Netherlands Research School for Astronomy

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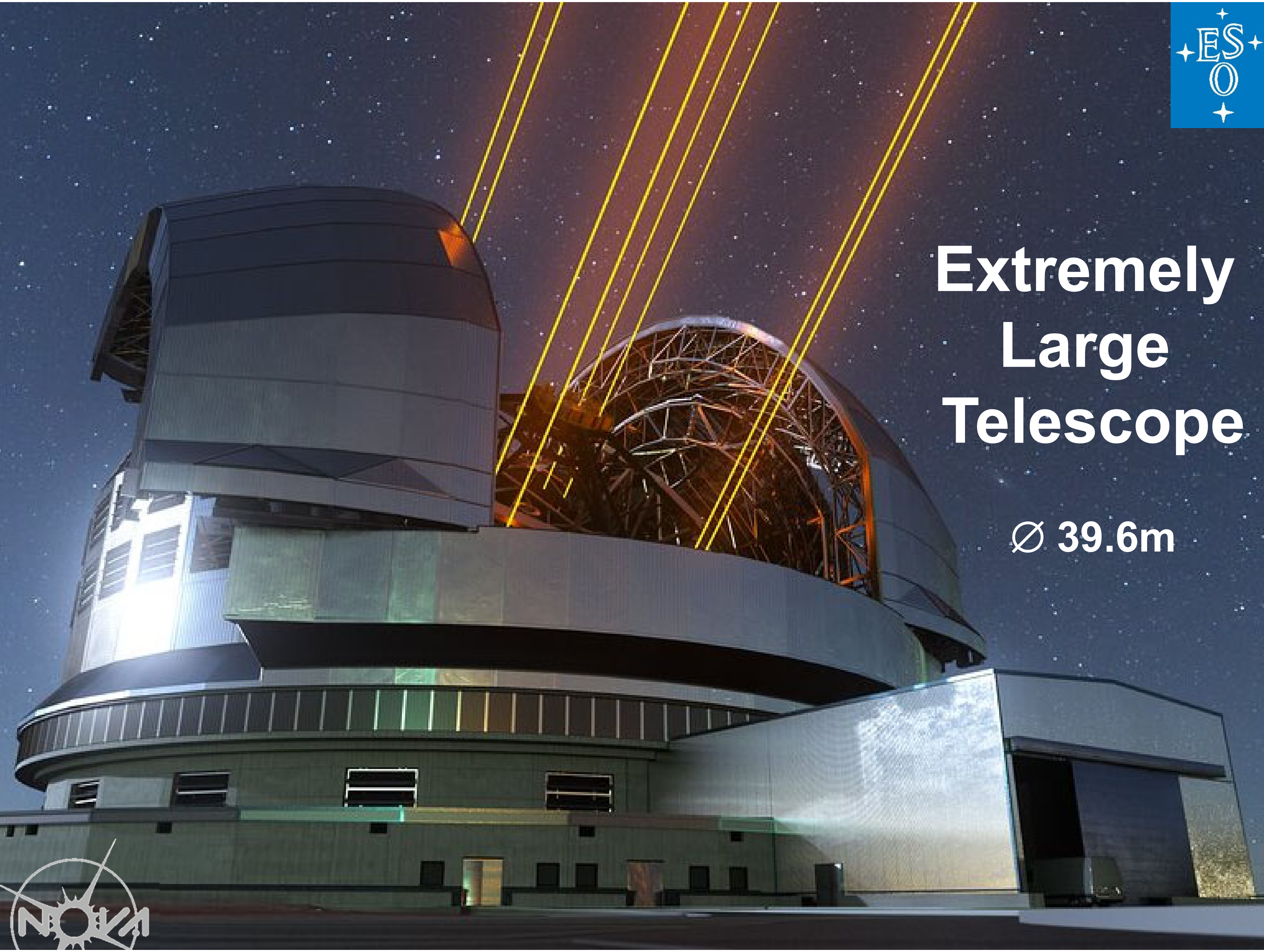
ELT Instruments Day 2022

7th April 2022
Geneva, Switzerland

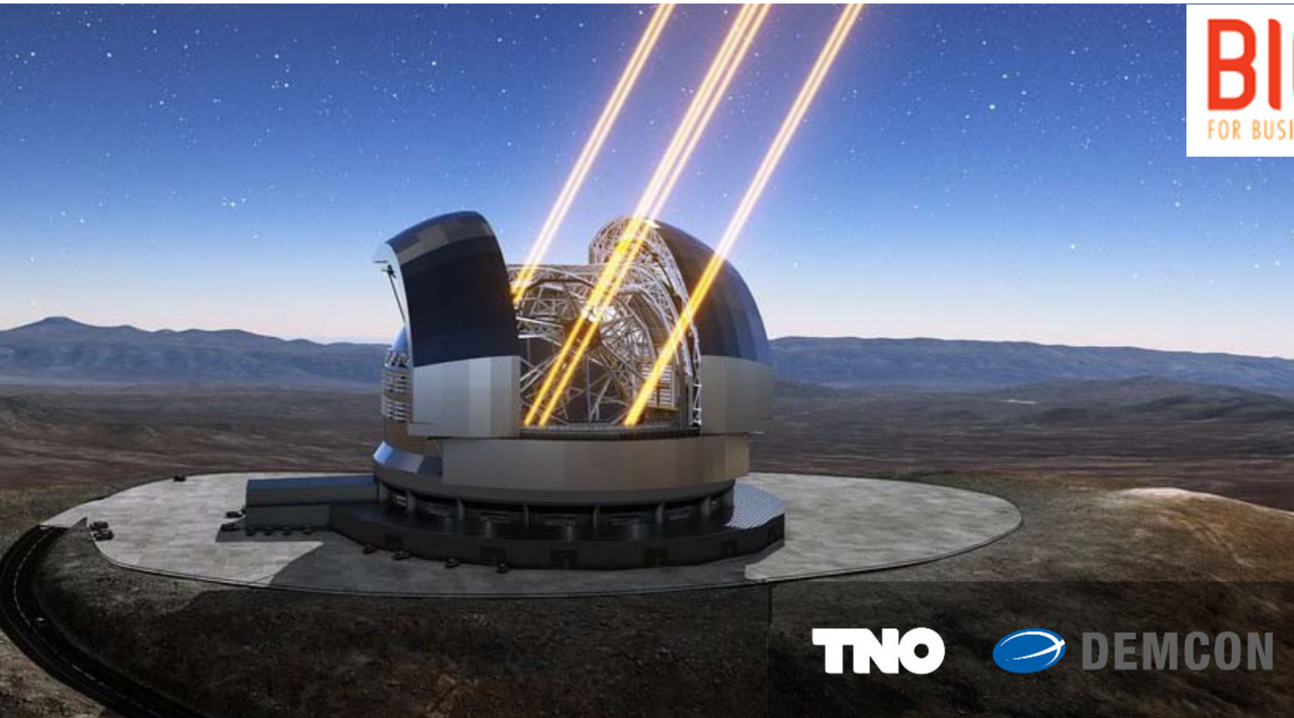
Exhibitors List

- A.D.S. International
- ACTIVE SPACE TECHNOLOGIES S.A.
- AGC Glass Europe SA
- ALMATECH SA
- ALPAO
- ALSYMEX
- ALTER TECHNOLOGY
- AMOS S.A.
- APCO Technologies
- ASE Optics Europe
- AVS Added Value Solutions
- AWGE Technologies, S.L.
- Bilfinger Noell GmbH
- Cadinox SA
- Cambridge Consultants
- Centre Spatial de Liège
- CoRES HES-SO//Genève
- Creotech Instruments S.A.
- Cryoworld BV
- Cryo Diffusion
- CSEM SA
- Dal Ben SpA
- DEMACO HOLLAND B.V.
- Demcon Advanced Mechatronics
- EIE Group Srl.
- ENSA
- First Light Imaging
- Heidelberg Instruments Mikrotechnik
- HEIG-VD
- Heraeus Conamic
- Hexagon MI
- IDOM
- IMEC
- IPP CAS
- Institute of Scientific Instruments of the Czech Academy of Sciences
- JPE
- Kampf Telescope Optics
- Manufax Nelson Group
- MAXON
- Micro-Epsilon Messtechnik GmbH
- MPS Microsystems
- NYFORS Teknoloigi AB
- Observatory Sciences Ltd
- OFFICINA STELLARE SPA
- OIP Sensor Systems
- Optical-Calculation
- Optocraft GmbH
- Physik Instrumente GmbH
- RFR Solutions AB
- S2Innovation Sp
- SAFRAN REOSC
- SCHOTT AG
- SENER Aeroespacial
- SETIS
- SwissOptic AG
- SYDERAL SWISS
- SYMETRIE
- TECPA
- Teledyne SP Devices
- Thales SESO
- TNO
- TOPTICA Projects GmbH
- VDL
- von Hoerner & Sulger GmbH
- Winlight System

