

OPTICAL SPECTRUM ANALYZER MS9780A 600 to 1750 nm



For Fibers with Core Diameters of 10, 50, and 62.5 μm



The MS9780A is a diffraction-grating spectrum analyzer for analyzing optical spectra in the 600 to 1750 nm wavelength band. Its input section has been redesigned to support fibers with core diameters of 50/62.5 μm ; the input section of the MS9780A can be used to measure the spectra of LDs and LEDs, etc. In addition to uses such as measurement of LD and LED spectra, it has functions for measuring the transmission characteristics of passive elements such as optical isolators, as well as the NF/Gain of optical fiber amplifier systems. In addition to its basic features, the superior stability and reliability of the diffraction-grating (patent pending) capability easily passes the severe specifications required for the precise measurement of WDM communications methods, particularly in the 1.55 μm band. This analyzer, which is backed by Anritsu's high-level technology, has the dynamic range, reception sensitivity and sweep speed requested by users. Its high sensitivity meets the exacting demands placed on today's measuring instruments. In particular, the excellent wavelength and level specifications fully meet the dense WDM requirements in the 1.55 μm band. In addition to the high reliability and excellent basic performance, this analyzer has a full range of application functions to support accurate measurement in the fastest possible time.

Features

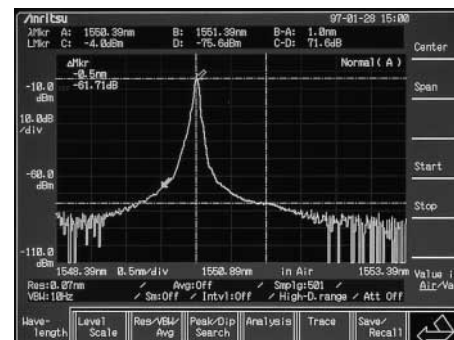
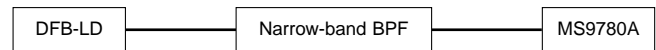
- 70 dB dynamic range
- -90 dBm guaranteed optical reception sensitivity
- Optical pulse measurement
- Full range of WDM application functions
- Tracking with tunable laser source

Applications

• 70 dB dynamic range
The measurement dynamic range of the MS9780A in the normal measurement mode at a wavelength 1 nm from the peak wavelength is 62 dB. In the high-dynamic range measurement mode, better than 70 dB can be achieved. The analyzer demonstrates its excellence in SMSR measurement of DFB-LDs, as well as in evaluation of narrow-band optical band pass filters.

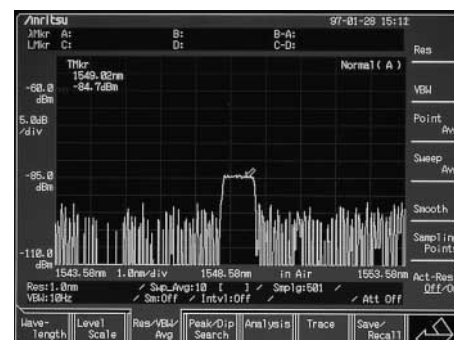
Measurement mode	Dynamic range (at SM fiber)	
	1 nm from peak	0.5 nm from peak
High dynamic range	70 dB	60 dB
Normal	62 dB	58 dB

Wide-dynamic range measurement example with DFB-LD spectrum passed via narrow-band BPF.



• -90 dBm guaranteed optical reception sensitivity

The MS9780A has achieved an improved S/N over a wide range by taking thorough countermeasures to noise and stray light. The RMS noise level at wavelengths from 1250 to 1600 nm is -90 dBm max. In addition, the S/N can be improved using sweep averaging. The screen display below shows the waveform after 10 averagings; the S/N is improved by more than 5 dB.



• **Full function lineup**

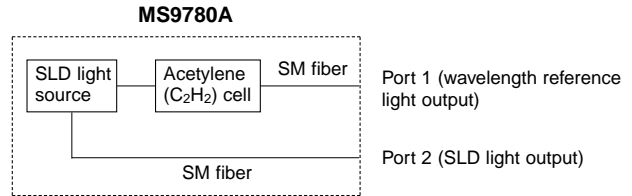
In addition to its excellent basic functions, the MS9780A comes with a full lineup of other useful functions summarized in the following table.

