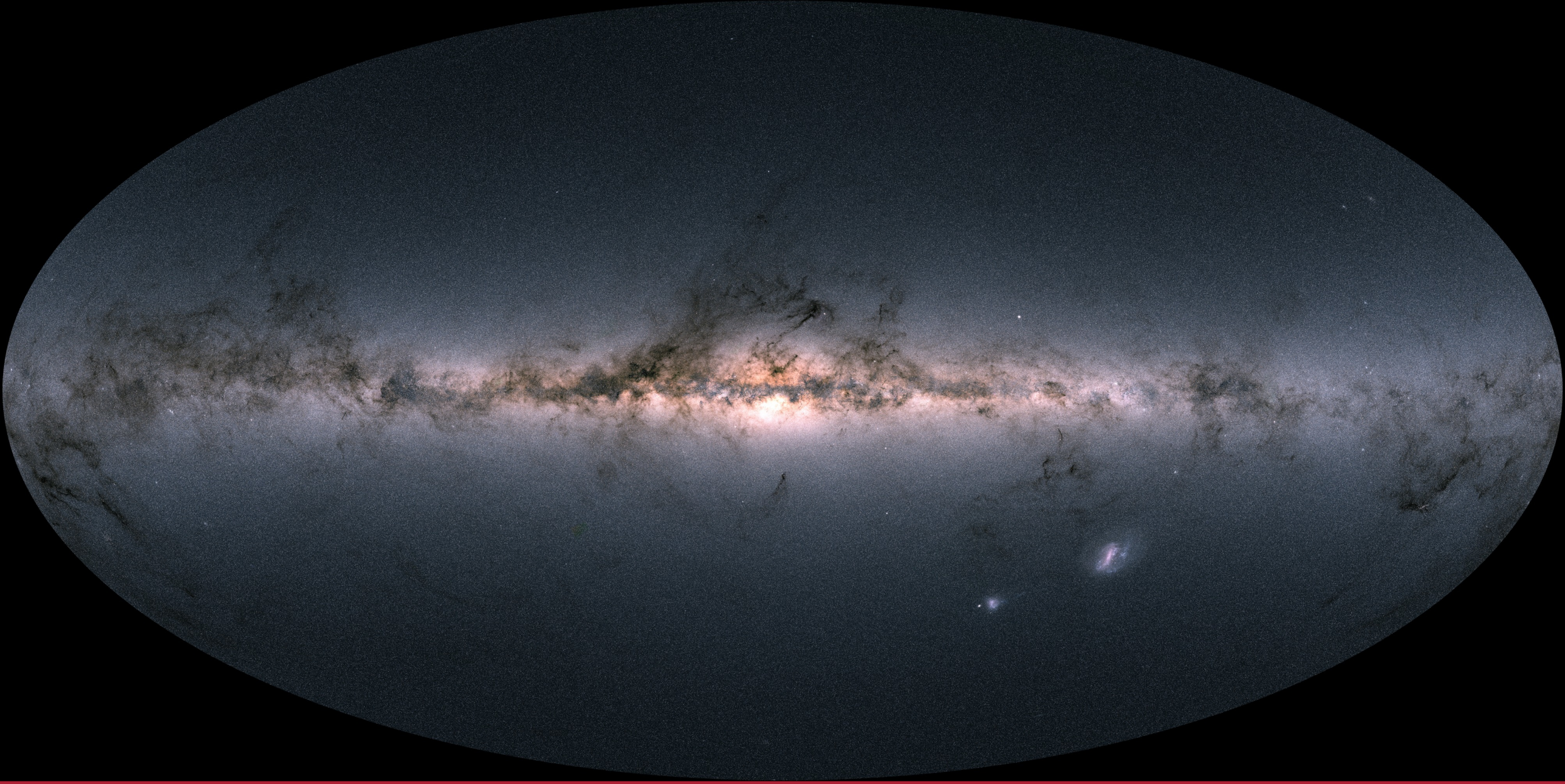
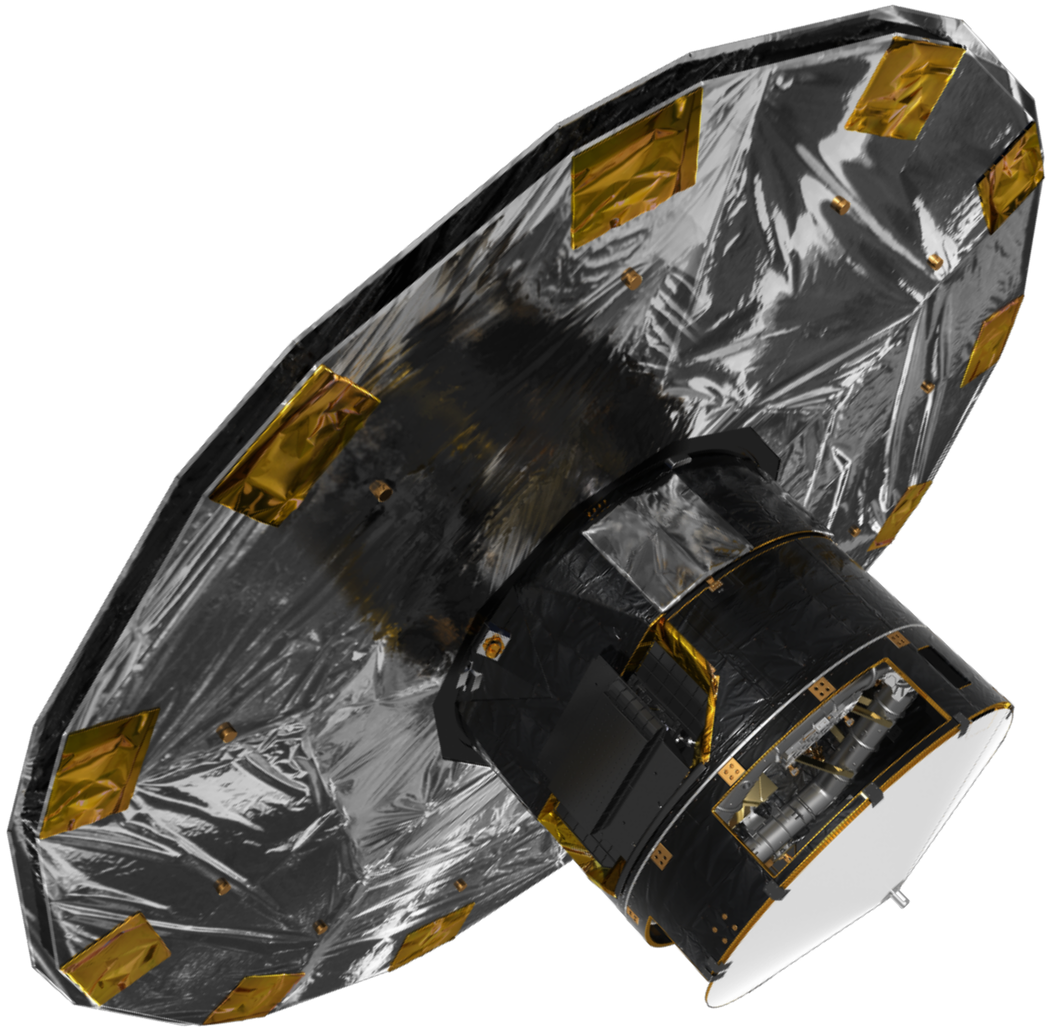
