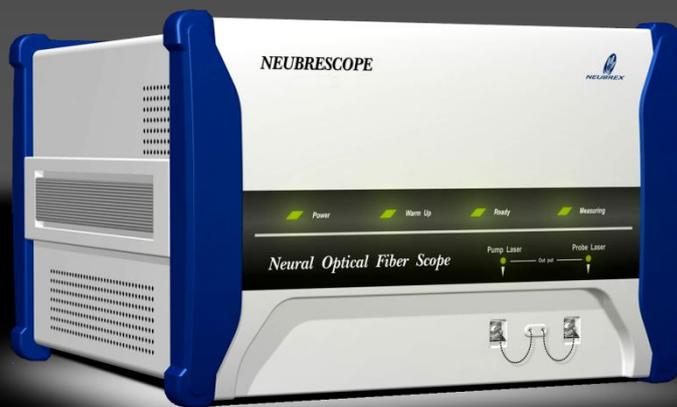


Give you a feel[®]
When every point of the optical fiber is a sensor

Neural Optical Fiber Scope

NEUBREScope NBX-7021

The Hybrid technology of Pulse-Pre-Pump BOTDA and Tunable Wavelength COTDR to measure and separate the distributed strain and temperature in single SM fiber.



Built-in control and data analysis units

Separation of strain and temperature

Measurement mode: **PPP-BOTDA / TW-COTDR / BOTDR**

Spatial resolution: **2cm** / Sampling resolution: **1cm**

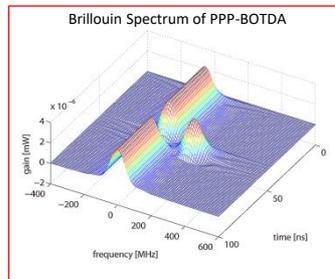
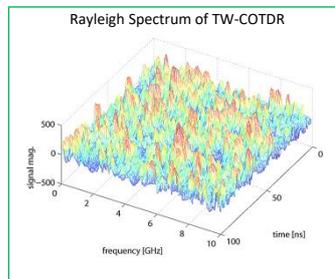
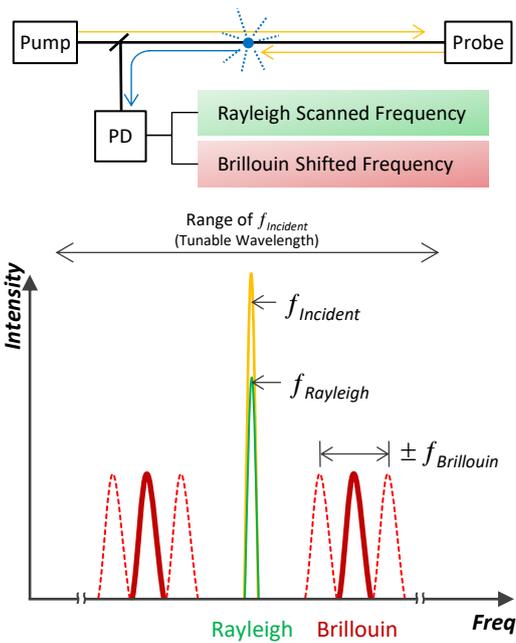
Measurement Repeatability: **5 $\mu\epsilon$ / 0.25 $^{\circ}$ C** (Hybrid mode)



Key Features

- The state-of-the-art hybrid Brillouin and Rayleigh sensing technology in single interrogator.
- Separation of strain and temperature by Hybrid Measurement Mode in a SM fiber.
- Built-in control unit and remote access interface.
- New User Interface to add new functionality and improve workflows.

The PPP-BOTDA and TW-COTDR



The Pulse Pre-Pump Brillouin Optical Time Domain Analysis (PPP-BOTDA) and Tunable Wavelength Coherent Optical Time Domain Reflectometry (TW-COTDR) are the two key technologies in the NBX-7021 instrument.

With the outstanding measurement performance, the cm-order resolution and the accuracy of $0.5\mu\epsilon/0.05^\circ\text{C}$, the NBX-7021 can be used in wide range of sensing and monitoring applications, providing unprecedented resolution and accuracy of the acquired data.

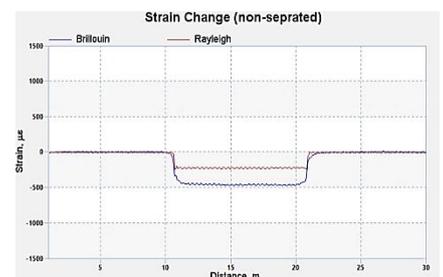
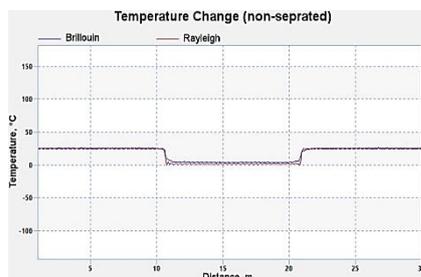
Separation of Strain and Temperature

The Advanced Data Analysis (ADA) Studio is Neubrex software that accompanied with NBX-7021. With the correction and analysis function of ADA Studio, the separation of strain and temperature in a single fiber can be achieved.

