PowerPhotonic
Enhancing Beam Performance

A proud member of
Phabulous

Enhancing beam performance for life sciences instrumentation

Micro-optics summit and expo

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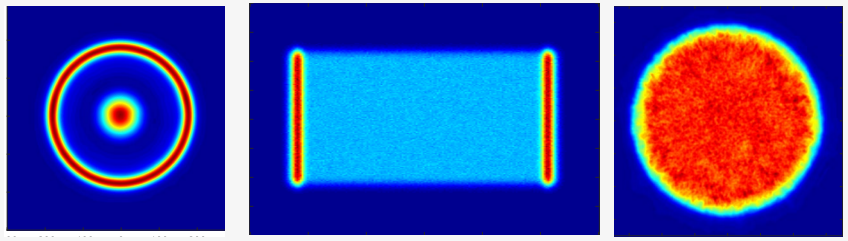
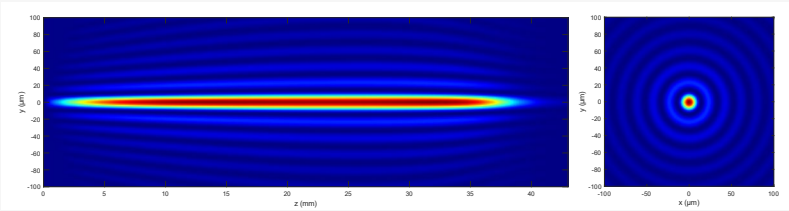
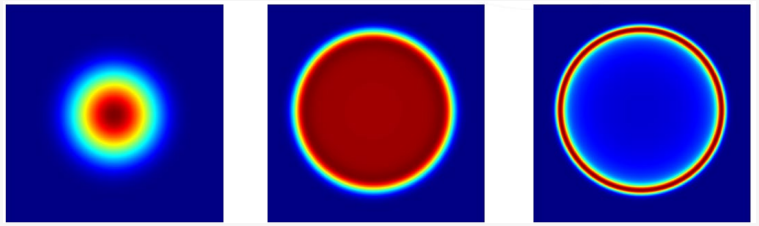
Single- and Multi-Mode Beamshapers



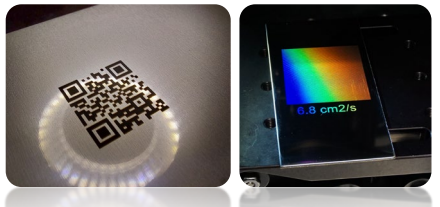
3D Beamshapers



Variable Beamshapers



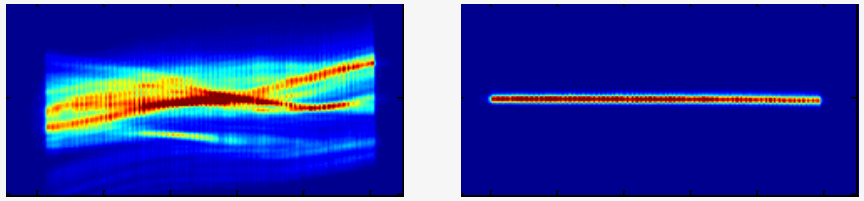
Beam Shaping – enhancing laser applications



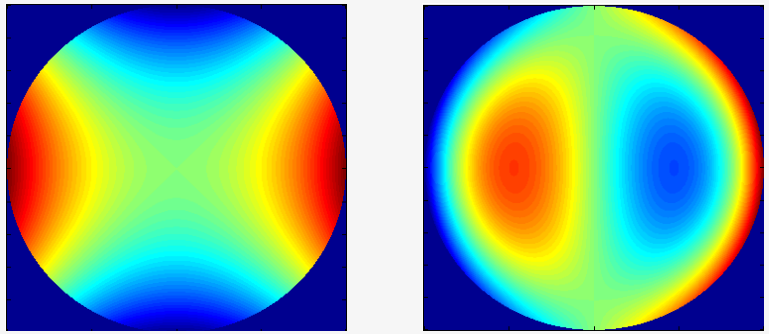
Fluence .technology

- Life sciences instrumentation
- Laser Projection
- Directed Energy systems
- Macro materials processing to >15kW
- Micro materials processing CW-ns-ps-fs

Collimation error correction



Aberration correction



Beam Correction – delivering performance edge

- Correcting & shaping diode laser array for diode pumping
- Aberration correction in life sciences instrumentation

