

IRT

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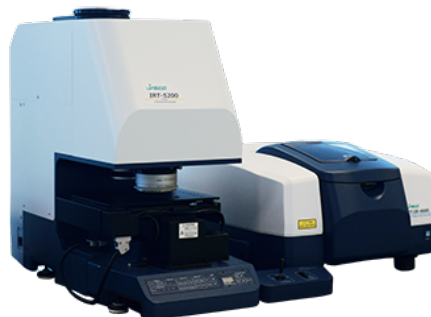
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# FTIR Microscopes

## An Overview of the FT/IR-5000 and FT/IR-7000 Series of FTIR Microscopes

FTIR microscopy has generally been reserved for measuring specified samples such as small contaminants on polymer films or micro samples transferred to infrared transparent windows. The innovative IRT-5000/7000 Series FTIR Microscopes provide new functions that dramatically improve infrared micro-spectroscopy analyses. These FTIR microscope systems are used together with the FT/IR-4X or FT/IR-6X Series spectrometers, offering the most advanced microscopy and imaging systems.



Coupling JASCO's proven technology for infrared spectroscopy with the most advanced optical design, the IRT-5000/7000 Series offer an ideal solution for the most challenging sample analyses.

### System Features

- Transmission and Reflection with a choice of magnifications
- ATR measurement with many prism options including 'view through' options
- High optical throughput using high quality reflective components
- Wide wavenumber range 15,000 to 400  $\text{cm}^{-1}$
- Excellent signal to noise ratio with a range of MCT and other detectors including electrically cooled DLaTGS.
- MCT Linear Array Detector (16 elements, wavenumber range 7,000 to 650  $\text{cm}^{-1}$ ) for fast imaging analysis and kinetics measurement
- High spatial resolution
- Full vacuum option for sensitive measurement without noise from environmental gases
- IQ Mapping for in-situ mapping experiments for high speed or samples that can be easily damaged when the ATR is moved
- Rapid IR Imaging experiments for kinetics using Rapid Scan
- Spectra Manager Imaging Suite – a fast and powerful interface for mapping and imaging
- Up to four objectives with automatic switching
- Exceptional visual observation quality with DIC and polarization options
- Wide area mapping and multi-ATR imaging
- Dynamic Imaging with Rapid Scan and Step-Scan options
- Multivariate analysis PCA

# FTIR Microscopes Specifications

Principle	FTIR microscope with cassegrain optical system
Measurement Method	Transmittance / Reflectance measurement
Standard Detector	IRT-5100: DLATGS detector (7800-400 $\text{cm}^{-1}$ ) IRT-5200 & IRT-7100: Single mid-band MCT (7800-600 $\text{cm}^{-1}$ ) IRT-7200: Linear array MCT (7000-650 $\text{cm}^{-1}$ x 16 element) Single mid-band MCT (7800-600 $\text{cm}^{-1}$ )
Detector Exchange	Dual detector capability (software controlled), user exchangeable single element detectors are available as an option.
Optional Detectors	Single element detector (IRT-5100): - Narrow-band: MCT (5000-750 $\text{cm}^{-1}$ ) - Mid-band: MCT (7800-600 $\text{cm}^{-1}$ ) - Wide-band: MCT (7800-450 $\text{cm}^{-1}$ ) - InSb: (15000-1850 $\text{cm}^{-1}$ ) - InGaAs detector: (12000-4000 $\text{cm}^{-1}$ )  Single element detector (IRT-5200, IRT-7100, & IRT-7200): - Narrow-band: MCT (5000-750 $\text{cm}^{-1}$ ) - Wide-band: MCT (7800-450 $\text{cm}^{-1}$ ) - DLATGS: (7800-400 $\text{cm}^{-1}$ ) - InSb: (15000-1850 $\text{cm}^{-1}$ ) - InGaAs detector: (12000-4000 $\text{cm}^{-1}$ )  Linear array detector (IRT-5200, IRT-7100): - MCT (7000-650 $\text{cm}^{-1}$ ), 1 x 16 element - MCT (7000-650 $\text{cm}^{-1}$ ), 2 x 16 element - InSb (10000-1900 $\text{cm}^{-1}$ ), 1 x 16 element - InGaAs (10000-5000 $\text{cm}^{-1}$ ), 1 x 16 element  Linear array detector (IRT-7200): - MCT (7000-650 $\text{cm}^{-1}$ ), 2 x 16 element - InSb (10000-1900 $\text{cm}^{-1}$ ), 1 x 16 element - InGaAs (10000-5000 $\text{cm}^{-1}$ ), 1 x 16 element
S/N Ratio	Single element detector (IRT-5100): - 1000:1 (Aperture size 300 $\mu\text{m}^2$ , resolution 4 $\text{cm}^{-1}$ , 1 min. acquisition, near 2200 $\text{cm}^{-1}$ , p-p)

