BrightSystem
A BRIGHT SOLUTIONS COMPANY

Applications overview

LASER World of PHOTONICS
June 26-29, 2017
Messe München

BrightSolutions
SOLUZIONI LASER INNOVATIVE

Glass microprocessing – intravolume marking

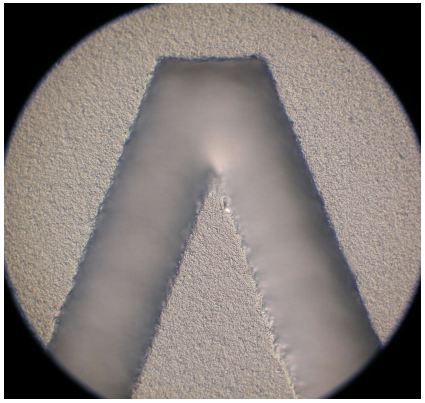
2D glass marking

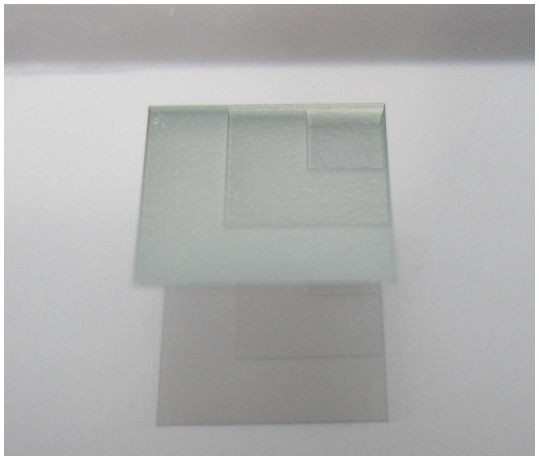
up to 600 dpi resolution

3D glass marking

Wedge HF 532 nm
Wedge HB 1064 nm

Glass microprocessing – surface engraving

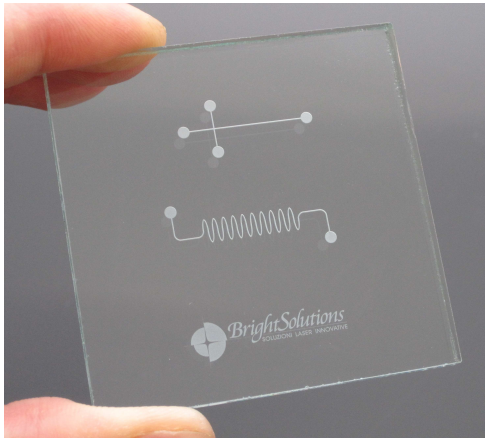


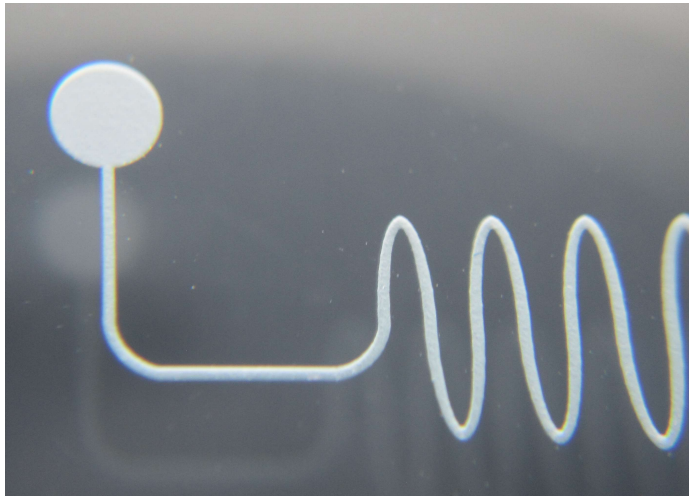


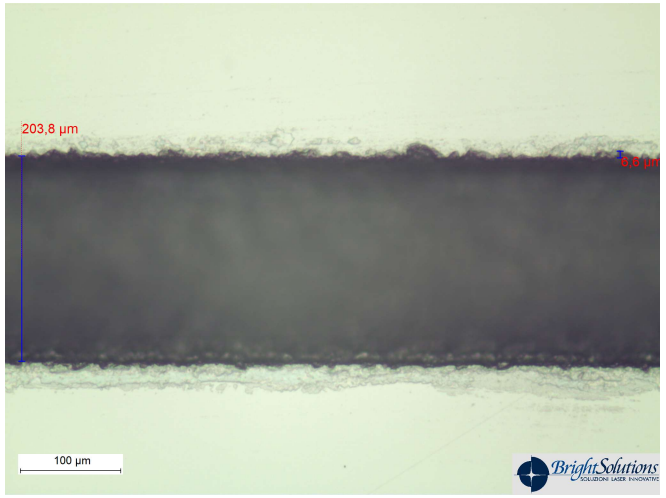
Wedge HF 532 nm
Wedge HB 532 nm

Glass microprocessing – microchannels

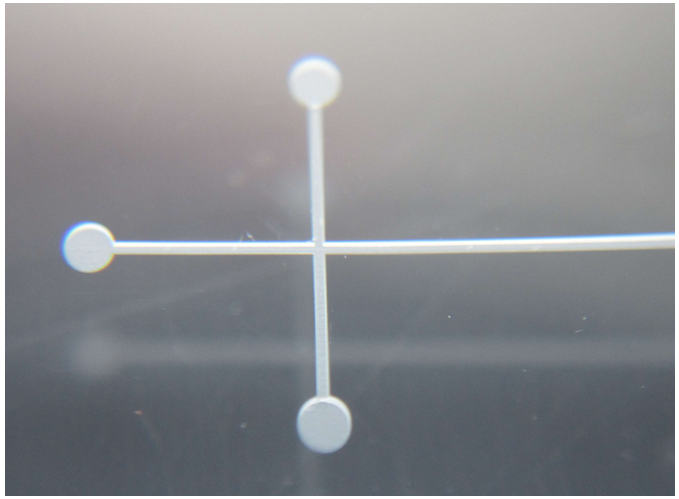
Wedge HF 532 nm

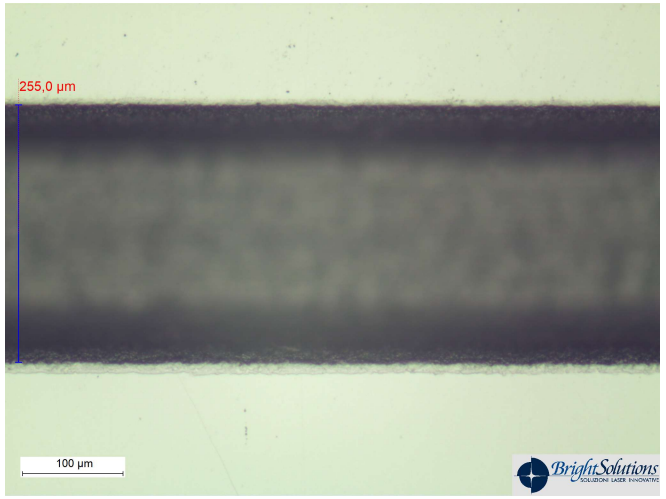






Wedge HB 266 nm

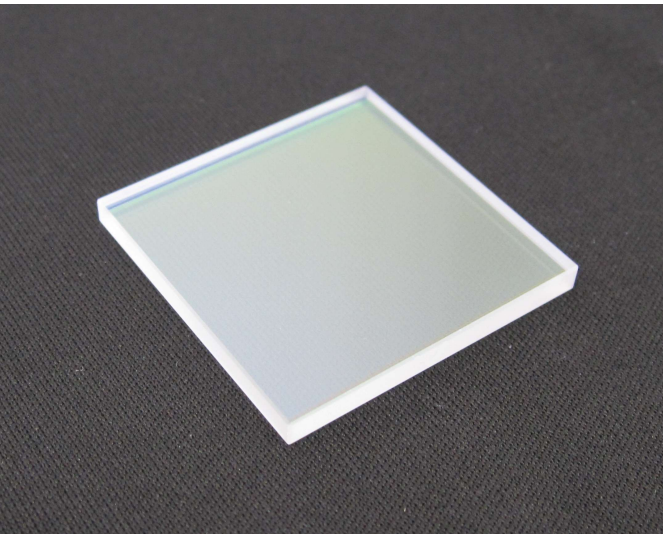




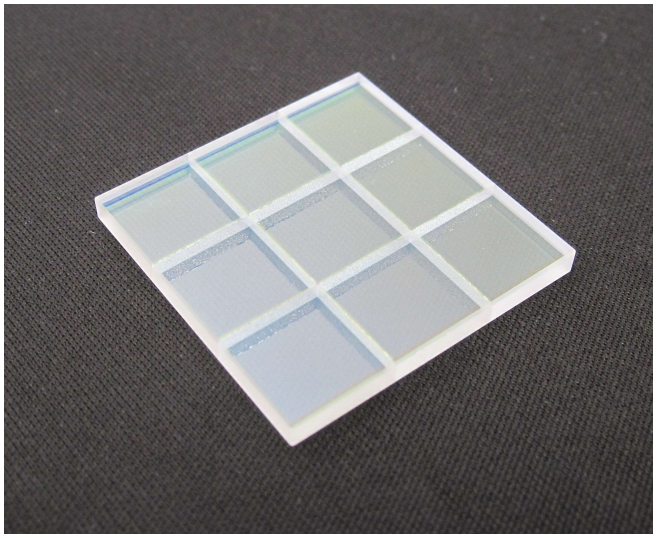
Glass microprocessing – sapphire dicing

