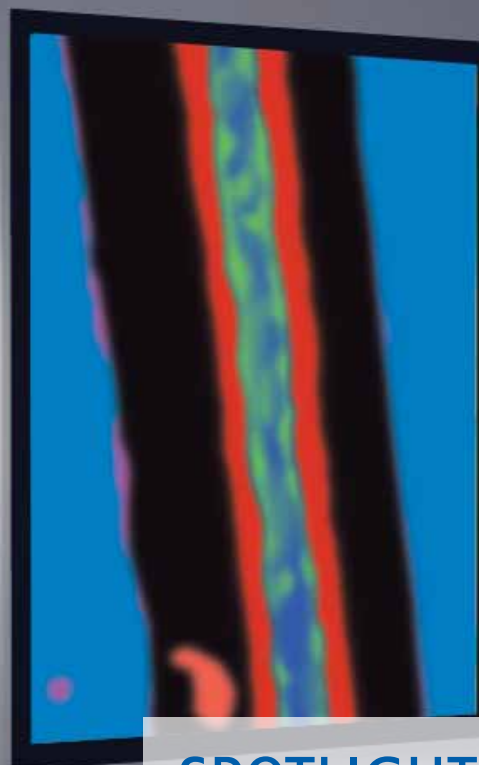
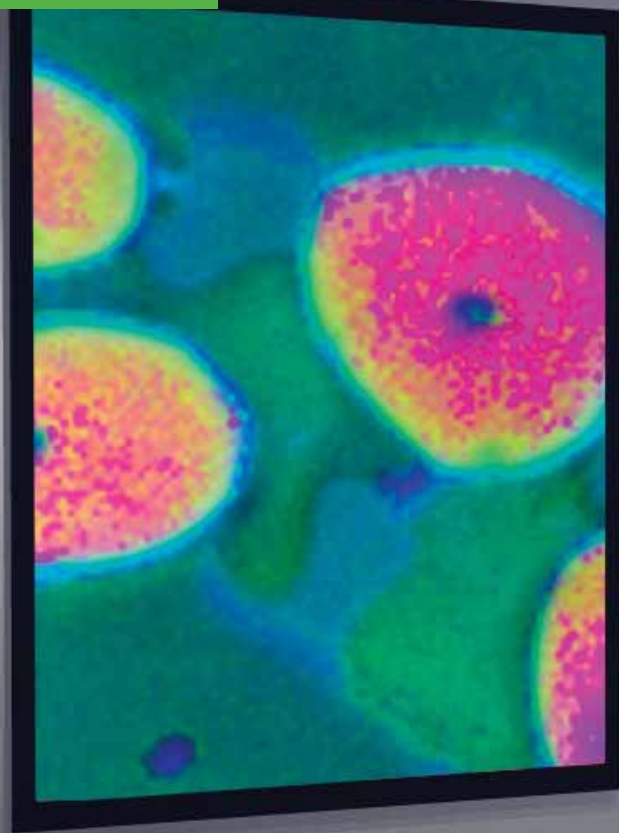


HUMAN HEALTH

ENVIRONMENTAL HEALTH



# SPOTLIGHT 400 FT-IR AND 400N FT-NIR IMAGING SYSTEMS



More Detail. Faster. Easier.  
The results will inspire you.

  
**PerkinElmer**<sup>®</sup>  
*For the Better*



Spotlight 400 with UATR macro-sampling

### Unsurpassed performance

- Widest spectral range
- Pixel size 50  $\mu$  to 1.56  $\mu$
- The highest spatial resolution achievable with FT-IR imaging
- Superior data quality
- Unmatched flexibility
- Image sizes that match your sample sizes

### A clearer, faster picture with infrared imaging

Both FT-IR and FT-NIR take advantage of the fact that the functional groups of every molecule generate a characteristic absorption or transmission spectral fingerprint that definitively identifies that chemical compound. FT-IR and FT-NIR are quickly becoming the preferred compound testing technologies because of their speed, accuracy and reliability. While infrared microscopy provides the highest sensitivity and widest spectral range for small area FT-IR measurements, collecting a microscopic chemical picture of your sample can be time consuming, depending on the data collection and sample size requirements. Unlike IR microscopes that employ a single detector measuring a single point at a time, FT-IR imaging systems contain multi-element detectors, producing IR images almost as fast as an optical microscope presents a visible image.