	<p>Single element detector (IRT-5200, IRT-7100, &amp; IRT-7200):</p> <ul style="list-style-type: none"> <li>- 8000:1 (Aperture size <math>100\text{ }\mu\text{m}^2</math>, resolution <math>4\text{ cm}^{-1}</math>, 1 min. acquisition, near <math>2200\text{ cm}^{-1}</math>, p-p)</li> </ul> <p>Linear array detector (IRT-7200):</p> <ul style="list-style-type: none"> <li>- 1500:1 (Aperture size <math>12.5\text{ }\mu\text{m}^2</math>, resolution <math>16\text{ cm}^{-1}</math>, 1 min. acquisition, near <math>2200\text{ cm}^{-1}</math>, p-p)</li> </ul>
Microscope Objectives	<p>IRT-5100, IRT-5200, &amp; IRT-7100:</p> <ul style="list-style-type: none"> <li>- Cassegrain: 16 x 32 x or 10 x</li> <li>- Automatic objective recognition function (standard)</li> <li>- Up to four objectives can be selected by the software.</li> </ul> <p>IRT-7200:</p> <ul style="list-style-type: none"> <li>- Cassegrain: 16 x 32 x as standard, 10 x as option</li> <li>- Automatic objective recognition function (standard)</li> <li>- Up to four objectives can be selected by the software.</li> </ul>
Condenser Mirror	<p>IRT-5100, IRT-5200, &amp; IRT-7100:</p> <ul style="list-style-type: none"> <li>- Cassegrain: 16 x 32 or 10 x (manual exchange)</li> <li>- Automatic condenser mirror recognition function (standard)</li> </ul> <p>IRT-7200:</p> <ul style="list-style-type: none"> <li>- Cassegrain: 16 x, 32 x as standard (manual exchange), 10 x as option</li> </ul>
Condenser Mirror Compensation	Standard auto-compensation function
Aperture	PC-controlled vertical horizontal adjustment and angle of rotation
Sample Storage	<p>Standard (IRT-5100 &amp; IRT-5200):</p> <ul style="list-style-type: none"> <li>- Manual stage with fine adjustment (Movable distance: X: 70, Y: 50, Z: 20 mm)</li> </ul> <p>Standard (IRT-7100 &amp; IRT-7200):</p> <ul style="list-style-type: none"> <li>- Auto XYZ stage with auto-focus function (Movable distance: X: 100, Y: 75, Z: 25 mm, <math>1\text{ }\mu\text{m}</math> step)</li> </ul> <p>Option (IRT-5100 &amp; IRT-5200):</p> <ul style="list-style-type: none"> <li>- Auto XYZ stage with auto-focus function (Movable distance X: 100, Y: 75, Z: 25 MM, <math>1\text{ }\mu\text{m}</math> step Joystick for auto XYZ stage control)</li> </ul> <p>Option (IRT-7100 &amp; IRT-7200):</p> <ul style="list-style-type: none"> <li>- Joystick for auto XYZ stage control</li> </ul>

Auto Focus	Option (IRT-5100 & IRT-5200)
	Standard (IRT-7100 & IRT-7200)
IQ Mapping	Standard (IRT-7100 & IRT-7200)
Sample Observation	High-resolution, 3 Megapixel CMOS camera with a 3X optional zoom function (standard)
	IQ Monitor (simultaneous sample measurement and observation) and auto illumination function (standard)  5.7 inch integrated color LCD display (option), Binocular (option)
Observation Options	Visible polarization observation, Differential interference contrast observation, Fluorescence observation
	Refractive objectives: 10×, 20×
Microscope Objectives	Cassegrain 16× - standard; 10×, 32× - optional
	Automatic objective recognition function is standard.
	Up to four objectives can be selected by the software.
ATR Measurement (Option)	"Clear-View" ATR objective (ATR-5000-SS/SD/SG) *1,
	conventional ATR objective (ATR-5000-D/Z/G) *1,
	Stage-mounted micro ATR using transmittance light path (ATR-5000-TPZ)
Grazing Angle Measurement (option)	Cassegrain grazing angle objective (RAS-5000) *2
Purge	Sample area purge case is optional as an option.
Integrated Control Panel	Transmittance/Reflection switching with indicator; detector indicator; objective selection/indicator; open/close and rotation of aperture; auto-compensation of condenser mirror; visible illumination adjustment
Dimension	IRT-5100 & IRT-5200:
	587 (H) × 302 (W) × 695 (D) mm, 54 kg
	IRT-7100 & IRT-7200:
	613 (H) × 302 (W) × 695 (D) mm, 56 kg
Power Consumption	IRT-5100 & IRT-5200:
	AC 100-240 V, 50/60 Hz, max. 60 VA
	IRT-7100 & IRT-7200:
	AC 100-240 V, 50/60 Hz, max. 75 VA

\*1 Pressure sensor (PRS-M-5000, PRS-A-5000) is required.

\*2 Infrared polarizer (PL-IR-5000, PL-IR-7000) is required.

# IRT-1000 In-Compartment FTIR Microscope

## Compact Manual FTIR Microscope for Simple Applications

### IRT-1000 In-Compartment FTIR Microscope

The IRT-1000 is a compact and easy to use in-compartment FTIR microscope that can be used with any FT/IR-X Series instrument. The microscope is exchanged in the same way as an ATR or transmission holder in the sample compartment, without an requirement for adjustment or optical alignment. The excellent throughput allows for highly sensitive measurements for samples as small as 20 microns. The IRT-1000 can be operated from the integrated touch panel and a PC using Spectra Manager™ Suite. Sample observation is made with an integrated color CCD camera and a 5 inch TFT color LCD monitor and recorded using the imaging function in Spectra Manager™. JASCO's unique ATOS (Aperture Through Optical System) provides simultaneous viewing of the sample image and sampling location specified by an aperture.



