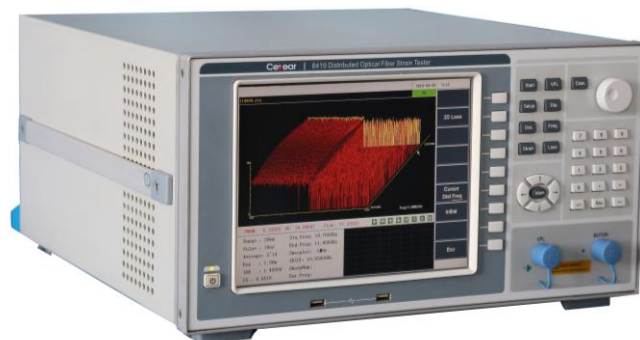




# 6419/6419A (BOTDR)

## Brillouin Optical Time Domain Reflector Meter



**Ceyear Technologies Co., Ltd.**

## Product Overview

6419/6419A 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).

6419/6419A 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 naval vessels and spacecraft etc.

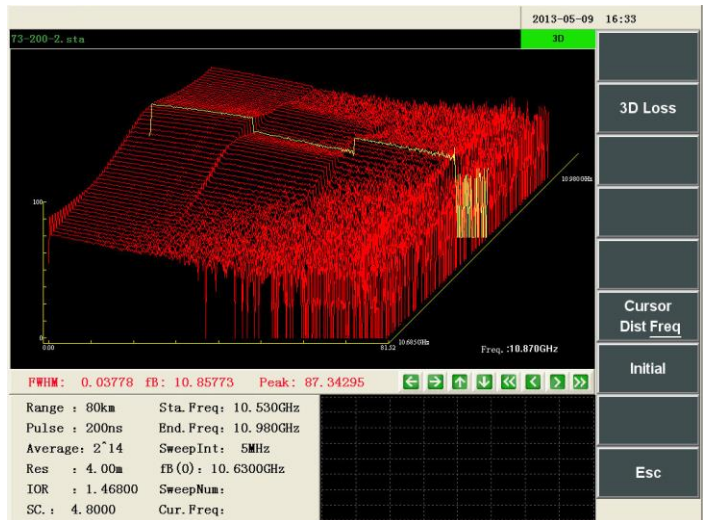
6419/6419A can be also used to measure the strain distribution of optical fiber loop or subsea optical cable when the optical fiber gyroscope (OFG) and optical fiber hydrophone are in the process of development, production, and test, or when the subsea optical cable is in the process of development,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

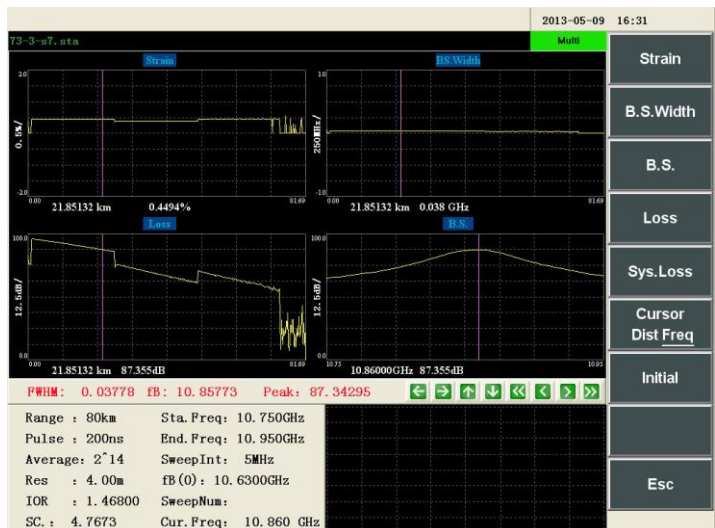
■ 3D Display

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.