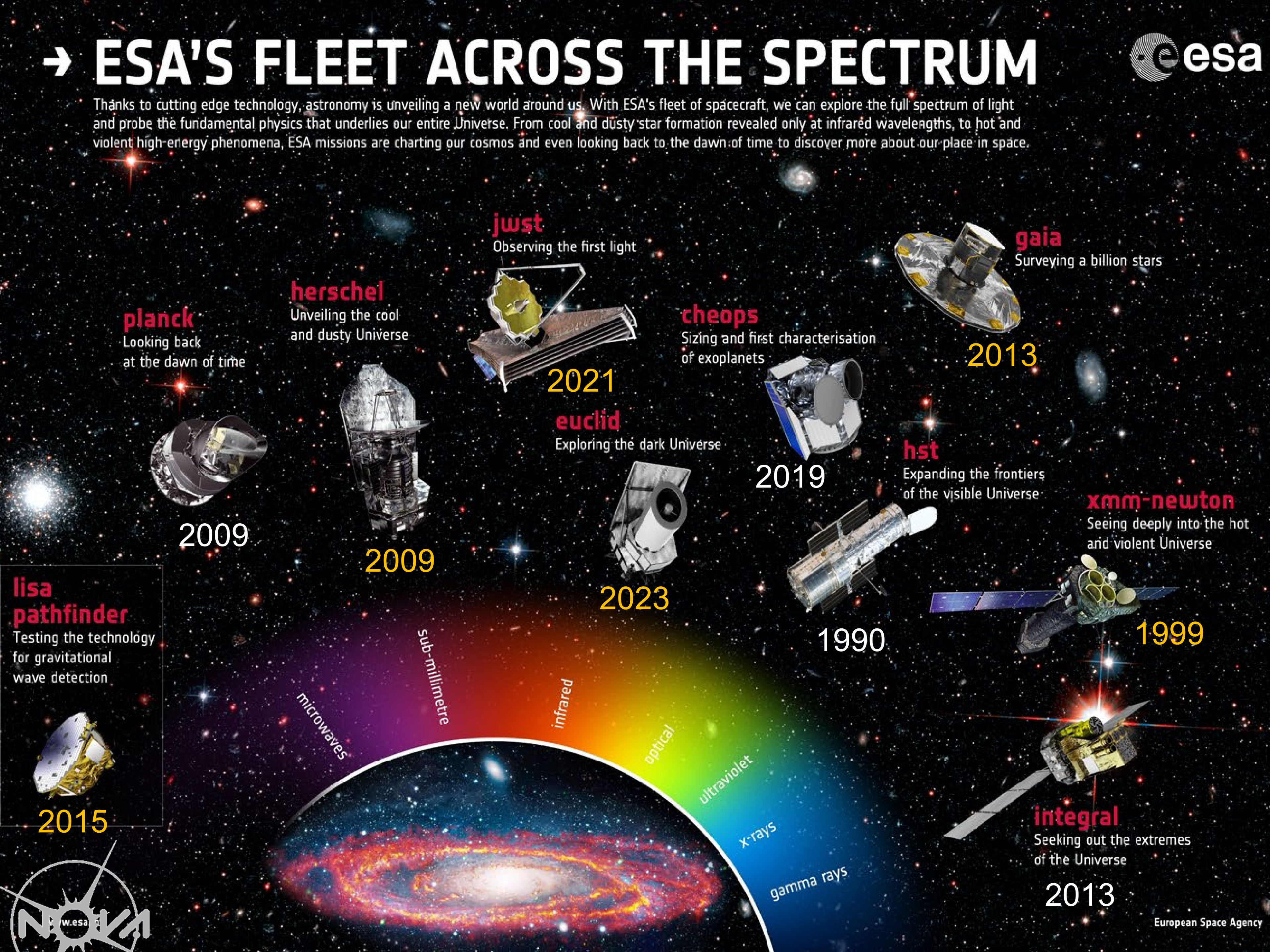

Extremely
Large
Telescope
∅ 39.6m

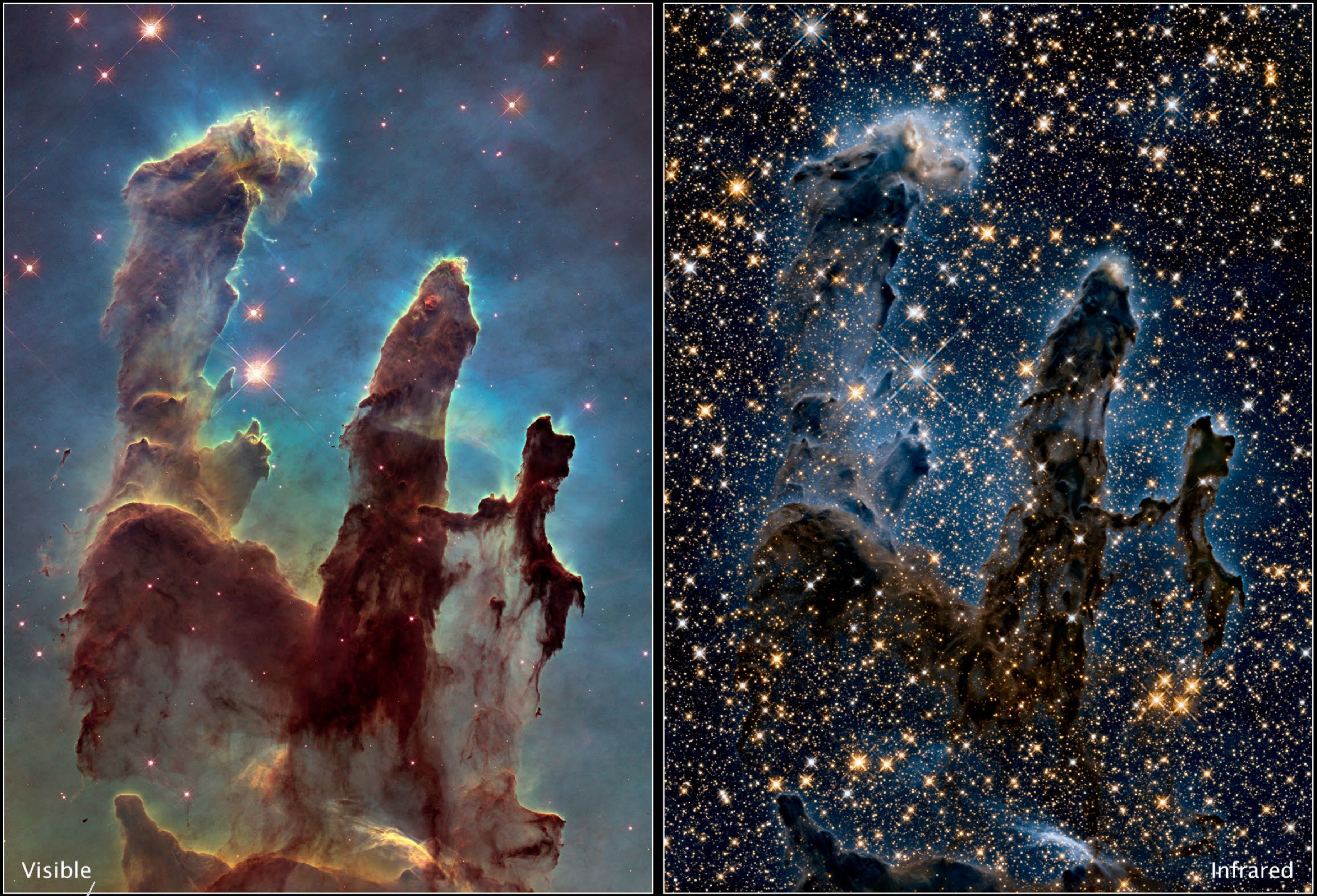
BIGscience.nl
FOR BUSINESS

iLO-net
INDUSTRIAL LIAISON OFFICERS NETWORK




METIS
MAORY
HARMONI
MICADO

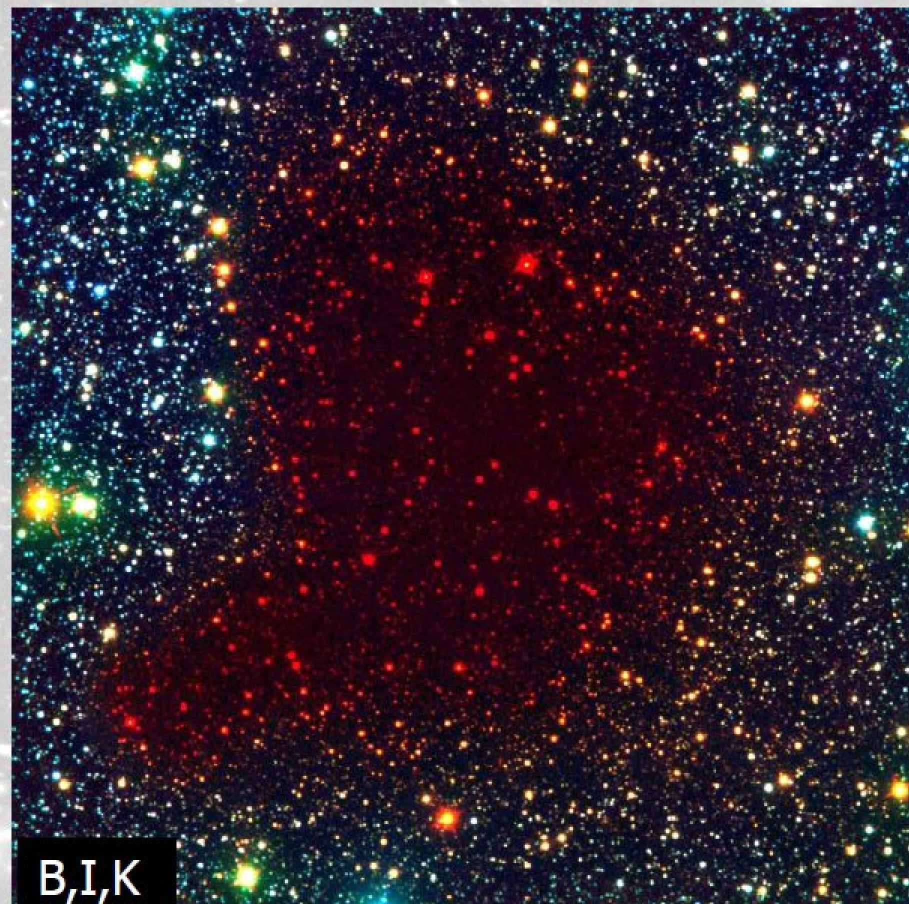

ESA'S FLEET ACROSS THE SPECTRUM
esa
Thanks to cutting edge technology, astronomy is unveiling a new world around us. With ESA's fleet of spacecraft, we can explore the full spectrum of light and probe the fundamental physics that underlies our entire Universe. From cool and dusty star formation revealed only at infrared wavelengths, to hot and violent high-energy phenomena, ESA missions are charting our cosmos and even looking back to the dawn of time to discover more about our place in space.
jwst
Observing the first light
2021
gaia
Surveying a billion stars
2013
herschel
Unveiling the cool and dusty Universe
2009
planck
Looking back at the dawn of time
2009
cheops
Sizing and first characterisation of exoplanets
2019
euclid
Exploring the dark Universe
2023
hst
Expanding the frontiers of the visible Universe
1990
xmm-newton
Seeing deeply into the hot and violent Universe
1999
lisa pathfinder
Testing the technology for gravitational wave detection
2015
microwaves
sub-millimetre
infrared
optical
ultraviolet
x-rays
gamma rays
integral
Seeking out the extremes of the Universe
2013
European Space Agency



M16 ▪ Eagle Nebula

Hubble Space Telescope ▪ WFC3/UVIS/IR

Expand Your Wavelength Range!