*IRT-1000 In-Compartment FTIR Microscope*

### System Features

- Easy location in the sample compartment – within seconds. No optical alignment is required before measurements
- Manual stage for moving and focusing the sample measurement area
- Three measurement modes: Transmittance, Reflectance, and ATR
- DLaTGS detector in FTIR main instrument (standard)
- MCT detector or NIR optimized detector (optional)
- Optional sampling accessories for liquid and powder samples
- Unique sample observation system allows observation of the sample, even during measurements
- Measurement and processing are performed by Spectra Manager™. A video capture of the sample view is stored in the spectral data file

### Options for the IRT-1000

#### SmartPurge™

An optional purge casing can be used to eliminate interference from atmospheric CO<sub>2</sub> and water vapor bands.



#### ATR Objectives

There are three types of optional ATR objectives, select from:- ZnSe, Ge, or Diamond crystal prisms. An optional pressure sensor (recommended), can be used to protect the ATR objective prism.



## Liquid Sample Holder

The liquid sample holder includes three standard spacers, 100, 50 and 25  $\mu\text{m}$  path lengths.



## Powder Sample Holder

The powder sample holder can be used for diffuse reflectance measurements of samples mixed with KBr. Up to five samples can be loaded onto the holder.



## ATR Objectives (Optional)

Model Name	ATR-1000-VZ	ATR-1000-VG	ATR-1000-VD
Wavelength Range ( $\text{cm}^{-1}$ )	4000 to 650	4000 to 650	4000 to 300
Objective Mirror			
Angle of Incidence	40 to 53°		
Numerical Aperture	0.8		
Magnification	12x		
Prism Material	ZnSe	Ge	Diamond
Refractive Index	2.4	4.0	2.4
Sample Area	250 $\mu\text{m}$ diameter		
Number of Reflections	1	1	1
Objective Dimensions	86 mm diam. x 49 mm height		
Weight	Approximately 430 g		
Recommended Pressure (Using Optional Pressure Sensor Stage)	up to 0.4	up to 0.7	

## IRT-1000 Microscope Specifications

Measurement Method	Transmission, Reflection (standard), ATR (optional)
Sample Observation	CCD camera (standard)
Objective Mirror	x8 cassegrain
Condenser Mirror	x8 cassegrain with transmission compensation
Objective Selection	Manual exchange with no alignment required
Detectors	Selection from available instrument detectors
Sample Observation Area	1.2 x 0.9 mm

Observation Method (ATOS)	CCD camera, 5 inch LCD ATOS: Aperture Through Optical System	
Minimum Measurement Area	20 $\mu\text{m}^2$ (MCT detector) 100 $\mu\text{m}^2$ (DLaTGS detector)	
Wavenumber Range	13,000 to 300 $\text{cm}^{-1}$ (dependent upon FTIR configuration)	
Sample Stage	X-Y-Z manual stage	
Aperture	Independent X and Y variable aperture	
Purge	SmartPurge™ System (FT/IR-4000, 6000)	
Sample Illumination	Transmission/reflection (adjustable intensity)	
Dimensions	144 (W) x 312 (D) x 292 (H) mm	
Weight	7 kg	
Power Requirements	DC12V 8W (110/220 V adapter included)	



# IRT-5000 FTIR Microscope

The IRT-5000 Series of FTIR microscopes provide new functions that dramatically improve infrared micro-spectroscopic analysis. The IRT-5000 microscope is used with either the FT/IR-4000 or FT/IR-6000 Series spectrometers, combining both micro and macro FTIR measurement, offering the most advanced microscopy and imaging systems. The systems are typically used in the mid-IR for materials identification and forensic analysis or in the near- and far-IR for more fundamental research.

## System Description

The IRT-5000 FTIR Microscope includes an automatic carousel with a choice of cassegrains and refractive elements for observation and measurement. A mid-band MCT detector is included (with option for a high sensitivity peltier cooled DLaTGS detector). Up to two detectors can be installed to expand the spectral range of the microscope. The unique IQ Mapping function can be used for Transmission/Reflectance or ATR mapping without requirement to move the sample stage. An optional automatic XYZ sample stage with auto-focus can be used for sample or mapping analysis of a larger sample area. The addition of a linear array MCT detector provides very high speed mapping and imaging especially useful for dynamic experiments.



## System Features

- IQ Mapping without moving sample stage
- Spectra Manager™ Suite
- KnowItAll® Informatics and library search
- Purge (Standard) Full vacuum (Option)
- Optional Rapid Scan with interval analysis software
- Manual or automatic stage with temperature control (cryo cooling and heating)
- Dual detector capability and user exchangeable detectors
- Carousel with multiple objective capability and automatic switching
- Exceptional visual observation clarity
- IQ Monitoring for simultaneous observation of the spectrum and sample image
- Spectrum preview to check conditions before measurement
- Data file includes sample image and aperture information

## IRT-5100: FTIR Microscope

The IRT-5100 is a general purpose FTIR microscope with a standard DLaTGS detector (liquid N2 cooling not required), it can also be fitted with a second MCT detector. An optional automatic XYZ stage with autofocus is used for mapping analysis and imaging.

