Welcome to OPTOPIA

Santec is a leading manufacturer of products for today’s fiber optics industry. Our mission is to contribute to the creation of a society highly supported by optical technologies – a true Optopia. We pride ourselves on our innovation and dedication to quality developed from 38 years of experience in the industry.
The Photonics Pioneer

For more than three decades, we have been guided by a commitment to the optical technology that is revolutionizing the way we perceive the world and share information. Founded in 1979, Santec produces innovative products with proven quality and reliability. Innovation has had its rewards and Santec has been first to market with many of its products. These include the world’s first optical fiber geometry test system in 1984, an external cavity tunable laser in 1987, linear sliding tunable filters in 1993, multi-channel integrated photo detectors in 2000, ultra-wideband light source in 2003, wavelength & bandwidth tunable filter and SS-OCT System in 2007, and LCOS based waveprocessor in 2011. We believe society will be advanced by photonics and look to the future by developing original products based on our advanced technologies.

Optical Components
Santec is renowned for its quality components for CWDM, DWDM and PON applications.

Optical Subsystems
Our complete knowledge of optical component design and technology makes Santec your best partner for custom development of optical subsystems.

Bench Top Tunable Lasers
Santec was the first company to commercialize tunable lasers for telecommunications. Our current range offers leading edge performance for a plethora of applications.

Test Instruments
Santec has over 38 years of experience designing and manufacturing fiber optic test systems. Developed by fiber optic engineers for fiber optic engineers.

Core Technology

With 38 years of experience in the optics industry Santec has command of the key manufacturing processes to build lasers, instruments and components that meet the stringent demands for excellence by our customers. By committing to innovation as well as listening to our customer requests, Santec has succeeded in introducing solutions for a broad range of new optical applications. Our drive for Optopia has resulted in steps that minimize the timeline for a product to go from conception to commercial applications.

Thermal Control

Medical Applications

MOVU is committed to helping clinicians improve Quality of Life with Advanced Optical Imaging. Movu has brought together a team of experts in medical device development, imaging, optical technology, engineering, and medicine. Combining these skill sets to deliver best-in-class optical imaging systems to market. We’ve combined the Swept-Source OCT (SS-OCT) technique with key technologies to produce ARGOS, an advanced optical biometer that accurately reads biometric information even for the densest of cataracts. The SS-OCT technique delivers improvements in speed and accuracy over traditional OCT techniques such as SD-OCT or TD-OCT. Movu designed the SS-OCT ARGOS Biometer to streamline biometry for the clinician. Enhanced ease-of-use and precision yield an accurate picture of the eye with minimal patient discomfort. A near infrared swept laser is scanned across the patient’s eye and detects the returned light from boundary layers, accurately reconstructing the eyes’ physiology in software.

Quality Products for Fiber Optic Applications

Santec manufactures a full range of passive optical components based on dielectric filter deposition, MEMS and other optical materials. These include interference filter products such as add/drop multiplexers and tunable filters, a range of variable attenuators, optical switches, and power monitoring devices, all specifically designed for WDM systems. Santec’s bench top tunable lasers are noted for their high optical output power, excellent wavelength and power stability, and competitive price. The tunable laser line includes laser products for the complete characterization, test, and manufacture of optical fibers, and optical components.

A full line of test and measurement equipment completes Santec’s fiber optic product range. Built on Santec’s expertise as an optical specialist, the test and measurement group provides the solutions that optical engineers demand, specializing in measurement equipment for the characterization, and manufacturing test of optical fibers and optical components.

ISO Certifications

ISO13485
ISO9001
ISO/TS16949
TUV
SANTEC CORPORATION

Company Profile
- Developing and manufacturing tunable lasers, optical instruments, fiber-optic components and laser source for optical coherence tomography.
- IT Solution business in Japan.
- Service for customers in more than 30 countries, which include most of the world's major telecommunications companies and telecommunications system manufacturers.
- Corporate Headquarters in Japan and three subsidiaries in the world.
- 151 employees in the world. (As of March 31, 2016)
- Founded on Aug 25, 1979 by Dr. Masao Sadamura
- Listed on the JASDAQ market in Tokyo Stock Exchange.

Key Figures (Consolidated) FY 2015 FY 2014
- Revenue (YM) 3,841 3,155
- Net income (YM) 525 454
- Capital (YM) 4,978 4,978

Locations

Management
- Daikou Tei, Ph.D.
  President & CEO
- Wonho Chong
  Executive Deputy President
- Nobuhiro Sugimoto
  Senior Vice President
- Changho Chong, Ph.D.
  Senior Vice President
- Toshiyuki Kambara
  Outside Director

Group Structure

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  Santec Photonics Laboratory (Silicon Valley)
  Santec Toranomon Office (Tokyo)
  Beijing Office (China)

FACT SHEET

Test & Measurement
- Bench Top Tunable Lasers
  High Performance Tunable Laser
  Full band High Performance Tunable Laser System
- Wavelength Selectable Laser
- Measurement Systems
  High Speed Swept Test System
  Optical Power Meter
  Optical Switch Unit
  Polarization Control Unit
  Polarization Extinction Ratio Meter
  Polarized Light Source
- Tunable Filters
  Top-Flat Tunable Filter
  Gaussian Tunable Filter
  Arbitrary Tunable Filter

