ADVANTEST

Q7607
Optical Chirp Test Set

For Quick and Easy Measurement of Dynamic Chirp of 50 Gb/s Optical Modulators and Laser Sources

- Supports 50 Gb/s and 10 Gb/s
- Measures wavelengths in C-band and L-band
- Built-in optical amplifier (optional)
- Fast time-domain chirp measurement in 30 sec. or less
- Convenient operation, data collection and display via PC software

Q7607

Features

Wide frequency bandwidth supports 50 Gb/s and 10 Gb/s

The Q7607 can be set for an optimum measurement mode of either 50 Gb/s or 10 Gb/s. The total frequency measurement range is 100 Hz to 100 GHz. This allows the Q7607 to also measure the Chirp of transmission signals greater than 50 Gb/s.

Wide wavelength measurement range of C- and L-band

Capable of measuring both C-band and L-band. If the output optical power is insufficient, an optical amplifier can be installed (optional).

Very fast Time-Domain Chirp Measurements in 30 seconds or less *1)

Until now, no fast and easy method has existed to measure dynamic chirp. With the Q7607, ADVANTEST makes dynamic chirp measurements a fast and easy process by automatically separating the frequency modulation (FM) and intensity modulation (IM) components. Conventional methods using spectral diffraction take 20 minutes or more to make a chirp measurement.

Fast and Simple Operation

The user can measure chirp using any personal computer equipped with GPIB interface. The measurement data file is in plain text allowing transfer of the data to a spreadsheet, transmission waveform simulator (OptSim) *2), etc…

*1): *The chirp measuring time depends on the oscilloscope's trigger setting and other factors.*

*2): *OptSim is provided by "ARTIS Software Corporation". Please contact "ARTIS Software Corporation" for detail. URL http://www.artis-software.com/*

Dynamic Chirp Measurement System

Chirp Measurement Considerations

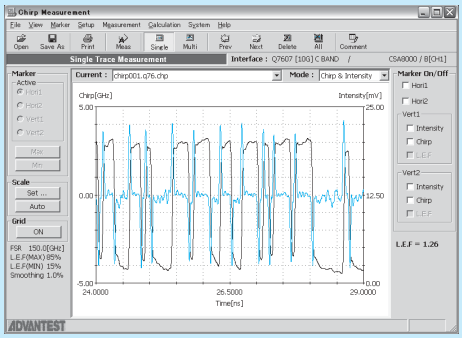
The chirp value is calculated from the difference of a pair of output signals from the Q7607 as measured by a sampling oscilloscope. Hence, the time resolution of the chirp measurement depends on the time resolution of the sampling oscilloscope. To make accurate measurements the user should measure the sampling oscilloscope's optical signal at an appropriate S/N ratio. Also, suitable averaging for the sampling oscilloscope should be selected to obtain the optimized S/N ratio.

Sampling Oscilloscope Considerations

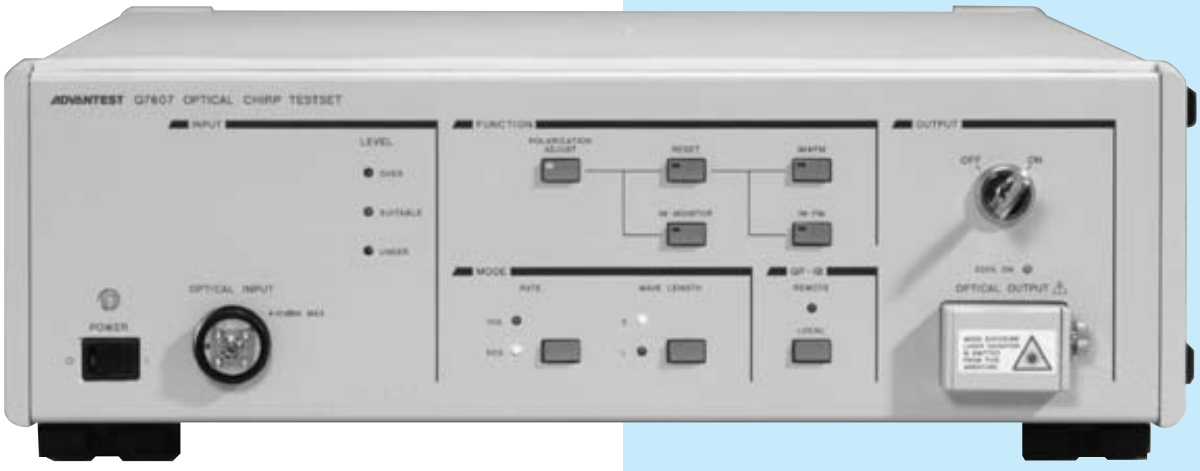
The output of the Q7607 is an optical signal. Therefore, an O/E converter with sufficient bandwidth and step response is required to display the optical output signal on the sampling oscilloscope. Since individual data bits, not an "EYE", are displayed on the oscilloscope, a low jitter pattern or frame trigger is also required.