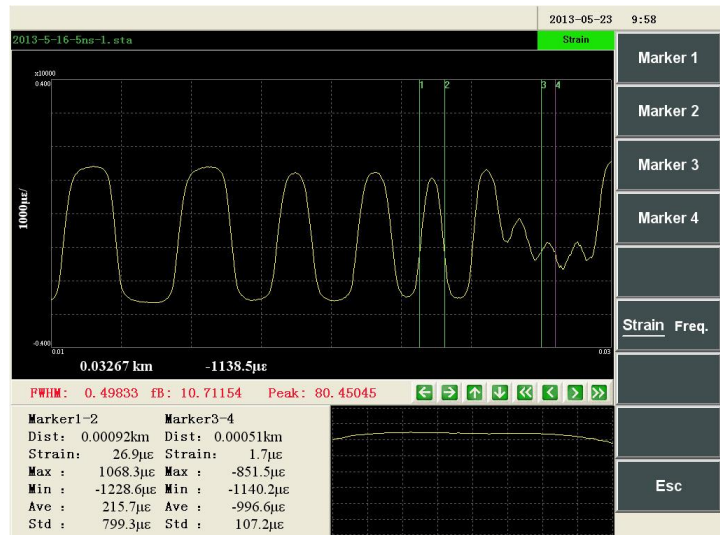
■ Long-distance detectivity

6419/6419A can detect the optical fiber line nearly 80km.



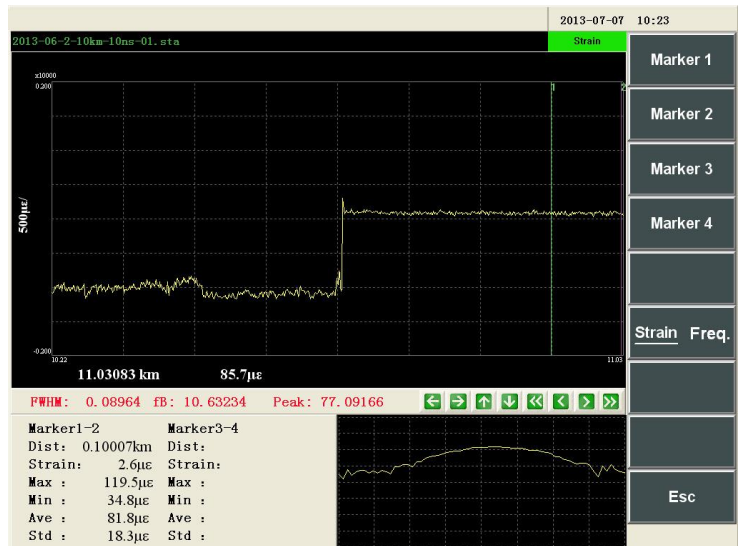
■ Spatial resolution of less than 1m

By optimizing the optical path, circuit and data processing model, 6419/6419A 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 6419/6419A BOTDR reaches  $\pm 18\mu\epsilon$  at a distance of 11km.



■ Visual Fault Locator (VFL)

6419/6419A 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

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

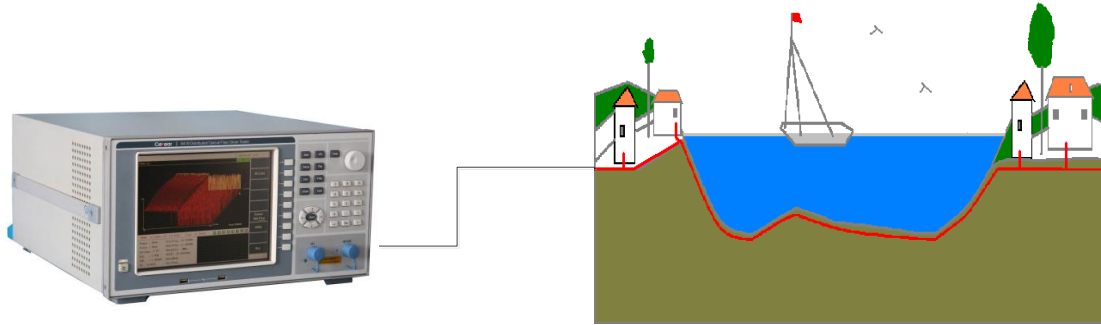
- Connection with external USB disc
- Connection with external printer based on USB interface
- Communication with PC computer
- Remote control via Ethernet
- Connection with external earphone

