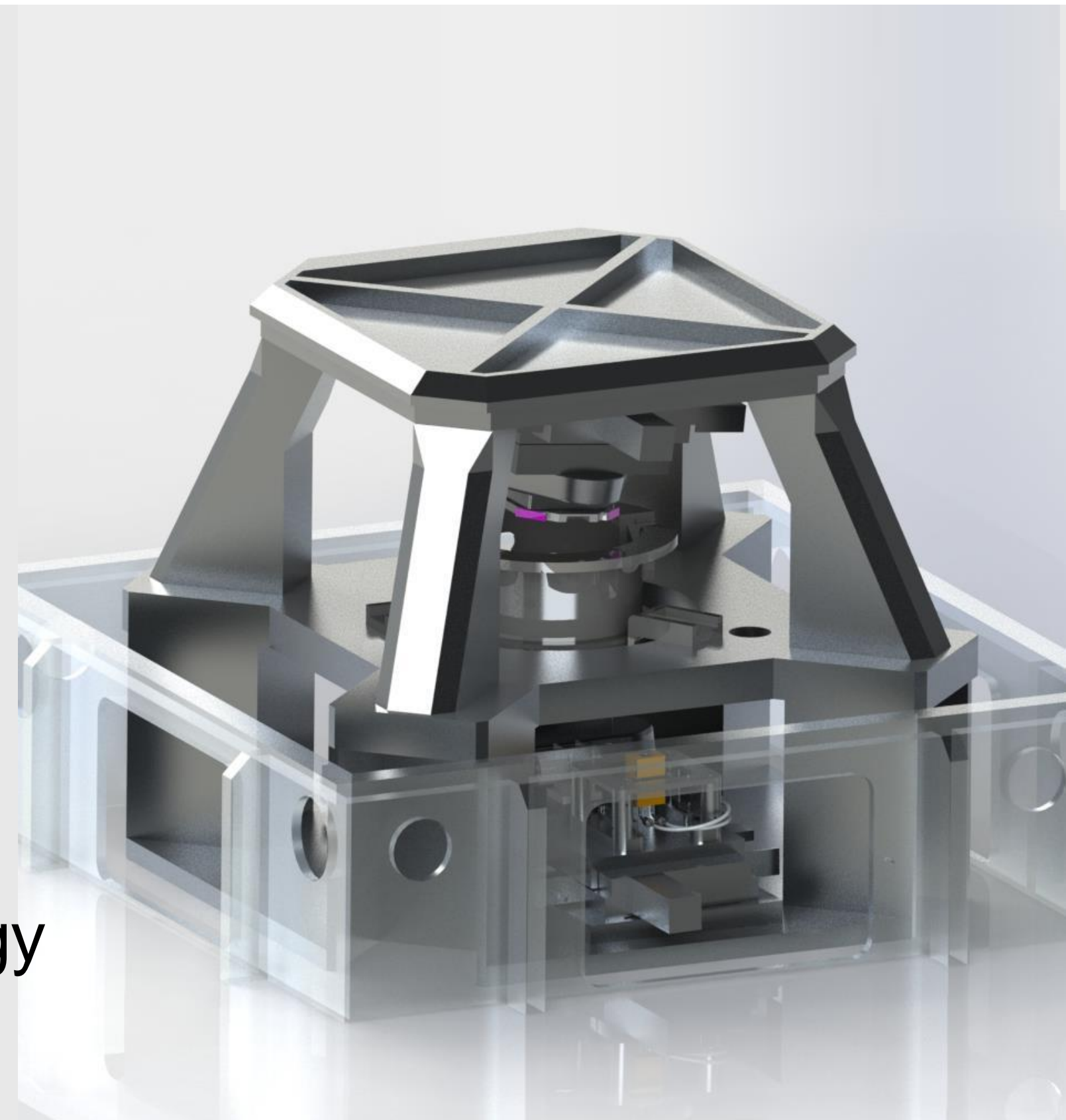


Development of a high numerical aperture EUV lithography tool: the Berkeley MET5 Platform

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MET5

- NA = 0.5
- Magnification = 5x
- Resolution limit = 8 nm
- Programmable pupil fill
- Mask angle of incidence = 6°
- Integrated wavefront metrology
- Robotic linked track

