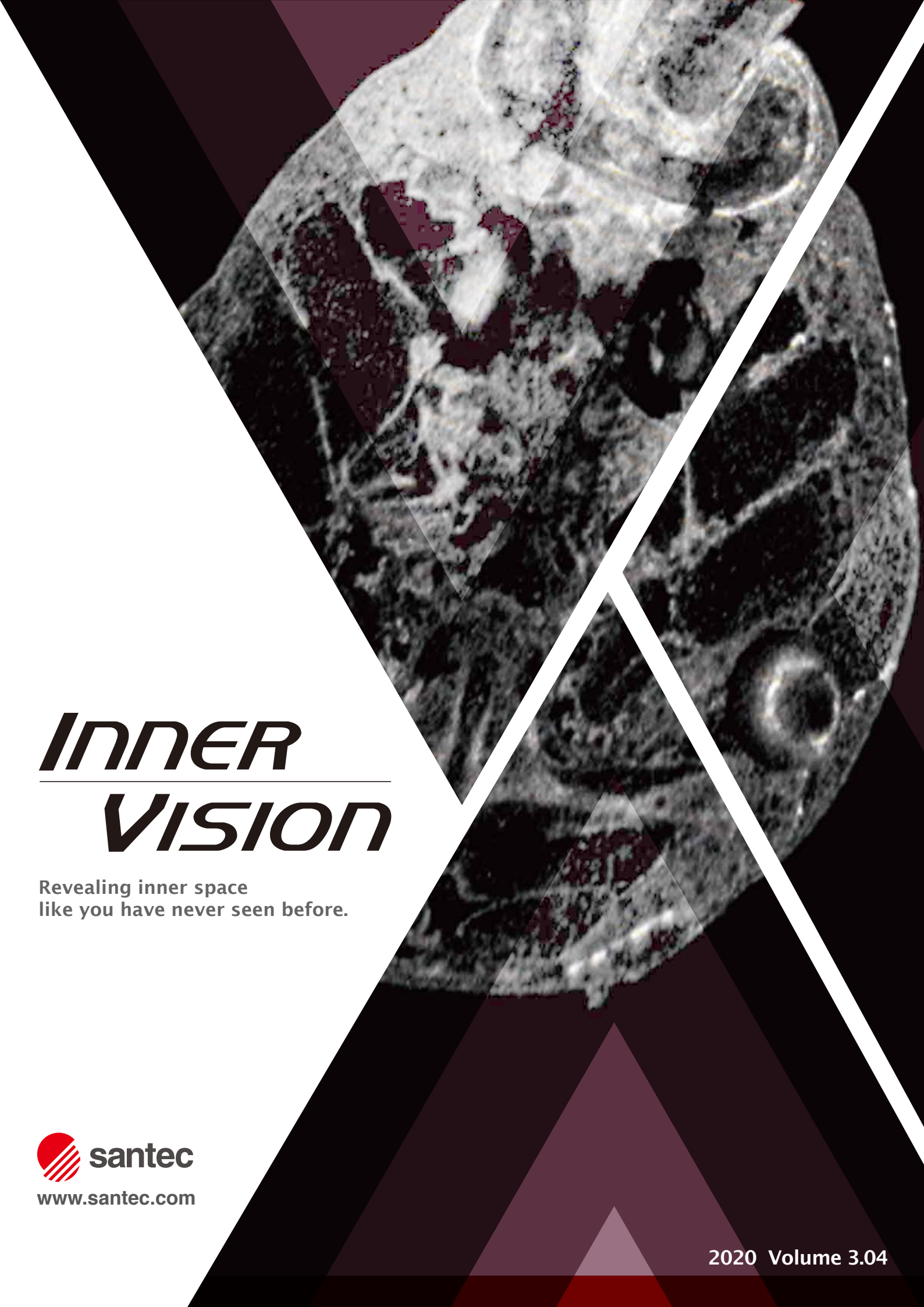

Inner Vision

Revealing inner space
like you have never seen before.

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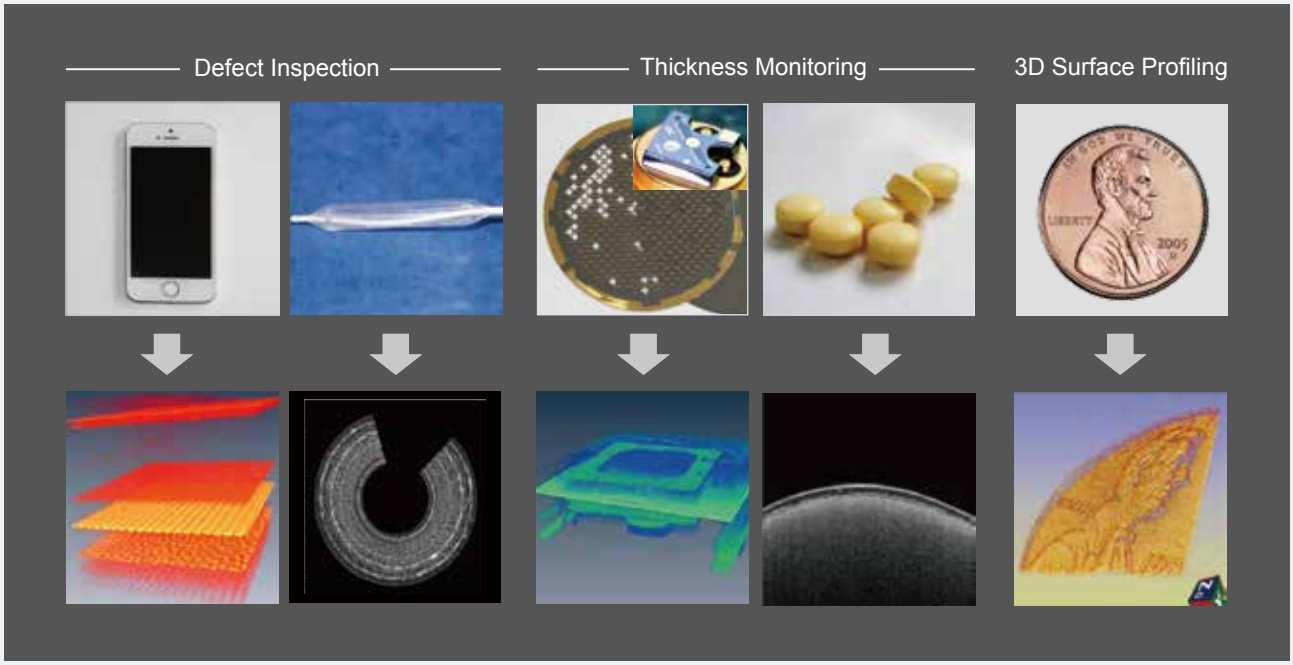
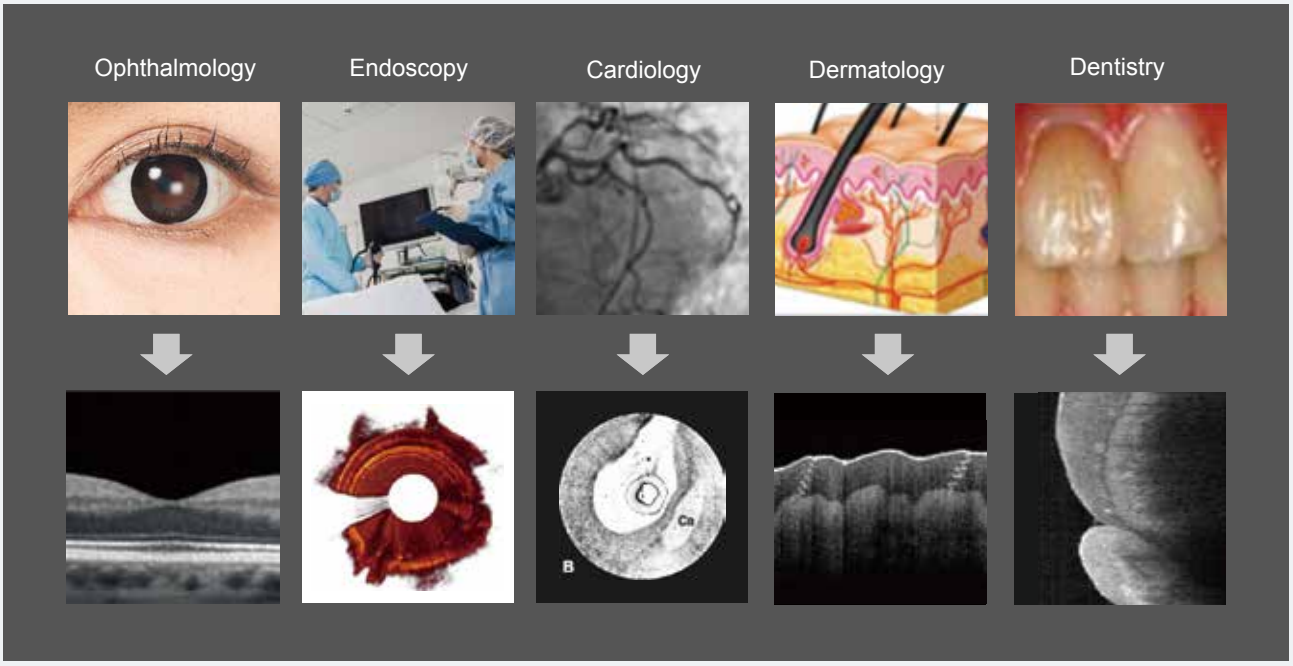
2020 Volume 3.04

