

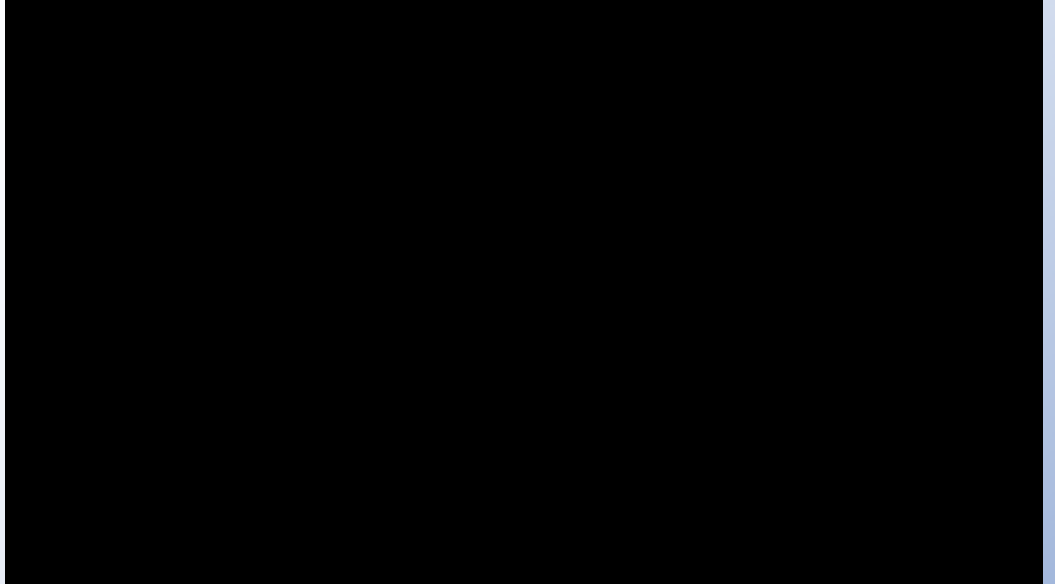


Gaia status

Timo Prusti
ESA

Gaia Summary

- Gaia: science with 1 billion objects in three dimensions
- ESA corner stone mission building on the Hipparcos heritage
- Astrometry, Photometry and Spectroscopy
- Satellite, including the payload, by industry, management and operations by ESA and data processing by scientists (DPAC)
- Launch 19 December 2013 with Soyuz from Kourou
- Commissioning formally completed 18 July 2014
- 5 years of operations in L2
- First intermediate data release summer 2016, but Science Alerts started



