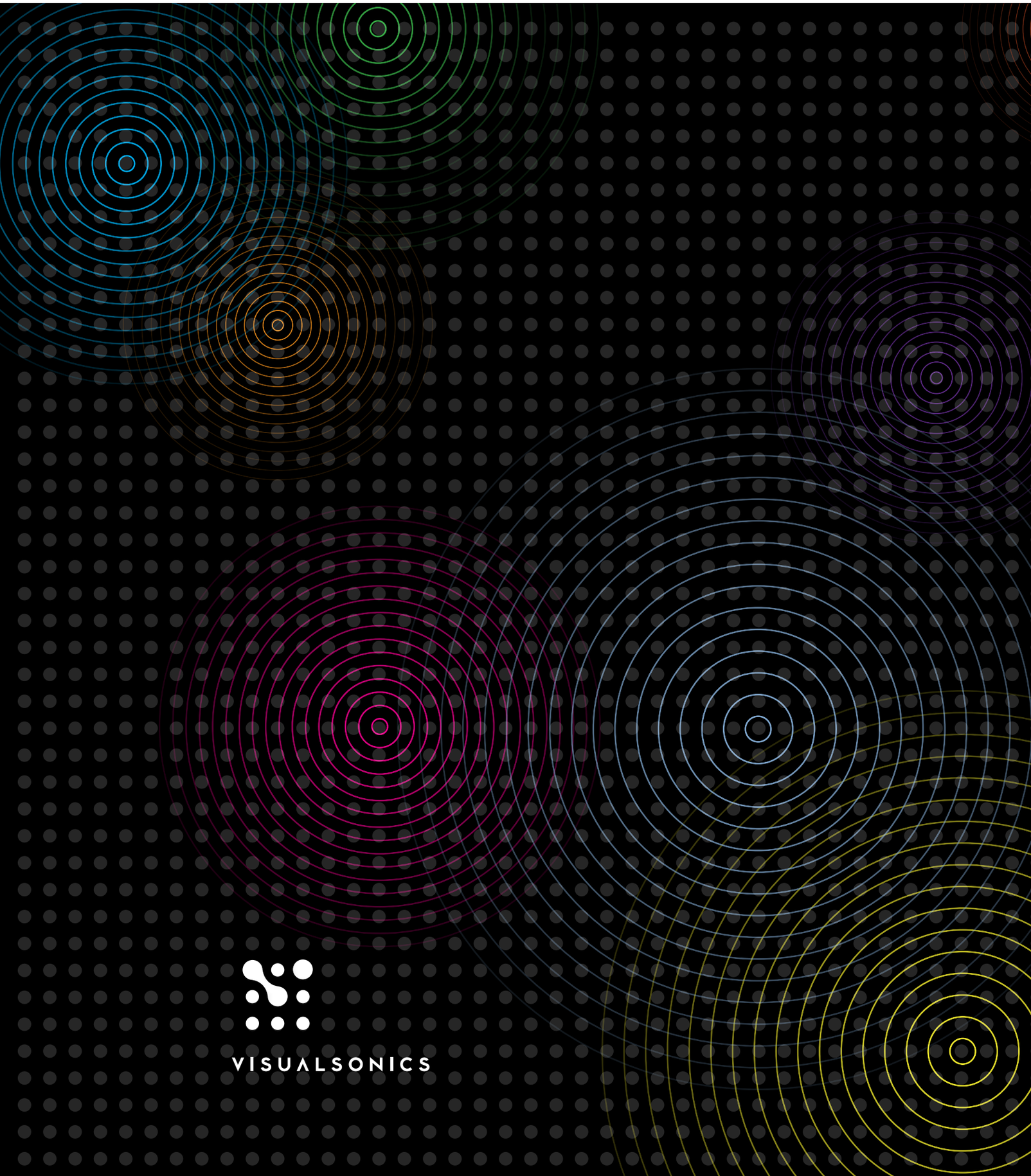
Vevo® LAZR

Photoacoustic Imaging Platform

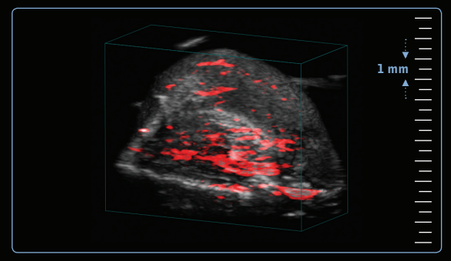
Listen to the light



VISUALSONICS

Vevo LAZR: The Future of Preclinical Imaging

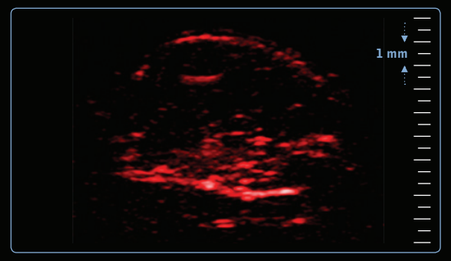
Features



Inherent Co-registration

Placement of photoacoustic signal into an anatomical context in 2D or 3D.

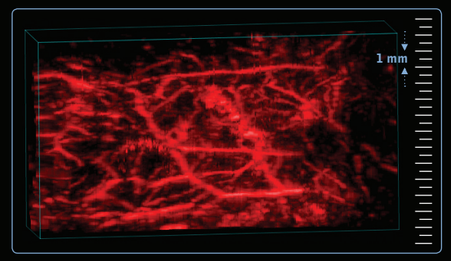
3D scan of a mouse hindlimb subcutaneous tumor showing co-registered anatomical and endogenous photoacoustic signal at 680 nm.



Hemoglobin Quantification

Calculation of total hemoglobin to assess anemia.

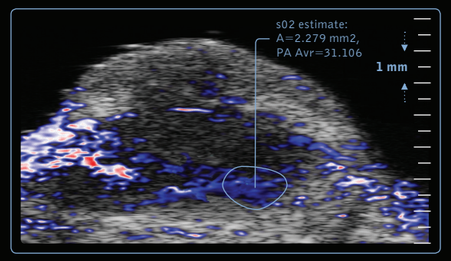
2D photoacoustic image of a mouse hindlimb subcutaneous tumor showing total hemoglobin signal calculated from images acquired at 750 and 850 nm.



Vasculature

