Specifications NBX-6050PM

Laser Wavelength		1550 ±2 nm				
Polarization Extinction Ratio		≧20 dB				
Distance Range		50 m, 100 m, 250 m, 500 m, 1 km, 2.5 km, 5 km, 10 km, 25 km				
Measurement Frequency Range		9~13 GHz				
Range of Strain Measurement		-30,000 to +40,000 με (-3 % to +4 %)				
Measurement Frequency Scan Step		1, 2, 5, 10, 20, 50 MHz				
Readout Resolution		5 cm (default), 1 cm (minimum)				
Sampling Points		600,000 (default), 3,000,000 (maximum)				
Average Count Settings		2^5 ~ 2^{23} times (inc. Hardware Average Count 2^{16})				
Pulse Width		0.5 ns	1 ns	2 ns	5 ns	10 ns
Spatial Resolution		5 cm	10 cm	20 cm	50 cm	100 cm
Dynamic Range(1)		1 dB	2 dB	3 dB	5 dB	7 dB
Max. Measurement Distance(2) (approx.)		1 km	5 km	10 km	15 km	25 km
Optical Budget(1)(7)		3 dB	5 dB	7 dB	8 dB	10 dB
Measurement Accuracy(3)(4)		15 με / 0.75 ºC	7.5 με / 0.35 ºC			
Repeatability(3)(4)(5)		10 με / 0.5 ºC	2.4 με / 0.3 ºC			
Measurement Time(6)		5 seconds (minimum)				
Signal Terminal	Input-Output Fiber	PANDA fiber				
	Fiber Connector	FC-PC / SC-PC (factory option)				
	Polarization Plane	Perpendicular (Slow axis, Y)				
Suitable Fiber		PANDA fiber				
Power Supply		AC100~240V 50/60Hz 250VA				
Laser Class		Class 1 (IEC60825-1: 2001)				
Dimensions / Weight		approx. 456 (W) × 485 (D) × 286 (H) mm / 30 kg				
Operating Temperature		10~35 ºC, Humidity below 85 % (no dew condensation)				
Storage Temperature		0~50 ºC				
Place of Production		Japan				

(1) Based on 2^{15} average cycles by progressive measurement mode.
(2) Based on average fiber loss of 0.3 dB/km using PANDA fiber.
(3) Based on the measurement of strain-free PANDA fiber.
(4) Based on the measurement of strain-free PANDA fiber and in constant temperature environment.
(5) The maximum standard deviation of measurement value in 5 consecutive measurements for 100 consecutive points.
(6) The settings of 50 m range, 2^{14} count settings, 41 scanning steps excluding the time for Pulse Adjustment.
(7) Within the allowable range being adjusted by the optical power excluding the case of nonlinear phenomena.
(1) - (5) are based on a frequency scan step of 5 MHz and with Pulse Adjustment and Auto Frequency Adjustment on.

*Specifications are subject to change without notice.

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(20101111)

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

Neural Optical Fiber Scope

NEUBRESCOPE NBX-6050PM

NEW

Pulse- PrePump Technique in BOTDA to measure strain and / or temperature

Now operated from laptop computer for easy in-the-field use

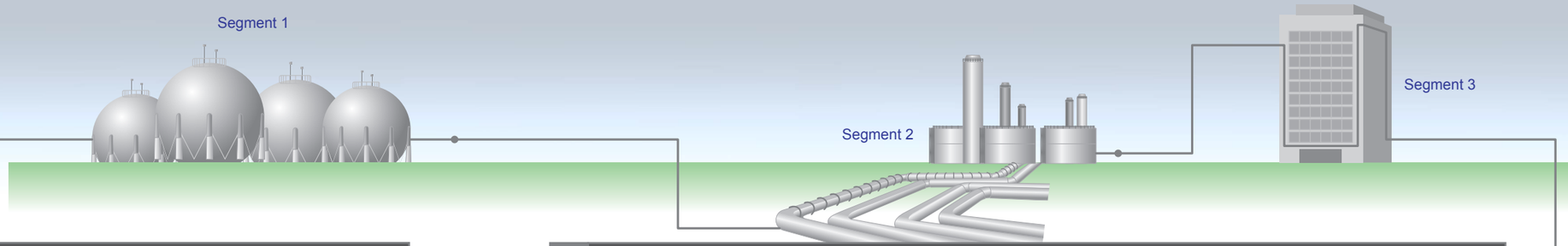
Polarization maintaining model

Spatial resolution: **5 cm** / Sampling resolution **1 cm**

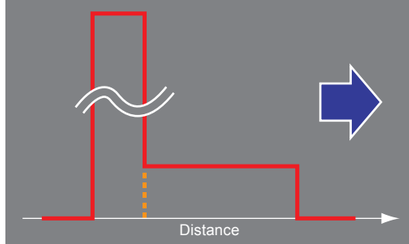
Repeatability of strain measurement: **2.4 με**

