Challenges of UV fs material processing with scanners

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Agenda

- **SCANLAB at a glance**
- **The challenge of UV fs material processing with scanners**
- **Solution 1: Color corrected f-theta lens**
- **Solution 2: XL SCAN**

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SCANLAB at a Glance

- Worldwide leading OEM manufacturer of scan solutions for deflecting and positioning laser beams
- HQ, engineering and manufacturing in Munich, Germany
- Subsidiaries and partners worldwide, including Scanlab America Inc. in the US
- Sales 2023: approx. € 144 million
- About 500 employees from 36 countries
- Around half of our highly qualified team are engineers and scientists

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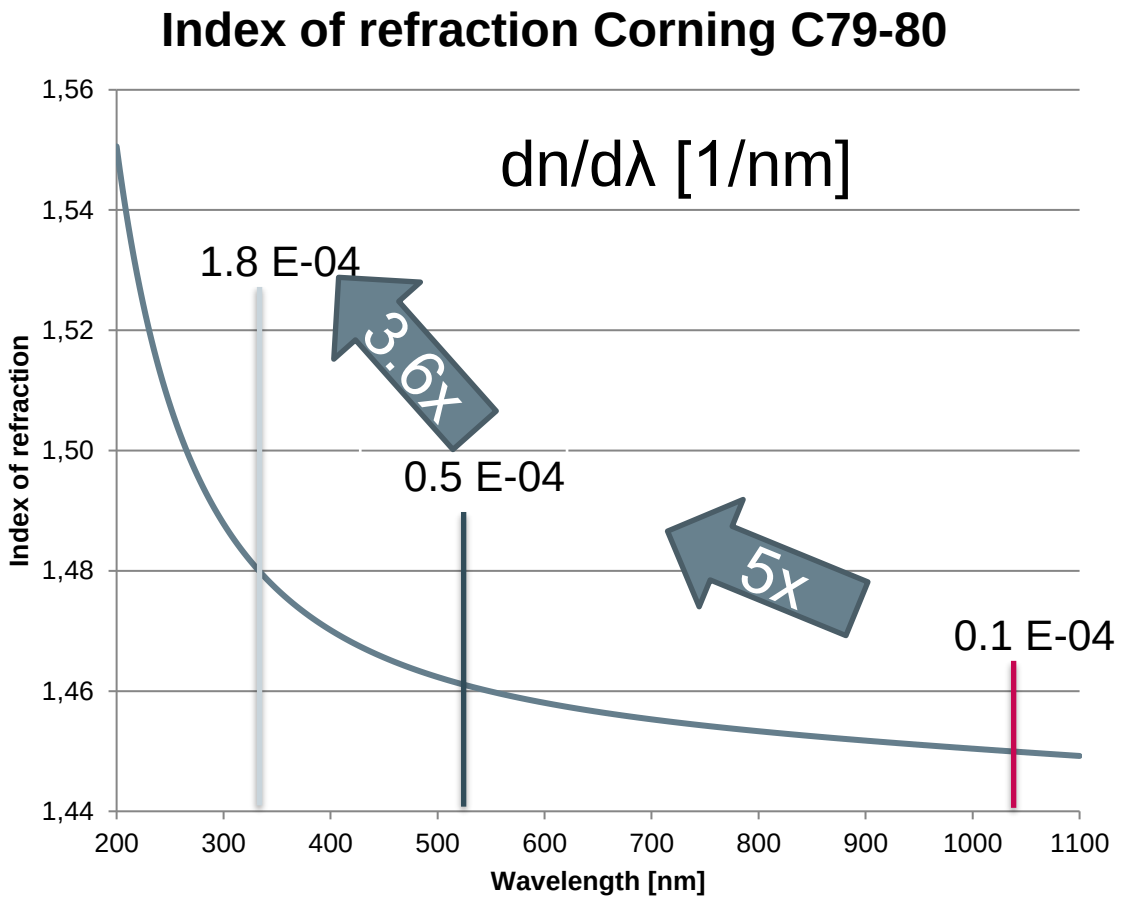
Dispersion of fused silica

