

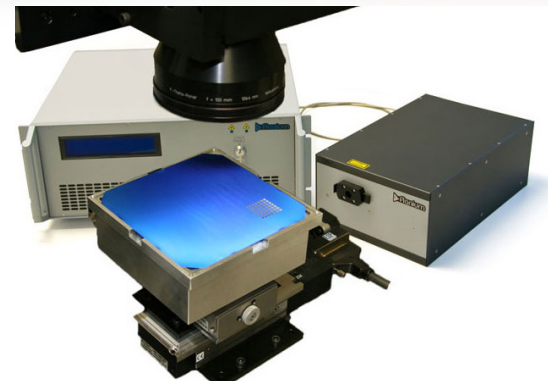
# PikaRay

## Picosecond Laser Micromachining System



### Product Features and Description:

- **Laser Wavelength: 1064 nm and 532 nm**
- **Pulse Energy: 10  $\mu$ J at 1064 nm and 5  $\mu$ J at 532 nm**
- **Pulse duration: 20 ps**
- **Repetition rate: from single shot to 1 MHz**
- **Linear Scanning: up to 10 m/s**
- **$M^2 < 1.3$**

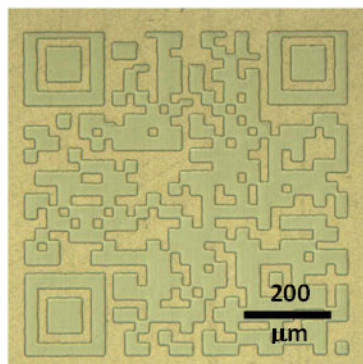
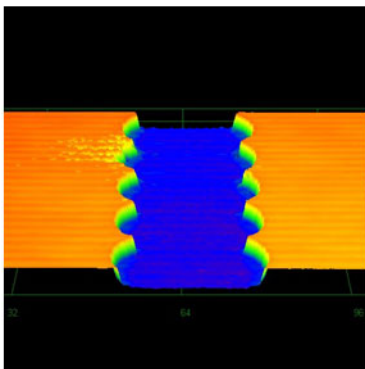


The PikaRay system is based on an ultrafast fiber laser combined with an optical scanner, positioning hardware and control software. Ultrafast fiber lasers provide a combination of reliability and ultra-high peak power, which makes them the ideal tools for industrial material processing applications. The laser ablation process occurs on such short timescales that thermal effects are minimized. Without thermal effects, micro-cracking, melting, and other common defects that are commonly problematic in nanosecond laser processing are avoided.

The input beam size and the focusing objective can be tailored to provide a customizable spot size on the workpiece as small as 5  $\mu$ m. The software synchronously controls the laser output and the location of the focused spot on the work surface, so arbitrary patterns and text can be marked and machined.

### Typical Applications:

- **Scribing and patterning of thin films on bulk substrates and thin membrane substrates**
- **Precision athermal marking and patterning metals, semiconductors, and dielectrics**
- **Laser scribing and patterning of transparent materials like glass, plastic, and sapphire**



Confocal microscope image of a patterned metal film (left) and microscope image of a patterned area of TCO film (right). The image demonstrates the capability to selectively remove and pattern the thin films in arbitrary and complex shapes.

### Laser Parameters:

The PikaRay includes ultrafast fiber laser system, which offers high average and peak power in a singlemode Gaussian beam, combined with excellent reliability and compact, maintenance free design. The laser system is based on a mode-locked fiber laser oscillator and two fiber amplifiers. It also includes optical pulse-picker enabling operation at variable repetition rates and pulse on-demand functionality. The fiber laser system operates at 1064 nm, but it is available with an optional 532 nm output with at least 50% conversion efficiency.

- Wavelength: 1064 nm  $\pm$  1 nm and 532  $\pm$  0.5 nm
- Maximum Average Power: 10W at 1064 nm and 5W at 532 nm
- Maximum Pulse Energy: 10  $\mu$ J at 1064nm and 5  $\mu$ J at 532 nm
- Repetition Rate: Single Shot to 1 MHz
- Pulse Duration: 20 ps
- Beam Quality Parameters  $M^2 < 1.3$
- Output Pulse Stability  $< 2\%$  RMS



More details on the laser specifications are available at:

[http://www.fianium.com/pdf/he-1064fs-532fs\(v1.1\).pdf](http://www.fianium.com/pdf/he-1064fs-532fs(v1.1).pdf)

### Scanner Parameters:

PikaRay uses the best galvanometer-based scanners available on the market.

- Scanning speed: up to 10 m/s scanning speed, enabling marking speeds exceeding 1000 characters per second
- Input aperture: 20-30 mm
- Beam displacement field size: up to 250 mm
- Focused spot sizes down to 5 $\mu$ m
- High long-term stability and low drift values are ensured via integrated temperature stabilization.

More information on the scanners is available at:

[http://www.scanlab.de/en/-/products/2D\\_scan\\_systems/hurrySCAN](http://www.scanlab.de/en/-/products/2D_scan_systems/hurrySCAN)



### Positioning:

Vertical sample position is adjusted via high precision stepper motors.

- Maximum Speed: up to 2 mm/s
- Travel range: 4.5 mm
- Minimum Incremental motion: 0.2  $\mu\text{m}$
- Unidirectional repeatability: 5  $\mu\text{m}$



XY sample positioning is accomplished by high precision stepper motors selected by the customer.

More details on stepper motors used in PikaRay system are available at: <http://www.newport.com/Motion-Control/995480/1033/content.aspx>

### Software Control and Features:

Pikaray is controlled by a proprietary software package.

- It operates under Windows 7 (32 + 64 bit), Vista, XP
- English, French, German and Chinese versions available.
- Fast rendering of graphical data
- Transformation of point items
- Entity list for defining the mark order
- Import image files

### Utility Requirements

- Ambient Temperature: 15-30  $^{\circ}\text{C}$
- Relative Humidity: 20-80 %
- Laser Safety: Class 4