Visualization of vascular structure in 2D and 3D.

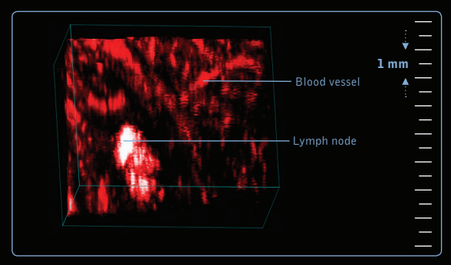
3D scan of mouse abdomen showing maximum intensity projection (MIP) of vasculature (680 nm).



Oxygen Saturation Quantification

Calculation of blood oxygen saturation with high sensitivity and anatomical specificity to identify regions of low oxygen saturation with high-resolution.

Co-registered 2D image showing quantification of oxygen saturation in a microenvironment of heterogeneous tumor tissue (750 and 850 nm).



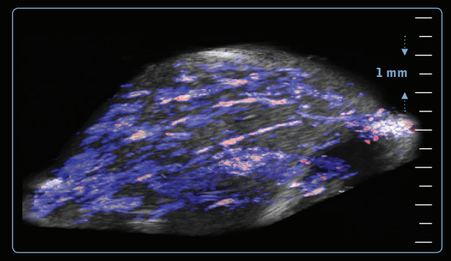
Multispectral Imaging

Multispectral processing to rapidly access photoacoustic signals from multiple wavelengths.

3D photoacoustic image showing the mouse axillary lymph node identified by the strong signal from methylene blue dye used as a contrast agent.

