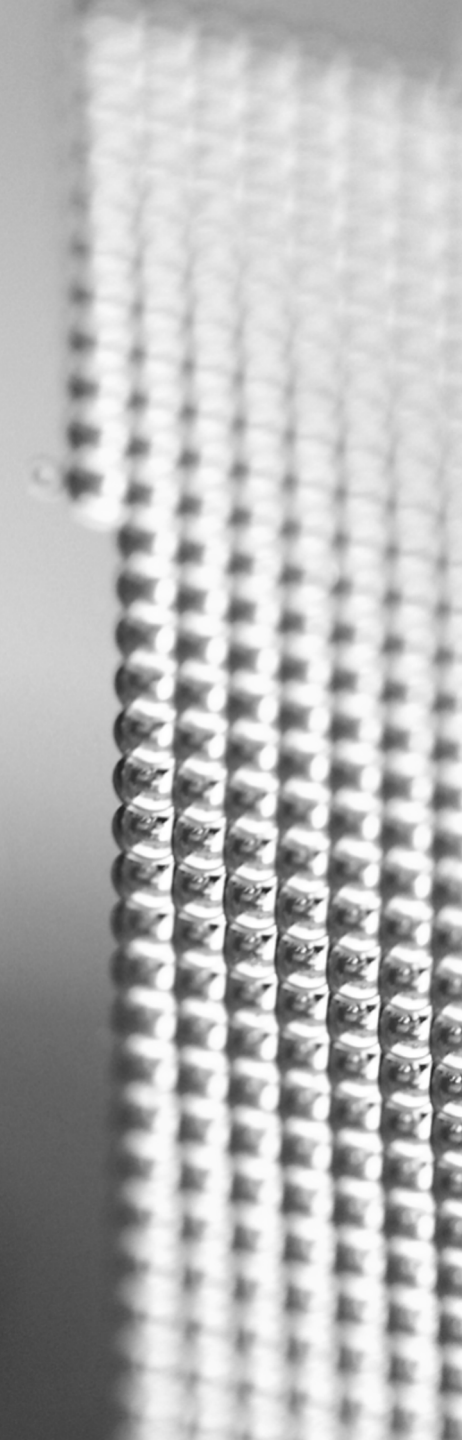


DPI - ON AXIS DIAMOND TURNING OF FULL 8" MASTERS

Marc Wielandts - CEO

EPIC Meeting on Advanced Microoptics at Nanoscribe - May 2022



COMPANY INTRODUCTION



Start

Incorporated in 2013.
100% Family owned.



Location

Located in Liège (Belgium)



