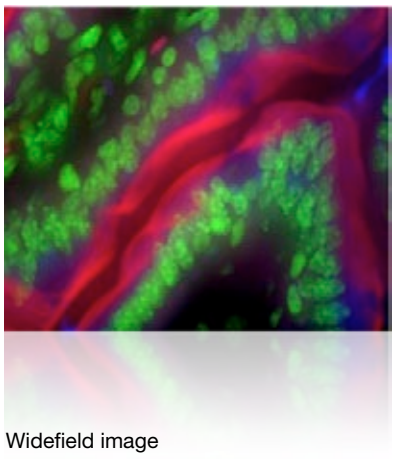
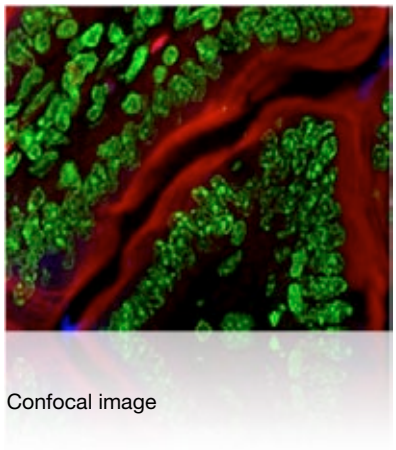


Widefield image



Confocal image

Microscopy Systems

Features and Benefits

- **Real-time control and viewing**
  Switch wide field and confocal with one mouse click
- **Full spectrum, laser-free**
  380 - 650 nm excitation
- **Excellent confocality**
  Clear optical sections even at low magnification
- **Cost effective**
  Easy alignment and low maintenance
- **Suitable for fixed and live specimens**
  Operating from 20x to 100x, image cells, tissues and embryos
- **Integrates with any microscope**
  DSD connects to any side or top port.
- **Andor Clara – best in class camera**
  Highest dynamic range, 14 bit digitization

Spinning Disk Structured Illumination Microscope

Andor Revolution DSD utilises Spinning Disk, Structured Illumination technology to achieve high optical sectioning by a combination of novel optical design and high speed image processing. The Revolution DSD does not rely on laser illumination, but provides excellent performance using broad band sources, making it a low maintenance, cost-effective solution for confocal imaging.

DSD delivers high contrast, low background images with objective magnifications ranging from 20x to 100x. It can be an effective alternative to laser scanning confocal in fixed and live cell, tissue and embryo imaging.

Specifications Summary

Imaging	**Up to 4 wavelengths per experiment**
Excitation range	**380 - 650 nm**
Emission range	**410 - 750 nm**
Frame rates (max)	**11 fps (1:1 binning),** **20 fps (2:2 binning)**
Confocality	**1.2 µm and 0.9 µm FWHM** **(with plan-apo 60X/1.4 NA objective)**

Hardware Specifications

Andor Differential Spinning Disk Unit

Spectral response	380 - 650 nm excitation 410 - 750 nm emission
Confocality	1.2 µm FWHM, High Signal mode 0.9 µm FWHM, High Sectioning mode (Specified with 60x / 1.4 NA plan-apo oil immersion objective)
Internal filter switching time	100 ms (N.B. 60 ms with quad band filter set)
Disk rotation speed	6000 rpm

Filters

Turret Name	Lines	Excitation & Emission Filter Pairs Centre/FWHM	Pre Filters	Fluorophores
GFP/RFP	2	457/50 & 525/50, 556/20 & 617/73	457/50, 556/20	GFP, RFP
CFP/YFP	2	427/10 & 475/50, 500/24 & 542/50	427/10, 500/24	CFP, YFP
Cy3/Cy5	2	534/36 & 577/24, 635/31 & 690/50	534/36, 635/31	Cy3, Alexa 555, Cy5, Alexa 647
D/F/T	3	406/15 & 457/50, 494/20 & 536/40, 575/25 & 628/40	406/15, 494/20, 575/25	DAPI, FITC, Texas Red
D/F/T/Cy5	4	Ex (Quad): 387/11, 485/20, 560/25,650/13 Em (Quad): 440/40, 520/24, 604/40, 700/56	387/11, 485/20, 560/25, 650/13	DAPI, FITC, TRITC, Cy5
Custom	N/A	ON SPECIAL REQUEST	-	-

