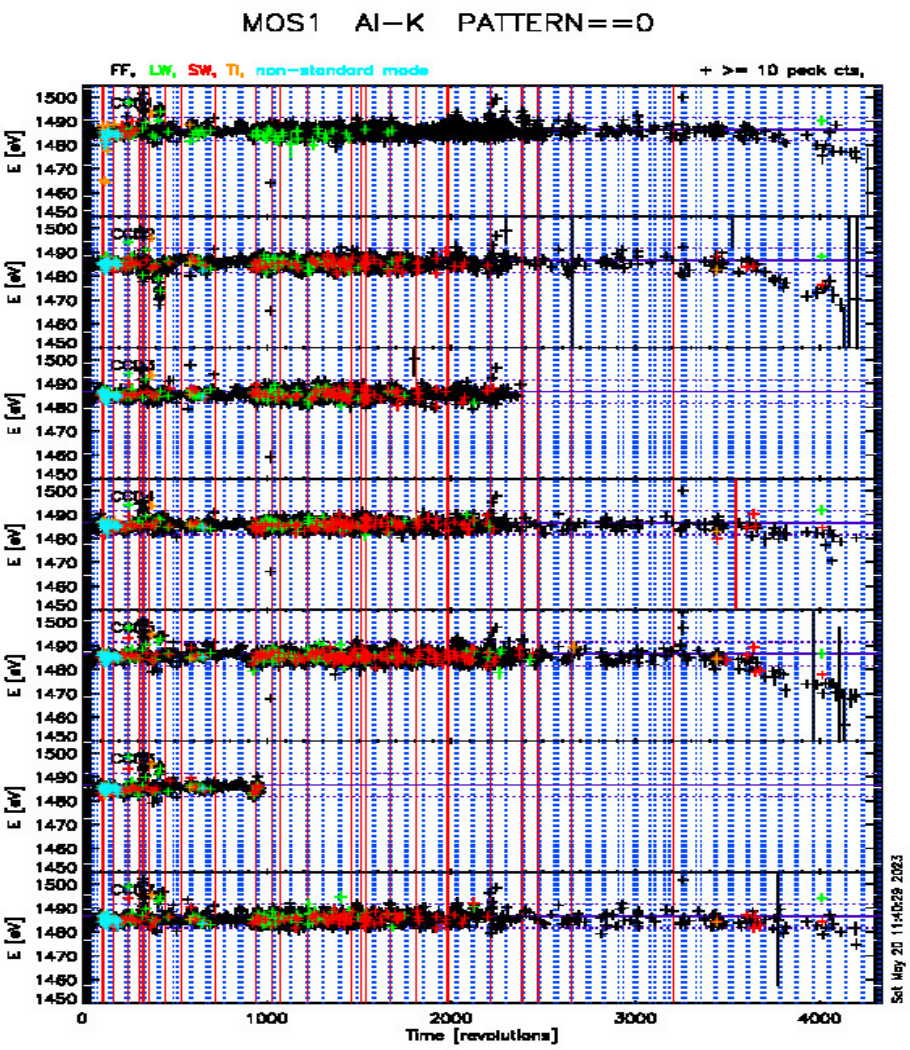
MOS monitoring

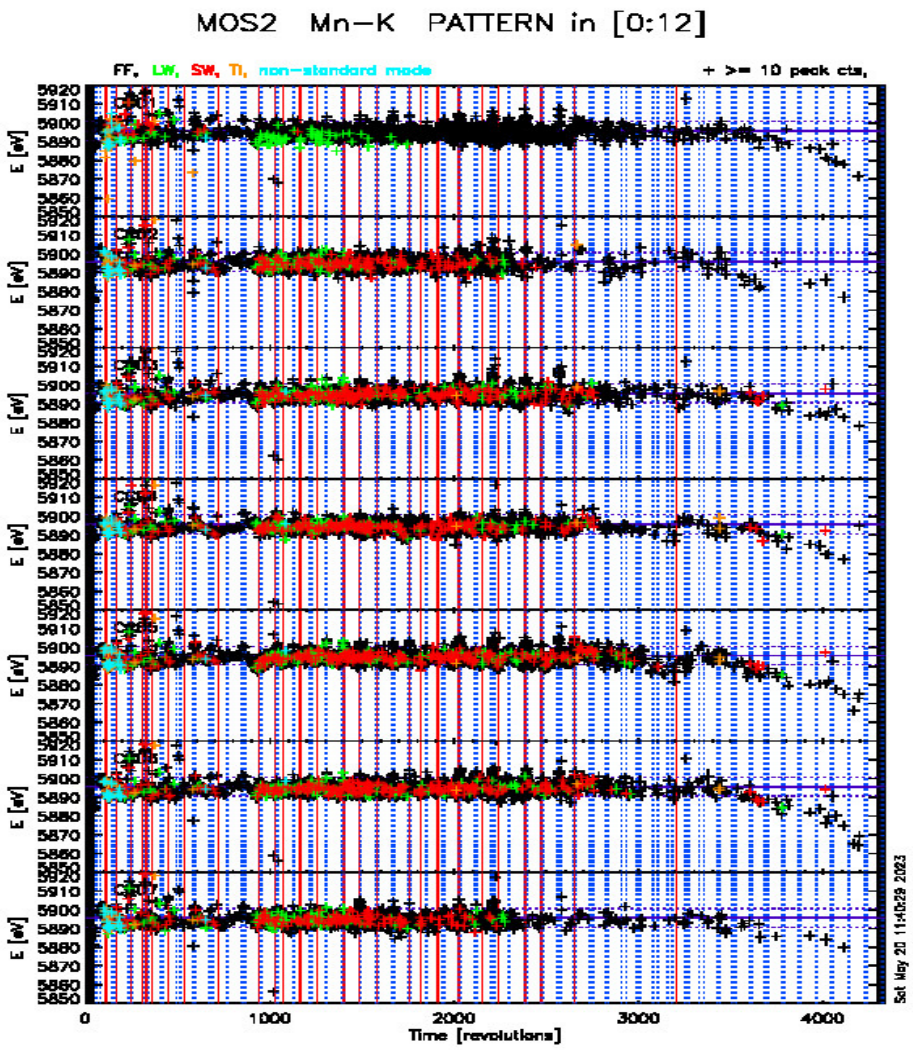
EPIC calibration meeting, ESAC

Martin Stuhlinger, Serco on behalf of ESA, SCO-04

22/05/2023

Line monitoring: before CTI update





CTI monitoring

Currently in transition phase:

Previous method: CTI monitoring code taken over from EPIC-MOS team of University of Leicester

