YOFC Launched 30/250 Polarization-maintaining Yb-doped Optical Fibre for Ultrafast Fibre Laser

With the rapid development of optical fibre laser and the continuous progress of Yb-doped fibre fabrication technology, the output power and beam quality of Yb-doped double-cladding optical fibre laser have been improved rapidly, and the laser has been widely used in military and civil fields. At the same time, compared with nanosecond fibre laser, picosecond and femtosecond fibre laser performs better in some specific fields. These ultrafast lasers not only helps to obtain better machining accuracy but also play an important role in the medical field in the future. As the key raw material of ultrafast fibre laser, polarization-maintaining Yb-doped fibre has been monopolized by foreign suppliers for a long time; its price is expensive, and the delivery cycle could not be guaranteed; therefore, the task of localization is extremely urgent.

Based on years of experience, Yangtze Optical Fibre and Cable Joint Stock Limited Company (hereinafter referred to as YOFC) prepared excellent boron-doped stress rod. Meanwhile, using the CDS-based MCVD platform, the Yb-doped core rod has been produced, then through the special fibre drawing process, 30/250 polarization-maintaining Yb-doped fibre which applied to ultrafast lasers has been developed successfully during several years. The technical indicators are shown in Table 1:

Table 1 30/250 Technical Indicators of Polarization-Maintaining Yb-Doped Fibre

Type of Optical Fibre	**YDF-DC-PM 30/250**	
Optical Performance	**Unit**	**Indicator**
Operating wavelength	nm	1040~1090
Cladding loss @ 1095nm	dB/km	<20
Cladding pump absorption @ 915nm	dB/m	1.8±0.2
Cladding pump absorption @ 975nm	dB/m	5.3
Core numerical aperture	N/A	0.06±0.01

Inner cladding numerical aperture	N/A	≥0.46
Geometric/mechanical properties		
Core diameter	μm	30±2
Inner cladding diameter	μm	250±8
Coating diameter	μm	395±15
Inner cladding shape	N/A	Circle
Proof test level	Kpsi	100

YOFC reserves the right to the final interpretation of the above terms.

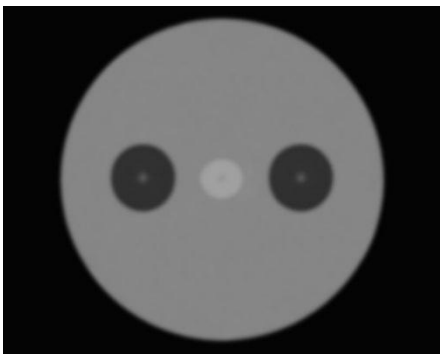

Figure 1. End View of

Polarization-maintaining Yb-doped Fibre

The 30/250 polarization-maintaining Yb-doped fibre shown in Figure 1 is mainly used in the amplification stage of ultrafast fibre lasers. Since the peak power is very high, the non-linear effect is easily to generate. In order to suppress this undesirable phenomenon it is necessary to obtain high conversion efficiency with the shortest fibre length. The slope efficiency and extinction ratio of the polarization-maintaining Yb-doped fibre developed independently by YOFC has reached 75% and 90% respectively under the 915nm pumping source, which meets the requirements of the application well.

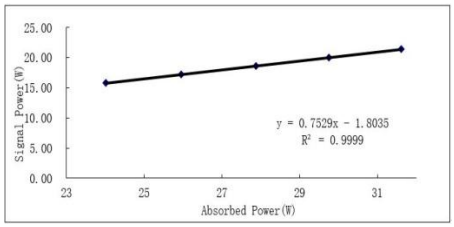

Figure 2. 915nm Pump Light Conversion

Efficiency Test Results

Figure 2 shows that the slope efficiency can reach 75% under 915 nm pump light, and the conversion efficiency can be increased under 976 nm pump source. As can be seen from Figure 3, the output spectrum has no harmonic peak and no non-linear effect.