Alves et al. 2001

Orbit:
L2 Sun-Earth-System

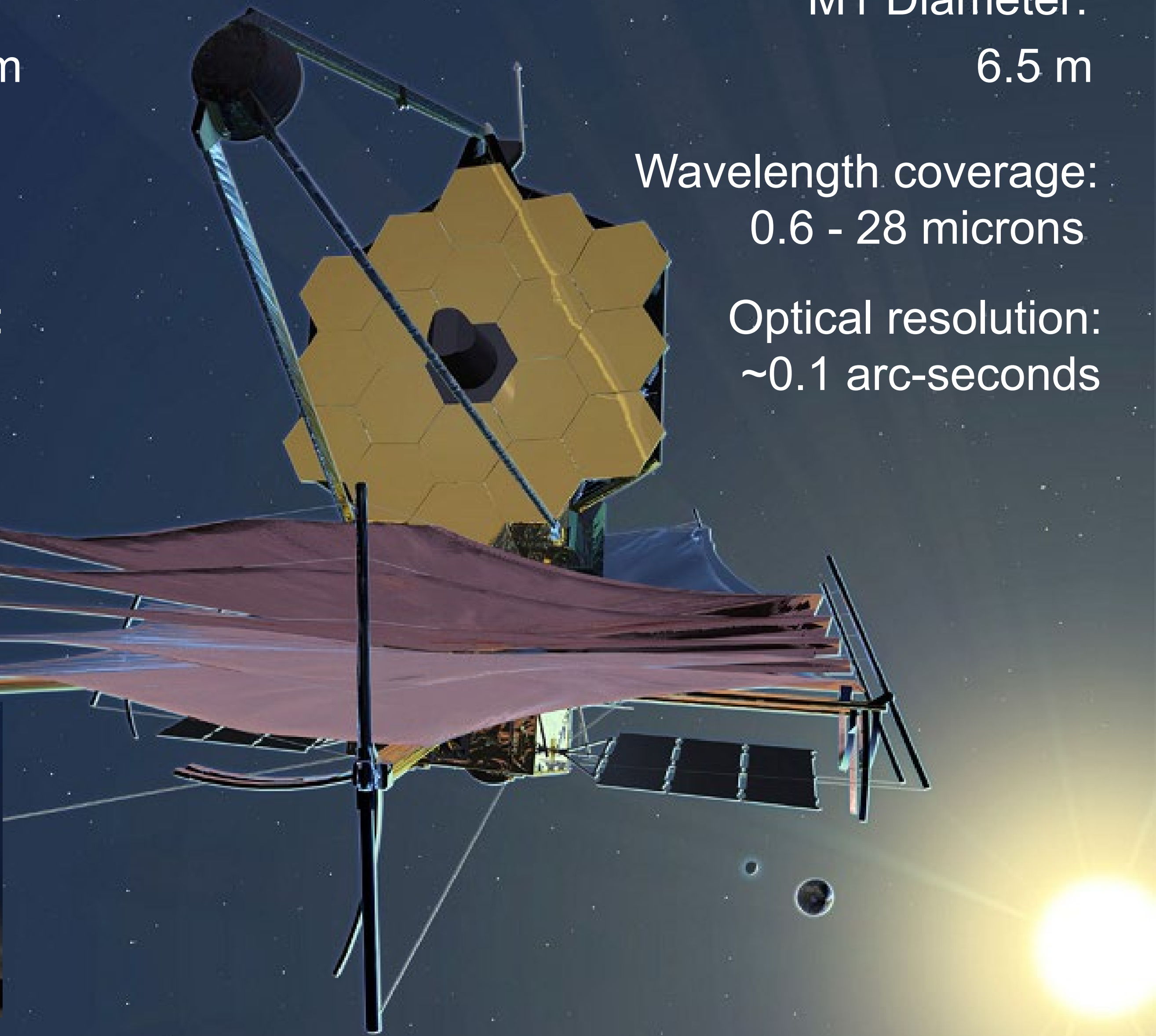
Launch mass:
6200 kg

Operating Temperature:
< 50K passive
< 7K active

M1 Diameter:
6.5 m

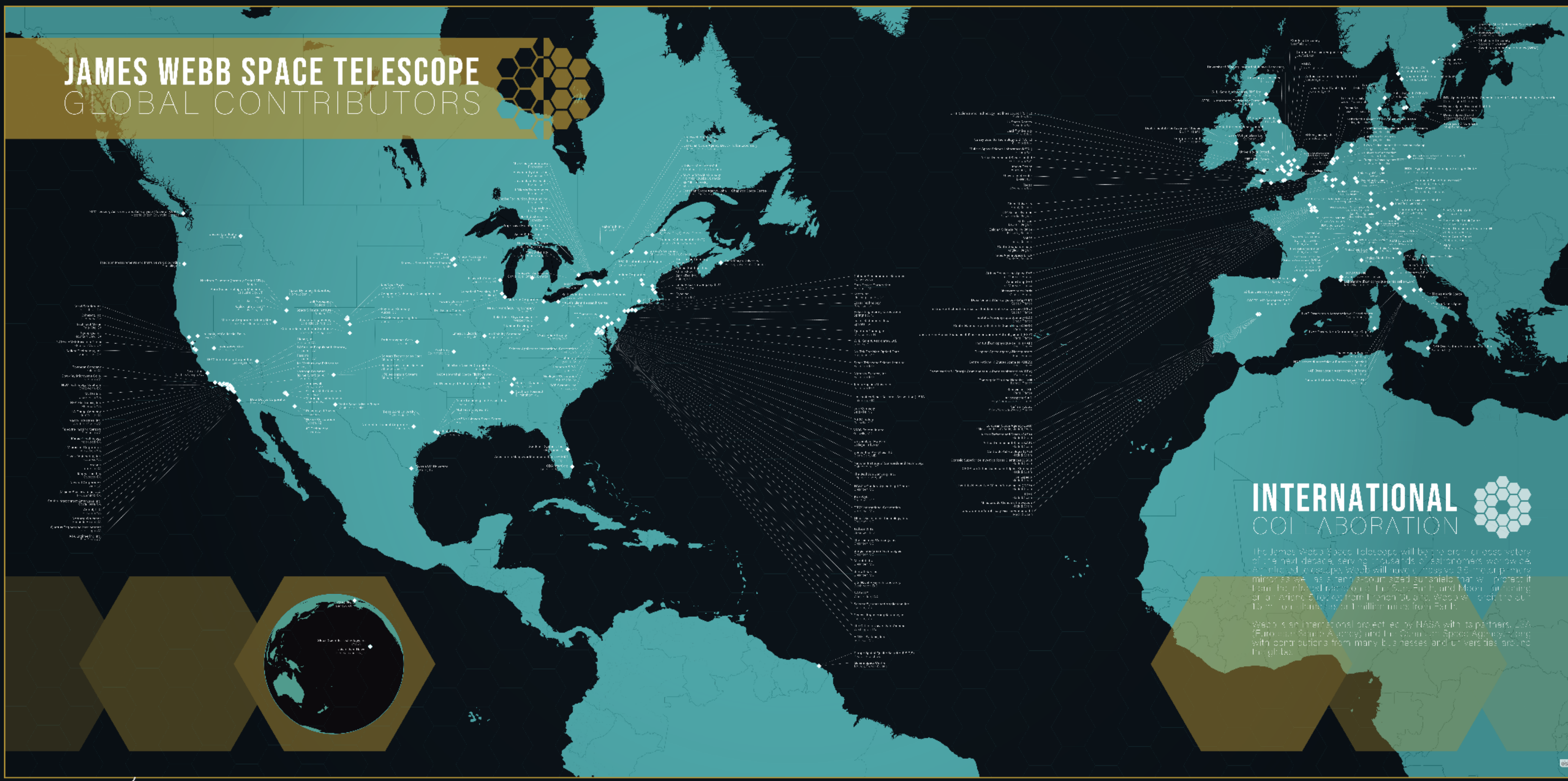
Wavelength coverage:
0.6 - 28 microns

Optical resolution:
~0.1 arc-seconds

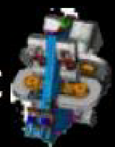
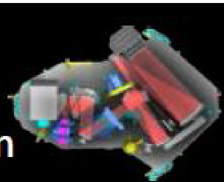
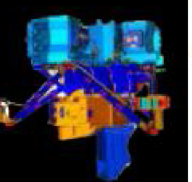
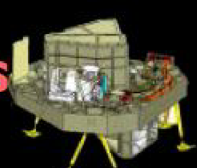


