

Dynamic Multibeam processing: new capabilities to deliver superior industrial microprocessing

Florent Thibault, CEO

- **2011: Founded**, pioneering multibeam laser technology application to material processing
- **2015: Introduced VULQ1**, the first industrial grade **OEM dynamic beam shaping system**
- **2021: Raised 1,3M€** to boost deployment of multibeam solutions into the market



#LWOP22AWARDS
WINNER OF THE
LASER SYSTEMS FOR INDUSTRIAL PRODUCTION ENGINEERING
QIOVA
VULQ1 Multibeam marking solutions

INNOVATION AWARD
LASER PHOTONICS
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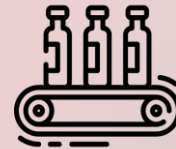
WORLD-OF-PHOTONICS.COM
26-29 APRIL 2022

Experts in high-throughput industrial laser material processing

We design and deliver innovative **high throughput laser processing solutions** to support **positive new product innovation** in the **industry of the future**

Applications

- **Laser Marking**
 - Individual product traceability
 - Anti-counterfeiting
- **Laser Micromachining**
 - Micro-drilling
 - Surface texturing



Sectors

- Luxe
- Industry
- Medical
- Automotive / Aeronautics

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Combined expertise to deliver unique solutions

Laser application service

Laser-matter interaction expertise

- ✘ *Faisability studies*
- ✘ *Process development*
- ✘ *Pre-series / Prototyping*



OEM product : VULQ1

*Patented
multibeam laser technology*

- ✘ *Design and manufacturing in our factory*
- ✘ *Standard offering*
- ✘ *Marking and micromaching lines*

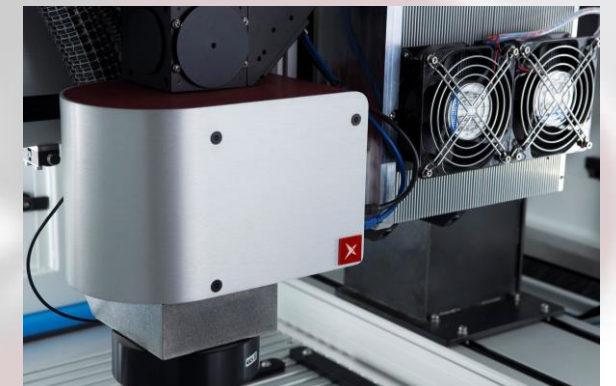


plastics

Laser solution integration

Customized to application

- ✘ *Autonomous laser processing system*
- ✘ *Includes specific software optimisation*
- ✘ *Retrofit/integration in std machine environment*



CONFIDENTIAL

Our innovation: VULQ1 Multibeam laser processing



- **VULQ1 patented Multibeam technology** allows to generate 10, 100 or 1000 laser beamlets on-demand, from one single laser beam.

Our innovation: Multibeam laser processing

VULQ1 allows to use 100 beams.....from one single laser



VULQ1 **patented Multibeam technology** allows to generate **10, 100 or 1000 laser beamlets** on-demand, from one single laser beam.

The beamlets are **independently controlled** by **software**, in a **dynamic** manner. They are applied **simultaneously** to the material, **scaling up process throughput without any compromise on quality**.

Throughput **x5 – x10**
Spatial resolution **< 50 μ m**

VULQ1 OEM / MICRO: Standard multibeam beam shaping system

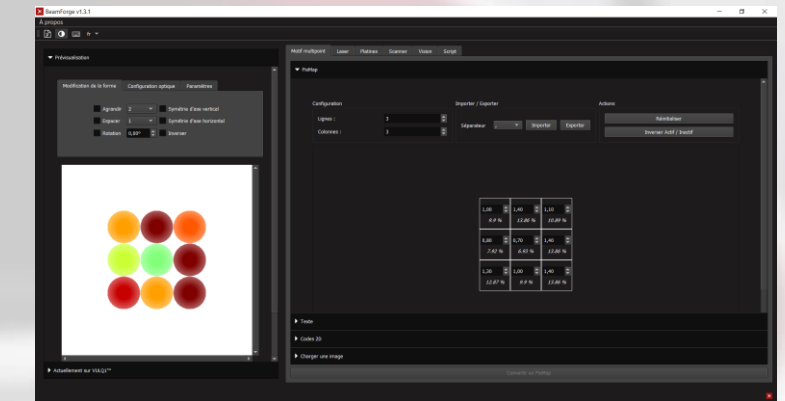
	Marking		Micromachining
	VIS-P050	NIR-P050	NIR-P100
Wavelength range	500-550nm	1000-1100nm	1000-1100nm
Max power	50W	50W	100W
Pulse duration	>1ns	>1ns	>500fs
Max energy	15mJ	30mJ	1mJ
Transmission	90%	90%	95%
Switching time	50ms	100ms	200ms
Spatial resolution (f100)	25µm	50µm	20µm