USP laser operation requires fused silica as optics material

Dispersion of fused silica ➔

No simple color correction possible for bandwidth > 0



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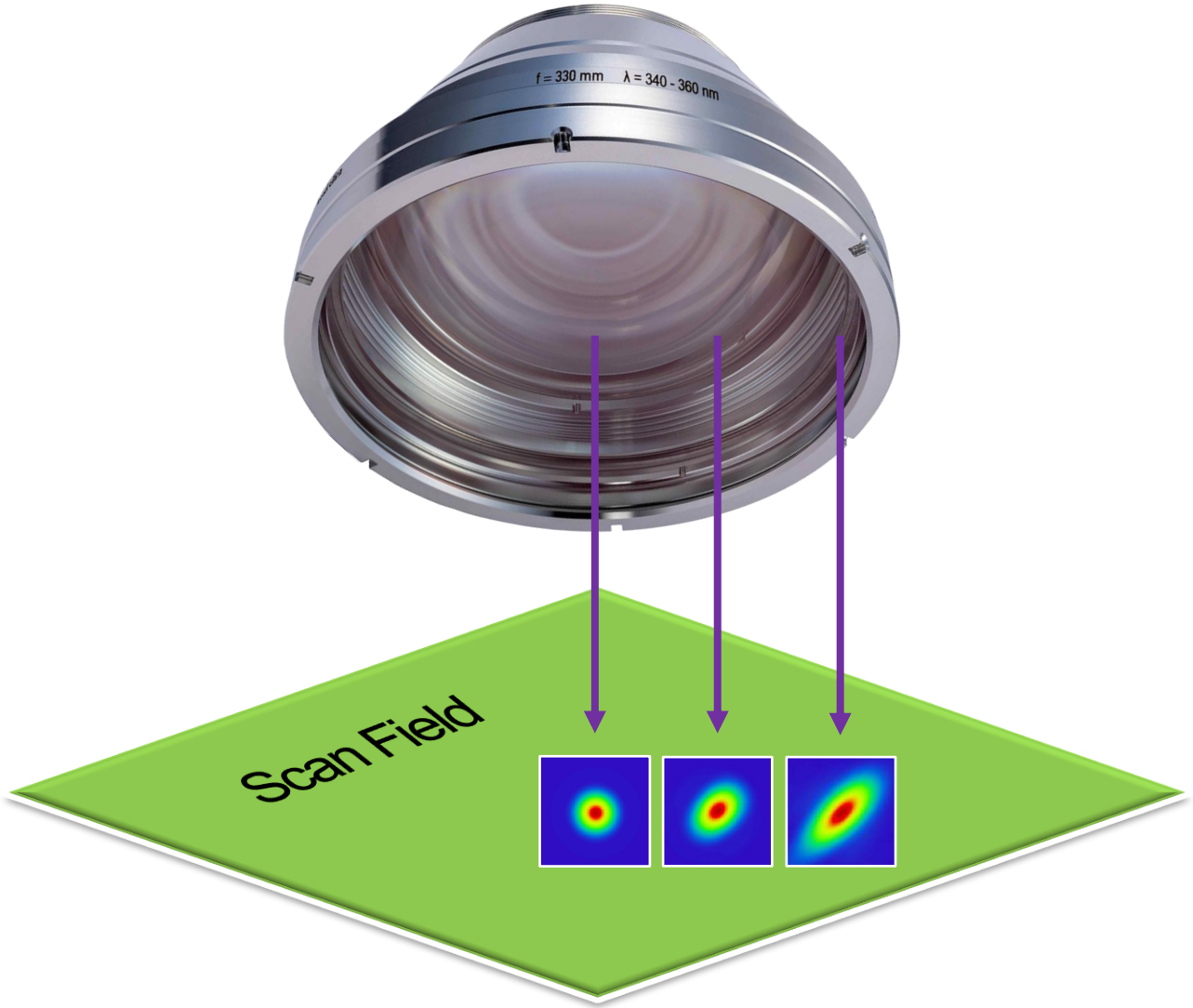
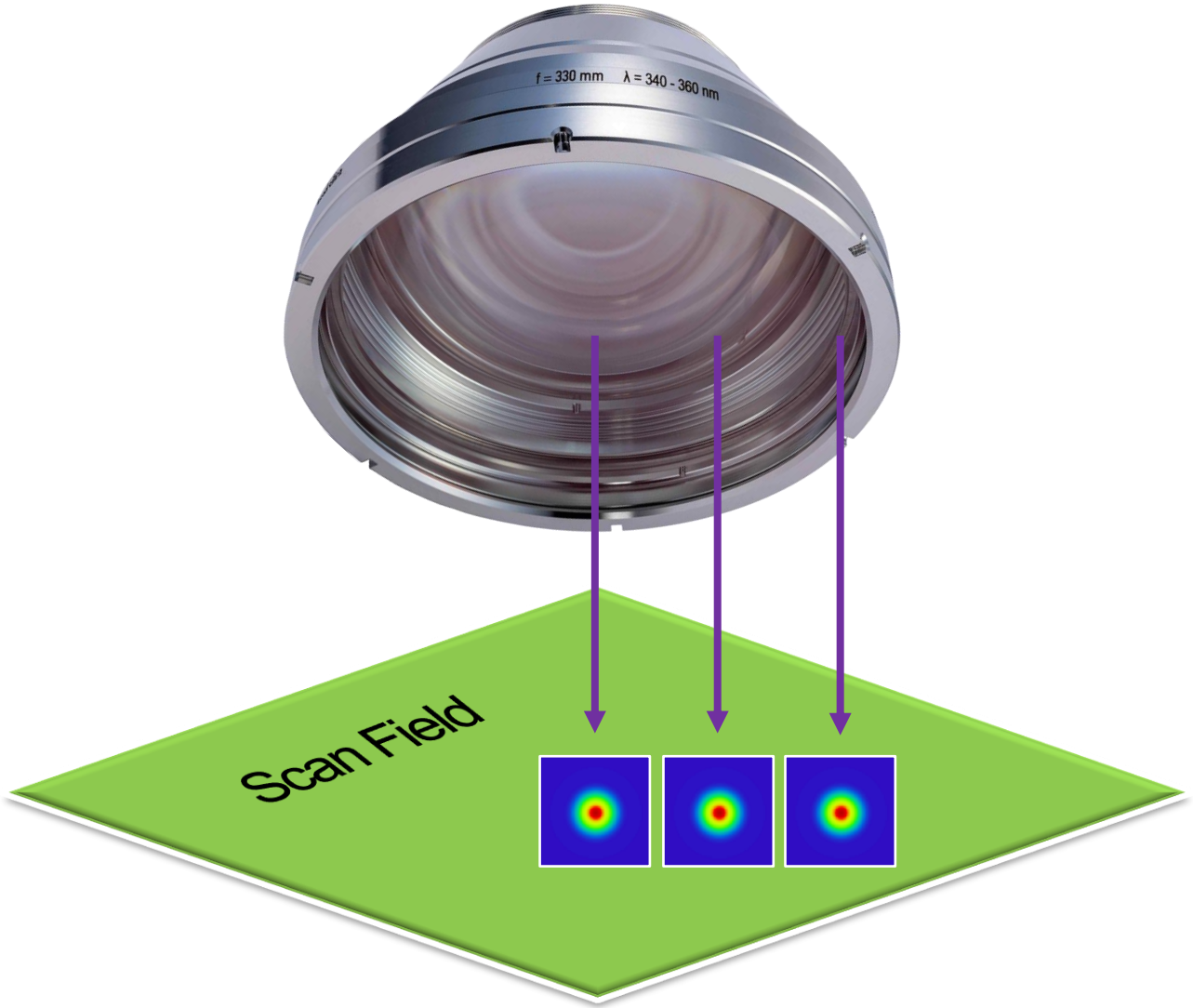
fs-application with non-optimized UV optics