- Dual detector
- Variety of measurement modes (Transmission, Reflectance, ATR, Grazing Angle)
- 4 position objective Carousel
- Optional automatic XYZ stage

## IRT-5200: FTIR Microscope

The IRT-5200 FTIR microscope includes a mid-band MCT detector (up to two detectors can be installed). IQ Mapping allows transmission/reflectance and ATR mapping experiments without moving the sample stage. An optional automatic XYZ stage provides auto-focus and mapping or imaging analysis of larger sample areas.

- IQ Mapping
- Dual detector, with user exchangeable detectors using a 'cassette' system
- Variety of measurement modes (Transmission, Reflection, ATR, Grazing Angle Reflection)
- 4 position objective carousel
- Field upgrade to high-speed IR Imaging System using a 16 element linear array detector

## User-Friendly Micro Analysis Measurement Program

Spectra Manager™ Suite provides many automated functions with a simplified operation. Measurement conditions, microscope sample monitoring/control operations and measurement results can be reviewed in a single screen. The dedicated microscope interface provides various types of measurements such as single and multiple points, mapping, and linear array measurements using a single mouse-click for mode selection. Real-time monitoring of the spectrum and a calculated functional group image can be specified during mapping measurement.

## Innovative ATR Mapping

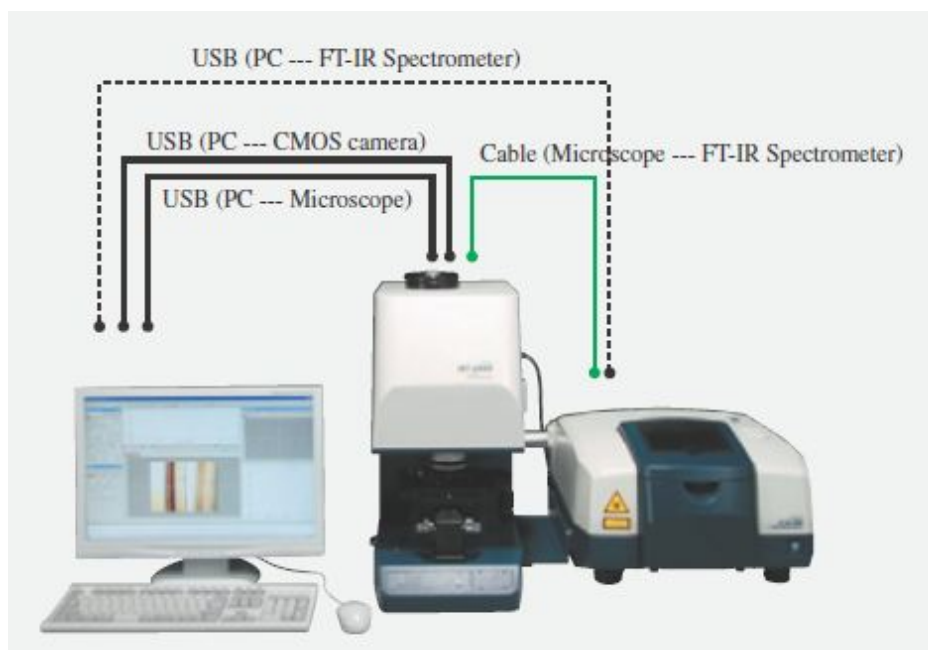
The ClearView ATR objective provides a simultaneous sample viewing as the ATR prism contacts the sample and during ATR data collection. IQ Mapping enables automated multi-point mapping, line mapping, grid mapping and IR Imaging analysis of a microscopic area with a manual sample stage and a single element detector.

IQ Mapping coupled with a "ClearView" ATR objective allows ATR mapping and ATR Imaging of a sample in contact with the ATR objective without moving the sample stage or ATR objective, while observing the sample area in contact with the crystal prism. IQ Mapping minimizes sample damage and provides high-speed and cross-contaminant free measurements of a relatively small sampling area.

## Purge and Full-Vacuum System

Absorption peaks due to atmospheric water vapor and CO<sub>2</sub> can make it difficult to obtain high quality sample spectra. The standard microscope and FTIR optical system includes multi-zone purge to reduce effects of atmospheric gases, but the most effective solution is the measurement of samples in a vacuum. The IRT-5000 series can be configured as a full vacuum FTIR microscope system.

## Standard Composition



Description	Quantity
IRT-5000 Microscope	
including:	
- Objective Cassegrain (16×, 32×, or 10×)	
- Condenser Cassegrain (16×, 32×, or 10×)	1 set
- MCT Detector	
- CMOS Camera	
-Manual Stage	
Spectra Manager™ Suite	1 pc.
Sample Plate	1 pc.
Micro-Sampling Kit	
consisting of:	
- Micro Sampling Knife S-type	
- Micro Sampling Knife H-Type	1 set
- Micro-Needle for Sample Manipulation	
- Tweezers for Micro Sampling	
Connection Plate between FTIR and IR Microscope	1 pc.
Connection tube (for light path) between FTIR and IR Microscope	1 pc.