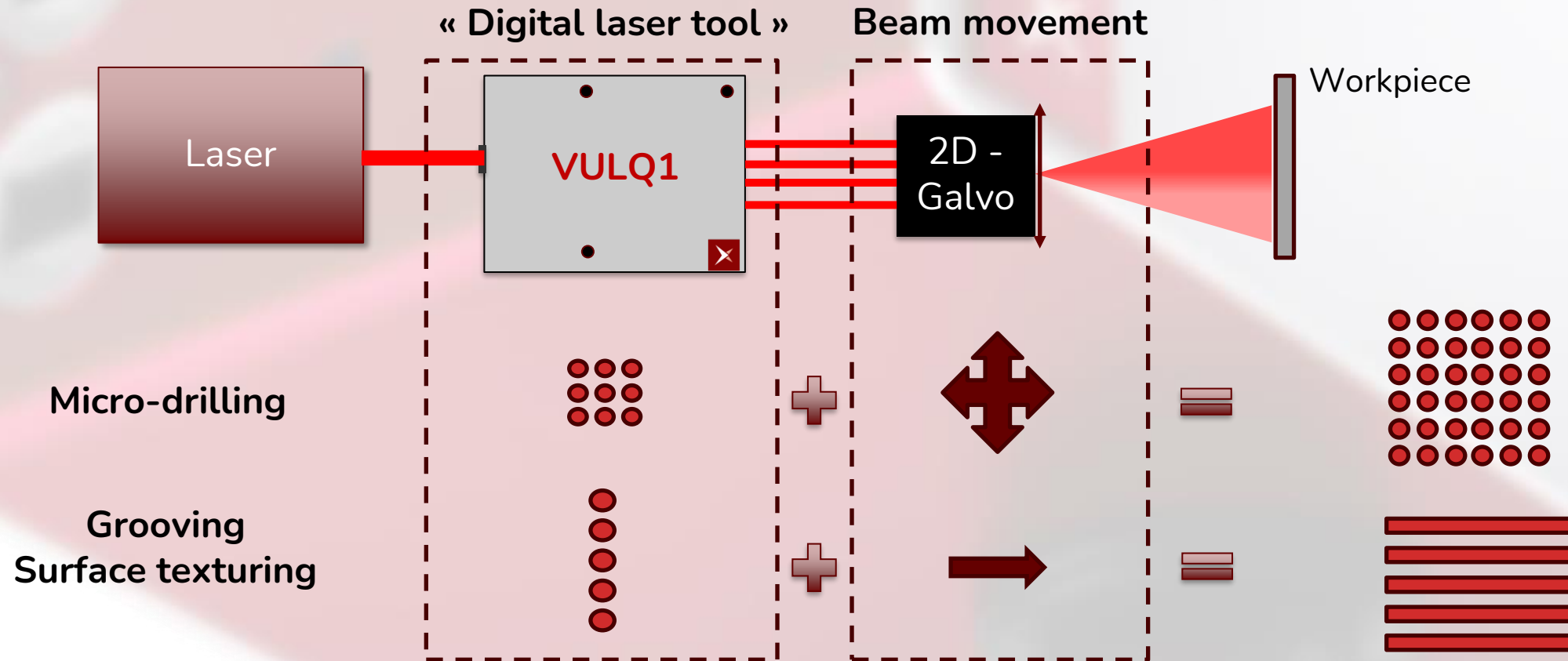
VULQ1 OEM line dedicated to industrial applications

Includes:

1. VULQhead: multibeam laser head
2. VULQontrol: 2U rack controller
3. Beamforge software: embeddable API
4. OEM service support strategy: hot swap



Dynamic multibeam processing: a flexible parallelization approach for superior micromachining performance

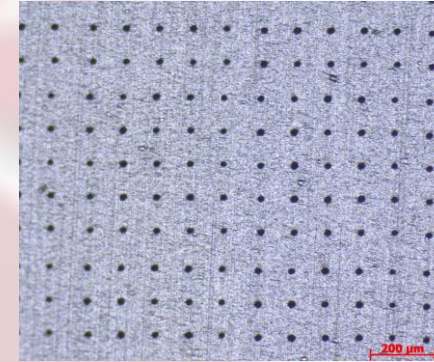


A breakthrough in laser manufacturing :

A dynamically configurable energy distribution = the « **DIGITAL LASER TOOL** »

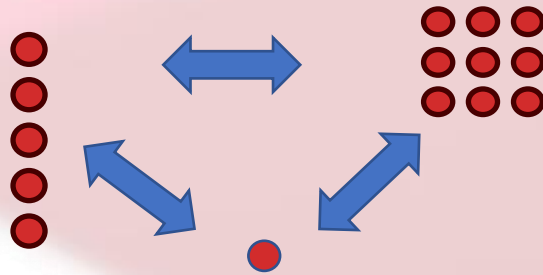
Dynamic multibeam processing enable new optimisation spaces

