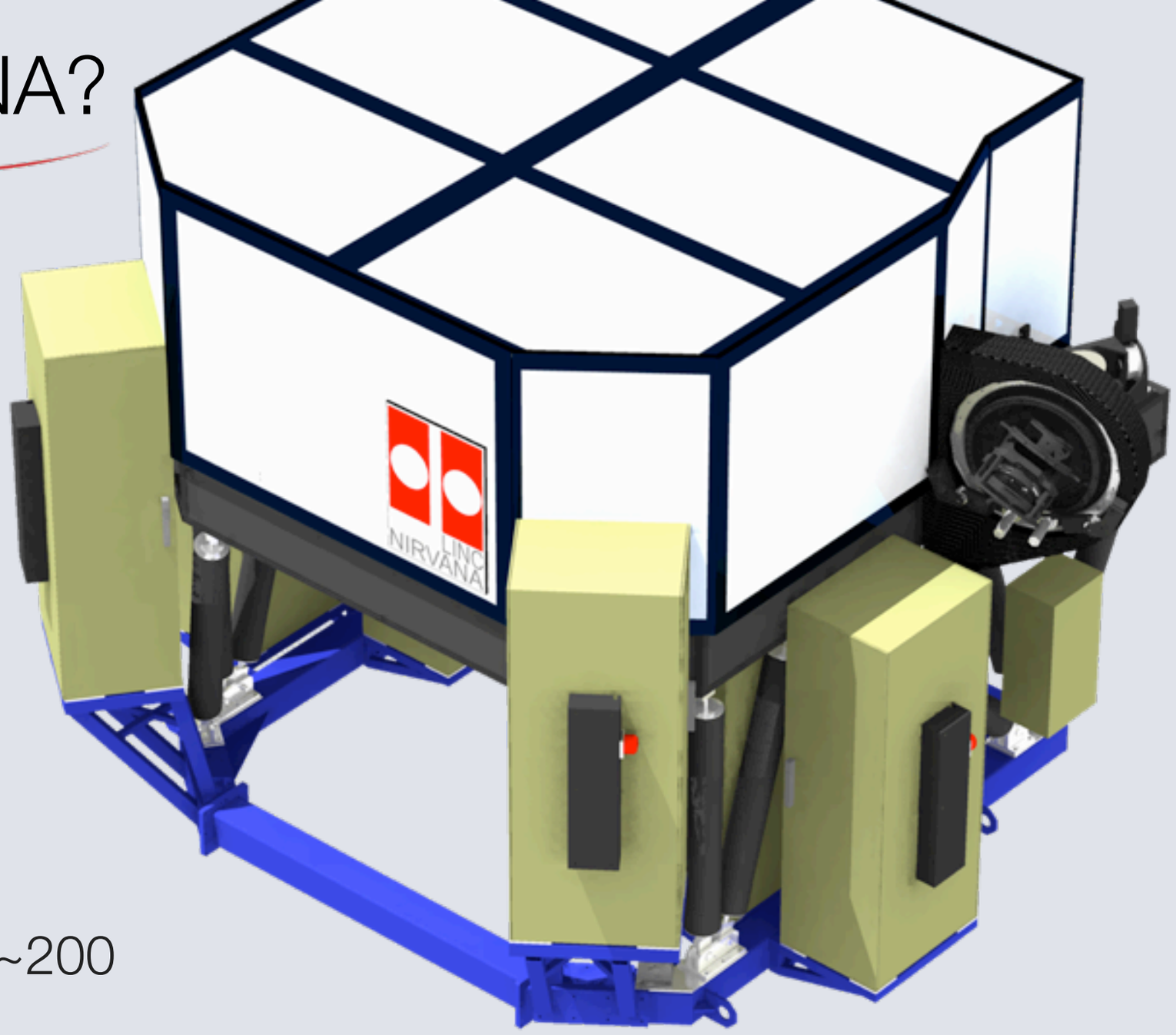
What is LINC-NIRVANA?

High Resolution
NIR Imager:
MCAO, Interferometry

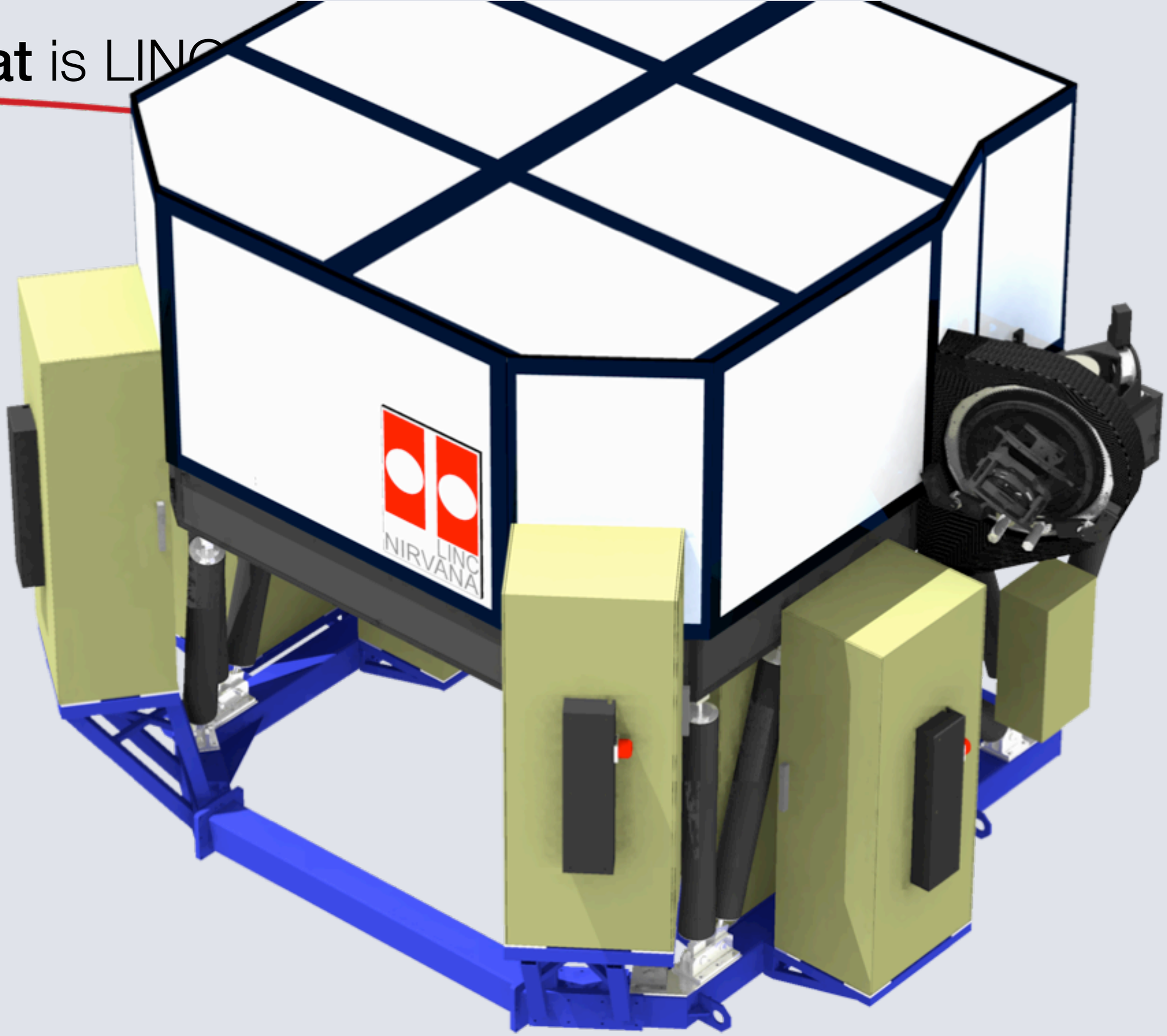
λ: JHK
Pixel: 5.11 mas
λ/23m: 10 mas (J)
15 mas (H)
20 mas (K)
R: Broadband to R~200



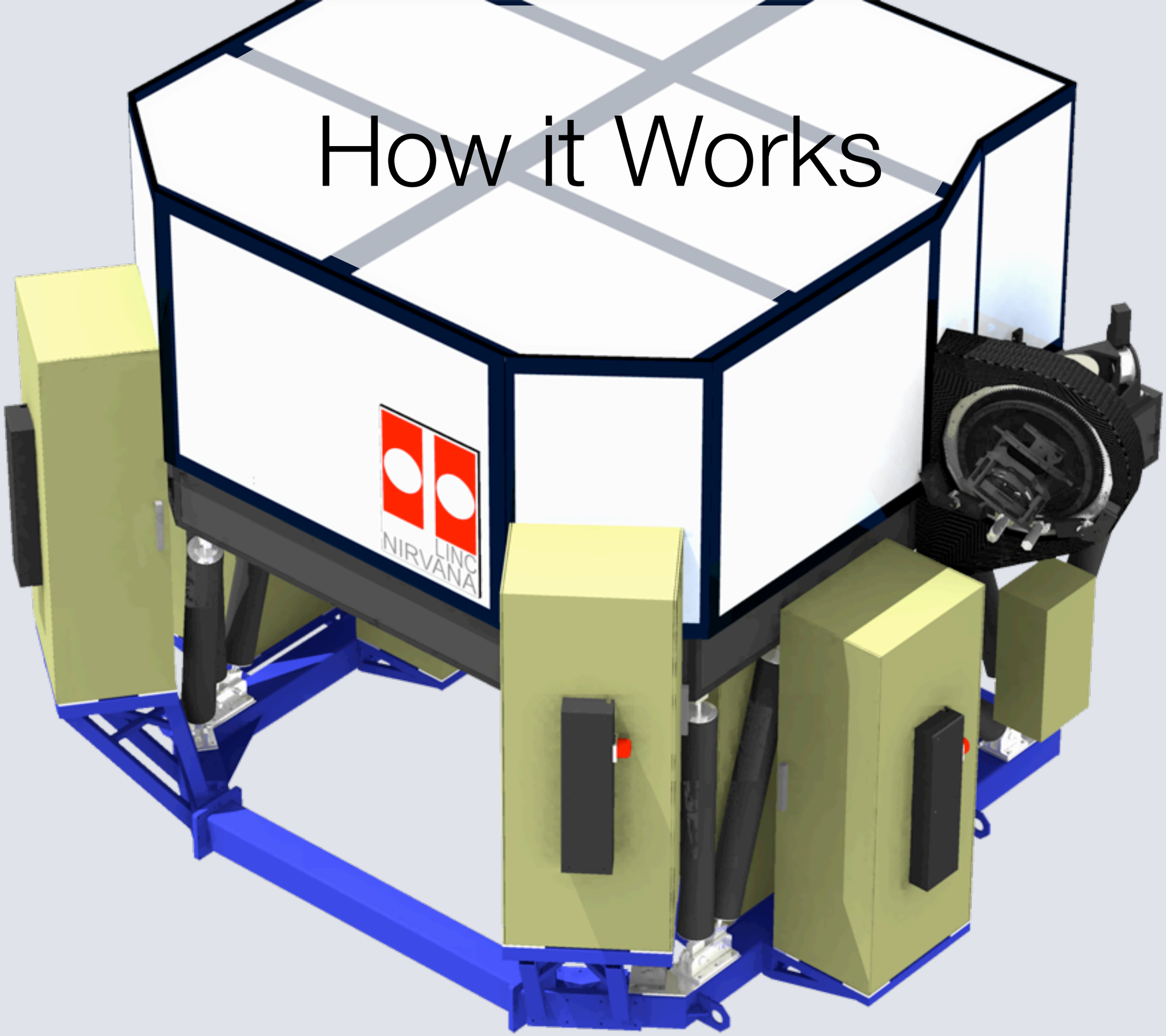
An International Project

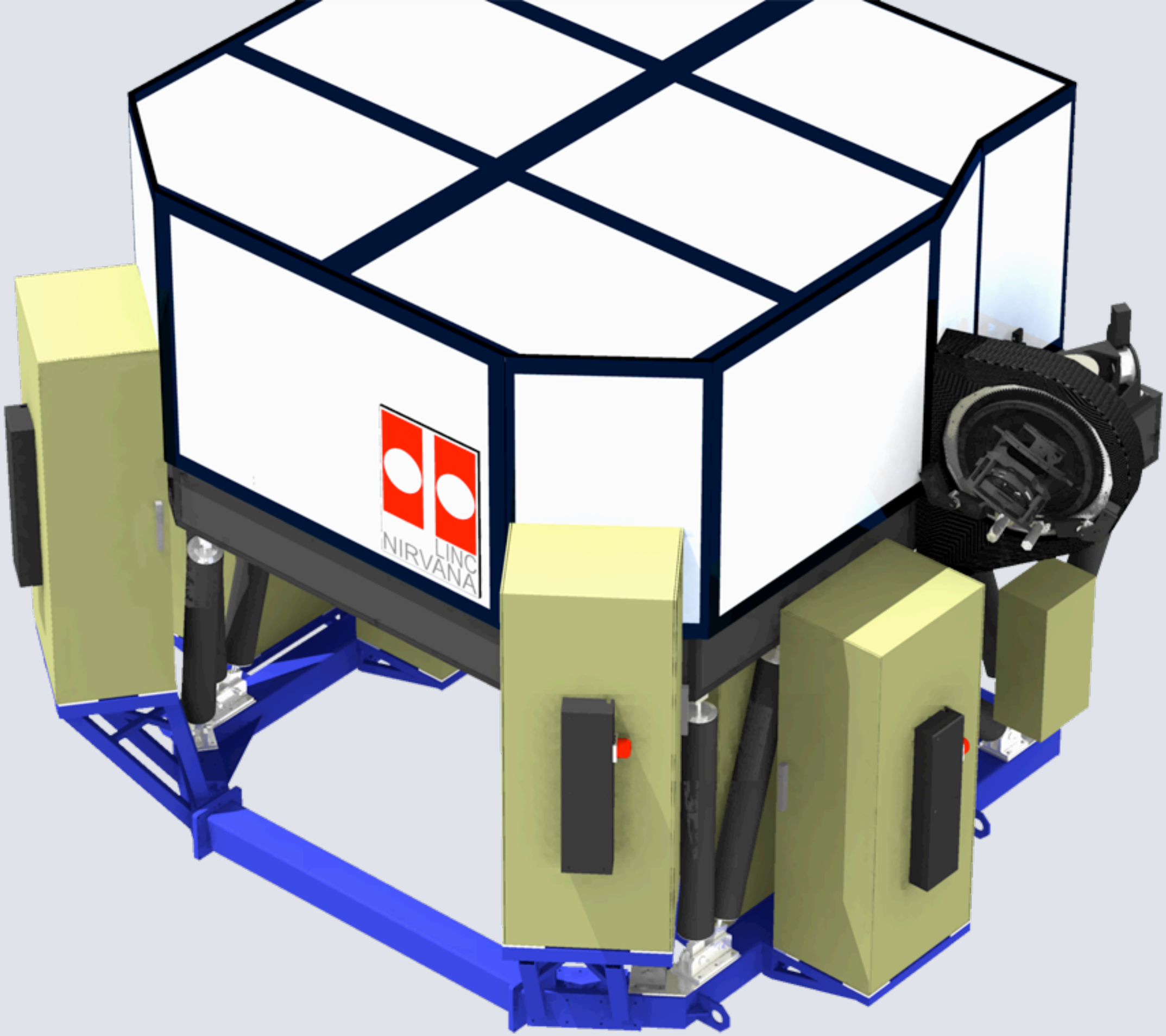
MPIA Heidelberg • INAF • University of Cologne • MPIfR Bonn