# IRT-7000 FTIR Linear Array Imaging Microscope

With fast 16 element MCT detector and IQ Mapping - for the fastest sample imaging.

## FTIR Linear Array Imaging Microscope

The IRT-7000 is a very fast FTIR Linear Array Imaging Microscope that can be interfaced with a FT/IR-6000 Series spectrometer, offering the most advanced microscopy and imaging system. The 16 element MCT offers faster response with excellent signal to noise and wider wavelength range than a focal plane array detector. The data processing is done using fast on-board computing so that there is no delay in data being delivered to the imaging software. This make this linear array microscope very fast and accurate.

## System Description

The IRT-7000 includes up to two detectors as standard; a 16-channel linear array detector for infrared sample imaging and a single-point MCT detector. The combination of the standard automatic sample stage and IQ Mapping offers high-speed mapping analyses over a very large sample area, multi-area ATR mapping, and IR imaging with spatial resolution close to the diffraction limit with excellent sensitivity in a short time. In combination with the FT/IR-6000 with Rapid Scan or Step Scan options, this system offers advanced dynamic imaging as well as time-resolved measurements. For multivariate analysis, Principal Component Analysis (PCA) is included as standard.



*IRT-7000 FTIR Linear Array Imaging Microscope*

## System Features

- IQ Mapping for in-situ mapping experiments for high speed or samples that can be easily damaged when the ATR is moved
- Rapid IR Imaging experiments
- Up to four objectives with automatic switching
- Exceptional visual observation quality with DIC and polarization options
- Wide area mapping and multi-ATR imaging
- Dynamic Imaging with Rapid Scan and Step-Scan options
- Multivariate analysis PCA

## IRT-7100: Fully Automated FTIR Microscope

Automatic Sample Stage with Mid-Band MCT Detector

The IRT-7100 automated FTIR microscope includes a standard mid-band MCT detector, with an option to simultaneously install up to two detectors. It is easily field-upgradable to an IR imaging system by adding an optional linear array detector. The standard automatic sample stage provides wide area mapping and multi-ATR mapping together with IQ Mapping.

- Fully automated sample stage with auto focus (standard)
- IQ Mapping
- Up to four objectives
- Dual detector capability (optional second detector and optional user-swappable detectors)
- Field upgrade to IR Imaging System using a linear array detector

## IRT-7200 Linear Array FTIR Imaging Microscope

Automatic Sample Stage, Mid-Band MCT Detector and 16 element Linear Array MCT Detector

The IRT-7200 Linear Array FTIR Imaging microscope includes two detectors as standard, a 16-channel linear array detector and a single-point mid-band MCT detector. The combination of the standard automatic sample stage and IQ Mapping allows mapping analyses of a larger sample area, multi-area ATR mapping, and IR imaging of a specified area with extremely high spatial resolution and excellent sensitivity in a short time.

- Full IR Imaging function
- IQ Mapping
- Up to four objectives
- Wide area mapping and multi-ATR imaging
- Dynamic Imaging with FTIR step-scan option
- Multivariate analysis PCA as standard

## Spectra Manager Imaging Suite – Micro Analysis Measurement Program

Spectra Manager™ provides automatic functions and simplified operation to minimize manual operation. Measurement conditions, microscope sample monitoring/control and measurement results can be viewed on a single screen. The microscope control interface includes various types of measurements such as single and multi-point, mapping, and linear array measurements using a single mouse-click for mode selection. Real time monitoring of the spectrum and a calculated chemical image can be specified during the mapping measurement.

## Innovative ATR Mapping with Clear View and IQ Mapping

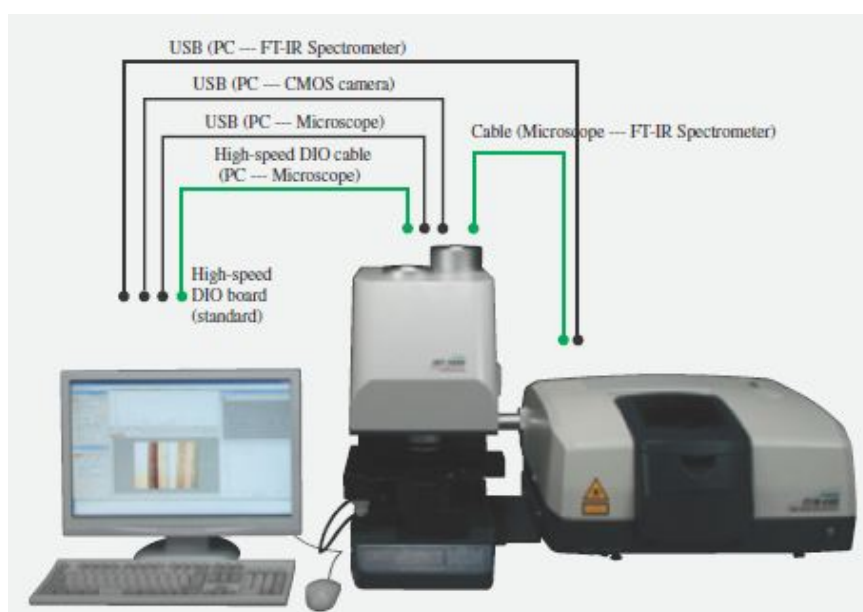
The Clear-View ATR objectives enable simultaneous sample viewing while preparing for ATR measurement and as the ATR crystal element contacts the sample. IQ Mapping can be used for automatic multi-point mapping, line mapping, grid mapping and IR Imaging analysis of a microscopic area even with a manual sample stage and a single element detector.