Device analysis	For analyzing and evaluating waveforms of optical elements (DFB-LDs, FP-LDs, LEDs)
Waveform analysis	For waveform analysis by RMS and threshold methods; SMSR, half-width evaluation, WDM waveform analysis
Application measurement	EDFA NF and gain measurement, PMD measurement (See applications.)
Modulation, pulsed light measurement	Max. frequency range (VBW) = 1 MHz (See applications.)
Markers	Multimarkers: Marker function for max. 128 points (See applications.) Zone markers: For waveform analysis in zone specified zone Peak/dip search: Searches for a peak or dip
Power monitor	Also functions as optical power meter
Vacuum wavelength	Converts displayed wavelength to value in display vacuum
External interfaces	GPIB, RS-232C

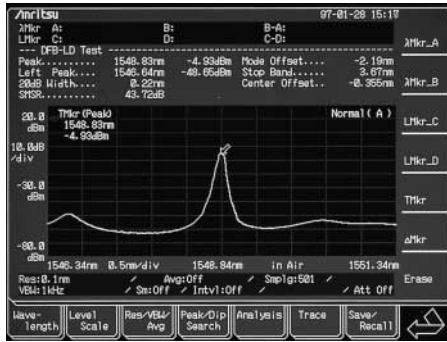
• **Convenient light source option (refer wavelength light) for better accuracy**

Any one of the wavelength reference & SLD light source (Option 03), SLD light source (Option 04), reference wavelength light source (Option 05), and white light source (Option 02) can be installed in the MS9780A.

The block diagram of the wavelength reference & SLD light source option is shown below. This option has two separate output ports: Port 1 for wavelength calibration, and Port 2 for measuring transmission characteristics. When the MS9780A is calibrated automatically by inputting the reference light for the wavelength, post-calibration wavelength accuracy in the 1.52 to 1.57 μm range is better than $\pm 0.05 \text{ nm}$. This is very useful in precision absolute measurement of the wavelengths of light sources used in WDM systems.

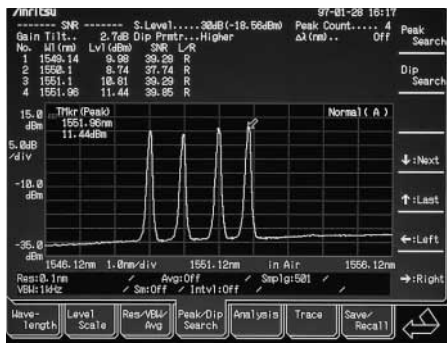


Block diagram of wavelength reference & SLD light



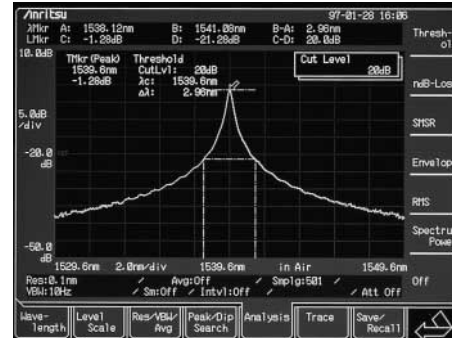
• **Spectrum analysis for WDM communication systems**

Difficult problems in WDM transmission technology are the wavelength characteristics for the gain, and signal to noise ratio (SNR) between each channel. In evaluation, it is very important to measure this quantitatively. The MS9780A permits extremely quick and simple waveform analysis of up to 128 spectra. The waveform and level (SNR) of each peak exceeding the set threshold is displayed. The screen display below shows an example of the tilt gain.



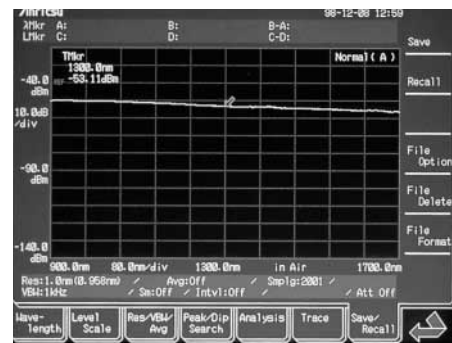
The following diagram shows the spectrum of the SLD light output from Port 2. When this light source is used instead of the earlier white light source for measurement of the wavelength transmission characteristics of optical receiver elements, it is possible to achieve a 20 dB wider dynamic range.

