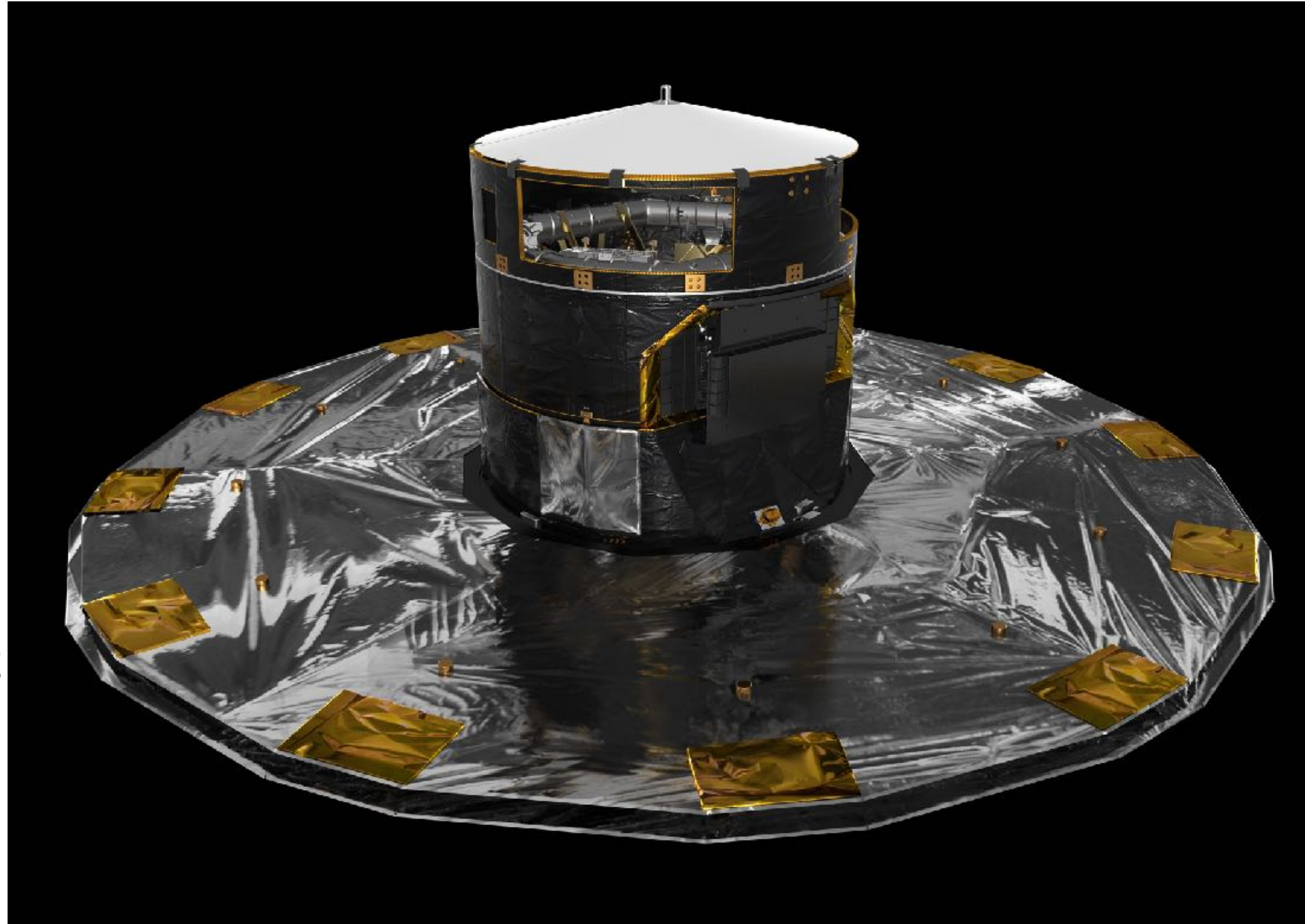


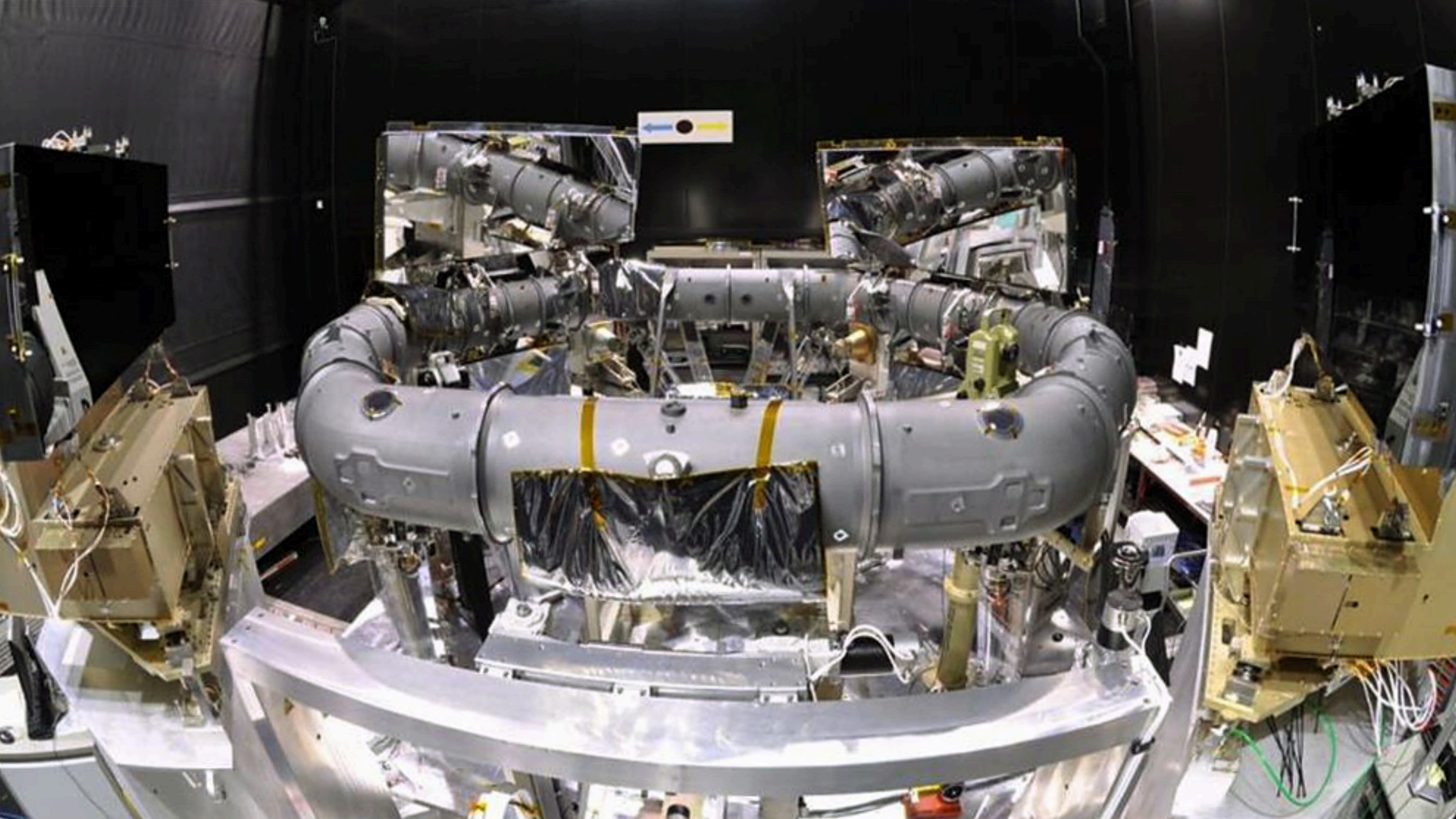
The Gaia mission status

Timo Prusti

Gaia Summary

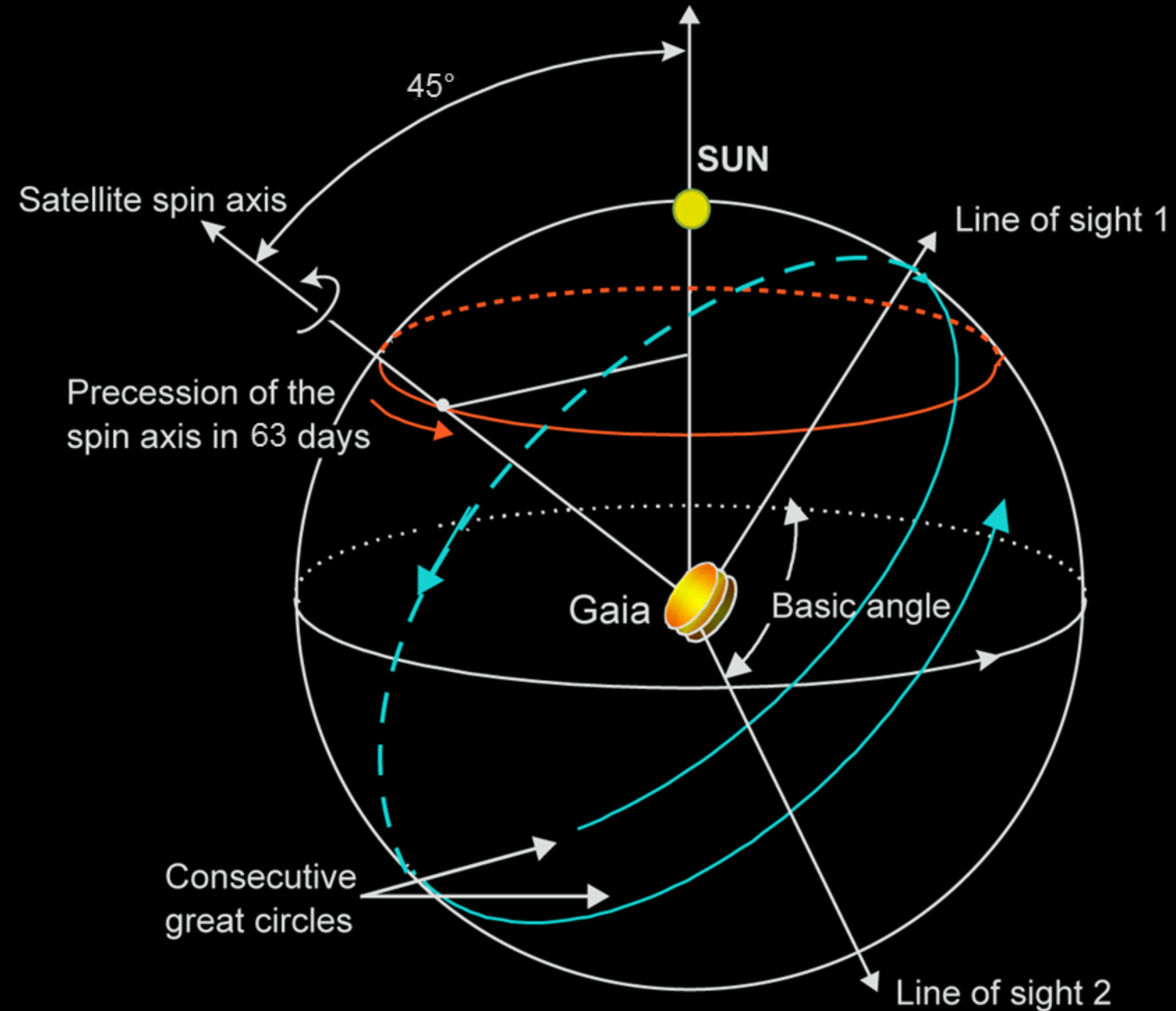
- ESA cornerstone mission building on the Hipparcos heritage
- Astrometry, Photometry and Spectroscopy
- Satellite, including the payload, by industry (Airbus DS), management and operations by ESA and data processing by scientists (DPAC)
- Launch 19 December 2013 with Soyuz from Kourou
- 5 years of operations in L2
- Gaia DR1 14 September 2016
 - Science Alerts started 2014
- Gaia DR2 April-2018