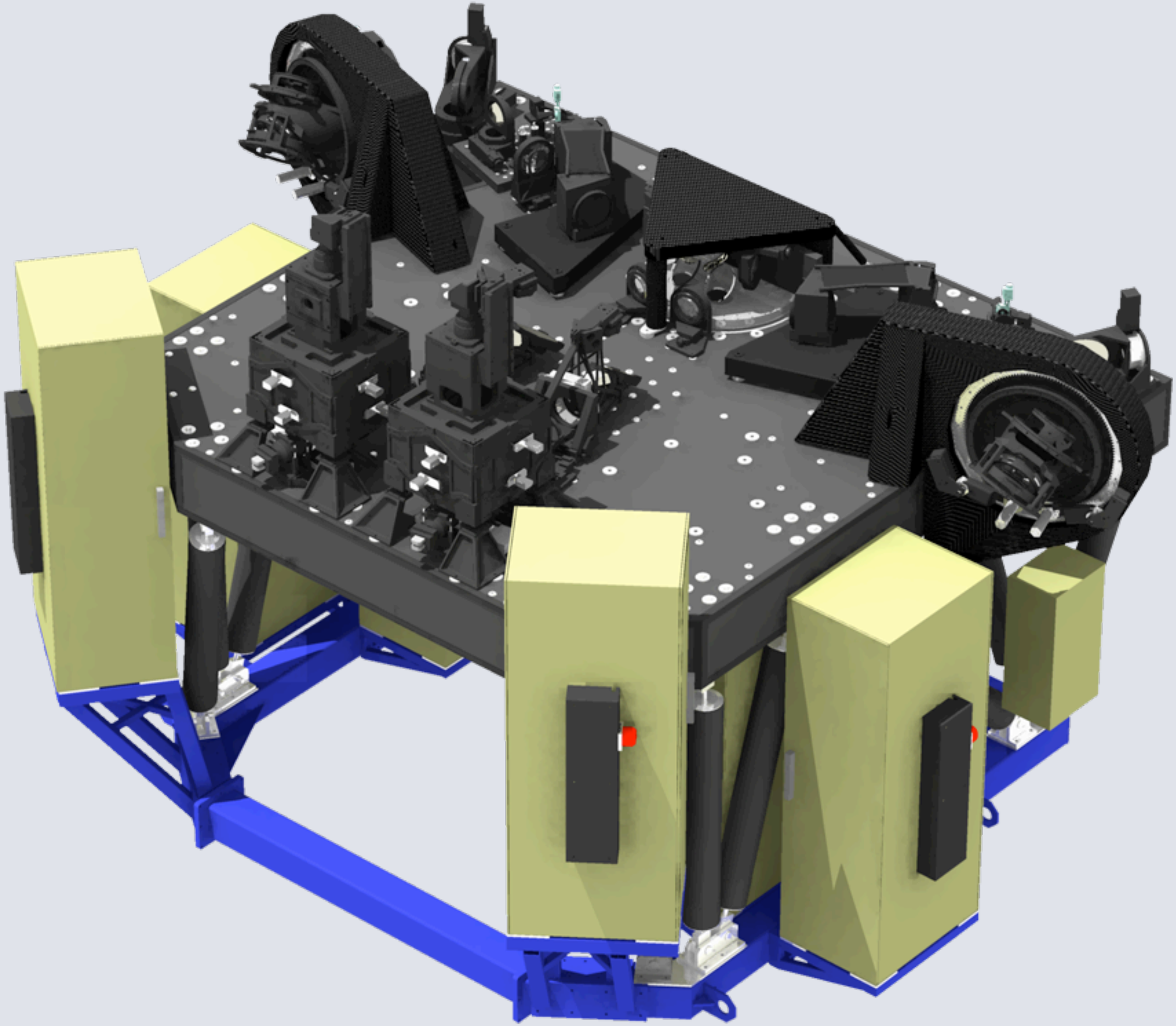
What is LIN

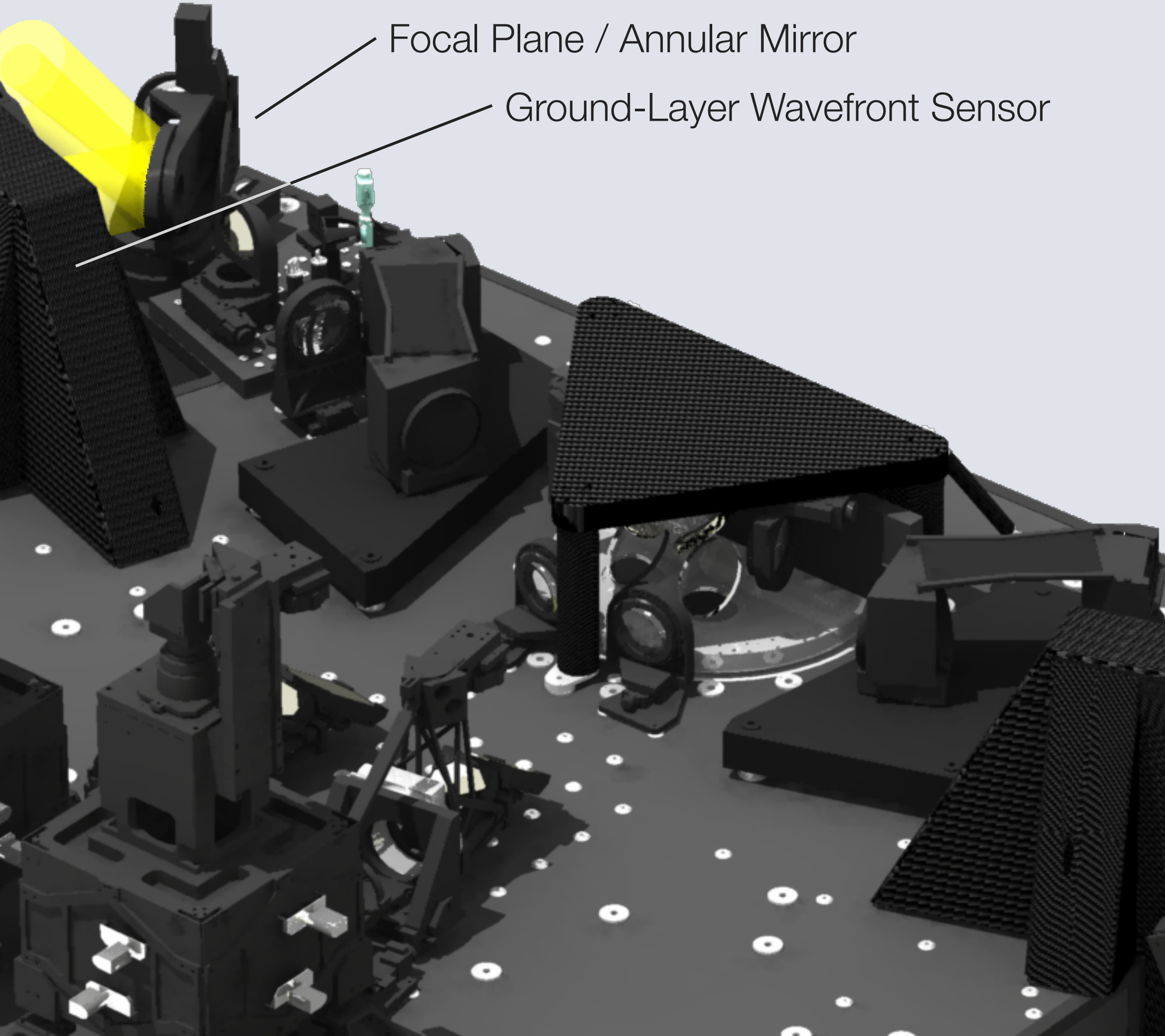


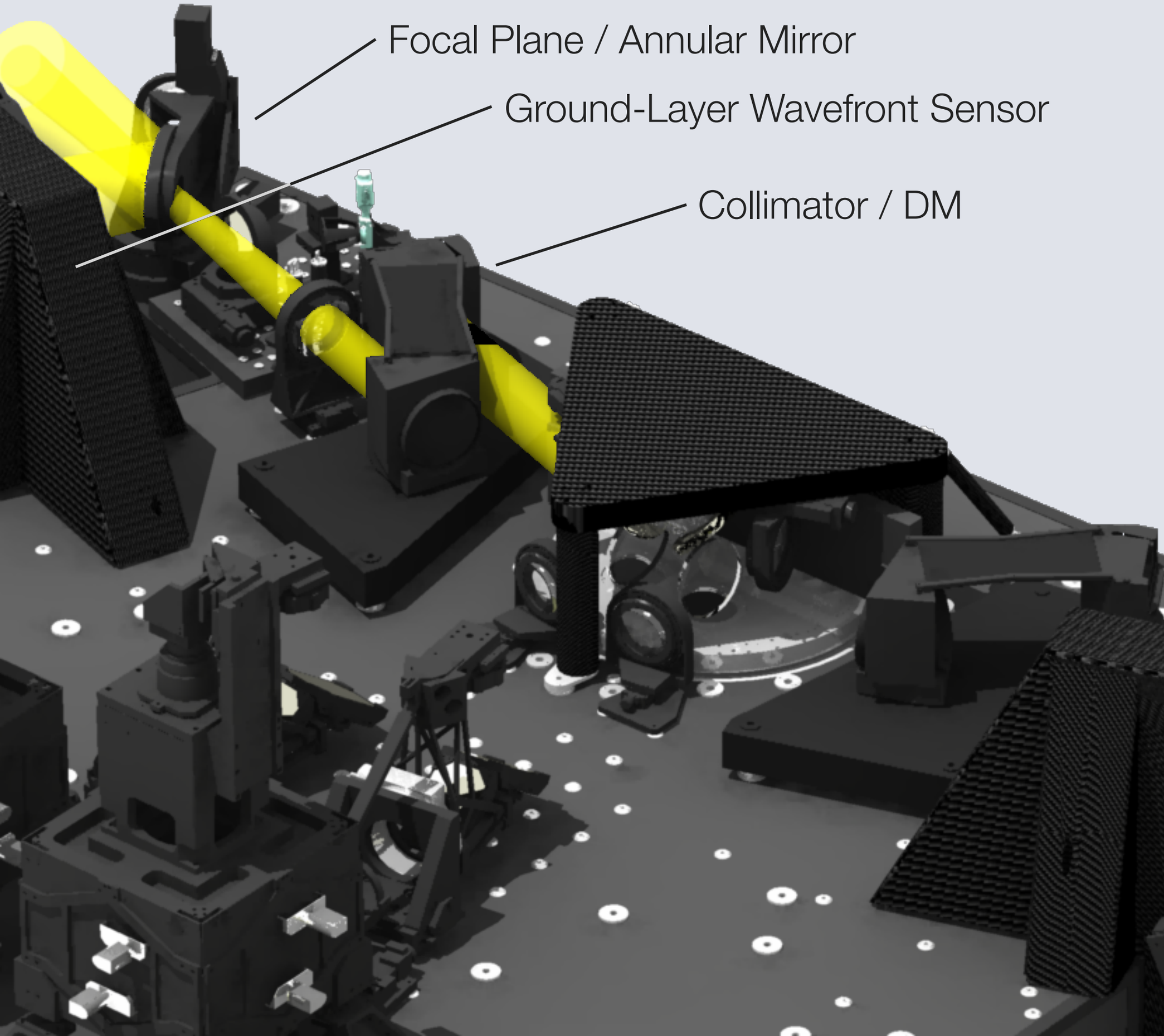
How it Works

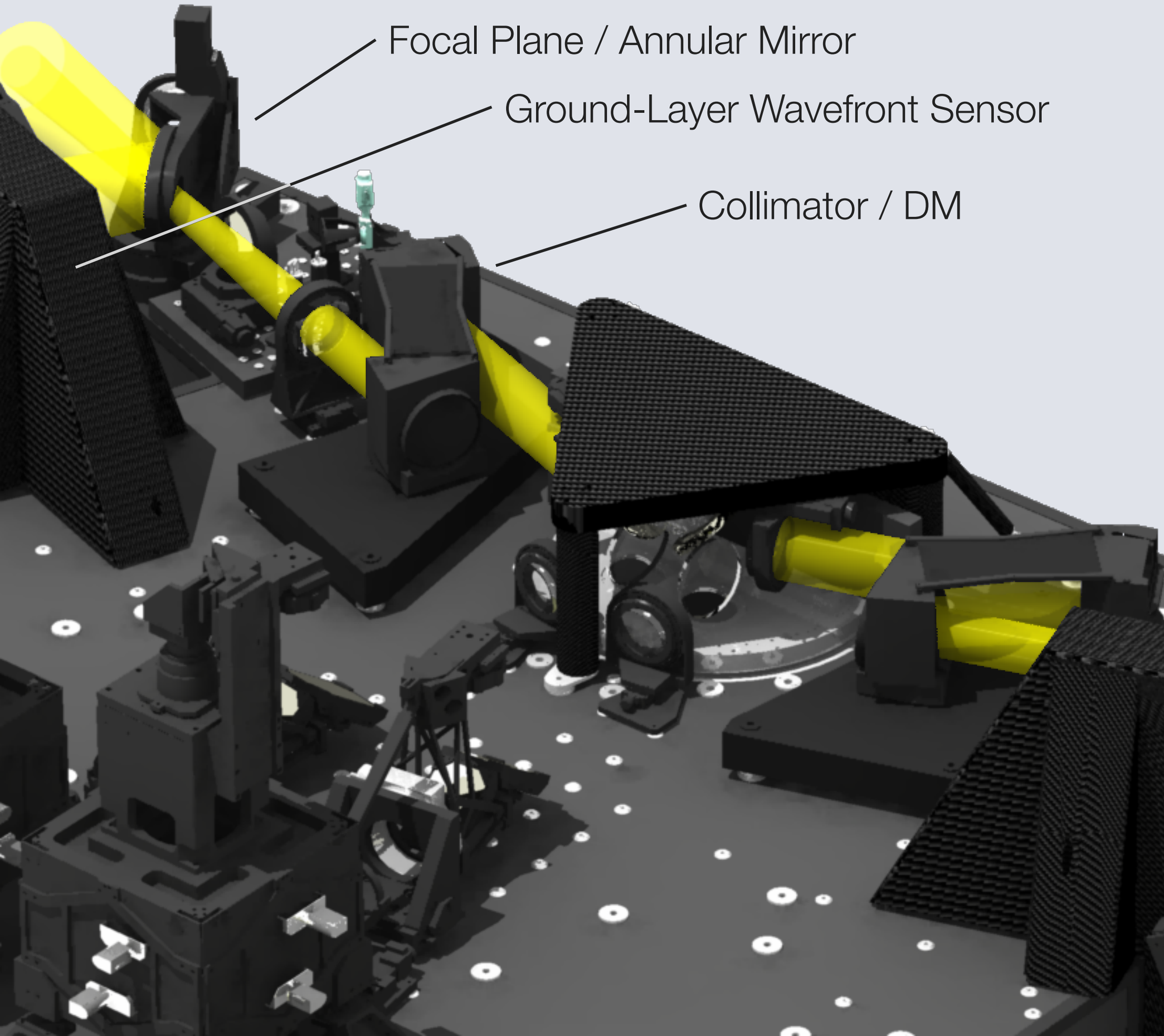



LINC
NIRVANA




Focal Plane / Annular Mirror
Ground-Layer Wavefront Sensor


Focal Plane / Annular Mirror
Ground-Layer Wavefront Sensor
