Development of the SEMATECH Berkeley MET5 Platform

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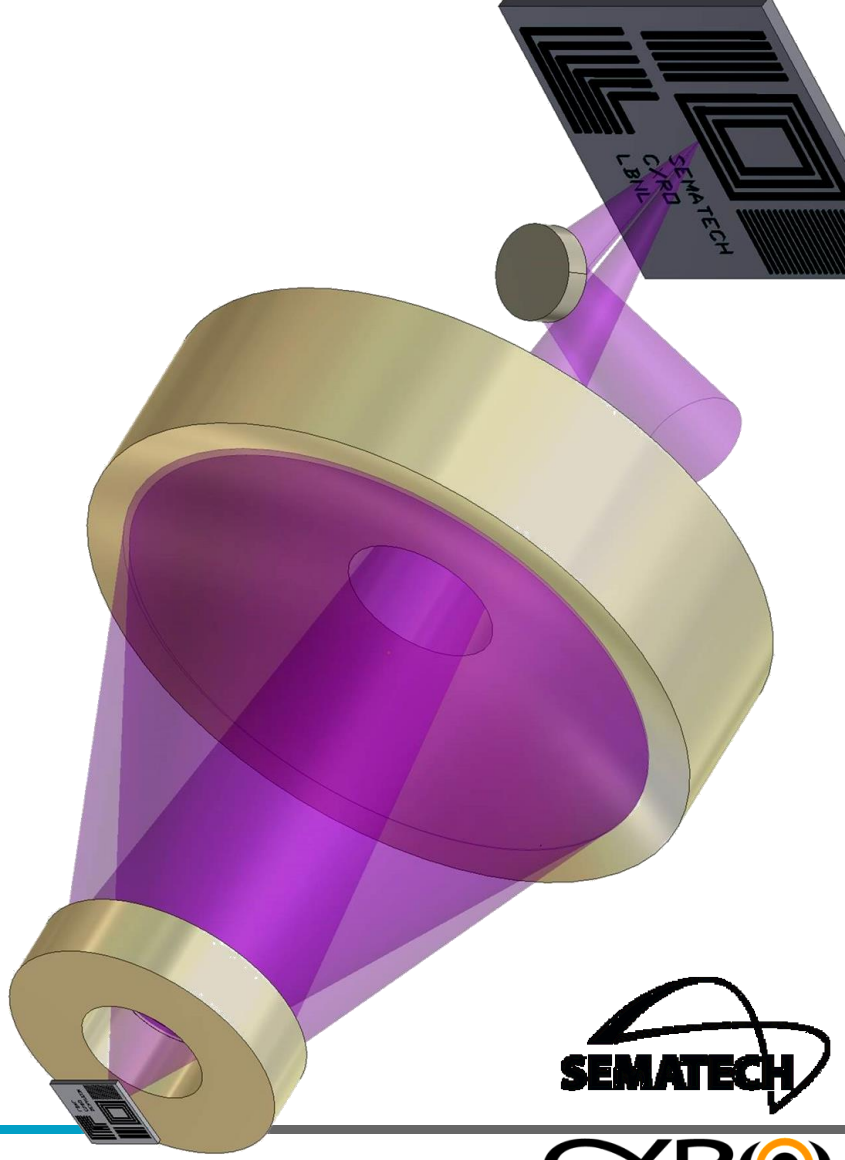
MET5

- NA = 0.5
- Magnification = 5x
- Resolution limit = 8 nm
- Programmable pupil fill
- Field of view = 200x30 μm
- Mask angle of incidence = 6°
- Integrated wavefront metrology



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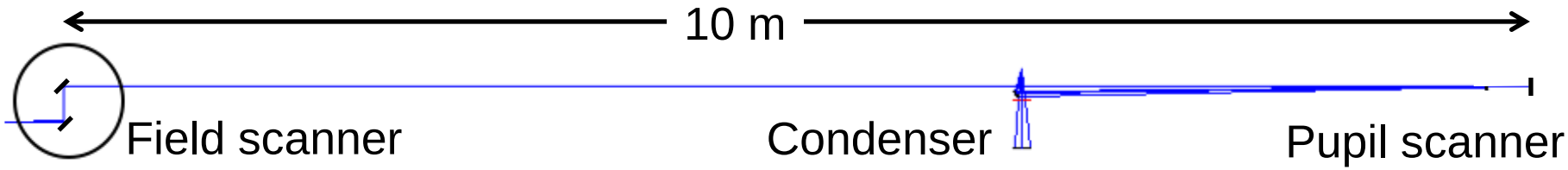
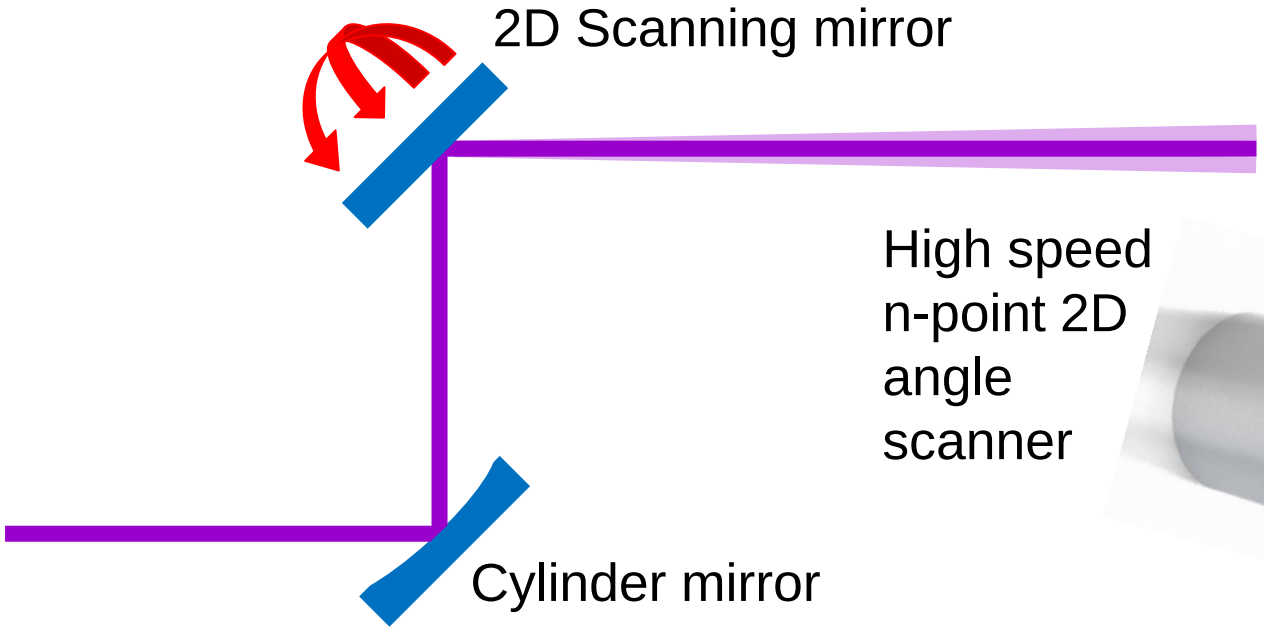
Synchrotron illuminator