Wedge HF 532 nm

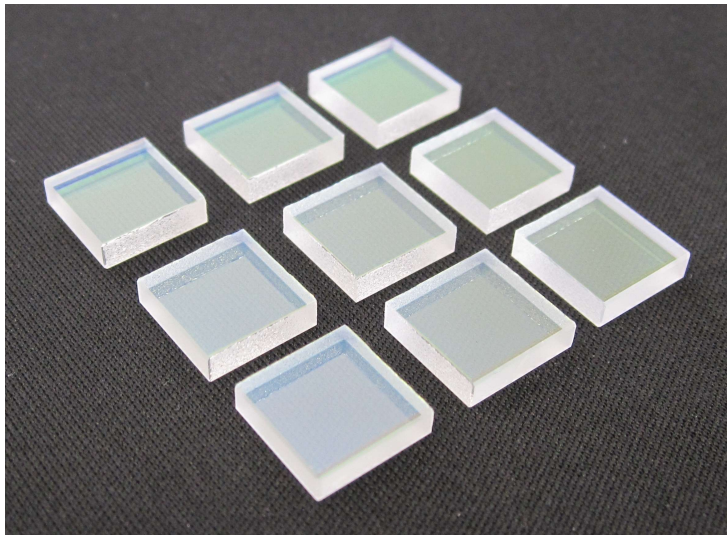
Step 1: sapphire substrate



Step 2: after laser exposure

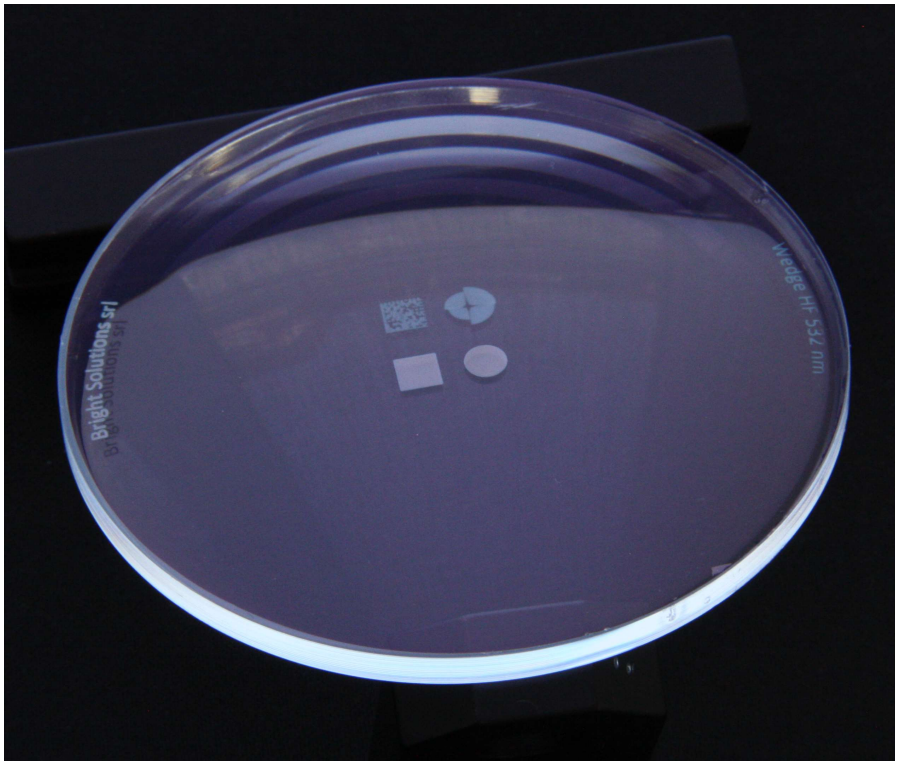


Step 3: after separation

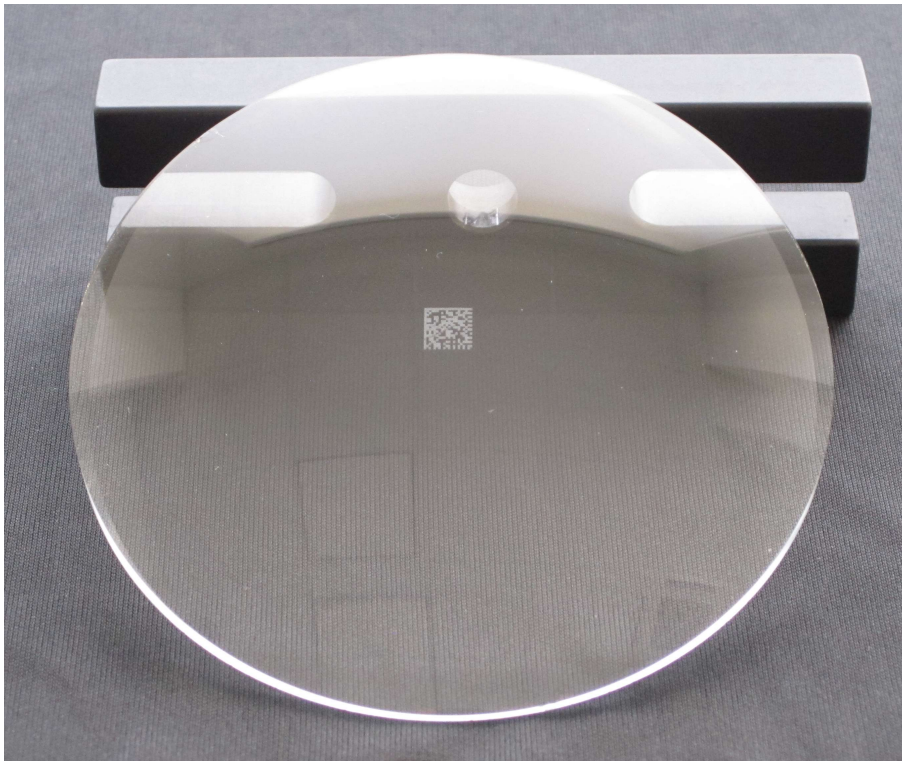


Lens marking

Wedge HF 532 nm



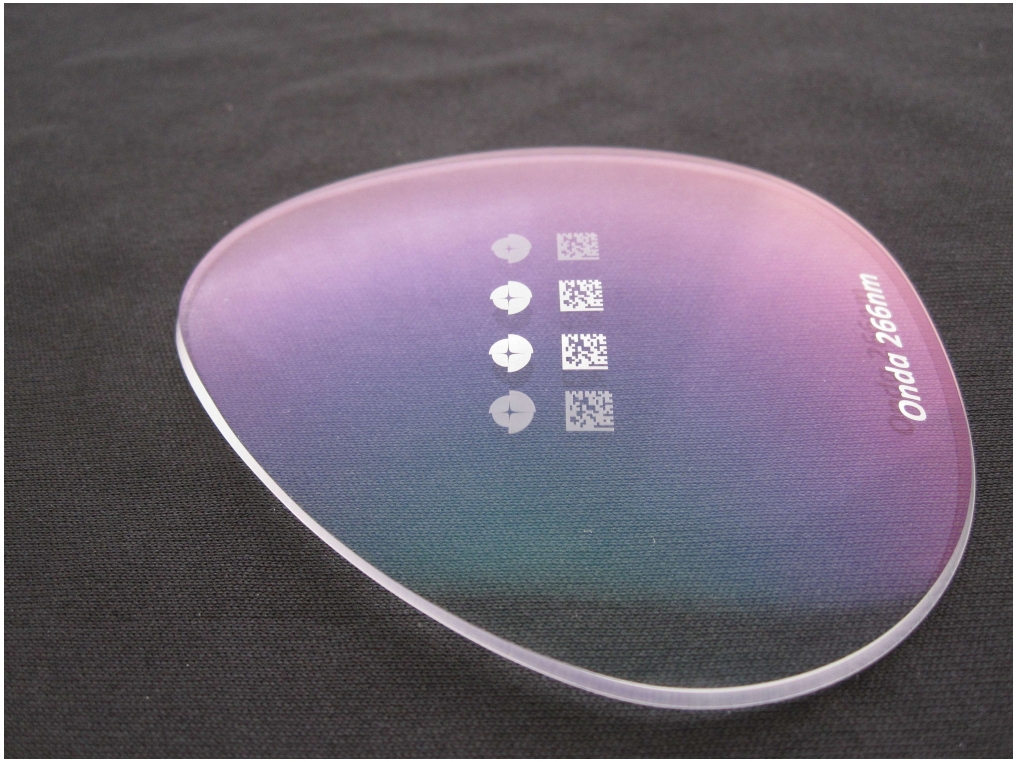
Organic lens
HI-index 1.67

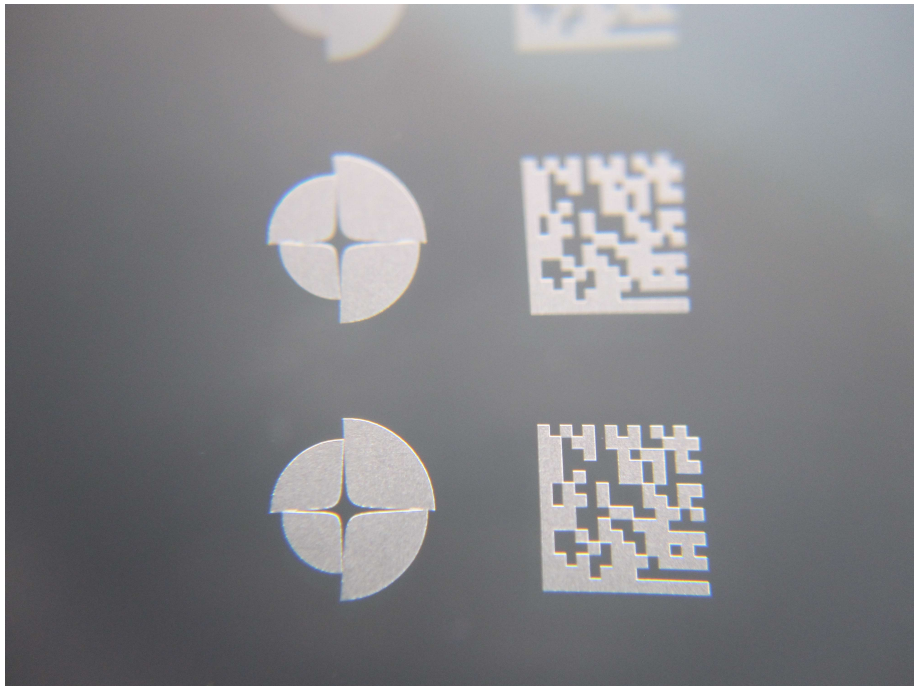


Organic lens
CR39 1.5

Lens marking

Onda 266 nm

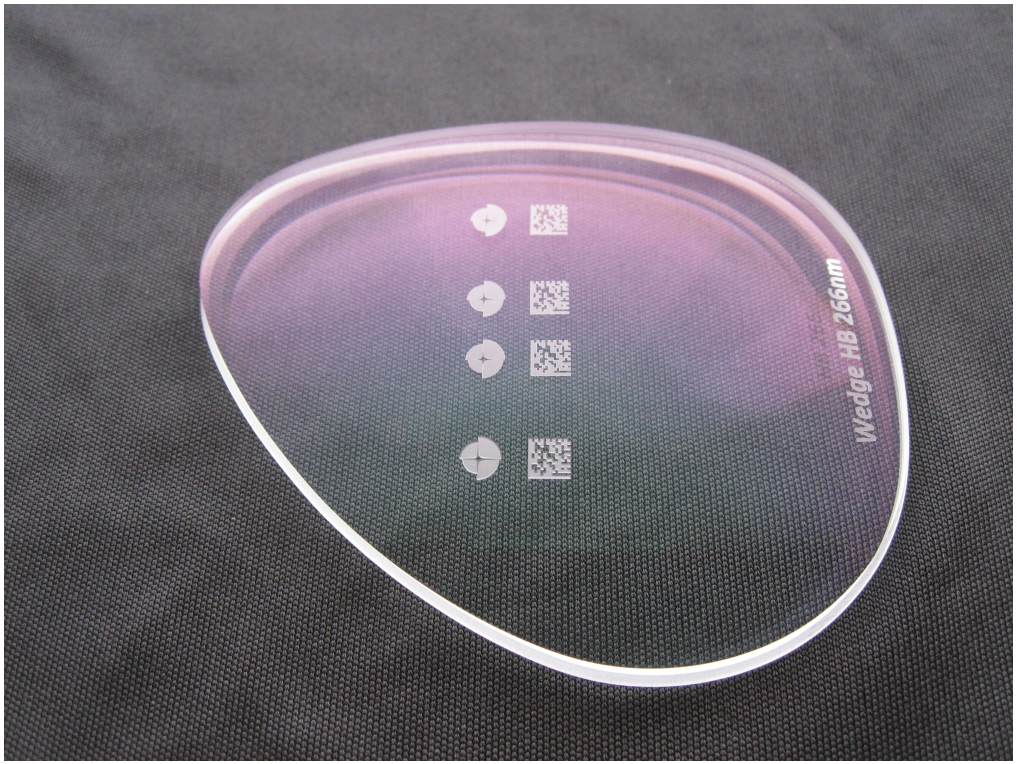




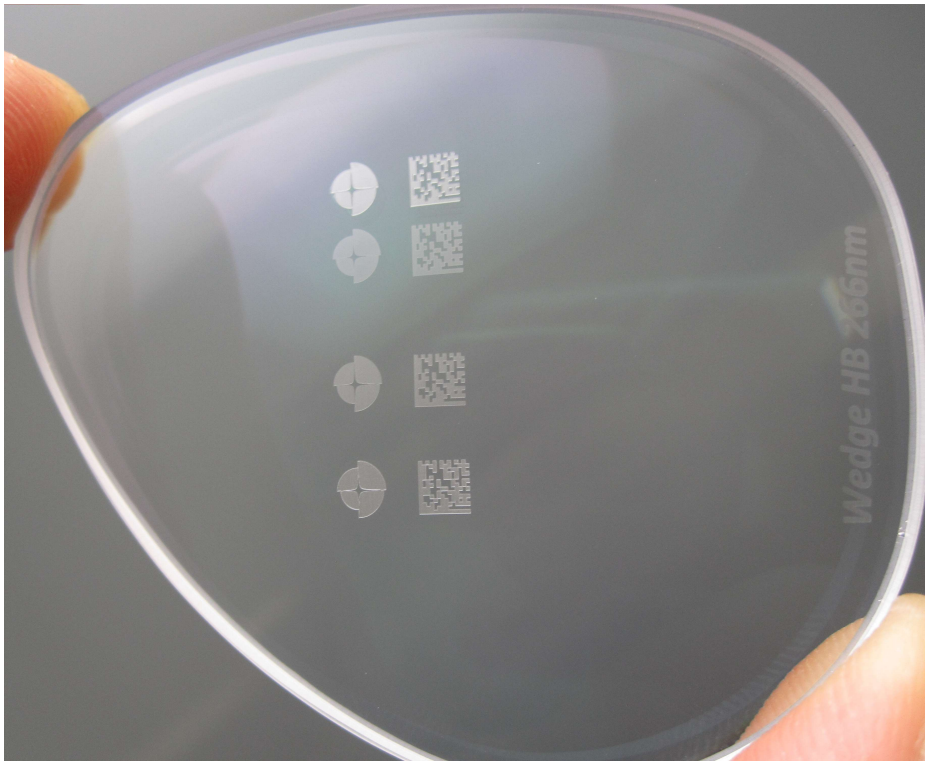
Organic lens
HI-index 1.61

Lens marking

Wedge HB 266 nm



Organic lens
HI-index 1.67

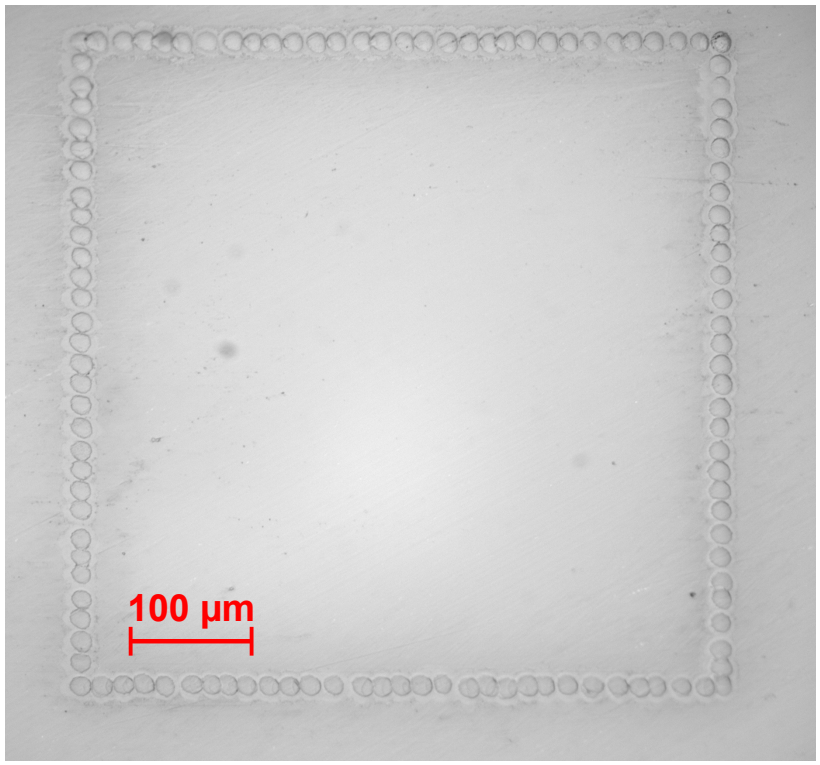


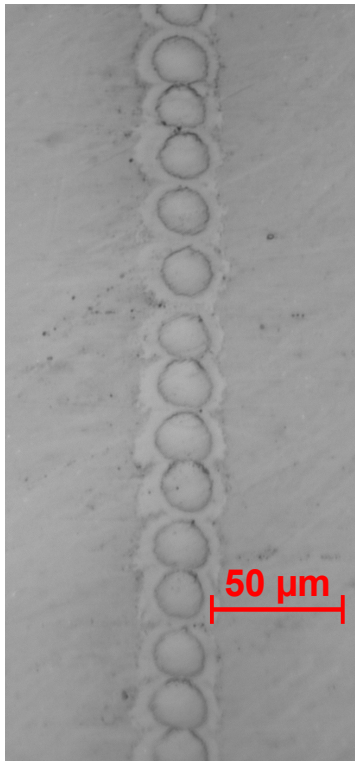
Organic lens
HI-index 1.74

Lens marking

Wedge HB 266 nm

Mineral glass

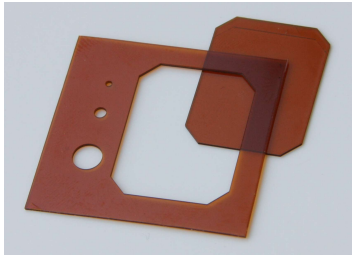




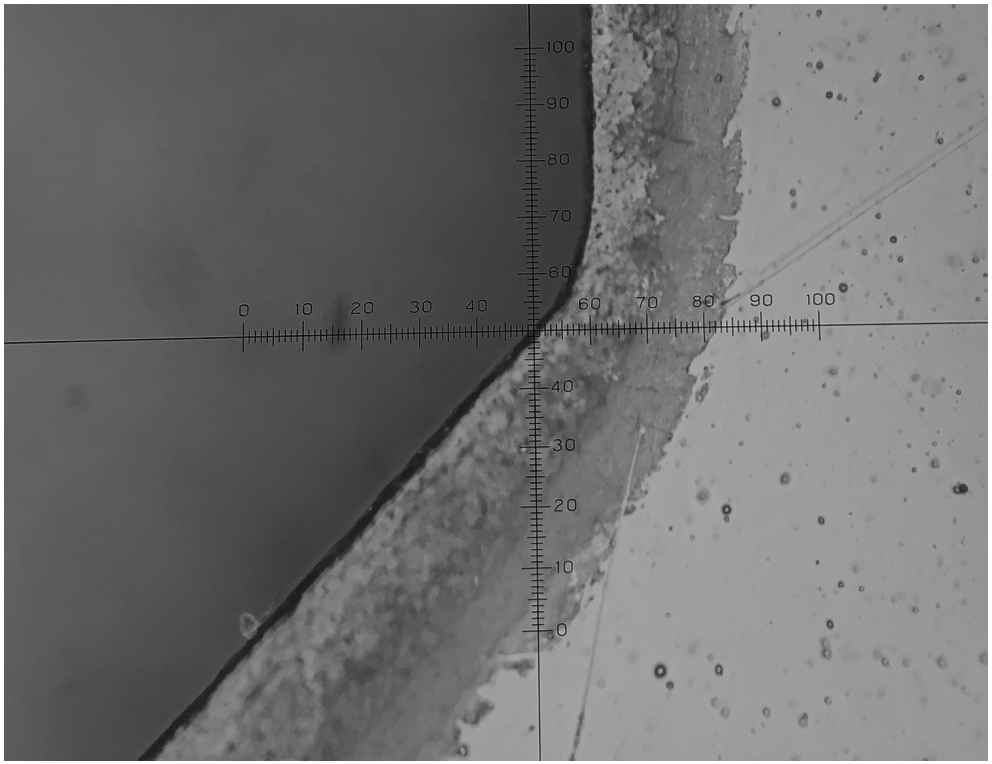
Single dot ablation for invisible glass marking

