Multi Modal Imaging

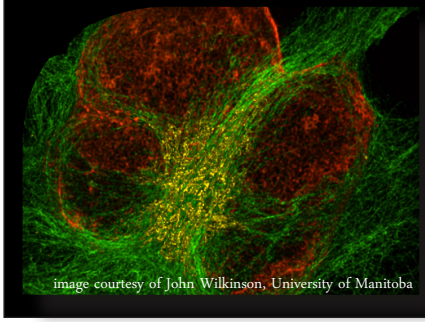
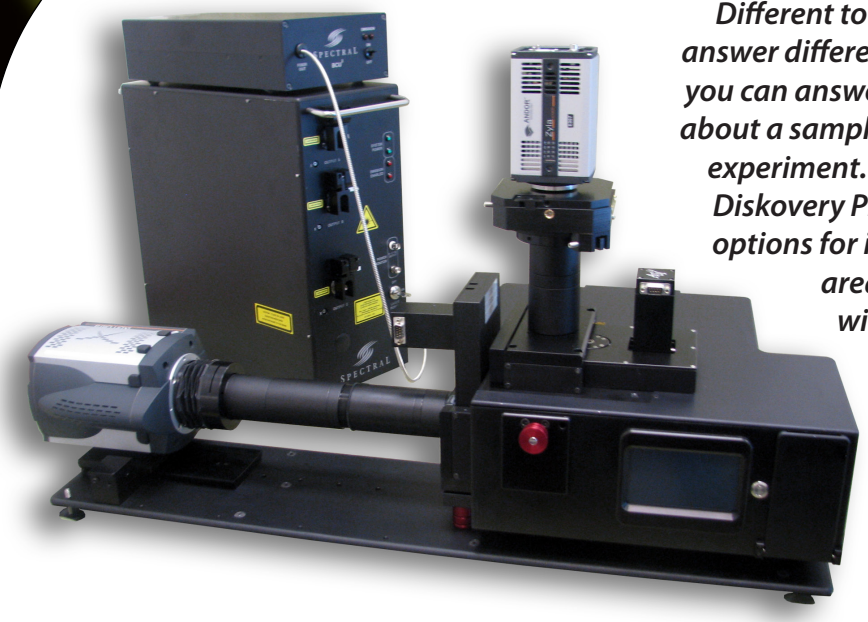


image courtesy of John Wilkinson, University of Manitoba

SPECTRAL

Diskovery Solutions

Flexibility



Different tools are required to answer different questions. Now you can answer more questions about a sample during the same experiment. The multi modal Diskovery Platform combines options for imaging the same areas in your samples with advanced TIRF, spinning disk, super resolution and widefield modalities.

Just imagine the possibilities.

Foundation

A stable, reliable and powerful light source is the backbone of all imaging systems. Spectral has been building laser engines for more than 8 years and installed more then 250 modules in the field.

Select from a broad range of Laser Light Engines to meet the needs of any application and budget.

3D opacity render of a simultaneous two camera acquisition using 491nm and 561nm laser excitations and imaged on two 512K BT EMCCD cameras split with a 565nm dichroic from mixed pollen grains plant slide, Carolina Biological

Spectral Diskovery Systems

Flexibility, Performance, Reliability, Longevity

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Diskovery Platform

New for 2013!

TIRF, Spinning Disk, Super Resolution Localization Microscopy Widefield, and MORE

Diskover

an Advanced Foundation for Diverse Imaging

- multiple imaging modes in one platform
- image the same sample plane with **multiple** techniques
- **NO** excitation dichroic required
- direct emmision pathway to single or multiple cameras
- use any combination of wavelengths **simultaneously**
- mounts to any microscope with a 100% video port
- integrates easily with new and older microscopes
- single and multiple camera support
- **diffraction**-limited optics with options for additional magnification
- cylindrical lenses for 3D imaging
- manual and motorized emission filter options
- guaranteed pixel-to-pixel registration between multiple cameras
- easily expandable and **upgradable**
- optimize for specific camera and objective combinations
- software support for multiple platforms and open source options

Multi Modal Imaging

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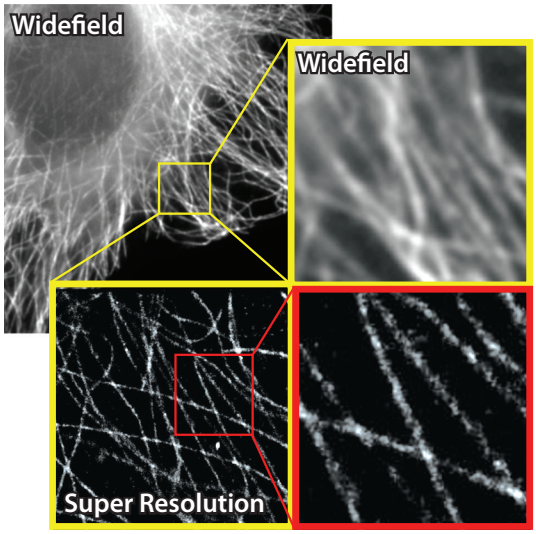
Borealis WF

Finally, a laser based excitation source optimized for your widefield digital imaging. Exactly match your excitation light to your camera's field of view at full frame or in smaller regions of interest using the Borealis WF technology. Power, uniformity, and control on any microscope with any camera.

