

# $\mu\text{FAB-3D}$

Three Dimensional, Two Photons Absorption Microfabrication System



- ▶ Efficient
- ▶ Reliable
- ▶ Simple
- ▶ Compact
- ▶ Cost Effective



[www.teemphotonics.com](http://www.teemphotonics.com)

# μFAB-3D

## EFFICIENT

- MicroChip lasers are more efficient for Two Photons Absorption (TPA) photochemistry than alternative femtosecond systems
- Two-dimensional Slicing Method (TSM) optimizes complex 3D object fabrication

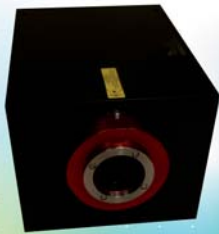
## RELIABLE

- 27,500 hours demonstrated lifetime
- 5,000 hours standard warranty

## SIMPLE

- Turnkey, air-cooled laser system
- Compact size
- Compatible with any inverted microscope

## COST EFFECTIVE



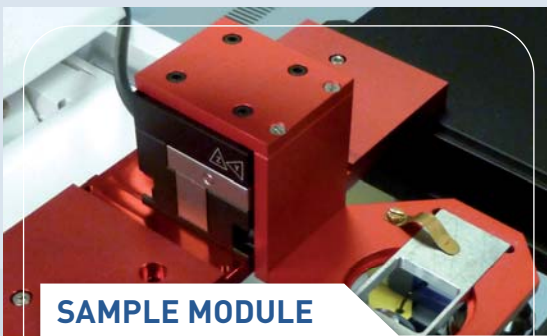
### LASER MODULE

- 532nm MicroChip laser
- Acousto-Optic Modulator
- Safety notch filter



### DRIVER AND SYNCHRONISATION MODULE

- Laser and Acousto Optic Modulator controller
- Data acquisition board
- Cables



### SAMPLE MODULE

- Fast 3D Piezo cube : 100x100x100μm, 200x200x200μm, 300x300x300μm
- Starting kit with ready to use polymer material



### MICROFABRICATION WORKSTATION

- PC Workstation
- Hardware control and basic fabrication
- Two-dimensional Slicing Method software



## THE RIGHT LASER FOR EFFICIENT PHOTOCHEMISTRY

> MicroChip more efficient than femtosecond systems :

- Same laser intensity for two-photon absorption
- More energy for excited states absorption and photochemistry activation
- Shorter wavelength, 532nm instead of 800nm

## RELIABLE INDUSTRIAL LASERS :

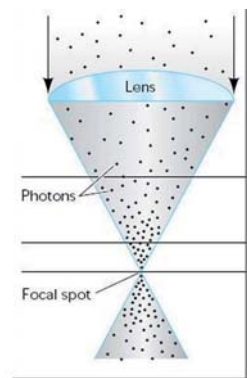
- Sealed
- No moving part
- Turnkey
- air-cooled
- >27,500 hours lifetime

## OPTIMIZED COMPLEX 3D OBJECT FABRICATION :

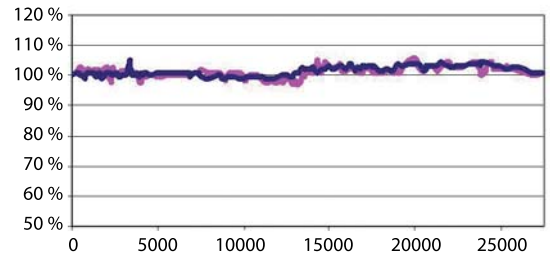
> Two-dimensional Slicing Method (TSM)

Currently existing micro fabrication software rely on the single-dimensional slicing method (SSM) also called layer-by-layer method. 3D shapes are sliced in stacks which are then build plane by plane. This is a simple but not very efficient method.

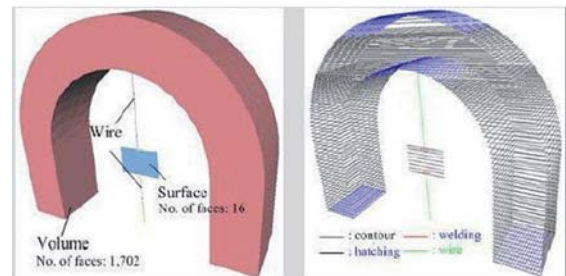
μFab3D's exclusive software uses the more powerful Two-dimensional Slicing Method (TSM) which required years of research and development. TSM allows combining 2D and 1D shapes seamlessly within any 3D structure resulting in improved quality and speed of the fabrication. It is capable of producing complex forms from most of the standard 3D CAD file format.



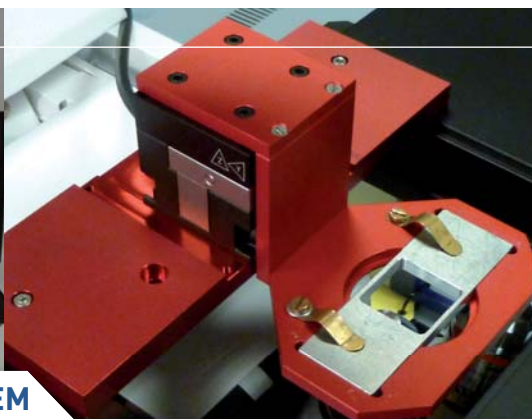
High photon density at the focal point allows for Two photon Absorption



Laser lifetime (Hours)



Example of two-dimensional slicing optimisation



### OPEN ENDED SYSTEM

- $\mu$ Manager based open source microscopy software
- Supported hardware : Olympus, Zeiss, PI, Mad City, Nikon, Leica...
- Microfabrication
- Micromachining : Scribing, Cutting, Etching

### MICROFABRICATION MATERIALS

- Monomeres polymerisation, Microfluidic
- Proteins crosslinking, Microstructure to control living cells, Bio-compatible materials
- Metals precipitation, Photonic crystal

#### References & Publications :

> <http://www.teemphotonics.com/products/microfab.html>

> <http://www-lsp.ujf-grenoble.fr/Fabrication-laser-3D>

Please find below several publications made in the past years showing the efficiency of Teem Photonics lasers for two photons photo-chemical reaction and proving their cost effectiveness. The power of the advanced software integrated in the  $\mu$ Fab3D system, resulting from several years of development, is also explained, as well as how final customer main concerns are addressed.

Tri-dimensional micro-structuration of materials by two-photon induced photochemistry, Basics and Applications of Photopolymerization Reactions, 2010: 000-000 ISBN: 978-81-308-0386-9, Patrice L. Baldeck, Olivier Stephan and Chantal Andraud

Two-dimensional slicing method to speed up the fabrication of micro objects based on two-photon polymerization, APPLIED PHYSICS LETTERS 91, 033108 (2007), Chao-Yaug Liaoa, Michel Bouriau, Patrice L. Baldeck, Jean-Claude Léon, Cédric Masclat, Tien-Tung Chung

Direct-Write Fabrication of Functional Protein Matrixes Using a Low-Cost Q-Switched Laser, Anal. Chem. 2006, 78, 3198-3202, Bryan Kaehr, Nusret Ertas, Rex Nielson, Richard Allen, Ryan T. Hill, Matthew Plenert, Jason B. Shear

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