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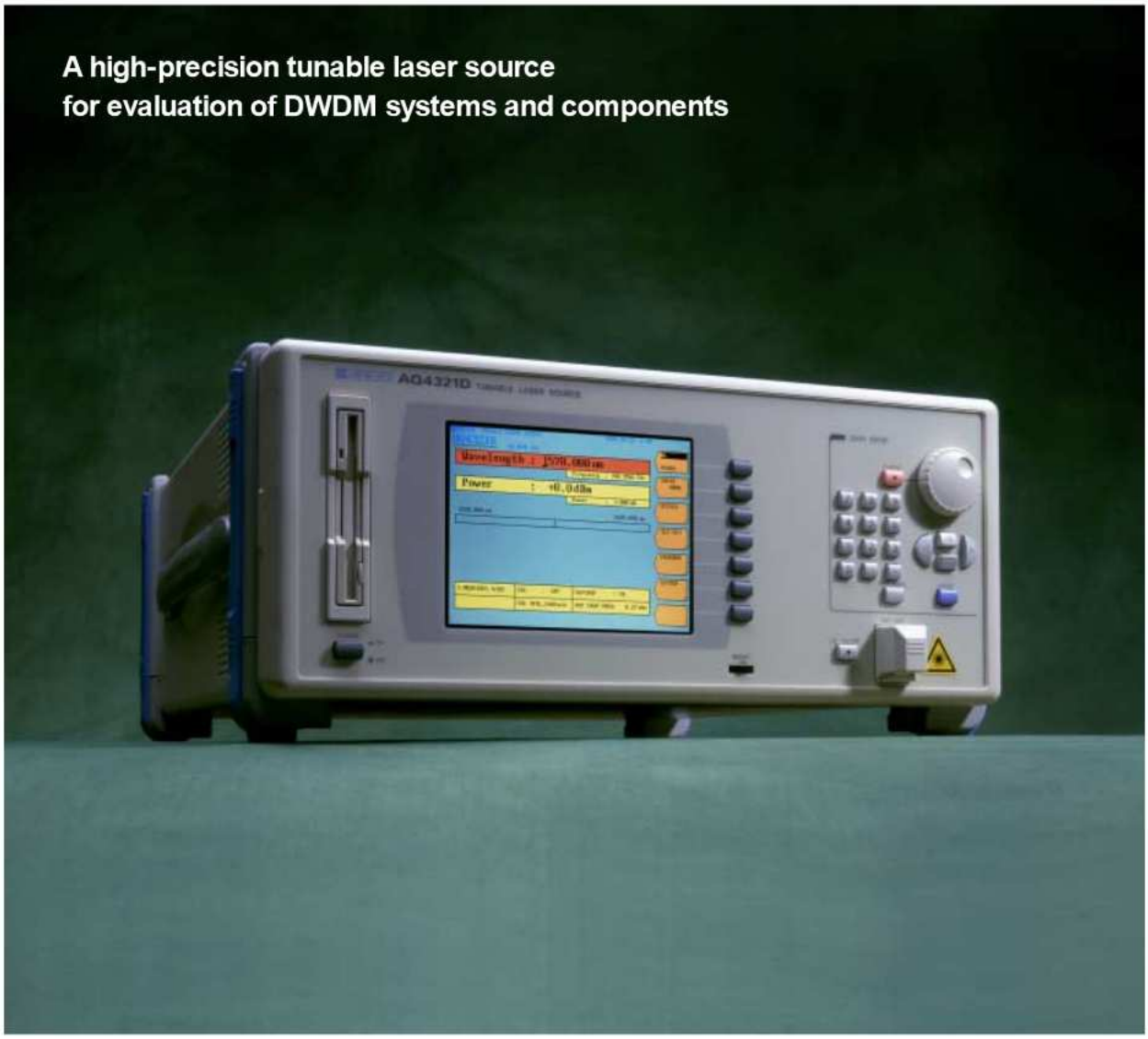
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Tunable Laser Source
AQ4321A/4321D



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A high-precision tunable laser source for evaluation of DWDM systems and components

The AQ4321A/4321D Tunable Laser Source is specially designed for DWDM applications, especially for the evaluation of optical components and DWDM systems. These tunable laser sources provide wide wavelength tuning range with great accuracy (±10 pm at 1520 nm). High output power, high SMSR and stability are excellent for the complete characterization of optical components.