The following figure shows an example of measuring the transmission characteristics of optical band pass filter using the SLD light.



Measurement of optical band pass filter

If this dynamic range is not required, a lower-cost white light source can be installed instead. The following figure shows the spectrum of the white light source. When this light is used, transmission characteristics can be measured in wide range of 900 to 1750 nm.



Spectrum of white light source

Specifications

• MS9780A

Fiber	SM (9.5/125 μm), GI (50/125 μm)*1, GI (62.5/125 μm)*1
Wavelength	Range : 600 to 1750 nm Sweep width: 0, 0.2 to 1200 nm Accuracy: ±0.3 nm (600 to 1750 nm, after wavelength calibration with external light source) ±0.05 nm (1550 ±20 nm, resolution: 0.07 to 0.2 nm, after calibration with wavelength reference light source option)*2 ±0.1 nm (1550 ±20 nm, resolution: 0.5/1.0 nm, after calibration with wavelength reference light source option)*2 Stability: ±5 pm (1 minute)
Resolution	Setting: 0.07*2, 0.1, 0.2, 0.5, 1.0 nm Accuracy*2,*3: ±30% (1300/1550 nm, resolution: 0.1 nm), ±15% (1300/1550 nm, resolution: 0.2 nm), ±7% (1300/1550 nm, resolution: 0.5 nm)
Level	Measurement range (attenuator: off, 0° to +30°C): -65 to +10 dBm (600 to 1000 nm), -85 to +10 dBm (1000 to 1250 nm), -90 to +10 dBm (1250 to 1600 nm), -75 to +10 dBm (1600 to 1700 nm), -55 to +10 dBm (1700 to 1750 nm, +10° to +30°C) Measurement range (attenuator: on, 0° to +30°C): -65 to +20 dBm (1100 to 1650 nm) Accuracy*2: ±0.6 dB (1300/1500 nm, -23 dBm, resolution: ≥0.2 nm) Stability*2: ±0.1 dB (1550 nm, -23 dBm, resolution: ≥0.2 nm, 1 minute) Linearity*2: ±0.1 dB (1550 nm, -50 to 0 dBm) Polarization dependency*2: ±0.15 dB (1300/1500 nm, resolution: ≥0.5 nm) Dynamic range*2 Normal mode: 62 dB (±1 nm), 58 dB (±0.5 nm) *1550 nm, resolution: 0.07 nm Wide dynamic range mode: 70 dB (±1 nm), 60 dB (±0.5 nm) *1550 nm, resolution: 0.07 nm, 25° ±5°C Return loss*2: 32 dB (1300/1550 nm)
Sweep	Sweep width: 0, 0.2 to 1200 nm Sweep speed (typical*4): 0.5 s (sweep width: 500 nm, normal mode measurement, VBW: 10 kHz)
Display	6.4 inch color TFT-LCD
Memory	A, B (2 trace), 3.5 inch FDD (for Windows®)
Printer	Internal (thermal type)
Interface	GPIO, RS-232C
Main functions	Optical pulse measurement, power monitor, wavelength auto-calibration
Operating conditions	Operating temperature: 0° to +50°C (FDD: 5° to 50°C), Storage temperature: -20° to +60°C Relative humidity: ≤90% (no condensation)
Power	85 to 132 Vac/170 to 250 Vac, 47.5 to 63 Hz, 150 VA (max.)
Dimensions and mass	320 (W) x 177 (H) x 350 (D) mm, ≤16.5 kg
EMC	EN61326: 1997/A1, 1998 (Class A) EN61000-3-2: 1995/A2, 1998 (Class A) EN61326: 1997/A1, 1998 (Annex A)
LVD	EN610101-1: 1993/A2, 1995 (Installation Category II, Pollution degree 2)

*1: The NA of GI fiber is 0.2 for a core diameter of 50/125 μm and 0.275 for 62.5/125 μm. However, the permissible NA is 0.1 due to the spectroscope limitations.

