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DIGITAL SLIDE SCANNER TECHNOLOGY IN COMPARISON

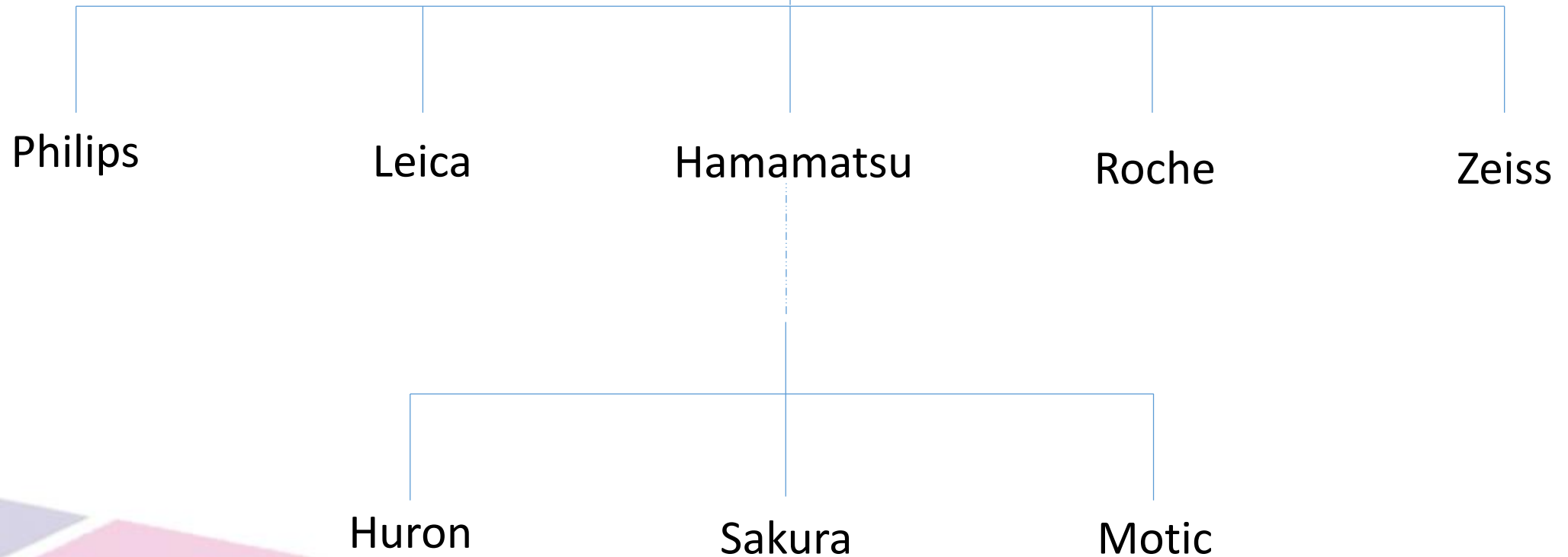
Dr Tamas Regenyi, 3DHISTECH Ltd.



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Scanner Comparison

Pannoramic





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Scanner Comparison

**3DHISTECH® offers
the most comprehensive
whole slide scanner solution
available today**



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Pannoramic Scanners

	DESK II (1)	MIDI II (12)	MIDI CONF (12)	SCAN II (150)	FLASH III (250)	P1000 (1000)
Bright Field						
	4 options DW slides	4 options	2 options	4 options	4 options	4 options DW slides
Fluorescent						
		8 options	2 options	8 options	8 options	



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Pannoramic Scanners

- 1st gen (2002) HiScope
- 2nd gen (2004) Mirax Scan
- 3rd gen (2009) Pannoramic Scan = Pannonia
- 4th gen (2011) P250
- 5th gen (2011) FLASH I
- 6th gen (2013) FLASH II
- 7th gen (2015) FLASH III / SCAN II / MIDI II / DESK II
- 8th gen (2017) P1000 FLASH IV



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Scanner Comparison

BRIGHTFIELD and FLUORESCENT



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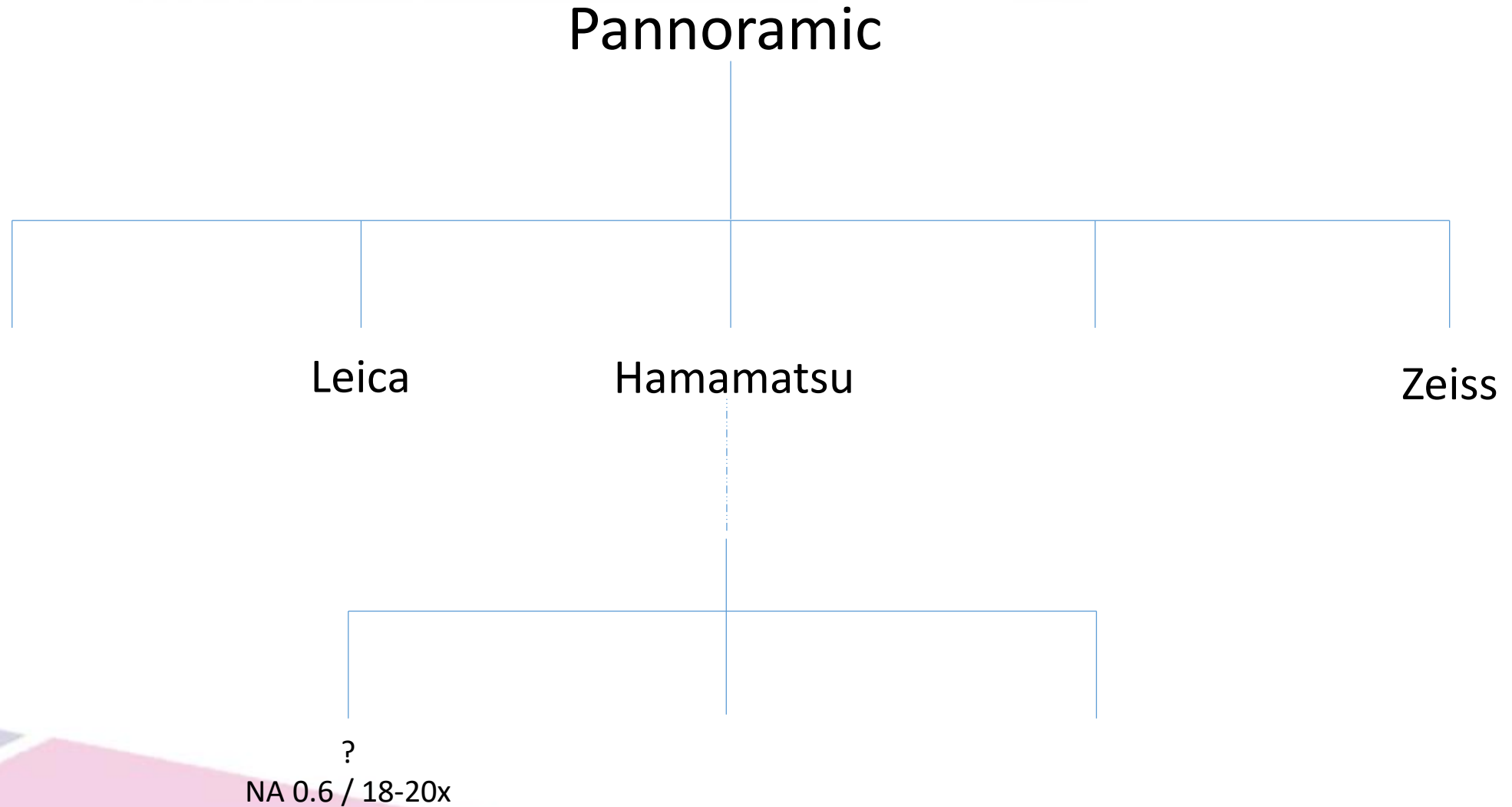
Pannoramic Scanners

	DESK II (1)	MIDI II (12)	MIDI CONF (12)	SCAN II (150)	FLASH III (250)	P1000 (1000)
Bright Field						
	4 options DW slides	4 options	2 options	4 options	4 options	4 options DW slides
Fluorescent						
		8 options	2 options	8 options	8 options	



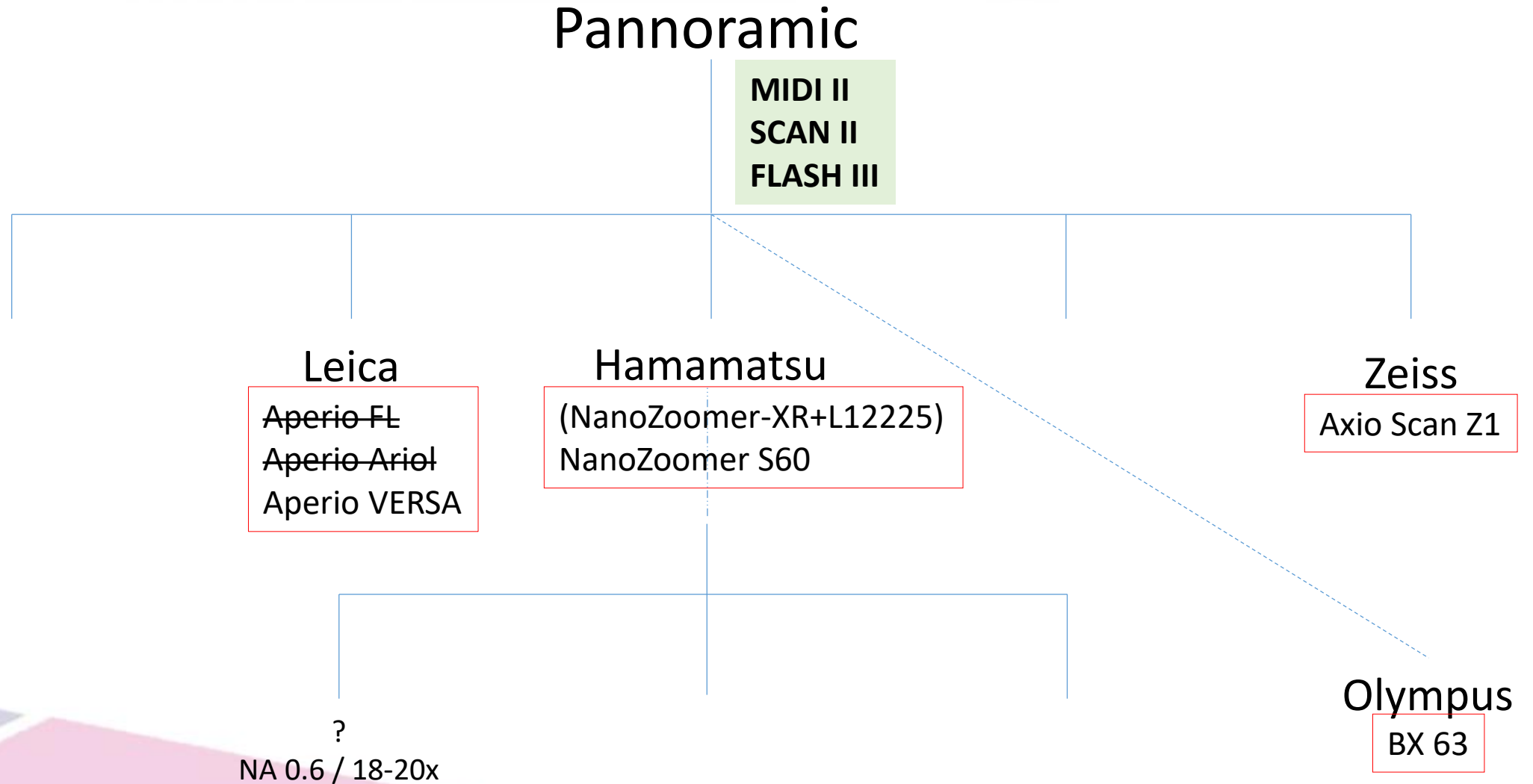
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Scanner Comparison BF + FL