Collimator / DM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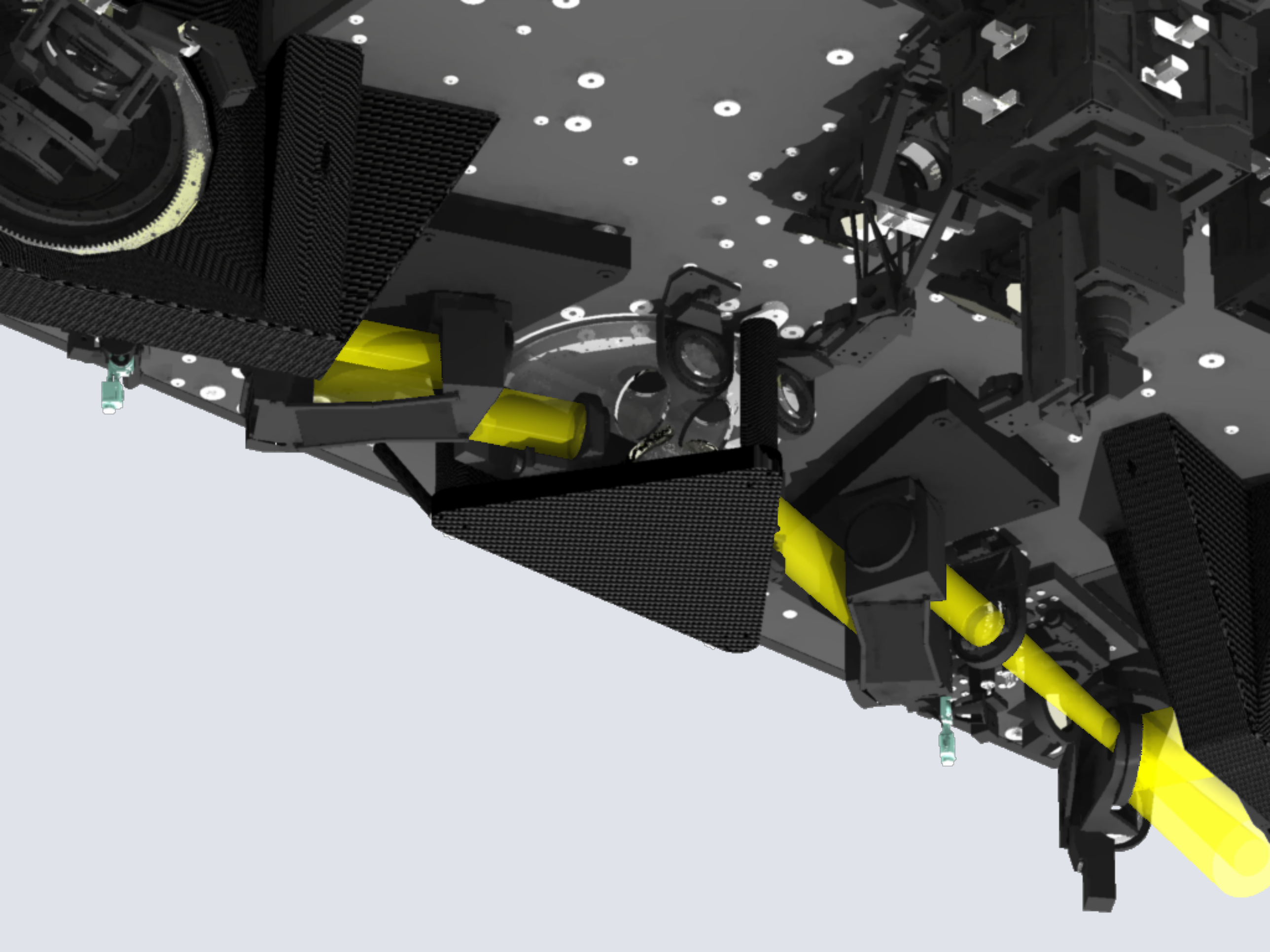
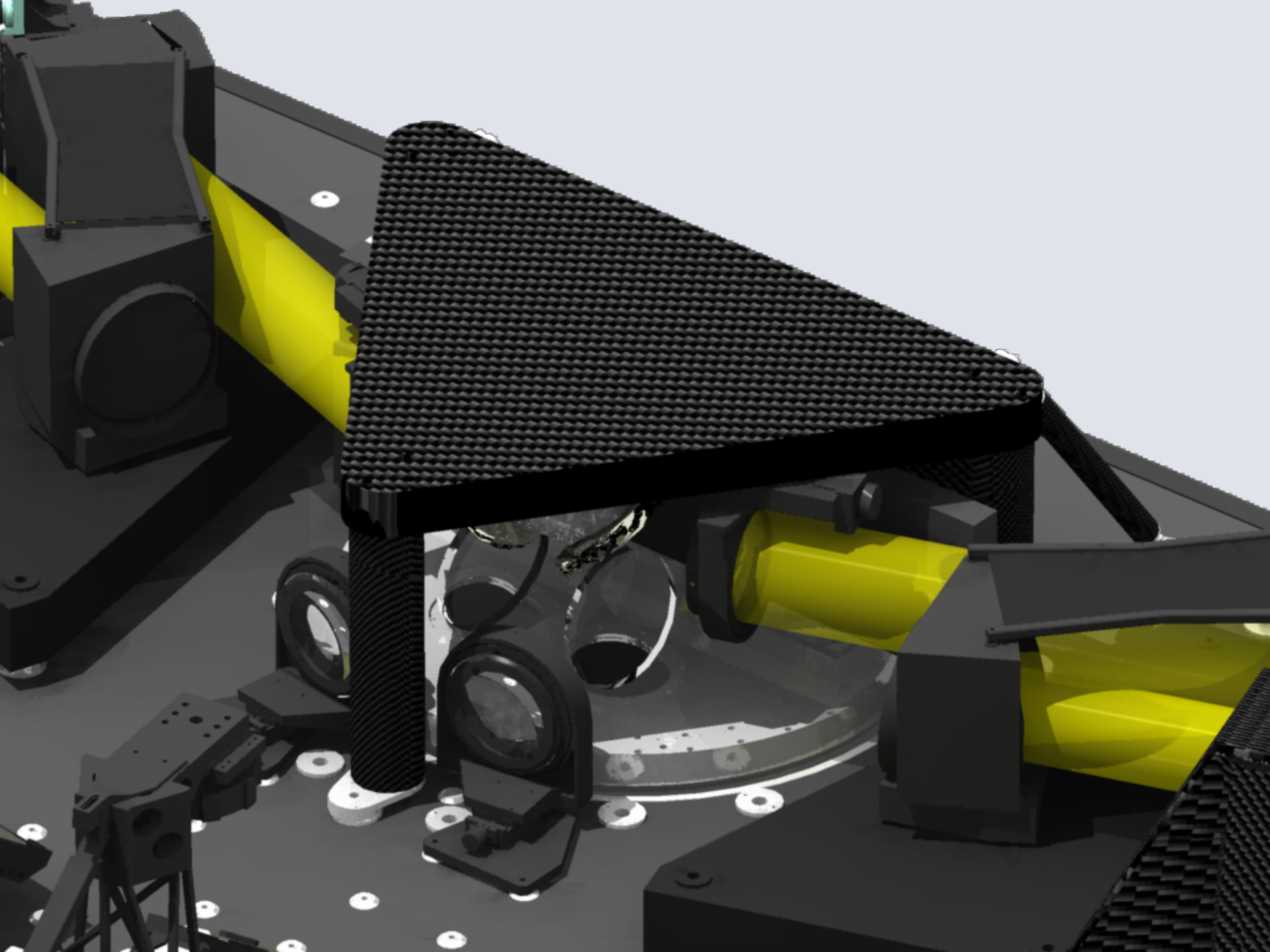
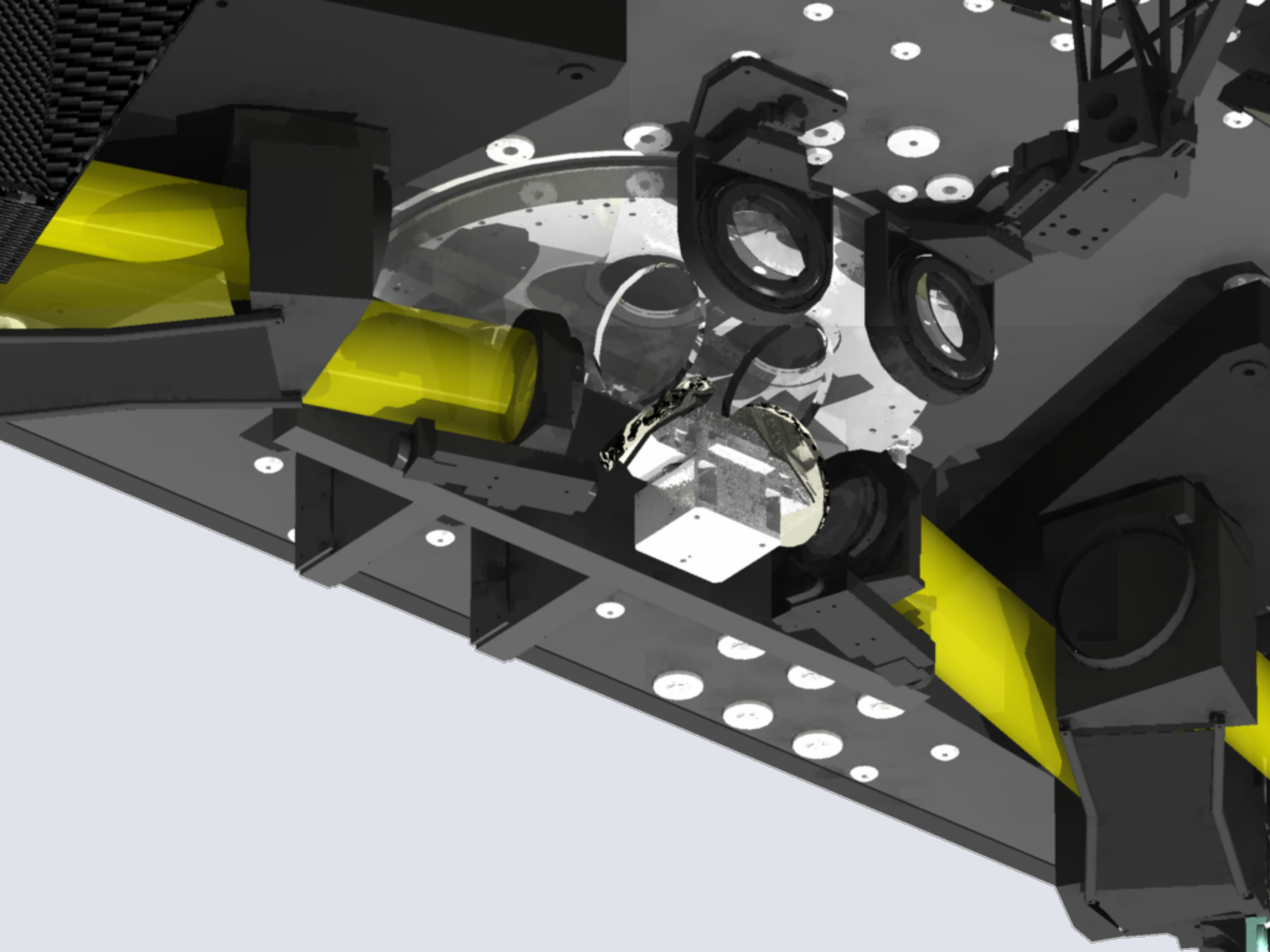
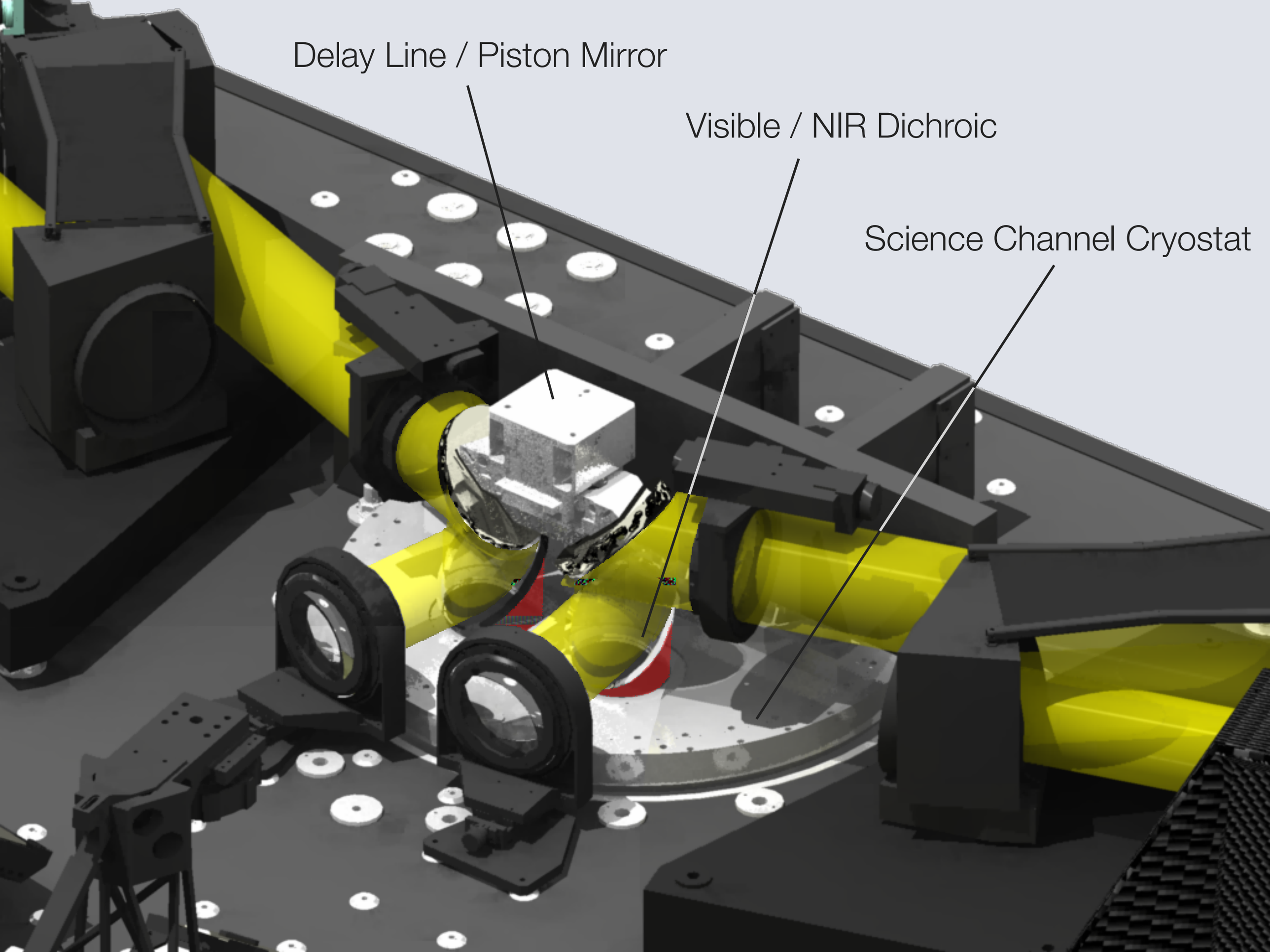
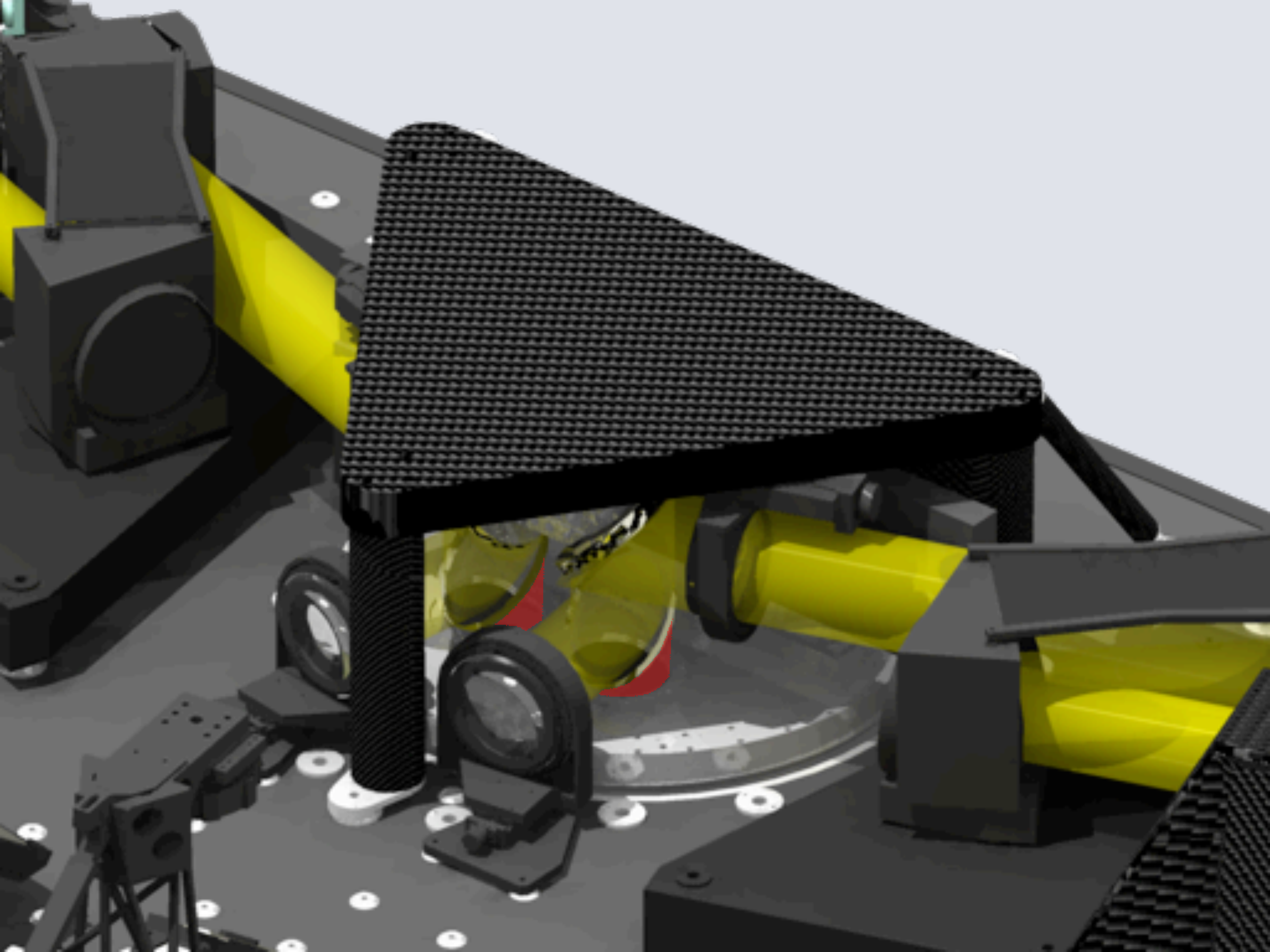
Ground-Layer Wavefront Sensor
Collimator / DM