R&D

Innovative technologies for
lens array manufacturing
DPI® & HiFi Optics®



Team

Highly skilled engineers
and technicians



Equipment

SoA UP Machining,
Prototyping, Metrology

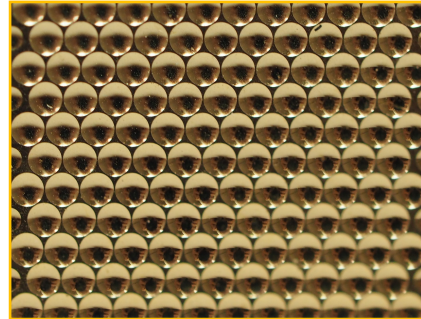


Customers

> 40 customers worldwide

ULTRA PRECISION MANUFACTURING SERVICES

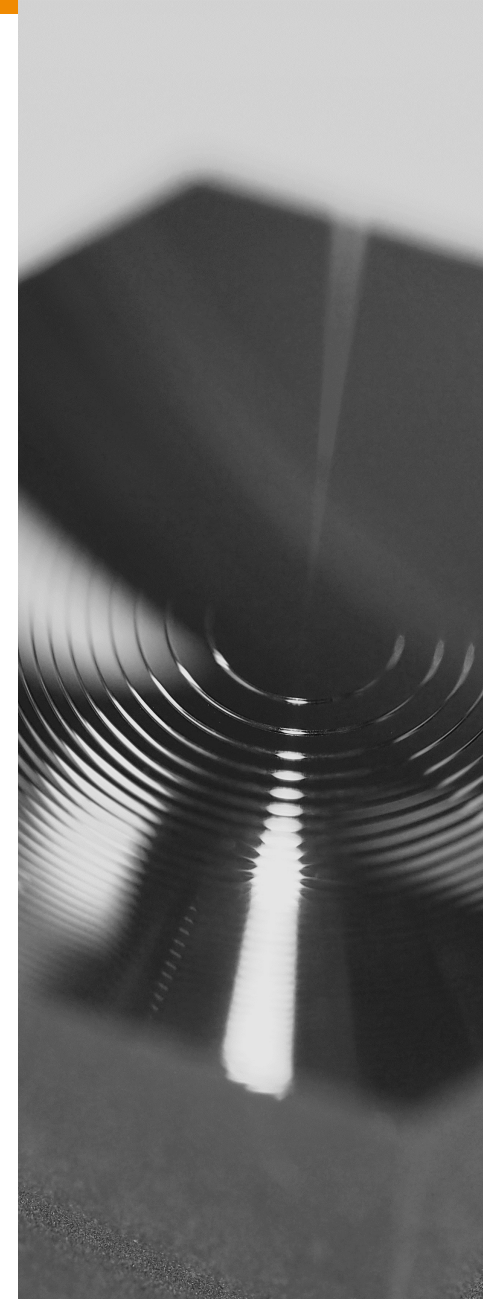
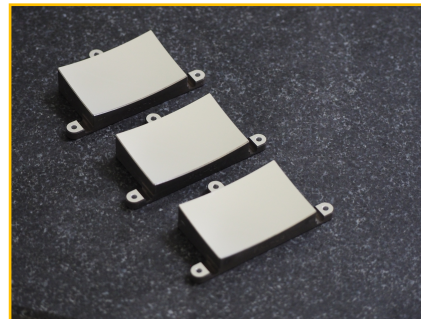
DPI® Lens array
masters / inserts



HiFi Optics®
Full plastic optics prototyping



SPDT Services



MARKET SEGMENTS AND REQUIREMENTS FOR MASTERS

Market segments:

- MLA sensors for mobile applications, LiDAR, diffusers, ...
- Automotive MLA headlights, carpet projectors,...
- Micro camera lenses for photography, AR, life sciences...
- Lighting structures

Application requirements for masters:

- Mass production by UV Imprint replication (WLO, R2R, R2P) & ICM
- Very tight specifications on asphere & freeform shapes, roughness, form accuracy, uniform quality, ...
- High sags, high slopes, 100% fill factor
- Up to Fully populated 8" masters (optimized use of replication area)



