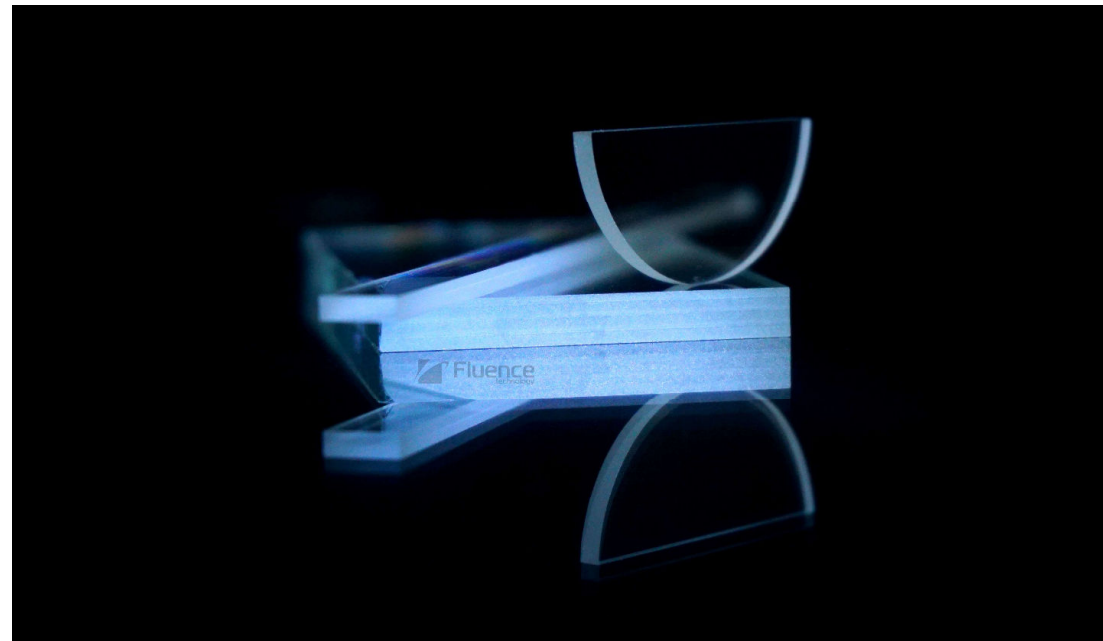


Holo/Or DeepCleave Glass Cutting with Fluence Laser



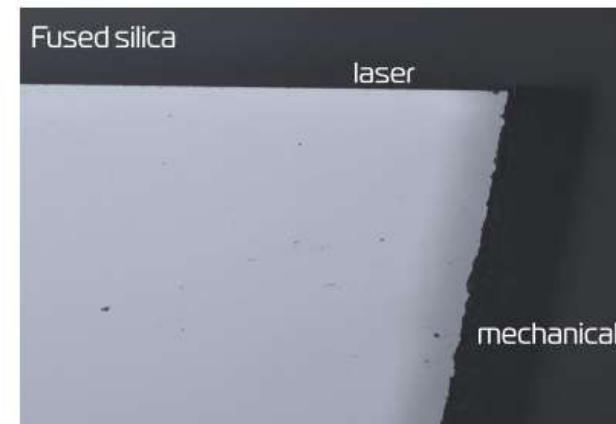
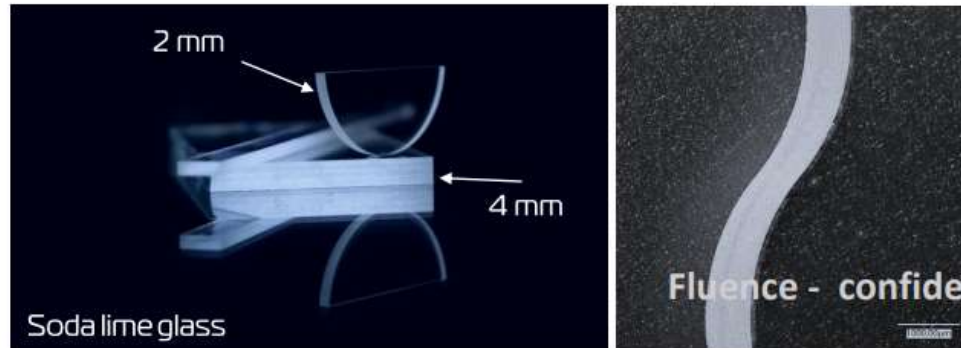
DeepCleave