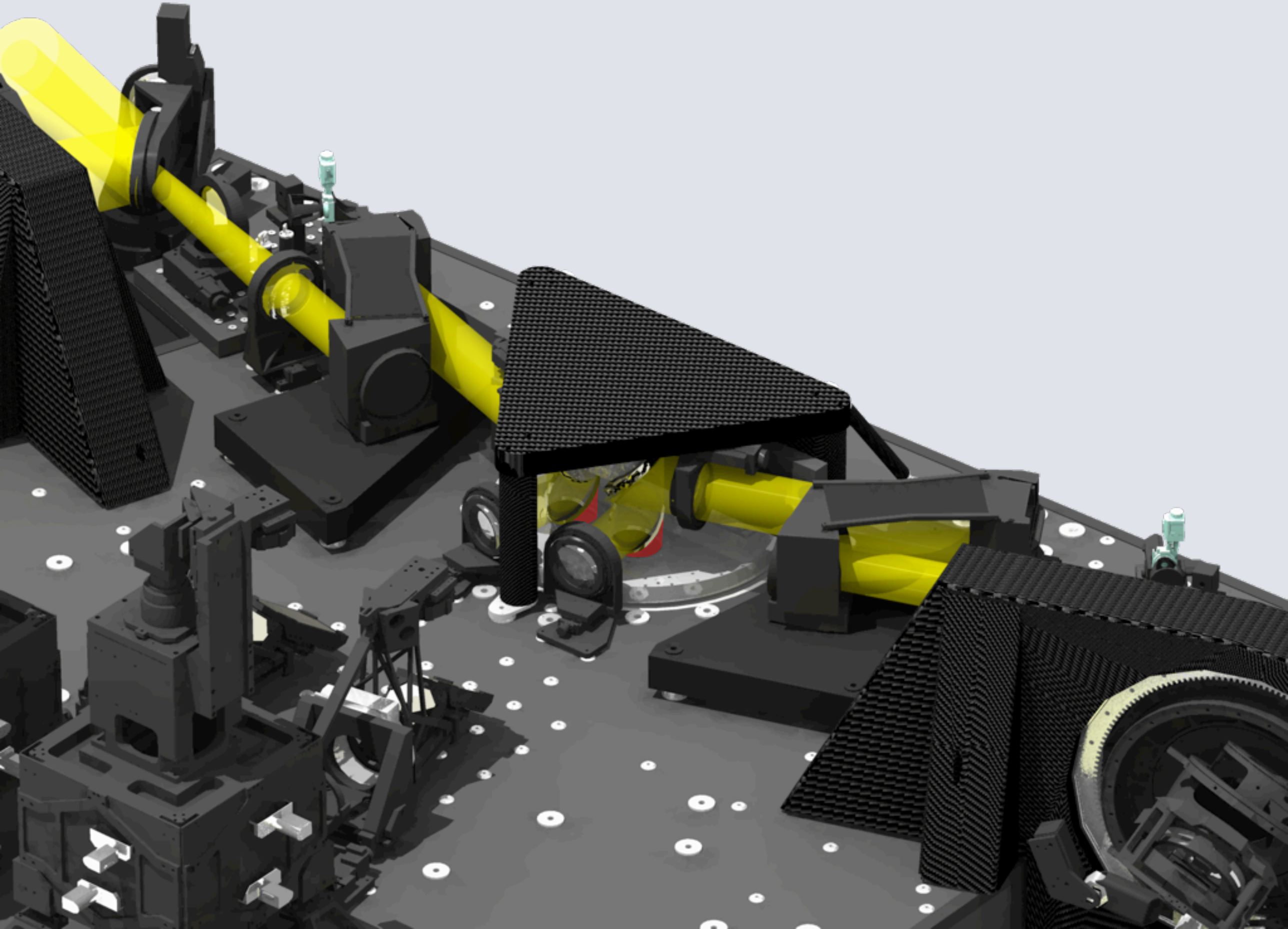


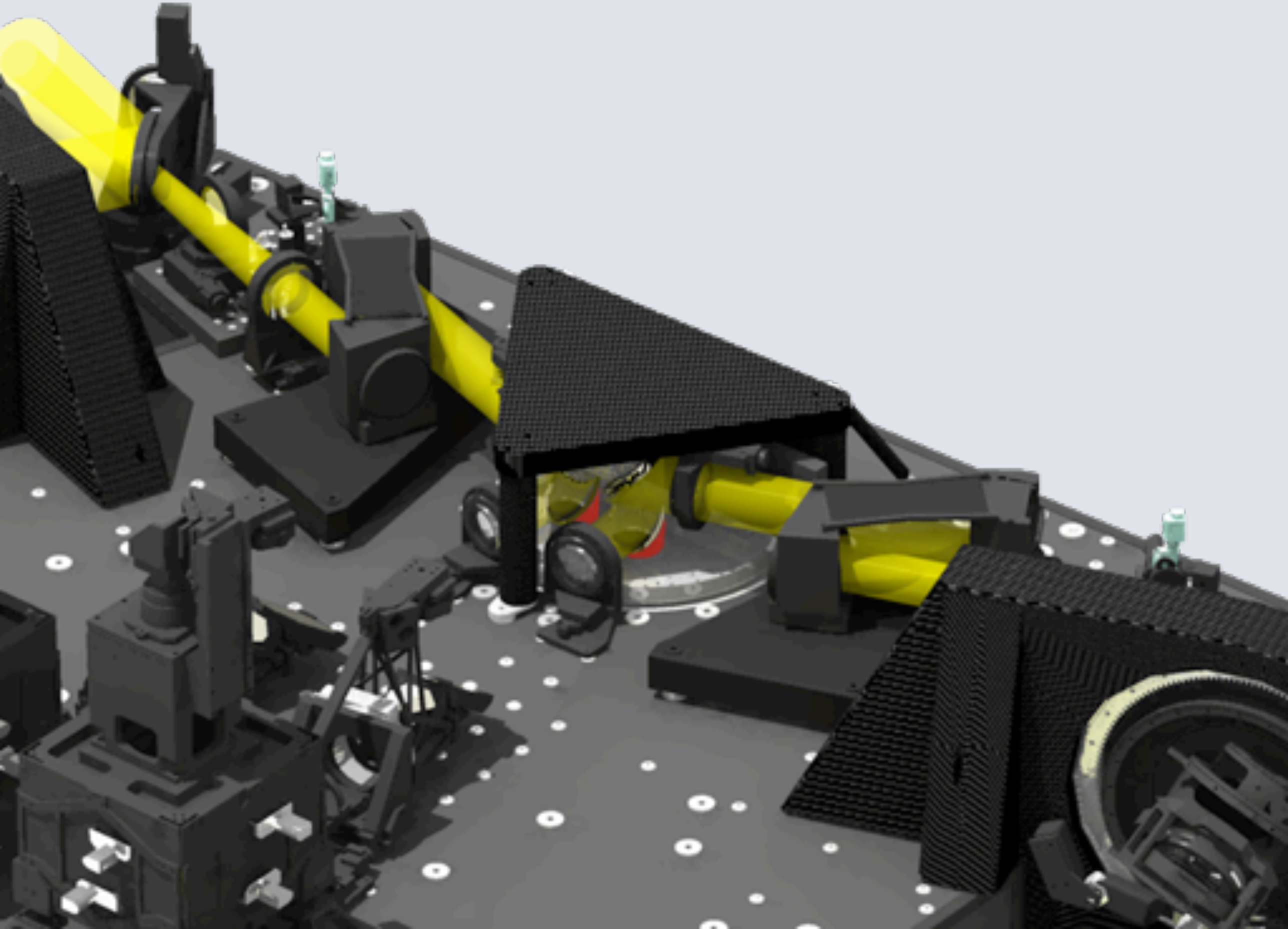


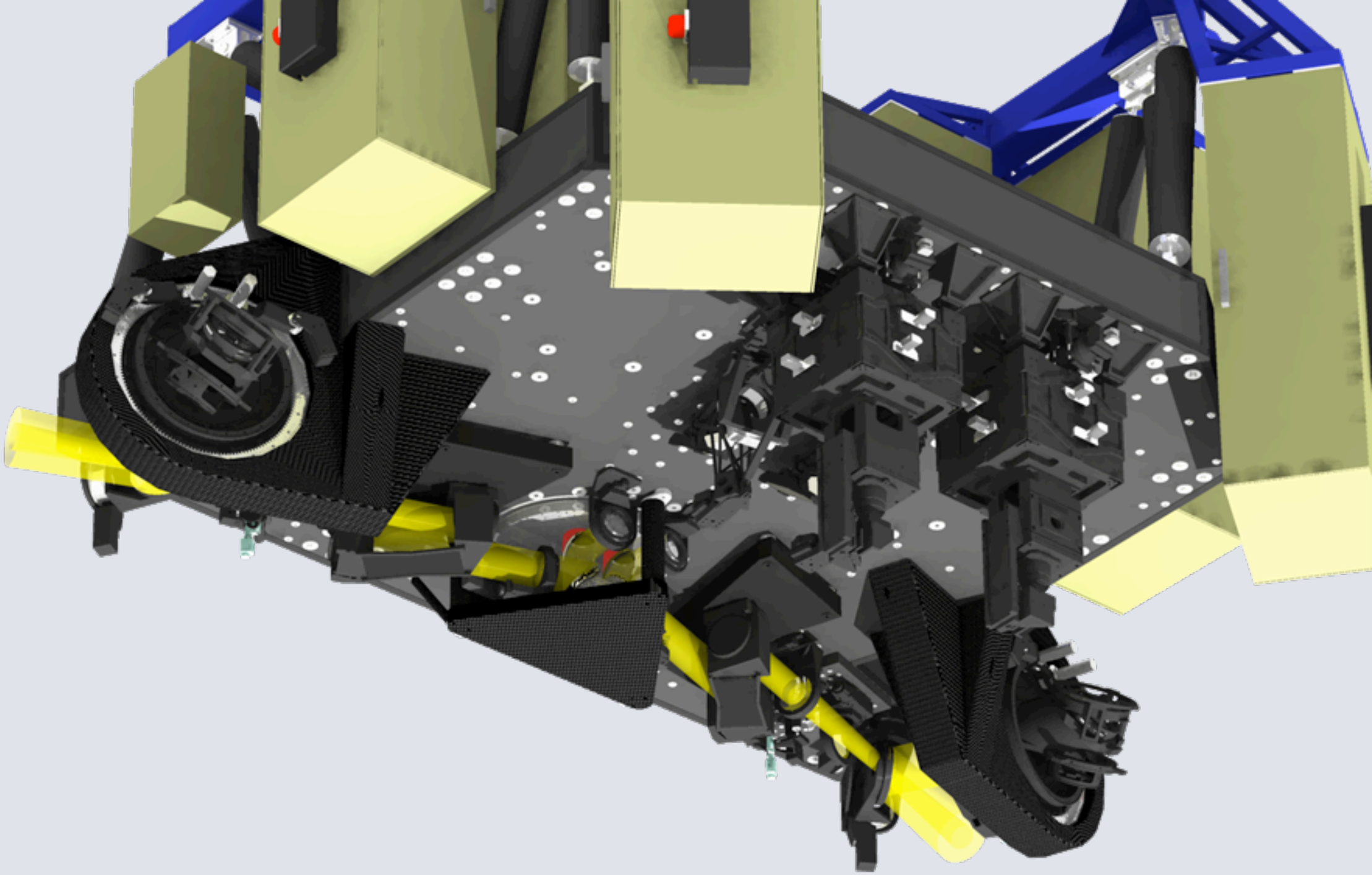


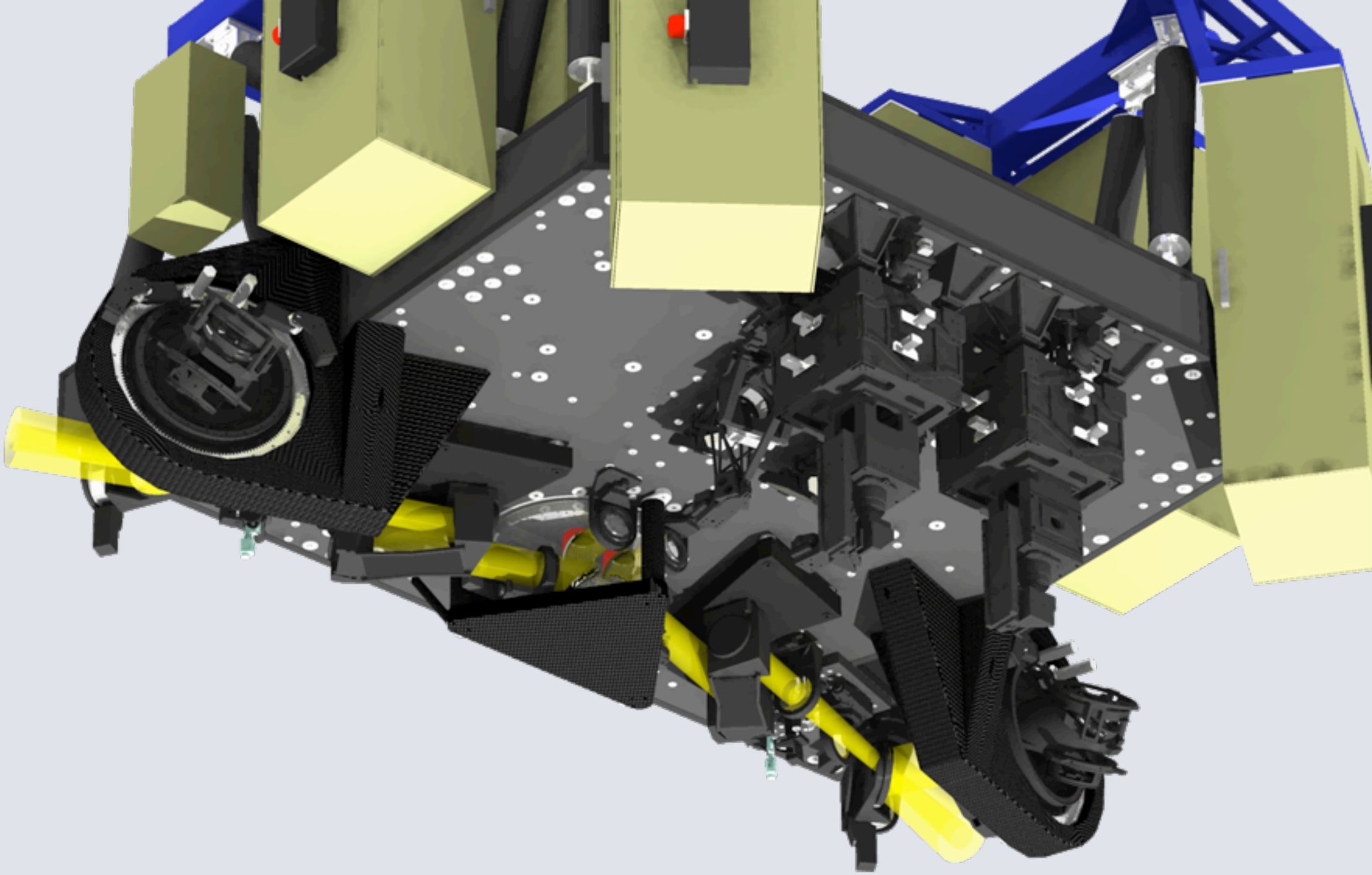

Delay Line / Piston Mirror
Visible / NIR Dichroic
Science Channel Cryostat

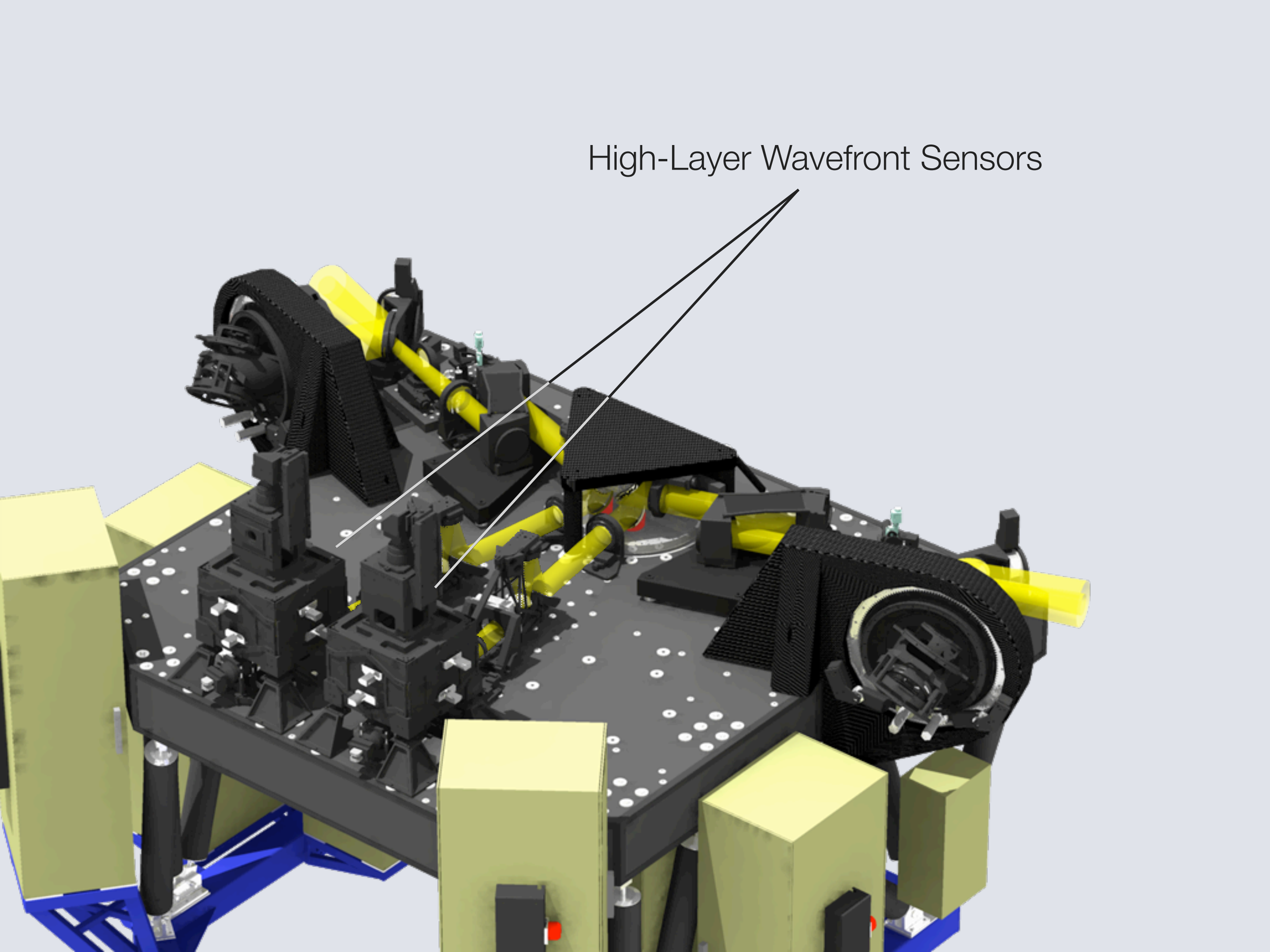


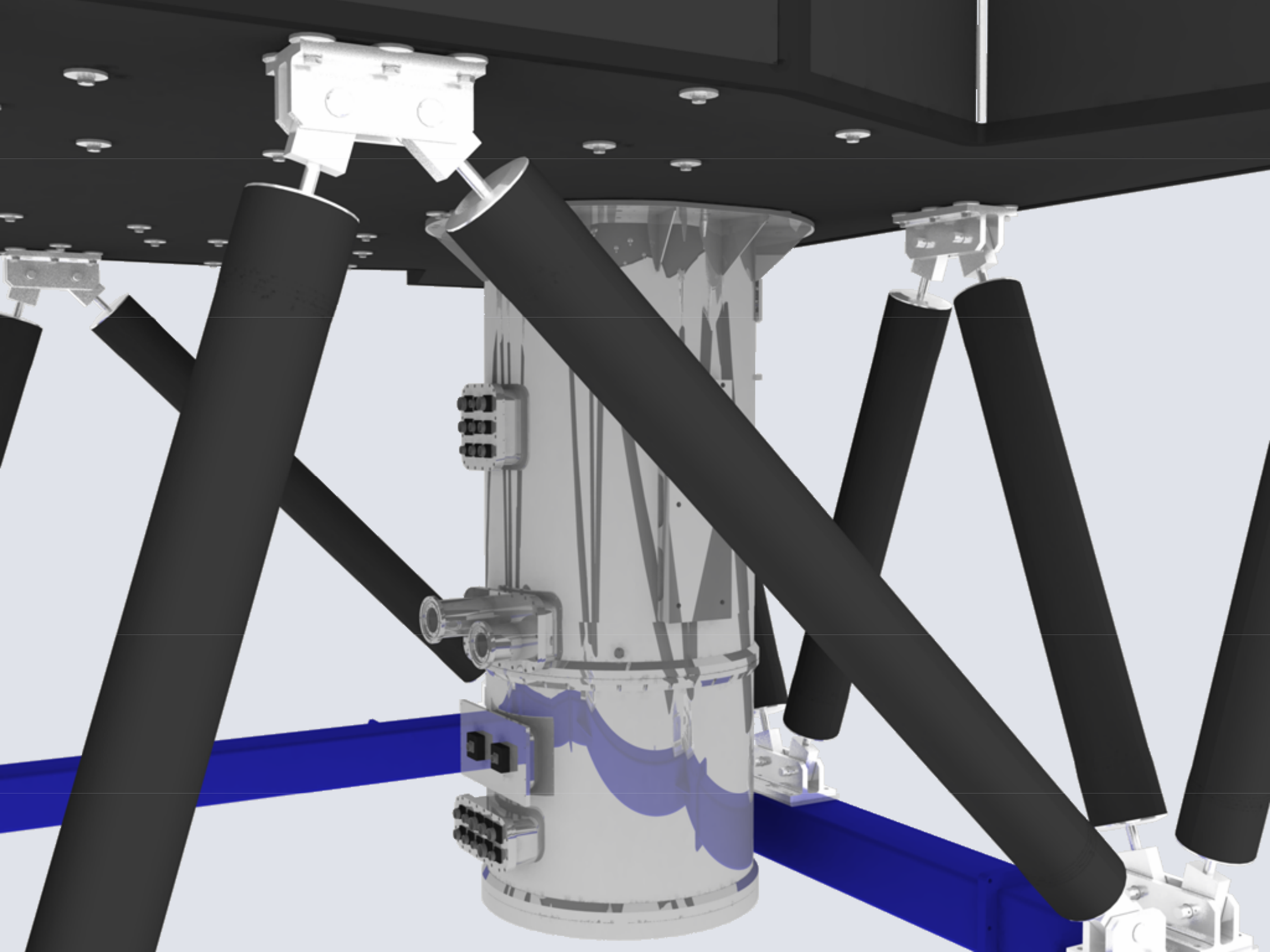






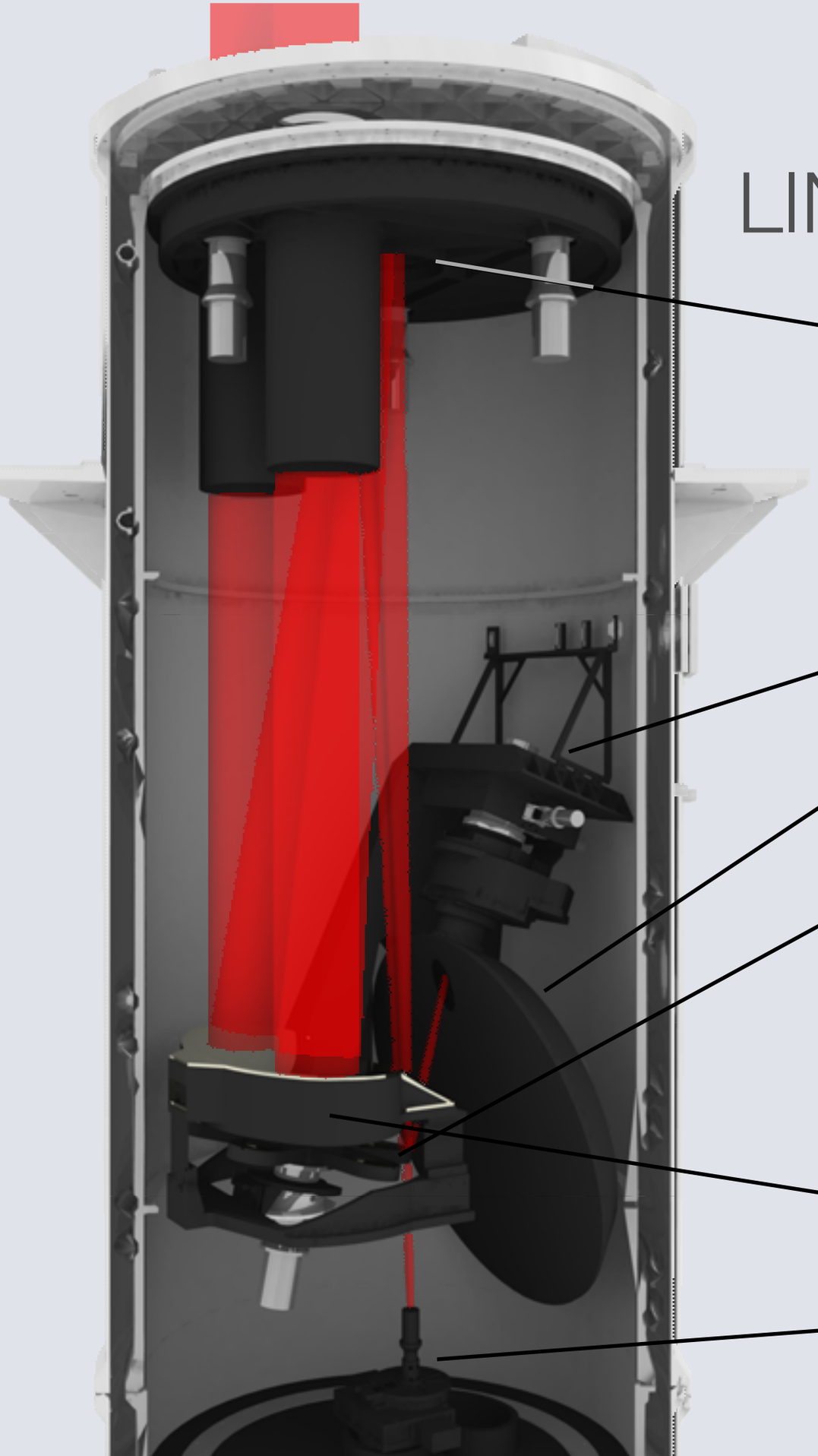



High-Layer Wavefront Sensors



LINC-NIRVANA Cryostat

LINC-NIRVANA Cryostat



Secondary

Science Detector / Derotator

Filter Wheel

IR-IR Dichroic

Primary

Fringe and Flexure Tracker

Outline

- About LINC-NIRVANA…
  - What it is
  - How it works
- Project Status…
  - LINC-NIRVANA AIV (HD)
  - First Light with Pathfinder (LBT)
- Implementation Plan…
  - MCAO & Interferometry
  - What's next…

LINC-NIRVANA AIV

AstroTechTalk
26 September 2014
MPIA Heidelberg

LINC-NIRVANA AIV

- Ground-Layer WFS testing complete
- Science channel cold optics delivered, tested, accepted
- Fringe and flexure tracker progressing
- Piston mirror control optimization complete
- LBT rail flexure problem solved
- Ground, High-Layer wavefront sensors accepted
- OVMS complete and handed over
- Cold testing of cryomechanics, FFTS, etc.
- Final bench integration 1st arm complete…