Santec OCT Systems and Lasers:
Being used in a wide range of applications

Industrial Inspection



Medical Imaging



Products

Systems

IVS-1000 VCSEL

Hi-Performance

IVS-2000 Series

Lasers

HSL-1

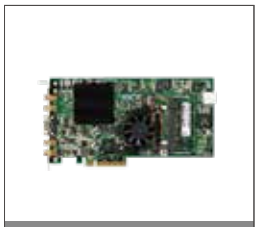
HSL-10, 20

HSL-2100

Accessories & Software

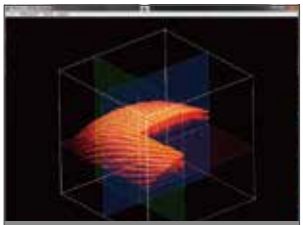
Probe

Balanced Photo detector



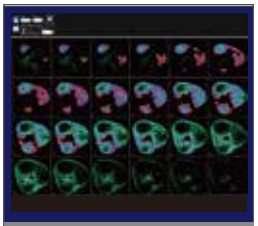
DAQ board

Interferometer



OCT Viewer

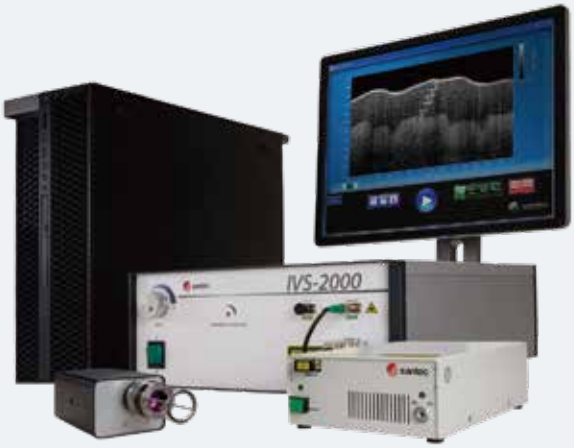
Inner Vision Software



Multi Slice Viewer

Swept Source OCT System

Optical Coherence Tomography (OCT) is a non-invasive technique that provides a cross-sectional view of objects and tissue. Santec's OCT system, "Inner Vision" enables 3-D and real time 2-D imaging with high resolution.



Features

- Non-contact, Non-destructive, Non-invasive
- High speed (200 kHz), High resolution (<5 µm)
- 1D, 2D & 3D measurements
- Time-lapsed image recording
- Data output by image, intensity and raw data
- 3D Viewer and analysis software (option)
- SDK for LabVIEW, C++ and C#

Model No.	Center Wavelength	Features	Lasers
IVS-1000-VCSEL	1060nm	Ultra Long Imaging Range	Tunable VCSEL
IVS-2000-HR	1310nm	High Resolution	HSL-2100
IVS-2000-HS	1310nm	High Speed	HSL-20
IVS-2000-LC	1310nm	Long Imaging Range	HSL-20
IVS-2000-ST	1310nm	Simple & Standard	HSL-2100

Products

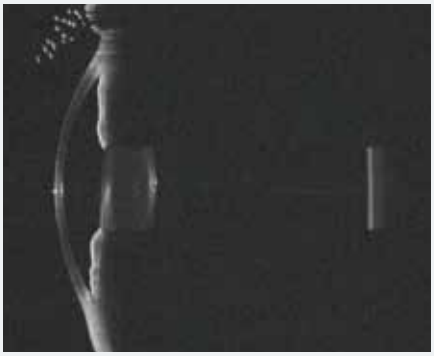
IVS-1000-VCSEL (Ultra Long Imaging Model at 1060 nm)

Features

IVS-1000-VCSEL is an SS-OCT system using Santec's Tunable VCSEL at 1060nm.
This system is suitable for samples containing a high percentage of H_2O due to the low absorption of light at this wavelength range. The acquisition speed can be changed to extend the imaging range.

Applications

- Samples with high water content
- Ophthalmic application



General performance (Typ.)

