PM SINGLE-MODE ER:YB FIBER FOR HIGH POWER 1.5 UM LASER SYSTEMS

EPIC 2024

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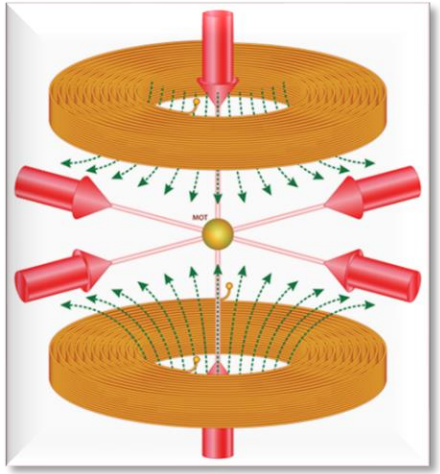
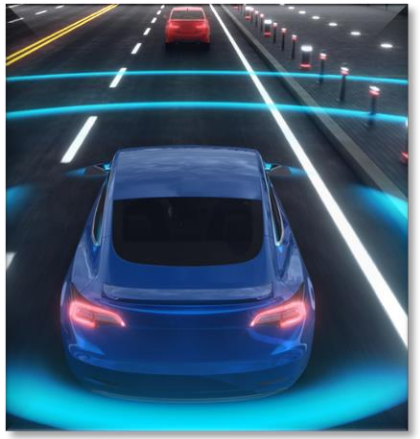
CURRENT MARKET NEEDS: 1.5UM POWER SCALING

- **>20W High Power Scaling:** Essential for applications needing high power outputs at 1.5µm, like quantum computing and space laser communication.
- **Single-Mode Operation:** Critical for maintaining beam quality in applications such as FMCW LiDAR and interferometric sensors.
- **Polarization Maintaining (PM):** Required for applications where polarization stability enhances performance, like Doppler wind detection.
- **Commercial Gaps:** Existing products do not fully meet the high power and single-mode performance simultaneously with polarization maintaining capabilities





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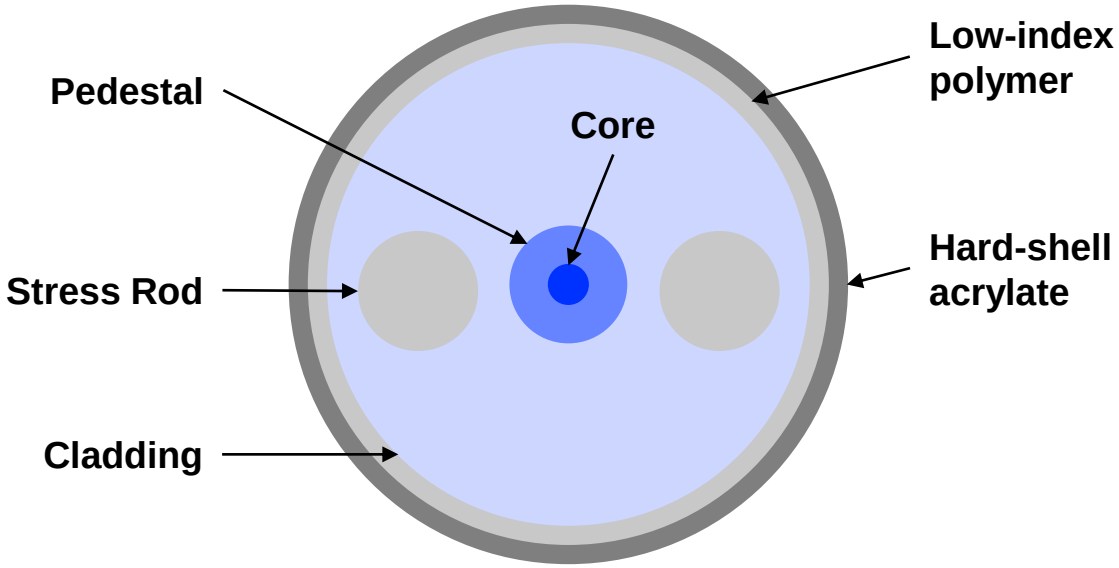
PRODUCT SOLUTION: PM-EYDF-10P/130-XPH

- **Design core material to achieve power > 20W**
- **Optimize pedestal layer to ensure robust SM operation**
- **Incorporate stress rods to achieve PM performances**



Performance Targets:

- ✓ Single-mode
- ✓ Polarization maintaining
- ✓ High beam quality
- ✓ Bend insensitivity
- ✓ Excellent ASE Contrast
- ✓ Power levels >20W
- ✓ Large mode areas to mitigate non-linear effects.

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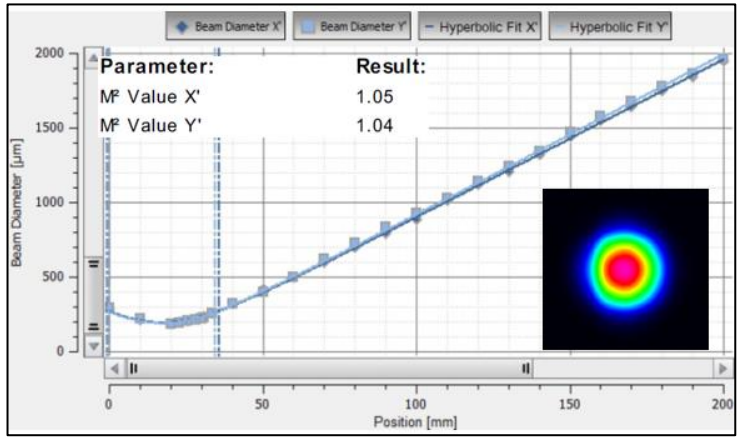
PERFORMANCE RESULTS: PM-EYDF-10P/130-XPH

