

# Status of EPIC operations

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Mallorca BOC meeting  
29-30 March 2011

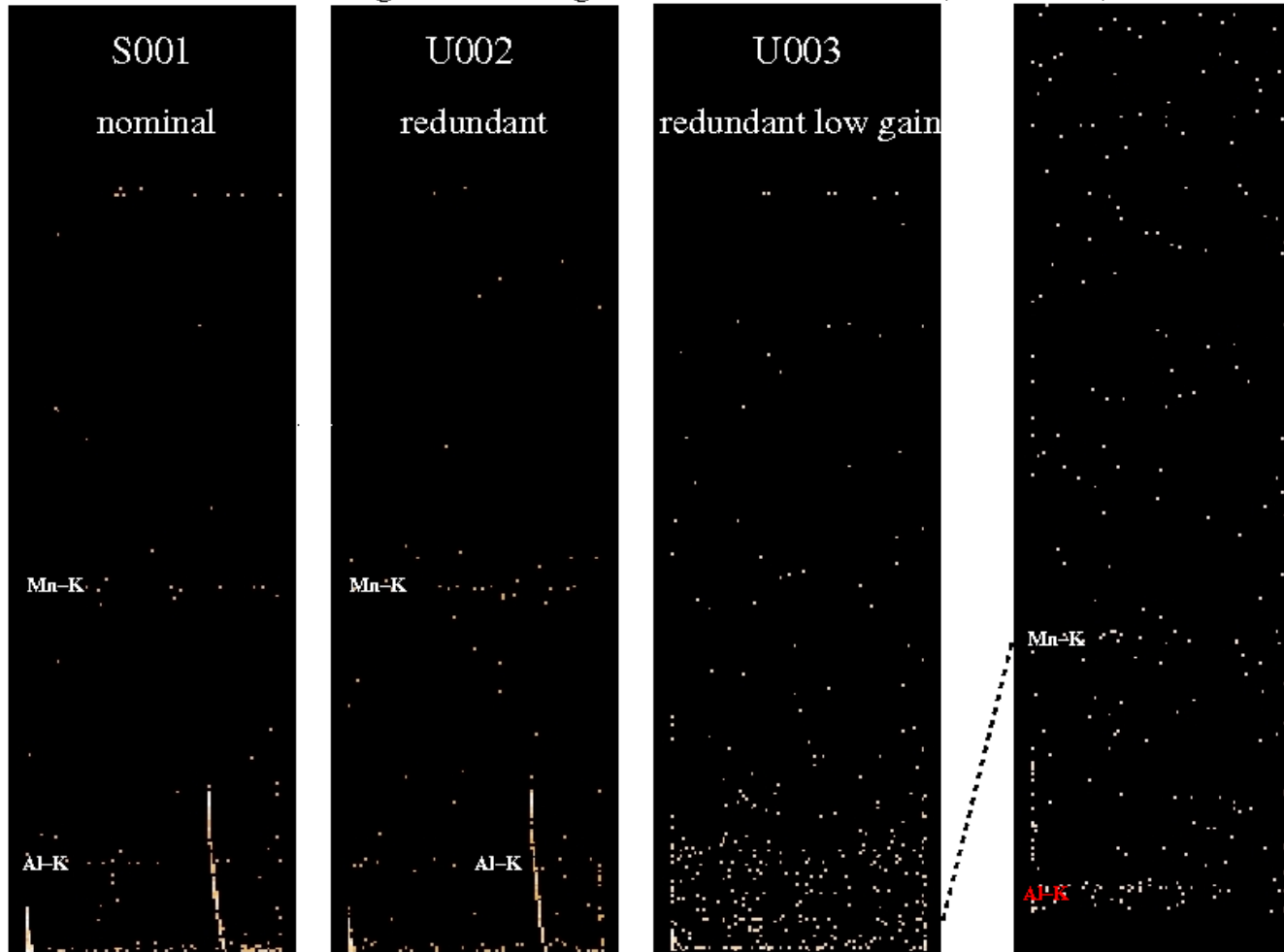
- Nominal observations
  - See the Quarterly Status report at [http://xmm.esac.esa.int/external/xmm\\_news/mission\\_status/index.php](http://xmm.esac.esa.int/external/xmm_news/mission_status/index.php)
  - Almost no time lost due to the instruments (~ 0.05%)
  