- Dedicated module for enhancing the laser glass cutting process
- Yielding higher throughput and a finer cutting process
- The DeepCleave module focuses an incident single mode laser into a tight spot with $\sim 1.8\mu\text{m}$ waist size along the entire Depth of Focus range (1-2mm typical range).



Glass Cutting with Elongated Focus

Examples of glass cutting with femtosecond fiber laser and DeepCleave module



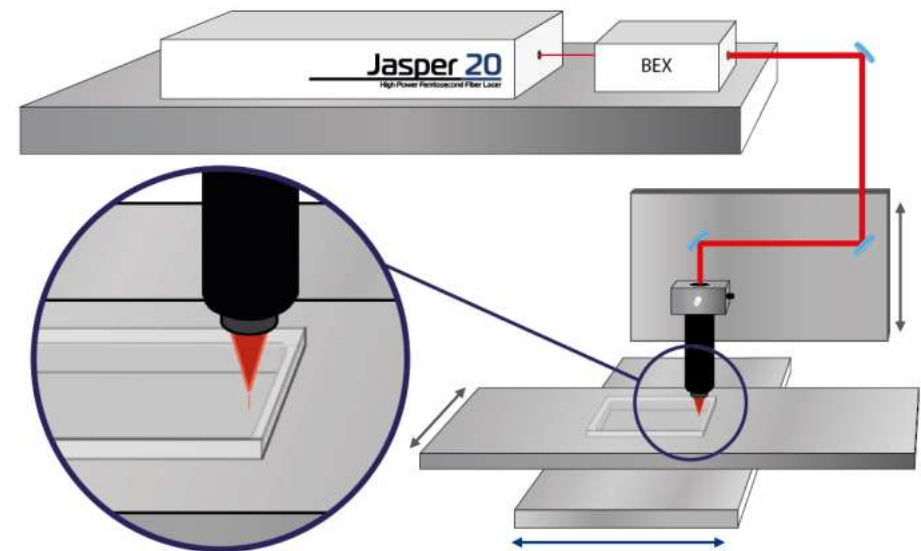
Done with:

- ✓ Jasper20 by Fluence
- ✓ DeepCleave by Holo/Or

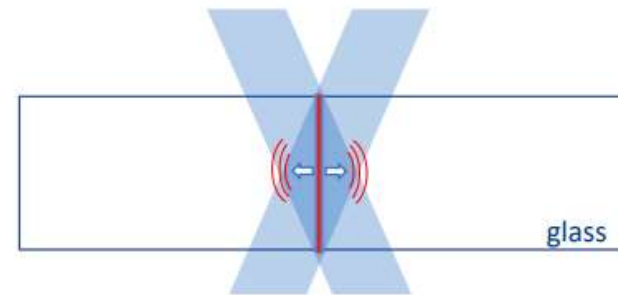
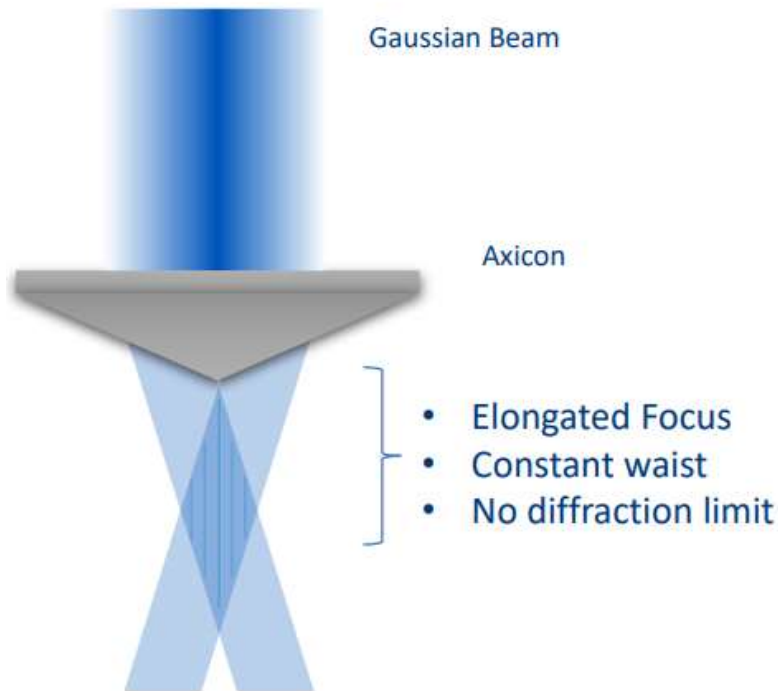
System Setup

Simple Setup – Easy to Integrate

- [Jasper 20 laser by Fluence](#)
 - Average power: 20W
 - Wavelength: 1030nm
 - $M^2 < 1.3$
 - <250 fs up to 8 ps
 - <100 μJ (200 μJ in a burst)
 - Single pulse to 20 MHz
- [Holo/Or DeepCleave](#)
 - The focused spot is equivalent to 0.35 objective NA
 - 1.8 μm beam diameter
 - 7.4 mm working distance (larger available)
 - Focus length: 1.0 mm in air (other values are available)
 - Flat-top distribution along the focus



Bessel Beam Glass Processing



Requirements:

- ☐ Sufficient fluence within focal volume $\sim 1\text{kJ/cm}^3$
- ☐ Ultrashort pulse (high intensity)
- ☐ Appropriate ratio of cone angle to pulse peak intensity to reduce nonlinear propagation due to electron avalanche

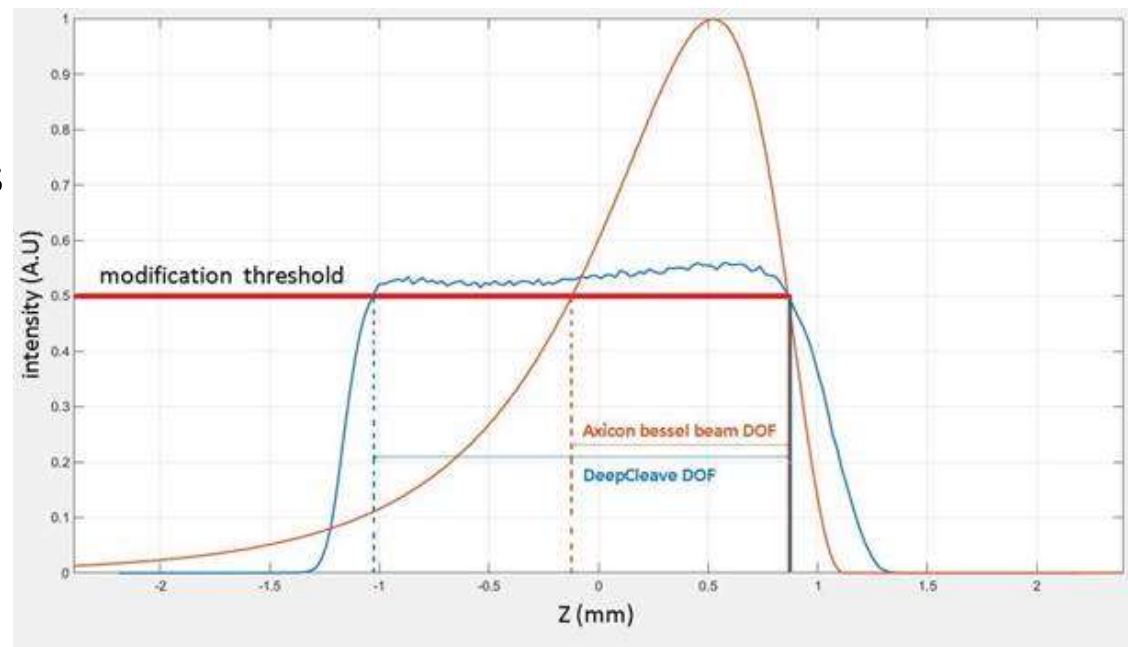
Mishchik, K., et al. *Optics Express* 25.26 (2017).