Chirp Measurement Software Considerations (Supplied with the system)

The chirp measurement software requires 10 megabytes of free disk space on the personal computer's hard-drive. A Pentium® class processor, CD ROM reader, a current version of Windows® and a National Instruments GPIB interface are required.



Example of Chirp Measurement



System Configuration

Products used in system

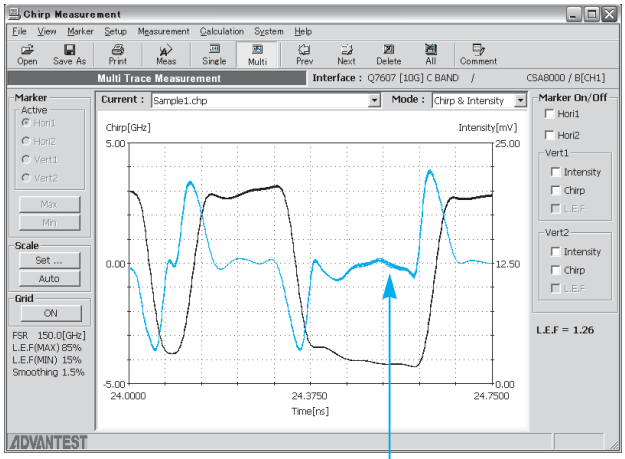
Product Type	Model
Optical Chirp Test Set	Q7607 (ADVANTEST)
Chirp Measurement Software	PQ76000402-CD supplied with the system (ADVANTEST) Note: For Windows 98, Windows 2000 or higher
Pulse Pattern Generator	D3186 (ADVANTEST): Clock Option 10 (150 MHz to 12 GHz) or Clock Option 13 (150 MHz to 12.5 GHz) is necessary. Or 50 Gb/s Pulse Pattern Generator. Frame/pattern sync output is required.
Personal Computer	Note: OS: Windows 98, Windows 2000 or higher
GPIB Board	Note: National Instruments, Configured as a controller
Sampling Oscilloscope	Tektronix: CSA8000, CSA8000B, TDS8000, TDS8000B Agilent Technologies: 83480A, 86110A/B
Sampling Oscilloscope Plug-in (O/E converter)	Tektronix (Oscilloscope: Bit rate: Sampling head): 80C85/80C86 Agilent Technologies: 83482A, 83485A/B, A86116A
Optical Amplifier*	Note: Gain should be fixed

** Optical Amplifier is unnecessary if the built-in option (OPT7607+10) is used.*

Reference
Time-resolved chirp measurement of modulator-integrated DFB LD by using a fiber interferometer. OFC '95 Technical Digest
Y. Kotaki, H. Soda