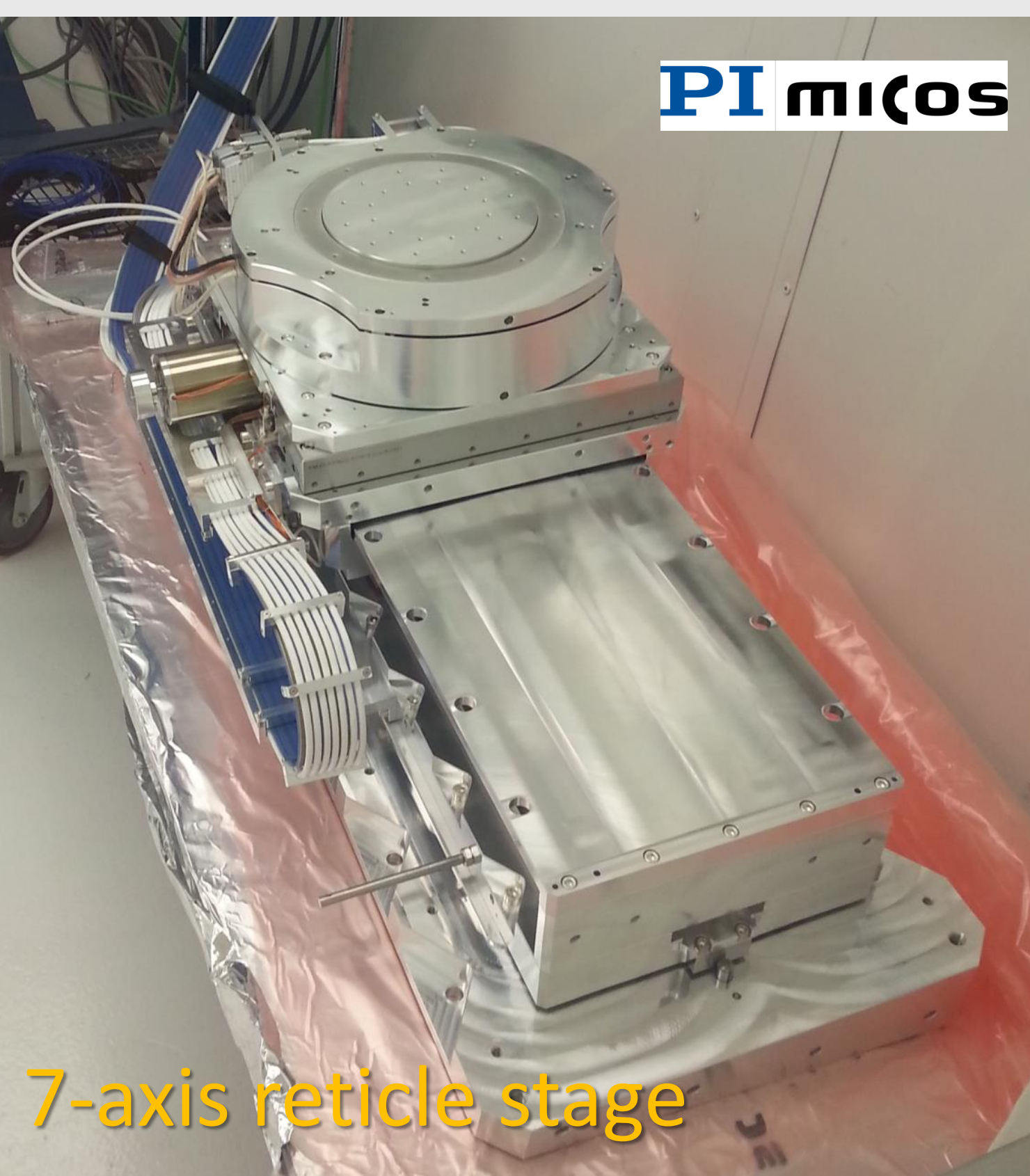
