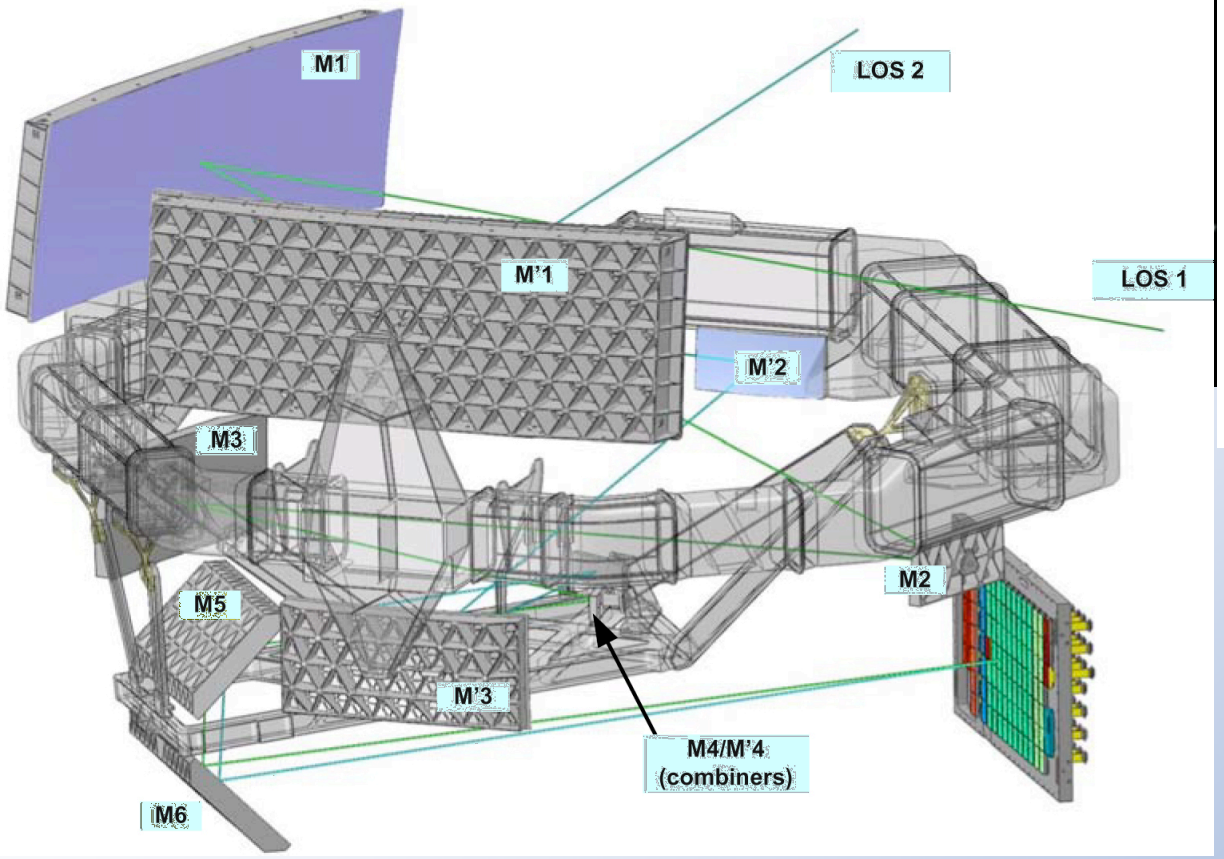
General Status of the Gaia Mission and Expected Performance