*2: Connects to SM fiber (10/125 μm)

*3: Effective resolution value

*4: Typical value for reference; not guaranteed specification

• White light source (Option 02)

Optical output	≥-59 dBm/1 nm (typical value: -55 dBm/1 nm)
Wavelength range	900 to 1600 nm
Operating temperature	18° to 28°C

• Wavelength reference & SLD light source (Option 03)

Optical output	≥-40 dBm/1 nm (single mode/fiber input)
Wavelength range	1540 to 1560 nm
Operating temperature	15° to 30°C
Wavelength reference	1.53 μm band Acetylene

• SLD light source (Option 04)

Optical output	≥-40 dBm/nm (single mode/fiber input)
Wavelength range	1540 to 1560 nm
Operating temperature	15° to 30°C

• Reference wavelength light source (Option 05)

Wavelength reference	1.53 μm band Acetylene
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• VBW, sweep speed, minimum light reception sensitivity*6

VBW	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
Sweep speed (typ.)	30 s	5 s	0.5 s	0.5 s	0.5 s	0.5 s
Minimum light reception sensitivity*7	-90 dBm	-80 dBm	-70 dBm	-60 dBm	-50 dBm	-40 dBm

*6: Data for reference; not guaranteed specifications (except tracking with MG9541A)

*7: RMS noise level (1.25 to 1.6 μm)

Note: Warm-up to the MS9780A for about 5 minutes to ensure stable operation. The above specifications were obtained 2 hours after power-on.

Ordering information

Please specify model/order number, name, and quantity when ordering.

Model/Order No.	Name
MS9780A	Main frame Optical Spectrum Analyzer
	Standard accessories
	Optical connector adapter*1: 1 pc
	Power cord, 2.5 m: 1 pc
F0012	Fuse, 3.15 A (for 100 Vac system): 2 pcs
Z0312	Printer paper: 2 rolls
W1477AE	MS9780A operation manual: 1 copy
W1478AE	Remote control operation manual: 1 copy
MX978001S	LabVIEW® driver (RS-232C): 1
MX978001G	LabVIEW® driver (GPIB): 1
B0239G	Front cover: 1 pc
	Options
MS9780A-02	White light source*2
MS9780A-03	Wavelength reference & SLD light source*2
MS9780A-04	SLD light source*2
MS9780A-05	Reference wavelength light source*2
MS9780A-06	Monitor output (VGA output)*3
MS9780A-27	E2000 (Diamond) connector*3
MS9780A-37	FC connector*4
MS9780A-38	ST connector*4
MS9780A-39	DIN connector*4
MS9780A-40	SC connector*4
MS9780A-43	HMS-10/A (Diamond) connector*4
	Application parts
J0654A	RS-232C cable (9P-9P)
J0655A	RS-232C cable (9P-25P)
J0007	GPIB cable, 1m
J0617B	Replaceable optical connector (FC)
J0618D	Replaceable optical connector (ST)
J0618E	Replaceable optical connector (DIN)
J0618F	Replaceable optical connector (HMS-10/A)
J0619B	Replaceable optical connector (SC)
J0635B	FC-PC · FC-PC · 2M-SM (FC-PC optical fiber cord, 2 m, SM)
J0893B	FC · PC-FC · PC-2M-GI (50/125 μm)
J0894B	FC · PC-FC · PC-2M-GI (62.5/125 μm)
J0203	Optical fiber cord with lens attached to end (50 μm core diameter), 2 m
J0204	Optical fiber cord with lens attached to end (200 μm core diameter), 2 m
Z0282	Ferrule cleaner (Cletop A type, 1 pc)
Z0283	Tape for ferrule cleaner (6 pcs/set)
Z0284	Cleaner for optical adapter (stick-type, 200 pcs/set)
B0336C	Hard carrying case
B0330C	Tilt stand

*1: Specify the connector to be supplied as the standard connector when ordering the above options. If the connector is not specified, the FC connector (MS9780A-37) is supplied as standard.

*2: Factory options; Two units cannot be installed simultaneously. Exchangeable-type optical connectors (FC, ST, DIN, HMS-10/A) are supplied when specified at ordering. One conversion cord is supplied for connecting other optical connectors to the FC connector.

*3: Factory option

*4: User replaceable

Note:

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