Freeform design turning **ideas** to **products** using direct-write fabrication

Freeform = design freedom

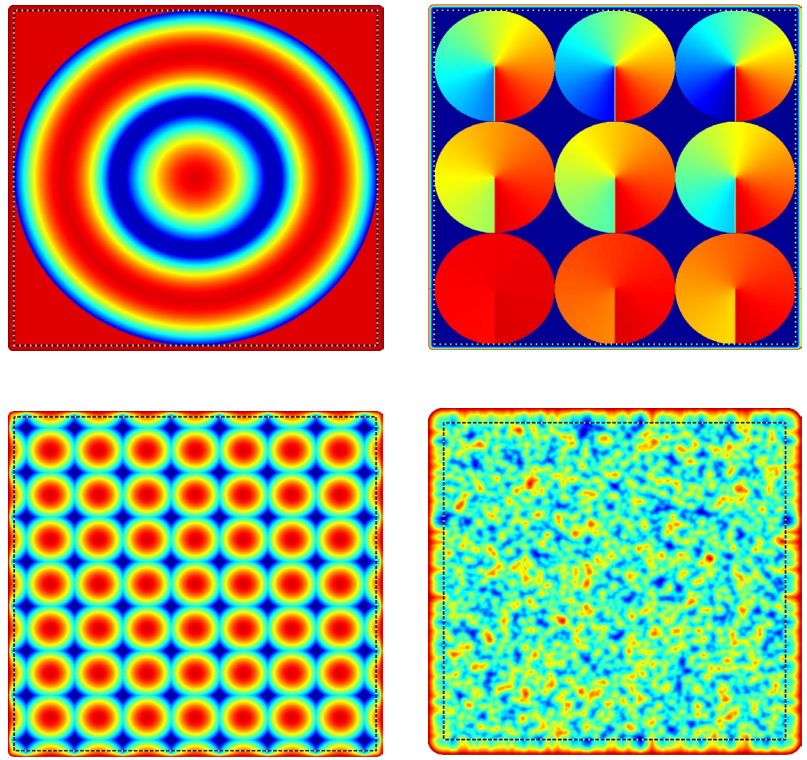
- No symmetry constraints
- Realise complex optical designs
- Wide range of functionality

Direct-write = flexibility

- No masks, no moulds
- Trial, iterate and optimise design
- Prototype to volume in one process

Laser-polished fused silica optics:

- Low roughness ,**~1nm**
- High transmission efficiency, **>99%**
- High power handling



Origination for Phabulous pilot line

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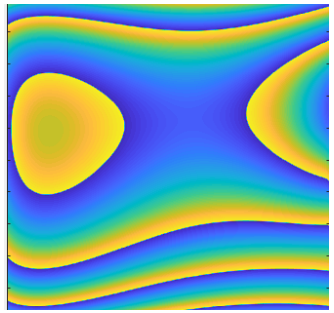
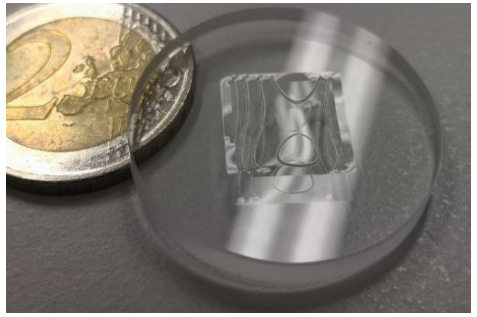
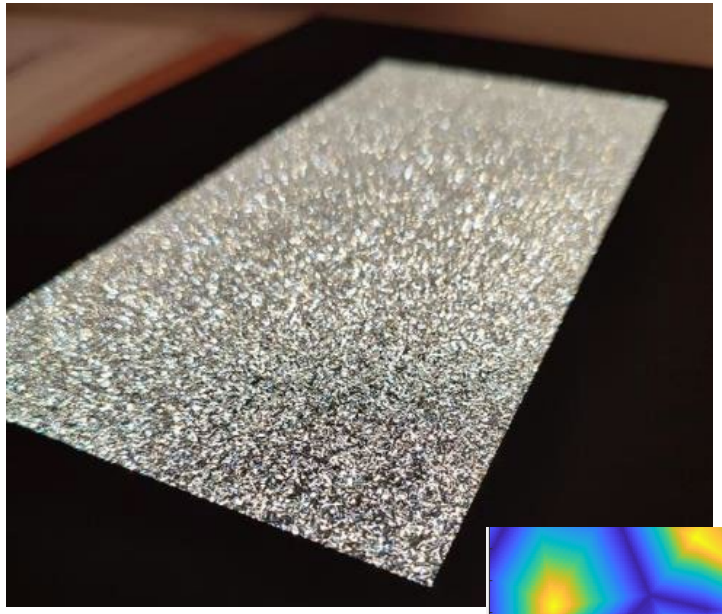
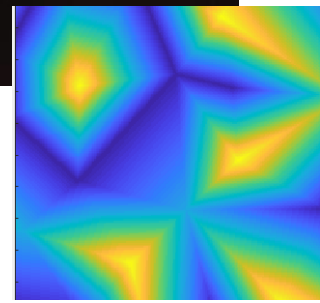
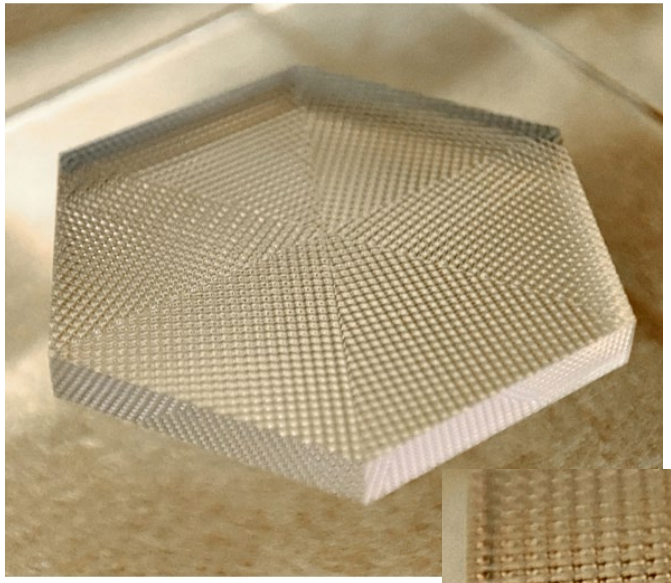