Components
- Spatial Light Modulator
  Liquid Crystal Based Spatial Light Modulator
- Optical Monitors
  Multi Photo detector Array
  Tap-Integrated Photodetector
  Miniature Tapped Photodetector
  Digital Output Multi-channel Monitor
- Wavelength Selective Switch
  (1×2, 1×4, 1×9)
- Variable Attenuators
  MEMS Attenuator
- Optical Filters
  WDM Filters and Band Splitters

Medical Applications
- Advanced Optical Biometer
- OCT Applications
  OCT system for research, feasibility studies and product development
  Non-invasive real time imaging system "Inner Vision"
  Compact and All-in-one design SS-OCT system
  Features of IVS software
  Tunable VCSEL
  MEMS based HSL
  Polygon scanner based HSL
  OCT-grade Balanced Detector
  Integrated Interferometer Module
  High Speed Imaging DAQ Board
- 3D Printer
  ZEUS

Business Solutions
- Remote Support Tool
- Remote Control Tool
- Solus
- keukey
- Fiber Optic HDMI Extender

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FACT SHEET

SANTEC CHINA
Shanghai
Beijing

High Performance Tunable Laser

TSL-710 (Flagship)
TSL-550 (Market Leader)

The TSL-710 and TSL-550 are the latest in high performance tunable lasers. Combining high output power with high signal-to-noise ratio these lasers are invaluable tools for precise optical testing. An innovative external cavity design has been implemented to lower the optical ASE noise, leading to a high signal-to-noise ratio of over 90dB/0.1nm, while maintaining a high output power of over +10dBm. These lasers are also equipped with features such as fine-tuning and coherence control as standard. GPIB and USB interfaces with the industry standard SCPI command set provide a convenient automated measurement solution.

Features
- Maximum 160nm tuning range within 1260-1680nm
- Mode-hop-free with 100nm/s sweeps
- High Output Power: +13dBm
- High Signal-to-Noise Ratio: 90dB/0.1nm
- Narrow Linewidth: 100kHz

Applications
- Optical component characterization
- Fiber optic transmission testing
- Photonic material characterization
- Optical spectrometry
- Interferometry

Model Selection (TSL-710/TSL-550)
- TSL-710: Premium performance, +/-2pm wavelength accuracy,
- TSL-550 Type A: Standard performance, +/-5pm wavelength accuracy,
- TSL-550 Type C: High performance, +/-5pm wavelength accuracy

Full Band High Performance Tunable Laser System

The Full-band TSL is a full-band, high performance tunable laser system that covers the ultra-wide tuning range from 1260 to 1680nm (O-band to U-band). The system comprises up to four Santec tunable lasers (TSL-710, TSL-550 and TSL-510) with an optical switch module (OSU-100) and full control software.

Features
- Wide Wavelength Range: 1260-1680nm
- Mode-hop-free wavelength sweeps
- 1000nm/s sweep speed
- Easy and automatic operation by exclusive

Wavelength Selectable Laser

WSL-100 (Single or two ports)
MSL-100 (Up to 100 ports)

The WSL-100 is a compact and cost-effective tunable laser source for use in WDM systems and optical measurement applications. This laser is tuned to any wavelength with high resolution of 1MHz in C-band or L-band, covering a 38nm tuning range. An internal wavelength locker provides high wavelength accuracy and stability.

Features
- C-Band or L-band tuning with high resolution
- Fine tuning available with 1MHz resolution
- Narrow linewidth <100kHz
- High output power >+15dBm
- Integrated wavelength locker

Applications
- Fiber optic transmission testing
- DWDM component testing
- Testing & measurement
- Local Oscillator for Coherent detection

Full-band TSL includes 1260-1680nm (O-band to U-band) with an external cavity design to provide high wavelength accuracy and stability.
High Speed Swept Test System

The Santec Swept Test System has been developed to streamline photonic testing, providing a complete solution for WDL and PDL measurement when high-speed analysis, along with high resolution and accuracy are key. Combining one of Santec’s tunable lasers (TSL-710, TSL-550 or TSL-510) with a Santec optical power meter (MPM-200), a polarization control unit (PCU-100) and custom software, the complete Swept Test System optimizes WDL and PDL measurement for use in both R&D and production environments. The Mueller Matrix method is used to generate fast PDL measurements. Our power meter, the MPM-200 mainframe is used with the 4-channel current meter module, the MPM-20. The Swept Test System combined with the MPM-200 and the 4-channel current meter module, the MPM-20.