Andor Clara Interline CCD

Active pixels (W x H)	1392 x 1040
Pixel size (W x H)	6.45 x 6.45 µm
Image area (W x H)	8.98 x 6.71 mm
Read noise	2.4 e^- @ 1MHz; 4.5 e^- @ 10 MHz; 5 e^- @ 20 MHz
Maximum dynamic range	> 6,500:1; 12,500 with binning
Thermoelectric cooling	-55ºC (-40°C fan off)
Dark current	0.0003 e^-/pixel/sec
Maximum frame rate	11 fps full frame, 20 fps full frame @ 2 x 2 binning

Hardware Specifications

Andor Metal Halide Light Source

Wavelength range	380 - 700 nm
Switching speed	~ 60 ms filter wheel
Shutter	Motorized intensity/shutter, 0% - 100%, 1% resolution, 40 ms Open/Close
Optical coupling	UV/Vis liquid light guide, NA 0.5, length 2 m (optional 3 m)
Light source	200 W stabilized metal halide lamp
Lamp lifetime	2200 hours
Interface	USB
Dimensions	221 mm [8.7"] x 345 [13.58"] x 229 [9"] (Requires at least 200 mm free space at top, left, right and rear of unit. Mount on hard shelf)
Weight	9.4 kg [20 lb 11 oz]

Andor Piezo Z-Stage

Travel range	100 µm, 200 µm, 250 µm and 500 µm
Accuracy / linearity	0.5% of travel
Stage control	Analog (0 - 10 VDC), USB and RS232
Settling time	> 10 ms (to 90%)
Inserts	Slide, Petri dishes (250, 500 µm ranges support microtitre plates)
Output-Position Signal	0.0 - 10.0V

Motorized XY & Z Control

Stages	Closed loop with linear optical encoders
Travel range	Typically >100 x 75 mm, with 0.02 µm resolution
Travel speed	Up to 30 mm/sec
Repeatability	0.3 µm rms
Compatibility	Accepts APZ-X00 Piezo stage insert for fast Z scanning

Hardware Specifications

Piezo Objective Control

Travel range	PI PIFOC® P721 - 100 µm; PI PIFOC® P725 - 400 µm
Setting time	Tuneable to < 10ms
Resolution	1.25 nm
Control	Analogue or digital
Objectives	Oil and water
Accuracy/Linearity	0.2% of travel

Stage Incubator

Piezo compatibility	Piezo inserts from Andor, Prior, Ludl, ASI supported
Cooling options	Electric, water and cryogenic
Temperature range	3°C above T_{amb} to 50°C
Cryo control with water jacket	Heating and cooling between 10 to 50 °C
Temperature regulation	± 0.3°C (water) and ± 0.1°C (water and cryogenic)
CO_2 range	0 - 100%