1. Multiply throughput with optimal quality



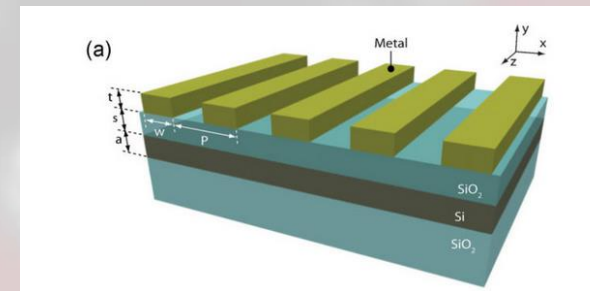
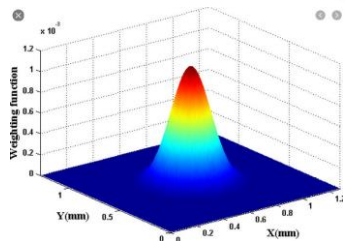
12500 holes/s in SS with
12,5W
20μm diameter holes
92% roundness

2. Adapt the digital laser tool to the process step



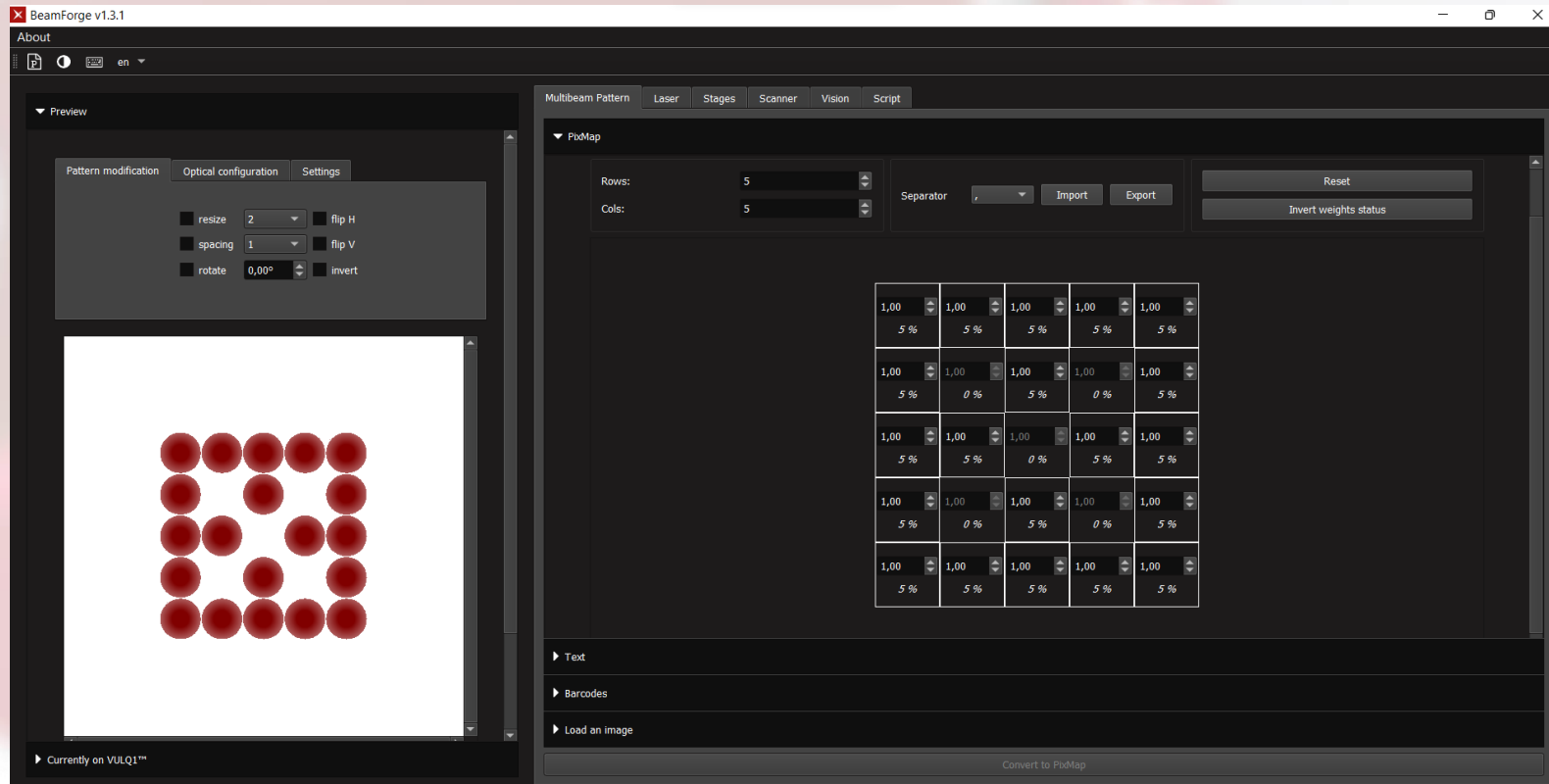
Same concept as on a CNC machine

3. Optimize the beam profile to the task



Square tool for square shape !