Gaia Summary

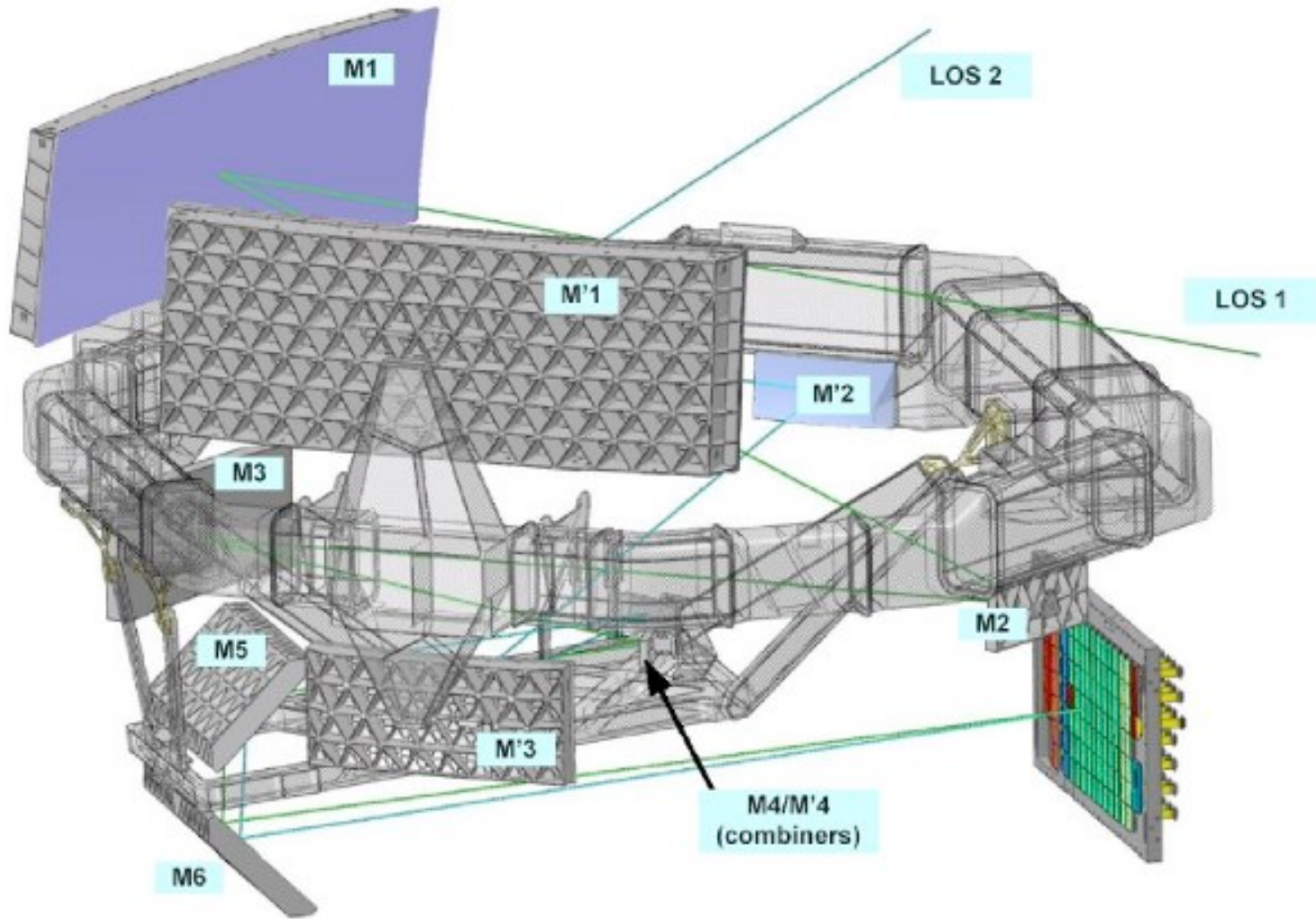
Science topics

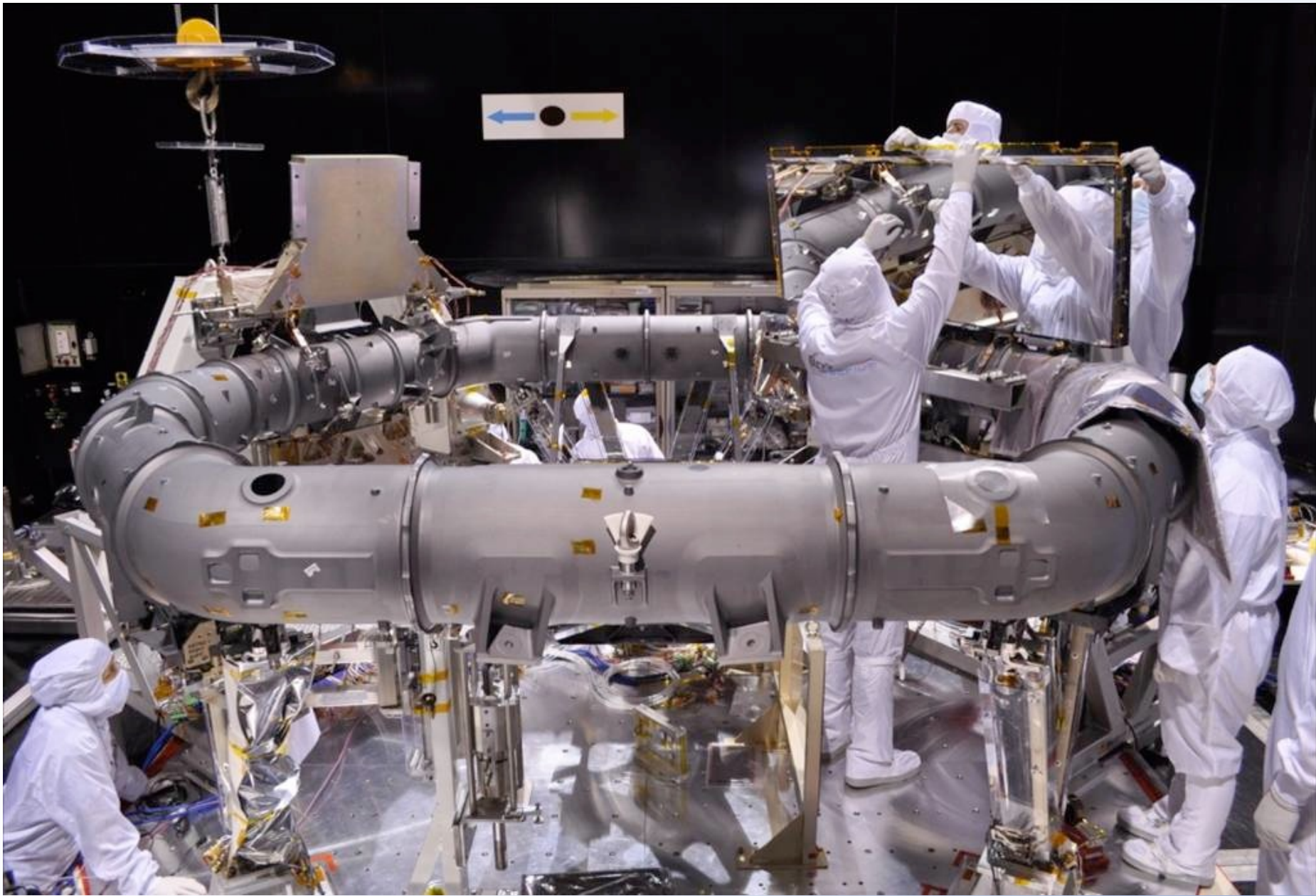
- Structure and dynamics of the Galaxy
- The star formation history of the Galaxy
- Stellar astrophysics
- Binaries and multiple stars
- Brown dwarfs and planetary systems
- Solar system
- Galaxies, Quasars and the Reference Frame
- Fundamental physics: General relativity