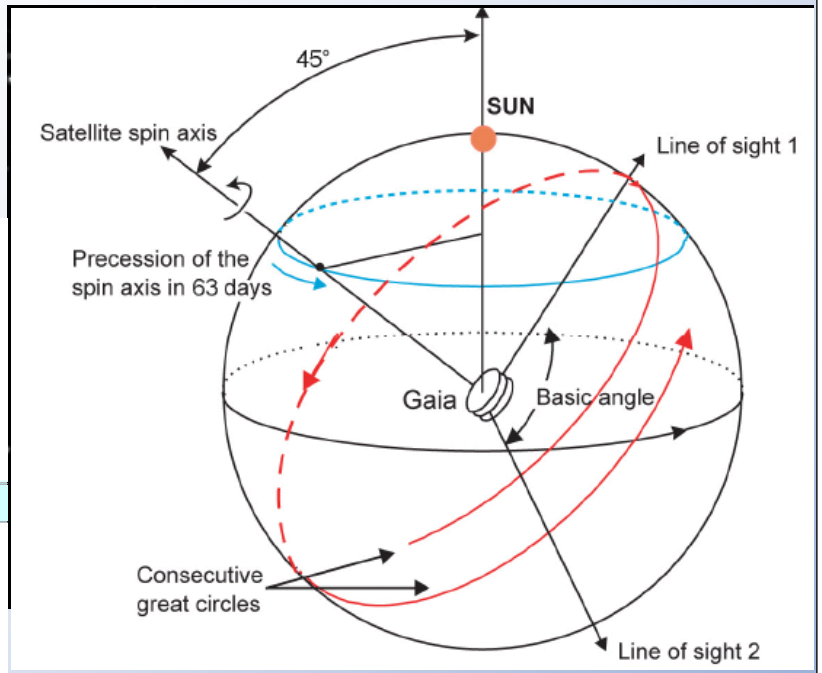
Timo Prusti

Mission requirements

- A Stereoscopic Census of Our Galaxy
- Astrometry (V < 20):
  - completeness to 20 mag (on-board detection) 10^9 stars
  - parallax accuracy: 7 μarcsec at <10 mag; 12–25 μarcsec at 15 mag; and 100–300 μarcsec at 20 mag
- Photometry (V < 20):
  - astrophysical diagnostics (low-dispersion photometry) + chromaticity
  - 8–20 mmag at 15 mag: T_{eff} ~ 200 K, log g, [Fe/H] to 0.2 dex, extinction
- Radial velocity (V < 16.5–17):
  - third component of space motion, perspective acceleration
  - <1 km/s at 13-13.5 mag and <15 km/s at 16.5-17 mag

Gaia mission





Mission elements

- Satellite and Payload: EADS Astrium
- Launch: Soyuz-Fregat from Kourou
- Mission Operations Centre: ESA-ESOC and ground stations Cebreros and New Norcia
- Science Operations Centre: ESA-ESAC
- Gaia Data Processing and Analysis Consortium (DPAC)