Features
- Real-time power referencing
- Rescaling algorithm utilizing the santec power meter or the Swept Processing Unit
- Multi-channel measurement available.
- Supporting LabVIEW control software

Optical Power Meter

- **MPM-200** (Main frame)
  - Wavelength range: 1250-1650nm
  - Wide dynamic range: ±3dBm ~ ±30dBm (MPM-10)
  - Wide dynamic range: 3dBa ~ 7dBa (MPM-20)
  - Up to 20 ports measurement
  - Fast measurement (20kHz) with high resolution
  - Data logging

Optical Switch Unit

- **OSU-100**
  - Wide wavelength range: 1260-1680nm
  - 1x4 optical switch
  - Fast switching time
  - Single mode fiber or polarization maintaining fiber

Polarization Control Unit

- **PCU-100**
  - Wavelength range 1260-1360nm/1500-1630nm
  - High SOP repeatability
  - Power monitor function
  - PDL measurement with Mueller Matrix method

Typical configuration

IL / PDL measurement setup with the polarization controller PCU-100 and the power meter MPM-200

Polarization Extinction Ratio Meter

The PEM-330 provides the simultaneous display of polarization ratio (PER), optical power and polarization angle. This device has very high accuracy and wide dynamic range covering the full band from 1260nm to 1630nm. It is particularly suitable for the rapid alignment of optical components to polarization maintaining (PM) fibers. The GPIB and analog interfaces allow full production automation.

Features
- Simultaneous display of extinction ratio, optical power, and polarization angle
- 50dB dynamic range for PER with high resolution 0.01dB
- Wavelength range: 1260 - 1630 nm
- Direct PD analog output
- High power (+20~+20dBm) is available

Polarized Light Source

The PLS-100 is a light source with well defined polarization. It features stable high output power while maintaining a high polarization extinction ratio of 45dB (typ). Combining PLS-100 and PEM-330 provides an optimized system for PER measurement of polarization maintaining (PM) fibers.

Features
- Polarization extinction ratio, up to 45dB
- High output power and power stability
- Wavelength range : 1310±20 nm or 1550±20 nm

Santerc/Swept Test Systems are used for high speed and high resolution photonic testing and for both R&D and production environments. The Swept Test System is a complete solution for WDL and PDL measurement, providing high accuracy and high resolution. The MPM-200 mainframe is used with the 4-channel current meter module, the MPM-20. The Swept Test System combined with the MPM-200 and the 4-channel current meter module, the MPM-20.

Features
- Real-time power referencing
- Rescaling algorithm utilizing the santec power meter or the Swept Processing Unit
- Multi-channel measurement available.
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Optical Power Meter

- **MPM-200** (Main frame)
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  - Wide dynamic range: ±3dBm ~ ±30dBm (MPM-10)
  - Wide dynamic range: 3dBa ~ 7dBa (MPM-20)
  - Up to 20 ports measurement
  - Fast measurement (20kHz) with high resolution
  - Data logging

Optical Switch Unit

- **OSU-100**
  - Wide wavelength range: 1260-1680nm
  - 1x4 optical switch
  - Fast switching time
  - Single mode fiber or polarization maintaining fiber

Polarization Control Unit

- **PCU-100**
  - Wavelength range 1260-1360nm/1500-1630nm
  - High SOP repeatability
  - Power monitor function
  - PDL measurement with Mueller Matrix method

Typical configuration

IL measurement setup with the power meter MPM-200

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- 50dB dynamic range for PER with high resolution 0.01dB
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- High output power and power stability
- Wavelength range : 1310±20 nm or 1550±20 nm

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Top-Flat Tunable Filter

Programmable type OTF-980

The OTF-980 is a versatile programmable optical tunable filter that provides simultaneous and independent tuning of center wavelength and bandwidth over C & L bands. The OTF-980 is built with novel free-space optics combined with an ultra-fine tuning mechanism to ensure precise filter control and a flat-top passband shape. The fully programmable OTF-980 has automatic adjustment of the filter center wavelength and bandwidth. An integrated power meter monitors power at the output and features an automatic peak search function. The OTF-980 is also controlled via the front panel touchscreen.

Features
- Center wavelength & bandwidth tuning independently
- Flat-top filter shape with steep filter slope: Ultrafine 0.08-4.0nm, Ultrafine-Plus 0.05-3.0nm
- Wavelength tuning range: C&L-band 85 nm
- Bandwidth adjustable range: Ultrafine 0.08-4.0nm, Ultrafine-Plus 0.05-3.0nm
- Peak search function
- Touchscreen and GPIB/Ethernet/USB interfaces

Applications
- 100Gb/s, 400Gb/s transmission test
- Peak search function optionally (1, 2 or 4 outputs)
- Excellent optical filtering with steeper edge (Typ.400dB/nm)
- Fine frequency and bandwidth control (Typ.1GHz)
- C- or L-band operation
- Programmable arbitrary spectral shaping
- Power monitoring and peak search functions
- Full GPIB support with LabView driver

Manual type OTF-350

The OTF-350 is a versatile manually optical tunable filter that allows both wavelength tuning and passband width tuning independently. Unique precision free space optics and an accurate tuning mechanism deliver excellent optical control and a flat-top passband shape.

