

From Gaussian to Flat-Top

Advancing Microscopy with
Flat-Field Illumination

Silvio Vater

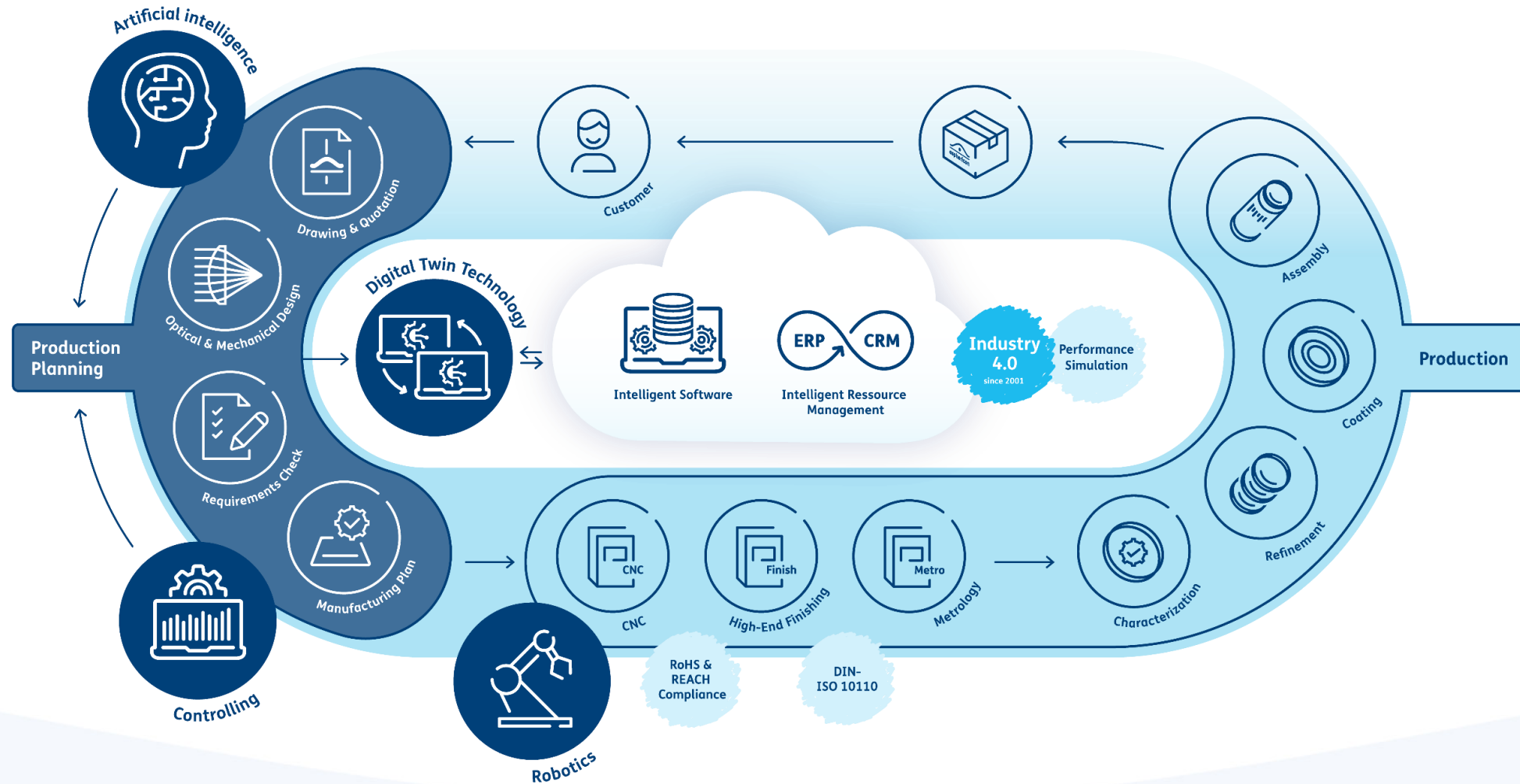
Visionen leben – Bringing visions to life.

With this mission, aspericon is always pushing boundaries of what is possible and establishing new milestones in the world of optics.



