

# Keysight PicoView Software

Enhanced Imaging and Analysis Package  
for Keysight AFM Systems



Data Sheet



# Overview

The new PicoView imaging and analysis software package from Keysight Technologies has been designed specifically for utilization with state-of-the-art Keysight AFM and SPM systems. These popular systems, which include the 5500, 5600LS, and 7500, offer versatile platform modularity, industry-leading environmental and temperature control, and an expansive range of high-precision imaging modes.

Keysight PicoView is a rich, robust and intuitive package that gives researchers easy access to numerous advanced capabilities via a user-friendly interface. In addition to basic force spectroscopy, PicoView now enables the use of volume spectroscopy and FlexGrid spectroscopy. PicoView also affords researchers new, customizable math plug-ins that return values to facilitate quantitative mapping of sample properties at the nanoscale.

Improved electrochemistry capabilities, such as cyclic voltammetry (CV) using either the AFM tip or the sample, allow the software to provide superior control for EC-AFM and EC-STM experiments. Moreover, the new version of PicoView fully supports Keysight's unique PicoScript (automation/customization) and PicoLITH (lithography/nanomanipulation) options.

## Features and Benefits

- New volume spectroscopy and FlexGrid spectroscopy
- New math plug-ins facilitate quantitative analysis
- Improved electrochemistry (EC) capabilities
- Full support of unique PicoScript and PicoLITH options
- Rich, robust, and intuitive package with user-friendly interface
- PicoCafe' Online Forum – Interactive Web Community [www.keysight.com/find/nano](http://www.keysight.com/find/nano) (Whats New)

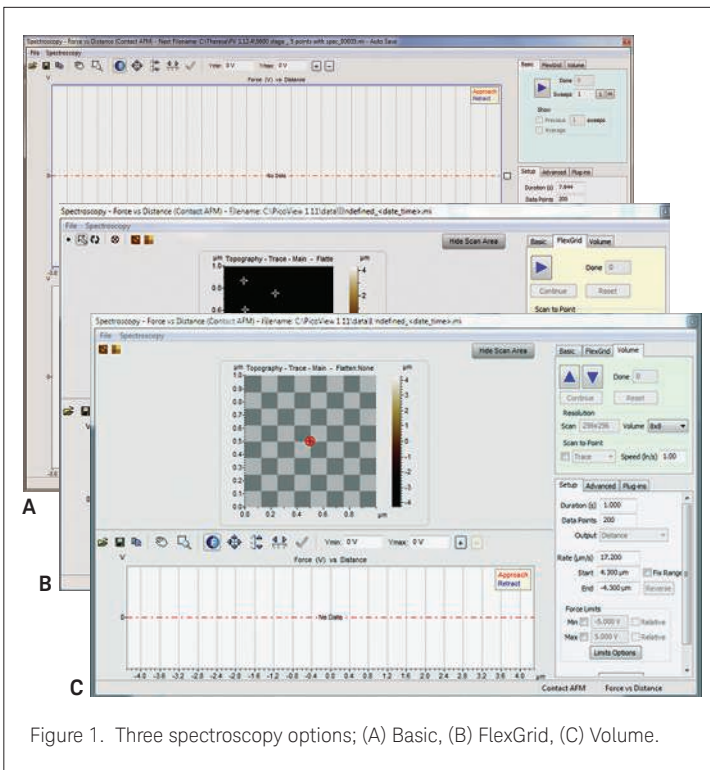


Figure 1. Three spectroscopy options; (A) Basic, (B) FlexGrid, (C) Volume.