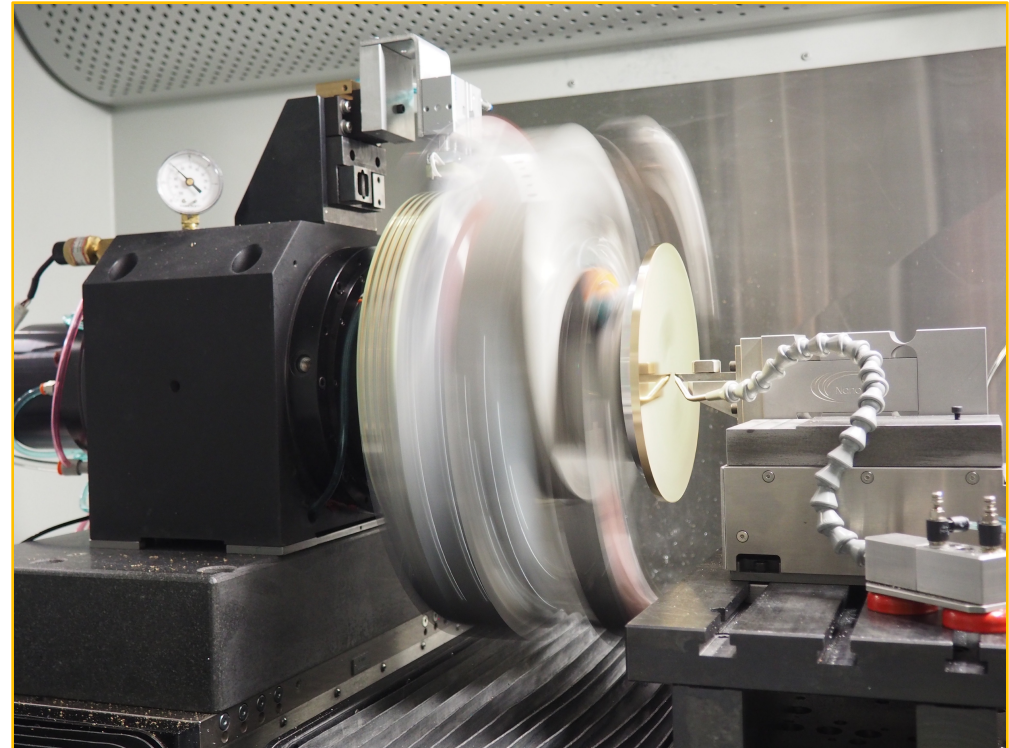
DPI® TECHNOLOGY

Dynamic Part Indexing (DPI®) is:

- A patented technology 100% developed and owned by Wielandts UPMT
- Dynamically offset the part wrt the work-spindle in a balanced manner using eccentric rotary movements
- Sequentially 2/3-axis Single Point Diamond Turning of each lens on the workspindle axis
 - ➔ best, repeatable form and roughness
 - Roughness: 2 nm (NiP)
 - Form irregularity: 100 nm p-v
- Up to 8" masters with highest position accuracy:
 - Lens to lens: < 1 μm ,
 - MLA to MLA: < 1 μm

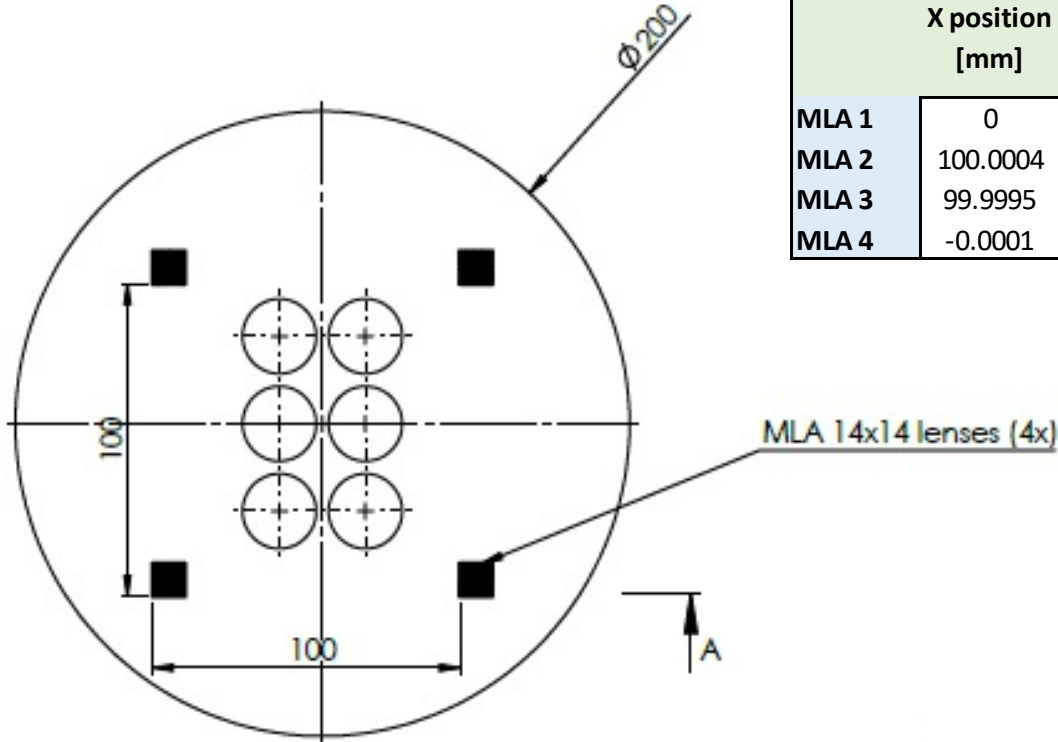
Optical design freedom:

- Aspheres, mild freeforms, diffractive structures ...
 - Feature size: > 10 μm
 - Lens sag: < 10 mm
 - Edge slopes: < 80° (limited by tool clearance)
 - 100 % fill factor
 - Each lens can have a different optical definition !
- Alignment fuducials, reference surfaces, ...