- Center wavelength: 1060 nm
- A-line rate: 10-400 kHz （selectable）
- Axial resolution : <16 μm （in air）

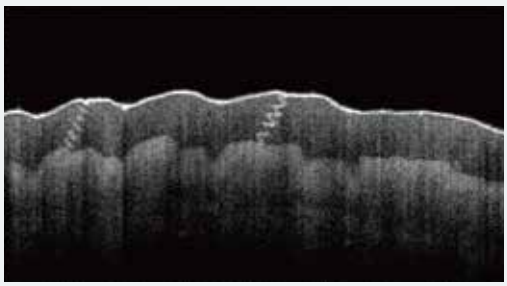
IVS-2000-HR (High Resolution Model at 1310 nm)

Features

IVS-2000-HR has been developed for applications requiring high axial resolution. The IVS-2000-HR utilizes our widest scanning range laser with a choice of high-resolution probes to image the finest detail in high scattering samples such as skin.

Applications

- High resolution skin imaging for cosmetic research
- Industrial imaging with high resolution and accuracy
- Cancer evaluation in vivo



General performance (Typ.)

- Center wavelength: 1310 nm
- A-line rate: 20kHz
- Axial resolution : <9 μm （in air）

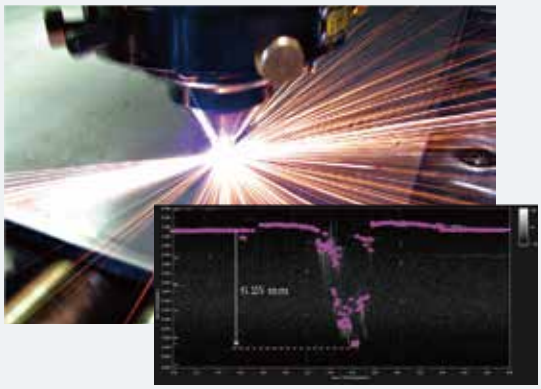
IVS-2000-HS (High Speed Model at 1310 nm)

Features

IVS-2000-HS is Santec's fastest SS-OCT system at the 1310 nm wavelength range. The low-scattering coefficient at this wavelength range allows for a high contrast, providing deeper imaging of high scattering samples such as skin.

Applications

- Cardiovascular and endoscopic imaging
- Laser weld monitoring
- Industrial imaging for in-line inspection



General performance (Typ.)

- Center wavelength: 1310 nm
- A-line rate: 100 kHz
- Axial resolution : <18 μm (in air)

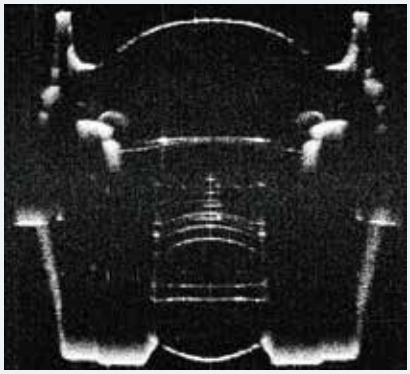
IVS-2000-LC (Long Imaging Range Model at 1310nm)

Features

IVS-2000-LC provides a long imaging range (>18 mm in air) centered at 1310 nm. The fast data acquisition and extended depth imaging capabilities make this system suitable for the precise measurements of 3D surfaces.

Applications

- Anterior chamber of the eye imaging
- 3D shape measurement



General performance (Typ.)

- Center wavelength: 1310 nm
- A-line rate: 50kHz
- Axial resolution : <18 μm (in air)

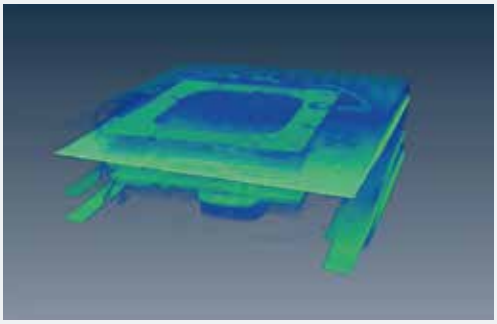
IVS-2000-ST (Standard Model at 1310 nm)

Features

The IVS-2000-ST is Santec's standard system for imaging with the center wavelength 1310 nm. The IVS-2000-ST has been used as a successful OCT system from in-line inspection to medical imaging. The high measurement accuracy, stable performance and low cost allow this system to become an ideal starting point for anyone whom interested in SS-OCT.

Applications

- Imaging system development
- Industrial measurement for in-line inspection



General performance (Typ.)

- Center wavelength: 1310 nm
- A-line rate: 20 kHz
- Axial resolution : <18 μm (in air)

OCT Lasers

Since 2005, Santec has been a leading supplier of swept source lasers for imaging applications such as optical coherence tomography (OCT). These laser products are capable of continuous scanning at high speeds with a wide tuning range of up to 170nm. Lasers with a scan rate of up to 200 kHz and selectable coherence length (up to >100 m) are available.
Santec's High-speed Scanning Laser, the "HSL Series" has opened up applications beyond OCT in fields such as spectroscopy, metrology, and fiber-optic sensing.

Model No.	Center Wavelength	Features	Technology
HSL-1	1060 nm	Flexible Scan Rate & Range Long Coherence Length	Tunable VCSEL
HSL-10	1060 nm	High Scan Rate	MEMS External Cavity
HSL-20	1310 nm	High Scan Rate / Wide Scan Range	MEMS External Cavity
HSL-2100	1310 nm	Linear Scan / Wide Scan Range	Polygon External Cavity

Products

HSL-1 (Flexible Speed & Range Model at 1060 nm)

NEW

The HSL-1 is based on advanced electrically pumped VCSEL (Vertical Cavity Surface Emitting Laser) technology. The HSL-1 is capable of providing long coherence length, variable scan speed and low signal noise.

Features

- High Scan Rate
- Single mode lasing: ultra long coherence length
- Flexible scanning rate, tuning range, and direction
- Coherence revival and mode competition noise free
- Compact design for reliability
- Integrated K-trigger
- Low cost at mass production stage

Tunable VCSEL Chip

Bench Top Model

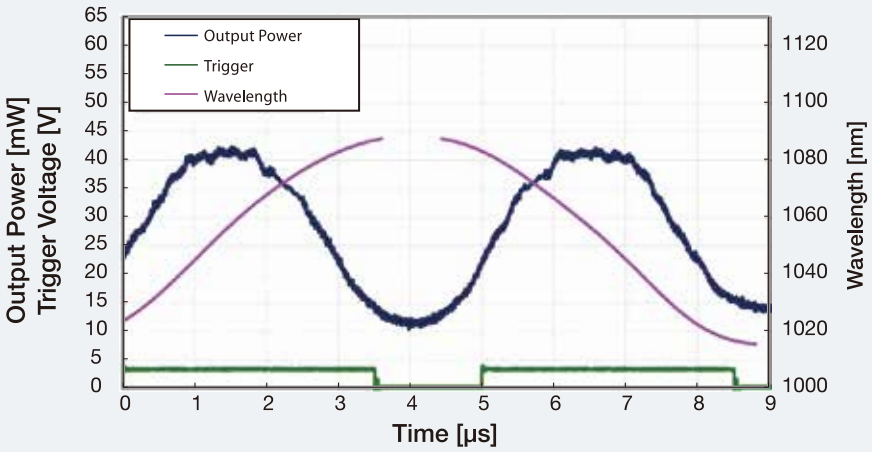
OEM Model

Applications

- Ophthalmology
- Samples with high water content

General performance (Typ.)