Features
- Wavelength range: 1530-1610nm (C&L Band) O-band is available
- Bandwidth: 0.2-10.0nm (Normal type)
- Bandwidth: 0.1-15.0nm (Wide type)
- Flat-top filter shape

Applications
- Programmable arbitrary spectral shaping
- < or L-band operation
- Fine frequency and bandwidth control (Typ.1GHz)
- Excellent optical filtering with steeper edge (Typ.400dB/nm)
- Switching function optionally (1, 2 or 4 outputs)
- Optical equalizer for high-speed optical signals
- 100Gb/s, 400Gb/s transmission test
- Adjustable and adaptive DWDM, OFDM channel filtering
- Next generation bundle wavelength OXC

Gaussian Tunable Filter

Programmable type OTF-930

The OTF-930 bench-top tunable filter features a full 80nm bandwidth tuning range, and improved tuning mechanics to ensure low insertion loss. The patented linear ‘sliding tuning’ method achieves excellent optical properties, including very low PDL and PMD. The versatile configuration of the device allows you to select both the filter profile and the number of cascaded filters (S1, S2, or S3), offering a wide variety of filter profile options to suit most filter optic applications. It comes equipped with GPIB and RS-232C control interfaces to enable remote control and data acquisition.

Features
- 800nm tuning range, 0.01nm resolution
- Filter selections: 3dB Bandwidth 0.25 - 5.5 nm
- Low PDL (<0.1dB) “linear sliding” filter
- Power monitoring and peak search functions
- Full GPIB support with LabView driver

Manual type OTF-320

The OTF-320 is a manually tunable optical filter that features a wavelength indicator.

Applications
- Programmable arbitrary spectral shaping
- Adjustable and adaptive DWDM, OFDM channel filtering
- Arbitrary optical filtering and switching functions with santec’s unique LCOS (Liquid Crystal On Silicon) technology
- It can be used as an optical equalizer for high-speed signals beyond 100Gbps, as an adaptive channel filtering for advanced optical transmission systems, or as a flexible test and measurement system.

Features
- Programmable arbitrary spectral shaping
- Adjusted and adaptive DWDM, OFDM channel filtering
- Optical equalizer for high-speed optical signals
- 100Gb/s, 400Gb/s transmission test
- Next generation bundle wavelength OXC

Arbitrary Tunable Filter

WSS-1000

The WSS-1000 is a system programmable to generate arbitrary optical filtering and switching functions with santec’s unique LCOS (Liquid Crystal On Silicon) technology. It can be used as an optical equalizer for high-speed signals beyond 100Gbps, as an adaptive channel filtering for advanced optical transmission systems, or as a flexible test and measurement system.

Features
- Programmable arbitrary spectral shape
- Switching function optionally (1, 2 or 4 outputs)
- Optical equalizer for high-speed optical signals
- 100Gb/s, 400Gb/s transmission test
- Adjusted and adaptive DWDM, OFDM channel filtering
- Next generation bundle wavelength OXC

Applications
- Optical equalizer for high-speed optical signals
- 100Gb/s, 400Gb/s transmission test
- Adjustable and adaptive DWDM, OFDM channel filtering
- Next generation bundle wavelength OXC
Liquid Crystal Based Spatial Light Modulator

Santec spatial light modulator (SLM) is based on reflective liquid crystal on silicon (LCOS) microdisplay technology. The SLMs enable optical phase modulation, freely and generate arbitrary 2D phase patterns on a LCOS pixel-by-pixel basis. The SLMs are characterized by ultra-low phase fluctuation from high drive frequency over 1kHz and 10bit high resolution addressing. These abilities are suitable for various applications including laser material processing, optical switching devices, wavefront correction and pulse shaping.

Features
- No mechanical motion
- Ultra-low phase fluctuation
- High resolution phase control
- User-friendly graphical user interface

Optional manipulation
- Programmable phase pattern

Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength range</td>
<td>500-1650 (User specified) nm</td>
</tr>
<tr>
<td>Resolution</td>
<td>1440 x 1050 pixel</td>
</tr>
<tr>
<td>Pixel size</td>
<td>10.0/10.4 µm</td>
</tr>
<tr>
<td>Panel size</td>
<td>14.98 x 10.92 mm</td>
</tr>
<tr>
<td>Addressing bit depth</td>
<td>10 bit</td>
</tr>
<tr>
<td>Video frame rate</td>
<td>60 Hz</td>
</tr>
<tr>
<td>LCOS drive frequency</td>
<td>1kHz</td>
</tr>
<tr>
<td>Phase depth</td>
<td>Typ. 2π / (User specified) rad</td>
</tr>
<tr>
<td>Phase fluctuation</td>
<td>Typ. &lt; 0.002 rad</td>
</tr>
<tr>
<td>Signal format</td>
<td>DVI</td>
</tr>
<tr>
<td>Dimensions</td>
<td>130 x 100 x 33 mm</td>
</tr>
</tbody>
</table>

LCOS-SLM: High definitionのLCOS（液体クリスタルオンシリコン）を用いた、高解像度の空間相変調です。High Definitionの4K解像度で、標準以上4倍の高解像度を実現します。LCOS-SLMは、光波長変調、波長変調、空間相変調、動的相変調などの機能を実現しています。

Multi-Photo detector Array

The MPA-100 is a highly integrated rack model of pigtailed photo-detector array. Multi-channels optical power from MPO or MTP connectors are detected by photo-detector array. Photo-detector of Si type for 850nm range and InGaAs type for 1300-1610nm are available. The detected photo-current are converted to voltage output using a 16-bit DAQ interface. The dimension is (W)482.6 x (D)430 x (H)44mm.

