


Optical Measuring Instruments and Optical Device Test Systems

For Measuring Chromatic Dispersion and Amplitude Characteristics of Optical Devices

Q7750

- Optical transmission characteristics (S11, S21) can be batch-measured in the optical carrier frequency area.
- Optical frequency resolution : Up to 50 MHz (0.4 pm converted based on wavelength)
- High-speed measurement : Approx. 6.7 msec (for each measurement point), Approx. 4 sec (in a specified span)
- Wide measurement wavelength range: 1525 to 1635 nm
- Wide dynamic range : 40 dB
- Group delay measurement range : Maximum resolution 0.1 psec, Maximum measurement range 25 nsec
- Chromatic dispersion characteristics of optical fiber can be easily measured.



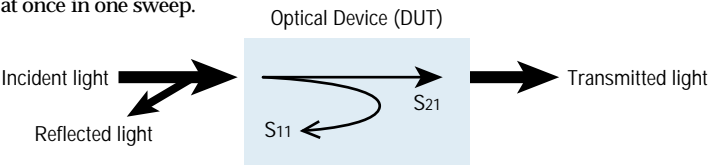
(Photo is Q7750)

Q7750 Optical Scope (Optical Network Analyzer)

Research and development of ultra high-speed optical communication and high-density wavelength division multiplexing optical communication (Dense-WDM) has made significant advances, and these technologies are increasingly being used in industrial applications. In the field of research and development, the amplitude characteristics, chromatic dispersion characteristics, and group delay characteristics of an optical device or optical subsystem need to be measured with high optical frequency resolution. Examples of equipment that needs the function include AWGs, fiber grating filters, dispersion compensators, and so on. In particular, the chromatic dispersion value must be reduced or managed since the chromatic dispersion characteristics can be an obstacle to increasing the bit rate of optical communication. Q7750 optoscope (optical network analyzer) is an revolutionary piece of equipment for measuring optical transmission characteristics that measures the amplitude/chromatic-dispersion/group-delay characteristics of the incident and reflected light from an optical device at high-speed and with high resolution in the optical carrier frequency area. A variety of chromatic dispersion characteristics including the zero-dispersion characteristics and dispersion slope characteristics of a dispersion shift fiber or non-zero dispersion fiber can also be measured easily. The phase shift method is Used for measurement, enabling both a high optical frequency resolution and wide dynamic range.

Optical transmission characteristics can be batch-measured in the optical carrier frequency area

Q7750 incorporates a variable-wavelength light source, enabling the simultaneous measurement of transmission and reflection characteristics (S21 and S11 as an S parameter) in the optical carrier frequency area by sweeping through a range of wavelengths (optical frequencies). The measurement parameters are shown in the table below. These parameters can be measured at once in one sweep.



List of Measurement Parameters

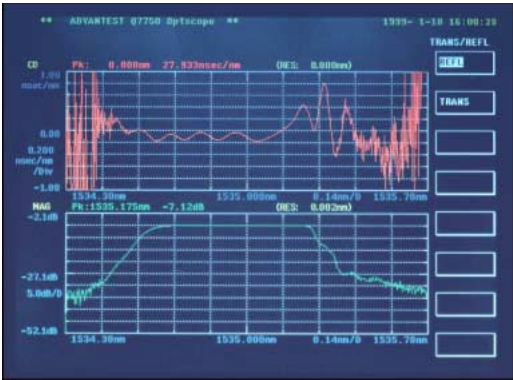
Measurement Parameters	Reflection characteristics (S11)	Transmission characteristics (S21)
Amplitude characteristics	<input type="radio"/>	<input type="radio"/>
Group delay characteristics	<input type="radio"/>	<input type="radio"/>
Chromatic dispersion characteristics	<input type="radio"/>	<input type="radio"/>

High optical frequency resolution

Optical frequency resolution : Up to 50 MHz (0.4 pm converted based on wavelength)
The maximum optical frequency resolution of the Q7750 is 50 MHz. This enables measurement in the ultra high resolution optical carrier frequency area, for which measurement had previously been impossible. The amplitude and chromatic dispersion characteristics of an optical device for Dense-WDM or Ultra-Dense-WDM (channel space: 100 GHz, 50 GHz, 25 GHz, and so on) can be measured easily. The selectable wavelength span is from 70 nm (max.) to approx. 0.1 nm (min.).

