AQ7410 High-Resolution Reflectometer

■ Measures high-resolution reflection and loss distribution of an optical module and a waveguide.

*This product is manufactured by NTT Electronics Co. and Ando Electric Co. using technology of Nippon Telegraph and Telephone Corporation.

Introduction

The AQ7410 high-resolution reflectometer featuring wide dynamic range is based on a Michelson interferometer with low-coherence light sources such as LEDs.
Using a AQ7412 ASE wavelength-tunable narrow-band light source unit, it is possible to obtain optical loss distributions of waveguides and optical module by observing Rayleigh backscattered light.

Features

- Does not require adjustment of a polarization controller
- Measurement distance: 2.0m (in the air)
- Can be used for evaluation of WDM modules in accordance with ITU-T grid for its tunable wavelength center (when using AQ7412)
- Achieves high-sensitivity measurement

Applications

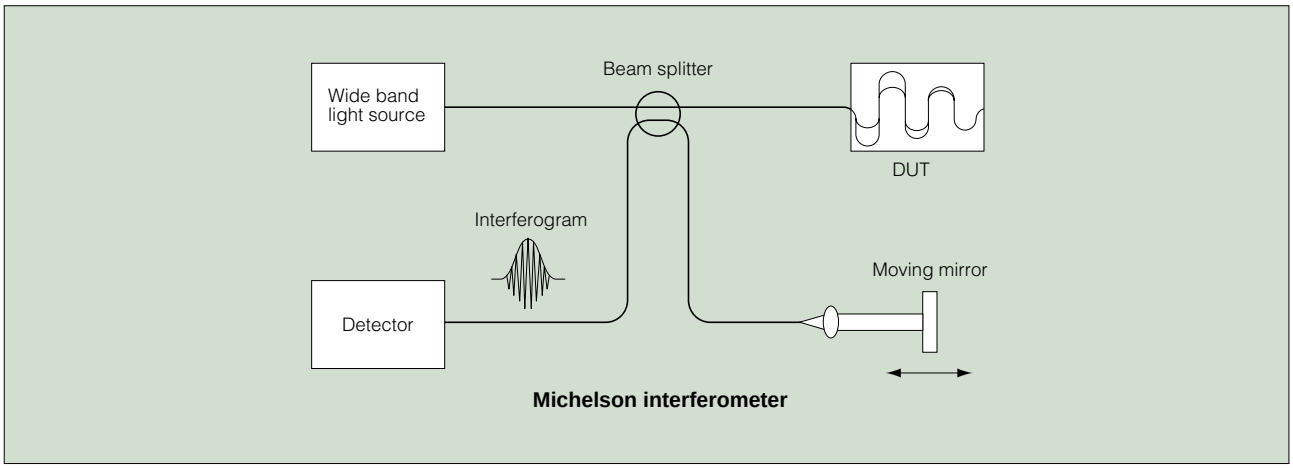
- Measures loss/reflection distribution of optical waveguide such as PLC
- Measures inner reflection distribution of an optical module
- Measures return loss of optical connector

Measurement principle

The AQ7410 is a high-spatial resolution reflectometer that uses a short coherence length light source for a Michelson interferometer.