- Eclipse season; nominal.
  - 22 earth eclipses, one combined earth+lunar eclipse, and one lunar only.
  - On each eclipse the instruments are switched OFF and ON
  - MOS2 wrong telemetry events happened at some post eclipse switch on.
  
- RBI clock resynchronization every ~194 days
  - One on August 7<sup>th</sup> 2010
  - Other on February 17<sup>th</sup> 2011.
  
- MOS1 CCD6 periodic check: no changes
  - CCD still full of AFFA<sub>(hex)</sub>

➤ Includes :

- MOS Offset Tables v14
- More items for automate the Eclipse time tagged commands preparation
- More preparation for use the redundant instruments if needed (MOS analog chains, filter wheel, use of redundant LCL and electronics, etc)
- Automatic recovery (via Autocomand) in case of EPIC Radiation Monitor 'normal' hardware resets
- Simplification of spacon work ...

- **MOS noise;** Study of when/how MOS2 CCD5-like noises appear and disappear (OCR#2032, 7 May 2010)
  - The test consisted of a series of short exposures in Full Frame, CalClose, separated by exposure start and stop. The observation was required to be performed when the radiation was high. The goal was to see if and how the noises appear or disappear after each of those exposures/sequencers stops.
  - The quick result was no noise change.
  
- **EOR-8;** Test for MOS1 timing mode echo due to meteorite column
  - Performed a Timing Low Gain Cal\_Closed test exposure
  - OCR#2046, 29 Nov 2010.
  
  - The complex configuration required use the redundant Analog Chain, so a reference exposure using the redundant chain in normal gain was also performed.
  - Also another 3 test were required for verify and refine the instrument configuration, all it performed manually.

MOS1 Timing mode low gain test: 0655450201 (rev. 2010)