IQ Mapping coupled with a Clear-View ATR objective allows ATR mapping and ATR Imaging of any sample in contact with the ATR objective without moving the sample stage or ATR objective, while observing the entire area of the sample in contact with the crystal. This provides high-speed and cross-contaminant-free measurements of a small sampling area.

## Full-Vacuum System

For FTIR measurement, absorption peaks due to atmospheric water vapor and CO<sub>2</sub> can make it difficult to obtain high quality sample spectra. The most effective solution to this problem is the measurement of samples in the vacuum. As a factory option, a vacuum type FTIR microscope system can be provided.

## Standard Composition



Description	Quantity
IRT-7000 Microscope	
including	
- Objective cassegrain (16× and 32×)	
- Condenser cassegrain (16× and 32×)	
- Linear array MCT detector (1 × 16 element)	1 set
- Mid-band MCT detector (single element)	
- CMOS camera	
- XYZ auto-stage	
Spectra Manager™ Installation Disk	1 pc.
Instruction Manual	1 copy
Sample Plate	1 pc.
Micro-Sampling Kit	
consisting of	
- Micro Sampling Knife S-type	
- Micro Sampling Knife H-Type	1 set
- Micro-Needle for Sample Manipulation	
- Tweezers for Micro Sampling	
High-Speed DIO Board for PC and Cable	1 set
USB Cable	2 pcs.
Cable between FTIR and IR Microscope	1 pc.
Connection Plate between FTIR and IR Microscope	1 pc.
Connection Pipe (for light path) between FTIR and IR Microscope	1 pc.
Spare Fuses	2 pcs.
AC Cable	1 set
Funnel	1 pc.
Lid for MCT Dewar	2 pc.
Pipette	1 pc.

# SliceMaster Series

Precision Cutting from 10-200  $\mu\text{m}$

Originally developed for FTIR microscopy, SliceMaster is a line of compact precision cutting tools that can also be used for any variety of applications requiring extremely thin sample sections, such as packaging materials, films, laminates or pellets. The SliceMaster is an economical tool that can repeatably slice thin sections without damaging samples.

## Versatile

With four different models, sections can be made from many different materials at different angles to prepare samples for microscopy.

## Low Cost

As a replacement for more expensive microtomes, the SliceMaster can repeatably cut thin sections without damage to the sample.

## Simple and Safe Handling

The very sharp blade is retained behind a safety guard and adjustment is very easy with a micrometer adjustment for the section thickness and hand operated cutting action.



# DC-500 Diamond Compression Cell

The DC-500, diamond compression cell, compresses thick/uneven samples for measurement.

- Micro sample (approximately 20  $\mu\text{m}$ ) for measurement of solid samples
- Macro and Microscopic measurement with transparent chamber
- Requires only two screws to compress the sample
- Excellent corrosion resistance and a non-adhesive, can be easily cleaned with organic solvents such as acetone
- Hard surface with a high level of precision, so grinding and rolling are possible for easy sample observation

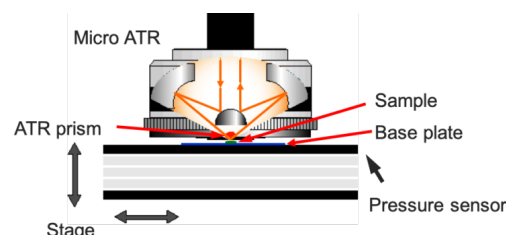


# IR Microscopy using ATR Objectives

## Why should I use an ATR objective for IR Microscopy?

For more than two decades the use of measurement accessories that use attenuated total reflectance (ATR) has significantly reduced the amount of sample preparation necessary for routine FTIR measurement. Before ATR was widely available samples could only be measured using transmission or reflection, which involves time consuming dilution, pellet making or diffuse reflectance measurement. Using ATR and with good crystal contact, virtually any sample (solid, powder liquid or film etc.) can be measured without pretreatment.

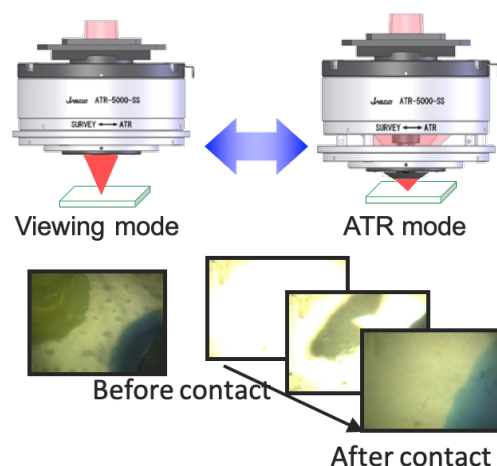
IR microscopy has similar problems with sample preparation as routine macro measurement, but these can also be remedied in the same way by using an ATR objective in place of a transmission or reflection cassegrain. However in microscopy the additional element of sample observation creates a second and important consideration – how to identify the correct measurement location? In transmission or reflection the upper cassegrain is typically used to observe the sample prior to measurement, until recently it has been impossible to ‘look through’ an ATR to observe the sample, this means a the upper cassegrain or a refractive objective has to be used for observation and then exchanged with the ATR for measurement; with spatial resolution to single microns, synchronization between the observed and measured images can be challenging.