Applications:

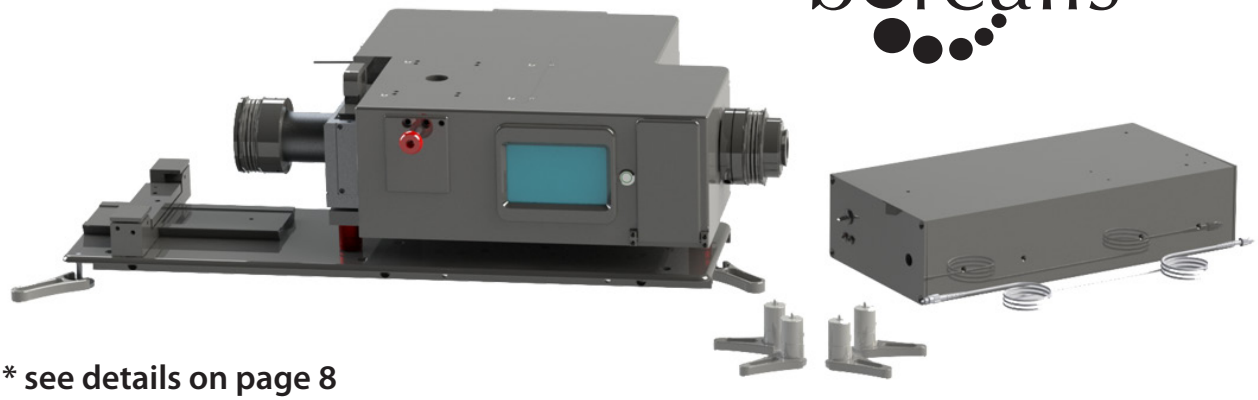
- super-resolution localization microscopy
- mixed TIRF and widefield imaging
- single molecule imaging
- single particle tracking
- deconvolution microscopy
- FRET microscopy
- quantitative FRAP
- spectral karyotyping
- image based correlation spectroscopy
- multi-wavelength photoactivation
- optigenetic applications



Tubulin-Alexa647 in 3T3 cells prepared by Dr. Nicholas Touret (University of Alberta)

Power > 10kW/cm²*

borealis²



* see details on page 8

Power and Uniformity

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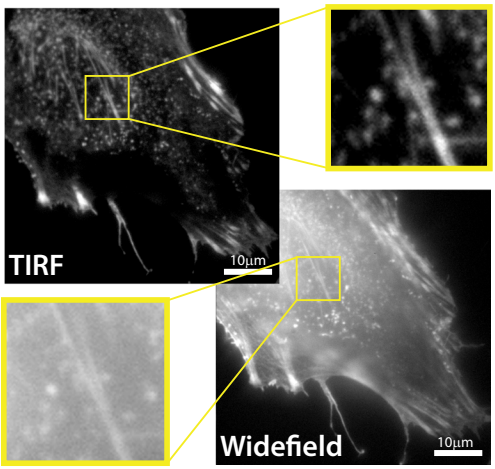
S-TIRF

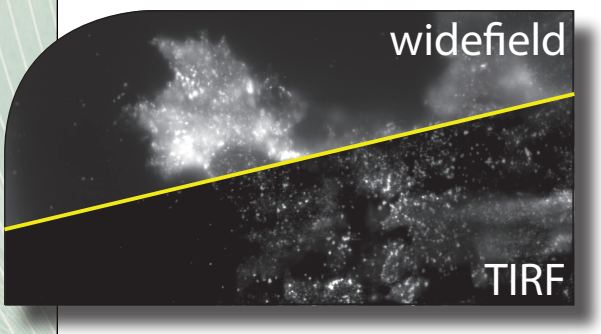
Diskover the dynamic world of activity 100 nm from your coverslip with Spectral's new, multi-channel total internal refection fluorescence (-TIRF). Designed to work with any research microscope.