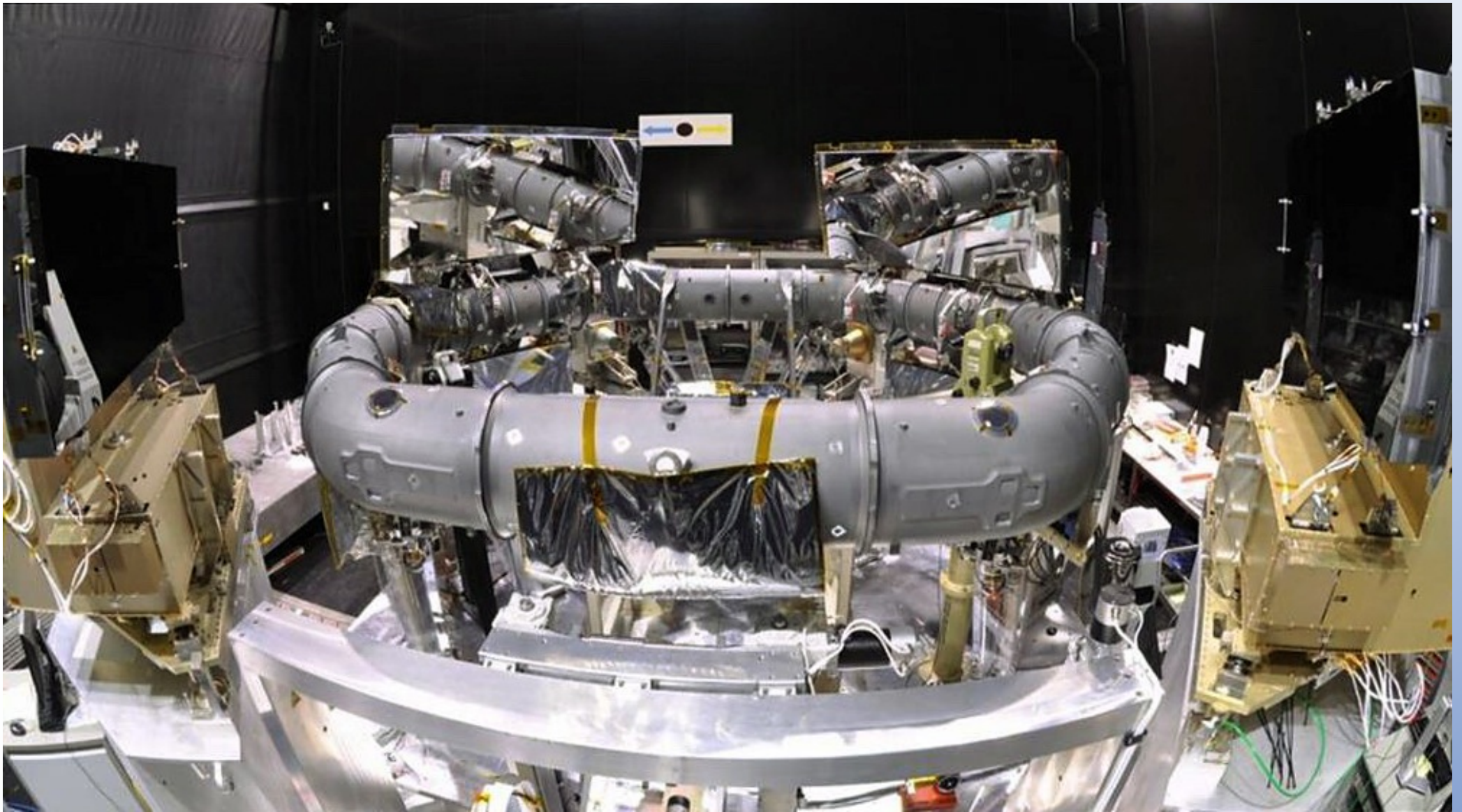
cosmos.esa.int/gaia



Payload and Telescope

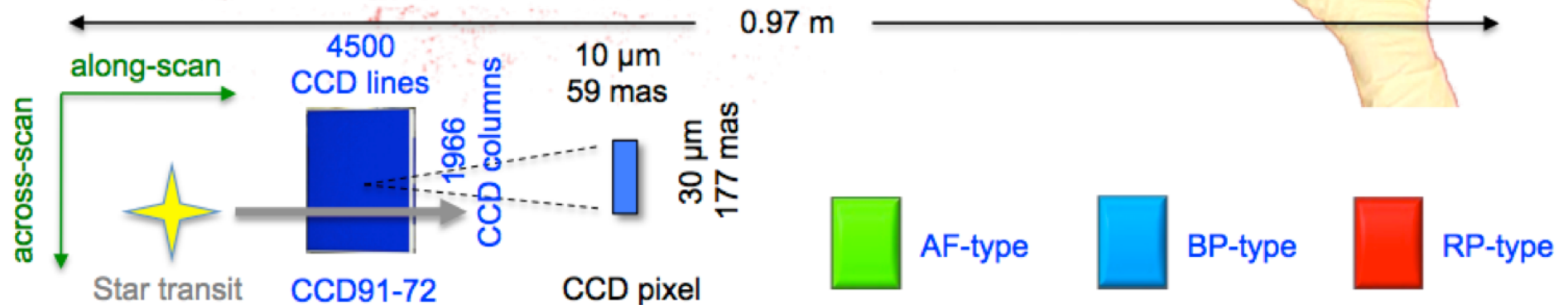


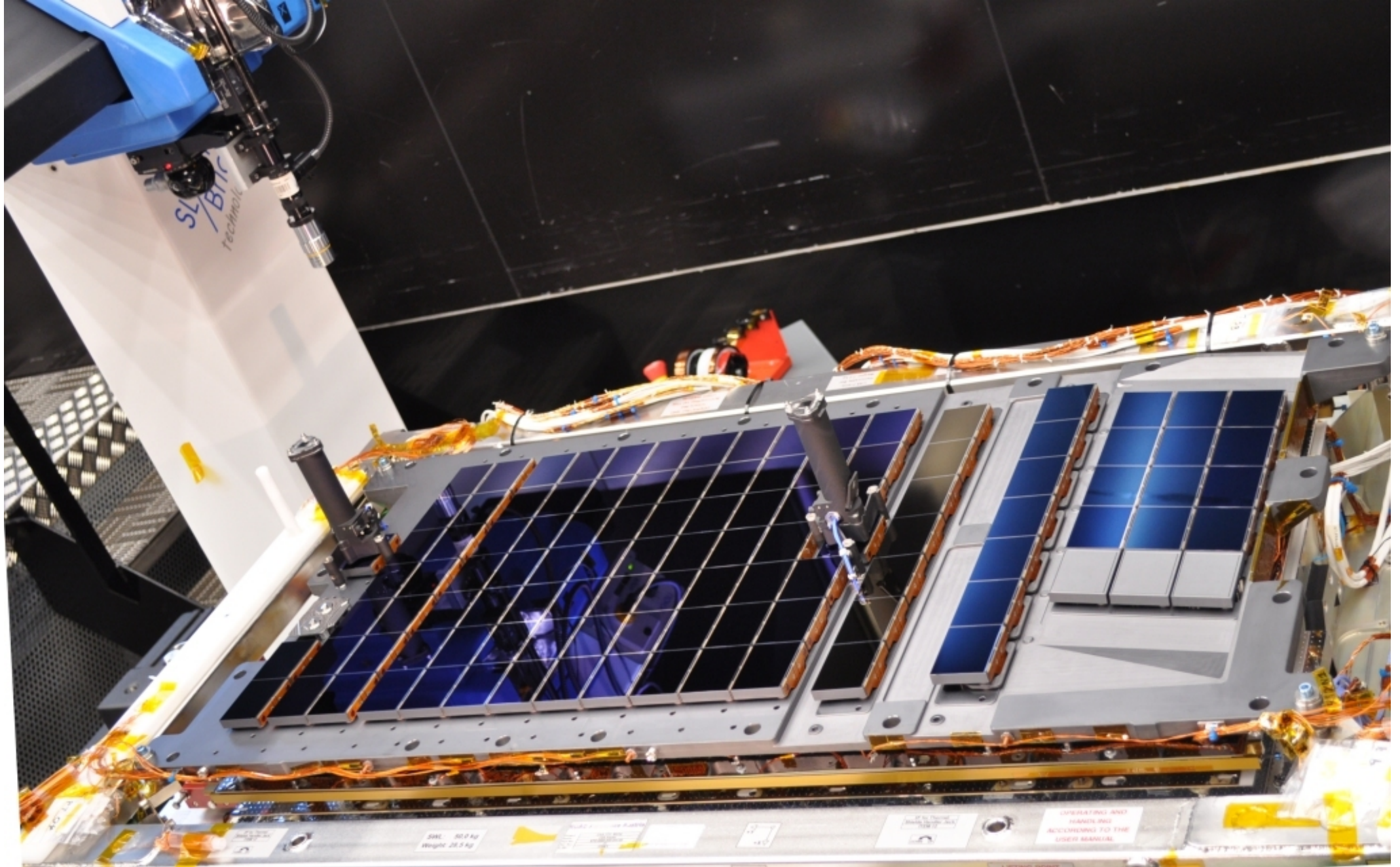




Focal Plane

Figure courtesy Ralf Kohley







Gaia integration on Fregat



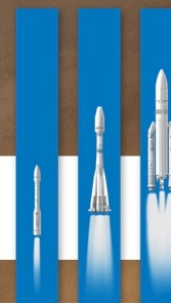
©2013 ESA-CNES-ARIANESPACE / Optique Vidéo du CSG - P. DAUDON