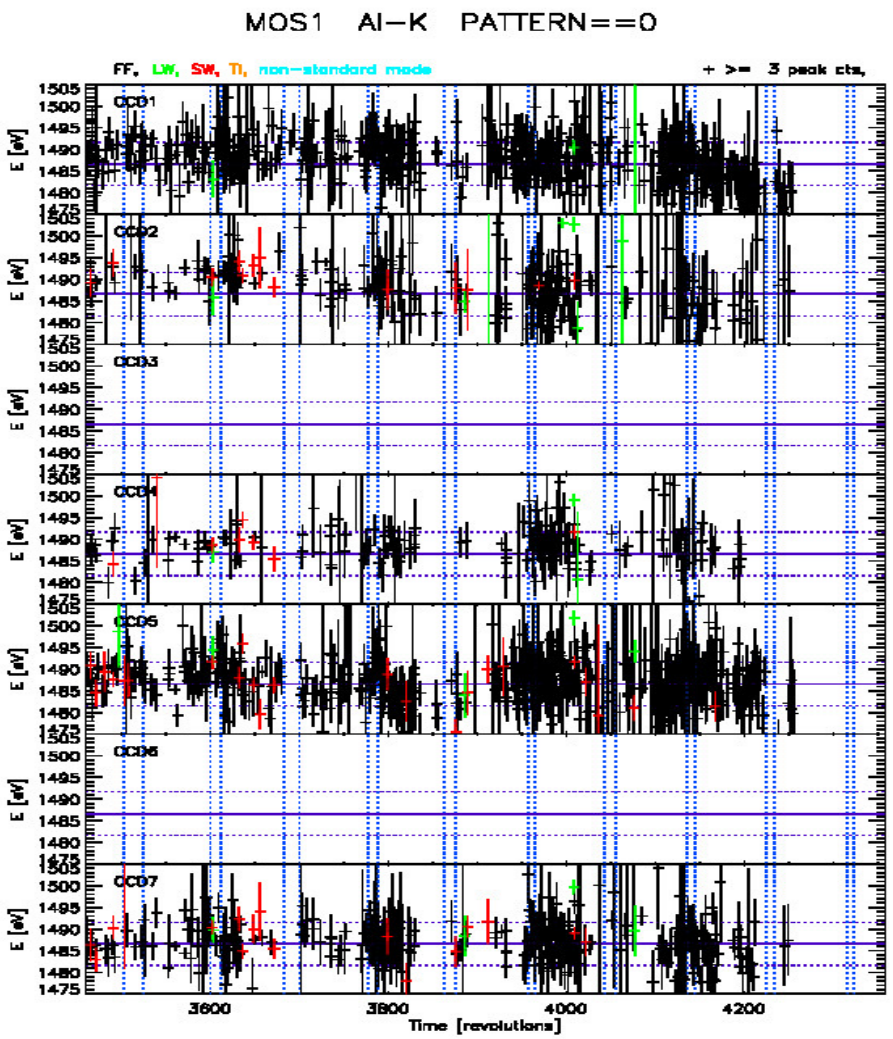
- Measure for a TBD epoch the parallel CTI, serial CTI and calculate the gains to adjust energy scale.
- Due to decay of ^{55}Fe calibration source, statistics insufficient for CTI measurements in current epoch.

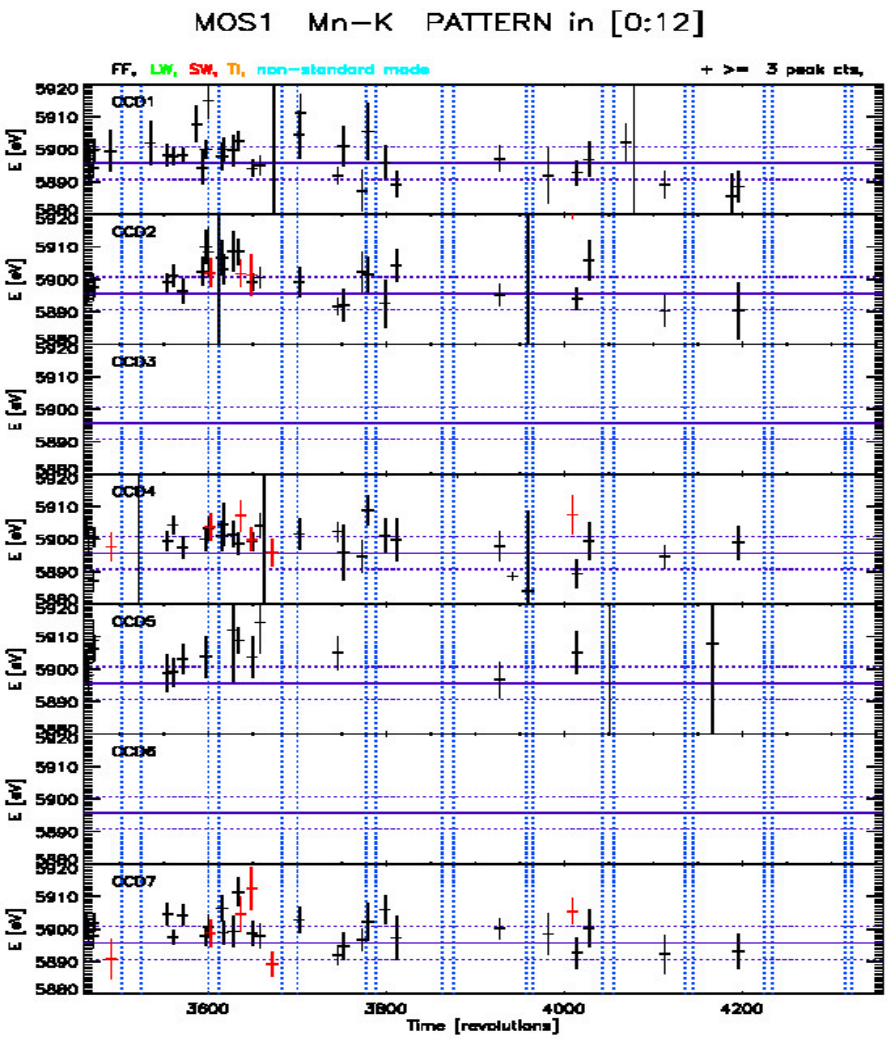
New method:

- CCD averaged calibration line energies can still be measured.
- Calculate required parallel CTI to shift Al/Mn line energies to expected values.
- Assume serial CTI to be constant. Justified by measured evolution when statistics were still sufficient (rev. range about 1000-3000). Serial readout in storage area.
- Assume gains to be constant (values of previous epochs). Assumption to first solve the CTI in transition phase.