Unique -TIRF Features

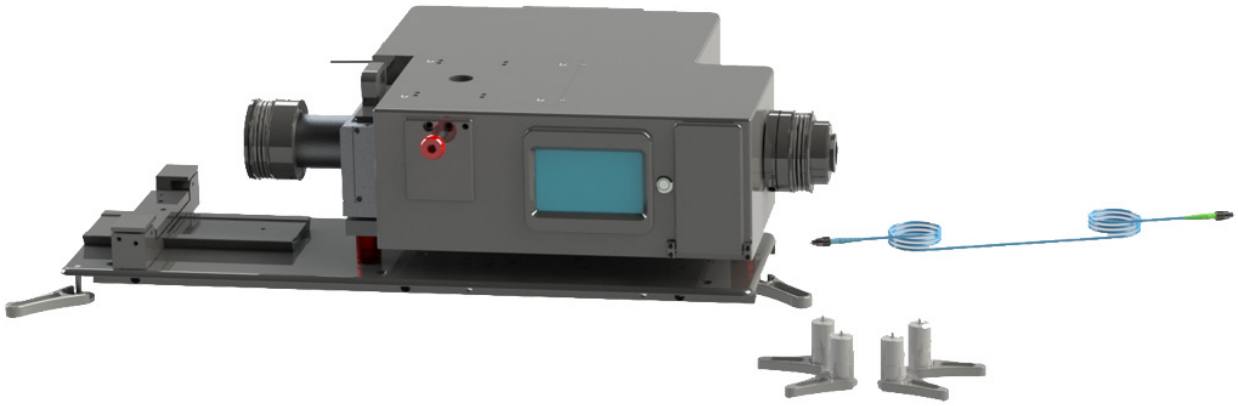
- ***no excitation*** dichroic required
- single fiber and one pathway for imaging ***multiple*** wavelengths without changing alignment
- one command places all wavelengths at the same TIRF penetration depth for ***simultaneous*** or sequential imaging
- control TIRF without moving the fiber
- precise alignment and control with superb **repeatability**
- fine and repeatable motorized control of penetration depth
- reflected laser excitation is captured to reduce stray light and reduce noise



Actin-RFP in HeLa cells prepared by Dr. Bebhinn Treanor (University of Toronto)
System Integration provided by Quourm Technologies Inc.



- supports polarized excitation and emission separation
- TIRF performance optimized from excitation to emission
- does not require specialized TIRF filter cubes
- system designed with all TIRF applications in mind
- works with a broad range of objectives (N.A. ≥ 1.4)



Multiple lines - no dichroic

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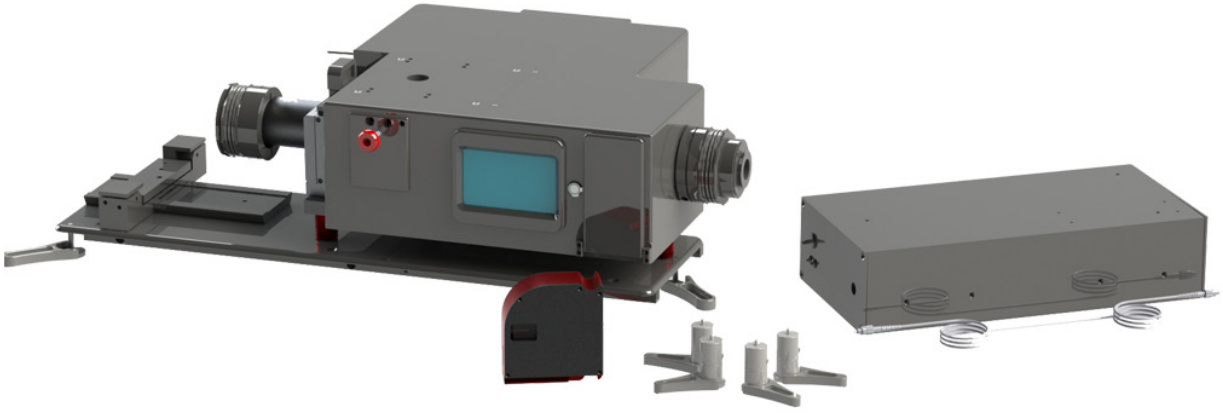
S-Disk

borealis^2

Why be limited by a fixed sized pinhole, camera resolution and a limited range of objectives? Spectral Systems and optics harness the most from a Confocal Spinning Disk and provide flexible solutions that allow you to achieve multiple configurations and optimal performance with just one investment.

- multiple pinhole sizes and patterns per disk
- easily removable and interchangable disk assemblies
- 4 different sized fields of illumination
- 4 different laser power densities for increased diversity
- motorized disk removal for widefield imaging
- all disk speeds 5000 rpm
- enhanced noise reduction
- Borealis quality illumination with <10% variation across image
- any laser combinations possible with no excitation dichroic
- no excitation dichroic means all pinholes are imaged at the same optical plane
- direct imaging path to single or multiple cameras