## 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.

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

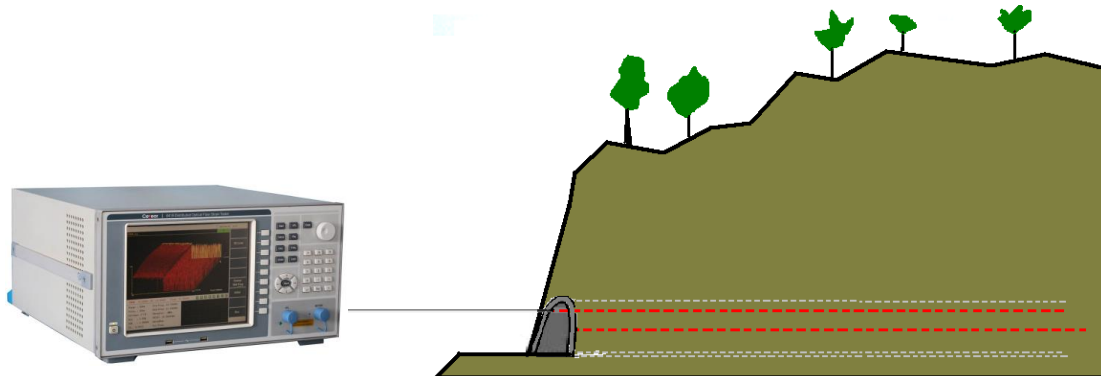


### ■ Detection of geologic hazard (landslide)

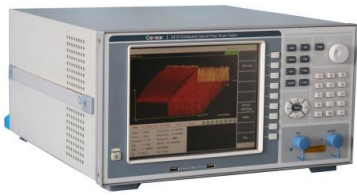
By laying optical fiber on the important landslide, with the aid of 6419/6419A BOTDR, we can detect the shift degree of landslide internal rock-soil and detect its real-time tendency. When the strain is remarkable, operator can handle it in time by setting appropriate threshold alarm, so this can avoid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