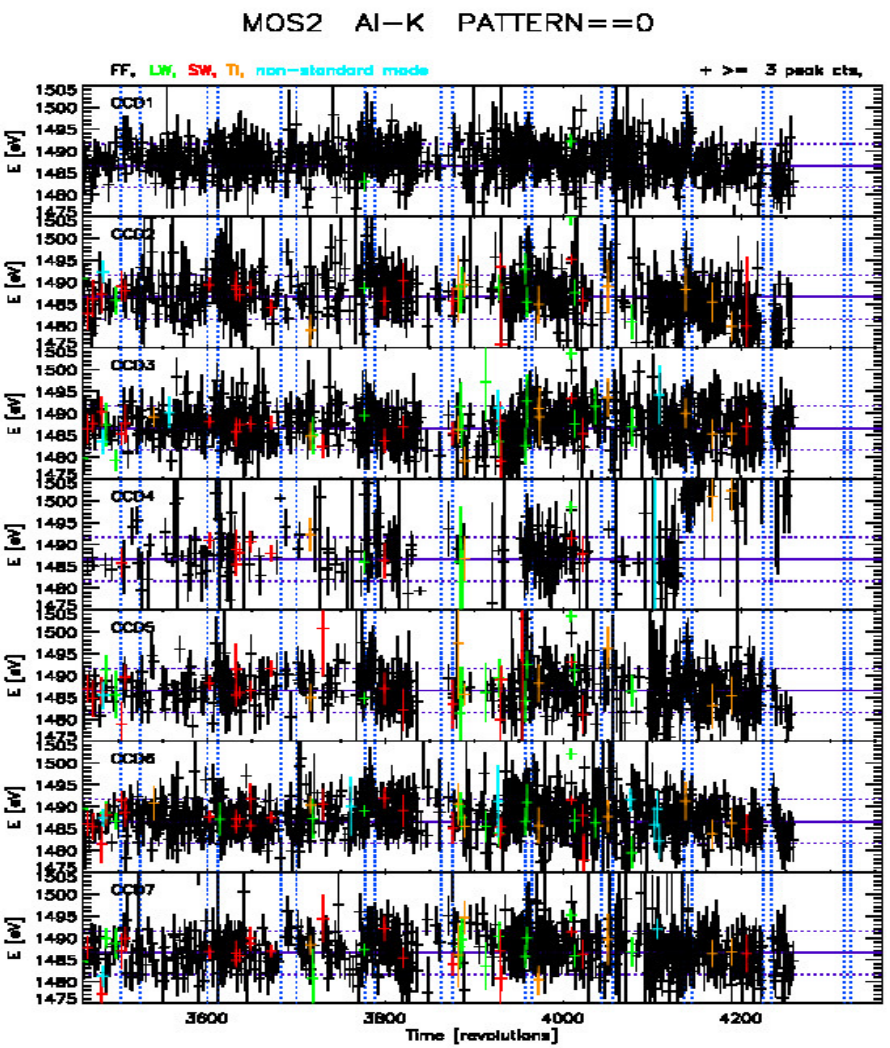
New CTI CCFs recently (May 2023) published applying this new method.