Multiple Pinholes - Multiple Disks

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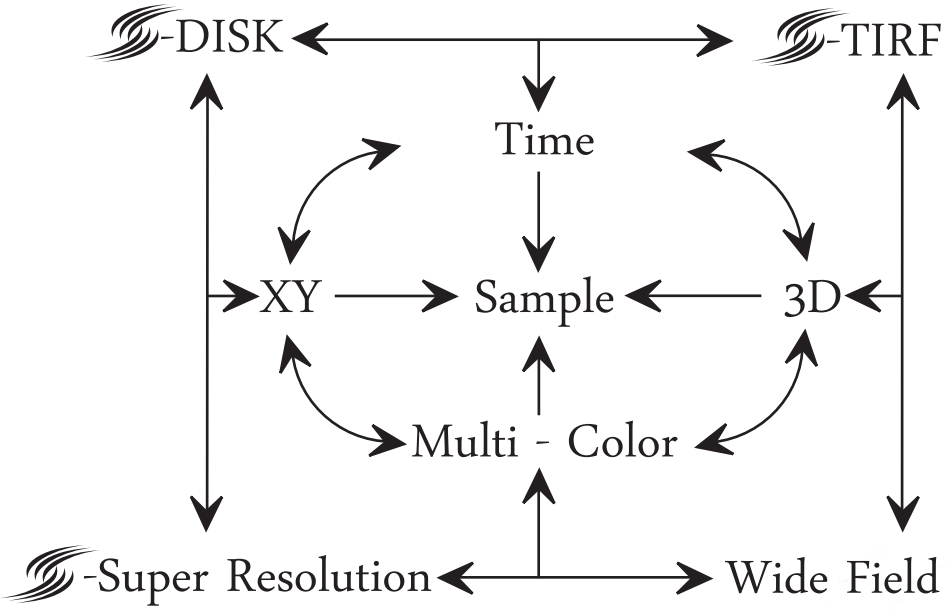
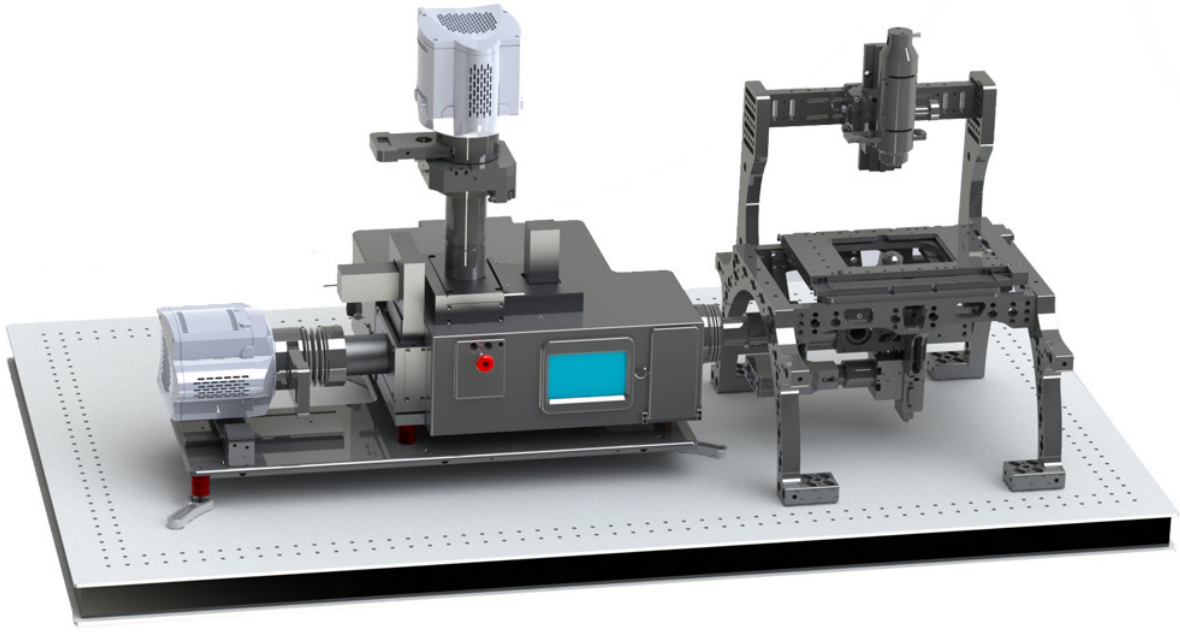
Diskovery Flex

Add a new dimension to your multi-dimensional imaging. Combine techniques that will better help you answer your research question.





