DeltaVision OMX® (Version 4) Technical Details.

Certifications

Certification	Details
CE Certified	No particular registration number needed

Resolution

Excitation Wavelength	Expected 3D-SIM XY Resolution	Typical Values	Expected 3D SIM Z resolution	Typical Values
405 nm	110 +/- 5 nm	107 +/- 2.5 nm	340 +/-10 nm	317 +/- 8.5 nm
445 nm	115 +/- 5 nm	115 +/- 3.5 nm	340 +/-10 nm	315 +/- 10 nm
488 nm	120 +/- 5 nm	117 +/- 3.9 nm	350 +/-10 nm	316 +/- 9.0 nm
514 nm	120 +/- 5 nm	120 +/- 4.0 nm	350 +/-10 nm	320 +/- 10 nm
568 nm	135 +/- 5 nm	129 +/- 2.5 nm	350 +/-15 nm	325 +/- 12.5 nm
647 nm	160 +/- 5 nm	137 +/- 5 nm	380 +/-20 nm	376 +/- 17 nm

For comparison purposes below are the maximum resolution values possible as predicted by 3D-SIM theory. This is for a 1.4 NA lens.

Excitation	Emission	Max Theory Lateral Resolution
405	435.5	91.43
445	477.5	100.36
488	528	110.50
514	541	114.84
568	609	128.05
642	683	144.19

Widefield Resolution – Diffraction Limited

Excitation Wavelength	Widefield XY resolution	Widefield Z resolution
405 nm	210 +/- 10 nm	400 +/-10 nm
445 nm	230 +/- 10 nm	450 +/- 10 nm
488 nm	250 +/- 10 nm	500 +/-10 nm
514 nm	270 +/- 10 nm	520 +/- 10 nm
568 nm	300 +/- 10 nm	580 +/-10 nm
647 nm	350 +/- 10 nm	660 +/-10 nm

Pixel Size for Widefield and TIRF Applications

Camera type	Pixel size	40x objective pixel size	60x objective pixel size	100x objective pixel size
sCMOS or HQ2	6.45 um	120 nm	80 nm	48 nm*
EMCCD	16 um	195 nm**	130 nm	80 nm
* Pixel size is oversampled which can lead to increased noise which may be undesirable for localization imaging. **Lateral pixel size would be undersampled for deconvolution.				

DeltaVision OMX (V4) Laser Performance

Wavelength	Nominal Power +/- 5%	Typical Values			
		Power at Head	Input End of Fiber	Output SI Fiber	Output TIRF Fiber
405 nm	100 mW	107 +/- 6%	105 +/-8%	61 +/- 16%	58 +/- 14%
440 nm	100 mW	95.3 +/-5%	79 +/- 7%	44 +/- 21%	42 +/- 29%
488 nm	100 mW	105 +/- 4%	98 +/- 6%	68 +/- 13%	68 +/- 11%
514 nm	100 mW	101 +/- 6%	87 +/- 5%	50 +/- 2%	47 +/- 12%
568 nm	100 mW	104 +/- 4%	97 +/- 4%	58 +/- 15%	55 +/- 11%
642 nm for SI imaging	110 mW	101 +/- 4%	94 +/- 4%	48 +/- 13%	TBD
642 nm for Localization	300 mW	313 +/- 5%	268 +/-4%	163 +/- 6%	164 +/- 7%

Laser Shutter Speeds

Shutter Type	Open/Close times
Standard Shutters	~1.8 ms
High Speed Galvo Shutters	~200 us

SSI Operational Specifications

"Name"	Color	Wavelength Range (nm)	Center/Bandpass (nm)	Power (mW)	
				Min	Max
DAPI	Blue	381-410	395.5/29	80	140
CFP	Cyan	426-450	438/24	80	140
FITC/GFP	Green	461-493	477/32	55	110
YFP	Yellow	505-520	512.5/15	11	45
mCherry	Red	562-581	571.5/19	60	125
Cy5/DIC	Far Red	638-653	645.5/15	60	45

Camera Technical Details

	sCMOS	EMCCD
Manufacturer	PCO	Photometrics
Chip Type	Front Illuminated sCMOS	Back Thinned Frame Transfer CCD
Chip Size	2560 x 2160 pixels*	512 x 512 pixels
Pixel Size	6.45 um	16 um
Readout Speeds	95 MHz, 286 Mhz	5 MHz, 10 MHz
Readout Modes	Rolling Shutter, Global Shutter	Conventional Mode, EM Mode
Camera Interface	Camera-Link	Turbo-Firewire
Bit Depth	15 bit	16 bit
Quantum Efficiency	~60%	~87%
Dynamic Range	1:15,000	1:10,000
Read Noise	1.5 e @ 33 fps 2 e @ 100 fps	10 MHz EM - 45e 5 MHz EM – 32e 5 MHz non EM – 12e
On chip Binning	Not supported	Supported
* Currently the working area of the chip is limited to 512 x 512 for SIM imaging and 1024 x 1024 for Widefield and TIRF imaging. This is due to the geometry of the optics and vignetting effects near the edge of the FOV.		

