



PARTNER

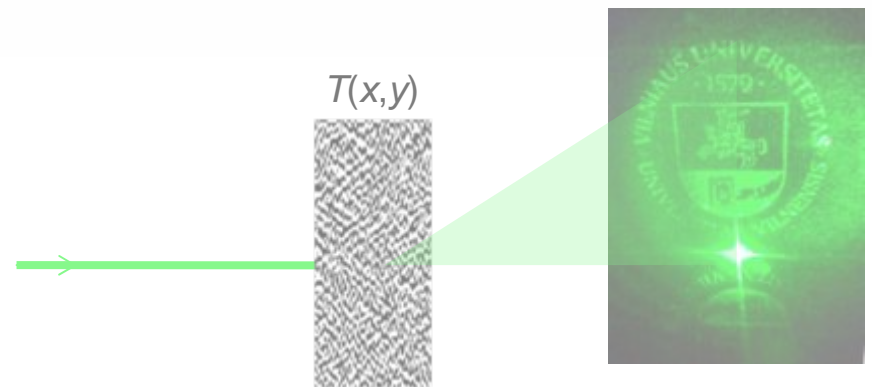
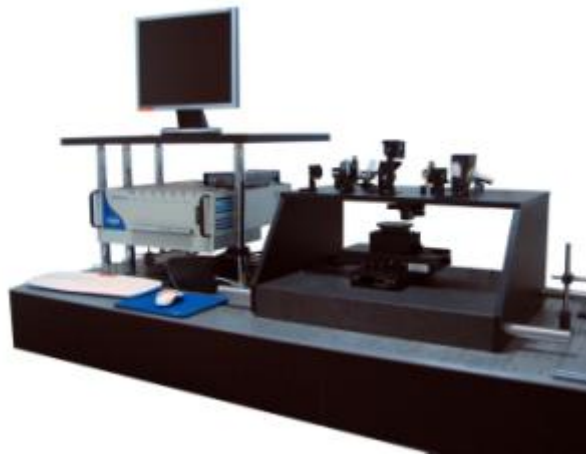
FOR LASER TECHNOLOGIES AND APPLICATIONS

ALTECHNA Co. Ltd.

From components to technologies

AItSCA

Femtosecond laser micromachining system



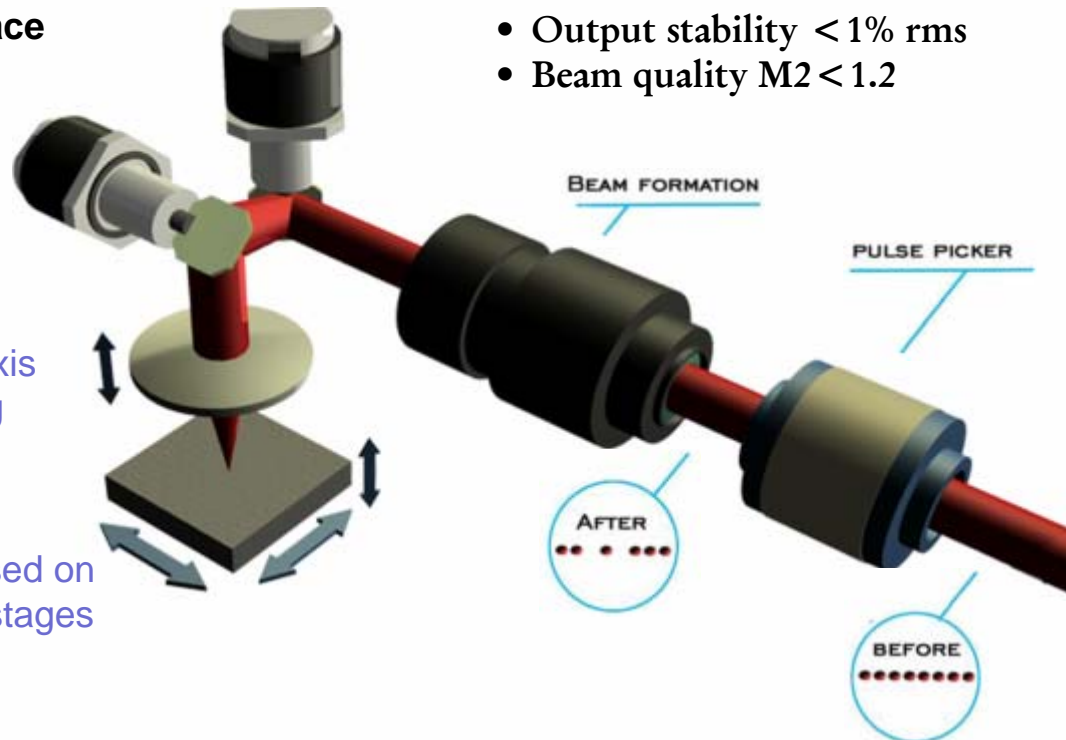
AltSCA FEATURES

- High fabrication speed
- Submicron resolution
- No thermal effects
- Shot number control
- Synchronization in space and time
- Original software interface