CLAP™ SUBMICRON ALIGNMENT

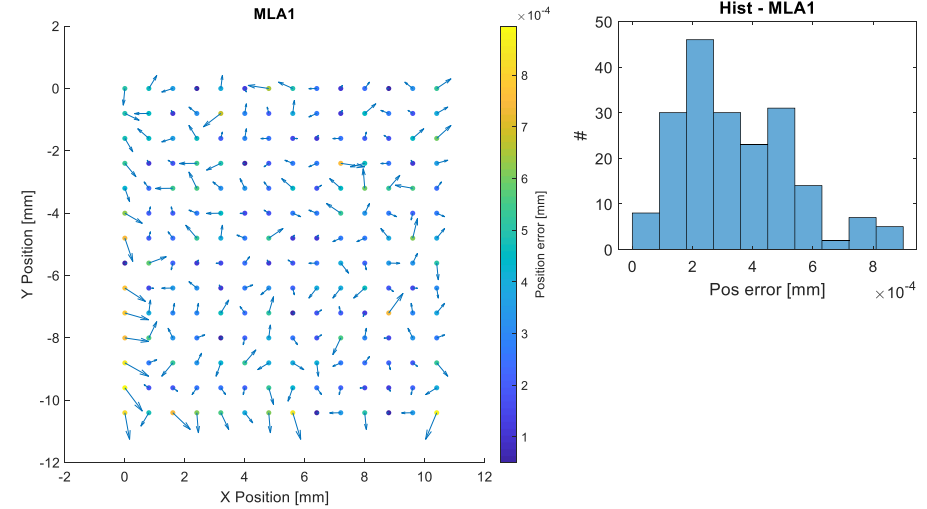
CLAP™ is an alignment process designed to improve the DPI® position accuracy of each element of the master during the entire process.



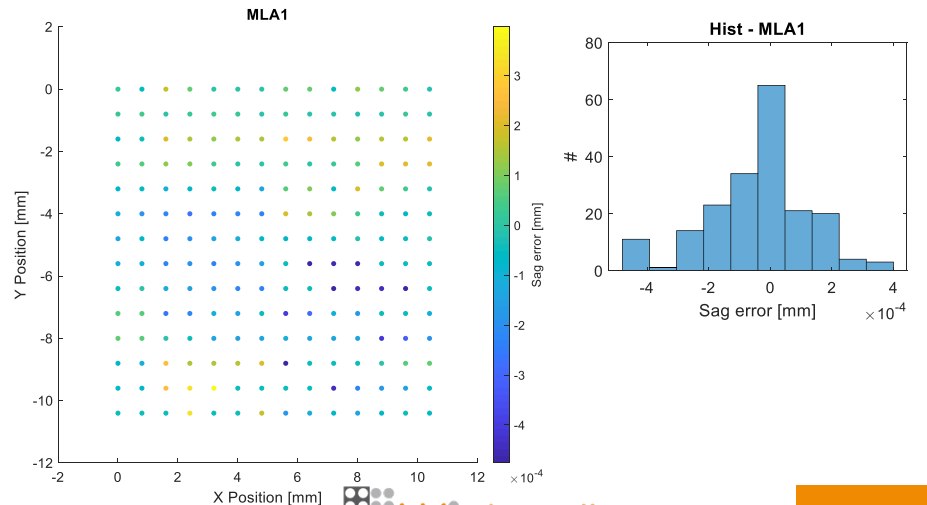
Typical MLA to MLA Position errors

	X position [mm]	Y position [mm]	Position error [mm]
MLA 1	0	0	0
MLA 2	100.0004	-0.0005	0.00064
MLA 3	99.9995	99.9999	0.00051
MLA 4	-0.0001	-100.0002	0.00022

