

# *Unprecedented resolution delivers outstanding research*

## **Breakthrough Multi-Beam Optical Coherence Tomography**



Plastic and ceramic part inspection

Tissue Engineering

Biopsy analysis

Si-MEMS metrology

IVIS metrology

Developmental  
biology

# Breakthrough Multi-Beam OCT

*Unprecedented resolution delivers outstanding research*



- **Unique Multi-Beam OCT delivers near cellular image resolution**
- **Turnkey – arrives ready to go – easy to set up and use**
- **Real time images – rapid results**
- **Unrivalled choice of three excellent support packages tailored to suit your needs**
- **3D facility**

The EX1301 OCT Microscope is ideal for sample analysis applications, enabling you to see microscopic detail below the surface of a sample instantly, without affecting it, damaging it, or requiring any special preparation.

Designed for deep imaging (much greater than achievable with a confocal microscope), this bench-top scanner is a perfect solution for the researcher who needs to see inside a specimen, but can't afford to alter or damage it in any way.

## *The Michelson Advantage – Four beams are better than one!*

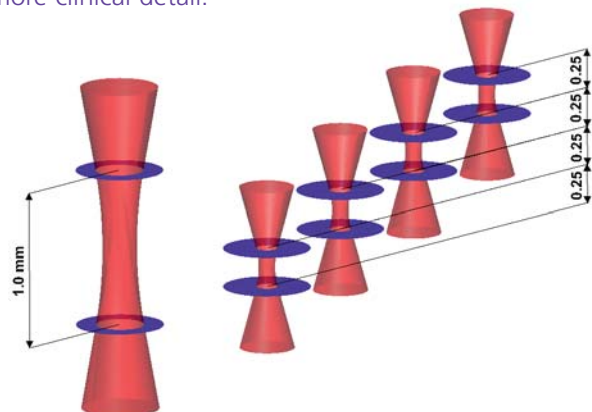
This breakthrough invention provides Optical Coherence Tomography (OCT) images at unprecedented lateral resolution – at least double that of competitor instruments using one beam – providing the user with much higher detail of sub-surface tissue than would otherwise be possible.

Due to the physics of light, a single 1300 nm wavelength laser beam cannot be brought to a focus of better than 20  $\mu\text{m}$  over a desired depth of focus of 1 mm.

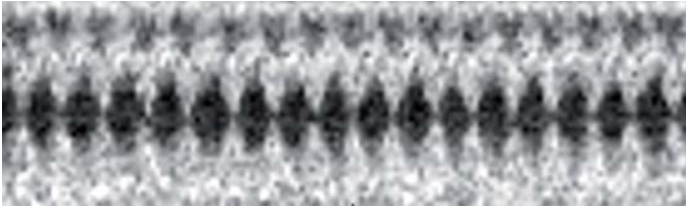
**To arrange a demonstration please call us on + 44 (0) 208 308 1695 or email [demo@md-ltd.co.uk](mailto:demo@md-ltd.co.uk)**

Four laser beams focused at different depths can be brought to a lateral focus of better than 7.5  $\mu\text{m}$  over depth of focus of 0.25 mm each, providing a total focal range of 1 mm.

Four beams are better than one, providing double the lateral resolution of competing solutions, for clearer images with more clinical detail.



## Examples of images using Multi-Beam OCT



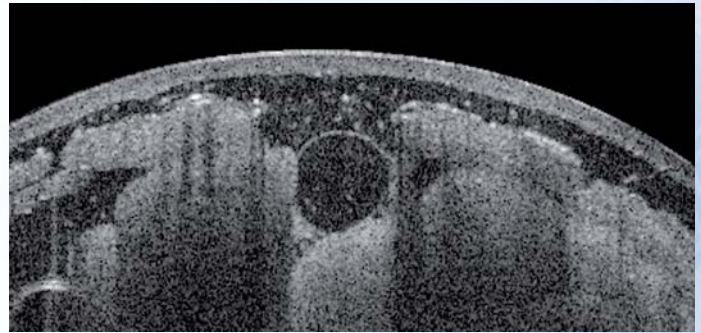
Time sequence of healthy fruit fly heart (300 beats per minute) showing chamber fully closing. Frame rate 39 fps

### What is OCT?

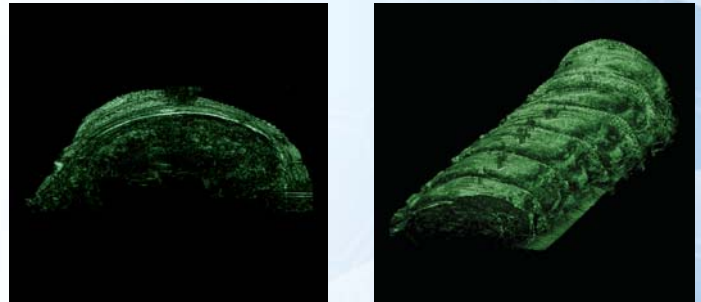
OCT obtains high-resolution ( $<7.5 \mu\text{m}$  lateral and  $<10 \mu\text{m}$  axial) images of sub-surface detail in materials that cannot be penetrated by conventional visual or confocal microscopy. The technique works to a depth of up to 3 mm, and is good for a wide variety of materials, especially biological samples, but also for silicon and some plastics and ceramics.