## SPOTLIGHT 400 FT-IR AND 400N FT-NIR IMAGING SYSTEMS

It's not every day that a masterpiece is created. But how else does one describe a laboratory instrument that will dramatically improve the understanding of materials across an unprecedented range of industries. With the Spotlight™ 400, IR imaging is faster, more efficient and more flexible than before. It is quite simply the most productive laboratory FT-IR imaging system in the world.

### A new era in imaging performance and speed

The Spotlight 400 has the ability to collect 170 high-quality spectra per second, so you can now obtain higher quality images faster than ever before. This translates to superior insights in the research lab; improved diagnostic and troubleshooting results in analytical labs and, ultimately, a better understanding of products, materials and tissues.

The Spotlight's unprecedented performance and reliability reflect a number of patent-pending innovations, including the first Linear Detector Array for Infrared Imaging Microscopes. Enhanced by superior control electronics, these breakthroughs enable the fastest, high-quality spectral acquisition times available on the market.

### The flexibility of a great performer

The Spotlight 400 also breaks new ground in flexibility. In addition to pixel sizes of 6.25  $\mu$  and 25  $\mu$ , Spotlight now includes a 50  $\mu$  pixel for faster survey imaging. This flexibility is particularly valuable in applications where the highest spatial resolution offered by imaging is not required.

A survey can now be completed up to four times faster than before, providing an ideal first-pass screening tool for all problem analysis or routine quality assurance.

No matter what your sample type the Spotlight 400 can deliver. Application capabilities are further enhanced by the Attenuated Total Reflectance (ATR) Imaging Accessory that, in addition to enabling sampling for difficult or non-reflective samples, takes spatial resolution beyond the physical limitation of traditional IR imaging by providing an effective pixel size of 1.56  $\mu$ .

Additionally, the Spotlight 400 now gives you the ability to image multiple areas in a single, amazingly resourceful operation. The system's unattended mode frees resources and permits overnight experiments, further increasing productivity in the demanding lab environment. An optional large imaging stage increases the available sampling area, allowing a large number of samples or extremely large areas to be run in a single operation, maximizing efficiencies and providing more information on your samples.

### What is the difference between FT-IR and FT-NIR?

**FT-IR spectra** provide very strong, very sensitive detections.

**FT-NIR spectra** are not as strong as FT-IR spectra, which typically eliminates the need for sample preparation, increases speed and offers non-destructive testing of samples.

### Both FT-IR and FT-NIR technologies...

- Are information rich – revealing the identity of a broad range of chemical components in materials, as well as displaying areas of homogeneity and difference
- Are preferred material-testing techniques because of their speed, ease-of-use and reliability
- Facilitate research, accelerating a higher-level understanding of materials
- Enable faster new product introductions, rapid troubleshooting, quality improvements and, ultimately, cost reductions

*Call a PerkinElmer Spotlight FT-IR and FT-NIR specialist today to find out which of these infrared imaging solutions matches your specific application needs.*



### ATR Imaging Confidence

Infra-red light from the imaging system's objective is directed into an optimized germanium crystal in such a way that it strikes a flat sampling surface at an oblique angle. The beam is reflected by total internal reflection back to the detector with very high efficiency. This total internal reflectance creates an evanescent wave a few microns immediately below the sampling face; a sample placed here absorbs energy according to its composition, thus giving an IR spectra. ATR images are compiled by scanning the crystal and sample with extremely high precision and accuracy under the imaging system – the refractive index of germanium allowing approximately four times higher spatial resolution to be achieved. It is this unique combination of ATR imaging and scanning that provides the Spotlight 400 system with large imaging areas and maximum image size flexibility.

