*i*Diagnostics (*i*TIRF Array) Application Development Kit

*i*Diagnostics - the Cellphone Future of Precision Medicine

precise, rapid, personalized, yet affordable diagnosing

Develop *your* custom-design molecular diagnostics using our *i*Diagnostics Application Development Kit

The early detection and prognosis of cancer and other diseases, personalized medicine, the prevention of pandemics, and other health-care tasks require a highly sensitive, accurate, rapid, multiplexed, and yet affordable diagnostics system. Nine years of research at TIRF Labs resulted in the development of such technology - our novel cellphone based diagnostics platform, termed - *i*Diagnostics (*i*TIRF Array). *i*Diagnostics 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 *i*Diagnostics available and affordable to the general public. To facilitate the development of applications, TIRF Labs offers an *i*Diagnostics 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 the collaborative development of molecular diagnostics products.

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

TIRF Labs will provide comprehensive support to the development of *i*Diagnostics applications, and will incorporate user feedback into 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 *i*Diagnostics 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 *i*TIRF array. *i*Diagnostics requires no or minimum sample preparation. Whole blood can be analyzed after the addition of an anticoagulant. However, simple sample preparation modules are included in the cartridge. Additional space is reserved in 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 the manual microarrayer for printing *i*TIRF arrays using a micropipette. The use of a robotic arrayer is optional. The response of *i*TIRF arrays will be recorded by the camera of a smartphone and data analysis performed as shown in Fig. 4. See the *i*Diagnostics brochure for more information.

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

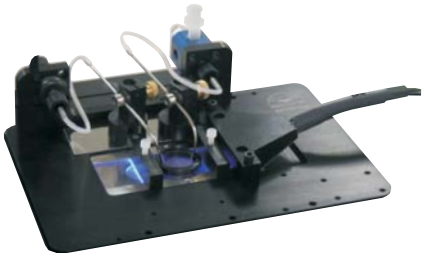


Fig. 2. Open perfusion / closed flow cell TIRF system for iDiagnostics application development.

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

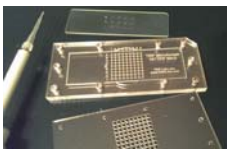
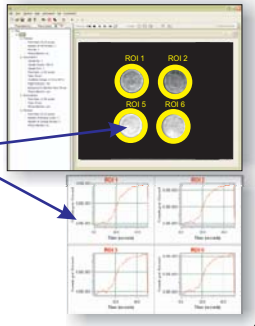


Fig. 4. Data acquisition and analysis

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

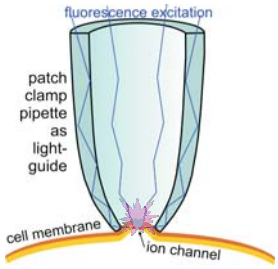


Accurate and Rapid Cell Phone Based Molecular Diagnostics

*i*Diagnostics (*i*TIRF Arrays)
TIRF Microscopy
TIRF Spectroscopy

TIRF Labs
Total Internal Reflection Fluorescence

Single ion Channel Single Molecule Detection



Patch clamp technique combined with fluorescence single molecule detection

*i*Diagnostics
cellphone based molecular diagnostics

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

Turnkey Single Molecule Detection TIRF Microscopy System

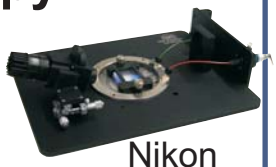
Modular TIRF systems include:

- Fluorescence microscope
- lg-, 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

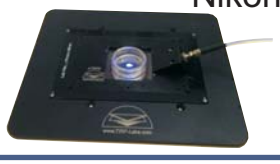
Lightguide- and Prism-based TIRF Microscopy

- Use YOUR microscope and YOUR objectives
- lg-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


Olympus


Nikon


Zeiss


Leica

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