Create your own « laser digital tool » in a few clicks

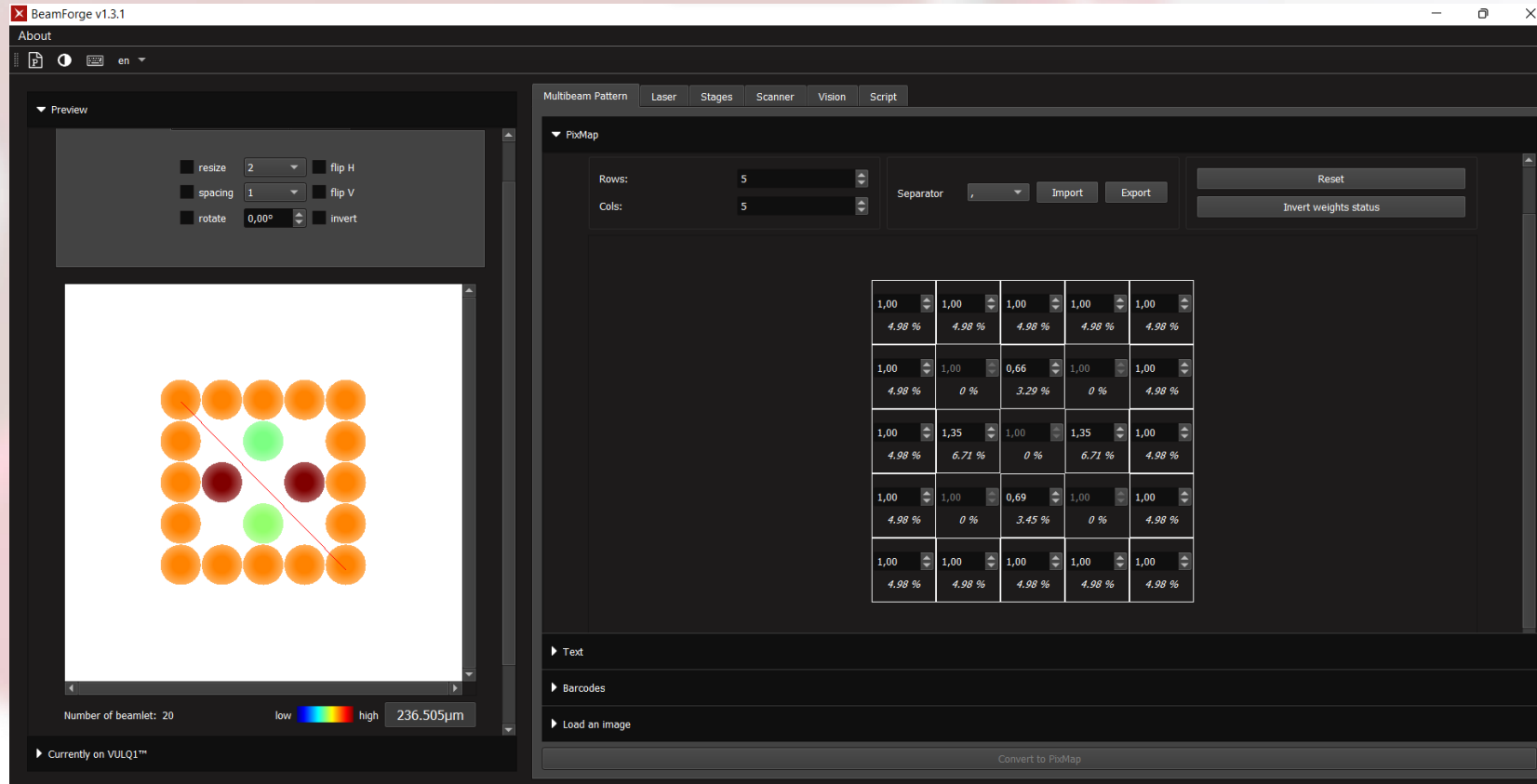


BeamForge PixMap
Interactive « digital laser
tool » generation

- ✦ Generate the virtual mask where the beamlets will be placed
- ✦ Configure globally: pitch, orientation, distance between spots
- ✦ Create the beam pattern for your application in a few clicks

Well done, you created your first « laser digital tool » in a couple minutes!