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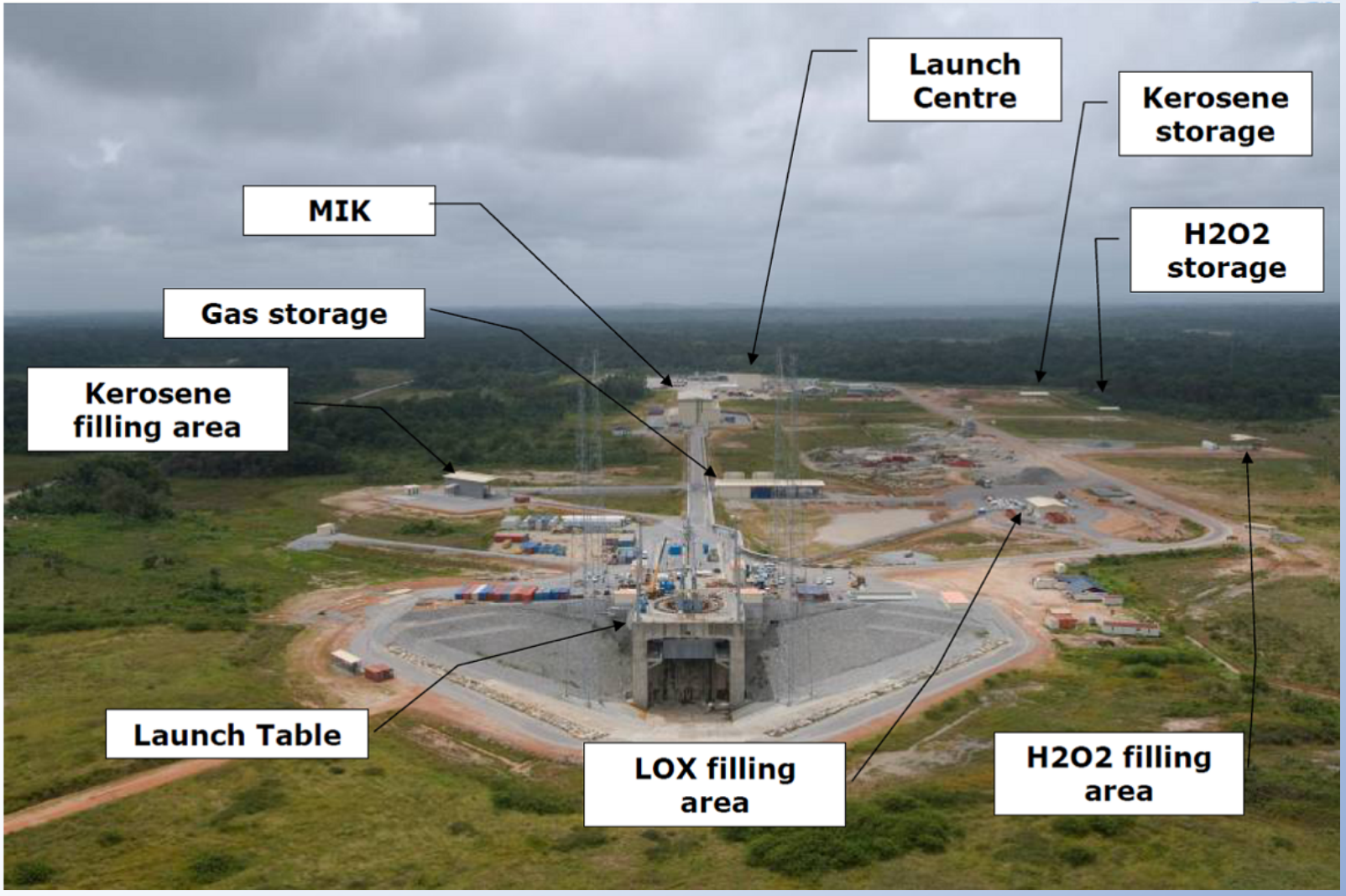
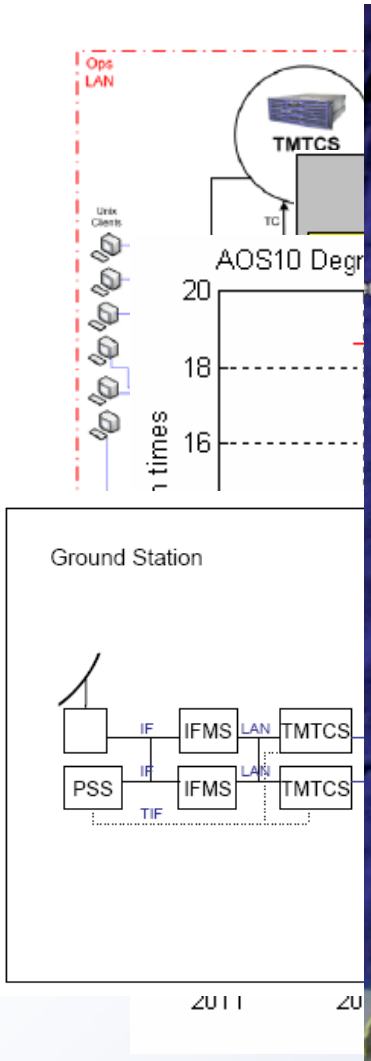
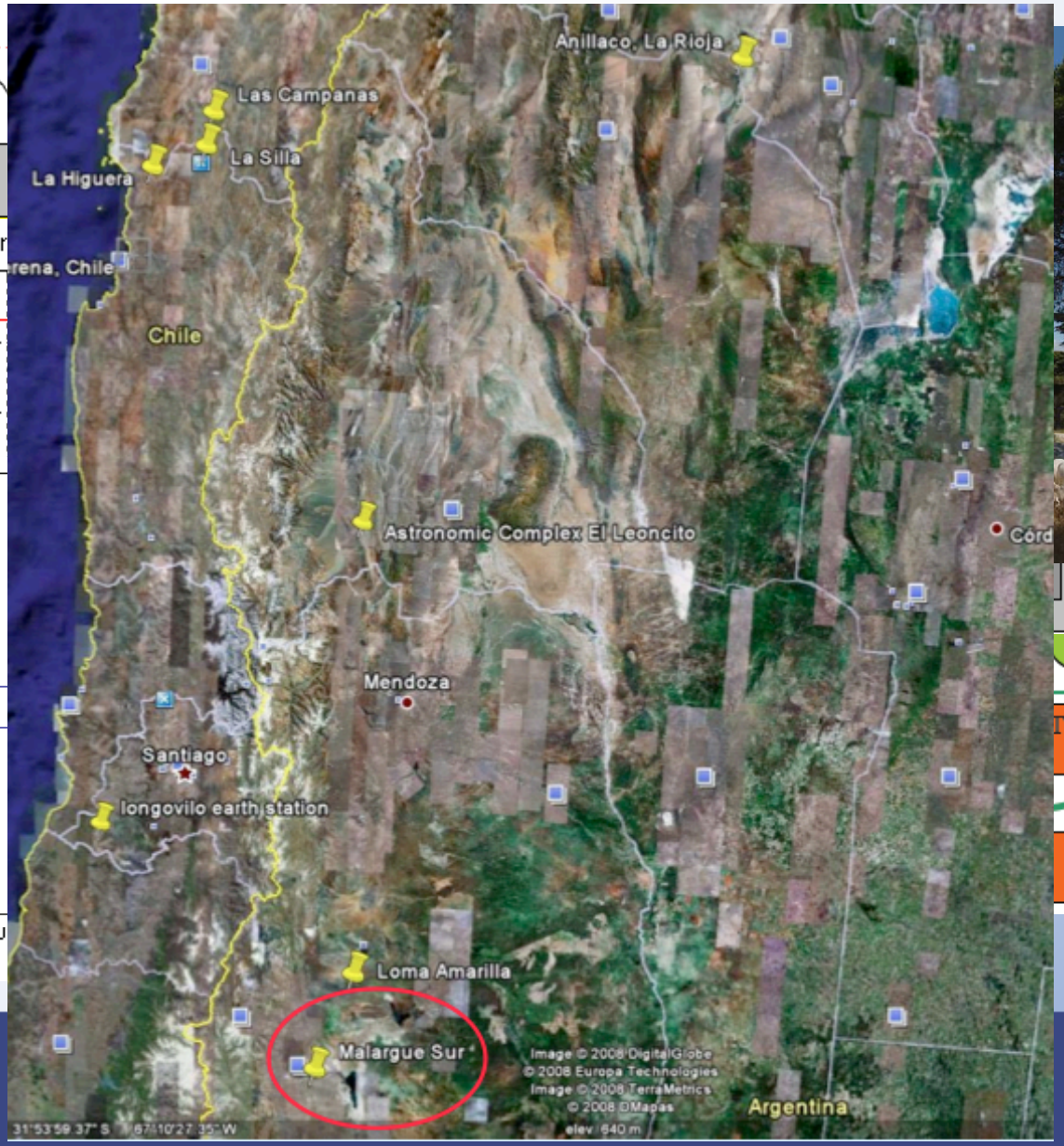
- Mission Operations Centre: ESA-ESOC and ground stations Cebreros and New Norcia
- Gaia Data Processing and Analysis Consortium (DPAC) including Science Operations Centre at ESAC

