial biomolecules and DNA bases. Nanotechnology. 2014 Mar 28;25\(12\):125705. - 02/27/2014](#)
- ▶ [Boynton P, AV. Balatsky, IK Schuller, M Di Ventra. 2014. Improving sequencing by tunneling with multiplexing and cross-correlations. J Comput Electron DOI 10.1007/s10825-014-0571-2 - 01/01/2014](#)

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,965,586	05/08/2018	2012-118

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## OTHER INFORMATION

### CATEGORIZED AS

- ▶ **Nanotechnology**
  - ▶ NanoBio
- ▶ **Research Tools**
  - ▶ Nucleic Acids/DNA/RNA
- ▶ **Sensors & Instrumentation**
  - ▶ Physical Measurement
  - ▶ Scientific/Research

### RELATED CASES

2012-118-0