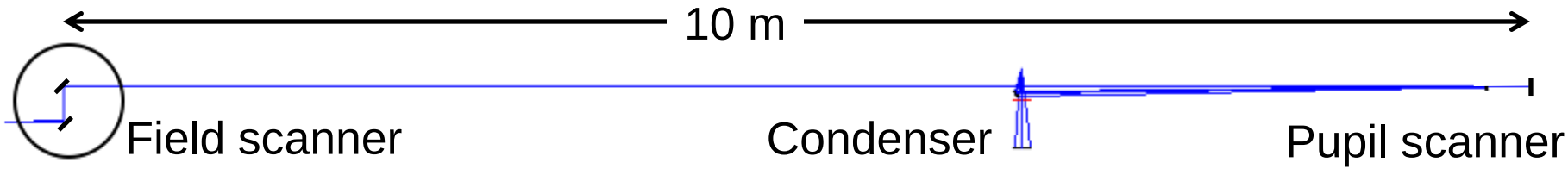
Field size and uniformity control

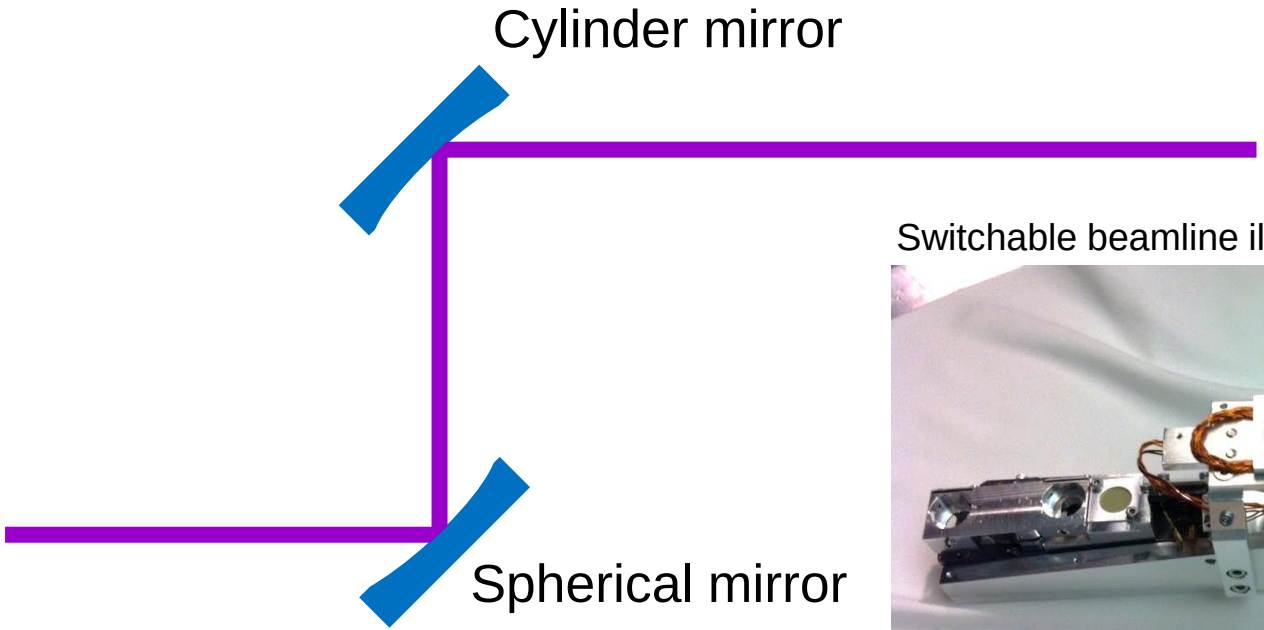




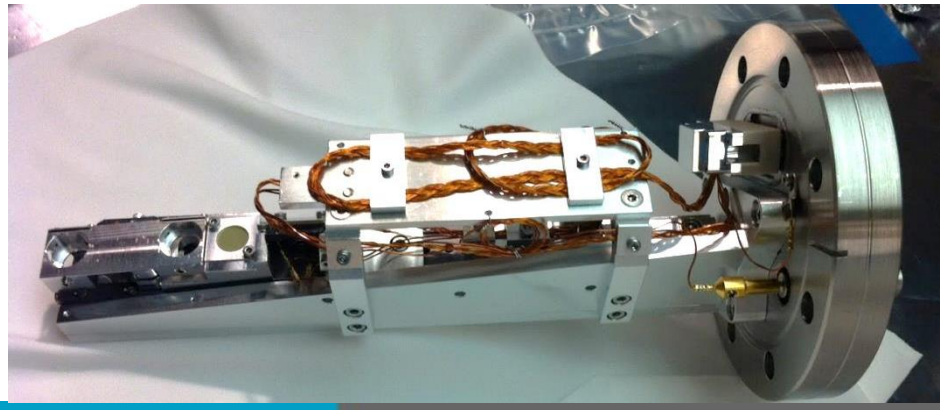
High speed n-point 2D angle scanner

Wavefront metrology mode

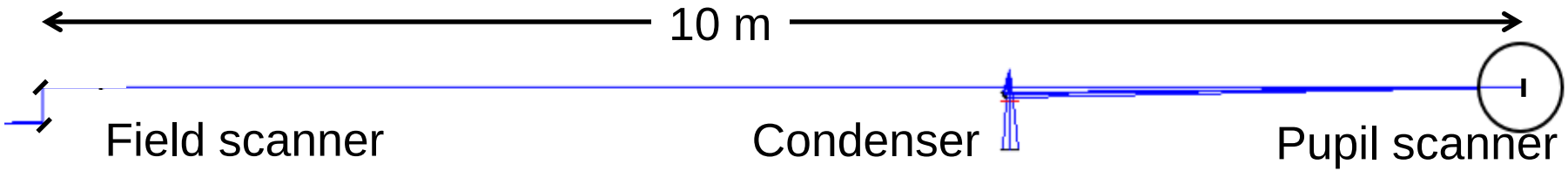


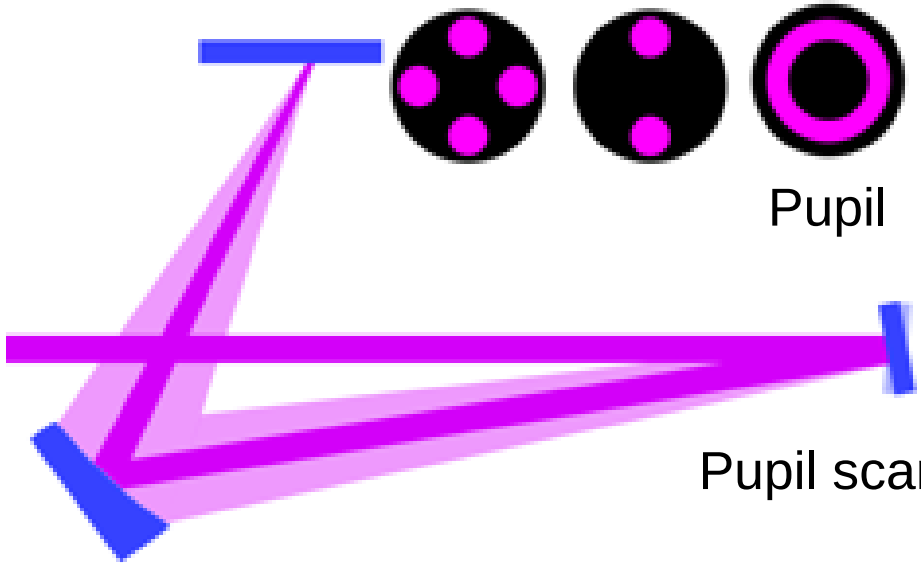


Switchable beamline illuminator mirror with diagnostics

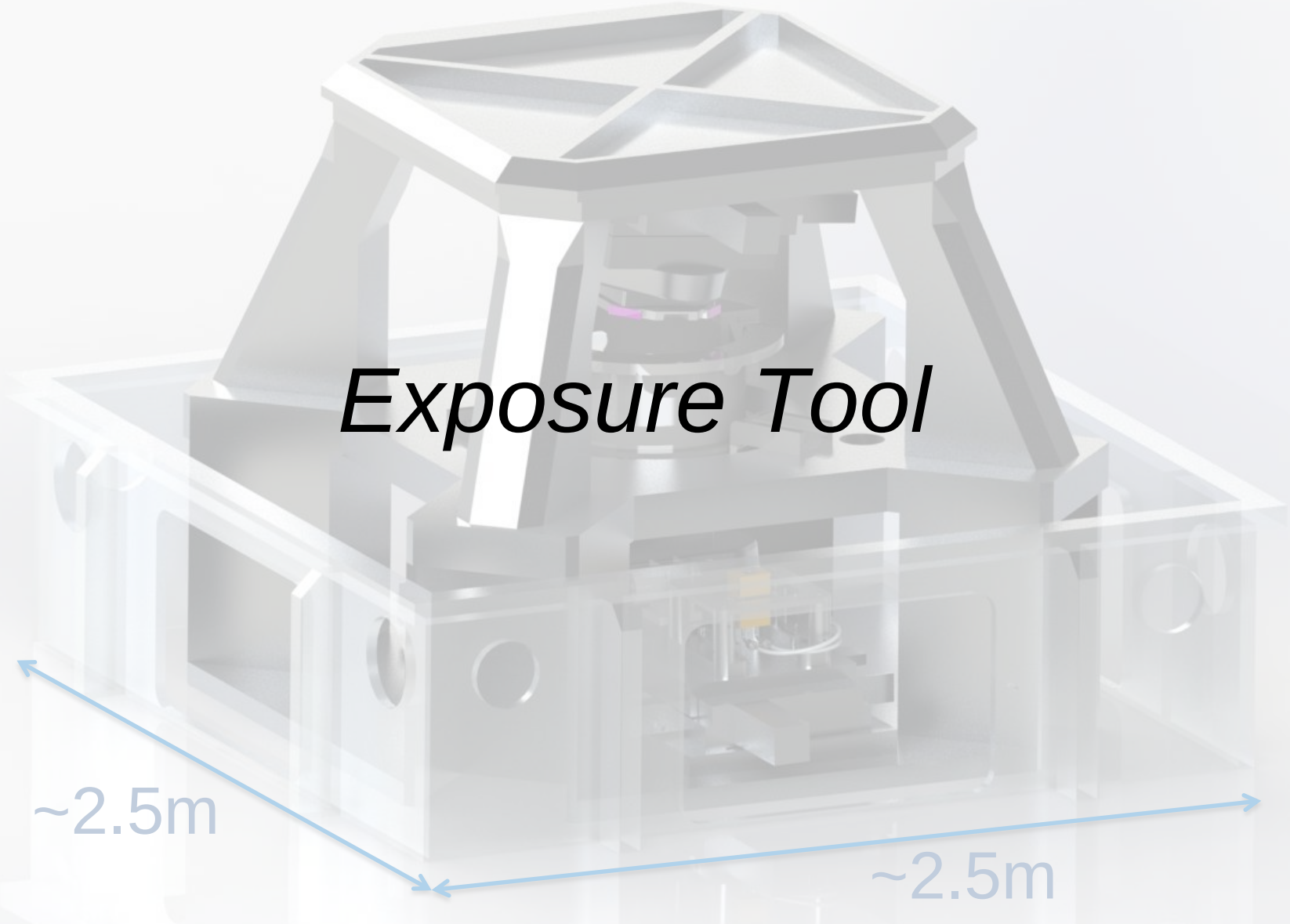


Computer controlled pupil fill





Exposure Tool