Precision laser cutting

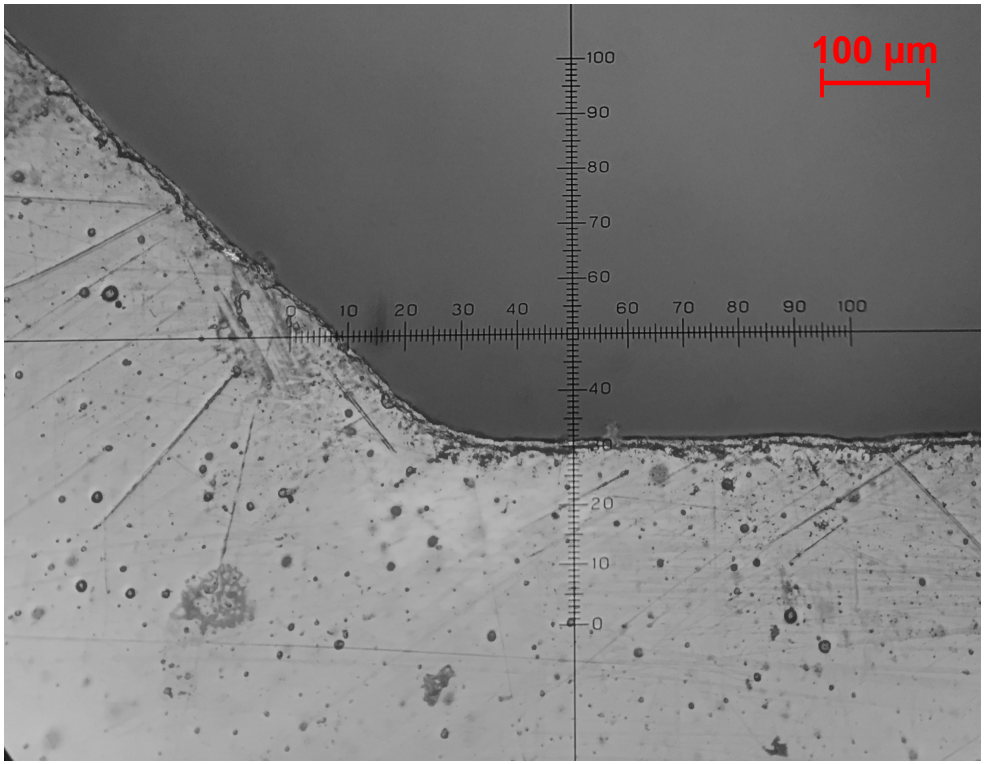
425 µm thick PDMS cutting



Sol 20W 532 nm



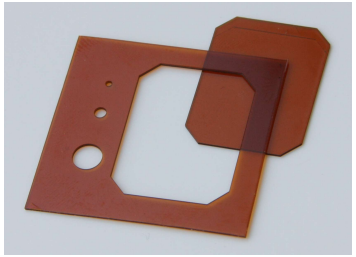
corner – laser entrance side



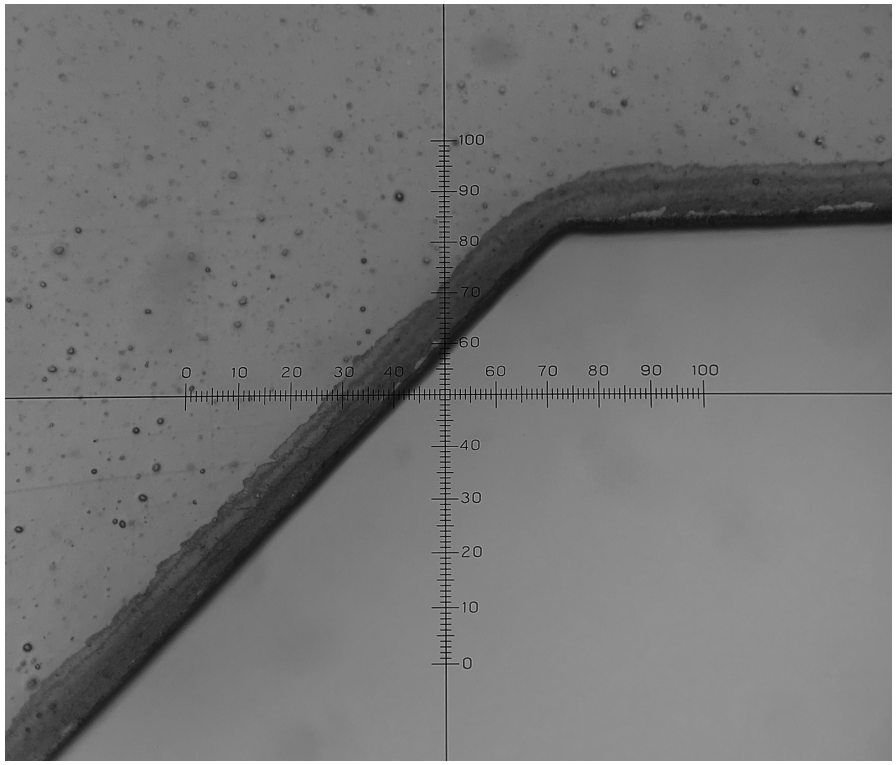
corner – laser exit side

Precision laser cutting

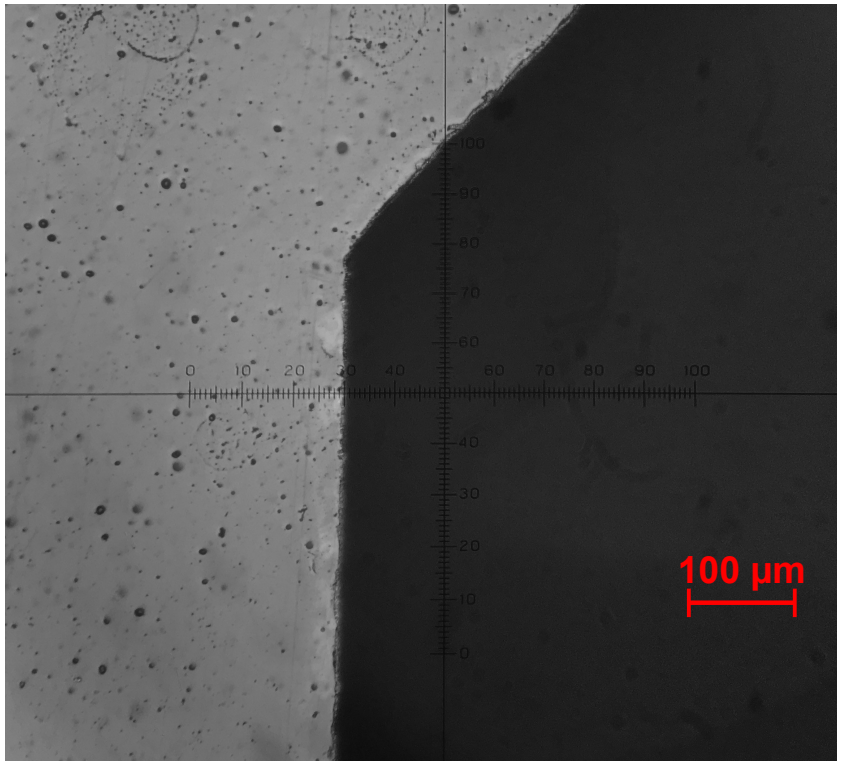
425 µm thick PDMS cutting



Wedge HF 532 nm



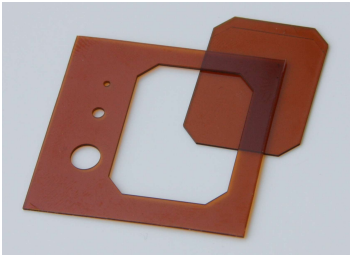
corner – laser entrance side



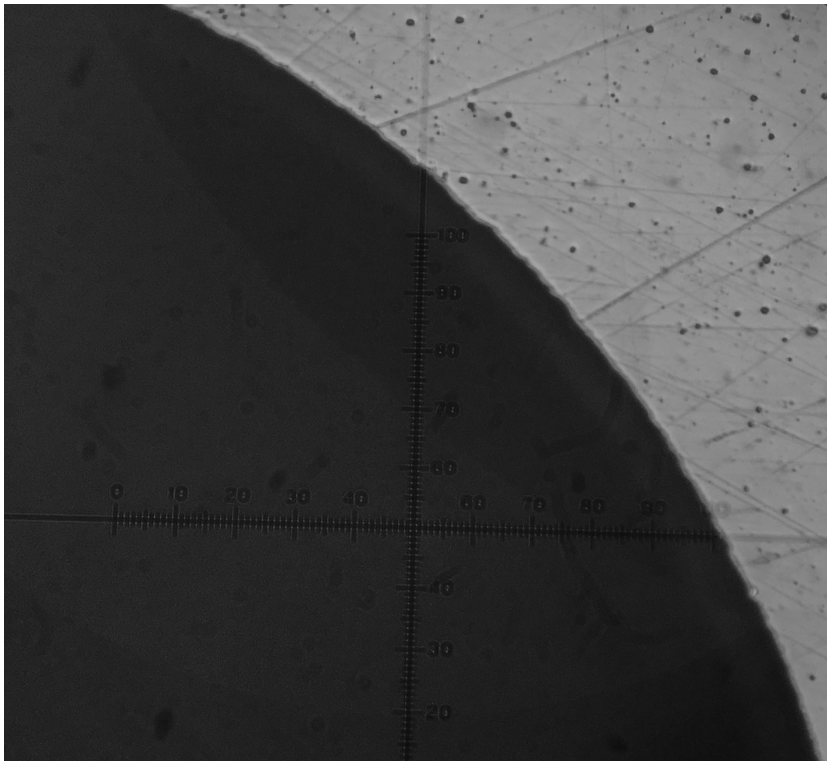
corner – laser exit side

Precision laser cutting

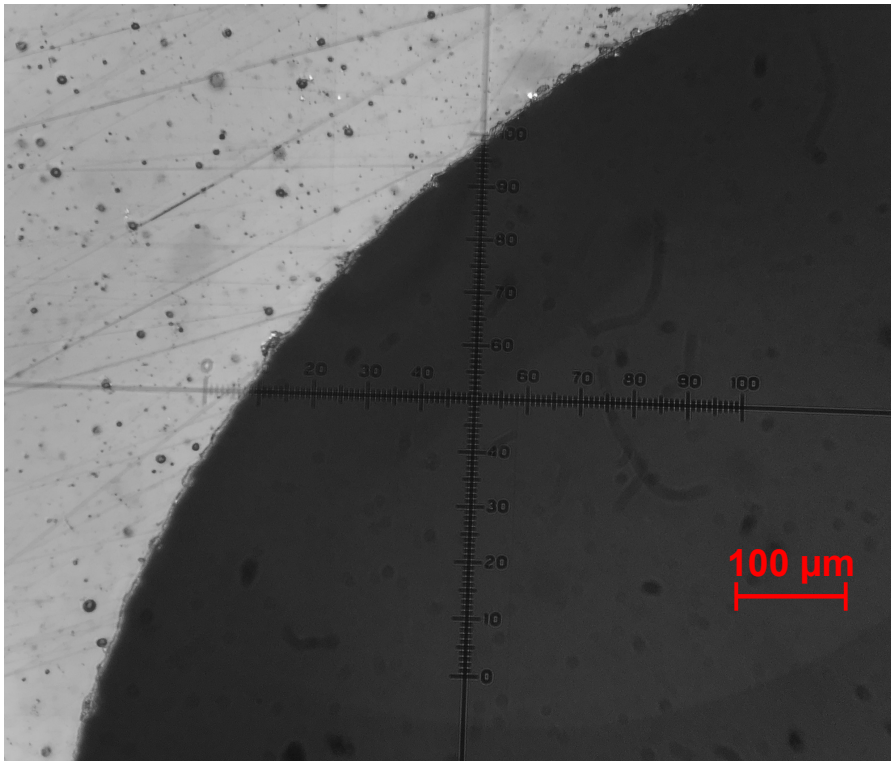
425 µm thick PDMS cutting



Wedge HF 266 nm



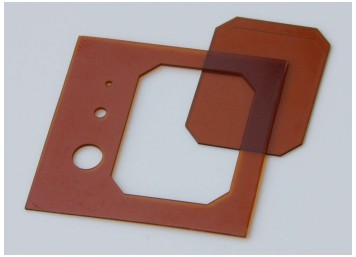
2 mm diameter hole cut – laser entrance side



2 mm diameter hole cut – laser exit side

Precision laser cutting

425 µm thick PDMS cutting

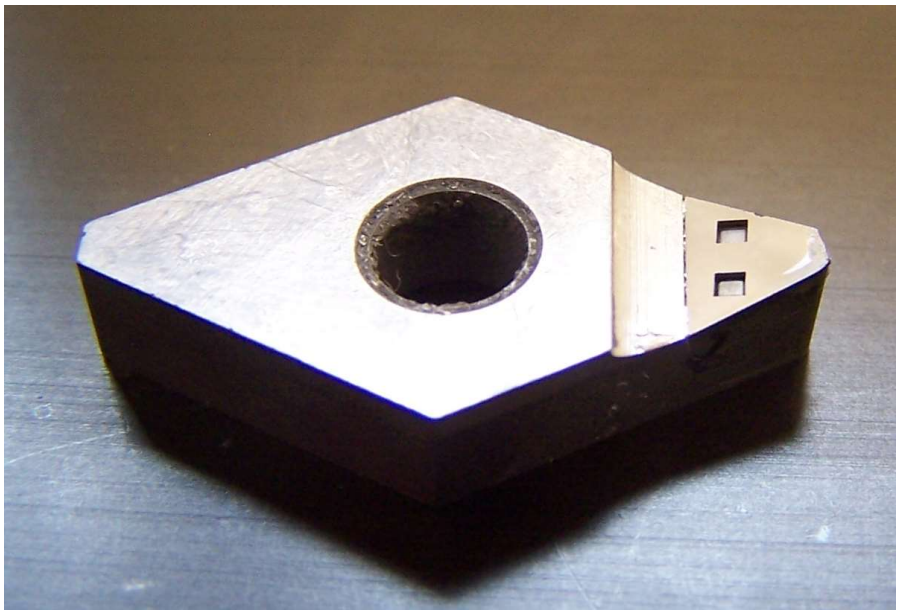


Laser	Pulse duration	cut HAZ at entrance side	cut exit side
Sol 10W 1064nm	~20 ns	300-400 µm	melted material
Wedge HF 532nm	~0.8 ns	60-80 µm	clean
Wedge HF 266nm	~0.7 ns	~5 µm	clean