High performance GSI[®]
galvanometer scanners

Piezo-driven PI[®] z-axis
objective positioning

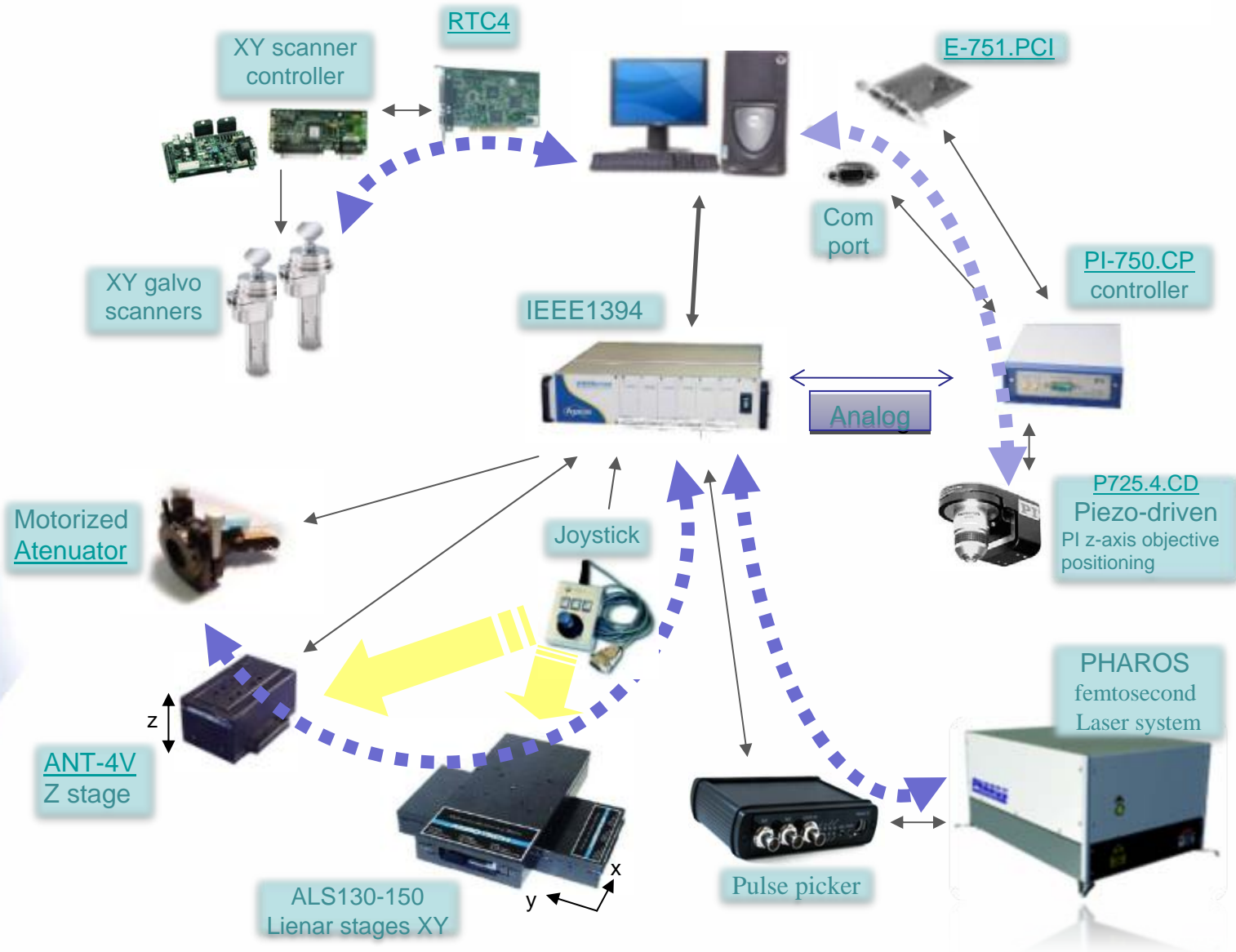
3D positioning based on
Aerotech[®] linear stages



Superior laser source

- Max. average power – 6W
- Repetition rate – 1 to 350 kHz
- Pulse duration < 300 fs
- Output stability < 1% rms
- Beam quality $M2 < 1.2$

SCHEME



SCA[®] SOFTWARE

System Control Application

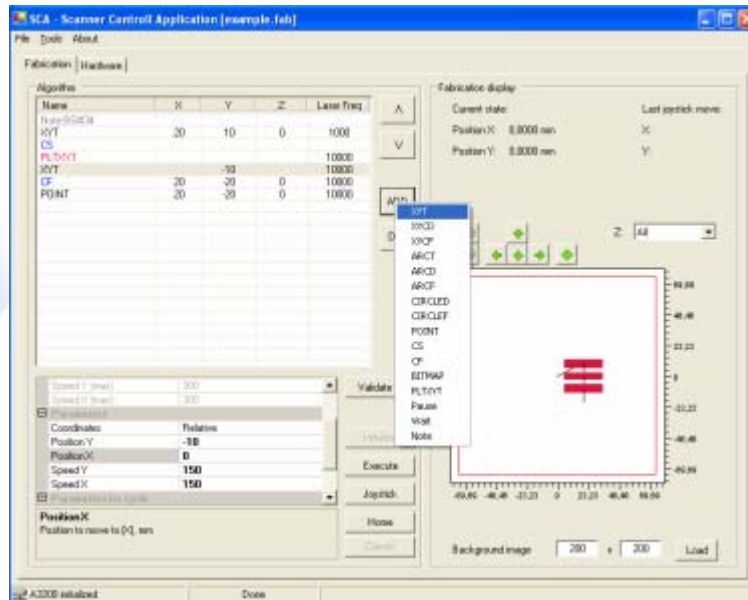
Original Software for controlling micromachining systems with various hardware*



* Aerotech, GSI Lumonics, PI, etc.