Scanner Comparison BF + FL





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Scanner Comparison BF + FL

Pannoramic

MIDI II
SCAN II
FLASH III

Leica

Aperio FL
Aperio Ariel
Aperio VERSA



Hamamatsu

(NanoZoomer-XR+L12225)
NanoZoomer S60



Olympus

BX 63

?
NA 0.6 / 18-20x

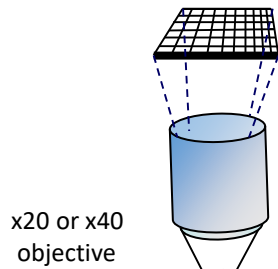


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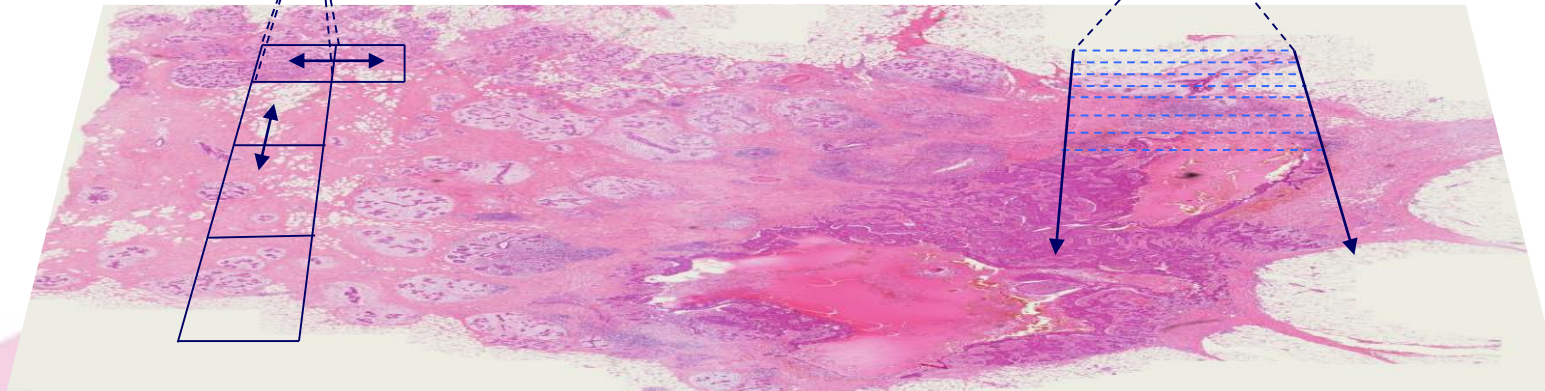
Scanner technologies

Area / Tile scanners

Camera sensor (2048x2048 pixel)

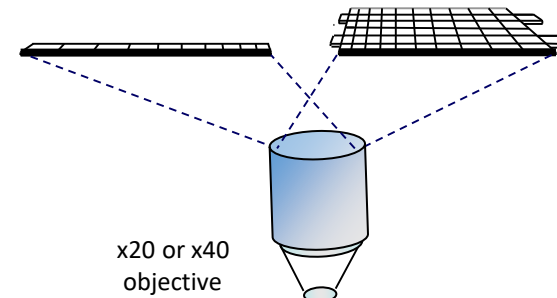


x20 or x40 objective



Line / TDI scanners

(4096 pixel) TDI sensor (≥64 x 4096 pixel)



x20 or x40 objective

TDI: CCD

Tile: CMOS

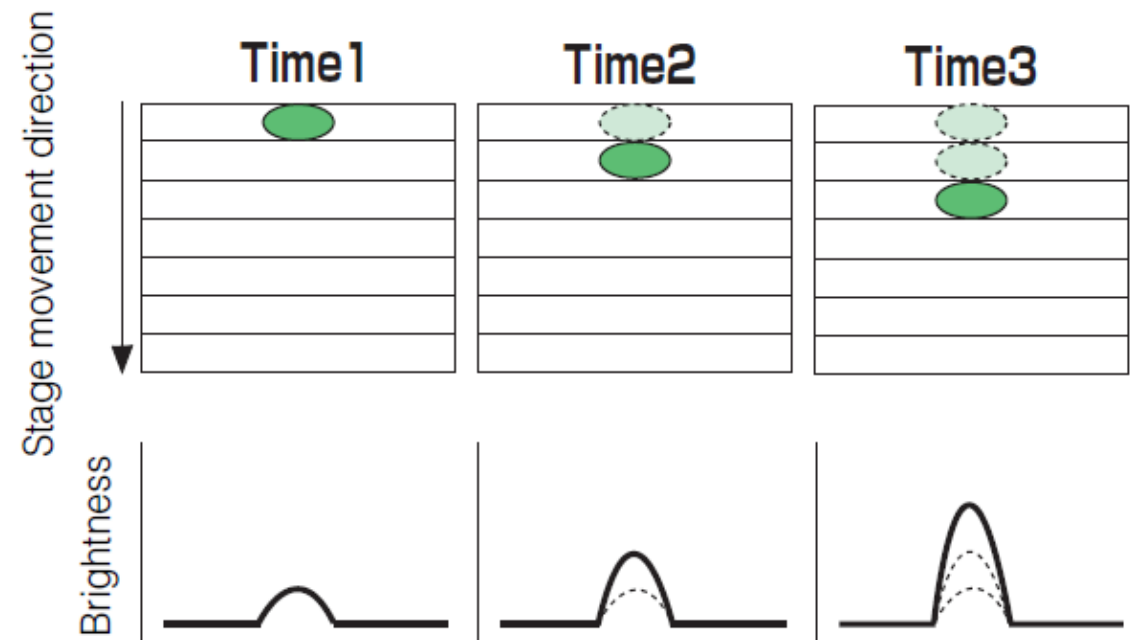
- Sensor size
- Speed
- Cost
- Sensitivity



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TDI principle

- Sample movement is synchronized with camera readout
- Photons from the sample are summed as the sample passes by the camera lines





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Area Scanner

- Area Sensor
 - The stage can be stopped
 - Extended Focus
 - Z-Stack
 - Change the filter as many time as we want
 - Have any exposure time we need
 - Live image



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FL scanners

Vendors	Scan Mode	Camera	Bit depth
3DHISTECH MIDI, SCAN150, P250	Area sensor	PCO 4.2MP PointGray 5.0MP	16 bit
C. Zeiss AxioScan Z1	Area sensor	Hamamatsu	16 bit
Leica Aperio VERSA	Area sensor	Andor	16 bit
Leica Aperio Ariol	Area sensor		
Leica Aperio FL	TDI sensor		
Hamamatsu S60	Area sensor	Hamamatsu	16 bit
Hamamatsu XR	TDI sensor		
Olympus BX63	Area sensor	Hamamatsu	16 bit

PCO CMOS sensor : TDSI sensor light collection 100 : 1-3

All camera vendors (PCO, Hamamatsu, Andor) switched top the same sCMOS chip



NanoZoomer-XR + L12225



NanoZoomer S60 + L13820



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FL scanners

Scanners	Pannoramic FLASH III / SCAN II / MIDI II	Aperio VERSA	S60	AXIOSCAN Z1	Olympus BX 63
Scanner ?	Yes	Digital microscope	Yes	Yes	Digit. microscope
Scanning Mode	Area	Area	Area	Area	Area
FL Camera	sCMOS 4.2 MP 16 bit CMOS 5.0 MP 16 bit	sCMOS 5.5 MP 16 bit	sCMOS 16 bit	AxioCam 1.4 MP sCMOS 16 bit	sCMOS 16 bit
Capacity					
Slide size					
BF / FL Cam					
Objective					
Z-stack					
Cost					
FL Illumination FL Light Source					



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FL scanners

Scanners	Pannoramic FLASH III / SCAN II / MIDI II	Aperio VERSA	S60	AXIOSCAN Z1	Olympus BX 63
Scanner ?	Yes	Digital microscope	Yes	Yes	Digit. microscope
Scanning Mode	Area	Area	Area	Area	Area
FL Camera	sCMOS 4.2 MP 16 bit CMOS 5.0 MP 16 bit	sCMOS 5.5 MP 16 bit	sCMOS 16 bit	AxioCam 1.4 MP sCMOS 16 bit	sCMOS 16 bit
Capacity	250 / 150 / 12	8 or 200*	60	12 or 100*	1
Slide size	Std	Std	Std / DW	Std / DW	Std
BF / FL Cam	Dual / Single / Single	Dual	Dual	Dual	Dual
Objective	20x/0.8 40x/0.95	1,25x 5x 10x 20x 40x 63x	20x/0.75	2,5x/0.12 10x/0.45 20x/0.8 40x/0.95	1,25x 5x 10x 20x 40x 63x
Z-stack	Yes	Yes	Yes	Yes	Yes
Cost	PCO/Spectra \$\$ PointGr/Sola \$	\$\$-\$\$\$	\$\$-\$\$\$	\$\$\$	\$\$\$
FL Illumination FL Light Source					



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FL scanners

Competitive advantage is the FL Illumination / Quality + Cost + all BF capability: Resolution and Speed and Capacity

Scanners	Pannoramic FLASH III / SCAN II / MIDI II	Aperio VERSA	S60	AXIOSCAN Z1	Olympus BX 63
Scanner ?	Yes	Digital microscope	Yes	Yes	Digit. microscope
Scanning Mode	Area	Area	Area	Area	Area
FL Camera	sCMOS 4.2 MP 16 bit CMOS 5.0 MP 16 bit	sCMOS 5.5 MP 16 bit	sCMOS 16 bit	AxioCam 1.4 MP sCMOS 16 bit	sCMOS 16 bit
Capacity	250 / 150 / 12	8 or 200*	60	12 or 100*	1
Slide size	Std	Std	Std / DW	Std / DW	Std
BF / FL Cam	Dual / Single / Single	Dual	Dual	Dual	Dual
Objective	20x/0.8 40x/0.95	1,25x 5x 10x 20x 40x 63x	20x/0.75	2,5x/0.12 10x/0.45 20x/0.8 40x/0.95	1,25x 5x 10x 20x 40x 63x
Z-stack	Yes	Yes	Yes	Yes	Yes
Cost	PCO/Specta \$\$ PointGr/Sola \$	\$\$-\$\$\$	\$\$-\$\$\$	\$\$\$	\$\$\$
FL Illumination FL Light Source	Lumencor SOLA Lumencor SPECTRA	Metal Halide arc	Metal Halide arc	Colibri	Lumencor SOLA



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FL scanners

Scanners	Pannoramic FLASH III / SCAN II / MIDI II	Aperio VERSA	S60	AXIOSCAN Z1	Olympus BX 63
FL Illumination FL Light Source	Lumencor SPECTRA	Metal Halide arc	Metal Halide arc	Colibri	Lumencor SOLA
	Direct attached	Cable coupled	Cable coupled	Cable coupled	Cable coupled
	High Power			Low Power	High Power
	6 channels / switchable	Lower Quality	Lower Quality	4 channels / switchable	6 channels / switchable


- Directly attached
- Constant higher power
- Multi channel

- High Quality – Low budget:
 - cmos + sola
- Superior High Quality:
 - Scmos + spectra




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Pannoramic® MIDI II - Highly efficient 12 slides scanner with Fluorescence option

Scanner type	Article number	BF / FL	Model	Magnification / Resolution	Camera	Objective
Pannoramic® MIDI II 	MI2FGHM0001007SOL1	Bright field & Fluorescent	MIDI II	60x / 0,17 µm	5 MP mono CMOS	single
	MI2FGHM0001009SOL1		FL HR*	110x / 0,09 µm		dual
	MI2FGHM0002007SOL1		MIDI II	40x / 0,27 µm		single
	MI2FGHM0002009SOL1		FL HS*	70x / 0,14 µm		dual
	MI2FPC40001007LUM1		MIDI II	30x / 0,33 µm	4.2 MP mono Sci CMOS	single
	MI2FPC40001009LUM1		FL Sci*	60x / 0,16 µm		dual
	MI2FPC4000A007LUM1		MIDI II	45x / 0,20 µm		single
	MI2FPC4000A009LUM1		FL SciHR*	90x / 0,10 µm		dual

* HR: High Resolution, HS: High Speed, Sci: Scientific, SciHR: Scientific-High Resolution

Scanner type	Article number	BF / FL	Model	Magnification / Resolution	Camera	Objective
Pannoramic® SCAN II 	SI2FGHM0001007SOL1	Bright field & Fluorescent	SCAN II	60x / 0,17 µm	5 MP mono CMOS	single
	SI2FGHM0001009SOL1		FL HR*	110x / 0,09 µm		dual
	SI2FGHM0002007SOL1		SCAN II	40x / 0,27 µm		single
	SI2FGHM0002009SOL1		FL HS*	70x / 0,14 µm		dual
	SI2FPC40001007LUM1		SCAN II	30x / 0,33 µm	4.2 MP mono Sci CMOS	single
	SI2FPC40001009LUM1		FL Sci*	60x / 0,16 µm		dual
	SI2FPC4000A007LUM1		SCAN II	45x / 0,20 µm		single
	SI2FPC4000A009LUM1		FL SciHR*	90x / 0,10 µm		dual

* HR: High Resolution, HS: High Speed, Sci: Scientific, SciHR: Scientific-High Resolution