Gaia inside the fairing

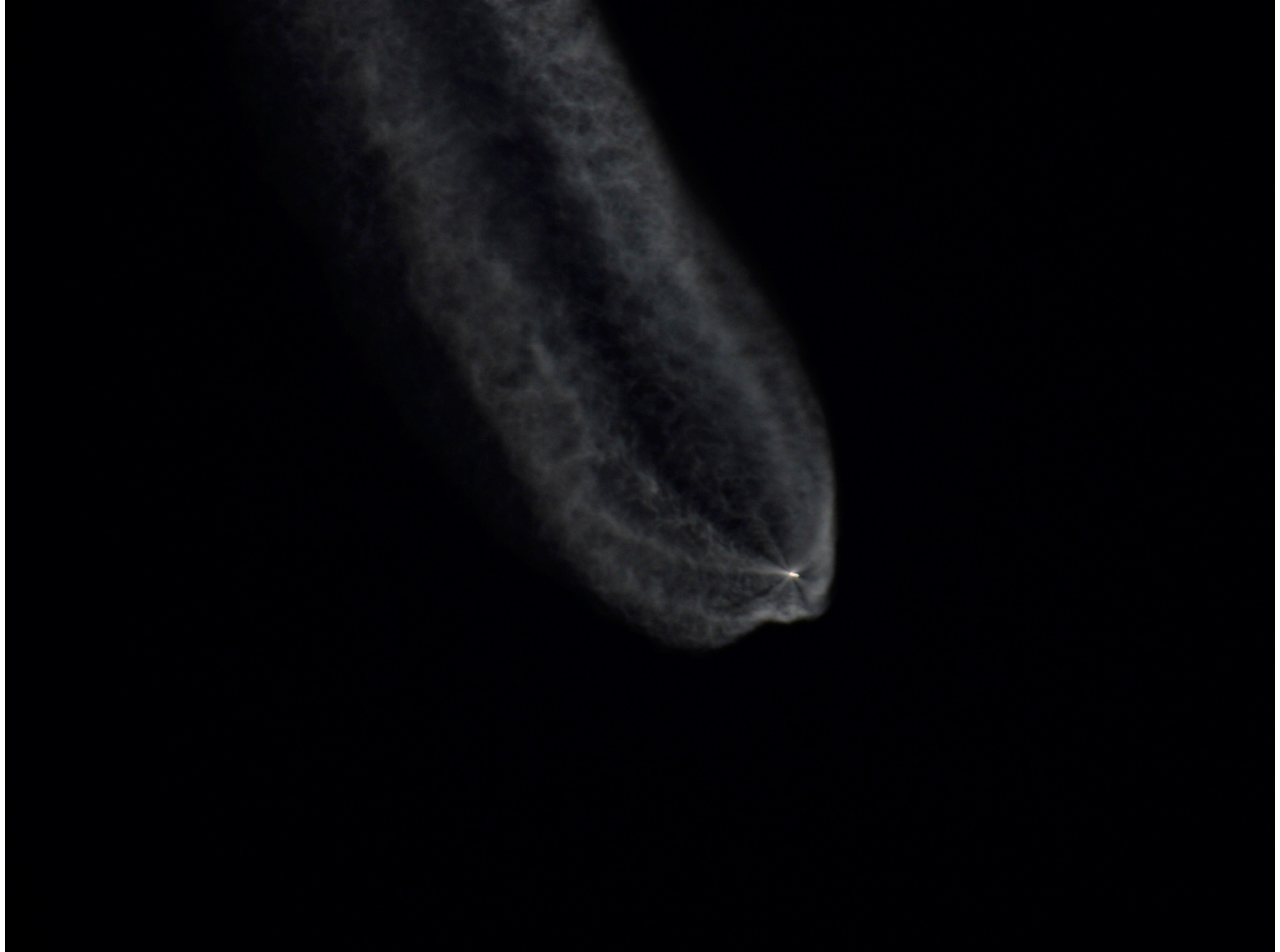


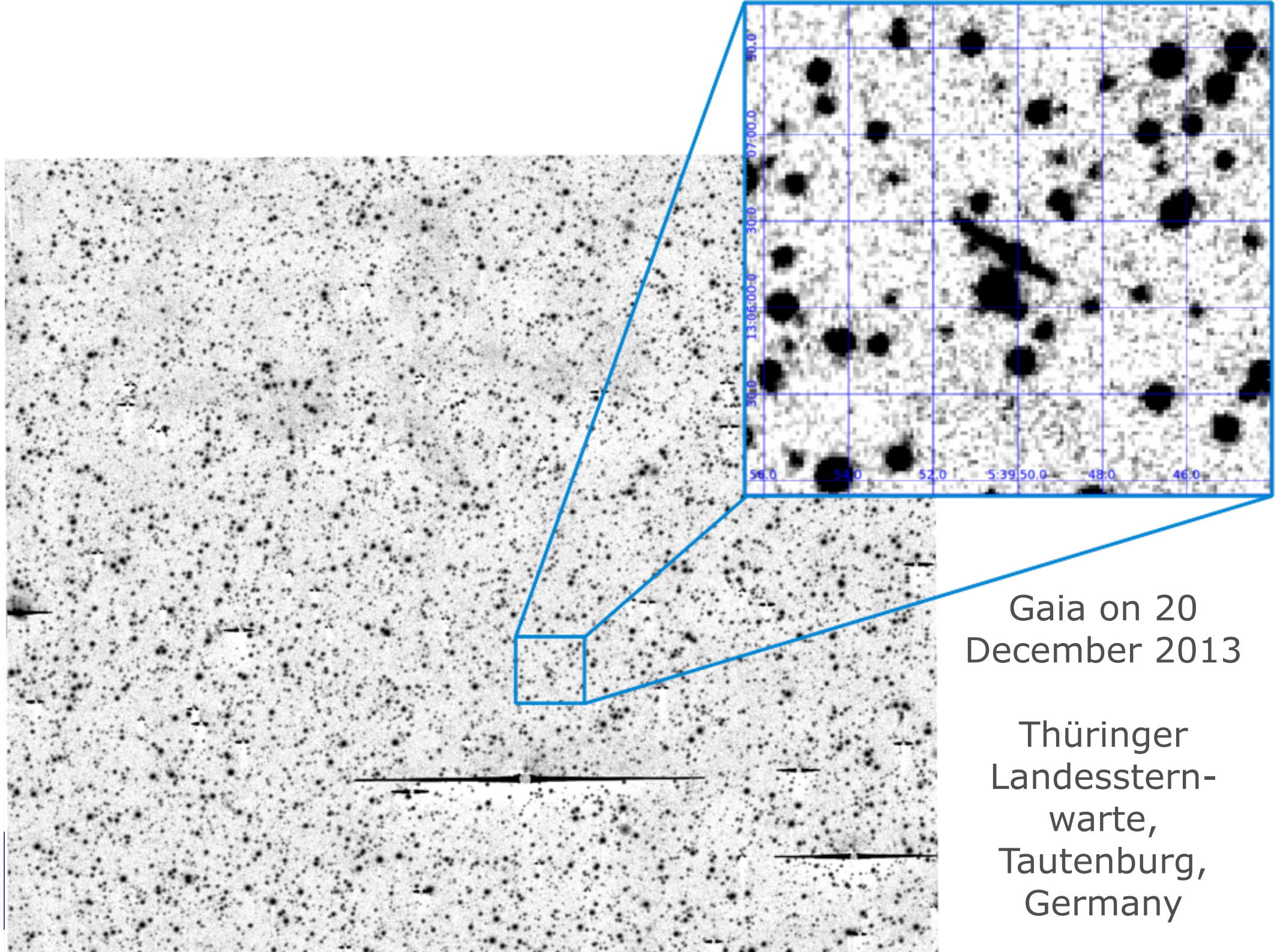


VS06 • gaia - December, 19th 2013









Gaia on 20
December 2013

Thüringer
Landesstern-
warte,
Tautenburg,
Germany

LEOP

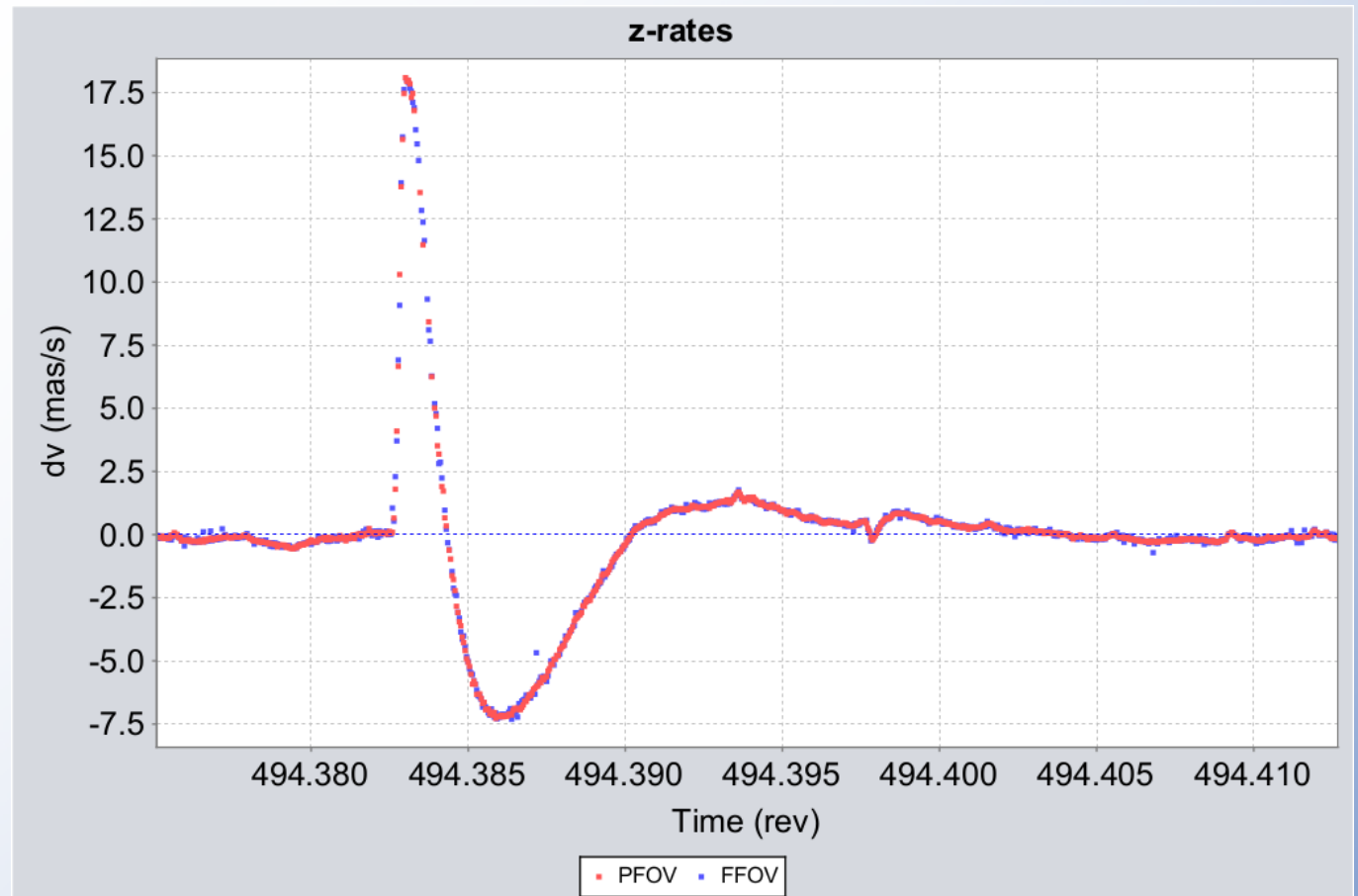


- After launcher separation automatic sequence:
 - transmitter, gyroscopes, Payload module bipod release, CPS priming, thermal control configuration
- Acquisition of Sun pointing attitude
- Sunshield deployment
- Start of Payload decontamination
- Star tracker switch-on and preparation for day-2 manoeuvre
- Day-2 trajectory correction



Commissioning results

- Micro propulsion system working well
- Attitude and Orbit Control System working well
- Phased Array Antenna operating with healthy link budget
- Clock working at required accuracy
- 106 CCDs, electronics, data acquisition and storage all functioning



Micro-meteoroid hit example.
Figure by F. van Leeuwen



Moving object “detection”

- Solar system object detection 4997 Ksana (V=18.5 mag)