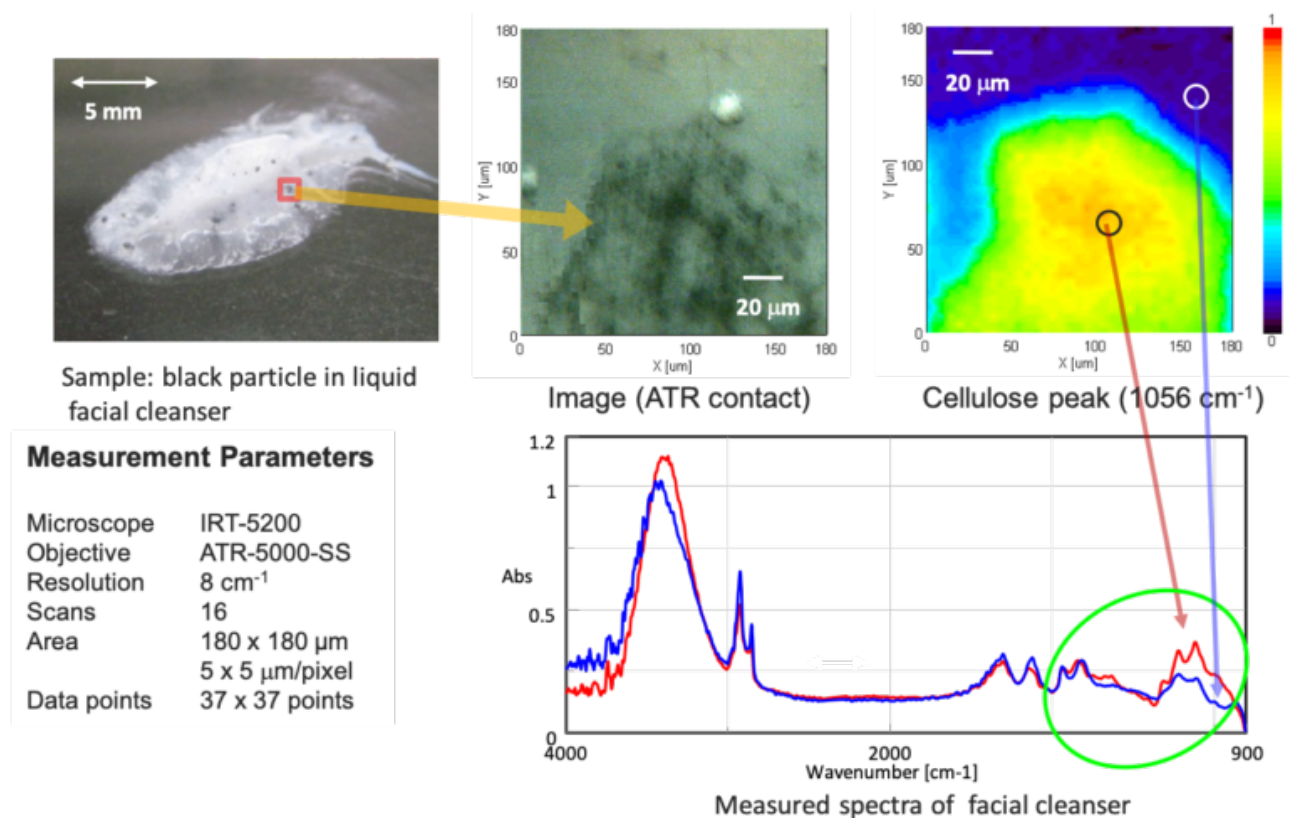
*Schematic of a microscope ATR Objective*

## ClearView ATR objectives

The unique ClearView ATR developed by JASCO has overcome this limitation and it is now possible to observe the sample directly through the ATR, which is then moved into direct contact for measurement at exactly the same position. This method guarantees the observed position is exactly matched with the measured position that generates the chemical map. The visual image can also be precisely overlaid with the chemical image to create a composite.



*Direct observation through a ClearView ATR*



Chemical image overlaid with the visual image using an ATR Objective

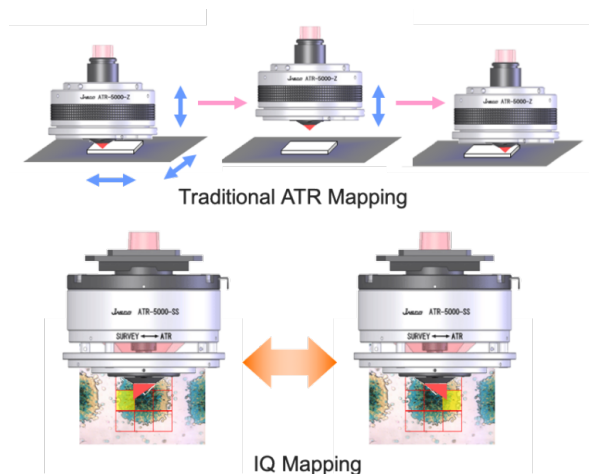
Several different crystal materials used for the prism in the ClearView ATR allowing analysis of different samples different spatial resolutions, penetration depth and wavenumber range.