A New Dimension

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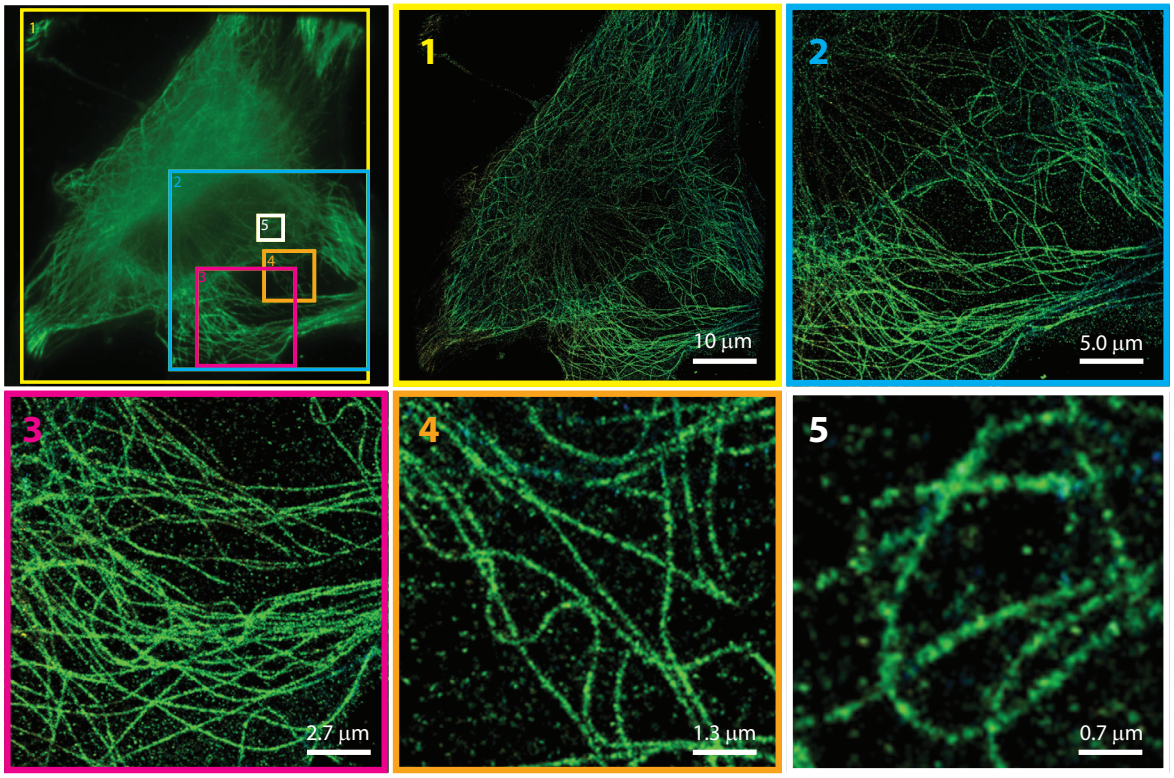
Power where you need it!

see how size can matter



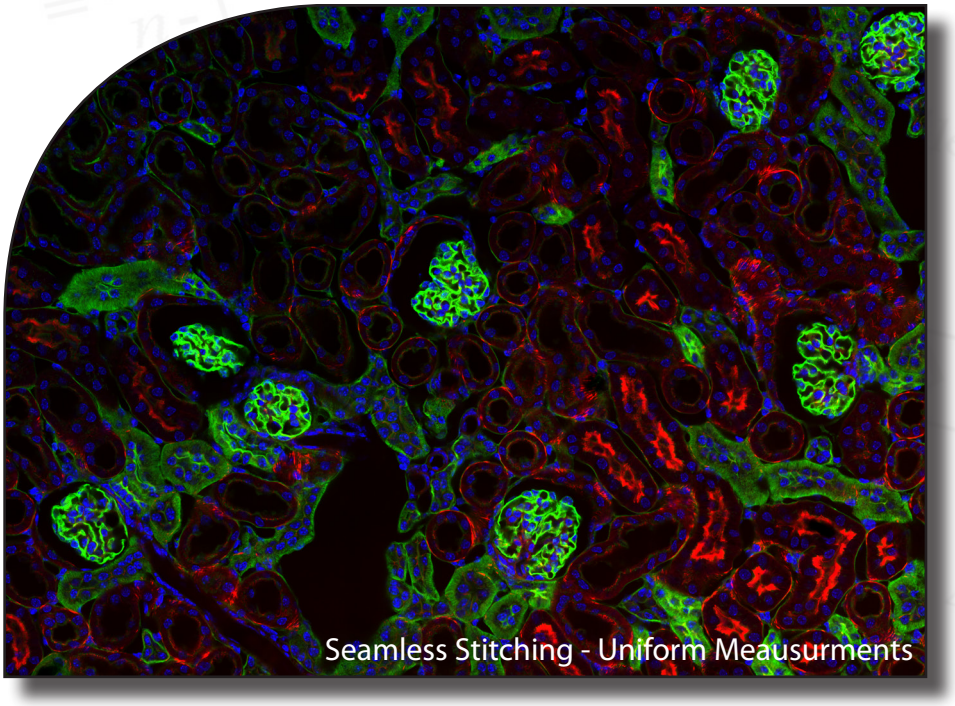
select a range of sizes that best suit your applications

Area of Illumination

Area of illumination on sample (µm) based on 60X 1.4na oil objective	1 137	2 68.3	3 34.2	4 17.0	5 8.54
Area of illumination on camera (mm)	8.20	4.10	2.05	1.02	0.51
Input laser power (mW) representing wavelengths from 380 - 800 nm: 10	0.05	0.21	0.86	3.46	13.7
25	0.13	0.54	2.14	8.65	34.2
50	0.27	1.07	4.28	17.3	68.5
100	0.54	2.14	8.57	34.6	137
200	1.07	4.28	17.1	69.2	274