Fully digitized process landscape

INTEGRATED MANUFACTURING FOR HIGH-QUALITY AND EFFICIENT RESULTS



System provider

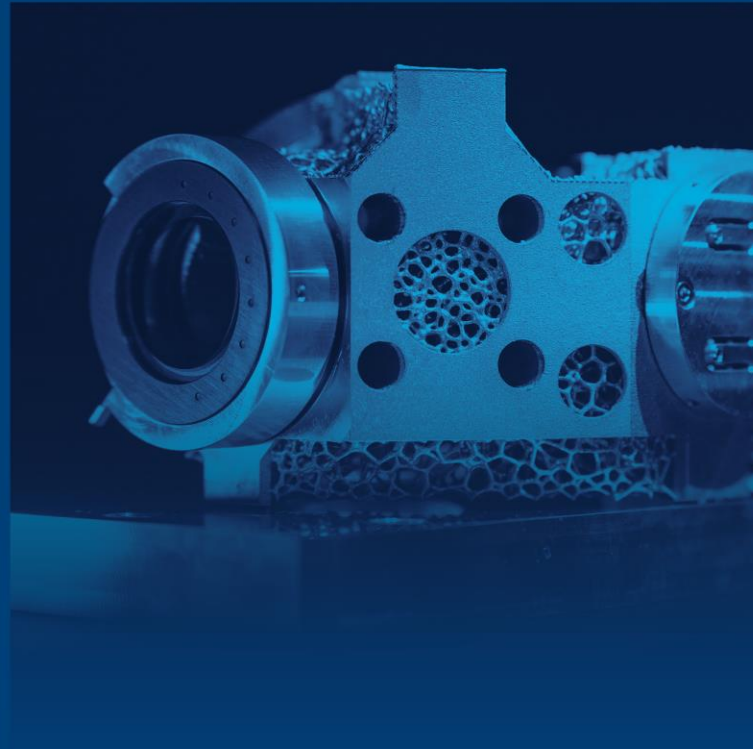


BeamTuning



- = World's first aspheric beam shaping and expansion system
- = High precision wavefront for all wavelengths

Fo+

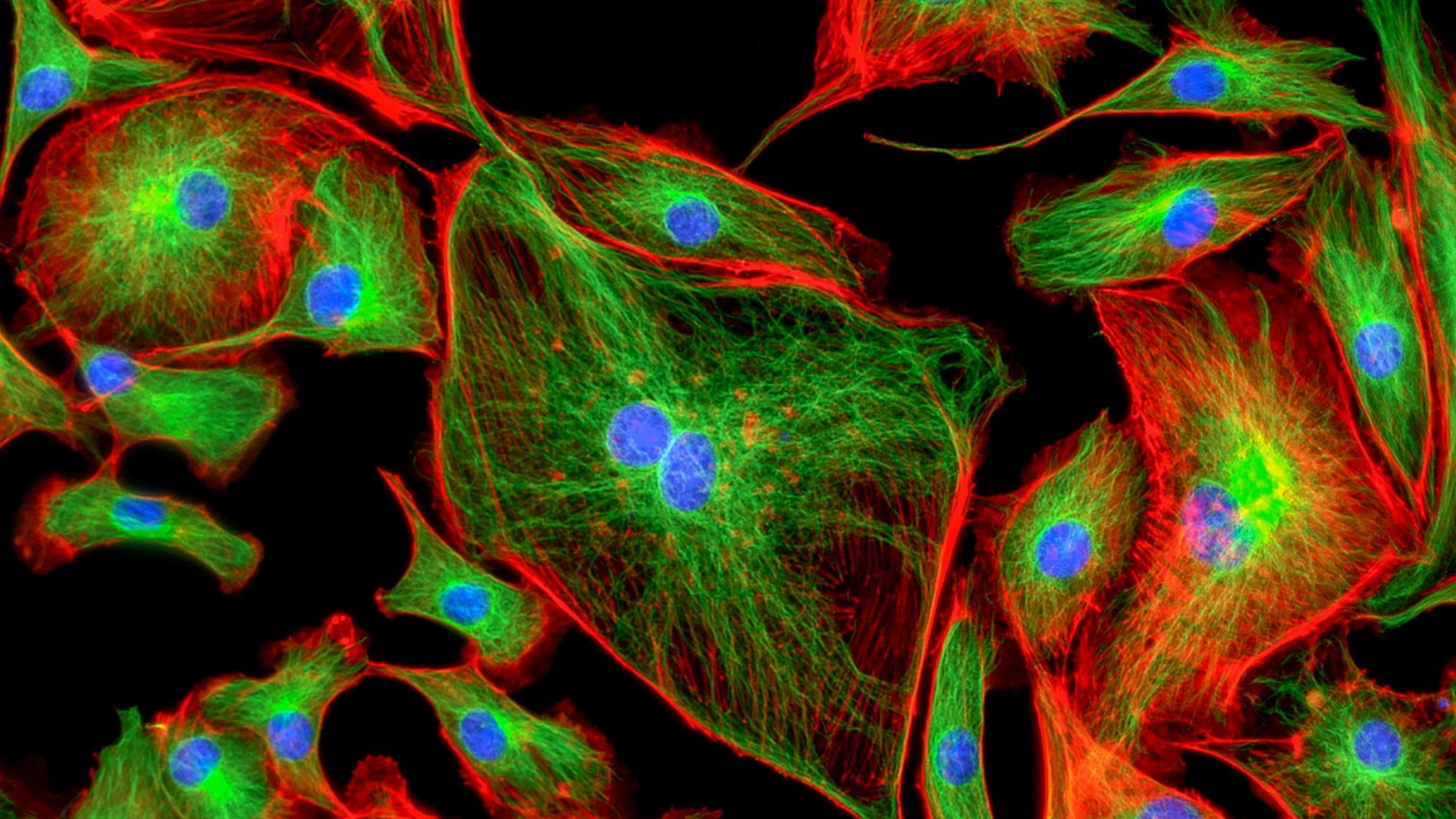


- = Reflective beam shaper based on freeform optics
- = Laser becomes a flexible tool (high laser power up to 10 kW, all wavelengths)