Instability of metal halide arc lamps

Sources of Instability in Metal Halide Arc Discharge Lamps

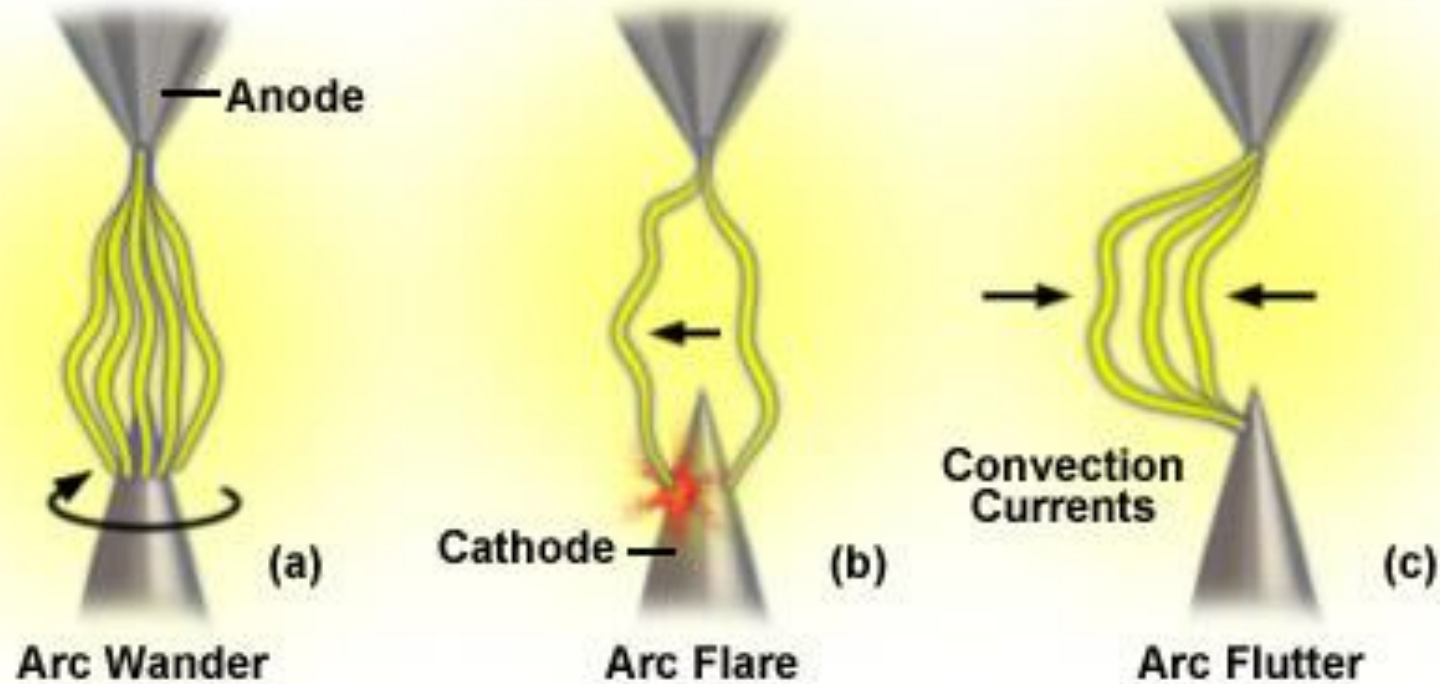


Figure 1

- The illumination intensity and pattern always changes



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Metal halide cost

- Metal Halide bulb has 2 000 hours life time
- One replacement bulb costs around 1000 Euro
- Light engine has more than 20 000 hours life time
- During the same life time the Metal Halide light source costs 10 000 Euro more!



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Lumencor Solid State Light Engine Spectra

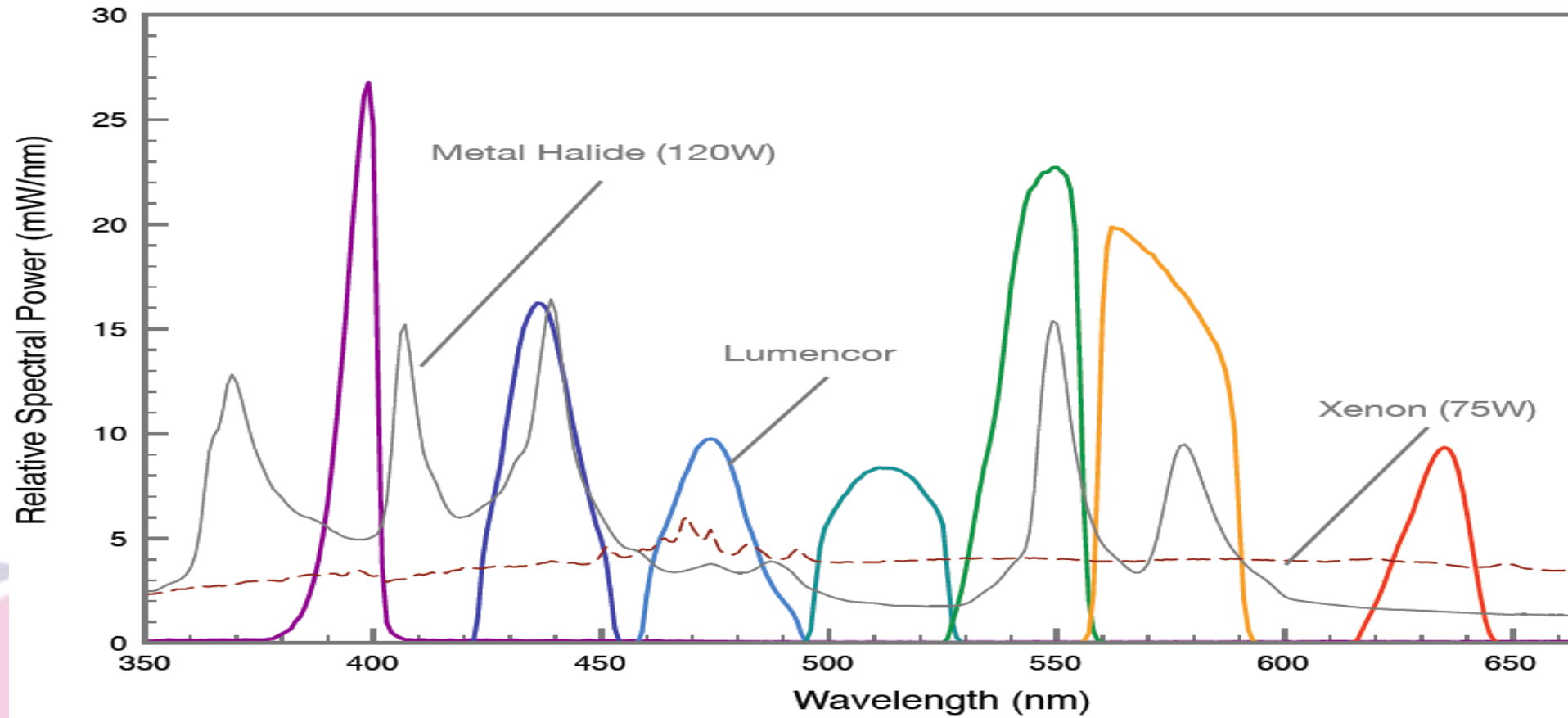
- Brighter than metal halide arc lamps
- Absolutely stable in time (arc lamps are instable)
- Homogeneous (arc lamps are less homogeneous)
- Colors can be switched on-off individually
 - Perfect shuttering
 - Support for multi band pass filters





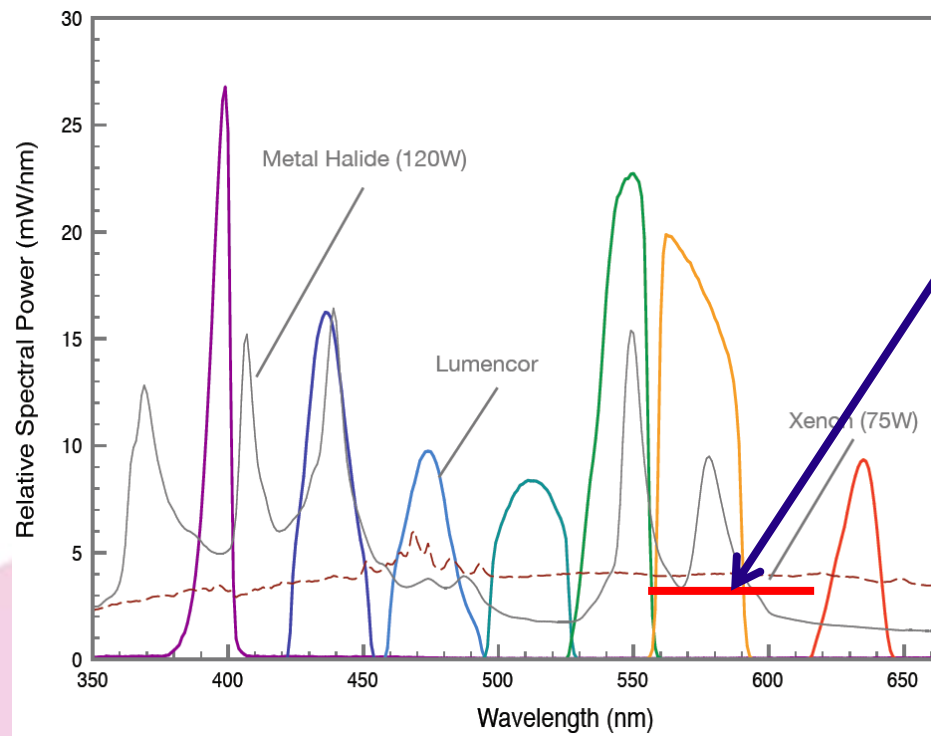
Lumencor Solid State Light Engine Spectra

- Metal halide has no peak for Cy5 and Cy7 channel
- Solid state is brighter at all significant wavelength



Zeiss Colibri light source

- Colibri has only 4 channels, Lumencor has 6
- LEDs are weak in green color, Lumencor uses patented light pipe technology for green



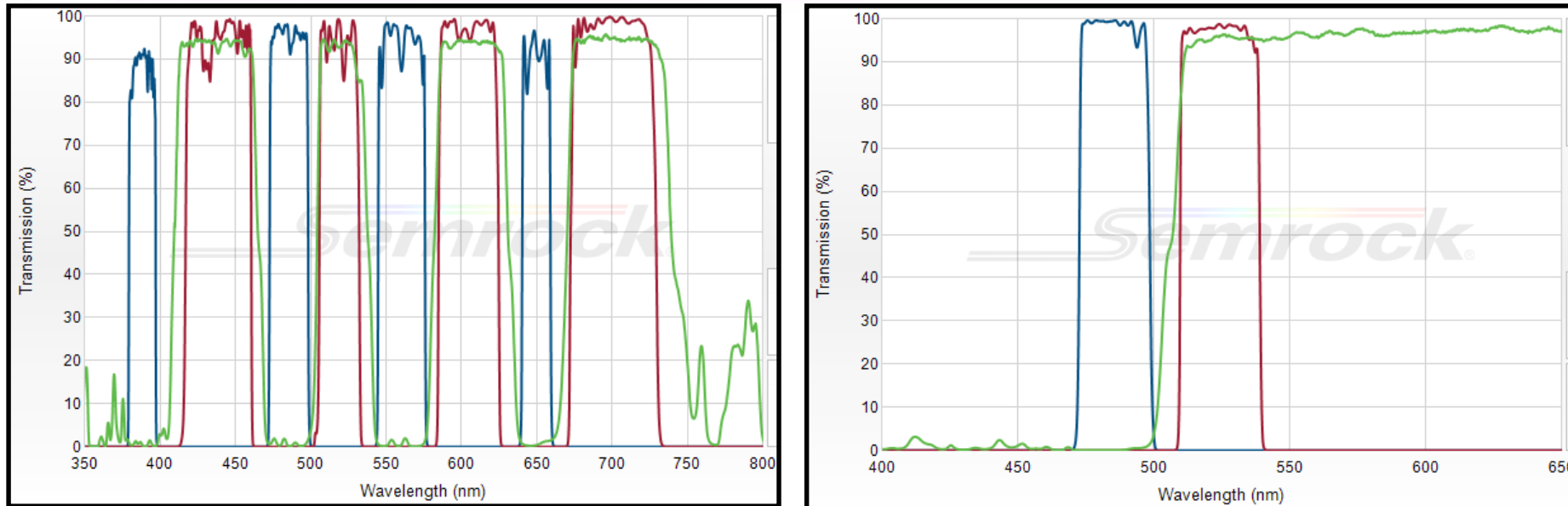
LED would be here





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Multi vs. single band pass filters



- With multiband filters there is no need for mechanical filter changing -> **faster scanning**
 - 3DHISTECH Panoramic FLASH III / SCAN II / MIDI II
 - Carl Zeiss AxioScan Z1