MAIN FEATURES:

- Easy to use (no G-Code programming)
- Flexible
- Hides different device integration burden away from the end user
- WYSIWYG - **What You See Is What You Get**

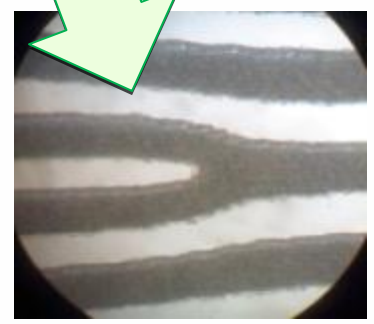
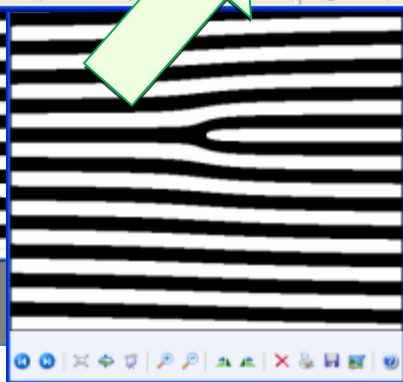
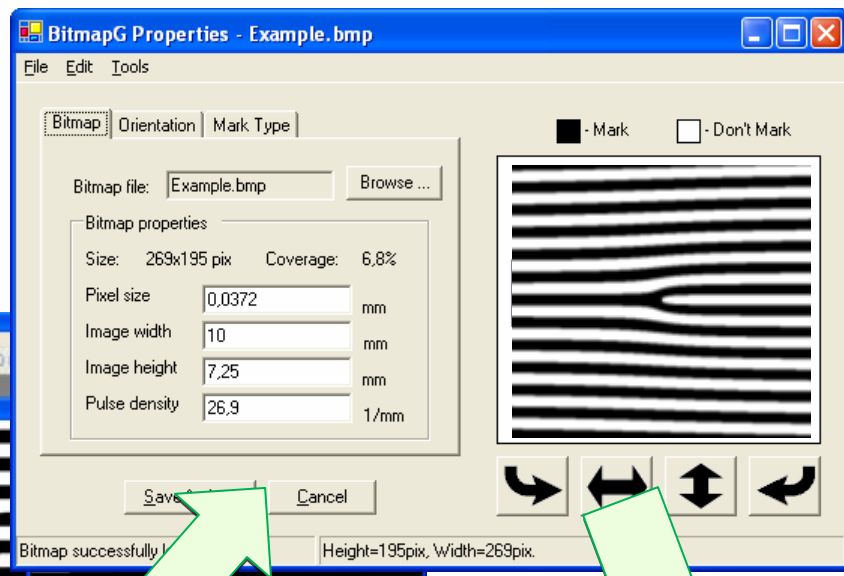
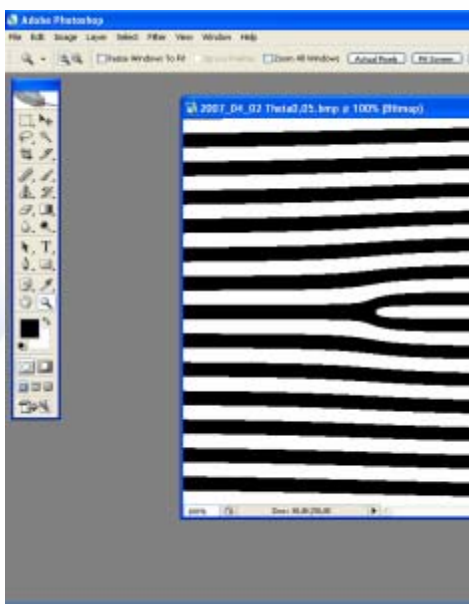


- Commands:
- ZT
 - XYZT
 - XYCD
 - XYCF
 - XYZCD
 - XYZCF
 - ARCT
 - ARCD
 - ARCF
 - CIRCLED
 - CIRCLEF
 - POINT
 - CS
 - CF
 - Bitmap
 - PLTXYT
 - TEXT
 - LASER
 - PAUSE
 - WAIT
 - Note

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Bitmap fabrication

1. DRAW A PICTURE
2. SAVE TO BMP
3. LOAD IN BITMAPG
4. FABRICATE



HPGL fabrication

1. Draw in CorelDRAW
2. Export to HPGL (*.PLT)
3. Load in AMarkPLT
4. Fabricate

Commands:

- ZT
- XYZT
- XYCD
- XYCF
- XYZCD
- XYZCF
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- ARCD
- ARCF
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- *Bitmap*
- **PLTXYT**
- TEXT
- LASER
- PAUSE
- WAIT
- Note