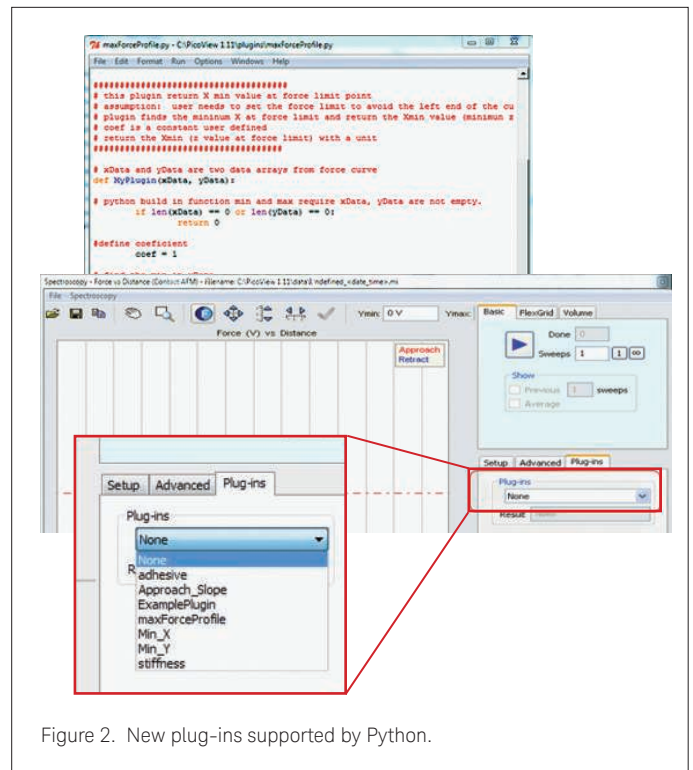


Figure 2. New plug-ins supported by Python.

## New Volume and FlexGrid Spectroscopy

Spectroscopy is an AFM-based technique utilized to measure, and sometimes control, the polarity and strength of the interaction between the AFM tip and the sample. Although the tip-sample interaction may be studied in terms of the energy, the quantity that is measured first is always the tip-sample force – hence the nomenclature, force spectroscopy. In contrast to imaging mode, force spectroscopy disables the servo feedback loop, thus using the cantilever tip assembly as a force sensor.

Keysight PicoView software not only lets researchers perform basic force spectroscopy but also permits easy switching to volume spectroscopy and FlexGrid spectroscopy. These modes (volume and FlexGrid) can be extended through easy to use plug-ins to provide additional flexibility in data analysis and generation.

Volume spectroscopy combines AFM imaging and force spectroscopy. This technique extends the utility of force spectroscopy by making it easy to extract useful information from multiple force spectroscopy data sets in a graphical user interface. The final recorded data set contains a three-dimensional image as well as force spectroscopy data for all of the user-selected points within the image. Volume spectroscopy, therefore, enables simultaneous imaging and a full force curve at every point.

FlexGrid spectroscopy allows researchers to mark multiple locations (XY coordinates) anywhere within an AFM image and to record at those locations one or more force-distance curves from a single or multiple approach-retract cycles of force spectroscopy during scanning. Essentially, the FlexGrid technique provides “instant” spectroscopy.

## New Math Plug-ins

PicoView software now offers researchers easy-to-use math plug-ins that have been created to quickly process the data required for quantitative analysis. The new math plug-ins can also be customized to facilitate special experiments. Simply write Python code, drop it in, and run!

To perform force spectroscopy analysis, PicoView provides math plug-ins for elasticity, adhesion work, adhesion force, and indentation. Each of these plug-ins returns values in the proper units (e.g., elasticity in Pa, adhesion force in N). Quantitative mapping of sample properties, such as elasticity nanoscale mapping ([Pa]) and adhesion mapping ([N], [J]), is also supported.

The PicoView interface is truly extensive. Different elasticity models can easily be implemented by modifying the plug-ins. Furthermore, researchers can write their own spectroscopy online analysis.

## New Electrochemistry Capabilities with Advanced Software

PicoView allows complete control of all scanning parameters and provides the flexibility required for more complex EC-AFM and EC-STM experiments. Keysight’s new EC-friendly version of the PicoView software package provides an easier-to-use interface, a greater number of control parameters (with expanded ranges), and cyclic voltammetry using either the AFM tip or the sample.

Among the many electrochemistry applications facilitated by the EC-friendly version of PicoView are fuel cells and energy storage (e.g., lithium ion batteries), visualization of electrochemical metallization, organic photovoltaics, corrosion studies and nanofabrication.

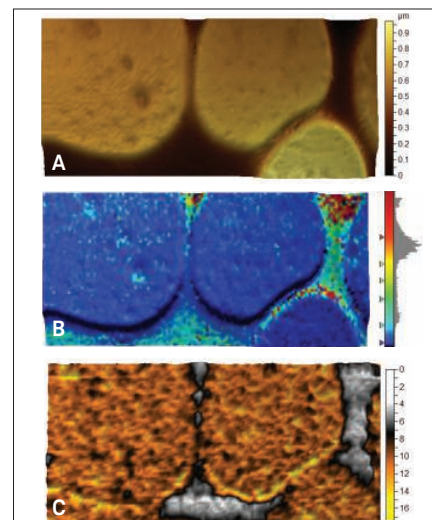


Figure 3. Elasticity mapping of red blood cells with the 5500AFM using PicoView plug-ins and PicoImage post processing. Images: volume spectroscopy with three plug-in windows: (A) topography, (B) elastic modulus, (C) indentation.