Challenges to design and produce optimized (color-corrected) UV optics

- Selection of the ideal material
- Design of a premium UV Coating (LIDT)
- Consideration of low outgassing regarding manufacturing / transport / storage
- Highest clean room requirements
- Determination and inspection of quality criteria (specification values)

fs-application with optimized UV F-Theta lenses



Advantages using optimized UV optics for <500fs

- Minimal spot size variations over the entire scan field
- Color corrected
- Very high damage thresholds in the fs range due to high-performance UV coatings

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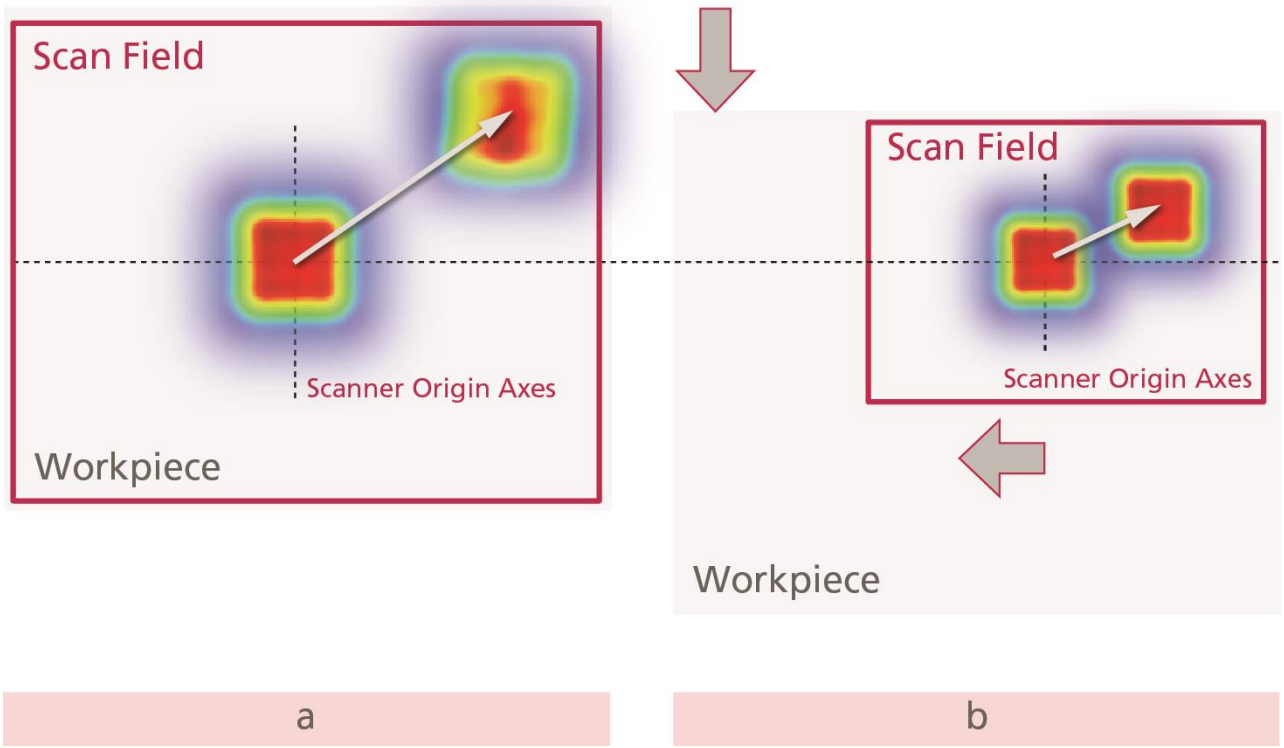
Alternative approach

Use XL SCAN to combine
stage motion
with scanner motion



Imporve accuracy with XL *SCAN*

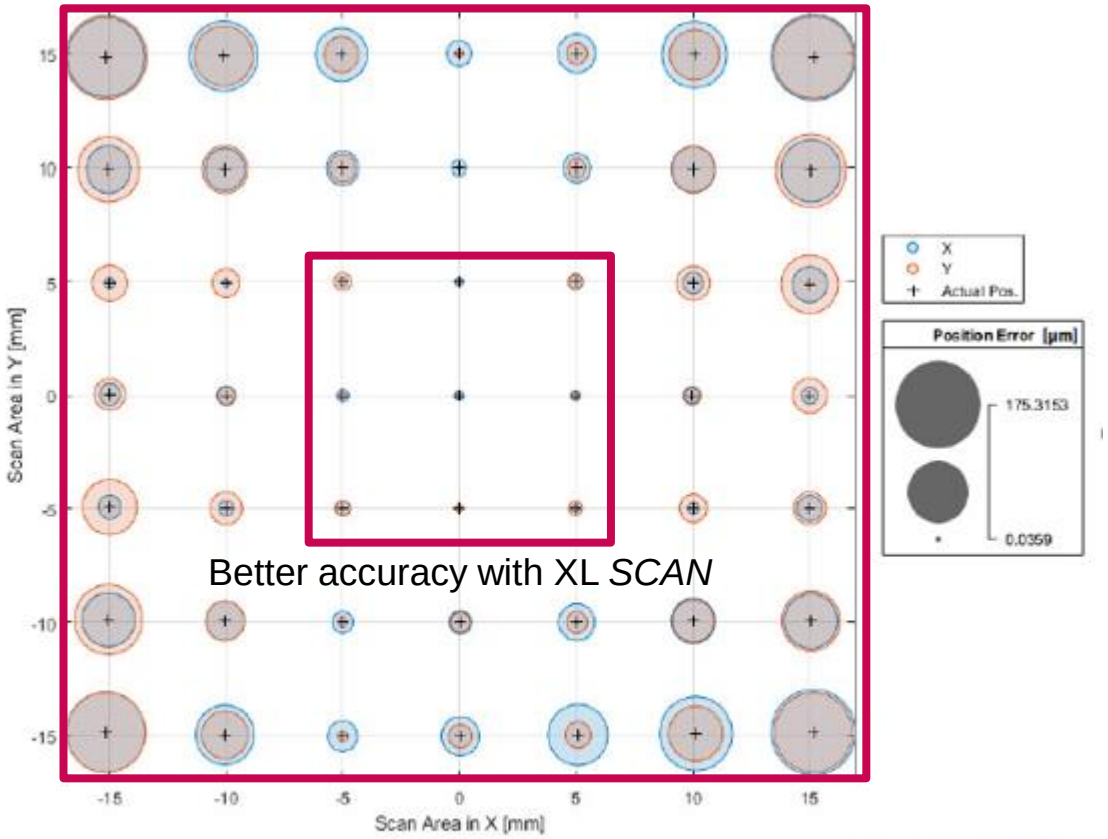
Within a small radius the position accuracy is better then for the whole field