## WITH BEST-IN-CLASS TECHNOLOGY THE SPOTLIGHT 400 IS IN A CLASS OF ITS OWN

PerkinElmer was the first instrument company to offer large area microscopic ATR imaging coupled with a Linear Array Detector. The unique combination of these technologies provides a maximum ATR image area, increasing the range of applications that can benefit from the higher spatial resolution and sampling benefits provided by ATR.

### A new standard for ATR imaging

Up until now, the ATR method of sampling was not always appropriate for FT-IR imaging due to performance and image area limitations. Advances by PerkinElmer in ATR imaging have solved these previous limitations and have opened up a new world of applications.

PerkinElmer's ATR Imaging Accessory uses a germanium crystal that captures infrared spectral images with up to four times higher spatial resolution than conventional reflectance or transmission imaging. Our patent-pending design approach to the ATR crystal optics provides the maximum ATR sampling area possible while maintaining the integrity and quality of the spectral information obtained. The ATR Imaging Accessory can measure sample diameters up to 500 microns and optionally to 1200 microns, providing up to ca100 - 400 times larger images than can be achieved by other instrument manufacturers.

### The Spotlight 400 ATR Imaging Accessory offers a wide palette of sampling advantages...

- Superior accuracy: PerkinElmer's optimized germanium crystal provides the highest spatial resolution without compromising data quality
- Imaging of difficult samples: Easy access to samples that are difficult to image in other reflectance or transmission methods, or that have confusing depth structure
- Increased range of applications: Provides an effective pixel size of 1.56  $\mu$ , allowing smaller features and components to be measured
- Largest ATR imaging sampling area: 500  $\mu$  ATR tip with optional 1200  $\mu$  version enables large sampling areas without repositioning and "stitching" individual images together. This allows more information to be obtained from your materials, quickly and easily

## THE SPOTLIGHT 400 LINEAR ARRAY DETECTOR THE BEAUTY IS IN THE DETAIL

The heart of the Spotlight 400 is its unique Linear Array Detector that provides the highest quality information – faster than any other IR spectroscopy imaging system.

The performance, reliability and sample-handling capabilities offered by Linear Array Detector technology surpass those of alternative Focal Plane Array (FPA) Detectors providing much higher sensitivity and spectral range for any given sample area and analysis time. PerkinElmer pioneered Linear Array Detector technology in 2001 for FT-IR use and continues to stay in a leadership position with the Spotlight 400 family.

The Spotlight 400 Linear Array Detector incorporates high quality, intrinsically pure mercury cadmium telluride (MCT) arranged as 16 individual, gold-wired infrared detector elements. The sample is swept over the detector in a precise linear pattern, using patented stage movement and interferometer synchronization to maximize data collection speed, delivering images with the added assurance of capturing data from all 16 elements and with a 100% fill factor. The uncompromised design of the Spotlight results in data quality so exceptional that often a single scan is all that is required to obtain high-quality spectra in addition to providing the widest spectral range, high sampling flexibility and reduced sampling times... more than any other instrument can offer.

In contrast, traditional FPA Detectors require longer sampling cycles to deliver comparable data quality and measure over an abbreviated spectral range. The Spotlight 400 detector provides the capability to measure down to 720  $\text{cm}^{-1}$  and beyond, allowing the detection of material characteristics that would be impossible on many competitive FT-IR imaging systems.



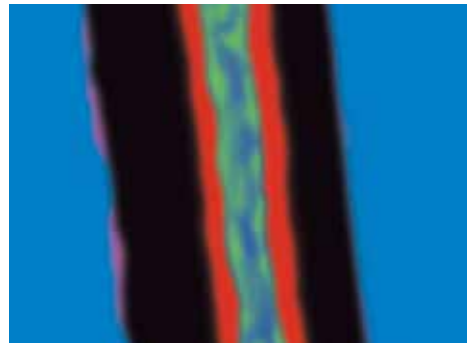
### The Spotlight 400 Technology...