James Webb Space Telescope

Global Cooperation

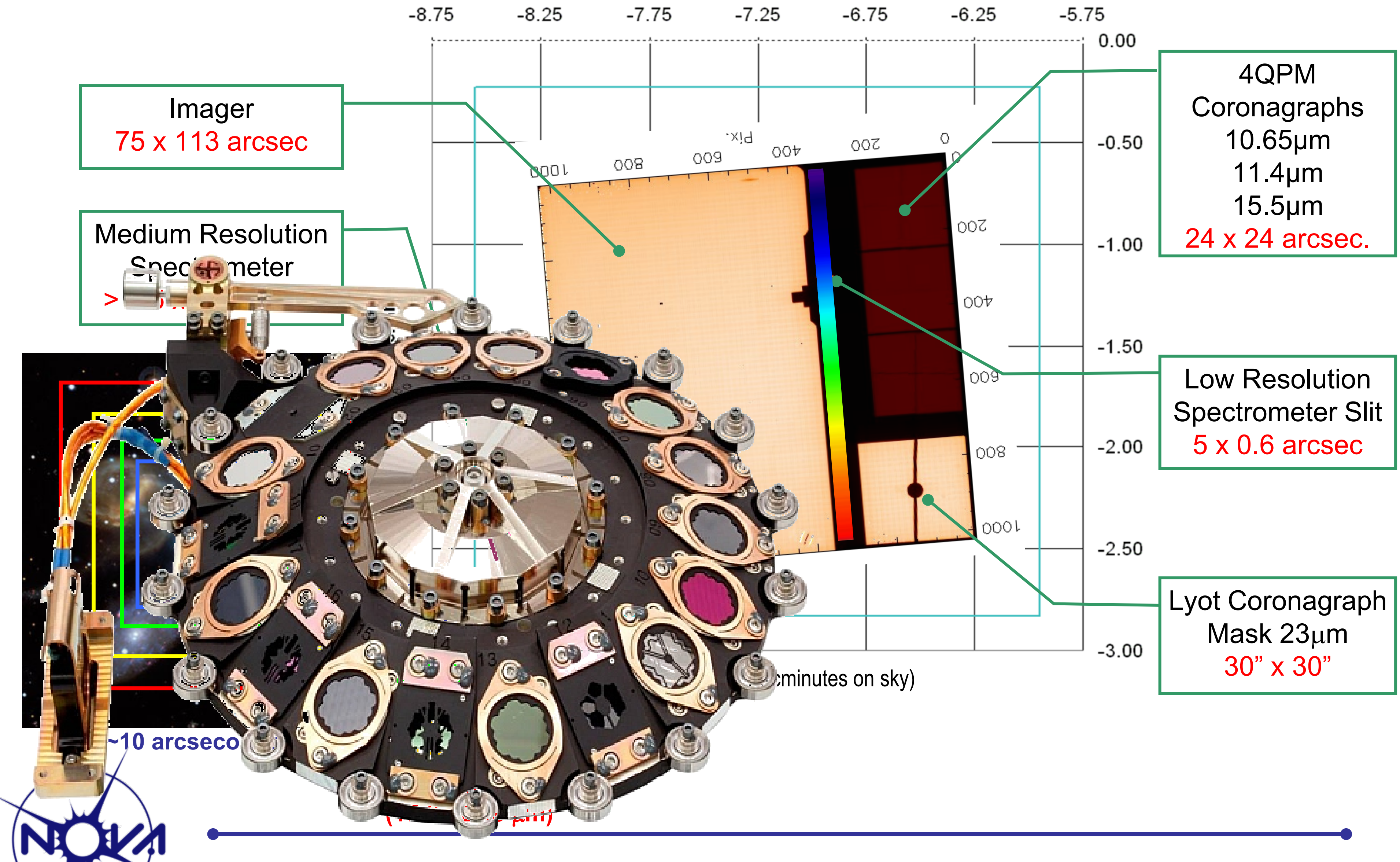


JWST Science Instruments

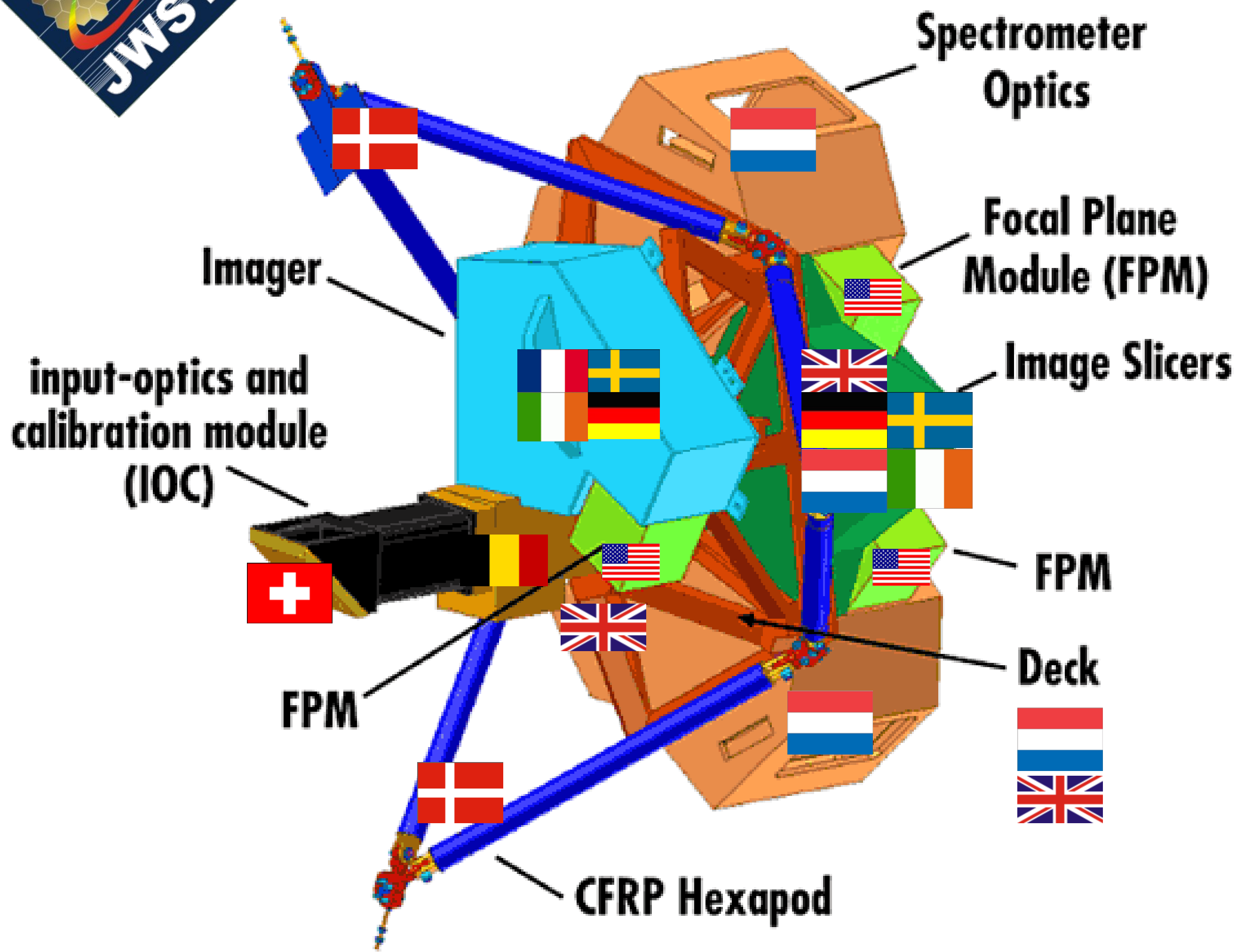
Instrument	Science Requirement	Capability
NIRCam Univ. Az/LMATC 	Wide field, deep imaging ›0.6 μm - 2.3 μm (SW) ›2.4 μm - 5.0 μm (LW)	2.2’ x 4.4’ SW at same time as 2.2’ x 4.4’ LW with dichroic Coronagraph
NIRSpec ESA/Astrium 	Multi-object spectroscopy ›0.6 μm - 5.0 μm	9.7 Sq arcmin Ω + IFU + slits 100 selectable targets: MSA R=100, 1000, 3000
MIRI ESA/Consortium /UKATC/JPL 	Mid-infrared imaging › 5 μm - 27 μm Mid-infrared spectroscopy › 4.9 μm - 28.8 μm	1.9’ x1.4’ with coronagraph 3.7”x 3.7” – 7.1”x 7.7” IFU R=3000 - 2250
FGS/NIRISS CSA 	Fine Guidance Sensor 0.8 μm - 5.0 μm Near IR Imaging Slitless Spectrometer	Two 2.3’ x 2.3’ 2.2’ x 2.2’ R= 700 with coronagraph

Mid-InfraRed Instrument capabilities:

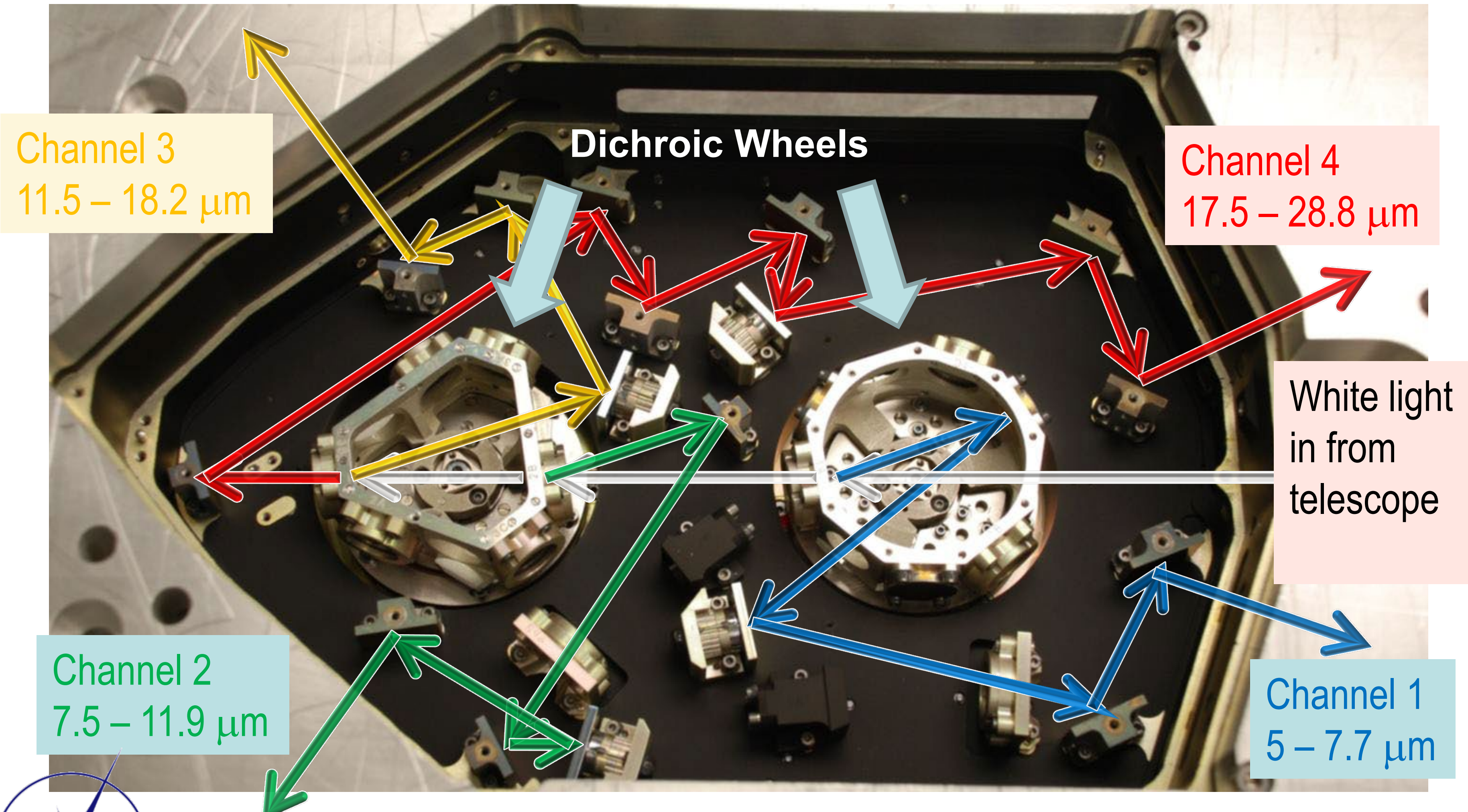
MIRI optical configurations map



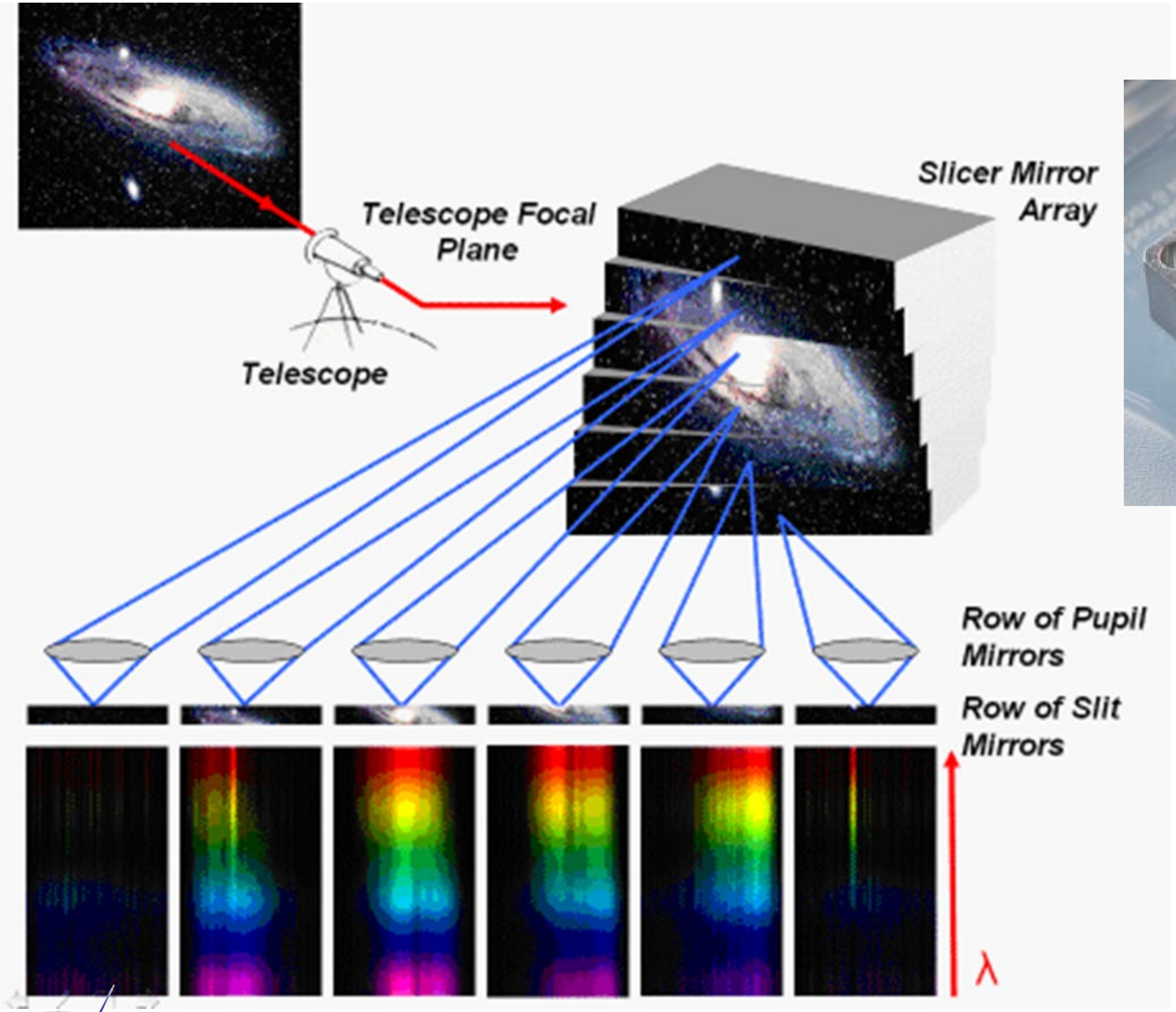
Mid Infrared Instrument (MIRI)