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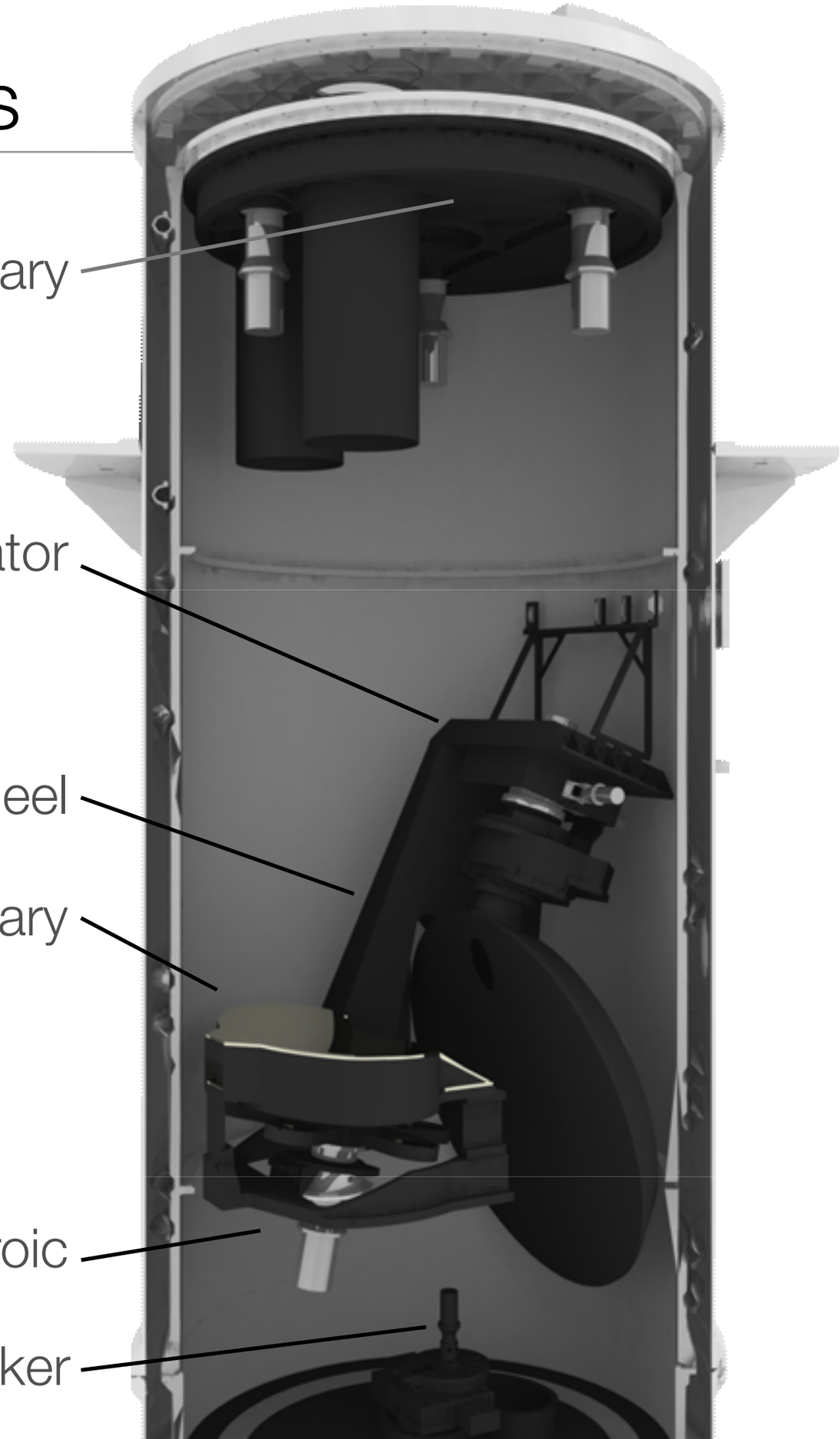
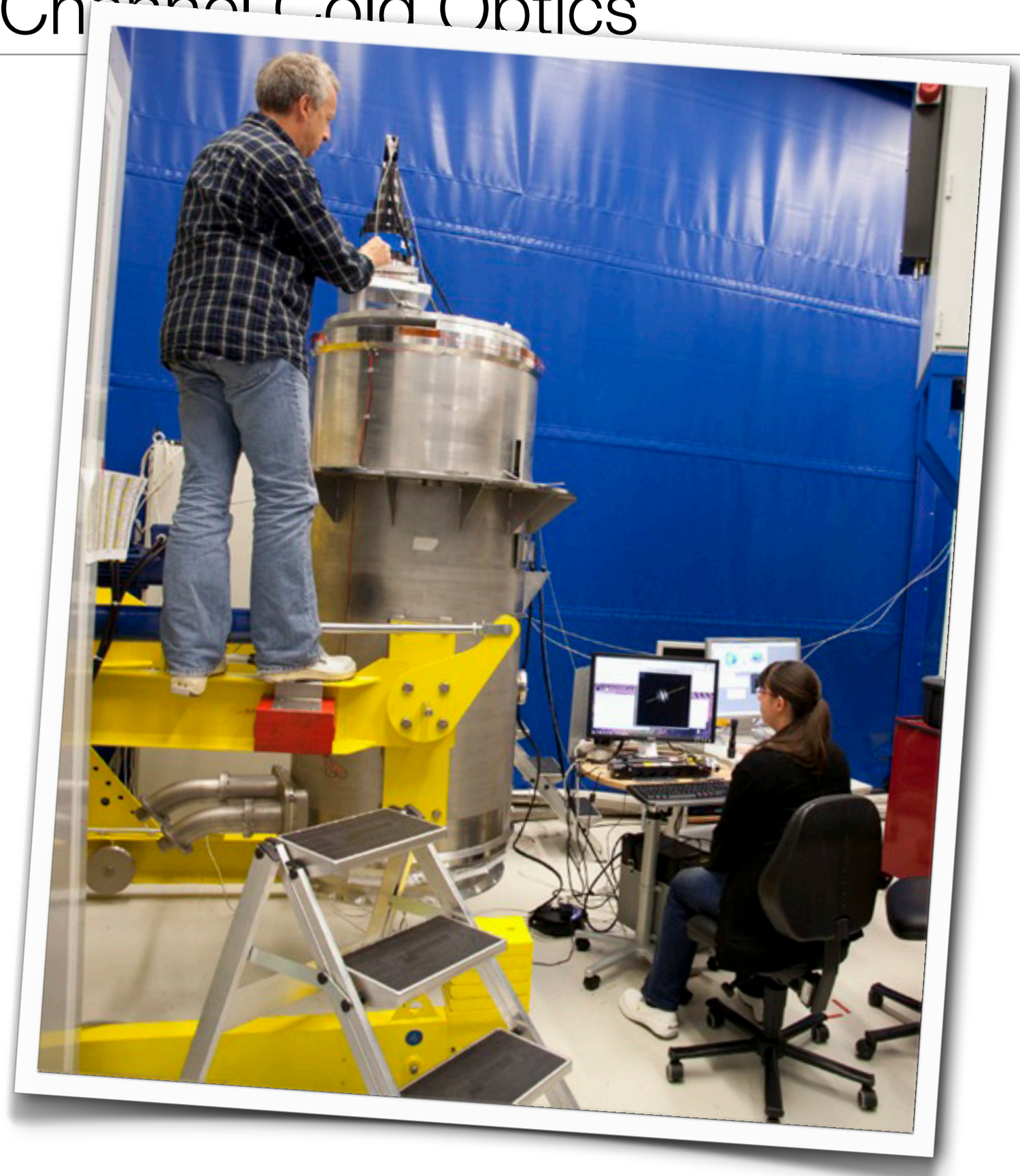
Science Channel Cold Optics

