Title: Next Generation Molecular Detection – with a CMOS capacitive detector

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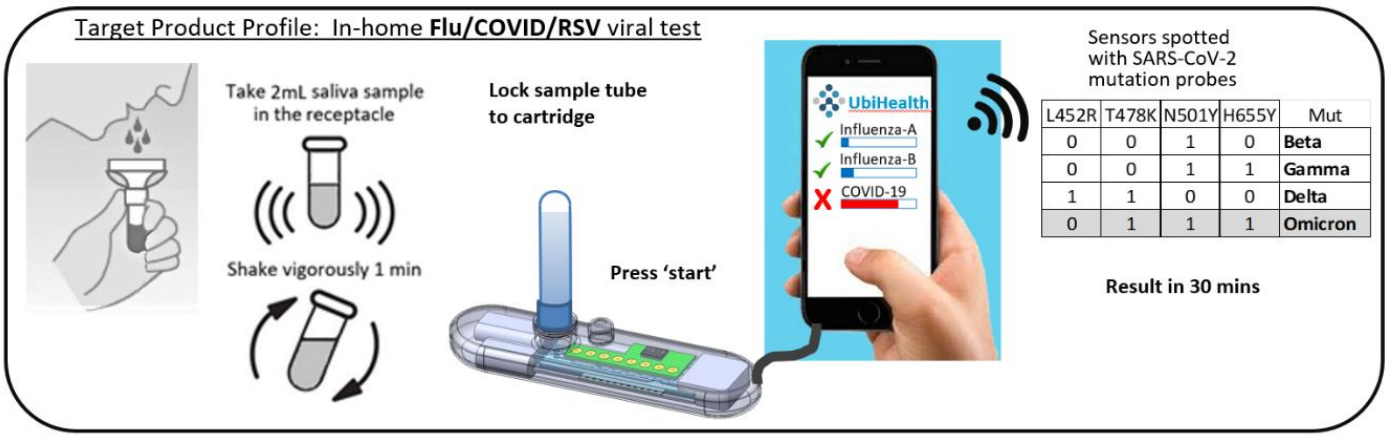
Abstract: Altratech Ltd is developing an alternative to PCR for the detection and quantification of molecular targets. The method – Detection by Proxy – combines nanotechnology, microfluidics, and semiconductors in a unique way that facilitates molecular detection outside a clinical setting. The assay, named PNA-BeadCAP®, employs synthetic PNA-probes, which eliminates sample-preparation/pipetting/centrifuging. Detection is with a CMOS capacitive sensor, which eliminates bulky and expensive optical detectors. These novel methods make it eminently suitable for portable hand-held use, outside of hospitals and laboratories, by untrained personnel, at Point-of-Care, and eventually in the home.

Its first commercial instantiation is a home viral respiratory test, for COVID/Flu detection, with variant identification:



Outline of presentation:

1. Introduction
    a. Molecular detection basics
    b. PCR & LAMP methods; probes & primers.
    c. Biosensor review: ISFET, Electrochemical, GMR & magnetic biosensors
    d. CMOS Biosensor review: optical, magnetic, capacitive CMOS biochips & circuits

2. Altratech's Next-Generation Molecular Detection method
    a. The SARS-CoV-2 viral particle and genome structure
    b. PNA-probes; mutations & variant détection.
    c. Capacitance-versus-RNA results
    d. The home Flu/Covid test

3. The BeadCAP® CMOS capacitive sensor
    a. Bead capacitance detection principle
    b. Capacitive electrode field modelling
    c. Capacitive-to-Digital Converter architecture & circuit design
    d. Converter transfer function & atto-Farad per bead
    e. Sensor layouts

Author / Presenter BIO:

- Tim Cummins is co-founder and CTO of AltraTech Ltd, a biotechnology startup based in Cork & Limerick.
- Previously founded ChipSensors Ltd, designing environmental CMOS sensors, - acquired by Silicon Labs Inc.
- Designed 15 CMOS converter & mixed signal & system IC's, for consumer, industrial & medical markets.
- Senior Member IEEE; has presented papers at ISSCC & ESSCIRC; & published 5 papers (incl. 2 JSSCC journal).
- Holds over 50 international patents, generating > $100M revenue in Semiconductors & Sensors.