Swept Wavelength System

SWS2000 Series

Key Features

- Scalable architecture—add more stations any time
- ±0.002 nm absolute wavelength accuracy
- Up to 128 detector channels available per station
- Remote source laser can be shared by up to 8 workstations
- High speed scanning (user controllable) up to 40 nm/s
- Flexible easy-to-use software
- Customized applications through dynamic link libraries (DLLs)
- 24/7 service and support

Applications

- Optical component and module characterization in both R&D and manufacturing environments
  - ROADMs, Wavelength Switches, Wavelength Blockers
  - Circuit Packs
  - Dense wavelength division multiplexing (DWDM)
  - Tunable Filters, Couplers, Splitters, Switches, Attenuators, Fiber Bragg Gratings (FBGs), Interleavers, Dichroic Filters
  - Micro-Electro-Mechanical Systems (MEMS) and Waveguide Devices
  - Complies with IEC 61300-3-29, IEC 61300-3-12

Safety Information

- Complies to CE requirements plus UL3101.1 and CAN/CSA - C22.2 No. 1010.1. The laser source in the Source Optics Module (SWS20010) is a class 1. The Tunable Laser Source (SWS17101) is a class 3B laser. Both are classified per IEC standard 60825-1(2002) and comply with 21CFR1040.10 except deviations per Laser Notice No. 50, July 2001.

The Swept Wavelength System SWS2000 series remains the industry standard solution for measuring insertion loss (IL), polarization dependent loss (PDL), return loss (RL) and directivity with high wavelength resolution in both research and development (R&D) and production environments. Currently used at more than 80 customer sites, with over 8500 detector channels deployed, the SWS test platform validates optical performance for the latest in optical components and modules including: ROADMs, Wavelength Switches, Tunable Filters and Circuit Packs. The SWS system consists of a tunable laser source, a source optics module (SOM), a control module, a receiver chassis, one or more detector modules and application software.

With a ±0.002 nm absolute wavelength accuracy over the entire 1520 to 1630 nm range, a high sweep speed of 40 nm/s, and a deep dynamic range of >70 dB, the SWS2000 provides excellent performance combined with a low cost of ownership; the distributed architecture supports up to eight separate, individually controlled measurement stations per source laser. Often purchased initially as an R&D tool, this scalability in the number of measurement stations provides customers the flexibility to transition the equipment from R&D to production.

Upgrade packages from legacy SWS systems to the SWS2000 platform are available to ensure that existing SWS users receive the maximum benefit from their existing capital infrastructure.

SWS directly measures IL, PDL and average loss as a function of wavelength. RL is measured with the optional RL modules (SWS20005). Using the raw IL and PDL data, the application software provides a comprehensive set of analysis tools that calculate:

- Loss at peak
- Center wavelength, from x dB threshold
- Loss at center wavelength
- Bandwidth at x dB threshold
- Crosstalk, left/right and cummulative
- Flatness

These parameters are calculated relative to the measured peak, ITU grid, or user-defined grid.

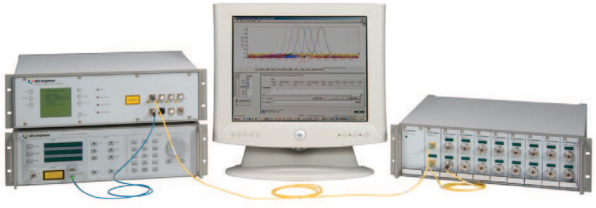
The SWS is delivered with a set of DLLs that can be used to develop software to suit custom testing requirements. The DLLs function through the SWS receiver hardware, allowing access to all SWS functionality. Using the supplied DLLs, applications may be developed in Visual Basic™, C, C++, or LabView environments.

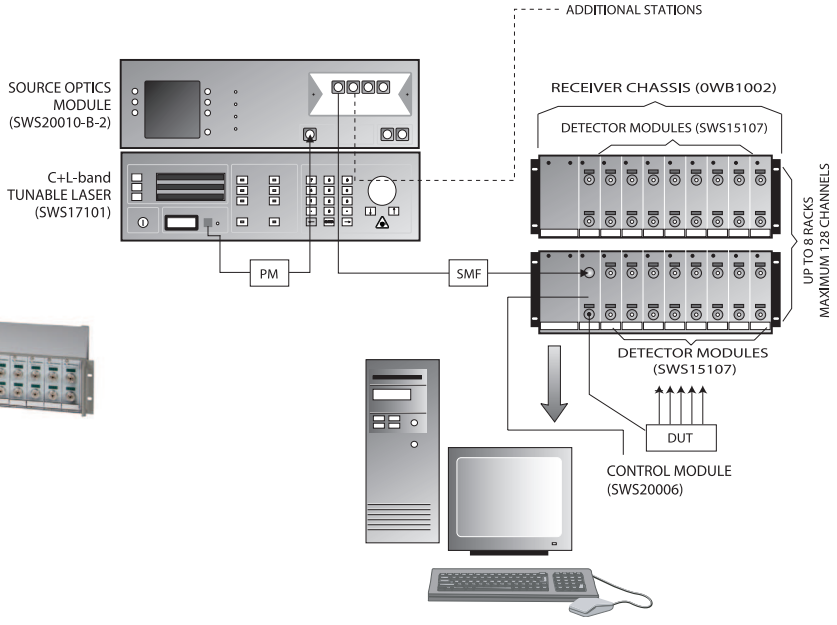
With a 4-State polarization controller located within the SOM, PDL and average loss are measured quickly as a function of wavelength. Four polarization states at 0°, 90°, –45° and circular polarization are measured, and the Mueller matrix analysis is used to accurately determine PDL at all wavelengths scanned.