OCT is based on light and optics rather than sound or X-rays, and uses a device called a Michelson interferometer. A laser beam is scanned into the sample, but most light is scattered and is useless for imaging. However, the interferometer selectively detects and measures non-scattered light from sub-surface features, and this is used to build the OCT image.

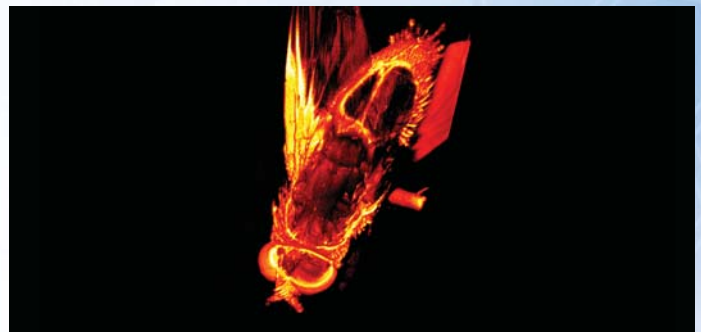
- Live sub-surface images at high resolution ( $<7.5 \mu\text{m}$  lateral and  $<10 \mu\text{m}$  axial)
- Up to 39 frames per second, enabling imaging of dynamic processes such as the heartbeat of a fruit fly
- Much deeper penetration than conventional optical microscopy
- No preparation of the sample required
- Eye-safe near-infrared light is used – no damage to sample is likely
- No ionising radiation – for use in office, clinic or lab



Cross-section of Diptera larva  
Pixel size  $4 \mu\text{m} \times 4 \mu\text{m}$ . Acquisition rate 10fps



3D images of Diptera larva  
Captured volume size (w x l x d): 4 mm x 8 mm x 2 mm. 1000 slices acquired in 125 sec



Volume rendering of house fly, with partial horizontal cutway showing internal organs

# Michelson Diagnostics

Experts in optical engineering, our team at Michelson Diagnostics is leading the way in developing OCT for demanding applications in medicine, science and engineering. Our patented 'Multi-Beam OCT' optics provides the highest resolution for crisp, clear images.

## EX1301 Multi-Beam OCT Microscope Specification

- Fast frame rate with up to 5 mm scan width and 1.5 mm depth of field
- Images presented in .TIFF format
- Raw data exportable for easy analysis and processing with common packages

Type:	Swept-source Fourier-Domain OCT
Light source:	HSL-2000-11 MDL* (Wider sweep range)
Laser peak power:	15 mW
Laser centre wavelength:	1305+/- 15 nm
Laser wavelength sweep range (>3 mW):	150 nm
Axial optical resolution (in tissue):	< 10 µm
Pixel size (isotropic, in tissue):	< 4.5 µm
Lateral optical resolution:	< 7.5 µm
Max frame width:	5 mm
Min frame width:	0.1 mm
A-line rate:	10 kHz
Frame rate:	> 6 fps (5 mm / 1,250 A-lines) > 20 fps (1 mm / 250 A-lines) > 30 fps (0.2 mm / 50 A-lines)
3D image acquisition:	Yes, with motorized stage option
Image formats:	TIFF, TIFF stack, raw
Visual channels:	2 MPixel, colour

## Rental or purchase?

We understand that projects may require the use of equipment for a specific period (weeks or months) and that there are often constraints with grant applications and budget limitations. We have a flexible approach to obtaining an EX1301 OCT Microscope which is available by:

### Rental or Direct purchase

- 3 levels of after sales support and training
- Support packages include annual maintenance visits
- 1 year warranty
- 70% of rental payments can count towards purchase

## Arranging a demonstration

**To arrange a no obligation demonstration and / or quotation please contact us on +44 (0) 208 308 1695 or email [demo@md-ltd.co.uk](mailto:demo@md-ltd.co.uk)**

\*for more details, see Santec laser datasheet

*"The power of Drosophila genetics in combination with this turn-key platform for physiological analysis is tremendous, and I expect integration of novel physiological read-outs with gene manipulation in flies to rapidly impact molecular cardiovascular research and other areas such as developmental biology.*

*We were excited to get working heart images of our fruit flies on the day our OCT Microscope was installed"*

**Gerald Dorn, Needleman Professor and Director of the Center for Pharmacogenomics at Washington University in St Louis, USA.**

### References:

J. Holmes, S. Hattersley, N. Stone, et al. (2008) "Multichannel Fourier domain OCT system with superior lateral resolution for biomedical applications" Ed. J. A. Izatt, et al. Vol. 6847, pp. 684700. Presented at Coherence Domain Optical Methods and Optical Coherence Tomography in Biomedicine XII, SPIE.

Jon Holmes. "In vivo real-time optical coherence tomography imaging of Drosophila for cardiovascular research" Nature Methods, October 2009, Volume 6 No 10 p iii-iv

**The EX1301 OCT microscope is for ex vivo research only.**



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