

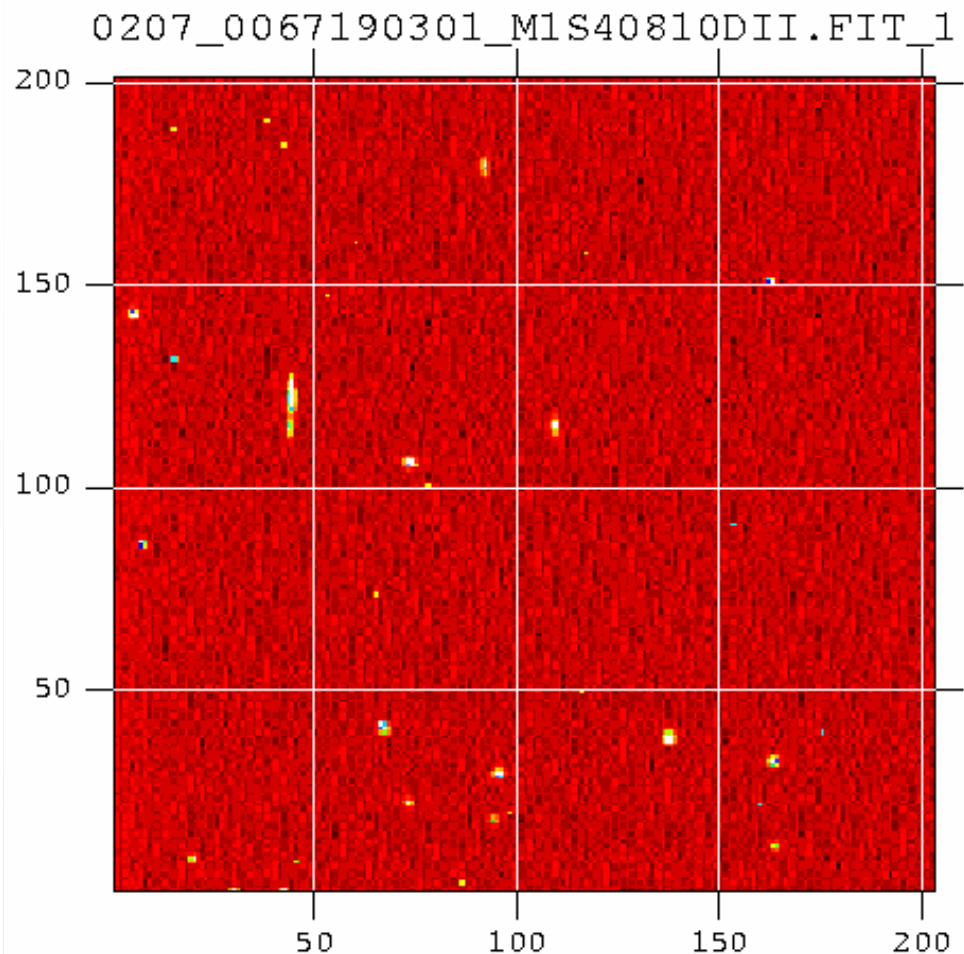
Using 3X3 Binned Mode for MOS Cameras for Fast(er) Imaging

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Introduction

- Started discussion of use of MOS for slew survey in May
- Full frame mode of 2.7s per frame causes too wide a PSF
- The original MOS modes included a 3X3 binned mode for fast diagnostics.
- In synchronised readout mode, this could read out the CCD in 0.4s
- A x4 slowing of the slew rate combined with the ‘new’ mode would reduce the slew-psf from 4 arcmins to 8.5arcsecs.
- The next slide shows a diagnostic image taken with 3X3 binning in rev 0207 – January 2001