DeltaVision OMX (V4) with Blaze Module Operational Speed with sCMOS cameras

Parameter	Expected Value Range	Notes
SIM Imaging	1.5 sec per 1 um stack	512 x 512, 1 ms exp, 125 nm step, 8 slices, 15 images per slide (135 images total, ~90 fps)
Stack reconstruction time	~24 sec per micron per channel. **	512 x 512, 5 ms exp, 125 nm step, 8 slices, 15 images per slide (135 images total), 1 color
*Fastest operational time is limited by system mechanics to approximately 3.8 ms per frame. **Note this can be highly variable and is not considered a specification due to the rapidly changing nature of computer hardware and software configurations.		

Widefield Imaging Speed with sCMOS Cameras in Time-lapse Mode

ROI	95 MHz Readout FPS	Single Frame	286 MHz Readout FPS	Single Frame
256 x 256	120 +/- 8%	8.65 ms	169 +/- 3%	6.59 ms
512 x 512	82 +/- 5%	12.49 ms	166 +/- 5%	6.70 ms
1024 x 1024	50 +/- 9%	18.09 ms	123 +/- 3%	8.66 ms
1 ms exposure, no Z move or time delay				

Widefield Imaging Speed with sCMOS Cameras in Fast Acquire Mode

ROI	95 MHz Readout FPS	Single Frame	286 MHz Readout FPS	Single Frame
256 x 256	203	4.91 ms	389	2.57 ms
512 x 512	119	8.40 ms	268	3.73 ms
1024 x 1024	64	15.4 ms	165	6.06 ms
1 ms exposure, no Z move or time delay				

Operational Speed with EMCCD cameras

Parameter	Expected Value Range	Notes
Widefield imaging	~28 fps (Evolve) >50 fps	512 x 512 10 MHz readout, 1 ms exp, 0 sec delay, 0 z-step 256 x 256
SIM Imaging	~4.2 sec per 1 um stack	512 x 512, 5 ms exp, 125 nm step, 8 slices, 15 images per slide (135 images total, ~ 20 fps)
Stack reconstruction time	~24 sec per micron per channel**	512 x 512, 5 ms exp, 125 nm step, 8 slices, 15 images per slide (135 images total), 1 color

Stage Operation

Parameter	Expected Value Range	Notes
Stage Range (XY)	25 mm x 25 mm	Longer travel stage (50 x 25 mm) under development
Y flatness	<10 um per 10 mm travel	Determined at factory and installation
X flatness	<10 um per 10 mm travel	Determined at factory and installation
Z piezo repeatability	+/- 50 nm	100 um total travel
XYZ Nanomover repeatability	+/- 100 nm	25 mm total travel
Z piezo step resolution	4 nm	
XYZ nanomover step resolution	10 nm	

Optical Cabinets

Component	Sizes (see install document for more details).	
	US Imperial	Metric
Main Optics Cabinet	72h x 46w x 48d inches,	183h x 117w x 123d cm
Electronics/Laser Cabinet	41h x 45w x 29d inches,	104h x 114w x 74d cm

For more specific details about sizes, weights and power requirements please refer to the OMX Site Guide documentation that covers these topics in much more detail.