OEM-System



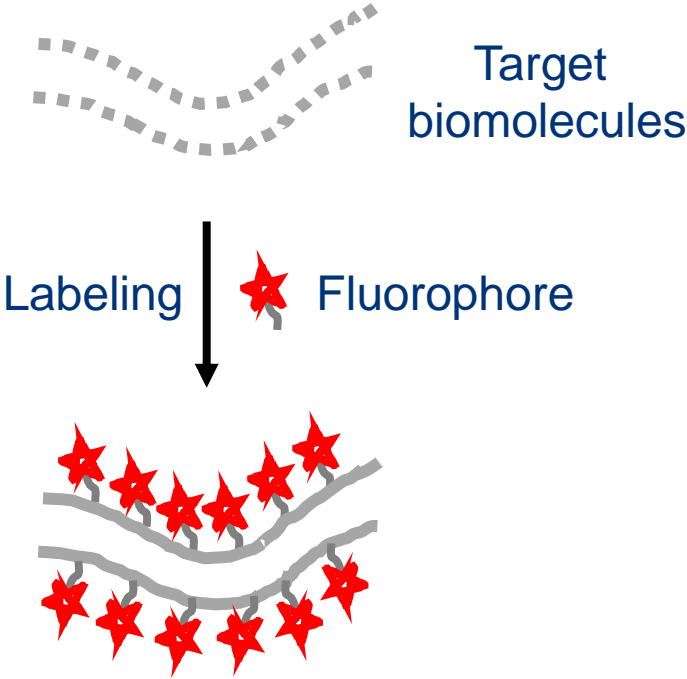
- = World's first aspheric Fizeau lenses
- = Largest measuring range
- = Up to three times lighter



Non-invasive imaging of living cells



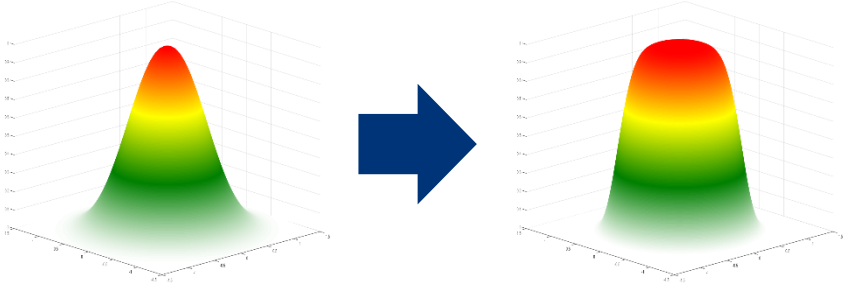
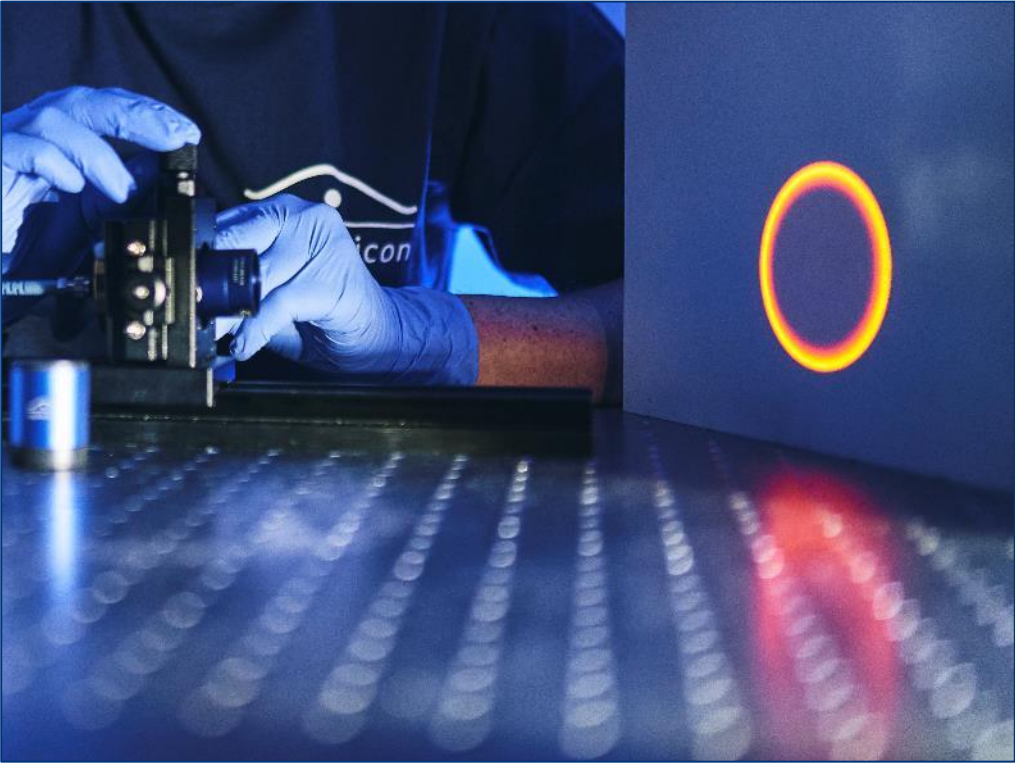
IMAGING OF BIOMOLECULES & STRUCTURES BY SPECIFIC FLUORESCENCE TAGGING