iQ / Imaris Workstation

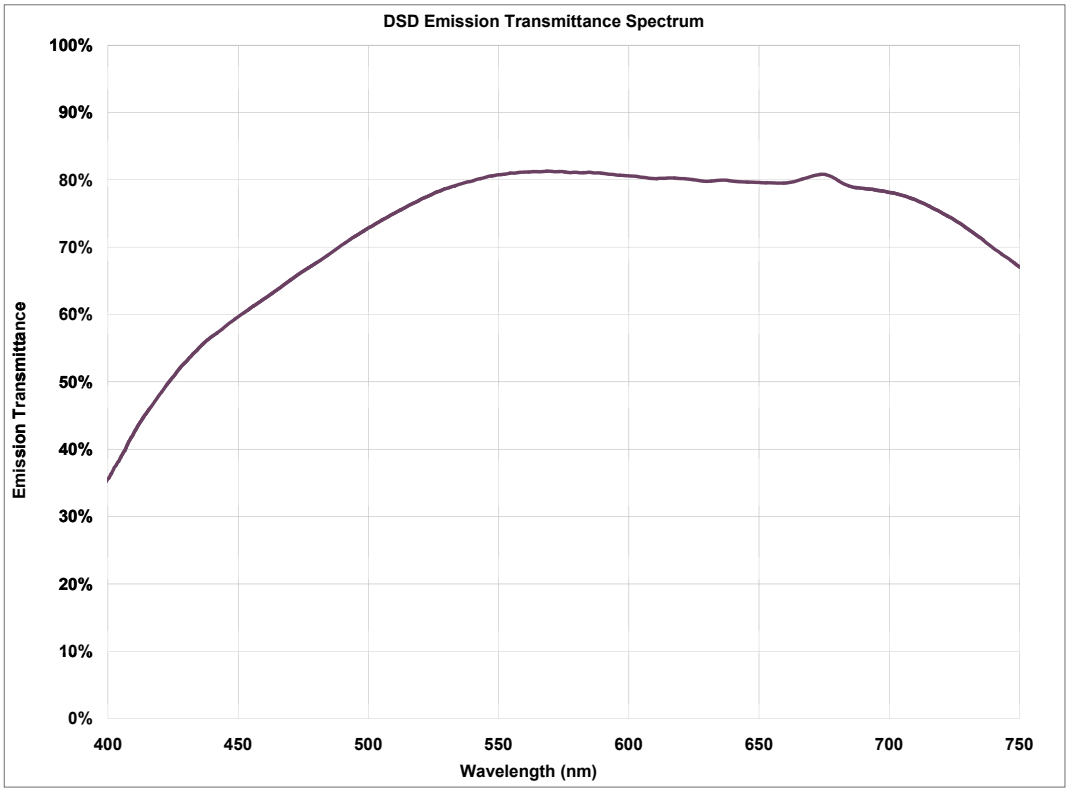
Desktop PC

Model	Dell Precision T3500
Weight	16.8 kg (37 lb)
Dimensions	171 mm [6.73”] x 471 mm [18.54”] x 448 mm [17.63”]

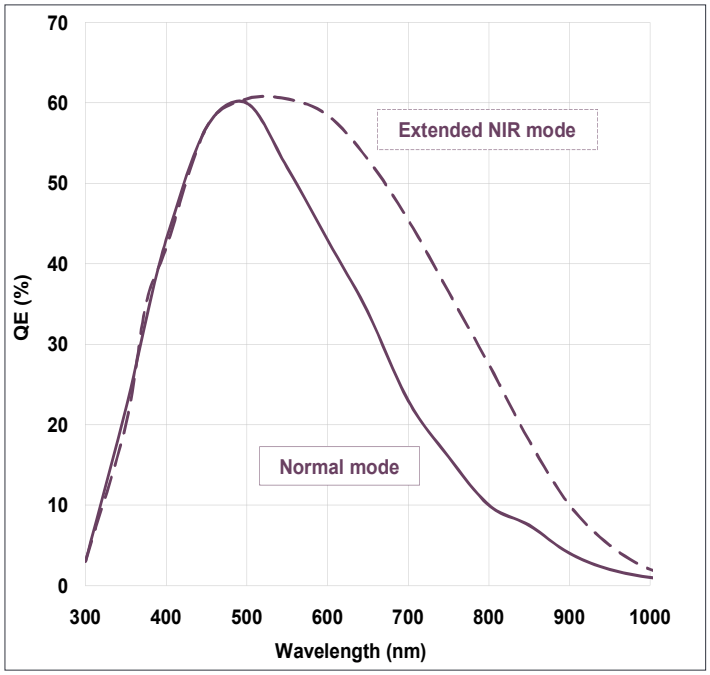
Monitor

Model	Dell 2709Wb
Weight	10.95kg [24 lb 2 oz]
Dimensions	632 mm [24.88”] x 200 mm [7.87”]- 230mm [9.05”] depending on monitor angle x 452 compressed (542 extended)