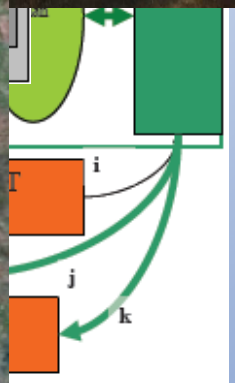
Launcher


Launch Centre
Kerosene storage
MIK
H2O2 storage
Gas storage
Kerosene filling area
Launch Table
LOX filling area
H2O2 filling area

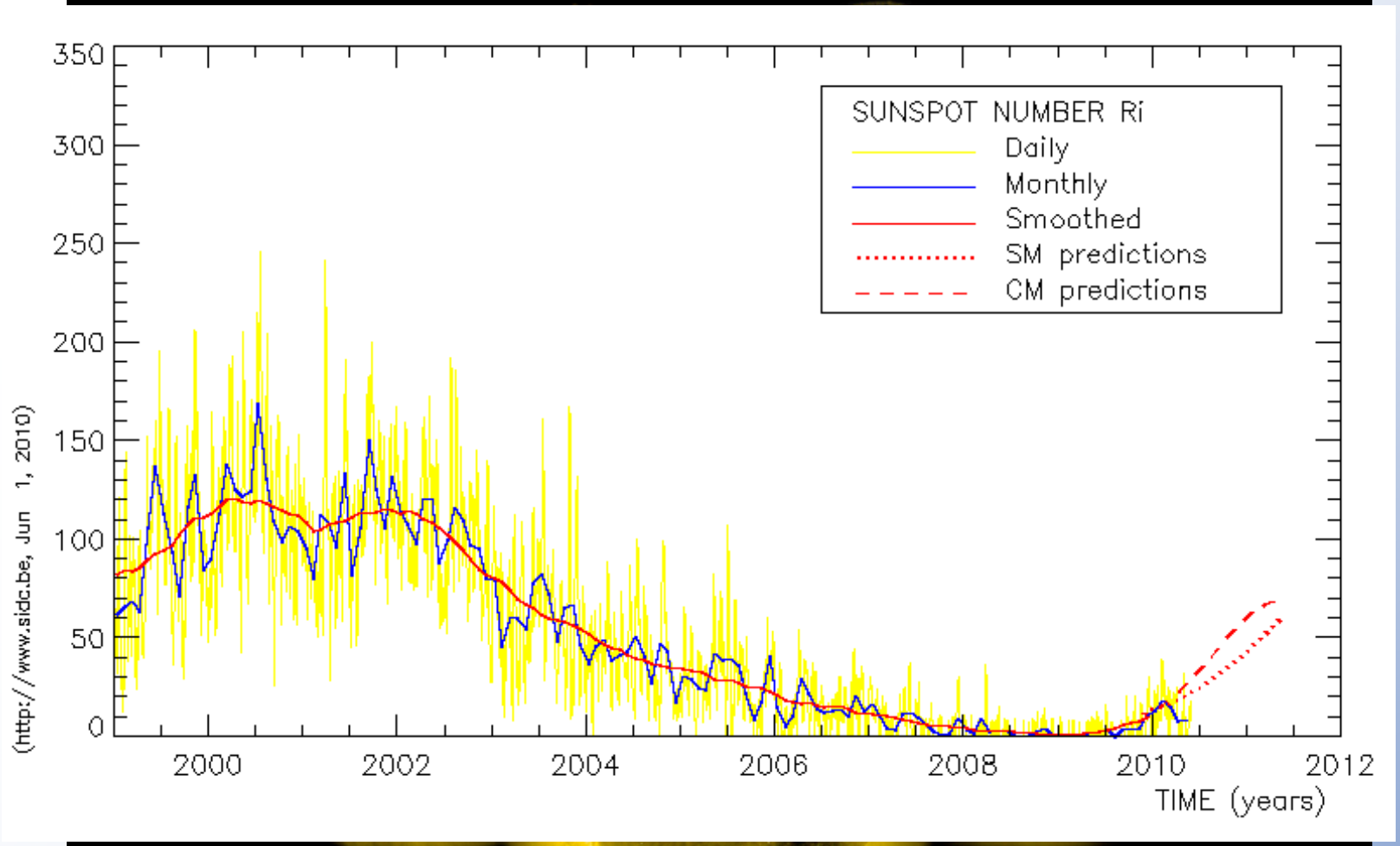
Mission Operations Centre





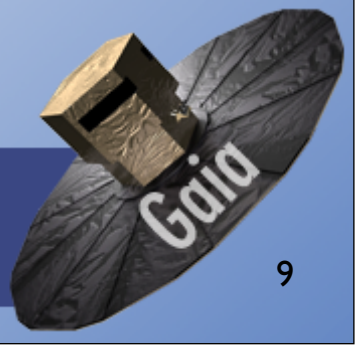


Radiation calibration



Scientific Performance

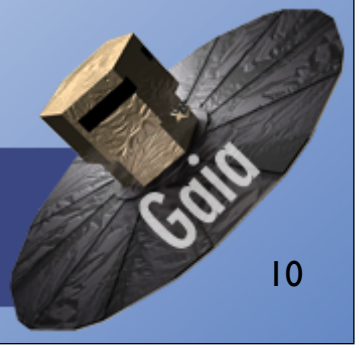
- 2010: Consolidation of performance estimates with all known effects included
- Payload Critical Design Review: February-April 2010
- Spacecraft Critical Design Review: July-October 2010
- Consolidated scientific performances from February:



Astrometry

	V mag	EOM Performance [μas]	Specification
B1V	< 10.0	10.7	< 7