Gaussian vs. Flat-Top beam profiles

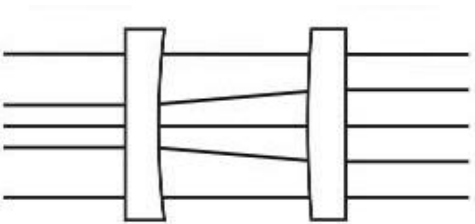


GAUSSIAN ILLUMINATION CHALLENGING FOR WIDE-FIELD APPLICATIONS



Gaussian

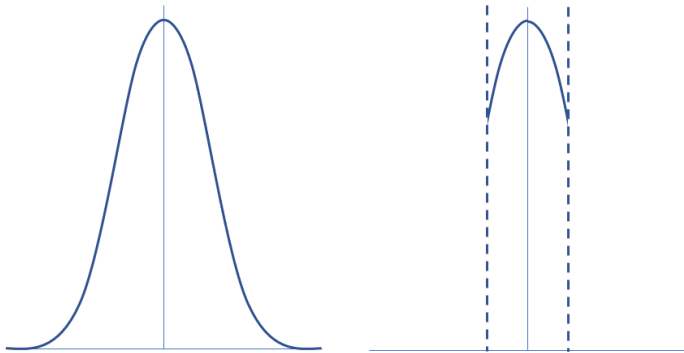
Flat-Top



Fundamental solution: Flat-Top beam

WAYS OF CREATION

Truncating the beam

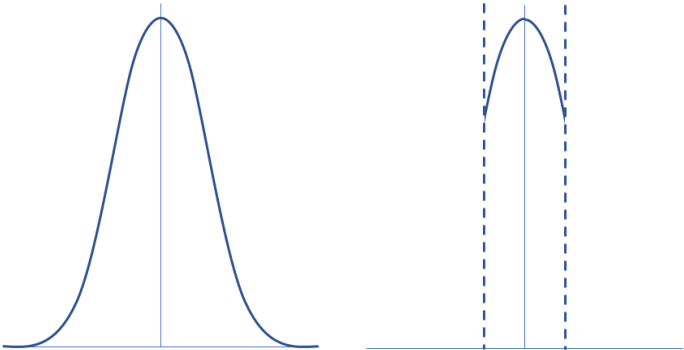


Fundamental solution: Flat-Top beam

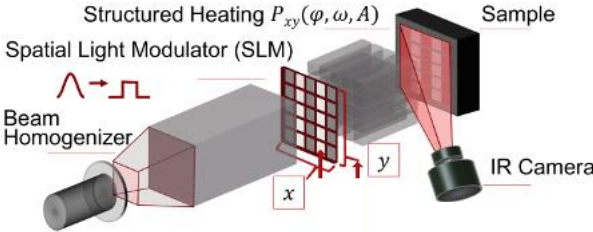


WAYS OF CREATION

Truncating the beam



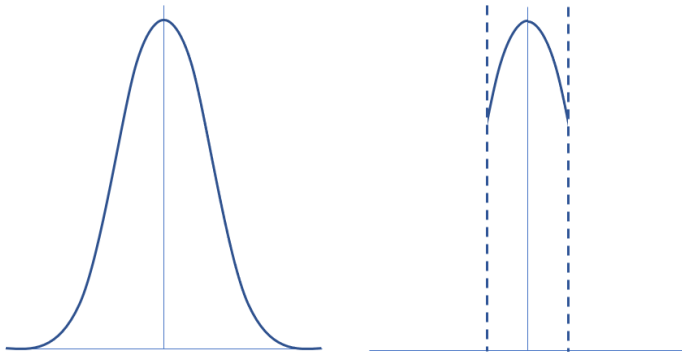
Spatial light modulators



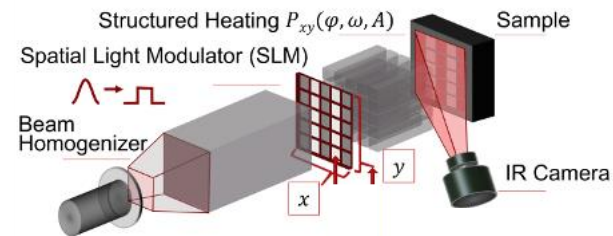
Fundamental solution: Flat-Top beam

WAYS OF CREATION