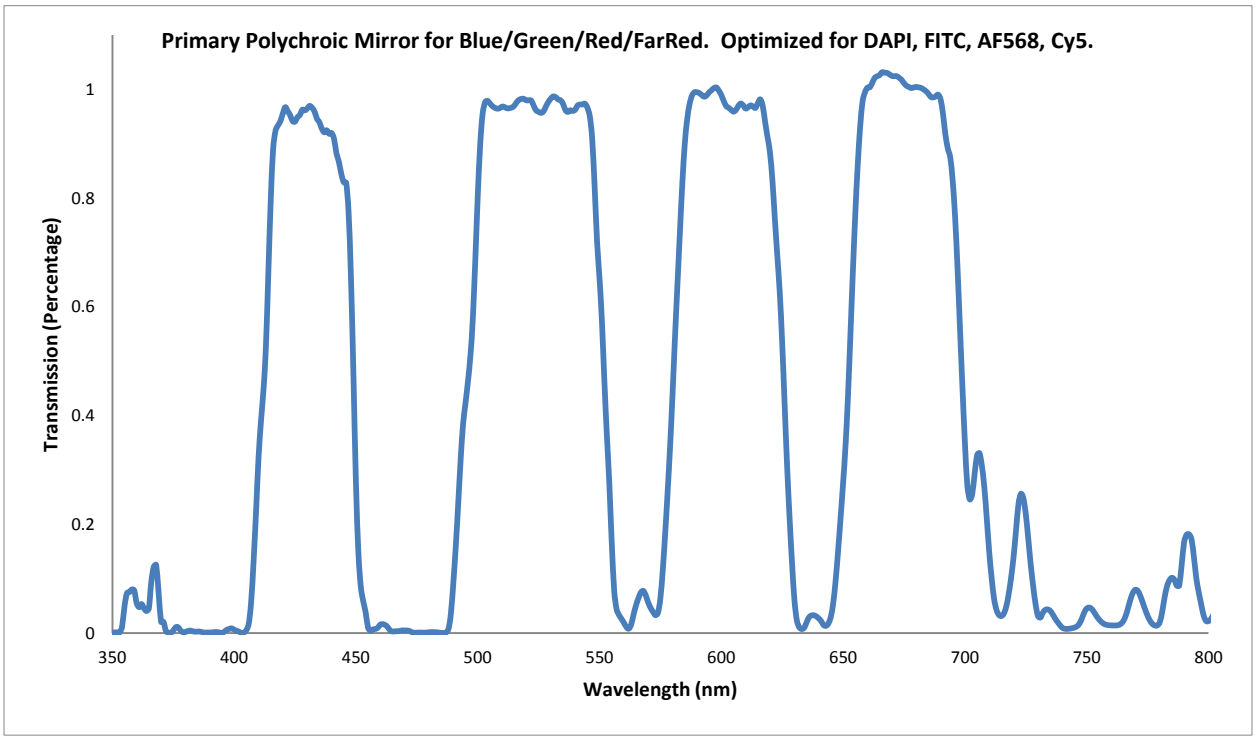
Filter Details

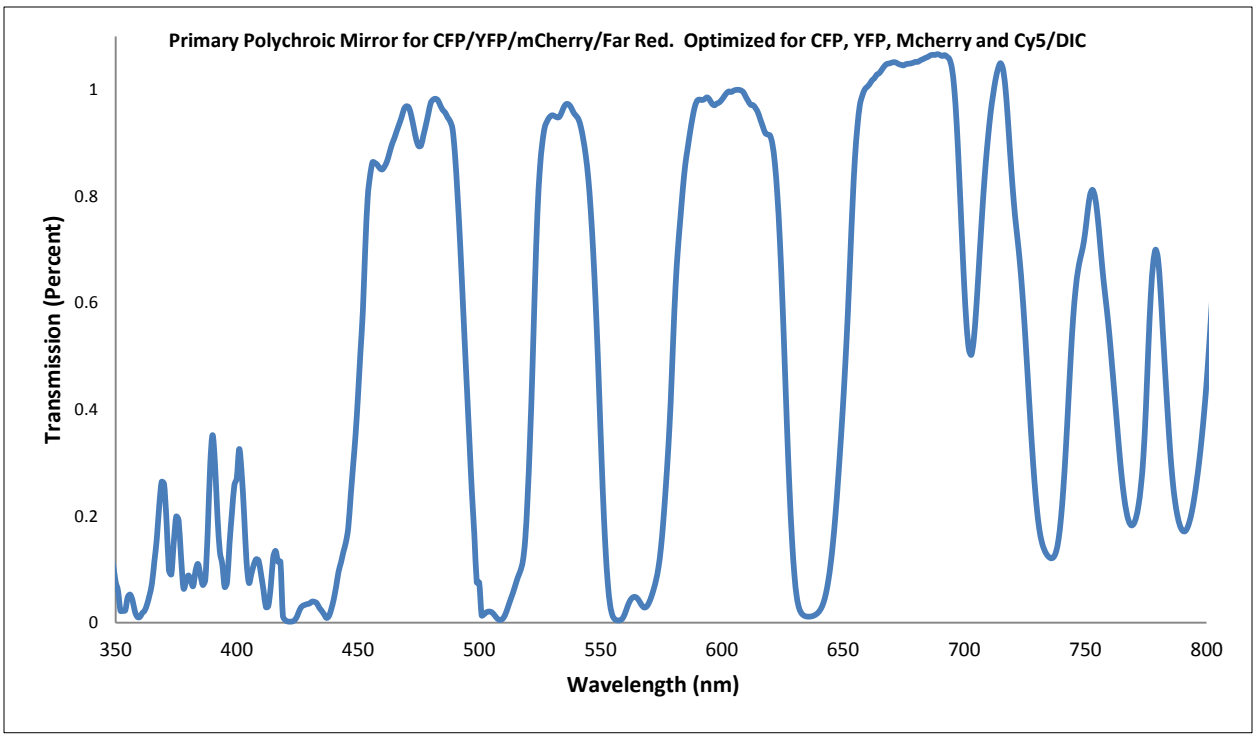
Excitation Filters						
Channel	**Center Wavelength (nm)**	**Bandwidth (nm)**	**Absolute Transmission (%T)**	**Blocking Range (nm)**	**Absolute Blocking (OD)**	**Average Blocking (OD)**
DAPI	395.5 ± 2.0	29.0 ± 2.0	≥ 90	300-371, 420-710	5	6
FITC	477.0 ± 2.0	32.0 ± 2.0	≥ 90	300-451, 503-710	5	6
mCherry	571.0 ± 2.0	19.0 ± 2.0	≥ 90	300-552, 591-710	5	6
Cy5	645.5 ± 2.0	15.0 ± 2.0	≥ 90	300-628, 663-710	5	6
CFP	438.0 ± 2.0	24.0 ± 2.0	≥ 90	300-416, 460-710	5	6
YFP	512.5 ± 2.0	15.0 ± 2.0	≥ 90	300-495, 530-710	5	6

