



## Portable TIRF Biosensor *TIRF Sense*



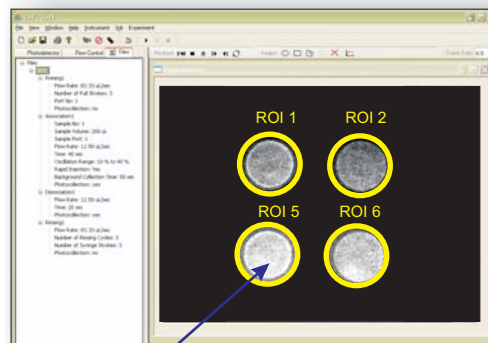
- *Portable TIRF array chem-bio sensor*
- *LED illuminator and EMCCD camera*
- *Electrochemical and electric field control*
- *On-board computer, Wi-Fi, BlueTooth, GPS*
- *Limit of detection - single molecules*
- *Detects DNA, RNA, protein, and metabolite markers of diseases and pathogens*
- *Rapid response - a few minutes*
- *Multiplicity - up to hundreds of analytes*
- *Low rate of false positive and false negative*
- *User-friendly software*

### Portable TIRF Biosensor TIRF Sense

TIRF Sense is a portable multipurpose chem-bio sensor designed for use in the field and mobile labs. TIRF Sense is well-suited for clinical diagnostics, food & water safety, forensic, military, biodefense, and agricultural applications. The limit of detection of TIRF Sense is at the level of single molecules, rate of response - several seconds to a few minutes, multiplicity - from a few to several hundreds of bioanalytes and chemical agents. TIRF Sense integrates fluorescence optics, electrochemical system, microfluidics, electronics, software, and nanoengineered bioassays into one portable device. Analyses are performed in the format of real-time TIRF microarrays that are capable of parallel detecting up to hundreds of nucleic acid, protein, and metabolite markers of diseases and pathogens, as well as toxins and chemical agents. Detection of chemical agents can be performed in liquid and/or gaseous phases. The sensor detects unlabelled molecular markers using reagentless bioassays based on DNA molecular beacons and aptamer- or antibody-based beacons. TIRF Sense requires no or minimal sample preparation and is capable of analyzing complex biological fluids, including whole blood, saliva, and urine. The device is remotely reprogrammable and can perform standard or user-defined analyses. The sensor is equipped with Wi-Fi, BlueTooth, USB, and cellular connectivity, and a GPS system. In contrast to traditional microarrays that detect only end-point results, TIRF Sense monitors the entire course of association and dissociation kinetics. Additionally, the sensor measures the dependence of association and dissociation kinetics on electrochemical polarization, which allows for discriminating between perfect targets and their close homologs. TIRF Sense device supports TIRF and other non-TIRF fluorescence assays, Electro-Chemi-Luminescence (ECL), and bio-luminescence assays. The assays can be immobilized at the surface in the form of monolayer or encapsulated into a hydrogel drops printed at the TIRF surface. TIRF microarrays include internal positive and negative controls and luminescence standards for normalization and calibration, which provides high reliability and broad dynamic range to analyses.

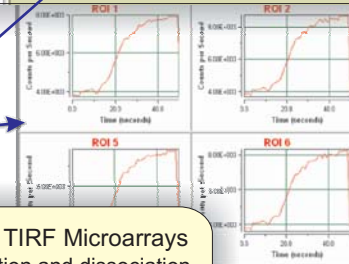
### Data Acquisition and Processing

Building of sensograms and calculating rate constants for selected regions of interest (ROI)



Selecting Regions of Interest (ROI)

Building Sensograms



Combined DNA & Protein TIRF Microarrays  
 real-time kinetics of association and dissociation