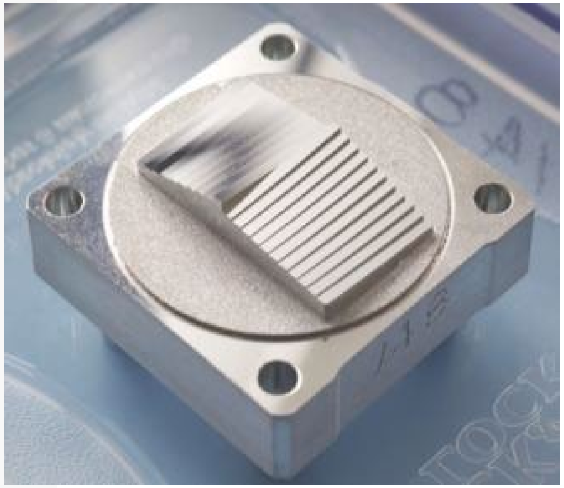


Spectral band selection by dichroic filtering

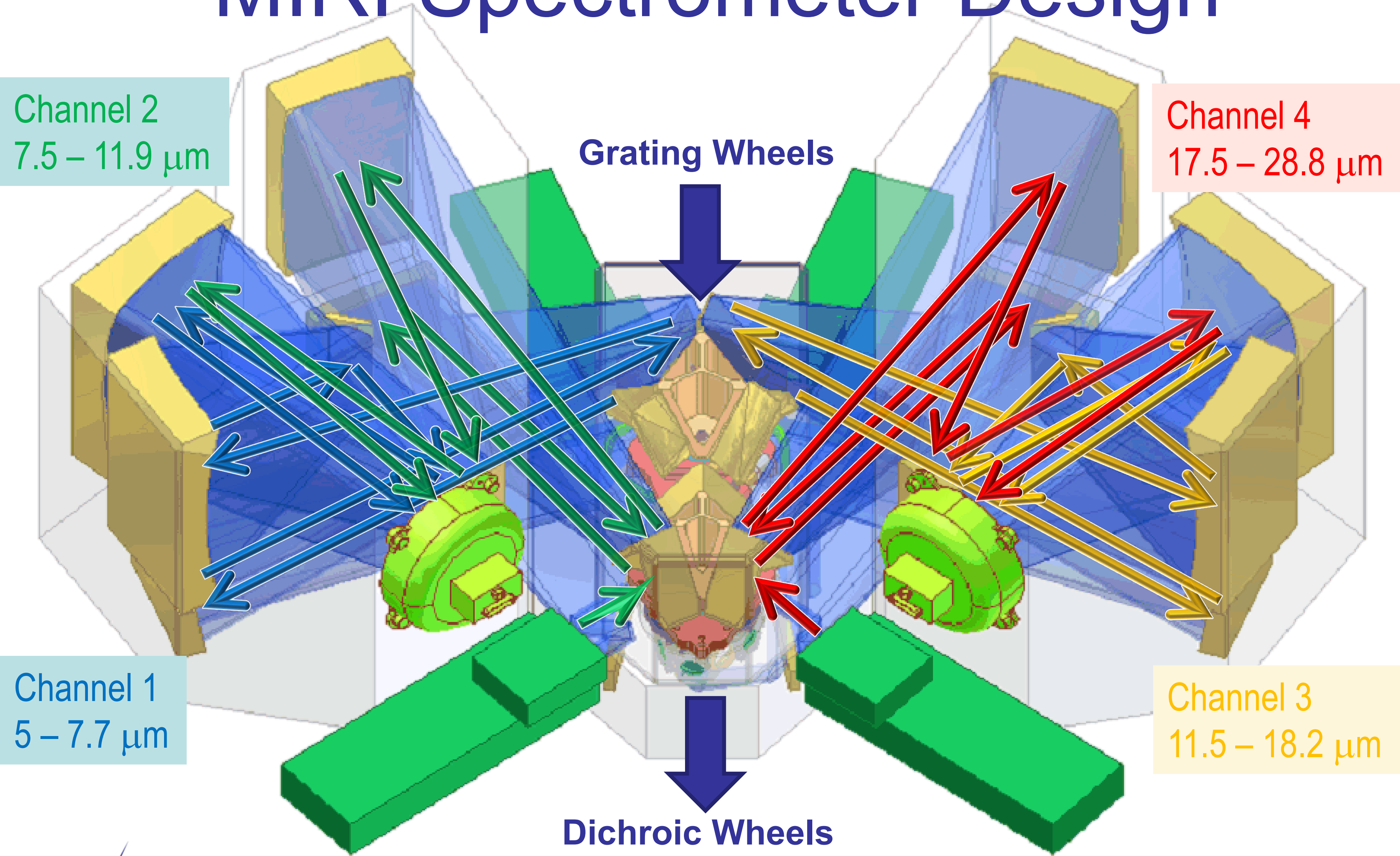


Integral Field Unit Concept

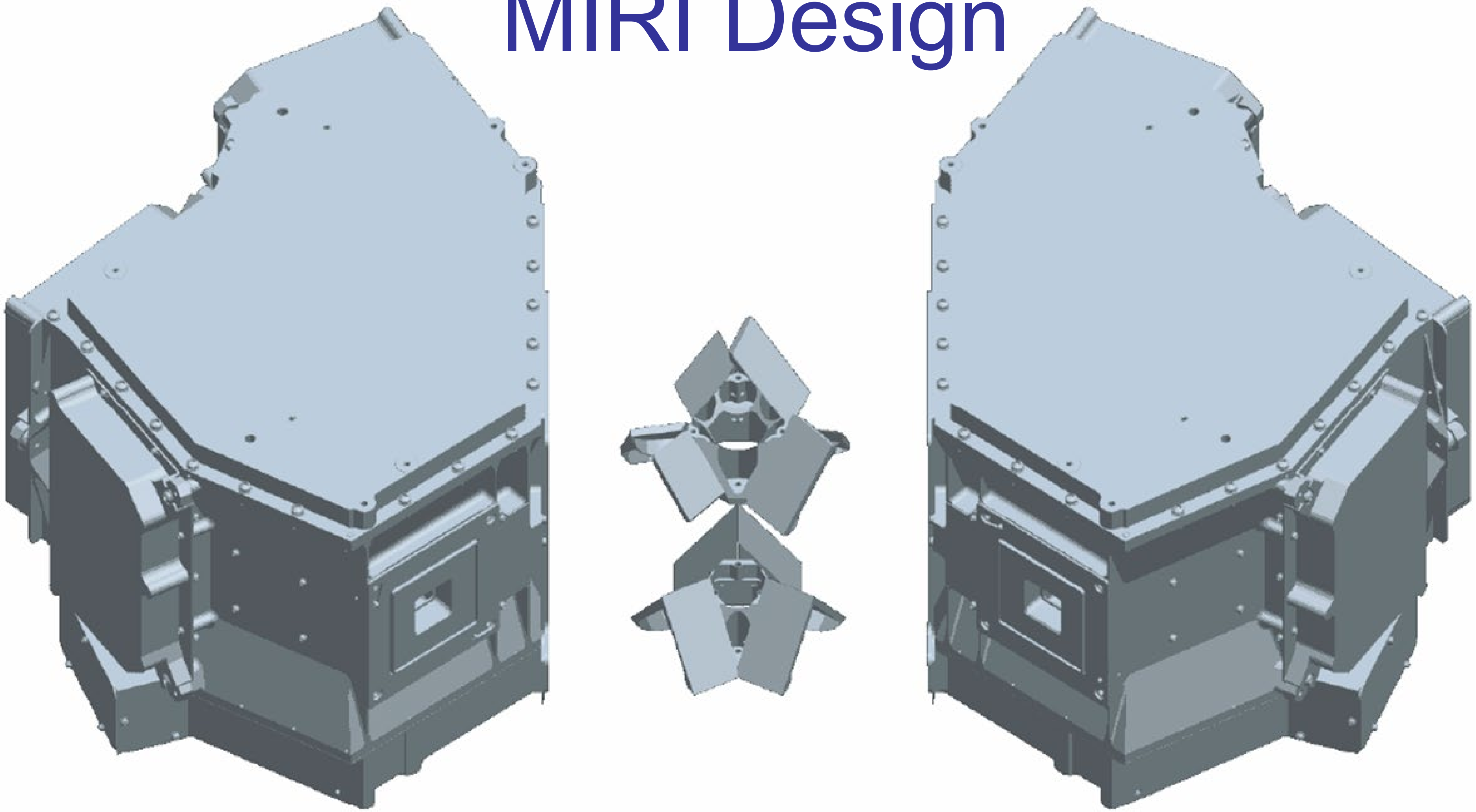




MIRI Spectrometer Design



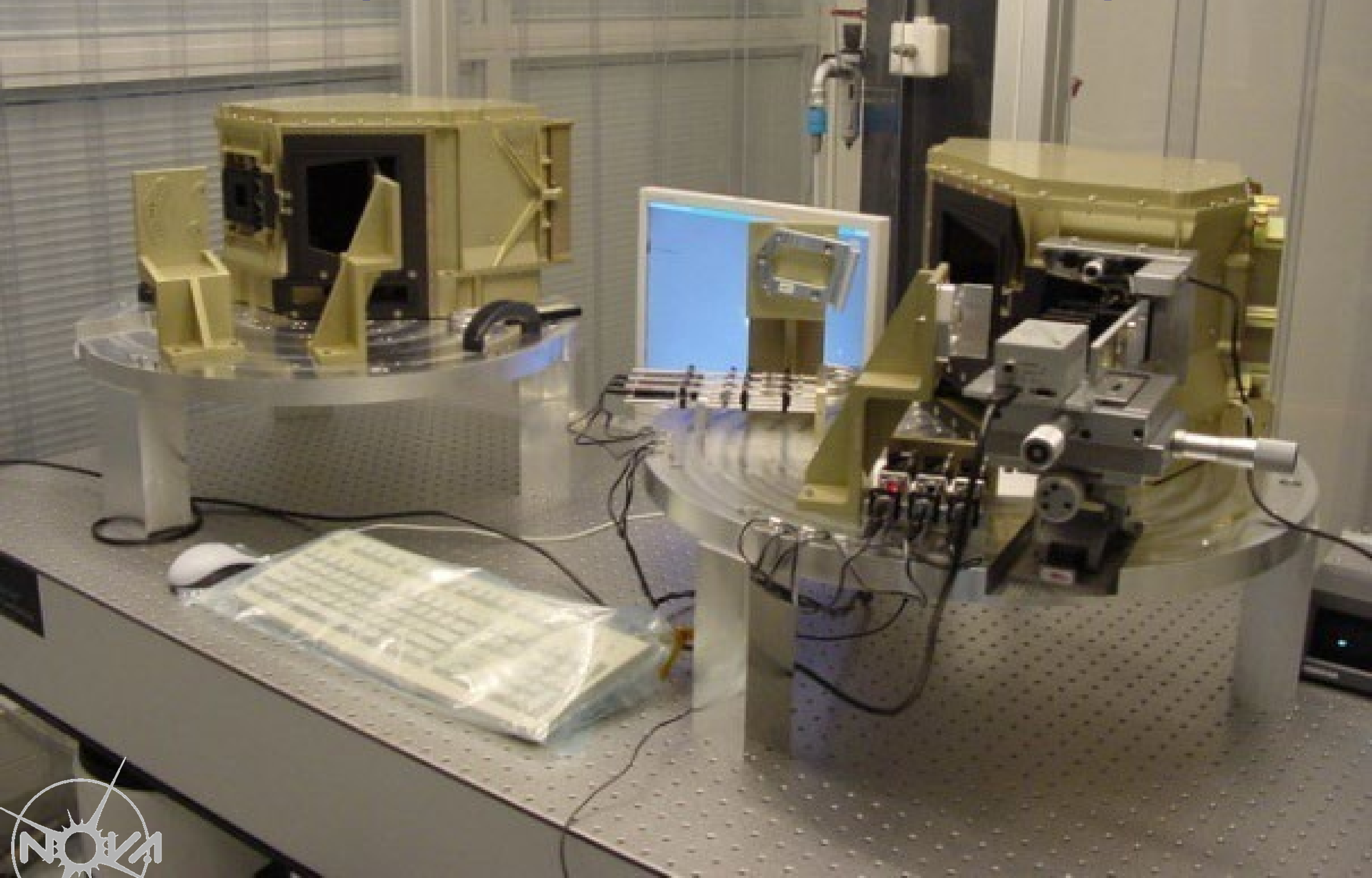
MIRI Design



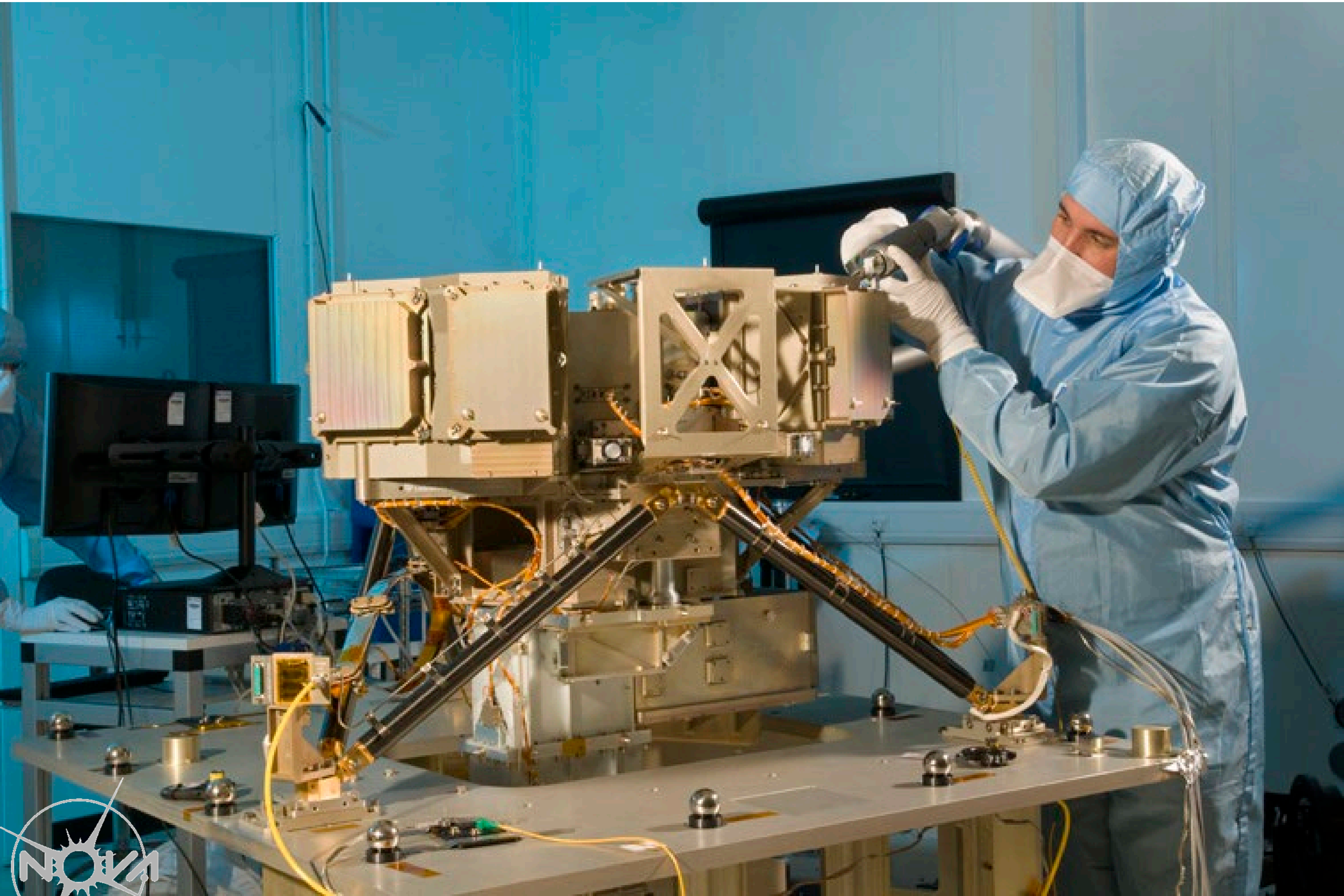