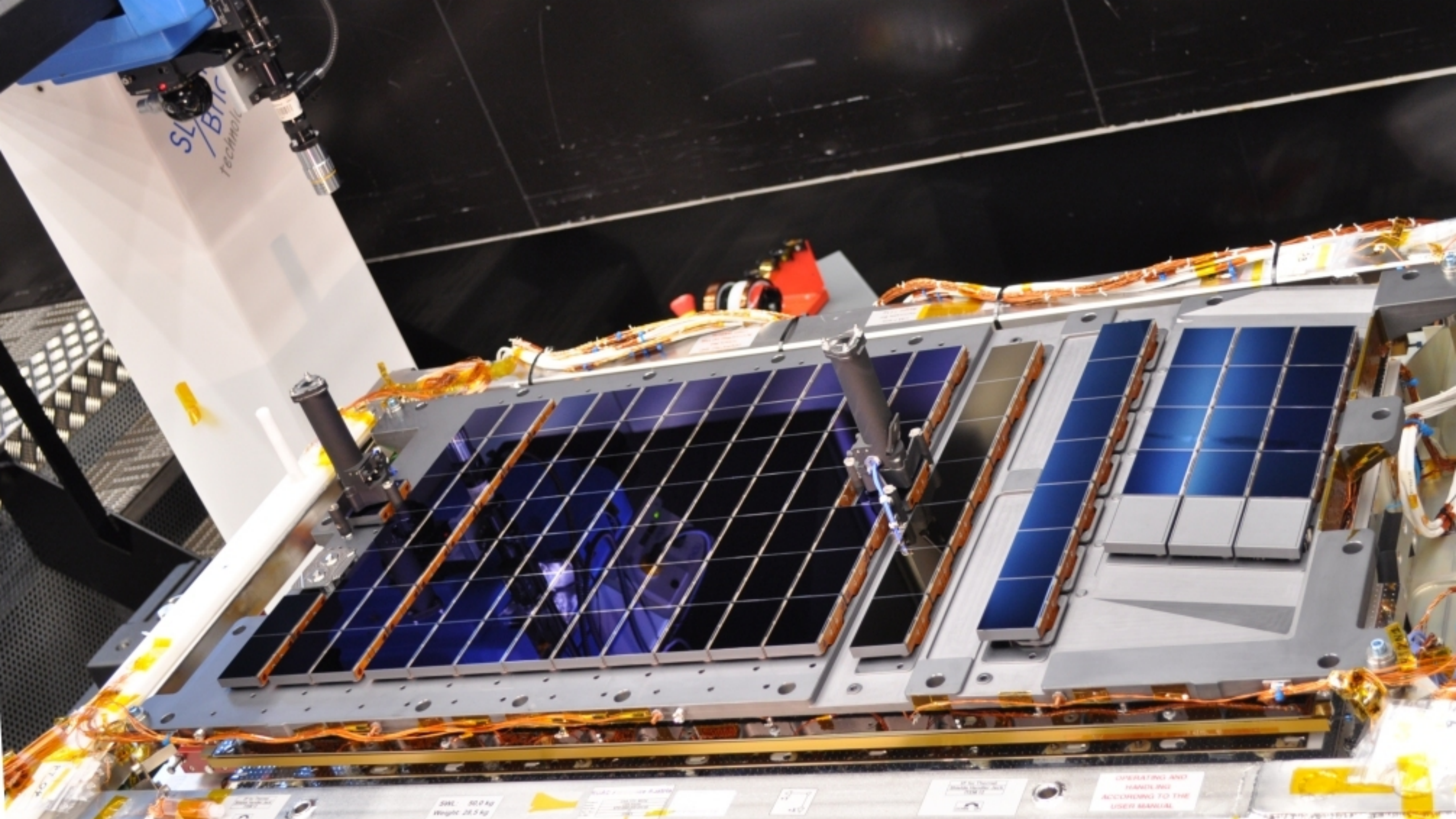
Gaia operations

- Gaia in routine operations since July 2014
- 1,000 days routine phase reached 20 April
- Operations: nominal
- 70 billion transits observed
- Nominal 5-year mission ends mid-2019
- Estimated end of mission due to cold gas exhaustion end-2023 (± 1 year)
- Mission extension process started



Unwanted features

- Contamination
 - Last decontamination in August 2016; no sign of transmission loss yet
- Micro-clanks and micrometeoroids
 - Taken into account in data processing for Gaia DR2
- Basic Angle Variation
 - Corrected with Basic Angle Monitor data for Gaia DR1 and DR2; more sophisticated analysis planned for the future
- Stray light
 - Impact on faint sources; on-board software modified from read-out dominated to background dominated case for faint objects
- Radiation damage
 - First signs visible, but less than anticipated before launch; pre-launch calibration work will become relevant in the future