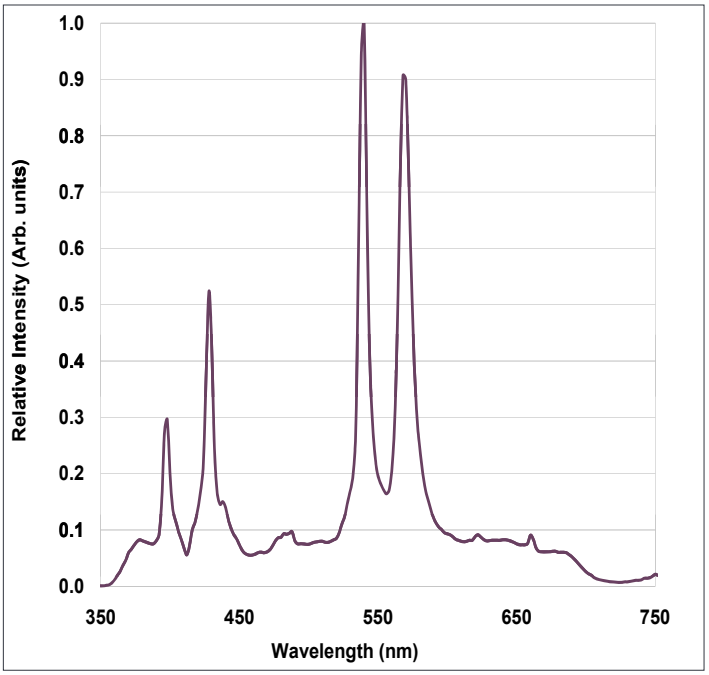
DSD Spectral Response Graph



Clara Quantum Efficiency



Andor MH Spectral Output



Creating The Optimum Product for You

How to customise Revolution DSD :

Step 1.
Choose DSD system mounting option.

Step 2.
Select filters required for your application.

Step 3.
Select feet to match DSD mounting option and inverted microscope models. Note: Feet not required for upright microscopes.

Step 4.
Select the appropriate objective scanner from the table.
We provide both Piezo stages and objective scanners for Z or focus control. Please contact Andor for specific requests.

Step 5.
We also offer high performance solutions for photo-ablation, uncaging, switching and FRAP. Please contact us for a detailed specification and quotation.

RD-DSD- Uni
example shown

Step 1.
Choose mounting type

Uni: Universal mounting platform (for inverted and upright configurations) - no enclosure
Core: Universal mounting platform (inverted configuration only) - with enclosure

PLEASE NOTE - The Revolution DSD enclosure is not compatible with a Leica microscope

Step 2.
Select the appropriate filter from the table below:

Fluorophores	Part Number
GFP, RFP	RD-DSD-FS1
CFP, YFP	RD-DSD-FS2
DAPI, FITC, Texas Red	RD-DSD-FS3
DAPI, FITC, TRITC, Cy5	RD-DSD-FS5
Cy3, Cy5	RD-DSD-FS6

Step 3.
Identify inverted microscope model & feet from the table below:

Microscope	Feet Part Number
Olympus IX71/81	TR-OLIX-MNT-XXX*
Nikon TiE	TR-NKTI-MNT-XXX*
Nikon TE2000	TR-NK2K-MNT-XXX*
Zeiss Axiovert 100/200	TR-ZSAV-MNT-XXX*
Zeiss Axio Observer	TR-ZAXO-MNT-XXX*
Leica DMI4/5/6000	TR-LCDM-MNT-XXX*

* XXX = 120 for Core enclosure, 110 for Uni mount

Step 4.
Select your required objective scanner from the table below:

Travel Range	Microscope	Part Number
100 µm	Nikon, Leica	MP-P100-OBJ-NKL-M25 *
100 µm	Nikon, Leica	MP-P100-OBJ-NKL-M32 **
100 µm	Olympus, Zeiss	MP-P100-OBJ-OLZ-RMS ***
400 µm	Nikon, Leica	MP-P400-OBJ-NKL-M25 *
400 µm	Nikon, Leica	MP-P400-OBJ-NKL-M32 **
400 µm	Olympus, Zeiss	MP-P400-OBJ-OLZ-RMS ***