Exclusive patent-pending PerkinElmer technology will provide your laboratory with the fastest available spectral acquisition times, superior accuracy and increased reliability.

|  | EU                      | US                     |
|--|-------------------------|------------------------|
| Small Detector Array for Infrared Imaging Microscope | EP2000307372 (pending)  | US2002033452 (pending) |
| Scanning IR Microscope                               | GB20010020170 (pending) | US2004222378 (pending) |
| Cross-Talk Linearity Correction                      | EP20010307002 (pending) | US2004217893 (pending) |

# NON-STOP PERFORMANCE ACROSS MANY APPLICATIONS

The Spotlight 400 FT-IR and 400N FT-NIR Imaging Systems reliably meet the challenges of many applications.



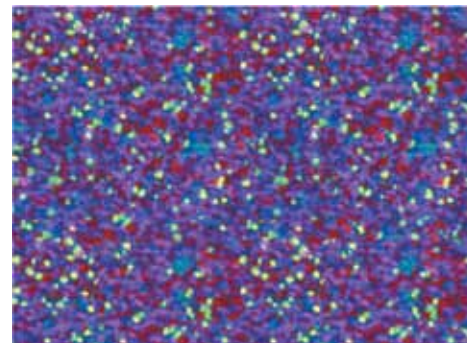
ATR image of a polymer laminate



## MATERIALS

See what you have been missing. Materials research, development and analytical services laboratories use this technology to visualize the chemical composition of a diverse range of end products. This greater understanding accelerates product development and quality trouble-shooting, providing information to aid process improvements, reducing costs and increasing competitiveness in a wide range of end industries, including consumer goods, semiconductors, food, packaging, transportation and high technologies.

- Characterize material formulations with a potential spatial resolution of 3  $\mu$
- Optimize product formulation for increased performance or product lifetime
- Identify product contaminants
- Assist product failure analysis
- Investigate new materials and manufacturing processes



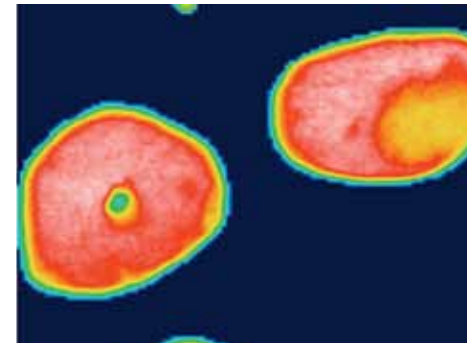
Distribution of ingredients in an over-the-counter pharmaceutical tablet



## PHARMACEUTICAL

IR imaging analyses have been recommended by the FDA for the pharmaceutical industry. Adoption of these methods offers the industry the opportunity to lower manufacturing cycle times and end-product variability, which can result in a shorter time-to-market and a reduced likelihood of product failures. The Spotlight 400 Series was designed to be versatile in handling pharmaceutical needs.

- Study of active and excipient distribution in powder blends and solid dose forms to understand their impact on key quality criteria, e.g., dissolution
- Study of tablet coatings and coating methods
- Enables characterization and increased understanding of novel drug delivery systems, such as time-released implants and trans-dermal patches
- Detection of counterfeit by comparison of component distributions in solid forms



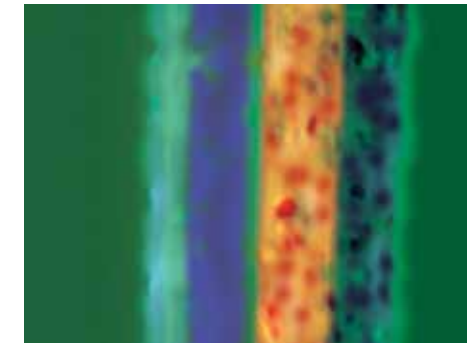
ATR image of a hair follicle demonstrating 3  $\mu$  spatial resolution achievable with the Spotlight 400



## ACADEMIA

The enhanced imaging capability provided by the Spotlight 400 significantly reduces the time it takes to view a complete chemical picture of your sample. In some cases, a full day of work is reduced to a mere half an hour. The speed of moving through your research, combined with the new ability to see information you have never seen before, makes this instrument a clear choice for world-class researchers.