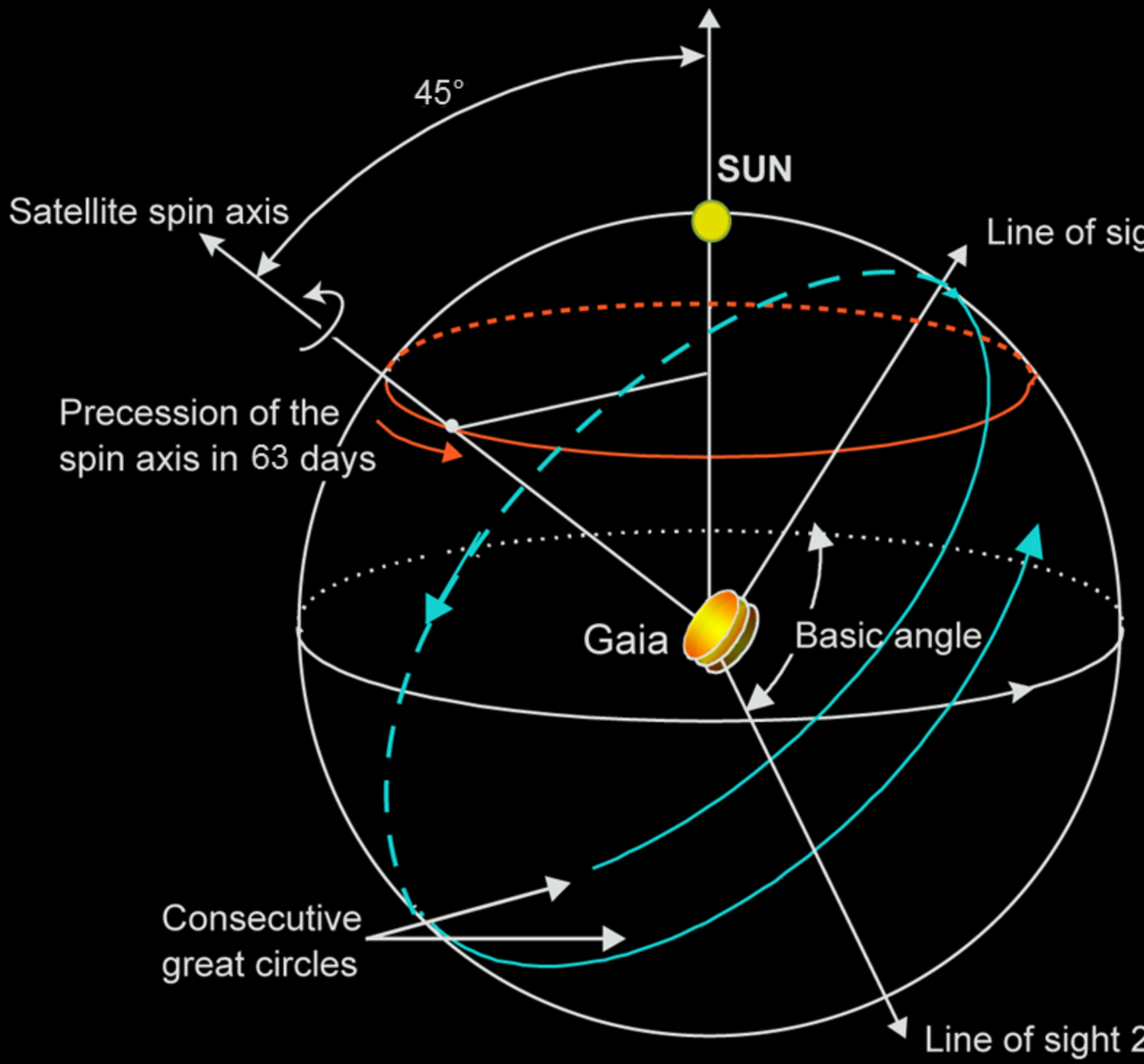
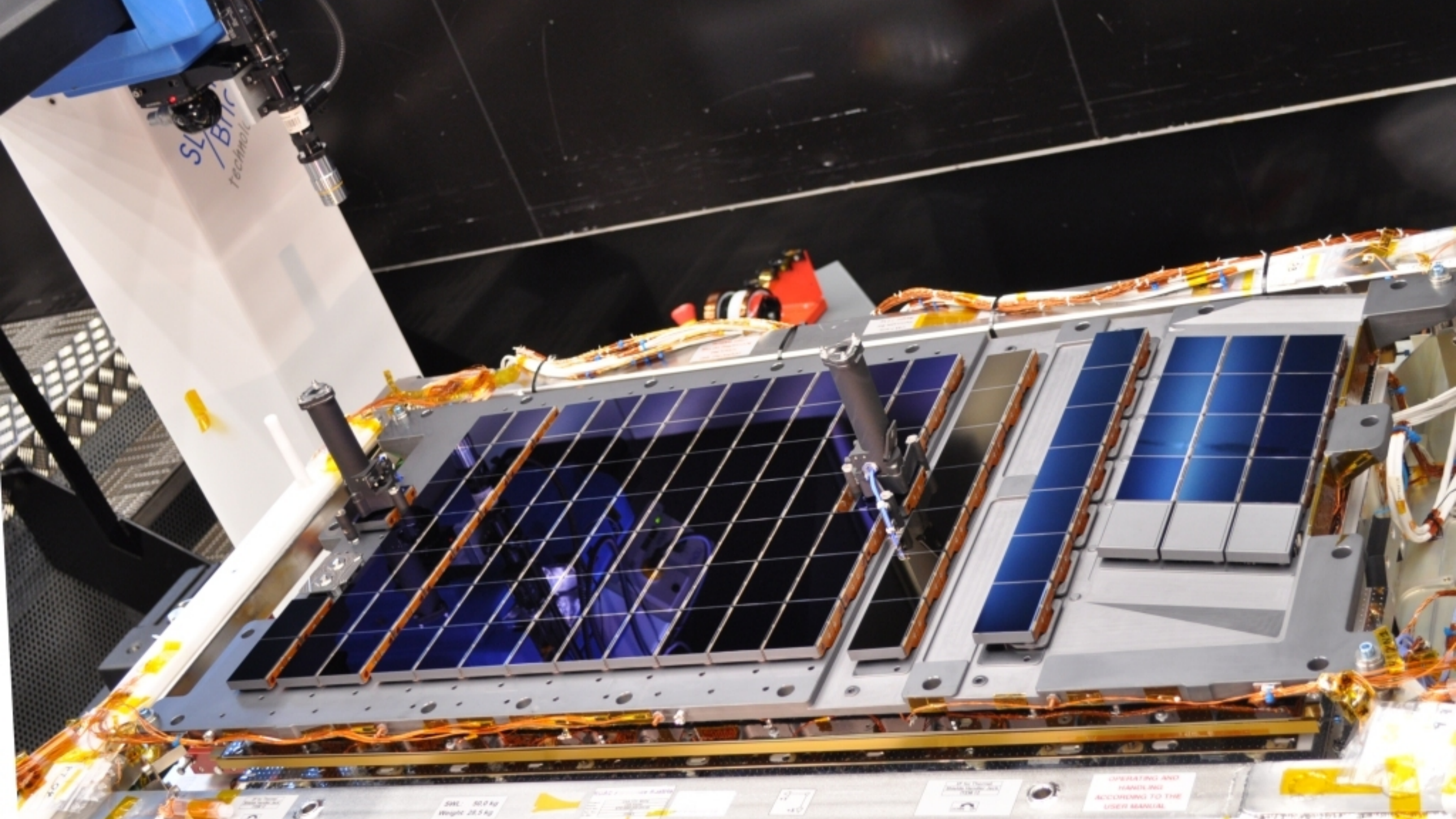