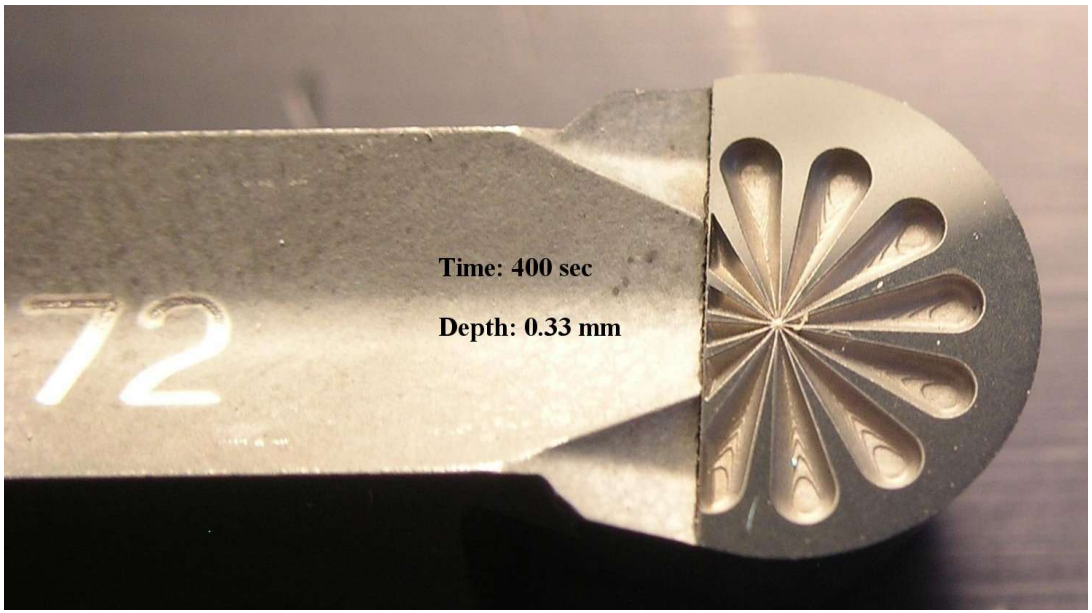
Micromilling of hard materials

Onda 1064 nm

Synthetic Polycrystalline Diamond (PCD)
for mechanical applications



Laser milling on a cutting tool

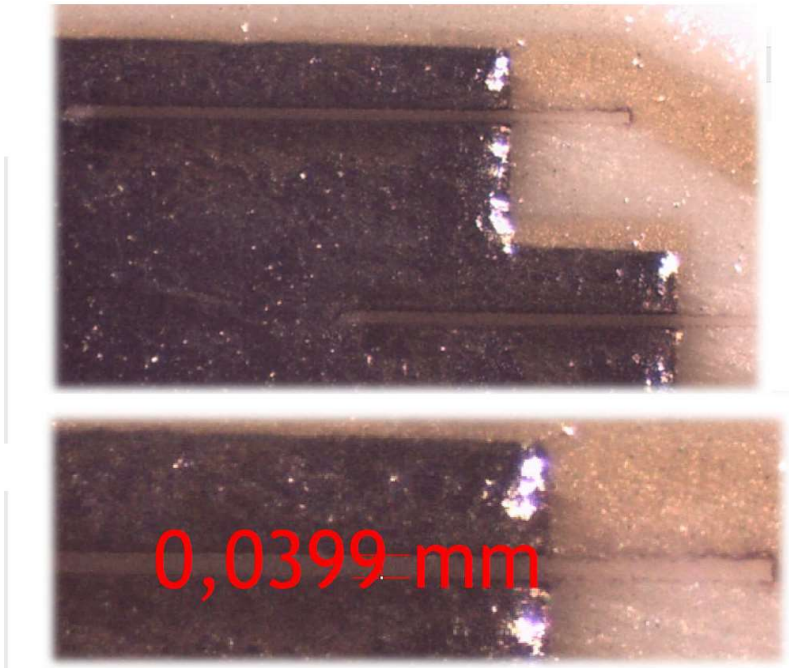


3D laser milling on a chip breaker

Laser trimming

Precision trimming of electronic circuits and sensors

Sol 6W 1064 nm

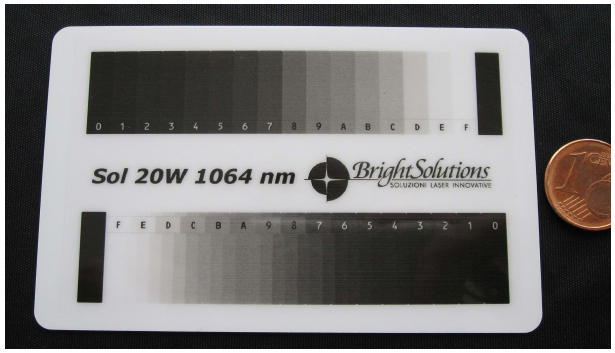


laser trimming for accurate control of electric resistance in circuit components

ID card marking

Gray scale laser marking on plastic cards

Sol 1064 nm



PQSY 3W 1064 nm

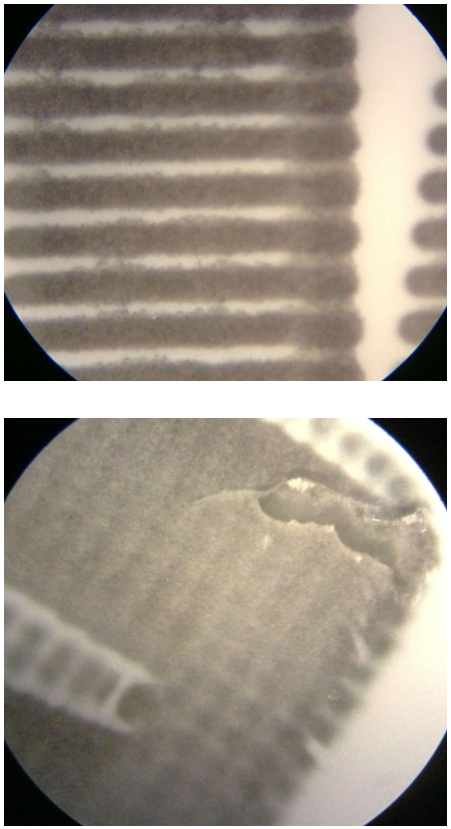
Onda 1064 nm

up to 600 dpi resolution

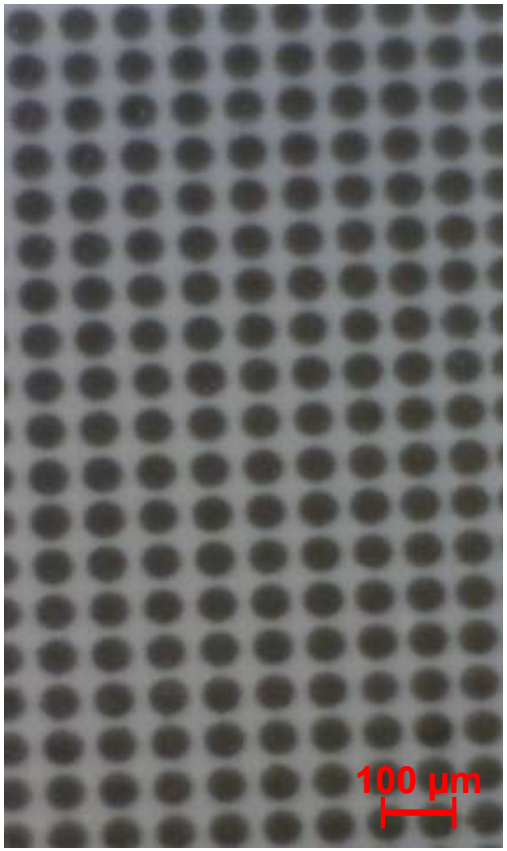
Plastic marking

High contrast marking on heat-sensitive polymeric materials

Sol 532 nm
ns laser marking



Wedge HF 532 nm
sub-ns laser marking



Metal marking & toning

Laser metal marking and color toning on different materials

Sol 1064 nm

PQSY 3W 1064 nm

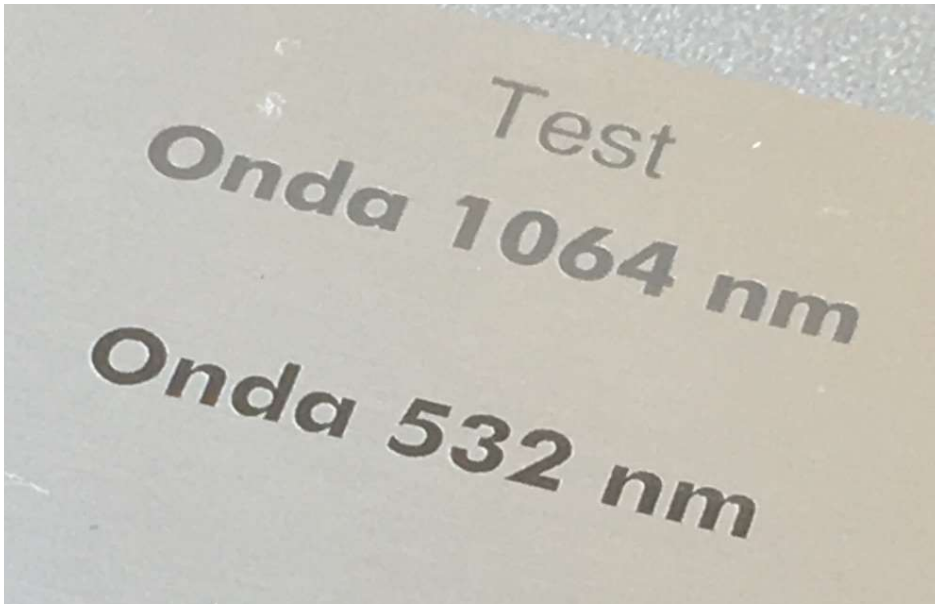
stainless steel

Onda 1064 nm

Metal marking & toning

Controlled blackening of aluminium

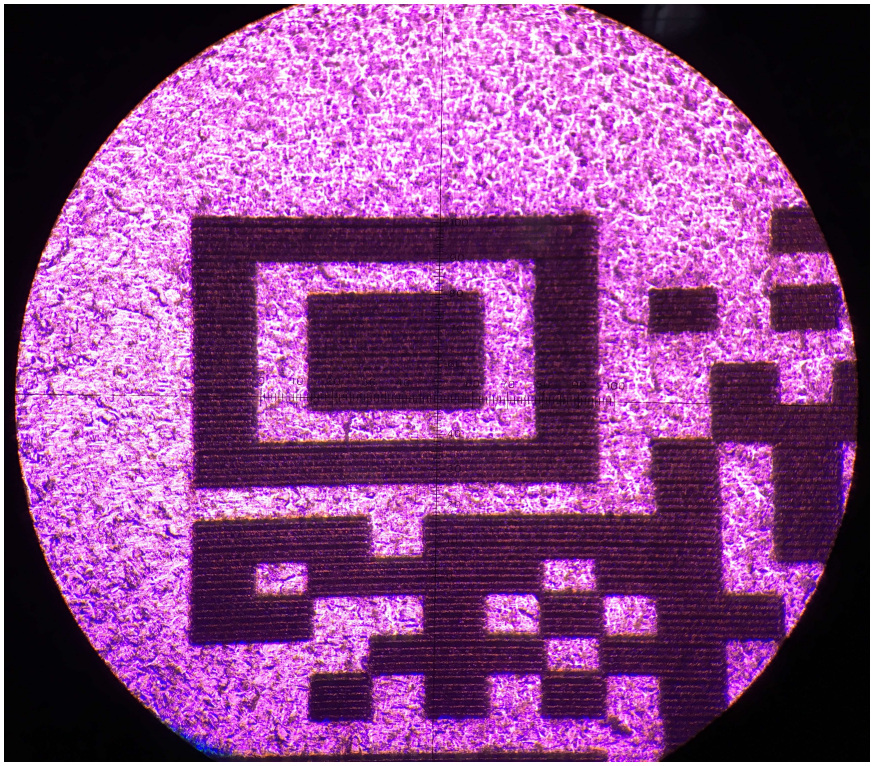
Onda



Metal marking & toning

Sub-ns laser marking on 100 µm thick stainless steel

Wedge HF 532 nm

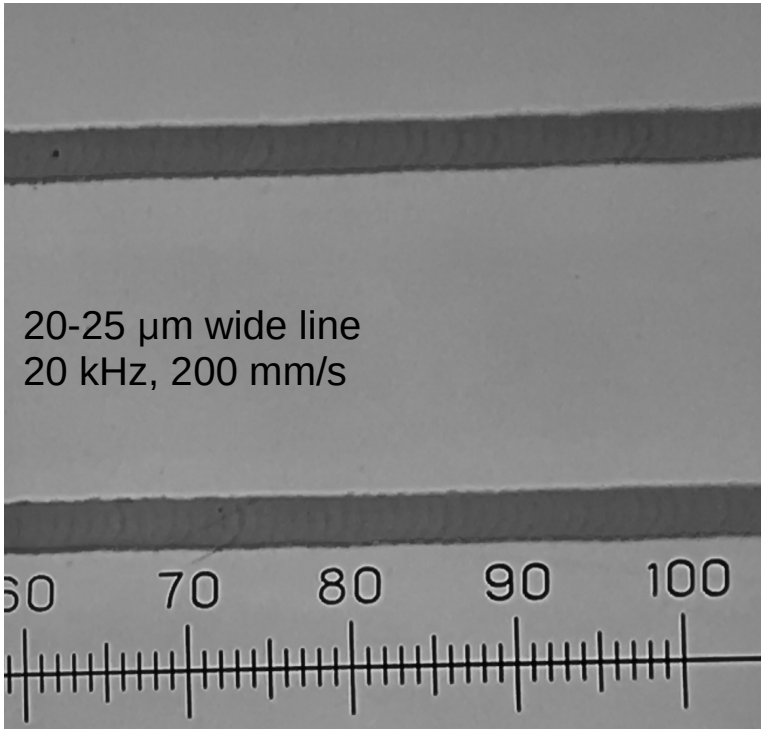


Selective laser ablation – thin film removal

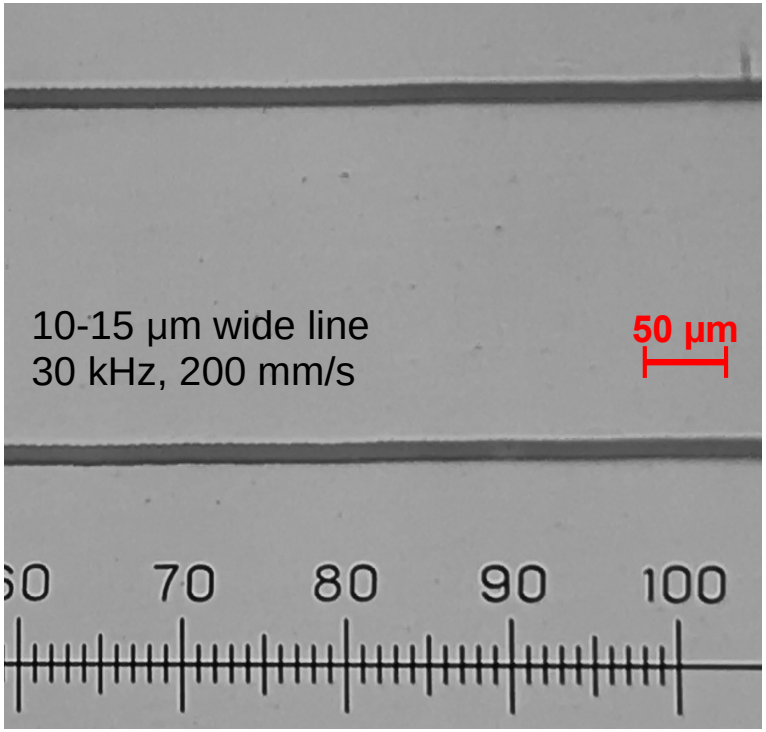
120 nm thick **ITO layer removal** on top of **polymeric substrate**

- clean ITO removal
- undamaged polymeric substrate
- tested for electrical insulation

Sol 6W 1064 nm



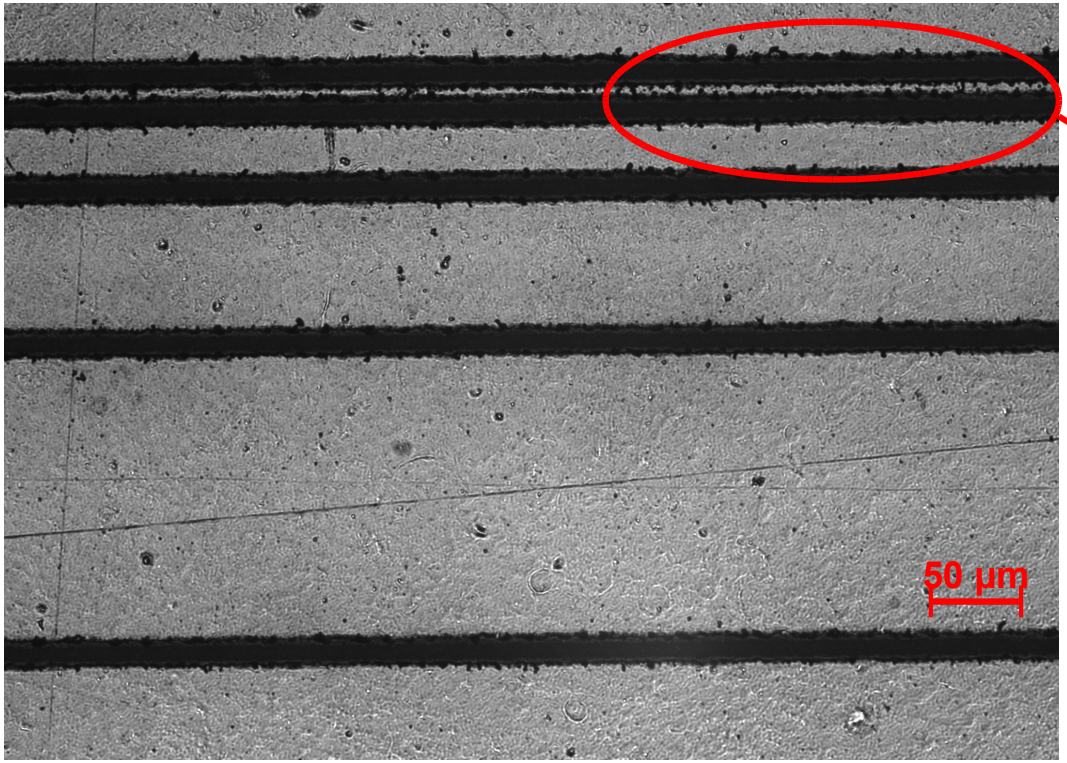
Sol 5W 532 nm



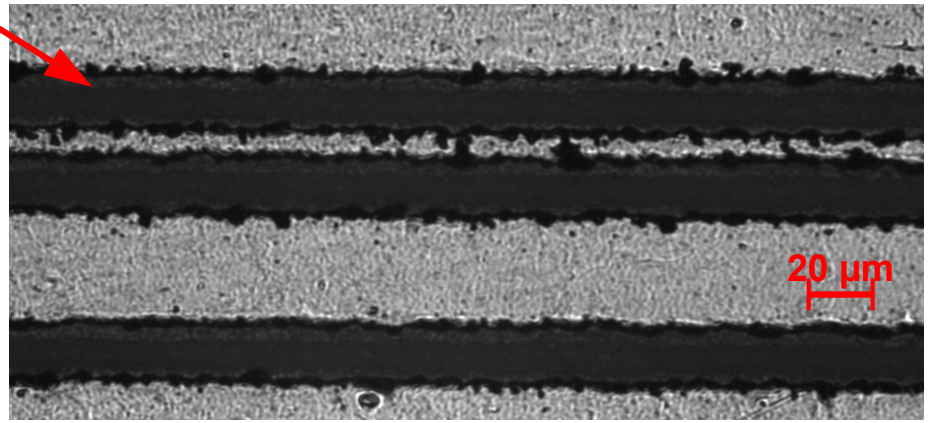
Selective laser ablation – thin film removal