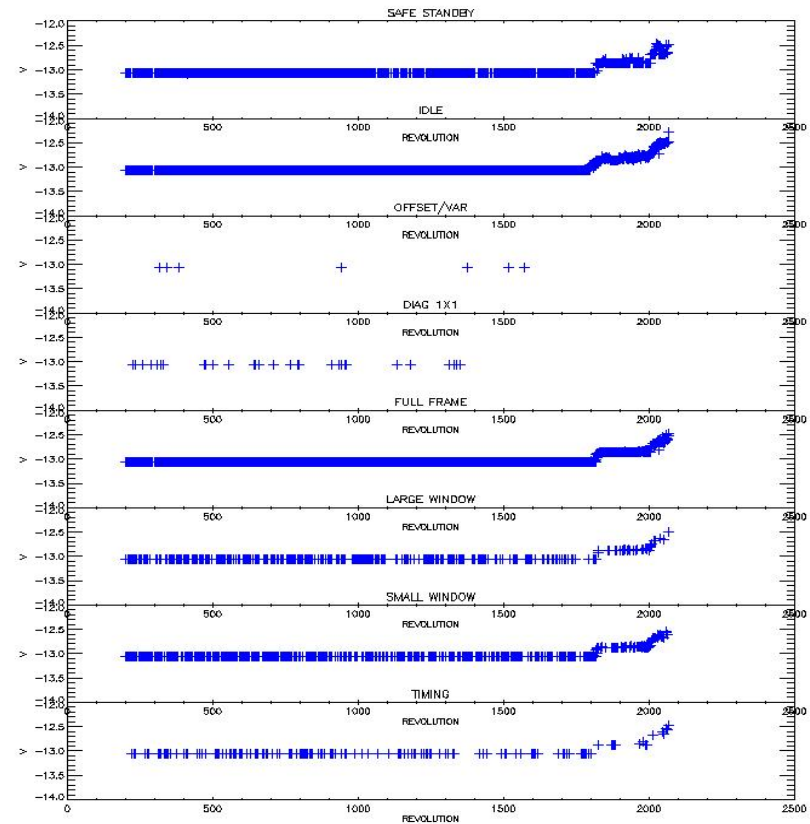


- MOS current limiter alarm in not used circuits => SEU (NCR#133)
  - 17 Jul 2010, MOS 1, into filter wheel circuit 1 when not in use. The FW was closed using the coil 2 circuit.
  - 4 Jan 2011, MOS 2, Door HOP circuit. First case in MOS2, a few hours after earth + lunar eclipse and wrong tlm event.
  
- MOS 2 CCD 1 science telemetry no start being generated => sequencer hung up
  - On 12 Jan 2011, after eclipse, wrong tlm, MOS2B test, return to MOS2A, and more wrong tlm.
  - Solved by procedure via exposure stop and restart
  
- MOS2 RBI crash on 27 July 2010 when observing. FW resync procedure needed to be improved.
- PN to Safe Standby manually due to too much diligent Spacon. 22 Sep 2010.
  
  
- Any of this have further consequences.

# MOS2A Voltage degradation continue

- The secondary power lines voltage degradation, started on 2009, continue increasing
- 'Reset' at the change to MOS2 B