Gaia mission overview and status

Timo Prusti



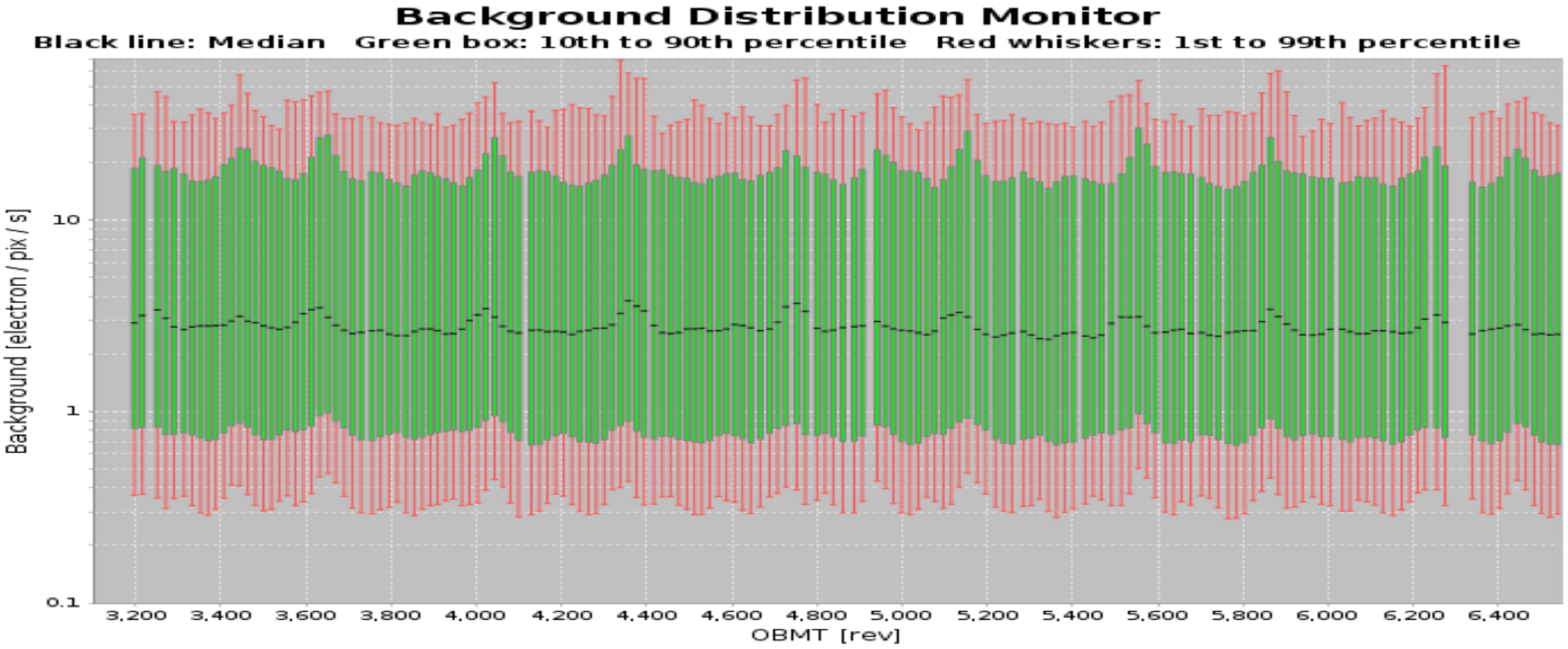

45°
SUN
Satellite spin axis
Line of sight 1
Precession of the
spin axis in 63 days
Gaia
Basic angle
Consecutive
great circles
Line of sight 2



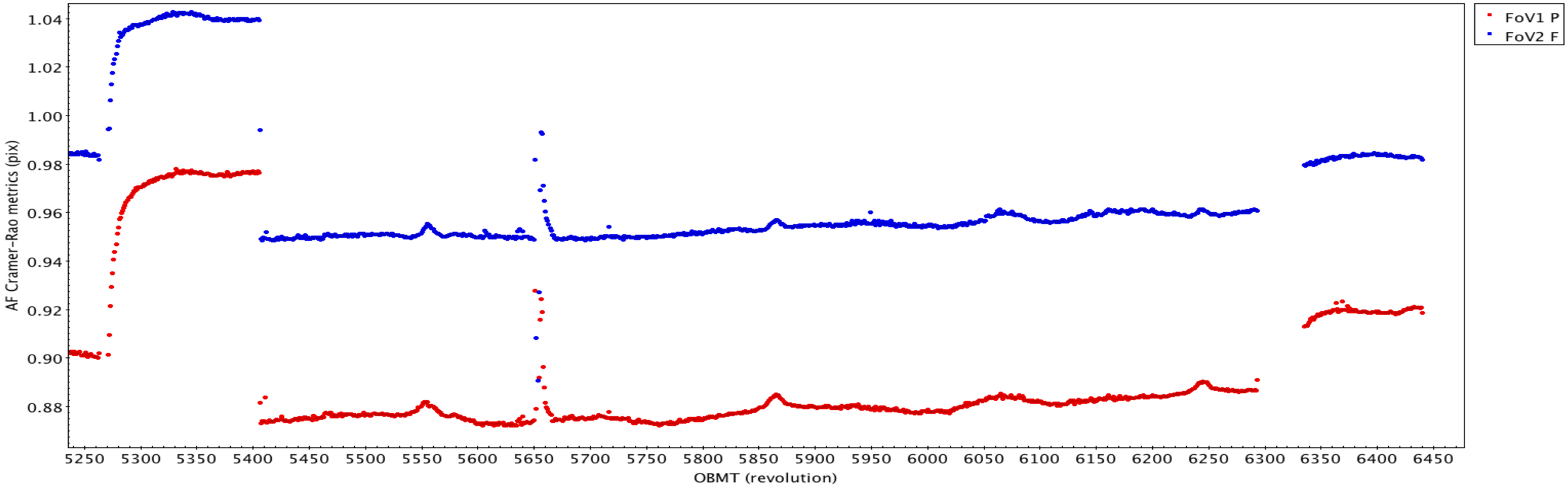
Introduction

- Gaia in routine operations since 25 July 2014
  - 49 months (Gaia DR2 was based on 22 months)
  - Operations
    - Nominal
    - (Scientific) issues to deal with:
      - Stray light
      - Focus evolution
      - Contamination
      - Micro-meteoroids and micro-clanks
      - Radiation damage
- Nominal end-of-mission summer 2019
  - Extension

