

# diCaliber

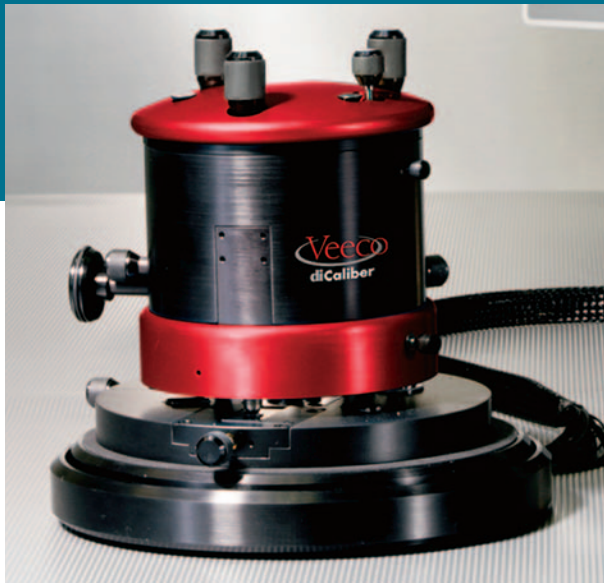
## High-Value Scanning Probe Microscope



- **Compact, Portable Design**
- **Flexible, Open-Hardware Architecture**
- **Closed-Loop Scanning**
- **Image a Variety of Sample Sizes**

# diCaliber

## Big SPM Functionality in a Tiny



The Caliber™ system is the robust embodiment of many years of leading-edge scanning probe microscope (SPM) design. As such, Caliber delivers highly reliable functionality, performance, and tremendous value.

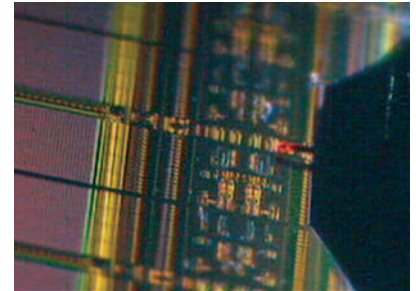
Caliber is able to perform a variety of distinct SPM applications on samples of various sizes. Designed to deliver dependable performance, this compact SPM provides a highly affordable research solution for materials and surface sciences, polymer studies, thin films and coatings, as well as biomaterials and inorganics. With unprecedented surface-to-surface portability, open-hardware architecture, extensive software capabilities, and several image modes, the Caliber SPM offers truly outstanding value.

- ▶ Scanning Tip Technology
  - Scans up to 90 x 90µm with a 10µm Z range
  - Permits analysis of odd size samples
- ▶ Closed-loop scanning
  - Provides distortion-free zoom, pan at any scan angle
  - Eliminates piezo nonlinearity, hysteresis, and creep
- ▶ Comprehensive SPM software
  - Allows image analysis without interrupting scan
  - Precision Force Spectroscopy with customizable controls
- ▶ Sensored Z
  - Accurate height measurements
  - Eliminates creep and hysteresis effects

### Multifunctional Design

Caliber's open-platform design allows researchers to customize hardware and optimize electronics for excellent application versatility. Extremely compact and portable, the Caliber SPM can be utilized on practically any surface. Streamlined operational convenience facilitates a broad array of stand-alone experiments.

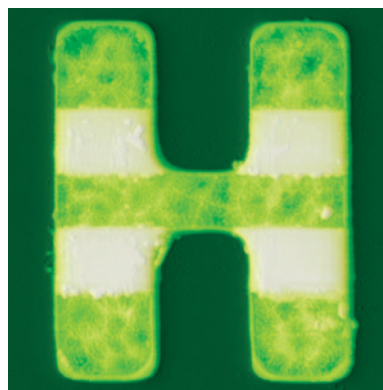
Caliber comes with its own controller and sample stage. In addition, researchers are free to build and use their own stage. Proprietary electronic control provides low electronic noise as well as a triple-DAC design for 16-bit scan control at any scan range and offset.



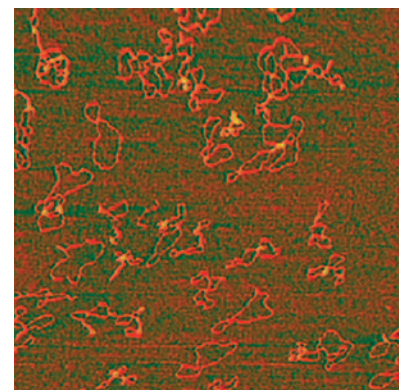
Tip view on semiconductor structure through the integrated video microscope.