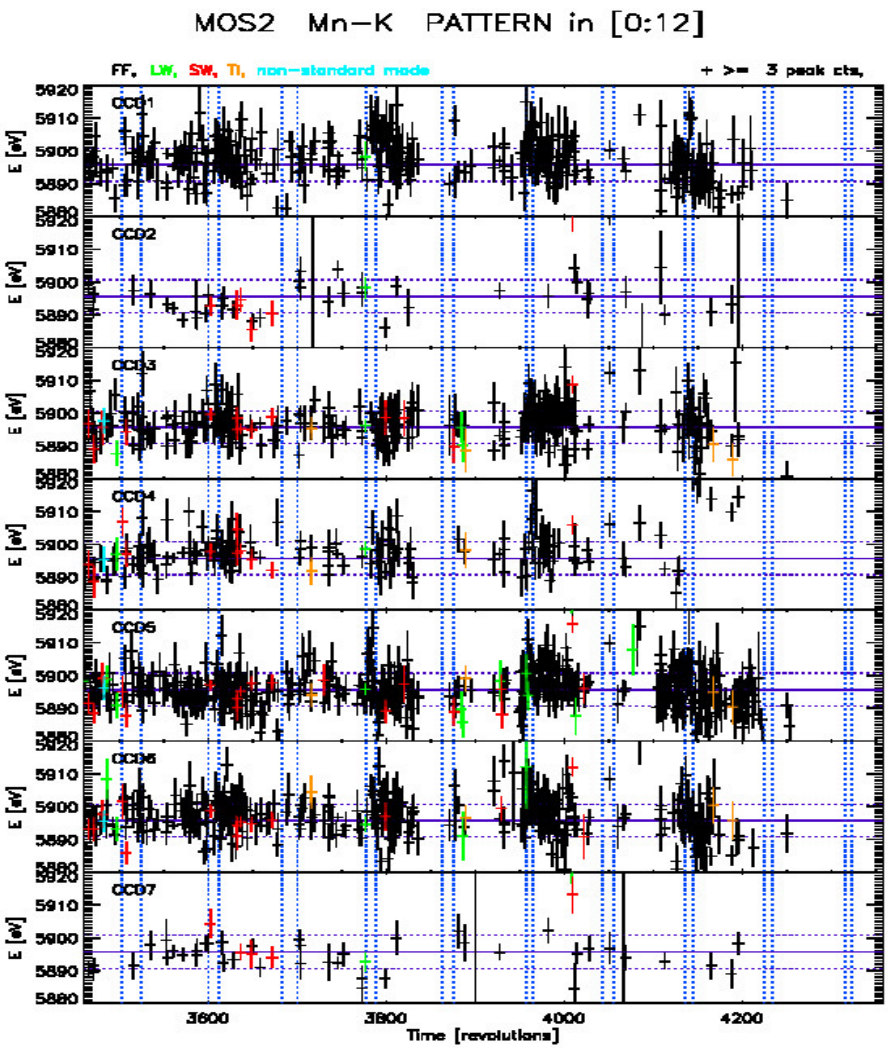
Line monitoring: MOS1 line energies



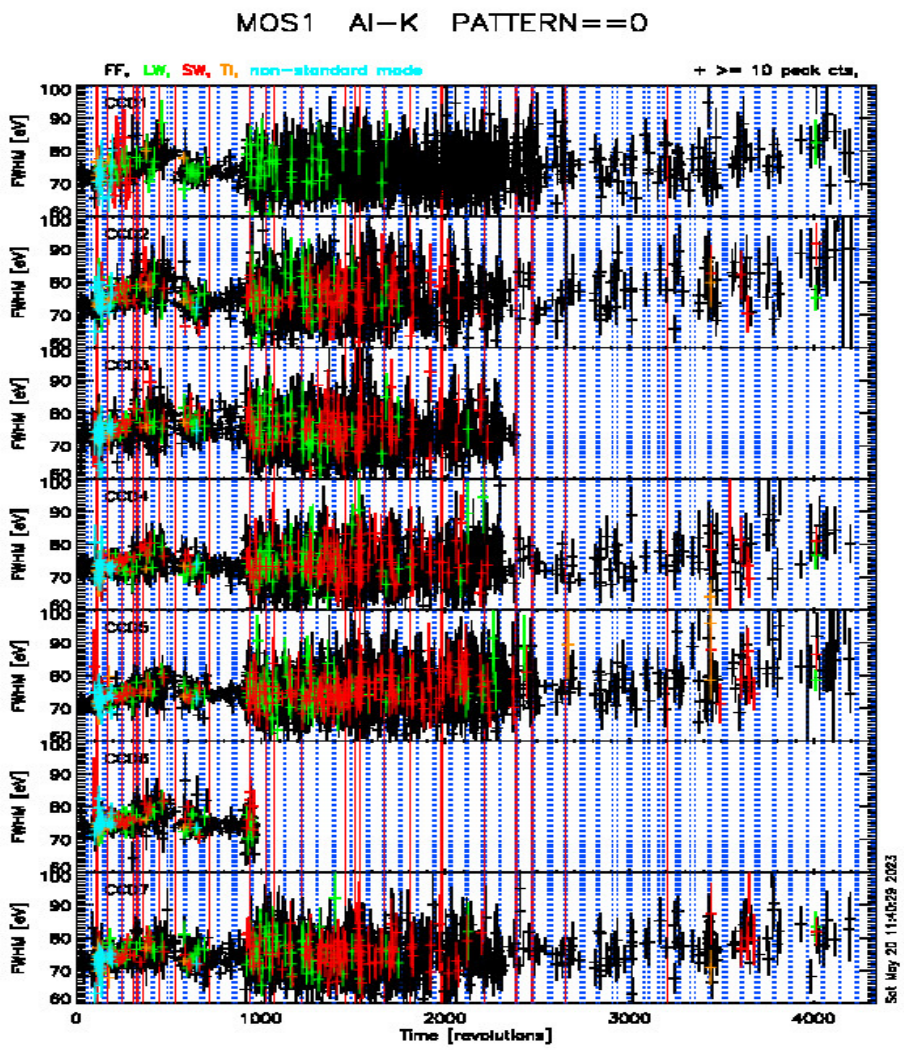


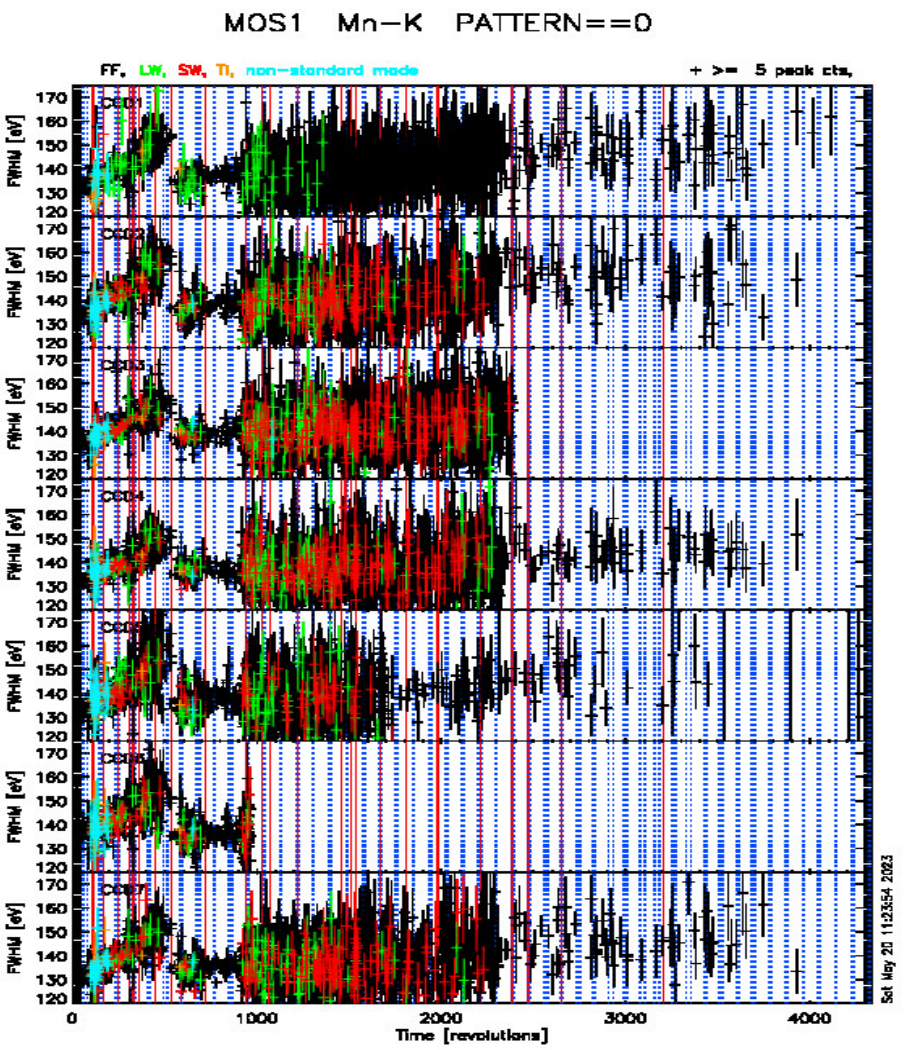
Line monitoring: MOS2 line energies



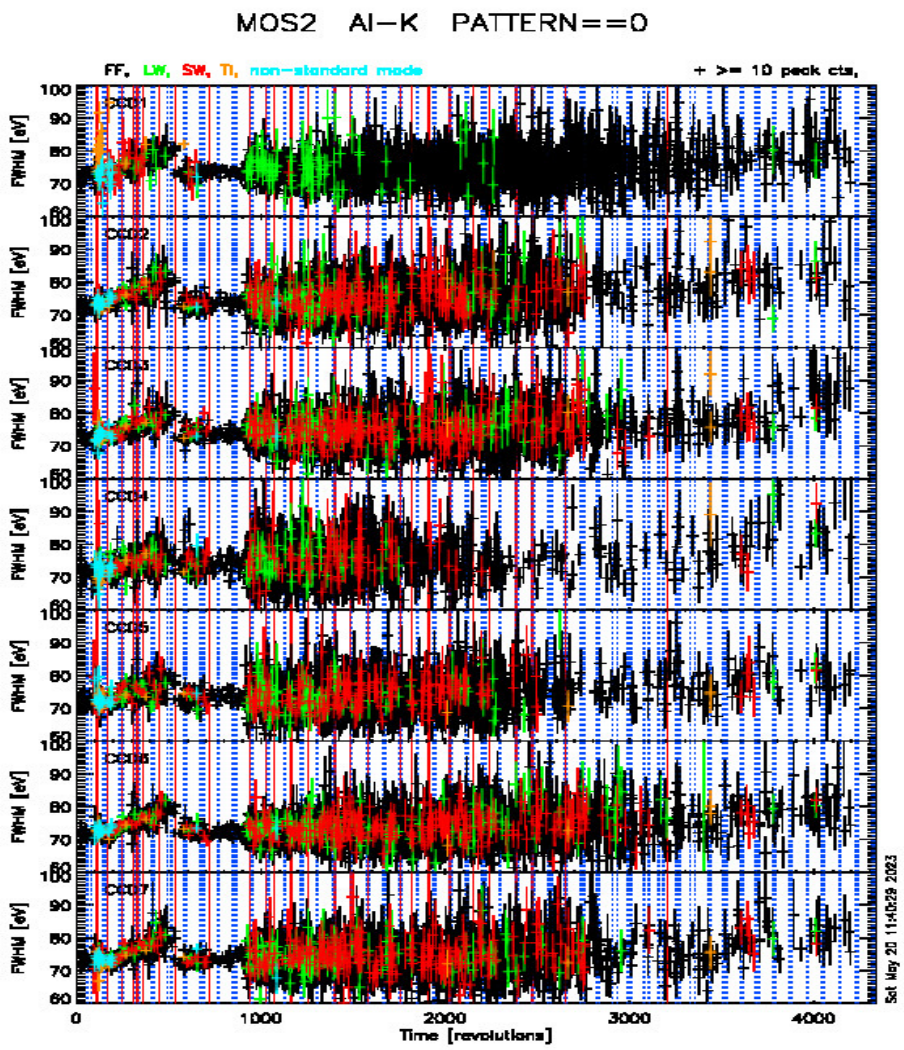


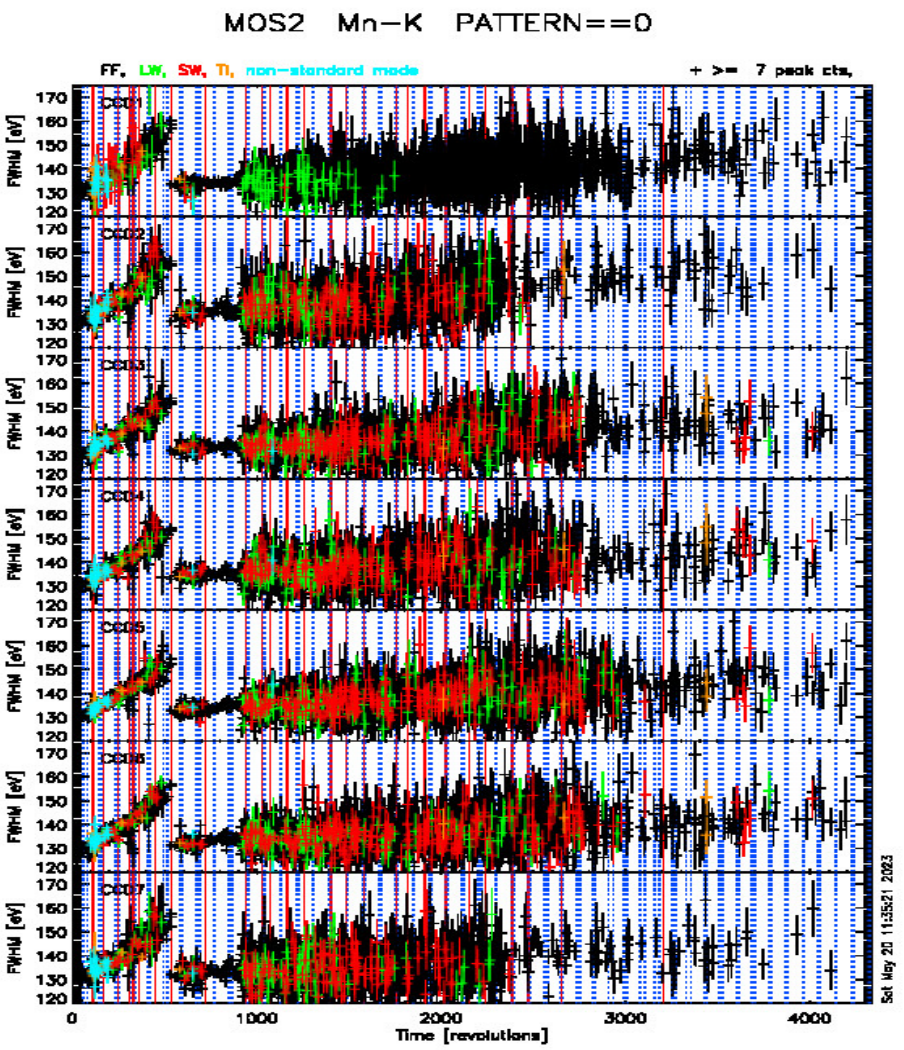
Line monitoring: MOS1 line widths



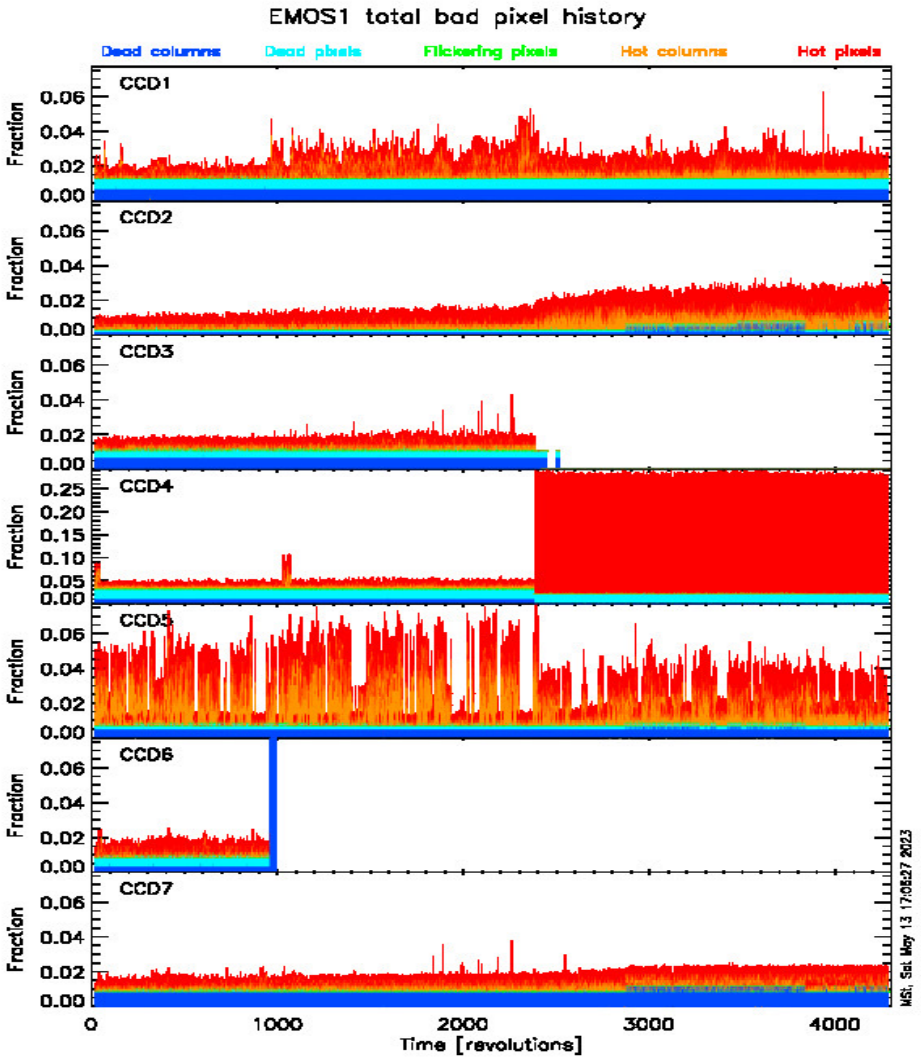