Stray light

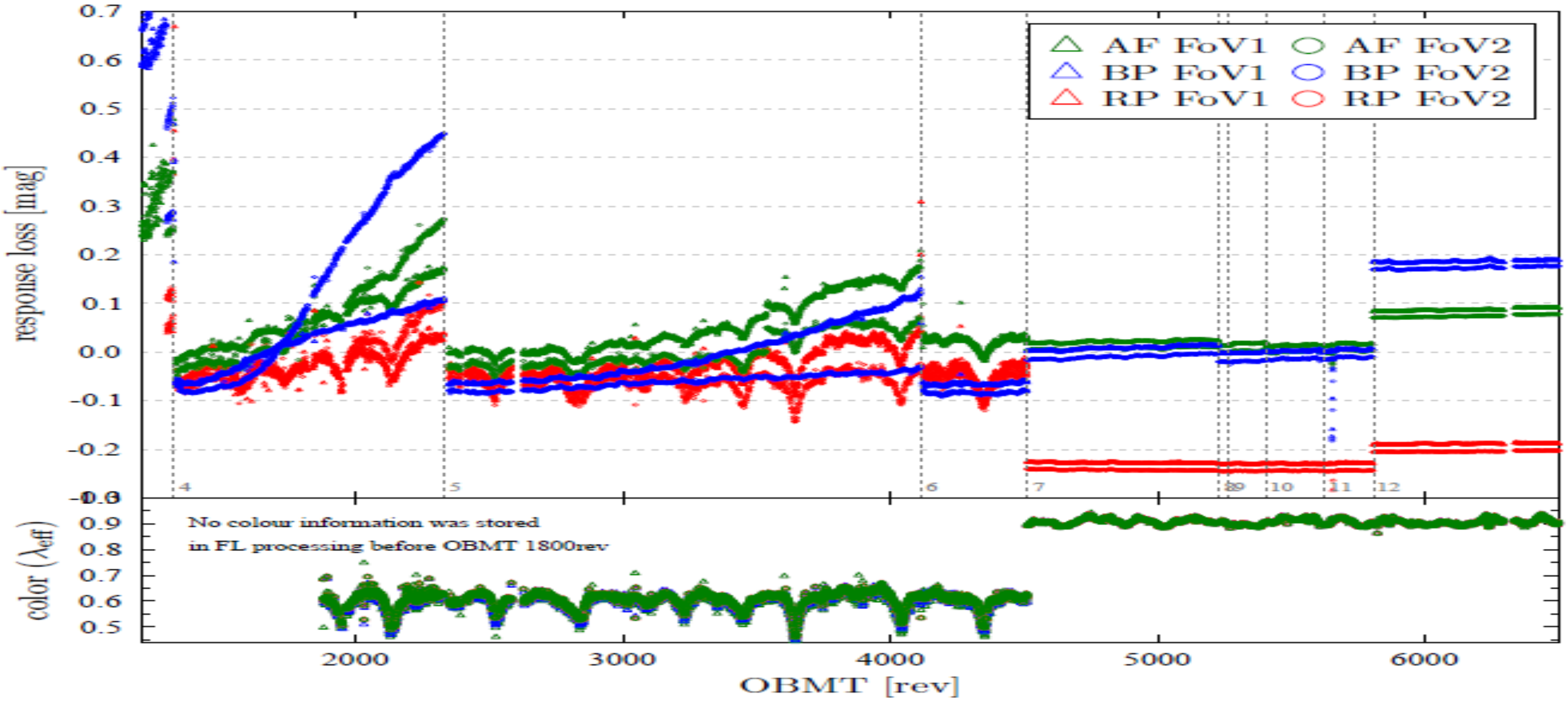

Background Distribution Monitor
Black line: Median Green box: 10th to 90th percentile Red whiskers: 1st to 99th percentile
Background [electron / pix / s]
10
1
0.1
3.200
3.400
3.600
3.800
4.000
4.200
4.400
4.600
4.800
5.000
5.200
5.400
5.600
5.800
6.000
6.200
6.400
OBMT [rev]

Focus

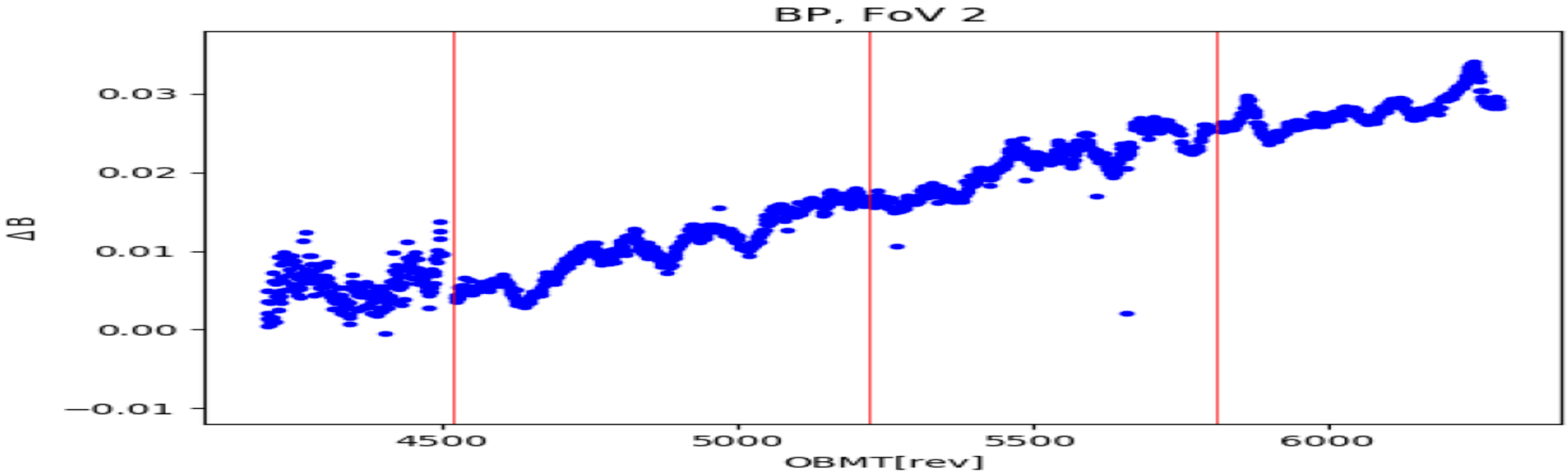


- Safe mode 6/17 caused focus degradation of 8.4 and 5.8% respectively to FoV1 & FOV2 => re-focus
- Safe mode 2/18 caused degradations of 3.9 and 2.3% (cumulative since last re-focus 5.3 and 3.6%) => wait and monitor