### Robust Flexibility

This compact, flexible instrument is capable of imaging topography on a wide range of spatial periods and feature heights. In order to satisfy a diverse set of application requirements, a variety of AFM probes is supported. Closed-loop XY scanning, a sample stage with a built-in XY translator, and the ability to scan up to 90µm all mean *big utility in a tiny footprint*.



Tapping mode image of implant region of SRAM device. 10µm scan.

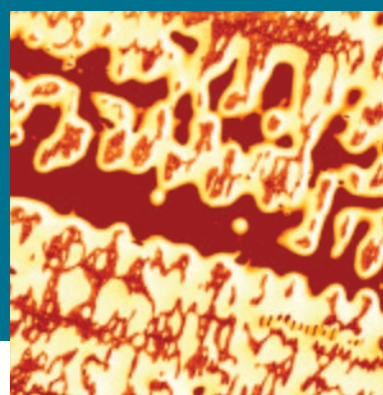


DNA deposited on mica. Tapping mode image showing individual DNA molecules 2.5µm scan.

# Footprint



Native Collagen fibrils exhibiting the typical 67nm banding pattern. 8.5 $\mu$ m scan.



Polydiethylsiloxane on silicon. Phase image revealing the mesomorphic state of the polymer. 25 $\mu$ m scan.

## Extensive Software Functionality

Caliber software gives users complete, flexible control of data acquisition via a suite of wide-ranging features:

### Real-time

- Line-by-line analysis of data without interrupting scan including Fast-Fourier Transform (FFT) and leveling (Offset and slope removal)
- Layered imaging allows users to take data at varying tip-sample separations at each image pixel.
- Built-in spring-constant calibration uses the power spectrum of the cantilever's thermal vibration in free air to determine its spring constant.

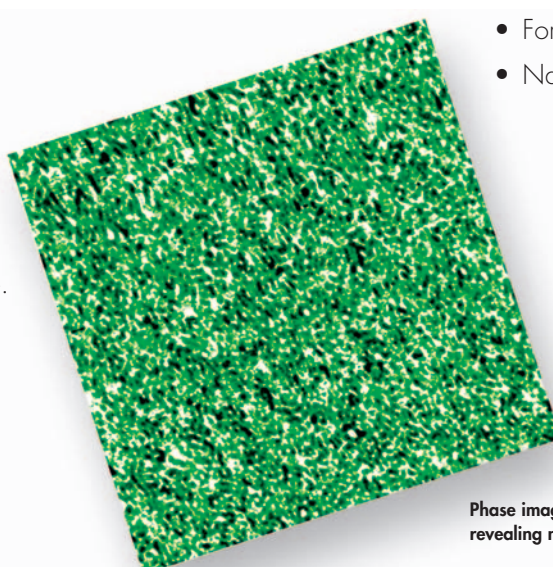
### Off-line

- Shape analysis offers data on the average dimensions of various feature patterns, such as parallel line width, curve radius, step height, and angle.
- User defined vector shading with real time 24 bit color allows better visualization of three-dimensional features from any view, angle, or perspective.
- One- and two-dimensional fractal analyses using Lake/threshold calculations provide characterization of advanced surface metrology.

## Streamlined Ease of Use

The Caliber system has been engineered with researchers in mind, thus affording a faster path to publishable data. The small, handheld Caliber can image large samples without having to cut them down. Also, the sample stage has a kinematic mount that allows users to scan and rescan the sample at the same location.

For the utmost convenience, Caliber uses pre-mounted tips that facilitate handling and laser alignment. The system also utilizes integrated optics with a color camera that enables easy judgment of tip-sample separation. The optics' large field of view allows researchers to find areas of interest quickly.



Phase image of the SBS tri-block copolymer revealing micro-phase separations. 2 $\mu$ m scan.

## Applications

- Materials and surface sciences
- Polymers
- Thin films and coatings
- Biomaterials
- Inorganics
- Nanolithography
- Semiconductor
- Nanotubes and Nanoparticles

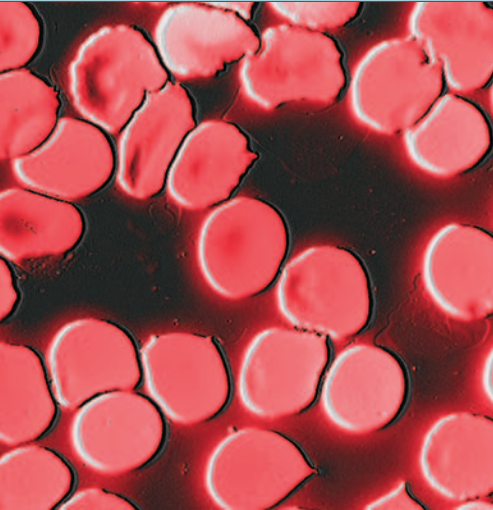
Contact Veeco to find out if Caliber is right for your application!