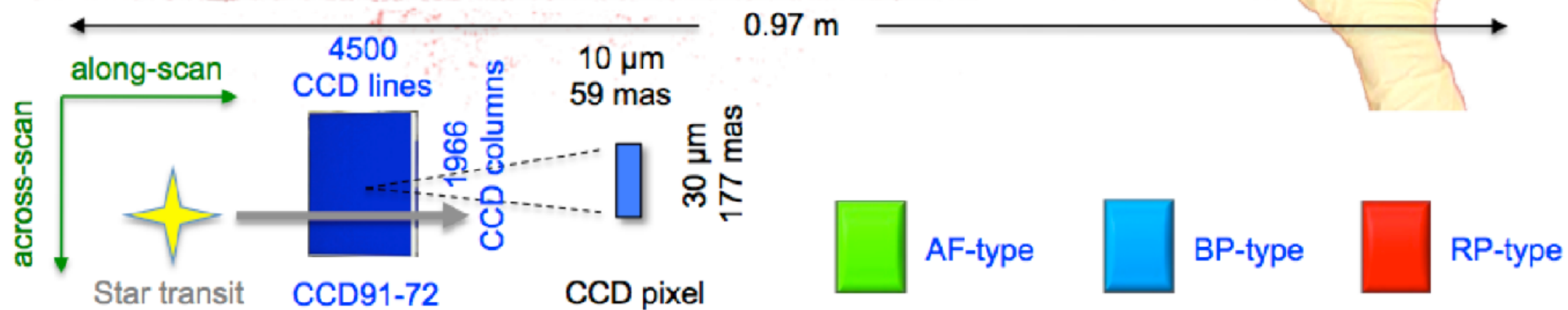
SLAC/BNL
Technomic

SNL: 50.0 kg
Weight: 28.5 kg

SLAC/BNL
Technomic

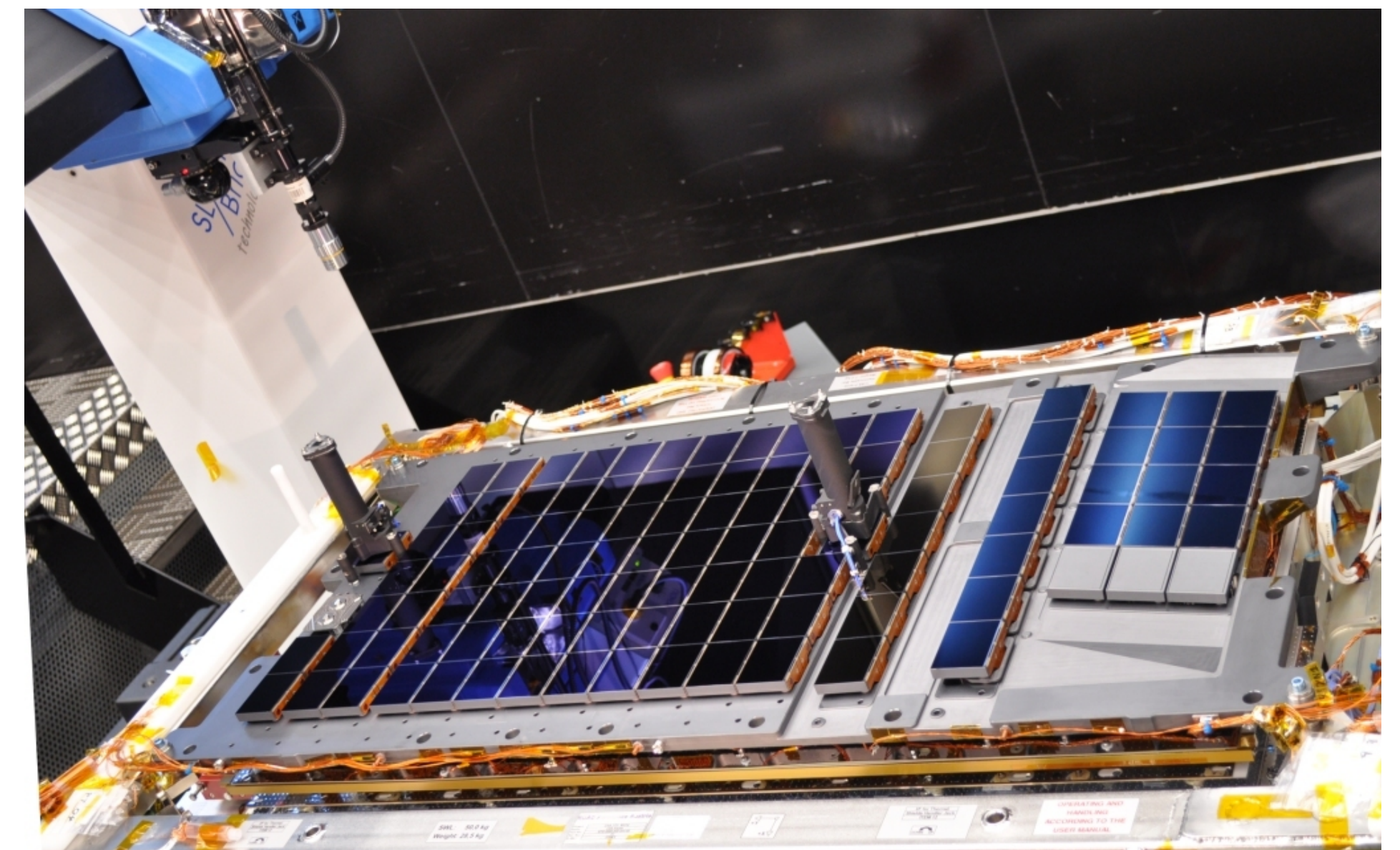
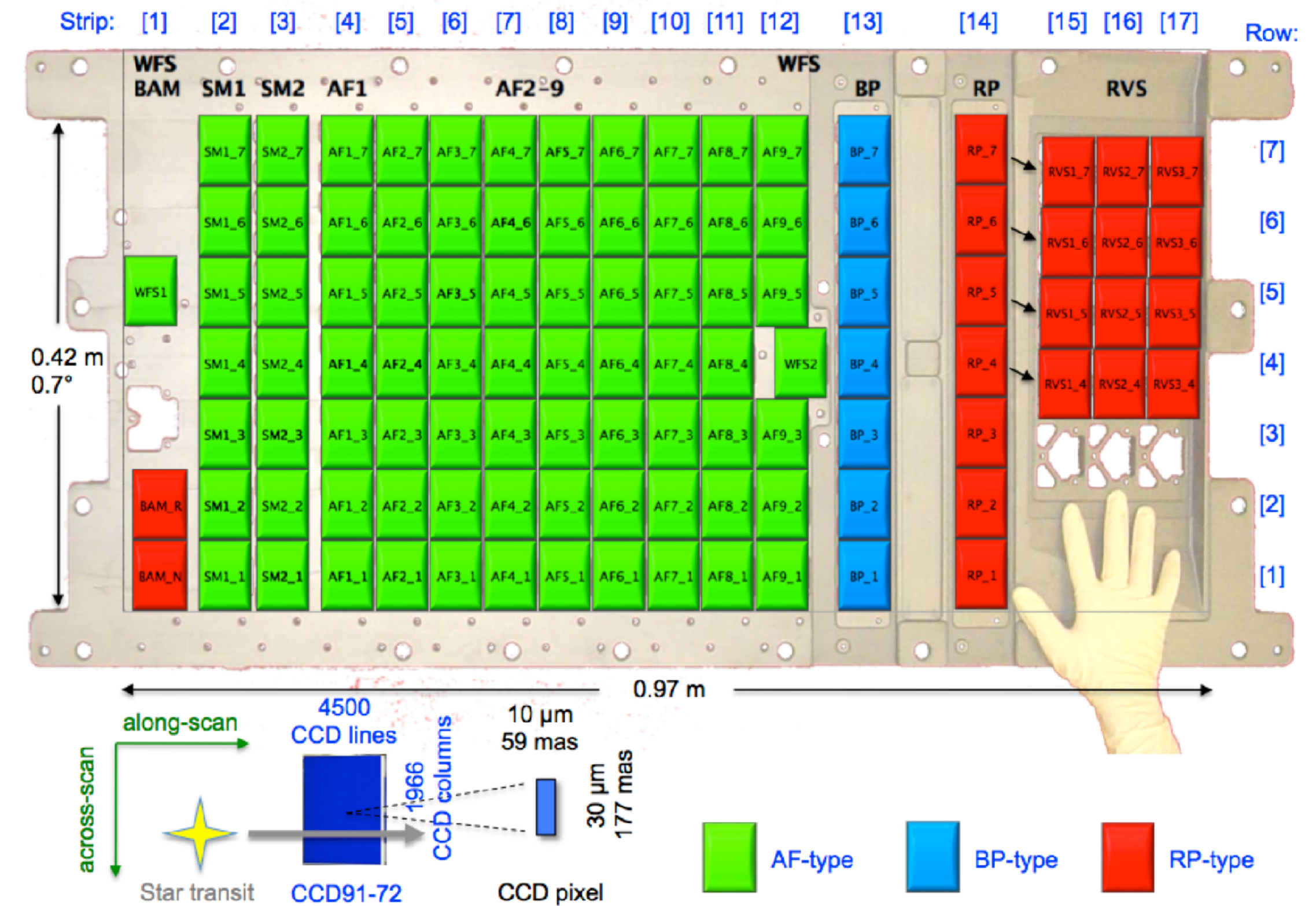
SLAC/BNL
Technomic