Test of 3X3 binned diagnostic image on Rev 0207

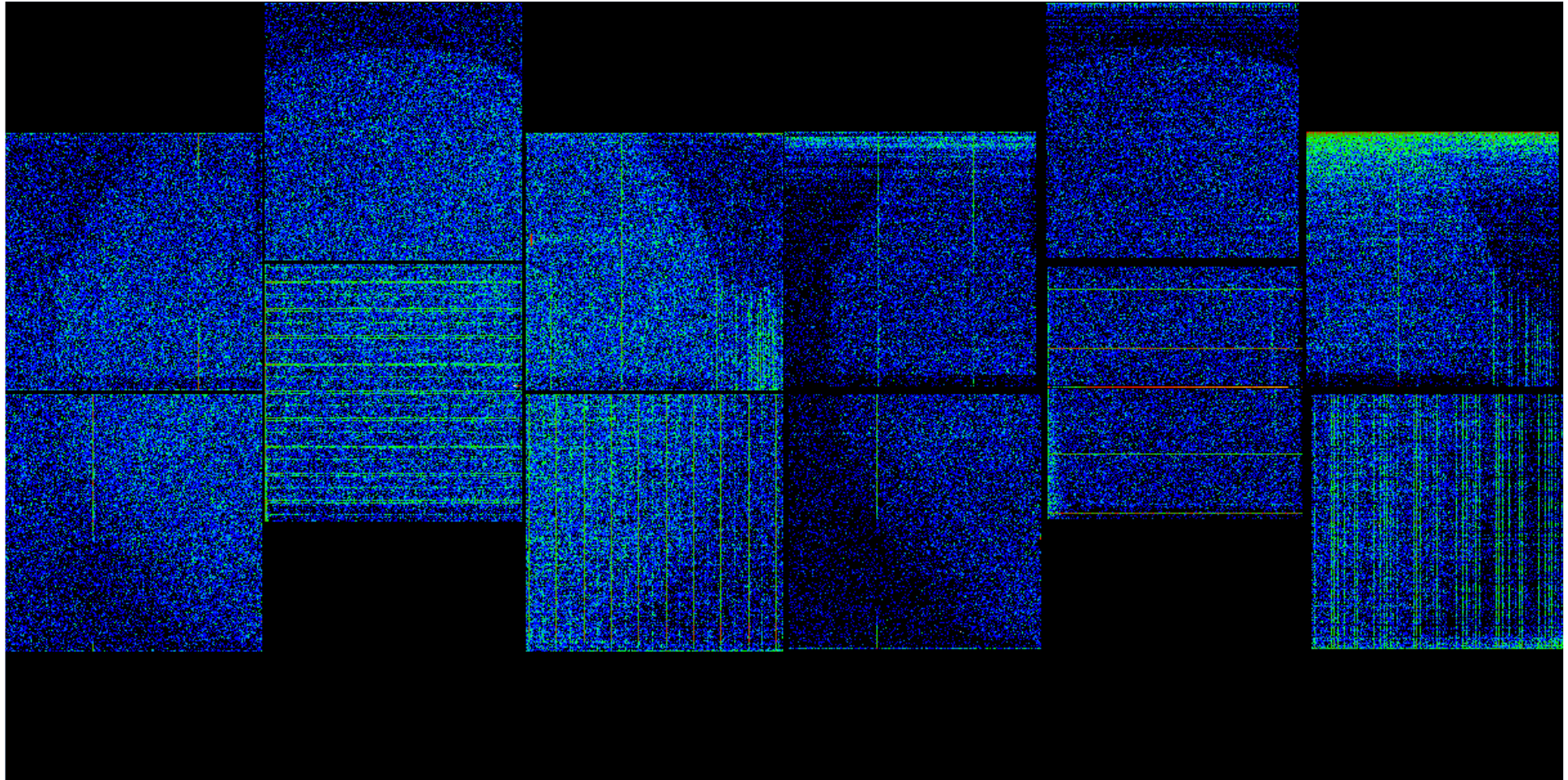


```
XTENSION= 'IMAGE ' / IMAGE extension
BITPIX = 16 / number of bits per data pixel
NAXIS = 2 / number of data axes
NAXIS1 = 203 / length of data axis 1
NAXIS2 = 201 / length of data axis 2
PCOUNT = 0 / required keyword; must = 0
GCOUNT = 1 / required keyword; must = 1
EXTNAME = 'M1DII1 ' / Extension name
EXTVER = 1 / Extension Version
TELESCOP= 'XMM ' / XMM mission
INSTRUME= 'EMOS1 ' / EPIC MOS Instrument
DATATYPE= 'DIAG.IM ' / Type of data
OBS_ID = '0067190301' / Observation Identifier
EXP_ID = '0067190301408' / Exposure Identifier
CCDID = 1 / Numerical identifier of the CCD
CCDNODE = 0 / CCD Node
WINDOWX0= 150 / X-Coordinate of bottom left corner of window
WINDOWY0= 151 / Y-Coordinate of bottom left corner of window
WINDOWDX= 310 / Size, along x-axis, of window
WINDOWDY= 300 / Size, along y-axis, of window
EDUID = 0 / EDU Identifier
EDUMODE = 0 / EDU Mode
EDUTHR = 0 / EDU Threshold
FRMTIME = 5 / Frame Integration Time
FRAME = 1 /
FTCRSE = 9 /
FTFINE = 23003 /
NPIXEL = 40803 /
FIFOVF = 0 /
DATE-OBS= '2001-01-24T13:09:37' / Start time of exposure
DATE-END= '2001-01-24T13:10:20' / End time of exposure
```

Tests of imaging in 3X3

- Much iteration between Leicester and ESAC was required for:
- Updating database for 3X3 science exposure to avoid too much manual commanding
- Setting up of offset tables
- Identifying and vetoing hot pixels
- These resulted in tests in closed cal – first on MOS1 – rev 1210 with 0.4 and 0.5 frame time to confirm that it really worked, and there were no ‘overruns with the shorter time – however see later
- Then both instruments with updated database in rev 1228