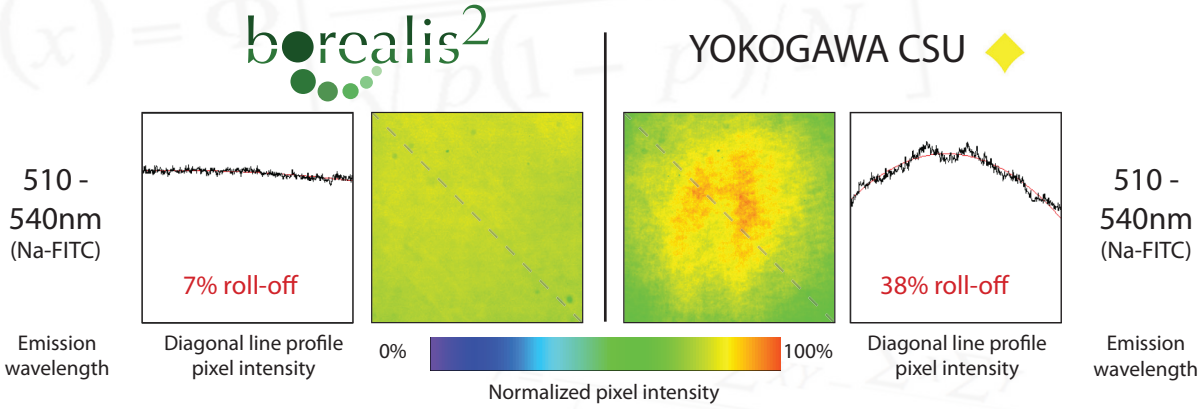
Approximate power at sample plane (kW/cm^2)

Uniformity to count by!



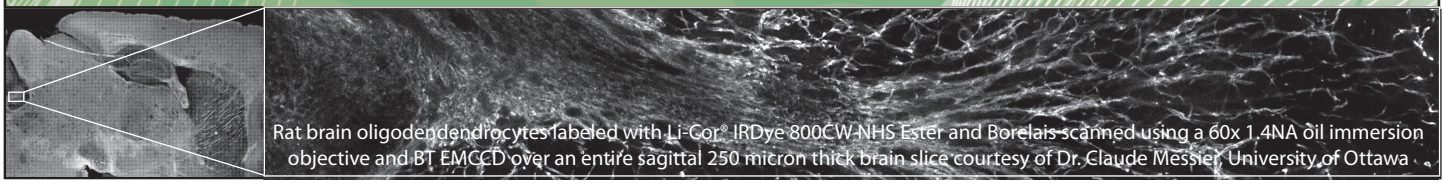
As a camera based imaging system the Nipkow series of confocals all require a wide field of illumination using high intensity lasers. Lasers, while wavelength specific and intense also create a distinctly Gaussian pattern of illumination which ultimately results in an uneven representation of your samples fluorescence emission on the camera. The Spectral Borealis systems not only illuminates your disk with minimal "roll-off" but also focuses the light only in the areas being imaged. This provides more power, less stray illumination and extremely uniform data for your analysis.

* FluoCells® prepare slide #3, mouse kidney section with Alexa Fluor® 488 WGA, Alexa Fluor® 568 phalloidin ,DAPI scanned using a 60x 1.4NA oil immersion objective on a Spectral Borealis system using a 512x512 BT EMCCD camera, MetaMorph Slide scan and butt stitching with no overlap. More than 9w x 7h fields.

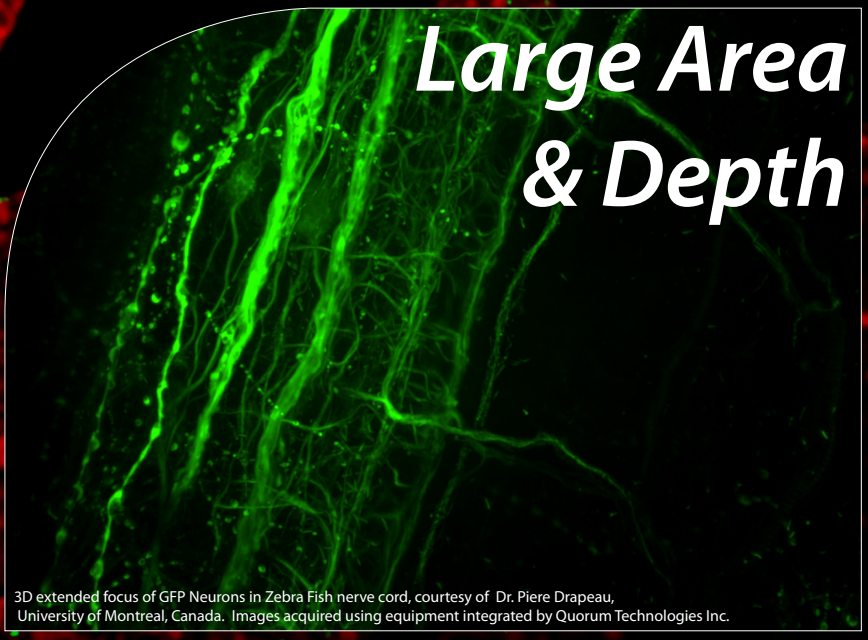


Illumination uniformity relates to the uniformity in the fluorescence emission as shown in these confocal images of concentrated dye solutions imaged using a back thinned EMCCD Camera.