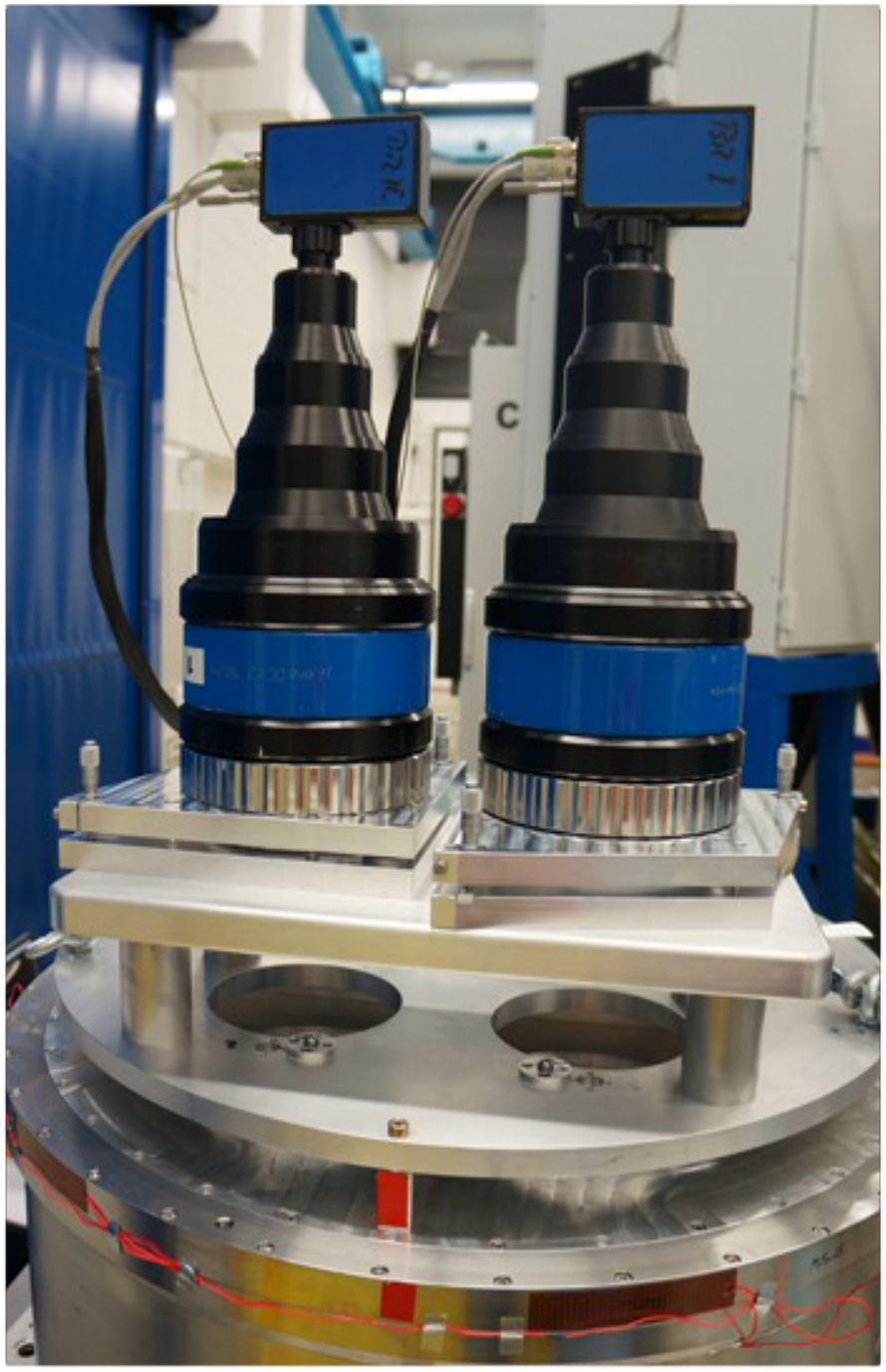
Science Channel Cold Optics

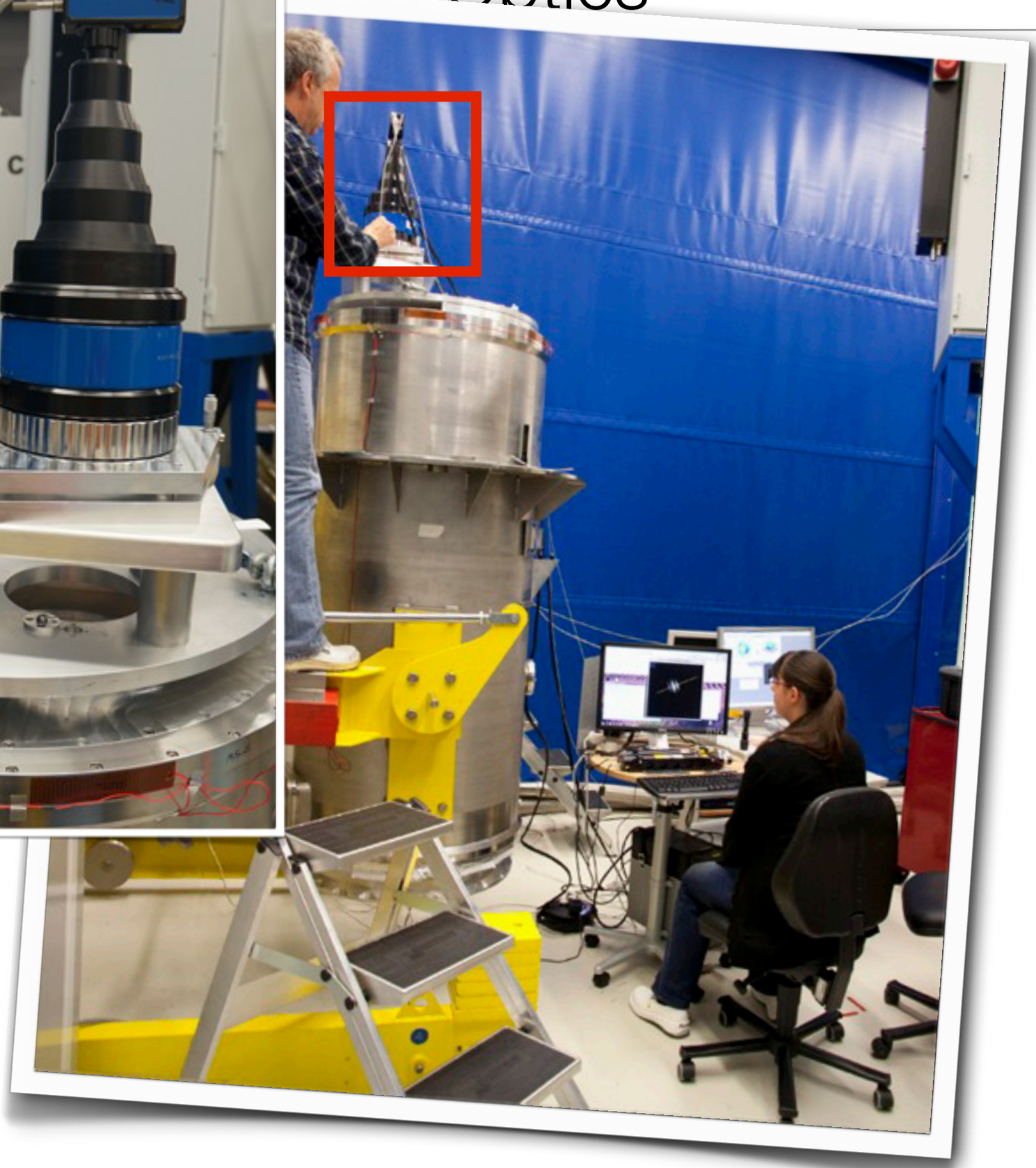


Science Channel Cold Optics

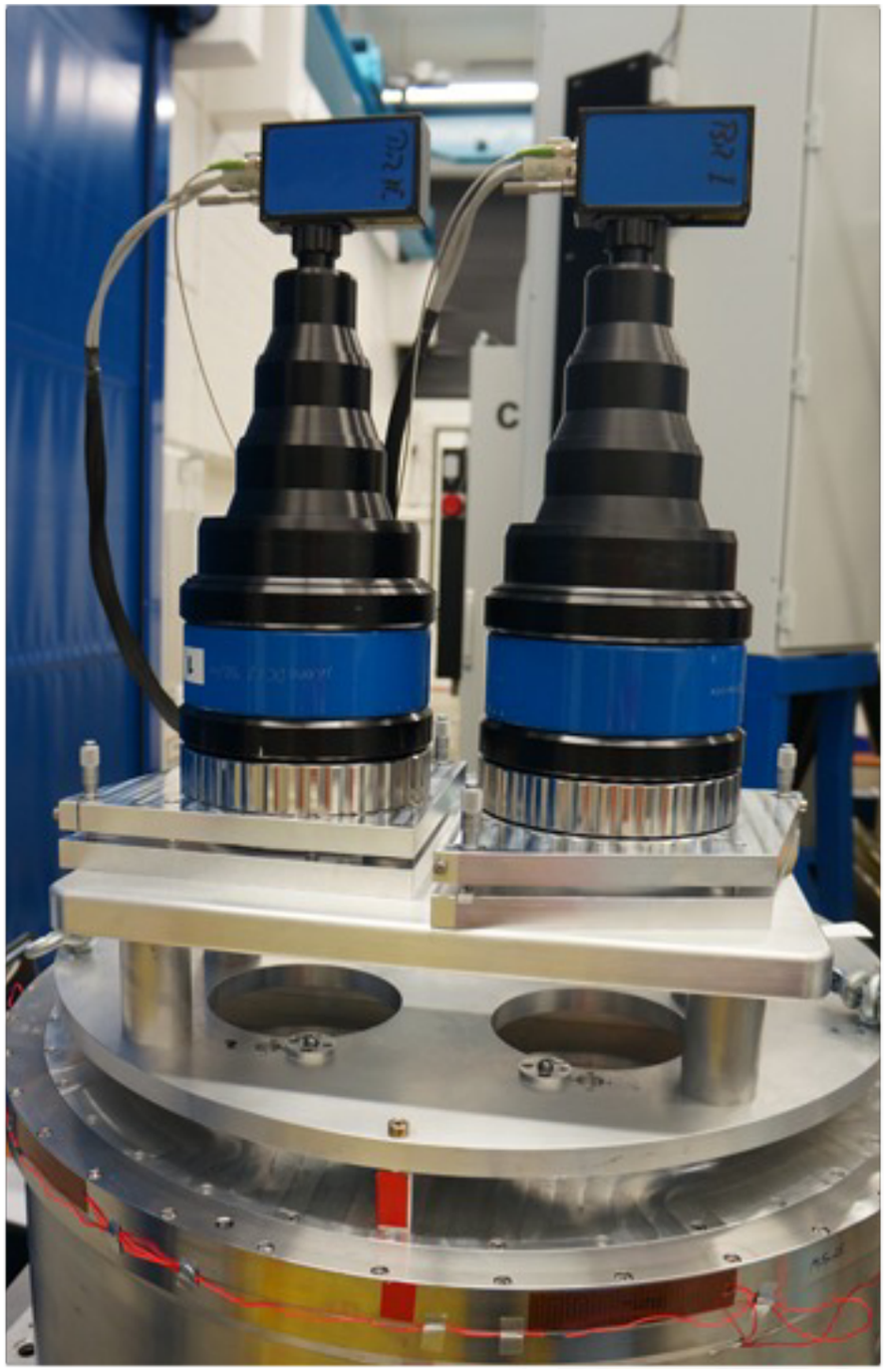


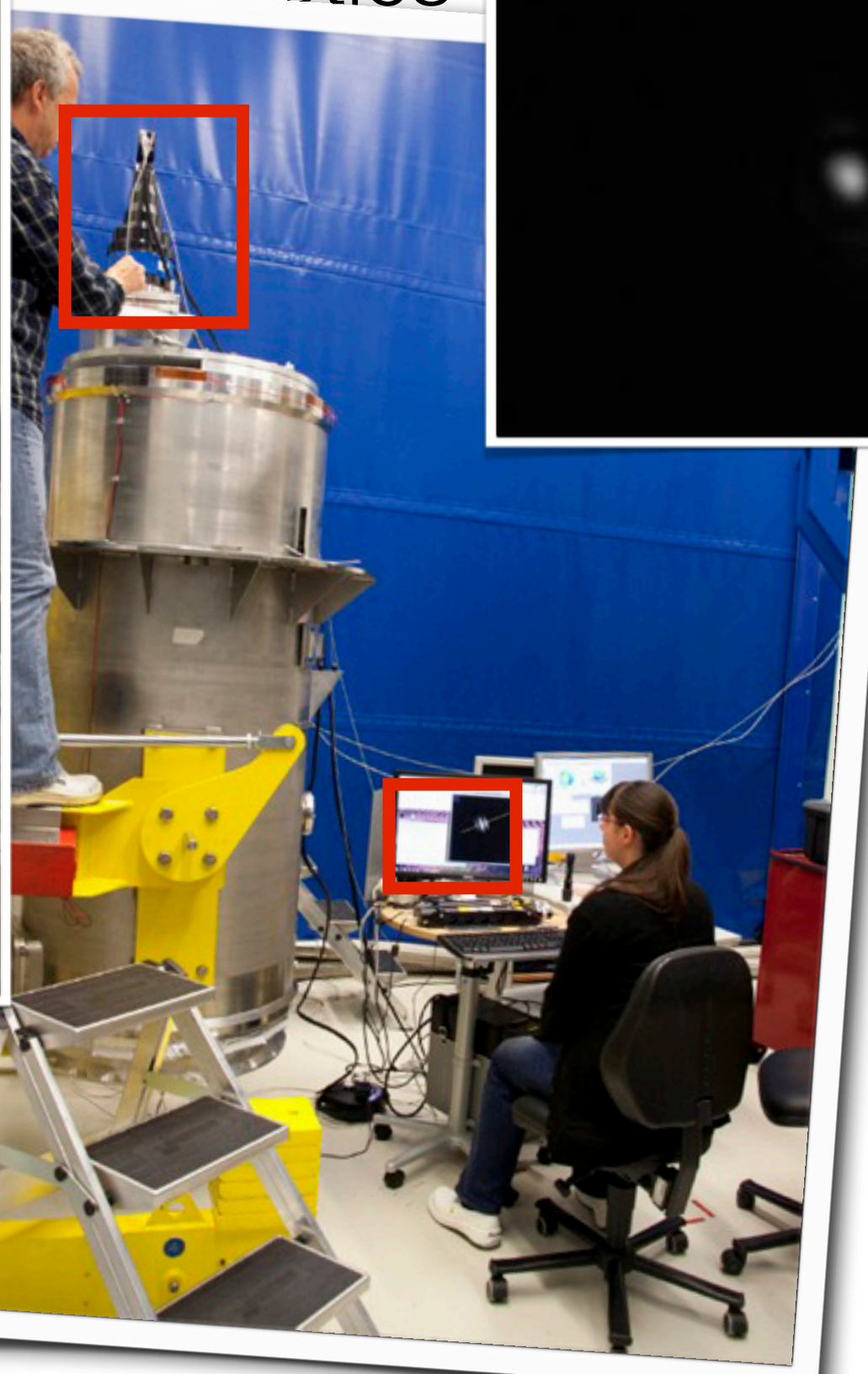
Cold Optics



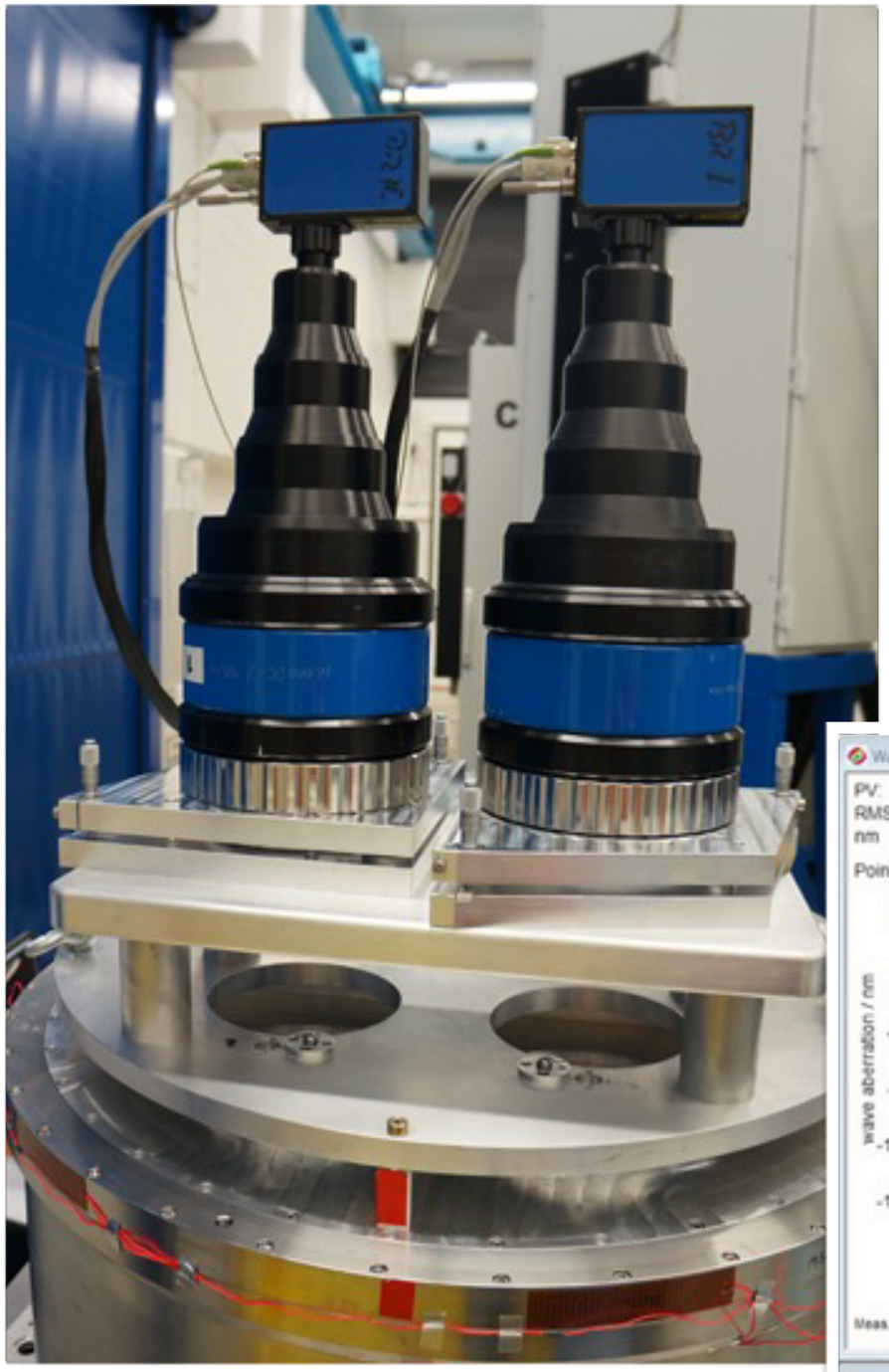


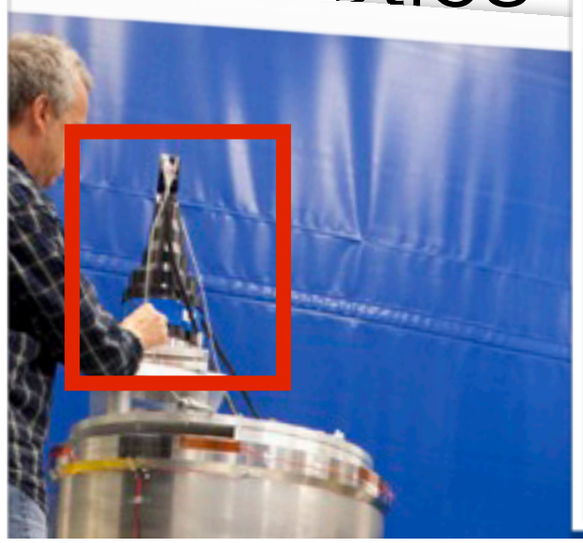
Cold Optics

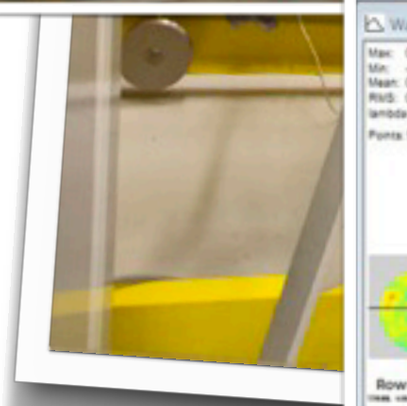


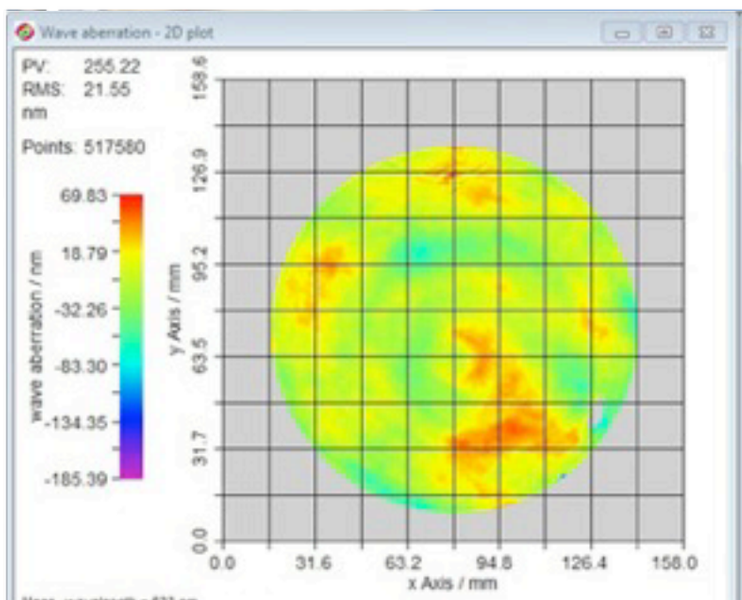


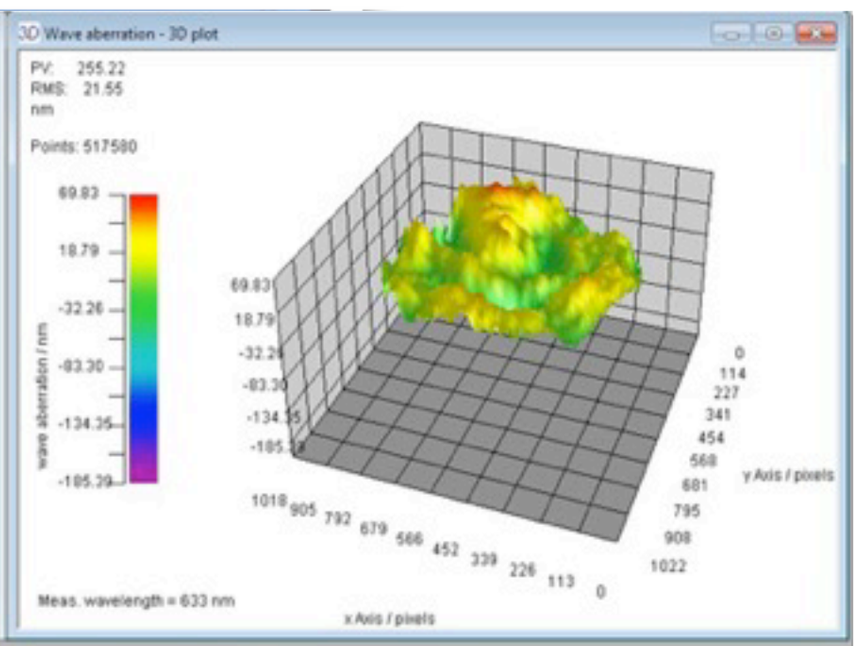
Cold Optics

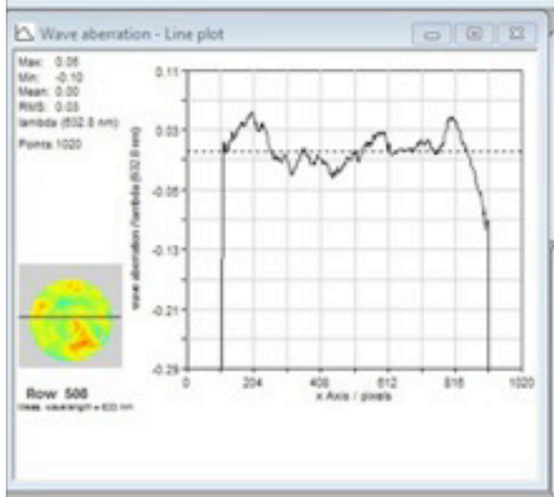




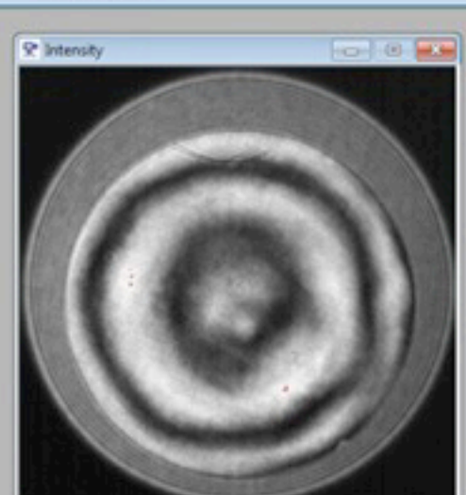



Wave aberration - 2D plot
PV: 255.22
RMS: 21.55
nm
Points: 517580
69.83
18.79
-32.26
-83.30
-134.35
-185.39
wave aberration / nm
158.6
126.9
95.2
63.5
31.7
0.0
y Axis / mm
0.0
31.6
63.2
94.8
126.4
158.0
x Axis / mm
Meas. wavelength = 633 nm

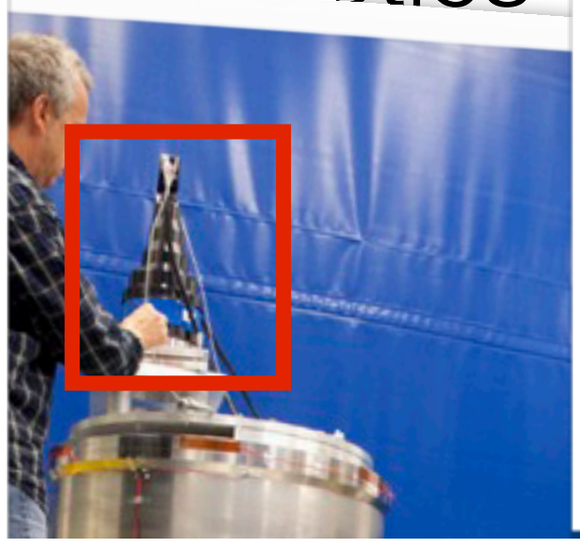

3D Wave aberration - 3D plot
PV: 255.22
RMS: 21.55
nm
Points: 517580
69.83
18.79
-32.26
-83.30
-134.35
-185.39
wave aberration / nm
0
114
227
341
454
568
681
795
908
1022
y Axis / pixels
1018
905
792
679
566
452
339
226
113
0
x Axis / pixels
Meas. wavelength = 633 nm

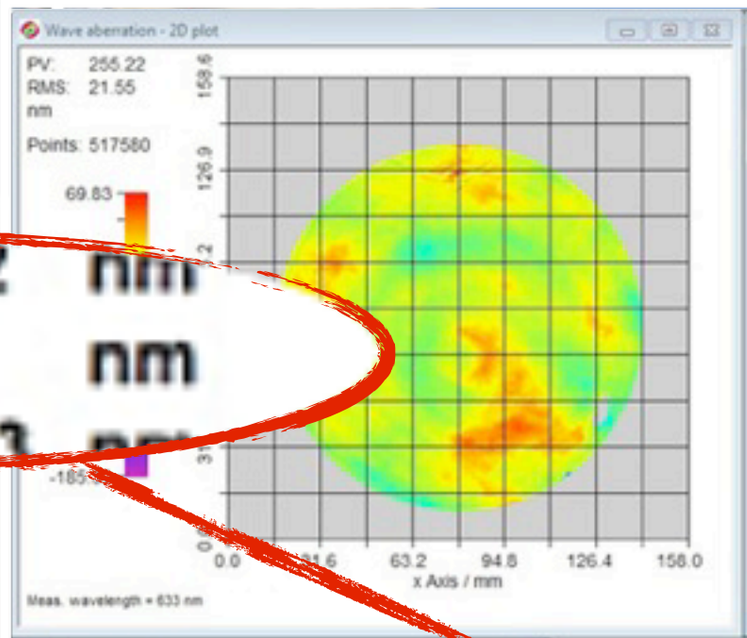

Wave aberration - Line plot
Max: 0.06
Min: -0.10
Mean: 0.00
RMS: 0.03
lambda (632.8 nm)
Points 1020
0.11
0.03
-0.05
-0.13
-0.21
-0.29
0
204
408
612
816
1020
x Axis / pixels
Row 508

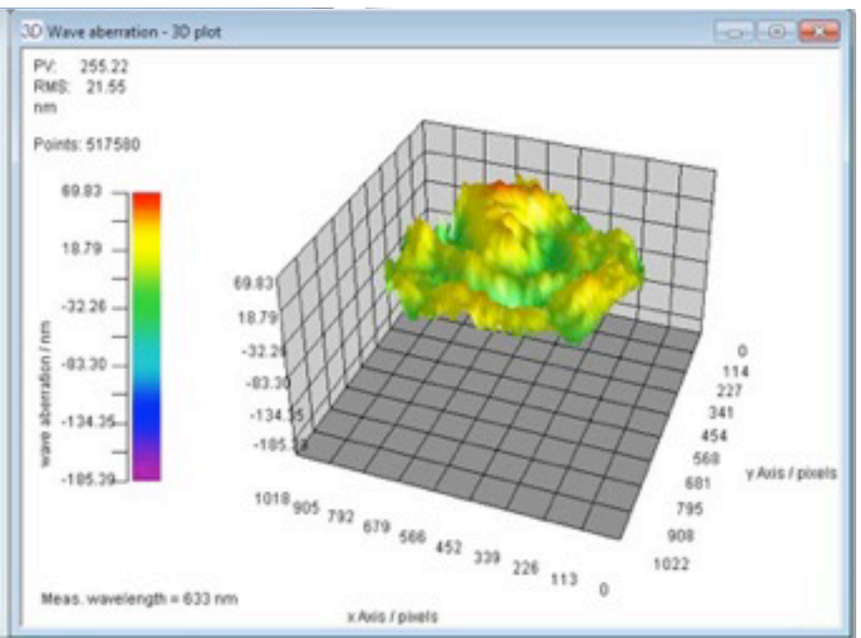

Test Wave aberration - Statistics
PV: 255.22 nm
RMS: 21.55 nm
Tilt: 1023.43 nm
Tilt x: -1.3 arcsec
Tilt y: 1.0 arcsec
Power: 737.86 nm
Test Task description
Result type: Wave aberration
Configuration: double transmission
Meas. wavelength: 632.8 nm
Adjustment parameters: quadratic fit (offset + tilt
Use calibration data: on
Hole closing: Pixel healing
Smoothing: 3 x 3 pixels
TimeMeas: 09/20/12 15:06:58
Operator: fisba


Intensity

Cold Optics




Wave aberration - 2D plot
PV: 255.22
RMS: 21.55
nm
Points: 517580
69.83
-185.39
158.6
126.9
0.0
31.6
63.2
94.8
126.4
158.0
x Axis / mm
Meas. wavelength = 633 nm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568
681
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908
1022
y Axis / pixels
Meas. wavelength = 633 nm