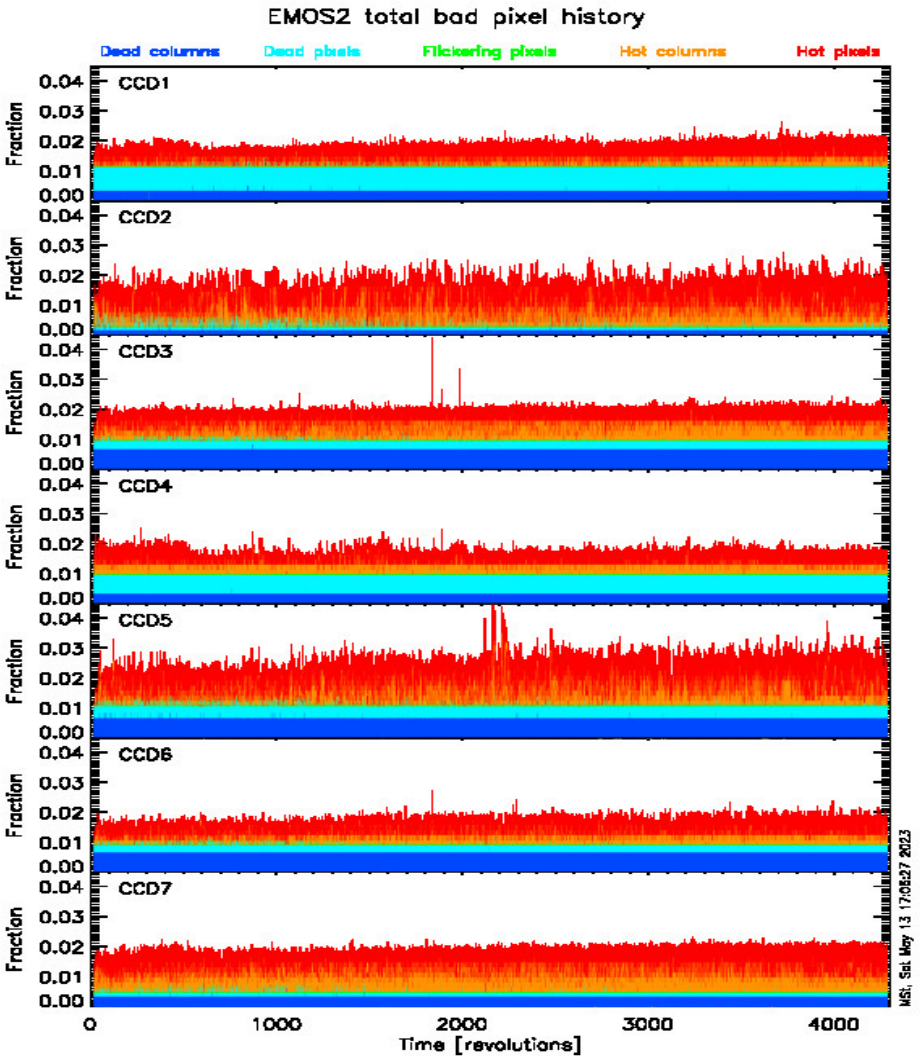
Line monitoring: MOS2 line widths





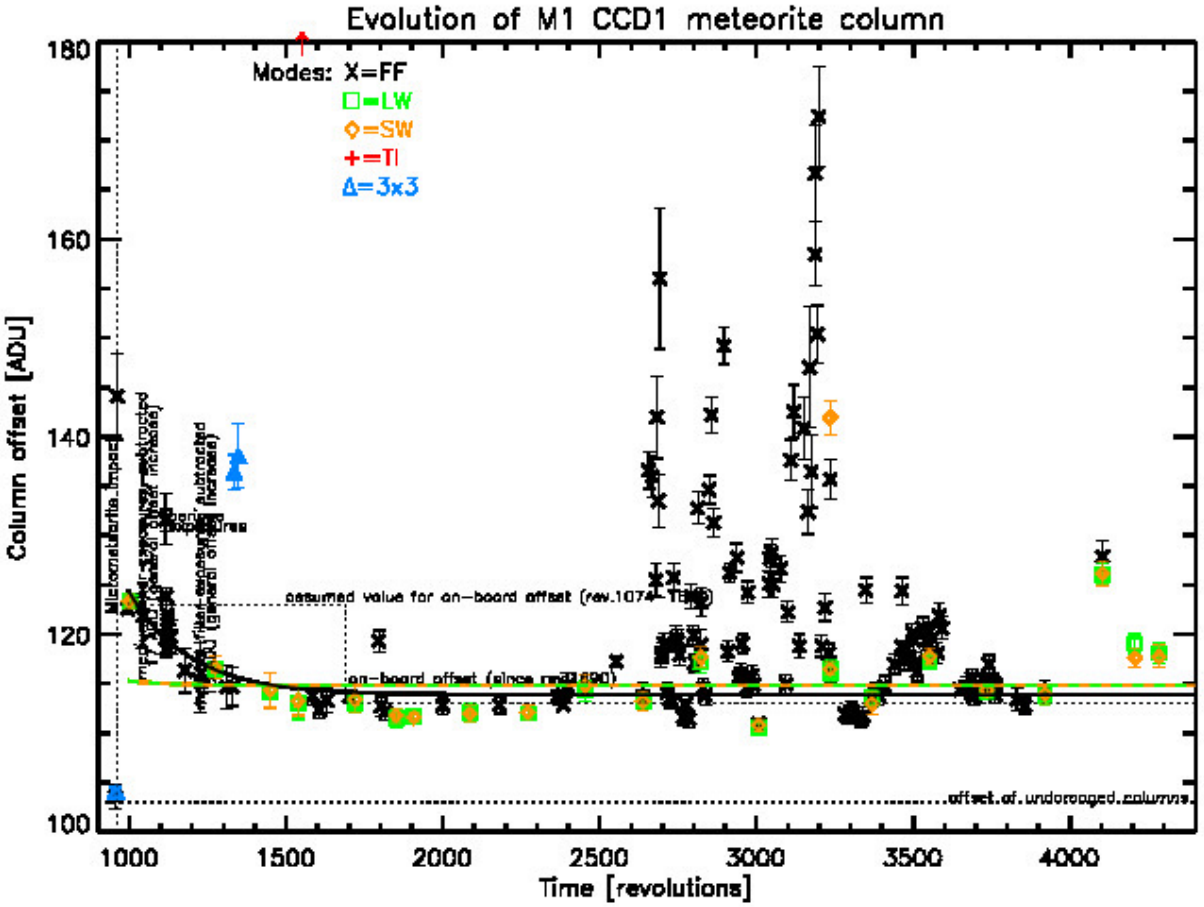
MOS bad pixel tables: event list files





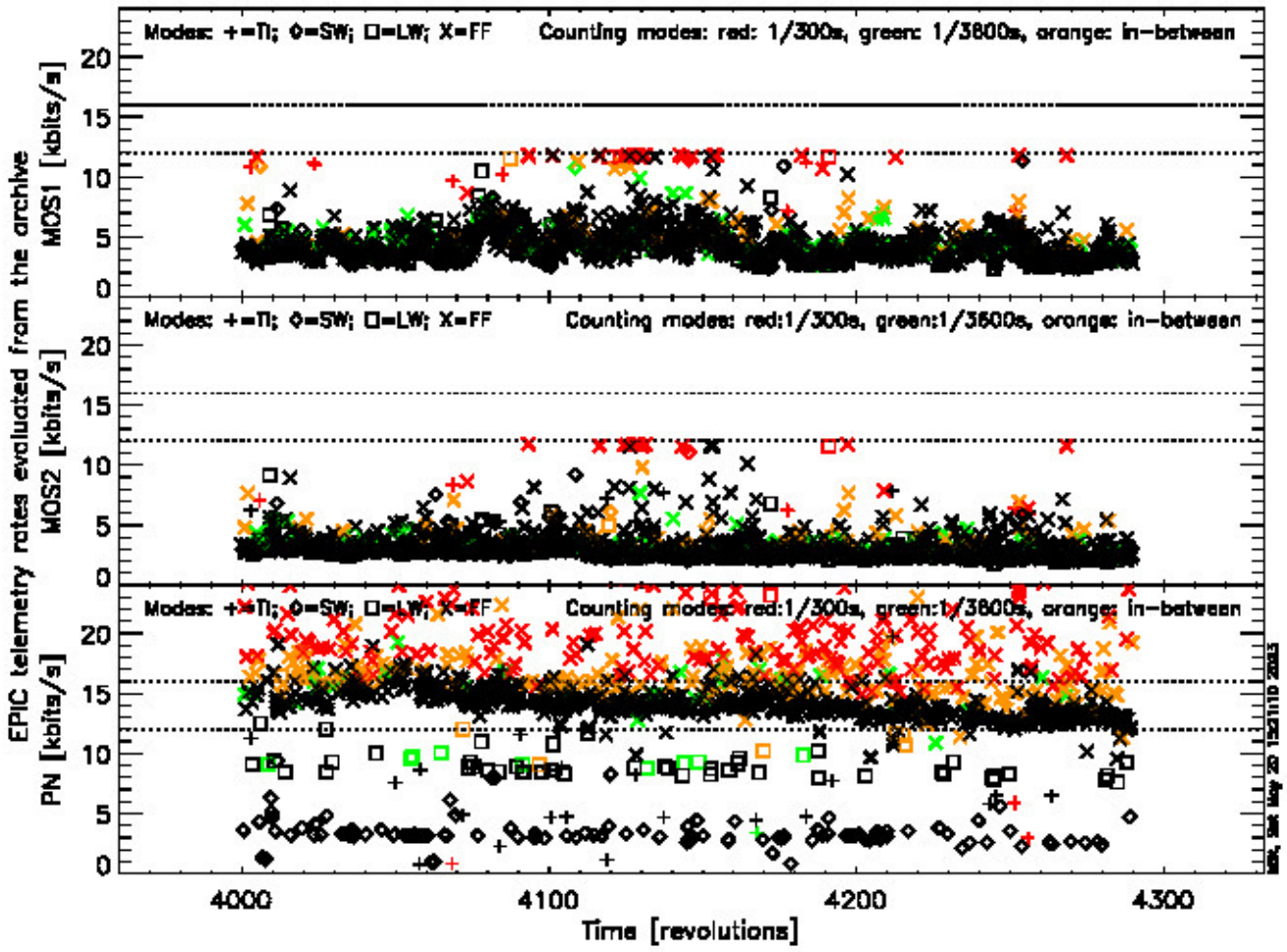
MOS1 meteorite column monitoring

- More frequent monitoring with additional diagnostic exposures stopped.