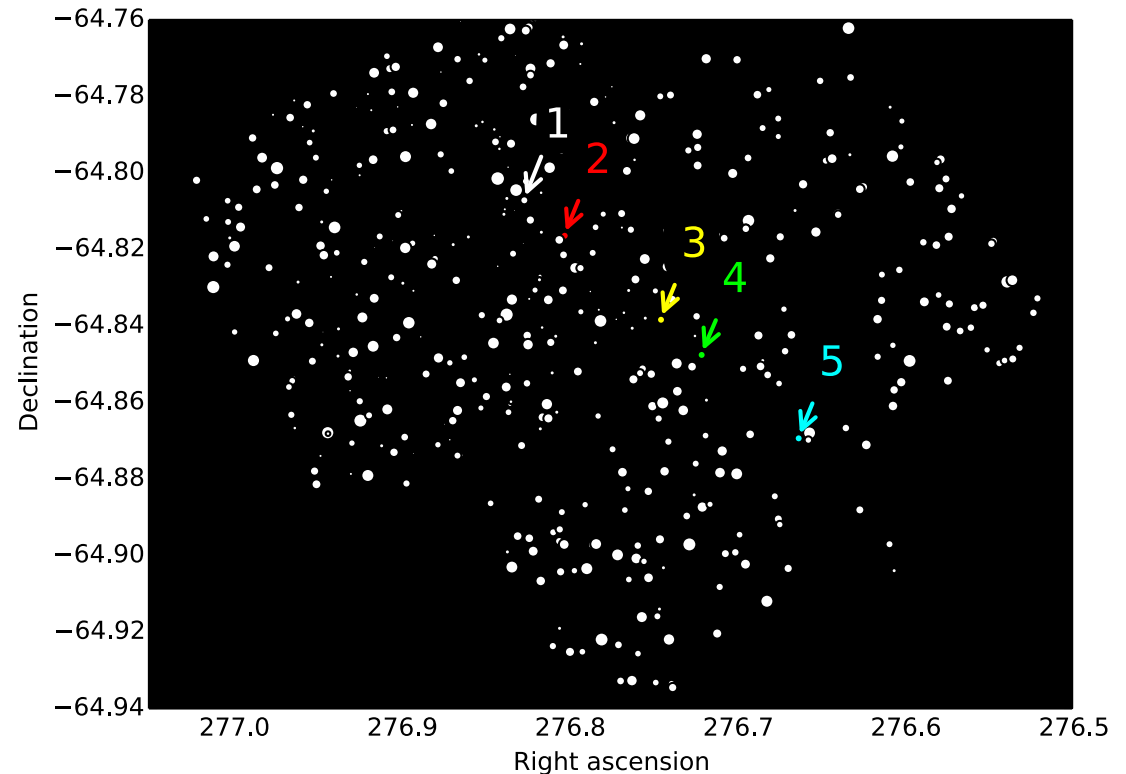
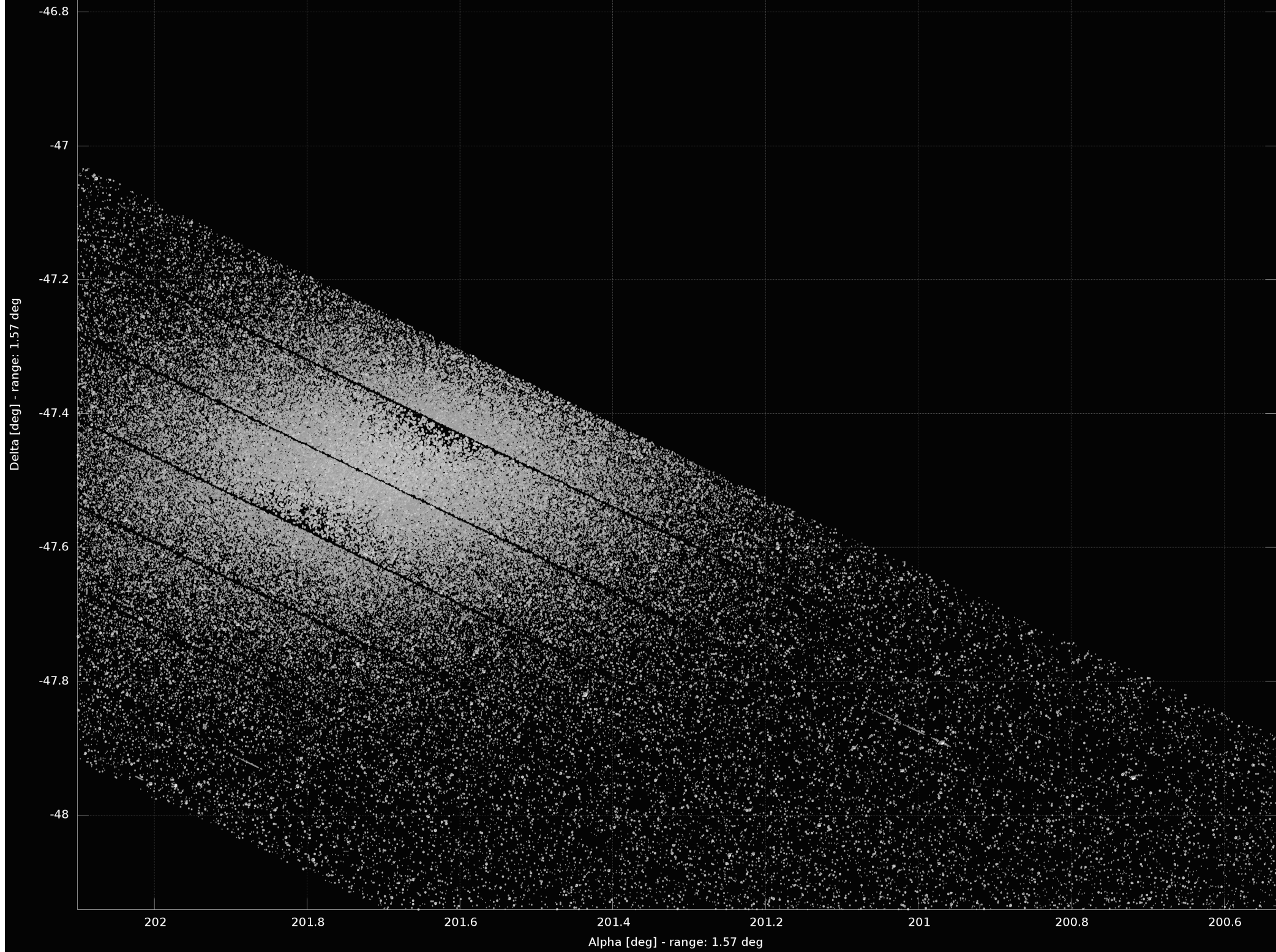
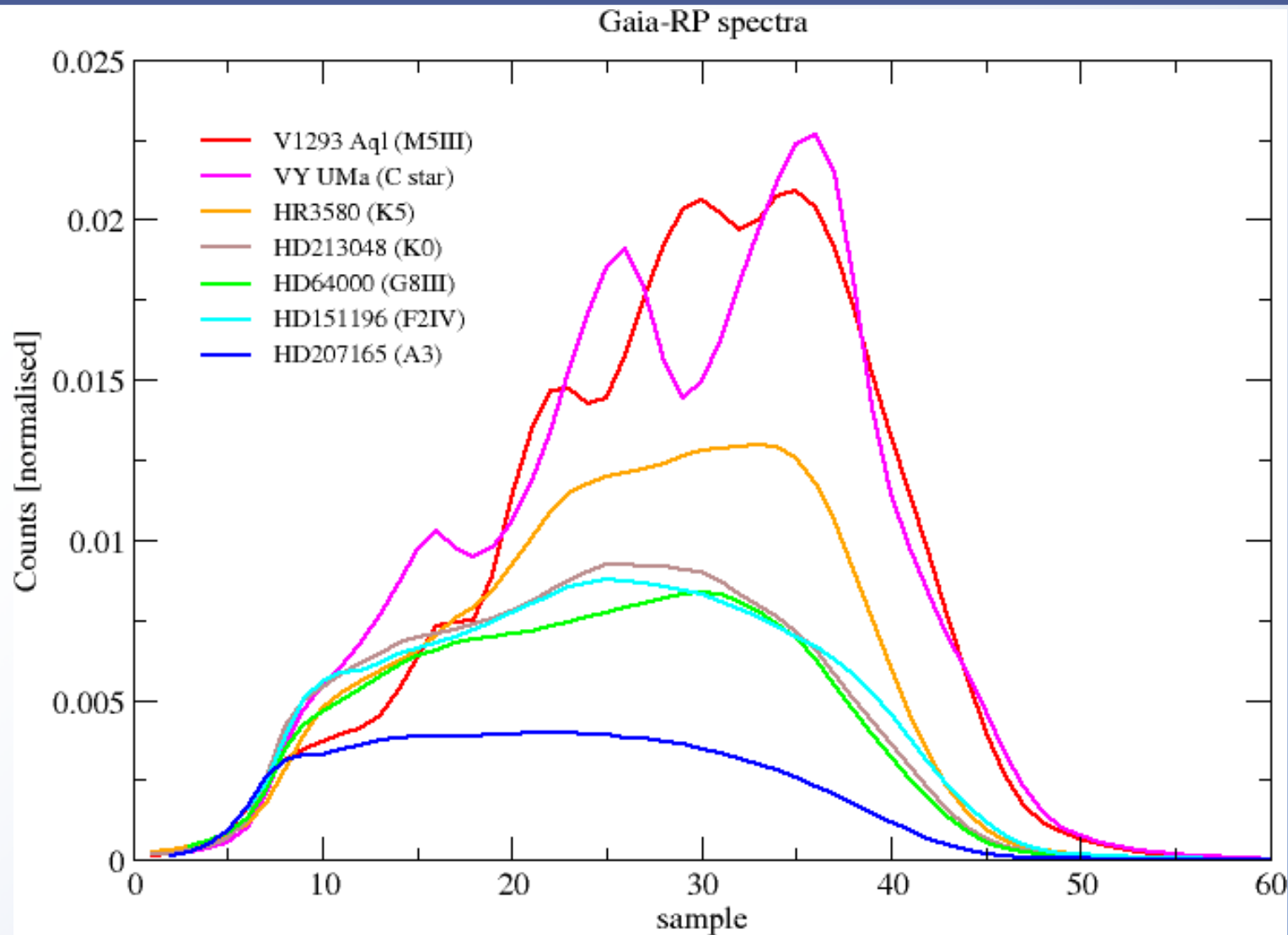