## Image Modes

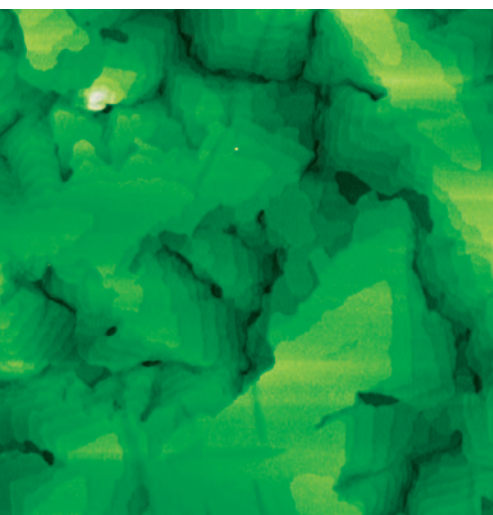
- Contact Mode
- TappingMode™
- PhaseImaging™
- Lateral Force Microscopy (LFM)
- Force Modulation Microscopy (FMM)
- Force Distance Curves
- Nanolithography (optional)



Front cover image: Phase image of multi-layer polyethylene clearly showing layers of high-and-low density PE and additional fine structure. 50 $\mu$ m scan.



Red blood cells on glass slide. 90 $\mu$ m scan.



Pentacene crystal imaged in tapping mode. Terraces separated by 1.5nm steps are clearly resolved. 6 $\mu$ m scan.

## Caliber Specifications

### SCANNERS

- Sample size:** – Unlimited (without translation stage)  
– 50mm diameter, 7mm high or 25mm diameter, 15mm high
- Closed-loop X-Y scanner range:** – 90 $\mu$ m
- X-Y noise:** – <4nm (80–625Hz bandwidth)
- Z scanner range:** – 10 $\mu$ m typical
- X-Y linearity error (integral):** – 1% typical
- X-Y crosstalk:** – <1°
- Z noise floor (system)<sup>1</sup>:** – <0.15nm (1kHz bandwidth) TappingMode
- Linearizer noise Z:** – <0.6nm (80–625Hz)

### AFM MODES

- Contact, LFM, FMM, point spectroscopy (force distance), nanolithography (optional)
- TappingMode, Phasemaging (with integrated I/O modulation plus board)

### SPECTROSCOPY MODES

- Single-point or multiple-point measurements in user-selectable array

### ELECTRONICS

- Measurement channels:** – Six dedicated 16-bit A/D converters
- Scan resolution XYZ:** – 16 bits, independent of gain and offset
- Data channels:** – Up to six images with 1000 x 1000 data points
- Expansion options:** – ECU-Plus Control System I/O Utility Board

### OPTICS

- Laser power:** – 1mW typical
- Camera:** – Integrated CMOS color camera and software-controlled white LED light source
- Field of view:** – 1.5mm x 1.5mm
- Optical resolution:** – 10 $\mu$ m

### SOFTWARE

- Operating system:** – Windows XP®

### PROBES

- Selection of pre-mounted contact and tapping

1: Under appropriate isolation.

Note: Performance specifications are typical and subject to change without notice.



112 Robin Hill Road, Santa Barbara, CA 93117  
800 873-9750  
www.veeco.com

B54, Rev AO, 6/28/06

© 2006 Veeco Instruments Inc. All rights reserved.

Caliber, TappingMode, and Phasemaging are trademarks of Veeco Instruments Inc. Windows XP is a registered trademark of Microsoft Corp.

## Worldwide Customer Support from the Industry Leader

Veeco Instruments Inc. provides solutions for nanoscale applications in the worldwide semiconductor, data storage, telecommunications/wireless and scientific research markets. Our Metrology products are used to measure at the nanoscale and our Process Equipment tools help create nanoscale devices. Veeco's manufacturing and engineering facilities are located in New York, New Jersey, California, Colorado, Arizona and Minnesota. Global sales and service offices are located throughout the United States, Europe, Japan and Asia Pacific.