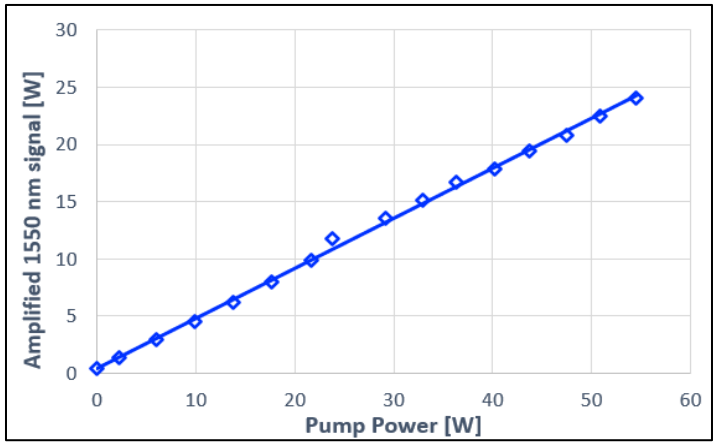
Beam Quality

M^2 < 1.05



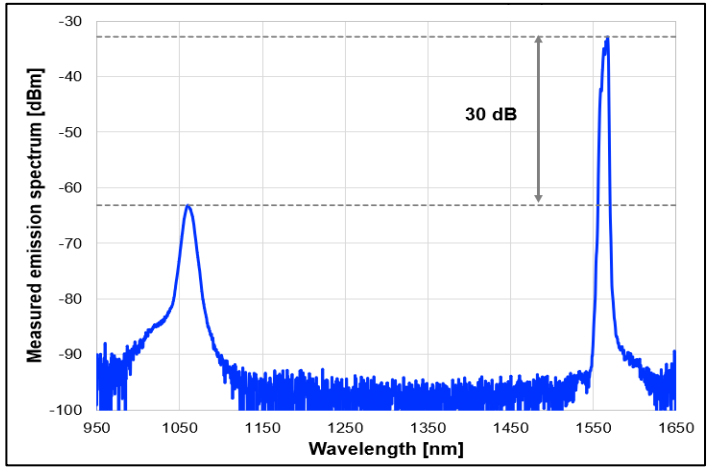
Power & Efficiency

23W & 43.7% efficiency

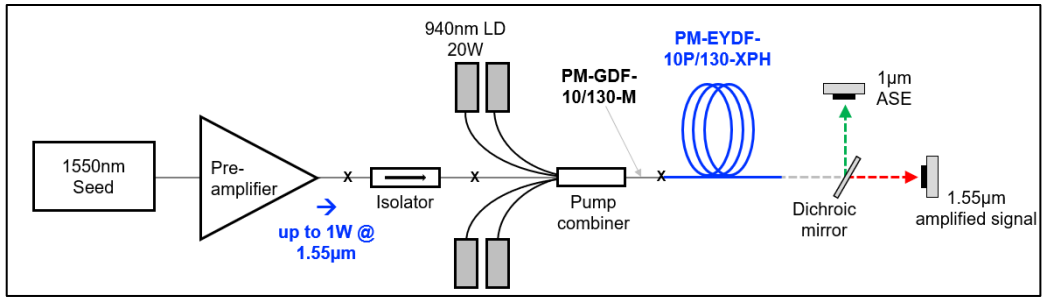


ASE to Signal Contrast

30dB ASE to signal



Test Setup:
Monolithic fiber amplifier using only COTS components



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MARKET APPLICATION IMPROVEMENT & BENEFITS

Performance Targets:

- ✓ Single-mode
- ✓ Polarization maintaining
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Key Improvement(s):

- Enables trapping of new atoms/ions
- High power amplification for longer range detection

End Use Benefit(s):

- Enhanced accuracy and efficiency of AI algorithms and computing
- Enhanced safety, navigation, and environment monitoring in LiDAR and sensor applications

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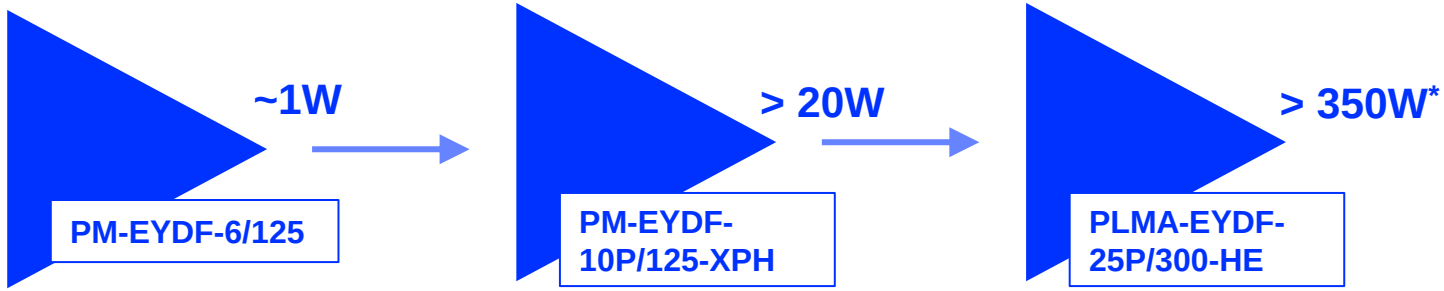
OUTLOOK FOR > 350W POWER SCALING AT 1.5µm

- **Developed a robust single-mode PM Er:Yb double-clad fiber solution to enable high power fiber amplifiers at 1.5µm:**
  - 23W output power with 30dB ASE contrast
  - > 43% O-O achievable efficiency
  - Diffraction-limited beam quality
  - Bend insensitive
- **Offer the complete Er:Yb fiber solution towards further power scaling**



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