

The development of the new Polarisation Maintaining（PM） Ytterbium doped Very Large Mode Area（VLMA）fibre was driven by demand for an easy to integrate double－clad fibre in the growing ultrafast fibre laser market．The combination of robust single mode behaviour in an all－solid glass form factor with $750 \mu \mathrm{~m}^{2}$ fundamental mode area makes this fibre an ideal tool for high－end industrial fibre laser manufacturers． Proprietary manufacturing ${ }^{(1)}$ process enables preferential fibre coiling and automatic amplifier output polarization orientation．

Complementary matching GRIN and passive VLMA fibres are available for all－fibre monolithic integration with standard LMA 10－125 PM pump combiners．Module assembly also available on request．
${ }^{(1)}$ Photonics Bretagne patent （WO／2022／112152）．

## Main characteristics

－Truly single mode polarization maintaining behavior
－All－solid step index based fibre design based on our all－vapor phase delivery process
－Industry standard low index polymer coating providing long term reliability \＆performance
Excellent fibre lot uniformity and consistency

## Applications

High power ultrafast pulsed fiber lasers／amplifiers for material processing，life science，spectroscopy or defense applications．

## Fibre specifications

| Fibre type | VLMA－40－220－PM－YB－V1 |
| :---: | :---: |
| Optical parameters |  |
| Background loss＠ 1150 nm （dB／km） | ＜ 10 |
| Cladding loss＠ 1300 nm （dB／km） | ＜ 35 |
| Cladding numerical aperture | $\geq 0.46$ |
| Measured cladding absorption＠915nm（dB／m）${ }^{(2)}$ | $2.7+/-0.2$ |
| Measured cladding absorption＠ 976 nm （dB／m）${ }^{(2)}$ | $8.0+/-0.5$ |
| Core numerical aperture（NA） | $0.045+/-0.005$ |
| LP01 MFD＠ 1060 nm （ $\mu \mathrm{m})^{(3)}$ | $32+/-1$ |
| Effective area aeff＠ 1060 nm （ $\mu \mathrm{m} 2$ ） | $750+/-40$ |
| Birefringence＠ 1060 nm | $\geq 1.10 \times 10^{-4}$ |
| Beam quality－ $\mathrm{M}^{2}$ Parameter ${ }^{(4)}$ | $<1.5$（see picture） |
| Typical fibre efficiency ${ }^{(4)}$ | $75 \%$ typical（see curve） |
| Recommended coiling diameters（cm） | 14 |
| Physical／Material parameters |  |
| Core diameter（ $\mu \mathrm{m}$ ） | $40+/-3$ |
| Core concentricity error（ $\mu \mathrm{m}$ ） | ＜ 0.5 |
| Cladding fibre outside large diameter（ $\mu \mathrm{m}$ ） | $230+/-7$ |
| Coating outside diameter（ $\mu \mathrm{m}$ ） | $335+/-10$ |
| Coating type | Low Index |
| Fibre geometry | Circular with opposite flats |

${ }^{(2)}$ Cut－back，small－signal with a broadband light source－Other absorption level on request
${ }^{(3)}$ Straight fibre
${ }^{(4)}$ Evaluated with 1040 nm signal in 976 nm forward pumping configuration

Schematic view of one VLMA module unit including Mode Field Adaptor（MFA）and end－cap

VLMA fibre efficiency and output beam mode quality