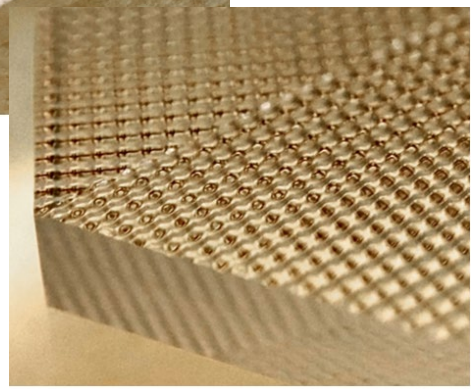


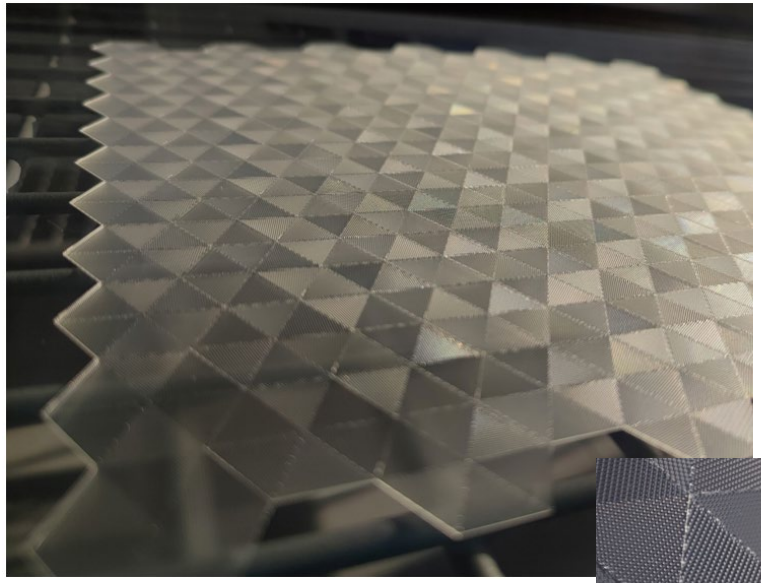




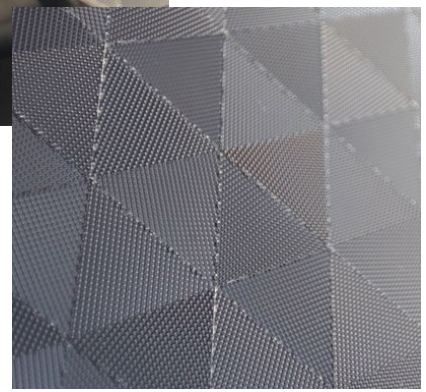


PowerPhotonic master



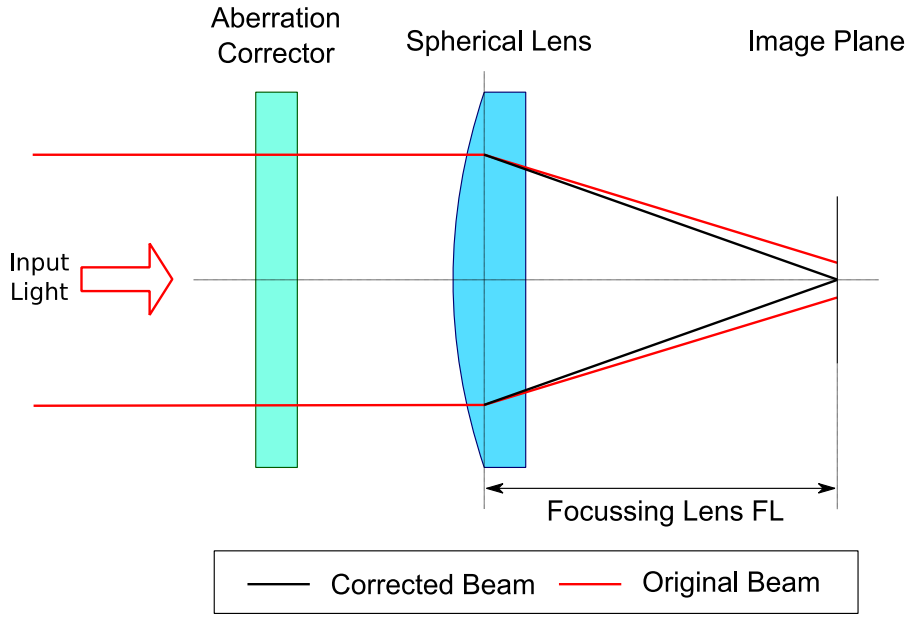


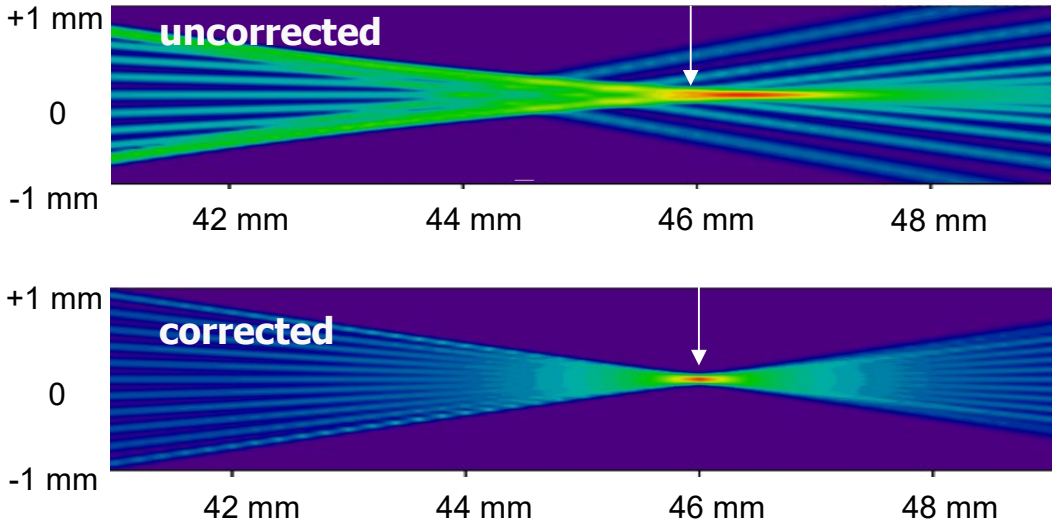
Stitched array of replicated masters performed by Joanneum



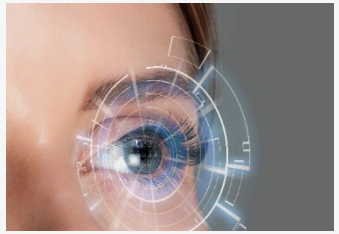
PowerPhotonic
Enhancing Beam Performance

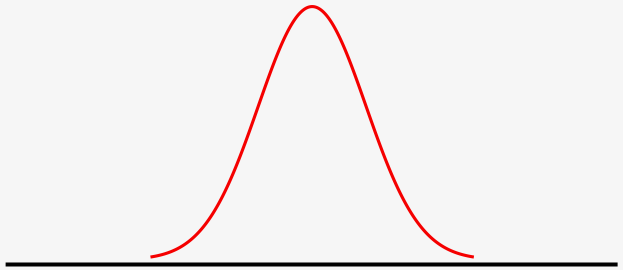
Enhancing beam performance for life sciences instrumentation (and other laser systems)