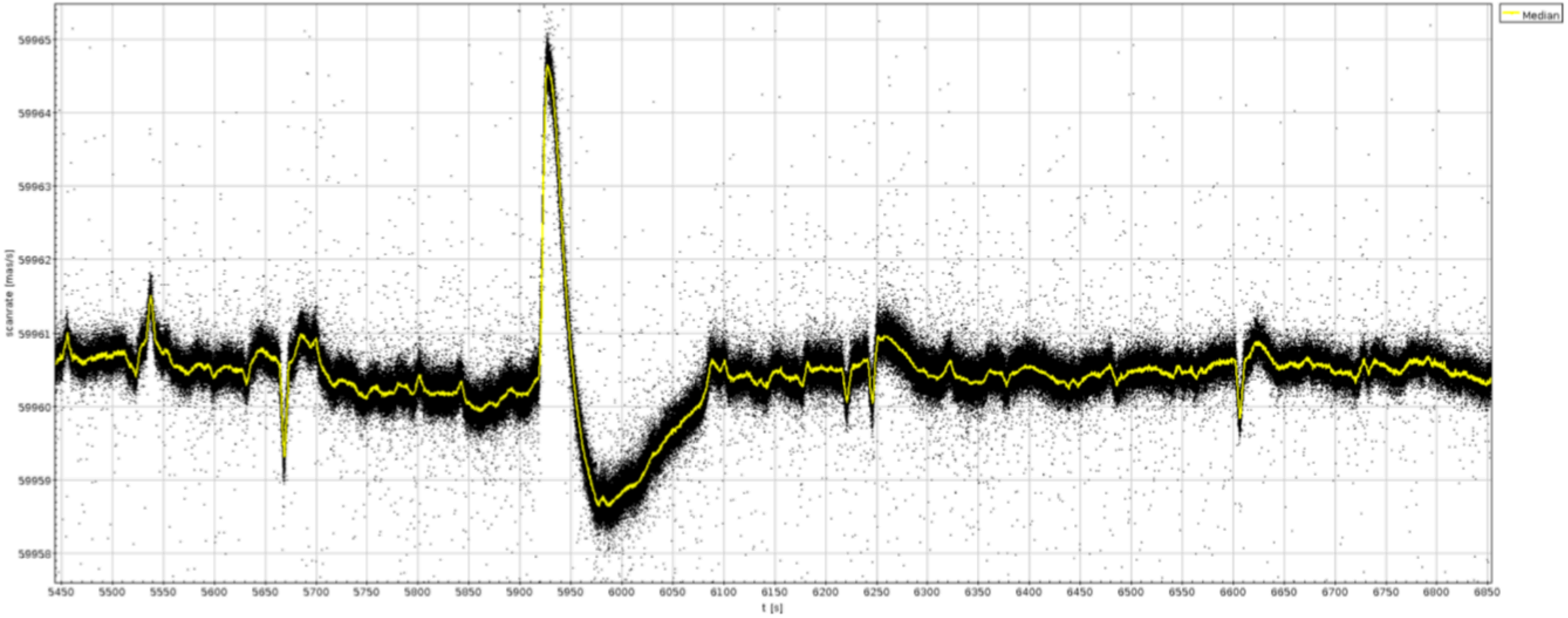
Contamination

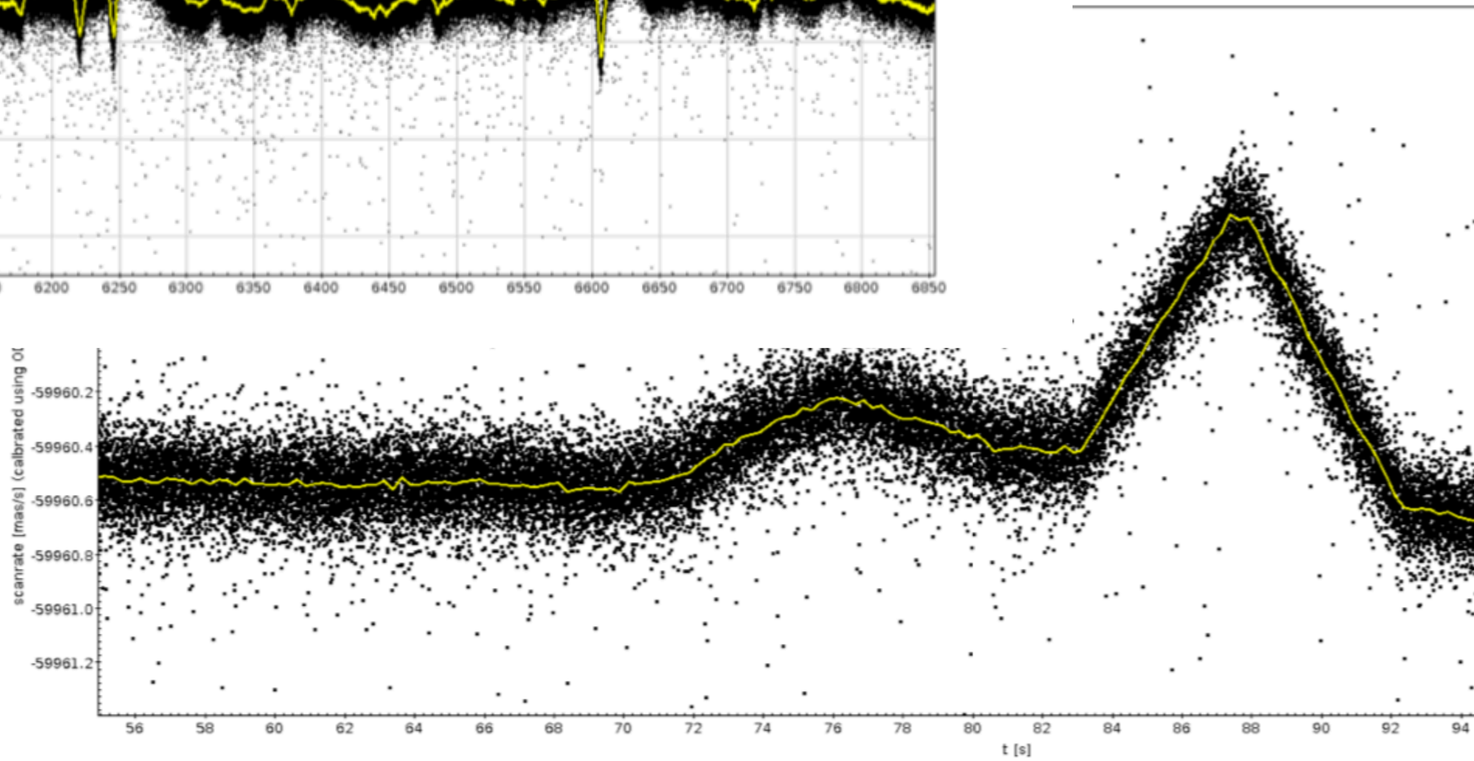


BP contamination

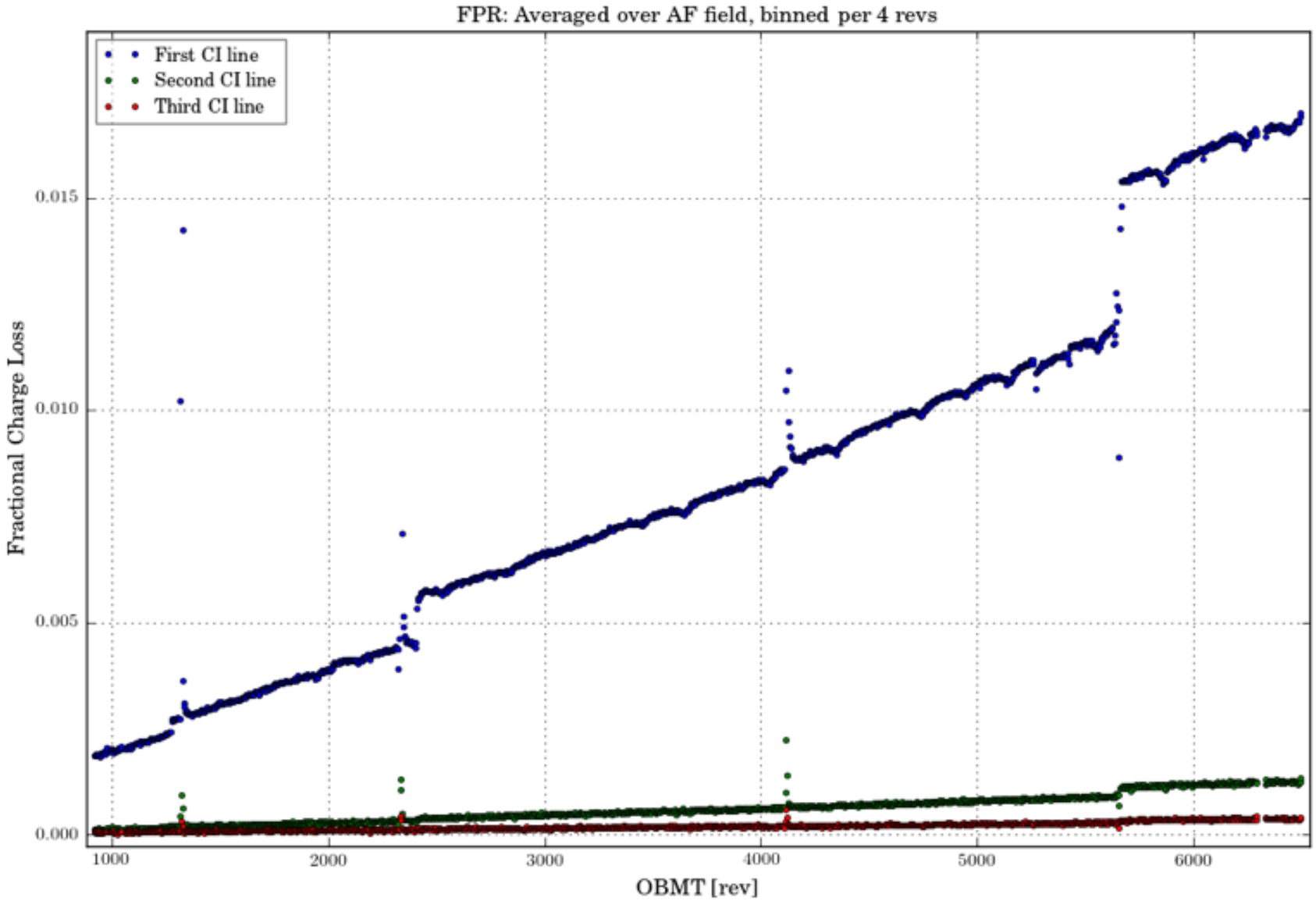


Micro-meteoroids and micro-clanks