For a detailed and complete technical review please visit Spectrals website @ www.spectral.ca/downloads where you will find a number of technical and performance reviews.



High Resolution

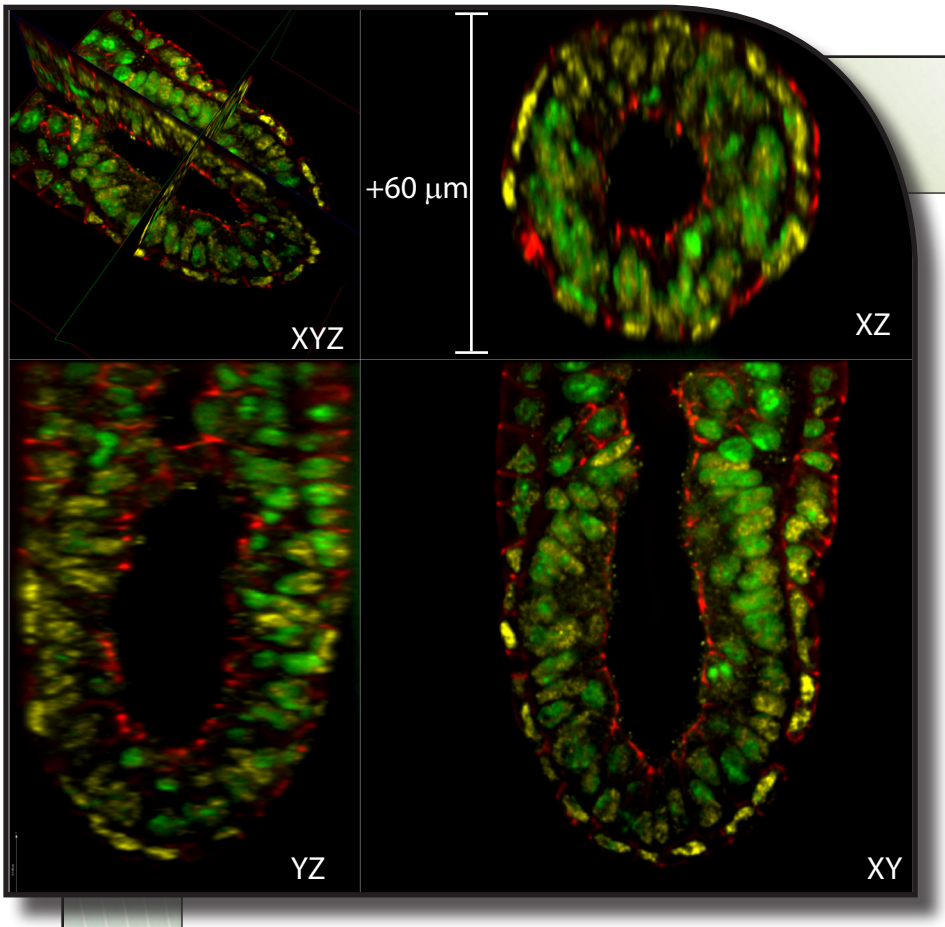


Large Area & Depth

3D extended focus of GFP Neurons in Zebra Fish nerve cord, courtesy of Dr. Piere Drapeau, University of Montreal, Canada. Images acquired using equipment integrated by Quorum Technologies Inc.

