

**iDiagnostics (iTIRF Array)**

**TIRF Spectroscopy**

**TIRF Microscopy**



**TIRF Labs**

**Total Internal Reflection Fluorescence**

# **iDiagnostics (iTIRF Array) Application Development Kit**

**iDiagnostics - the Cellphone Future of Precision Medicine**  
*precise, rapid, personalized, yet affordable diagnosing*

## **Develop your custom-design molecular diagnostics using our iDiagnostics Application Development Kit**

Early detection and prognosis of cancer and other diseases, personalized medicine, prevention of pandemics, and other health-care tasks require a highly sensitive, accurate, rapid, multiplexed, and yet affordable technology. Nine years of research at TIRF Labs resulted in the development of such technology - our novel cell phone based diagnostics platform, termed - iDiagnostics (iTIRF Array). iDiagnostics is a thousand-fold more accurate and more sensitive than traditional methods; it is rapid and robust, yet inexpensive.

The goal of TIRF Labs is to make iDiagnostics available and affordable to the general public. To facilitate the development of applications, TIRF Labs offers iDiagnostics Application Development Kit (ADK) to the diagnostics community, including academic, industrial, and government research groups. We will use the Open Innovation Approach to achieve synergy for collaborative development of molecular diagnostics products.

TIRF Labs offers an Application Development Kit (ADK), which includes: 1) iDiagnostics cradle, 2) cartridge blanks, 3) open perfusion/closed flow cell TIRF system as a tool for application development, 4) manual microarrayer, 5) reagents kit, 6) iOS, Android, and Windows Phone apps for data acquisition and analysis, 7) optional software development kit, and 8) experimental protocols. We anticipate that collaboration with research groups that have developed panels of assays for molecular diagnosing will allow for creating superior clinical applications for accurate diagnosis and prognosis of cancer and other diseases.

TIRF Labs will provide comprehensive support for the development of iDiagnostics applications, and will incorporate user feedback in the future releases of the ADKs. We will supply hardware, software, reagents, development tools, protocols, videos, and other technical support to accommodate the requirements for different diagnostic applications.

Fig. 1 shows the iDiagnostics cradle, cartridges, and an iPhone on the cradle. The base model of the cradle is supplied with blue 460 nm excitation. The arrays of bioassays printed at the surface of TIRF slide will include subpanels of assays for detecting protein, nucleic acid, and metabolite markers. The arrays contain internal controls to ensure reliability. The cartridge is equipped with a 20-microliters flow cell, which encompasses the iTIRF array. iDiagnostics requires no or minimum sample preparation. Whole blood can be analyzed after addition of an anticoagulant. However, simple sample preparation modules are included in the cartridge. Additional space is reserved at the cartridge for more complex sample prep modules as will be required for applications developed in the future.

Fig. 2 shows TIRF system arranged as an application development tool equipped with open perfusion or closed flow chambers. Fig. 3 shows manual microarrayer for printing iTIRF arrays using a micropipette. The use of a robotic arrayer is optional. The response of iTIRF array will be recorded by the camera of a smartphone and data analysis performed as shown in Fig. 4. See iDiagnostics brochure for more information.



Fig.1. iDiagnostics cradle with iPhone and cartridges. Android and Windows smartphones are also supported.

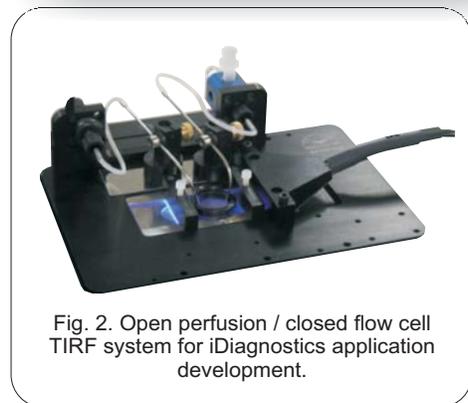


Fig. 2. Open perfusion / closed flow cell TIRF system for iDiagnostics application development.

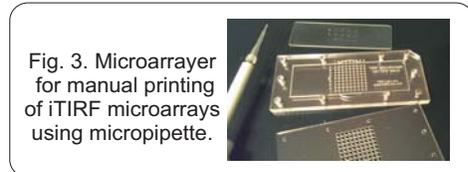


Fig. 3. Microarrayer for manual printing of iTIRF microarrays using micropipette.

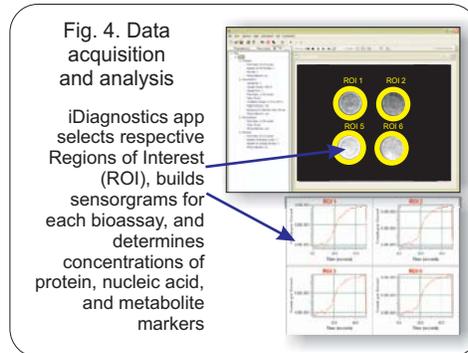


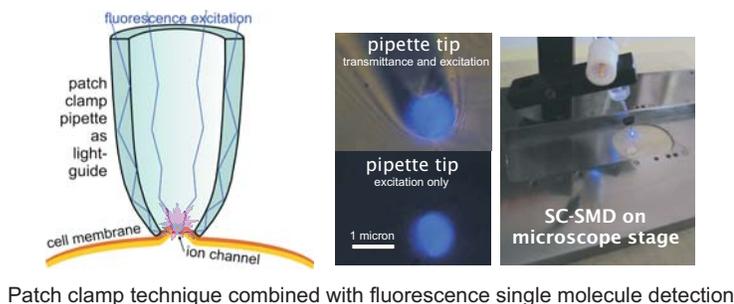
Fig. 4. Data acquisition and analysis

iDiagnostics app selects respective Regions of Interest (ROI), builds sensorgrams for each bioassay, and determines concentrations of protein, nucleic acid, and metabolite markers

**Accurate and Rapid Cell Phone Based Molecular Diagnostics**



### Single ion Channel Single Molecule Detection



### iDiagnostics

cellphone based molecular diagnostics



We extended TIRF into 3<sup>rd</sup> dimension and invented iDiagnostics  
Now you can hold a hospital laboratory in the palm of your hand

### Turnkey Single Molecule Detection TIRF Microscopy System

Modular TIRF systems include:

- Fluorescence microscope
- Ig-, p-, or/and o-TIRF microscopy flow systems
- Low light EM CCD camera
- Multi-color computer-controlled illuminator
- Computer-controlled fluidics system
- Potentiostat and/or wave-function generator
- Software for instrument control and data analysis



### Lightguide- and Prism-based TIRF Microscopy

- Use YOUR microscope and YOUR objectives
- Ig- and p-TIRF work with dry, water-, and oil-imm. lenses
- Use Xenon lamp, LED, or laser illuminators
- Open perfusion or closed flow chambers
- Install/uninstall in less than one minute
- Optional electrochemical control and computer-controlled fluidics



### TIRF Accessories for Fluorometers

- TIRF Accessory transforms your spectrofluorometer into a super-sensitive TIRF biosensor instrument
- Optional electrochemical, DEP and temperature control
- **SmartFlow** Fluidic System allows to run unattended TIRF experiments, measure sensograms to derive  $k_{on}$  and  $k_{off}$
- Novel microfluidics allows for handling nanoliter volumes