E1078 C EMAE -13V LINE (Rev: 200-2066)



# MOS 2 wrong telemetry

## (NCR#136)



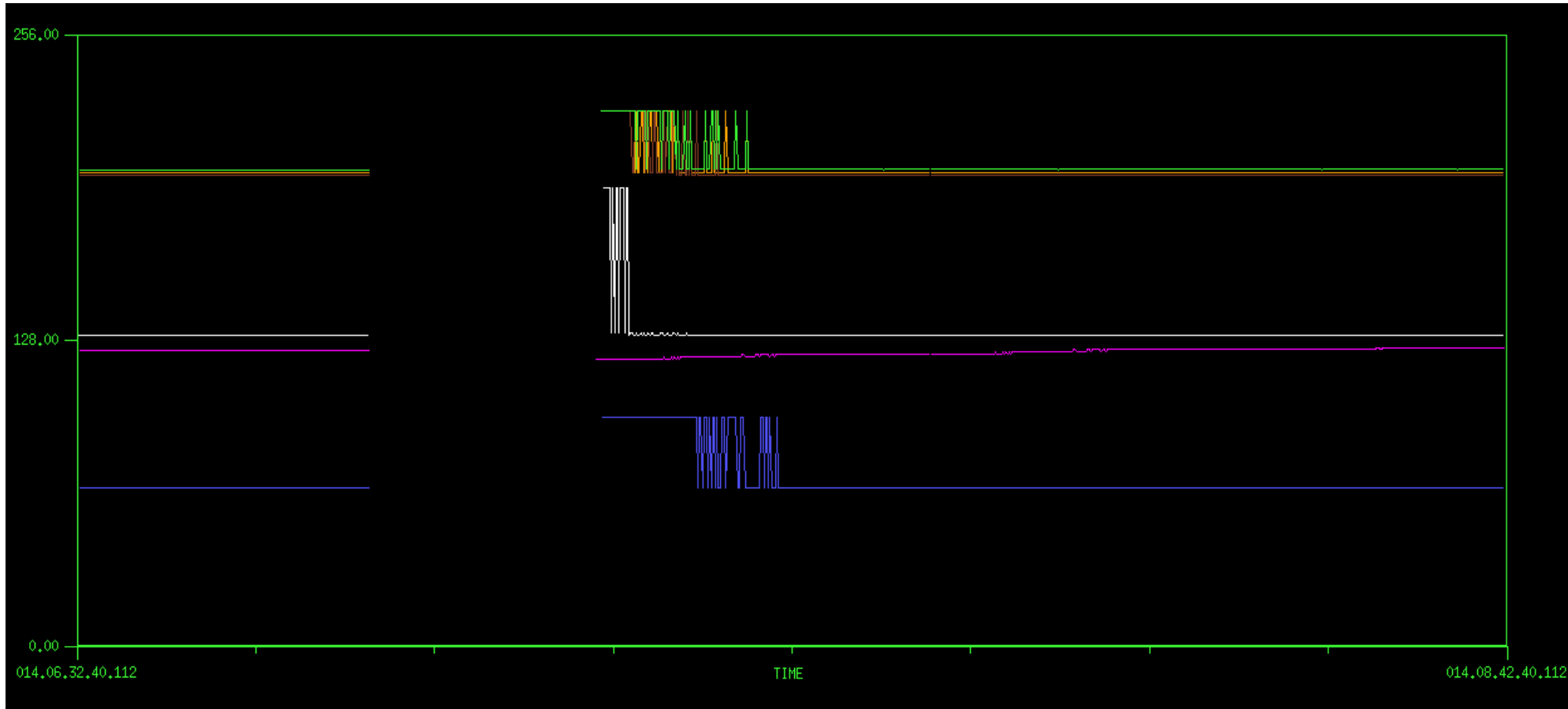
- Some telemetry parameter show peaks of raw digital wrong values.
- This start happening at the switch ON after eclipse, and last from 31 seconds to 21 minutes. Solved by itself
- Started happening after Winter eclipse #3 on 27 Dec 2010, and stopped after the last eclipse #12 on 14 Jan 2011.
- Reappear again in 5 March on perigee, at the lowers temperatures of the orbit.
- On 20 March started happening every time that the instrument was in Idle, and even when observing.
- The parameters affected are all from K1076 to K1090.
  - They are voltages and temperatures from EMAE, EMVC and EMCR.
  - They have in common an analog to digital converter into EMCR, and are all the lines that enter to that A/D.
  - The raw value jump to bit patterns were the  $2^5$  bit is usually the erroneous one. After that all the other LSBs stuck to a fixed value.



