

## Specifications NBX-6040/NBX-6040A

Laser Wavelength	1550±2 nm			
Distance Range	50m, 100m, 250m, 500m, 1km, 2.5km, 5km, 10km, 25 km			
Measurement Frequency Range	9~13 GHz			
Range of Strain Measurements	-30,000 to +40,000 $\mu\epsilon$ (-3% to 4%)			
Measurement Frequency Scan Step	1, 2, 5, 10, 20, 50MHz			
Readout Resolution	5 cm (minimum)			
Sampling Points	2,000,000 (maximum)			
Average Count Settings	2 <sup>5</sup> ~2 <sup>24</sup> times (inc. Hardware Average Count 2 <sup>16</sup> )			
Pulse Width	1 ns	2 ns	5 ns	10 ns
Spatial Resolution	10 cm	20 cm	50 cm	100cm
Dynamic Range <sup>(1)</sup>	1 dB	2 dB	3 dB	6 dB
Max. Measurement Distance <sup>(2)</sup>	1 km	5 km	10 km	20 km
Optical Budget <sup>(1)(5)</sup>	5 dB	7 dB	8 dB	10 dB
Measurement Accuracy ( $\sigma$ ) <sup>(3)</sup>	7.5 $\mu\epsilon$ / 0.35 °C			
Repeatability ( $\sigma$ ) <sup>(3)(4)</sup>	2.4 $\mu\epsilon$ / 0.1 °C			
Measurement Speed <sup>(6)</sup>	NBX-6040	5 seconds (minimum)		
	NBX-6040A	0.1 seconds (minimum)		
Signal Terminal	Signal Fiber	SM optical fiber		
	Fiber Connector	FC-APC / SC-APC (factory option)		
Suitable Fiber	SM optical 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 °C, Humidity below 85% (no dew condensation)			
Storage Temperature	0~50 °C			
Place of Production	Japan			

- (1) Based on 2<sup>15</sup> average cycles.  
 (2) Based on average fiber loss of 0.3dB/km using SM fiber.  
 (3) Based on the measurement of strain-free, UV-coated fiber.  
 (4) The standard deviation range of measurement value for 5 consecutive measurements for 100 consecutive points.  
 (5) Within the allowable range being adjusted by the optical power, except the case of nonlinear phenomena.  
 (6) Within the setting of 50m range, 2<sup>14</sup>count settings, 41scan steps except the time of Pre-Pump Adjustment.  
 (1) - (4) are all based on a frequency scan step of 5MHz and with Pre-Pump Adjustment and Auto Frequency Adjustment on.

\*Specifications are subject to change without notice.

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**Give you a feel<sup>®</sup>**  
 When every point of the optical fiber is a sensor

## Neural Optical Fiber Scope

# NEUBRESCOPE NBX-6040 / NBX-6040A <sup>NEW</sup>

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



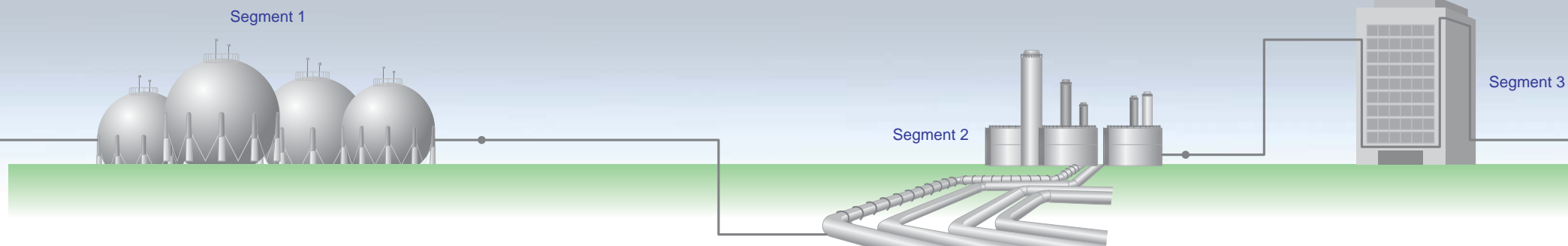
Spatial Resolution : **less than 10 cm**