Features

High wavelength accuracy: ±10 pm (at 1520 nm)
Accurately measures spectral characteristics of AWG, FBG, DWDM filters, etc.

High optical output with +10 dBm (typ.) (AQ4321A)
Ideal for the evaluation of optical amplifiers and DWDM transmission systems.

Continuous sweep
Achieve continuous wavelength tuning by applying Ando's unique external resonant structure.

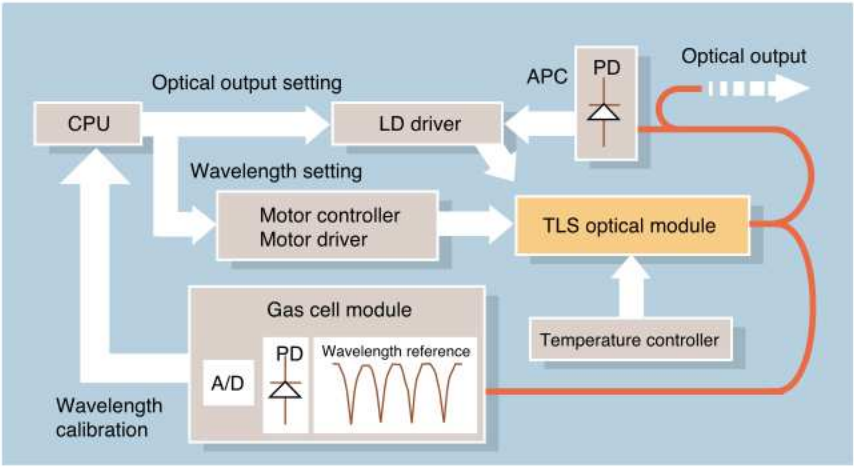
Wavelength range: 1480 to 1580 nm (AQ4321A)
1520 to 1620 nm (AQ4321D)

Side mode suppression ratio: 60 dB (typ.)

Wavelength calibration function
An absolute wavelength calibration function, using an internal gas cell absorption line is integrated into these TLSs. This calibration function provides high-accuracy, reliable measurements on DWDM components thanks to Ando's automatic wavelength calibration at set intervals.

Synchronous sweep function with optical spectrum analyzer
High-speed synchronous sweep with wide dynamic range can be achieved by coupling the world-renowned Ando AQ6317B Optical Spectrum Analyzer.