CorelDRAW X3 [Graphic1]

AMarkPLT

File Job

PLT File: Aerotech.plt

Dimension Orientation Mark type

Drawing dimensions

Millimetres per PLT unit: 0.022875

Width: 60.001 [mm]

Height: 47.855 [mm]

Save job Open job Prepare Close

HPGL Export

Pen Page Advanced

Pen	Color	Width	Velocity
1	Black	0.35 mm	32 cm/s
2	Blue	0.35 mm	32 cm/s
3	Red	0.35 mm	32 cm/s
4	Green	0.35 mm	32 cm/s
5	Magenta	0.35 mm	32 cm/s
6	Yellow	0.35 mm	32 cm/s
7	Cyan	0.35 mm	32 cm/s
8	Brown	0.35 mm	32 cm/s
9	(Unused)	0.35 mm	32 cm/s
10	(Unused)	0.35 mm	32 cm/s

Pen color: Black

Pen width: 0.35 mm

Pen velocity: 32 cm/s

Pen libraries: (Default) Save Delete

OK Cancel Help

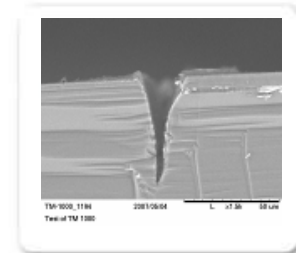
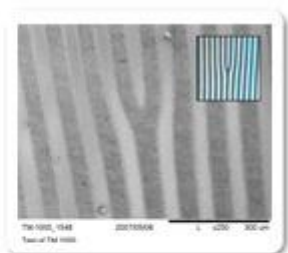
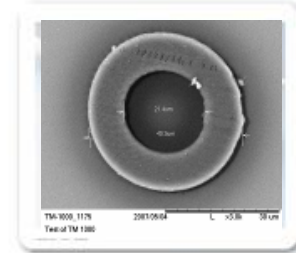
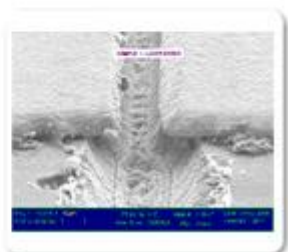
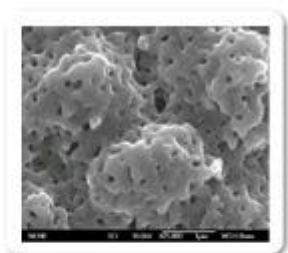
G-code viewer