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Scanner Comparison

BRIGHTFIELD

HIGH THROUGHPUT LAB

&

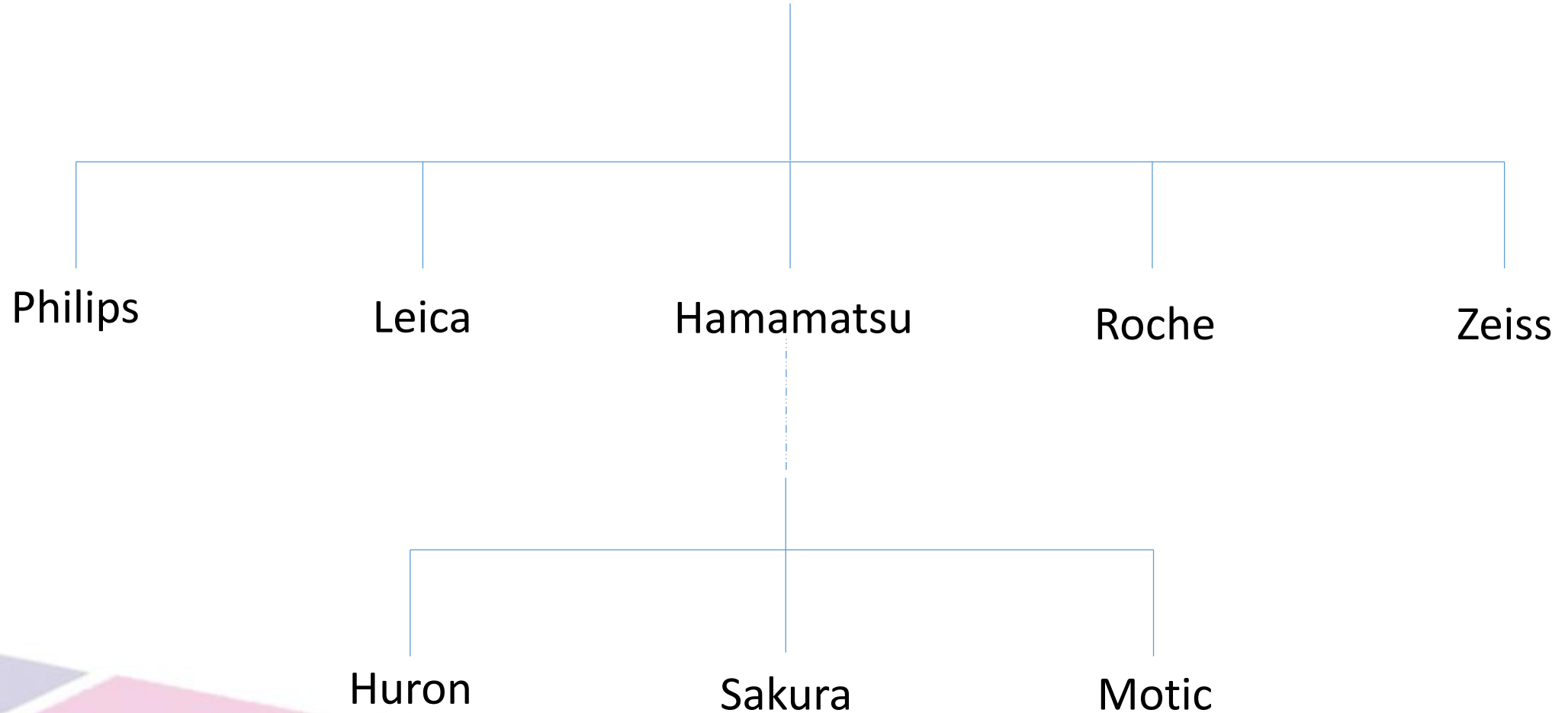
SATELLITE LAB



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Scanner Comparison

Pannoramic





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DW 2"x3"
Std 1"x3"

1000



Philips



300

Std 1"x3"

Leica



400

Std 1"x3"
DW 2"x3"

Hamamatsu



360

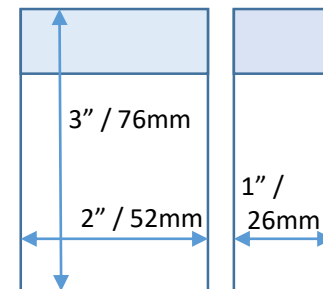
Std 1"x3"

Roche



360

Std 1"x3"



DW
2"x3"

Std
1"x3"



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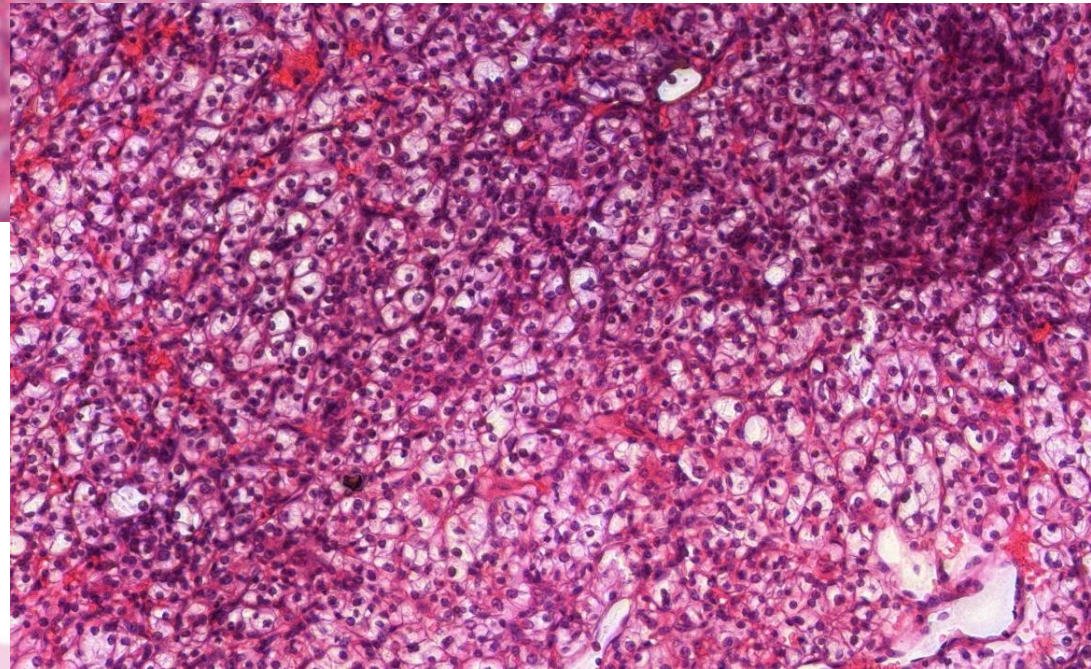
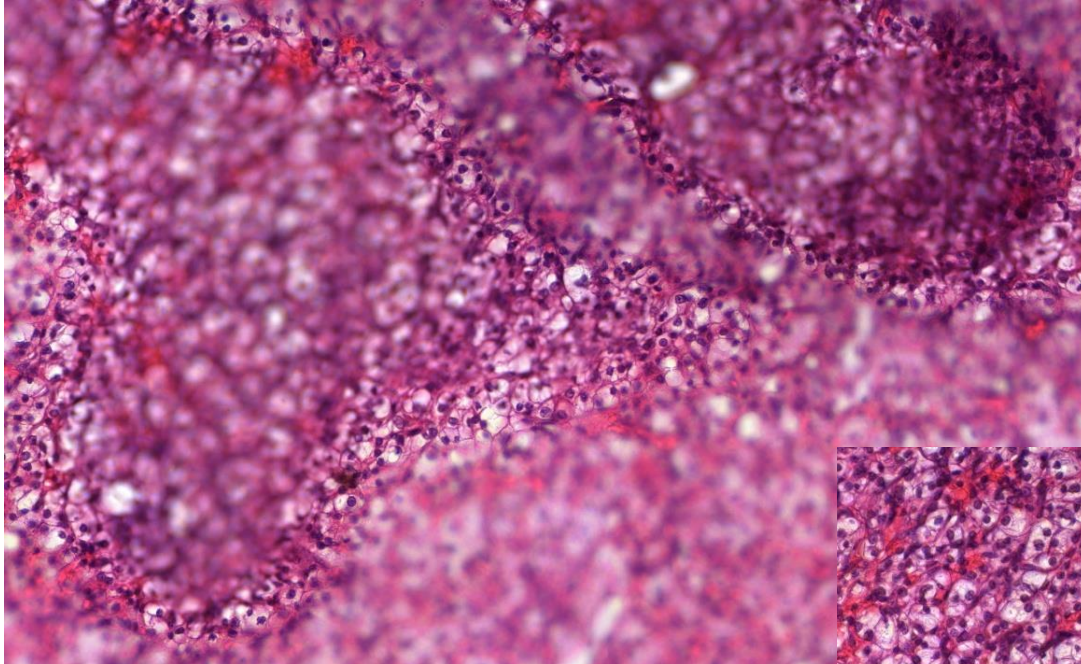
Scanner Comparison

- | | |
|------------------------|--------------------|
| • Philips UFS | TDI/Line Scanning |
| • Hamamatsu S360 | TDI/Line Scanning |
| • Leica Aperio AT2 | TDI/Line Scanning |
| • Roche iScanHT | TDI/Line Scanning |
| • Pannoramic FLASH III | Area/Tile Scanning |
| • Pannoramic 1000 | Area/Tile Scanning |
- TDI vs area has far less significance in bright field
 - Only extended focus is not possible with TDI



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Example of extended focus





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Scanner Comparison

- Throughput vs scanning time
- Gross vs net scanning time
 - Loading – unloading
 - User Interaction
 - Preview, scan area determination
 - Barcode
 - Image Compensation



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Scanner Comparison

	Capacity	Slides/hour @40x
• Philips UFS	300	30
• Hamamatsu S360	360	82*
• Leica Aperio AT2	400	20
• Roche iScanHT	360	20
• Pannoramic FLASH III	250	55
• Pannoramic 1000	1000	100-120*

*1 For the case of 5 focus points



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Scanner Comparison

	Capacity	Slides/day
• Philips UFS	300	600 (2 cycle)
• Hamamatsu S360	360	1080 (3 cycle)
• Leica Aperio AT2	400	400 (1 cycle)
• Roche iScanHT	360	360 (1 cycle)
• Pannoramic FLASH III	250	750 (3 cycle)
• Pannoramic 1000	1000	2000 (2 cycle)



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Scanner Comparison

	DW slide	Multilayer scan
• Philips UFS	No	No
• Hamamatsu S360	No	Z-stack
• Leica Aperio AT2	2"x3"	Z-stack
• Roche iScanHT	No	Z-stack
• Pannoramic FLASH III	No	Z-stack
• Pannoramic 1000	2"x3"	Z-stack



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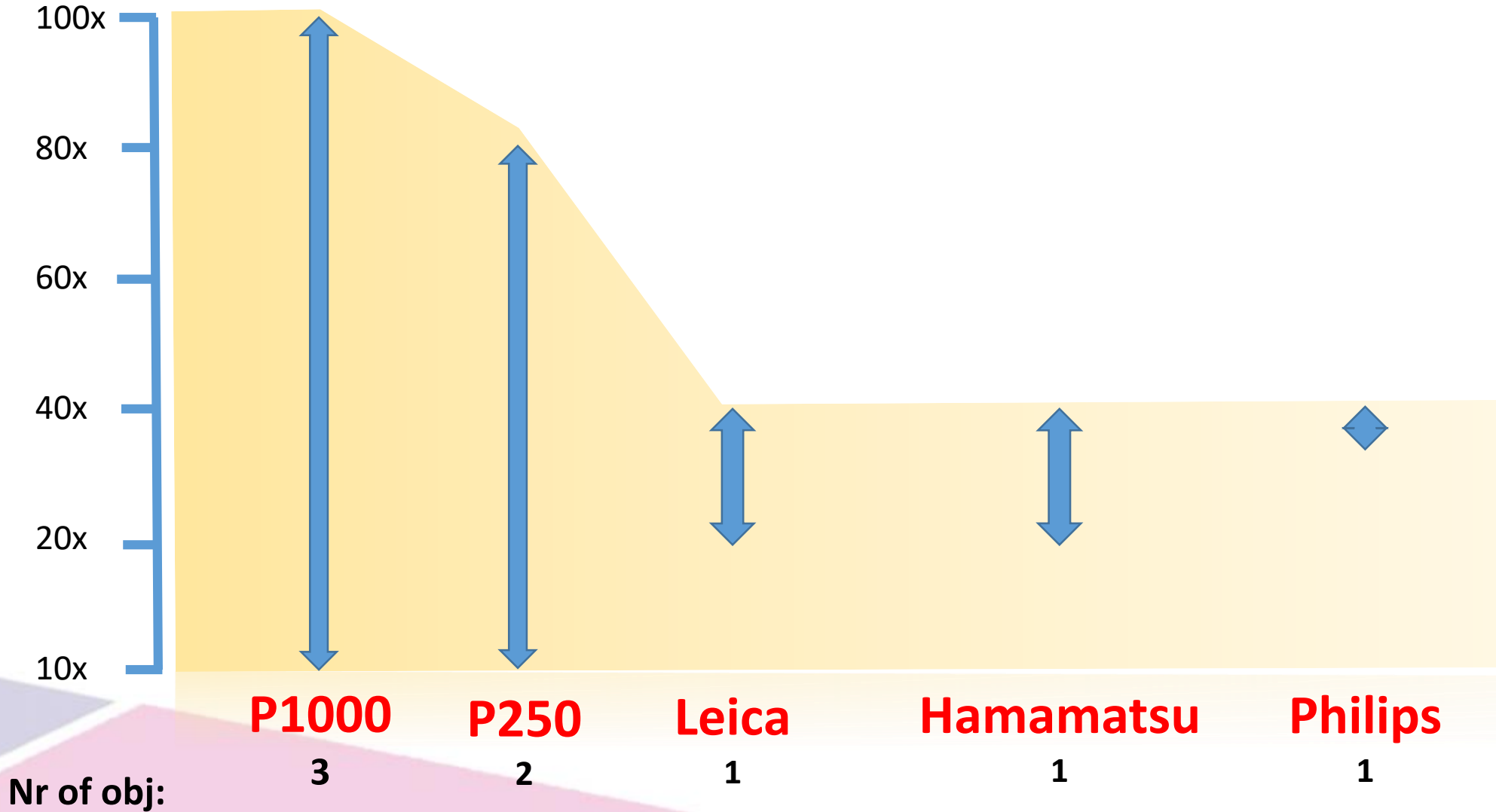
Scanner Comparison