25.4 µm thick **noble metal removal** on top of **alumina substrate**

- complete metal removal
- reduced line separation with intact metal stripe in between (few µm)
- undamaged alumina substrate



Wedge HF 532 nm

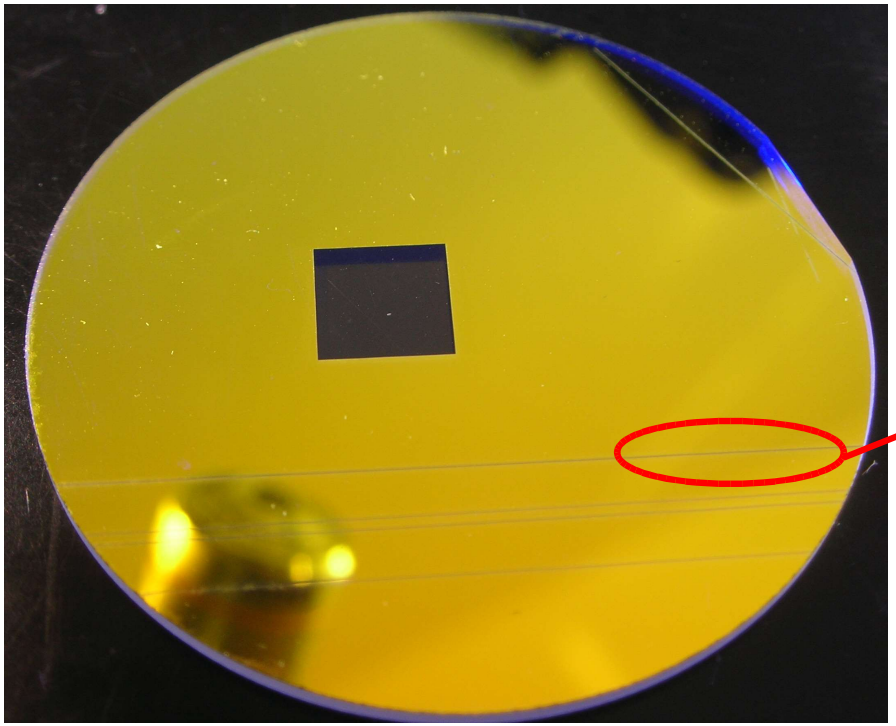


< 20 µm wide line
10 kHz, 20 mm/s

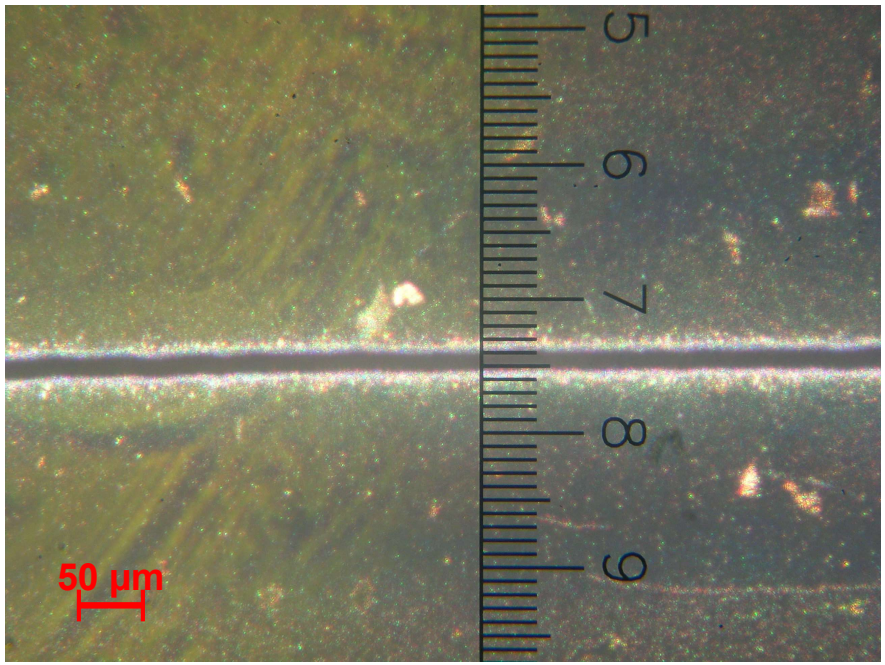
Selective laser ablation – thin film removal

Coating removal on glass substrates

Onda 1064 nm



5x5 mm^2 square coating removal



10-15 µm wide line
10 kHz, 100 mm/s

Micromachining & microprocessing

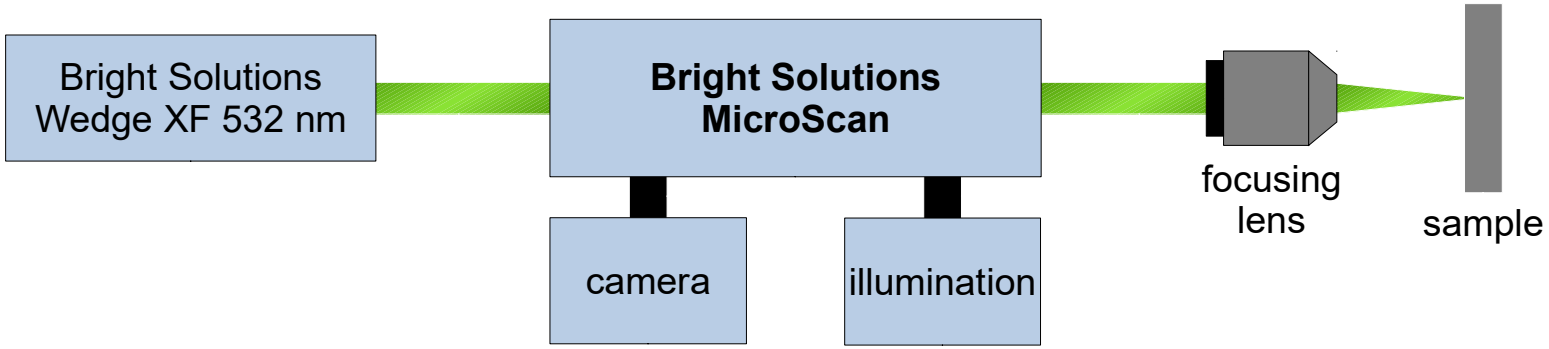
Integrated system for laser micromachining applications under a microscope configuration

- sub-ns laser **Wedge XF 532 nm**
- high numerical aperture focusing optics
- completely integrated scanning system
- high precision, small spot size (2-3 μm)
- small field of view (1 mm), scan speed of tens of mm/s
- live imaging of the processed sample
- embedded illumination unit
- suitable for vast range of materials
- optional XY translation stage

Wedge XF 532 nm

Micromachining & microprocessing

Integrated system for laser micromachining applications under a microscope configuration



Wedge XF 532 nm

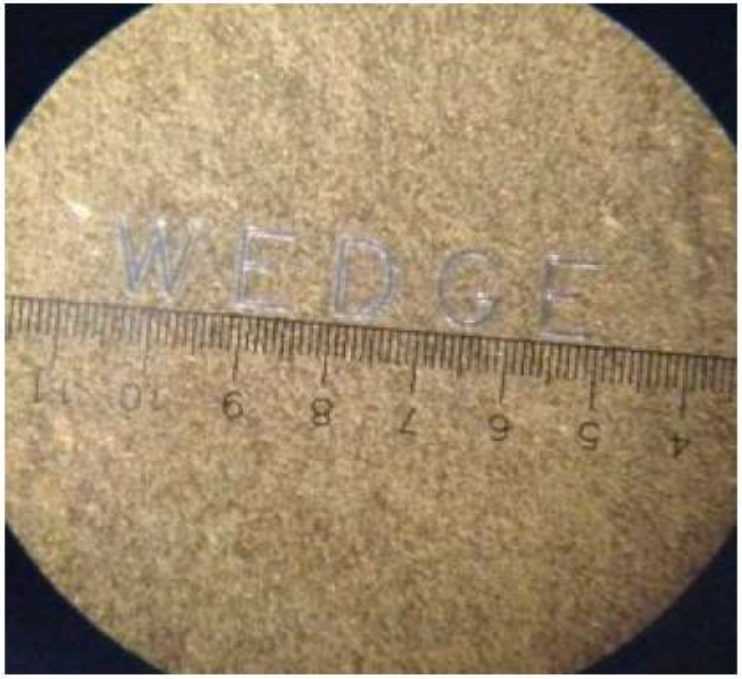
1064nm Wedge models	Sub-ns platforms Wedge XF
Max Pulse energy	60 µJ
Repetition rate	10 kHz to 100 kHz (option: single shot to 200 kHz)
Harmonics / Wavelength conversion	532 nm – 355 nm – 266 nm 1.5 µm – 3.3 µm
Pulsewidth	down to 400 ps
Peak Power	up to 100 kW
Polarization	Linear 100 : 1 (option circular polarization)
Beam quality (M^2)	< 1.3
Cooling	Air-cooled (option: water cooling and contact cooling)

Micromachining & microprocessing

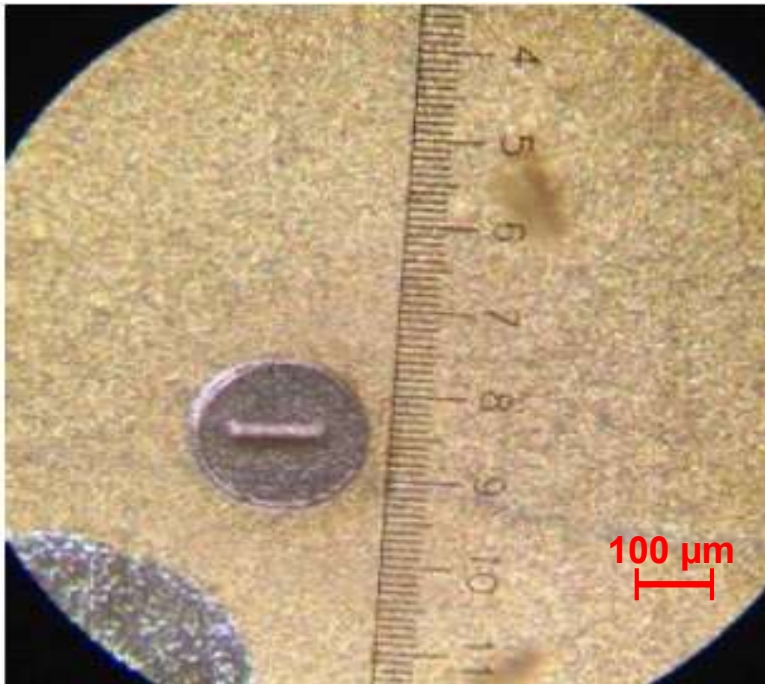
Micromachining on stack of metal samples

- micro-marking
- selective removal of different layers

'WEDGE' text with a single line font:
100 µm character height, 7 µm line thickness



ablation of thin gold on thick nickel (180 µm circle), and ablation of thick nickel (15 µm slit) on copper