Repeatability of Strain Measurement: **less than 2.4  $\mu\epsilon$**

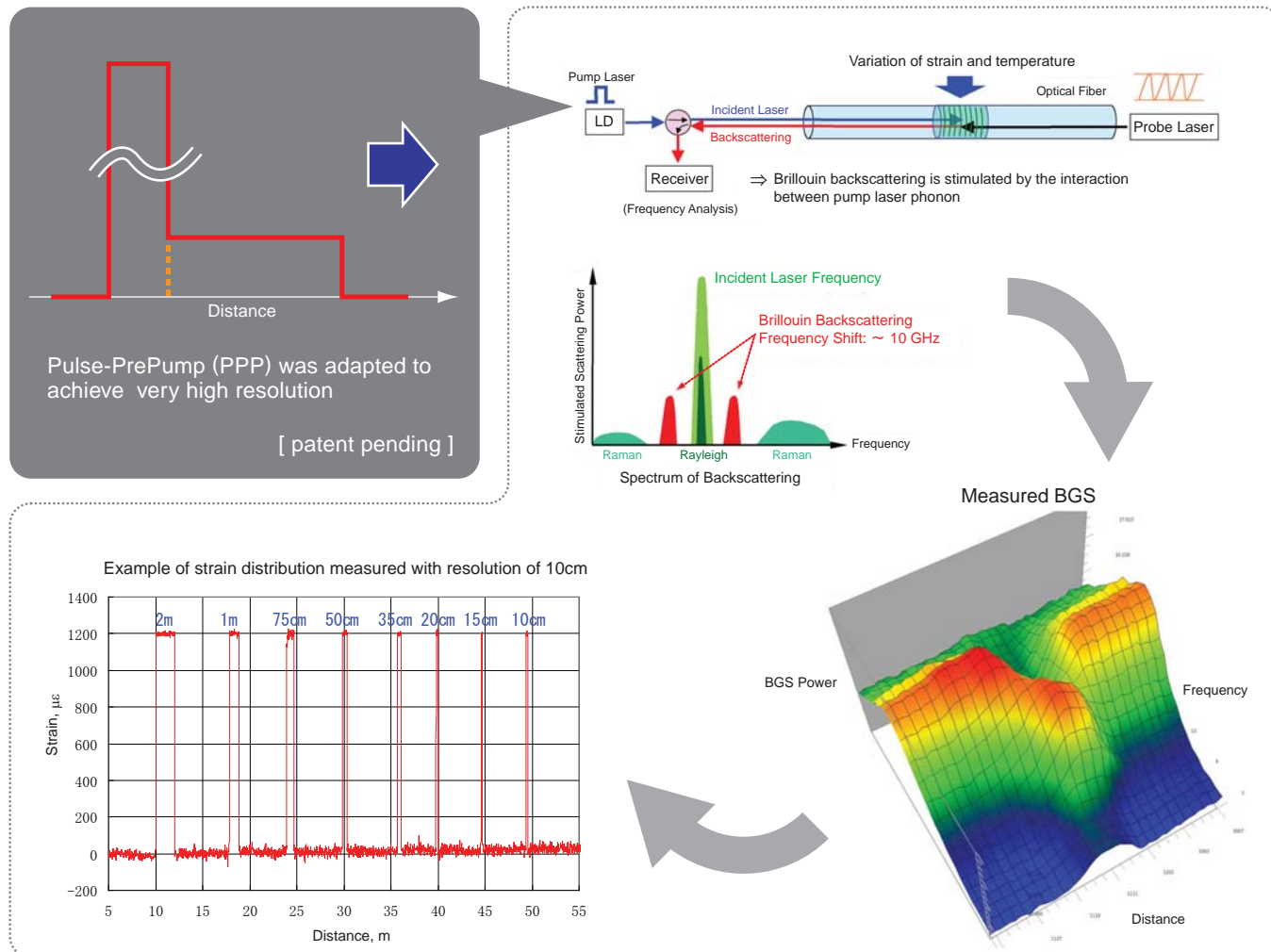
Repeatability of Temperature Measurement: **less than 0.1 °C**