Rev 1228 MOS1 3x3 results – comparison with rev 1190 non-binned



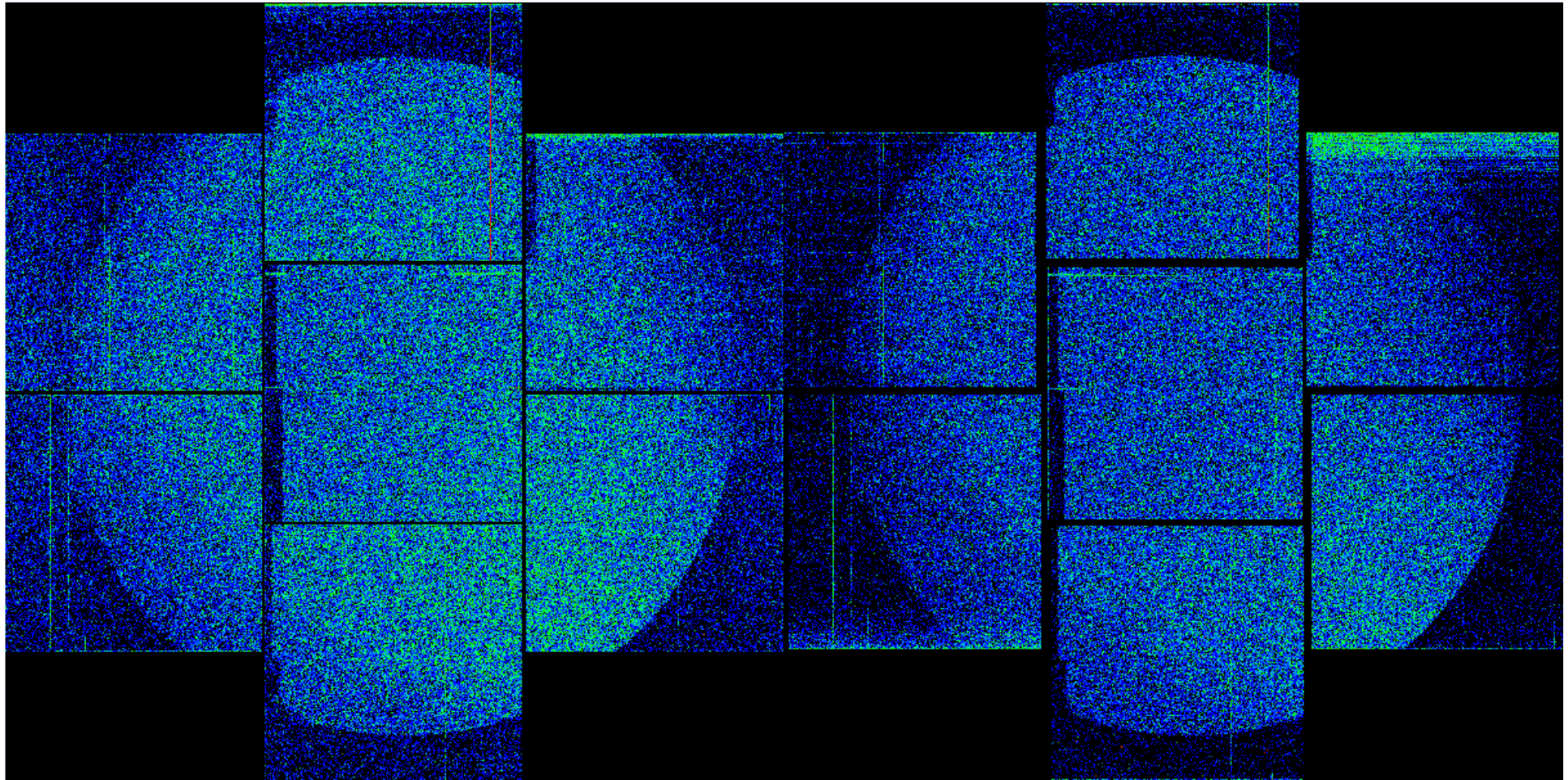
1190

1228

XMM Calibration/Ops Meeting Mallorca
26-27 October 2006