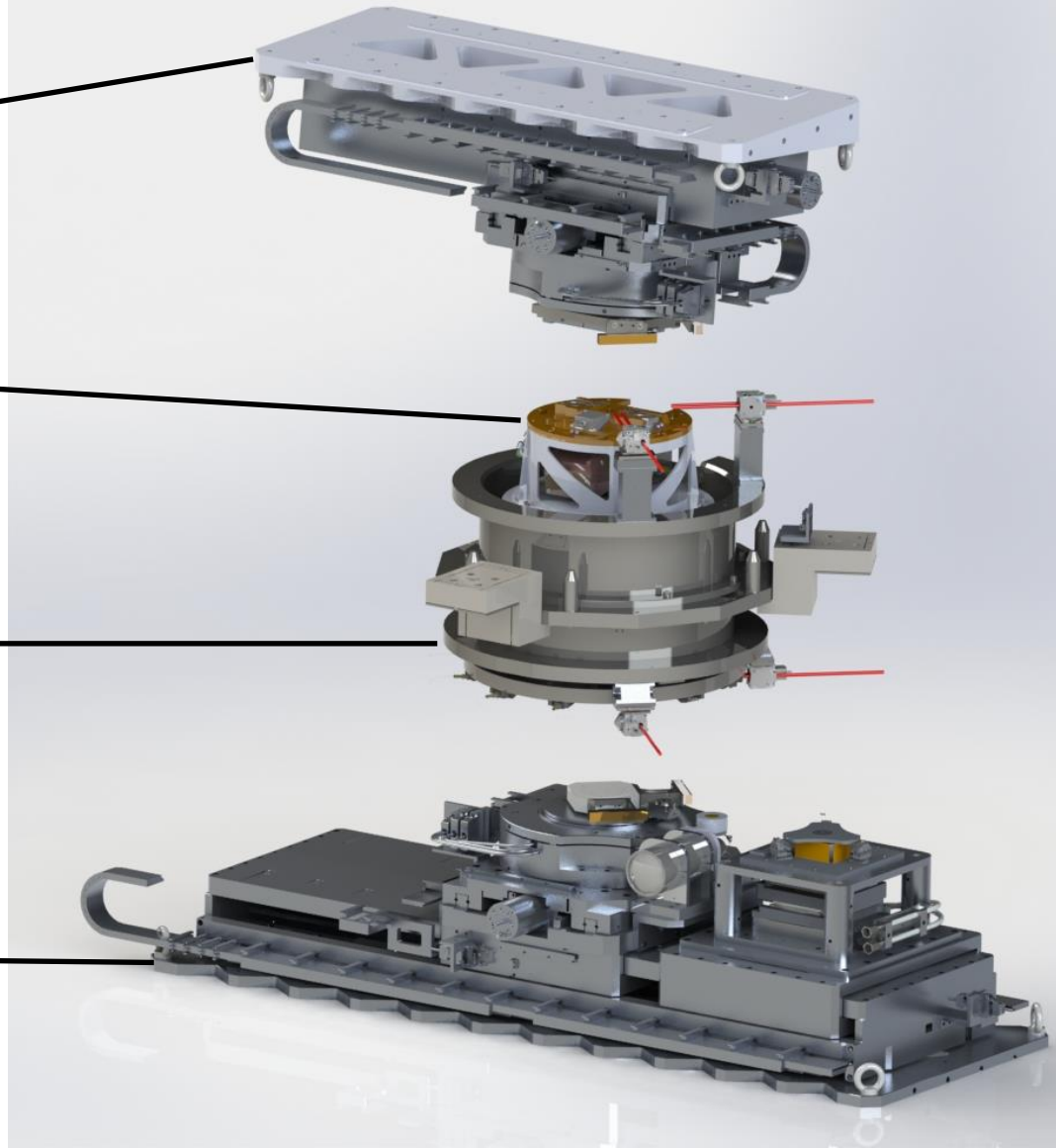


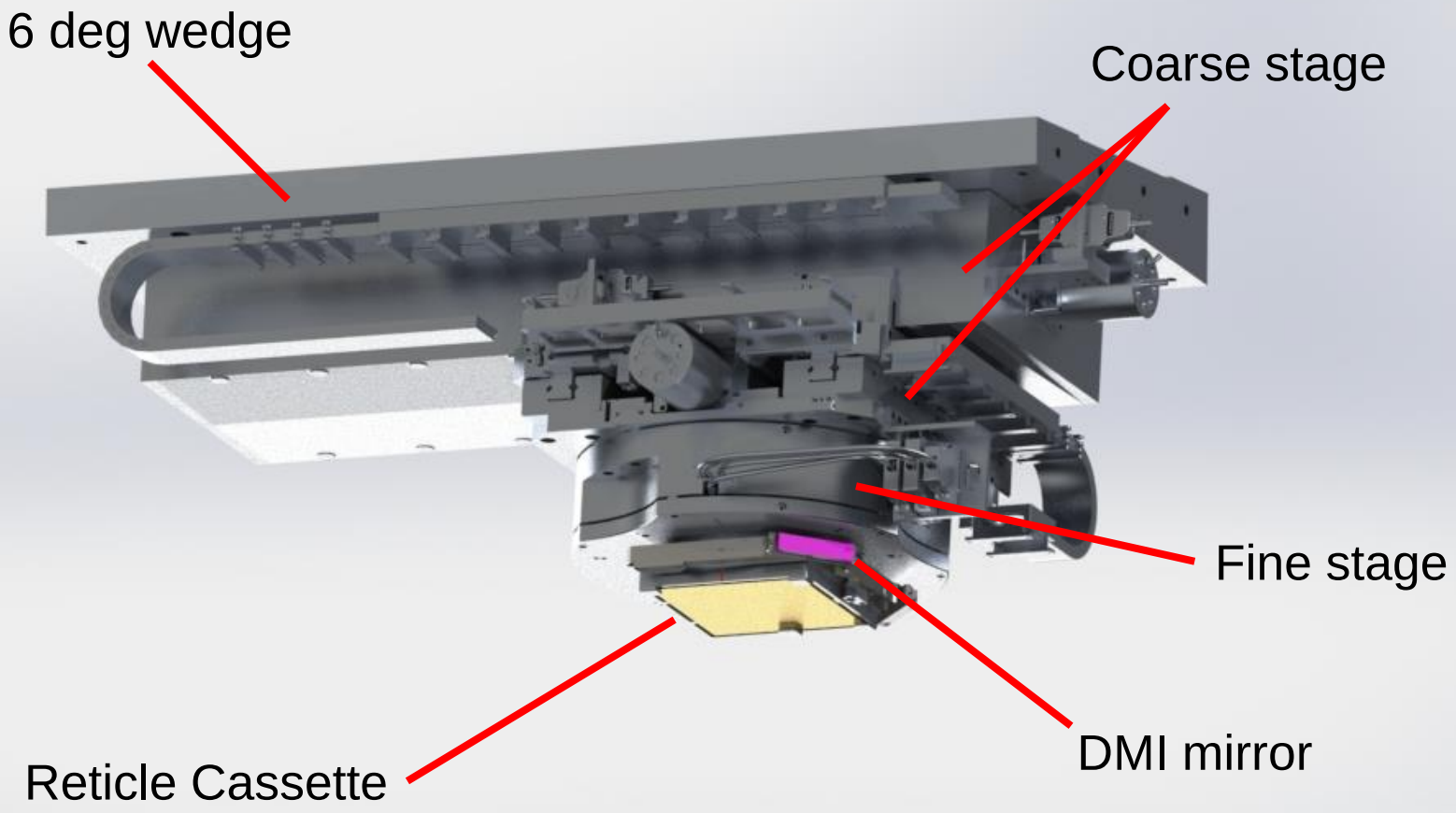
Reticle stage assembly

Projection optics box

Tool core metrology frame

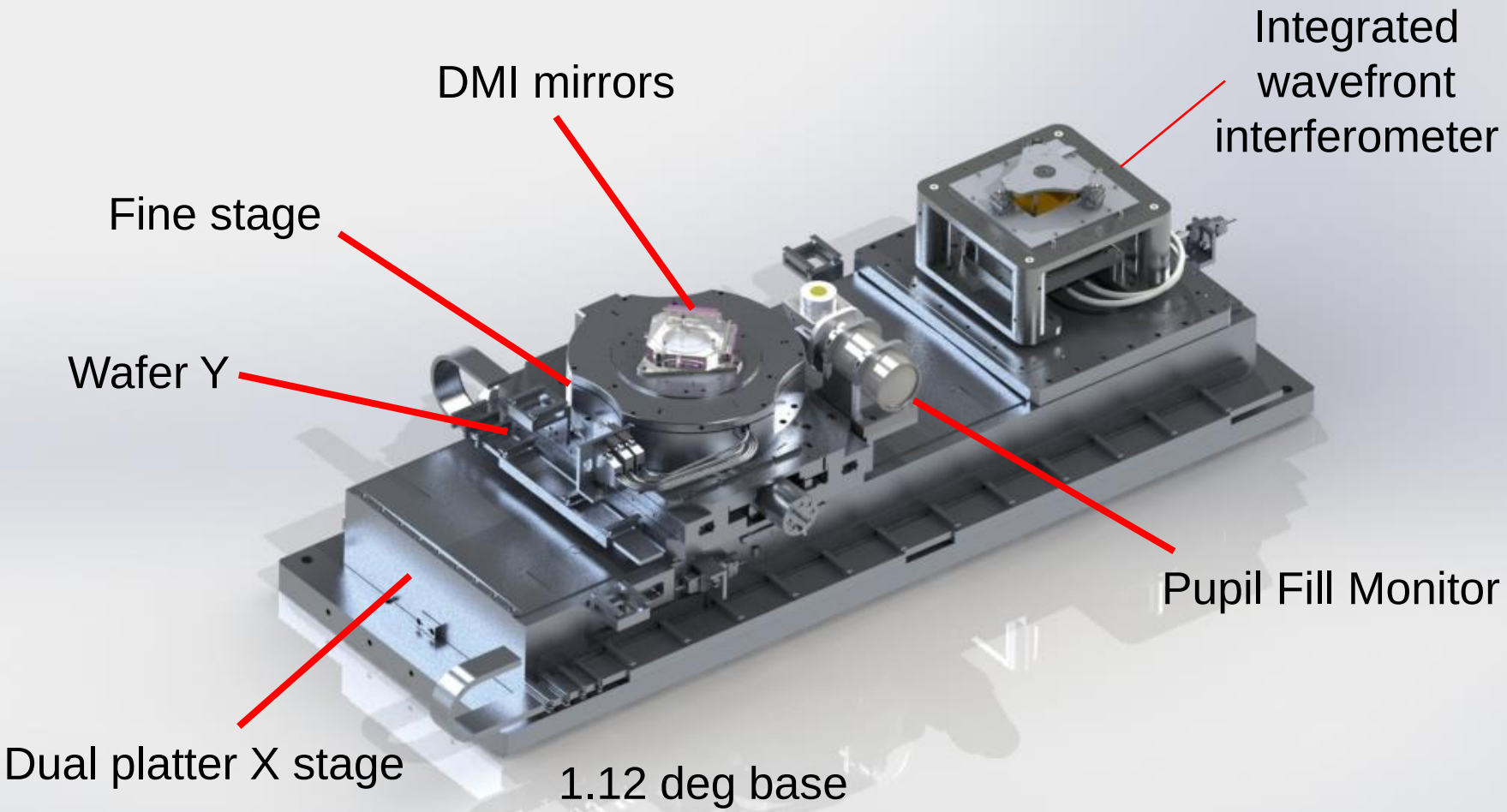
Wafer stage assembly




6 deg wedge
Coarse stage
Fine stage
DMI mirror
Reticle Cassette

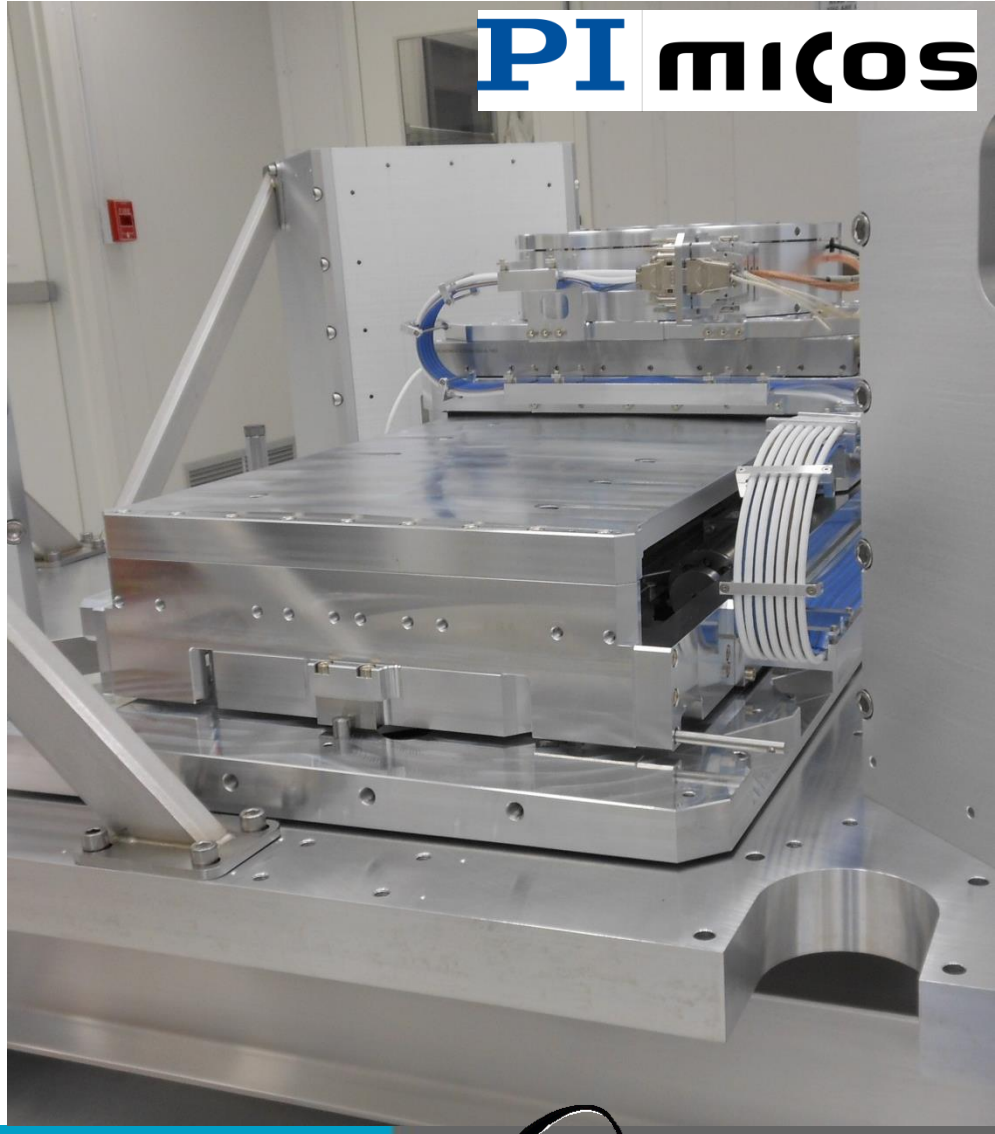
7-axis reticle stage

	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


Integrated wavefront interferometer
DMI mirrors
