

## Product Overview

6419 BOTDR can simultaneously measure strain distribution, loss distribution and Brillouin scattering spectrum at different location of optical fiber, and can display 3D and multiple distribution parameters. It has the advantages of high-precision strain measurement, good repeatability, single-end non-destructive measurement etc.. It has become an indispensable instrument in the field of optical fiber communication and optical fiber sensing (OFS).

6419 can be widely used for the health monitoring of bridge, dam, tunnel, lofty building, oil well platform and oil pipeline etc., the forecasting and alarming of geological hazard such as mountain landslide, mud-rock flow and earthquake etc., as well as the health inspection of intelligent structures as nal vessels and spacecraft etc..

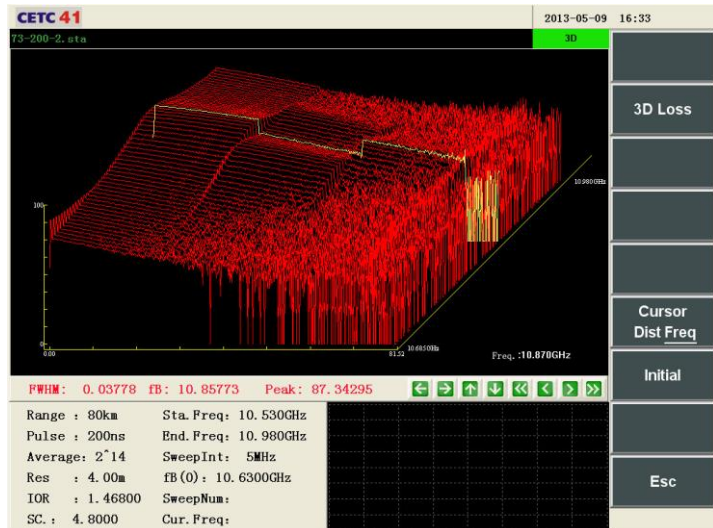
6419 can be also used to measure the strain distribution of optical fiber loop or subsea optical cable when the optical fiber gyroscope (OFG) and optical fiber hydrophone are in the process of development, production, and test, or when the subsea optical cable is in the process of development, production, construction, acceptance inspection and maintenance.

## Main Characteristics

- Single-end nondestructive test
- Measurement of Brillouin scattering spectrum width distribution
- Measurement of optical fiber strain distribution
- Measurement of optical fiber loss distribution
- Measurement of Brillouin scattering spectrum
- Multi-window display
- 3D display of loss distribution
- Large screen color LCD display, touch screen operation
- Built-in visual fault locator (VFL)
- Remote control
- System software on-line upgrading, no need to return to factory

■ 3D Display

Tri-dimensional distribution of Brillouin scattering spectrum at different location can be observed conveniently in 3D display.



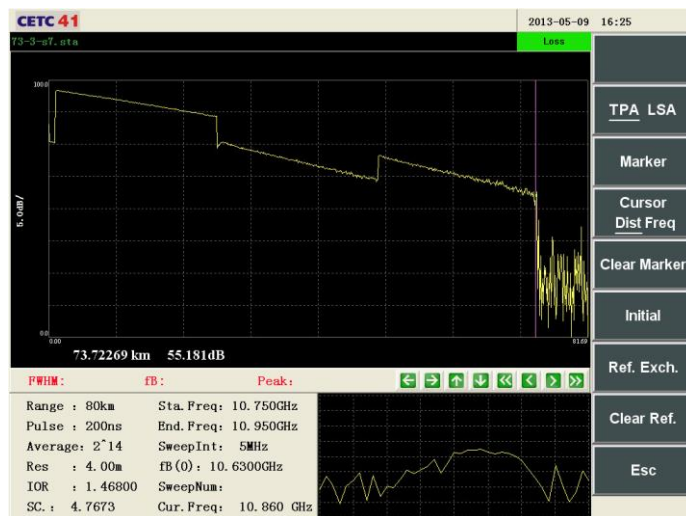
■ Multi-window Display

The multi-window display allows to simultaneously observe the strain, Brillouin scattering spectrum, spectrum width and scattering power at different location along the optical fiber.