One Platform

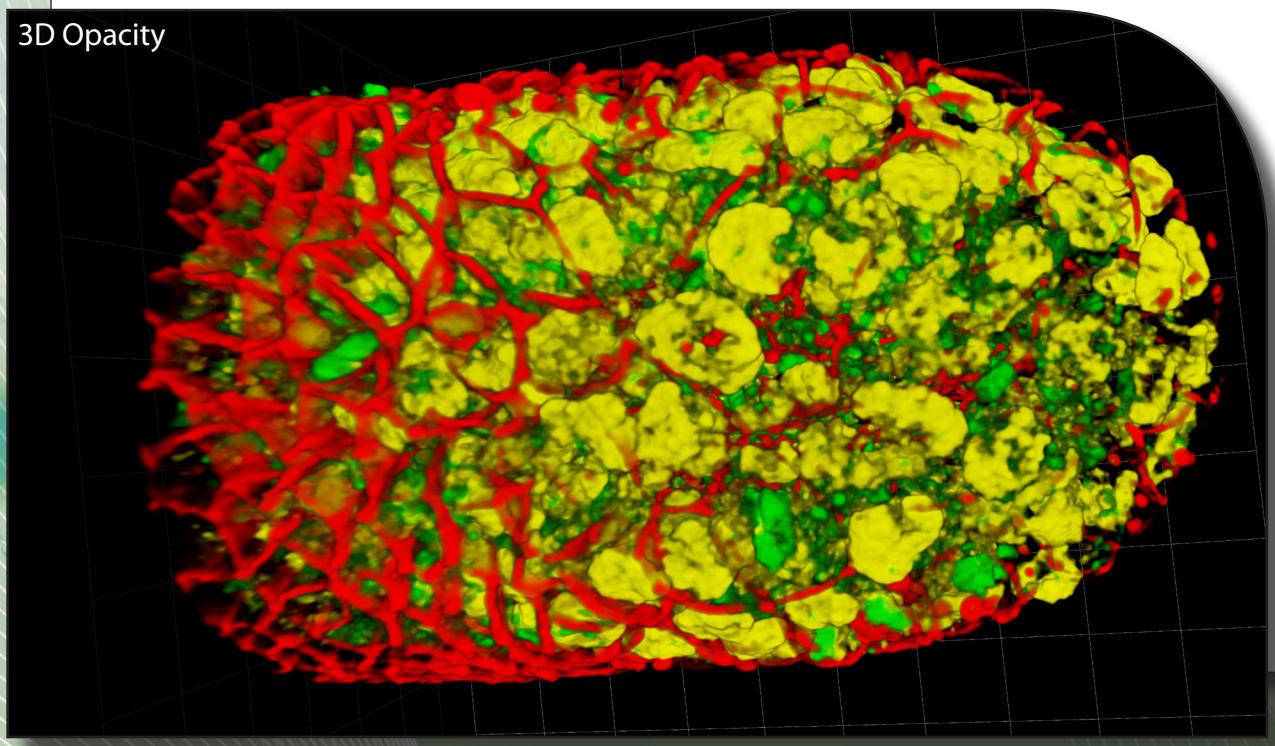
Venus TRF_1 GFP and Histone RFP 3D time lapse courtesy of Dr. Peter M. Lansdorph, BC Cancer Agency, Vancouver, Canada. Images acquired using equipment integrated by Quorum Technologies Inc.



Expectations

The Nipkow Disk based series of devices are not limited to fast 2D confocal imaging of photo sensitive samples. When implemented properly, the Nipkow technology is capable of highly confocal, quantitative imaging in a wide range of samples producing superb 2D images and stunning 3D sectioning while still exhibiting the hallmark sensitivity required in live samples and repeated confocal scanning.

Do not be undersold.
Understand what you should expect from a Spinning Disk.



Embryonic day 5.5 mouse prepared by Drs. Masahiro Narimatsu and Jeff Wrana at the Samuel Lunenfeld Research institute, Mount Sinai Hospital, Toronto, Ontario Canada.
Imaged using a 40X 1.25NA oil immersion objective, 512x512 BT EMCCD camera, 50mW 405nm laser DAPI (green), 50mW 561nm laser anti-phospho-Smad2-DyLight 549 (Yellow), 40mW 647nm laser mouse-b-catenin-DyLight 649 (Red), 85.15µm total volume 0.5µm steps, 254nm per pixel. Images acquired using equipment integrated by Quorum Technologies Inc.

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borealis²

Want to learn more? Contact Spectral at www.spectral.ca

Specifications

Spectral Diskovery Platform:		
Core	Usable Lasers	405nm, 445nm, 473nm, 488nm, 491nm, 514nm 532nm, 552nm, 561nm, 593nm, 630nm, 640nm, 730nm, 780nm
	Usable Laser Powers	1mw - 3W with Spectral laser system
	Brightness Control	solid state, ND wheel and/or AOTF and FLCR™
	Laser Introduction	Fiber method (FC connector)
	Safety	Integrated Interlock
	Spectral laser systems support 1-7 lasers with computer control	
Laser Software Support	Micromanager, Metamorph, Volocity, HC Image, Explora Nova, TTL, MATLAB, Spectral LMM GUI and SDK available	
Compatible microscope	any microscope with a dedicated 100% video port	
Objectives	large range of fluoescence grade objectives	
Mode Changes	Supports methods for simultaneous FRAP, Epi-Fluorescence, Super Resolution Imaging	
Camera Options	1-4 integrated ports for simultaneous imaging, more with image splitters or dual chip cameras (Hamamatsu OrcaD², C11254-10B)	
Emission Filter	supports 1-2 motorized filter wheels and/or single manual filter paddles	
Excitation Dichroic	not required	
Camera Splitters	reflecting >500nm, 565nm, 605nm, 640nm, 750nm mounted in custom alignment holders	
Camera Registration	perfect Pixel - Pixel registration with XY translation, rotation and axial focus correcting for magnification and chromatic shifts	
Camera Support	Custom mounts for most camera types and manufactures	
Camera Magnification	Custom matched to meet the resolution for your experiments	
Modes	TIRF, Spinning Disk, Super Resolution Localization Microscope, Widefield	

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