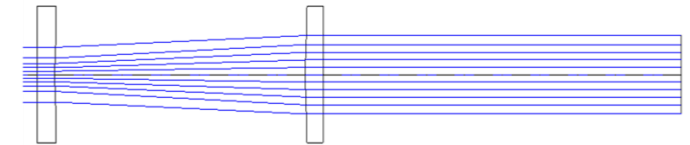
Truncating the beam



Spatial light modulators



Beam shaping optics

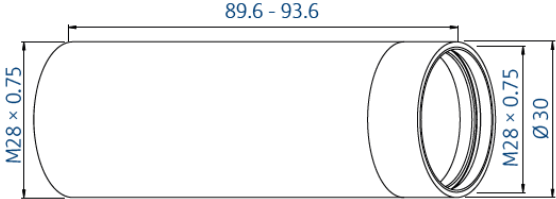


Integrated solution for easy implementation



BEAMTUNING SOLUTION BY ASPHERICON

Dimensions
a|TopShape

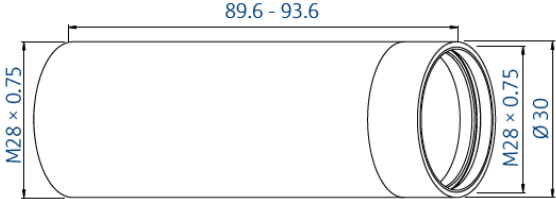


Integrated solution for easy implementation

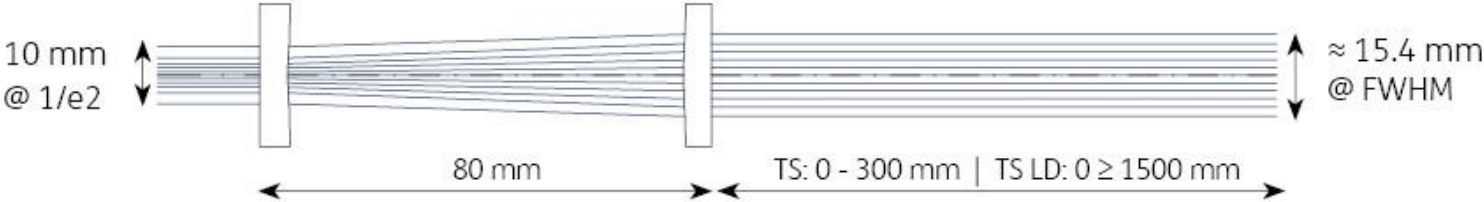


BEAMTUNING SOLUTION BY ASPHERICON

Dimensions
a|TopShape



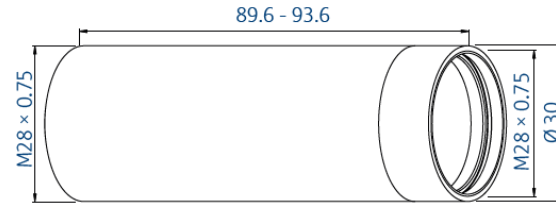
Working principal
a|TopShape



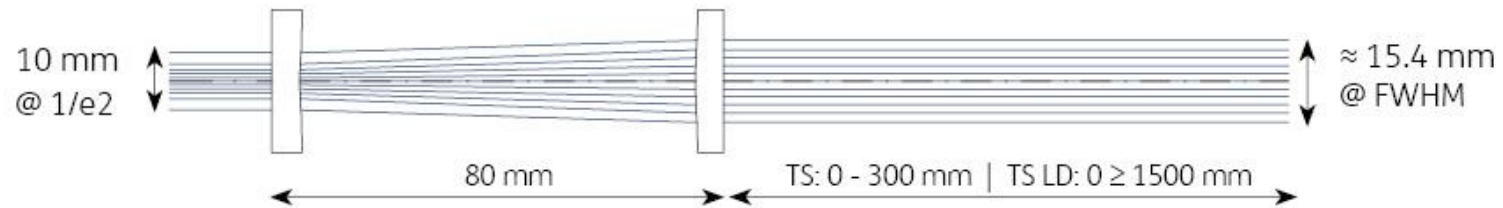
Integrated solution for easy implementation

