Mecwins: developing biomedicine applications using nanomechanical sensors

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Abstract
Mecwins was founded in 2008 by Dr. Javier Tamayo and Dr. Montserrat Calleja, Bionanomechanics group leaders from the Institute of Microelectronics of CSIC (IMM - CSIC) [1]. Since then, we have been developing cutting edge technology for nanomechanical sensing. The technology, based on detecting variations in the deflection and resonance frequency of nanomechanical sensors, was the groundwork for the technical improvements that led us to our new ultrasensitive detection device, SCALA.

SCALA (SCAnning Laser Analyzer) [2] is a commercial platform with high potential for the analysis of biomolecule interactions in human whole blood samples for biosensing applications. The technology uses cantilevers as trasducers for the detection of biomolecules. Cantilever arrays have been extensively explored as high-sensitive nanomechanical biosensors [3]. The molecular recognition on the surface of a biofunctionalized cantilever results in a nanomechanical response, that produces cantilever bending of a few nanometers (static mode) or changes in cantilever resonance frequency (dynamic mode) where the added mass due to selective molecular recognition decreases resonance frequency value.

SCALA has been used for the successful detection of different protein biomarkers in clinical diagnosis, focusing our preliminary experiments on oncology, cardiac and infectious diseases biomarkers. SCALA combines mechanical detection technique (microcantilevers resonance frequency analysis) with a new optical detection technique that increases current levels of sensitivity in clinical practice a million times [4] in comparison with techniques currently used in hospitals and central laboratories and without increasing current cost per sample. The adoption of ultrasensitive detection equipment will enable screening for early detection of a wide range of diseases with established diagnostic biomarkers from a droplet of blood.

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References

[1] Spanish Research Council: http://www.imm-cnm.csic.es/bionano/es
[2] http://mecwins.com/
[3] Arlett *et al.* Nat Nanotechnol 6(4),203-15 (2011)
[4] Kosaka *et al*. Nat Nanotechnol. 9(12),1047-53 (2014)

Figures

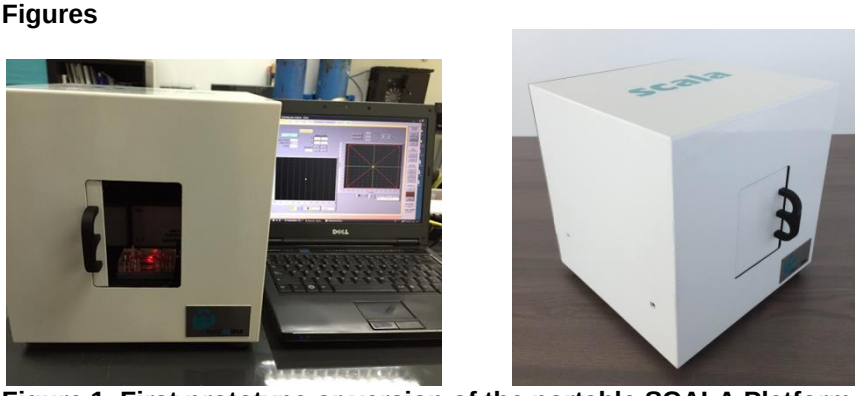

Figure 1. First prototype or version of the portable SCALA Platform