Excellent chirp and L.E.F reproducibility

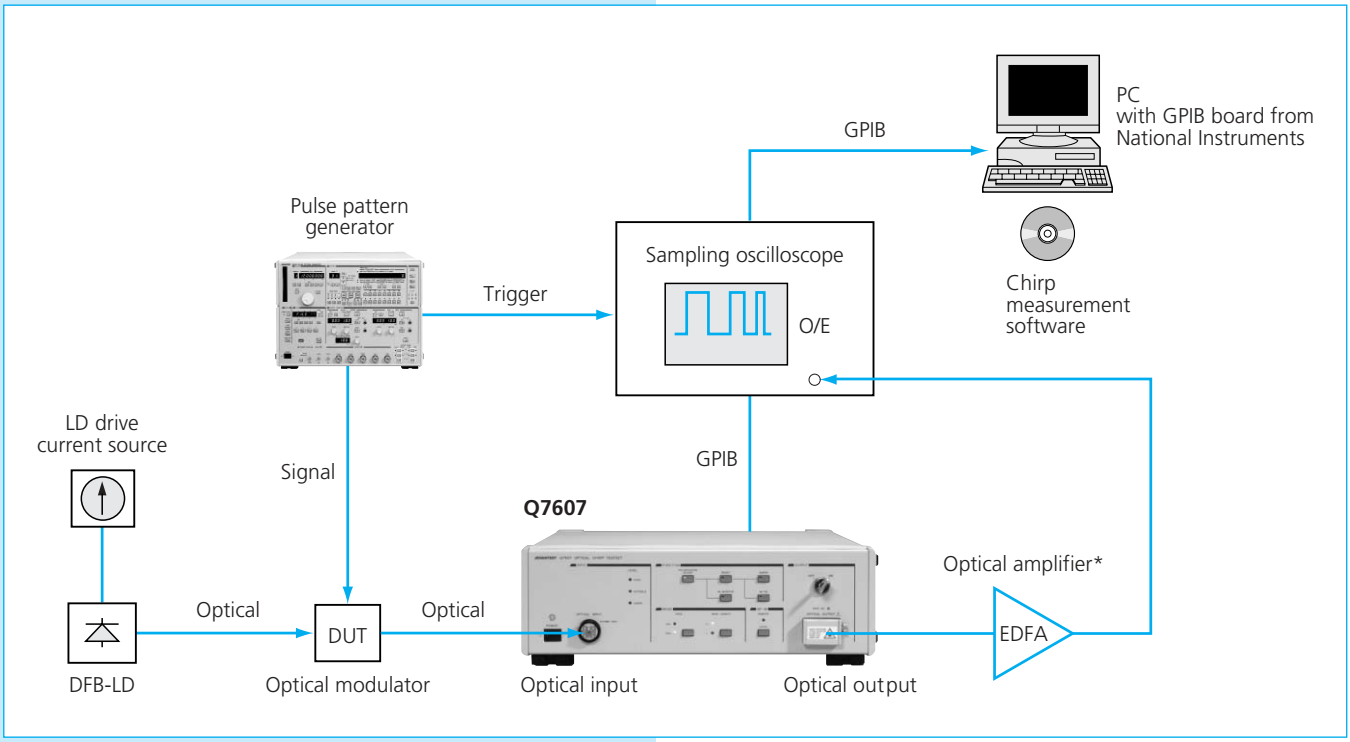
The repetition reproducibility in the measurement is very high (typ. 3%).



When measurement made ten times

Superimposed data (ten times)

System connection diagram



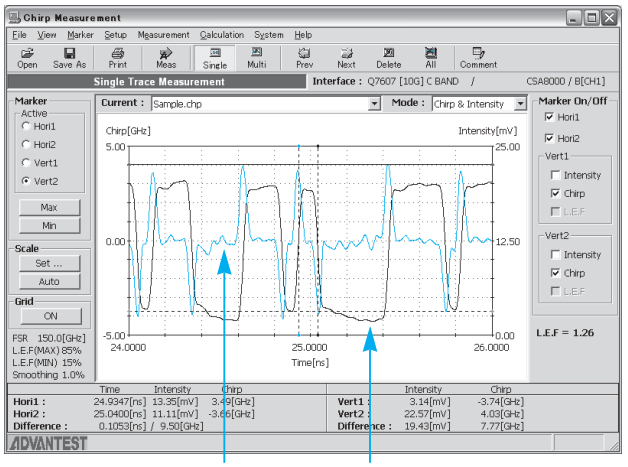
** Optical Amplifier is unnecessary if the built-in option (OPT7607+10) is used.*

Wide variety display functions

The chirp measurement software (supplied with the system) displays chirp, optical intensity, and L.E.F (line width enhancement factor) waveforms. Two of these three measurements can be displayed at the same time. It is also possible to display two or more superimposed data measurements.

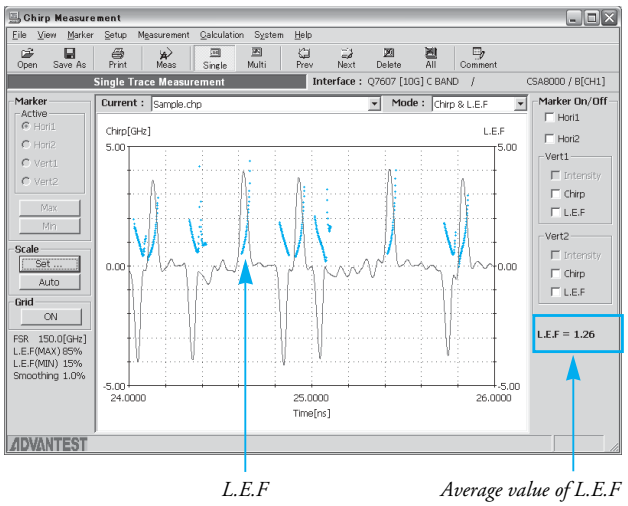
Time-domain chirp and optical intensity display

Q7607 displays time-domain chirp and optical intensity measurements. In addition, the software features horizontal and vertical marker functions. These features enable simple point and delta measurements.



