

Flat Top Converter

Transforms Gaussian beam into a flat-top shaped beam

Why choose flat-top?

- 100% suitable for your application – designed according to your laser beam specifications
- Suitable for high-LIDT applications and high-power lasers
- Wavelength range from 300 nm to 2 μm
- Conversion efficiency up to 70% (wavelength dependent)
- Large aperture (up to 15 mm; standard is 6 mm)

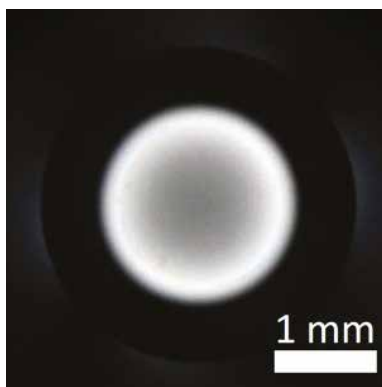
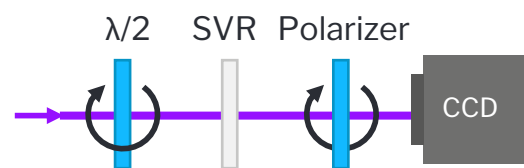
Gauss to top-hat converter

Space variant waveplate for flat-top conversion is beam shaping optics.

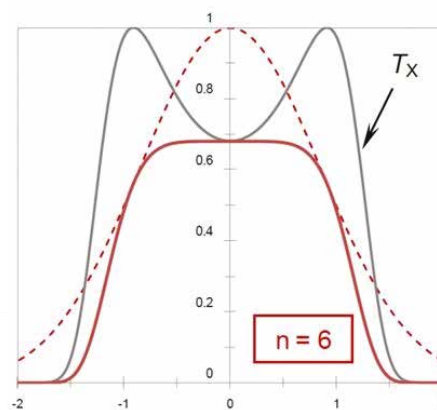
A combination of a space-variant waveplate and a polarizer acts as a space-variant transmission filter that converts the Gaussian beam spot profile to a flat-top beam with equal energy distribution.

$$\theta(r) = \text{asin} \left(0.65 \cdot e^{\left(\frac{r}{221}\right)^2 - \left(\frac{r}{18876}\right)^{14}} \right) \cdot 180/\pi$$

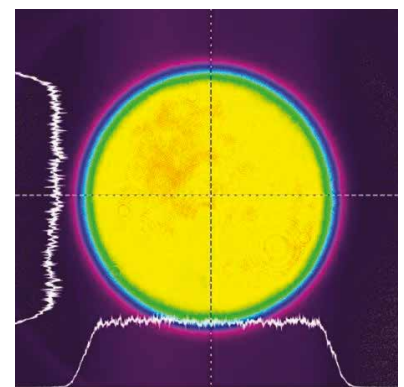
$$R = \text{const}$$



Converter photo in cross polarized light (CA = 4 mm, $\lambda = 1064$)



Slow axis distribution



It is a space-variant phase retardation plate inscribed inside a bulk of fused silica glass by femtosecond laser pulses.

A well-known fact is that flat-top intensity distributions have noticeable advantages in micromachining in terms of efficiency and quality compared to Gaussian beam profiles.¹

A converter enables on-the-fly adjustment of the beam shape from flat-top to a shape with a dip in the middle.

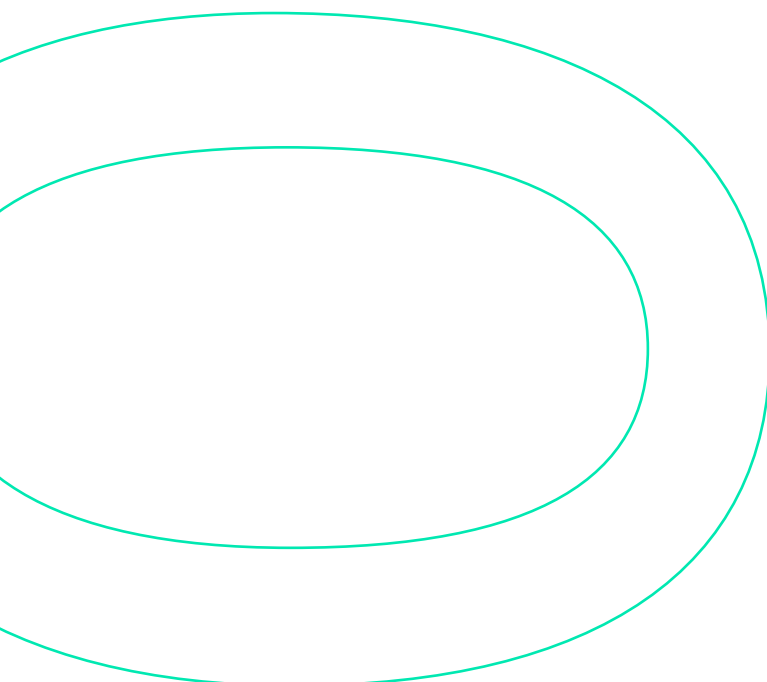
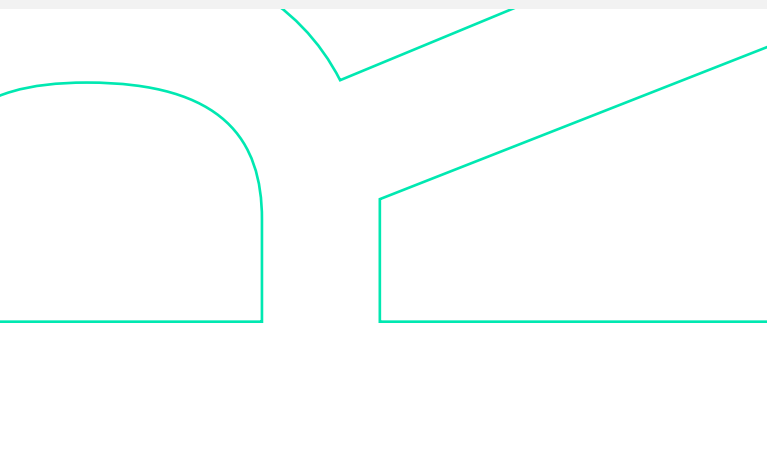
The converter paired with a polarizer filters out the input beam to generate a beam with Super-Gaussian intensity distribution. The Super-Gaussian intensity profile can be adjusted for the best performance according to specific needs.