- Accelerates the pace of research
- Rapid data collection shortens publication preparation time
- Provides an efficient means for gathering data support for papers, publications and peer review
- Opens up a wide range of new research opportunities



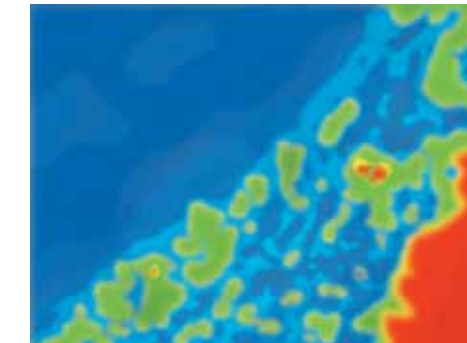
IR image of paint chip showing individual paint layers and distribution of paint fillers



## FORENSICS

The intrinsic chemical specificity and enhanced visualization of FT-IR spectroscopic imaging found in the Spotlight 400 open a window of opportunities for counter-terrorism and crime-fighting, with applications ranging from analysis of paint chips, drugs, fibers and explosives, to fiber-plastic fusion studies and imaging of tablets, packaging and documents.

- Trace evidence
- Road traffic accidents
- Art and document forgery
- Substances of abuse
- Terrorism investigations
- Counterfeit tablets



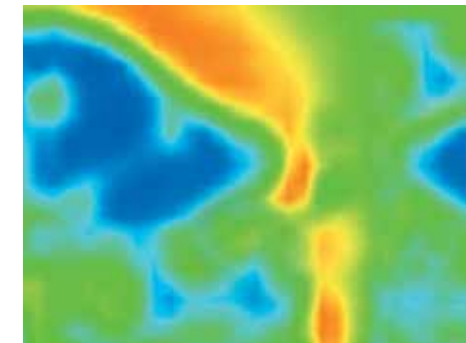
IR image of lipid/amide ratios in section of rabbit artery



## BIOMEDICAL

The PerkinElmer Spotlight 400 significantly helps with diagnostic tool development and functional understanding on a wide range of biological tissues. This high-performance, research-grade instrument and its powerful software are used to examine processes and chemical changes in a wide range of diseases including, among others, osteoporosis, cancer and tumor growth, Alzheimer's and other protein-folding diseases.

- Now see chemical changes in tissues previously unknown to pathologists
- Test hypotheses of disease pathways
- Research new approaches to disease detection
- Provides state-of-the-art research platform opening up a wide range of biomedical research and publication opportunities



IR image of solid phase drug delivery system showing distribution of ingredients



## BIOMATERIALS

The new emerging field of biomaterials can benefit from the PerkinElmer Spotlight 400, which can be utilized to examine not only the composition of novel biomaterials but also the biomaterial-host interface. Researchers are using FT-IR imaging and FT-IR ATR imaging techniques for the study of biomaterial surfaces and events that occur at them.

- Study novel composite materials to facilitate performance optimization
- Better understand interactions at biomaterial-tissue interfaces, e.g., dental implants, adhesives and prosthetics
- Investigate how a material's composition influences the performance of slow-release drug implants or novel drug delivery systems

"The advantage of chemical imaging compared to other sensor technologies is the ability to analyze the spatial distribution of the component materials in blends, granules, or finished dosage forms. This approach has the potential to monitor processes to reveal the extent of ingredient blending, particle-size distributions, agglomeration of component particles, and the presence of polymorphs, hydrates, and other trace contaminants."

– Jeannette Lyon, of the FDA, on the use of chemical imaging for the pharmaceutical industry



# COMPLETE THE PICTURE



## CHOOSE FROM A RANGE OF ACCESSORIES THAT GET YOU THE MOST UP-CLOSE LOOK AT YOUR SAMPLE

The Spotlight ATR Imaging Accessory's novel, patent-pending design is optimized using a specially selected germanium crystal and its uniquely engineered mechanical arm lever, which together provide both high spatial resolution and high-quality sample illumination. These and other design achievements within the ATR FT-IR Imaging Accessory result in maximum sample areas and an ability to provide quicker ATR imaging answers for your lab or research center.

Now ATR imaging can be performed with ease...