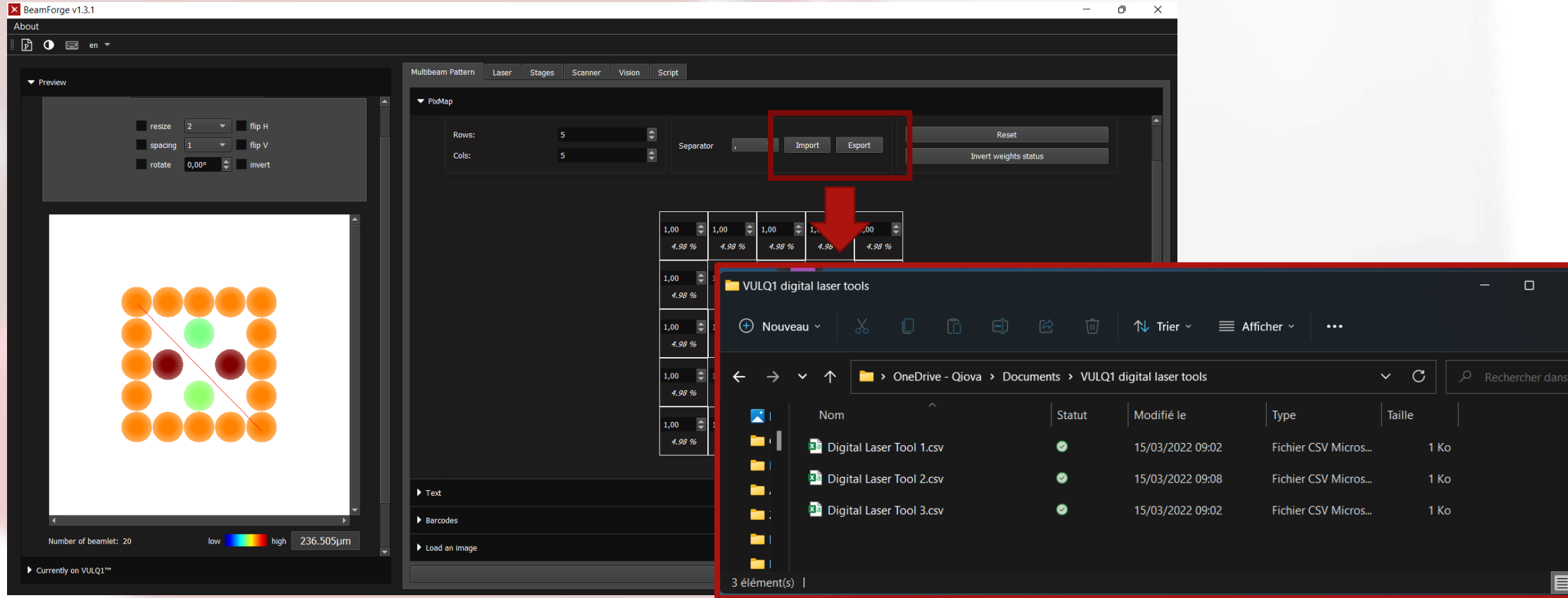
Fine tune your « digital laser tool » for your application



Fine tuning functions toolbox in BeamForge

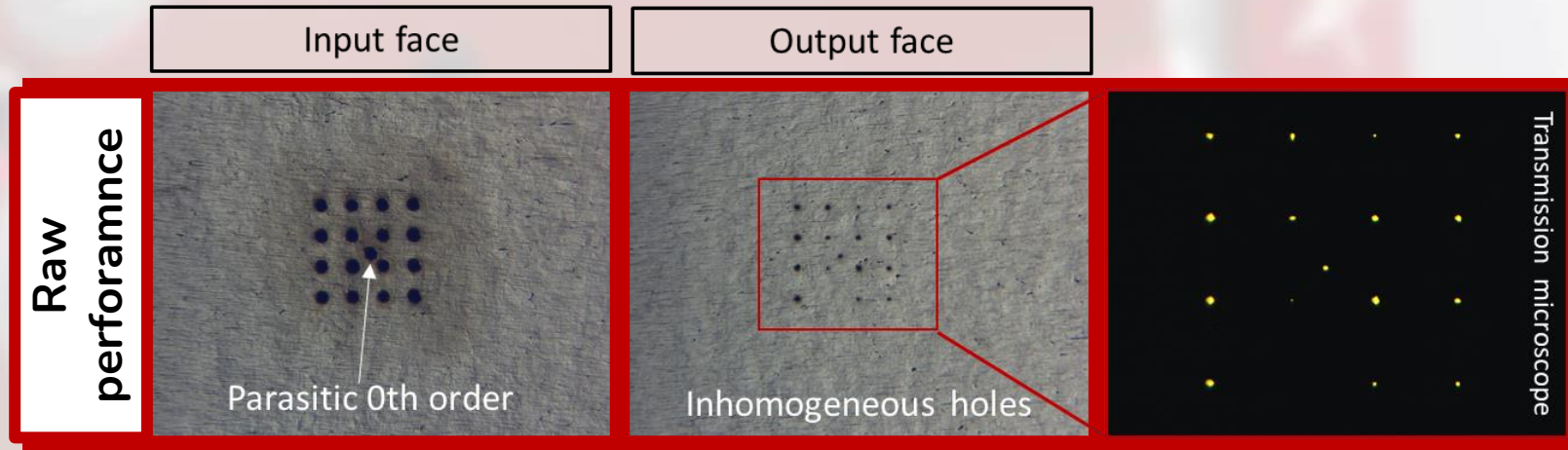
- ✦ Tune beamlets energy and spacing finely
- ✦ Manage central spot
- ✦ Optimize beam profile