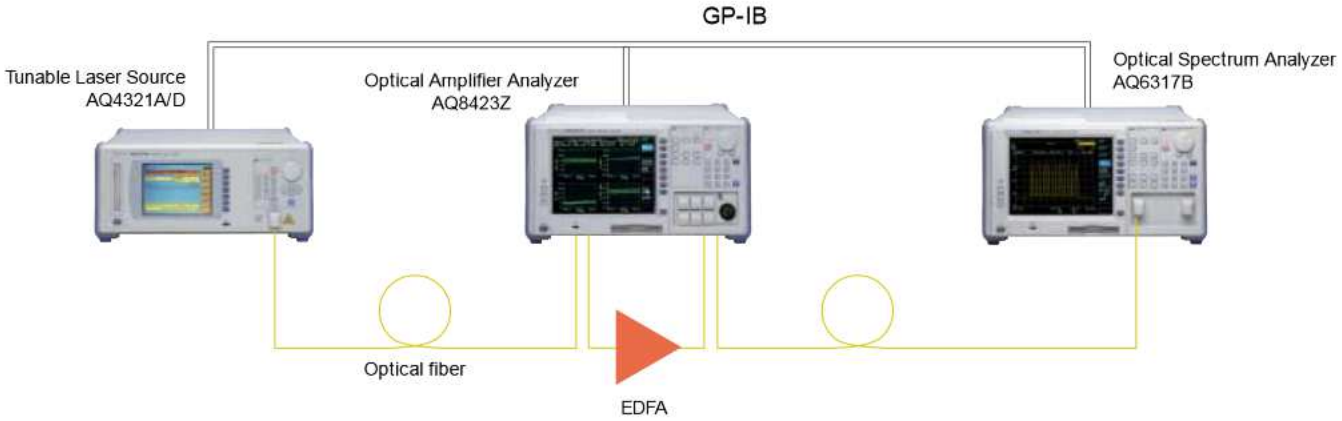
Construction



The internal structure of the AQ4321A/4321D is illustrated in the diagram at left. Inside the TLS optical module, there is a precision motor. It achieves wavelength tuning by controlling the position of optical grating at the sub-micron level. A portion of optical output is extracted and goes through the reference gas cell for wavelength offset calibration. The output light from the TLS optical module is constantly monitored by a photo detector (PD). An automatic power control (APC) circuit is used to maintain very high stability in output level. Therefore, long-term high wavelength accuracy and high output stability for AQ4321A/4321D are assured.

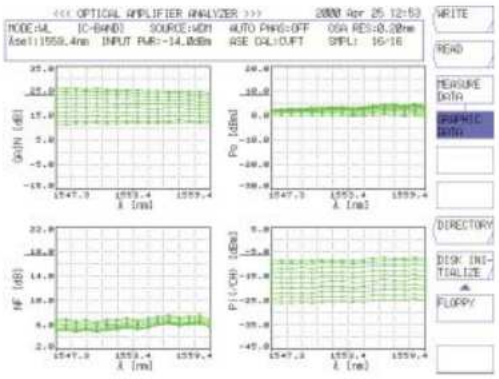
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Application 1



Example of optical amplifier automatic measurement

The AQ4321A/4321D Tunable Laser Source can connect to Ando's AQ8423Z Optical Amplifier Analyzer via GP-IB. This testing system can accomplish automatic measurement of the optical amplifier which was previously difficult to execute.



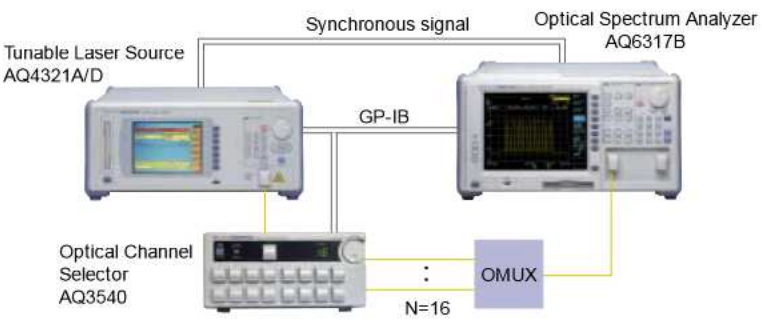
Example of output wavelength

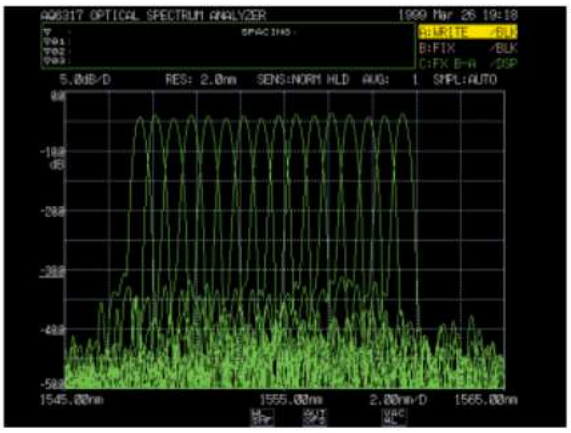
Application 2

Example of automatic measurement of optical MUX/DEMUX

When combined with Ando's AQ6317B Optical Analyzer, optical MUX/DEMUX (AWG, etc.) spectral characteristics can be easily and accurately measured without an external controller.