- Software wizard guides users through ATR operation, minimizing mistakes and ensuring the highest quality data
- System automation speeds focusing and alignment procedures, saving user time
- Large ATR image areas reveal the most information from samples without time-consuming sample repositioning
- High-quality optical and mechanical assemblies deliver the highest quality data and spatial resolution of 3  $\mu$

### FT-IR ATR Imaging Accessory

- Accommodates large samples with a measurement area of 400 x 400  $\mu$ , (optionally 1200 x 1200 $\mu$ ) eliminating the need to patch together several smaller images
- Acquires spatial resolutions of 3.1  $\mu$  that are diffraction-limited over most of the spectral range
- Achieves optimum oversampling by utilizing a pixel spacing of 1.56  $\mu$
- Provides both high spatial resolution and high-quality sample illumination through a novel design optimization technique

### Micro-ATR Objective

- Provides micro-ATR measurement of larger spatially resolved areas (100  $\mu$  contact area)
- Can be combined with stage movement to allow ATR images of areas of up to 160 x 60 mm to be collected
- Spring-loaded crystal tip ensures high contact pressure at the sample while, at the same time, safeguarding the crystal tip
- Permanent alignment provides ease-of-use, speeding operation as well as ensuring reproducible and accurate measurements

### Spectrum Universal ATR Accessory

- Allows macro-ATR analysis of a wide range of samples, from liquids to solids
- Assures perfect measurement-to-measurement reproducibility with a permanently aligned, kinematically mounted sampling
- Ensures confidence in your results: smart plug-and-go accessory recognition and integrated diagnostics warn of common sampling or analysis errors
- Automatically recognizes top plate crystal material, number of reflections, and serial number

## PERKINELMER FRONTIER FT-IR, NIR AND FIR SYSTEMS

### DEFINING THE STANDARDS FOR FT-IR TECHNOLOGY

PerkinElmer is an experienced and knowledgeable supplier of IR and NIR solutions for laboratories worldwide.

In order to meet the requirements of today's demanding lab environments, PerkinElmer Frontier FT-IR, NIR and FIR systems are designed and manufactured to the highest quality standards to ensure quick and consistently superior results.

Available for both the mid-infrared range, the near infrared range, or both ranges the Frontier system is engineered by the experienced and knowledgeable FT-IR experts at PerkinElmer.

RELIABILITY – With high-quality engineering, driven by customer requirements, the Frontier system provides your lab with unmatched longevity and high dependability

QUALITY OF RESULTS – Superior design, developed through a thorough knowledge of FT-IR and FT-NIR instrumentation, delivers the highest sensitivity and stability in its class, providing accurate data every time

INCREASED PRODUCTIVITY – Exclusive sampling features and intelligent software offer quick, predictable and reproducible results



### Imaging Tablet and Powder Accessories

- Allow automated imaging of multiple tablets or powders, reducing operator interaction and maximizing efficiency
- Flexible pin-in-place tablet holders allow measurement of a wide range of tablet sizes and shapes
- Drop-on design allows fast switch between accessories

### Spectrum NIR Tablet Autosampler

- Allows rapid, non-destructive characterization of whole tablets, delivering vital information on active and excipient concentrations
- Automates the measurement of powders or tablets using a 30-position autosampler, increasing system productivity
- Provides the highest reproducibility with the patented custom tablet mold system

### Dewar

- Large volume nitrogen dewar auto-feeds detector coolant, minimizing system downtime
- 1 liter capacity increases detector cool time to a minimum of 24 hours, allowing longer periods between refills
- Allows the Spotlight to work unattended overnight, maximizing laboratory efficiency and the productivity of the Spotlight 400

### Large Stage

- Provides a 160 x 60 mm sampling area for the measurement of very large areas or the maximum number of multiple images
- 0.1  $\mu$  stage precision for confidence in data and the highest spatial resolution
- Tablet and powder accessories available in large stage sizes to further increase unattended operation times

### Environmental Enclosure

- Isolates the sample from changes in the external laboratory
- Purge capabilities allow spectral absorbencies due to atmospheric H<sub>2</sub>O and CO<sub>2</sub> to be minimized

# EXHIBIT NEW EFFICIENCIES USING SPOTLIGHT 400 SOFTWARE

Spotlight 400 software is specifically written for spectroscopists who want the most advanced efficiencies written into their imaging systems. This software is much more than a general purpose imaging software system – it is a suite of tools that enables you to see the most relevant areas of your samples so you get the information you need with the least amount of time and effort. With a single push of a button, your data analyses can now be completed up to ten times faster than before.