	15.0	30.0	< 25
	20.0	390.3	< 300
G2V	< 10.0	10.4	< 7
	15.0	27.8	< 24
	20.0	344.1	< 300
M6V	< 10.0	10.4	< 7
	15.0	10.3	< 12
	20.0	110.4	< 100

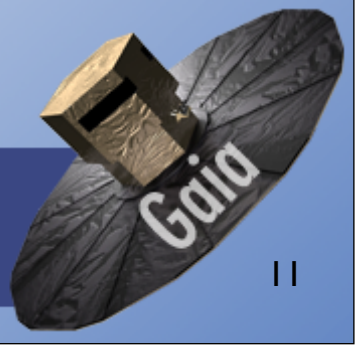
End of mission astrometry performances



Photometry

	Band	EOM Performance [mmag]	Specification
B1V - V=15	C1M410	5	< 10
	C1M549	6	< 8
	C1M965	9	< 20
G2V - V=15	C1M410	6	< 10
	C1M549	5	< 8
	C1M965	6	< 10
M6V - V=15	C1M410	13	< 20
	C1M549	6	< 8
	C1M965	4	< 10

End of mission photometry performances



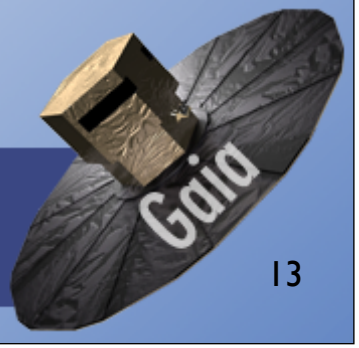
Spectroscopy

	V mag	EOM Performance [km/sec]	Specification
B1V	7.0	0.5	< 1
	12.0	8.1	< 15
G2V	13.0	0.6	< 1
	16.5	14.1	< 15
K1IIIMP	13.5	0.6	< 1
	17.0	15.6	< 15