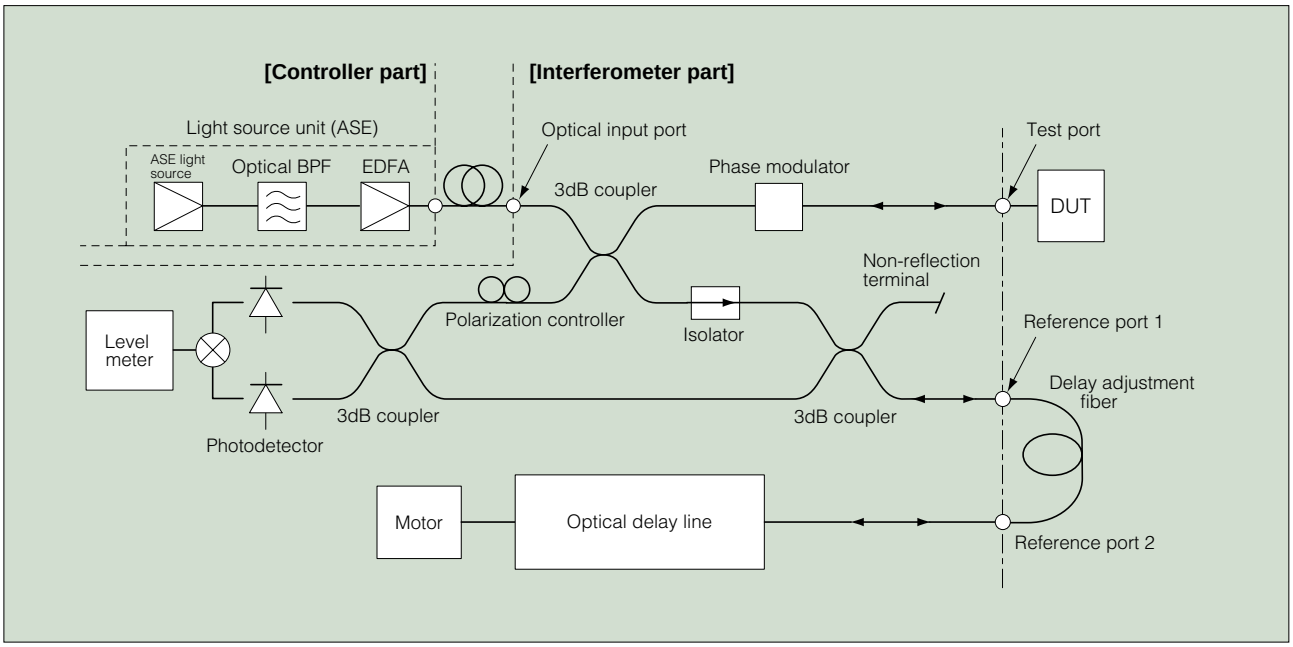
As shown in the below figure, wide-band optical output from the light source is launched into a beam splitter and divided in two. One part is incident into the DUT. Another part is used as a local oscillator(LO) light through an optical delay line consisting of moving mirrors and reflectors.

The reflection from the DUT is combined with LO light and the interferogram produced by the interference is detected with a square-law detector when these path lengths are equalized. Reflection point is attained by scanning the moving mirror position and reflectivity is obtained by interference signal intensity.

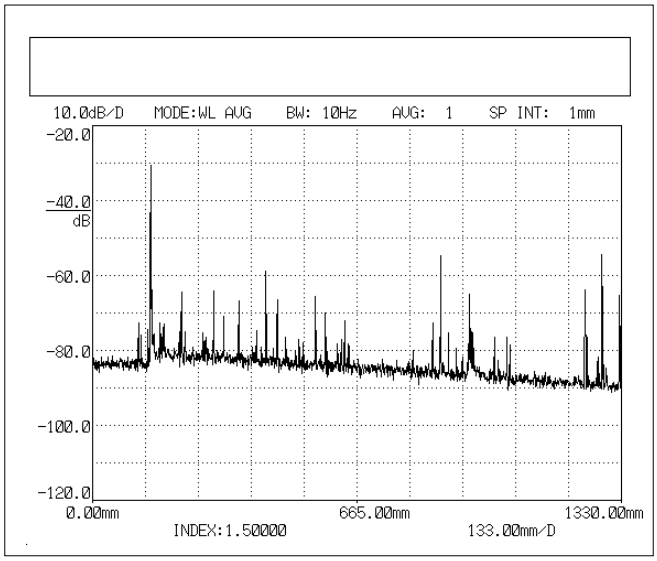


Michelson interferometer

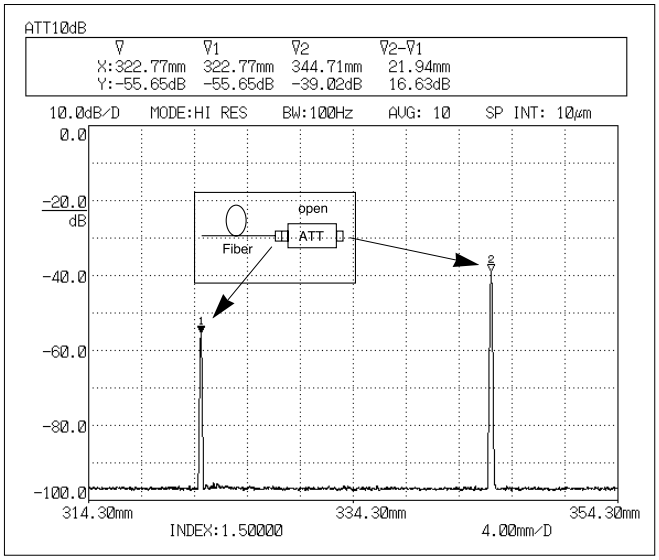
Configuration



Measurement examples



Result of PLC's loss distribution measurement
(PLC measurement example: proposed by NTT Electronics Co.)