# MOS 2 typical wrong values

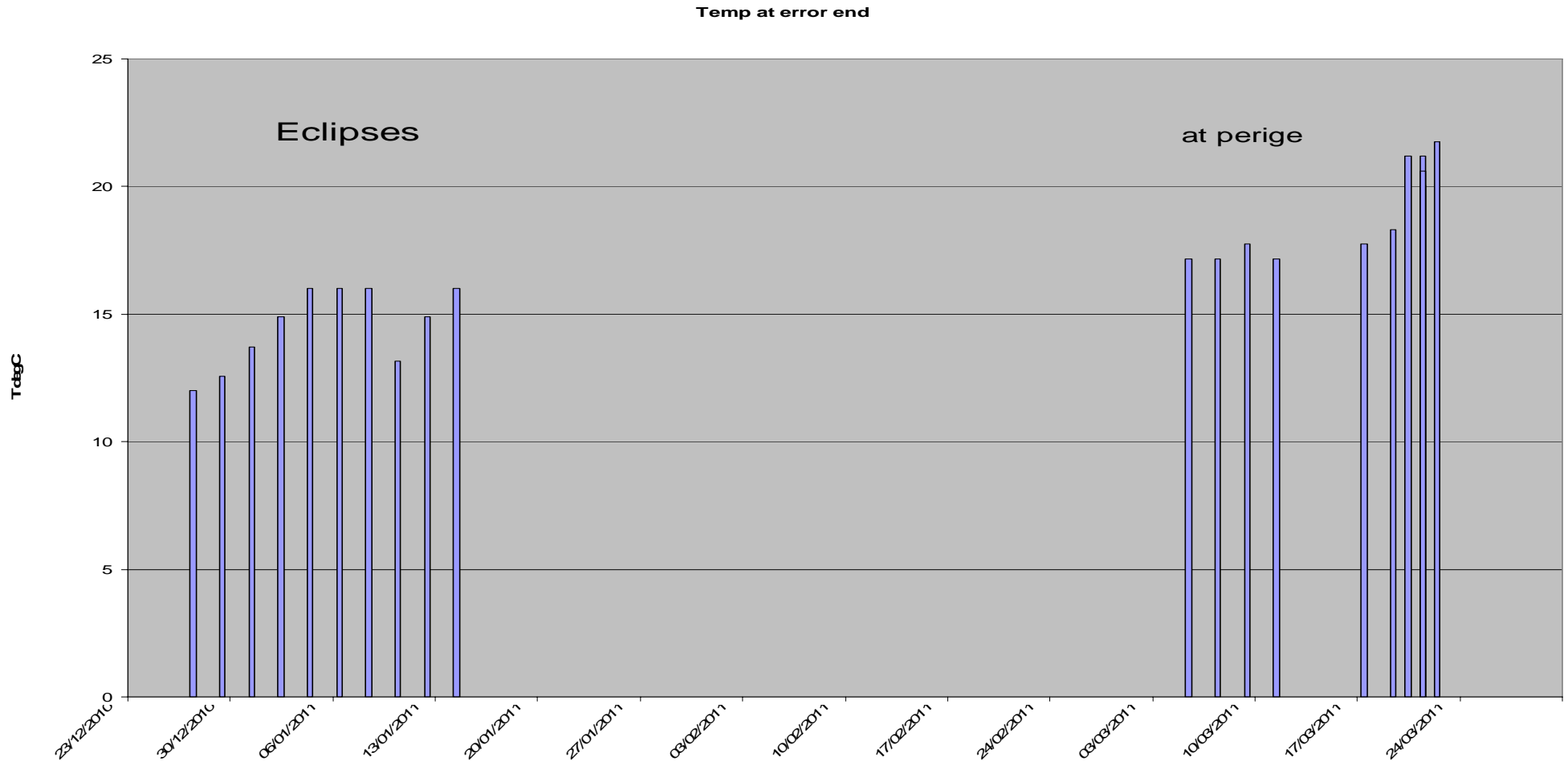
NAME	DESCRIPTION	VALUE	UNIT
K1076	C EMAE -5V LINE	A0	HEX
K1077	C EMAE +5V LINE	E0	HEX
K1078	C EMAE +13V LINE	A0	HEX
K1079	C EMAE +13V LINE	E0	HEX
K1080	C EMAE +25V LINE	E0	HEX
K1081	C EMAE +18V LINE	E0	HEX
K1082	C SIGNAL GROUND	E0	HEX
K1083	C EMAE +32V LINE	E0	HEX
K1084	V EMVG TEMP. #1	A0	HEX
K1085	C EMCR TEMP. #1	A0	HEX
K1086	C EMCR +5V LINE	E0	HEX
K1087	V EMVG TEMP. #2	A0	HEX
K1088	C EMCR +13V LINE	A0	HEX
K1089	C EMCR +13V LINE	E0	HEX
K1090	C EMCR TEMP. #2	A0	HEX