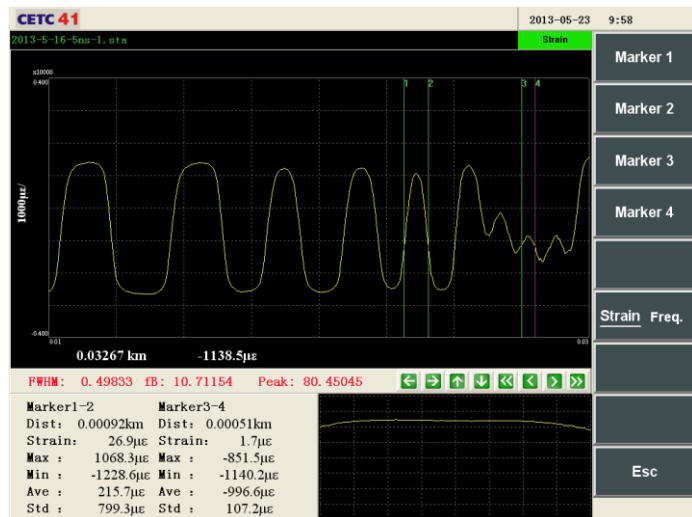


■ Long-distance detectivity

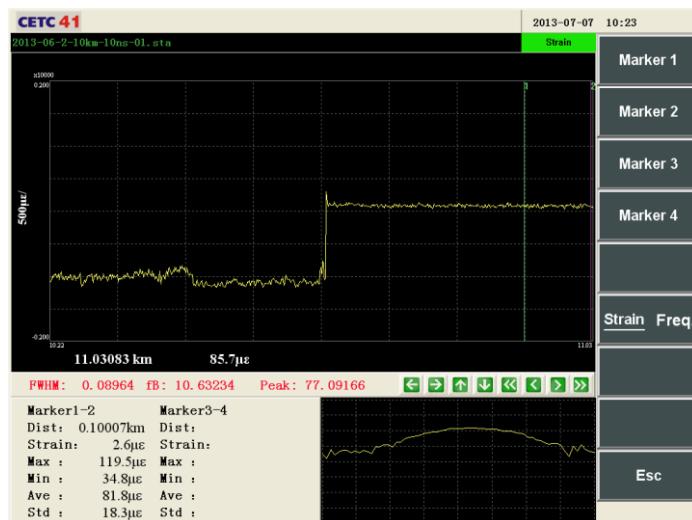
6419 can detect the optical fiber line nearly 80km.



■ Spatial resolution of less than 1m  
 By optimizing the optical path, circuit and data processing model, 6419 has spatial resolution of less than 1m. In the right fig, the distance between marker1 and marker 2 is 1m, and the distance between marker 3 and marker4 is 0.5m.



■ High-precision strain test  
 Under 10ns pulse width, the strain test accuracy of 6419 BOTDR reaches  $\pm 18\mu\epsilon$  at a distance of 11km.



■ Visual Fault Locator (VFL)

6419 has built-in visual fault locator (VFL) function, with three operation modes of CW, 1Hz and 2Hz. It can help operators to quickly locate the break points or the remarkable loss points in short-distance optical fiber line.