## Rapid data collection

Added to the Spotlight 400 software are many enhancements to data collection productivity. The 50  $\mu$  option is a rapid way to collect survey images and quickly preview a large sample area – allowing you to determine what part of the image you eventually need to see in a higher resolution form. Using the “Scan Images at all Markers” mode, you don’t waste time imaging non-interest areas. The Spotlight 400 now collects spectra at up to 170 spectra per second. This, combined with its patented design technology, ensures that no matter what image is desired the Spotlight 400 collects the fastest, highest quality images possible.

## Enhanced data analysis

After getting an FT-IR image much faster, the “Show Structure” feature can be used to quickly and easily enhance the contrast of your image. By automatically analyzing all infrared spectra in the image and applying PerkinElmer’s image analysis know-how, the true chemical variations within your sample are rapidly displayed. Previously, to achieve this level of contrast could have taken one to two hours. With Spotlight 400 software this is accomplished in seconds.

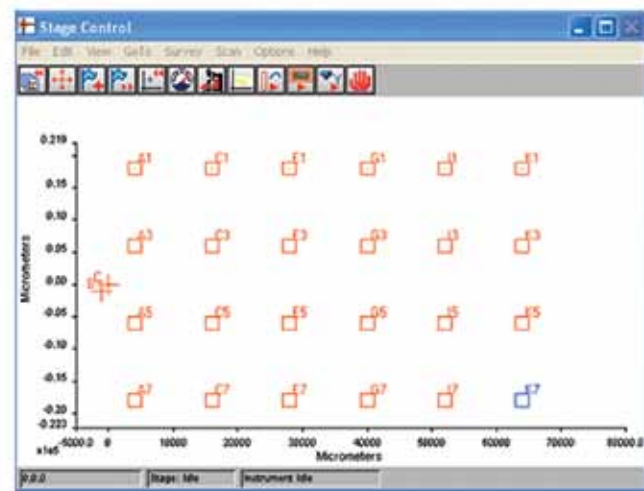
*Image markers from the Spotlight 400 Multiple Image templates form a grid which is user-definable, reducing set-up times for multiple sample experiments.*

## Sample automation – software to match the accessories

Now, multiple samples or sample areas can be set up easily and left to run unattended. The Spotlight 400 software has the ability to use multiple-sample image templates that efficiently capture and store multiple images from a single button press. A number of pre-defined templates are provided to allow quick operation with the tablet and powder accessories. In addition, users can define, store and recall custom multiple sample templates allowing for custom holders to be utilized rapidly.

## Feature highlights of the Spotlight 400 software

- Flexible image sizes – simply draw the area of interest on the visible image and go
- Multiple Area Image mode – dramatically reduces data collection time. Two modes:
  - > Scan Images at all Markers
    - Set up shape, size, label and focus position at each marker point with auto focus available
    - Scan and save all marker images in a single operation
  - > Multiple Image templates
    - For use with Imaging Tablet and Powder Accessories
    - Image markers form a grid which is user-definable
    - Standard grid sizes available
    - 24 x 11 mm, 12 x 15 mm, 6 x 22 mm
- Ability to quickly extract interesting areas from the larger complex image as quickly as possible
- Full set of hardware control functions
- Very easy manipulation of visible and infrared images
- Automation of all image controls



*“The detector is the heart of the entire system and what makes it work so well. For our customers, the principal way this technology is superior is that they will have better information faster.”*

**Dr. Robert Hoult, DPhil**

33 years with PerkinElmer  
Systems Technology Director  
Systems Engineer for the Spotlight 400

## THE PERKINELMER DRAWING BOARD

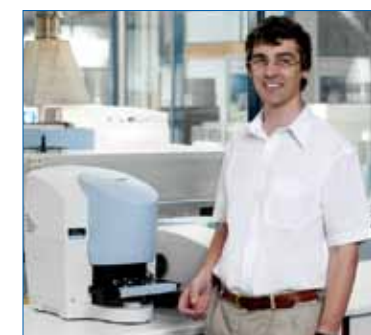
## THE HIGHEST CALIBER OF TALENT COLLABORATE TO BRING YOU THE BEST PERFORMING INSTRUMENT IN IMAGING

With a PerkinElmer Spotlight 400 purchase, you don’t buy just an instrument – you buy the company behind it.