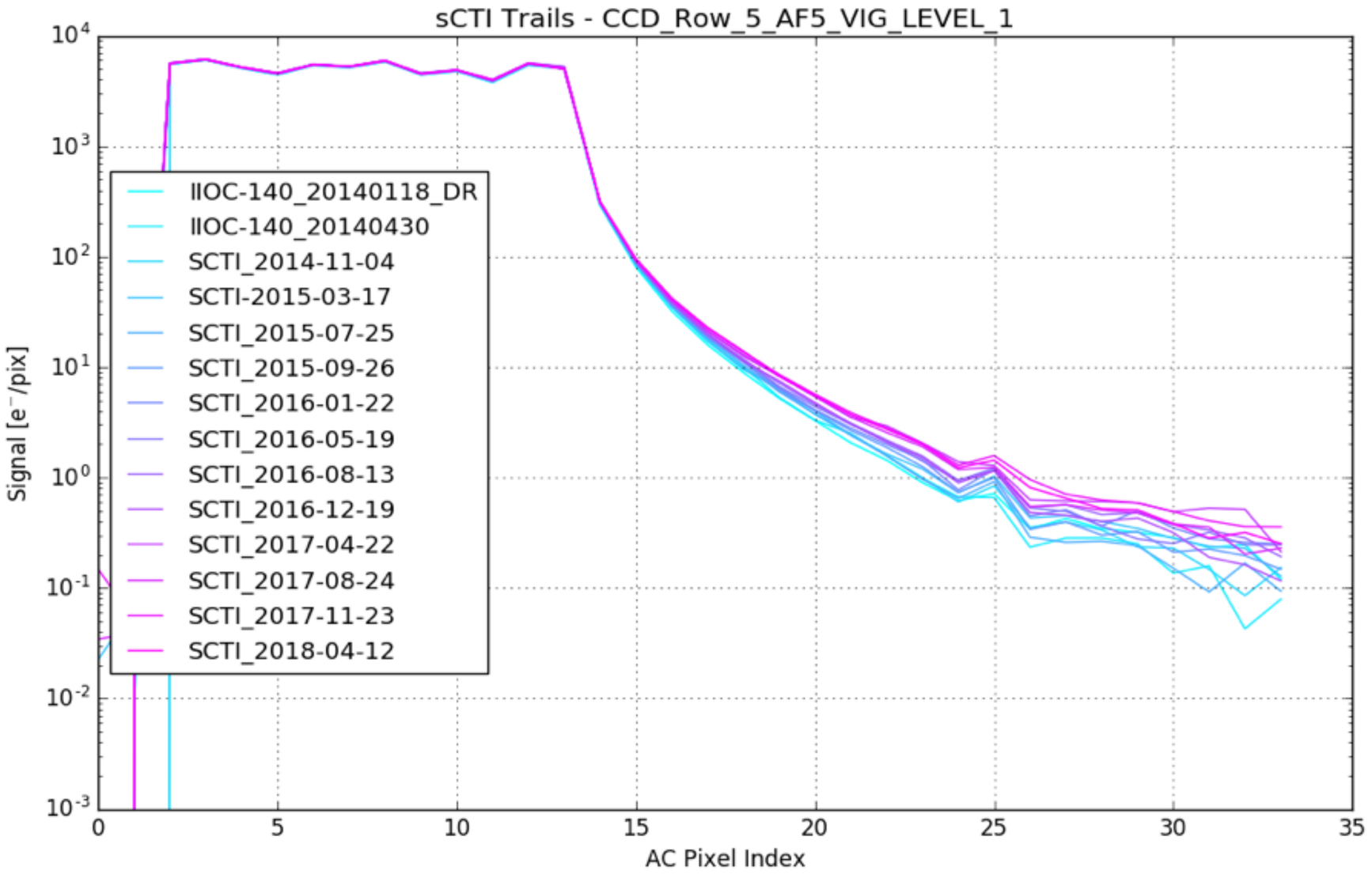


Radiation damage AL



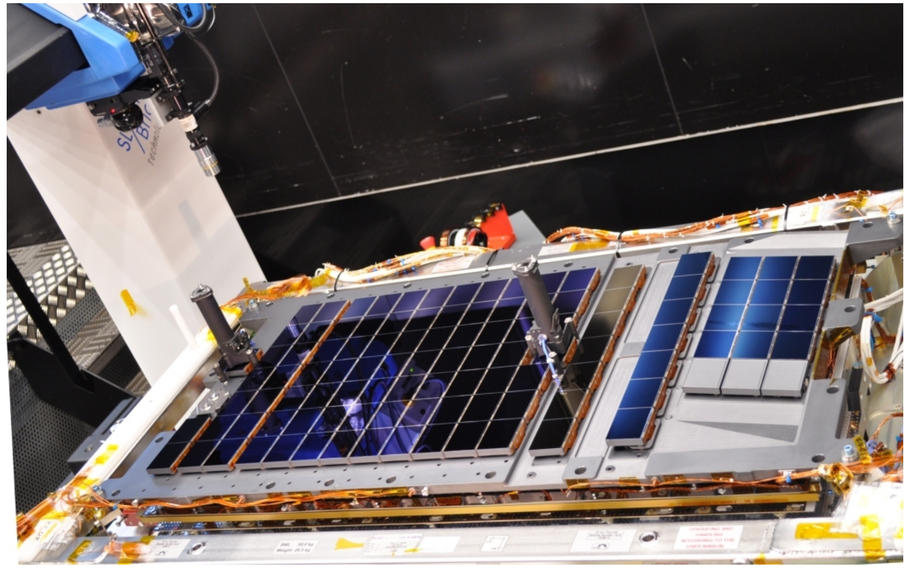
- Radiation damage after big 9/17 flare still factor of 6 below pre-launch expectation