■ Multiple External Interface

6419 offers multiple external interfaces, such as USB, Ethernet, RS232C, earphone etc., which can realize the functions as follows:

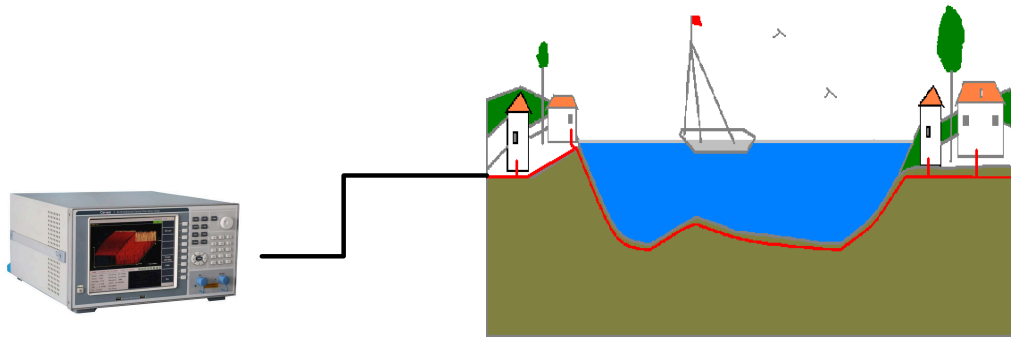
- Connection with external USB disc
- Connection with external printer based on USB interface
- Communication with PC computer
- Remote control via Ethernet
- Connection with external earphone

## Typical Applications

### ■ Monitoring of submarine optical cables

It is necessary to measure the strain distribution of the submarine optical fiber cable during the phases of production, checkout after the arrival, check and maintenance before and after the construction, in order to prevent the optical fiber from breaking due to the large strain, which can further break off communication and bring about large damage.

6419 is applicable to measure the strain distribution during all the phases of production, transport and construction of optical fiber cables.

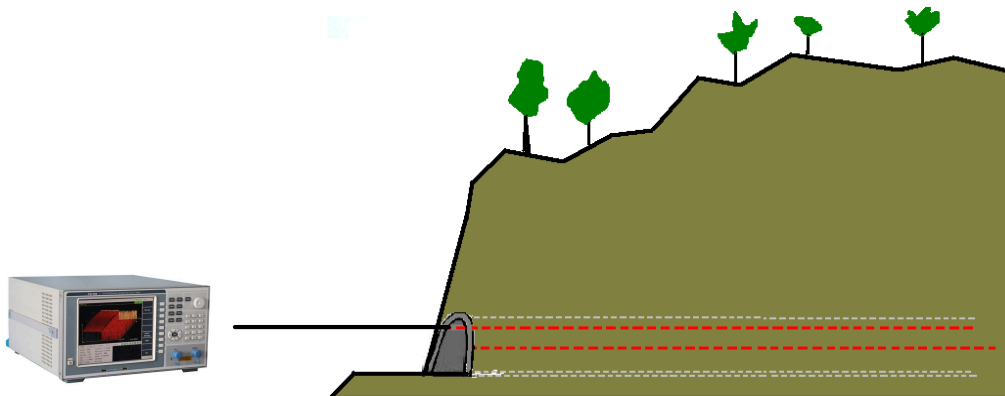


### ■ Detection of geologic hazard (landslide)

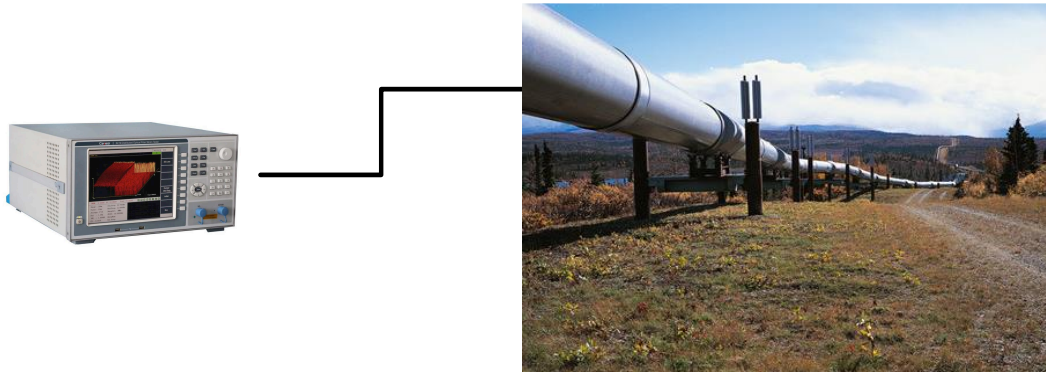
By laying optical fiber on the important landslide, with the aid of 6419 BOTDR, we can detect the shift degree of landslide internal rock-soil and detect its real-time tendency. When the strain is remarkable, operator can handle it in time by setting appropriate threshold alarm, so this can avoid big loss by geology hazard.