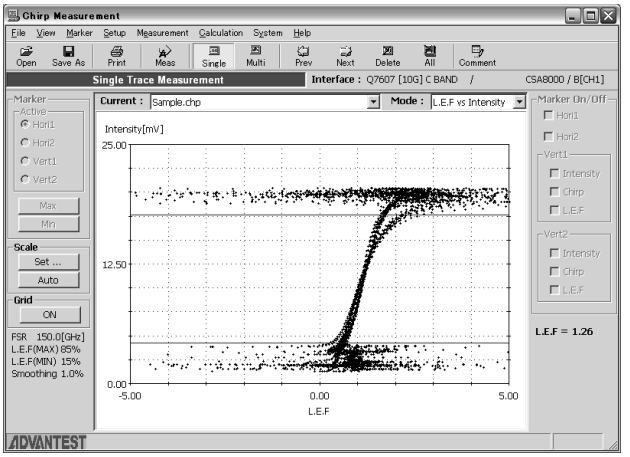
Time-domain chirp and L.E.F display

Time-domain chirp and L.E.F are displayed. The software package analyzes the L.E.F at the rising or falling edge of the modulated signal. Notice, the average L.E.F value is shown at the lower right of the display.



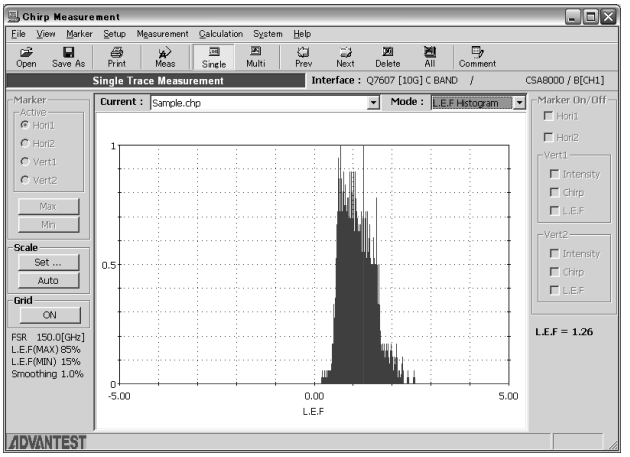
L.E.F intensity dependency display

The optical intensity dependency of L.E.F is shown. The software displays L.E.F on the horizontal axis and optical intensity on the vertical axis. Notice that the L.E.F distributions for the rising and falling edges of the modulated waveforms are obvious.This feature is useful to calculate and show the amplitude range and average value of the distributed L.E.F.



Histogram display of L.E.F

The software also displays the L.E.F data points in a histogram. This feature allows the user to effectively analyze the L.E.F distribution.



Specifications

Functions

Measurement principle:	Using the conversion characteristics between optical frequency and intensity in the built-in optical-fiber-type Mach-Zehnder interferometer, the instrument converts the dynamic chirp (optical frequency modulation) into a change in optical power FM. By controlling the discrimination point of the interferometer, FM is either added to or subtracted from the intensity IM of the optical input signal.
Polarization compensation:	Automatic polarization compensation by the internal optical-fiber-type polarization controller
Built-in optical amplifier with automatic gain adjustment option (OPT7607+10):	Available as an option, the Q7607 has a built-in optical amplifier with automatic gain adjustment. The optical output power is approx. 0 dBm, regardless of the optical input power.