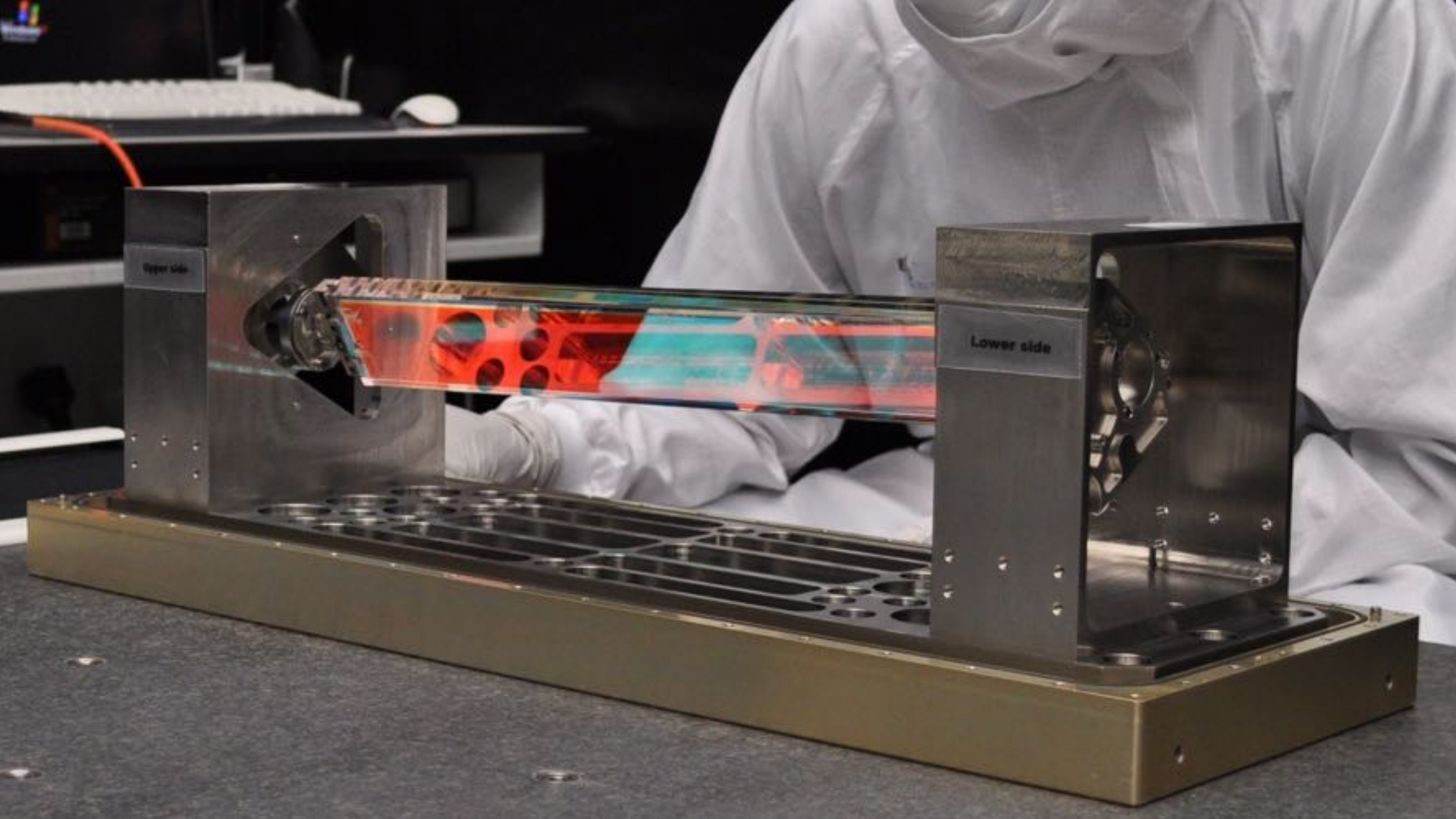
OPERATING AND
HANDLING
ACCORDING TO THE
USER MANUAL



Gaia astrometry

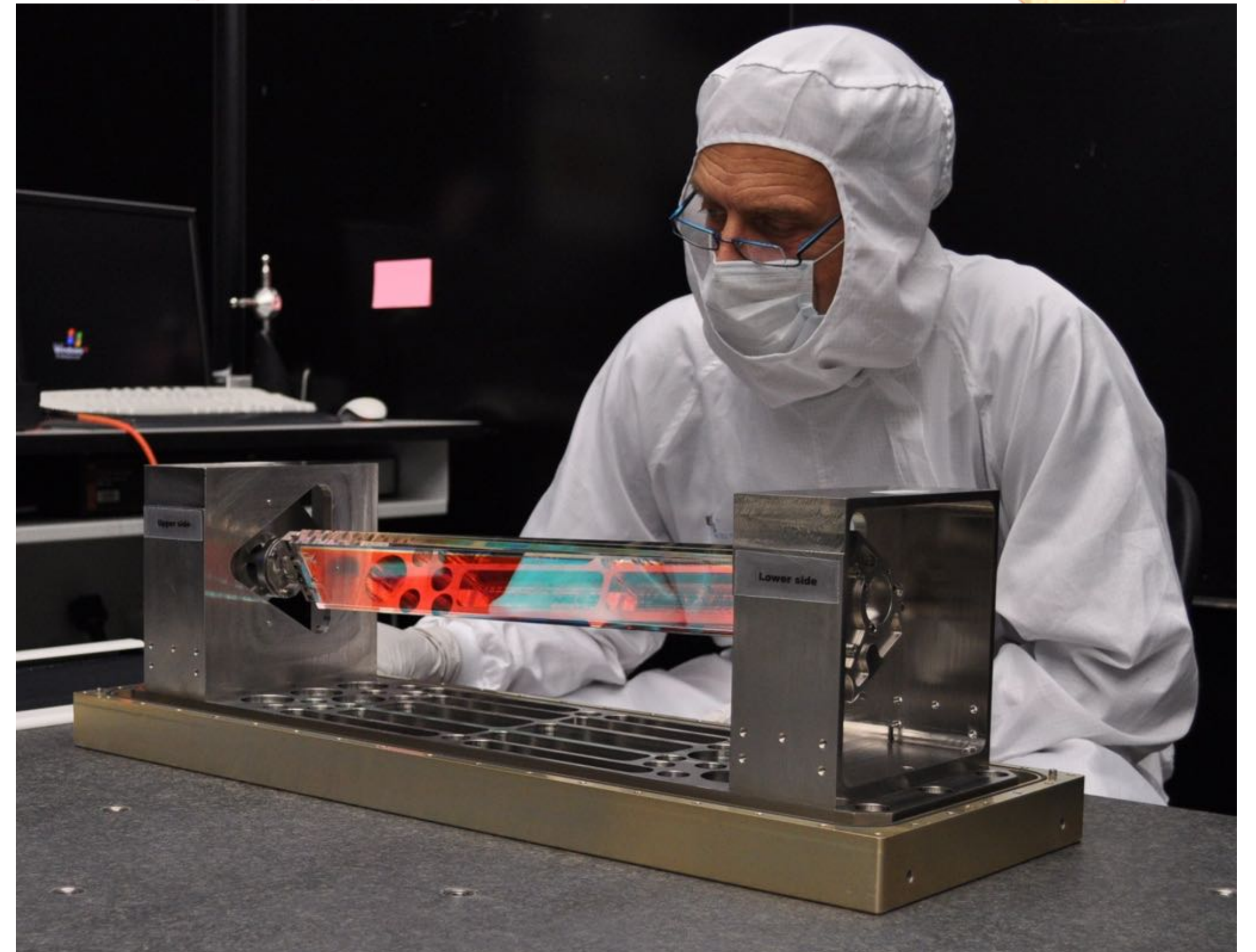
- Astrometric measurements: 688 billion
 - $G < 20.7$ mag
- Bright limit around $G = 2-3$ mag
 - All bright stars covered with special measurements
- Selected crowded regions imaged with Gaia Sky Mapper