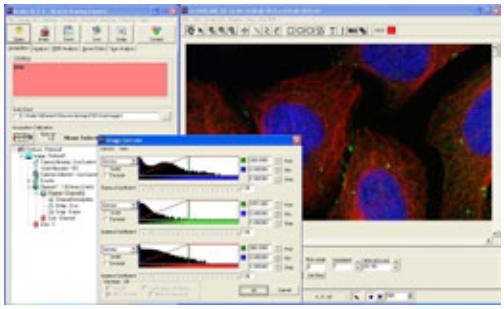
* M25 objective thread, suitable for Nikon CFI60 and Leica Nosepiece B
** M32 objective thread, suitable for Nikon M32 EPI CFI and Leica Nosepiece M
*** RMS standard objectives (0.8") suitable for all Olympus RMS and Zeiss RMS

Software

Andor iQ2

Multi-dimensional imaging with Python IDE

Andor iQ2 provides acquisition and control for the Revolution DSD system. iQ2 offers optimized control of Andor's award winning iXon3 EMCCD and Clara CCD cameras with powerful multi-dimensional acquisition through flexible Protocols. Continuous development and improvement ensures that iQ2 represents a powerful and flexible core for a range of bio-imaging applications. iQ2 combined with Imaris provides a powerful and flexible platform.



Features

- User-controlled acquisition of confocal, wide field or both images from DSD
- Multidimensional at its core - from time-lapse to 4D multi-channel imaging
- ImageDisk, virtual memory system, for smooth management of huge data sets
- Accessible dashboard interface and flexible Protocol structure
- Supports ratio imaging and analysis for functional imaging
- Fast Live refresh even with long exposure times to ease specimen review
- Multi-field & montage capability for large specimens or increased throughput

Imaris

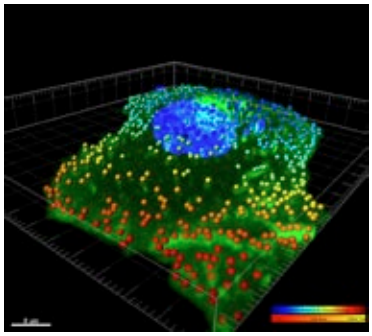
The Ultimate Tool for Visualisation and Analysis of Multi-Dimensional Images

Imaris delivers all the necessary functionality for visualization, segmentation and interpretation of multidimensional datasets. By combining speed, precision and intuitive ease-of-use, Imaris provides a complete set of features for handling multi-channel image sets of any size up to 50 gigabytes.

Imaris will read, visualize and analyze images acquired from almost any confocal and wide field microscope. Imaris and iQ have been co-designed to provide seamless ImageDisk access for Imaris 7.1 and above, avoiding the tedious save/open cycles required for third party data. Imaris has been specifically designed to target the critical data processing needs of the most demanding life-science imaging applications. Its intuitive workflow approach takes away the need to select and manage a range of imaging tools and frees the scientist to get on with their research.

Features

- Advanced Volume Rendering - Maximum Intensity Projection (MIP), Blend Projection and Real-Time Shadow Rendering
- Surfaces, Segmentation and interactive Iso-Surfaces, Region Growing and Semi Automatic Surface Generation
- Spots, Segmentation and Interaction - Identify and interact in 3D with hundreds of objects
- Smart Handling of Huge Images > 50 GB
- Multithreading & Advanced Computer Graphics - High-resolution, multiple light sources and 3D holographic rendering