Main evaluation parameters: central wavelength, insertion loss, NdB, bandwidth, crosstalk, etc.
Wide dynamic range measurement: 70 dB or more
High-speed synchronous sweep measurement: maximum 10 nm/sec.





Measurement example of transmission characteristics of 16-channel AWG

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Specifications

Model		AQ4321A	AQ4321D
Wavelength range		1480 to 1580 nm	1520 to 1620 nm
Wavelength set resolution		0.001 nm	
Wavelength stability		±100 MHz/h (±0.8 pm/h) (typ.) [2, 3]	
Absolute wavelength accuracy		±0.01 nm [2, 3, 4, 8] ±0.015 nm, ±0.01 nm (typ.) [2, 3, 4, 7]	
Relative wavelength accuracy		±0.01 nm (typ.) [2, 3, 4, 7]	
Spectral width	Narrow	200 kHz (typ.) (1 MHz or less)	
	Wide	200 MHz (typ.) (100 MHz or more)	
SMSR		50 dB or more (optical output: +7 dBm, 1550 nm)	50 dB or more (optical output: +6 dBm, 1590 nm)
Optical output		+10 dBm (typ.) peak +7 dBm or more, 1520 to 1570 nm +5 dBm or more, 1500 to 1580 nm +3 dBm or more, 1480 to 1580 nm	+7 dBm (typ.) peak +6 dBm or more, 1560 to 1600 nm +5 dBm or more, 1540 to 1620 nm +3 dBm or more, 1520 to 1620 nm
Settable optical output range		20 dB or more (0.1 dB steps, at peak wavelength)	
Optical output stability	5 min	±0.01 dB or less [2, 9]	
	1 h	±0.05 dB or less [5, 9]	
	8 h	±0.3 dB or less [6, 9]	
Optical output accuracy		±1 dB or less [4, 9]	
Optical output reproducibility		±0.04 dB, optical output fixed [4, 5, 9]	
Optical output level flatness		±0.1 dB [4,9] (1500 to 1580 nm)	±0.1 dB [4, 9] (1540 to 1600 nm)
RIN		-145 dB/Hz (typ.)	
Internal modulation (CHOP)	Set frequency	0.2 to 300 kHz [10]	
	Set resolution	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz [10]	
External modulation (CHOP)	Set frequency	0.2 to 300kHz [10]	
	Set resolution	–	
Direct modulation	Modulation rate	5% or less (Modulation frequency: 100 kHz to 300 MHz, modulation input level: 0 dBm or less)	
Wavelength sweep speed		100 nm/sec (max.)	
Applicable optical fiber		SMF (10/125 µm)	
Applicable connector		FC/PC (Standard), optical return loss: 50 dB or more	
Environmental conditions		Operating temperature: 10 to 35 °C, storage temperature: -10 to +50 °C, humidity: 80 % RH or less (no condensation)	
Power requirements		AC100 to 120 V/200 to 240 V, 50/60 Hz, approx. 150 VA	
Dimensions and mass		Approx. 425 (W) x 177 (H) x 450 (D) mm, approx. 20 kg	
Accessories		Power cord: 1, AQ9441 (FC) connector adapter: 1, 50 Ω terminal: 1, FD: 2, instruction manual: 1	

Notes:
1) The above specifications without any special remarks are results under the following conditions: CW light, at the output point of 2 m-long optical fiber, after warming-up for 1 hour
2) Constant temperature: 23 °C
3) Spectral width: Narrow, Sweep FINE, Opt ATTN Cont = 1
4) Optical output level: +3 dBm
5) Within ±1 °C in the range of 10 to 35 °C
6) 10 to 35 °C
7) 2σ (1 hour after wavelength calibration)
8) At 1520 nm wavelength
9) Spectral width: wide
10) Duty: 50 ±5 %

Options

AQ9441(SC) Connector Adapter
AQ9441(ST) Connector Adapter

Specifications are subject to change without notice.

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