Performance of real life laser instrumentation





What's needed?

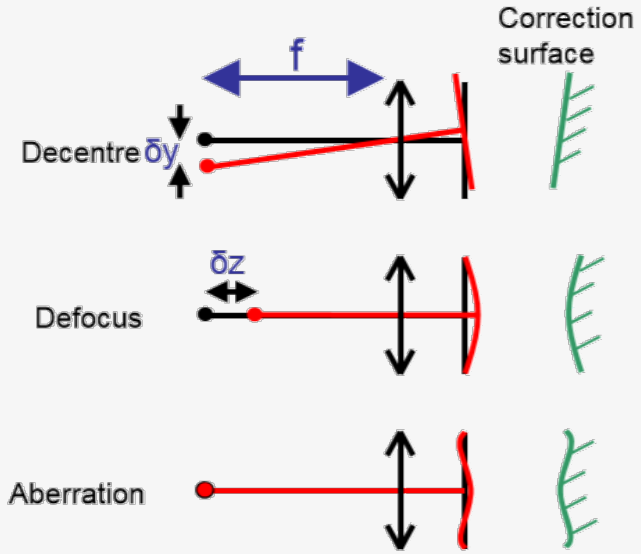
To achieve:

- High image quality
- Performance consistency
- System efficiency

We require:

- Consistent laser beam
- High beam quality
  - Pointing
  - Divergence
  - Intensity profile
  - Wavefront

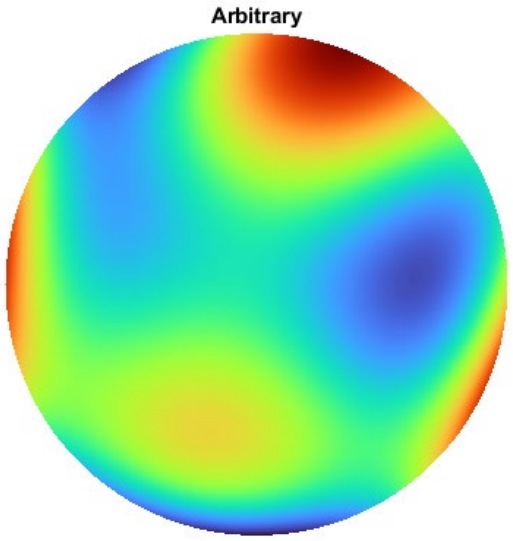
Performance of real life laser instrumentation

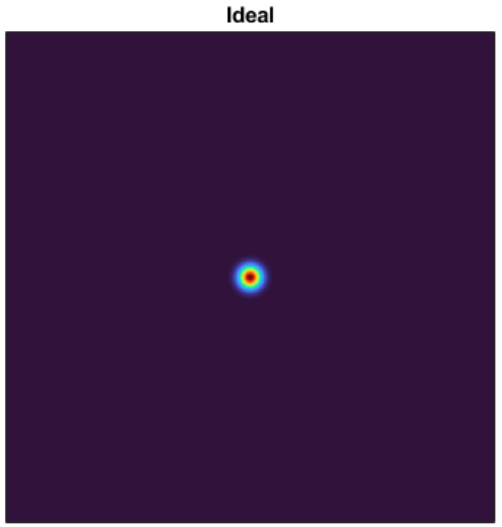


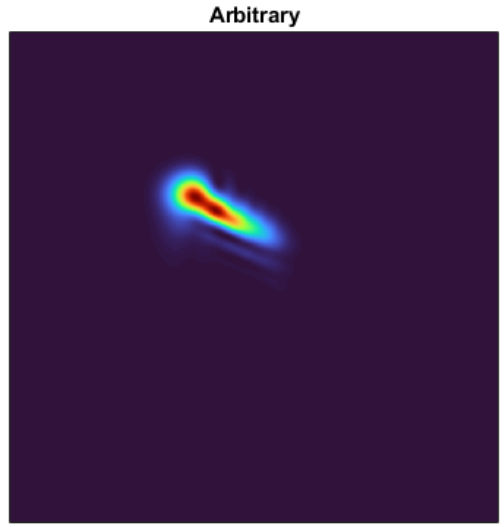
What's in the way?