Image courtesy of Paolo Tanga

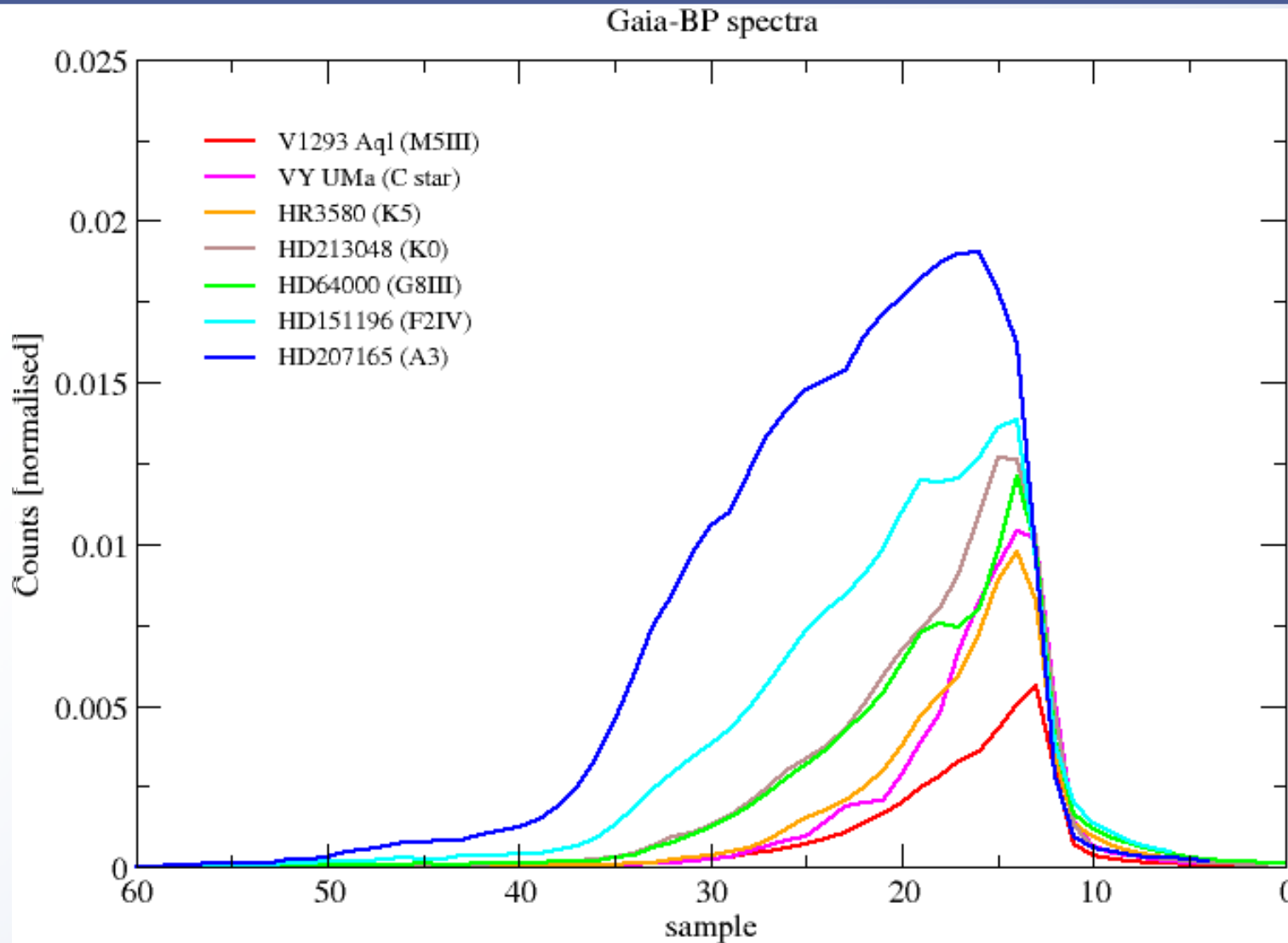




Photometry

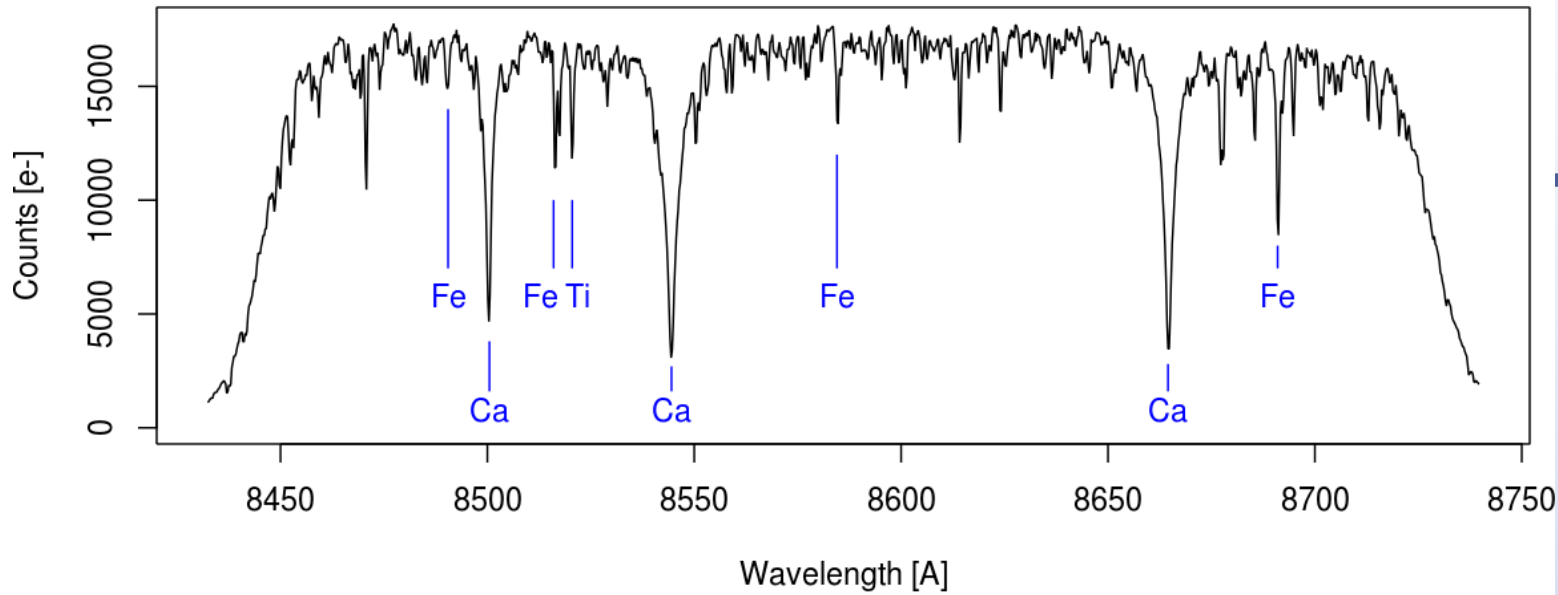


Photometry



Spectroscopy

Gaia-RVS spectrum of HIP 86564



Narval spectrum of HIP 86564

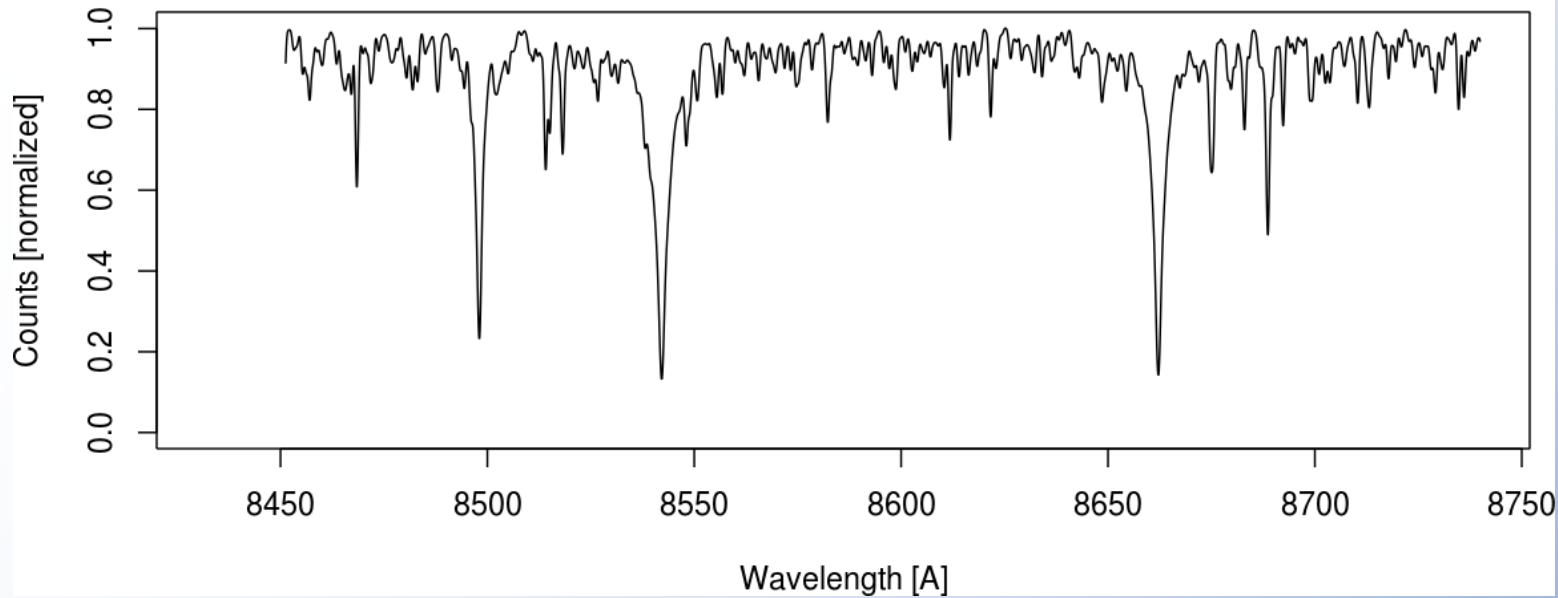


Figure courtesy D. Katz,
O. Marchal, C. Soubiran



Unwanted surprises

- Stray light both from astronomical sources and the Sun
 - Sun stray light paths not yet identified
 - Impacts faint sources and especially in spectroscopy
- Transmission loss due to continuing contamination of mirrors by water
 - Water source not yet exhausted with maximum contamination rate about 1 mmag/day
- Basic Angle variation larger than expected



Next steps

- Stray light
 - Current work on edge effects of the Sun shield
 - On-board s/w modification under development for spectroscopy
- Contamination
 - A new decontamination procedure has been executed involving a short heating of mirrors (executed 22-23 September) => full transmission recovery and now monitoring
 - Re-focus 24 October and now monitoring
- Basic Angle variation larger than expected
 - Analysis of dedicated measurements have verified Basic Angle variation being true
 - Working group established to chase the root cause of the variations



Scientific performance

For unreddened Solar type (G2V) star

<i>V-magnitude</i>	<i>Astrometry (parallax)</i>	<i>Photometry (BP/RP integrated)</i>	<i>Spectroscopy (radial velocity)</i>
<i>6 to 12</i>	<i>5-14 μas</i>	<i>4 mmag</i>	<i>1 km/s</i>
<i>15</i>	<i>25 μas</i>	<i>5 mmag</i>	<i>13 km/s</i>
<i>20</i>	<i>540 μas</i>	<i>60 (RP) – 80 (BP) mmag</i>	

Calculations by: Airbus DS, D. Katz, C. Jordi, L. Lindegren, J. de Bruijne



Scientific performance

For unreddened Solar type (G2V) star

- Single epoch precisions for BP integrated photometry
 - 0.01 mag reached at $G=15.0$ mag
 - 0.1 mag reached at $G=17.8$ mag
- Single epoch precisions for RP integrated photometry
 - 0.01 mag reached at $G=16.0$ mag
 - 0.1 mag reached at $G=18.8$ mag