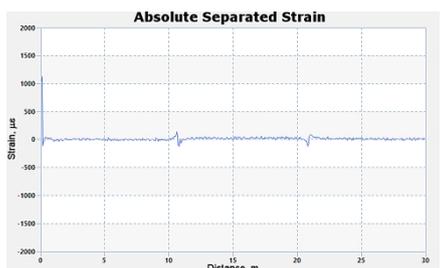
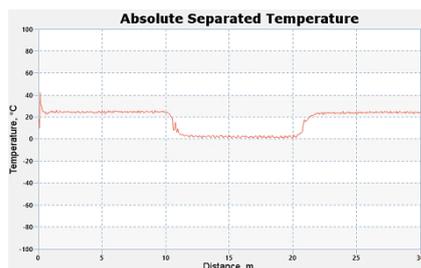
The fiber under test is immersed in the oil bath at 0°C . The external environment temperature is 26°C . The fiber in the bath is strain free.

The upper plots present the measured non-separated temperature and strain distributions for both Brillouin and Rayleigh measurements.

The lower plots show the separated, absolute temperature and strain, clearly demonstrating that fiber is in strain-free state while at different temperatures.



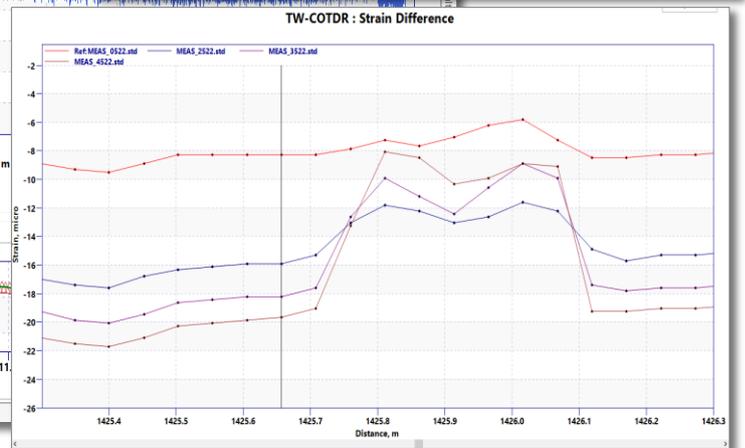
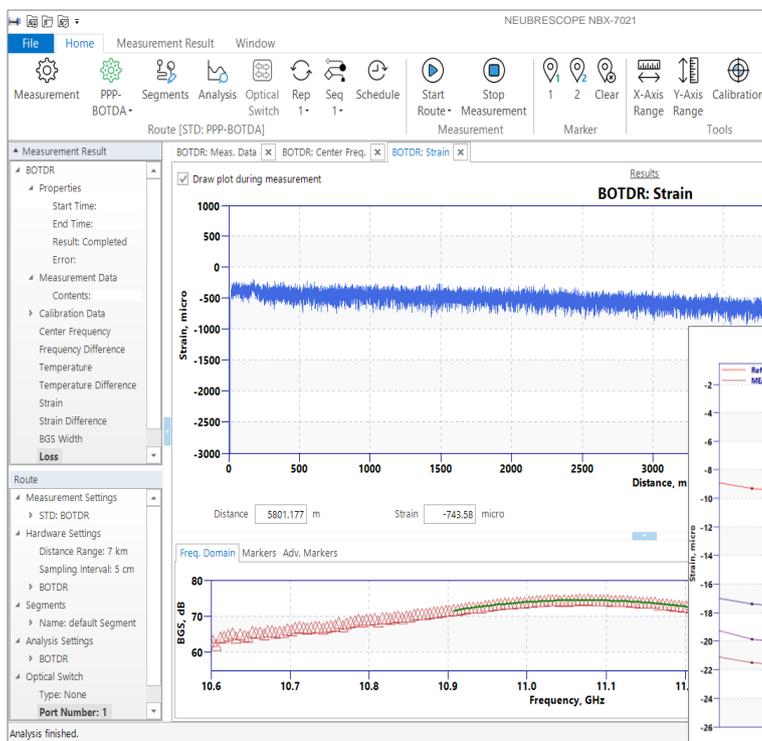
Advanced Data Analysis



Software and Operation User Interface

NEUBRESCOPE NBX-7021 features redesigned User Interface, considerably improving user experience and productivity. The instrument is fully controlled via software. Moreover, software open-architecture allows one to extend this list and add support for any other format. Several USB and Ethernet ports are also available as well.

- Strain / Temperature waveform along with length of fiber.
- Gain of Frequency Shift.
- Comparison in between of multiple given measured data.
- Advanced Marker for cross reference easily and quickly.