PerkinElmer’s commitment to developing the highest quality instrumentation for their customers is evident through its people. With an unprecedented number of combined years of experience in microscopy and imaging sciences – and a corporate philosophy that cultivates collaboration and encourages higher learning – PerkinElmer imaging engineers met the challenge head-on when asked to deliver a new imaging system that answers molecular composition questioning better.

With the Spotlight 400, these system engineers have provided the ability to see more detail than ever before, while allowing for higher levels of productivity in multiple ways.

By implementing innovative new imaging techniques, the Spotlight 400 addresses the molecular imaging needs of today, and brings you the highest performing imaging system available.



*“The major advantage is that the Spotlight 400 works a lot faster than the other systems. We can get images done in half the time. Coupled with that, we have a lot of extra automation built into the software on the system.”*

**Ralph Carter**

24 years with PerkinElmer  
Hardware Systems Development Manager



*“With the dewar system for the Spotlight 400, we can now run imaging for twice as long as before – allowing us to run samples 24/7.”*

**Terry Kinnane**

26 years with PerkinElmer  
CAD Manager



*“Built into this system is a brake feature that prevents the crystal from falling down on the sample and damaging it. The raising and the lowering mechanism here is quite good, and it’s what I am most proud of designing.”*

**David Thaw**

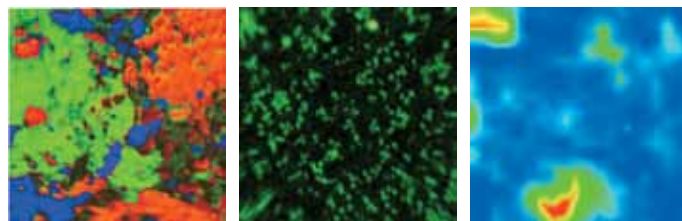
36 years with PerkinElmer  
Senior Hardware Engineer

# PERKINELMER: EXCEEDING EXPECTATIONS FOR OVER 65 YEARS

PerkinElmer manufactures and supports the broadest range of instruments, reagents, and consumables in the industry – giving us unparalleled knowledge and depth of expertise. With over 60 years of experience, PerkinElmer is a company you can count on to be there when you need us. We have the largest and most experienced service force in the industry. Our 1,200 factory trained and certified engineers have an average of 15 years of experience maintaining leading-edge scientific equipment including preventative maintenance, validation support and instrument repair, along with the training and technical support you have come to rely upon.

We provide the skills and capabilities to deliver solutions that enable laboratories like yours to be more productive and efficient. Our solutions are customized to meet your individual needs, and can address issues ranging from asset management to technical training of your personnel to equipment moves. We also provide solutions for multi-vendor environments, including preventative maintenance, validation, repair and compliance. Working with you, we'll make sure that your laboratory achieves its goals. That's precisely our business.

For a complete listing of our global offices, visit [www.perkinelmer.com/ContactUs](http://www.perkinelmer.com/ContactUs) or visit our website at [www.perkinelmer.com/spotlight400](http://www.perkinelmer.com/spotlight400)



## THE PERKINELMER SPOTLIGHT 400 FT-IR AND 400N FT-NIR ADVANTAGE – CONSIDER THESE BENEFITS

- High spatial resolution
- Broad range of sampling: more samples, larger sample size
- Fast, efficient data collection
- Automated mathematical data extraction routines
- Image analysis software
- Unattended operation
- Extensive applications flexibility

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For a complete listing of our global offices, visit [www.perkinelmer.com/ContactUs](http://www.perkinelmer.com/ContactUs)

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