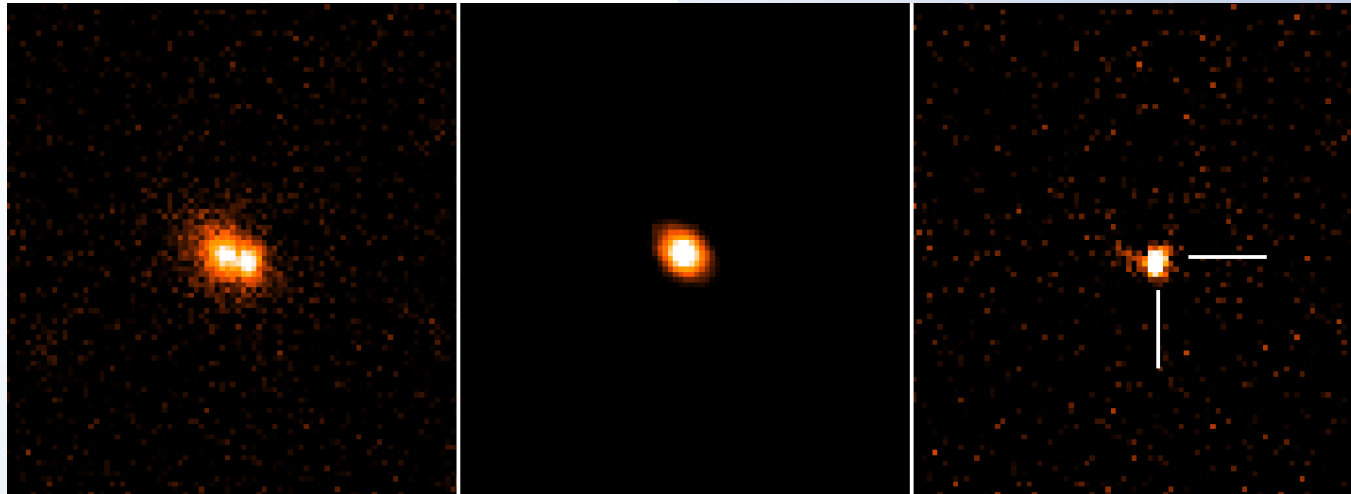
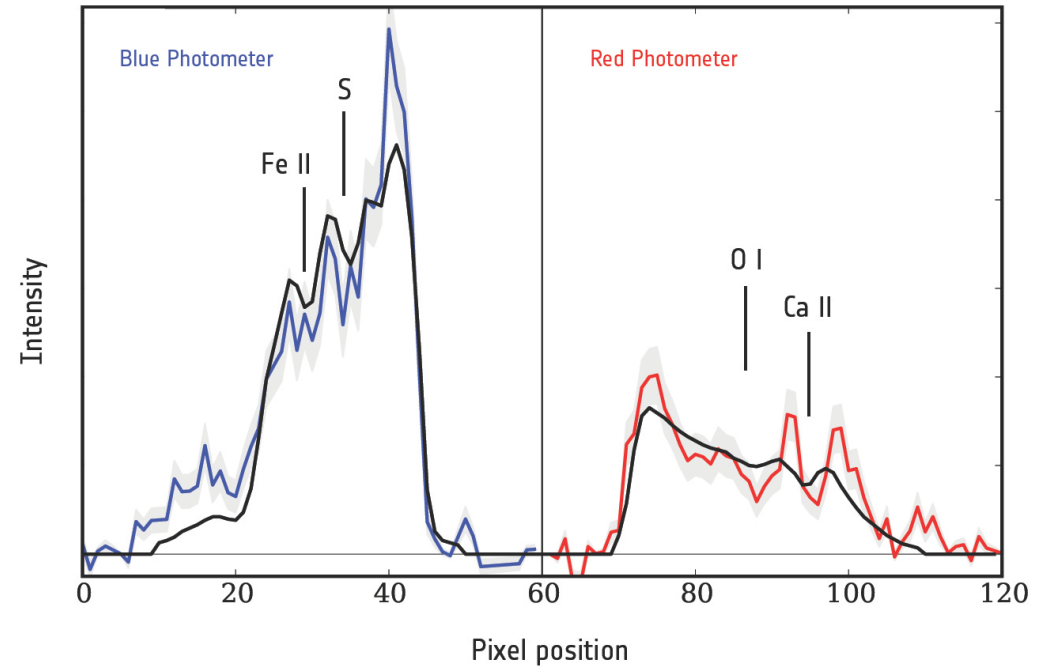
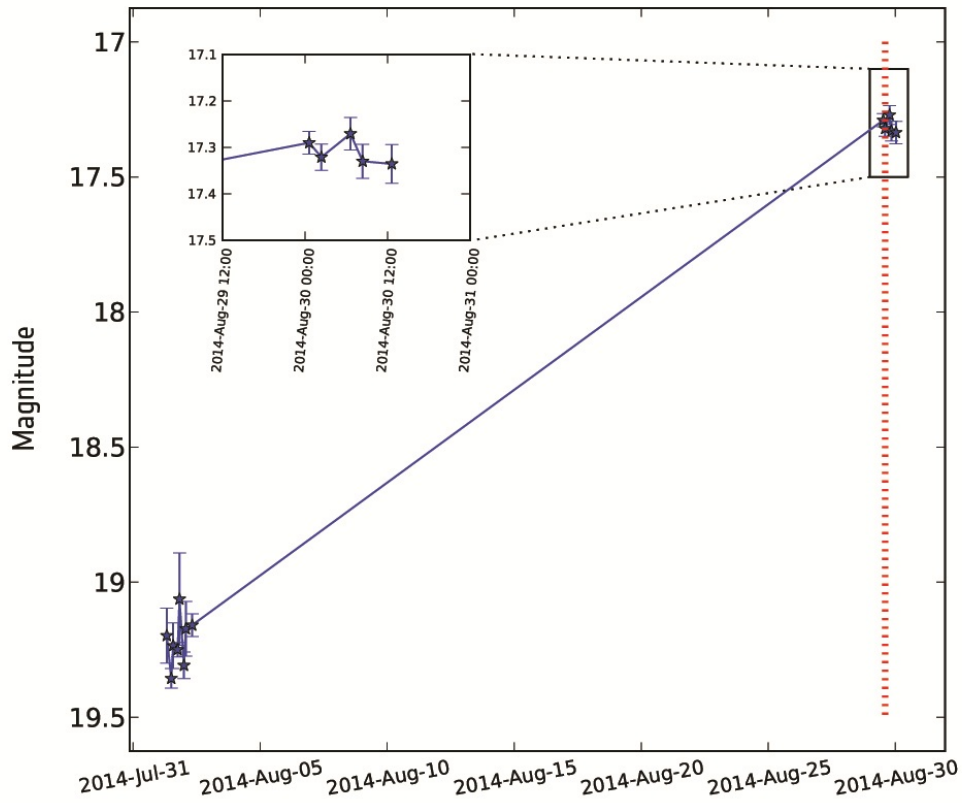
Calculations by: Airbus DS, D. Katz, C. Jordi, L. Lindegren, J. de Bruijne



Time Line

- Routine phase started with 28 days of Ecliptic Pole Scanning
- Now operating in optimised Nominal Scanning Law
- Activities to be finished:
 - Magnitude limits for astrometry and photometry
 - Currently $-\infty$ - 2 - 3 - 6 - 20 - 21 mag
 - Magnitude limit for spectroscopy
 - Currently 2-3 - 16.2 mag
 - Decontamination as needed followed with focus check
 - Completion of BA and stray light WG tasks and possible follow-up
 - Sort out ground station time for larger amounts of telemetry
- Consolidate intermediate release schedule for summer 2016 and early 2017





The first SN detected by Gaia: gaia14aaa



Alerts

- Agreed approach for photometric alerts
- Make science alert public to the whole world even in validation phase (with appropriate caveats)
 - Caveat 1: validation phase thus many false alarms may be triggered
- Ensure partner observatories conducting follow-up
 - Caveat 2: well prepared affiliated units will do follow-up work
- SSO FUN approach?

gaia.ac.uk

Gaia DPAC Wiki RSSD MyPortal ownCloud MAS Flexi Time IAU EAS ADS SIMBAD Astrometry

Gaia > Gaia Science Homepage Gaia-FUN-SSO-3 Photometric Science Alerts

Column	Name	Description
1	Name	GaiaYhnn
2	UTC timestamp	The time of the triggering datapoint (not the date we notice it).
3	RA	Right Ascension (ICRS, decimal degrees, note the comment on systematics above).
4	Dec	Declination (ICRS, decimal degrees).
5	AlertMag	Alert magnitude.
6	HistMag	Historic magnitude.
7	HistStdDev	Historic standard deviation.
8	Class	To begin with, we will classify everything as 'unknown'. As we learn more, this will start as a manual best-guess classification and should be treated with suspicion (until we begin running classification software.)
9	Comment	Time permitting we may add contextual information here.

Alerts

The table can be sorted by Name, UTC timestamp, RA, Dec and AlertMag - click column heading to sort.

Columns:

Name	UTC timestamp	RA	Dec	AlertMag	HistMag	HistStdDev	Class	Comment
Gaia14adg	2014-11-06 16:55:39	177.63660	-2.10474	18.94	19.50	0.04	unknown	On top of SDSS starforming galaxy z=0.156
Gaia14adf	2014-11-11 16:37:00	182.37337	20.10370	18.08	18.76	0.04	unknown	Starforming galaxy in SDSS z=0.06. Transient could be ~0.8 arcsecs away from nucleus.
Gaia14ade	2014-11-11 08:25:59	357.71672	28.98319	17.78	19.30	0.13	unknown	very blue star: CV?
Gaia14add	2014-11-11 04:44:38	182.15532	11.99387	17.70	18.71	0.04	unknown	QSO at z=0.36. Brightening of 1 mag
Gaia14adc	2014-11-06 02:55:24	316.06927	51.32732	15.92	18.10	0.06	unknown	Very red spectrum, possible Mira
	2014-10-							Near SDSS galaxy SDSS