Repeat to create your « digital laser tools » bank



- ✦ Once optimized, the laser tools can be stored in .csv and recalled at wish
 - ✦ Changing one tool to another takes ~100ms
- ✦ **You can now flexibly activate several digital laser tools with the same setup**

Fine tuning is essential for multibeam micromachining

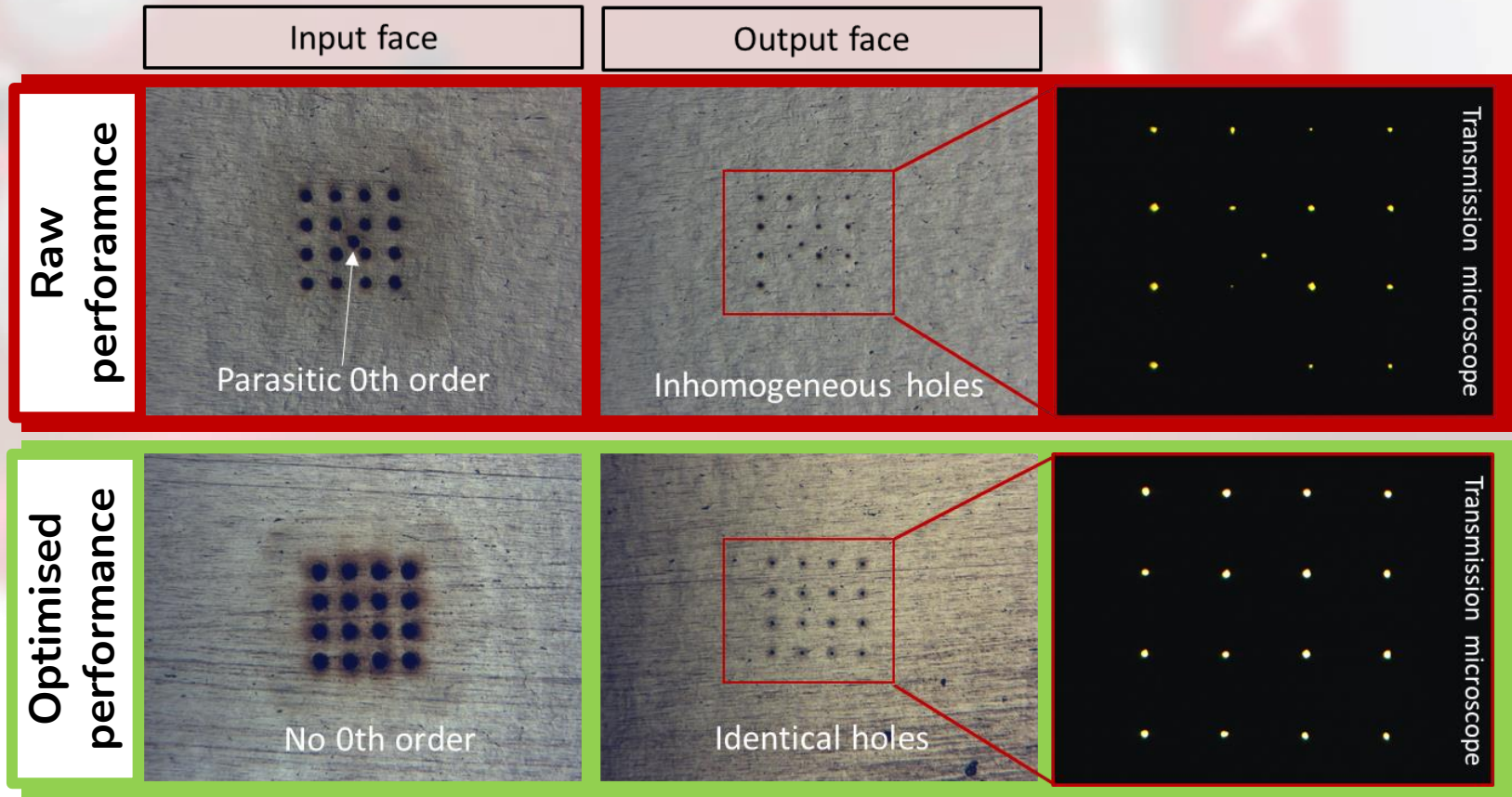


Parallel percussion drilling
50 μm Stainless Steel
Femtosecond IR

Usual process limitations in multibeam processing :

1. Parasitic 0th order \Leftrightarrow degraded processing quality
2. Uneven raw energy distribution \Leftrightarrow inhomogeneous processing

Fine tuning is essential for multibeam micromachining



Parallel percussion drilling
50 μ m Stainless Steel
Femtosecond IR

Fine tuning with software functions delivers optimal processing quality

High throughput precision micro-drilling in SS

MATERIAL:

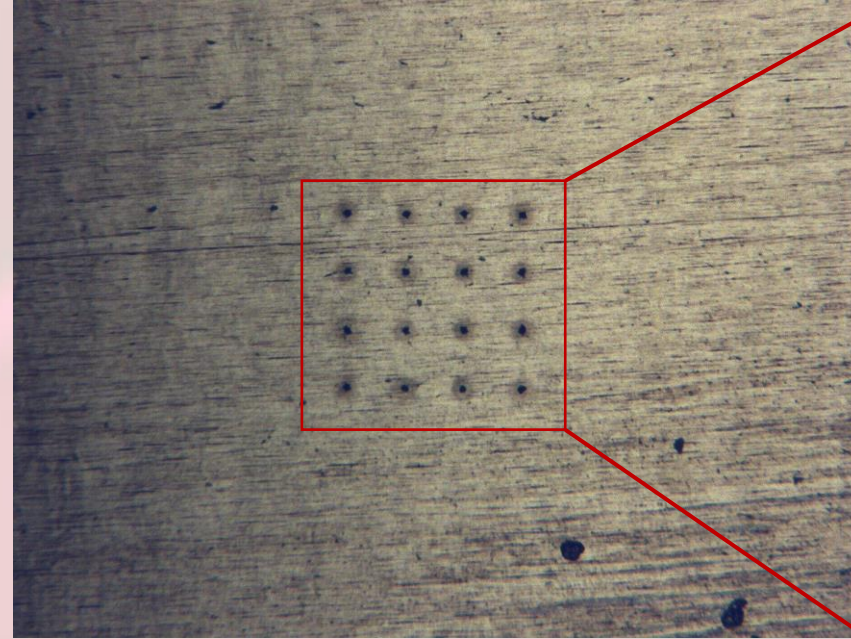
•Stainless steel

BEAM PATTERN:

•4x4 beam matrix

COST:

•<0,001€ for 1000 holes

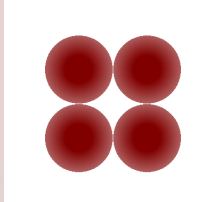


For Industry

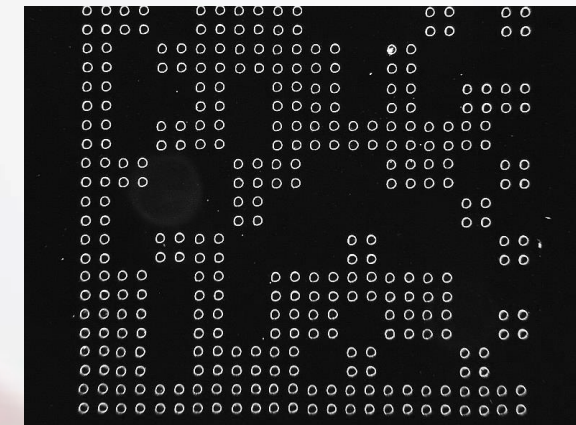
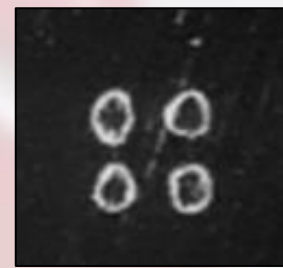
- Drilling throughput: 2500+ holes per second
- Drilling quality:
 - Holes diameter = $15\mu\text{m} \pm 1\mu\text{m}$
 - Holes roundness >90%

Beam profile control function: beam cleaning

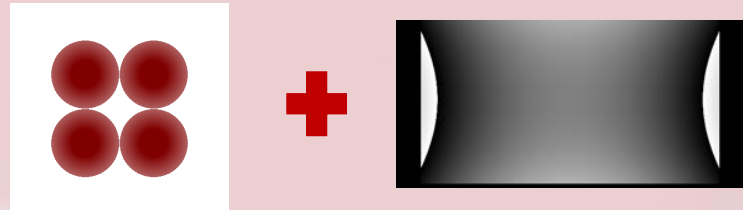
Without aberration control



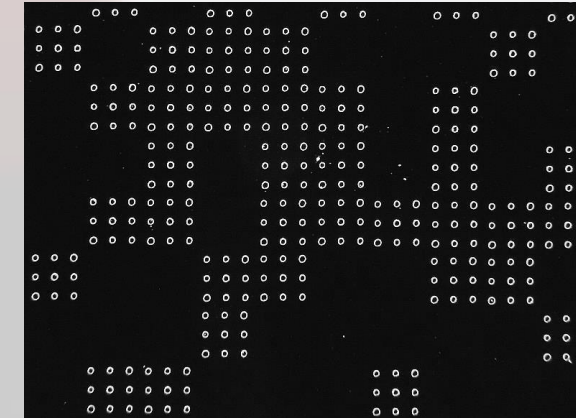
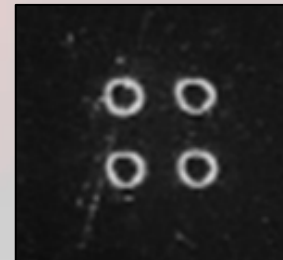
Beamforge software environment