- Inconsistent laser output
- Optical mis-alignment
- Aberrations
- Distortions caused by operating conditions
- Coalignment errors between multiple laser sources

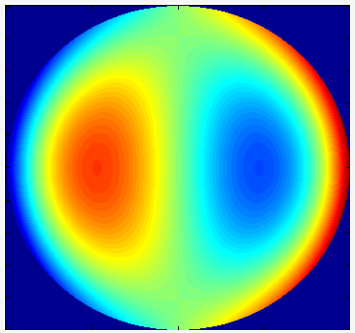
Aberrations and impact on your beam

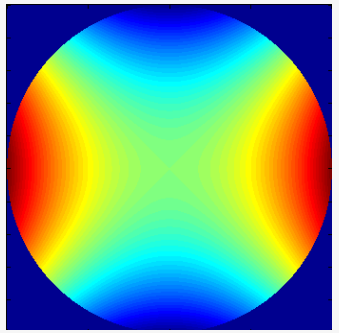


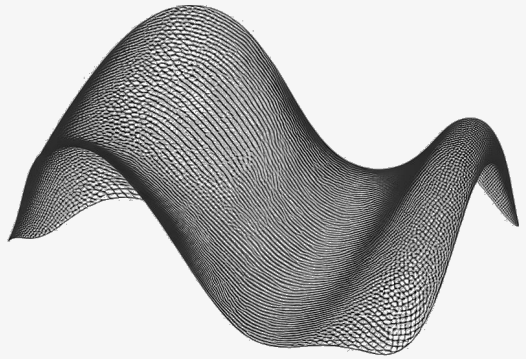




- Arbitrary wavefront distortions can be corrected with our ultra-smooth passive optical correctors.
- If we can measure – we can correct it!







Measuring wavefront errors

- **Optical simulation**

  Knowing your optical path and the details of optical components, you can simulate the wavefront distortion.

- **Wavefront measurement**

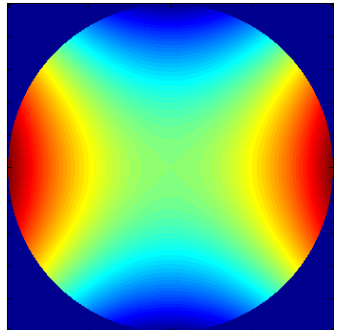
  Using a wavefront sensor, you can measure the wavefront and calculate the delta from the target.

- **Near-field or far-field measurement**

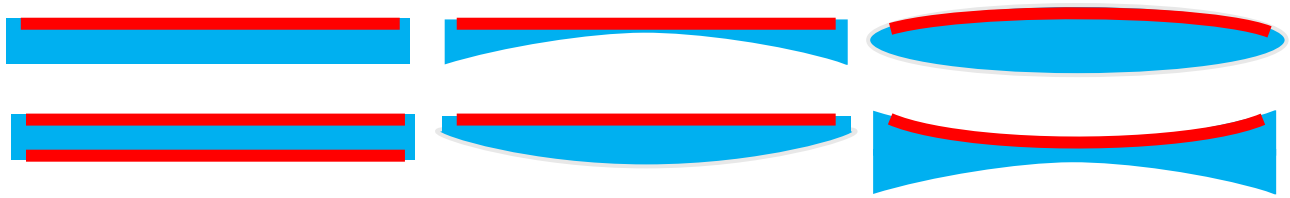
  Using far-field and near-field measurement, you can assess defocus and pointing errors.