Thermal Vacuum Model


James Webb
Space Telescope
MIRI
Mid InfraRed Instrument

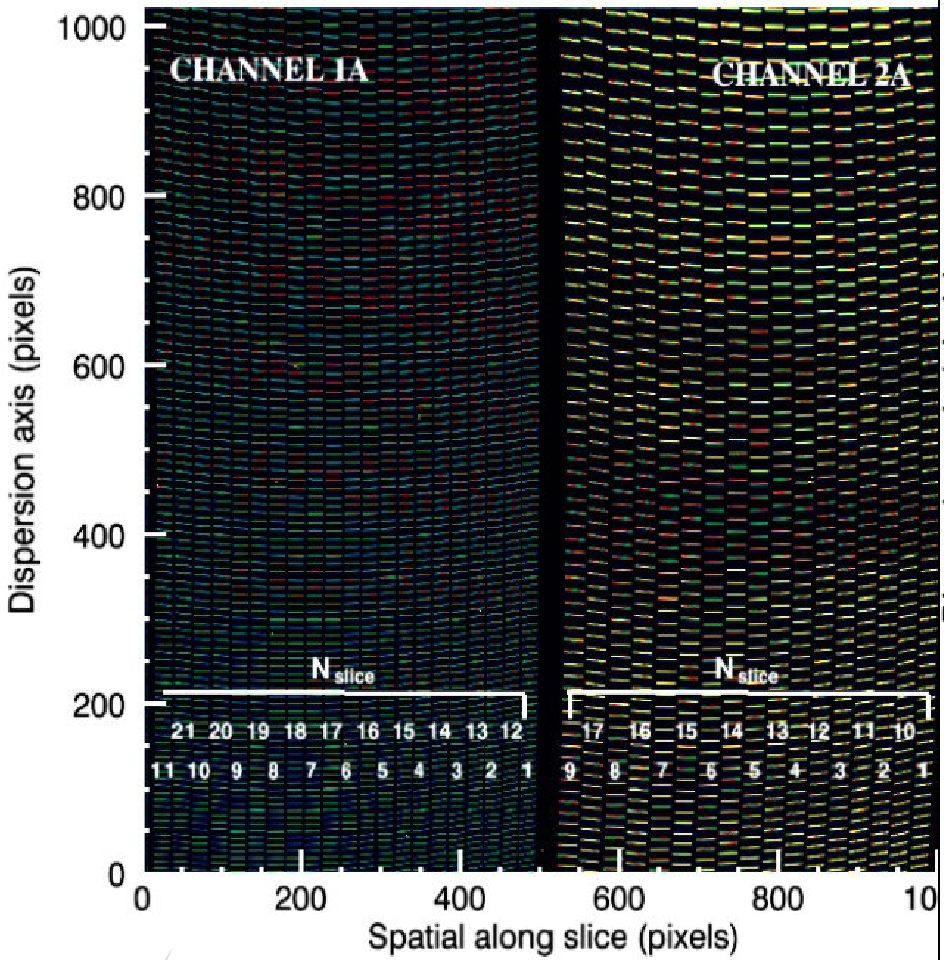
MIRI Spectrometer Main Optics

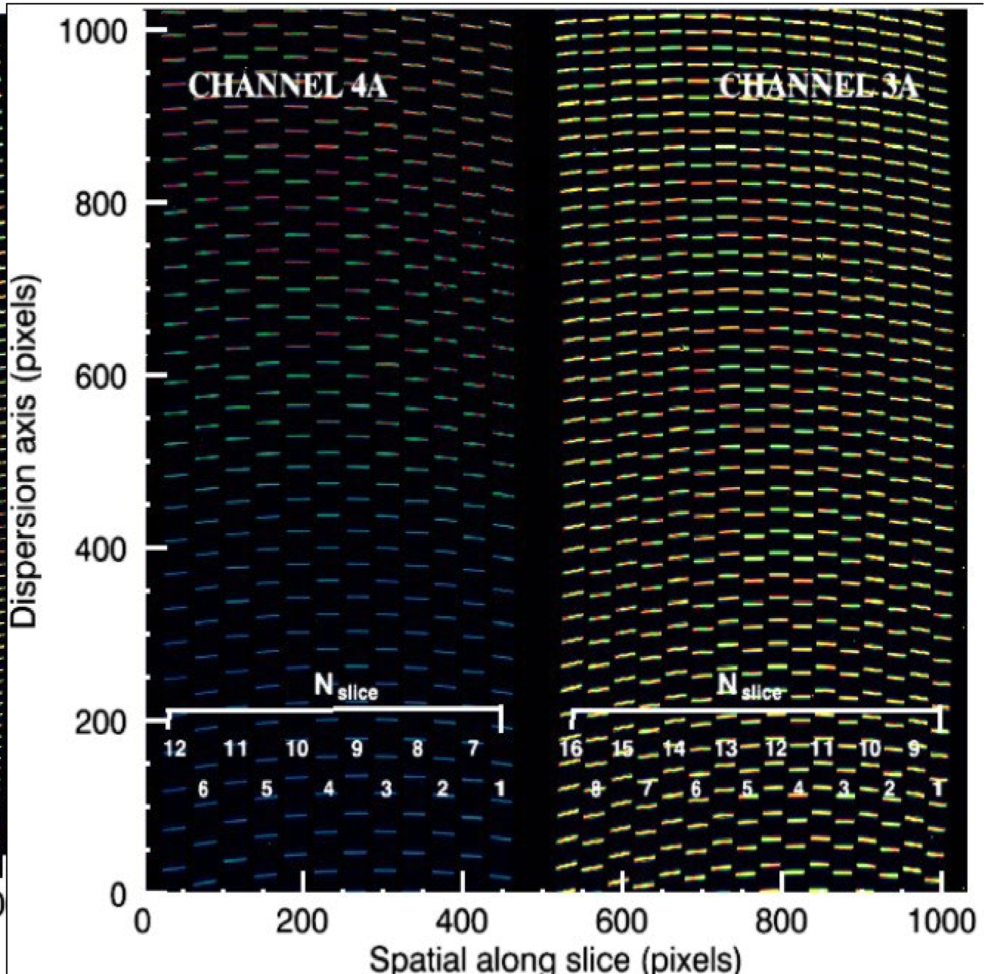


MIRI

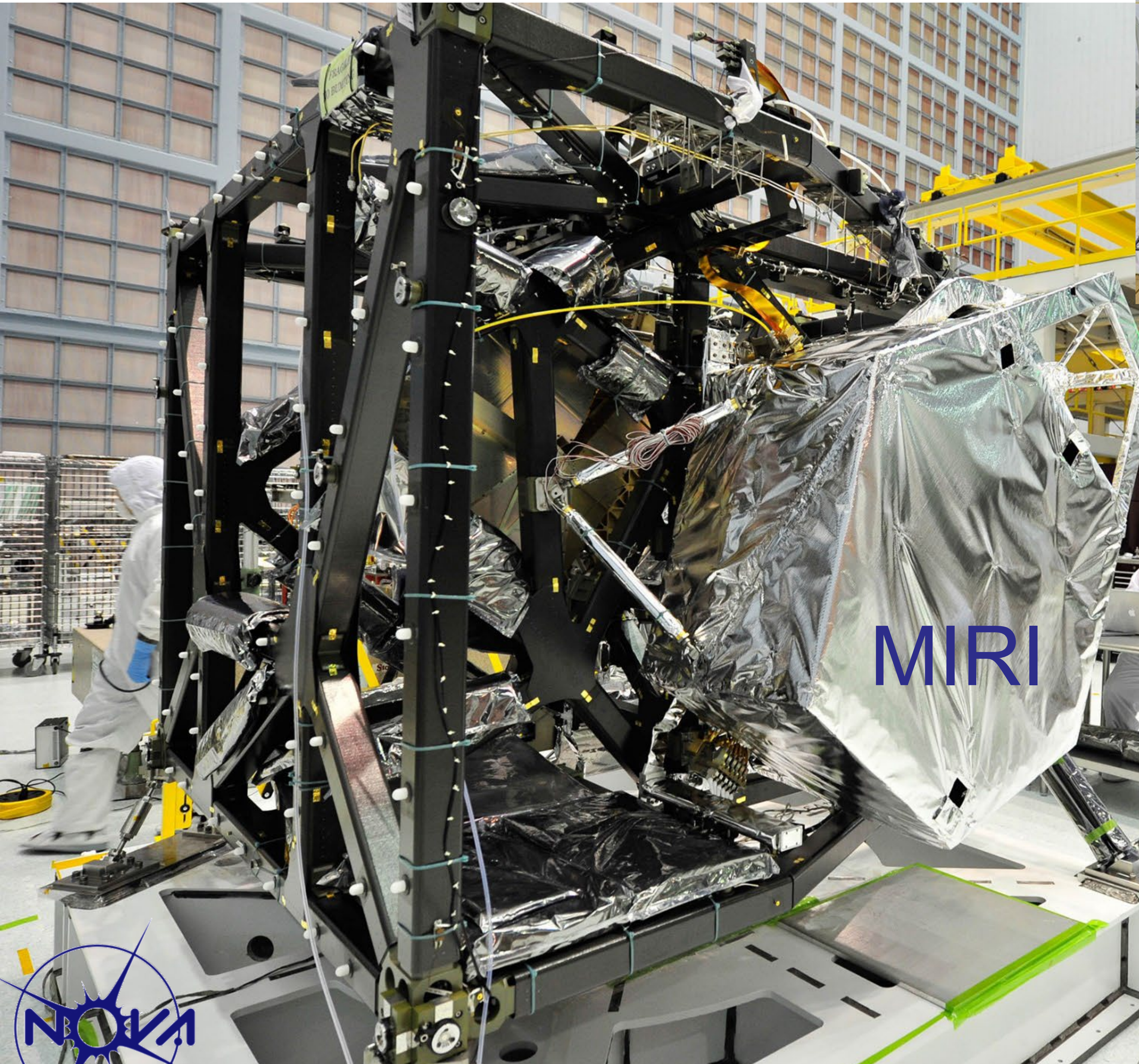


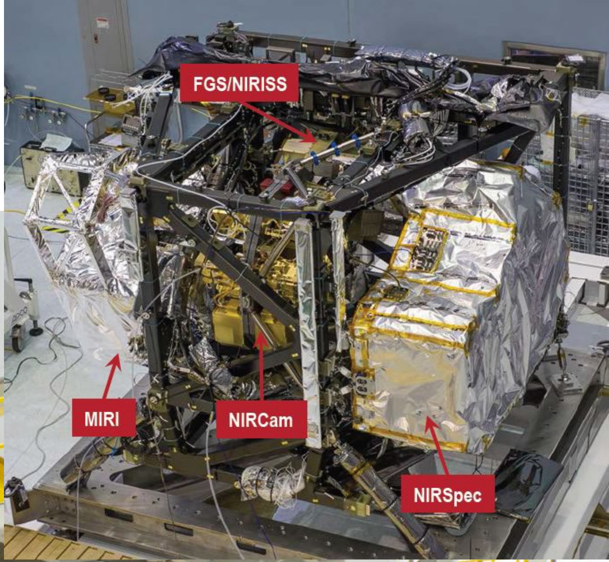
MIRI Spectrometer Spectra on Detector