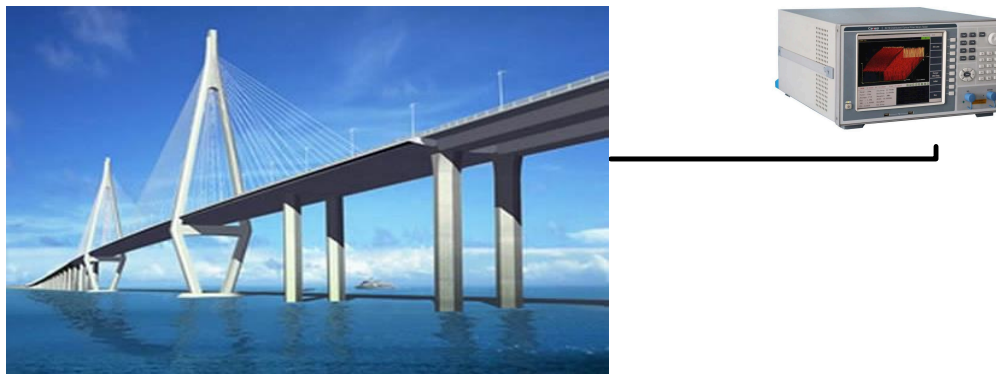
### ■ Tunnel health monitoring



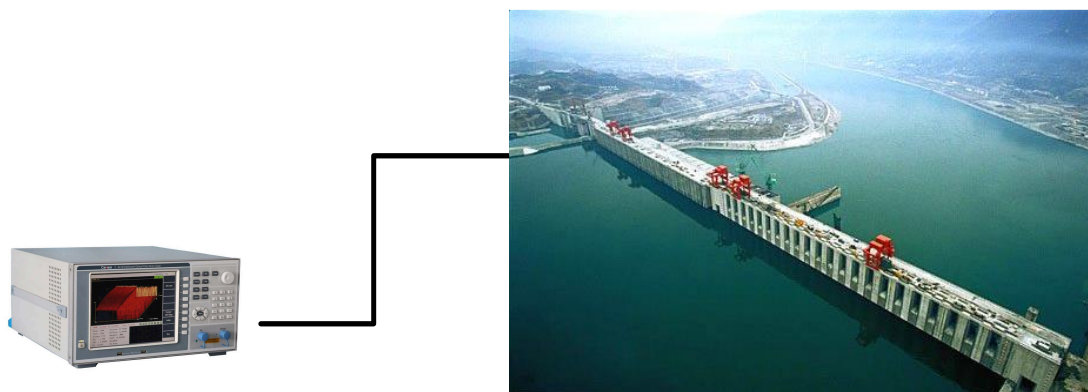
■ Oil pipeline monitoring



■ Bridge monitoring

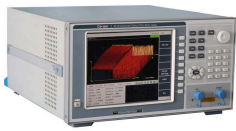


■ Dam monitoring

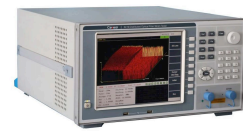


■ Power line monitoring

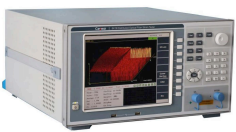




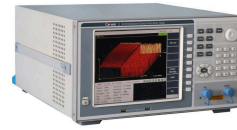
■ Coal mine passageway monitoring