When the very highest accuracy PDL measurements are required, a special version of the detector module should be used. The SWS15107-A contains specially selected and tuned components to allow PDL measurement to an accuracy of better than ±0.01 dB. This module is supplied with a fixed FC/APC connector.

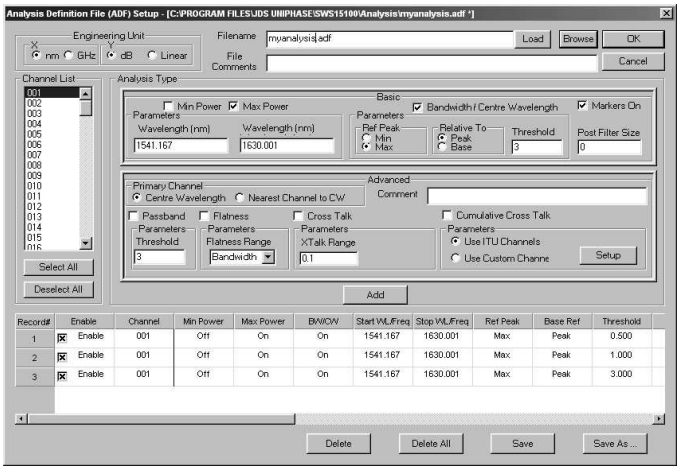
All specifications listed are met simultaneously. No change in wavelength accuracy (±2 pm) or scan speed (20 nm/s) is required to obtain a 70 dB dynamic range.