Features
- Multi-channels photo-detector array up to 80 channels
- Power monitoring and testing at 850 nm SR4, SR10
- Wide-operating wavelength range: 7260 ~ 1610nm
- Wide-optical input range: -50 ~ -10 dBm
- Excellent linearity: +/- 0.6dB
- MPO adapter / High-density MPO, MTP connectors
- 16-bit DAQ voltage output by a USB interface
- 1U Size (44mm) slim design
- Custom model is available upon request

Applications
- Optical power testing of transceivers for IEEE 802.3ba based SR4, SR10, LR4, ER4
- Optical power monitoring for data communications, broadband/CATV networks, and telecommunications networks
- Optical power monitoring in data center equipment
- Optical power monitoring of interconnections of active optical cables.

Example of input power and output voltage for 80 channels in a MPA-100-10-B-IR-SM-MT-01.

MPA-100: マルチチャネルのフィットディテクタラック・タイプのマウント型製品です。MPD・MTP端子のパイピングにより組み立てられる複数の光パワー信号をモニタします。波長850nm帯を検出するSi型（7260~1610nm）と検出するInGaAs型の光検出器を組み合わせ、パワーラベルの光を入力するMPO端子に接続します。
Tap-Integrated Photodetector

**IPD-1/4/8/10**

Santec’s IPD is an optical power monitoring device consisting of individual tap-integrated photodetectors. It is very compact and eliminates the need for separate couplers and photodetectors. Optical properties are excellent and include a broad wavelength range covering C and L-bands with low insertion loss and high sensitivity. A range of devices are available with properties customized for different applications.

**Features**
- Excellent optical properties
- Compact design
- Custom subsystem builds available
- Telcordia GR-468 qualified

**Rich variety of tap ratio**
- 0.5, 1, 2, 3, 5, 10, 30 and 50% tap
- Any customization available

**Option Lineup**

- Multi-channel type
  - 4, 8, 10 channel package available
  - Fiber ribonized available
  - Easy installation to your system

- Uni-direction type
  - Suitable for EDFA gain monitor
  - >33dB directivity

- Ultra-wideband type
  - All band and C/L-band
  - Suitable for OXC, Switch monitoring

- Low dark current type
  - <2nA@70°C dark current
  - 55dB(max.) dynamic range for high accurate sensitivity

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Miniature Tapped Photodetector

**MTP-1/8/10**

Santec’s MTP is an ultra-compact tap-photodetector, comprising all features of standard IPD including high reliability, performance and options. This module is excellent for high-density integration in next generation optical network system.

**Features**
- Excellent optical properties
- Ultra-compact design
- Telcordia GR-468 qualified

**Rich variety of tap ratio**
- 0.5, 1, 2, 3, 5, 10, 30 and 50% tap
- Any customization available

**Other lineup**
- Small bending radius fiber available (R>5mm)
- Multi mode fiber available
- Polarization maintain fiber (PMF) available
- Filter integration type
- Supervisory monitor
- Video signal detector for FTTH
- Specified signal monitor

**Optical input PD Array**

- Log Amp Micro-controller
- RS-232
- I2C

**Package variation**

- Standard: Φ3.5 x 21mm
- Uni-direction: Φ4.4 x 25mm

---

Digital Output Multi-channel Monitor

**IPM-8**

Santec’s IPM-8 is an integrated tap-monitor and high dynamic range log-amplifier module for any DWDM application. This device detects optical signal, and calculates to absolute optical power using a calibration data. The optical power data can be accessed from electrical communication interface.

**Features**
- Small package
- Good accuracy
- Wide dynamic range
- I2C and RS-232 interface

**Input Port**

- Splitter mirror

**Output Port**

- Lens PD

**Upstream**

- Video signal

**Filter**

- Lens PD

**Example (Video signal detector)**

- Digital Output Multi-channel Monitor

**Package variation**

- Standard: Φ3.2 x 15mm
- Uni-direction: Φ3.2 x 20mm

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Optical Monitors
**Wavelength Selective Switch**

**Wavelength Selective Switch (1x2, 1x4, 1x9)**

WSS-100

Santec’s WSS (Wavelength Selective Switch) is based on LCOS (Liquid Crystal on Silicon) technologies. It is fully compatible with the proposed spectrally efficient flexible grid standards for next-generation OTNs (optical transport networks). Santec’s proprietary LCOS driver architecture enables the accurate and flexible frequency management, while also reducing the power consumption for green OTNs. The compact design will contribute to drastic space reduction in network systems.

**Features**
- LCOS based technology
- C or L-band operation
- Flexible grid support
- Wide filter shape
- Low polarization dependent loss
- Fast response
- Low power consumption
- High reliable and stability
- Compact design 165x110x20mm (1x2, 1x4WSS)
  165x120x27mm (1x9WSS)

**Applications**
- Multi-degree ROADMs
- CDC-ROADMs
  * CDC: Colorless, Directionless, Contentionless

**Typical PDL performance**

- Santec’s WSS is based on LCOS (Liquid Crystal on Silicon) technologies.
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- The compact design contributes to drastic space reduction in network systems.
MEMS Attenuator

For DWDM application, Santec’s MOVA is an optical variable attenuator based on electrostatic MEMS technology. Our tilting mirror design coupled with laser welded packaging ensure a reliable, stiction-free device. Silicon MEMS devices are robust, which withstands repeated switching, wide temperature range and mechanical shock without failure. Operational stability and long-term reliability are ensured with Telcordia compliant packagings.