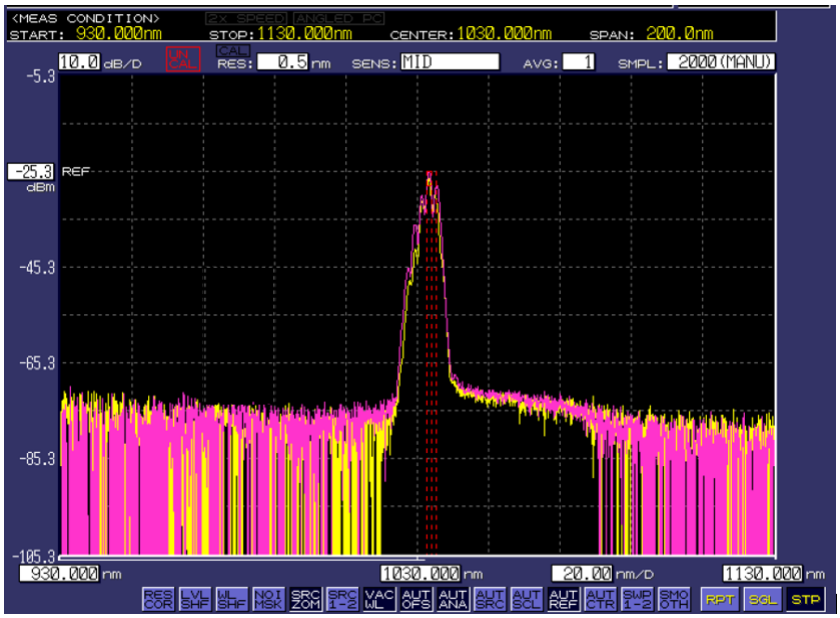

Figure 3. Output Spectrum

For ultrafast fibre laser in industrial applications, in order to ensure processing accuracy, excellent beam quality is required; therefore, the beam quality factor M^2 is particularly important. The M^2 of 30/250 polarization-maintaining Yb-doped fibre developed independently by YOFC under the operating wavelength is less than 1.3. It can be seen from Figure 4 that the distribution of the optical field is dominated by the fundamental mode and the beam quality is good.

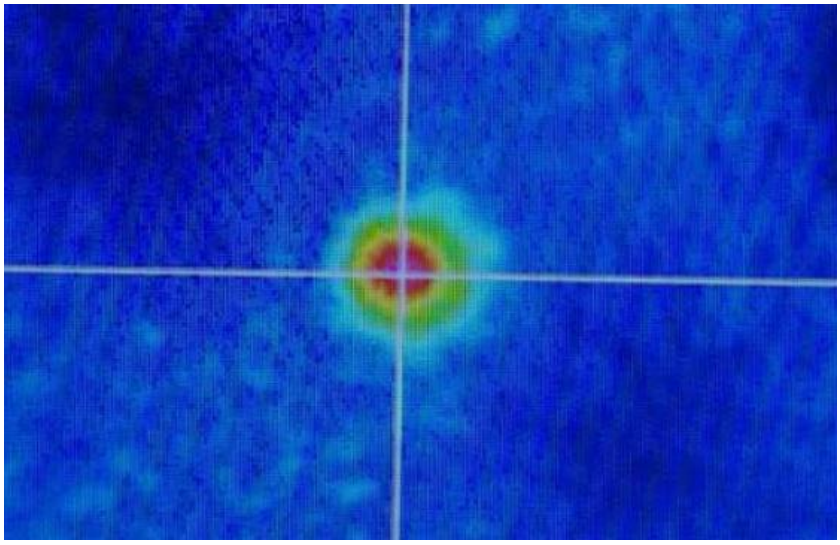

Figure 4. Optical Field Distribution

Focusing on the application market of ultrafast fibre laser in the future and basing on the excellent platform which has been continuously optimized over the years YOFC will strive to provide high-quality polarization-maintaining active fibre series for Chinese ultrafast fibre laser!

长飞光纤光缆股份有限公司
Yangtze Optical Fibre and Cable Joint Stock Limited Company
地址：武汉市光谷大道9号（430073）
ADD：No.9 Optics Valley Avenue, Wuhan, Hubei, China(P.C.: 430073)
电话(Tel)：+86 400-991-6698
邮箱(Email)：marketing@yofc.com
www.yofc.com