➔Use XL SCAN to combine stage motion with scanner motion

➔Reduce the active field of view

➔Minimize spot accuracy issues

Position accurcay

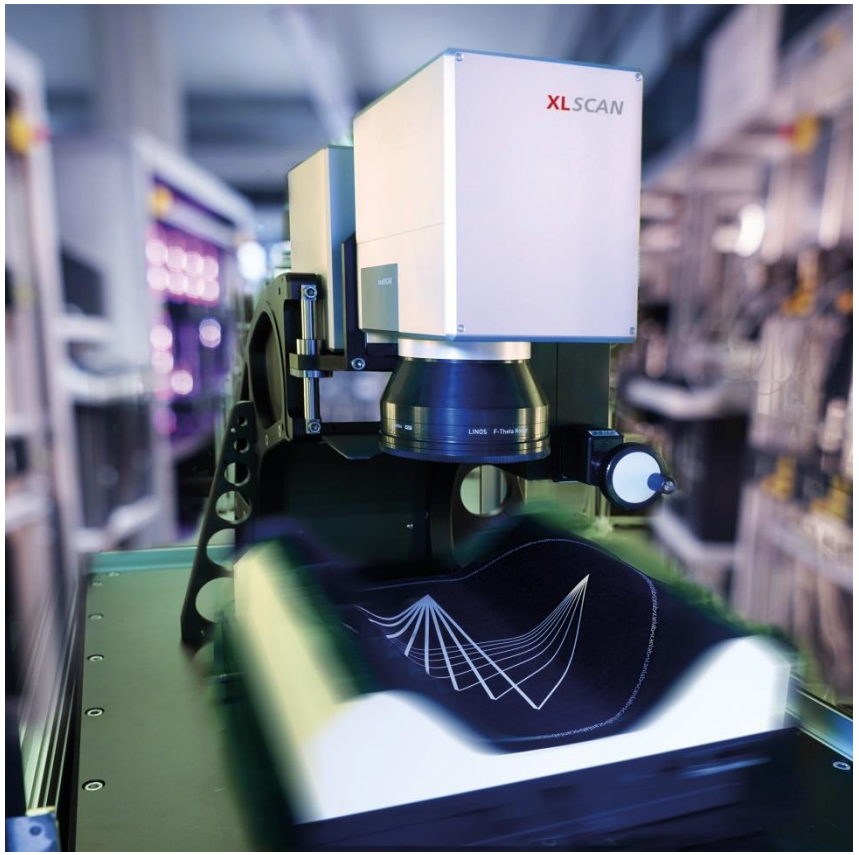


Better accuracy with XL *SCAN*

Full field:
Without XL *SCAN*

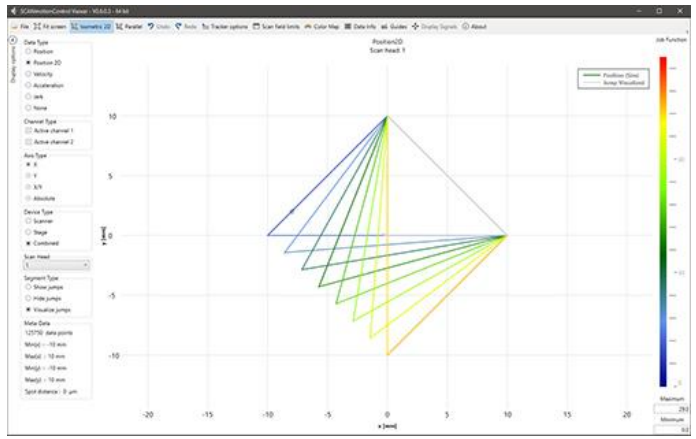
XL SCAN: Unlimited field of view

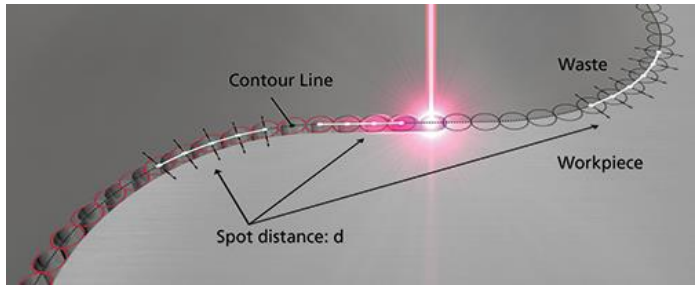
- Simultaneous 2D motion
- Control: *SCAN*motionControl & RTC6
- Scanner: excelli*SCAN*
- Axis control system: ACS Motion Control