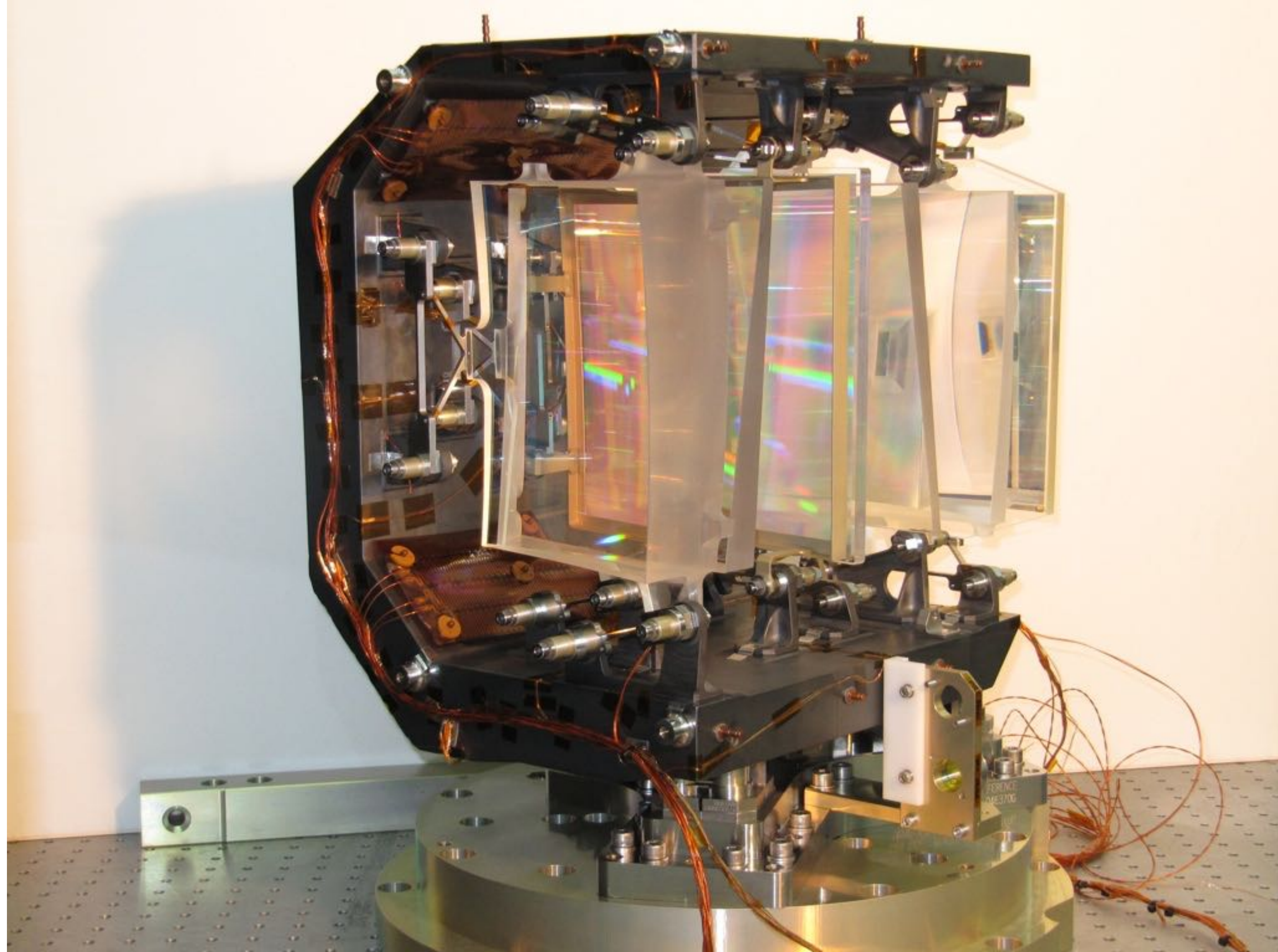




Gaia photometry

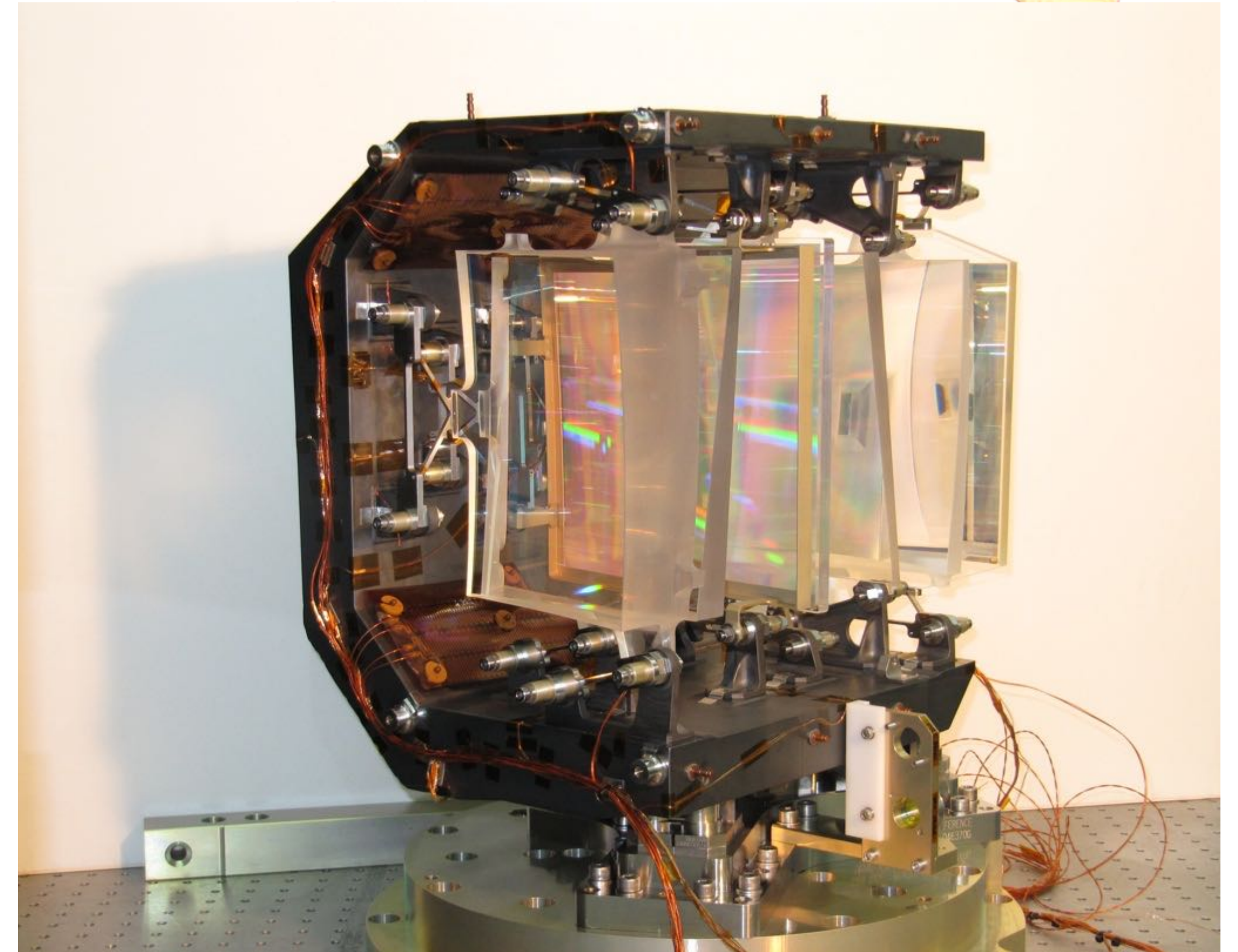
- Photometric measurements: 147 billion
- $G < 20.7$ mag
- Spectrophotometry
 - 330-680 nm BP
 - 640-1050 nm RP
 - Can also integrate BP and RP to get high precision measurements and a colour
- Astrometric measurements also photometric in G-band