High-speed measurement

Measurement time: Approx. 6.7ms (for each measurement point)
Approx. 4 sec (in a specified span)
The interval of one sweep (measurement time) is about 4 seconds. This means Q7750 can run measurement in 4 seconds, a process which took several tens of seconds before. When measurement takes a long time, accurate results may not be obtained since the characteristics of the DUT may change, affected by ambient conditions such as temperature. The Q7750, however, can run measurement in short time, ensuring high-speed, accurate measurement without being affected by the DUT's temperature characteristics.



Amplitude and Chromatic Dispersion Characteristics of FBG Optical Filter

Optical Measuring Instruments and Optical Device Test Systems

For Measurement of Optical Modulators and Laser Diodes

Q7750

Items		Specifications
Measurement functions	Sweep channel	2 channels (input-end reflection characteristics, forward transmission characteristics)
	Input-end reflection characteristics (S11)	Amplitude characteristics Group delay characteristics Chromatic dispersion characteristics Chromatic dispersion slope characteristics
	Forward transmission characteristics (S21)	Amplitude characteristics Group delay time characteristics Chromatic dispersion characteristics Chromatic dispersion slope characteristics
Optical signal source characteristics *1)	Measurement wavelength range Absolute wavelength accuracy *2)	1525 to 1635 nm ±0.050 nm (typ. ±0.025 nm) ±5 ppm ±1 ppm (when using OPT7750+10 and TQ8325 together) ±2 ppm (when using OPT7750+10 and HP86120C together (reference value))
	Wavelength setting resolution Wavelength setting range	0.001 nm Can be set within the range from 0.1 nm to 70 nm (i.e., 12.5 GHz to 8.75 THz).
	Wavelength repeatability *3) Sweep time (measurement time) *4)	Specified span × (±0.3%) ±30 MHz Approx. 6.7 ms (for each measurement point) Approx. 4 sec (in a specified span)
	Optical output level *5)	±15 dBm
Amplitude characteristics	Scale Modulation frequency range Dynamic range *6)	Logarithm (0.2, 0.5, 1.0, 2.0, 5.0, 10.0 dB/div) and linear 40 MHz to 3 GHz Forward transmission characteristics: 35 dB (typ. 40 dB) Input-end reflection characteristics: 33 dB (typ. 38 dB)
	Linearity *7)	Relative level S21 S11 ±0.10 dB 0 to -25 dB 0 to -23 dB ±0.25 dB -25 to -30 dB -23 to -28 dB
	Polarization dependency	Forward transmission characteristics (test port 2) : ±0.05 dB Input-end reflection characteristics (test port 1) : ±0.10 dB
	Sweep and extract repeatability *8)	±0.1 dB
Group delay characteristics	Modulation frequency range (fm)	40 MHz to 3 GHz
	Maximum measurement group delay time Group delay resolution Relative group delay time accuracy *7)	15 μs 0.1 ps (@ 3 GHz modulation frequency) Accuracy Relative level S21 S11 ±0.2%/fm 0 to -15 dB 0 to -13 dB ±0.4%/fm -15 to -20 dB -13 to -18 dB ±1.0%/fm -20 to -25 dB -18 to -23 dB
Chromatic dispersion	Measurement unit	Wavelength area (ps/nm), frequency area (ps/GHz) Chromatic dispersion slope (ps/nm ²) Inputting the length of a measured optical fiber determines the display format from ps/nm km, ps/GHz km, ps/nm ² km and ps/GHz ² .
	Measurement range Measurement resolution	0.1 ps/nm to 1 μs/nm 0.01 ps/nm