		Objectives	Image Quality
• Philips UFS	1	20x / NA 0.75	40x
• Hamamatsu S360	1	20x / NA 0.75	20x – 40x
• Leica Aperio AT2	1	20x / NA 0.75	20x – 40x
• Roche iScanHT	1	20x / NA 0.75	20x – 40x
• Pannoramic FLASH III	2	40x / NA 0.95	20x – 80x
• Pannoramic 1000	3	40x / NA 1.2	10x – 100x



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Image Resolution

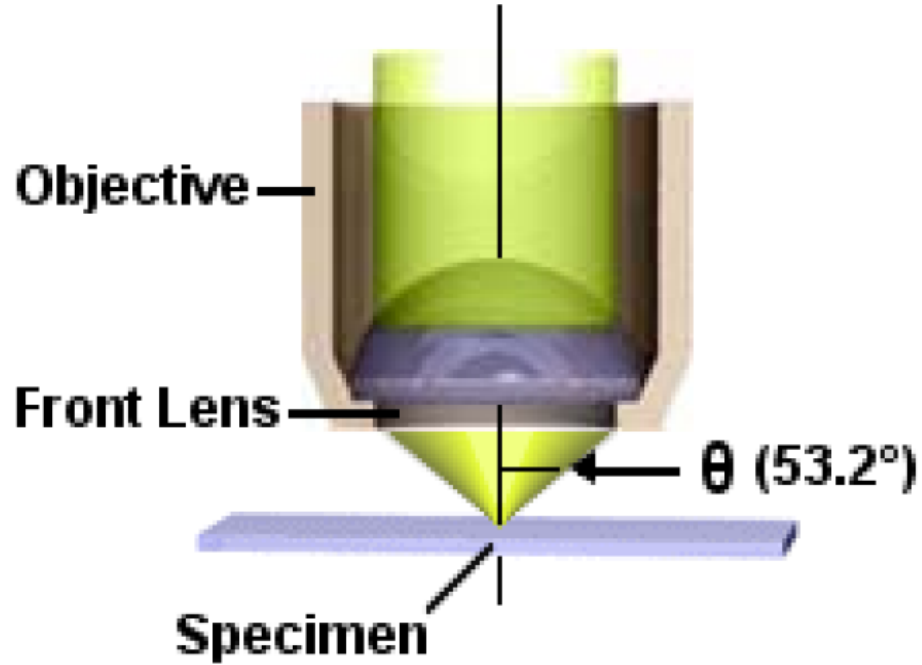




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Numerical Aperture

To resolve smaller details the objective has to collect light in a wider angle.





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Numerical Aperture

The viewing angle of the objective is described by
NUMERICAL APERTURE

Numerical Aperture = NA

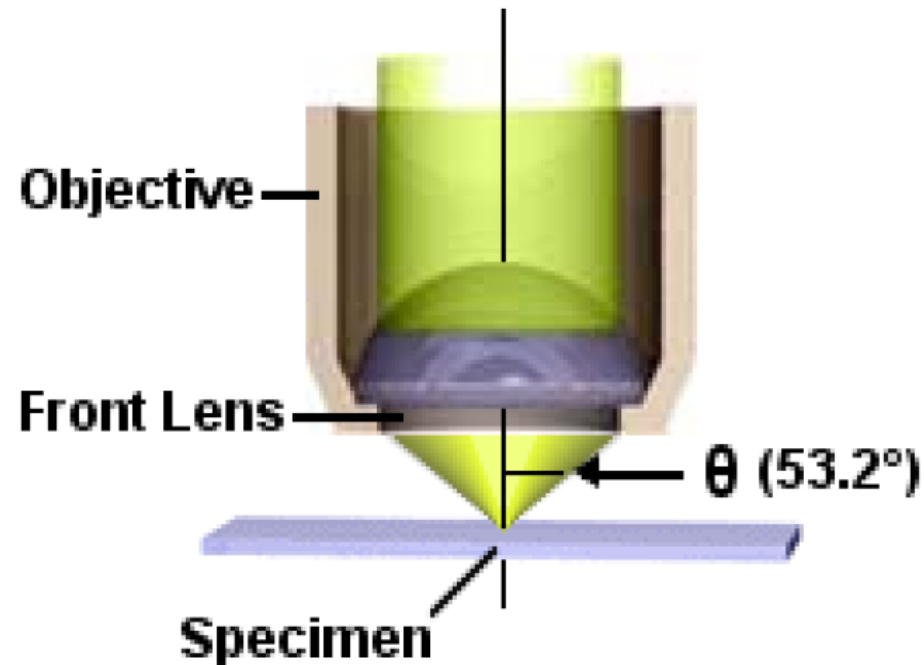
$$NA = n * \sin(\Theta)$$

n = Refractive Index (1.0 for air)

Θ = Angular Aperture

$$1.0 * \sin (53.2^\circ) = 0.8$$

$$NA = 0.8$$





Resolution Calculation

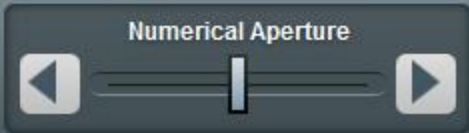
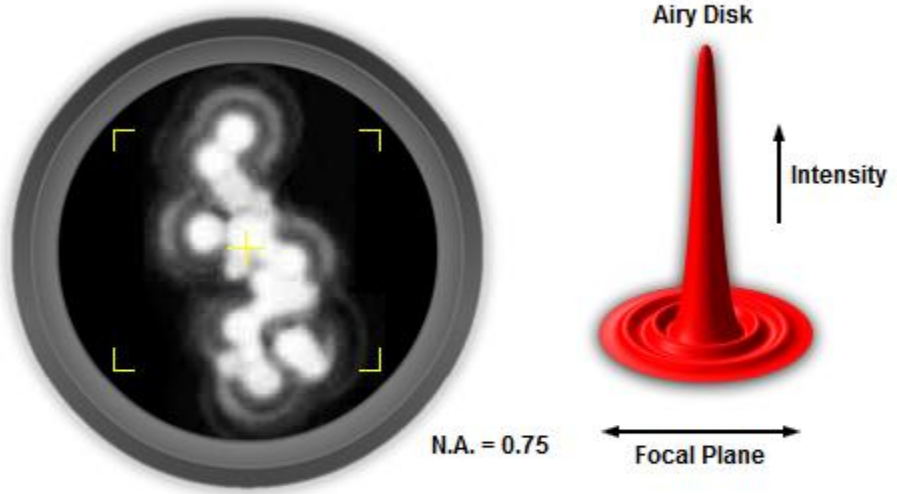
Resolution vs Magnification
Numeric Aperture
Focus depth

$$\text{Resolution (r)} = 1.22\lambda / (\text{NA}(\text{obj}) + \text{NA}(\text{cond}))$$

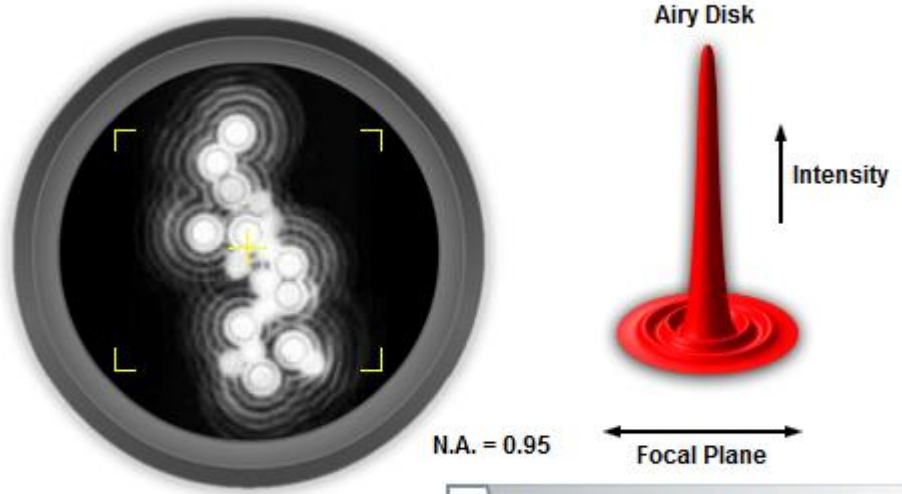
$$\text{Resolution (r)} = 0.61\lambda / \text{NA}$$

Magnification	Objective Type					
	Plan Achromat		Plan Fluorite		Plan Apochromat	
	N.A.	Resolution (μm)	N.A.	Resolution (μm)	N.A.	Resolution (μm)
4x	0.10	2.75	0.13	2.12	0.20	1.375
10x	0.25	1.10	0.30	0.92	0.45	0.61
20x	0.40	0.69	0.50	0.55	0.75	0.37
40x	0.65	0.42	0.75	0.37	0.95	0.29
60x	0.75	0.37	0.85	0.32	0.95	0.29
100x	1.25	0.22	1.30	0.21	1.40	0.20

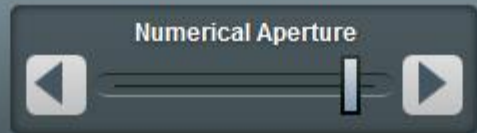
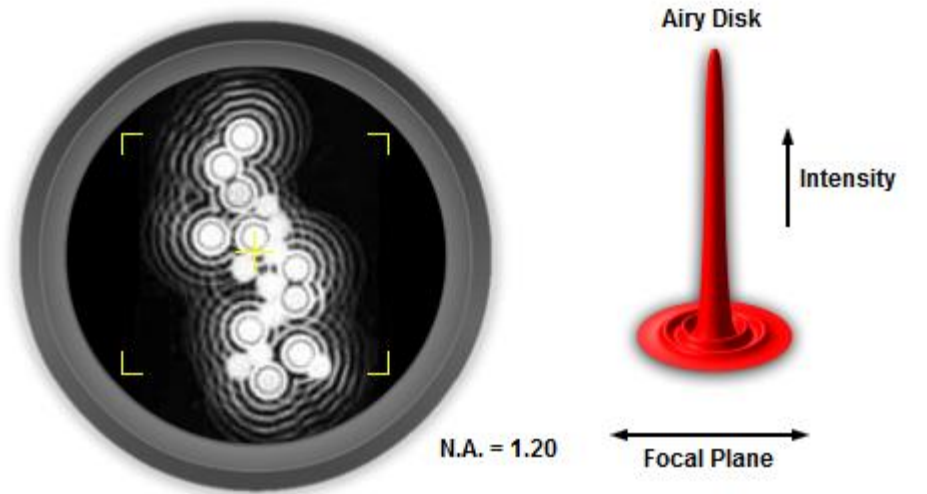
Numerical Aperture and Image Resolution