# MOS 2 tlm jumps at switch on



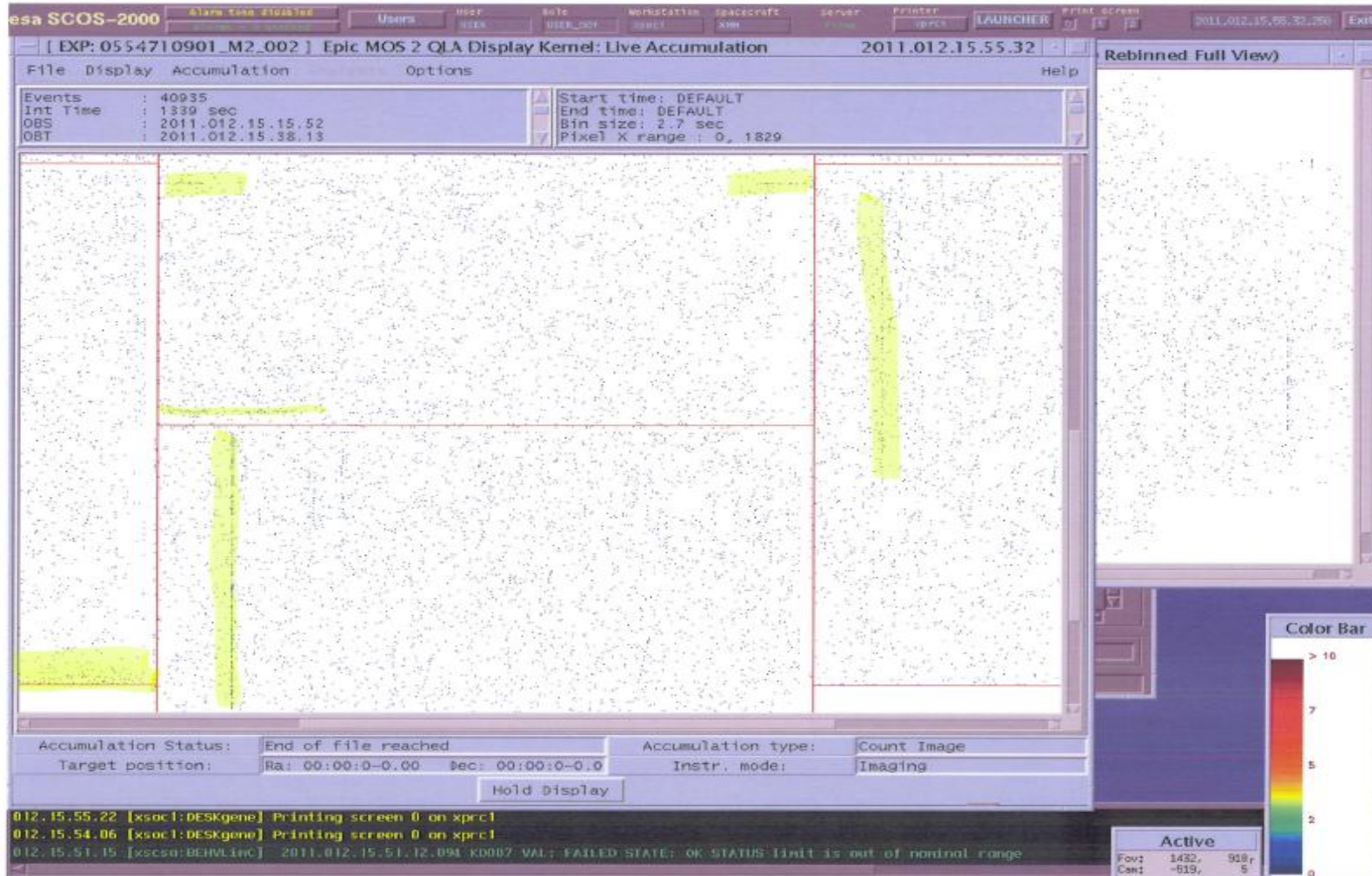
➤ Before ... Eclipse/Off Wrong tlm return to good telemetry

