

# Technical Whitepaper: Engineering Optimization of Side Firing Optical Fiber Systems

*High-Power Wave-Guide Integration for Urological Interventions*

**Wuhan Medfiber Technology Co., Ltd.**  
ISO 13485 Certified Manufacturer

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# 1. Clinical Paradigm & Market Requirements

The global urological landscape has shifted fundamentally toward minimally invasive laser therapies for Benign Prostatic Hyperplasia (BPH) and complex urinary calculi. Photoselective Vaporization of the Prostate (PVP) requires transmission systems capable of steering extreme energy density at right angles.

**Key Industry Constraint:** Standard bare-tip configurations deliver forward-directed beams, which are insufficient for safe transurethral side-resections. Global B2B procurement networks mandate highly reliable side-emission technology.

## 2. Core Architectural Engineering of Sidefiber Systems

At the center of advanced lateral emission optics is our proprietary **sidefiber** core technology. Our engineering framework integrates high-purity fused silica paired with precise micro-polished refraction blocks.

- **Fused Silica Purity:** Low-hydroxyl core configuration reduces internal thermal absorption.
- **Beam Deviation Precision:** Exactly calibrated refraction angles between 70° and 90°.
- **Structural Enclosure:** Reinforced quartz capsules designed to buffer tissue back-retropulsion effects.

### 3. Mechanical Resilience of Medical Laser Fiber Material

Operating inside fluid-dense internal tracts requires specialized multi-layer coating systems. Our premium-grade Medical Laser Fiber series provides elite lateral flexibility alongside robust thermal isolation.

This design utilizes high-tensile Hard Clad Silica (HCS) coatings. It completely dampens bend-induced micro-fractures, allowing smooth navigation through maximally deflected endoscopes.

## 4. BPH Treatment Optimization: Photoselective Ablation

When executing Photoselective Vaporization of the Prostate (PVP), delivering uninterrupted energy without distal tip degradation is paramount. The Side Firing Fiber for BPH is specifically reinforced to handle continuous thermal loads ranging from 120W to 180W.

**Gold-Jacketed Capsule Protection:** Our facility integrates advanced gold-coated tips flanking the micro-prism window to isolate extreme localized heat spikes, preventing cap detachment.

## 5. Dual-Utility Protocols: Laser Fiber for Lithotripsy

Beyond soft-tissue vaporization, advanced endourological setups deploy side-emission channels as a secondary Laser Fiber for Lithotripsy. This specific clinical intervention targets stones lodged within hard-to-reach lower pole renal calyces.

- **Perpendicular Targeting:** Enables full energy delivery without forcing the flexible scope into extreme mechanical strain.
- **Acoustic Wave Resistance:** Reinforced against mechanical shockwaves produced by rapid pulse calculus vaporization.

## 6. Optical Coupling Mechanics & Generator Interface

Surgical efficacy is heavily dependent on the connection at the laser source. Implementing our heavy-duty [SMA905 Side Firing Fiber](#) assemblies guarantees perfect coaxial alignment.

**Air-Gap High-Power Technology:** Medfiber utilizes custom sub-micron air-gap connectors that isolate back-reflected thermal spikes, protecting expensive proprietary laser diode modules.

## 7. Comprehensive Engineering Specification Matrix

Core Parameter Keyword	Refraction Mechanics	Standard Core Diameters	Maximum Power Output
sidefiber	Quartz Prism (70°-90°)	400µm / 600µm	120 Watts
Medical Laser Fiber	Flat/Custom Tips	200µm to 1000µm	200 Watts
Side Firing Fiber for BPH	Gold-Jacketed Capsule	600µm Optimized	180 Watts
Laser Fiber for Lithotripsy	Shock Coated Tip	200µm / 272µm	60 Watts
SMA905 Side Firing Fiber	Air-Gap High Power	Universal Fit	200 Watts

## 8. ISO 13485 Manufacturing Framework

Because urological fibers navigate internal tracts under extreme thermal strain, regulatory compliance and cleanroom controls are strictly maintained throughout our manufacturing facilities.

- **Class 100,000 Cleanrooms:** All assembly and tip polishing are performed in dust-free zones.
- **Ethylene Oxide (ETO) Sterilization:** Guarantees immediate clinical deployment safety.
- **Concentricity Auditing:** Every interface undergoes mapping to limit insertion losses below 0.2dB.

## 9. Global Wholesale & Institutional OEM Frameworks

Wuhan Medfiber Technology Co., Ltd. operates under an integrated factory-direct framework, supporting international distributors and medical device brands with scalable sourcing structures.

- **White-Label Packaging:** Full support for double-pouch sterile medical packaging.
- **Custom Component Configuration:** Fully adjustable fiber shaft lengths and variable numerical apertures (NA).

## 10. Strategic Advantages: Lowering Sourcing Friction

- 1. Direct Factory Cost Structures:** Eliminates middle-tier broker margins to boost contract bidding profitability.
- 2. Engineering Agility:** Direct access to our optical R&D laboratory allows immediate changes to technical parameters.

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