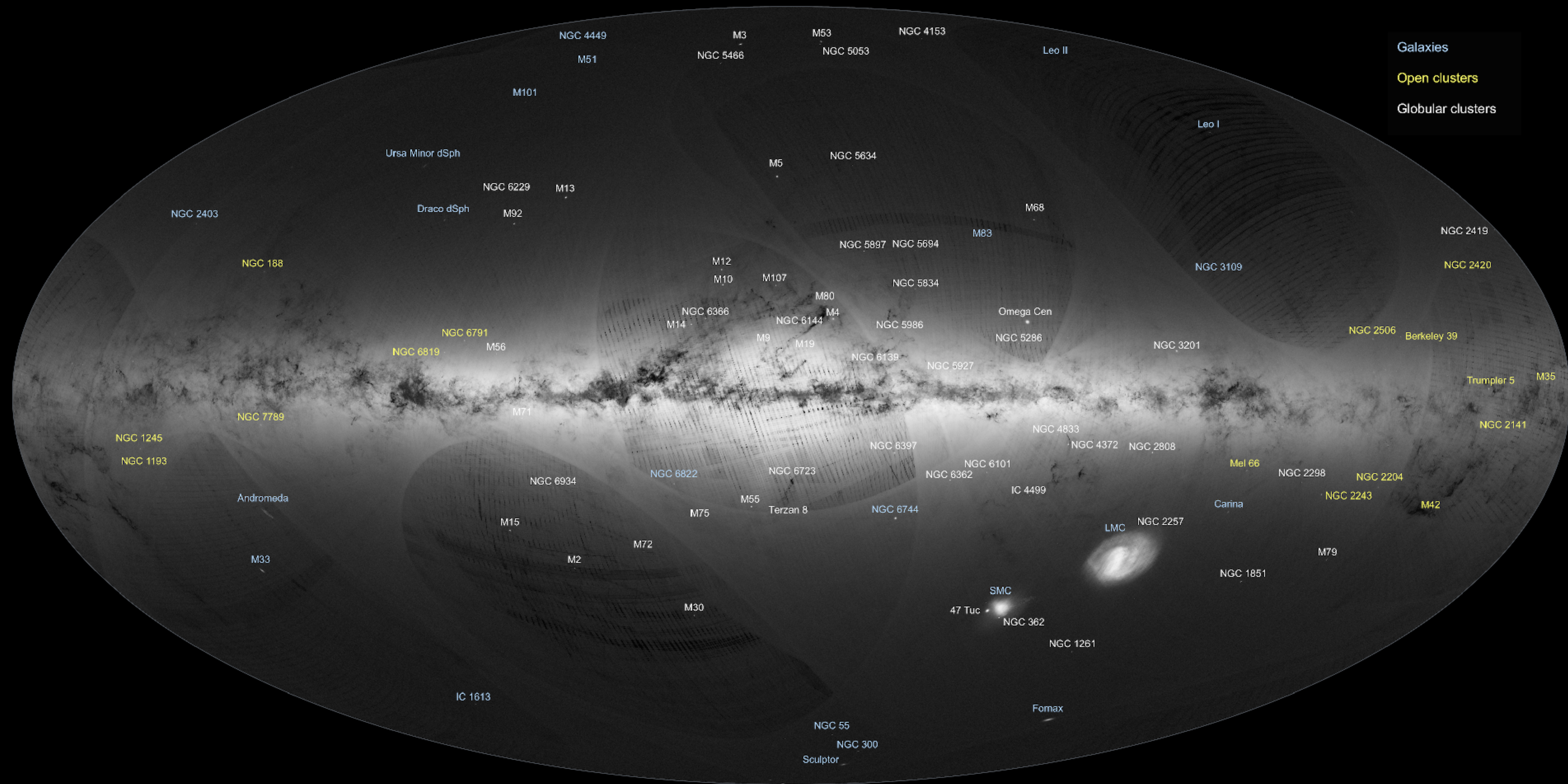
Gaia spectroscopy

- Spectroscopic measurements: 13.7 billion
- $G_{RVS} < 16.2$ mag
- 845-872 nm with R about 10,800
- Radial Velocity Spectrometer for >100 million radial velocities
- Spectroscopy till about $G_{RVS} = 11-14$ mag



Gaia DR1

Credits: ESA/Gaia/DPAC
Image acknowledgement: Moitinho & Barros
Video acknowledgement: de Bruijne