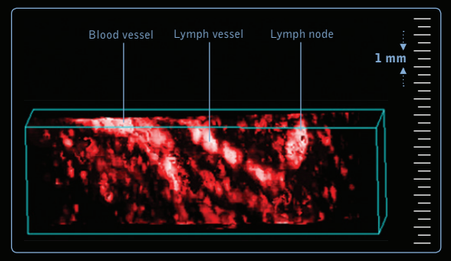
Vevo LAZR: Listen to the Light

Applications



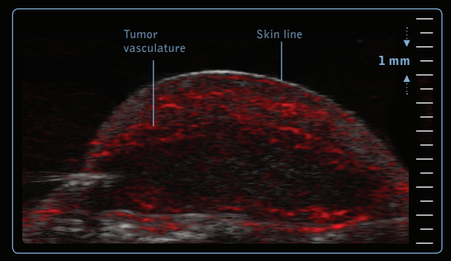
Tumor Microenvironment

3D scan of a mouse hindlimb subcutaneous tumor showing co-registered anatomical oxygen saturation signal (750 and 850 nm).



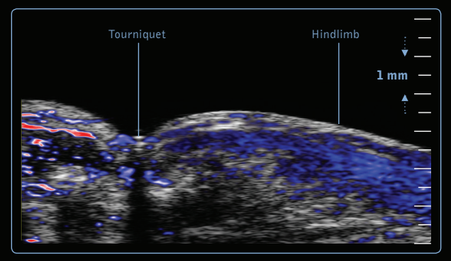
Lymph Node Detection

3D scan of mouse axilla showing maximum intensity projection (MIP) of lymph node and associated lymph vessel containing methylene blue as a contrast agent (680 nm).



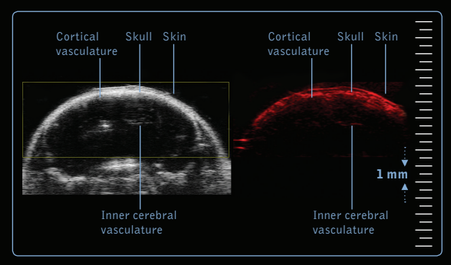
Nanoparticle Research

Co-registered 2D anatomical and photoacoustic image showing enhanced vascular signal due to intravenous injection of gold nanorods (800 nm).



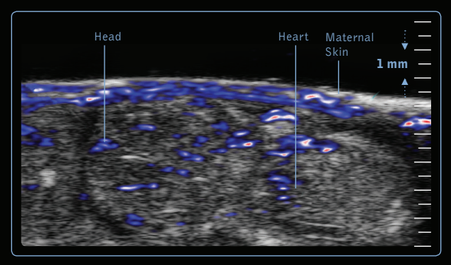
Ischemia

Co-registered 2D anatomical and photoacoustic image showing oxygen saturation signal in a mouse hindlimb under ischemic conditions induced with a tourniquet (750 and 850 nm).



Brain Imaging

2D anatomical and photoacoustic image of a mouse cranium showing photoacoustic signal from vasculature in the skin and superficial cortical vasculature (850 nm).



Developmental Biology

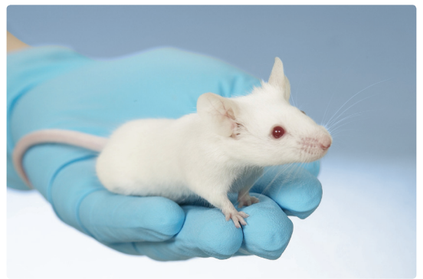
2D *in vivo* co-registered anatomical and photoacoustic image of oxygen saturation in a mouse embryo (E17) at 750 and 850 nm.

VisualSonics

World leader in preclinical real-time *in vivo* micro-imaging systems

The Vevo® LAZR Photoacoustics Imaging technology from VisualSonics® integrates the sensitivity of optical imaging with the resolution of high-frequency ultrasound to provide never-before-seen insights into tissue microenvironment, hemodynamic changes and a wealth of other research areas.

