



## Ultra-precision MLA masters using DPI™ on-axis diamond turning technology

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EPIC Meeting on Wafer Level Optics at Süss MicroOptics, November 2019

Marc Wielandts, CEO - WIELANDTS UPMT sa



## Start

Incorporated in 2013.  
100% Family owned.



## Location

Located in Liège (Belgium)



## R&D

Innovative technologies for  
lens array manufacturing  
**DPI™ & HiFi Optics™**



## Team

7 highly skilled engineers  
and technicians



## Services

UPM services using DPI™  
technology



## Customers

> 30 customers worldwide

### Market segments:

- MLA sensors for mobile applications
- Automotive MLA headlights/carpets
- Wafer level CCM optics
- ...

### Application needs for masters:

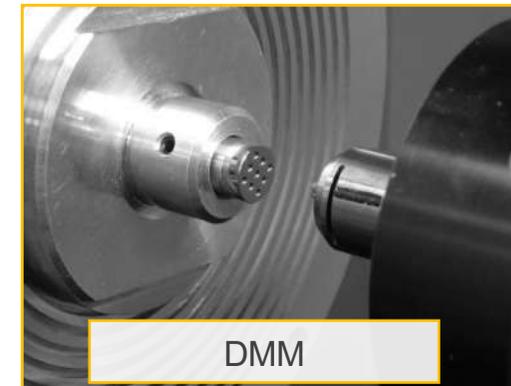
- Tight specifications on shapes, rugosity, form accuracy, ...
- All lenses identical
- Short delivery time
- Masters should be as perfect as possible



Dynamic Part Indexing (DPI™) is:

- Sequentially 2/3-axis turning of each lens of an array on the workspindle axis for best form and roughness
- Dynamically offset the part wrt the work-spindle in a balanced manner using eccentric rotary movements
- All lenses machined on same on axis position => identical !

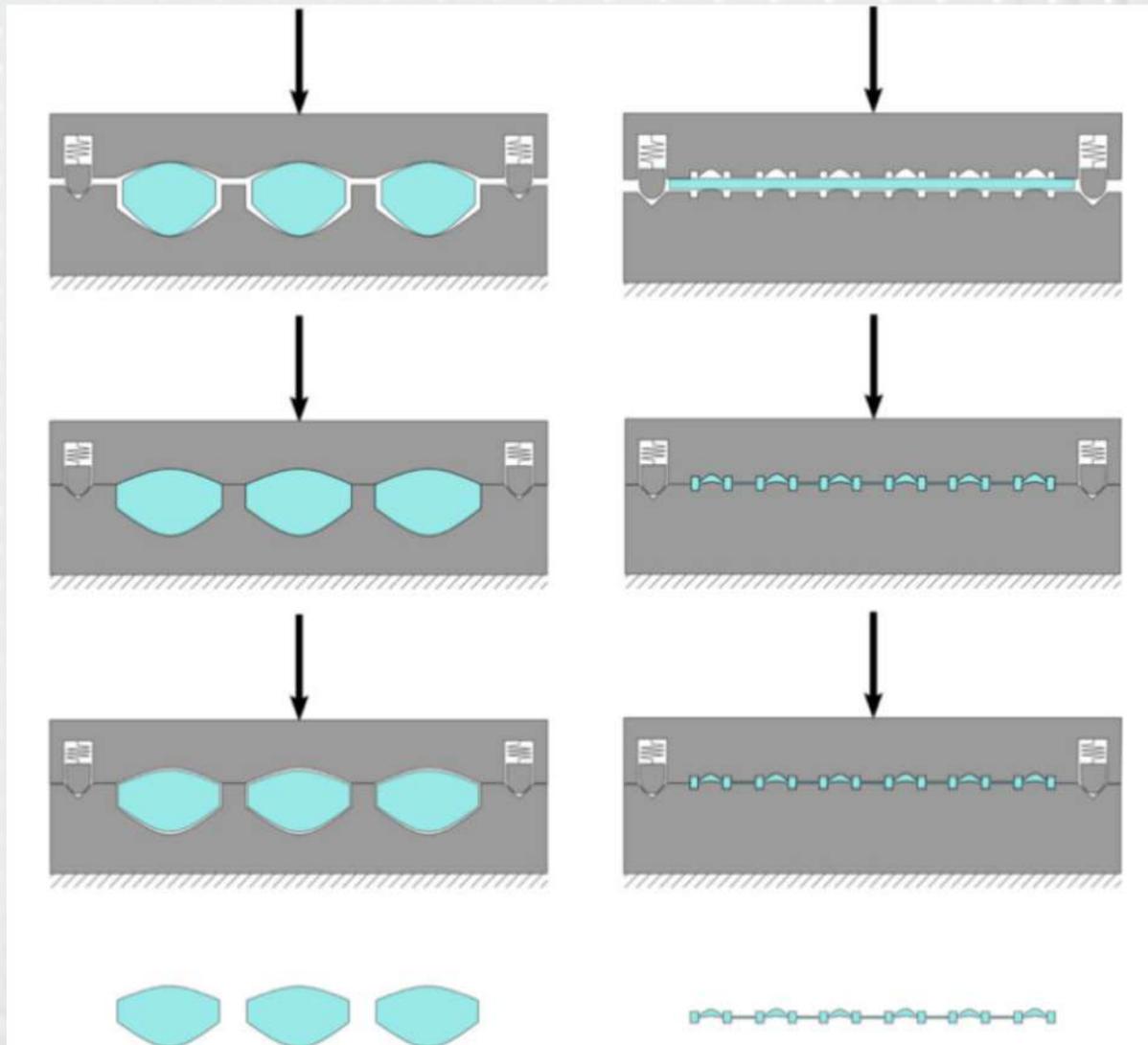
But: could be all different (freeform) to compensate for replication repeatable errors.