AXIS X Pos AXIS Y Pos

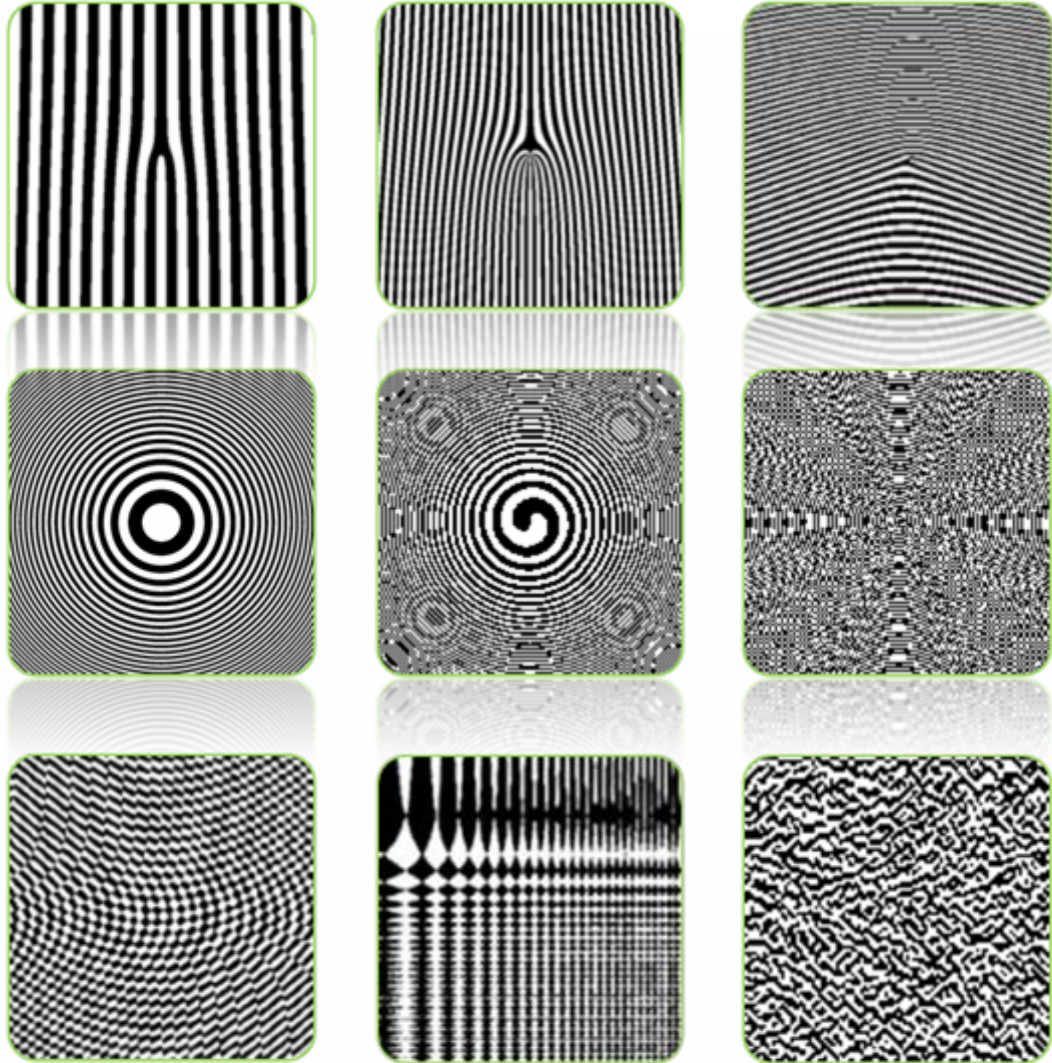
AEROTECH

Applications

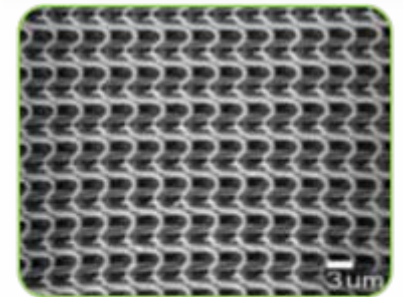
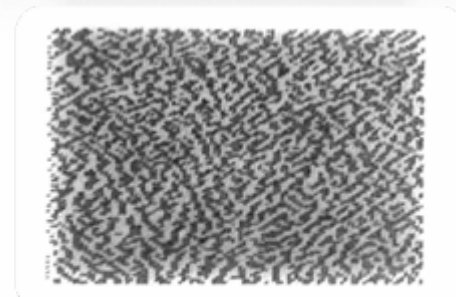
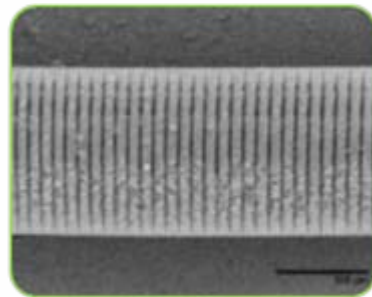
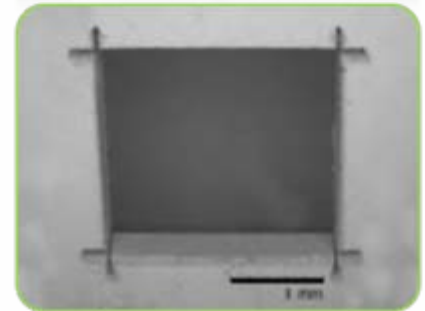
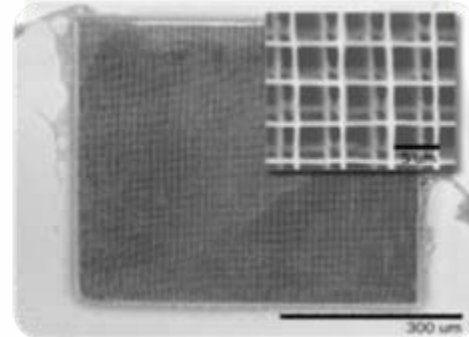
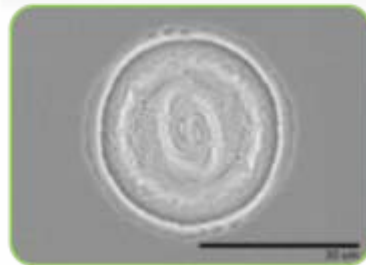
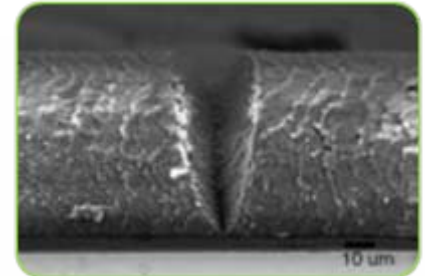
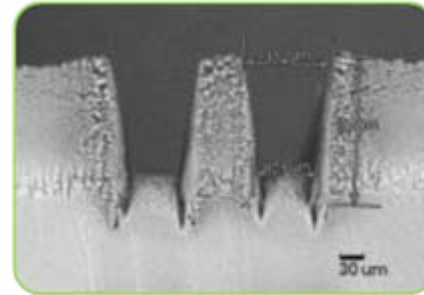
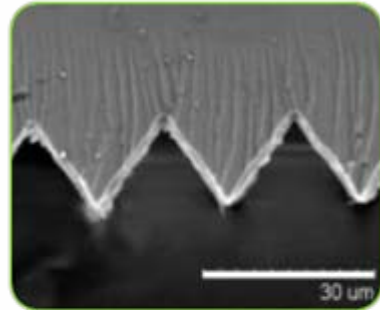
- ✓ Fabrication of micro optical devices
 - Diffractive optical elements
 - Optical waveguides
 - Photonic crystals
 - Micro lens, mirrors
 - Optical memory
 - MEMS fabrication
- ✓ Lithography mask fabrication and repair
- ✓ Microchip repair
- ✓ Fuel cell material fabrication
- ✓ Solar cell fabrication
- ✓ LIBWE
- ✓ Medical applications
- ✓ Laser induced diffusion