Fine stage
Wafer Y
Pupil Fill Monitor
Dual platter X stage
1.12 deg base

5-axis wafer stage/ 2-axis LSI carriage

	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



Lateral shearing interferometry module

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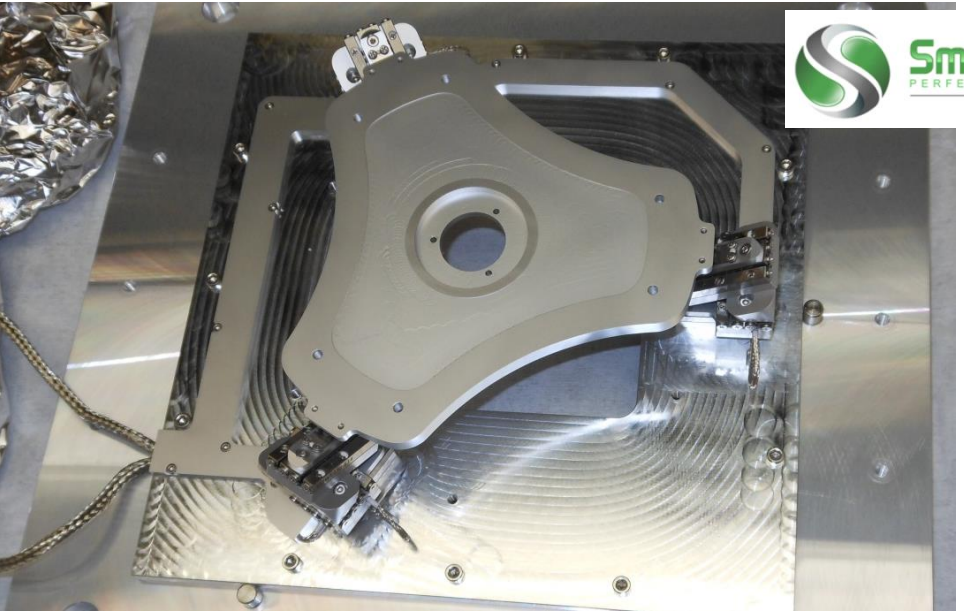
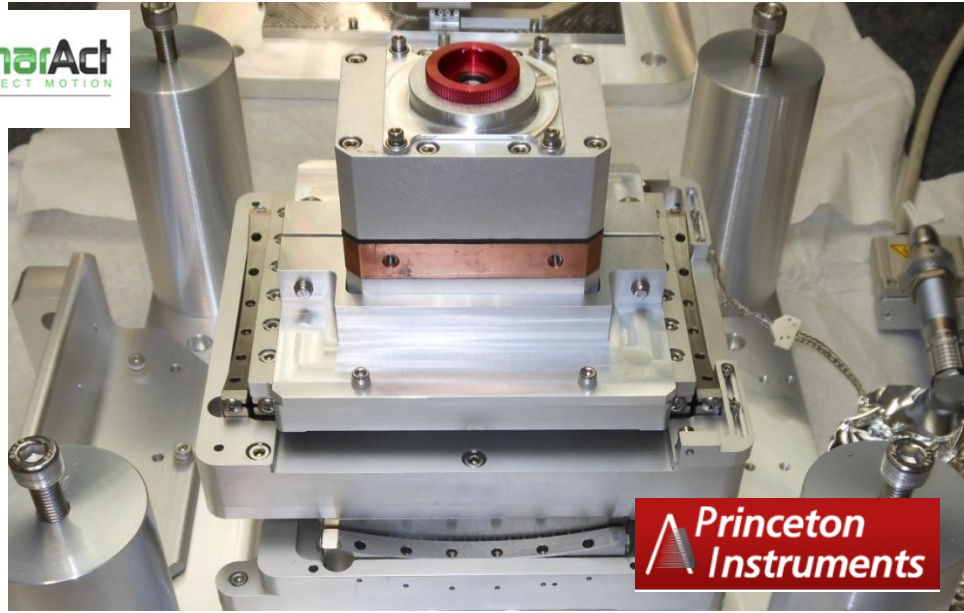
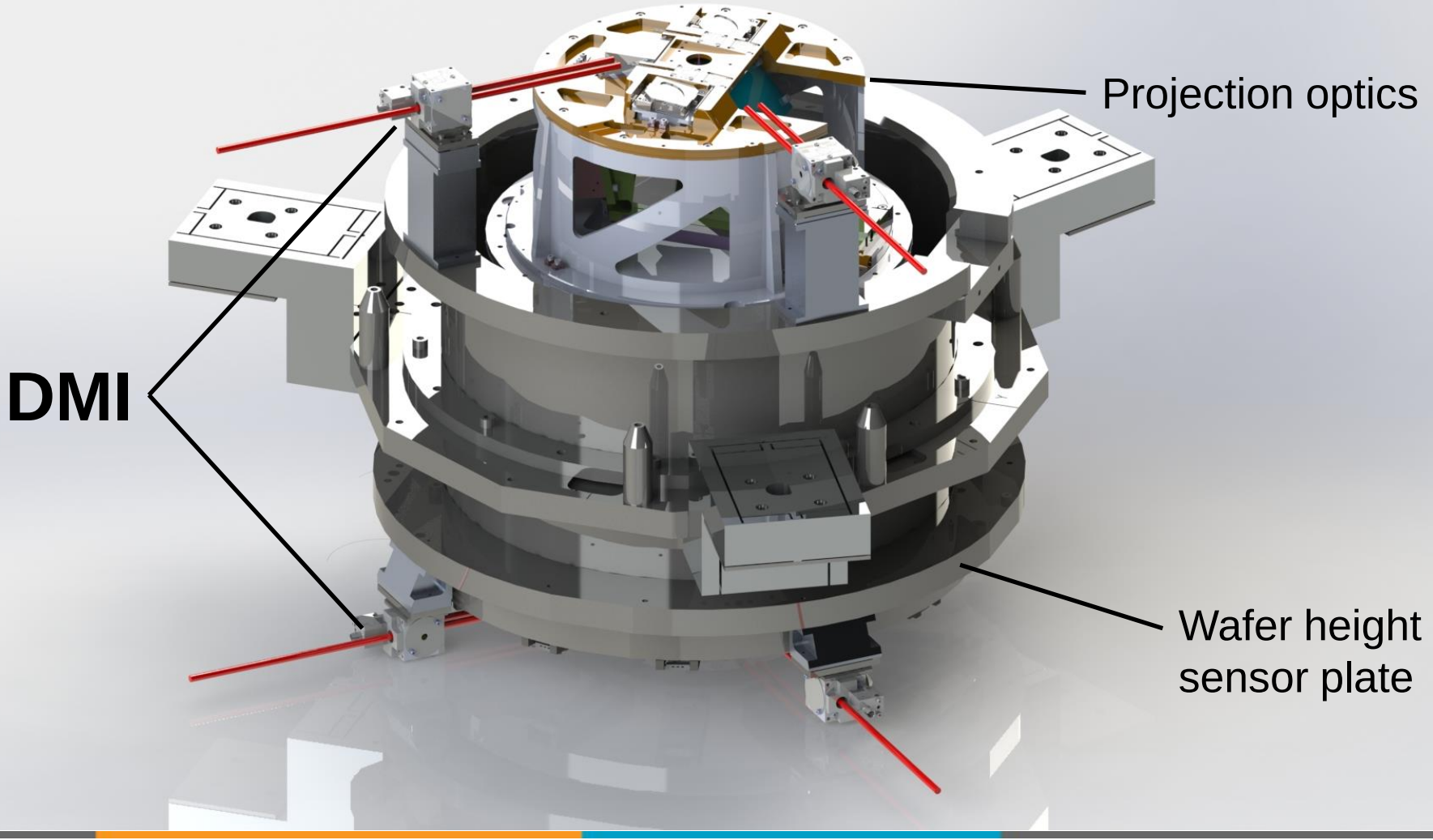
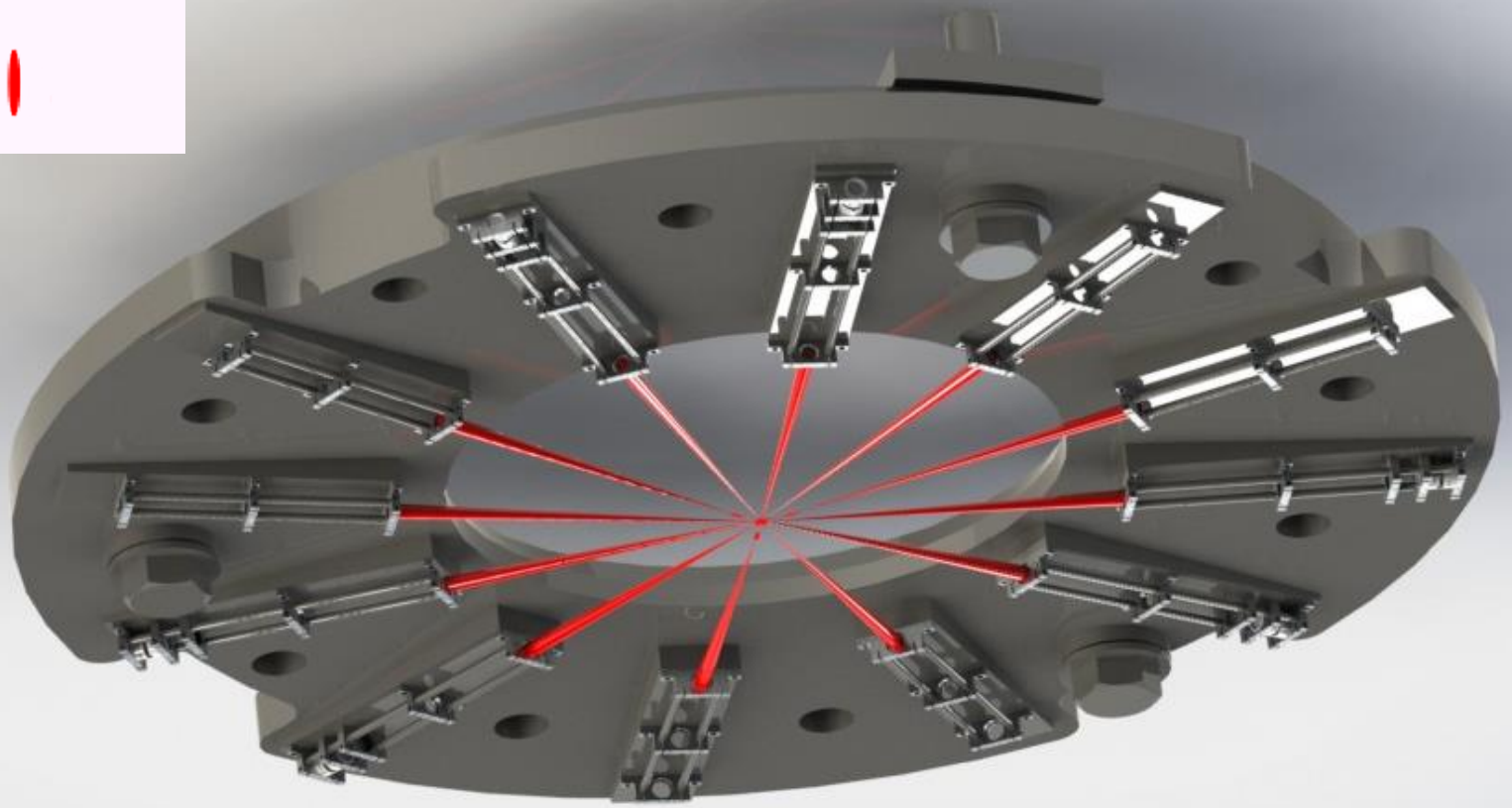
Hexapod grating stage