Vevo LAZR Photoacoustics Imaging platform has built-in multispectral imaging, quantification and assessment of oxy and deoxy-hemoglobin, high sensitivity, high specificity, real-time and 3D imaging capabilities among a host of other premium features and sets a new standard of performance and functionality for preclinical imaging platforms.



Study a wide range of animal models from embryos to adults

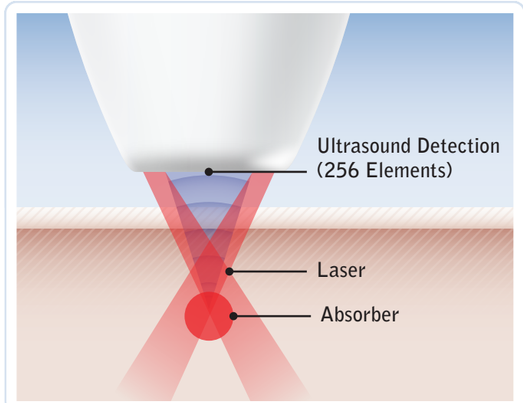
Real-Time Photoacoustic Imaging with Vevo LAZR Technology

Inherent Co-registration of Photoacoustic and Anatomical Data

Photoacoustic imaging with Vevo LAZR Technology uniquely and inherently co-registers high sensitivity and 'high' specificity with high-resolution – even in deep tissues – and in real-time. Detection and quantification of high-resolution, functional photoacoustic signals in real-time is revolutionary; understanding where the signals are with respect to microscopic anatomy is essential to effectively address the needs of biological research.

The photoacoustic principle is simple – light is used to generate sound. Biology, however, is complex and requires complex solutions. Vevo LAZR technology employs integrated fiber-optic transducers to deliver nanosecond laser pulses into deep anatomical targets. Tissues differentially and specifically absorb the light causing transient thermoelastic expansions, generating acoustic pressure waves which are detected by 256 sensitive piezoelectric elements. Transmitted ultrasound pulses are similarly received generating high-resolution images of microscopic anatomical structures. Inherent co-registration of photoacoustic signals acquired in real-time with high-resolution ultrasound is unique to Vevo LAZR technology – it is the future of preclinical imaging.

- Inherent co-registration of photoacoustic and anatomical images
- Real-time, 3D processing
- High sensitivity, high specificity
- Multispectral imaging
- Facilitates biomarker development and translational research
- Longitudinal studies



Laser Pulse

Photon Absorption and Transient Thermoelastic Expansion

Acoustic Waves

Micro-ultrasound Detection

The Vevo LAZR Photoacoustic Imaging Platform

A new benchmark for preclinical imaging systems

Photoacoustic Imaging

- Inherent co-registration
- Real-time *in vivo* imaging of deep tissue (up to 1 cm)
- High sensitivity and specificity
- 45 micron resolution
- 3D imaging

Features & Functionality

- Co-registration of photoacoustic and anatomical images
  - Inherent co-registration in both 2D and 3D planes
- 3D-Mode
  - Real-time comprehensive visualization of targets
  - Rapid volumetric acquisition
- Multispectral photoacoustic imaging with tunable laser
  - Detection and quantification of contrast agents
  - Sentinel lymph node detection
  - Functional imaging
  - Cellular specificity
- Oxygen saturation and hemoglobin content
  - Hypoxia in heterogeneous tumors
  - Anemia
  - Fetal/maternal physiology
  - Stroke/ischemia
- Advanced post processing and analysis
  - Digital RF-Mode export
  - Review, analysis and export of co-registered data
- Respiration gating capability
  - Eliminate motion induced artifacts in imaging