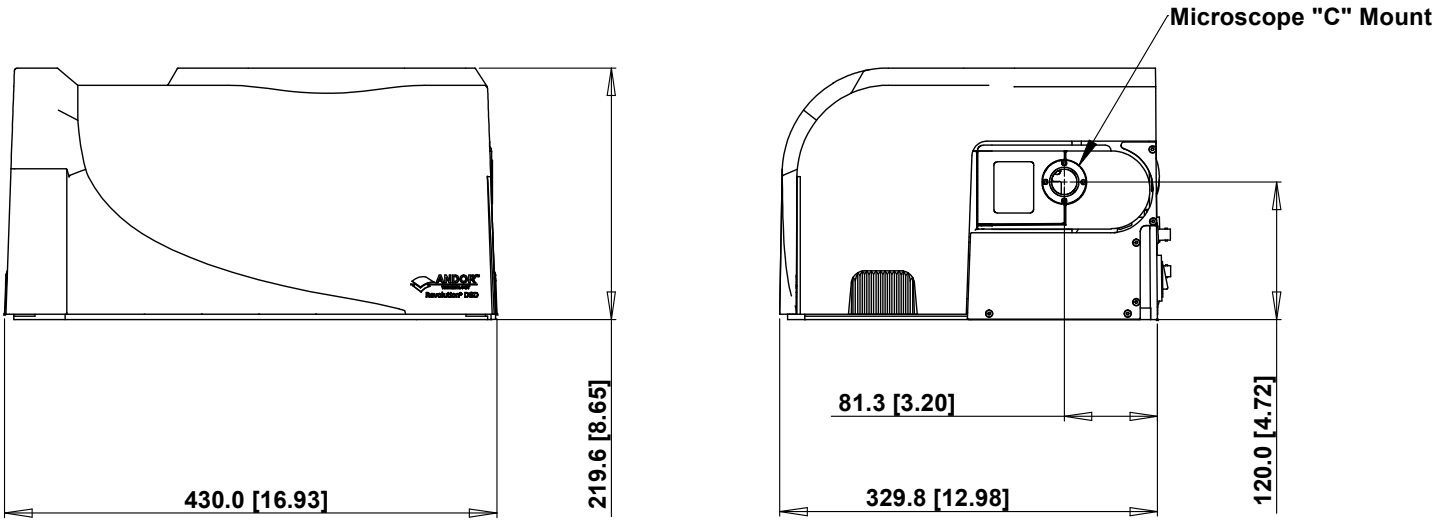
Core Features

- Rotational drift correction
- A free rotation image processing tool
- Andor iQ ImageDisk reader
- Additional support for ZVI files
- IMOD data import functionality

Product Drawings - DSD Core Platform

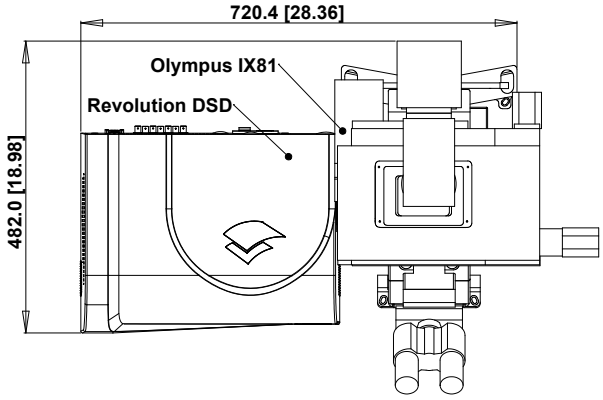
Dimensions in mm [inches]

Enclosure

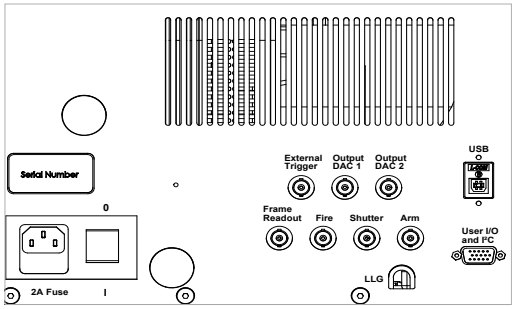


Weight:

Enclosure with Clara & DSD = 15.3 kg [33 lb 12 oz]