Integrated Science Instrument Module (ISIM) with MIRI

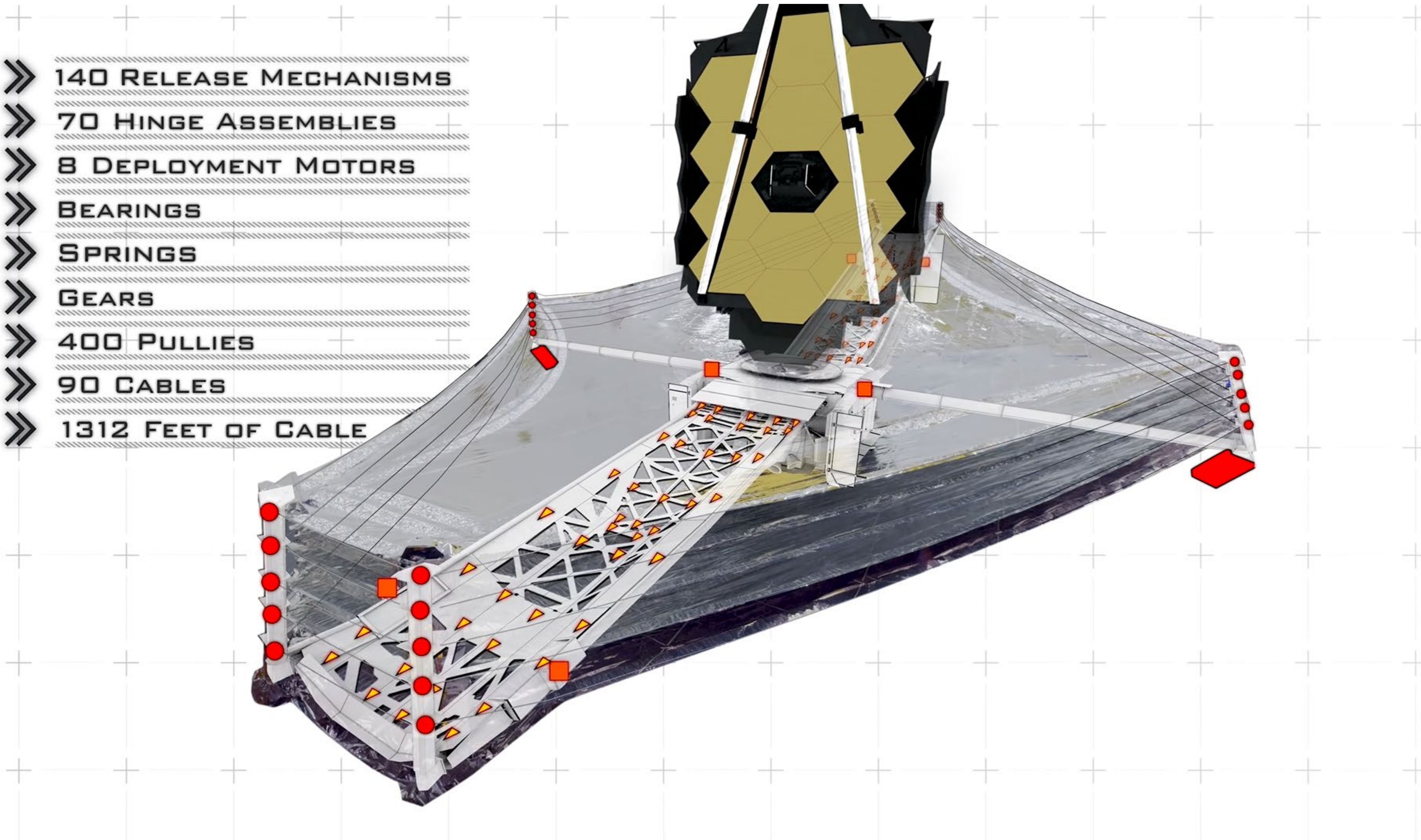





James Webb
Space Telescope

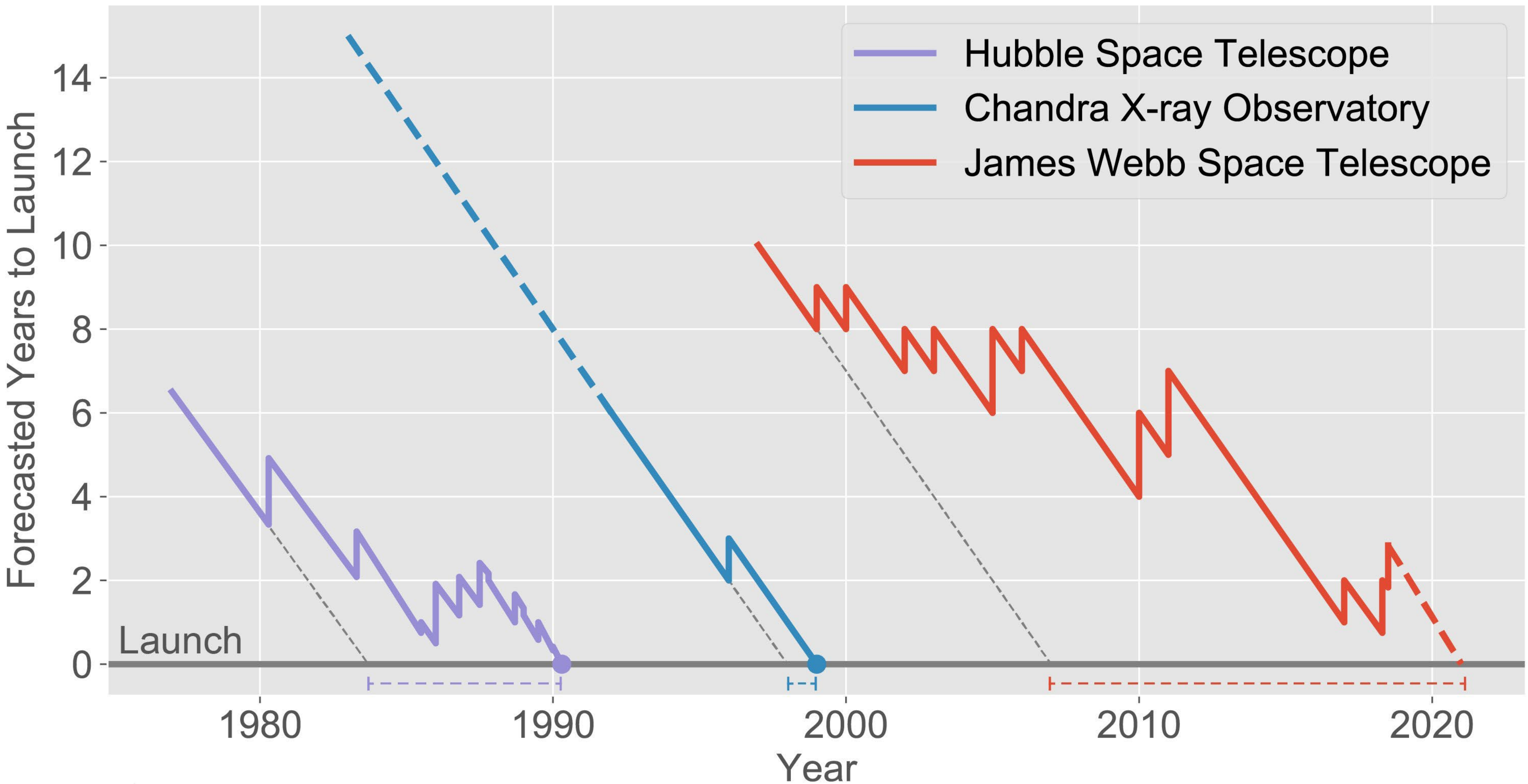

esa
JWST
MIRI
NOVA

Heat Shield: 5 layers 14 x 21m




esa
ariane 6
COMBINED TESTS
esa
arianeGROUP
cnes
esa
SA-CNES-ARIANESPACE / Optique vidéo du CSG - P BAUDON