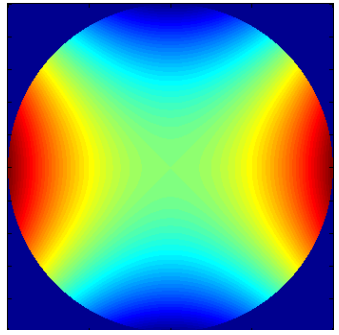
Now you know your wavefront error

Monolithic beam correctors

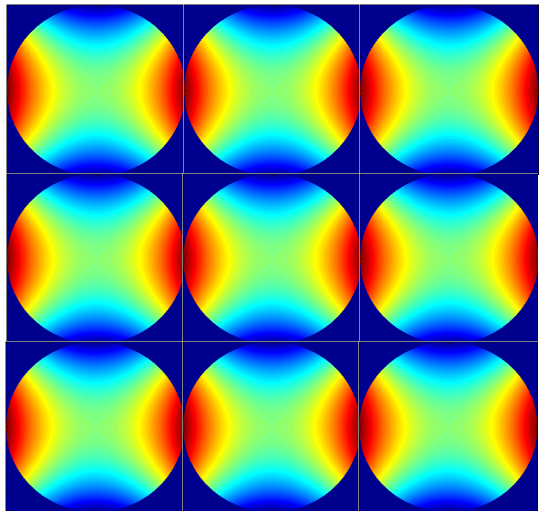


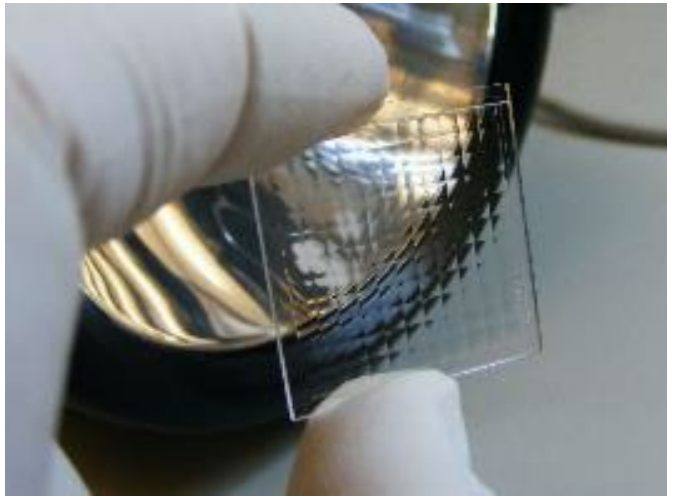
Single aperture beam correctors





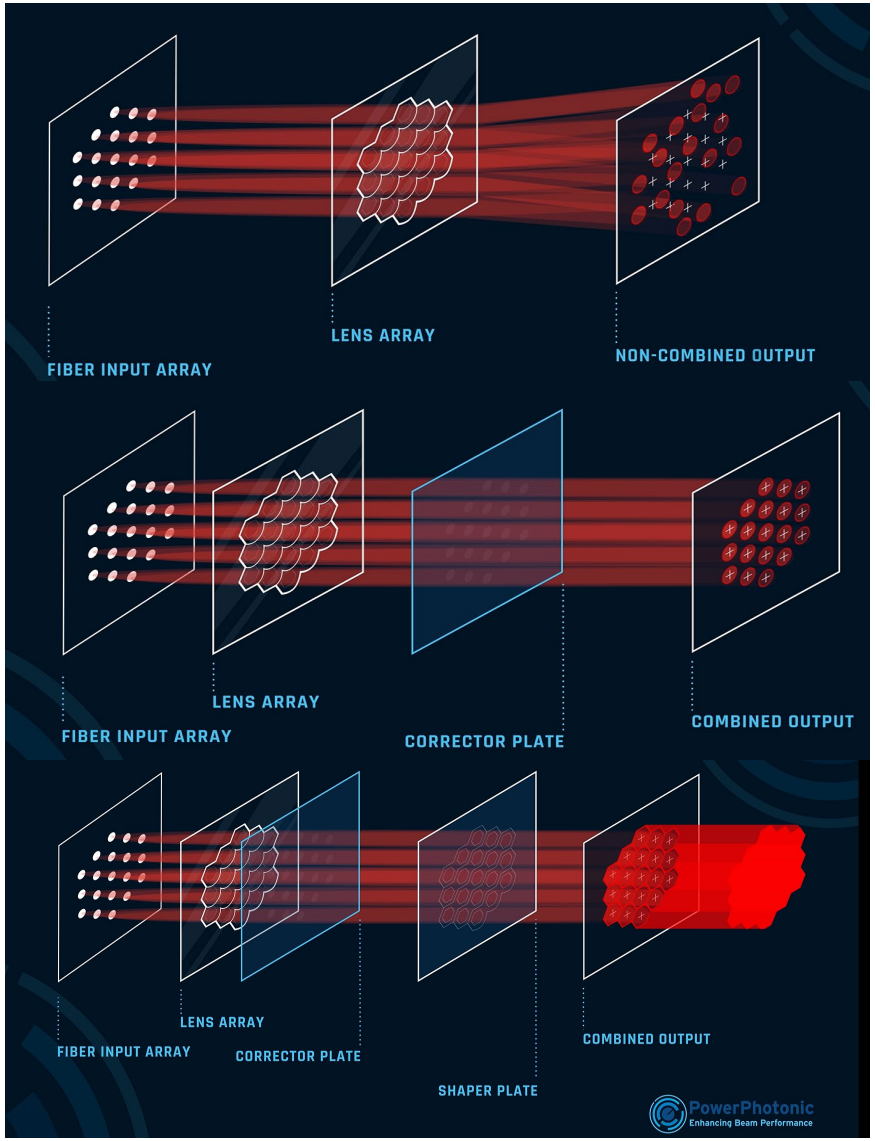
Array of corrective elements





Let’s look at some examples

Application example: coherent beam combiner



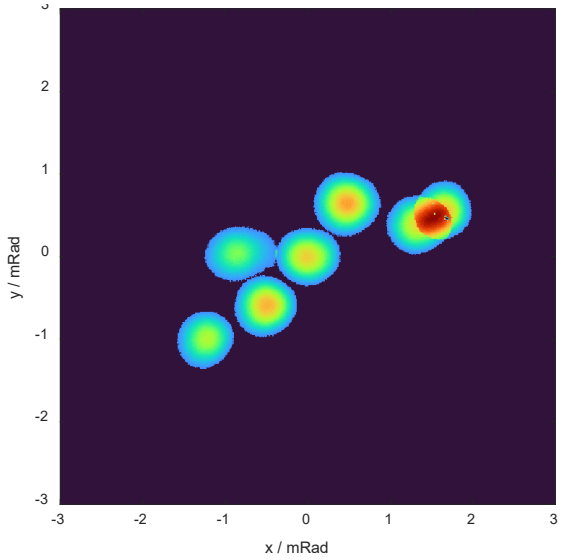
Pointing errors occur in hexagonal fiber laser after collimation.