Repeatability of temperature measurement: **0.3 ºC**

NEUBREX®

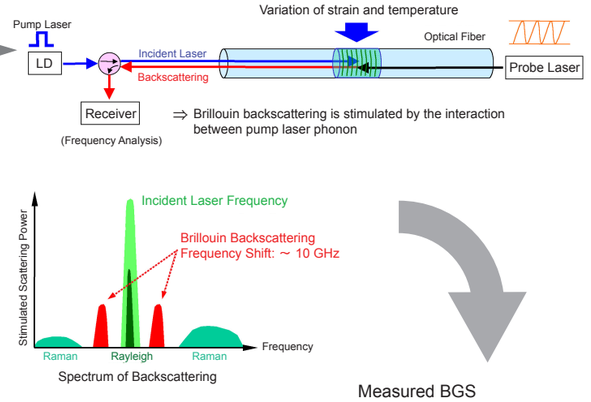


Principle of PPP-BOTDA

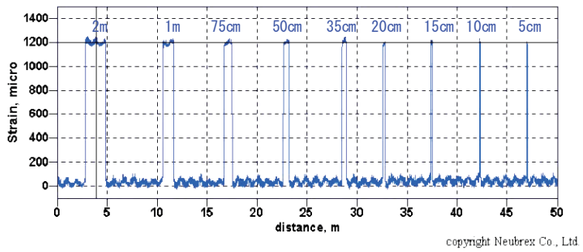


Pulse-PrePump (PPP) was adapted to achieve very high resolution

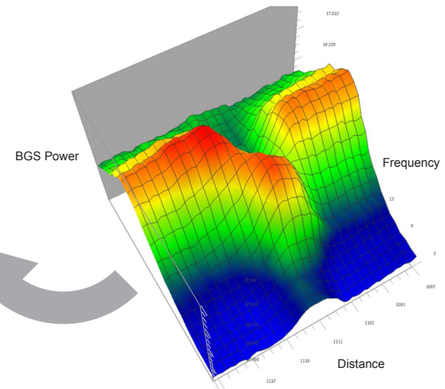
[patent pending]



Example of strain distribution measured with resolution of 5cm

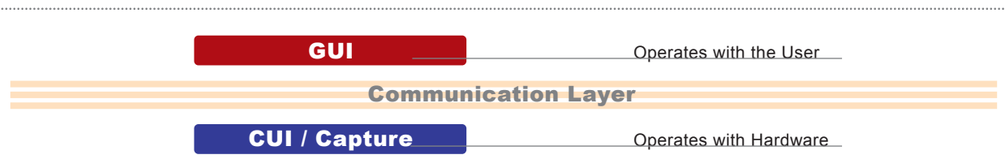


Measured BGS



Neubrex technology of PPP-BOTDA successfully increases the spatial resolution and strain accuracy one-order higher than previous products. This is the only one technology in the world.

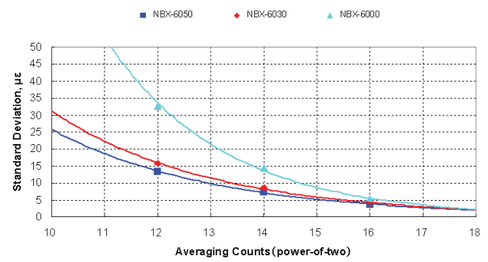
Open Architecture



- Open Architecture (OA), allows User to customize, automate, and extend the standard capabilities of NEUBRESCOPE software
- .NET Remoting in communication layer

Accuracy

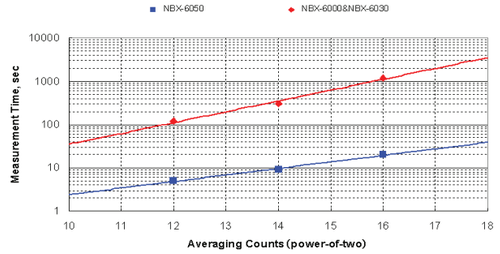
Relation between repeatability and averaging counts



Frequency scan step	5 MHz (frequency counts 41)			2 MHz (frequency counts 101)		
Averaging counts	2^{12}	2^{14}	2^{16}	2^{12}	2^{14}	2^{16}
Accuracy (με)	±12.0	±9.0	±7.5	±10.0	±7.0	±5.0
Repeatability (με)	±13.4	±7.3	±3.7	±11.4	±4.8	±2.4
Speed (sec)	5	9	20	13	25	50

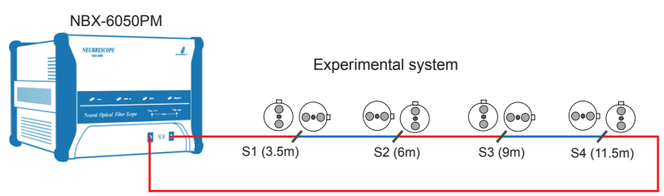
Speed-accuracy trade-off for different frequency steps

Relation between measurement and averaging counts



The effective way of increasing the speed of measurements is to decrease the averaging count of optical signal. As a result, however, this reduces the SNR (signal to noise ratio), and thus, decreases accuracy of measurements. Setting larger frequency scan steps also reduces the measurement time, but increases the strain error in the transfer from frequency data. So there is a trade-off relation among speed, averaging count, and frequency scan step. The table on the left lists the performance parameters of NBX-6050.
Comparing with our previous models, each of these parameters has been improved 10 times. Neubrex is the one and only manufacturer in the world providing you with the machine of such specifications.

Measurement example of Polarization Maintaining Fiber



Conditions:
$\Delta\nu_{Bshift} = 2Va \times (n_{slow} - n_{fast}) / \lambda$
$= 2.96MHz$ (approx. $60\mu\varepsilon$)
$\lambda = 1550$ nm
$Va = 736$ m/s
$n_{slow} - n_{fast} = 4 \times 10^{-4}$

Measure manually by switching polarization of 0° and 90°