Courvoisier, François, et al. *Applied Physics A* 112.1 (2013): 29-34

Hendricks, F., et al. *Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XVI*. Vol. 9740 SPIE, 2016.

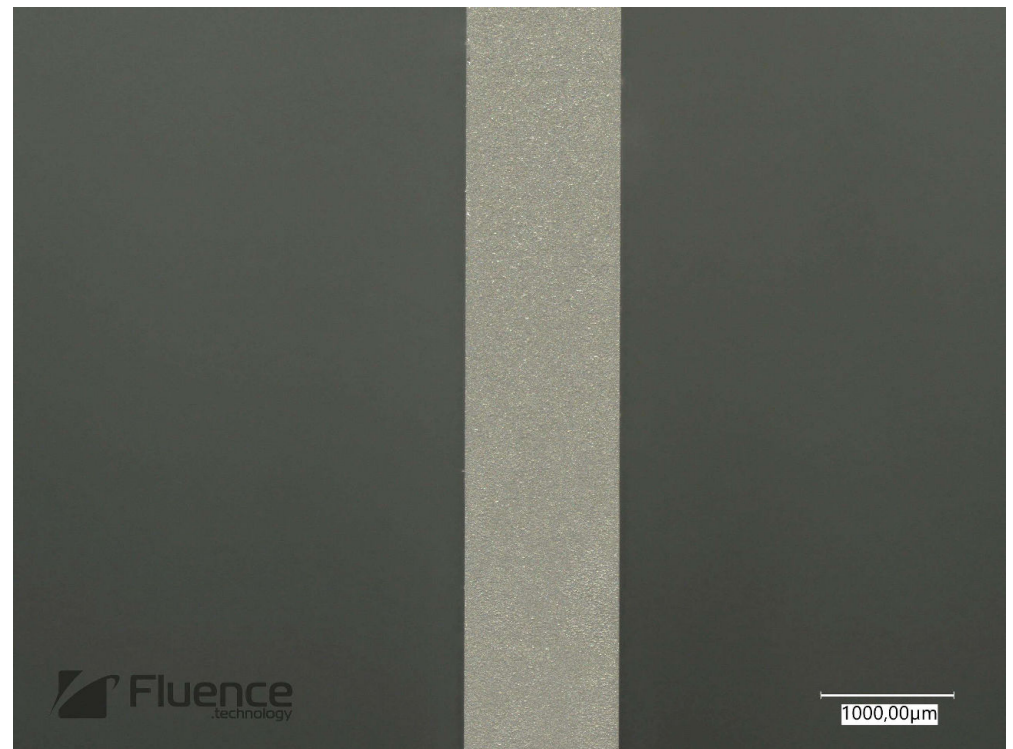
DeepCleave Advantages over the Axicon Bessel Beam

- Constant peak power along the focus region
- Cuts twice the thickness
- Double the throughput and savings on energy



Cutting Speed

- 0.75-1.0 m/s for 1.1 mm BK7
- 0.19-0.205 m/s for 4.0 mm soda lime glass
- Cutting in any direction, proper separation, high edge quality



More Glass Cutting Results