A single beam corrector plate produces an array of parallel beams with flat top intensity profile.

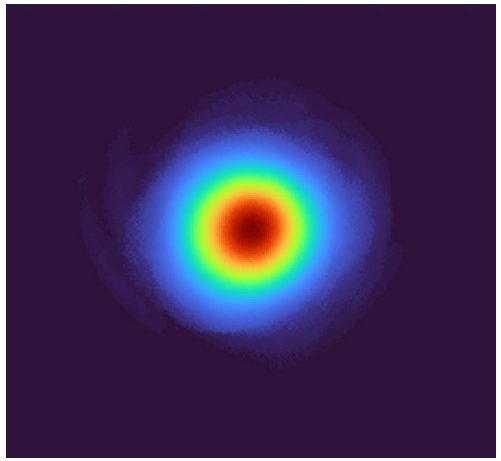
A second corrector plate creates flat wavefront.

Application example: coherent beam combiner

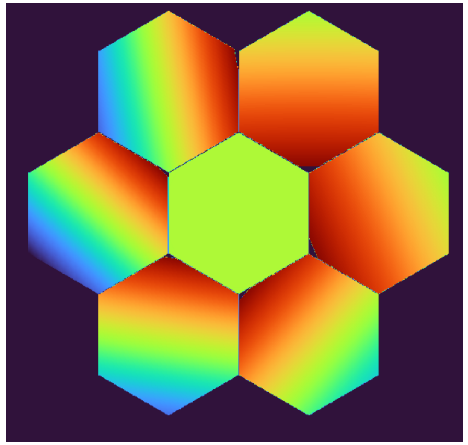
Far field pattern <u>before</u> correction



Far field pattern <u>after</u> correction

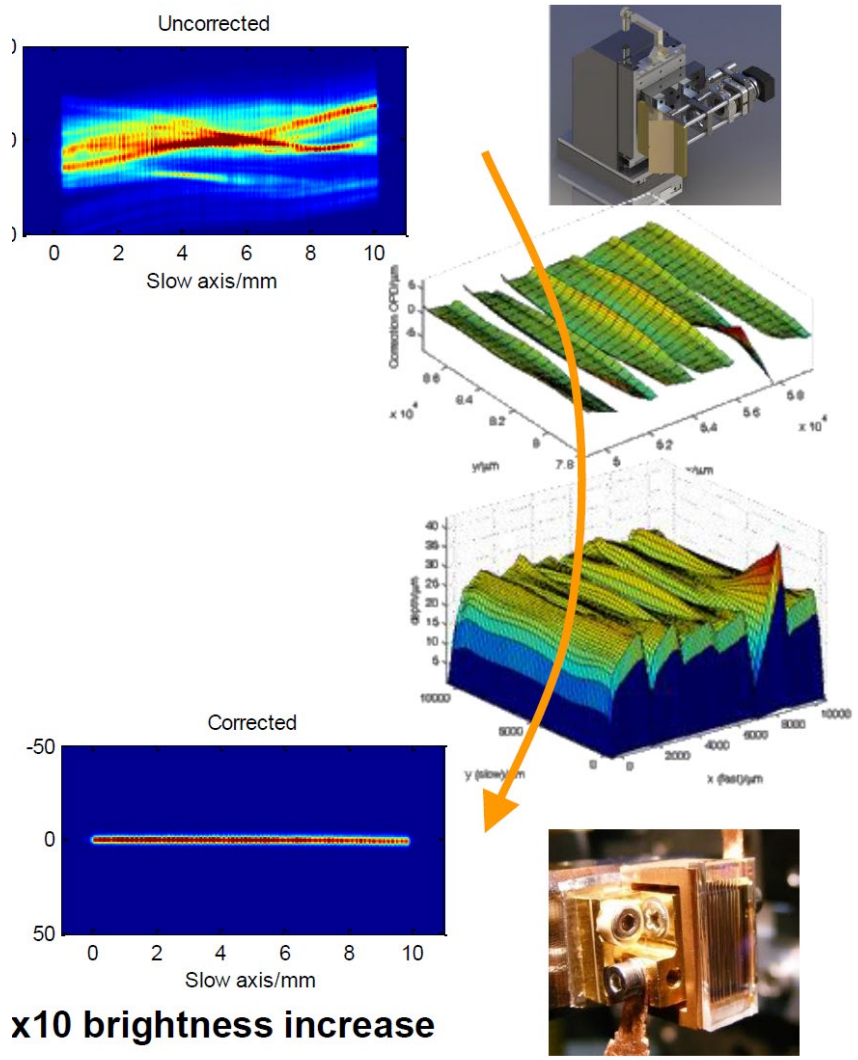


Corrector array



Application example: Low SWaP QCW Stack

- Initial diode laser array quality (extreme example)
- Map of the measured wavefront errors
- Automated design and fabrication of correction plate
- Improved beam quality



