

TriTom

Small Animal Whole Body Photoacoustic
Fluorescence Tomography (PAFT)



Specifications

PHOTOACOUSTIC (PA) IMAGING CHANNEL		
Type	3D	<i>High-resolution deep tissue molecular, physiological, and anatomical 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	532 nm & 650 - 1300 (2300) nm	<i>Extension to 2300 nm with an optional OPO idler</i>
Detection Points Per Scan	> 34,500 (> 69,000)	<i>Single scan, 360 deg azimuthal rotation (with optional 20 Hz upgrade of the Laser Excitation Unit)</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>

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, two monitors, 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>mat, vtk</i>	

IMAGE ACQUISITION UNIT		
Single Scan Time	36 s	<i>360 deg azimuthal rotation, 360 (720) data frames</i>
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 Volume of a 3D Image	<i>30 x 30 x 30 mm³ (50 x 50 x 50 mm³ for an optional larger excitation spot)</i>	
Whole Body Imaging	<i>Enabled as a stack of 3D volumes, manual axial positioning of the test subject for optimized single-scan imaging of head/neck, chest, or abdomen regions, 10 mm positioning steps, 40 mm total positioning range, 70 (90) 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 Liquid	DI water	<i>Subject is submerged under anesthesia during the scan, degassing available</i>
Environment Temperature Control	20-40 \pm 0.5 °C	<i>Controlled heating and circulation of the coupling liquid</i>
Test Subject Monitoring	<i>Continuous 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)	69 cm x 35 cm x 69 cm	
Power Requirements	208-240 V, 4A or 120 V, 8A, 50/60 Hz	

LASER EXCITATION UNIT		
Tunable Wavelength Range	532 nm & 650 - 1300 nm	<i>Option: Vis-NIR II, dual-range FWS (650 - 1300 nm & 1065 - 2300 nm)</i>
Pulse Repetition Frequency	10 (20) Hz	<i>Optional upgrade to 20 Hz</i>
Pulse Energy	> 180 mJ @ 700 nm > 20 mJ @ 532 nm	<i>For a 20 Hz PRF option, max pulse energy 160 mJ @ 700 nm</i>
Energy Meter	<i>Real-time automatic pulse energy measurements</i>	
Fast Wavelength Switching (FWS)	Change to any wavelength between 650 - 1300 nm every 100 (50) ms	
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	208 or 240 VAC, single phase 50/60 Hz, < 1.5 kVA	
EXCITATION FIBEROPTIC BUNDLE		
Transmission	> 70%	
Excitation spot, axial size	30 mm (50 mm)	<i>Standard (optional)</i>
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>	