Wave aberration - Line plot
Max: 0.06
Min: -0.10
Mean: 0.00
RMS: 0.03
lambda (632.8 nm)
Points 1020
0.11
0.03
-0.05
-0.13
-0.21
-0.29
0
204
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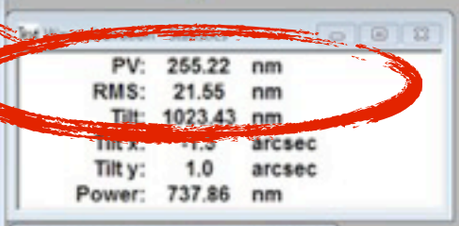
612
816
1020
x Axis / pixels
Row 508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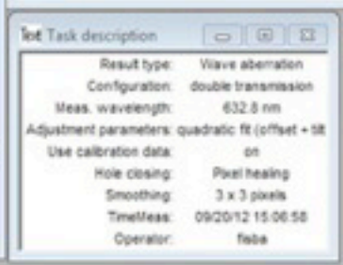
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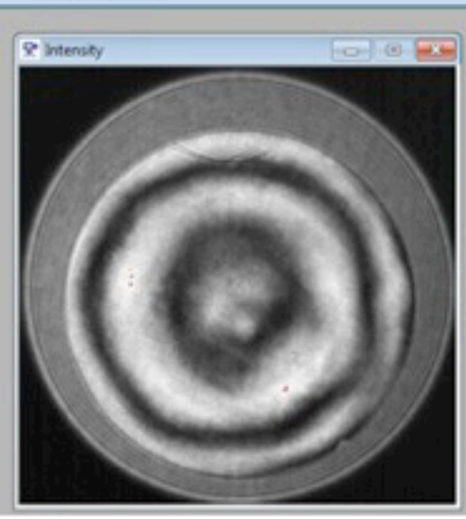
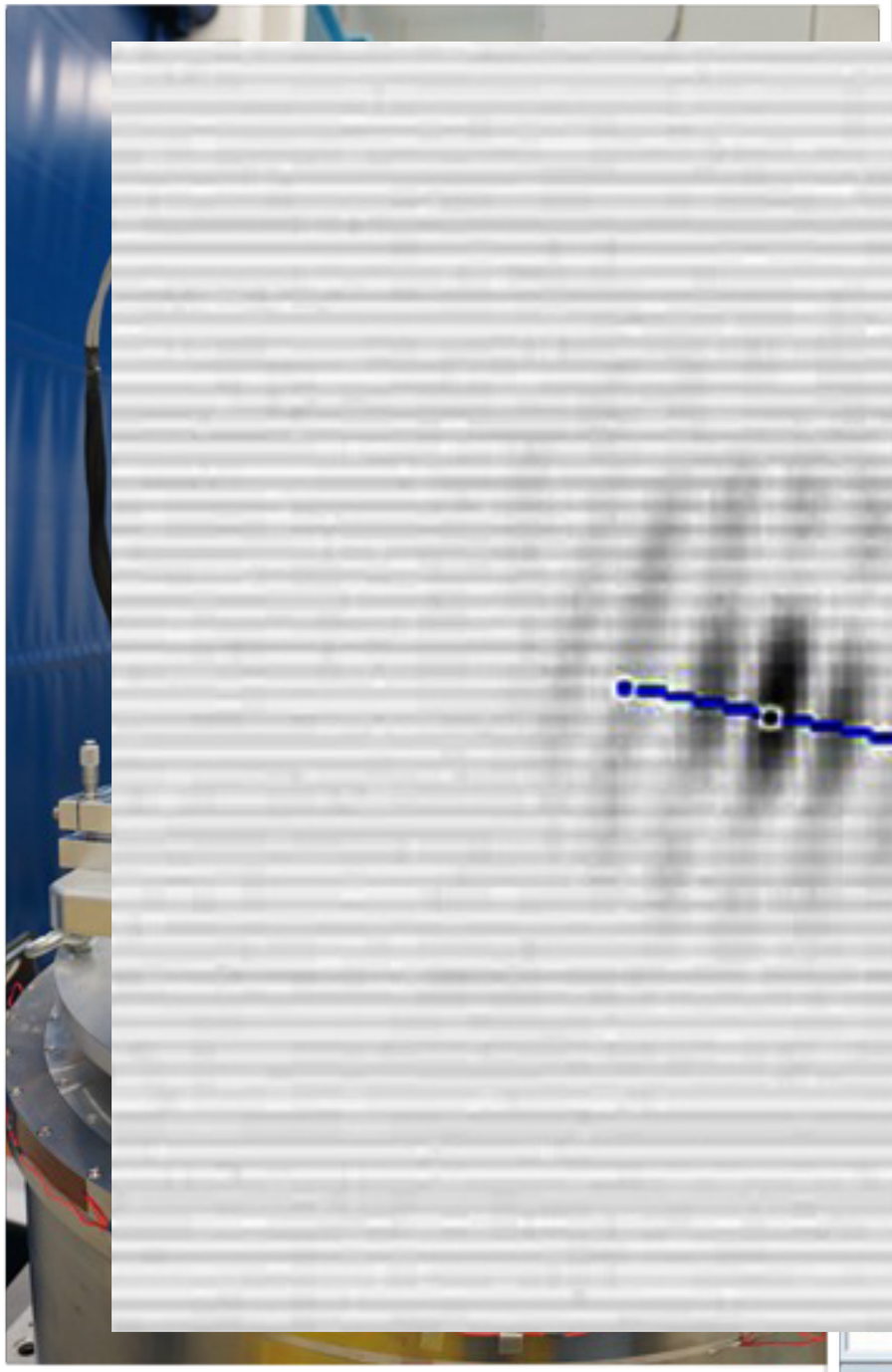
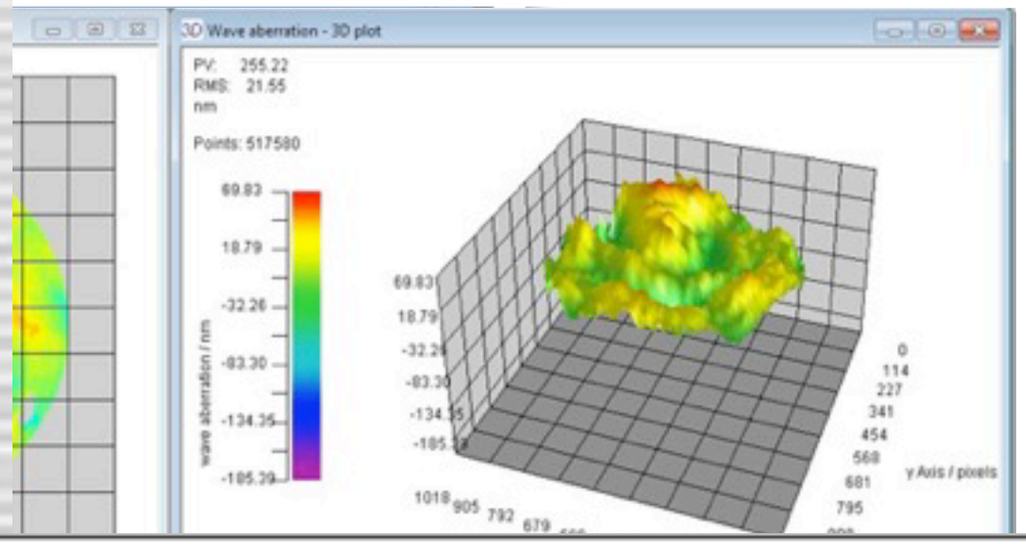

Intensity

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RMS: 21.55
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Points: 517580
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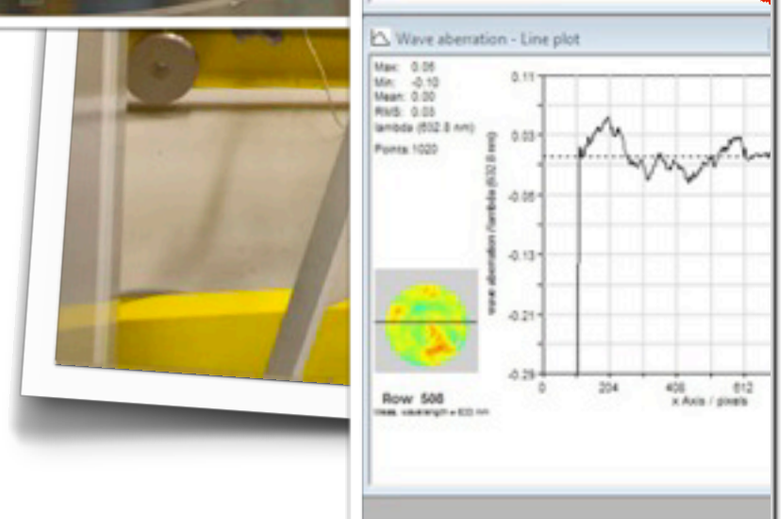
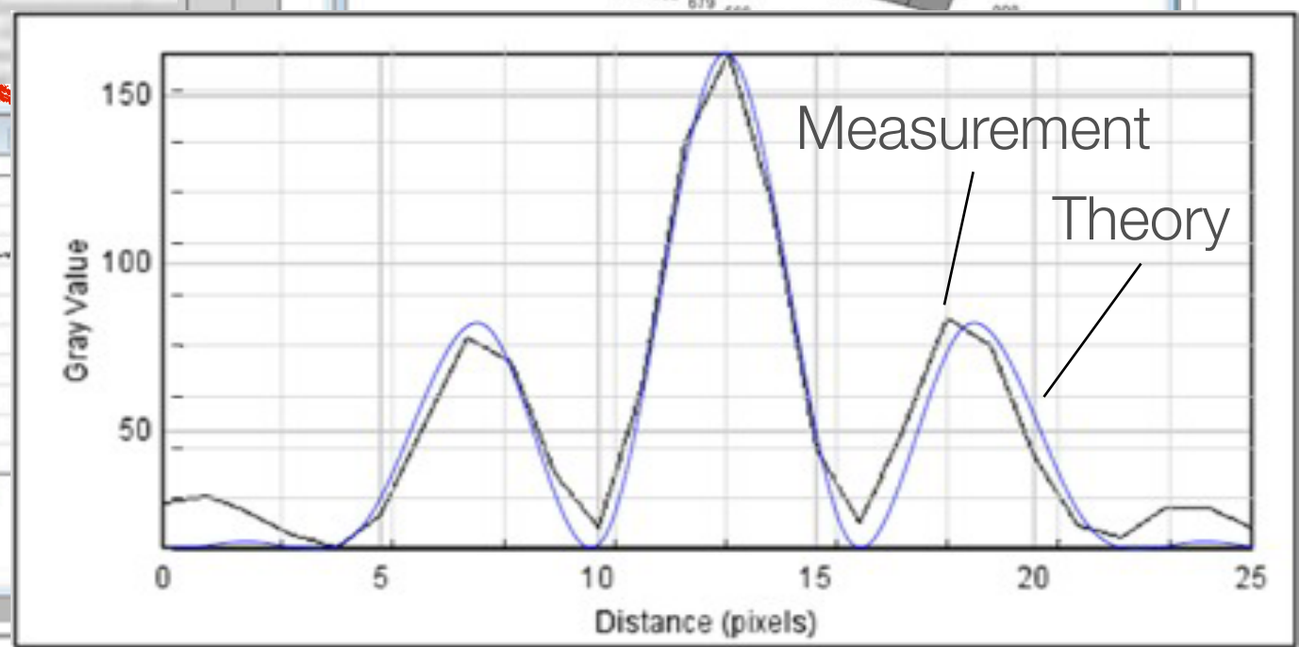
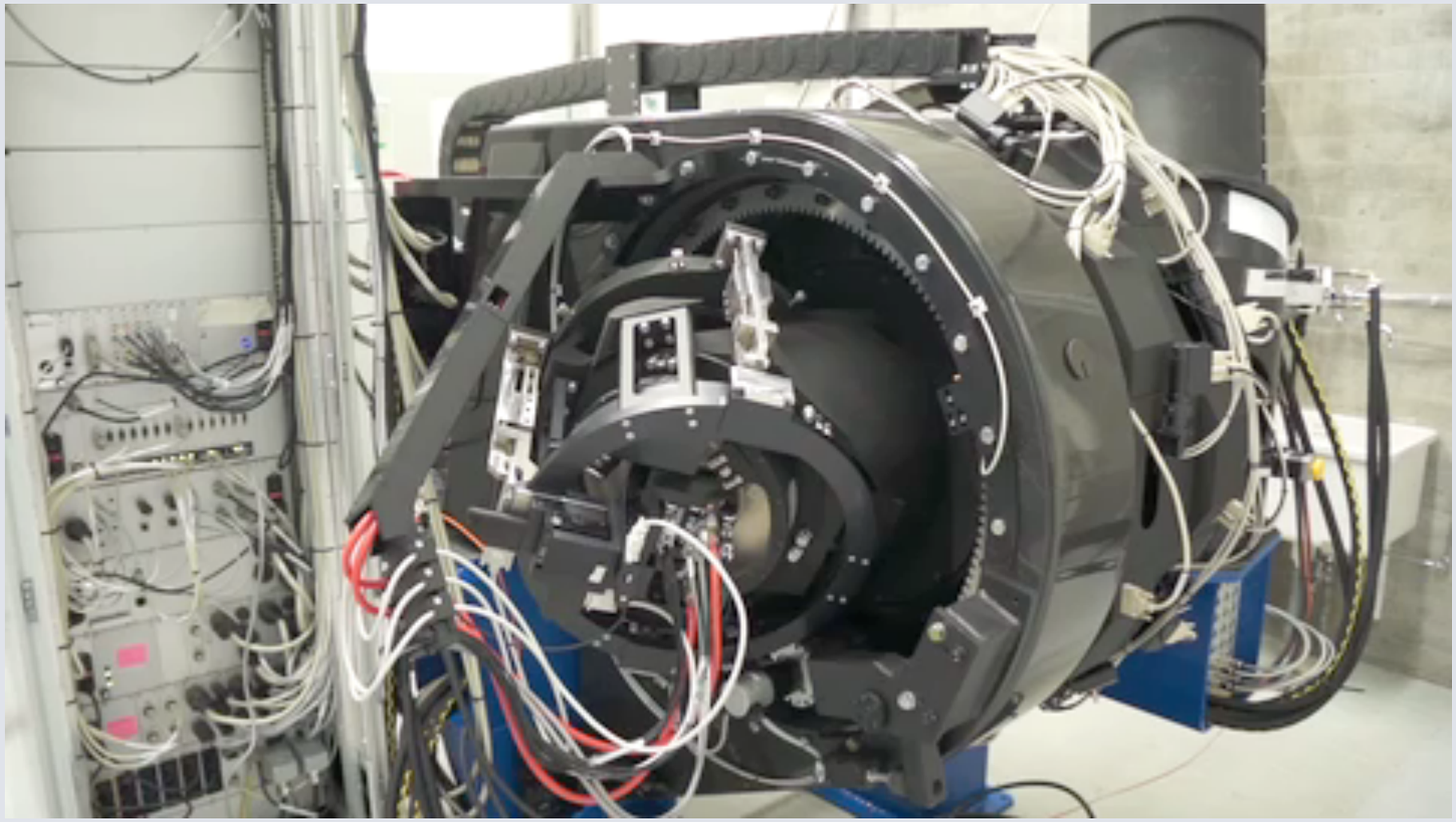


Wave aberration - Line plot
Row 508
x Axis / pixels


Measurement
Theory
Gray Value
150
100
50
0
5
10
15
20
25
Distance (pixels)

