

## TriTom - Standard Edition

Small Animal Whole Body Photoacoustic  
Fluorescence Tomography (PAFT)



### Specifications

PhotoAcoustic (PA) Imaging Channel		
<b>Type</b>	3D	<i>High-resolution deep tissue molecular, physiological, and ana-tomical imaging, subcutaneous &amp; skin imaging</i>
<b>Spatial resolution</b>	160 $\mu\text{m}$ x 160 $\mu\text{m}$ 160 $\mu\text{m}$ x 470 $\mu\text{m}$	<i>Transverse anatomical planes Sagittal and coronal anatomical planes</i>
<b>Molecular imaging sensitivity</b>	100 nM ICG	<i>In blood plasma, multispecies molecular unmixing, CNR 1.7</i>
<b>PA excitation range</b>	532 nm & 650 - 1300 (2300) nm	<i>Extension to 2300 nm with an optional OPO idler</i>
<b>Detection points per scan</b>	> 69,000	<i>Single scan, 360 deg azimuthal rotation</i>
<b>Detector configuration</b>	Curve-linear array	<i>Cylindrical focusing</i>
<b>Detector central frequency</b>	6 MHz $\pm$ 10%	<i>T/R measurements, optimized sensitivity in receive mode</i>
<b>Detector bandwidth @ - 6 dB</b>	$\geq$ 55%	<i>T/R measurements</i>
<b>Number of array elements</b>	96	<i>Wide-angle 3D imaging transducers</i>
<b>Detector working environment</b>	<i>Continuous immersion under 0.5 m of water between 10 and 40°C, EM shielded, protected from impact of laser light</i>	
<b>PA signal digitizer</b>	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		
<b>Type</b>	3D or real-time 2D	<i>Molecular imaging, co-registered with PA Imaging Channel &amp; visible-light image of the test subject Real-time 2D imaging in coronal, sagittal or any intermediate view at 20 fps</i>
<b>Spatial resolution</b>	70 $\mu\text{m}$ x 125 $\mu\text{m}$	<i>At a skin level of a live test subject</i>
<b>FL excitation range</b>	532 nm, 650 - 800 nm	
<b>Excitation linewidth</b>	< 1 nm	<i>Tuning step - 1 nm, equivalent to employing 150 extremely nar-row-band excitation filters</i>
<b>Emission filter set</b>	4 filters covering emission range between 555 nm and 870 nm, 6 additional filter slots available	
<b>Optical filter wheel</b>	Programmatically controlled filter positioning	
<b>Detector type</b>	FSI sCMOS	<i>Air-cooled scientific camera</i>
<b>Bit depth</b>	16-bit	
<b>Number of pixels</b>	2048 x 2040	
<b>Pixel resolution</b>	19.5 $\mu\text{m}$	
<b>Max frame rate</b>	35 Hz	
<b>Dynamic range</b>	86 dB	
<b>Quantum efficiency</b>	72% @ 595 nm	<i>25% - 72% in 400 - 900 nm spectral range</i>
<b>Readout noise</b>	2.0 e-	<i>Low readout noise for high frame rate applications</i>
<b>Dark current</b>	< 0.006 e-/pixel	<i>For 50 ms or shorter exposures</i>

Control Station (typical specs are provided, subject to change without notice)		
<b>Form Factor</b>	Desktop	<i>MidTower or Mini ITX case</i>
<b>Configuration</b>	High-performance Nvidia GPU, high-performance SSD, MS Windows 10 or 11, 1440p or high-er resolution monitor, keyboard, mouse	
<b>Imaging Software</b>	TriTom Imaging Suite - <i>for data acquisition, image reconstruction, and molecular imaging</i> 3D Slicer - <i>for visualization &amp; image analysis</i>	
<b>Data formats</b>	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		
<b>Single scan time</b>	36 s	360 deg azimuthal rotation, 720 data frames
<b>Scan types</b>	Continuous azimuthal rotation or reverse scans ( $\square$ 360 deg), time-limited by 10 min	
<b>Excitation sequence</b>	Single wavelength; Linear or custom wavelength sweep; Popular spectral unmixing pre-sets for molecular, physiological and anatomical imaging	
<b>Max size of a single-scan 3D image</b>	30 mm x 30 mm x 30 mm	
<b>Whole body imaging</b>	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	
<b>In vivo imaging subjects</b>	Mice, rats (< 200 g); any fur should be shaved/depilated from the studied section of the body before imaging procedure	
<b>Max weight of the test subject</b>	0.5 kg	
<b>Coupling medium</b>	DI water	Subject is submerged under anesthesia during the scan, de-gassing enabled
<b>Environment temperature control</b>	20-40 $\pm$ 0.5 $^{\circ}$ C	Controlled heating and circulation of the coupling liquid
<b>Test subject monitoring</b>	Visual monitoring with a camera	
<b>Laser safety</b>	Light-tight imaging chamber, laser interlocks, no eye protection required	
<b>Chassis type</b>	Benchtop	
<b>Dimensions (L x W x H)</b>	78 cm x 35 cm x 70 cm	55 cm x 35 cm footprint
<b>Power requirements</b>	208-240 V 4A or 120 V 8A, 50/60 Hz	

Laser Excitation Unit		
<b>Tunable wavelength range</b>	532 nm & 650 - 1300 nm	Option: Vis-NIR II, dual-range FWS (650 - 1300 nm & 1065 - 2300 nm)
<b>Pulse repetition frequency</b>	20 Hz	
<b>Pulse Energy</b>	> 160 mJ @ 700 nm > 20 mJ @ 532 nm	Before fiber bundle transmission
<b>Energy meter</b>	Real-time automatic pulse energy measurements	
<b>Fast wavelength switching (FWS)</b>	Change to any wavelength between 650 - 1300 nm every 50 ms	

<b>Chassis type</b>	Mobile	<i>Rolled on wheels, positioned on the floor next to the Image Acquisition Unit</i>
<b>Dimensions (L x W x H)</b>	68 cm x 44 cm x 89 cm	
<b>Power requirements</b>	120, 208 or 240 VAC, single phase 50/60 Hz, < 1.5 kVA	

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

Accessories		
<b>Gas Anesthesia System</b>	Mice and small rats	<i>Includes animal induction chamber</i>
<b>Mouse restrainer</b>	<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>	
<b>Microcuvette holder</b>	<i>An accessory for scanning up to ten 50 µl cuvettes containing liquid samples, quick setup</i>	
<b>Microcuvettes</b>	<i>Cylindrical PTFE cuvettes, 0.8 mm ID, 50 µm wall thickness, for making □ 50 µl samples</i>	
<b>Containers for coupling liquid</b>	<i>Used to fill and drain the Image Acquisition Unit with coupling liquid</i>	