EPIC-MOS MONITORING

Martin Stuhlinger
EPIC OPS/CAL meeting
ESAC, 15.03.2018
CTI monitoring

- New set of MOS CTI+ADUCONV CCFs uploaded (Feb. 2018).
- Epoch conformity between MOS1 and MOS2 CCFs is broken after 2006-04-15 (rev. 1163).
  - 24 MOS1 epochs: 12 previously defined (< rev.1074) + 12 new epochs.
  - 27 MOS2 epochs: 12 previously defined (< rev.1074) + 15 new epochs.
- First 12 epochs (< rev. 1074) use previously published CTI values, with new calculated column offset and gain values.
- All epochs after rev. 1074 are newly defined epochs with new calculated CTI, column offset and gain values.
- All epochs after rev. 1074 use fits to the long term evolution for the serial CTI. Required to get reasonable slope results due to large spread of data points within single epochs.
- MOS1 CCD4 uses 2 different long term evolutions for serial CTI to address additional noise after micro-meteorite impact (before/after rev. 2382).
CTI monitoring: MOS1 serial and parallel CTI

Serial CTI of EPIC-MOS1

Parallel CTI of EPIC-MOS1
CTI monitoring: MOS2 serial and parallel CTI

Serial CTI of EPIC-MOS2

Parallel CTI of EPIC-MOS2

MOS Mor
CTI monitoring: MOS1 column traps examples
CTI monitoring: MOS2 column traps examples
Line monitoring: MOS2 line energies

MOS2 Al-K PATTERN == 0

MOS2 Mn-K PATTERN in [0:12]
Line monitoring: MOS1 line widths

MOS1 Al-K PATTERN=0

MOS1 Mn-K PATTERN=0
Line monitoring: MOS2 line widths

MOS2 Al-K PATTERN==0

MOS2 Mn-K PATTERN==0
MOS2CCD5 effect

- Monitoring of low energy (<1 keV) out-FOV count rate ratios.

![Graphs showing MOS1 and MOS2 data with ratio plots over time](image)
Currently absent since ~ rev. 3271 (18th Oct. 2017).
No larger solar flare periods.
MOS1 meteorite column less active (currently absent).
Increased activity in hot column MOS1 CCD2 RAWX=431.
Spread of peripheral CCD count rates mainly due to hot column MOS1 CCD2 RAWX=431.

Peculiar FF rates for 3160_0800230101 (Nova Lup 2016) when MOS2 in TI

MOS1 timing mode always saturated due to meteorite column.
Solar background level as diagonal in FF mode.

Peculiar FF rates: 3174_0802820201 (GX13+1, no MOS1 exposure) and 3248_0803990401 (anomaly, see next)
MOS2 instrument anomaly: 03.09.2017

- Beatriz Gonzalez reported strange MOS2 exposure at QLA checks.
- Focal CCD1 affected in Exp.ID 3248_0803990401_EMOS2_U002.
- Part of the central CCD1 shows less counts than other part.
- A hot column is separating the two areas.

- Anomaly started with frame 2236.
- CCD1 runs into counting mode every about 30 seconds for about 15 seconds.
- No more counts below RAWX=258.
- Events between RAWX=258-865.
Source positions and hot column sections indicate a shift in the RAWX coordinate of 256 (=2**8) starting at frame 2236.
Pedro Calderon reported peak in telemetry with following single counting mode.

Flash in MOS2 => possible micro-meteorite impact.
Flash monitoring: new event on 25.06.2017

Differences to previous flashes:
- Monitoring didn’t find it.
- Nearly no PATTERN=31 events. (That’s why!)
- Flash consists mainly out of single events.
- Event energies mainly below 500 eV.

Field-of-view imprint indicates:
- not just a noisy frame.
- origin outside MOS camera head (filter wheel).

No flat detector illumination => no optical flash.
Nothing in MOS1 at identical time.
No damage detected.

FALSE ALERT, NO IMPACT! But what was it?
Operational error after first eclipse caused both MOS detectors to execute a scientific exposure at focal plane temp. of -130°C (instead of -120°C).

Quadrant box temp. of pn higher than nominal, but still at upper border of the calibration range.

Scientific validation required.
Target MSH 15-56 (4).

- Spectral gradient over extended source emission.
- Slightly different source regions to get maximum of counts.
- Use APEC noline model with 12 Gaussian for O VIII, Fe XVII, Ne IX, Ne X, Mg XI, Mg XII, Si XIII, S XV lines.

- MOS2 spectrum shows significant changes in energy scale.
- EPN spectrum match nicely with model line energies.
New CTI+ADUCONV CCFs uploaded.
- First 12 epochs (revs.<1074) identical.
- New epochs defined, triggered mainly by trap offset changes.
- Epoch conformity between MOS1 and MOS2 broken for new defined epochs.

Low energy noise plateaus (MOS2CCD5 effect) still frequently present, mainly in MOS2 CCD5 and MOS1 CCD4.
- MOS1 meteorite column calmed down, even disappeared since about 70 revolutions.
- Telemetry monitoring indicates increased MOS1 count rates due to hot column in CCD2.
- MOS2 instrument anomaly with sudden RAWX shift by 256 columns.
- Flash of single events in MOS2. Unlikely a signature of impact. No damages detected.
- pn quadrant box temperature calibration corrects possible gain shifts at upper border of calibration range.
- MOS2 exposure at -130°C shows significant change in energy scale.