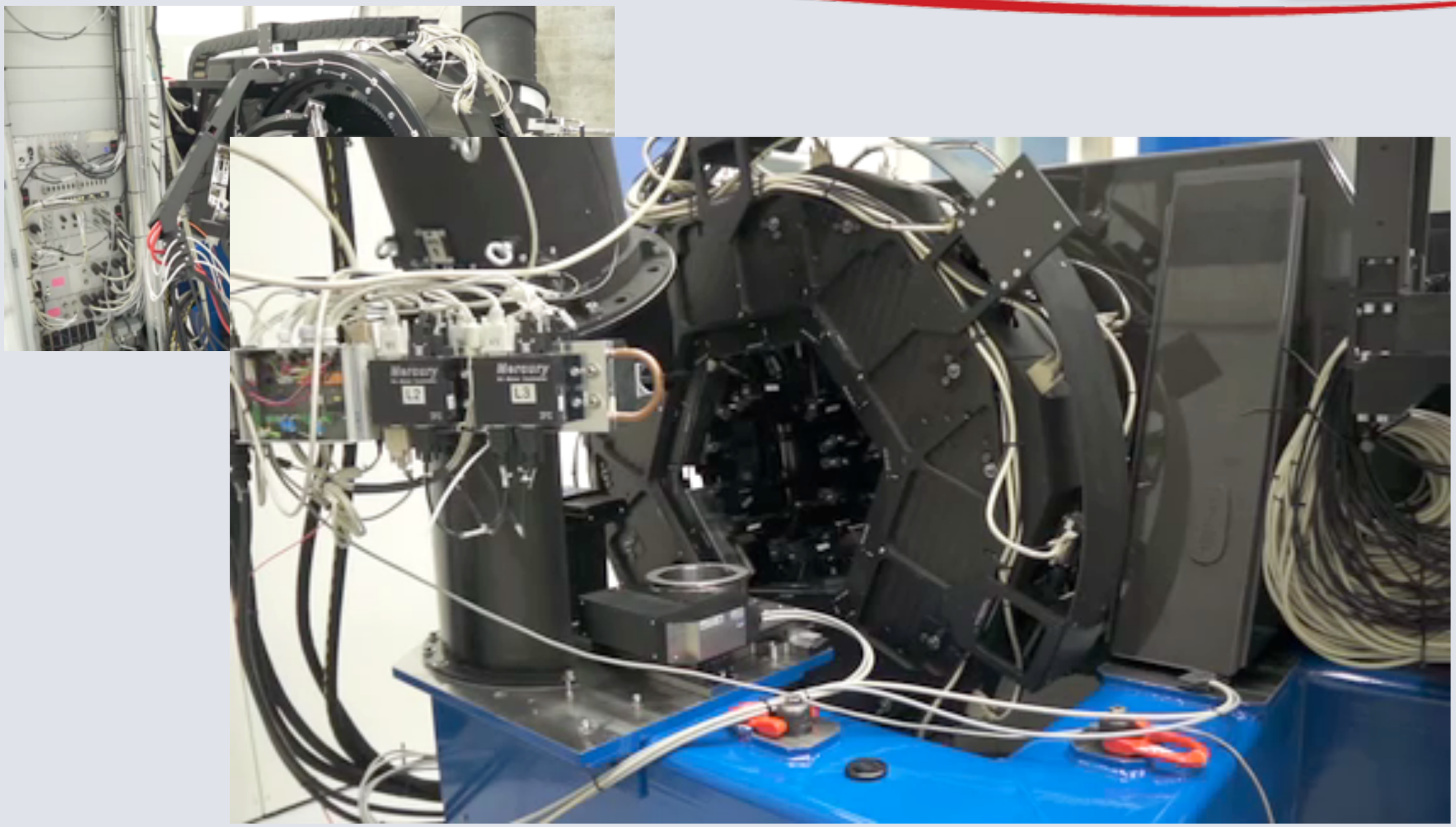
Wavefront Sensors 1

Wavefront Sensors 1 Ground Layer



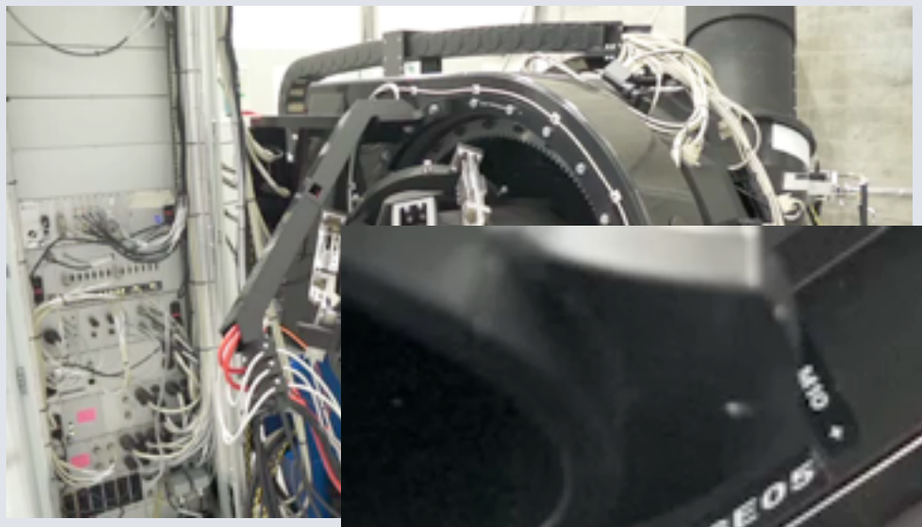
Sky Tracking

Wavefront Sensors 1 Ground Layer

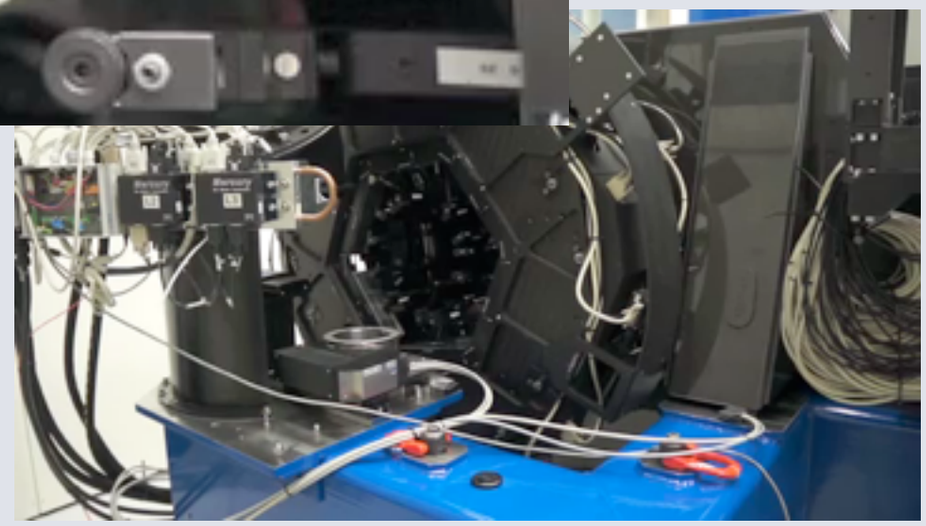


Sky Tracking

Wavefront Sensors 1 Ground Layer



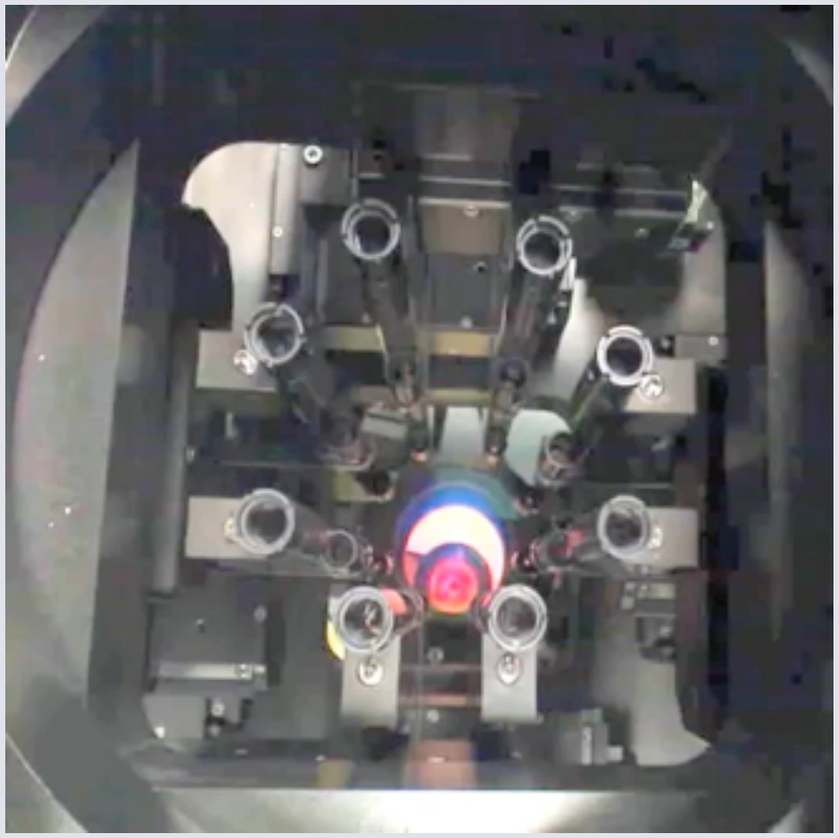
Star Finding



Wavefront Sensors 2

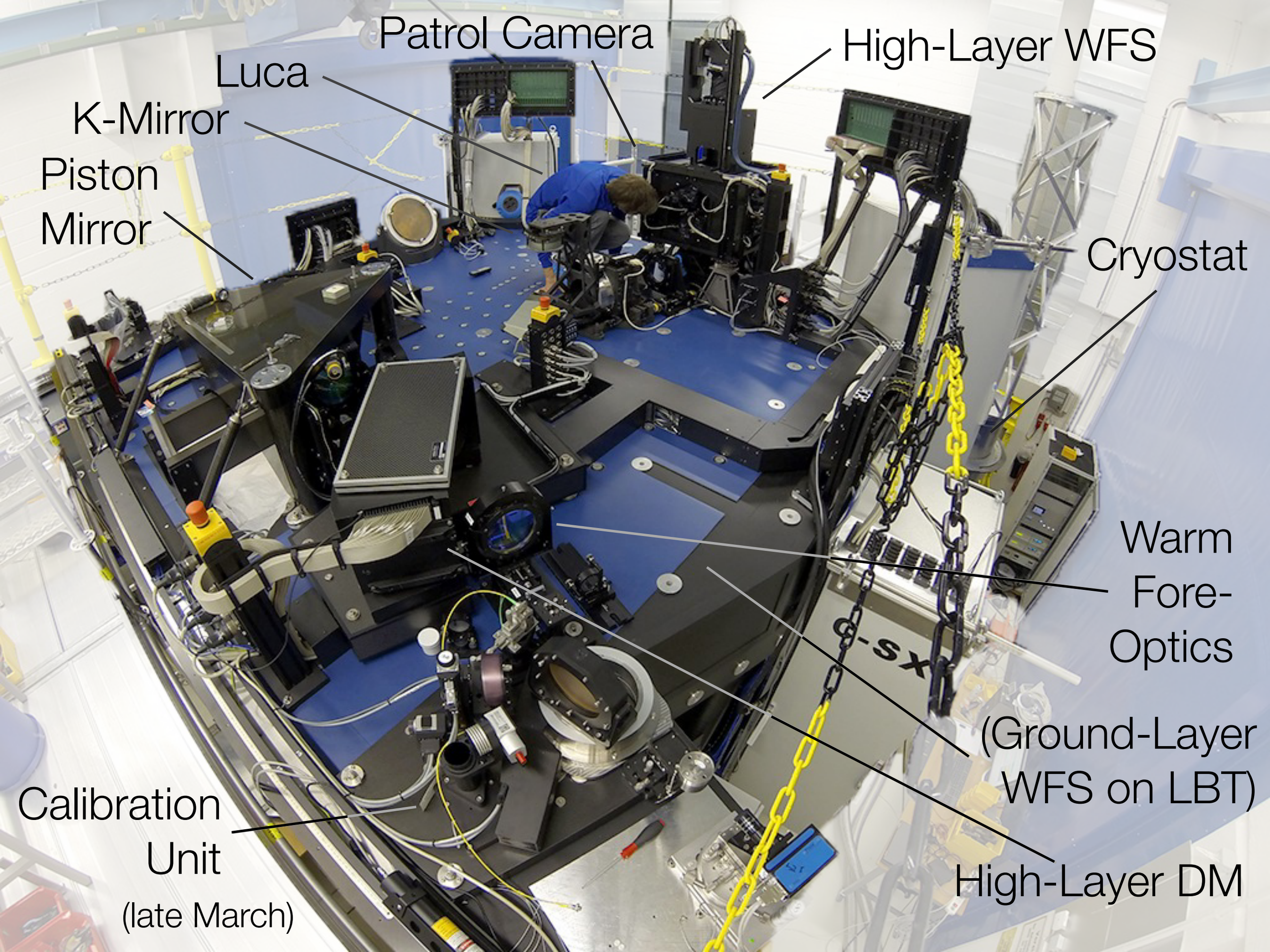
Wavefront Sensors 2 High Layer

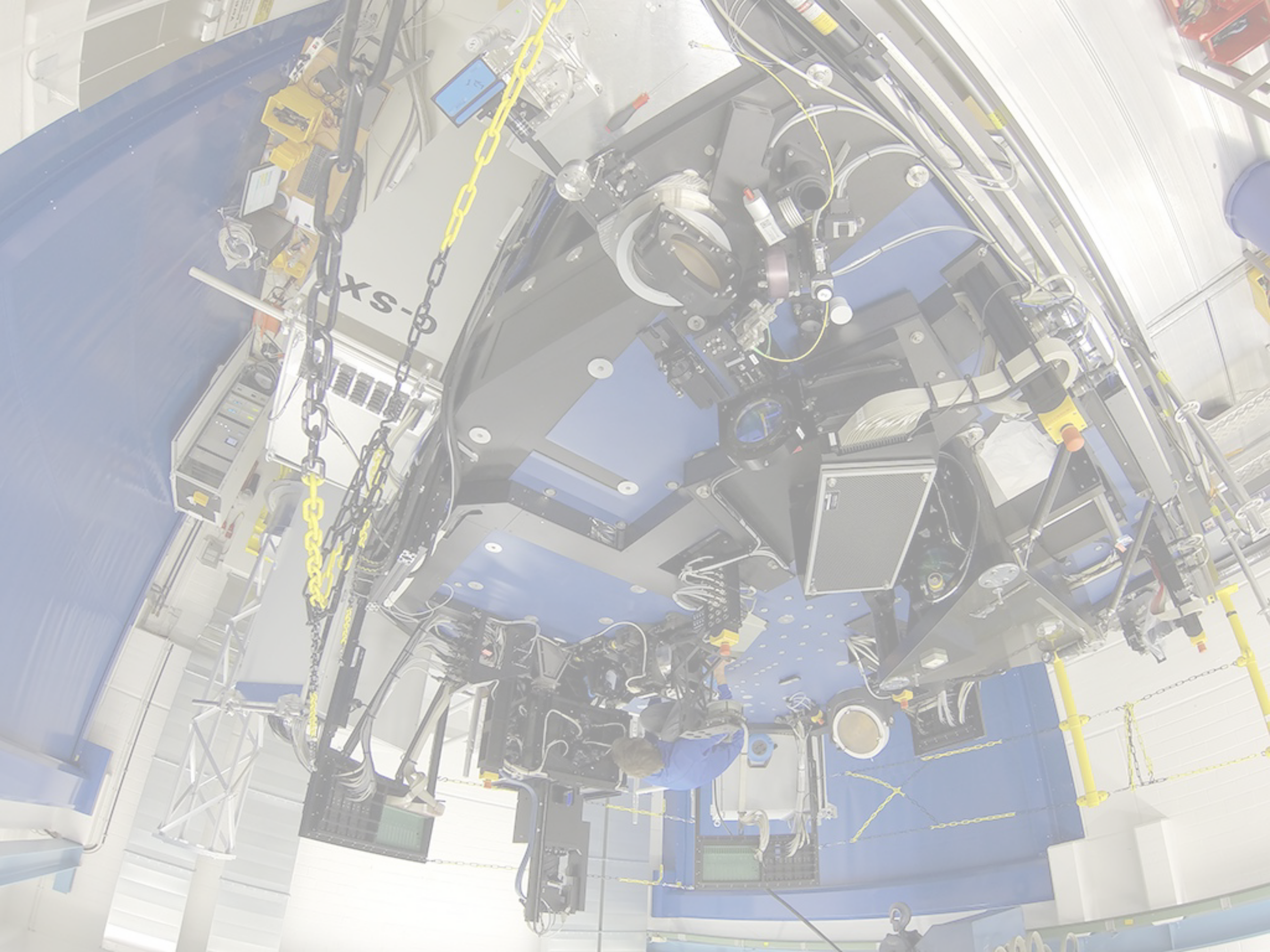
Operator GUI



Star Finding

(late March)


Patrol Camera
Luca
K-Mirror
Piston
Mirror
High-Layer WFS
Cryostat
Warm
Fore-
Optics
(Ground-Layer
WFS on LBT)
High-Layer DM
Calibration
Unit
(late March)



Fore-Optics

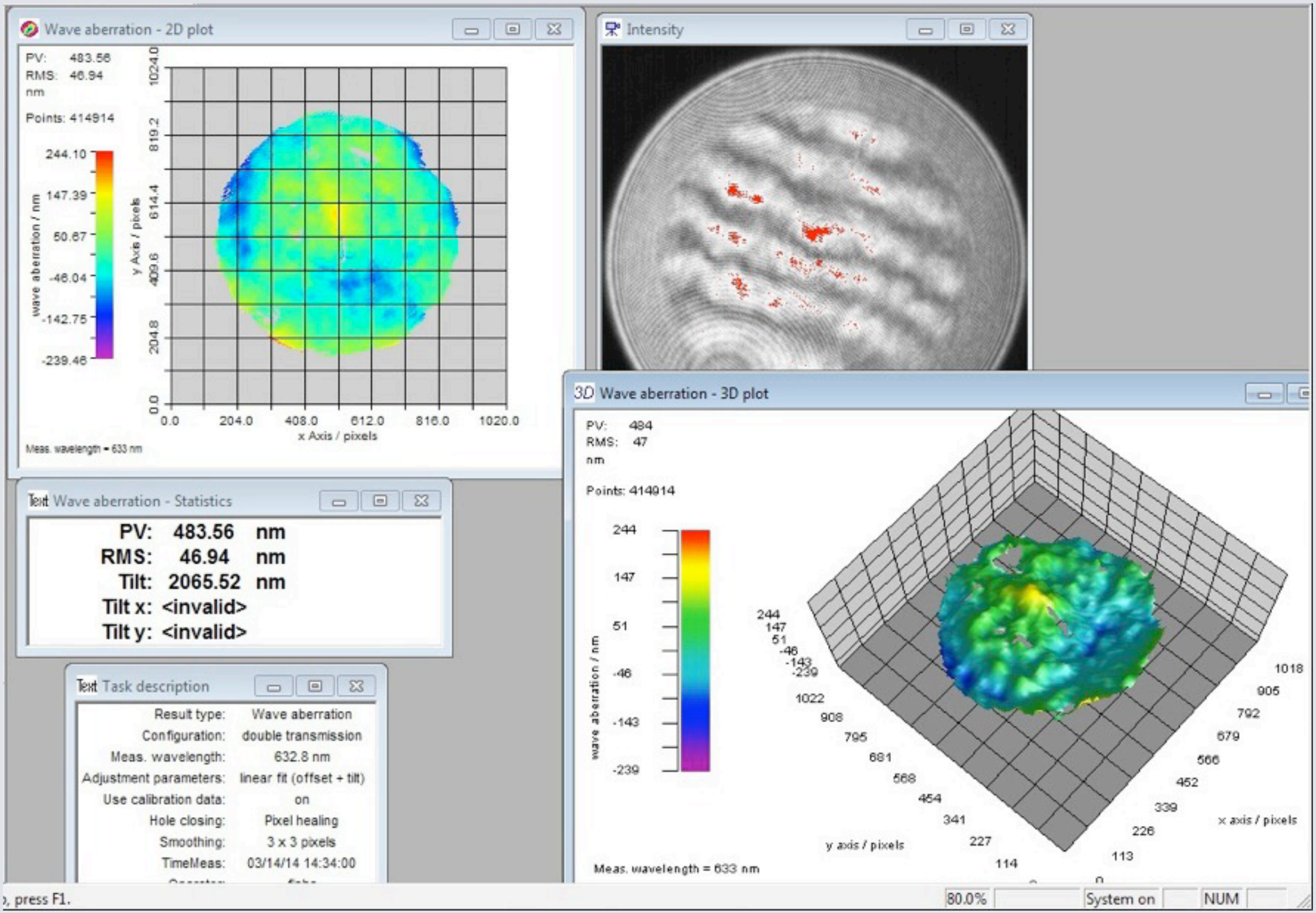
- 6 lenses
- 4 reflections, including DM

WFS Optics

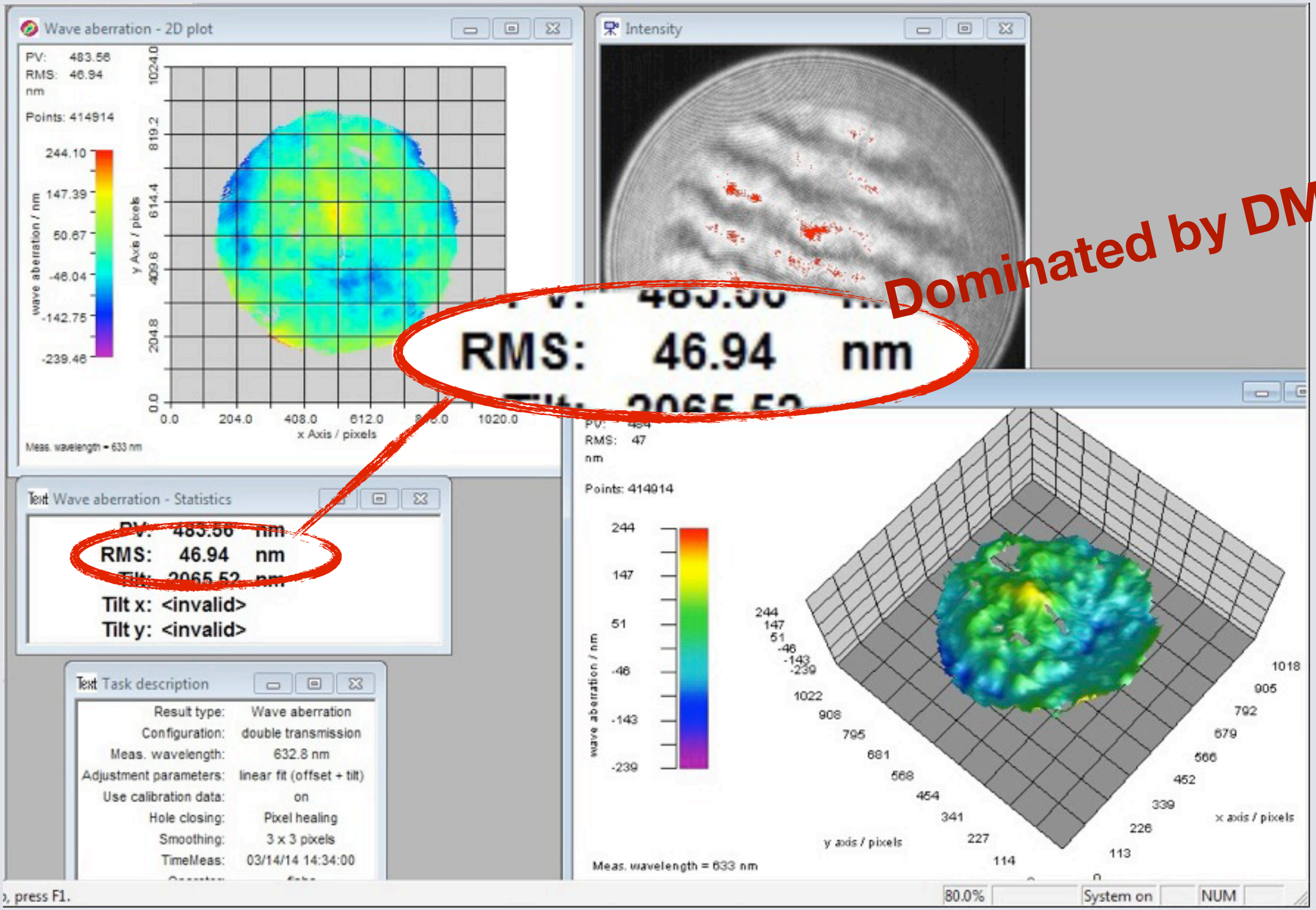
- 4 lenses
- 1 filter
- 4 reflections

30 surfaces

Delivered Wavefront Quality



Delivered Wavefront Quality




Reinraum / Clean Room