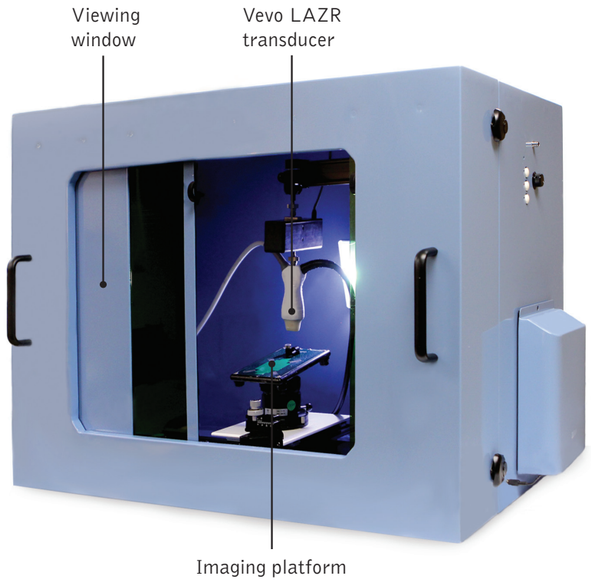
LAZRTight Imaging Enclosure

Exclusive Animal Handling System

The LAZRTight™ imaging enclosure is a laser light containment and animal handling and positioning system. The set-up provides encapsulation of the imaging station and the Vevo LAZR transducer allowing for maximal system performance for image and data generation while ensuring safety of the operator. Furthermore, it optimizes the welfare of the animal and ensures an efficient and reproducible imaging session.

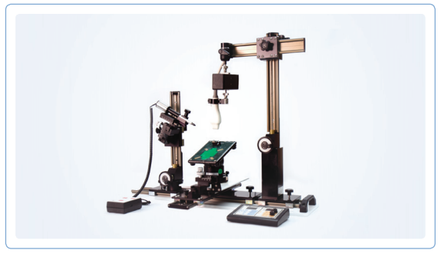
Features:

- Containment of laser light
- No dedicated room required
- Fits over animal imaging system
- Temperature controlled platform
- Integrated physiological monitoring
- Transducer mounting system – for precision and accuracy
- 3D positioning system environment
- Integrated anesthesia

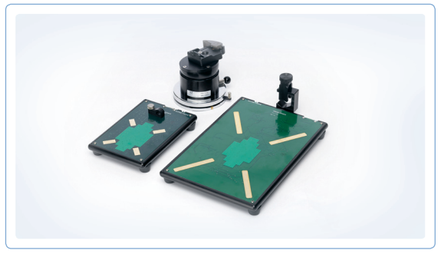


LAZRTight Imaging enclosure
(certified Class I device for safe handling of laser light)

Accessories



Vevo Imaging Station



Mouse & Rat Table

Anesthesia System

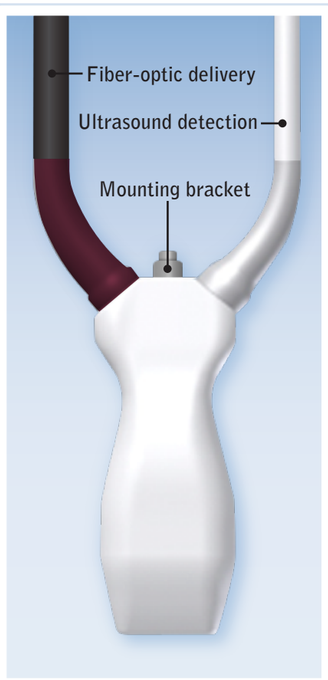
The LZ Series fiberoptic MicroScan Linear Array Transducers

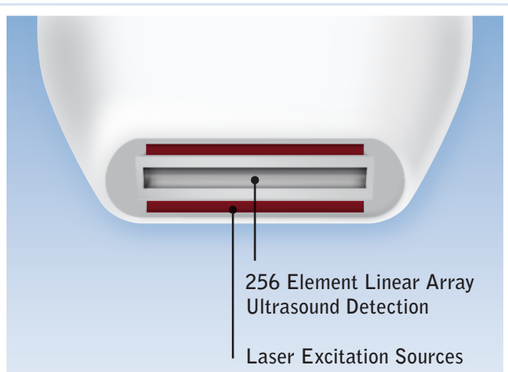
Integrating light and ultrasound

The core of the Vevo LAZR technology is the LZ Series integrated fiber-optic linear array transducers with microbeamforming technology. Harnessing the sensitivity of 256 active elements, the LZ Series transducers provides laser excitation as well as provides clear, highly resolved ultrasound images - in both 2D and 3D modes.