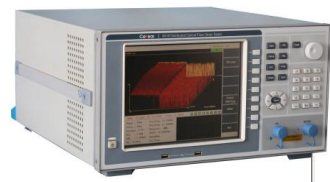
### ■ Tunnel health monitoring



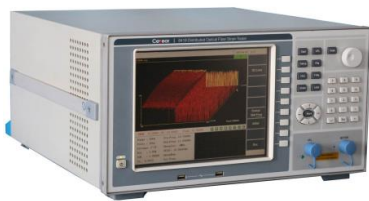
■ Oil pipeline monitoring



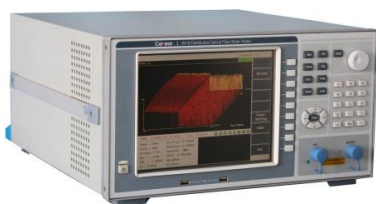
■ Bridge monitoring



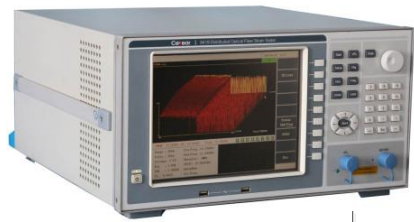
■ Dam monitoring



■ Power line monitoring



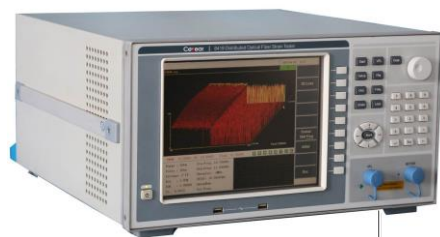
■ Coal mine passageway monitoring



■ Oil well platform monitoring

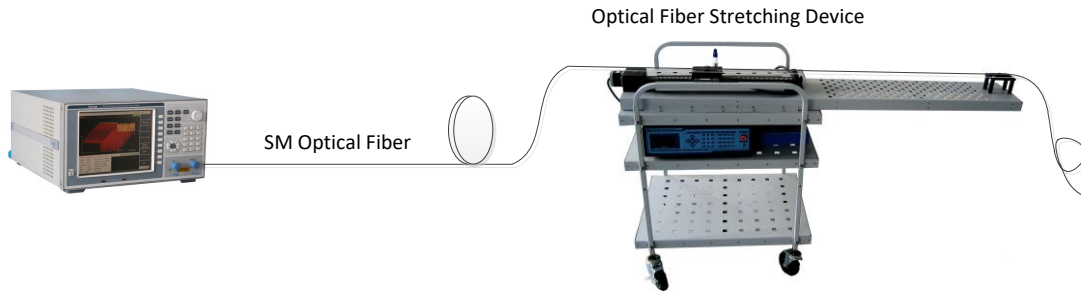


■ Lofty building health monitoring



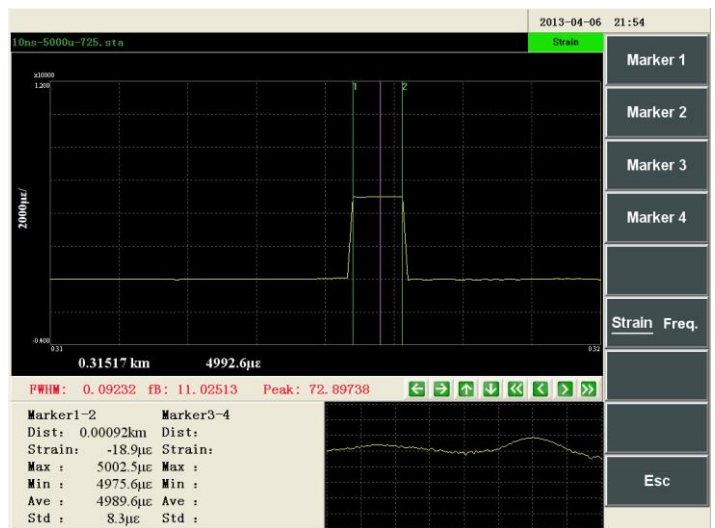
■ Typical experiments

(1) Repeatability test experiment

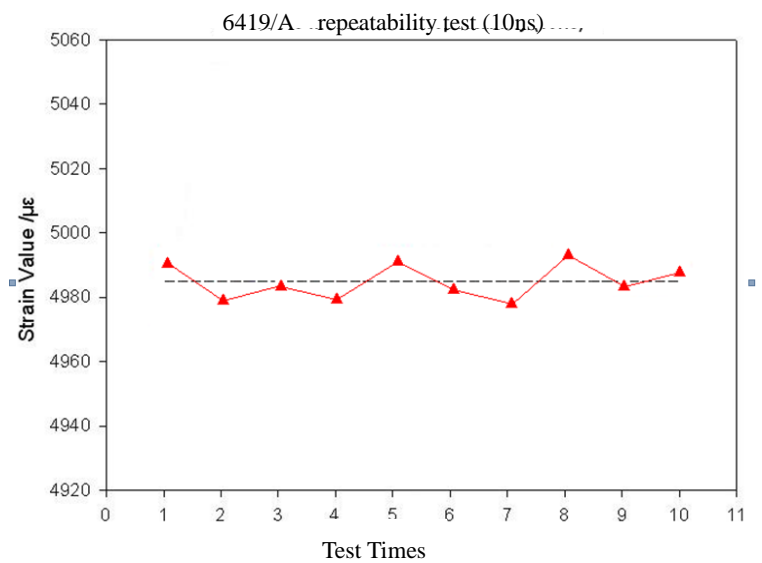


Testing curve

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 6419/6419A under 10ns detection pulse.