Measurement Speed: **5 sec / 0.1 sec**



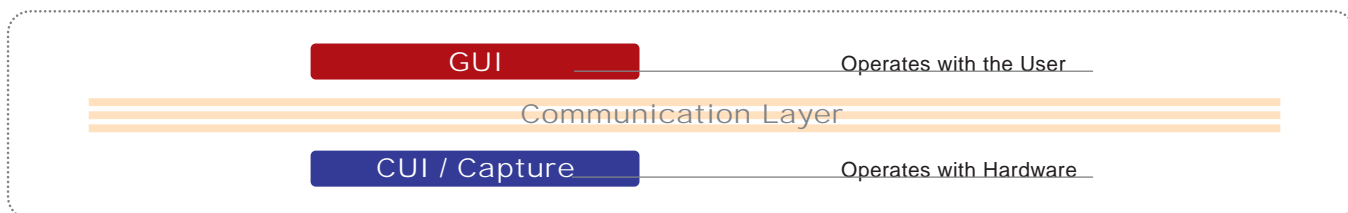


## Principle of PPP-BOTDA



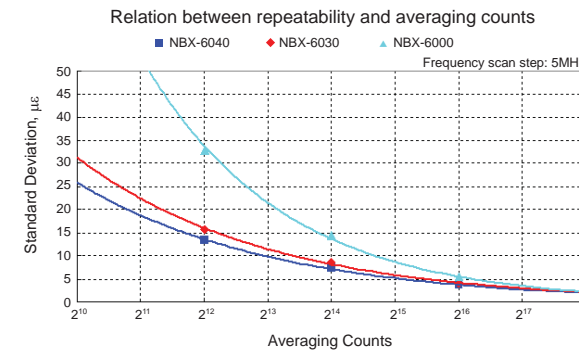
Neubrex technology of PPP-BOTDA successfully increase the spatial resolution and strain accuracy one-order higher than previous products. This is the only one technology in the world.

## Open Architecture

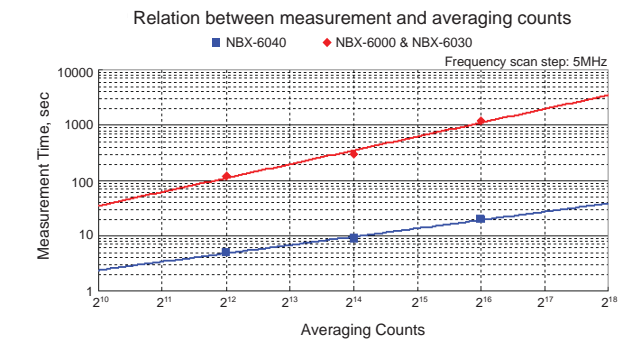


- Open Architecture (OA), allows User to customize, automate, and extend the standard capabilities of NEUBRESCOPE software
- .NET Remoting in communication layer

## Accuracy Ever Reached

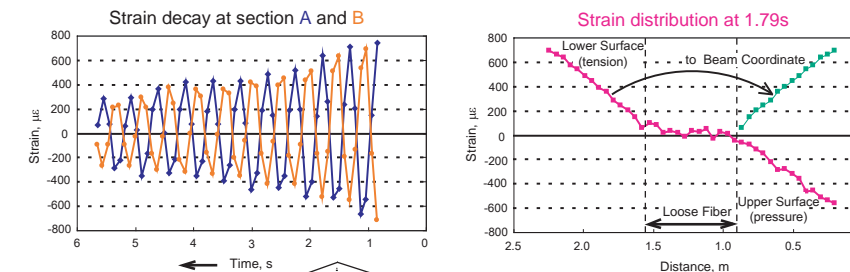


Speed-accuracy trade-off for different frequency steps (NBX-6040)



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-6040. 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.

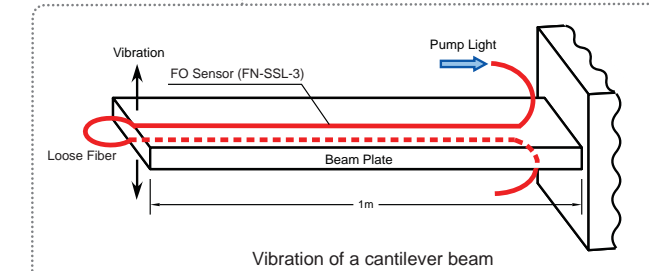
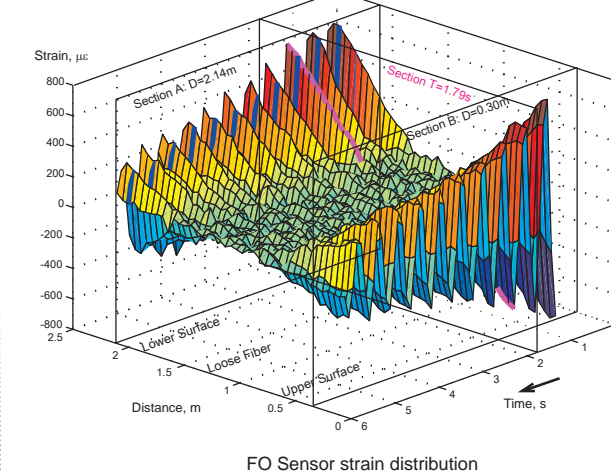
## Fast Mode (NBX-6040A)



- Conditions:
- Spatial resolution: 10 cm
  - Sampling rate: 5 cm
  - Measured strain range: ±1500 μs
  - Averaging counts: 2<sup>7</sup>

Range	50m	100m	500m
Repeatability (μs)	50	50	50
Speed (sec)	0.089	0.11	0.25

Speed-accuracy trade-off for different distance range



The example demonstrates first ever distributed measurements during vibrations. The dynamic behavior of specimens as long as 100 m can be recorded with 10 Hz speed, each measurement containing up to 2,000 sampling points.