

# Keysight 5500 ILM AFM/SPM

Imaging on an Inverted Light Microscope

Data Sheet



## Overview

The Keysight Technologies, Inc. 5500 inverted light microscope (ILM) system combines the power of a high-resolution atomic force microscope (AFM) with the direct optical viewing capability of an inverted optical microscope. (Figure 1) The Keysight ILM offers unparalleled performance and ease of use for imaging in fluids. It extends AFM utility in order to encompass studies of single molecules, polymers, cell membranes, whole cells, and much more. Atomic force and optical (or fluorescence) microscopy data can be obtained simultaneously with the Keysight ILM (Figure 2).

The ILM's patented mounting design incorporates a rigid structure that provides the low noise floor needed to obtain subnanometer resolution. Furthermore, the advanced design allows the AFM to sit on top of an inverted microscope and under the illumination pillar, resulting in better optical contrast for the images (Figure 3).

Keysight's QuickSlide sample-loading mechanism and a flexible sample-handling plate make sample preparation easy. The microscope is positioned on the QuickSlide assembly, allowing the user to change samples and/or solutions without affecting the alignment of the AFM or the optical microscope (Figure 4).

## Applications

- Life science/biology
- DNA
- Proteins
- Cell biology
- Polymer
- Thin films
- Nano beads
- Electrochemistry
- Non-aqueous solvents

## Features and Benefits

- High-resolution atomic force microscope with inverted optical microscope allows simultaneous AFM and fluorescence imaging
- Top-down scanner design enables effortless setup
- Inverted optical view, open-top viewing access, and top illumination provide superior optical contrast
- Patented, rigid stage mounting provides low noise floor for sub-nanometer resolution
- Patented MAC Mode® option provides gentlest, nondestructive AFM imaging of samples in fluid
- PicoTREC™ option delivers real-time, simultaneous topography and recognition imaging
- Several sample-handling plates available to facilitate easy imaging in fluids or ambient air
- Easy Quick Slide sample-loading mechanism makes sample preparation simple
- Flow-through liquid cell lets researchers monitor real-time changes while exchanging solutions
- Temperature control available to enable imaging applications under a broader range of physiological conditions
- Full compatibility with Keysight's modular AFM/SPM microscopes offers simple upgrade path for extended capabilities

## Imaging Options

Optimized for use with Keysight's 5500 AFM/SPM, the ILM allows researchers to take advantage of the many powerful features that are available only with Keysight's AFM/SPM products. For instance, Keysight's patented MAC Mode, the most gentle imaging mode available for any AFM platform, provides unparalleled performance in fluids (Figures 6 and 7). Flow-through liquid cells and precise temperature control options allow users to image soft biological samples under controlled physiological conditions. Keysight's proprietary sample plate stability further supports high-resolution AFM (Figure 5). Additionally, the unique PicoTREC option delivers real-time, simultaneous topography and recognition imaging.

A wide range of complementary techniques can be performed with the ILM system including FRET, fluorescence, darkfield and brightfield microscopy.

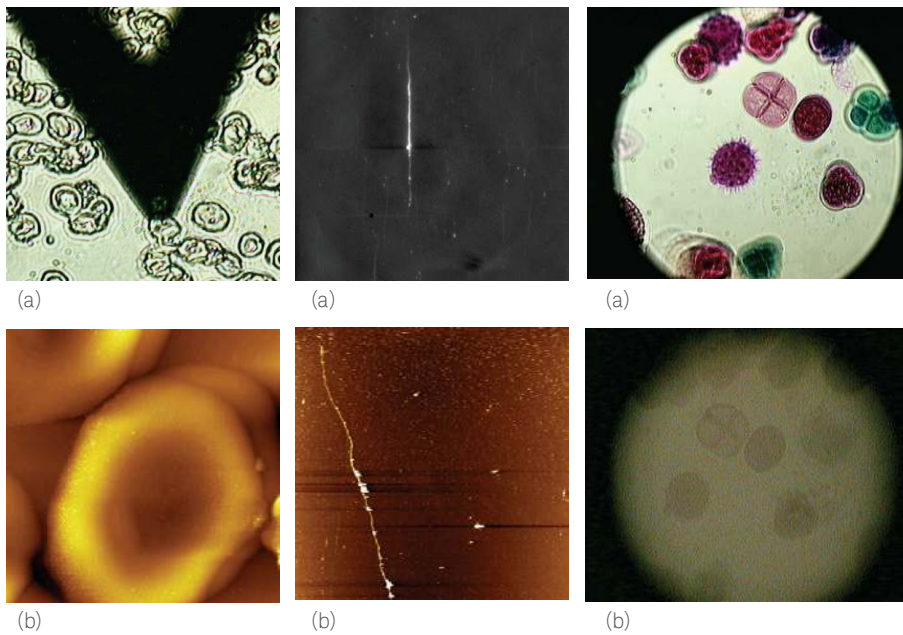


Figure 1. (a) Optical view of a red blood cell sample and AFM probe. (b) AFM topography image of a red blood cell. Scan size: 11  $\mu\text{m}$  x 11  $\mu\text{m}$ .