- Nominal calibration plan includes two series of diagnostic exposures per year.
- No series of FF exposures, just one diagnostic per CCD does not allow measurement of full column (cosmics).
- Column offset calibration of the most recent two SW/LW series consistent at about 117/118 ADU.
- Recently column more often available in scientific exposures.



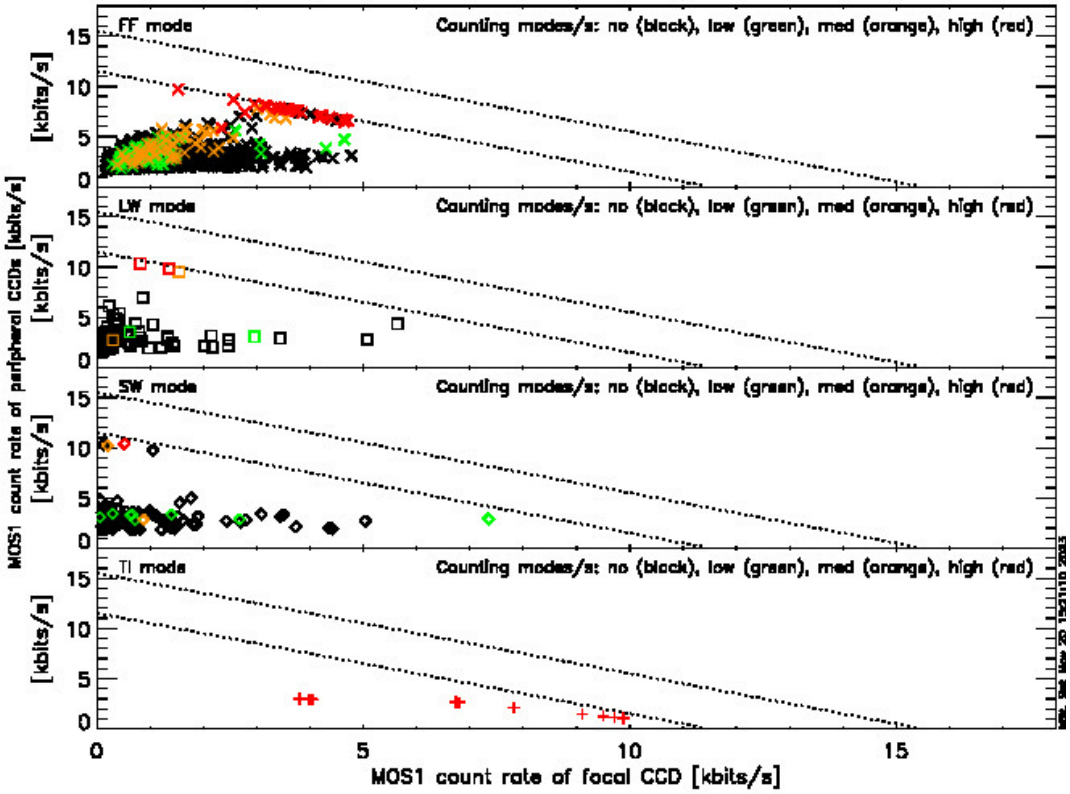