■ Oil well platform monitoring

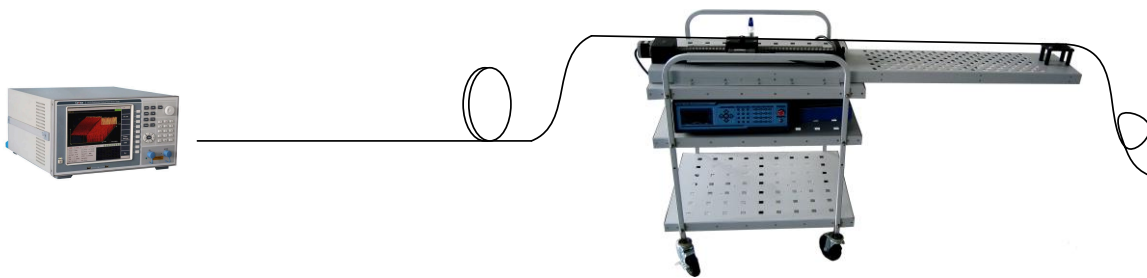


■ Lofty building health monitoring



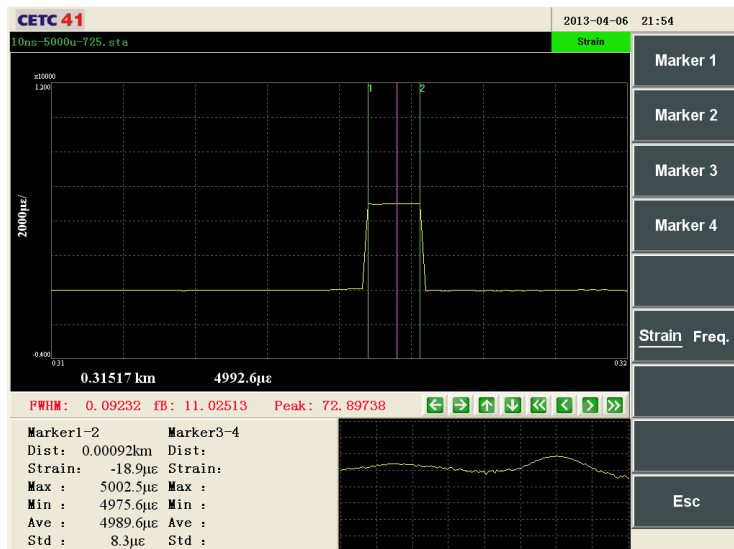
■ Typical experiments

(1) Repeatability test experiment

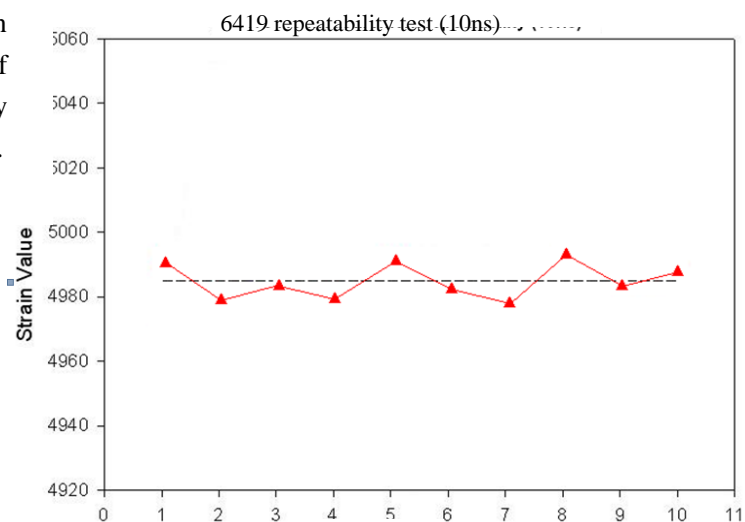


Testing curve

Optical fiber strain due to stretching can be found obviously at the location of 0.3157km, and the strain is about 4992.6 $\mu\epsilon$ .