Emission Filters						
Channel	**Center Wavelength (nm)**	**Bandwidth (nm)**	**Absolute Transmission (%T)**	**Blocking Range (nm)**	**Absolute Blocking (OD)**	**Average Blocking (OD)**
DAPI	435.5 ± 2.0	31.0 ± 2.0	≥ 90	300-410, 461-710	5	6
FITC	528.0 ± 2.0	48.0 ± 2.0	≥ 90	300-494, 562-710	5	6
mCherry	609.0 ± 2.0	37.0 ± 2.0	≥ 90	300-580.5, 637-710	5	6
Cy5	683.0 ± 2.0	40.0 ± 2.0	≥ 90	300-653	5	6
CFP	477.5 ± 2.0	35.0 ± 2.0	≥ 90	300-450, 505-710	5	6
YFP	541.0 ± 2.0	22.0 ± 2.0	≥ 90	300-520, 562-710	5	6

Polychroic DAPI/FITC/ mCherry/Cy5	AO I= 45.0 ± 0.5 degrees						
Region	**Channel**	**Band (nm)**	**Absolute Transmission (%T)**	**Average Transmission (%T)**	**Laser Line (nm)**	**Phase Band (nm)**	**Phase Control (Deg)**
Transmission #1	DAPI EM	421-450	> 80%	> 90%	-	-	-
Reflection #1	DAPI EX	382-409	< 20%	< 10%	405	403-407	≤30
Transmission #2	FITC EM	505-549	> 80%	> 90%	-	-	-
Reflection #2	FITC EX	462-492	< 20%	< 10%	488	487-488	≤30
Transmission #3	mCherry EM	591.5-626.5	> 80%	> 90%	-	-	-
Reflection #3	mCherry EX	561-580	< 20%	< 10%	568	561-569	≤30
Transmission #4	Cy5 EM	664-702	> 80%	> 90%	-	-	-
Reflection #4	Cy5 EX	639-652	< 20%	< 10%	640	639-644	≤30

DeltaVision OMX V4 Primary Polychroic Mirrors.





SI Workstation Hardware Specifications

Feature	**2011-2012**	**>2012**
CPU	Dual Xeon Quad Core CPUs (8 cores total)	Intel i7, 6 Core CPU
Clock Speed	2.00 GHz	
Memory	16 GB DDR3 1333 MHz ECC	
Power Supply	600 W	
Drives	500 GB SATA Boot Drive	
RAID	3 x 1 TB SATA in RAID5 Configuration	
Video Card	NVidia FX380	
VRAM	256 MB	
Video Bus	PCIE	PCIE
Monitor	24 Inch	24 Inch
Resolution	1920 x 1200	1920 x 1200