EPIC telemetry monitoring: revs. 4000-4289

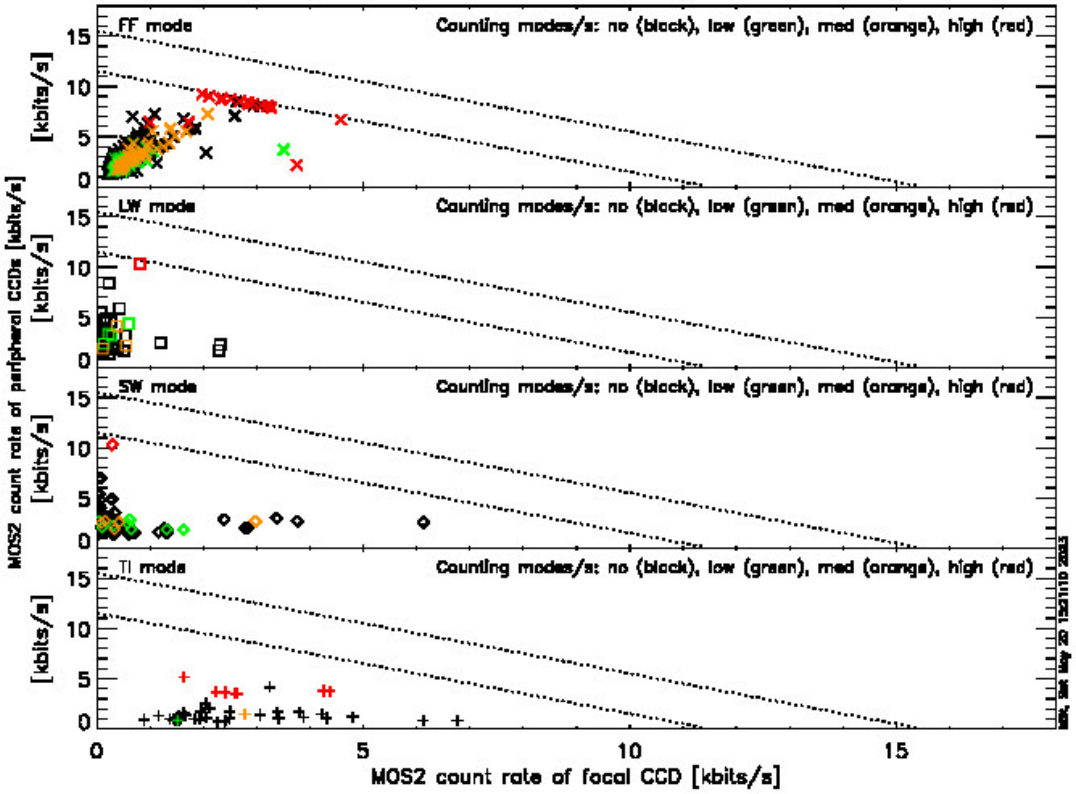
- Telemetry of EPIC instruments nominal.
- MOS1 FF telemetry shows variability due to more or less active CCD1 meteorite column.
- MOS2 FF telemetry shows soft decrease after about rev.4110.
- PN average FF telemetry shows soft decrease since about rev.4050.