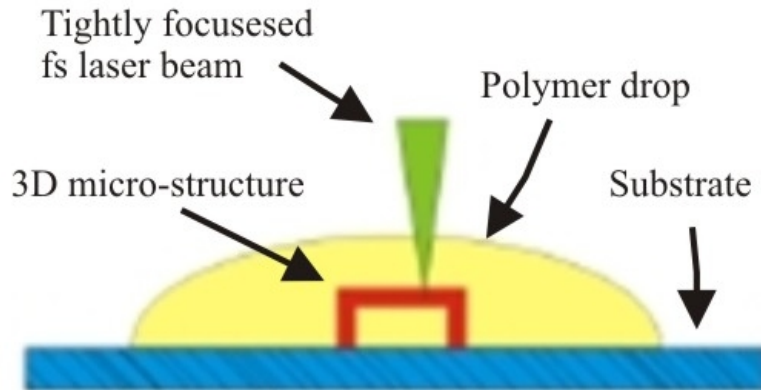
Various DOE fabrication



Micromachining samples

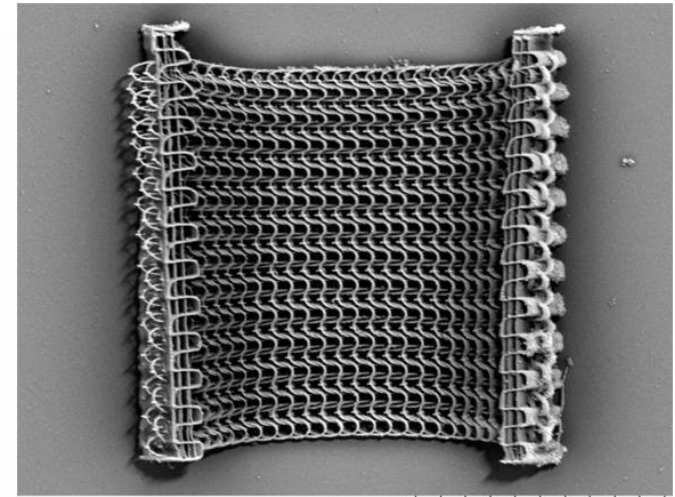


Two-Photon Polymerization for 3D micro-structuring



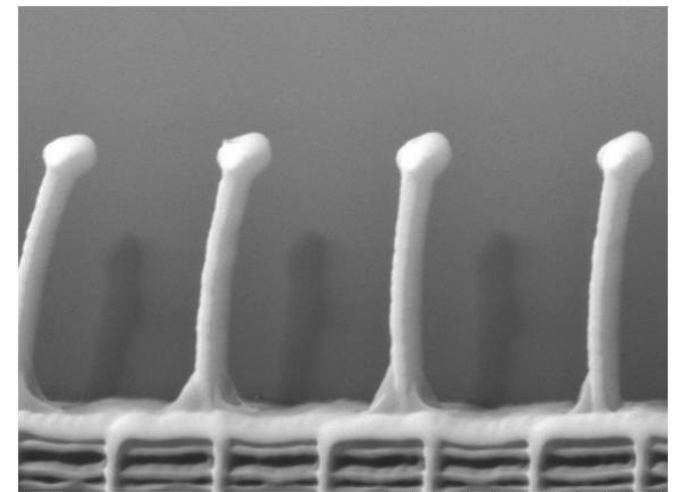
2PP advantages for nanotechnology:
3D structuring
Resolution <200 nm
Flexible fabrication from CAD file
Various materials
Relatively cheap

Applications: micro-optics, photonics, micro-mechanics & micro-fluidics, tissue



Polymeric nano-scale chain mail

50 μm



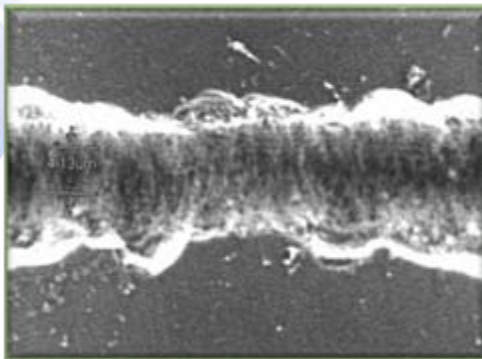
Micro cantilever

10 μm

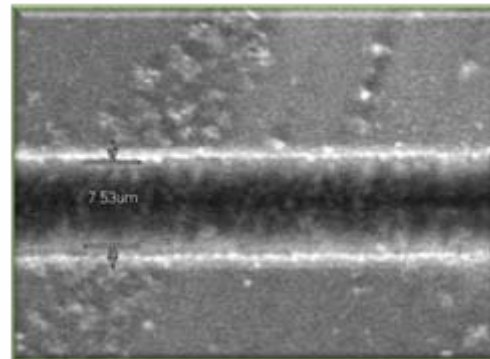
Beam shaping

- Gaussian to Flat-top
- Advantages in **micromachining** and **laser scanning microscopy**:
 - Homogeneous intensity distribution
 - More efficient energy usage