Performance Specifications[*1)]

Wavelength measurement range:	Q7607; 1510 to 1610 nm Q7607+10; 1530 to 1610 nm
Optical input power range:	-10 to 10 dBm
Frequency conversion accuracy:	within ±15%
FM demodulation coefficient (50 G/10 G)[*2)]:	P x 0.021/GHz / P x 0.042/GHz
Free Spectral Range (50 G/10 G):	300 GHz ±15 GHz / 150 GHz ±15 GHz
Demodulation band width (50 G/10 G)[*3)]:	100 Hz to 100 GHz / 100 Hz to 50 GHz
Deviation of demodulation frequency (50 G/10 G):	135 GHzpp or less / 65 GHzpp or less
Insertion loss:	Q7607; 13 dB or less
Optical output power:	Q7607+10; -3 to 0 dBm[*4)]
Input light polarization compensation:	Automatically controlled

Input/Output Specifications

Optical input/output:	FC/PC connector (changeable to SC or ST type)
GPIB:	In accordance with IEEE488-1978
Optical remote interlock:	BNC connector (for OPT7607+10/10A)

General Specifications

Operating environment:	Ambient temperature; 0 to +40°C Relative humidity; 85% max. (no condensation)
Storage environment:	Ambient temperature; -20 to +60°C Relative humidity; 90% max. (no condensation)
Power supply:	AC100–120 V, AC220–240 V, 50/60 Hz, 100 VA or less Automatic switching between the 100 and 200 V systems
Dimensions:	Approx. 132 (H) x 424 (W) x 500 (D) mm (Approx. 5.2 (H) x 16.7 (W) x 19.7 (D) in.)
Mass:	13 kg (28.7 lbs) or less

Options

Built-in Optical Amplifier:	OPT7607+10
Retrofit Optical Amplifier:	OPT7607+10A

Accessory (supplied with the system)

Chirp Measurement Software:	PQ76000402-CD

Separately Sold Accessories

FC connector adapter:		A08161
SC connector adapter:		A08162
ST connector adapter:		A08163
Rack mount kit:	EIA, with Front handles	A02708
	JIS, with Front handles	A02709
	EIA, without Front handles	A02718
	JIS, without Front handles	A02719

*[*1)] At 23 ±5°C*

*[*2)] P: optical average power*

*[*3)] 100 MHz as standard, 1 dB down*

*[*4)] Total output of optical power*

Please be sure to read the product manual thoroughly before using the products. Specifications may change without notification.

ADVANTEST®

ADVANTEST CORPORATION
Shinjuku-NS building, 4-1
Nishi-Shinjuku 2-chome
Shinjuku-ku, Tokyo 163-0880,
Japan
Tel: +81-3-3342-7500
Fax: +81-3-5322-7270
http://www.advantest.co.jp

Korea:
Advantest Korea Co., Ltd.
16F, MIRAEWASARAM Bldg.,
942-1, Daechi-Dong,
Kangnam-ku, #135-280, Seoul,
Korea
Tel: +82-2-3452-7157
Fax: +82-2-3452-0370

China:
Advantest (Suzhou) Co., Ltd.
Shanghai Branch Office
5F, No.46 Section Factory
Building, No.555 Gui Ping Road,
Caohejing, Hi-Tech Area,
Shanghai, China 200233
Tel: +86-21-6485-2725
Fax: +86-21-6485-2726

Beijing Branch Office
Room 517, Beijing Fortune Bldg.,
5 Dong San Huan Bei-Lu,
Chan Yang District, Beijing,
China 100004
Tel: +86-10-6590-8170
Fax: +86-10-6590-8175

Taiwan:
Advantest Taiwan Inc.
No.1 Alley 17, Lane 62,
Chung-Ho Street, Chu-Pei City,
Hsin Chu Hsien, Taiwan R.O.C
Tel: +886-3-5532111
Fax: +886-3-5541168

Singapore, Malaysia, Thailand, Indonesia, Philippines, Vietnam:
Advantest (Singapore) Pte. Ltd.
438A Alexandra Road, #08-03/06
Alexandra Technopark Singapore
119967
Tel: +65-6274-3100
Fax: +65-6274-4055

North America, Canada, Mexico:
Advantest America Measuring Solutions, Inc.
Head Office
258 Fernwood Avenue
Edison, NJ 08837, U.S.A.
Tel: +1-732-346-2600
Fax: +1-732-346-2610
http://www.advantest.com/ProdServices/instr.htm

Santa Clara Office
3201 Scott Blvd., Santa Clara,
CA 95054, U.S.A.
Tel: +1-408-988-7700
Fax: +1-408-987-0688

Europe:
Rohde & Schwarz Engineering and Sales GmbH
Mühldorfstraße 15
D-81671 München, Germany
(P.O.B. 80 14 29
D-81614 München, Germany)
Tel: +49-89-4129-13711
Fax: +49-89-4129-13723

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