LZ Series fiber-optic MicroScan™ transducers:

- Integrates ultrasound detection and fiber-optic delivery in a small handheld foot print
- Real-time signal acquisition
- Multiple frequencies available and optimized for specific research applications





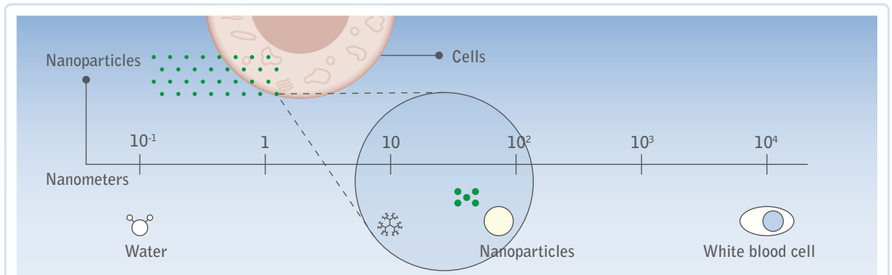
TRANSDUCER	AXIAL RESOLUTION
LZ550 32–55 MHz	44 µm
LZ250 13–24 MHz	75 µm

Nanoparticles

Biomarker detection and therapeutics approaches

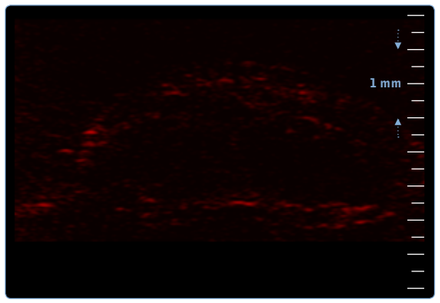
Nanoparticles such as gold nanorods and carbon nanotubes have emerged in recent years as specific, customizable agents capable of being detected with photoacoustics. Since many diseases do not ordinarily show endogenous photoacoustic contrast, nanoparticles are being developed to complement screening by enhancing the range of imaging applications.

The Vevo LAZR platform gives researchers with *in vivo,* real-time, co-registered visualization of nanoparticles in anatomical images. The multispectral imaging functionality (imaging with multiple wavelengths 680-970 nm), facilitates development of multifunctional and multiplexed nanoparticles.

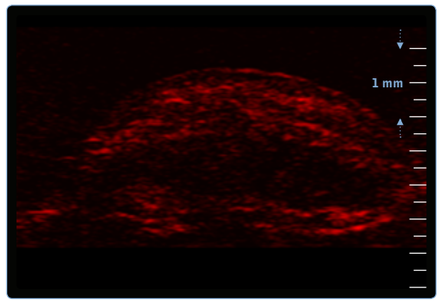


Because of their small size, nanoscale devices can readily interact with biomolecules on both the surface and inside cells. With the ability to gain cellular and molecular access, nanoparticles have the potential to detect disease and deliver treatment in ways unimagined before now. Nanotechnology is being investigated by researchers for its potential to improve cancer detection, diagnosis and treatment. Specifically:

- Augmenting sensitivity of photoacoustic imaging techniques
- Detecting cancer at the onset of early molecular changes
- Developing biomarkers for cancer detection and diagnosis
- Mapping and marking of DNA mutations associated with cancer



Photoacoustic image at 800 nm of a subcutaneous hindlimb tumor before nanoparticle injection.



Photoacoustic image of a subcutaneous hindlimb tumor after a tail vein injection of 200 µL of untargeted gold nanorods (800 nm).