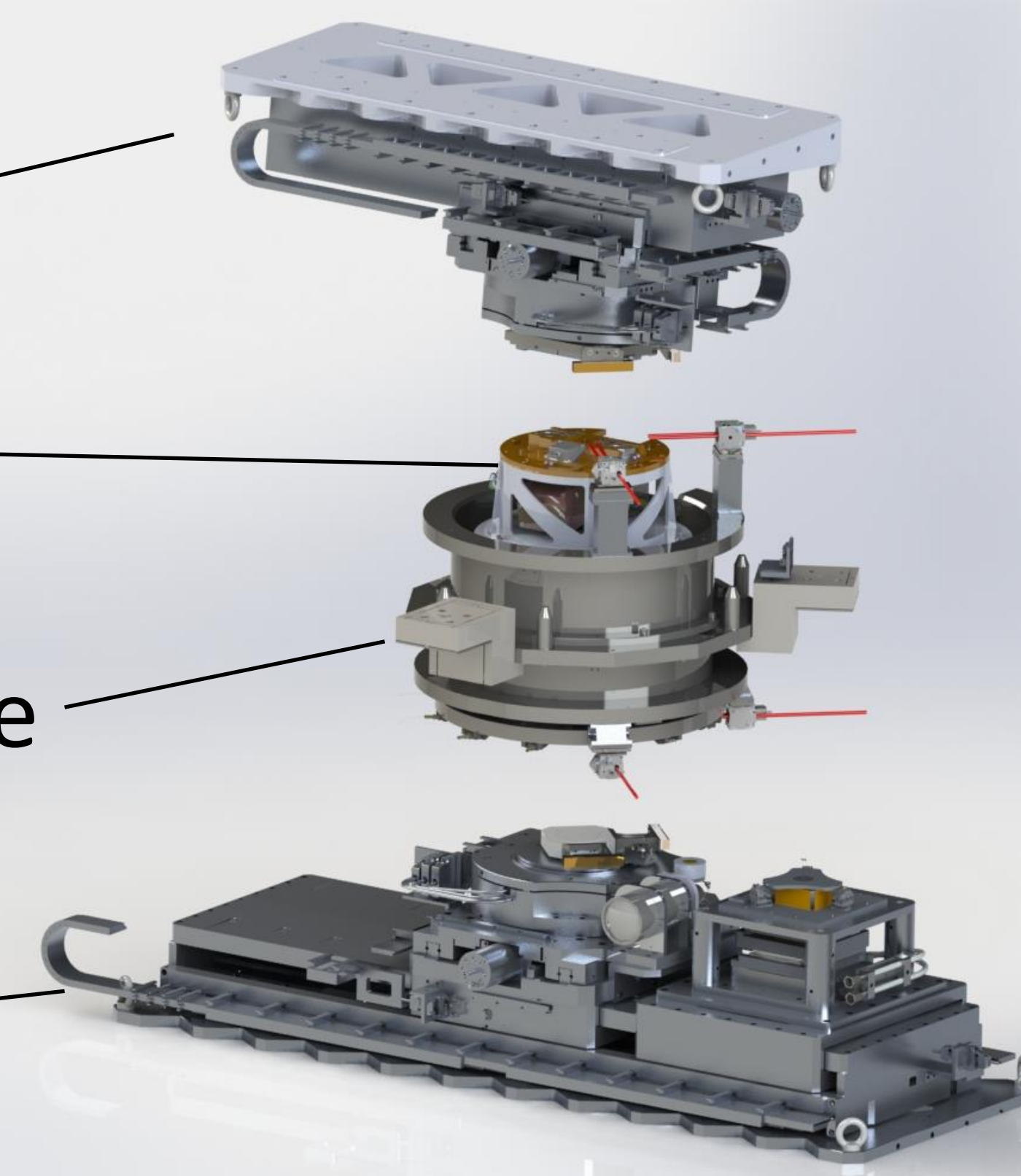