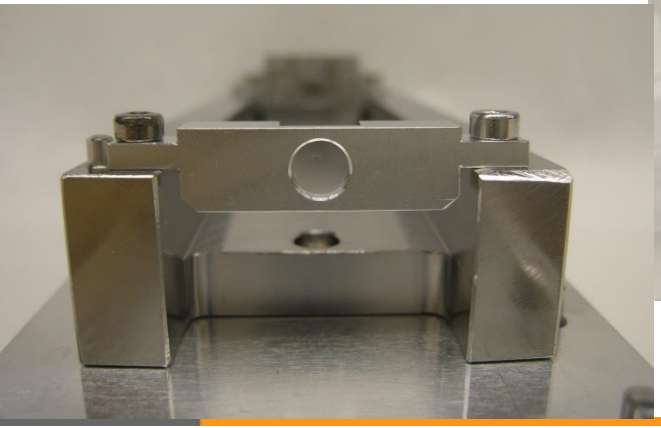
Goniometer CCD stage

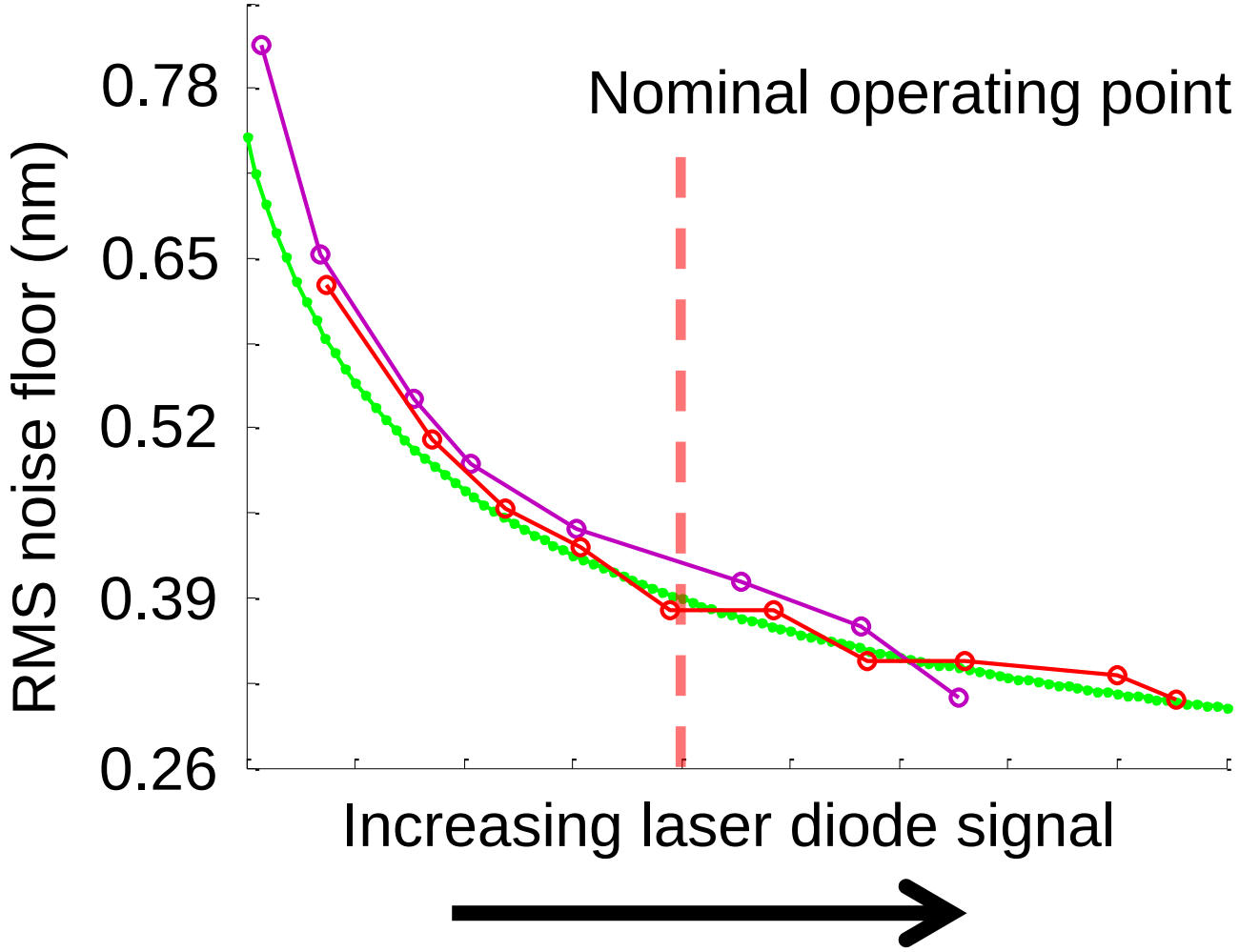



Projection optics
DMI
Wafer height
sensor plate




27J550F
Serial # 10



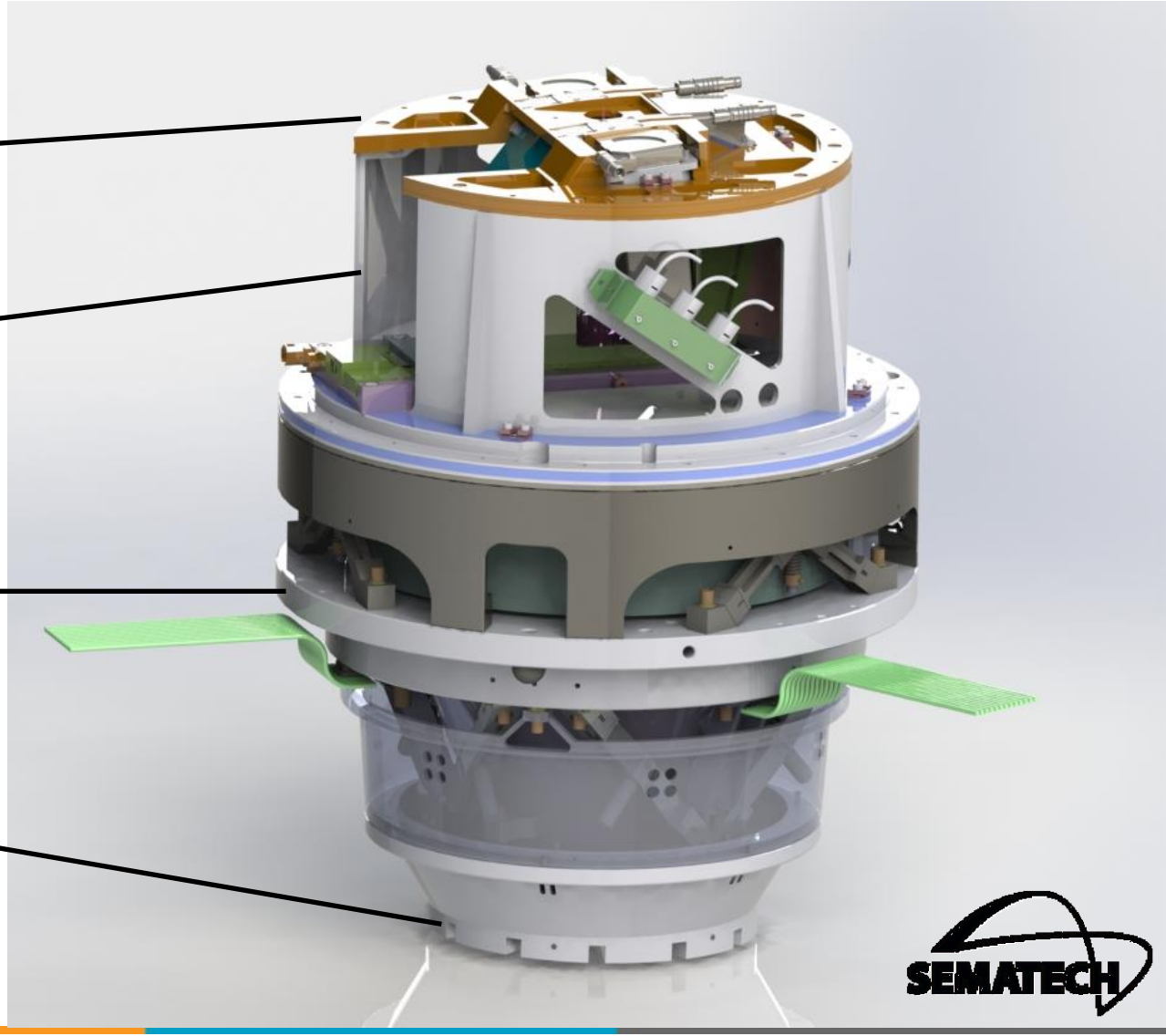

Nominal operating point
RMS noise floor (nm)
0.78
0.65
0.52
0.39
0.26
Increasing laser diode signal