Fiber chromatic dispersion measurement *9)	Dispersion coefficient measurement repeatability Zero-dispersion wavelength measurement repeatability Dispersion slope wavelength repeatability for zero-dispersion wavelength Zero-dispersion wavelength measurement accuracy	0.025 ps/nm, 0.003 ps/nm/km 0.030 nm 0.025 ps/nm ² , 0.002 ps/nm ² /km ±0.080 nm ±0.035 nm (when using OPT7750+10 and TQ8325 together) ±0.030 nm (when using OPT7750+10 and HP86120C together (reference value))
	Wavelength fitting function	Linear fit, quadratic fit, 3 term Sellmeier fit, 5 term Sellmeier fit
Fiber length measurement	Measurement range	0.2 m to 10,000 km
	Resolution Reflective index input range	0.02 nm or 0.01% of measured length (larger one) 1.000000 to 2.000000
Processing function	Memory function	Measured data is stored in a backup memory and a floppy disk.
	Display Calculation/analysis	Optical frequency, superimposition, vertical dual-screen (upper/lower) split, cursor function Automatic measurement, automatic phase offset correction, half-value width calculation, averaging, normalization, smoothing, wavelength fitting (linear, quadratic, 3 term Sellmeier, 5 term Sellmeier) functions
Optical input/output	Optical connector type*10)	FC-type optical connector (standard) SC and ST connects are also available using an optional adapter.
Input/output interface	GP-IB / Floppy drive / Printer / keyboard / Display	IEEE-488-1978/3.5", MS-DOS format/D-SUB 25-pin ESC/P, ESC/P R, PCL /Conforms to IBM PC-AT/15 pins, D-SUB connector (VGA)
General specification	Operating environment	Temperature range : 15 to 35°C 85%RH or less (without condensation)
	Storage environment	Temperature range : -10 to 45°C 90%RH or less (without condensation)
	Power supply	Display unit : AC100 to 120 V, AC220 to 240 V, 50/60 Hz, 300 VA or less
	Dimensions	Optical network analyzer unit : AC100 to 120 V, AC220 to 240 V, 50/60 Hz, 310 VA or less
	Mass	Display unit : Approx. 424 (W) × 220 (H) × 400 (D) mm Optical network analyzer unit : Approx. 424 (W) × 220 (H) × 500 (D) mm Display unit : 16 kg or less Optical network analyzer unit : 25 or less
Option		OPT7750+10
Monitor output emission power: Optical connector type:		-20 dBm or higher Angled PC/FC-type optical connector is fixed.

*1) Warm up time : 2 hours

*2) During a step sweep operation at a constant temperature.

*3) During a non-instantaneous consecutive sweep operation at a constant temperature.

*4) During a non-instantaneous consecutive sweep operation with a specified span of 60 GHz or less (excluding the internal setting time).

*5) At average power.

Accessory (Optional)

Product Name	Part Number
Optical connector adapter	FC connector adapter : A08161 SC connector adapter : A08162 ST connector adapter : A08163

*6) When the difference between the amplitude level and the noise level (average) during slew measurement (S21) or full-reflection measurement (S11) SENSITIVITY = HIGH SENS.

*7) The relative level is based on the amplitude level during slew measurement (S21) or full-reflection measurement (S11).

*8) When running a sweep and extract 10 times using an SMF fiber with FC connector.

*9) When running a measurement 20 times for 11-km dispersion shift fiber at a constant temperature. Providing the zero-dispersion wavelength as a center wavelength, measurement wavelength span of 10 nm, step sweep measurement, 11 points (1 point/1 nm).
By quadratic fitting. Dispersion slope: 0.074 ps/nm²/km.
Unless otherwise specified, an external wavelength meter is not used.

*10) The user can easily replace the optical connector.