Features
- Excellent optical performance
- Low power consumption
- Fast response
- Bright / Dark types available
- High durability (Up to 1 billions cycles)
- Stiction-free structure
- High reliability and stability
- Polarization maintaining fiber available
- Shutter function
- Telcordia GR-1221 qualified

WDM Filters and Band Splitters

Santec’s standard CWDM/DWDM filter modules cover both C and L-bands with standard ITU grid, while custom filters are also available. The modules can be supplied in either 2-port, 3-port or multi-channels, multiplexer or demultiplexer configurations. The modules use high quality thin-film filter technology and boast excellent optical properties with low loss, low PDL and low chromatic dispersion. The filters are fully tested to Telcordia GR-1221 with proven reliability in the field.

OFM-15 (2-port)
WDM-15/CWDM-15 (3-port)
MDM-15/C-CWDM (Multi channel)

MOWA-1

MOVA-1 MEMS Attenuator

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- Polarization maintaining fiber available
- Shutter function
- Telcordia GR-1221 qualified

Typical Operational Vibration Characteristic

Control Voltage (V) vs. Attenuation (dB)

Response Speed

Driving Voltage [V] vs. Response Time [ msec]

Attenuation Characteristics

X-axis Y-axis Z-axis

Frequency [Hz] vs. Attenuation [dB]
The ARGOS Optical Biometer has been designed to maximise the clinician’s ease-of-use while delivering superior precision. This non-invasive, non-contact optical biometer outperformed its competitors in clinical trials. ARGOS streamlined the process of acquiring biometric parameters. It delivers:

**Features**

- Benefit from next generation optical biometry
- Swept source OCT technology
- New standard in repeatability
- 9 biometric parameters in less than a second
- Whole eye imaging, fewer surprises
- Barrett Formula ・ Toric Planner ・ DICOM

ARGOS is made in Japan with FDA certification number CE 0123.

ARGOS光学計は、波長分散型OCT光源を使用した光学式厚さ測定装置で、屈折率分布の測定のための必要となる測定パラメータの測定を従来技術よりも高精度、高速で行うことを実現した眼科向け医療機器です。従来型の理論モデルを用いて、測定時に、角膜から網膜までの全屈折率について2次元OCT画像を表示することが可能です。さらに、従来、測定に使われていた厚さの測定を可能にした場合においても、測定の精度を飛躍的に向上させています。
OCT Applications

OCT system for research, feasibility studies and product development

**IVS-2000**

The system can be a default system suitable for initial development of your OCT system. Customizability and the ease of use save your development resources. The control software is LabVIEW based; the SubVI is available as an option. The probe configuration is customizable in terms of mechanical design and lateral spot size. The swept source specification is also widely customizable, selectable from the wide range of specifications offered in the santec’s HSL series lasers.

**OCT image gallery**

- Developmental Biology
- Industrial Inspection

Non-invasive real time imaging system “Inner Vision”

OCT (Optical Coherence Tomography) is a non-invasive imaging technique that relies on analyzing the frequency components of backscattered light from the internal structure of an object or tissue. The santec OCT system “Inner vision”, which utilizes the source “HSL series”, enables either 3-D imaging or real time 2-D imaging with high resolution.

**Features**
- Non-contact, Non-distractive, Non-invasive
- 2D & 3D measurement
- High resolution (Min. 6um)
- Deep measurement depth (>15mm)
- 2D & 3D measurement
- Television delay line
- Balanced photodetector
- Processor / special OCT software

**Applications**
- Industrial non-invasive inspection
- Film thickness
- Defect inspection
- Figuration
- Biology & medical microscope

**Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength band</td>
<td>mm</td>
<td>1000/1510</td>
</tr>
<tr>
<td>Axial resolution</td>
<td>μm</td>
<td>6~12</td>
</tr>
<tr>
<td>Lateral resolution</td>
<td>μm</td>
<td>3~10</td>
</tr>
<tr>
<td>Measurement speed</td>
<td>mm/sec</td>
<td>20,000-100,000</td>
</tr>
<tr>
<td>Imaging depth</td>
<td>mm</td>
<td>3.0</td>
</tr>
<tr>
<td>Imaging width</td>
<td>mm</td>
<td>15.0</td>
</tr>
</tbody>
</table>

**Compact and All-in-one design SS-OCT system**

**IVS-300**

This all-in-one, portable system is especially suitable for feasibility studies in clinical research applications, or for preliminary general OCT studies. This system provides a low cost solution and a simple interface, like a microscope.

