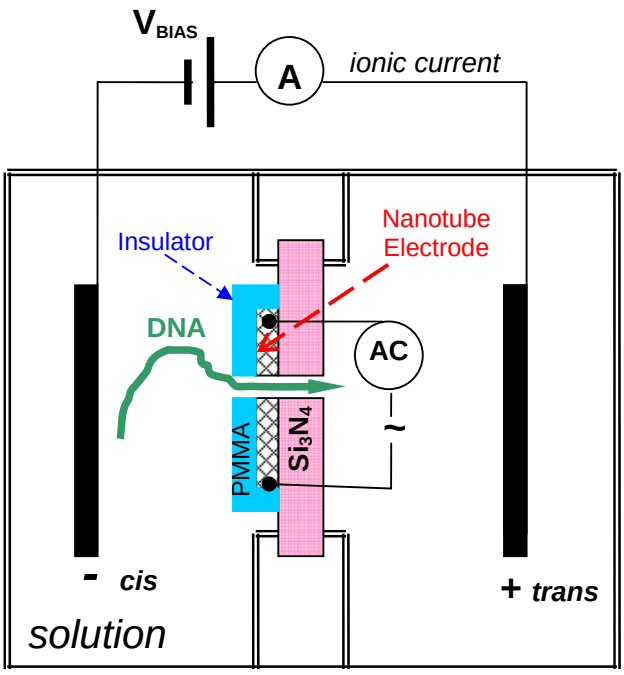
4.1 Final publishable summary report

Overall objectives

The goal of this project is to investigate a novel single-molecule DNA sequencing nanotechnology protocol (gene sequencer) that has potential to sequence a molecule of genomic dimensions in hours without expensive and fault sensitive DNA copying steps and chemical reactions. The gene sequencer is based on the electrical characterization of individual nucleobases, while DNA passes through a nanopore with integrated nanotube side-electrodes. The research proposed here will provide a unique combination of state of the art capabilities for cutting and usage of single wall carbon nanotubes as electrodes forming a lithographically fabricated "nanogap" with nanometer precision.

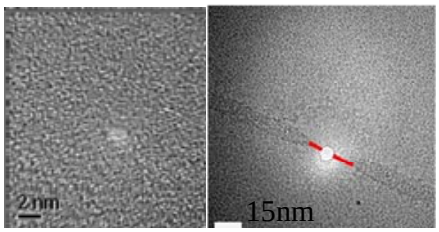


Set-up for DNA electrical characterization
www.nanoDNAsequencing.org

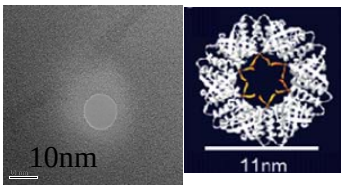
Achievements

State-of-the art nanofabrication:

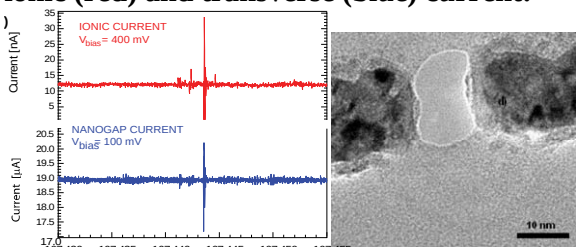
- Nanopores down to 1 nm are successfully fabricated using TEM (left).
- Nanopore drilled through individual SWCNTs leaving a CNT contact pair (right).



Slowing down DNA translocation by Nanopore coating with SP1 polymer and by complexing DNA with proteins:



Preliminary measurements of transverse current through the metal electrodes, ionic (red) and transverse (blue) current:



Transverse current calculation on finite voltage: (Nucleobases "reading" by voltage switching)

- Adenine exhibits transport through LUMO state (electron-like transport)
- Guanine exhibits transport through HOMO state (hole-like transport).