BEAMTUNING SOLUTION BY ASPHERICON

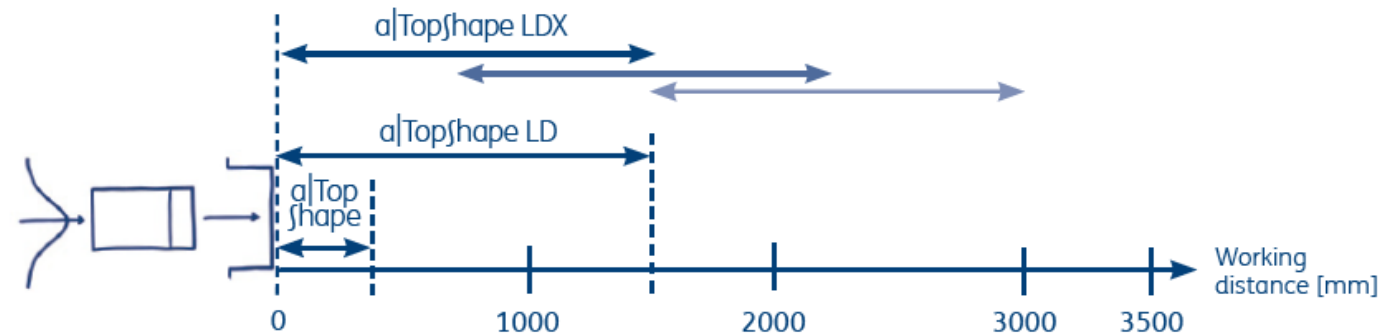
Dimensions
 $a|_{\text{TopShape}}$



Working principal
 $a|_{\text{TopShape}}$

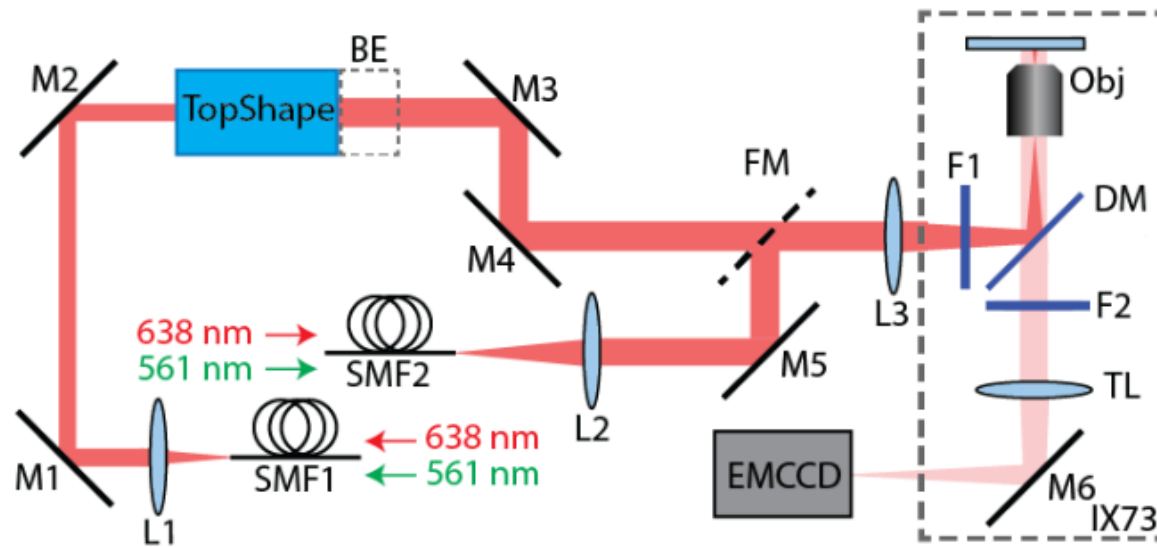


Working distance
 $a|_{\text{TopShape}}$



Experimental set-up Flat-Field Illumination

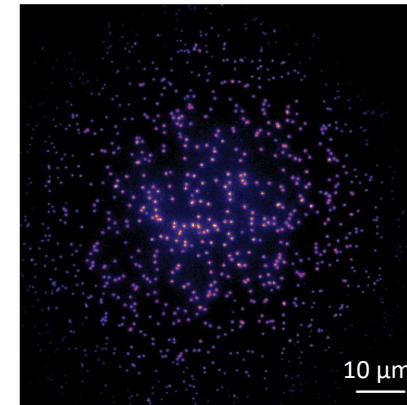
BEAMTUNING SOLUTION BY ASPHERICON



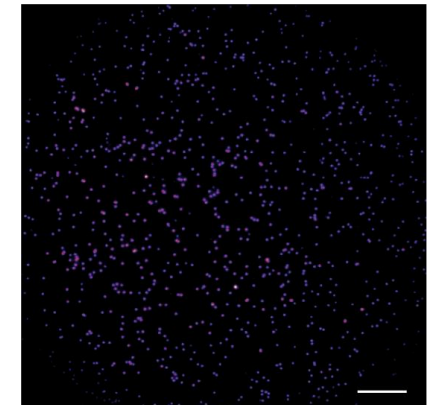
Experimental set-up. BE, 1.5x beam expander; DM, dichroic mirror; F1-2, excitation/emission filters; FM, flip mirror; L1-3, lenses; M1-6, mirrors; Obj, objective; SMF1-2, single mode fibers; TL, tube lens.

Single-molecule imaging

Gaussian



FFI



⇒ Under FFI the molecules exhibited much more uniform fluorescence

I. Khaw, B. Croop, J. Tang, A. Möhl, U. Fuchs, and K. Han, "Flat-field illumination for quantitative fluorescence imaging," *Opt. Express* 26, 15276-15288 (2018).