Material	Refractive Index	Magnification	Wavenumber Range	Area
Diamond	2.4	x35.2	7,000 to 700 cm <sup>-1</sup>	180μm x 180μm
Zinc Sulfide (ZnS)	2.2	x35.2	7,000 to 700 cm <sup>-1</sup>	180μm x 180μm
Germanium (Ge) Standard G45	4	x64	5,000 to 650 cm <sup>-1</sup>	70μm x 70μm
Germanium (Ge) MG	4	x16	5,000 to 650 cm <sup>-1</sup>	400μm x 400μm
Germanium (Ge) WG	4	x4	5,000 to 650 cm <sup>-1</sup>	1,600μm x 1,600μm

## IQ Mapping

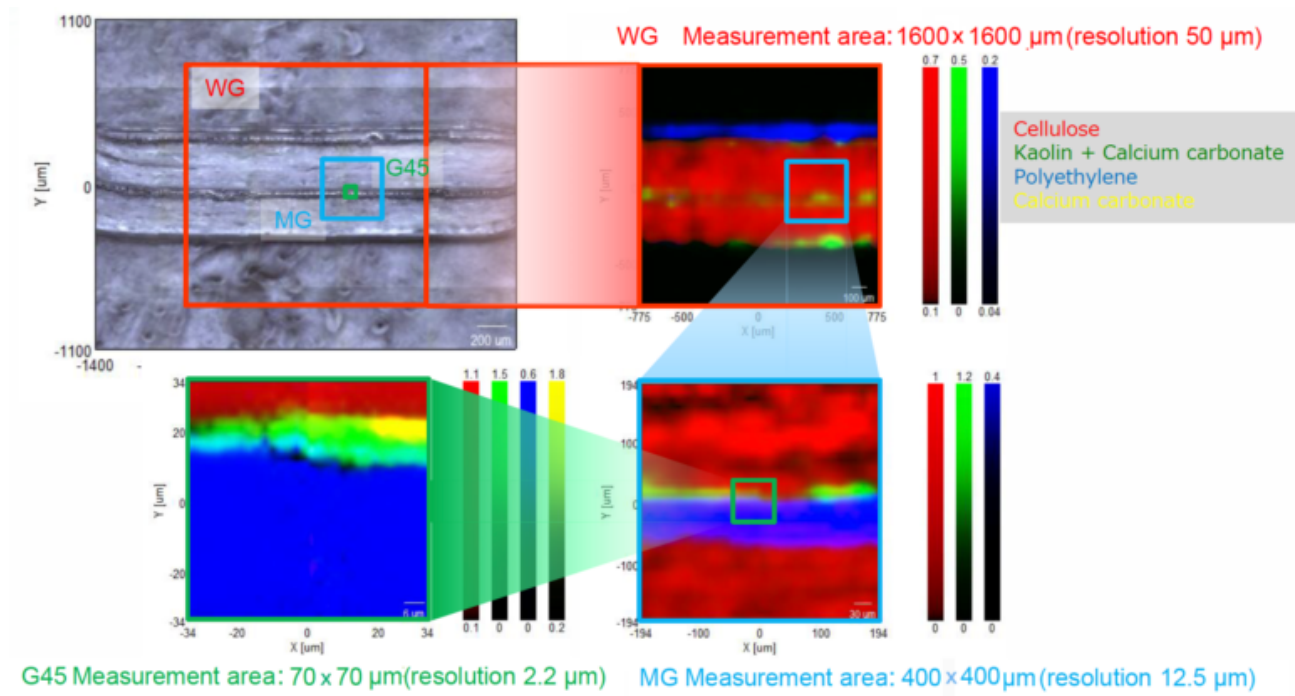
Another disadvantages of ATR measurement is the requirement for intimate sample contact; relatively strong contact is required for the evanescent field propagated from the crystal to interact with the molecules at the sample surface. If the sample is easily deformed or likely to move, mapping can be difficult. In transmission or reflection measurement the sample is not in direct contact with the objective, so that the stage can easily be moved to map an area, but with ATR, the objective has to be moved away from the sample to change measurement positions, this can cause a change in the shape of the material.

JASCO developed IQ Mapping to move the measurement aperture around the field of view of the ATR objective.



Instead of moving the stage IQ Mapping can be used with an ATR objective the measurement position is changed by moving the aperture around the crystal while still in contact with the sample (as shown with the red grid and yellow square in the above figure).

Typically this gives a typical measurement area of  $180\mu\text{m} \times 180\mu\text{m}$ , with the WG version of the ATR, the measurement area can be up to  $1600\mu\text{m} \times 1600\mu\text{m}$ , and with the knife-edge aperture being adjustable to define the size and shape of the measurement point.



*Cross section analysis of paper pack using an ATR*

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