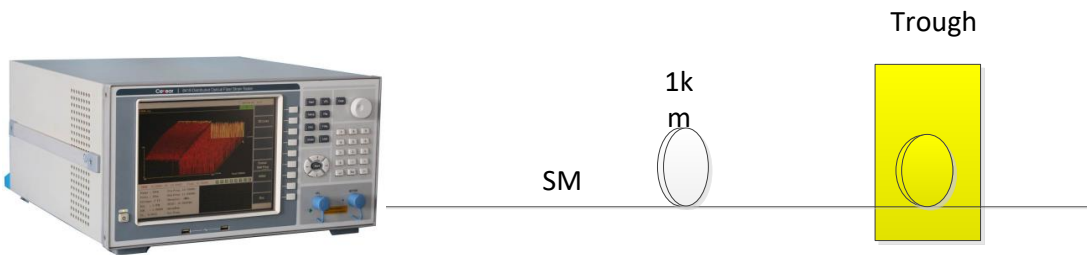


(2) Test experiment of optical fiber ring

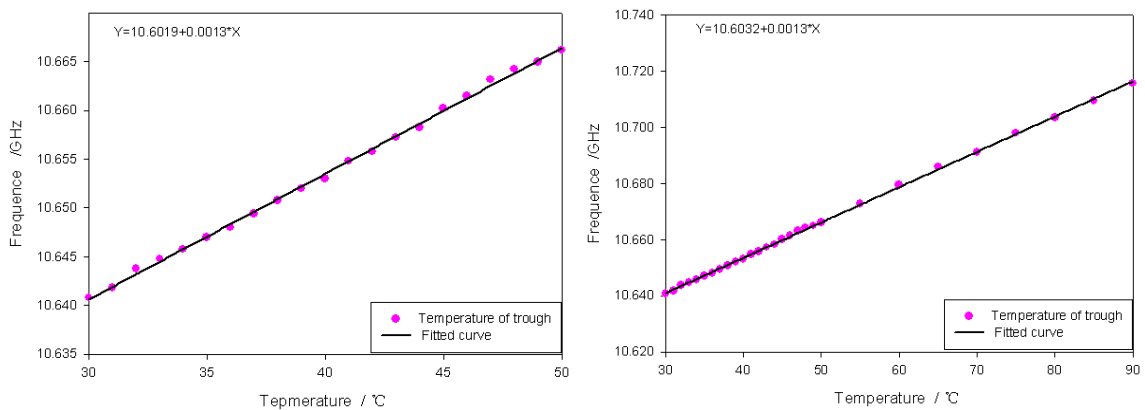
During the development, production and test of fiber optical gyroscope, 6419/6419A BOTDR can be used to measure the strain distribution of the optical fiber ring.



(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 6419/6419A can be 0.5°C

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

Model	6419	6419A
Operation wavelength	1550nm±5nm	1550nm±5nm
Optical fiber type	Single-mode	Single-mode
Maximum dynamic range <sup>2</sup>	15dB	15dB
Highest spatial resolution	1m	1m
Distance accuracy	$\pm (0.2+2 \times \text{sample spacing} + 2 \times 10^{-5} \times \text{distance})$ (m)	$\pm (0.2+2 \times \text{sample spacing} + 2 \times 10^{-5} \times \text{distance})$ (m)
Strain test accuracy <sup>3</sup>	$\pm 50\mu\epsilon$ ( 10ns~20ns ) ; $\pm 10\mu\epsilon$ ( 50ns~200ns )	$\pm 50\mu\epsilon$ (10-20ns), $\pm 10\mu\epsilon$ (50-200ns)
Strain test repeatability	$\leq \pm 100\mu\epsilon$	$\leq \pm 100\mu\epsilon$
Strain test range	-15000~+15000 ( $\mu\epsilon$ )	-30000~+40000 ( $\mu\epsilon$ )
Distance range	0.5km,1km~127km,1km steps	0.5、1、2、.....、128km; 1km steps
Pulse width	10ns~200ns,10ns steps	10、20、.....、200ns; 10ns steps
Average times range	$2^{10} \sim 2^{24}$	$2^{10} \sim 2^{24}$
Highest sampling resolution	0.05m	0.05m
Sample points	80000	80000
Refractive index setting range	1.00000~1.99999; 0.00001 steps	1.00000~1.99999; 0.00001 steps
Frequency sweep interval	1, 2, 5, 10, 20, 50MHz	1、2、5、10、20、50MHz
Frequency sweep range	9.9GHz~12.0GHz	9.0GHz~13.0GHz
Display	10.4-inch TFT, 1024×768 resolution	10.1-inch, 1280×800 resolution
Interface Language	Simplified Chinese /English	Simplified Chinese /English
Interfaces	VGA, RS232C, USB, LAN, Earphone	VGA, RS232C, USB, LAN, Earphone
Optical output connector	FC/APC (conveniently replaced by SC or ST connector)	FC/APC (conveniently replaced by SC or ST connector)
VFL	650nm±30nm, 2mw ( Typical ) ; operation mode: CW, 1Hz, 2Hz	650nm±30nm, 2mw ( Typical ) ; operation mode: CW, 1Hz, 2Hz
Power Supply	AC power: 100V~242V (1.5A), frequency range: 50/60Hz	AC power: 100~240VAC (1.5A), frequency range: 50/60Hz
Maximum power consumption	100W	100W
Dimensions	435mm (W) × 230mm (H) × 495 (D) mm	435mm (W) × 190mm (H) × 495 (D) mm
Weight	$\leq 20\text{kg}$	$\leq 17\text{kg}$
Environmental adaptability	Operating temperature: 0°C~+40°C ; Storage temperature: -20°C~+65°C Relative humidity: 5% ~ 90% . Non-condensing.	Operating temperature: 0°C~+40°C ; Storage temperature: -20°C~+65°C 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:** 6419/6419A 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	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	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.

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