- Center wavelength: 1060 nm
- Maximum output power: ≥40mW
- Scan range: ≥75 nm
- Scan rate: 10-400 kHz （selectable）
- Coherence length : >100 m (theoretical value)



HSL-10 (High Speed Model at 1060 nm)

HSL-10 is an integrated MEMS based swept source laser that outperforms other lasers in speed, coherence length and scan range. It provides 100kHZ swept rates with superior stability and reliability. The source is equipped with a K-trigger and start-trigger for system synchronization.

Features

- Santec proprietary MEMS technology
- Wideband & long coherence length
- K-trigger integrated
- Unidirectional sweep
- OEM package/ customization available
- USB interface

Bench Top Model

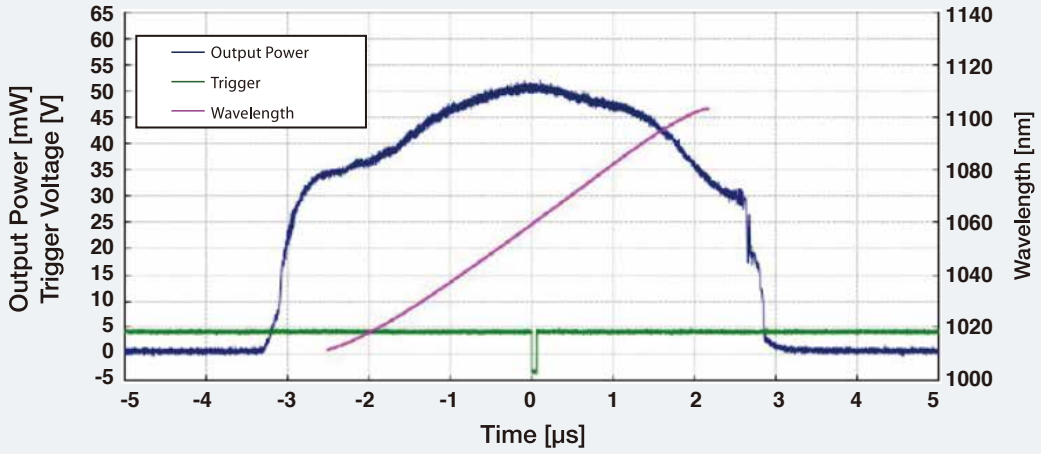
Applications

- Retinal imaging

OEM Model

General performance (Typ.)

- Center wavelength: 1060 nm
- Maximum output power: ≥40 mW
- Scan range: ≥90 nm
- Scan rate: 100 kHz
- Coherence length : ≥10 mm



HSL-20 (High Speed / Long Imaging Range Model at 1310nm)

HSL-20 is an integrated MEMS based swept source laser that has an advantage in speed, coherence length and scan range. It allows for swept rates of up to 100 kHz with high stability and reliability. The source is equipped with K-trigger and start-trigger for system synchronization.

Features

- Santec proprietary MEMS technology
- Wideband & long coherence length
- K-trigger integrated
- Unidirectional sweep
- OEM package/customization available
- USB interface

Bench Top Model

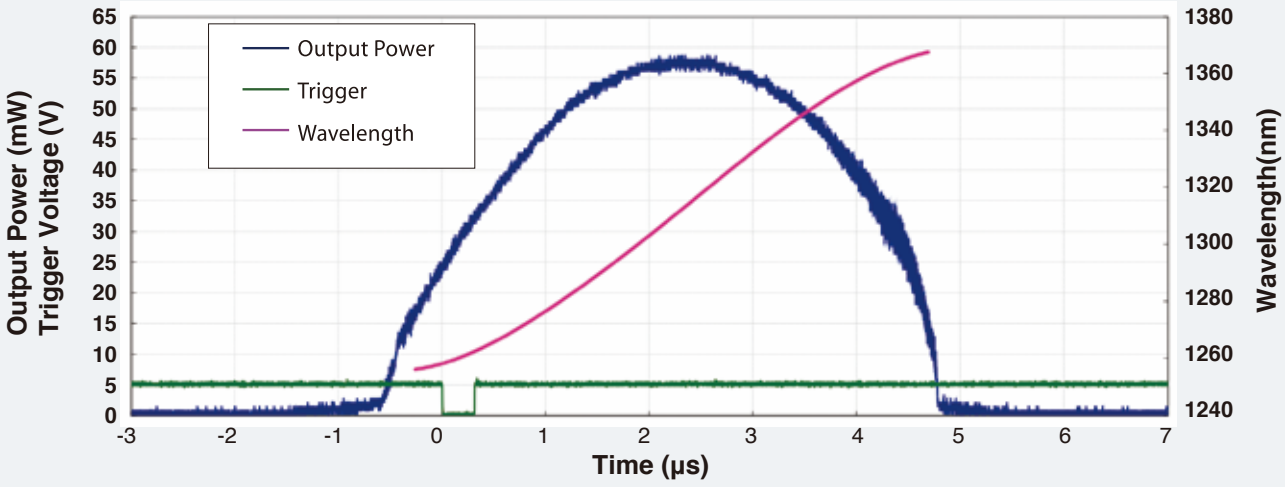

OEM Model

Applications

- Intraoral & dental imaging
- Anterior chamber of the eye imaging
- Cardiovascular and endoscopic imaging
- Laser-weld monitoring
- In-line inspection for industrial products

General performance (Typ.)

- Center wavelength: 1310 nm
- Maximum output power: ≥40 mW
- Scan range: ≥105 nm
- Scan rate: 50 kHz / 100 kHz
- Coherence length : ≥20mm / ≥16mm



HSL-2100 (High Accuracy Model at 1310nm)

Santec's polygon scanner based HSL is the best-selling product among our SS-OCT selection. This laser has been successfully integrated in a range of FDA approved medical systems. The HSL-2100 features high scan linearity and high repeatability; thus, OCT systems can be built without the need of K-clock sampling which significantly reduces system complexity.