EPIC telemetry monitoring: observation modes

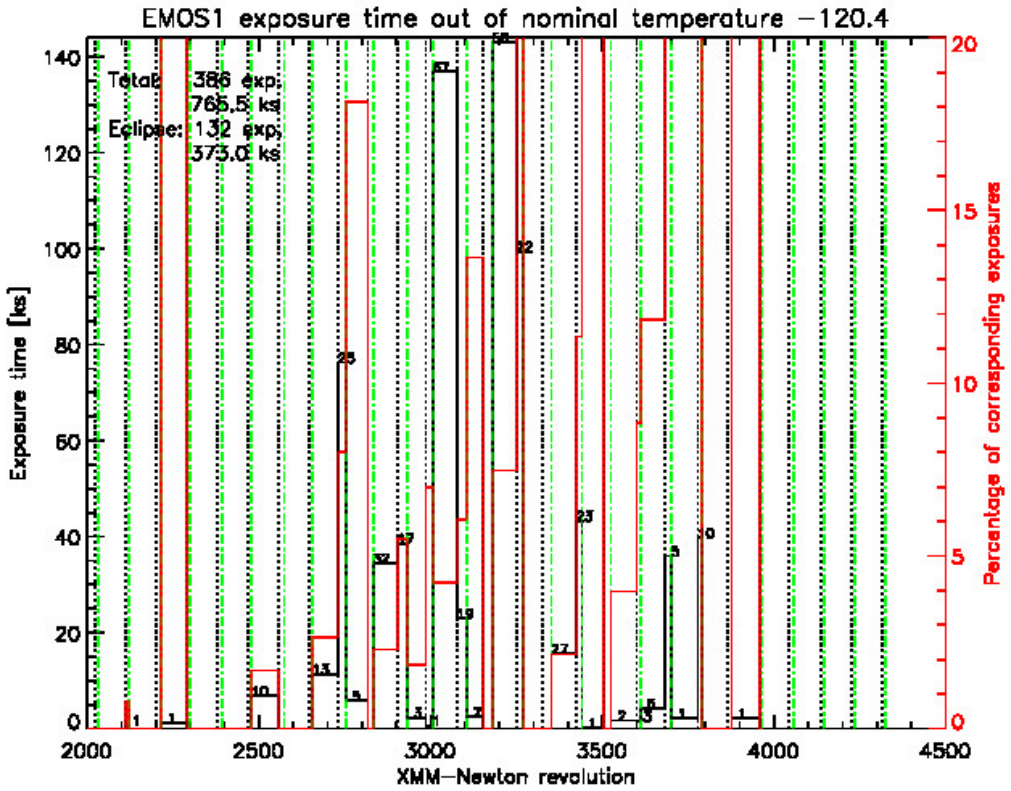
- Nothing unusual to report.

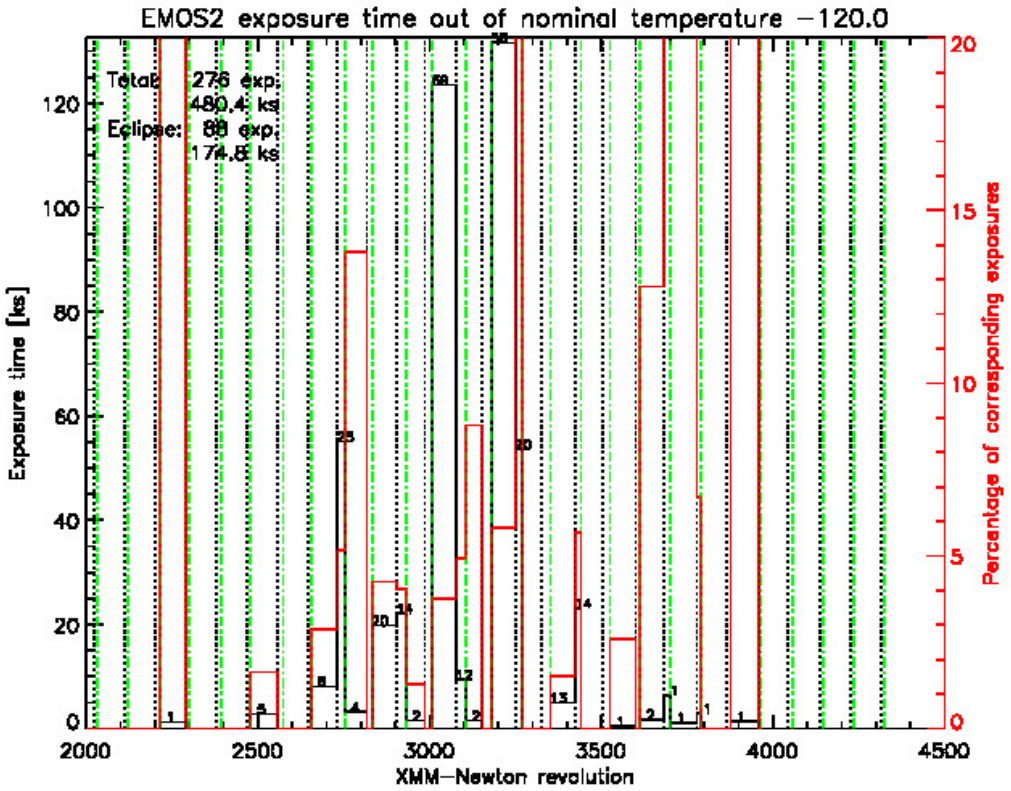




Exposure time out of nominal focal plane temperature

- No scientific exposure affected for last 5 exclipse cycles (M1 exposures during M2 SEU rev. 3785).
- Last exposure affected in rev. 3935 (CalClosed ObsID 0864010201).





Summary

- Recent MOS CTI update using new method still in transmission phase corrects line energy reconstruction for current epoch to better than ~10eV (MOS1 CCD5 @Mn).
- ADUCONV CCF update will correct for MOS2 CCD4 line energy jump after eclipse season around rev. 4140.

- Bad pixel level still low for active CCDs: MOS1 3-6% (except CCD4), MOS2 up to 3%.

- MOS1 meteorite column offset calibration is fine with quiescent state, the column currently is available in many science observations.

- No telemetry issues present for EPIC-MOS due to 12 kbits/s limit.

- Mission operation/planning successfully prevents science observations at non-nominal focal plane temperatures. No scientific exposure affected for last 5 eclipse cycles.