Reticle sensor plate

Illuminator

Mounting flange

Height sensor channels and wafer sensor plate



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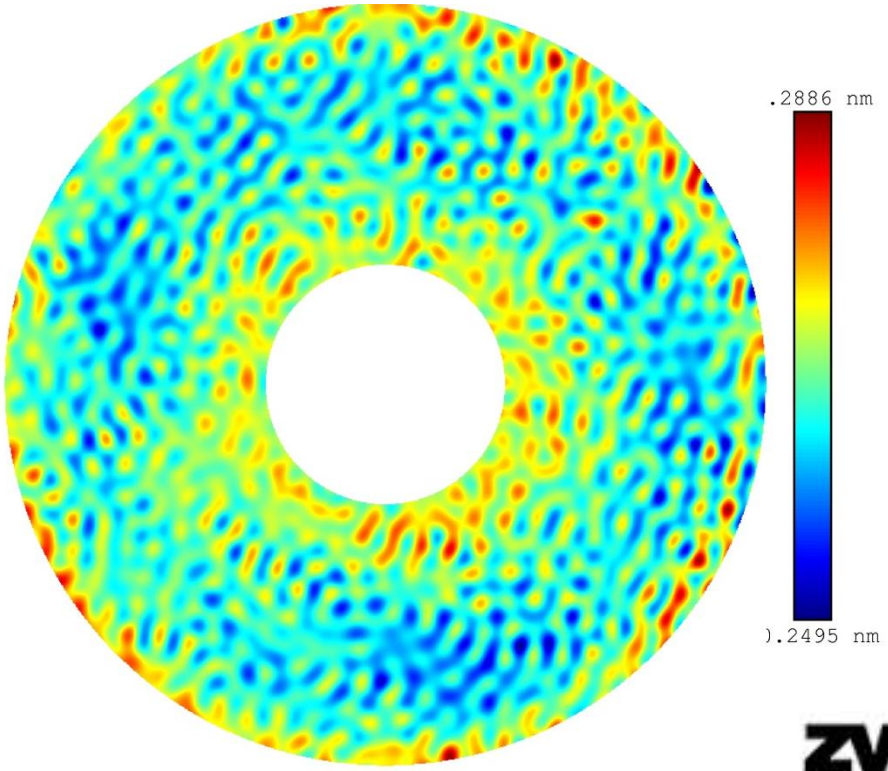
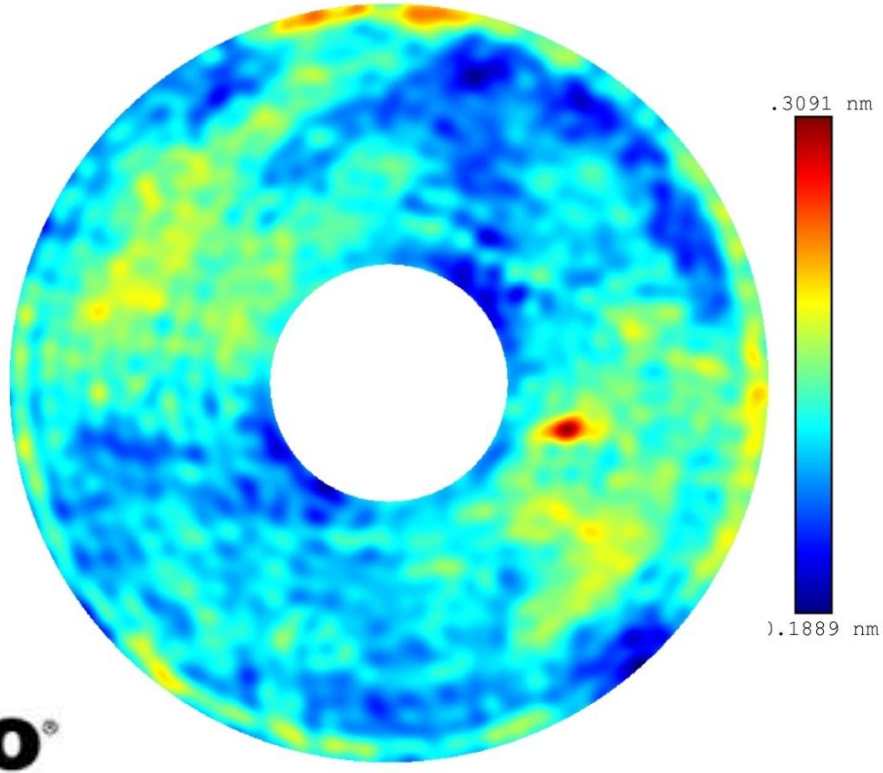
Set I Mirrors (Pre-Coating) Exceed Specs

M1 Figure = 0.07 nm RMS



M2 Figure = 0.06 nm RMS



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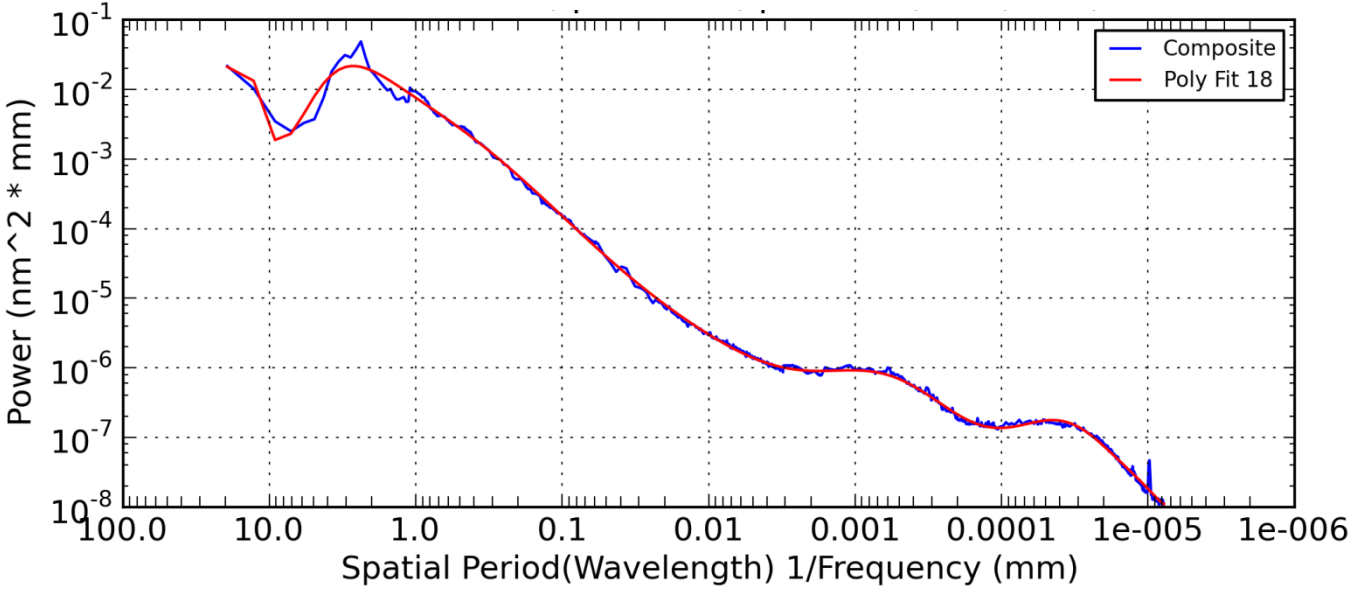
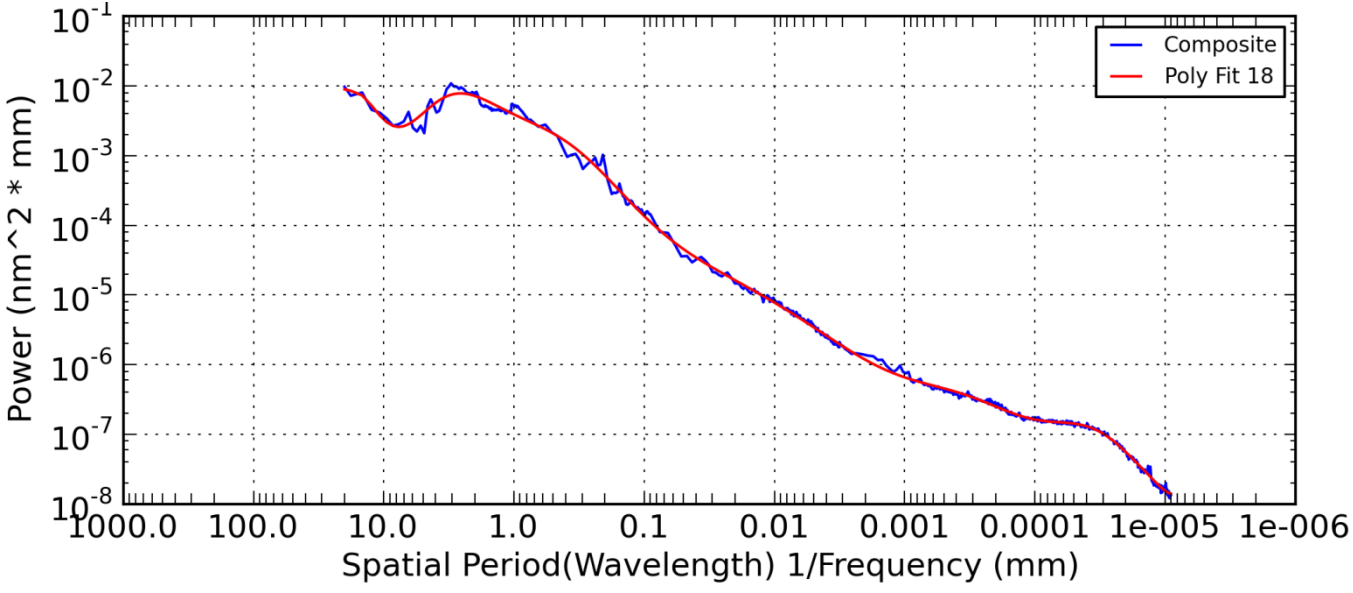
M1 MSFR =
0.155 nm RMS