With aberration control



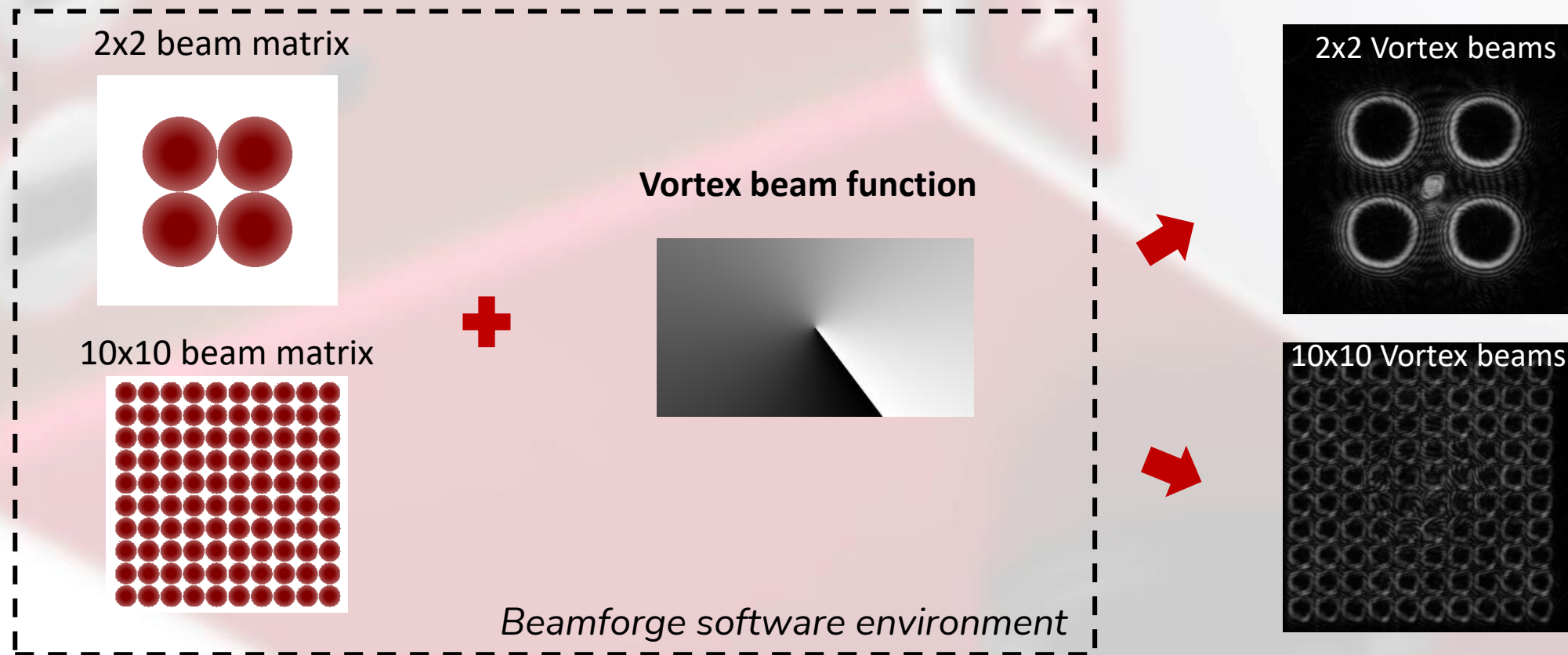
Beamforge software environment



GLASS MARKING APPLICATION

Dynamic compensation of beam aberrations ensures optimal processing conditions:
Static correction of optical line, laser beam quality evolution over time

Beam profile control function: Gaussian profile \rightarrow Vortex

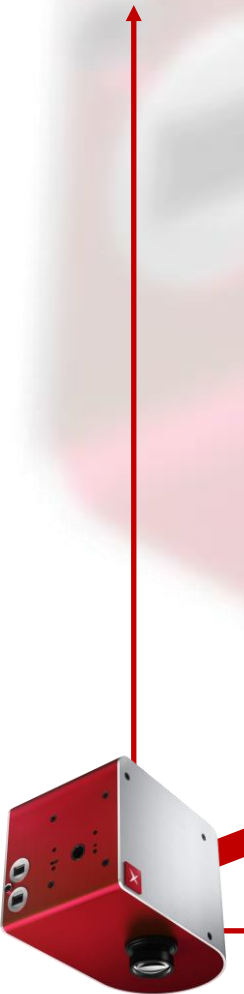


New beam profiles are managed as add-ons to the main software, like smartphone apps

- Development of toolbox of standard laser tools: flat-top, linebeam, Bessel,..
- Development of custom laser tool for OEM customer

Towards smart laser micromachining tools

Performance



Today



<10% additional investment = +400% productivity step

mic parallelization
 convergence and stabilization
 laser tools toolbox
 the learning applied to process result

Tomorrow

What can we do for each others?

EPIC community ↔ QIOVA

- Early-adopters and technical partners
- Co-develop new application cases for multibeam microprocessing
- Get privileged access to new multibeam solutions development



Any question, simply pick your preferred channel!

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