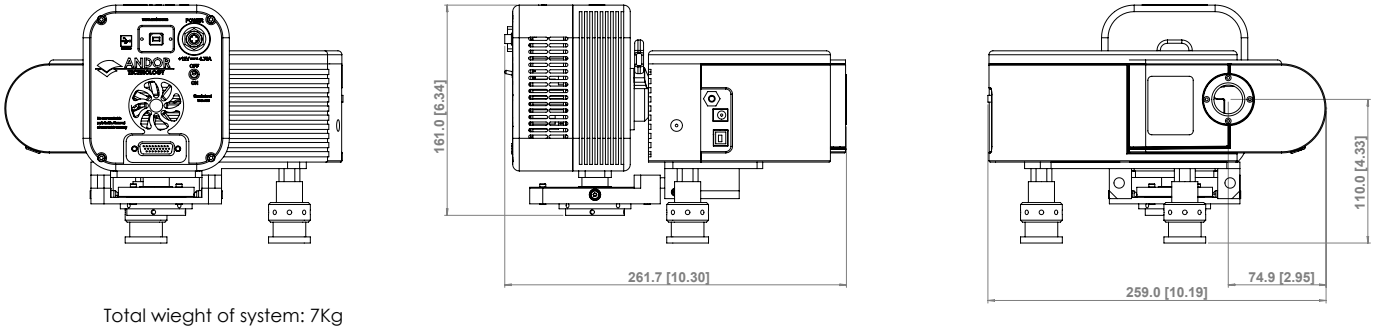
Typical footprint of DSD fitted to microscope (Olympus)



Connector rear panel

Product Drawings - DSD Universal Mounting Platform

Dimensions in mm [inches]



Total wieght of system: 7Kg

Clara = 2.35Kg
DSD = 3.75Kg
Bracket= 0.9Kg

SD-SIM in more detail

In a DSD system, the spinning element comprises a single synthetic quartz disk supporting a thin layer of coated aluminium in which the Structured Illumination Pattern (SIP) is created by photo-lithography. The aluminium SIP has a 1:1 mark to space ratio (half metal and half space), which means that approximately half of the light falling upon it is reflected (R) and half transmitted (T). This is true for light which is incident from either side of the disk and is a critical feature of the device. Figure 1. below illustrates the two patterns on the DSD disk: one with a pitch or period of 320 µm on the inner radius; the second with pitch 160 µm on the outer radius.

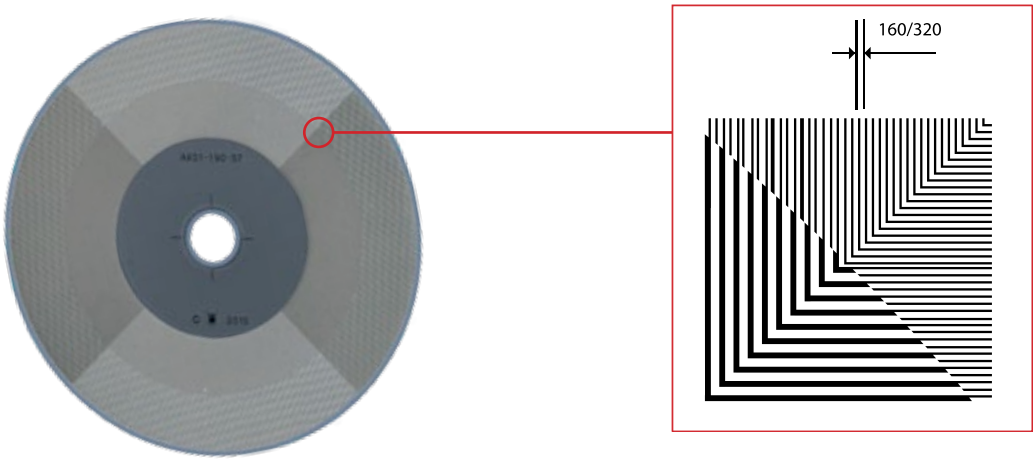
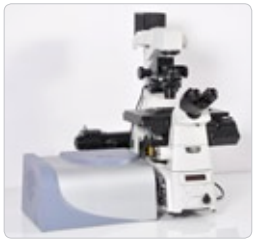


Figure 1. The differential spinning disk is manufactured with two structured illumination patterns, radially disposed. In the Andor DSD, the inner and outer patterns are designed respectively with 320 and 160 µm pitch and 1:1 mark-space ratio. These patterns are referred to as the “high signal” and “high sectioning” SIPs and allow the user to adapt DSD sectioning and signal-to-noise ratio performance to their specimen thickness and magnification choice.