Vevo Scientific Support

The advanced technology of the Vevo LAZR high-resolution photoacoustic imaging system is supported by an equally sophisticated approach to service and support. The VisualSonics team provides expert training and applications support and is committed to maintaining system performance. VisualSonics offers a broad range of service solutions that meet your needs.

Applications Support and Training Customized to Your Needs

- On-site customer training
- Vevo Imaging Courses
  - Available in Toronto & Amsterdam
  - Vevo MicroMarker contrast imaging
  - Abdominal and 3D techniques
  - Cardiovascular imaging
  - Doppler and vascular techniques
  - Photoacoustic imaging
  - Strain Imaging using VevoStrain™ Software
- Symposia
  - Associated with major conferences

Online Learning Center and Customer Website http://www.visualsonics.com

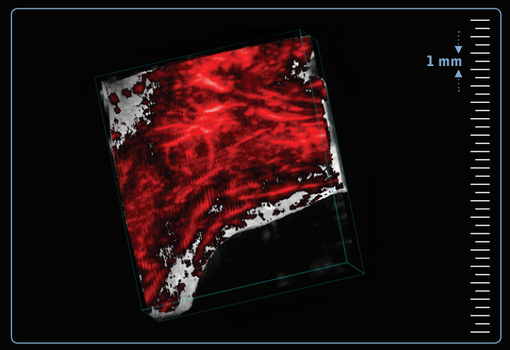
- Find publications, protocol guides, imaging guides & training videos
- Private, secure
- VisualSonics moderated forum allows users to ask questions and share their experience with the Vevo systems

Technical Support

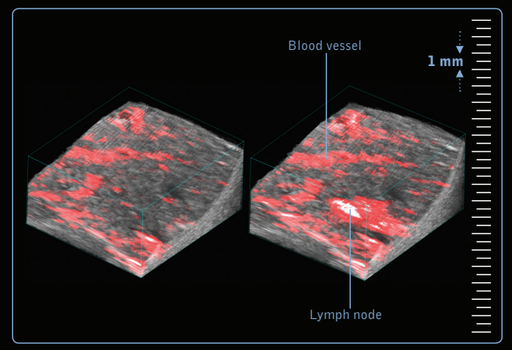
VisualSonics provides on-going Service and Technical Support with our team of experienced and certified professionals.

support@visualsonics.com

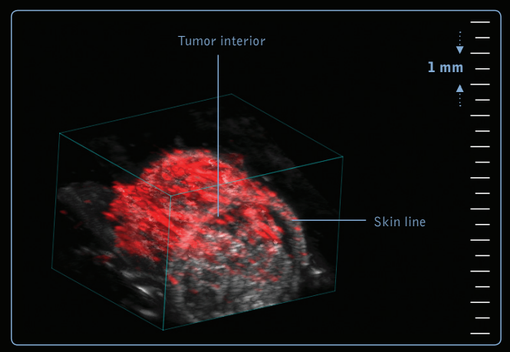
Performance and reliability you expect



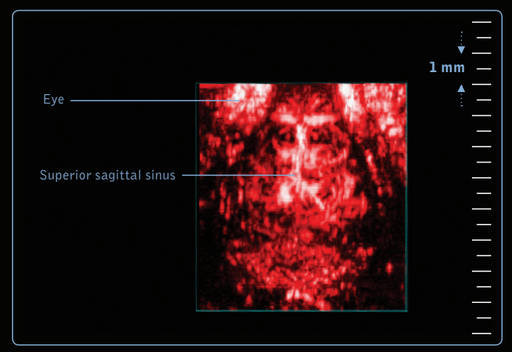
Mouse axilla 3D (680 nm).



Sentinel lymph node following methylene blue injection into paw (750 nm left, 680 nm right).



Co-registered anatomical and photoacoustic 3D image of subcutaneous hindlimb tumor at 750 nm.



Photoacoustic image of mouse brain with skin removed at 850 nm.

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