Features

- Wide tuning range, up to 170nm
- Various scanning speed from 3kHz to 50kHz
- High linearity and repeatability
- Works with a standard data acquisition card using the rescaling method

Bench Top Model

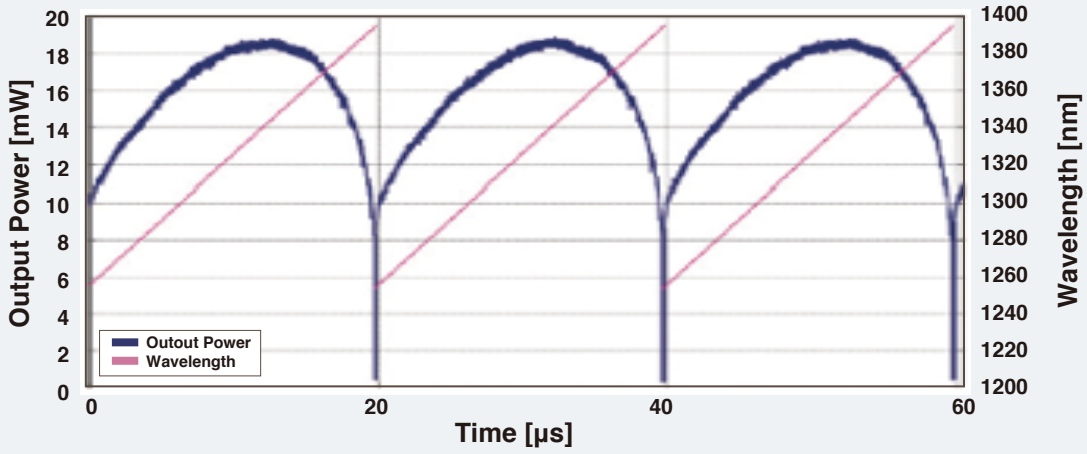
Applications

- High resolution imaging application
- Wafer thickness and profiling
- Low cost SS-OCT

OEM Model

General performance (Typ.)

- Center wavelength: 1310 nm
- Maximum output power: >20 mW
- Scan range: ≥170 nm
- Scan rate: 20kHz
- Coherence length : ≥6 mm



Specifications of Swept Source

Parameter		Unit	HSL-1	HSL-2100	
				Standard	Wide Range
Wavelength Scan *1	Center Wavelength	nm	1045 - 1075	1315 - 1340	1290 - 1320
	Scan Range	nm	≧70	≧110	≧170
Output Power	Peak	mW	≧40	>20	>20
Scan Rate		kHz	10 - 400	20	20
Coherence Length*2		-	>100 m	≧6 mm	≧5 mm
Duty Cycle		%	>45	>65	>60
Trigger		-	Integrated Start Trigger		
Output Optical Fiber		-	SMF		
Output Optical Connector		-	SC connector Angled PC		
Operation Environment	Temperature	°C	15-35		
	Humidity	%	<80, no condensation		
Electric Power		-	DC +12V ±5%	AC 100V - 240V ±10%, 50/60Hz	
Power Consumption		VA	15	80	
Size (W) x (D) x (H)		mm	134 x 184 x 51	343 x 376 x 153	
Weight		kg	1.5	10	

Parameter		Unit	HSL-10	HSL-20	
				Long Coherence	Hi-Speed
Wavelength Scan *1	Center Wavelength	nm	1040-1070	1280-1340	1280-1340
	Scan Range	nm	≧90	≧105	≧105
Output Power	Peak	mW	≧40	≧40	≧40
Scan Rate		kHz	100	50	100
Coherence Length*2		mm	≧10	≧20	≧16
Duty Cycle		%	≧45	≧45	≧45
Trigger		-	Integrated Start Trigger and K-trigger		
Output Optical Fiber		-	SMF		
Output Optical Connector		-	SC connector Angled PC		
Operation Environment	Temperature	°C	15-35		
	Humidity	%	<80, no condensation		
Electric Power		-	DC 12V ±5%		
Power Consumption		VA	20		
Size (W) x (D) x (H)		mm	150 x 226 x 67		
Weight		kg	2		

*1 : -10 dB bandwidth

*2 : Round trip path length @-6dB signal drop Ex) 10mm coherence length = 5mm depth @-6dB down signal drop in OCT image

Accessories & Software

Santec provides all of the necessary components for SS-OCT and related sensing with high quality and reliability based on telecom & medical grade needs. Santec also provides the software with an excellent display and analysis. The SDK (Software Development Kit) and sample programs are available for customers who want to customize the software by themselves. In addition, Santec has the ability to develop software for defect detection of OCT data using A.I. algorithms.

Products

BPD-200 (OCT Grade Balanced Photo Detector)

BPD-200 is a balanced photo detector that outputs the difference of two detector signals. Typically used for the reduction of common mode noise due to the laser power fluctuation. In heterodyne detection like in most OCT applications, balanced detection yields a 3 dB sensitivity advantage when detecting the signal inverted in phase between two input signals. Furthermore, the special optics design significantly reduce undesired image artifacts.

Features

- Wide dynamic range(DC to 80, 200 or 400 MHz)
- High reliability, gain and linearity
- Flat balanced level
- Specially designed for artifact-reduction

Applications

- Swept Source – OCT
- Heterodyne measurement
- OFDR (Optical Frequency Domain Reflectometry)

General performance (Typ.)

- Wavelength range: 950 nm -1600 nm
- Frequency response: 80 MHz / 200MHz / 400MHz
- Maximum input power: 20 mW / 20 mW/ 10 mW

HAD-5200B-S (Flexible SS-OCT DAQ Board)

Santec offers a high speed imaging Data Acquisition (DAQ) Board compatible with our high performance swept source laser. Santec's patented rescaling algorithm is encoded into the FPGA for the real-time OCT image processing.

Features

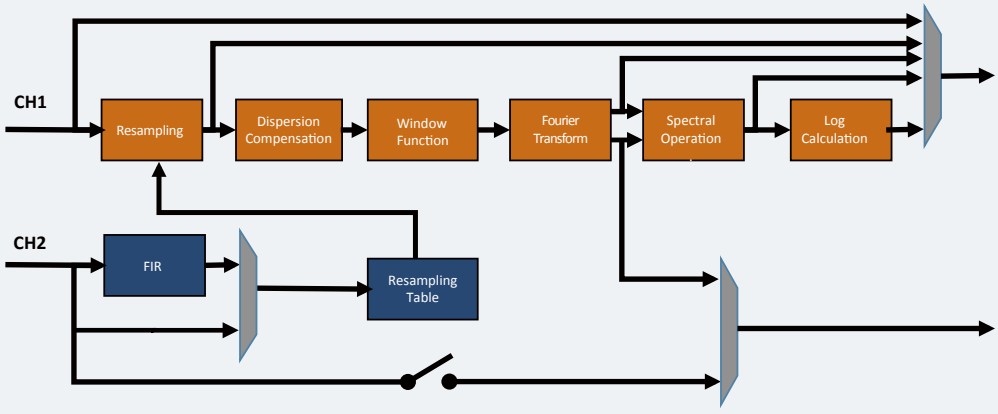
- High speed ADC (12 bit/1 GSps sampling)
- Customized FPGA for SS-OCT with HSL-Series
- Real-time resampling, FFT, FIR filter and dispersion compensation
- High reliability, gain and linearity
- Includes analog output (2ch)

Applications

- Swept Source – OCT
- Heterodyne measurement
- OFDR (Optical Frequency Domain Reflectometry)

General performance (Typ.)