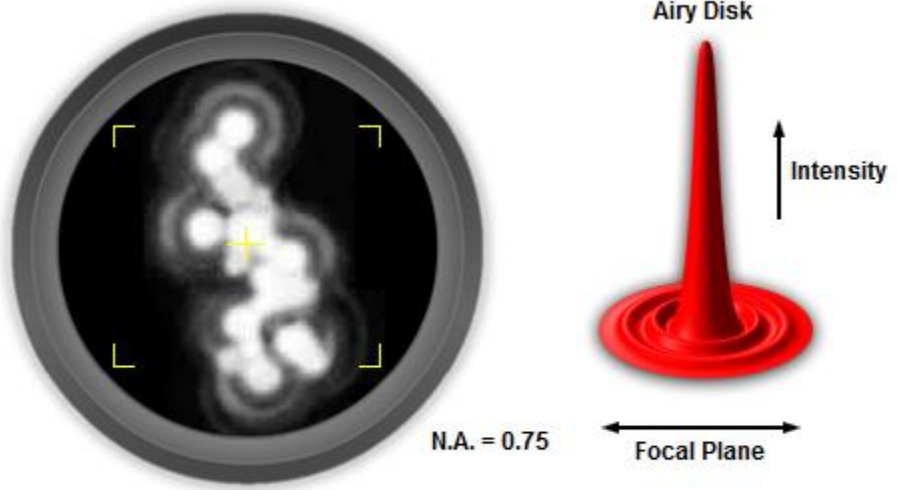
Numerical Aperture and Image Resolution



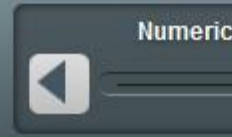
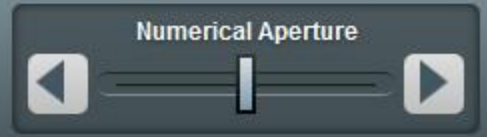
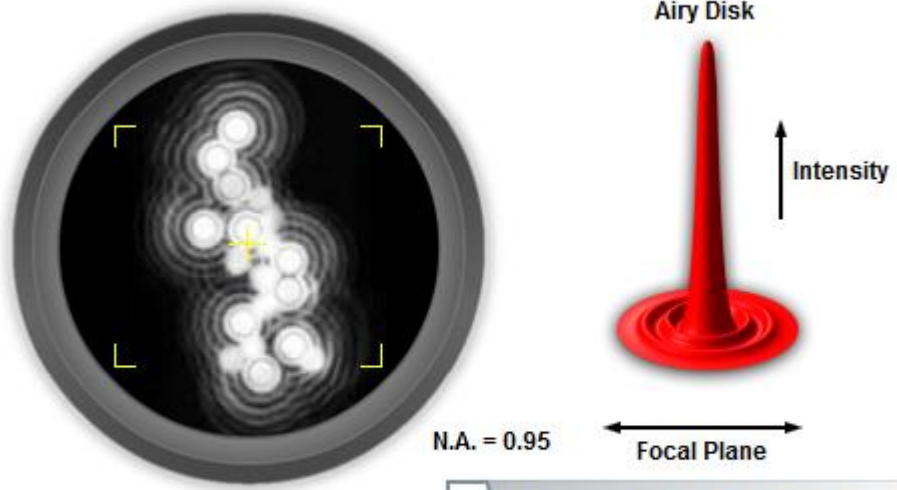
Numerical Aperture and Image Resolution



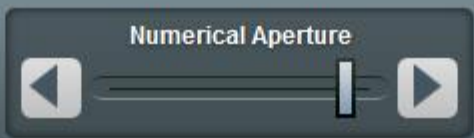
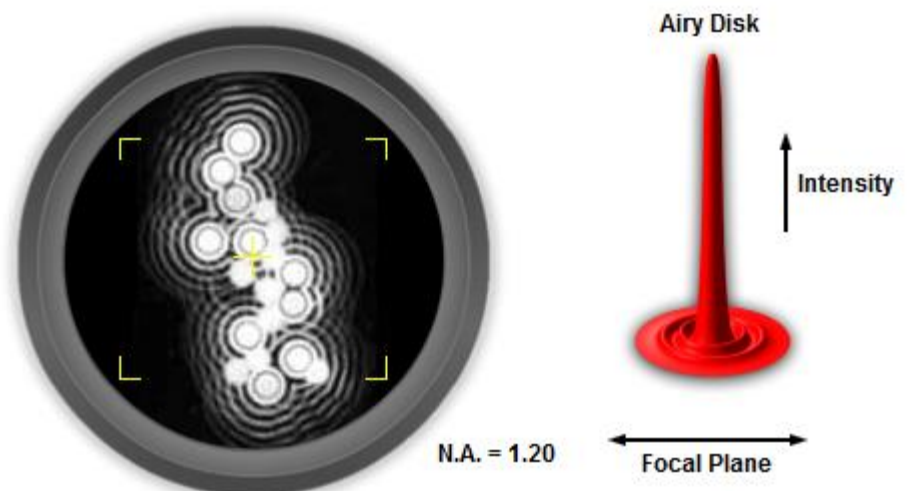
Numerical Aperture and Image Resolution



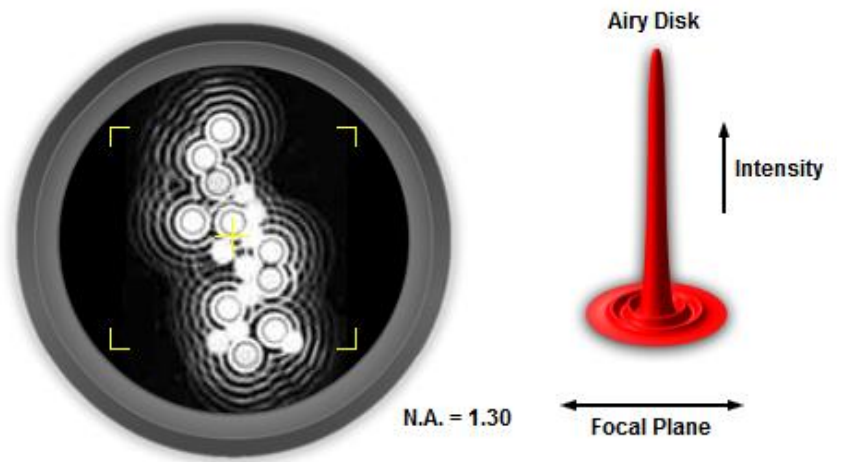
Numerical Aperture and Image Resolution

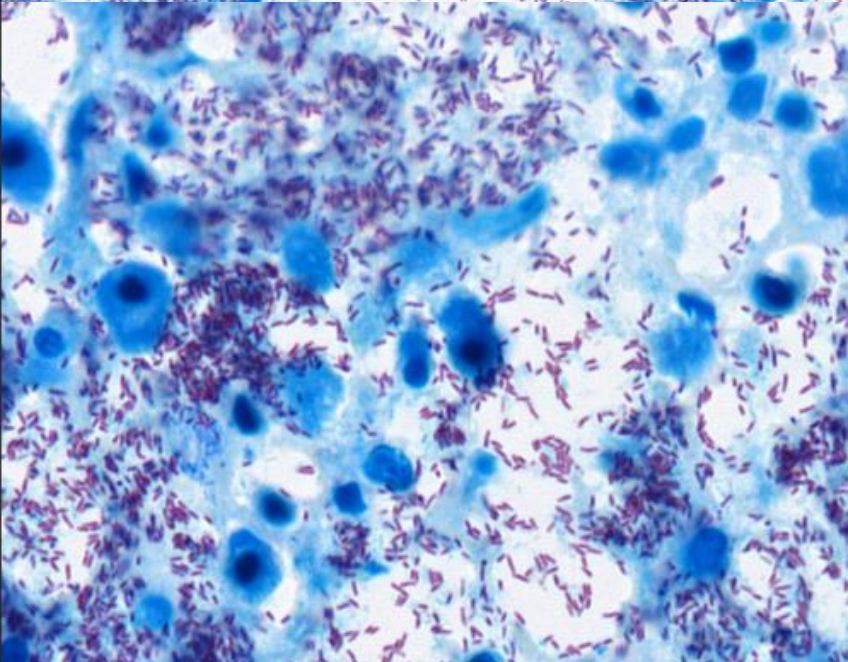
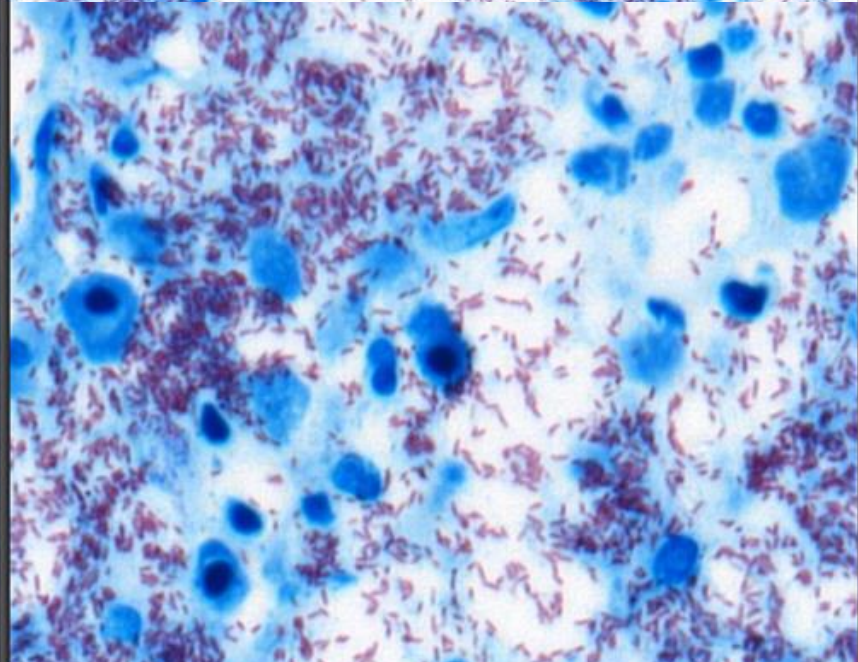
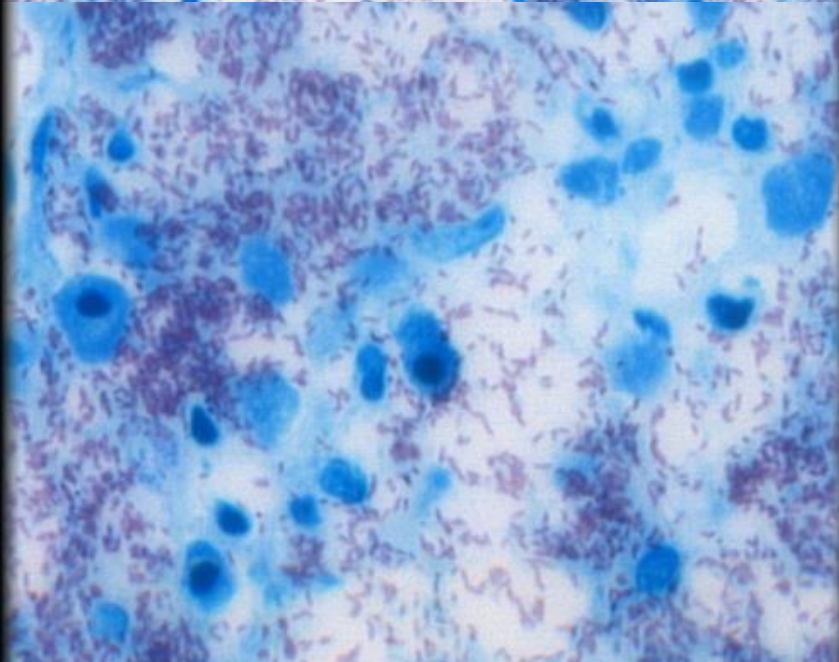
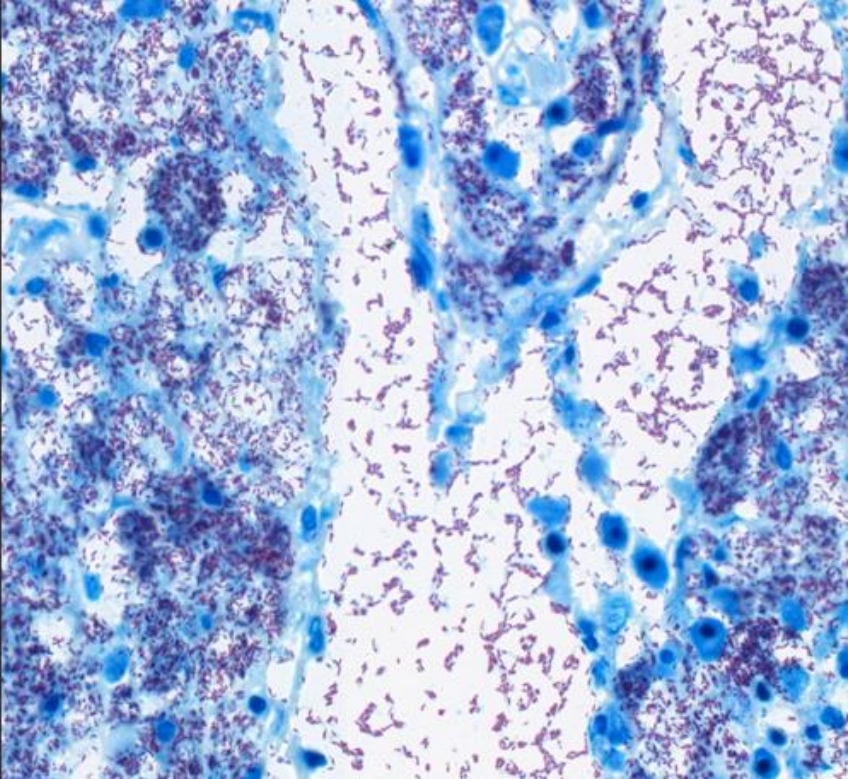
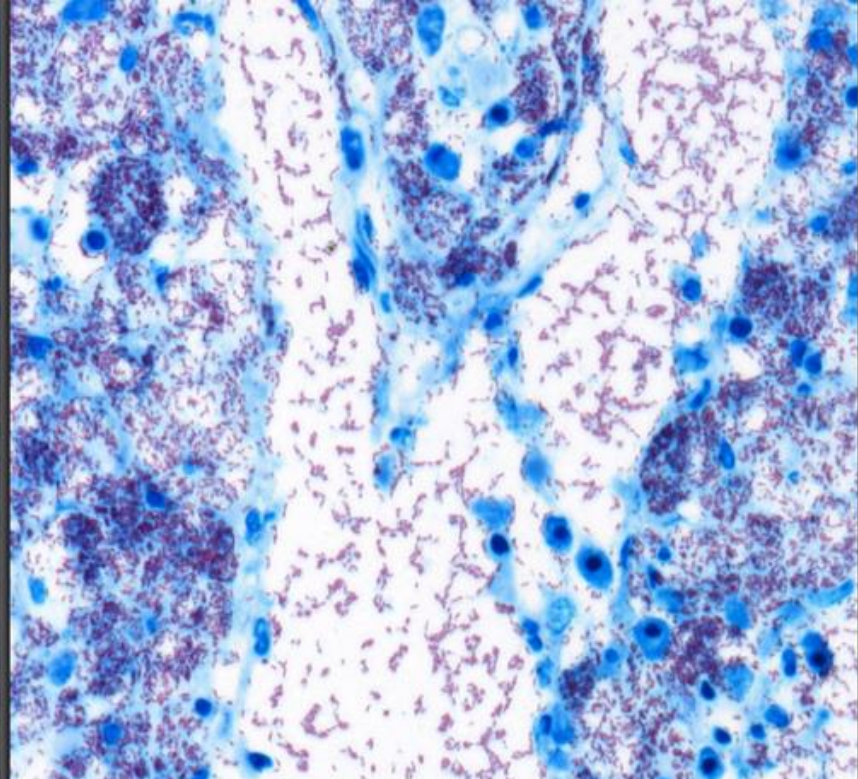
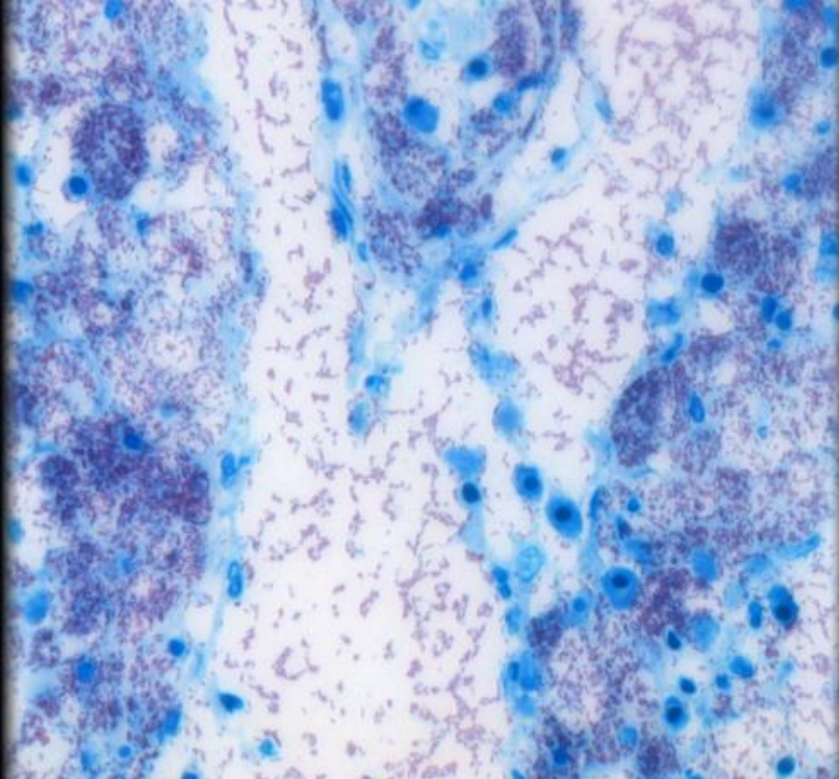