# Errors along time and versus temp

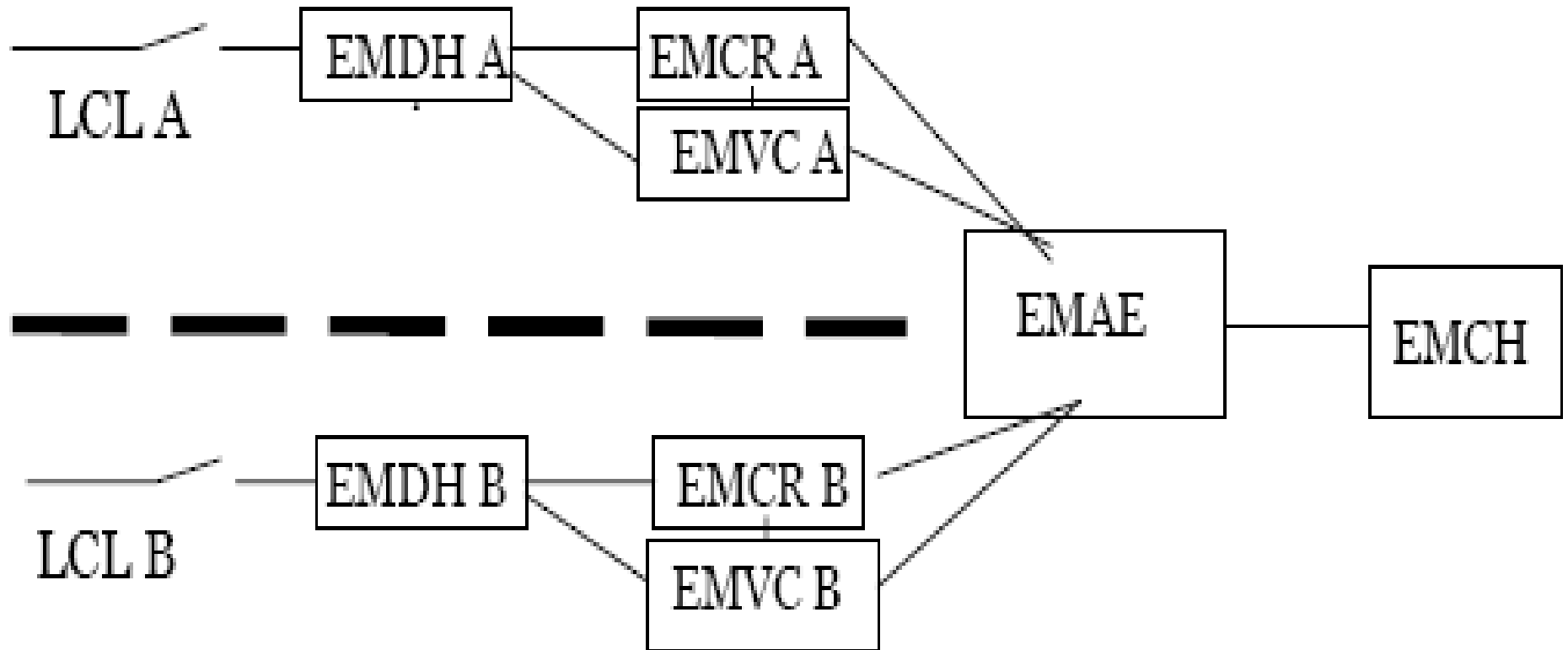


- The problem is within the conversion to digital of the measurement (raw data), not with the physical value measured (engineering values).
- Have a relation with low temperatures
  - But the sensors and heaters are box wide, giving not enough information about the conditions in the suspected chip.
- A test was done on 6 Jan. A switch off/on so quick as for avoid thermal changes. No wrong telemetry appear.
- MOS 2B (the redundant electronic) was tested (powered) for fist time since launch. OCR#2084, 12 January 2011.
  - The redundant electronic is the only solution to the wrong tlm problem.
  - It is OK. A test calibration observation was performed and look good.