**Features**
- High Performance
  - High speed: 36kHz A line rate
  - High resolution: <10um (Typ.)
  - High sensitivity: >100dB (Typ.)
- Easy Operation
  - Touch panel
  - 2D/3D imaging mode
- Compact 2 axis handheld probe
- Long Neck or Grip Configurations
- High-Resolution type & Cross Polarization type available
- Free 3D Viewer attached

**Options**
- High-resolution type
- Cross Polarization type

**Features of IVS software**
- Proprietary rescaling algorithm integrated FPGA DAQ board
- Real time imaging up to 30fps
- 1D, 2D, 3D imaging mode
- Storage mode for time elapsed measurement
- Scan angle setting arbitrary angle scan
- OCT graph capture, Raw data import/export
- Custom settings Viewing area (IVS-2000)
- Thickness, distance analysis software for industrial application available (IVS-2000)
- LabVIEW Sub-VI files, source codes are available as option

**OCT Main software**

IVS-2000 and IVS-300 systems are developed as a portable system with a simple interface, suitable for feasibility studies in clinical research applications, or for preliminary general OCT studies. This system provides a low cost solution and a simple interface, like a microscope.

**IVS-500C**

This system is a compact and all-in-one design SS-OCT system that integrates the swept source, interferometer, and detector into a single unit. It is designed to be easy to use and suitable for a wide range of applications, including medical imaging and industrial inspection.

**Probes**

- Long neck type
- Grip type
- Lateral scan area: 50mm
- Depth of focus: 3mm
- Working-distance: 1mm
- Suitable application: Dental, General

**Probe type**

IVS-500C is a compact and all-in-one design SS-OCT system that integrates the swept source, interferometer, and detector into a single unit. It is designed to be easy to use and suitable for a wide range of applications, including medical imaging and industrial inspection.
OCT Applications

**Tunable VCSEL**

**HSL-1**

The HSL-1 is based on advanced electrically pumped VCSEL (Vertical Cavity Surface Emitting Laser) technology. An attractive laser for SS-OCT applications, the HSL-1 takes advantage of a number of features intrinsic to VCSELs to deliver best-in-class performance, including long coherence length, variable scan speed and low signal noise. The HSL-1 has been designed with system integration in mind; a compact, efficient package the laser is also robust, reliable and suitable for mass production.

**Features**
- 1060nm Wavelength Range
- Single Mode Lasing: Ultra Long Coherence Length >100mm
- Flexible Scanning Rate, Tuning Range, and Direction
- Coherence Revival and Mode Competition Noise Free
- Compact and Designed for Reliability
- Integrated k-Trigger
- Booster Amplifier Option

**Applications**
- Swept Source OCT
- Spectroscopy
- Interferometry
- Optical Sensing

**MEMS based HSL**

**HSL-20** (1.31um wavelength band)

The HSL-20 is Santec’s MEMS based swept laser that combines high speed operation with long coherence length in a compact package for the ultimate in integrated sources for SS-OCT imaging. Scan rates up to 100kHz are available from this robust laser that may be configured with start trigger and k-clock depending on system needs.

**Features**
- 1.31um wavelength band
- 50kHz and 100kHz unidirectional sweep
- Long coherence length >20mm
- High output power >50mW (at peak)
- k-Trigger integrated
- Compact size (150x226x67mm)
- OEM package/Customerization available
- USB interface

**Applications**
- OEM source for OCT systems
- OEM source for Point-of-Care applications

**Polygon scanner based HSL**

**HSL-2100** (1.31um wavelength band)

The HSL-2100 is Santec’s best selling tried and trusted scanning laser designed for OCT applications. The output wavelength is scanned continuously at high speed using a polygon based filter. Scan rates of up to 50kHz (high speed model) and tuning range of up to 170mm (wideband model) are available, with linear scan that allows for imaging using rescaling technique without k-clock. Averaging of A-lines to increase image SNR is made possible by the high-stability technique without k-clock. Averaging of A-lines to increase image SNR is made possible by the high-stability technique without k-clock. Averaging of A-lines to increase image SNR is made possible by the high-stability technique without k-clock.

**Features**
- Max. 50kHz scan rate, >170nm tuning range
- Linear frequency scan. High-linearity option available

**Applications**
- Research in Biomedical Imaging, Spectroscopy and Fiber-Optic Sensing.
- OEM source for OCT systems/HSL-200 (Medical devices and in-line inspection systems)

**Scanning Laser for Spectroscopic analysis**

**HSL-200 / HSL-2100 Optical Characteristics**

- Tunable VCSEL
  - Pros: Tunable speed and Ultra long Lo No coherence revival.
  - Cons: Scan range is still limited.
- MEMS
  - Pros: High speed and long Lo
  - Cons: k-clock or real time rescaling is needed
- Polygon scanner
  - Pros: Simple rescaling
  - Cons: Lo and Speed is not so high

**HSL-200**

OE Solution

HSL-200 is the OEM swept source package based on the same technology used in the bench-top lasers, HSL-2100. The HSL-200 packs the same high performance of the bench-top unit into a smaller footprint and adds features such as RS-232C communication for integration into customer systems. Santec will customize HSL-200 laser performance to match imaging requirements.