Typical XY Position errors

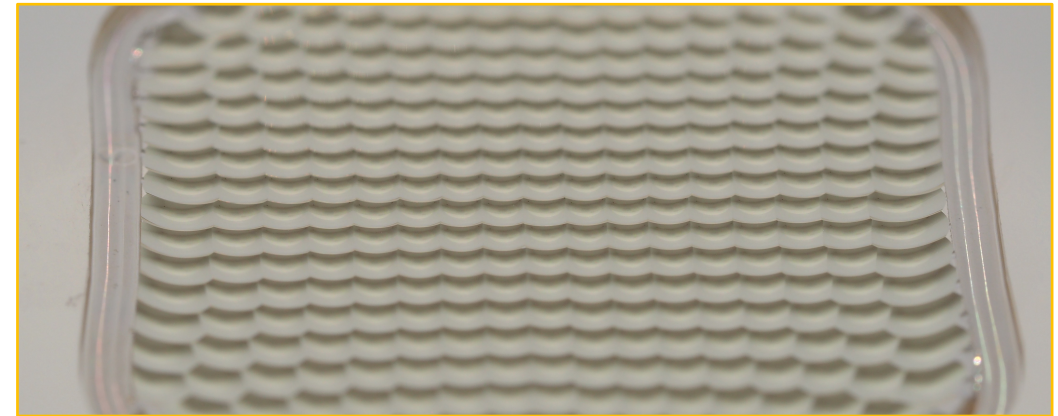
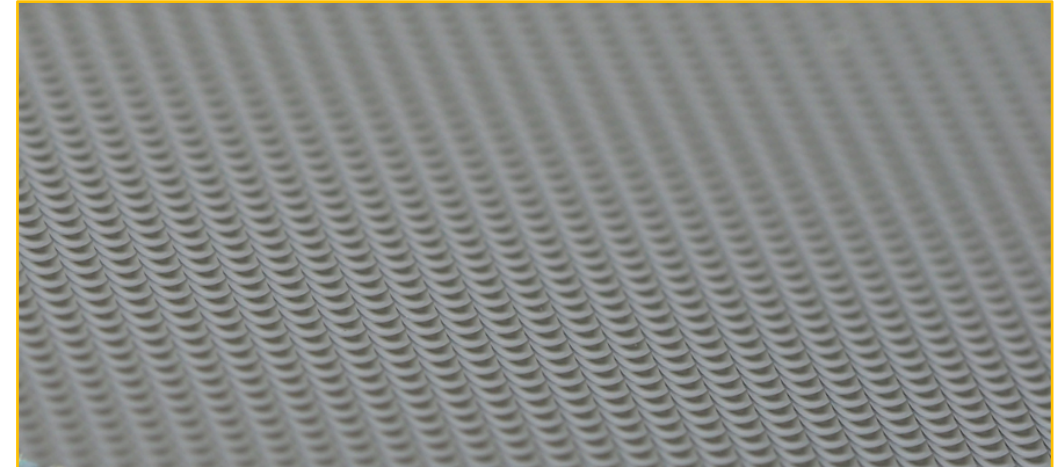


Typical Sag errors

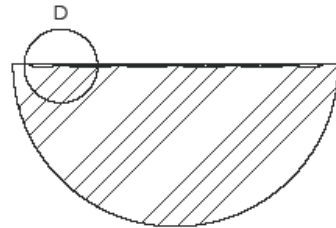
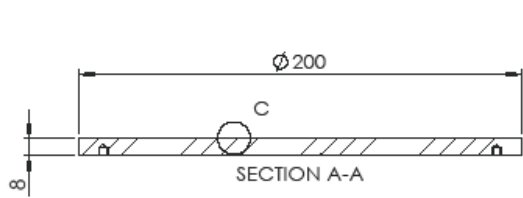