PowerPhotonic
Enhancing Beam Performance

LightForge™

Rapid Prototyping

- Upload design via web portal
- 2 week turn around for uncoated optic

Design Freedom

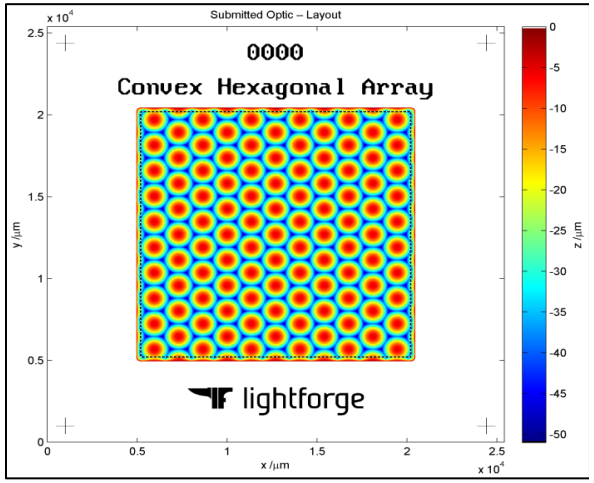
- 15x15mm CA
- 65um max Sagitta
- 45deg max slope

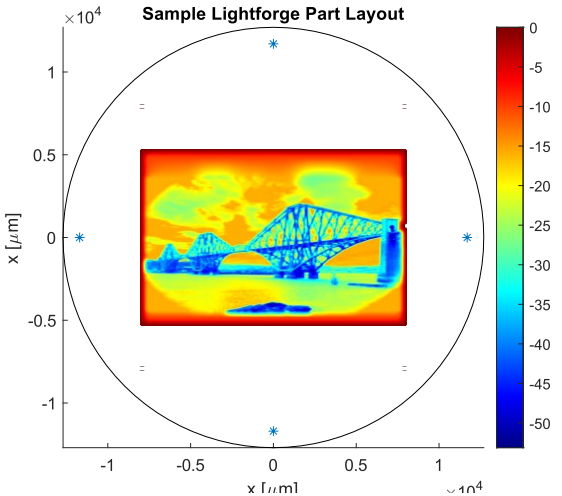
Cost Effective

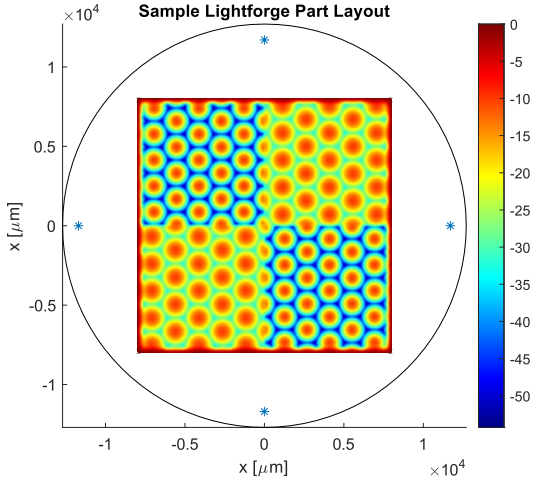
- No mask
- No set up fee

Easy Installation

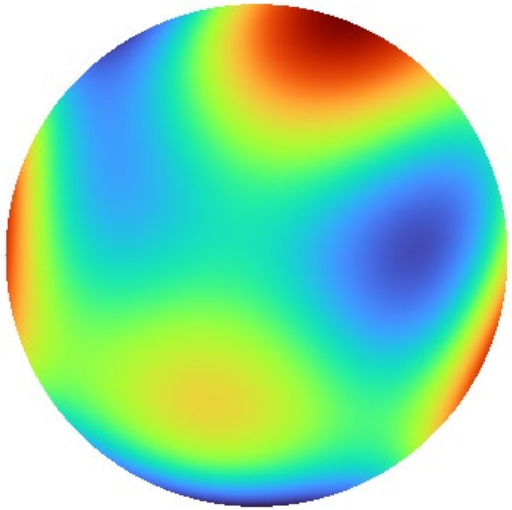
- 25.4mm square or round substrate



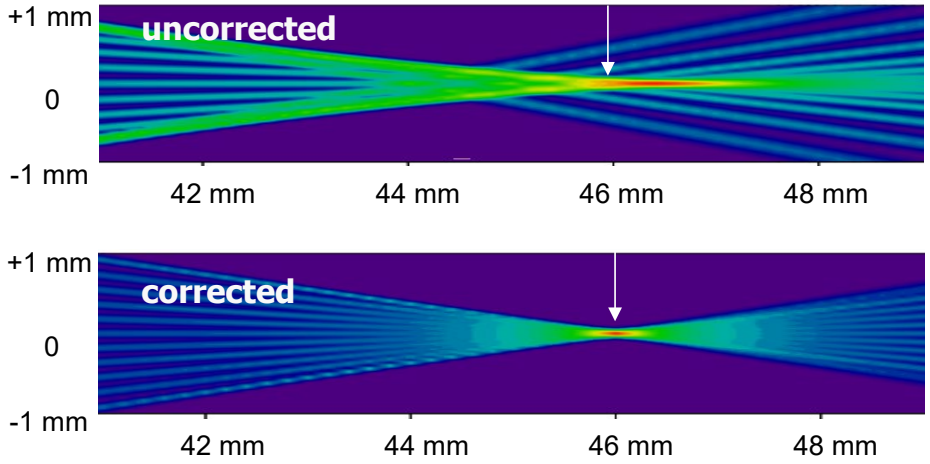




Thank you for your attention



Please get in touch to enhance beam performance in your laser system



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