NGC 6101

Mel 66

NGC 6362

IC 4499

Carina

LMC

NGC 2257

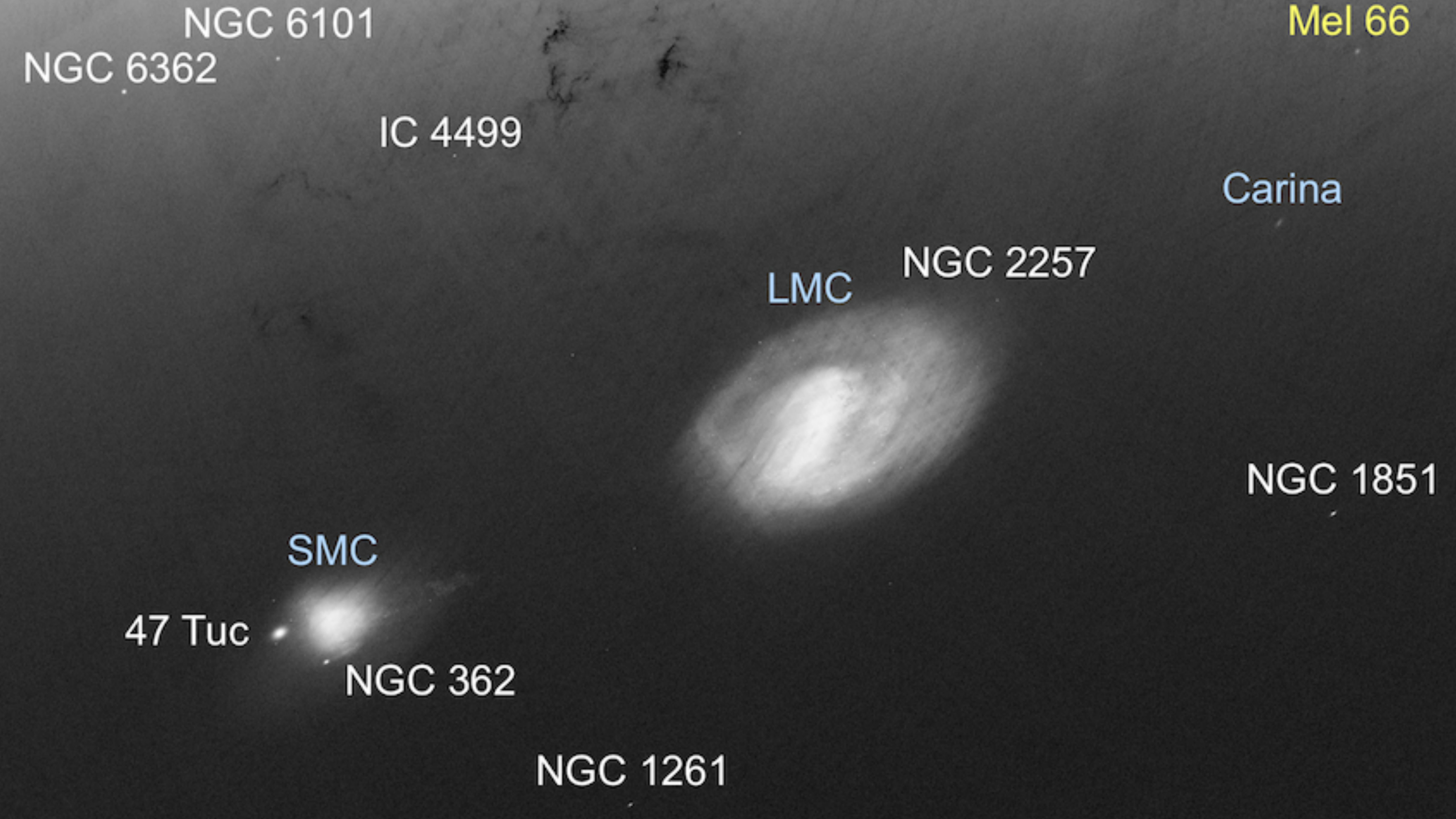
NGC 1851

SMC

47 Tuc

NGC 362

NGC 1261



NGC 2141

NGC 2204

2243

M42



Gaia DR2

April 2018; details in other presentations in this symposium

Mission extension

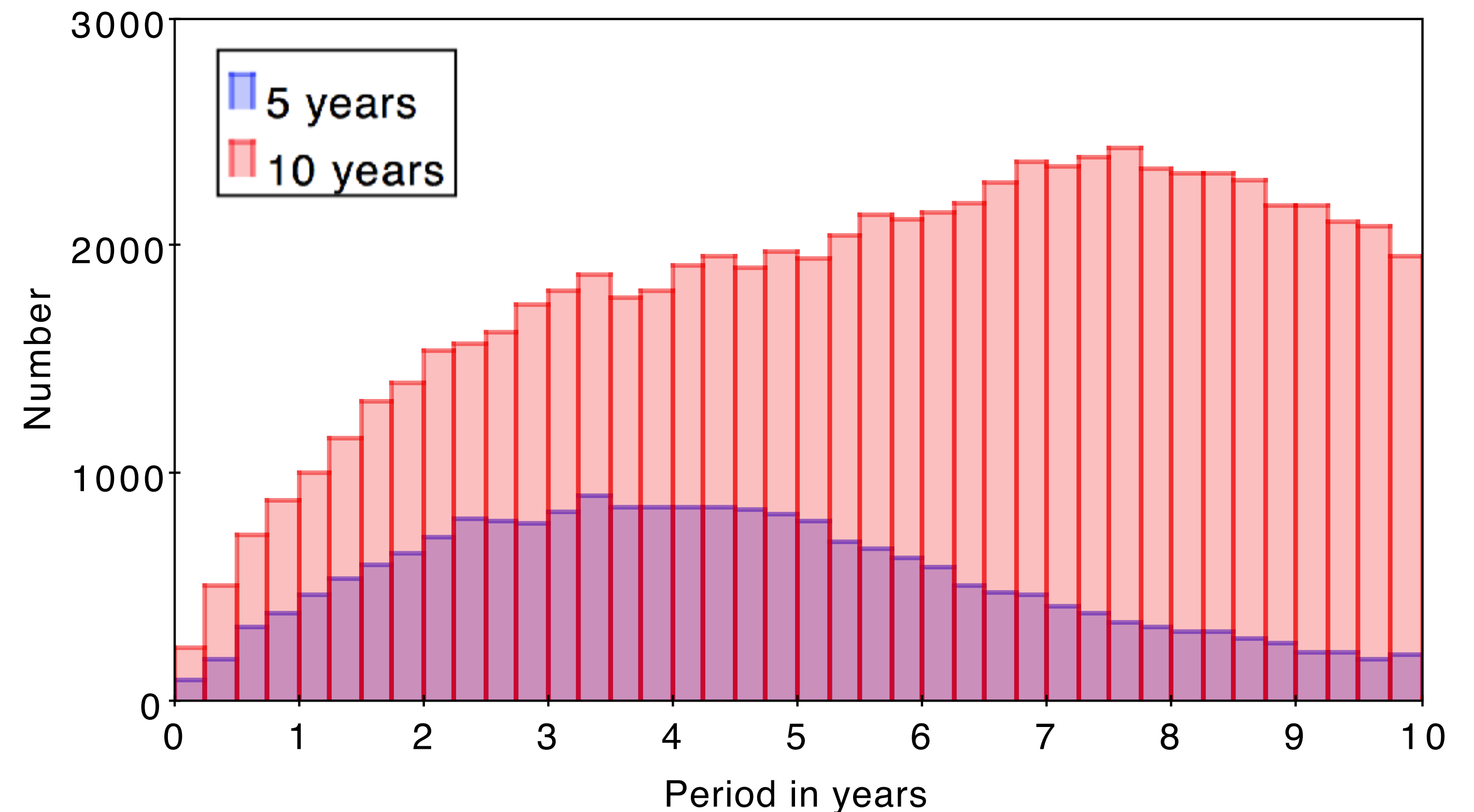
Gaia extension

- Nominal mission end: mid-2019
- Likely end of mission: end-2023 \pm 1 year
- GST prepared with the help of many the science case for the ESA advisory bodies
 - Science case was prepared for a 5 years extension, but ESA extension cycle is 2+2 years so Gaia is in for the preliminary, scientific, extension approval for mid-2019-20
 - End-2018 definitive extension for mid-2019-20 and preliminary scientific extension approval for 2021-22
- Due to ministerial level decision December 2016 on ESA the science budget, the extension decision was postponed from November 2016 to June 2017