# MOS 2B Cal\_Close test



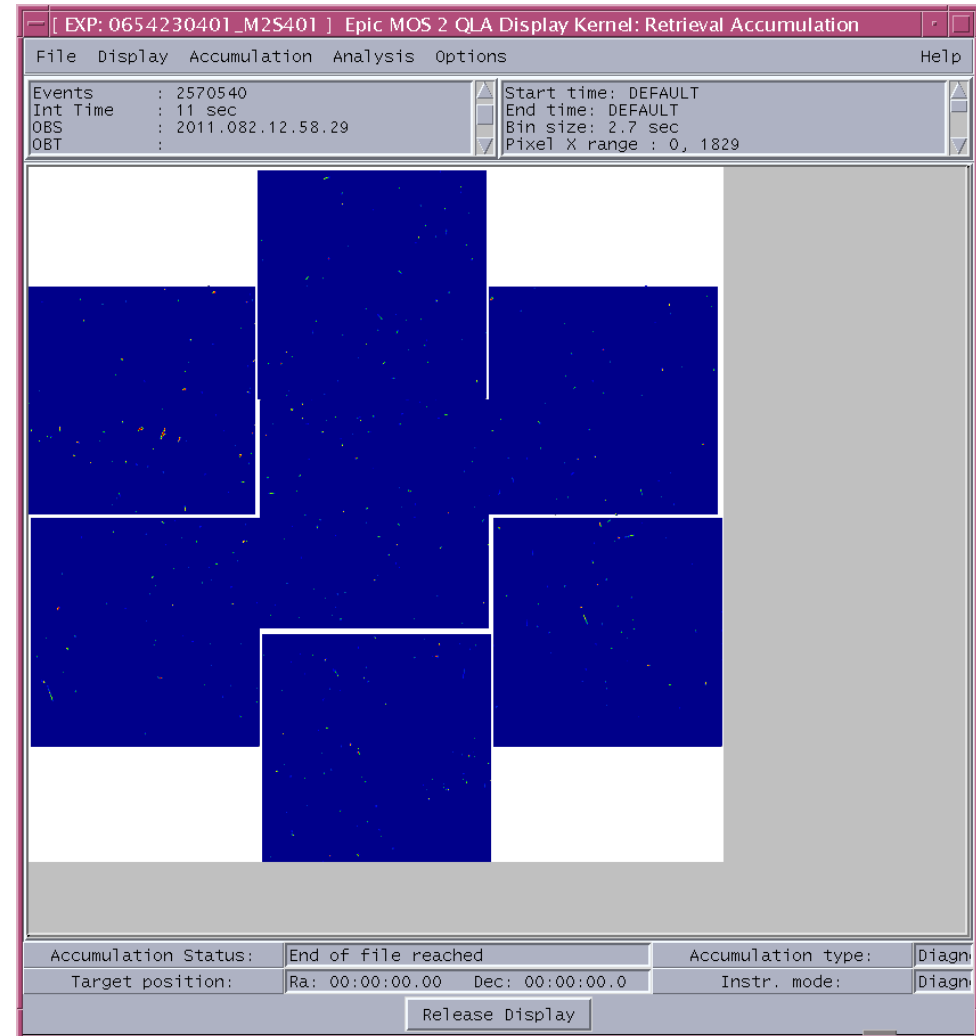
MOS  
Z  
B



- The MRB (Material Review Board) meeting on 22 March.
  
- Given the heavy increase of wrong telemetry and the voltage degradation, a decision is taken for change nominal operations to the redundant electronic MOS 2 B.
  
- Implemented in the perigee start of revolution 2067, 23 March 2011.
  - MOS2A off
  - MOS2B on and configured
  - Test/validation exposures via Autostack
    - Diagnostics 1X1 (all CCDs)
    - Diagnostics SW & LW
    - Timing with FW=Thin
    - Small Window with FW=Medium
    - Large Window with FW=Thick
    - Full Frame with FW=Cal\_Close along 10.000 seconds

# MOS2 B operational

- The change of operations was successful
- MOS2B have no degradation into the secondary power lines
- Almost all the ground segment is ready for operate the MOS2B
  - Minor problems solved manually
  - Next OBD will return all to automatic
  - Some changes identified for eclipse operations (next eclipse in June)
- First exposures look nice
  - Diagnostics 1X1 =>
- No changes are expected in calibration







- Really well, being older than designed
- And with an instrument electronics as new as taken out of storage.



# xmm-newton