Applications Guide

- Cellular Biochemical Imaging, e.g. Ca2+ (not Fura2) & pH
- Fluorescent Protein Dynamics e.g. Trafficking, Translocation
- Development e.g. C. elegans, Zebrafish and Drosophila
- Cytoskeleton and Membrane Dynamics and Motility
- Membrane Trafficking, Endo and Exo-Cytosis
- Nuclear Organization and Dynamics
- Photo-Manipulation – e.g. Activation and Ablation
- Viral Infection and Translocation
- Motility and Chemotaxis Assays
- Immunofluorescence

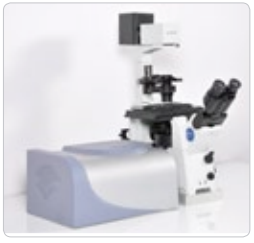
Typical Configurations



DSD Core with Nikon TIe

DSD Core with Zeiss Axiovert 200

DSD Uni with Nikon Eclipse



DSD Core with Olympus IX 81

DSD Uni with Leica DMI6000

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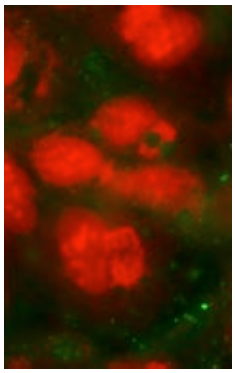
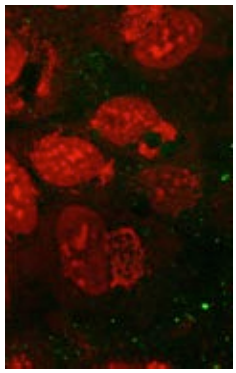
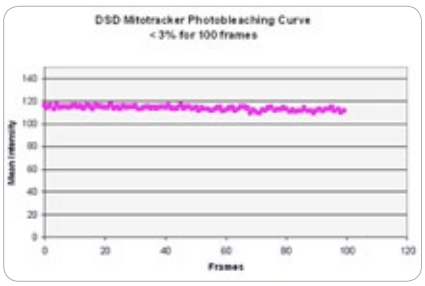
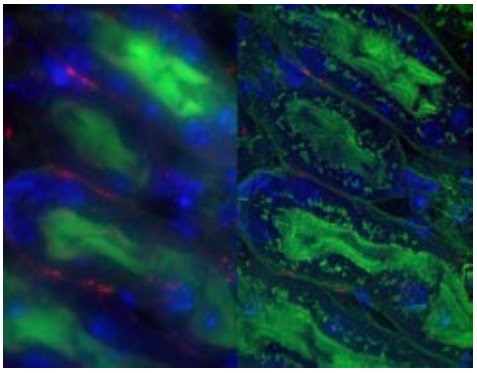






A two-colour image series of living MDCK cells acquired with Revolution DSD. Mito-tracker label shown in red and lysotracker in green. 200 images were acquired over a period of approximately 3 minutes of imaging and analyzed for bleaching as shown in the intensity graph to the right. DSD shows low levels of photo-bleaching with < 3% recorded over the 200 frame series (100 per channel).



Extended focus images of mouse kidney captured on Revolution DSD system - left is wide field and right confocal. Both images acquired simultaneously to illustrate contrast between modes. The DSD was attached to an Olympus IX81 with 60X/1.4 oil objective.

Operating & Storage Conditions
Operating Temperature 15°C to 30°C ambient
Relative Humidity < 70% (non-condensing)
Storage Temperature -10°C to 50°C

Power Requirements
110 - 240 VAC, 50/60 Hz

MDSDSS 0911 R1