

TriTom – Premium Edition

Small Animal Whole Body Photoacoustic
Fluorescence Tomography (PAFT)



Specifications

PhotoAcoustic (PA) Imaging Channel		
Type	3D	<i>High-resolution deep tissue molecular, physiological, and ana-tomical imaging, subcutaneous & skin imaging</i>
Spatial resolution	160 μm x 160 μm 160 μm x 470 μm	<i>Transverse anatomical planes Sagittal and coronal anatomical planes</i>
Molecular imaging sensitivity	100 nM ICG	<i>In blood plasma, multispecies molecular unmixing, CNR 1.7</i>
PA excitation range	460 - 1300 nm	
Detection points per scan	> 69,000	<i>Single scan, 360 deg azimuthal rotation</i>
Detector configuration	Curve-linear array	<i>Cylindrical focusing</i>
Detector central frequency	6 MHz \pm 10%	<i>T/R measurements, optimized sensitivity in receive mode</i>
Detector bandwidth @ -6 dB	\geq 55%	<i>T/R measurements</i>
Number of array elements	96	<i>Wide-angle 3D imaging transducers</i>
Detector working environment	<i>Continuous immersion under 0.5 m of water between 10 and 40°C, EM shielded, protected from impact of laser light</i>	
PA signal digitizer	LEGION ADC	<i>12-bit, 256 parallel channels, up to 400 Hz frame rate, 40 MHz sampling rate, programmable amplifier 46-91 dB</i>

Fluorescence (FL) Imaging Channel		
Type	3D or real-time 2D	<i>Molecular imaging, co-registered with PA Imaging Channel & visible-light image of the test subject Real-time 2D imaging in coronal, sagittal or any intermediate view at 20 fps</i>
Spatial resolution	70 μm x 125 μm	<i>At a skin level of a live test subject</i>
FL excitation range	460 - 800 nm	
Excitation linewidth	< 1 nm	<i>Tuning step - 1 nm, equivalent to employing 340 extremely nar-row-band excitation filters</i>
Emission filter set	8 filters covering emission range between 510 nm and 995 nm, 2 additional filter slots available	
Optical filter wheel	Programmatically controlled filter positioning	
Detector type	Back-illuminated sCMOS	<i>High sensitivity cooled scientific camera</i>
Bit depth	16-bit	
Number of pixels	2048 x 2048	
Pixel resolution	19.5 μm	
Max frame rate	40 fps	
Dynamic range	86 dB	
Quantum efficiency	95% @ 600 nm	<i>30% - 95% in 400 - 900 nm spectral range</i>
Readout noise	1.2 e-	<i>Low readout noise for high frame rate applications</i>
Dark current	< 0.008 e-/pixel	<i>For 50 ms or shorter exposures</i>

Control Station (typical specs are provided, subject to change without notice)		
Form Factor	Desktop	<i>MidTower or Mini ITX case</i>
Configuration	High-performance Nvidia GPU, high-performance SSD, MS Windows 10 or 11, 1440p or high-er resolution monitor, keyboard, mouse	
Imaging Software	TriTom Imaging Suite - <i>for data acquisition, image reconstruction, and molecular imaging</i> 3D Slicer - <i>for visualization & image analysis</i>	
Data formats	Scan data: <i>raw, mat</i> ; 3D Image: <i>PA/FL - mat, vtk</i> ; 2D Image (video): <i>FL/Vis - raw, mat, png, tif (mp4)</i>	

Image Acquisition Unit		
Single scan time	36 s	360 deg azimuthal rotation, 720 data frames
Scan types	<i>Continuous azimuthal rotation or reverse scans (□ 360 deg), time-limited by 10 min</i>	
Excitation sequence	<i>Single wavelength; Linear or custom wavelength sweep; Popular spectral unmixing pre-sets for molecular, physiological and anatomical imaging</i>	
Max size of a single-scan 3D image	30 mm x 30 mm x 30 mm	
Whole body imaging	<i>Enabled as a stack of 3D volumes, manual axial positioning of the test subject for opti-mized single-scan imaging of head/neck, chest, or abdomen regions; 10 mm positioning steps, 40 mm total positioning range, 70 mm total imaging range</i>	
In vivo imaging subjects	<i>Mice, rats (< 200 g); any fur should be shaved/depilated from the studied section of the body before imaging procedure</i>	
Max weight of the test subject	0.5 kg	
Coupling medium	DI water	<i>Subject is submerged under anesthesia during the scan, de-gassing enabled</i>
Environment temperature control	20-40 ± 0.5 °C	<i>Controlled heating and circulation of the coupling liquid</i>
Test subject monitoring	<i>Visual monitoring with a camera</i>	
Laser safety	<i>Light-tight imaging chamber, laser interlocks, no eye protection required</i>	
Chassis type	Benchtop	
Dimensions (L x W x H)	78 cm x 35 cm x 70 cm	<i>55 cm x 35 cm footprint</i>
Power requirements	208-240 V 4A or 120 V 8A, 50/60 Hz	

Laser Excitation Unit		
Tunable wavelength range	650 - 1300 nm & 460 - 649 nm	
Pulse repetition frequency	20 Hz	
Pulse Energy	> 130 mJ @ 700 nm > 10 mJ @ 500 nm	<i>Before fiber bundle transmission</i>

High-energy excitation @ 1064 nm	> 350 mJ	
Energy meter	<i>Real-time automatic pulse energy measurements</i>	
Fast wavelength switching (FWS)	<i>Change to any wavelength between 650 - 1300 nm or 460 - 649 nm every 50 ms</i>	
Chassis type	Mobile	<i>Rolled on wheels, positioned on the floor next to the Image Acquisition Unit</i>
Dimensions (L x W x H)	68 cm x 44 cm x 89 cm	
Power requirements	120, 208 or 240 VAC, single phase 50/60 Hz, < 1.5 kVA	

Excitation Fiberoptic Bundle	
Transmission	> 70%
Excitation spot, axial size	30 mm
Length	2 m

Accessories		
Gas Anesthesia System	Mice and small rats	<i>Includes animal induction chamber</i>
Mouse restrainer	<i>B-type optimized for imaging abdominal region and legs of a live mouse H-type optimized for imaging thoracic region, head and neck of a live mouse</i>	
Microcuvette holder	<i>An accessory for scanning up to ten 50 µl cuvettes containing liquid samples, quick setup</i>	
Microcuvettes	<i>Cylindrical PTFE cuvettes, 0.8 mm ID, 50 µm wall thickness, for making □ 50 µl samples</i>	
Containers for coupling liquid	<i>Used to fill and drain the Image Acquisition Unit with coupling liquid</i>	