- Input: Single-end 2ch
- Sampling rate: 1GS/s
- Resolution: 12bit
- Trigger: External trigger / Analog trigger / Software trigger
- Analog Output: +/- 4V 16bit 2ch
- System Bus: PCI Express 2.0 (Gen2) 5.0GT/s x8



IFM-100/200 (OCT Grade Interferometer Module)

IFM-100/200 is an OEM module Mach-Zehnder type interferometer. A wide range of configurations can be arranged based upon customer requirements including PS-OCT with added features such as targeting diode lasers and optical delay line. Custom configuration including other interferometer types (ex. Michelson, Fizeau type) can be designed for OEM solutions.

Features

- Custom configuration(Michelson, Mach-Zehnder, Fizeau, etc)
- Optical delay line, variable attenuator, polarization controller optional integration
- PMF type also available

Applications

- Swept Source-OCT
- Heterodyne measurement
- OFDR (Optical Frequency Domain Reflectometry)

Handheld Probes (OCT Probes)

Hand-held probes and small endoscopic probes are available as custom options with Santec's SS-OCT Systems. A microscope is also available with integrated CCD camera for targeted area searching.

Features

- 2D / 3D Imaging capability

Applications

- Dental and oral applications
- Dermatological diagnosis

Inner Vision Software (Main Software of IVS Series)

This software is the base software provided with the SS-OCT System. It offers 2D, 3D and preview modes and allows for the export of the image and raw data.

Functions

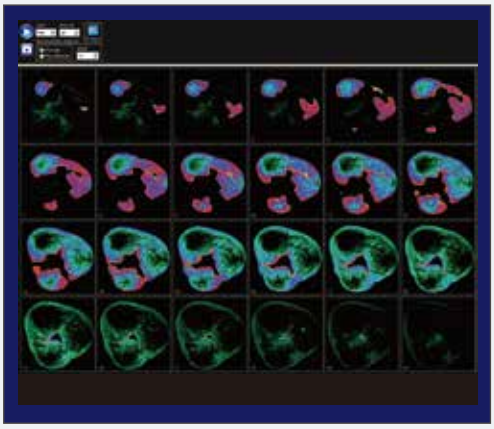
- Measurement and display cross section & 3D voxel image
- Time lapse image recording
- Averaging
- Refractive index conversion
- Image and raw data output
- Distance measurement point to point
- Peak detection

Multi Slice Viewer (3D OCT Image Analysis Software)

This software provides advanced analysis capabilities for 3D data (raw data from the IVS-2000 or IVS-300). Simultaneous analysis of all X-Y-Z plane data leads to a better understanding. This powerful tool assists extraction of detailed information from the data-sets and quantify the 3D image content.

Functions

- Simultaneous 2D slice data presentation from all 3 planes
- 2D slice image taken from any randomly selected point
- Averaging of any arbitrary 2D data point
- Peak search function within any arbitrary 2D data
- Refractive index scaled presentation of data
- Data image can be saved (BMP, JPG, PNG)
- Distance measuring function between any 2 data points
- Simultaneous 3-planes presentation



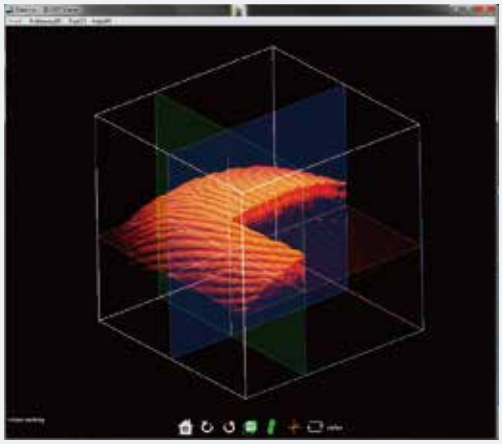
OCT Viewer (3D OCT Image Viewer)

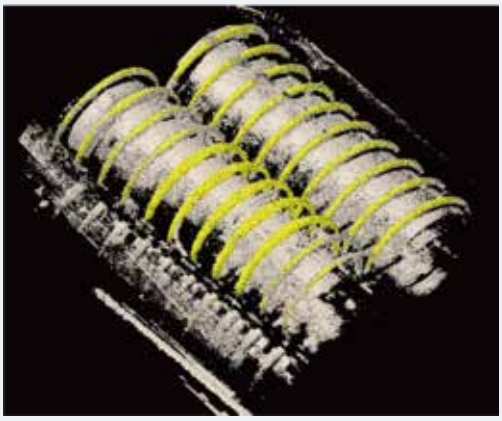
NEW

With Santec's OCT Image Viewer software, 3D OCT image presentations can be developed using OCT volume image data which is measured by an OCT system such as TD, SD and SS-OCT. Simply import the processed OCT data into the software to generate the clear and striking images. The OCT 3D Image Viewer has the capability to make an effective presentation that contains the animated images by using the rotation, transparency, trimming or contrast adjustment settings.

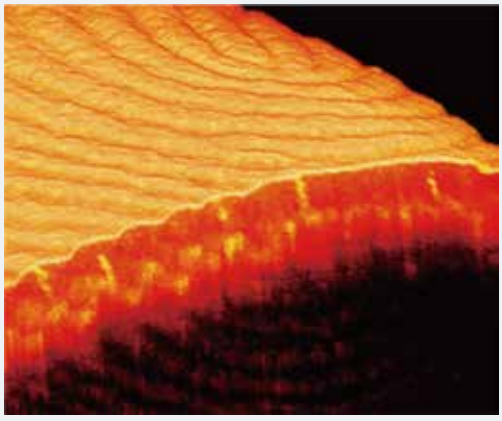
Functions

- Zoom-In/Out, Drag/Move, Add Frame
- Trimming (Clipping), Rotation
- Leveling of clipping plane from any point of view
- Segmentation (Isolation of desired part) *1
- Leveling of clipping plane from any point of view
- Contrast setting, Transparency, Rendering
- Color histogram display
- Export as Bitmap file and movie file (option)
- Simple data loading from Santec's OCT system software (Inner Vision)





Pen with Ink Chamber and Spring *1



Sweat Duct

OCT Engine

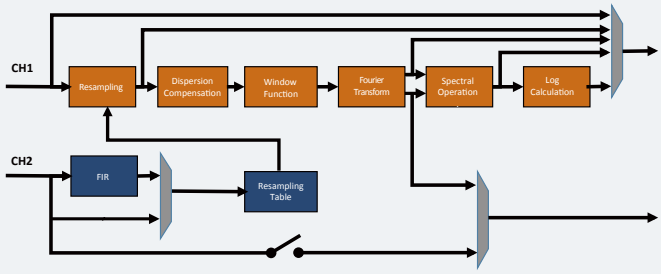
Solutions for OCT measurement

NEW

Santec's OCT Engine is based on the High-Speed Scanning Laser (HSL) series, OCT-grade Balanced Photo Detector BPD-200, and the real-time resampling OCT DAQ card HAD-5200B-S. Santec is the pioneer for scanning lasers and Swept Source OCT technology with cutting-edge performance in our SS-OCT systems. Santec OCT is used for various applications in medical and industrial fields. With our experienced OCT team, we can provide great solutions to any integration and customization needs with continuous support.

