

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 anatomical imaging, subcutaneous & skin imaging</i> |
| Spatial resolution | 160µm x 160µm 160µm x 470µm | <i>Transverse anatomical planes Sagittal and coronal anatomical planes</i> |
| Molecular imaging sensitivity | 100nM ICG | <i>In blood plasma, multispecies molecular unmixing, CNR 1.7</i> |
| PA excitation range | 460 - 1300nm | |
| 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 | 6MHz ± 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 0.5m 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 400Hz frame rate, 40MHz sampling rate, programmable amplifier 46-91dB</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 | 70µm x 125µm | <i>At a skin level of a live test subject</i> |
| FL excitation range | 460 - 800 nm | |
| Excitation linewidth | < 1nm | <i>Tuning step - 1nm, equivalent to employing 340 extremely narrow-band excitation filters</i> |
| Emission filter set | 8 filters covering emission range between 510nm and 995nm, 2 additional filter slots available | |
| Optical filter wheel | Programmatically controlled filter positioning | |

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| Detector type | Back-illuminated sCMOS | <i>High-sensitivity cooled scientific camera</i> |
| Bit depth | 16-bit | |
| Number of pixels | 2048 x 2048 | |
| Pixel resolution | 19.5µm | |
| Max frame rate | 40 fps | |
| Dynamic range | 86dB | |
| Quantum efficiency | 95% @ 600nm | <i>30% - 95% in 400 - 900nm 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 50ms 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 | 36s | <i>360 deg azimuthal rotation, 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 size of a single-scan 3D image | 30mm x 30mm x 30mm | |
| 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; 10mm positioning steps, 40mm total positioning range, 70mm total imaging range</i> | |
| In vivo imaging subjects | <i>Mice, rats (< 200g); any fur should be shaved/depilated from the studied section of the body before imaging procedure</i> | |
| Max weight of the test subject | 0.5kg | |
| 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> | |

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| Chassis type | Benchtop | |
| Dimensions (L x W x H) | 78cm x 35cm x 70cm | 55cm x 35cm footprint |
| Power requirements | 208-240V 4A or 120V 8A, 50/60Hz | |

| Laser Excitation Unit | | |
|---|--|---|
| Tunable wavelength range | 650 - 1300nm & 460 - 649nm | |
| Pulse repetition frequency | 20Hz | |
| Pulse Energy | > 130mj @ 700nm > 10mj @ 500nm | <i>Before fiber bundle transmission</i> |
| High-energy excitation @ 1064 nm | > 350mj | |
| Energy meter | <i>Real-time automatic pulse energy measurements</i> | |
| Fast wavelength switching (FWS) | <i>Change to any wavelength between 650 - 1300nm or 460 - 649nm every 50ms</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) | 68cm x 44cm x 89cm | |
| Power requirements | 120, 208 or 240 VAC, single phase 50/60 Hz, < 1.5kVA | |

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

| 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 50µl cuvettes containing liquid samples, quick setup</i> | |
| Microcuvettes | <i>Cylindrical PTFE cuvettes, 0.8 mm ID, 50µm wall thickness, for making ≤ 50µl samples</i> | |
| Containers for coupling liquid | <i>Used to fill and drain the Image Acquisition Unit with coupling liquid</i> | |