Experimental set-up Flat-Field Illumination

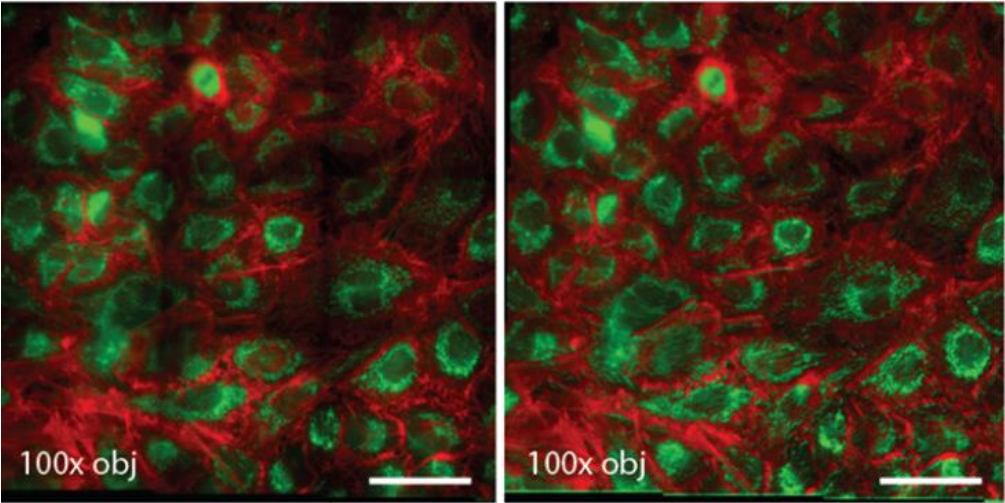


BEAMTUNING SOLUTION BY ASPHERICON

High-throughput Imaging

Gaussian

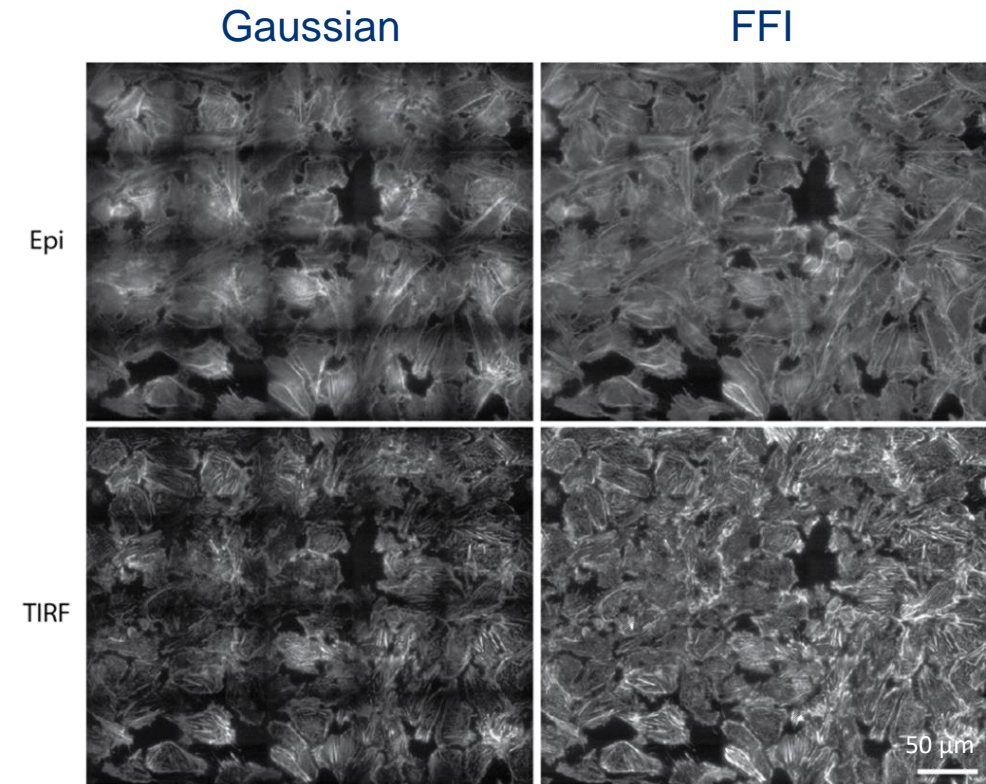
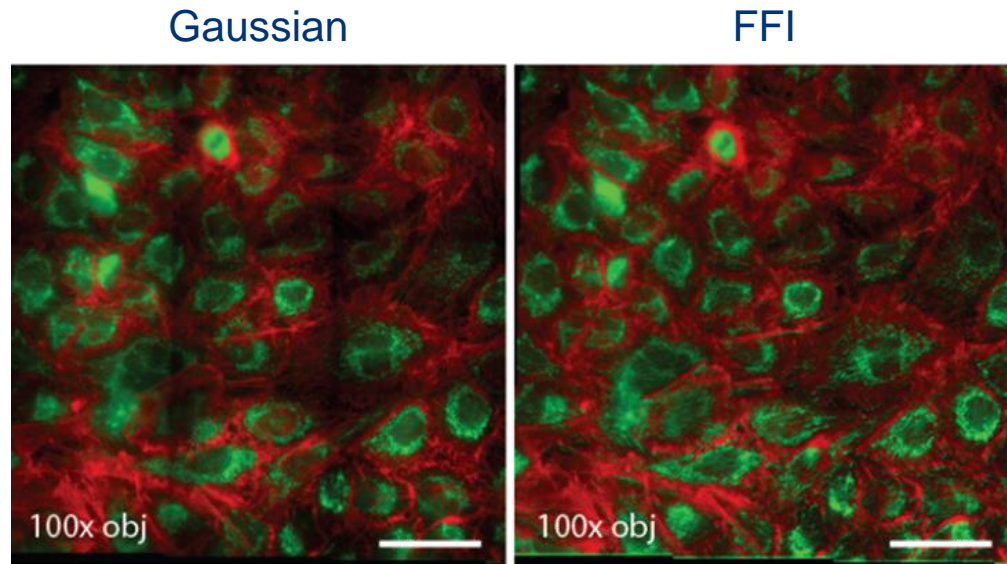
FFI