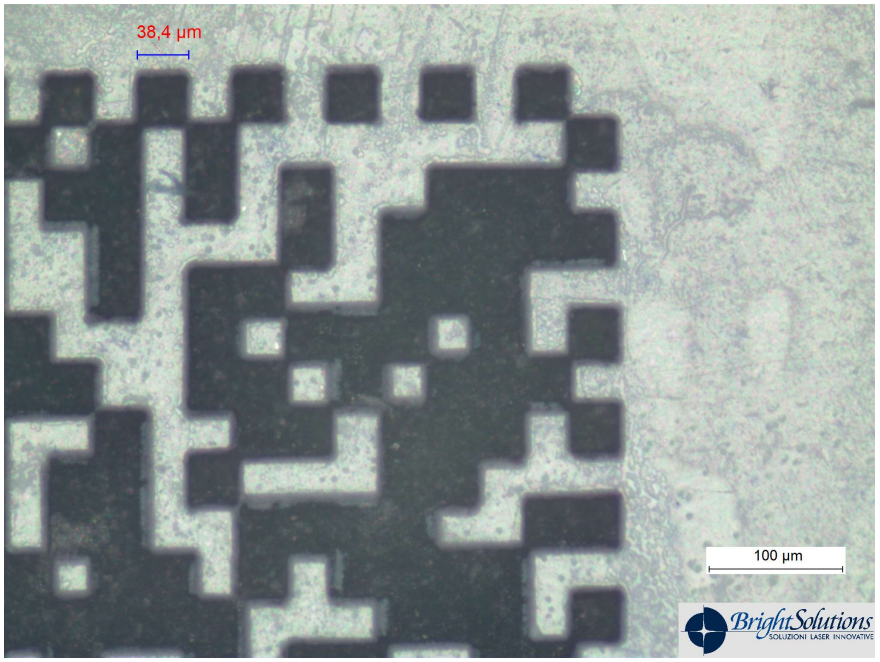
Wedge XF 532 nm

Micromachining & microprocessing

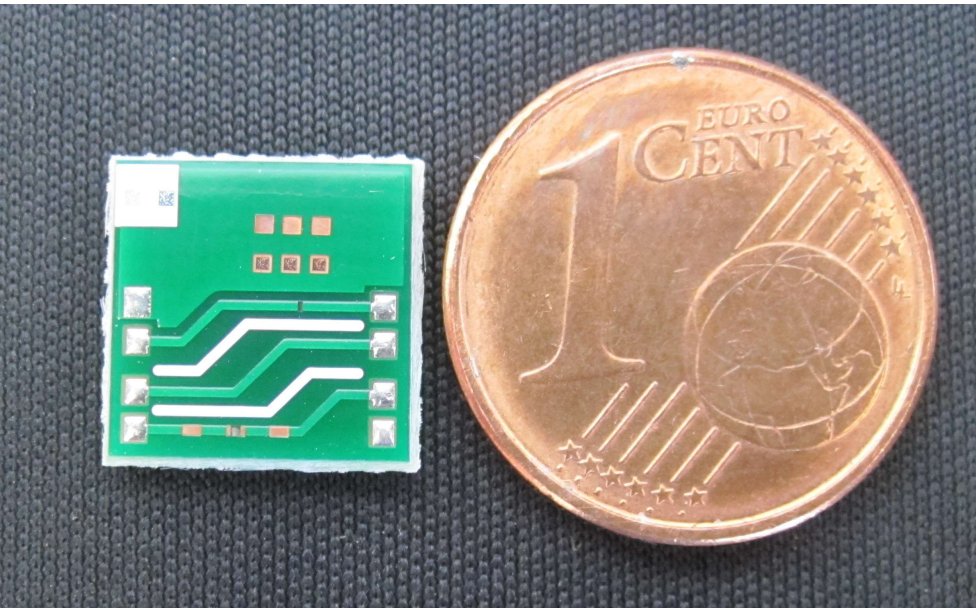
Printed **electric boards** and devices

- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

datamatrix marking on white varnish



copper layer covered with solder resist film



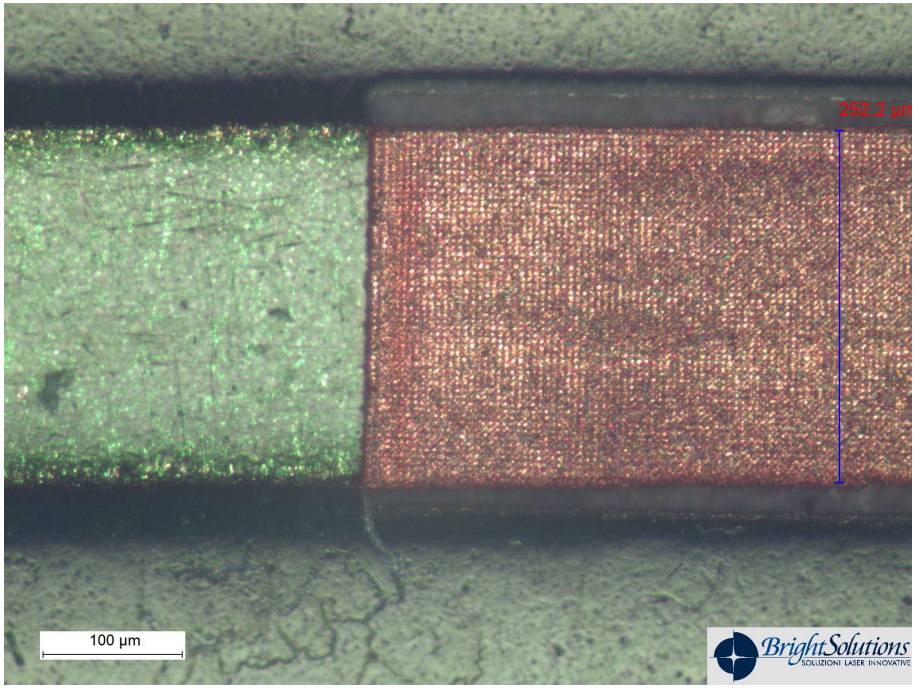
Wedge XF 532 nm

Micromachining & microprocessing

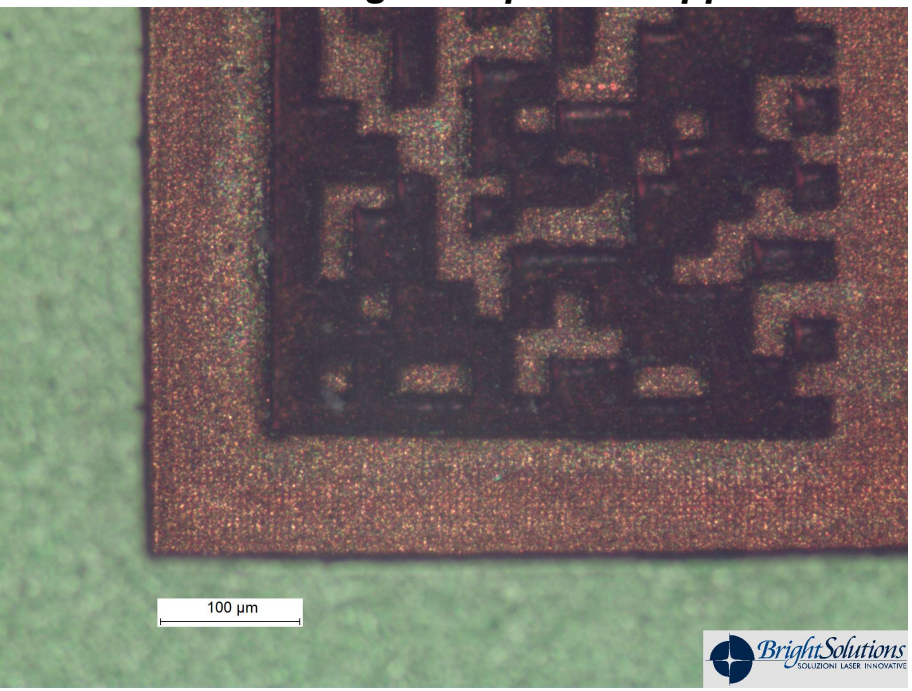
Printed **electric boards** and devices

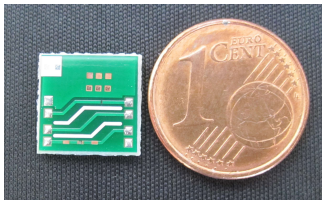
- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

selective exposure of copper layer



datamatrix marking on exposed copper





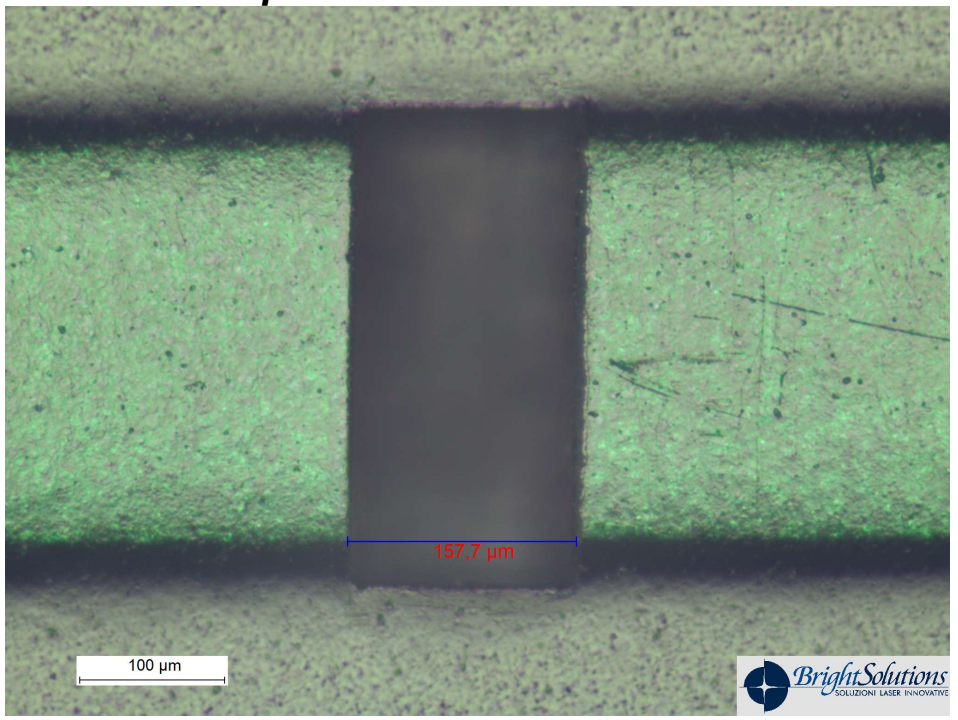
Wedge XF 532 nm

Micromachining & microprocessing

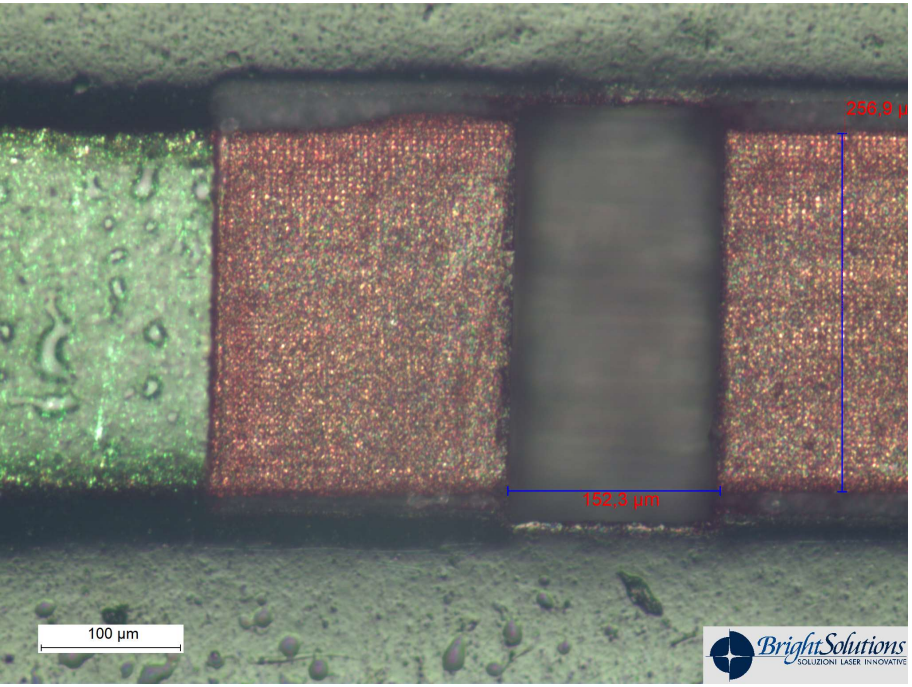
Printed **electric boards** and devices

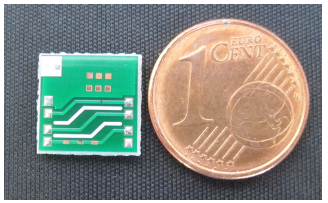
- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

track interruption



track interruption (with selective copper exposure)





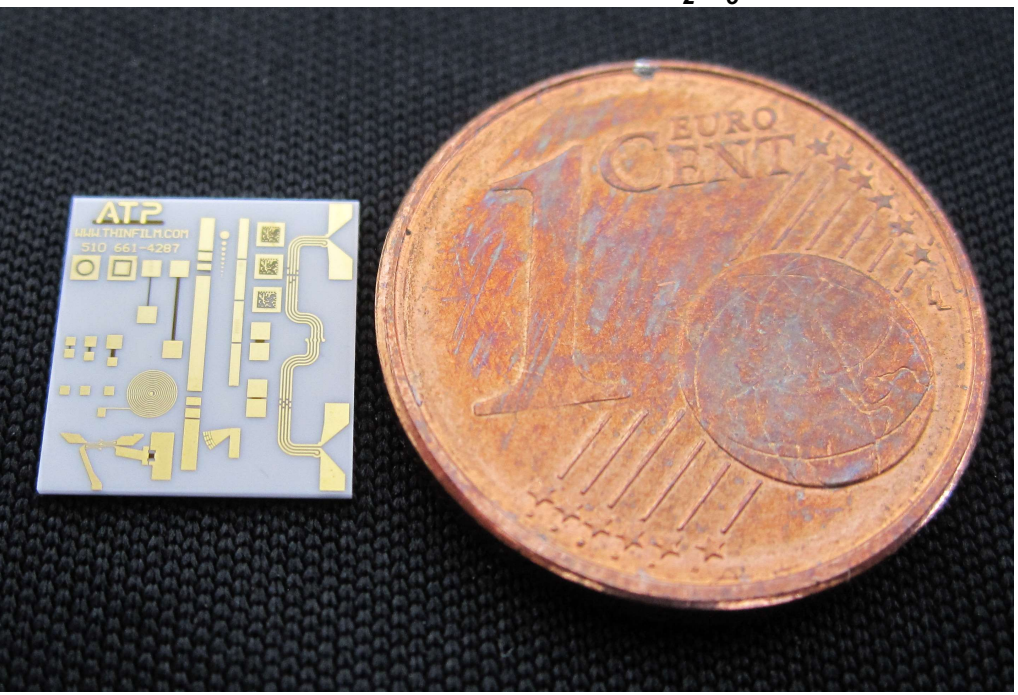
Wedge XF 532 nm

Micromachining & microprocessing

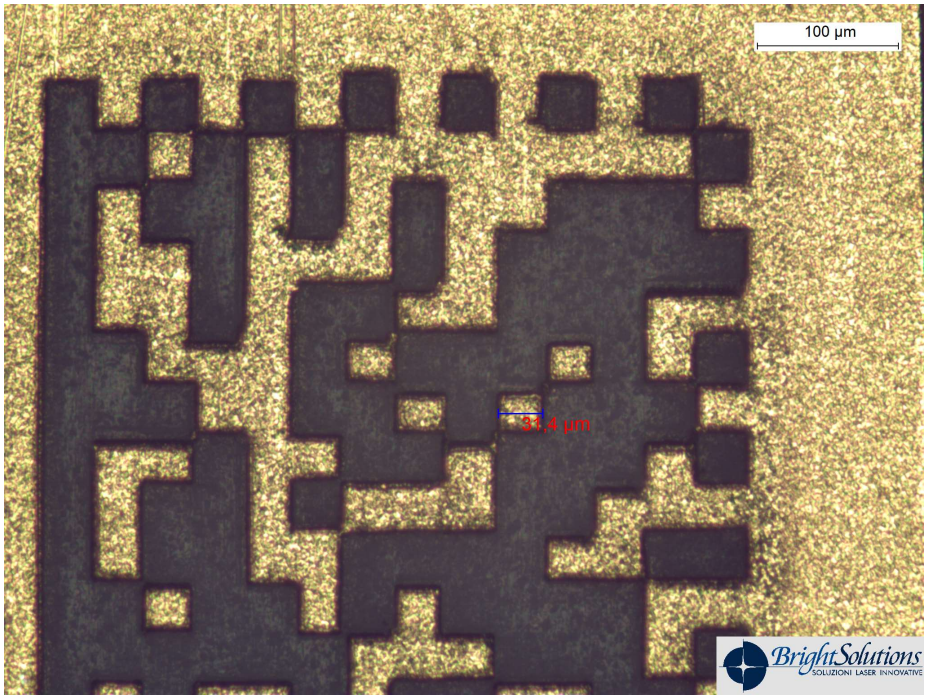
Printed **electric boards** and devices

- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

gold on alumina (TaN/TiW/Au on Al_2O_3)