Values from our knowledge before Phabulous project !	DPI™ On-axis Diamond Turning	Lithography	Laser Ablation
Form irregularity	100 nm p-v	300 nm p-v	> 1 µm p-v
Ra roughness	2 nm	20 - 40 nm	100 - 200 nm
Shapes	Aspheres/ freeforms with some degree of rotation symmetry (astigmats, saddle, golf ball)	Reflow: spheres Gray scale: freeforms	Freeforms
Optical feature sizes	> 30 µm (XY), sag (Z) > 5 µm	Sag (Z) < 60 µm – 100 µm	Sag (Z) < 200 µm
Edge slopes	< 75°	< 90°	90°
Diffractive structures	Yes (Fresnel)	Reflow: no Gray scale: yes multi-level	Yes
100% fill factor	Concave: yes Convex: by inverted copy	Reflow: no Gray scale: yes	Yes
Position accuracy	1 - 2 µm	< 1 µm	1 µm

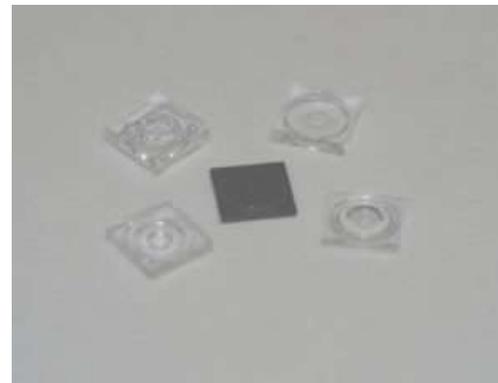
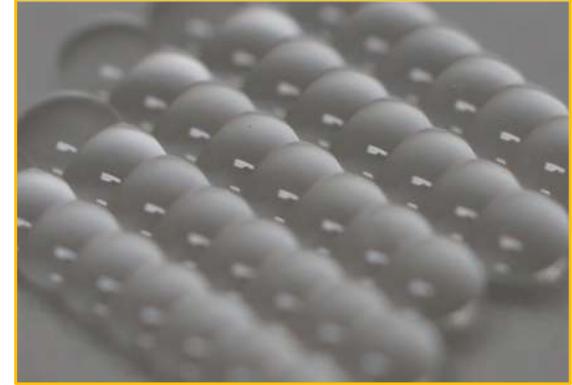
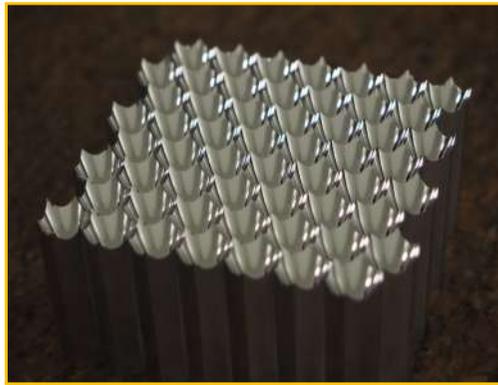
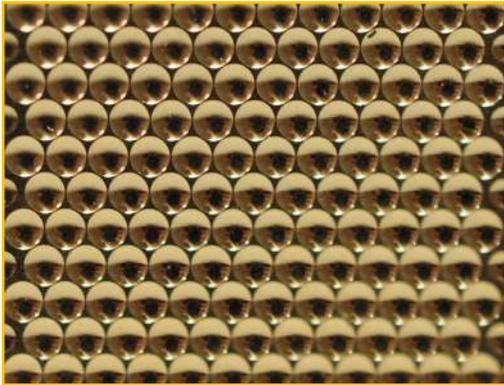
HiFi Optics - S

HiFi Optics -W



- Lens-to-lens positioning  $< 1 \mu\text{m}$
- Long term deviation closed loop control
- Strong and high spatial frequency freeform lens arrays (Phabulous)
- HiFi Optics™ isothermal compression molding
  - Convex MLA masters with 100% fill factor
  - Double sided thin, high-aspect ratio lens wafers
  - Materials and coatings
- Machining of monolithic hard material multi-cavity molds

## Innovative Technologies for your Lens Array Manufacturing



Are you involved in developments  
for next-generation optics and  
facing mastering or replication  
technology limitations ?

⇒ Please contact us

Marc Wielandts – CEO

[marc.wielandts@upmt.be](mailto:marc.wielandts@upmt.be)

+32.499.37.65.33

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