The converter is compatible with high-power ultrashort lasers.

¹ Homburg, O., & Mitra, T. (2012). Gaussian-to-top-hat beam shaping: an overview of parameters, methods, and applications. *Laser Resonators, Microresonators, and Beam Control XIV*. doi:10.1117/12.907914

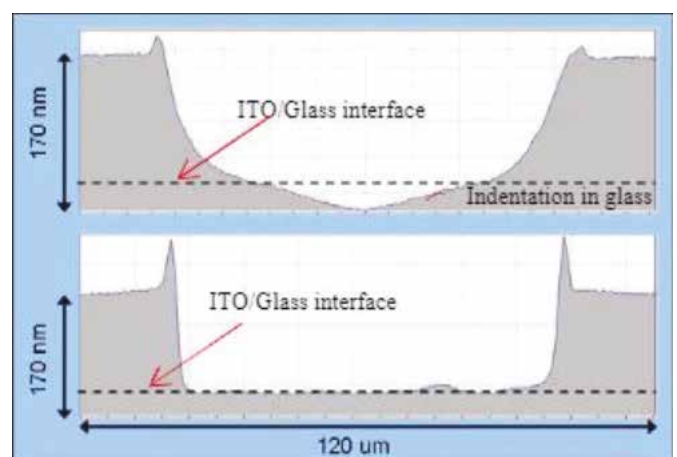
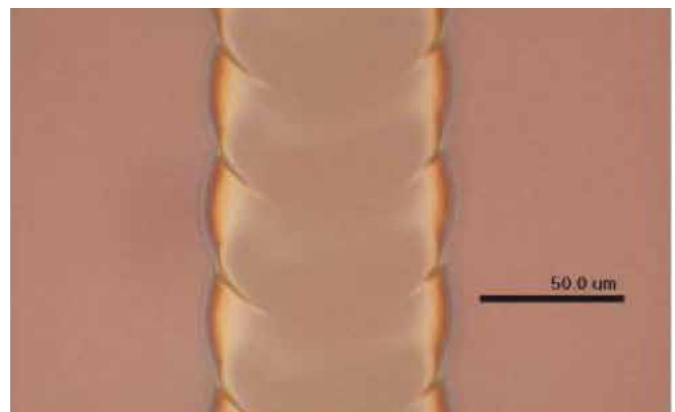
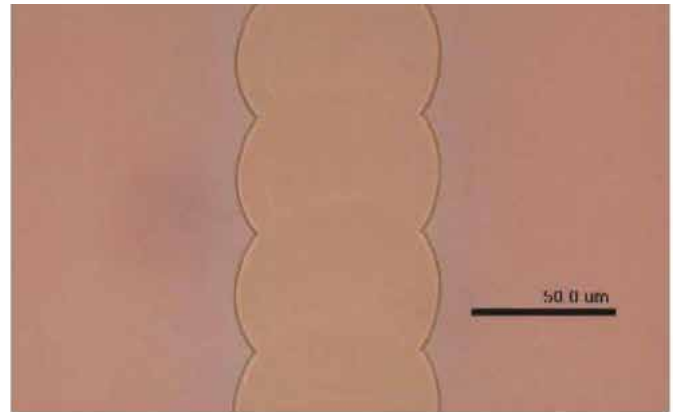
Technical features

- Material: UVFS, IRFS
- Wavelength range: 330 – 2000 nm
- Efficiency: depends on Super-Gauss order N
- Element size: up to 15 mm
- Coating (optional): AR/AR coating
- LIDT | High damage threshold:
63 J/cm² @ 1064 nm, 10 ns;
2 J/cm² @ 1030 nm, 212 fs
- Transmission (no AR coating):
85% @ 343 nm, 92% @ 515 nm,
94% @ 1030 nm



Application examples

- Micromachining applications
- Laser pump shaping



High power, nanosecond pulse Q switch laser technology with Flat-top beam shaping technique for efficient industrial laser processing