Improvement of scientific performance

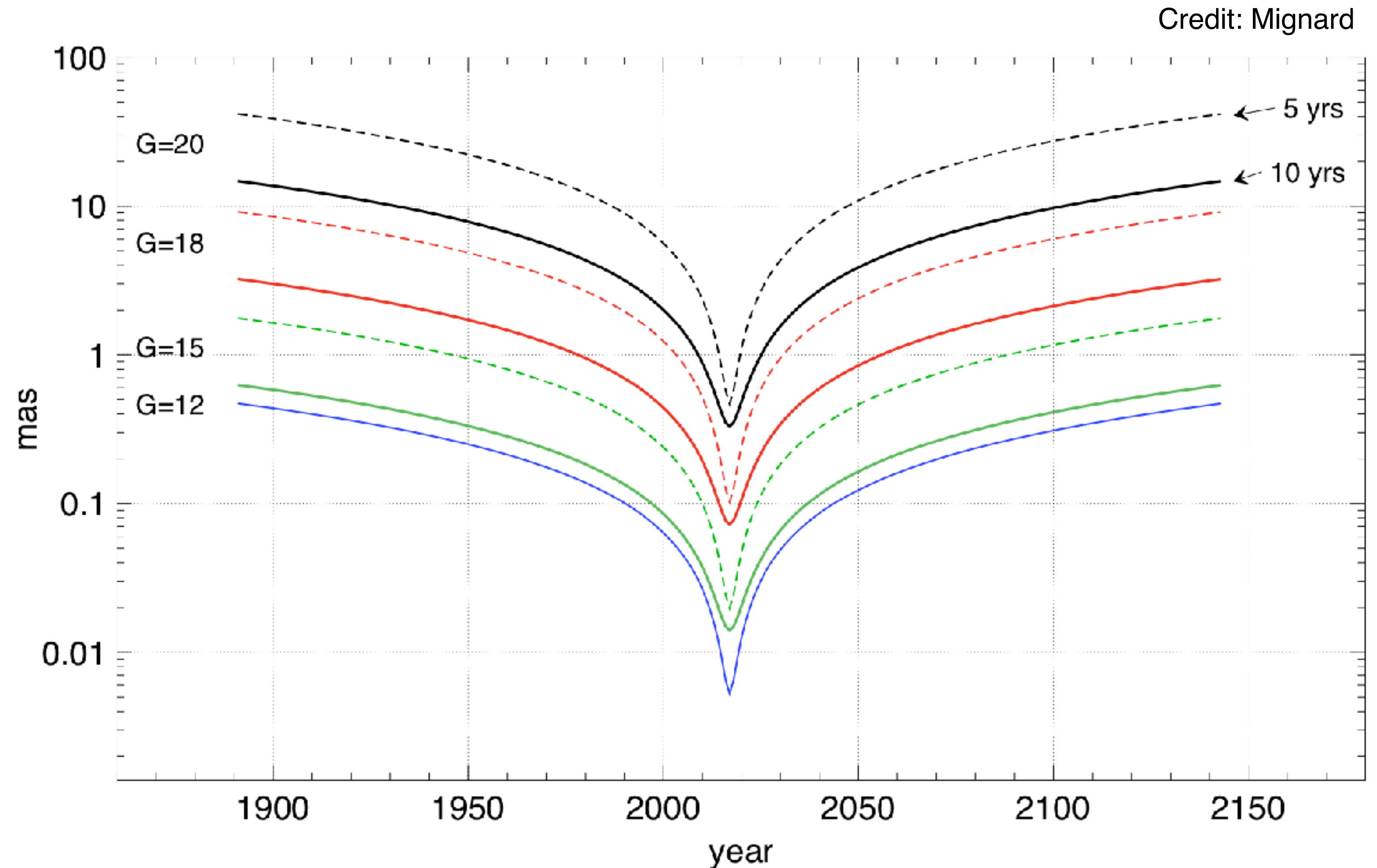
- Basic mission results improve like $t^{0.5}$
 - Position, parallax, photometry and radial velocities
- Rapidly increasing gain in kinematics and dynamics
 - Proper motion improvement scales as $t^{1.5}$
- More complex systems scale quicker e.g. exoplanets

Credit: Lindegren



Reference frames

- Reference frame degradation is mainly due to proper motion errors
- Mission extension improves proper motions significantly
- Astrometric calibration of the past possible: photographs, CCD images
- Astrometric calibration of the future: extremely large telescopes
- Very long term e.g. GaiaNIR



Conclusions

- Gaia is on the way to fulfil its promise
- Gaia DR1 is just a starter, yet a huge leap forward
- Get ready for Gaia DR2
- Gaia DR2 processing: challenges and excellent results