Result of return loss measurement

Specification

AQ7410 High-Resolution Reflectometer

Measurement mode	Return loss measurement mode Loss distribution measurement mode (when using AQ7412 unit)
Distance range [1]	0 to 2000mm
Spatial resolution [2]	150µm (AQ7412 unit, return loss measurement mode) 700µm (AQ7412 unit, WDM/loss distribution measurement mode) 150µm (AQ7413 unit, at 1.55µm return loss) 70µm (AQ7413 unit, at 1.31µm return loss)
Sampling resolution	0.005, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0mm
Refractive index	1.00000 to 3.99999
Maximum sampling point	20001
Sweep speed (return loss measurement mode) [1]	36 mm/s (when set at 1.31µm) 43 mm/s (when set at 1.55µm)
Measurement time (loss distribution measurement mode)	0.3, 1.0, 3.0s/sample (Normal mode) 0.5, 2.0, 6.0s/sample (Averaging mode)
Return loss measurement range [2]	10 to 75dB (AQ7413 unit, when set at 1.31µm) 10 to 70dB (AQ7413 unit, when set at 1.55µm) 10 to 90dB (AQ7412 unit)
Loss distribution measurement range [3]	20dB or more
Level measurement accuracy [1, 4]	±2.0dB or less
Optical fiber	10/125µm SMF
Optical connector	SC (AdPC) [5]
Environmental conditions	Operating temperature: 25 ±10°C, storage temperature: -10 to +50°C, humidity: 80%RH or less (no condensation)
Power requirements	AC 85 to 265V, 50/60Hz, approx. 200VA
Dimensions and mass	Controller part: approx. 425 (W) x 222 (H) x 450 (D) mm, approx. 15kg Interferometer part: approx. 425 (W) x 177 (H) x 450 (D) mm, approx. 25kg
Accessories	Connection cable: 3, optical fiber cord: 1 (both ends: SMF with SC connector), power cord: 1 (with 3/2 conversion plug), floppy disk: 2, recording paper: 2 rolls, instruction manual: 1

Note 1: In the air
Note 2: At 10/125µm SMF
Note 3: Relative rate of Rayleigh backscatter light level and back noise level at 10/125µm SMF
Note 4: Average rate of 10 measurements
Note 5: Optical return loss: 50dB or more

AQ7412 ASE Light Source Unit

Center wavelength	1545 ±20nm (return loss measurement mode) 1530.0 to 1565.0 ±1.0nm (loss measurement mode) ITU-T grid wavelength ±0.5nm (WDM measurement mode) [1]
Spectrum bandwidth	35nm or less (return loss measurement mode) 2.0nm or less (WDM/loss measurement mode)
Optical output level	+10dBm or more (return loss measurement mode) +10dBm or more (WDM/loss measurement mode)
Optical fiber	10/125µm SMF
Optical connector	SC (AdPC) [2]
Environmental conditions	Operating temperature: 25 ±10°C Storage temperature: -10 to +50°C Humidity: 80%RH or less (no condensation)
Dimensions and mass	Approx. 200 (W) x 100 (H) x 450 (D) mm, approx. 3.5kg

Note 1: ITU-T grid [1538.98 to 1563.86nm, 0.8nm interval, 32-channel]
Note 2: Optical return loss: 50dB or more

AQ7413 LED Light Source Unit [1]

Center wavelength	1.55 ±0.04µm 1.31 ±0.05µm
Spectrum bandwidth	140nm or less (1.55µm) 100nm or less (1.31µm)
Optical output level	-18dBm or more (1.55µm) -16dBm or more (1.31µm)
Optical fiber	10/125µm SMF
Optical connector	SC (AdPC) [2]
Environmental conditions	Operating temperature: 25 ±10°C Storage temperature: -10 to +50°C Humidity: 80%RH or less (no condensation)
Dimensions and mass	Approx. 200 (W) x 100 (H) x 450 (D) mm, approx. 2.5kg

Note 1: Special unit for return loss measurement
Note 2: Optical return loss: 50dB or more

Option

• Optical cord for AQ7410
(0.25, 0.50, 0.75, 1.00, 2.00 m)
*Connector type: Both ends SMF with SC-PC connector
(optical return loss: 50dB or more)