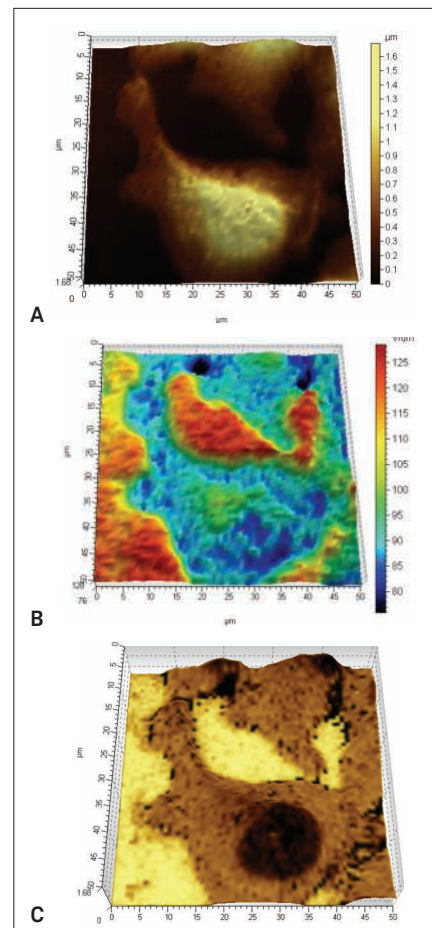


Figure 4. Elastic mapping on T24 cells, (A) topography, (B) stiffness, (C) topography overlaid with indentation. Data acquired with the 5500 AFM using PicoView plug-ins and PicoImage post processing software.

## Keysight PicoScript Option

Keysight PicoScript is an optional scripting interface package that greatly enhances the capabilities of PicoView. Scripts can be written to automate tasks and create custom experiments. PicoScript, which is integrated with PicoView software, comes with an application programming interface (API). Scripts can be developed utilizing Python, C/C++, and MathWorks MATLAB. PicoScript also provides virtual instruments (VIs) for National Instruments LabVIEW.

PicoScript gives users access to all major function classes (e.g., set/get parameters), as well as to special functions, status functions, and more than 400 commands (e.g., display) for writing scripts. Online help and examples are provided for each function; generating scripts that combine multiple functions is easy. Moreover, applications can be combined into libraries for shared use.

Using PicoScript to automate controls for an Keysight AFM system facilitates increased productivity and permits more advanced experiments to be developed. Furthermore, the Python programming language can be used to develop new routines for data analysis, enabling even greater flexibility. PicoScript can also provide status updates remotely to users, allowing them to concentrate on other tasks.

## Keysight PicoCafé

Keysight Technologies' PicoCafé' is an interactive web community created exclusively for its atomic force microscopy users. Keysight AFM users from around the world are invited to visit the PicoCafé' at [www.Keysight.com/find/nano](http://www.Keysight.com/find/nano) (Whats New) to share original script programming and instrumentation-related insights with one another.

The PicoCafé' has been constructed to serve as a convenient and comfortable online gathering place for researchers and AFM users of all skill levels who are seeking to optimize the utility of their own Keysight AFM systems. The site provides an invaluable repository of user-submitted, innovative tools and highly practical knowledge for AFM users working in a broad range of scientific and industrial fields.

## Keysight PicoLITH Option

Keysight PicoLITH lithography and nanomanipulation software is a CAD-style package. This optional package allows users to sketch various shapes on a canvas (including lines, poly-lines, circles, and boxes) that can then be mapped to a real sample surface. Individual shapes can be assigned a unique set of parameters. Each parameter set is associated with a color for easy visual reference. Accessible parameters include force, probe bias, sample bias or potential, and probe speed.

PicoLITH gives users the ability to cut and paste predesigned shapes to assist in the building of more complex patterns. Once designed, shapes can be reused in future experiments and are easily resized.

## AFM Instrumentation from Keysight Technologies

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

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

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