datamatrix marking on gold

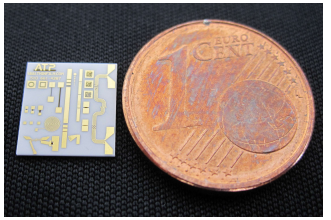


Wedge XF 532 nm

Micromachining & microprocessing

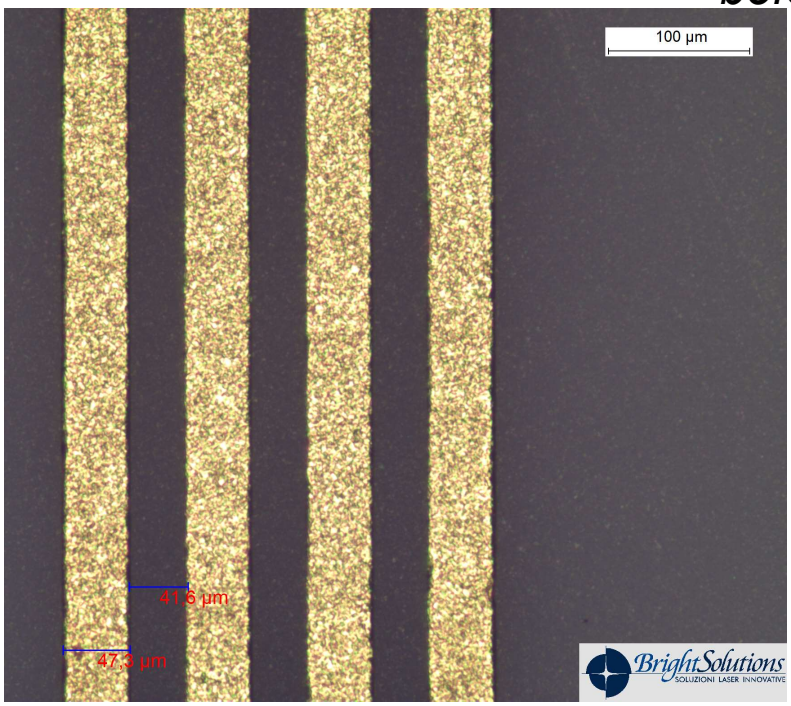
Printed **electric boards** and devices

- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

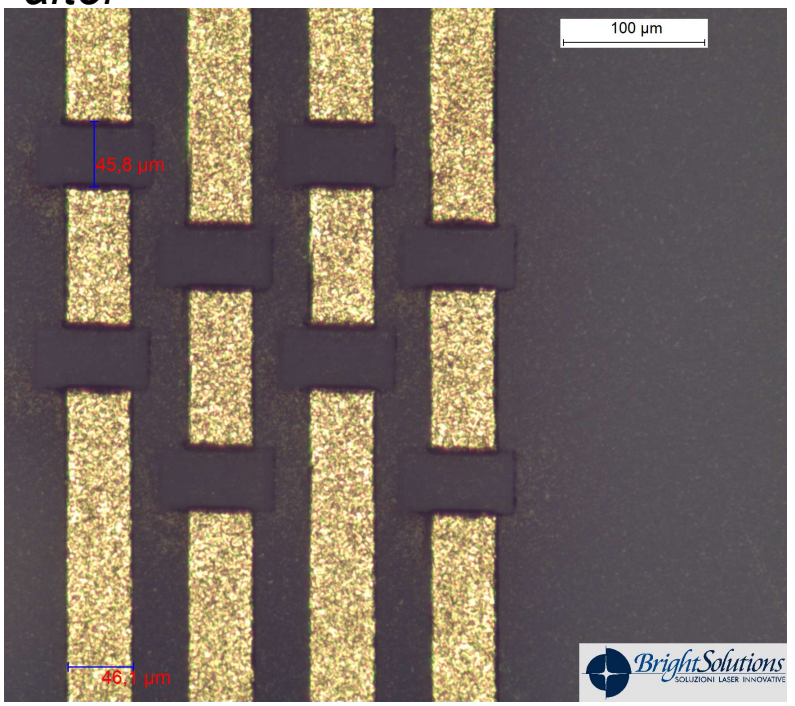


track interruption

before



after



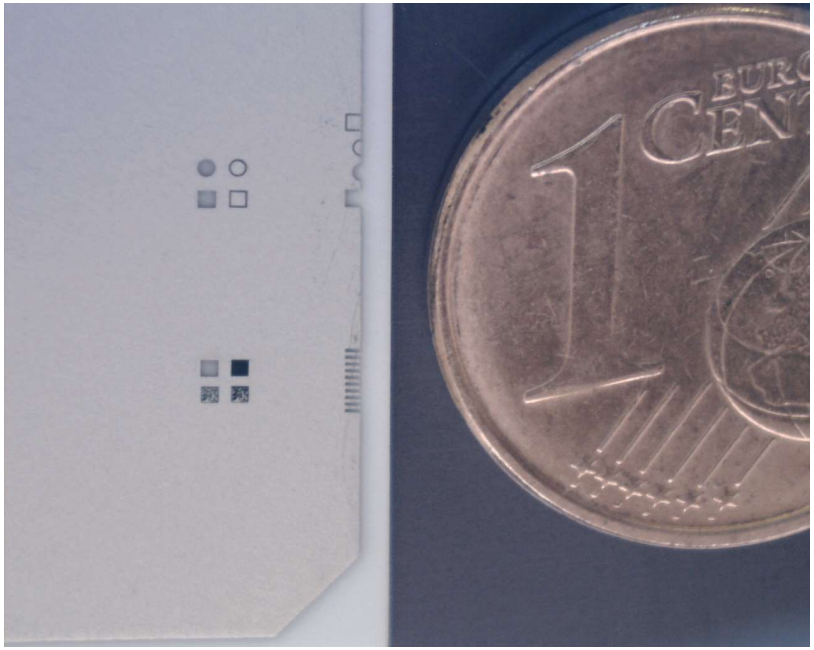
Wedge XF 532 nm

Micromachining & microprocessing

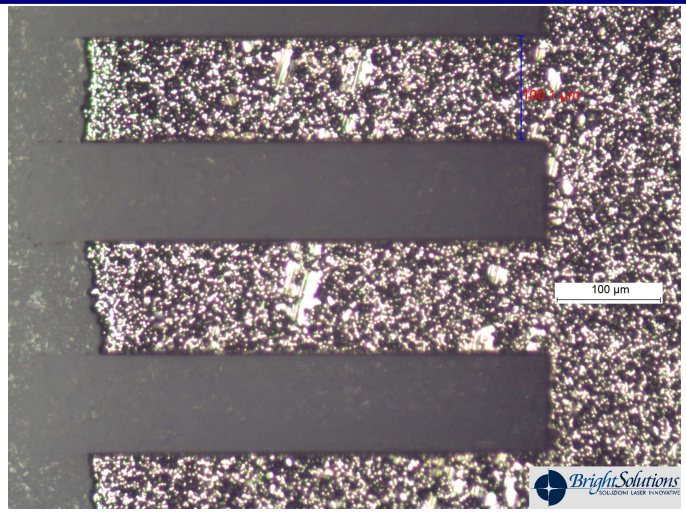
Printed **electric boards** and devices

- in-situ **micro-corrections** of connection errors
- selective removal of different layers
- barcode/datamatrix marking

