

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	> 69,000	<i>Single scan, 360 deg azimuthal rotation</i>
Detector configuration	Curve-linear array	<i>Cylindrical focusing</i>
Detector central frequency	6 MHz ± 10%	<i>T/R measurements, optimized sensitivity in receive mode</i>
Detector bandwidth @ -6 dB	≥ 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	532 nm, 650 - 800 nm	
Excitation linewidth	< 1 nm	<i>Tuning step - 1 nm, equivalent to employing 150 extremely narrow-band excitation filters</i>
Emission filter set	4 filters covering emission range between 555 nm and 870 nm, 6 additional filter slots available	
Optical filter wheel	Programmatically controlled filter positioning	
Detector type	FSI sCMOS	<i>Air-cooled scientific camera</i>
Bit depth	16-bit	
Number of pixels	2048 x 2040	
Pixel resolution	19.5 μm	
Max frame rate	35 Hz	
Dynamic range	86 dB	
Quantum efficiency	72% @ 595 nm	<i>25% - 72% in 400 - 900 nm spectral range</i>
Readout noise	2.0 e-	<i>Low readout noise for high frame rate applications</i>
Dark current	< 0.006 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 higher 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	Continuous azimuthal rotation or reverse scans (≤ 360 deg), time-limited by 10 min	
Excitation sequence	Single wavelength; Linear or custom wavelength sweep; Popular spectral unmixing pre-sets for molecular, physiological and anatomical imaging	
Max size of a single-scan 3D image	30 mm x 30 mm x 30 mm	
Whole body imaging	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 mm total imaging range	
In vivo imaging subjects	Mice, rats (< 200 g); any fur should be shaved/depilated from the studied section of the body before imaging procedure	
Max weight of the test subject	0.5 kg	
Coupling medium	DI water	Subject is submerged under anesthesia during the scan, degassing enabled
Environment temperature control	20-40 \pm 0.5 $^{\circ}$ C	Controlled heating and circulation of the coupling liquid
Test subject monitoring	Visual monitoring with a camera	
Laser safety	Light-tight imaging chamber, laser interlocks, no eye protection required	
Chassis type	Benchtop	
Dimensions (L x W x H)	78 cm x 35 cm x 70 cm	55 cm x 35 cm footprint
Power requirements	208-240 V 4A or 120 V 8A, 50/60 Hz	

Laser Excitation Unit		
Tunable wavelength range	532 nm & 650 - 1300 nm	Option: Vis-NIR II, dual-range FWS (650 - 1300 nm & 1065 - 2300 nm)
Pulse repetition frequency	20 Hz	
Pulse Energy	> 160 mJ @ 700 nm > 20 mJ @ 532 nm	Before fiber bundle transmission
Energy meter	Real-time automatic pulse energy measurements	
Fast wavelength switching (FWS)	Change to any wavelength between 650 - 1300 nm every 50 ms	
Chassis type	Mobile	Rolled on wheels, positioned on the floor next to the Image Acquisition Unit
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	Includes animal induction chamber
Mouse restrainer	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	
Microcuvette holder	An accessory for scanning up to ten 50 μ l cuvettes containing liquid samples, quick setup	
Microcuvettes	Cylindrical PTFE cuvettes, 0.8 mm ID, 50 μ m wall thickness, for making ≤ 50 μ l samples	
Containers for coupling liquid	Used to fill and drain the Image Acquisition Unit with coupling liquid	