Numerical Aperture and Image Resolution



Numerical Aperture and Image Resolution







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Scanner Comparison

High Throughput BF Scanners

Pannoramic 1000	Pannoramic 250	Leica Aperio AT2	Hamamatsu S360	Philips UFS	Roche iScanHT
Area/Tile	Area/Tile	TDI/Line Scanning	TDI/Line Scanning	TDI/Line Scanning	TDI/Line Scanning
1000	250	400	360	300	250
30 sec/slide	60 sec/slide	150sec/slide	30-60sec/slide	60 sec/slide	150 sec/slide
100/hour	55/hour	20/hour	82/hour*	30/hour	20/hour
750/day	2000/day	400/day	1080/day	600/day	360/day
1"x3"/2"x3"	1"x3"	1"x3"/2"x3"	1"x3"	1"x3"	1"x3"
Z-stack	Z-stack	Z-stack	Z-stack	No	No
3 objectives	2 objectives	1 objective	1 objective	1 objective	1 objective
Water / Oil	No immersion	No immersion	No immersion	No immersion	No immersion
0.8/0.95/1.2/1.4	0.8/0.95	20x / NA 0.75	20x / NA 0.75	20x / NA 0.75	20x / NA 0.75
10x – 100x	20x 40x 80x	20x 40x	20x 40x	40x	20x 40x



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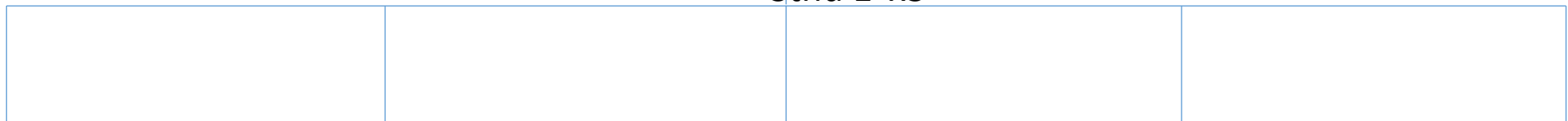


DW 2"x3"
Stnd 1"x3"

1/12/150



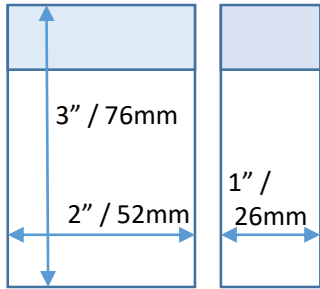
Stnd 1"x3"



Leica



Hamamatsu



DW
2"x3"

Stnd
1"x3"

Huron



Sakura



Motic





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Scanner Comparison

- Aperio CS2
- Hamamatsu SQ
- Hamamatsu S60 / S210
- Motic EasyScan / Pro
- Sakura VisionTek
- Huron LE / LE120 / PE
- Pannoramic DESK II / MIDI II / SCAN III



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Scanner Comparison

• Aperio CS2	BF	TDI	5 / 2x3	1"x3"	
• Hamamatsu SQ	BF	TDI	1	1"x3"	
• Hamamatsu S60	BF	TDI	60	1"x3"	2"x3"
• Hamamatsu S210	BF	TDI	210	1"x3"	
• Motic EasyScan / Pro	BF		1 / 6	1"x3"	
• Sakura VisionTek	BF		1	1"x3"	
• Huron LE	BF		12	1"x3" (12)	2"x3" (3) 6"X8"(1)
• Huron LE120	BF		120	1"x3" (120)	2"x3" (30) 6"X8"(10)
• Huron PE	BF		2	1"x3" (2)	2"x3" (1)
• Panoramic DESK II	BF	Area	1	1"x3" stnd	2"x3" DW
• Panoramic MIDI II	BF/FL	Area	12	1"x3" stnd	
• Panoramic SCAN III	BF/FL	Area	150	1"x3" stnd	

Live View: Panoramic and Sakura



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Scanner Comparison

• Aperio CS2	1 obj	20x/NA 0.75		Z-stack
• Hamamatsu SQ	1 obj	20x/NA 0.75		option
• Hamamatsu S60	1 obj	20x/NA 0.75		Z-stack
• Hamamatsu S210	1 obj	20x/NA 0.75		option
• Motic EasyScan / Pro	1 obj	20x/NA 0.65 / 0.75		Z-stack
• Sakura VisionTek	1 obj	20x/NA 0.5		Z-stack
• Huron LE	1 obj	20x/NA 0.75		Z-stack
• Huron LE120	1 obj	20x/NA 0.75		No
• Huron PE	1 obj	20x/NA 0.75		No
• Panoramic DESK II	1 obj	40x/NA 0.95		Z-stack
• Panoramic MIDI II	2 obj	20x/NA 0.8	40x/0.95	Z-stack
• Panoramic SCAN III	2 obj	20x/NA 0.8	40x/0.95	Z-stack



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Scanner Comparison

- Aperio CS2 4.5 min / slide @40x
- Hamamatsu SQ 4.5 min / slide @40x
- Hamamatsu S60 2.5 min / slide @40x
- Hamamatsu S210 2.5 min / slide @40x
- Motic EasyScan / Pro 6 min / slide 3 min / slide
- Sakura VisionTek 3 min / slide @20x
- Huron LE 4 min / slide @40x
- Huron LE120 4 min / slide @40x
- Huron PE 10 min / slide @40x
- Panoramic DESK II 2.5 min / slide @40x 5.5 min / slide @60x
- Panoramic MIDI II 2.5 min / slide @40x 5.5 min / slide @60x
- Panoramic SCAN III 2.5 min / slide @40x 5.5 min / slide @60x



HURON TISSUESCOPE			
LE	LE120	CF	PE
BF	BF	CONF-FL	BF
12	120	12	2
1" x 3" (12) 2" x 3" (3) 6" x 8" (1)	1" x 3" (120) 2" x 3" (30) 6" x 8" (10)	1" x 3" (12) 2" x 3" (3) 6" x 8" (1)	1" x 3" (2) 2" x 3" (1)
1 x 0.75 NA	1 x 0.75 NA	1 x 0.6 NA	1 x 0.75 NA
0.2 μm (40x) 0.4 μm (20x)	0.2 μm (40x) 0.4 μm (20x)	0.5 μm (~18x) 1.0 μm (~9x)	0.25 μm (35x) 0.5 μm (18x)
1 min 0.4 μm (20x) 4 min 0.2 μm (40x)	1 min 0.4 μm (20x) 4 min 0.2 μm (40x)	n.a. (slow)	>4 min 0.5 μm (20x) >10 min 0.25 μm (40x)
Z-stack	Z-stack		Z-stack

TissueSnap
Preview scanner
LE, LE120
1" x 3" (12) 2" x 3" (3) 6" x 8" (1)

FL: Molecular
NA 0.6 max



	Objective Type					
	Plan Achromat		Plan Fluorite	Plan Apochromat		
Magnification	N.A.	Resolution (μm)	N.A.	Resolution (μm)	N.A.	Resolution (μm)
4x	0.10	2.75	0.13	2.12	0.20	1.375
10x	0.25	1.10	0.30	0.92	0.45	0.61
20x	0.40	0.69	0.50	0.55	0.75	0.37
40x	0.65	0.42	0.75	0.37	0.95	0.29
60x	0.75	0.37	0.85	0.32	0.95	0.29
100x	1.25	0.22	1.30	0.21	1.40	0.20

SAKURA VISIONTEK		PANNORAMIC	
LIVE DIGITAL MICROSCOPE		DESK	
LIVE MODE	SCANNER MODE	SCAN+LIVE MODE	
BF	BF	BF	BF
1	1	1	1
1" x 3" (1)	1" x 3" (1)	1" x 3" (1) 2" x 3" (1)	1" x 3" (1) 2" x 3" (1)
0.075/0.3/0.5 NA	0.075/0.3/0.5 NA	1 x 0.8 NA	1 x 0.95 NA
2.2 μm (5x) 0.55 μm (10x) 0.275 μm (20x)	0.55 μm (10x) 0.275 μm (20x)	0.27 μm (40x)	0.17 μm (60x)
n.a.	3 min 0.275 μm (20x)	2,5 min 0.27 μm (40x)	8 min 0.17 μm (60x)
Z-stack	Z-stack	Z-stack	Z-stack
CCD Cam 4.1MP		CMOS 15 MP	
16 FPS (slow)		75 FPS (slow)	
LED		LED	
Plan Neofluar		Plan Apochromat	