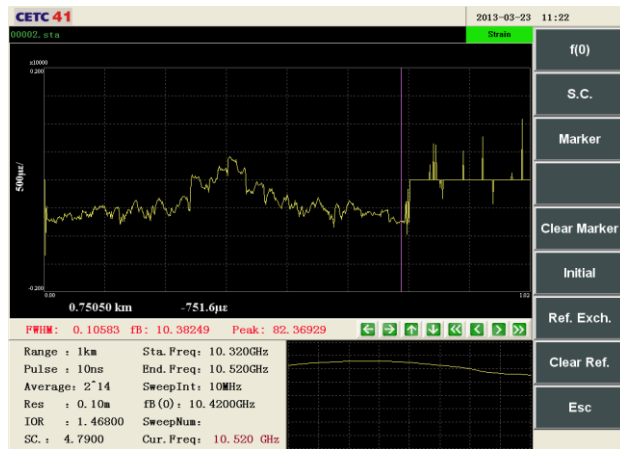


The right fig. shows the strain measurement results of 10 successive times by 6419 under 10ns detection pulse.



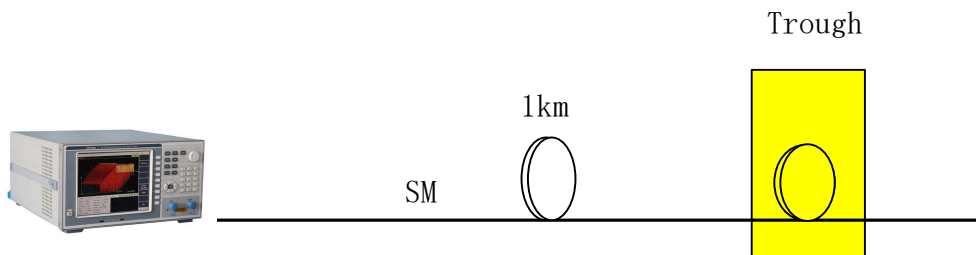


(2) Test experiment of optical fiber ring

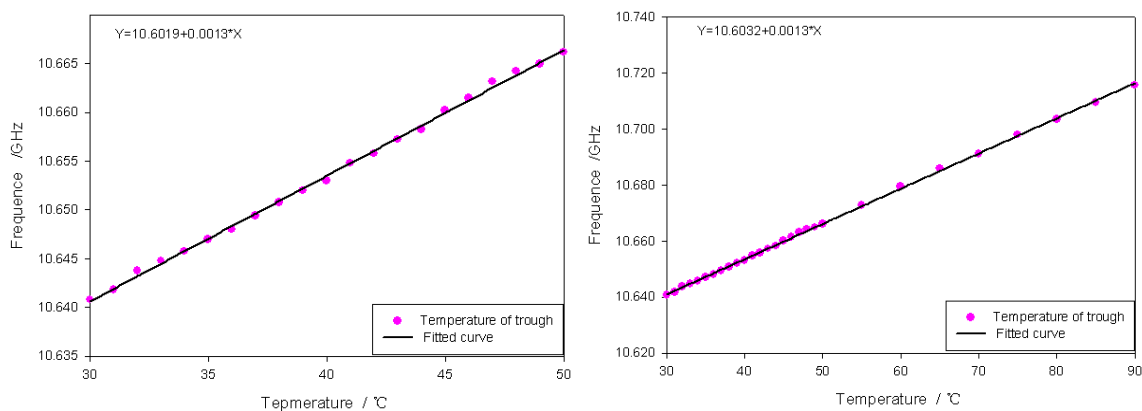


During the development, production and test of fiber optical gyroscope, 6419 BOTDR can be used to measure the strain distribution of the optical fiber ring.