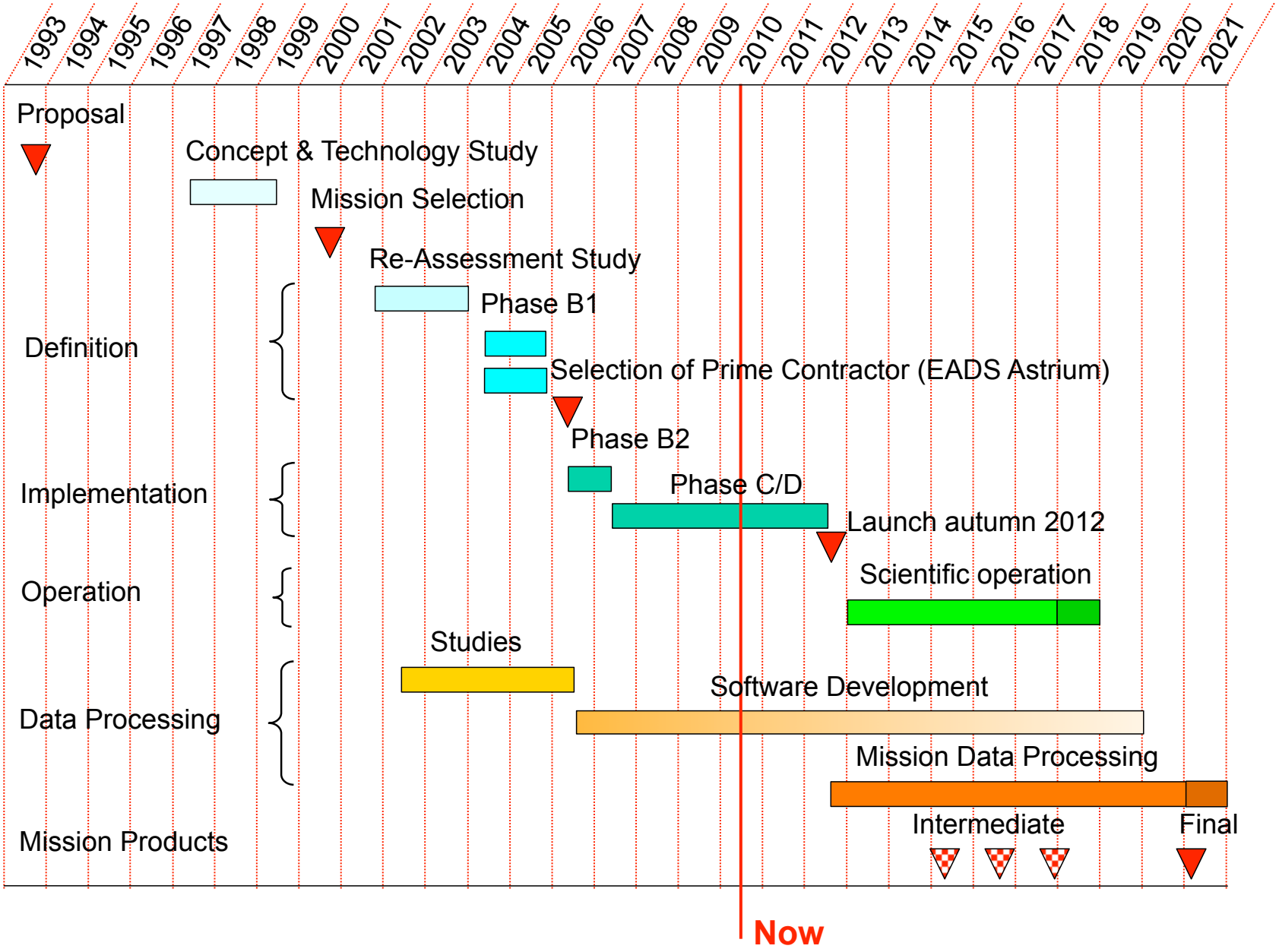
End of mission radial velocity spectrometry performances

Conclusions

- Design ready: EADS Astrium focusing on assembly, integration and testing
- DPAC focusing on calibrating Gaia
- Scientific Community getting ready and GREAT is there to help