Features

- 1060 or 1310 nm center wavelength
- High sensitivity, low noise with real-time imaging
- User-friendly with a software development kit for LabVIEW & C++/# available
- Image optimization with real-time resampling and dispersion compensation
- 2-ch analog output (+/- 4 V, 16-bit) to control the Galvo/MEMS scanner



Parameter	Unit	Specification			
		HSL-1	HSL-10	HSL-20-50	HSL-20-100
Center Wavelength	nm	1045 - 1075	1040 - 1070	1280 - 1340	1280 - 1340
Axial Resolution (in air)	µm	<16	<18	<18	<18
Imaging Depth Range (in air)	mm	>70 (@10kHZ)	>10	>20	>10
A-line Rate	kHz	10-400 +/- 0.1	100 +/- 0.1	50 +/- 0.1	100 +/- 0.1
Peak Output Power	mW	≥40			
Optical Fiber Type	-	SMF			
OS	-	Windows 10 (64 bit)			
System Bus	-	PCI Express 2.0 (Gen2) 5.0 GT/s x8			

*Please note, these specifications are subject to change. Please contact us for the details.

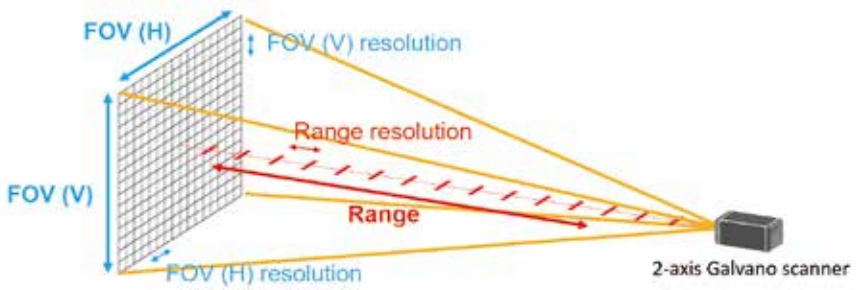
NEW

Inner Vision LiDAR

Beyond OCT Imaging

The **Inner Vision LiDAR** (Light Detection and Ranging) system combines Santec's Swept Source OCT (SS-OCT) technology with the High-Speed Scanning Laser (HSL) series to go beyond OCT imaging and provides FMCW (Frequency-Modulated CW) LiDAR solutions. Santec is the pioneer for scanning lasers and SS-OCT technology with cutting-edge performance in our OCT systems.
The **Inner Vision LiDAR** system can be used for various applications, not only in the medical and industrial fields where SS-OCT systems have already been used but also in other fields, including mobility, robotics and 3D mapping etc.
With our experienced team, we can provide great solutions to any integration and customization needs with continuous support.

Performance



Inner Vision LiDAR	Unit	Specification (Typical)		
Center Wavelength	nm	1060±15		
Detection Range	m	>1	>5	>200*
Range Resolution	mm	>0.06	>0.3	>12
Scan Rate (per point)	kHz	>50	>10	>1
Output Power	mW	>5		
Field-of-View (FOV) (maximum)	°	> 20 (H) x 20 (V) (variable)		
Lines (maximum)	-	> 1000 (H) x 1000 (V) (variable)		
FOV Resolution	°	≧FOV/Lines		
Frame Rate	Hz	$\leqq \frac{\text{Scan Rate}}{\text{H Lines x V Lines}}$		
Data Sampling Rate	GS/s	1		
Data Output Style	-	3D Point Cloud (X,Y,Z), Density (OCT Data)		

*Coming soon

*Please note, these specifications are subject to change. Please contact to us for the details.

Features

FMCW LiDAR Detection

- Santec's extensive SS-OCT technology allows for sophisticated FMCW detection based on coherent heterodyne detection.
- FMCW detection has longer-range detection and higher sensitivity with lower optical power than TOF (Time-of-Flight) detection which is based on direct pulsed laser detection.
- FMCW LiDAR is immune to solar light, ambient light (from surroundings) and light from other LiDAR sensors

Tunable VCSEL Swept Source

Santec's HSL-1 (based on an electrically pumped Vertical Cavity Surface Emitting Laser) delivers high performance, including long coherence length (single-mode lasing), variable scan speed with low signal noise.

Dual Mode (FMCW LiDAR & SS-OCT)

- The Inner Vision LiDAR system can simultaneously output FMCW LiDAR data as a 3D point cloud (X, Y, Z) and SS-OCT data as a set of 2D density plots.

Bench Top Model

OEM Model

Tunable VCSEL Chip

Camera Image

LiDAR Data (depth map)

OCT Data (density plots)

Customizable

With our experienced team and software support, we can provide great solutions and work to meet requirements for any customization needs with continuous support.

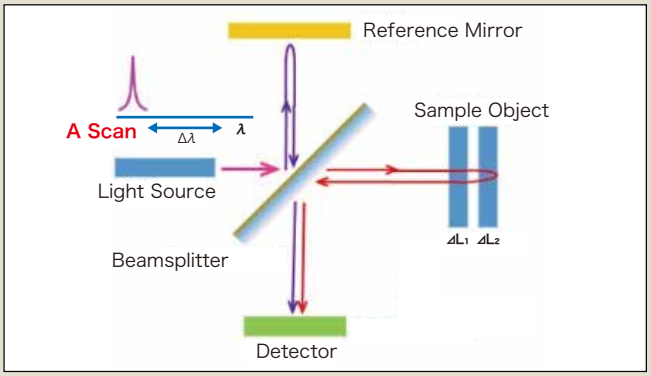
Applications

- Industrial non-invasive inspection
- Transportation
- Robotics
- 3D Mapping and 3D modeling
- Object detection and tracking
- Security systems
- Biomedical imaging