(3) The calibration experiment of optical fiber temperature coefficient



The relation curve between Brillouin frequency shift and Temperature:



The optical fiber under test was G.652 single-mode fiber. Above, the left figure shows the measurement trace of temperature range from 30°C to 50°C with the span of 1°C, and the right figure shows the trace of temperature range from 30°C to 90°C with the span of respectively 1°C (30°C - 50°C) and 5°C (50°C - 90°C). Through the left figure, it can be found out that the temperature resolution of 6419 can be 0.5°C.

## Technical Specifications<sup>1</sup>

|                                    |  |
|------------------------------------|--|
| Operation wavelength               | 1550nm±5nm   |
| Optical fiber type                 | Single-mode  |
| Maximum dynamic range <sup>2</sup> | 15dB   |
| Highest spatial resolution         | 1m   |
| Distance accuracy                  | ± (0.2+2×sample spacing+2×10 <sup>-5</sup> ×distance) (m)  |
| Strain test accuracy <sup>3</sup>  | ±50μϵ (10ns~20ns) ; ±10μϵ (50ns~200ns)   |
| Strain test repeatability          | ≤±100μϵ  |
| Strain test range                  | -15000~+15000 (μϵ)   |
| Distance range                     | 0.5km,1km~127km,1km steps  |
| Pulse width                        | 10ns~200ns,10ns steps  |
| Average times range                | 2 <sup>10</sup> ~2 <sup>24</sup>   |
| Highest sampling resolution        | 0.05m  |
| Sample points                      | 80000  |
| Refractive index setting range     | 1.00000~1.99999; 0.00001 steps   |
| Frequency sweep interval           | 1, 2, 5, 10, 20, 50MHz   |
| Frequency sweep range              | 9.9GHz~12.0GHz   |
| Display                            | 10.4-inch TFT, 1024×768 resolution   |
| Interface Language                 | Simplified Chinese /English  |
| Interfaces                         | VGA, RS232C, USB, Ethernet, earphone   |
| Optical output connector           | FC/APC (conveniently replaced by SC or ST connector)   |
| VFL                                | 650nm±30nm, 2mw (Typical); operation mode: CW, 1Hz, 2Hz  |
| Power Supply                       | AC power: 100V~242V (1.5A), frequency range: 50/60Hz   |
| Maximum power consumption          | 100W   |
| Dimensions                         | 435mm (W) ×230mm (H) ×495 (D) mm   |
| Weight                             | ≤20kg  |
| Environmental adaptability         | Operating temperature: 0℃~+40℃ ;<br>Storage temperature: -20℃~+65℃<br>Relative humidity: 5%~90%. Non-condensing. |

Notes:

1.  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ;
2. Pulse width 200ns, average times  $2^{16}$ , frequency sweep range 200MHz, frequency sweep spacing 5MHz;
3. Average times  $2^{16}$ , frequency sweep range 200MHz, frequency sweep spacing 5MHz;

### Ordering Information

**Main Unit:** 6419 BOTDR

#### Standard Package

| Item | Description                                    | Remarks                       |
|------|--|-------------------------------|
| 1    | Power Cord                                     | Standard tri-prong power cord |
| 2    | User Manual                                    |                               |
| 3    | Certificate of Conformity                      |                               |
| 4    | USB Interface Mouse                            |                               |
| 5    | Optical Transfer Jumper (FC/APC to FC/UPC)     |                               |
| 6    | 6419 Data Analysis Software (standard version) |                               |

#### Options

| Item     | Description  | Function  |
|----------|--|---|
| 6419-001 | Optical fiber end inspector                        | Inspect the using of the fiber connector end  |
| 6419-002 | Advanced lens paper                                | Clean the optical fiber end   |
| 6419-003 | FC/APC to SC/UPC jumper                            | Connect the tested fiber with SC/UPC connectors   |
| 6419-004 | 6419 data analysis software (professional version) | Provide the functions of comparison, print, data output, and deep analysis of batch files |

Note: for the necessity of design improvement, the above content is subject to change without any notice.