M2 MSFR =
0.126 nm RMS



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Set I Mirrors (Pre-Coating) Exceed Specs

M1

	Range	Specification	Result
Figure	CA – 3mm	< 0.1nm rms	0.07 nm rms
Flare	3mm – 0.43um	< 0.17nm rms	0.155nm rms (2.0%)
HSFR	1um – 10nm	< 0.15nm rms	0.101 nm rms

M2

	Range	Specification	Result
Figure	CA – 8mm	< 0.1nm rms	0.056 nm rms
Flare	8mm – 1.2um	< 0.17nm rms	0.126nm rms (1.4%)
HSFR	1um – 10nm	< 0.15nm rms	0.091 nm rms

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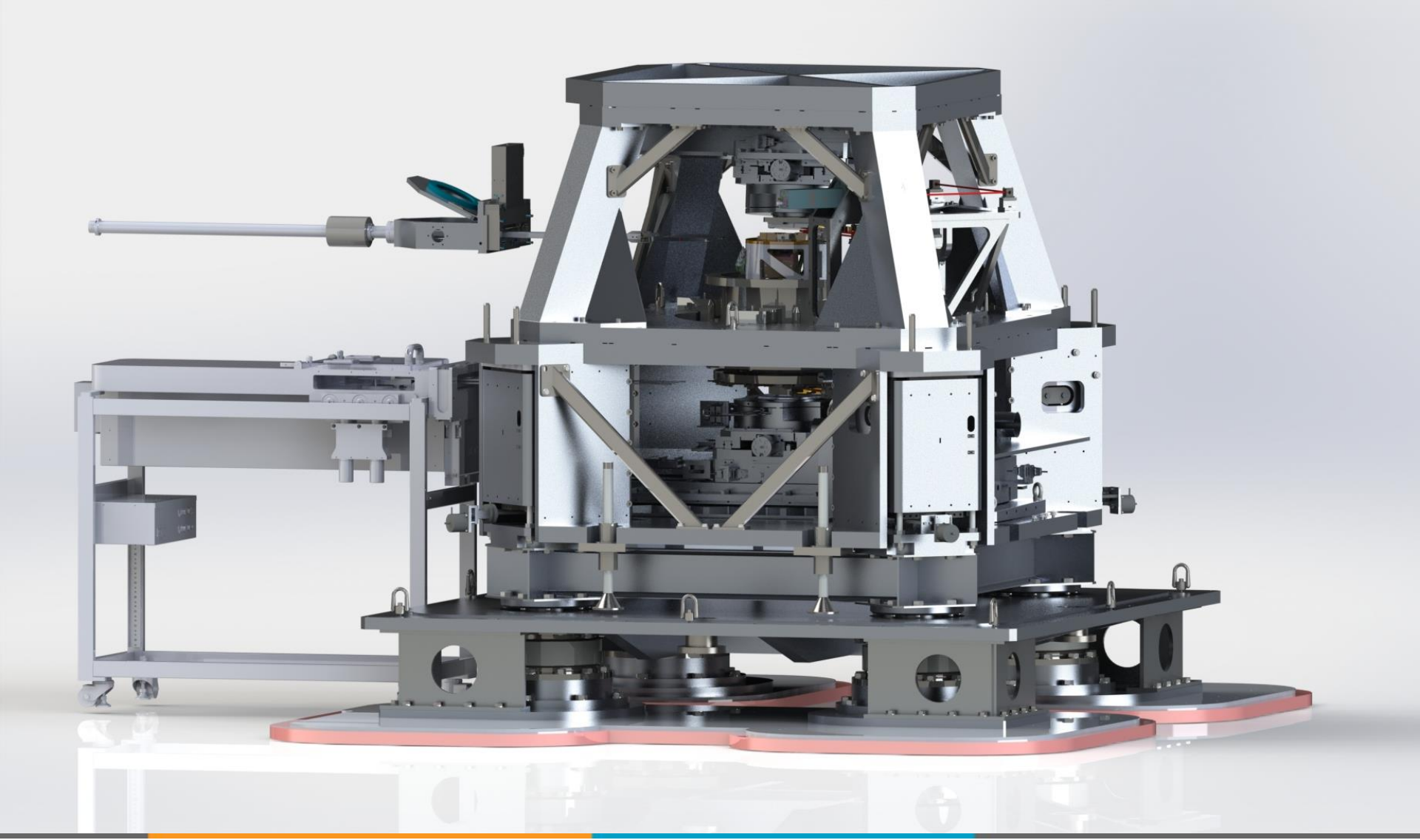
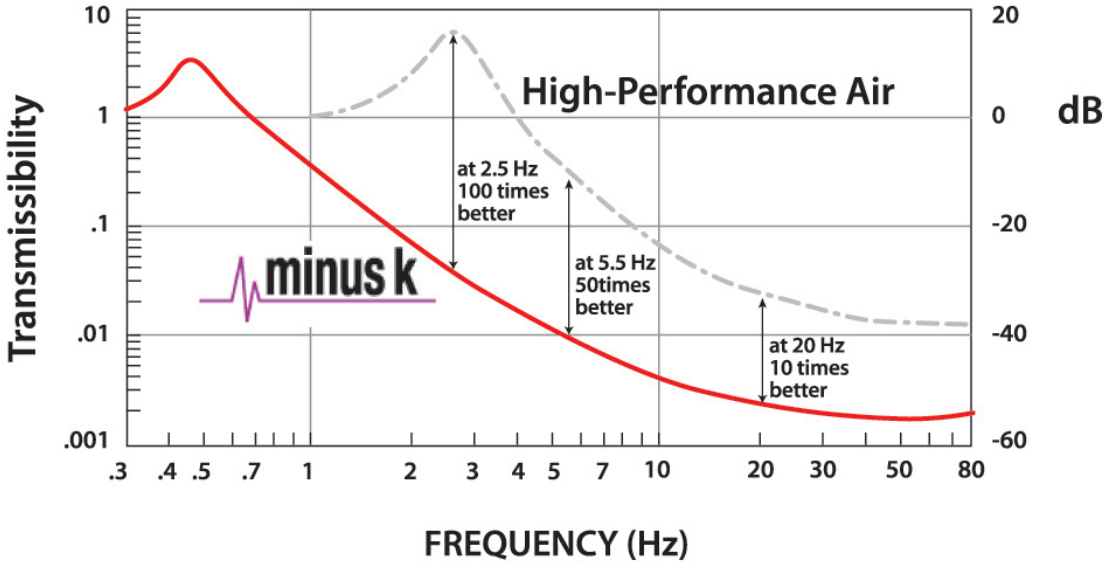
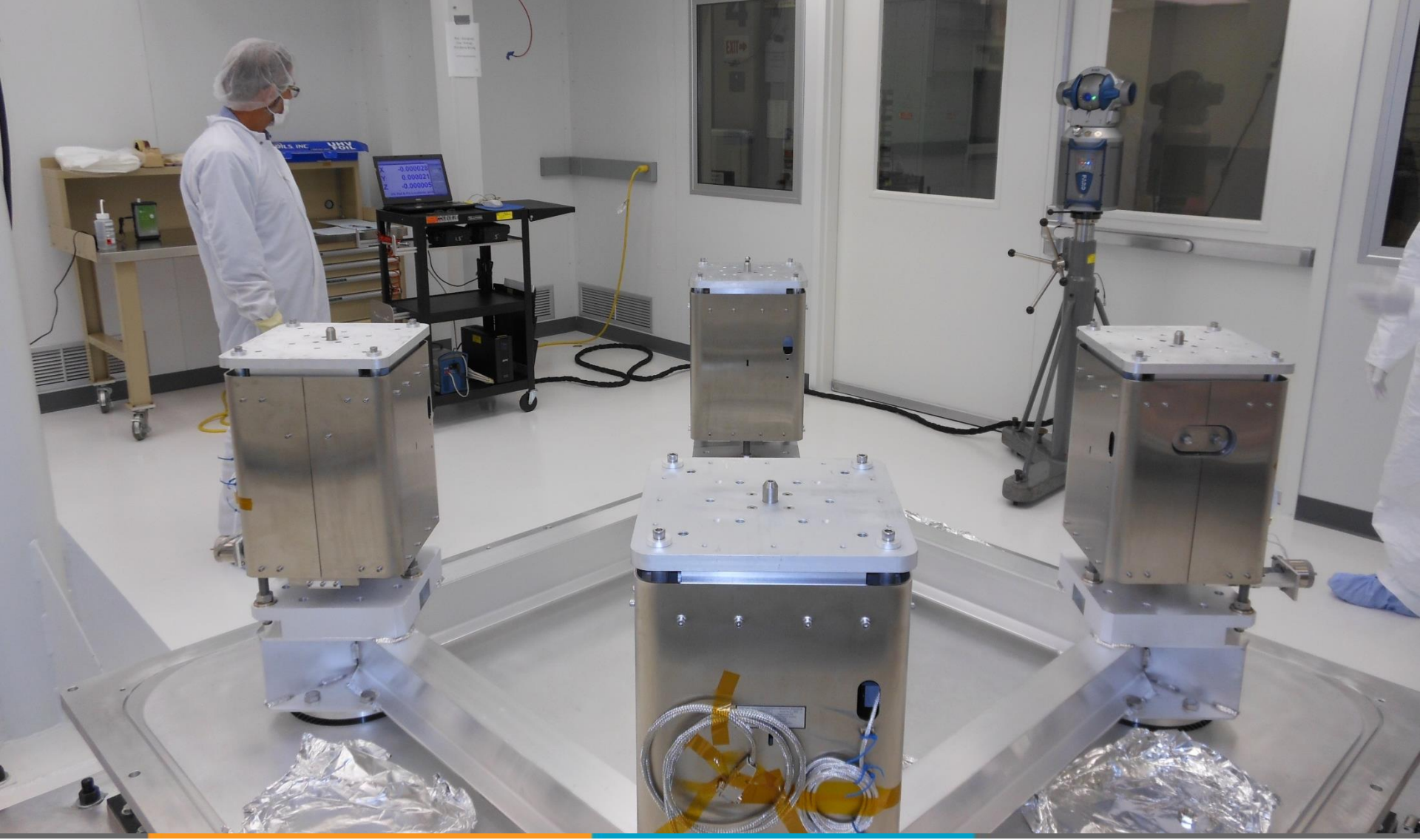
Frame and Facility