Configuration and Applications

- TW-COTDR**
 - Single-end fiber access.
 - High resolution.
 - Excellent sensitivity for Strain or Temperature.
- PPP-BOTDA**
 - Double-ended (Loop) fiber access.
 - High resolution.
 - Good accuracy and repeatability.
 - Frequency Sweep (FS) and Amplitude Transfer (AT) mode available for dynamic strain sensing.
- BOTDR**
 - Single-ended fiber access.
 - Good accuracy for Strain or Temperature.
 - Amplitude Transfer (AT) Mode available for dynamic strain sensing.



Specifications NBX-7021

General Function	Separation of strain and temperature measured in single fiber, PPP-BOTDA / BOTDR / TW-COTDR / COTDR													
Function	BOTDR		PPP-BOTDA						TW-COTDR					
Laser Wavelength	1550 ± 2 nm						1530 ~ 1560 nm							
Distance Range	50m, 100m, 250m, 500m, 1km, 2.5km, 5km, 10km, 25km													
Frequency Range	9 ~ 13 GHz						192300 ~ 196000 GHz							
Frequency Scanning Step	1, 2, 5, 10, 20, 50 MHz						100, 200, 250, 500 MHz							
Range of Strain Measurements	-30,000 to +40,000µε (-3% to +4%)						-15,000 to +20,000µε (-1.5% to +2%)							
Readout Resolution	5 cm (default), 1cm (minimum)													
Sampling Points	600,000 (default), 3,000,000 (maximum)													
Average Count Settings	2 ⁵ ~ 2 ²³ times (including Hardware Average count 2 ⁵ ~ 2 ¹⁶)													
Function	BOTDR		PPP-BOTDA						TW-COTDR					
Pulse Width (ns)	5	10	0.2	0.5	1	2	5	10	0.2	0.5	1	2	5	10
Spatial Resolution (cm)	50	100	2	5	10	20	50	100	2	5	10	20	50	100
Dynamic Range (dB) ^{*1}	1	2	0.5	1	1.5	3	3.5	6	0.5	1	3	6	8	10
Maximum Distance (km) ^{*2}	3	6	0.5	1	2	5	10	18	0.5	1	10	20	22	25
Optical Budget (dB) ^{*1 *8}	3	6	1	2	5	7	10	12	1	2	5	7	10	13
Accuracy (1σ) ^{*3 *4}	30µε/1.5°C		15µε/0.75°C		7.5µε/0.35°C		5µε/0.25°C		0.5µε/0.05°C					
Repeatability (1σ) ^{*3 *4 *5}	20µε/1.0°C		10µε/0.5°C		2.4µε/0.1°C		2µε/0.1°C		0.2µε/0.01°C					
Measurement Time ^{*6 *7}	≥ 5 seconds						≥ 60 seconds							
Hybrid Mode Accuracy	-		10µε/0.5°C											
Hybrid Mode Repeatability	-		5µε/0.25°C											
Applicable Fiber	Single-mode Fiber													
Connector Type	FC/APC (factory default)													
Input/output Interface	USB 2.0 x4, LAN x2, RGB x1													
Power Supply	AC100 ~ 240V, 50/60Hz, 250VA													
Laser Safety Class	Class 1 (IEC60825-1 : 2001)													
Dimensions / Weight	approx. 456 (W) × 485 (D) × 286 (H) mm / 30 kg													
Operating Temperature	10~40 °C, Humidity below 85% (no dew condensation)													
Storage Temperature	0 ~ 50 °C													
Place of Production	Japan													

*1. Based on 2¹⁵ average cycles.

*2. Based on average fiber loss of 0.3dB/km using SM fiber(UV type).

*3. Based on the measurement of strain free SM fiber(UV type).

*4. Based on the measurement of strain-free SM fiber(UV type) and in constant temperature environment.

*5. The maximum deviation range of measurement value for 5 consecutive measurements for 100 consecutive points.

*6. Within the setting of 50m range, 2¹³ count settings, 41scan steps except the time of Pre-Pump Adjustment.

*7. Within the setting of 50m range, 2¹³ count settings, 401scan steps except the time of Pulse Output Adjustment.

*8. Within the allowable range being adjusted by the optical power, except the case of nonlinear phenomena.

*1-*5 are based on a frequency scan step of 5MHz when using PPP-BOTDA and with Pre-Pump Adjustment and Auto Frequency Adjustment on.

*1-*5 are based on a frequency scan step of 250MHz by using TW COTDR and with Pre-Pump Adjustment and Auto Frequency Adjustment on.

* The specifications above and accessories layout are subject to change without notice. (20180618, A4)

Contact Address

Neubrex Co., Ltd.

Sakae-machi-dori 1-1-24, Chuo-ku, Kobe, Hyogo 650-0023, Japan

Tel: +81-78-335-3510 Fax: +81-78-335-3515

www.neubrex.com