Figure 2. (a) Fluorescence microscope image of DNA and (b) corresponding in situ AFM scan at 30 nm x 45 nm.

Figure 3. Keysight AFM top illumination (a) Top illumination compared to (b) bottom illumination

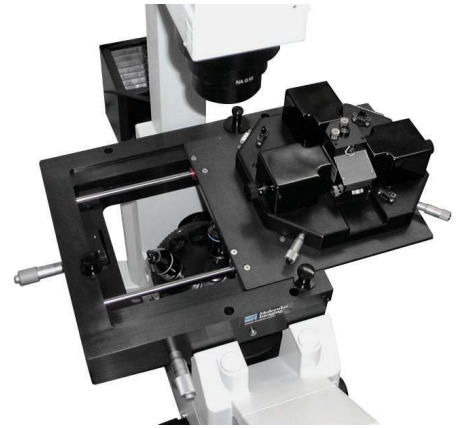


Figure 4. QuickSlide for easy sample loading.



Figure 5. Sample plates from left to right Standard plate, Petri dish plate, liquid cell plate.

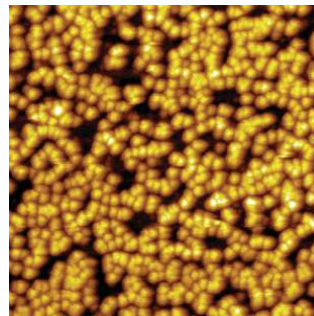


Figure 6. Ferritin molecules in water imaged with MAC Mode (raw data). Scan size: 1  $\mu\text{m}$  x 1  $\mu\text{m}$ .

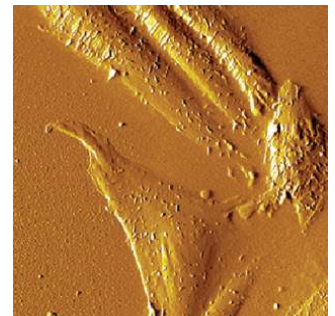


Figure 7. CHO cells in buffer imaged with MAC Mode. Scan size: 70  $\mu\text{m}$  x 70  $\mu\text{m}$ .

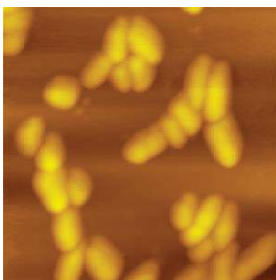
## Multiple User Platform

The Keysight ILM is a modular, multiple-user platform. The open-architecture design permits easy access, manipulation, setup, and modification of samples while experiments are being performed. Convenient access to the sample plate and familiar sample preparation techniques make the ILM ideal for life science and other applications that require intensive sample preparation.

Keysight's unique modular design also makes it easy to change imaging techniques (for example, MAC to EC or AFM to STM) or to use either the atomic force microscope or the optical microscope as a stand-alone system. Other operating modes available include current sensing AFM.

## Industry-Standard Compatibility

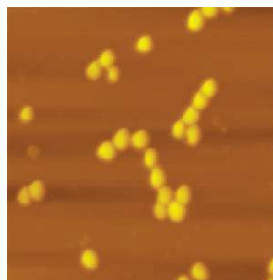
The 5500 ILM is compatible with a wide selection of inverted optical microscopes and cameras. The researcher can use 25 mm Petri dishes and glass slides.



(a) Escherichia coli Bacteria



(b) Rhodospseudomonas pallustris Bacteria



(c) Staphylococcus aureus Bacteria

Figure 8. These images show how gelatin coated mica can be used to immobilize both gram negative and gram positive bacteria for imaging in liquid. Scan size 15  $\mu\text{m}$  x 15  $\mu\text{m}$

## AFM Instrumentation from Keysight Technologies

Keysight Technologies offers high-precision, modular AFM solutions for research, industry, and education. Exceptional world-wide support is provided by experienced application scientists and technical service personnel. Keysight's leading-edge R&D laboratories ensure the continued, timely introduction and optimization of innovative, easy-to-use AFM technologies.

[www.keysight.com/find/afm](http://www.keysight.com/find/afm)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

### Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	800 047 866
Other AP Countries	(65) 6375 8100

### Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:

[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

(BP-09-23-14)

This information is subject to change without notice.

© Keysight Technologies, 2006-2014

Published in USA, July 31, 2014

5989-6005EN

[www.keysight.com](http://www.keysight.com)