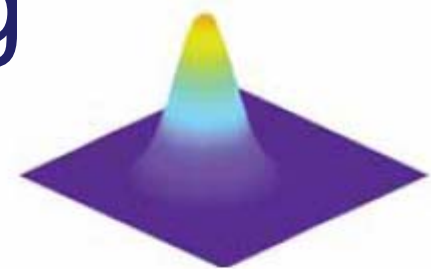
Example:



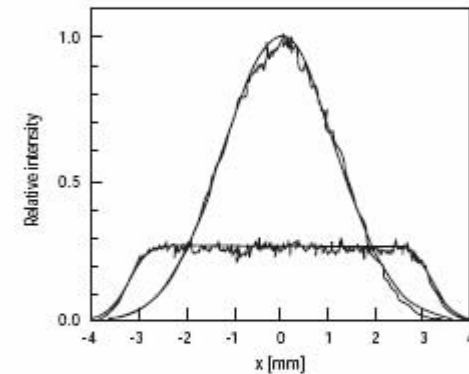
Without beam shaper



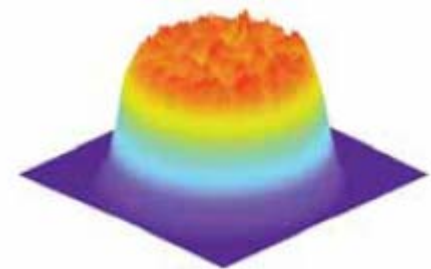
With beam shaper



Input Beam



Cross Sections of the Input and Output Beams



Output Beam

Laser scanning microscopy

- Aim – deep tissue imaging
- Confocal microscopy
 - removal of out-of-focus blur
 - optical slicing and 3-dimensional object reconstruction
 - improved resolution both laterally and axially
 - focused laser beam – nonlinear interactions possible
- Two photon microscopy
 - longer excitation wavelength, less scatter, deeper imaging
 - photobleaching confined to focal plane
 - no UV, less photodamage
 - natural sectioning: no pinhole, flexibility in detection geometry, more photons captured

Confocal and Widefield Fluorescence Microscopy

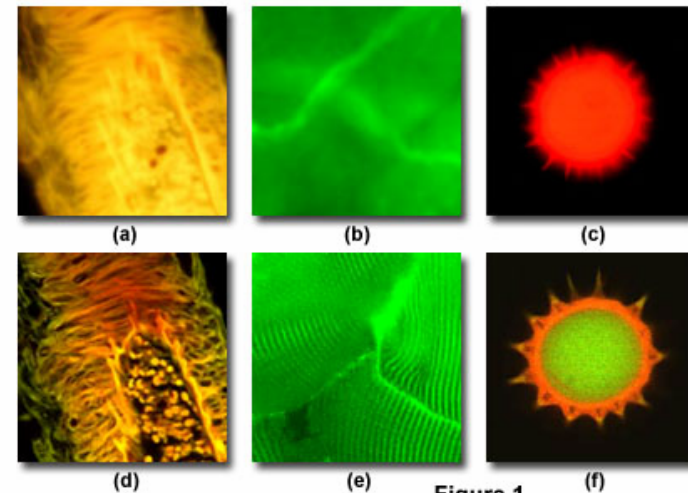


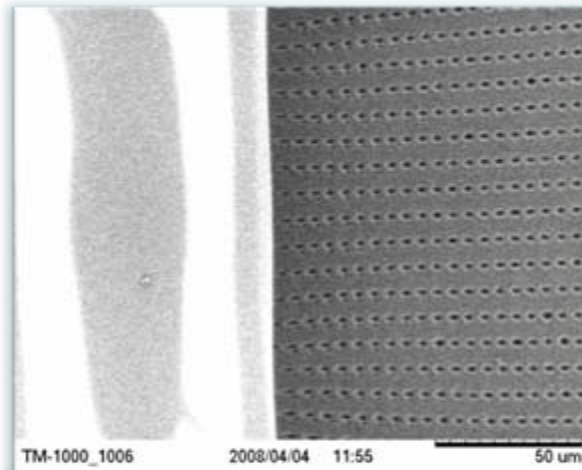
Figure 1

a, d: human medulla
b, e: rabbit muscle fibers
c, f: pollen grain

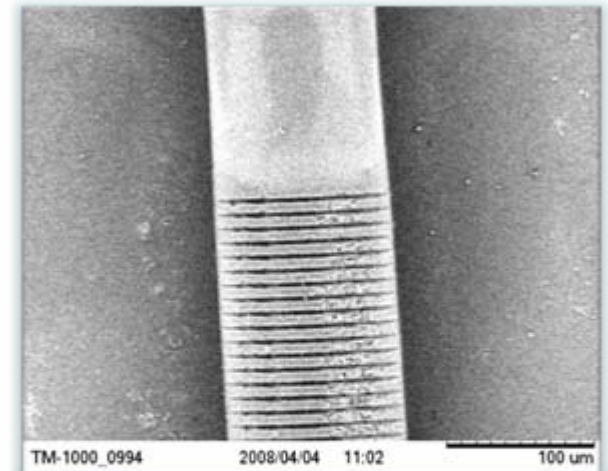
Bragg gratings

point-by-point inscription in fibers

- High spectral quality
- Strong first-order Bragg resonances
- Point-by-point inscription process
- Large birefringence (1.2×10^{-4})
- High degree of polarization dependent index modulation