Background of

Swept Source-OCT

Optical Coherence Tomography (OCT) is a non-invasive imaging technique that provides a cross-sectional view of objects and tissue. Diagnostic systems based on this technique are now widely practiced in ophthalmic applications. Compared to conventional medical imaging technologies such as Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), X-Ray Computerized Tomography (CT) and Ultrasonography, OCT provides a safe, high-resolution solution at a cost point that will enable widespread use in hospitals and clinics. Originally, OCT systems used Time-Domain optical interferometry in which the optical path length difference between the reference mirror and the sample in the Michelson or Mach-Zehnder interferometer is modulated with time.
Time-Domain (TD) OCT had opened up the potential of optical biopsy but there are performance limitations for further extension of the applications. Now, Fourier-Domain (FD) OCT is popular because of the performance advantages.
FD-OCT relies on analyzing the individual frequency components of backscattered light from the sample or tissue. There are two methods within FD-OCT. One is Spectral-Domain OCT (SD-OCT) which uses a low coherence light source and a spectrometer, where frequency components are spatially analyzed on the CCD array. The fast readout speed of CCD provides high imaging speed, and high signal-to-noise ratio (SNR) gives a 20-30 dB advantage over conventional TD-OCT. However, there are also disadvantages. Images get blurred and degraded when the sample arm motion washes out interference fringes on the CCD during the pixel integration time. Furthermore, unavailability of an InGaAs CCD with higher pixel resolution also limits the application of FD-OCT for in-vivo endoscopic applications. The other approach is Swept-Source OCT which uses a continuous and repetitively tunable (or "swept") light source where frequency components are analyzed in time with a single photodetector. Each wavelength scan produces an interference pattern signal by the reflections at different depths. Depth-dependent reflection profiles are calculated by a Fourier transform of the interferogram. Repeating this A-scan at different points produce a two dimensional cross section. This technique has a theoretical sensitivity benefit equal to that of SD-OCT, while overcoming the disadvantages of SD-OCT like fringe washout, and allowing the use of longer wavelengths, over a 1 µm range, for tissue imaging. Santec introduced a variety of swept sources that realize high speed, high resolution OCT imaging with extremely high reliability.



Imaging Speed

Wavelength swept rate, or scanning speed of the swept-source is directly reflected on the imaging speed. Swept rate corresponds to the A-line rate in SS-OCT. Increasing the A-line rate makes it possible to accommodate more A-lines per frame or increase the frame rate. In practical applications, the ability to produce video-rate images is of critical importance.

100kHz @1310nm IVS-2000-HS
400kHz @1060nm IVS-1000-VCSEL

This not only removes imaging artifacts that are created by any undesired movement but also enables a large area/volume measurement without compromising resolution, in a short amount of time. Depending on the applications, a swept rate in the 10 kHz to 200 kHz range is required.

Swept rate ⇔ Imaging speed

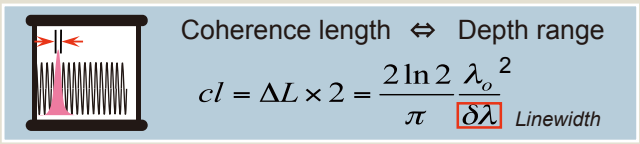
$$Fr = f_{swept} / N_A$$

f_s: Swept rate N_A: A-lines/frame

Imaging Depth Range

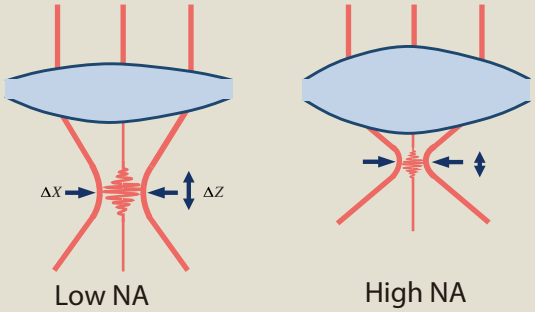
Imaging depth is limited by the penetration depth of the light source in the sample. Furthermore, the depth is limited by the number of data points by the Nyquist theorem in FD-OCT. Shorter interval data gives longer (deeper) imaging depth. The data interval is related to the data sampling speed of data acquisition card and scanning speed of light source in SS-OCT. On the other hand, the signal intensity drops for the higher frequency components, i.e. at a deeper range, since instantaneous linewidth is finite and the OCT signal is a convolution of its spectrum and interferogram. Longer coherence length gives lower signal intensity drops. Coherence length is defined as the optical round trip delay or twice of the depth range where fringe visibility drops half or the Fourier-transformed OCT signal drops 6 dB compared to the signal power at zero delay.

Imaging depth range ≥18mm @1310nm IVS-2000-LC
Imaging depth range ≥70mm @1060nm IVS-1000-VCSEL



Axial Resolution

The axial (depth) resolution is related to the scanning wavelength range and the center wavelength of the laser. Wider scanning range and shorter wavelength give a higher axial resolution.
It should also be noted that the center wavelength should be determined by the absorption and scattering coefficient of the sample.
Resolution (in tissue) 5 µm: IVS-2000-HR



Lateral Resolution

The lateral resolution is related to the NA (numerical aperture) of the lens setup in the probe. Higher NA gives higher lateral resolution at the beam waist depth position. But the depth of focus is limited. The NA of the lens setup is also dependent on the depth of focus suitable for the sample.
Santec's SS-OCT system "IVS series" supports several lens configurations.

$$\Delta Z = \frac{2\ln(2)}{\pi}\frac{\lambda c^2}{\Delta\lambda}$$

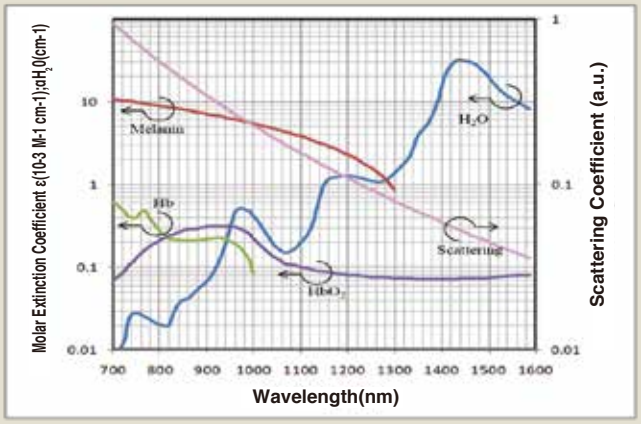
$$\Delta X = \frac{4\lambda f}{\pi d}$$

Δz = Axial resolution
Δλ = Scanning range
Δx = Lateral resolution
λc = Center wavelength
f = Focal length
d = Beam diameter

@1060 nm IVS-1000-VCSEL
@1310 nm IVS-2000-HR
IVS-2000-HS
IVS-2000-LC
IVS-2000-ST

Wavelength Range

The choice of the wavelength band in OCT is dependent on the water absorption and scattering property of the sample or tissue of interest. In general, an 800 nm range is used for retinal imaging because of low absorption in the vitreous humor, and recently 1060 nm range is gaining attention because of large penetration in retinal tissue as well as low dispersion in tissue. In endoscopic applications, the 1310 nm range or a longer range is commonly used because of low-scattering, resulting in large depth penetration. OCT in the 1310 nm range has another benefit: an abundance in available optical components in this range that are developed for optical fiber telecommunication applications.



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