Schedule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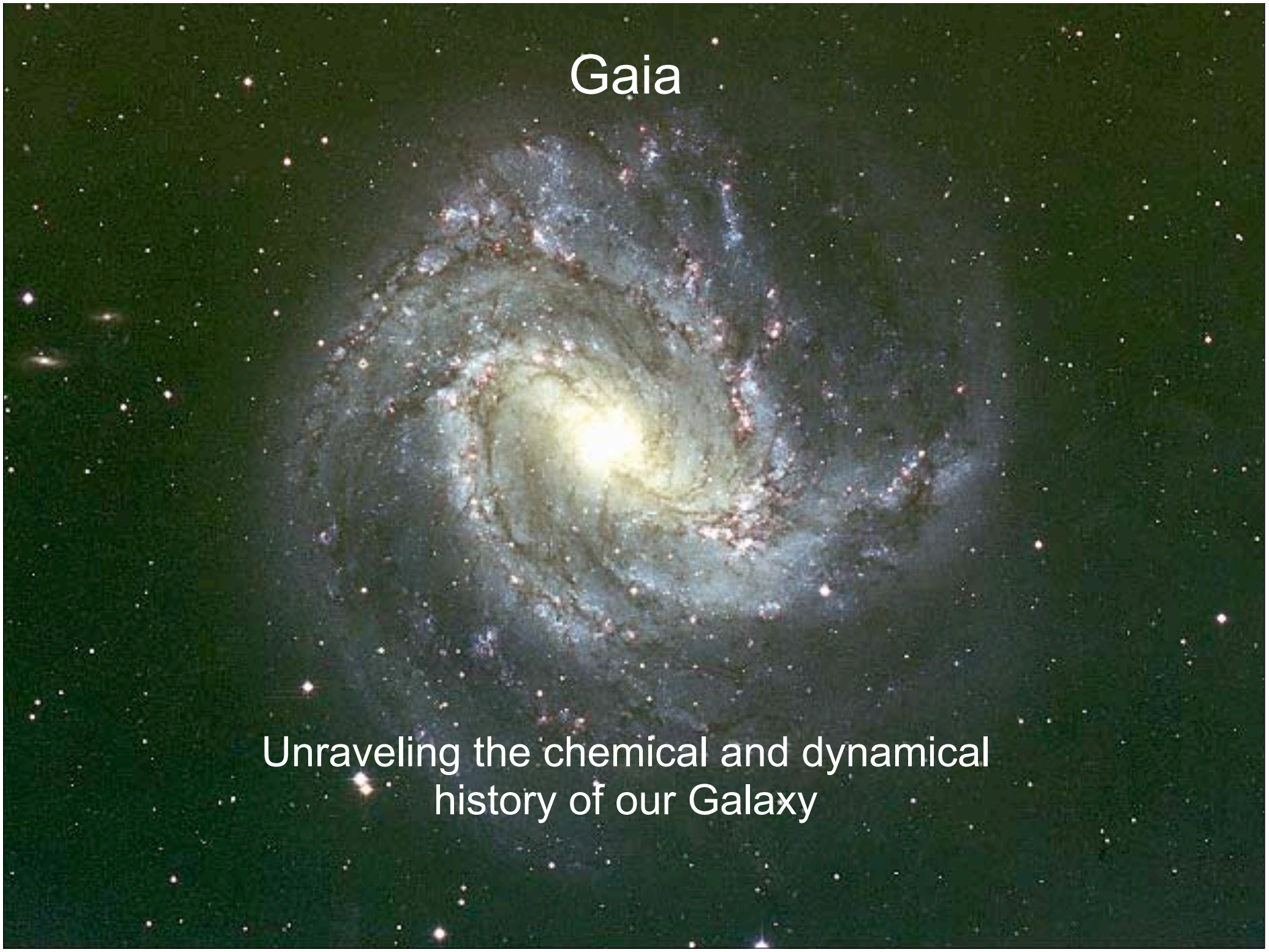
2021
Proposal
Concept & Technology Study
Mission Selection
Re-Assessment Study
Definition
Phase B1
Selection of Prime Contractor (EADS Astrium)
Phase B2
Implementation
Phase C/D
Launch autumn 2012
Operation
Scientific operation
Studies
Data Processing
Software Development
Mission Data Processing
Mission Products
Intermediate
Final
Now


Gaia
Unraveling the chemical and dynamical
history of our Galaxy