Pulse energy ~7 microjoules
Pulse duration ~300 femtoseconds
Repetition rate 25 KHZ



Pulse energy ~11 microjoules
Pulse duration ~300 femtoseconds
Repetition rate 25 KHZ

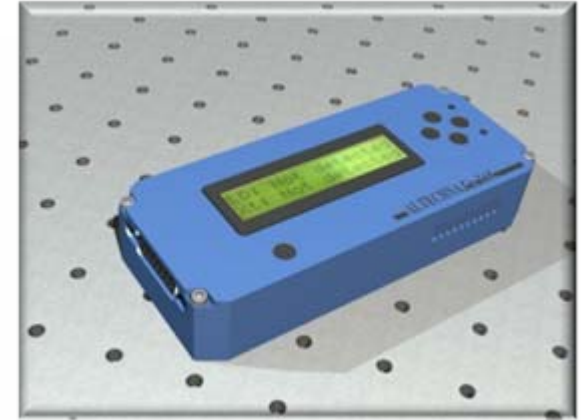
High power laser diode driver LasCon

The **Laser Diode Driver** is an electronic device that **combines** high power current source for **laser diode** and two controllers for Peltier thermoelectrical **coolers**.



APPLICATIONS

- Laboratory and OEM use
- Custom DPSS laser development



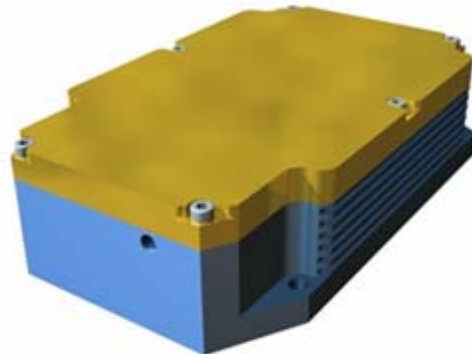
FEATURES

- Dual channel thermo electrical cooler driver
- Laser diode current source up to 8 A
- Compact size
- Overheating protection, slow current ramp-up
- Fully microprocessor controlled
- USB interface

High repetition rate Q-switched microchip laser ALTLAS

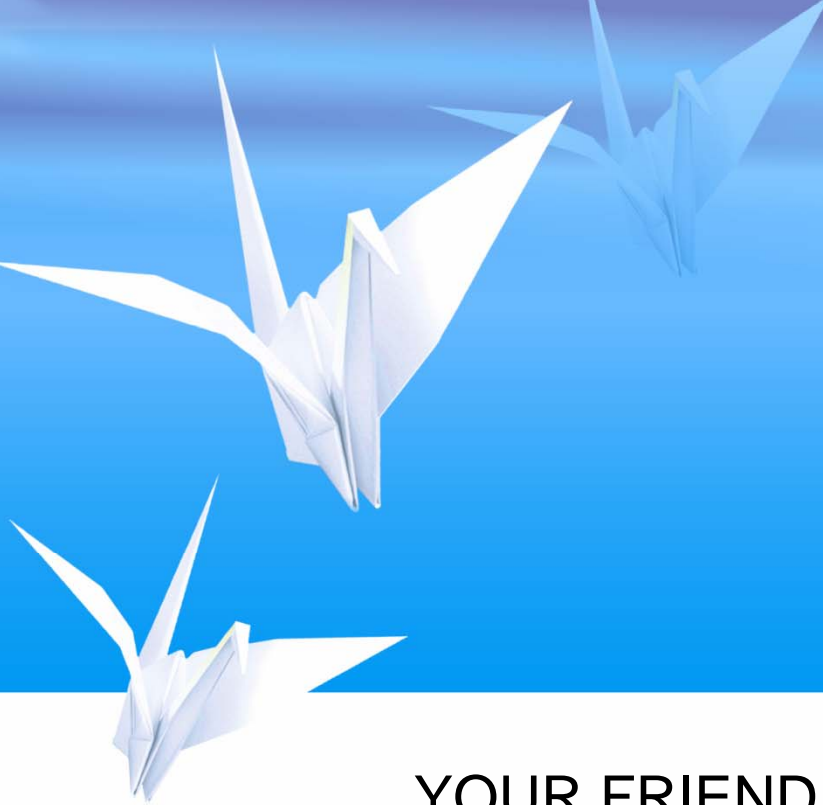
APPLICATIONS

- Physics (time resolving luminescence measurements, ranging)
- Biology and biomedicine (flow cytometry, laser induced fluorescence)
- Chemistry (spectroscopy)
- Material processing (marking)
- Pumping source for supercontinuum generation in Photonic Crystal Fibers



FEATURES

- Repetition rate up to 100 kHz
- Peak power up to 50 kW
- Pulse duration < 2 nanoseconds



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LASER APPLICATIONS

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