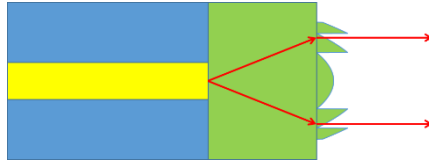


## FlatTop Beam Shaper Specification

Fiber collimator reduces the divergence angle of the light output from an optical fiber. Fiber collimators are used to match the beam divergence from a fiber with the optical setup. Another application is coupling light into the fiber from free space. To achieve efficient coupling light has to be focused on the fiber facet, creating the focal spot with the same size as the fiber mode, which could be as small as 3  $\mu\text{m}$  for visible light. Such small focal spot makes the alignment difficult. Fiber collimator increases the beam size, simplifying the alignment.



*Schematic of the diffractive fiber collimator*

Conventional fiber collimators use GRIN lenses, attached to the fiber using a mechanical housing. This requires an alignment and assembly of several components. Instead, we use a 3D diffractive lens, imprinted in the polymer very close to the fiber edge. Free form diffractive element acts as a perfect aspheric lens, preserving the diffraction limited beam quality. The space between the fiber edge and the diffractive lens is filled with a transparent polymer, making the whole assembly essentially a monolithic single piece component. No mechanical housing is required, making the collimator extremely compact. In fact, using a naked eye, one cannot tell the difference between a bare fiber and fiber with the collimator.

Besides the stability, the fiber nanoimprint technology allows for a precise control of the distance between the fiber and the lens. This makes possible to have small beam diameters (10-100  $\mu\text{m}$ ), enabling the control of a divergence angle, rather than a simple collimation. Relatively small beam diameter after the collimator is an advantage for fiber coupling applications. Indeed, having large beam diameter makes the spatial alignment easy, but the angular alignment becomes much more challenging! The small beam diameter of  $\sim 50\mu\text{m}$  achieves the compromise between lateral and angular alignment tolerance.

Fiber collimator specification:

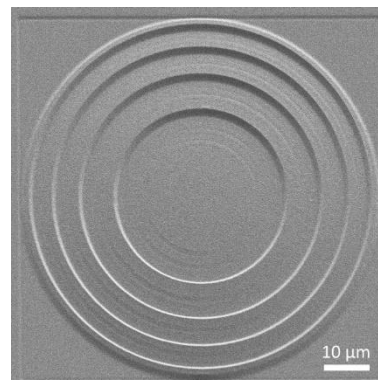
Wavelength, nm	Beam diameter, $\mu\text{m}$	Divergence full angle, degrees	Fiber	Connector
405 – 1550	10 – 100	0.15 – 6	Single mode	FC/PC, FC/APC

### Applications:

- Fiber Coupling
- Divergence Angle Control
- Collimation

### Advantages:

- No Alignment Required
- Monolithic Design
- Highly Reproducible
- Extremely Compact Size



*SEM image of the diffractive lens of a fiber collimator*