Reticle stage assembly

Projection optics box

Tool core metrology frame

Wafer stage assembly



PI micos

Delivered stages outperforming specifications

	Spec	Measured
XY Low freq. (<2Hz) PV	3 nm	0.92 nm
XY High freq. (>0.5Hz) RMS	2 nm	0.33 nm
Z Low freq. (<2Hz) PV	10 nm	1.7 nm
Z High freq. (>0.5Hz) RMS	3 nm	0.61 nm

	Spec	Measured
XY Low freq. (<2Hz) PV	3 nm	0.51 nm
XY High freq. (>0.5Hz) RMS	1 nm	0.65 nm
Tip/Tilt RMS	18 mrad	0.15 mrad
Z Low freq. (<2Hz) PV	10 nm	1.5 nm
Z High freq. (>0.5Hz) RMS	3 nm	0.42 nm



PI micos

5-axis wafer stage/
2-axis LSI carriage

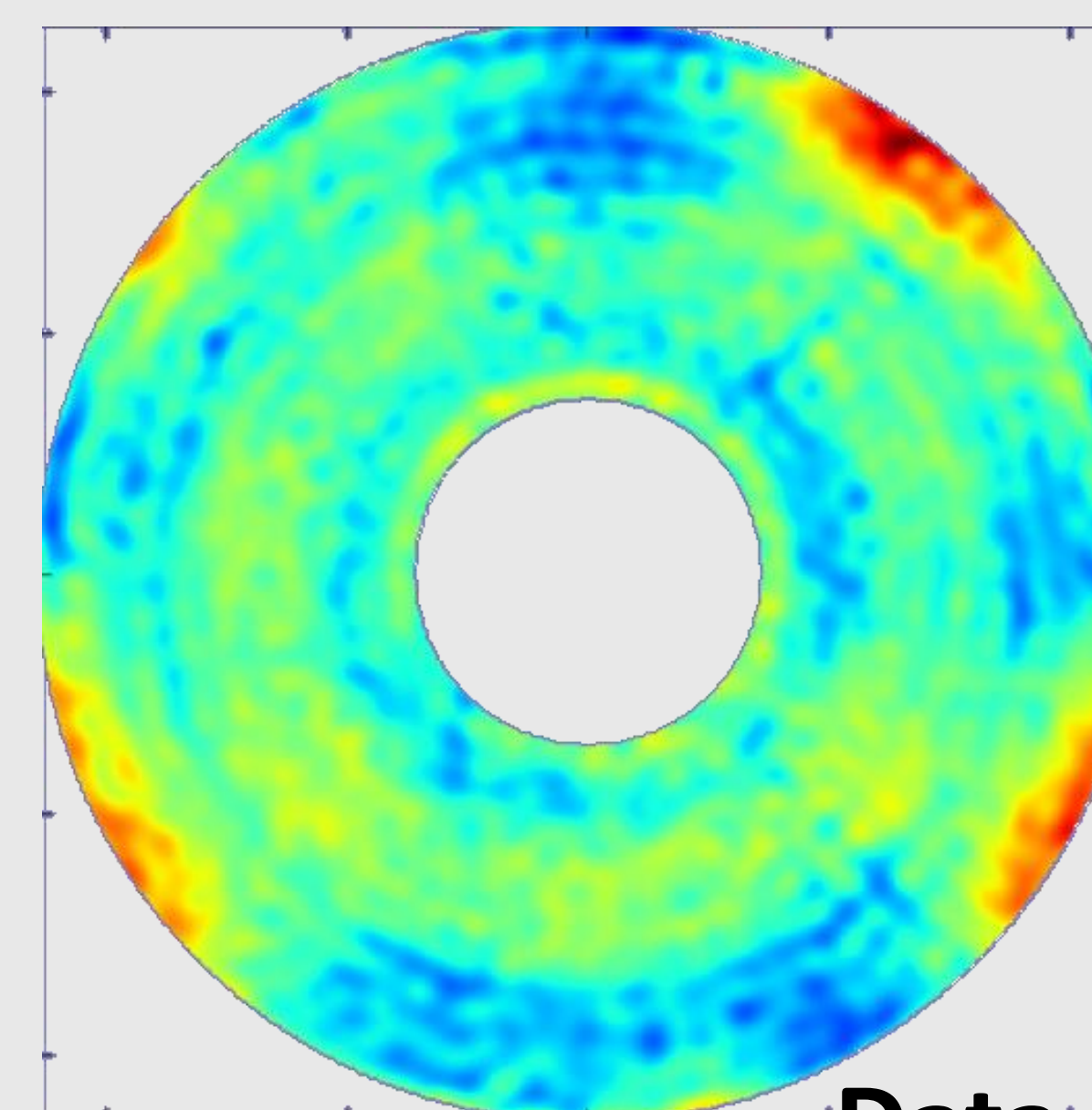
Projection Optics Box outperforms requirements

M1	Range	Specification	Result
Figure	CA – 3mm	< 0.1nm rms	0.04 nm rms
Flare	3mm – 0.43um	< 0.17nm rms	0.12 nm rms
HSFR	1um – 10nm	< 0.15nm rms	0.08 nm rms

M2	Range	Specification	Result
Figure	CA – 8mm	< 0.1nm rms	0.08 nm rms
Flare	8mm – 1.2um	< 0.17nm rms	0.14 nm rms
HSFR	1um – 10nm	< 0.15nm rms	0.09 nm rms



System wavefront error = 0.21 nm at center of field (spec = 0.5 nm)



Reticle field point (um)	WFE @ 30cycles across aperture (nm rms)
0, 0	0.21 (spec=0.5)
75, 500	0.43 (spec=1.0)
75, -500	0.41 (spec=1.0)
-75, -500	0.34 (spec=1.0)
-75, 500	0.36 (spec=1.0)

Data courtesy of zygo

Predicted POB EUV flare = 2.86%

Platform integration nearly complete

- Dedicated cleanroom
- 200-mm wafers
- Robotic linked track
- In-vacuum isolated frame
- Interferometer stage control
- Pupil fill and dose monitors

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