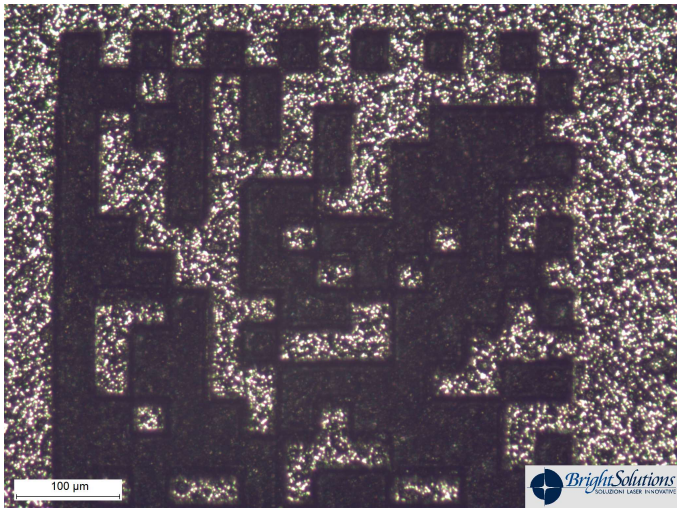
metal on alumina



selective removal of metal



metal marking



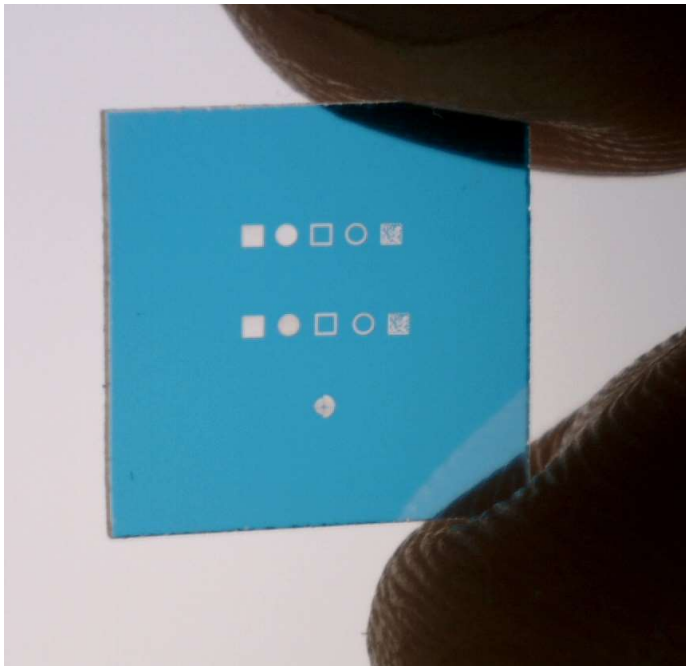
Wedge XF 532 nm

Micromachining & microprocessing

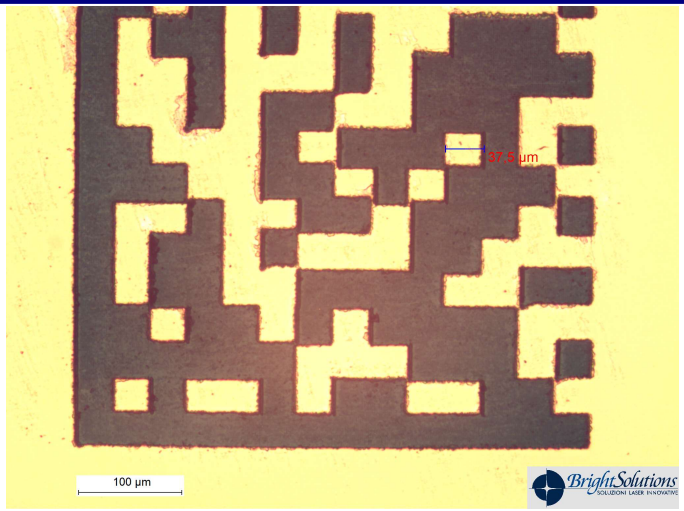
Coating removal on glass substrates

- clean ablation
- undamaged substrate

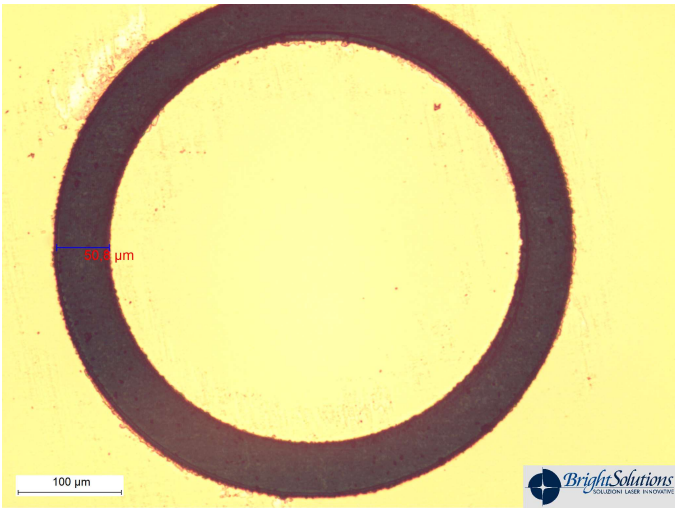
coated glass substrate



datamatrix



selective removal

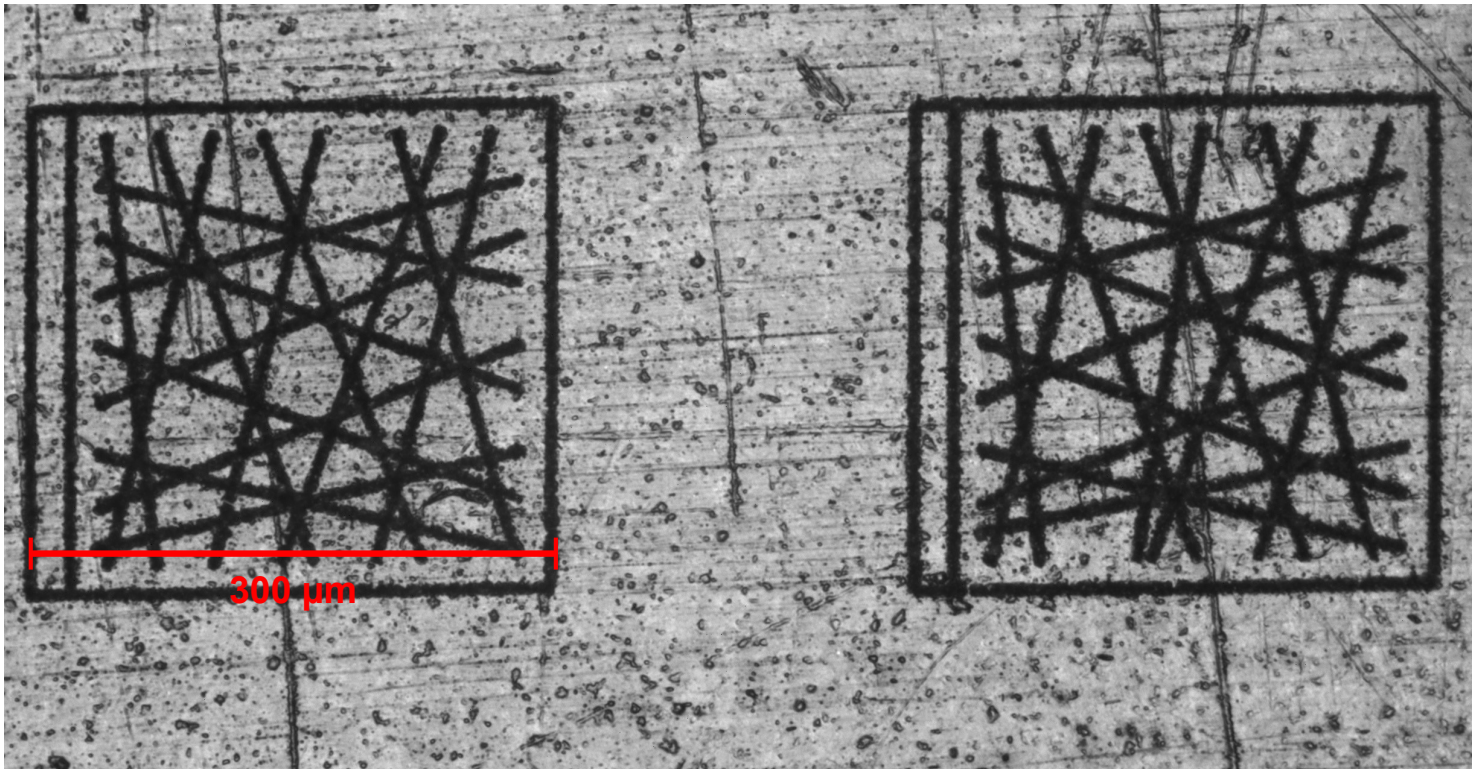


Wedge XF 532 nm

Micromachining & microprocessing

Precision micro-marking on polymeric materials

black plastic – 2DMI code marking



40 mm/s - 10 kHz
line width ~5 µm

Wedge XF 532 nm

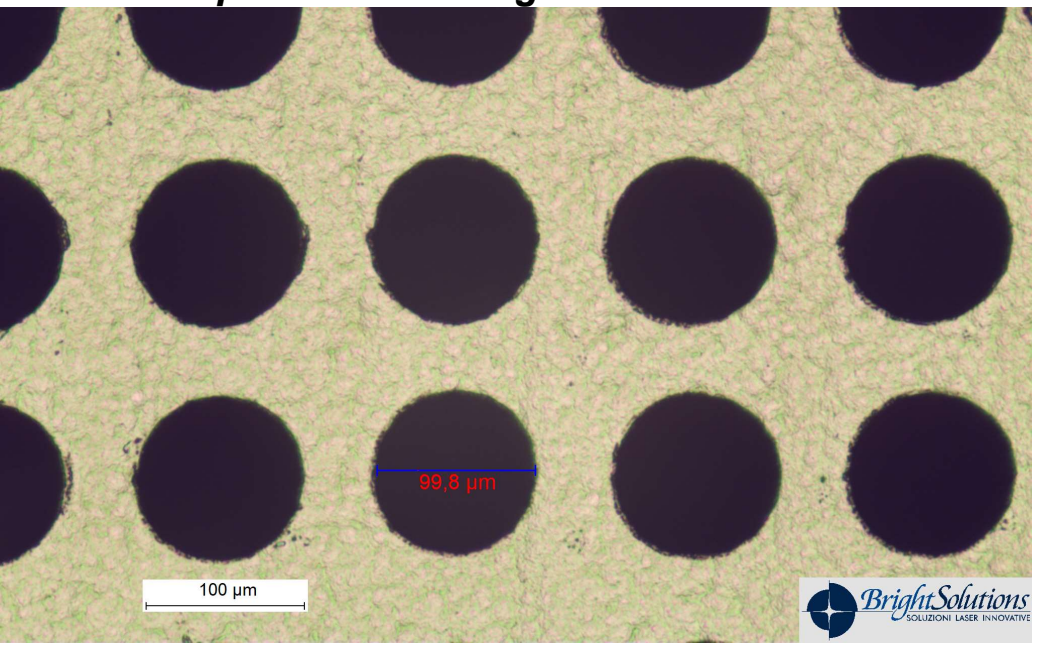
Micromachining & microprocessing

Micro-hole drilling

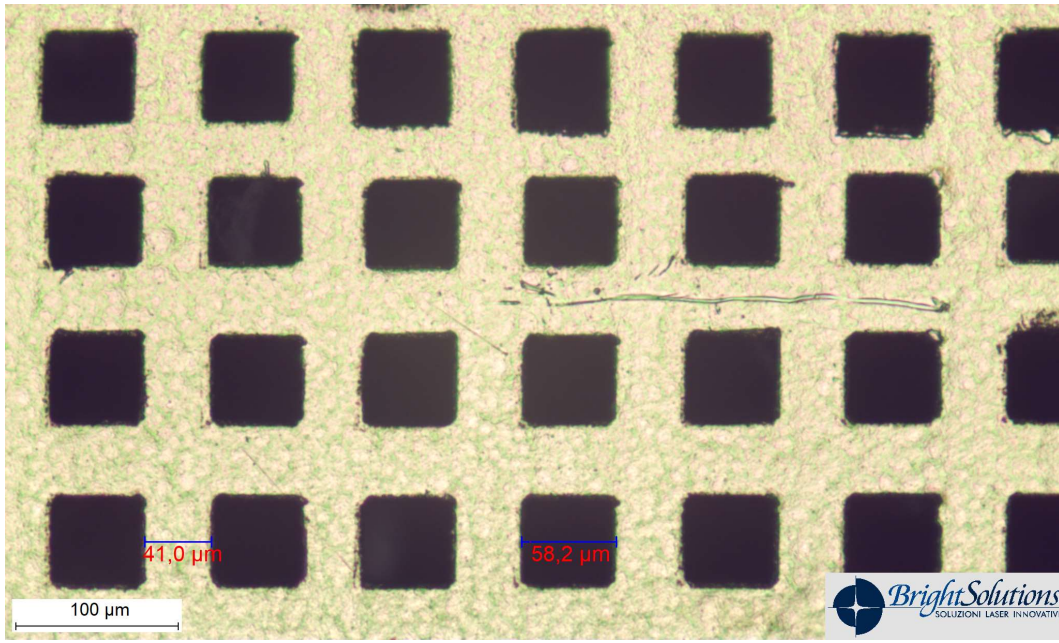
- blind or through holes

Nickel iron alloy – 50 µm thick
(OLED mask applications)

100 µm round through-holes matrix



50 µm square through-holes matrix



Wedge XF 532 nm

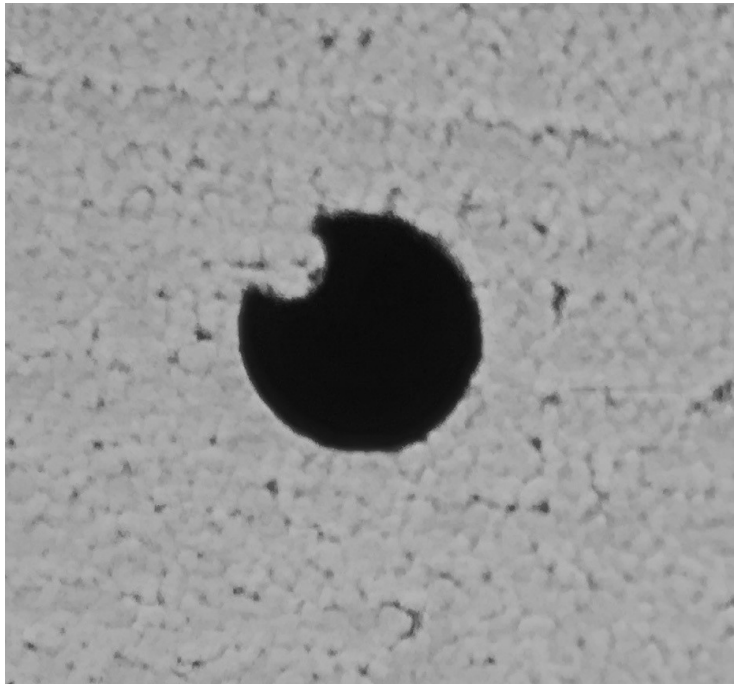
Micromachining & microprocessing

Micro-hole drilling

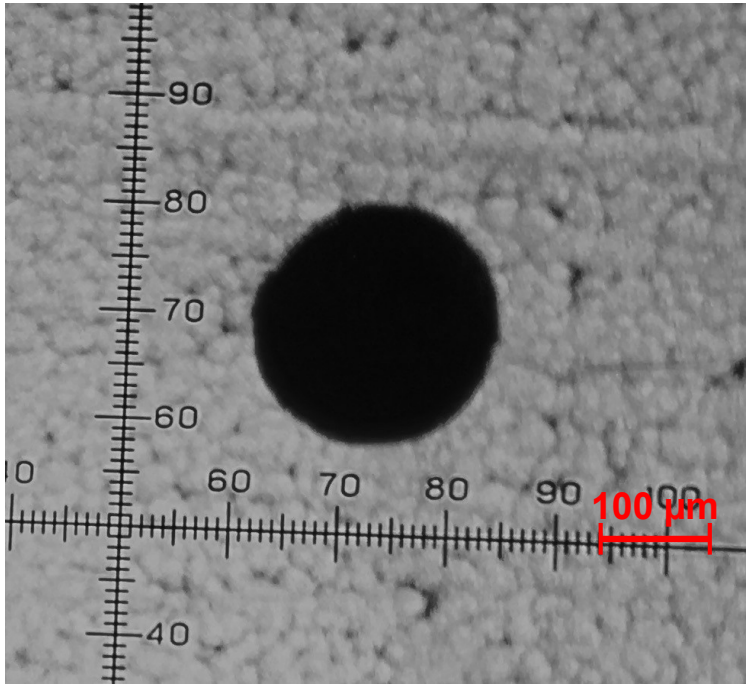
- correction of hole defects

Nickel iron alloy – 50 µm thick
(OLED mask applications)

*round hole **BEFORE correction***



*round hole **AFTER correction***



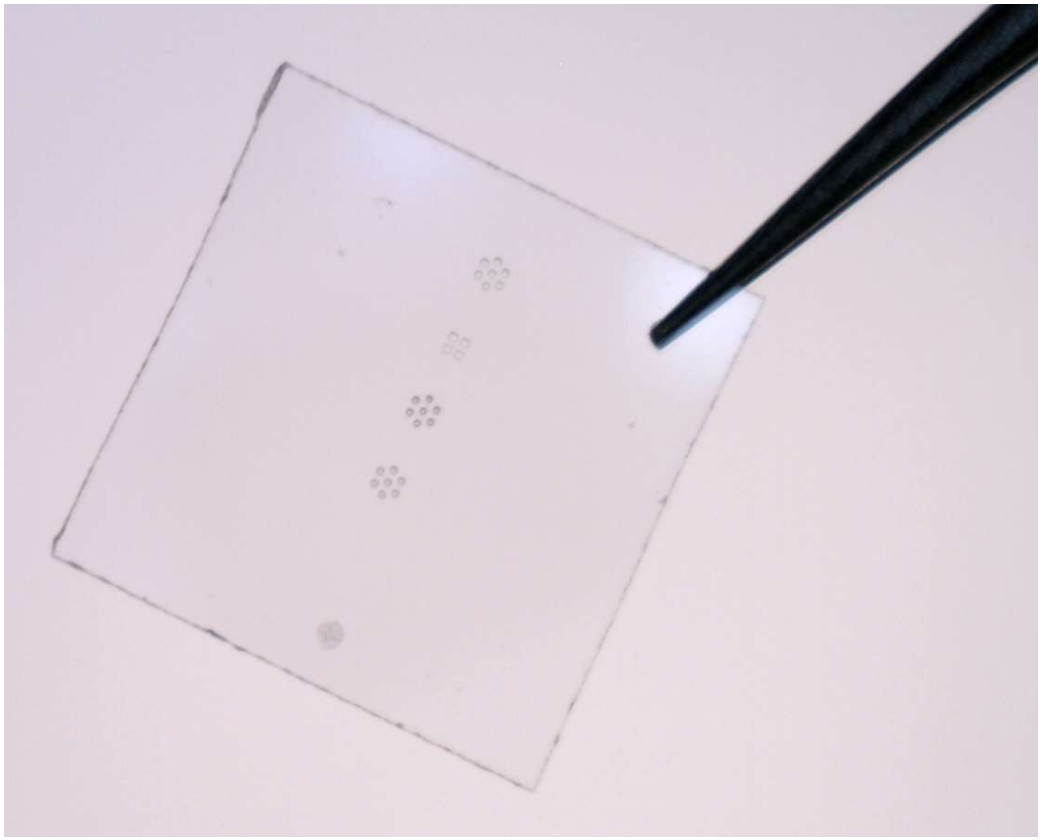
Wedge XF 532 nm

Micromachining & microprocessing

Micro-hole drilling

- blind or through holes

Glass slide – 120 µm thick



Wedge XF 532 nm

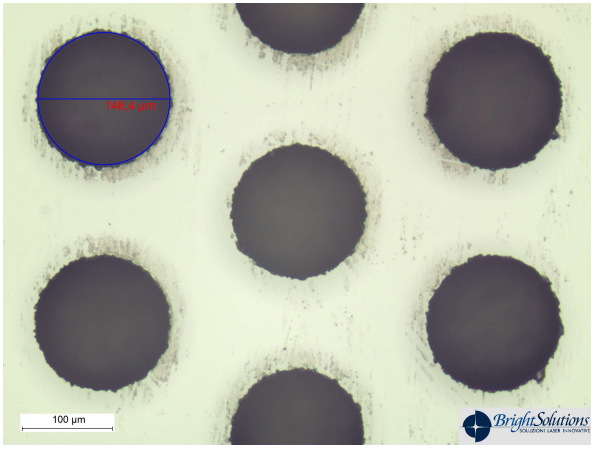
Micromachining & microprocessing

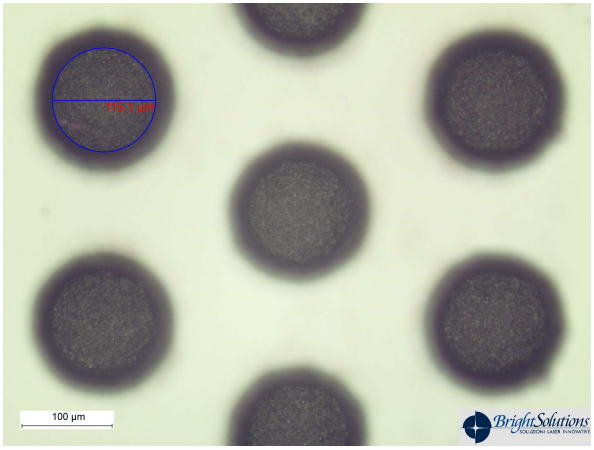
Micro-hole drilling

- blind or through holes

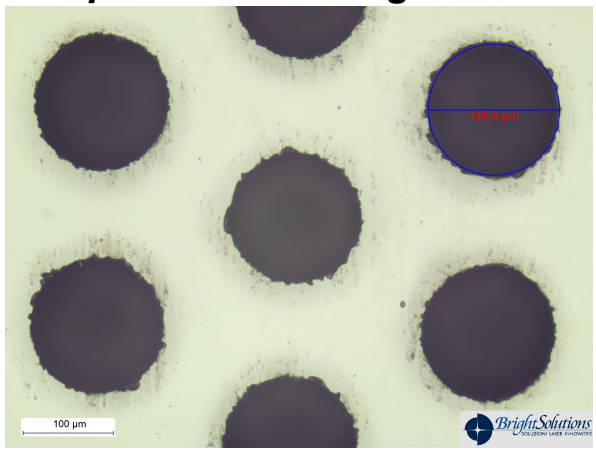
Glass slide – 120 µm thick

150 µm round blind holes

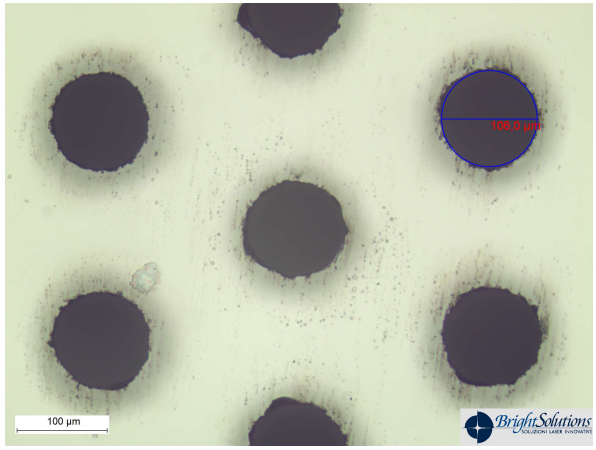




150 µm round through holes



entrance side



exit side

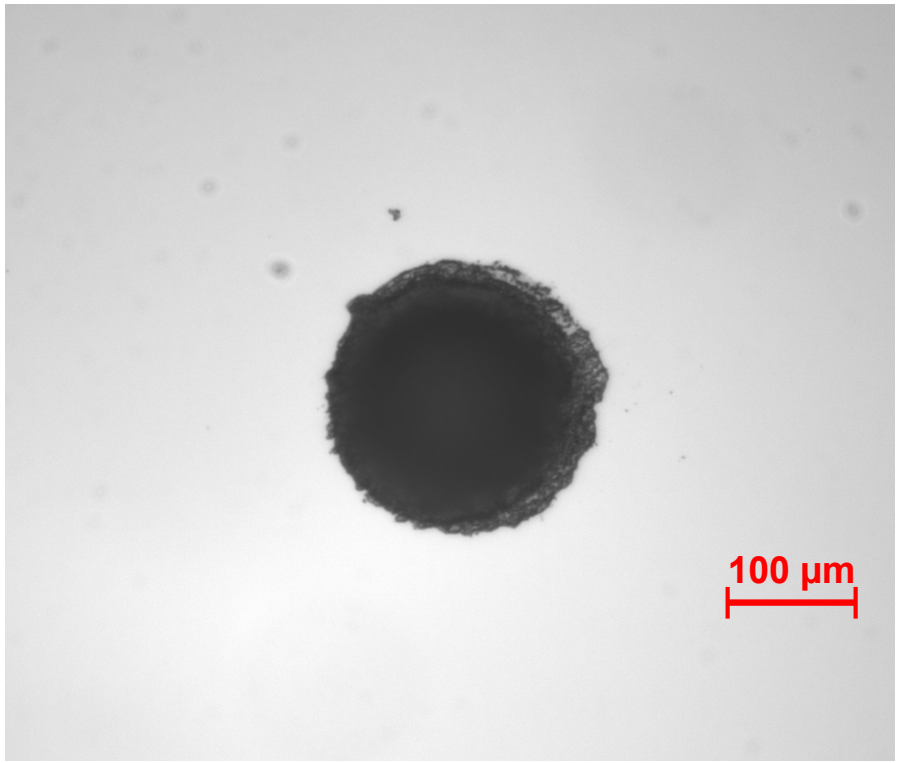
Wedge XF 532 nm

Micromachining & microprocessing

Micro-hole drilling

- blind or through holes

Lithium nitrite ceramic – 400 µm thick



round blind holes
entrance: ~80 µm
depth: ~100 µm

Wedge XF 532 nm

THANK YOU