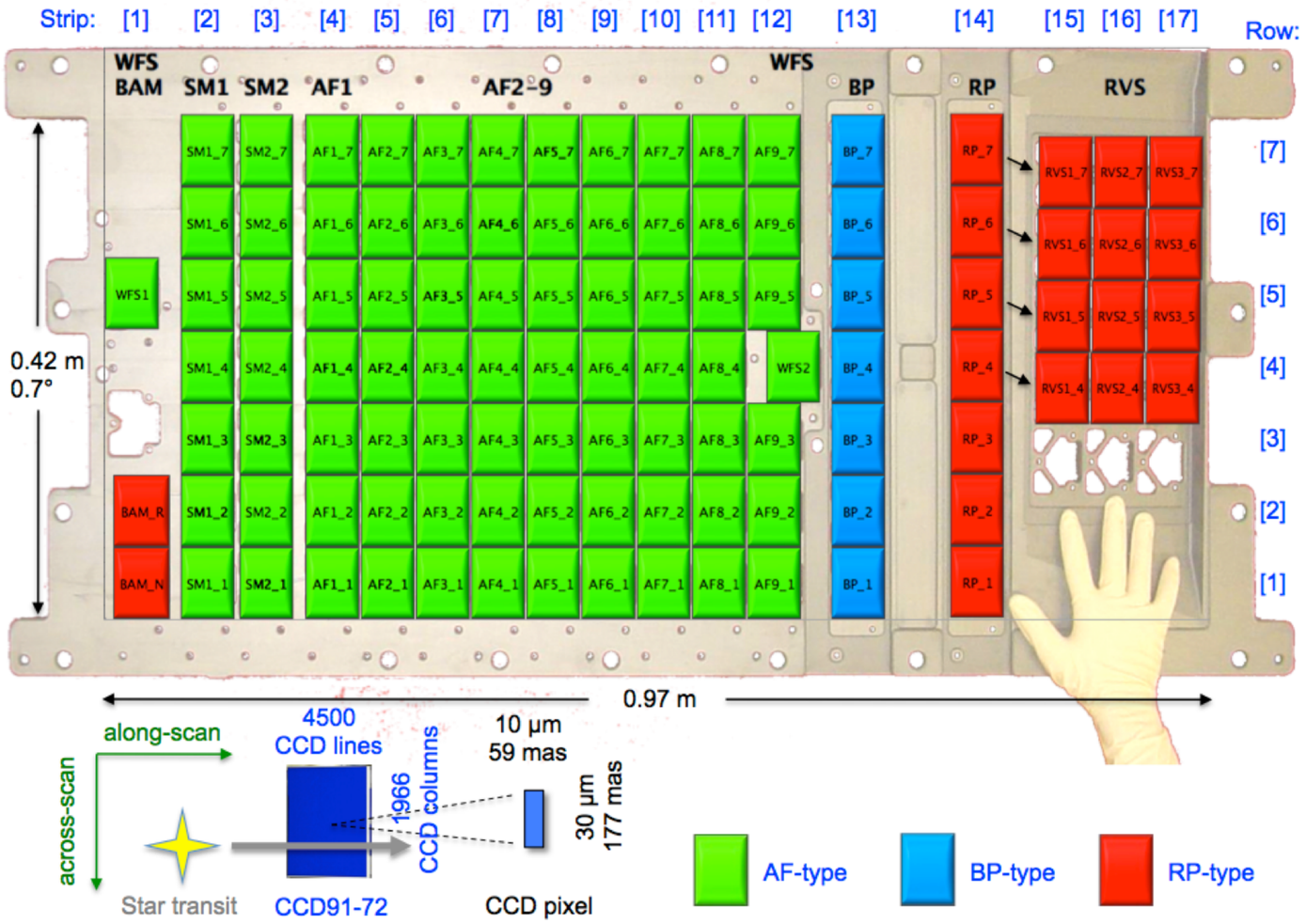
Radiation damage AC



Transits

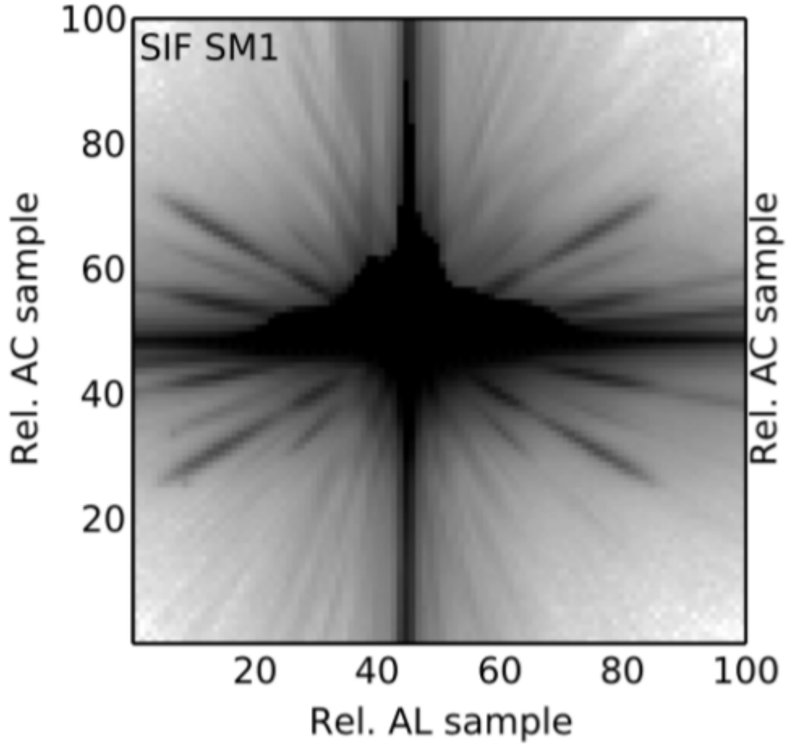
- 108 billion transits observed
  - Typically 300 transits per second
- Transit = autonomous detection (+ confirmation) + 9 astrometric measurements + blue and red spectrophotometry (+ 3 Radial Velocity Spectrometer measurements)
  - Astrometry and (spectro)photometry from 2-3 to 20.7 mag
    - 1,065 and 215 billion measurements respectively
  - Spectroscopy 2-3 to 16.5 mag
    - 20.5 billion spectra