Experimental set-up Flat-Field Illumination

BEAMTUNING SOLUTION BY ASPHERICON

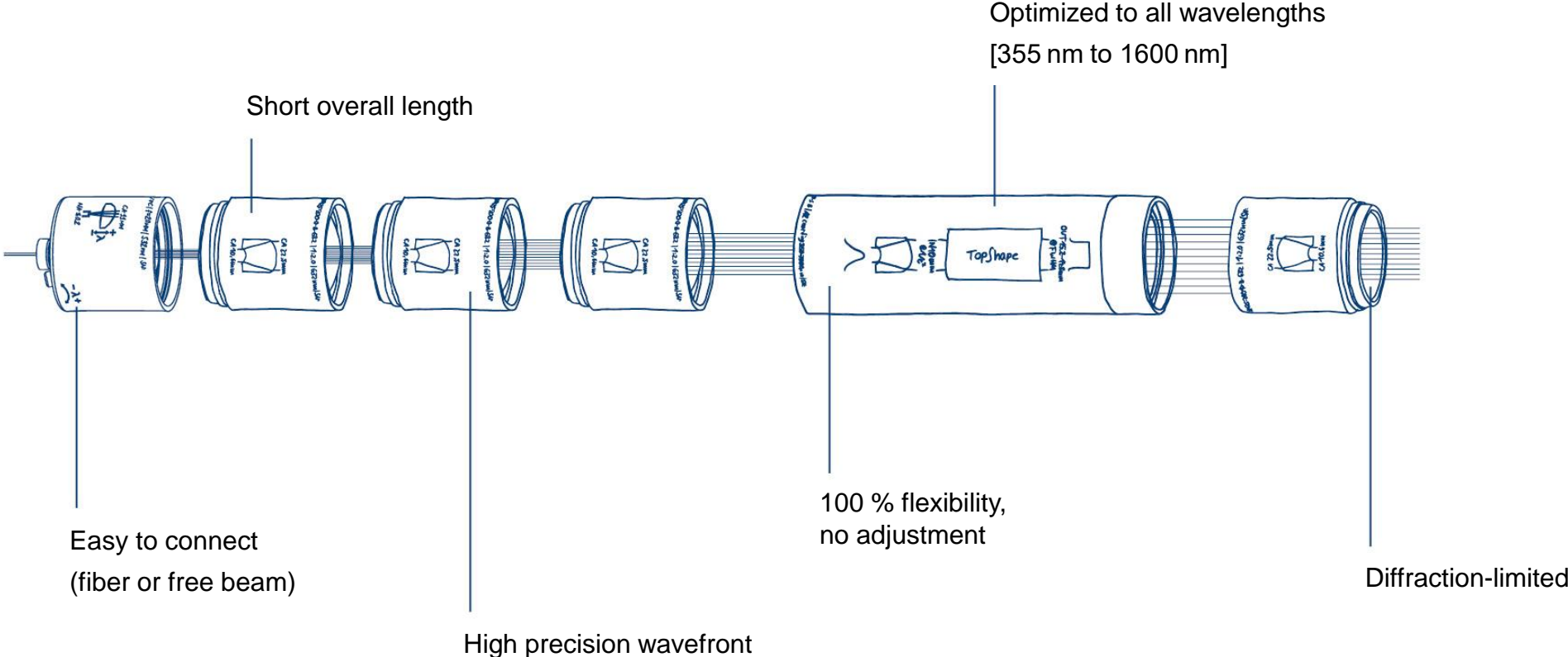
High-throughput Imaging



Top-Hat illumination in fluorescence microscopy



SIMPLICITY. PERFORMANCE. ADAPTABILITY.



Any Questions?



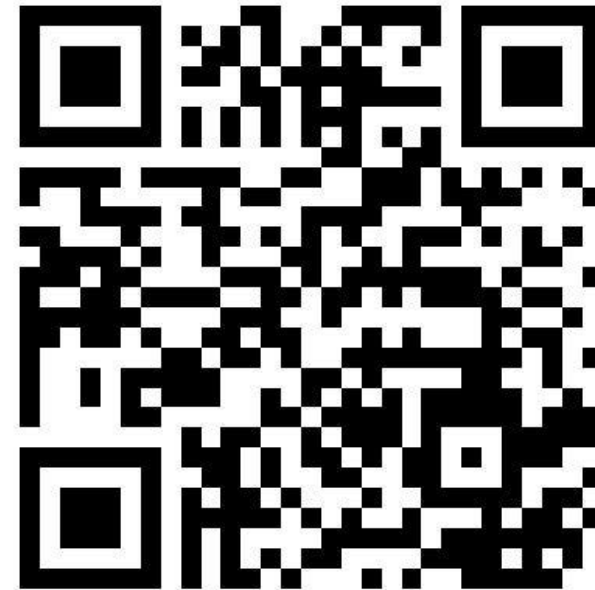
Are you up for the challenge?



**CHALLENGE
ME!**

Silvio Vater

SENIOR PROJECT MANAGER



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