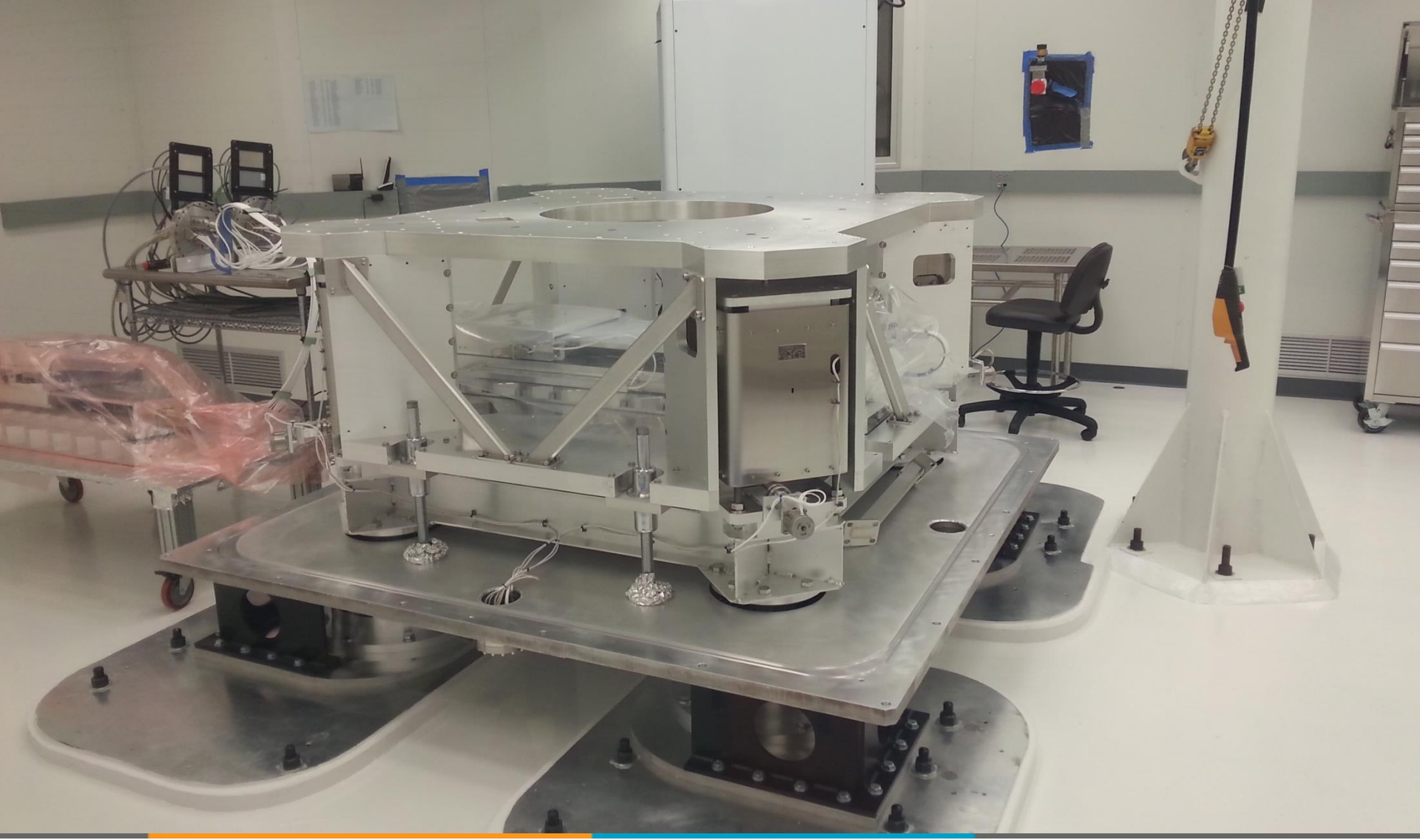


In vacuum vibration isolation

Minus K® Technology / SM-1 Vibration Isolator





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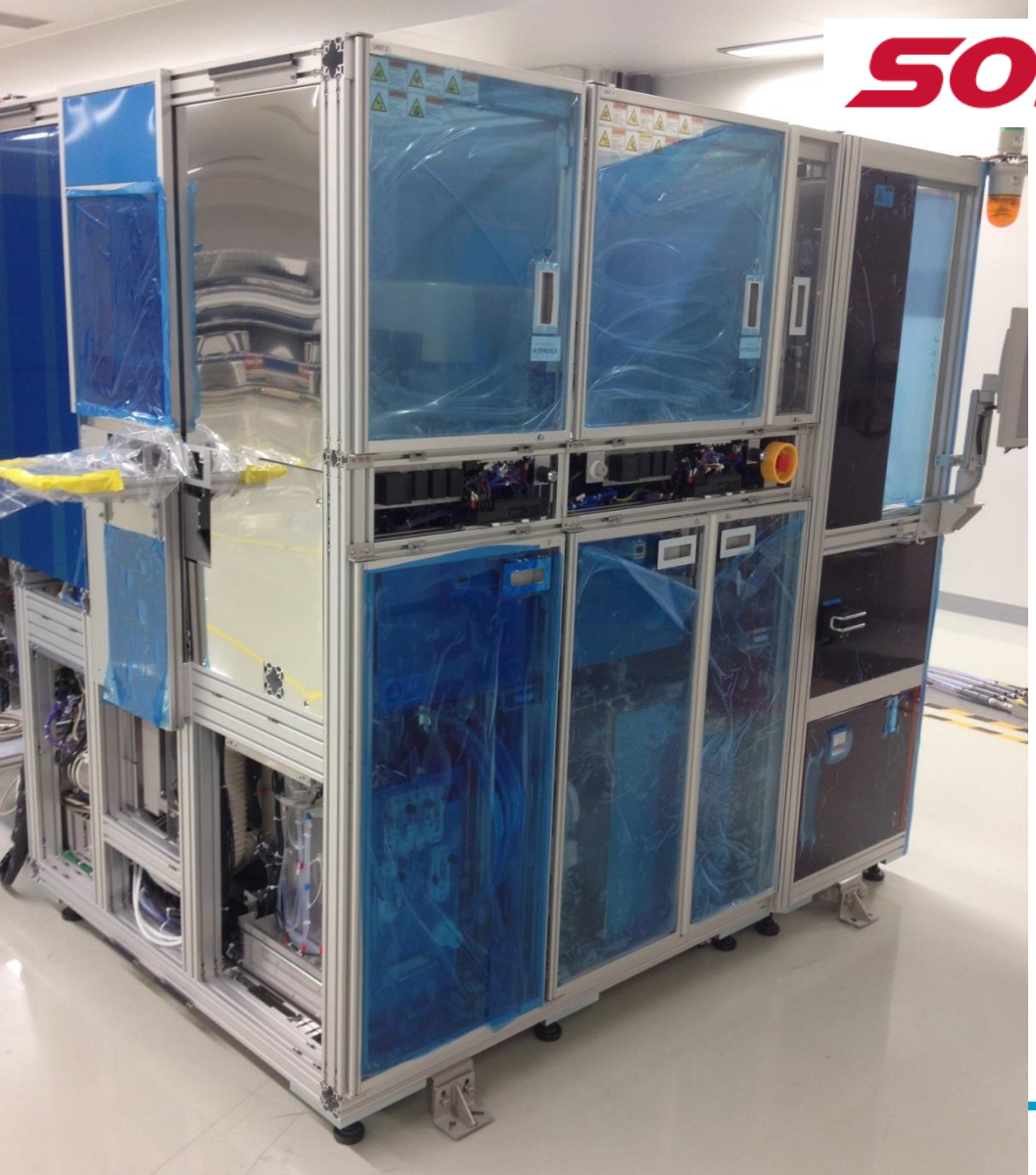

SOKUDO 80EX

- Customized track optimized for research
- 200-mm and 150-mm compatible
- Aqueous and solvent develop
- Automated syringe dispense

MET5

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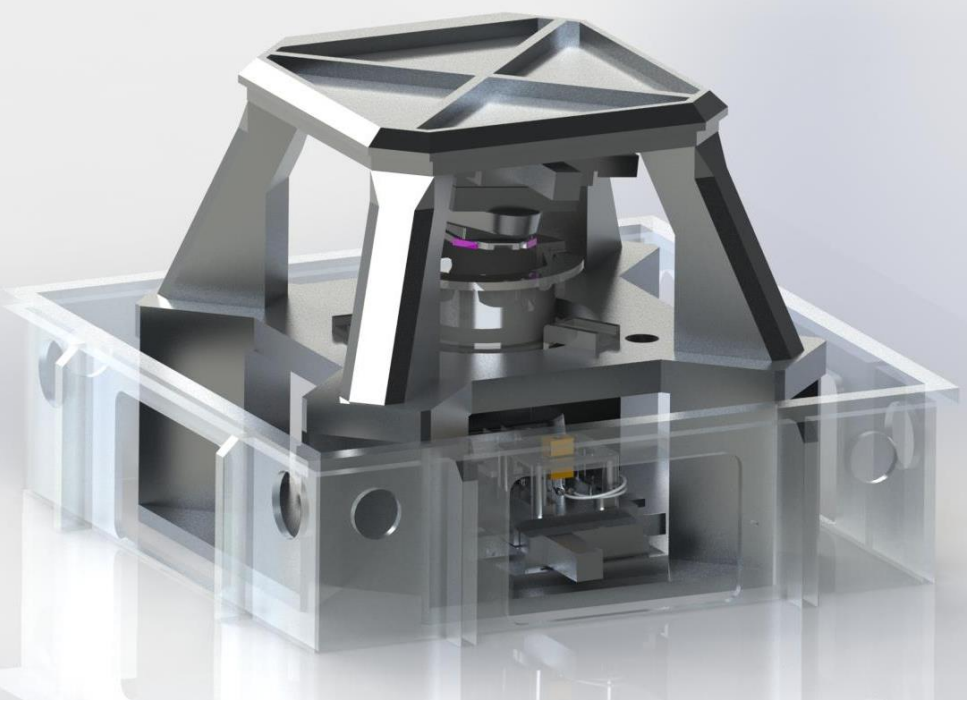

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