**Features**
- Max. 200kHz scan rate, >40nm tuning range
- Linear frequency scan. High-linearity option available

**Applications**
- OEM solution for OCT systems (HSL-200)
- (Medical devices and in-line inspection systems)

**Scanning Laser for Spectroscopic analysis**

**HSL-200 / HSL-2100 Optical Characteristics**

- Tunable VCSEL
  - Pros: Tunable speed and Ultra long Lo No coherence revival.
  - Cons: Scan range is still limited.
- MEMS
  - Pros: High speed and long Lo
  - Cons: k-clock or real time rescaling is needed
- Polygon scanner
  - Pros: Simple rescaling
  - Cons: Lo and Speed is not so high

**HSL-200**

OE Solution

HSL-200 is the OEM swept source package based on the same technology used in the bench-top lasers, HSL-2100. The HSL-200 packs the same high performance of the bench-top unit into a smaller footprint and adds features such as RS-232C communication for integration into customer systems. Santec will customize HSL-200 laser performance to match imaging requirements.

**Features**
- Max. 200kHz scan rate, >40nm tuning range
- Linear frequency scan. High-linearity option available

**Applications**
- OEM solution for OCT systems (HSL-200)
- (Medical devices and in-line inspection systems)
OCT Applications

OCT-grade Balanced Detector

**BPD-200**
DC to 80MHz
(Suitable for <30kHz A-Line rate)

**BPD-200-HS**
DC to 200MHz
(Suitable for >30kHz A-Line rate)

BPD-200 is a balanced photo detector that outputs the difference of two detector signals. This can be used for reduction of common mode noise due to the laser power fluctuation. In heterodyne detection as in most of OCT applications, it provides a 3dB sensitivity advantage when detecting the signal inverted in phase in between two input signals. Furthermore, special design significantly reduced the problem of the undesired image artifact which was a major problem in the other balanced detectors. BPD-200 is the best detector ever made specifically for SS-OCT applications.

**Integrated Interferometer Module**

**IFM-200**

IFM-200 is an OEM module Mach-Zehnder type interferometer. A wide range of configurations can be realized based upon customer requirements including PS-OCT with added features such as targeting diode laser, and optical delay line. Thirty-five years of optical integration and packaging experience is applied to maintain high quality and high reliability as well as optimizing cost. Custom configuration including other interferometer types (ex. Michelson, Fizeau type) can be designed for OEM solutions.

**High Speed Imaging DAQ-Board**

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

**BPD-200**
DC to 200MHz
(Suitable for >30kHz A-Line rate)

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

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

**Features**
- Real-time imaging (30 frames / sec)
- Customized FPGA for SS-OCT with HSL-Series
- High reliability and high gain, high linearity
- Includes analog output (2ch)

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

**BPD-200-HS**
DC to 200MHz
(Suitable for >30kHz A-Line rate)

**OCT Applications**

**Features**
- Designed for OEM solutions.
- Interferometer types (ex. Michelson, Fizeau type) can be optimized for cost. Custom configuration including other laser, and optical delay line.
- Thirty-five years of optical integration and packaging experience is applied to maintain high quality and high reliability as well as integration and packaging experience is applied to OEM solutions.

**Applications**
- Swept Source - OCT
- Heterodyne measurement
- OFDR (Optical Frequency Domain Reflectometry)
リモート支援ツール

RemoteViewと連携して、遠隔地パソコンの電源を起動できるスマート電源管理品

電源管理とコスト削減
必要なだけパソコンの電源を遠隔でONにできるので、不必要な電力消費を防げます。

モバイル端末からでもOK！パソコンだけでなくAndroid機等タブレット、iPhone/iPadにも対応しているため、スマートワーク環境を実現できます。

複数のパソコンを効率的に管理
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白眼生体認証統合ソリューション

Solus

IT Solutions

White Solutions

Components

Test & Measurement

OCT

IT Solutions

Solusは、あらゆる認証、本人確認において、負担のない、高セキュリティな認証ソリューションを提供します。

Windows Login 及びSSO連携イメージ

より便利で、よりセキュアな次世代の認証ソリューションをご体験ください。
直感的なキーボード入力修正メソッド

1. 前入力の修正
   昨日の花火大会に参加したかな。
   今日の花火大会に参加する。

2. 語彙の補充
   昨日の花火大会前に飲んだものを。
   昨日の花火大会前に飲んだもの。

3. 1文字連続入力
   昨日の花火大会にも参加したなら。
   昨日の花火大会にも参加したなら。

4. 義務の削除
   昨日の花火大会にも参加した。
   昨日の花火大会にも参加した。

5. 原文字から音検索
   木曜日
   昨日の花火大会にも参加した。

6. 委音から音検索
   木曜日
   昨日の花火大会にも参加した。

HDMI光エクステンダー

販売開始4年でフィールド故障0件
HDMI(高精細ディスプレイやディスプレイといったAV機器間の接続方法としてHDMIが普及しつつあります。販売機器の接続を前提としているので最長3m程度となっていて、HDMI信号を延長できるというニーズに対応するようになりました。HDMIエクステンダーは、元々無制限の伝送機能を有するレーザ光源3台を搭載し、波長重光ファイバー通信による500mまで大容量通信を実現しています。これにより電気信号をそのまま光信号に変換するので映像の再現性が極めて良好で、オーディオ信号が伝送されない。映像機器との相性が良好、伝送すれば即座に動作する。現場での障害発生が無く、信頼性が高いために、運用者や技術者、コンサート団体の専門家、衛星インターネットから好評です。