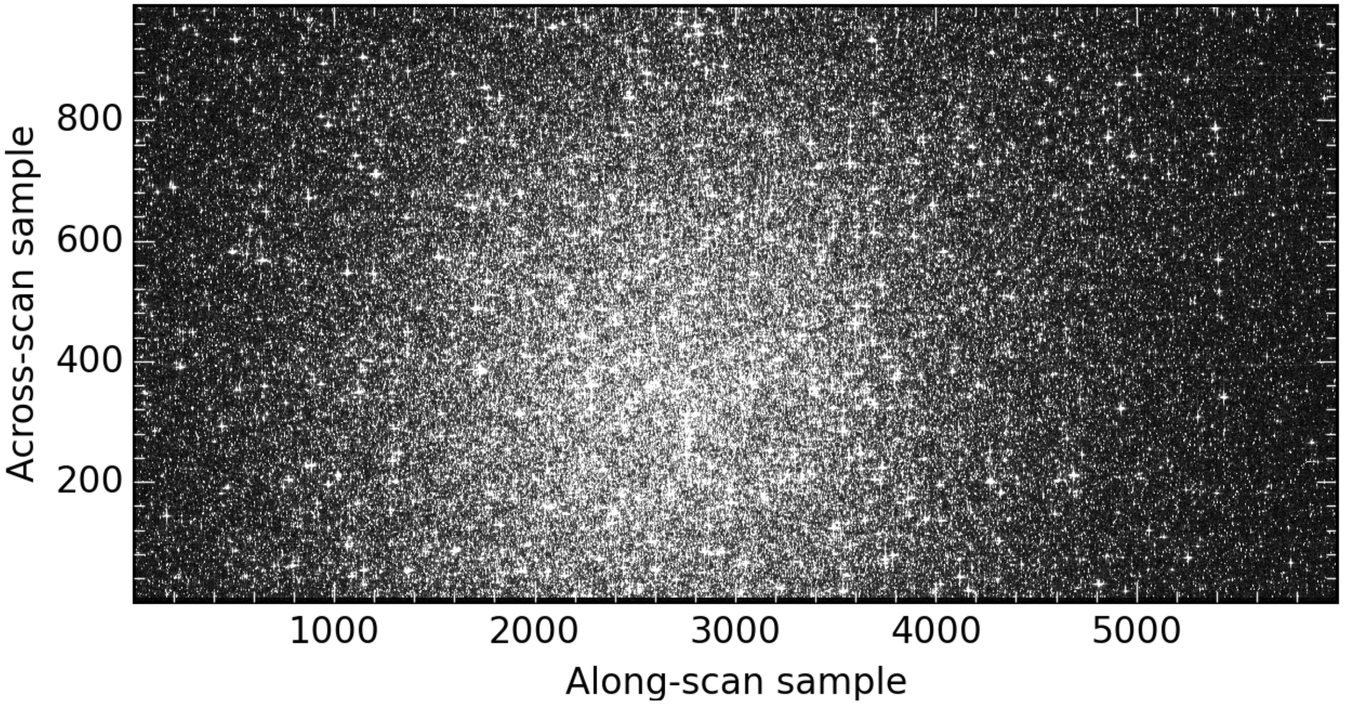


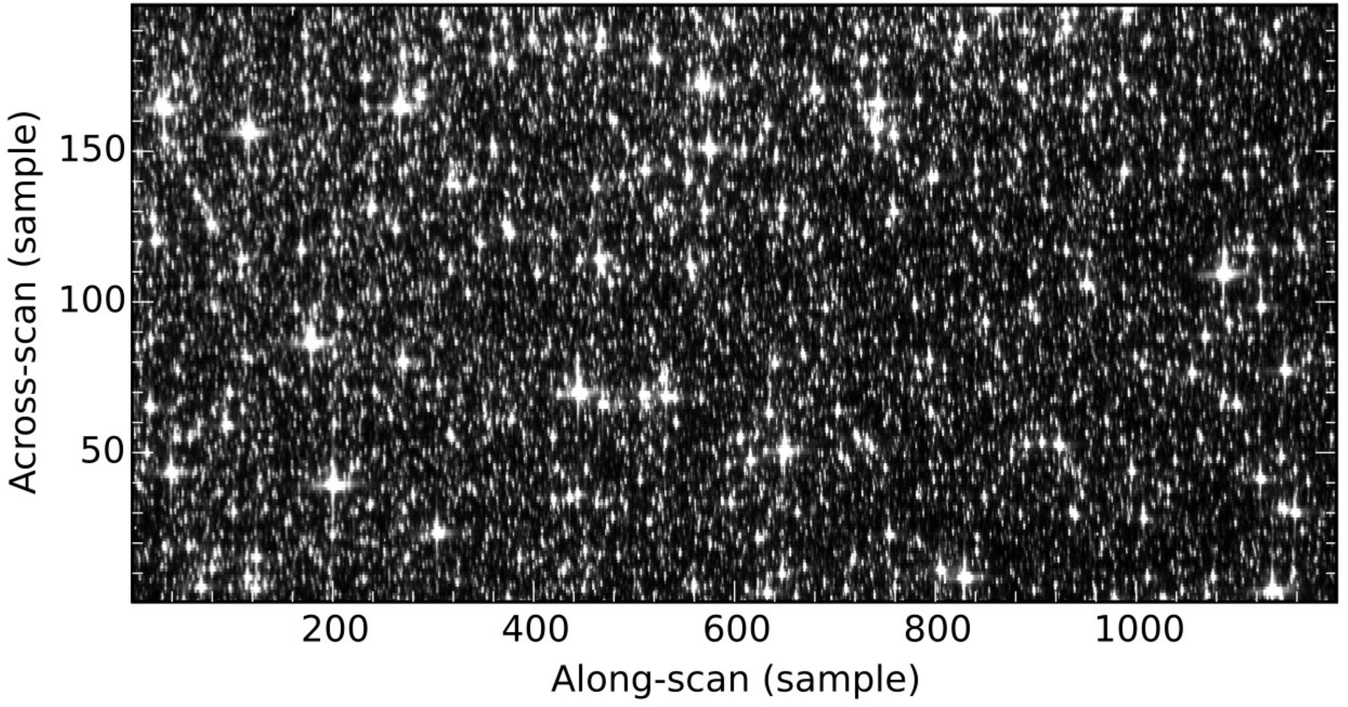


Additional science observations

- Basis for Gaia observations from transits
- Two main shortcomings
  - Crowded regions
  - The very bright stars (< 2-3 mag)

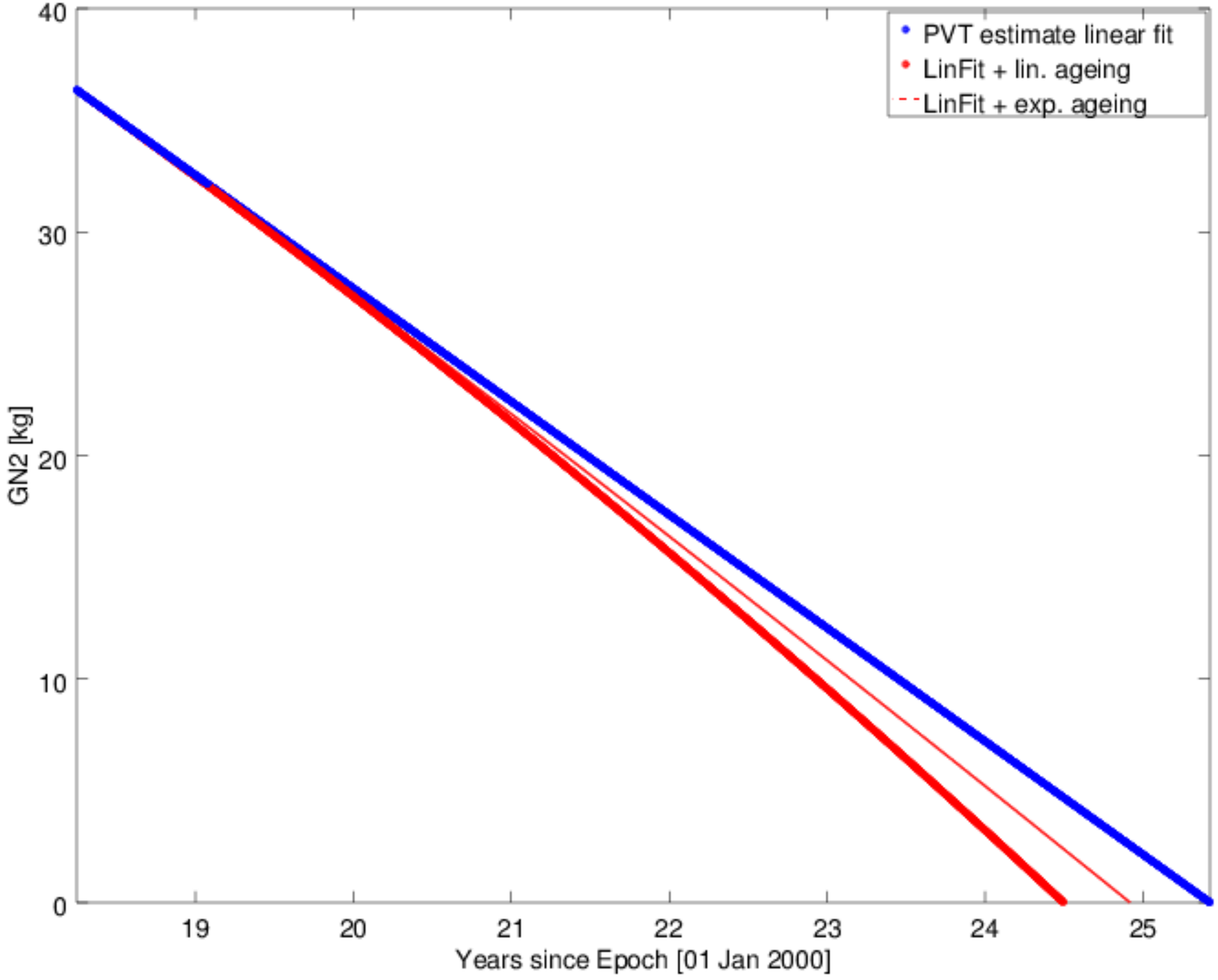






Life time

- If nothing breaks, end of cold gas for the micro-propulsion system will determine the end of the mission
  - Without cold gas no accurate attitude can be kept
- Estimate: November 2024
- Range: June 2024 - May 2025



Mission extension

- Gaia mission potentially has in addition to 5-year nominal mission 5-year extension
- Benefits
  - Faint end improvement in accuracy of photometry, parallax, radial velocity etc.
  - Proper motion accuracy scales as time to power 1.5
  - More complicated dynamics benefit even more of 10-year data taking (double stars, exoplanets, solar system bodies etc.)
- Status:
  - Scanning mode will continue in the extension phase
  - 5-year science case was already 2016 recommended by ESA advisory bodies
  - Indicative approval by ESA Science Programme Committee for mid-2019–2020
  - In November this year seeking definitive approval for mid-2019–2020 and indicative approval for 2021–2022