Launch date

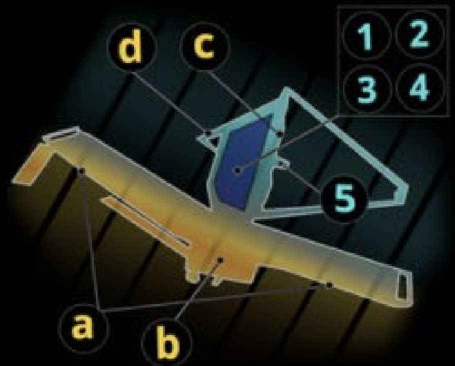


Hubble Space Telescope
Chandra X-ray Observatory
James Webb Space Telescope
Forecasted Years to Launch
14
12
10
8
6
4
2
0
Launch
1980
1990
2000
2010
2020
Year

JAMES WEBB SPACE TELESCOPE
GODDARD SPACE FLIGHT CENTER

WHERE IS WEBB? | About This Page | English <> Metric

Link



52c	325K	a
14c	287K	b
Hot Side		

-230c	43K	c
-236c	37K	d
Cold Side		

-187c	86K	1
-235c	39K	2
-236c	38K	3
MIRI / NIRCam / NirSpec		

-229c	44K	4
-239c	35K	5
FGS-NIRISS / FSM		

6

L+WEEKS

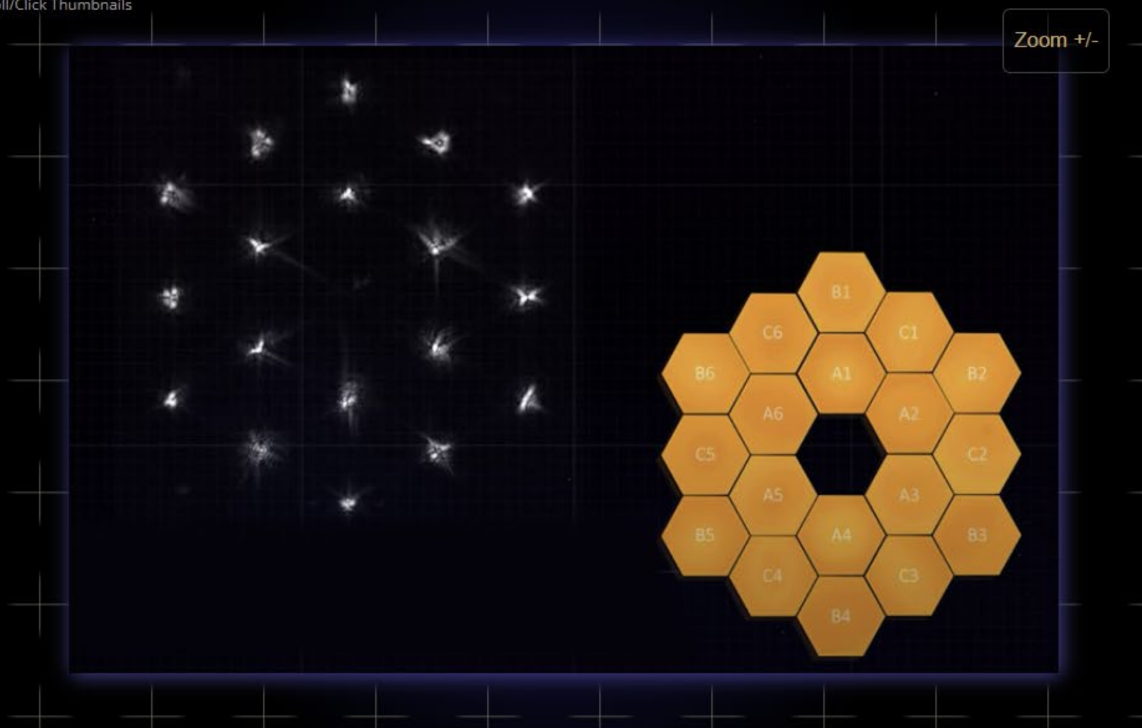
Spacecraft Deployment — 4 — Mirror Alignment & Cooldown — 8 — 12 — 16 Instrument Calibration

L2

Sunshield
Secondary Mirror
Primary Mirror
Mirror Segments
Step1: Segment ID
NIRCam Cooling & On
Step2: Segment Align
Step3: Image Stacking
Step4: Coarse Phasing
Step5: Fine Phasing
Step6: Telescope alignment
Step7: Final Correction

NEW!

Webb in 3d Solar System | 3d-Help | Labelled Spacecraft



Segment Alignment

Step 2

Nominal Event Time: Starts - Launch + ~2 Months

Status: Completed

After we have the image array, we can perform Segment Alignment, which corrects most of the large positioning errors of the mirror segments.

We begin by defocusing the segment images by moving the secondary mirror slightly. Mathematical analysis, called Phase Retrieval, is applied to the defocused images to determine the precise positioning errors of the segments. Adjustments of the segments then result in 18 well-corrected "telescopes." However, the segments still don't work together as a single mirror.

VIDEO: First Photons | Step 2 Segment Alignment

READ: About First Photons | Step 2 Complete

REPLAY: Media Telecon

Where Is Webb Now?

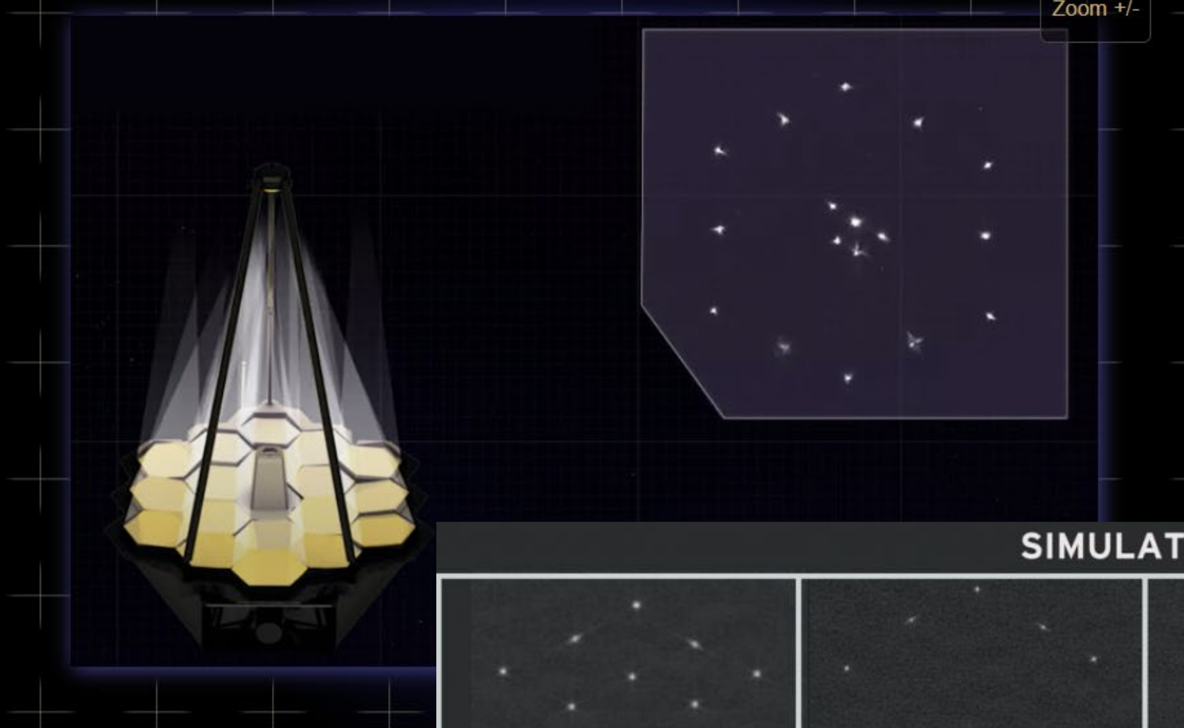


Image Stacking

Step 3

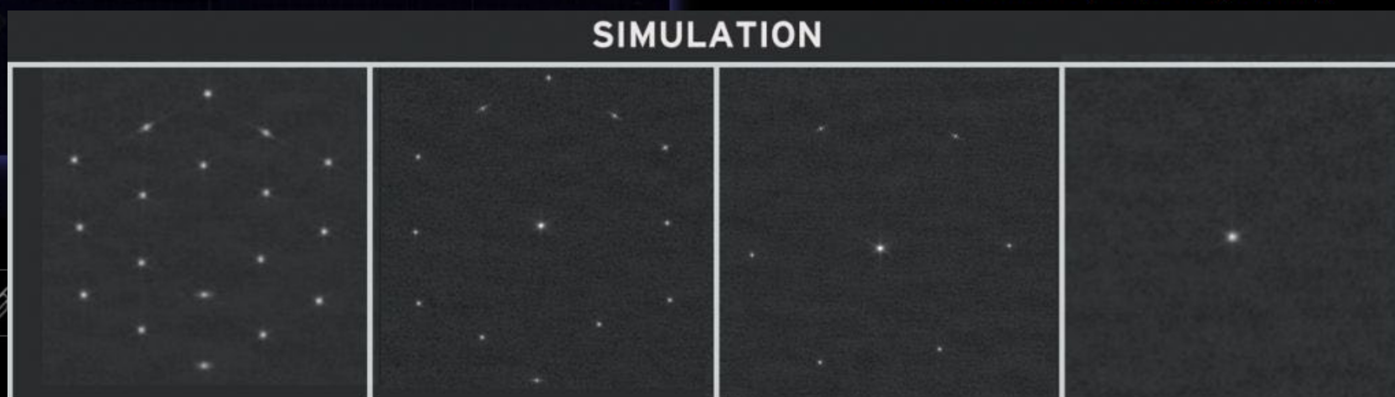
Nominal Event Time: Starts - Launch + ~2 Months

Status: Completed

To put all of the light in a single place, each segment image must be stacked on top of one another. In the Image Stacking step, we move the individual segment images so that they fall precisely at the center of the field to produce one unified image. This process prepares the telescope for Coarse Phasing.

The stacking is performed sequentially in three groups (A-segments, B-segments, and C-segments).

VIDEO: First Photons | Step 3 Image Stacking



Temperatures