EXAMPLES OF DPI® MASTER STRUCTURES

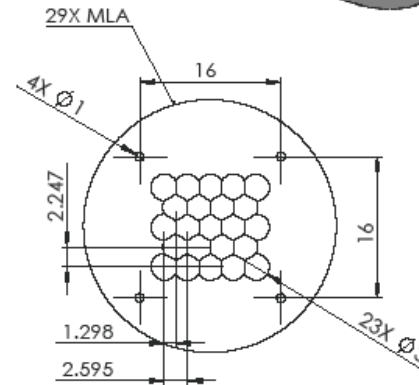
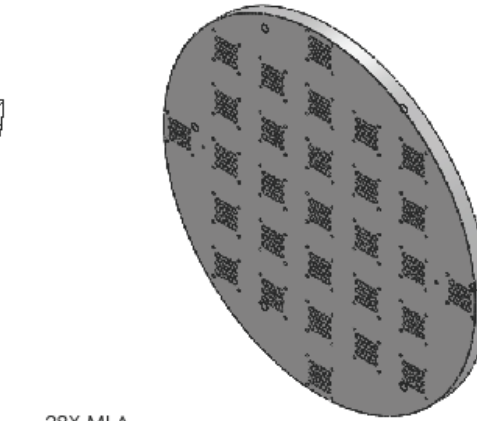
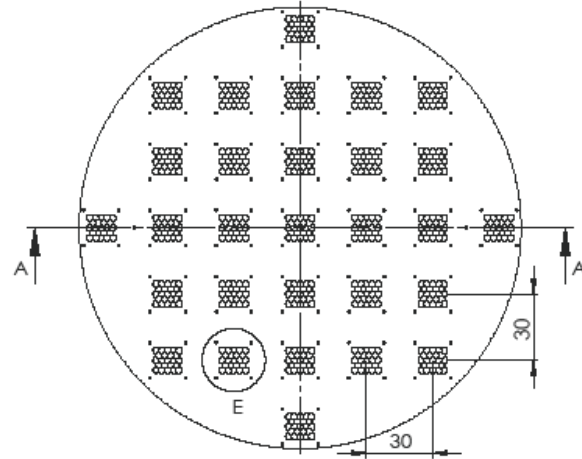
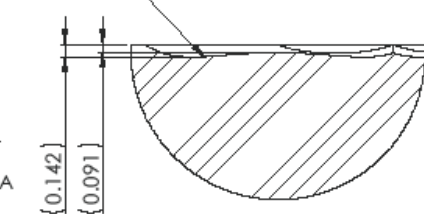
Substrate material	NiP	NiP
Shapes	Aspheres	Freeform, all lenses different
Feature sizes	0.7 mm	3mm
Lens sag	200 µm	500 µm
Form irregularity	200 nm p-v	300 nm p-v
Ra roughness	3 nm	3 nm
Edge slopes	50°	25°
100% fill factor	Yes	Yes
Position accuracy	Lens to lens: < 1 µm	Lens to lens: < 1 µm
Number of lenses	> 10.000	300



EXAMPLE OF A FULLY POPULATED DPI® MASTER

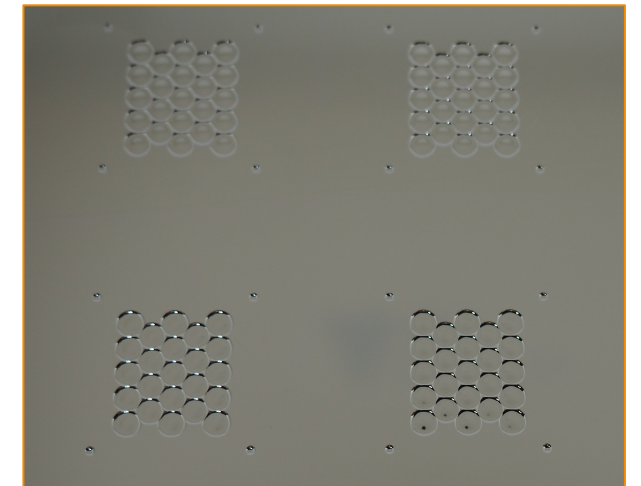


Aspheric lens
 $R=\text{inf.}$
 $A2=-0.1$
 $A4=0.04$
 $A6=0.01$



DETAIL E

SCALE 2 : 1



TECHNOLOGY STATUS & COLLABORATION ITEMS

DPI® status :

- V2: industrialised
- with CLAP™ : now validated for 8 inch
- **Ready for your applications !**

Ongoing development – collaborations wished:

- Strong freeforms & non machinable surfaces
- Inverting to 100% fill factor convex structures
- Cleaning
- Coating
- Dicing

*We thank You for your attention
& are looking to collaborate !*

Phabulous

New address !

WIELANDTS UPMT sa
36, Rue Louis Plescia
4102 Seraing, Belgium
+32 4 378 03 20
info@upmt.be
www.upmt.be

marc.wielandts@upmt.be
+32 499 37 65 33