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Pannoramic Scanner Options

	Model	Resolution	Magnification	Objective	Scanning time	Cam & Objective performance	File Size
Pannoramic SCAN II.®							
Brightfield	SCAN II 15 HR	0,17 µm	60x	(20x/0,8)	5,3 min	15 MP CMOS, 0.8 NA	2,6 GB (1748 FOV)
		0,09 µm	110x	(20x 40x/0,95)	19 min	15 MP CMOS, 0.8/0.95 NA	7,9 GB (7566 FOV)
	SCAN II 15 HS	0,27 µm	40x	(20x/0,8)	2,5 min	15 MP CMOS, 0.8 NA	1,2 GB (667 FOV)
		0,14 µm	70x	(20x 40x/0,95)	7,9 min	15 MP CMOS, 0.8/0.95 NA	3,7 GB (2832 FOV)

	Model	Resolution	Magnification	Objective	Scanning time	Cam & Objective performance	File Size
Pannoramic MIDI II.®							
Brightfield	MIDI II HR	0,17 µm	60x	(20x/0,8)	5,3 min	15 MP CMOS, 0.8 NA	2,6 GB (1748 FOV)
		0,09 µm	110x	(20x 40x/0,95)	19 min	15 MP CMOS, 0.8/0.95 NA	7,9 GB (7566 FOV)
	MIDI II HS	0,27 µm	40x	(20x/0,8)	2,5 min	15 MP CMOS, 0.8 NA	1,2 GB (667 FOV)
		0,14 µm	70x	(20x 40x/0,95)	7,9 min	15 MP CMOS, 0.8/0.95 NA	3,7 GB (2832 FOV)



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Key Differentiators

- QUALITY: Scanner optics
- FLEXIBILITY: Multiple objective / Automated changer
- EFFICIENCY: Loading capacity / Slide Management
- PRODUCTIVITY: Throughput / Scanning Speed 100/hour
- Scanner diversity
- Scanner complexity BF & FL
- Scanner image quality / resolution 10x -100x
- Scanner camera & illumination 12MP BF, SECTRA FL
- **AND THE FLASH TECHNOLOGY!!**



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Scanner Contest

2012:



2016:





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Scanner Contest

You can google it:





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The most comprehensive wholeslide scanner solution

	DESK II (1)	MIDI II (12)	MIDI CONF (12)	SCAN II (150)	FLASH III (250)	P1000 (1000)
Bright Field						
	4 options DW slides	4 options	2 options	4 options	4 options	4 options DW slides
Fluorescent						
		8 options	2 options	8 options	8 options	



3DHISTECH

Transitioning into Digital Histology

Thank you for your kind attention!

Tamas.Regenyi@3dhitech.com



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Hamamatsu

Specifications

Product name	NanoZoomer S210
Product number	C13239-01
Scanning speeds: 20× mode (15 mm × 15 mm)	Approx. 60 s
Scanning speeds: 40× mode (15 mm × 15 mm)	Approx. 150 s
Objective lens	20× (NA 0.75) User can select 20× or 40× mode at start of scanning.
Compatible glass slide	26 mm × 76 mm Thickness 0.9 mm to 1.2 mm
Slide loader (Standard size slide)	210 slides (30 slides × 7 cassettes)
Scanning resolution: 20× mode	0.46 μm/pixel
Scanning resolution: 40× mode	0.23 μm/pixel
Focusing method	Pre-Focus map
Z-stack feature	Acquires Z-stack images over entire scan area
Fluorescence imaging module	No
Barcode reader	1D barcode (standard feature), 2D barcode (option)
Image compression	JPEG compression, Uncompressed data (8 bit)
Slide format	JPEG compressed image + slide information
Power supply	AC100 V to AC240 V
Power consumption (Scanner only)	Approx. 160 VA

Specifications

Product name	NanoZoomer S60
Type number	C13210-01
Scanning speed: 20× mode (15 mm × 15 mm)	Approx. 60 s
Scanning speed: 40× mode (15 mm × 15 mm)	Approx. 150 s
Objective lens	20× (N.A. 0.75) User can select 20× or 40× mode at start of scanning
Compatible glass slides	26 mm × 76 mm (thickness from 0.9 mm to 1.2 mm) 52 mm × 76 mm (thickness from 0.9 mm to 1.2 mm) (option)
Slide loader	60 slides (20 slides of standard size × 3 cassettes) 30 slides (10 slides of double size × 3 cassettes) (option)
Scanning resolution: 20× mode	0.46 μm/pixel
Scanning resolution: 40× mode	0.23 μm/pixel
Focusing method	Pre-Focus map
Z-stack feature	Option
Barcode reader	1D barcode (standard feature), 2D barcode (option)
Image compression	JPEG compression, Uncompressed data (8 bit)
Slide format	JPEG compressed image + slide information
Power supply	AC 100 V to AC 240 V, 50 Hz/60 Hz
Power consumption (Scanner only)	Approx. 225 VA



Hamamatsu

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Specifications

Product name	NanoZoomer S360
Product number	C13220-01
Scanning speeds: 20× mode (15 mm × 15 mm)	Approx. 30 s
Scanning speeds: 40× mode (15 mm × 15 mm)	Approx. 30 s
Throughput: 20× mode (15 mm × 15 mm)	More than 82 slides/h*1
Throughput: 40× mode (15 mm × 15 mm)	More than 82 slides/h*1
Objective lens	20× (NA 0.75) User can select 20× or 40× mode at start of scanning.
Compatible glass slide	26 mm × 76 mm Thickness 0.9 mm to 1.2 mm
Slide loader (Standard size slide)	360 slides (30 slides × 12 cassettes)
Scanning resolution: 20× mode	0.46 μm/pixel
Scanning resolution: 40× mode	0.23 μm/pixel
Focusing method	Pre-Focus map
Z-stack feature	Yes
Fluorescence imaging module	No
Image compression	JPEG compression
Power supply	AC100 V to AC240 V
Power consumption (Scanner only)	Approx. 200 VA

*1 For the case of 5 focus points

Specifications

Product name	NanoZoomer-XR
Product number	C12000-01
Scanning speeds: 20× mode (15 mm × 15 mm)	Approx. 35 s
Scanning speeds: 40× mode (15 mm × 15 mm)	Approx. 45 s
Objective lens	20× (NA 0.75) User can select 20× or 40× mode at start of scanning.
Compatible glass slide	26 mm × 76 mm Thickness 0.9 mm to 1.2 mm
Slide loader (Standard size slide)	320 slide (40 slides × 8 cassettes)
Scanning resolution: 20× mode	0.46 μm/pixel
Scanning resolution: 40× mode	0.23 μm/pixel
Focusing method	Pre-Focus map / Dynamic Pre-focus
Z-stack feature	Acquires Z-stack images over entire scan area
Fluorescence imaging module	Option
Barcode reader	1D barcode (standard feature), 2D barcode (option)
Image compression	JPEG compression, Uncompressed data (8 bit)
Slide format	JPEG compressed image + slide information
Power supply	AC100 V to AC240 V
Power consumption (Scanner only)	Approx.300 VA

*1 For the case of 5 focus points



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Motic

TECHNICAL DATA

	<i>EASY SCAN</i>	<i>EASY SCAN</i> ^{EXT}
Objective	High NA APO 20X (NA 0.65)	UltraHigh NA APO 20X (NA 0.75)
Scanning time 15x15mm	6 min (40X magnification)	3 min (40X magnification)
Focus	Medium Fast Autofocus	Fast Realtime Autofocus
Camera sensor	Fast Speed CCD 0.5ms @ 15 fps · 2/3" CCD Sensor	
Resolution	20X: 0.5µm/pixel (binning); 40X: 0.25µm/pixel	
Optical System	CCIS® Infinity optics, 10W LED light source, Lifetime: >30,000 hours	
Slide capacity	1 and 6 Slide-Magazine	
Scanning Process	Automatic and Manual ROI mode One Click Scanning High Speed Autofocus Multi-Layer 3D High Precision Single Field Focusing	
Slide dimensions	Tolerances - Length: 76 (+0/-1) Width: 26 (+0/-1) Thickness: +0.1/-0.2	
Computer / Monitor	Dell workstation (RAM 8G, HD 1TB), 24" LCD Monitor	



TissueScope LE Key Features

- Easy to use
- Fast: <1 minute per slide, 15mm x 15mm @20X
- Sharp, clear image quality up to 40X magnification
- Scan up to twelve standard 1" x 3" slides, or any size up to 6" x 8" for unmatched versatility
- Z-Stack scanning
- Image-based barcode scanning
- Pair with the [TissueSnap preview station](#) for enhanced workflow optimization

TissueScope LE Technical Specifications

Imaging Mode

Brightfield

<1 minute per slide, 15mm x 15mm @20X magnification

Slide Formats

25mm x 75mm (1" x 3")
50mm x 75mm (2" x 3")
Whole mount slides up to 150mm x 200mm (6" x 8")

File Format

Non-proprietary 24-bit RGB Pyramidal BigTIFF
Uncompressed, or JPEG 2000 Compression
Export to JPEG, Flat TIFF and LZW Compressed TIFF

Dimensions & Weight

61cm (24.1") Width
56cm (22.2") Length
40cm (15.9") Height
39Kg (85lbs) Weight

Optical Resolution

0.75 NA

Resolution (µm/pixel)

0.2 at 40X
0.4 at 20X

Certification

CSA/UL/CE

Scan Speed

Warranty

Key Features

- Easy to use
- Fast: <1 minute per slide, 15mm x 15mm @20X
- Scan up to 120 brightfield slides continuously with automatic setup and non-stop operation
- Scan standard 1" x 3" and 2" x 3" slides as well as any size up to 6" x 8"
- Image-based barcode reading
- Pair with the [TissueSnap preview station](#) for enhanced workflow optimization

Technical Specifications

Imaging Mode

Brightfield

<1 minute per slide, 15mm x 15mm @20X

Slide Formats

25mm x 75mm (1" x 3")
50mm x 75mm (2" x 3")
Whole mount slides up to 150mm x 200mm (6" x 8")

File Format

Non-proprietary 24-bit RGB Pyramidal BigTIFF
Uncompressed, or JPEG 2000 Compression
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Optical Resolution

0.75 NA

Resolution (µm/pixel)

0.2 at 40X
0.4 at 20X

Certification

CSA/UL/CE

Scan Speed

Warranty



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Sakura





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Sakura



Specifications VisionTek® Live Digital Microscope

Intended Specimen	Observable Specimen	Glass slide with cover glass/film
	Size of Glass Slide	W x L: 25 x 75 mm or 26 x 76 mm D (thickness): 1.0 mm standard ± 0,2 mm
	Size of Cover Glass	Coverslip thickness: 100-170 µm, Typical coverslip material: D263® M glass (microscope cover glass) Cellulose Tri-Acetate film (microscope cover film)
	Mounting Media	Usually the slides are prepared using the following mounting media: Sakura film coverslip, Sakura glass mounting media, Eukitt
Microscope Frame	Observable area	Label: 24 x 20 mm Specimen : 24 x 50 mm Specimen need to be covered with cover glass or coverslip
	Illuminator	Bright field Koehler LED Illumination
	Objective Lenses	Carl Zeiss EC Plan-Neofluar 2.5x/0.075 Carl Zeiss EC Plan-Neofluar 10x/0.3 Carl Zeiss EC Plan-Neofluar 20x/0.5 40x digital magnification
	Motorized Stage	Motorized XY stage with automatic control Automated lens changer
	Focusing	Motorized automatic and manually focus
Digital Camera	CCD Camera	4.1M pixel (2336 x 1752 px; Pixel size 5,5 µm); high sensitivity and high resolution camera
	Live image display	16 frames/sec.
	Image file format	Scan: Proprietary Open format under development Snap shot: BMP, JPEG, TIFF

	Image Correction	Calibrated: Color Correction Shading correction White balance Distortion correction User settable: Brightness Contrast Sharpness
	Scan Area	W x L: 24 x 50 mm
Scan	Resolution	2.5x : 2.20 µm/ pixel 10x : 0.55 µm/ pixel 20x : 0.275µm/ pixel
	Scan Speed (15mm x 15mm)	175 sec using high resolution 20x (0.275µm/px)
System Control	Computer	DELL Minitower with Operating system windows 7 x 64 bit; Ultimate SP1 English; CPU Core i7
	Network Interface	100/1000 Mbit/s Ethernet
	Memory	Min. 8 GB RAM
	Hard Disc Drive	Primary: min. 120Gb Secondary: min. 1,0Tb
	Display	NEC Multisync PA241W
	VisionTek®	Fully automated User Interface
	Application Software	Live Mode: automated and manual autofocus zooming / panning / scrolling zooming while scanning annotations and measurements digital gallery live slide gallery Multi image display: comparison of views on slide, different slides, digital slides Scanner Mode: partial slide scanning automated whole slide scans z-stacking (multilayer) automated tissue detection