Typical Application of SWS2000

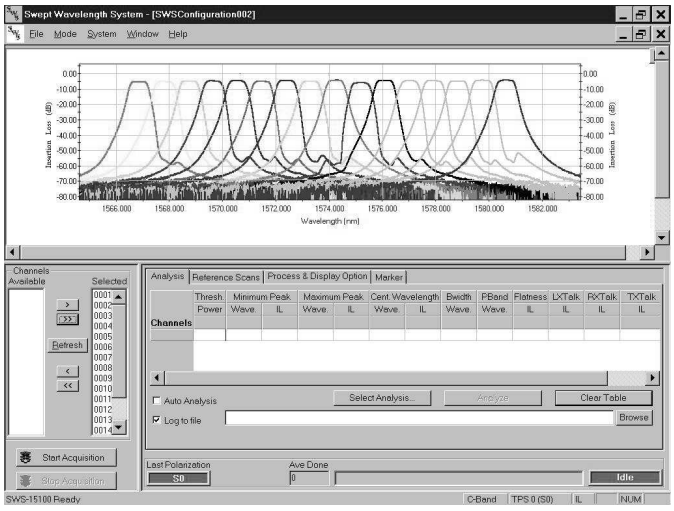




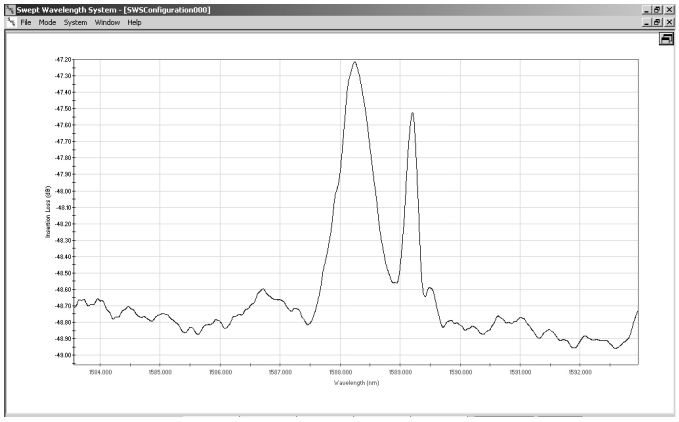
Analysis Setup Window



Data Display and Control Window



RL Measurement with SWS2000



SWS2000 Specifications

Parameter	Single Output Source Optics Module
Wavelength range	C+L-band 1520 to 1630 nm
Absolute wavelength accuracy	±2 pm
Measurement resolution[1]	1 pm
Wavelength sampling resolution	3 pm
Insertion loss (IL) measurement accuracy	±0.05 dB (0 to 25 dB device IL)
including polarization state averaged IL[2, 3]	±0.10 dB (25 to 45 dB device IL), ± 0.20 dB (45 to 65 dB device IL)
Dynamic range[3]	>70 dB
Loss measurement repeatability[2, 3, 4]	±0.02 dB
Loss measurement resolution	0.01 dB
Return loss (RL) measurement range[3, 5]	60 dB
Polarization dependent loss (PDL) measurement accuracy	±0.05 dB (0 to 20 dB device IL)
using standard detector module SWS15107[2]	±0.10 dB (20 to 40 dB device IL)
PDL measurement accuracy	±0.01 dB (0 to 20 dB device IL)
with 13-point smoothing and 4 averages[2]	±0.03 dB (20 to 40 dB device IL)
PDL measurement repeatability[2, 3, 4]	±0.01 dB
PDL measurement resolution[1]	0.01 dB
Maximum slope resolution	10 dB/pm (0 to 35 dB device IL)
Measurement time	9 s ±0.5 s per channel
Maximum scan speed[6, 7]	40 nm/s
Fiber type (to device-under-test)	SMF-28
Maximum outputs from device under test (DUT) measured	128
Measurement stations per transmitter	Up to 8, in 1, 2, 4, or 8 steps
Detector adapters	FC, SC, ST, LC, bare fiber
Input voltage	110 to 230 V AC , 50 to 60 Hz
Receiver control	Custom interface for Windows 95/98/2000/XP
Receiver communication with computer	National Instruments™ PCI interface card
Operating temperature[8]	15 to 30°C
Storage temperature	0 to 70°C
Operating humidity	80% RH maximum, non-condensing
Dimensions (W x H x D)	
Source optics module(SOM) (SWS20010-B-2)	48.3 x 13.3 x 37.5 cm
Tunable laser source (SWS17101)	48.3 x 13.3 x 43.2 cm
Receiver chassis (OWB10002)	48.3 x 13.3 x 46.0 cm
Control and detector modules	Plugged into chassis

1. Wavelength resolution defined as the minimum calculated center wavelength shift.
2. Does not include influence of connector.
3. Device IL range/dynamic range both reduced for multiple output SOM.
4. Measurement repeatability conditions:
   a. Polarization state averaged insertion loss.
   b. Loss less than 20 dB.
   c. Measurement performed within 15 minutes of taking reference.
   d. Measurement performed within ±3 °C of referencing temperature and within the operating temperature range.
5. RL module SWS20005 required.
6. 10 and 20 nm/s also selectable.
7. All other specifications are maintained when using a scan speed of 20 nm/s.
8. Temperature range over which the SWS equipment may be safely operated and within which measurement accuracy can be expected. Stability or repeatability of measurements made relative to a reference taken at a given temperature cannot be guaranteed across entire operating temperature range.

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Ordering Information

SWS2000 Core System

Product Code	Description
SWS17101	C+L-band Tunable Laser
SWS20010-B-2	Dual output integrated source optic module (SOM)
SWS20010-B-4	Four output integrated source optic module (SOM)
SWS20010-B-8	Eight output integrated source optic module (SOM)
SWS20006-B	All-band control module: PCI kit included
OWB10002	Receiver chassis
SWS15107	All-band detector module

SWS2000 Optional Equipment and Accessories

Product Code	Description
SWS20004	PCI Interconnect card and cable kit
SWS20005	Return loss (RL) cassette (single channel)
AC100	Detector cap
AC101	FC detector adapter
AC102	ST detector adapter
AC103	SC detector adapter
AC118	LC detector adapter
AC120	Magnetic detector adapter
AC121	Bare fiber holder (requires AC120)
Power Cords (Required)	
CORD-AU	Australia/China power cord
CORD-EU	European power cord
CORD-JP	Japan power cord
CORD-UK	United Kingdom power cord
CORD-US	United States power cord

Test & Measurement Regional Sales

NORTH AMERICA
TEL: 1 866 228 3762
FAX: +1 301 353 9216

LATIN AMERICA
TEL: +1 954 688 5660
FAX: +1 954 345 4668

ASIA PACIFIC
TEL: +852 2892 0990
FAX: +852 2892 0770

EMEA
TEL: +49 7121 86 2222
FAX: +49 7121 86 1222

WEBSITE: www.jdsu.com/test

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