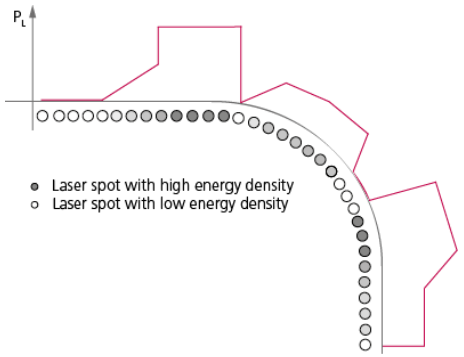


*SCAN*motionControl as basis of XL SCAN

More degrees of freedom for laser process control

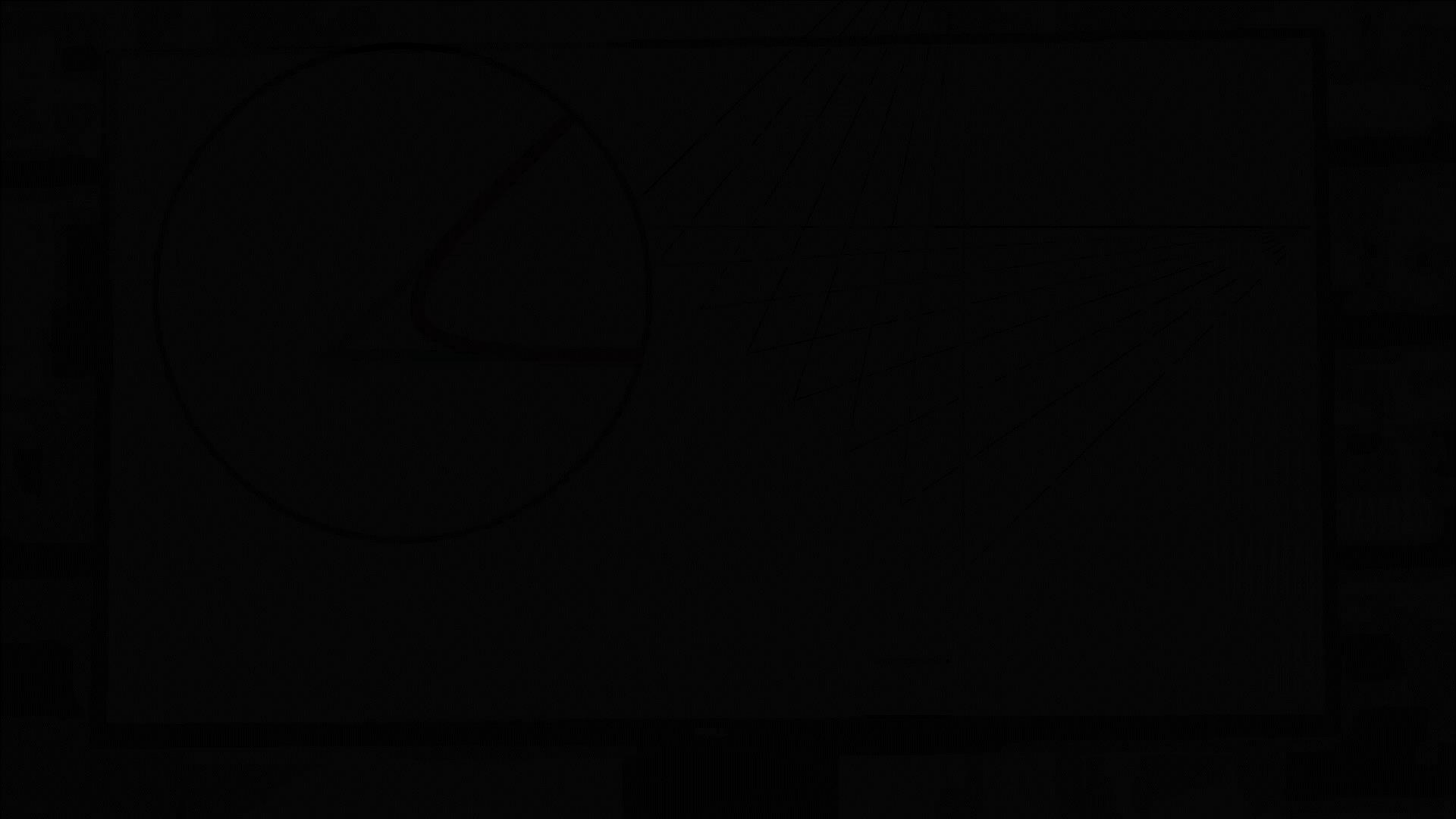






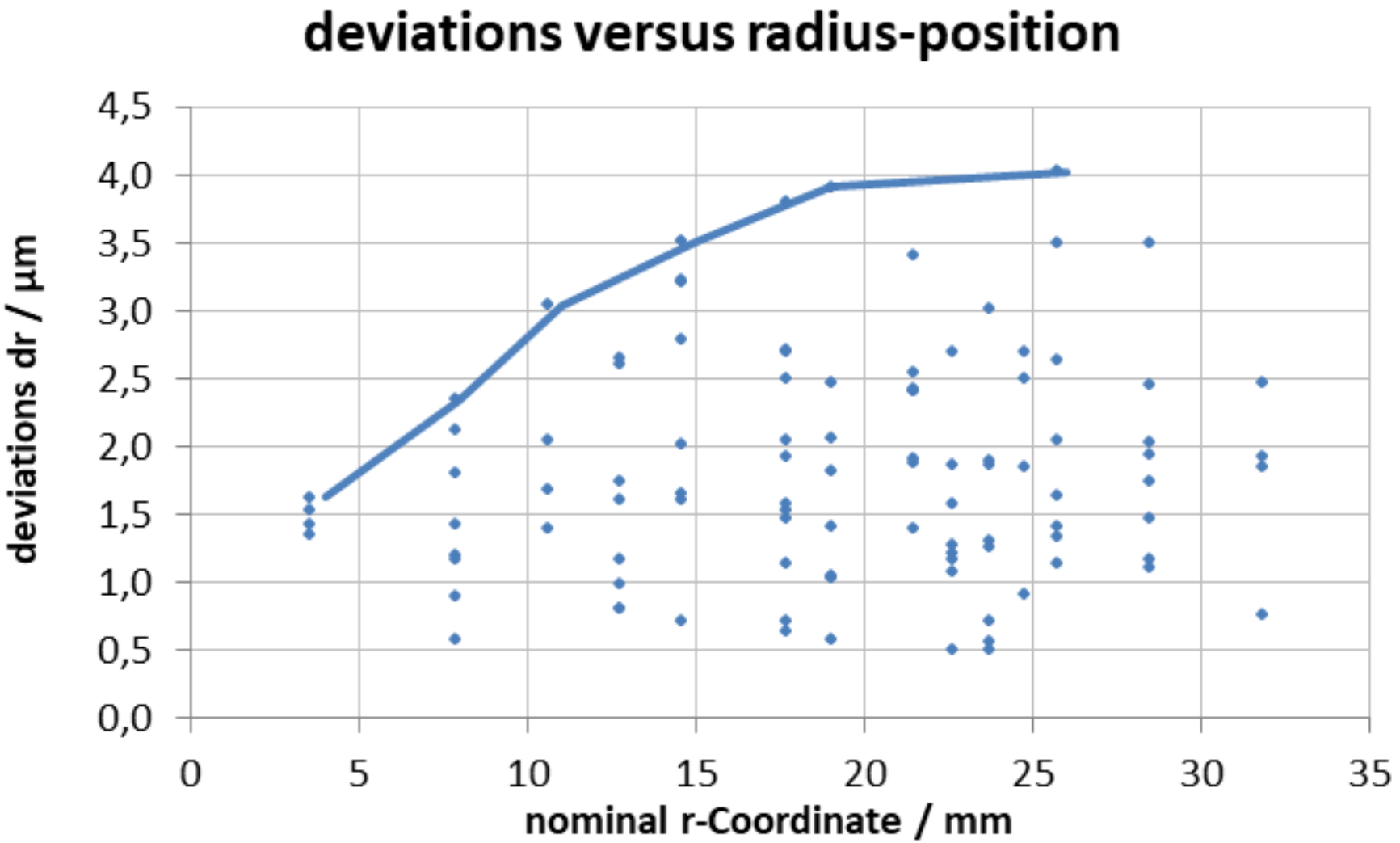
- No more scanner and laser delays – what you program is what you get
- Highest precision and exact laser control by trajectory planning
- Shortest process times through optimal use of scanner dynamics and laser power

- Parameters: Geometry, corner tolerance, process speed, power distribution



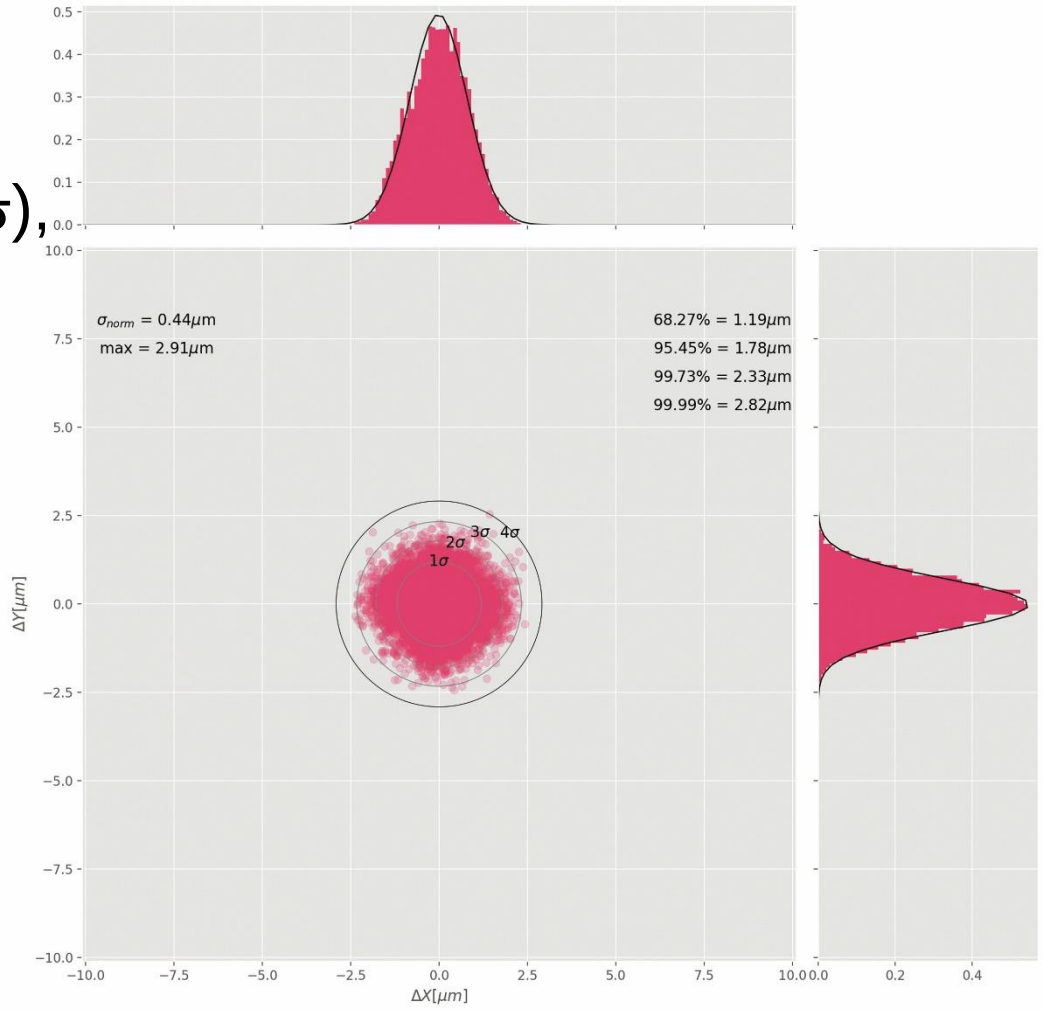
XL Scan: Video

f = 100mm scan system – conventional deviaitions



Accuracy

10000 shots
Accuracy: +/- 1.5µm (4σ),
f = 100 mm
Single beam
drill rate: 2600 Hz
Spot spacing: 100 µm



Thank you for your attention

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