Rev 1228 MOS2 3x3 results – comparison with rev 1190 non-binned



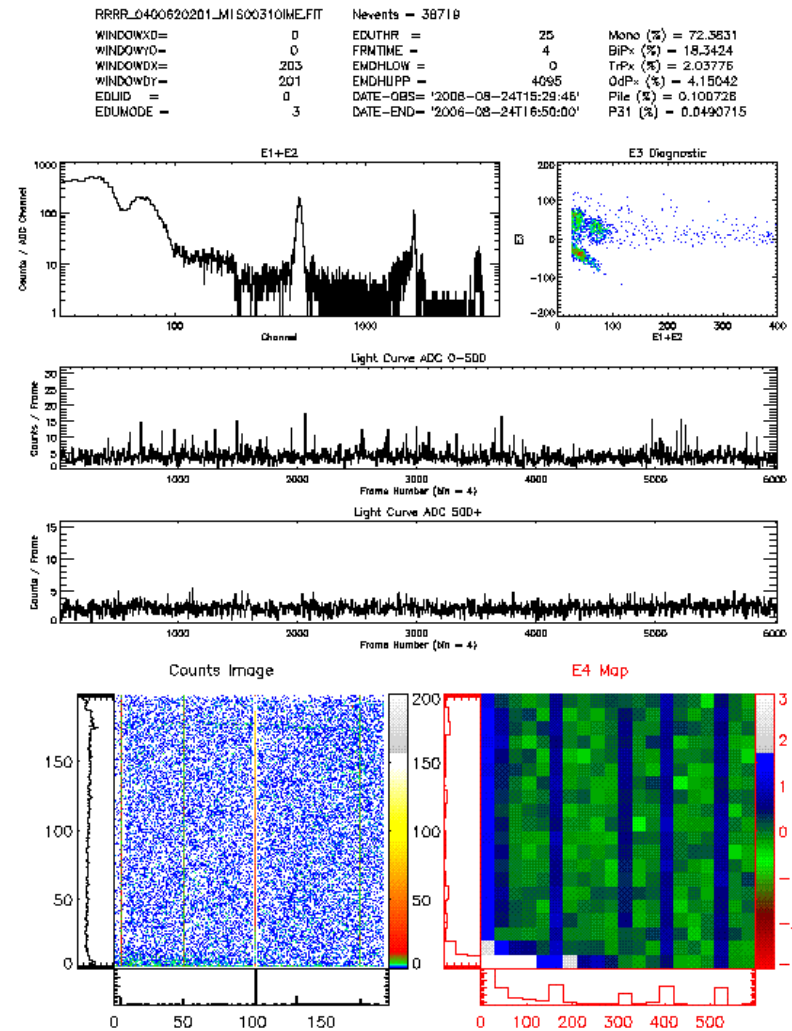
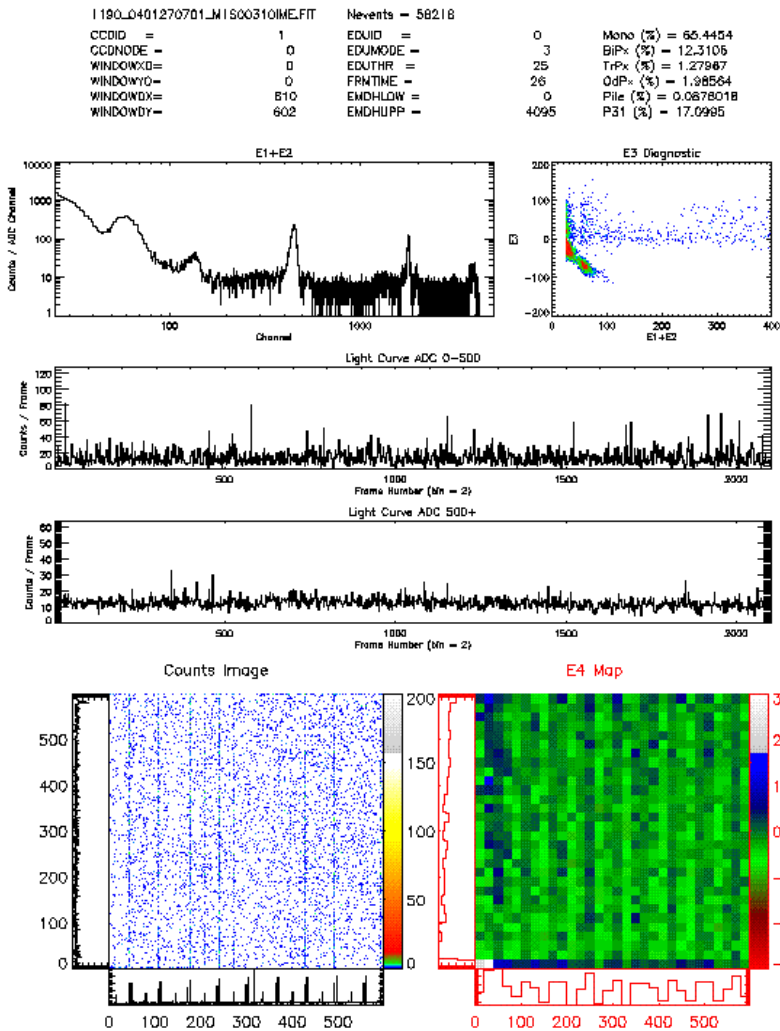
1190

1228

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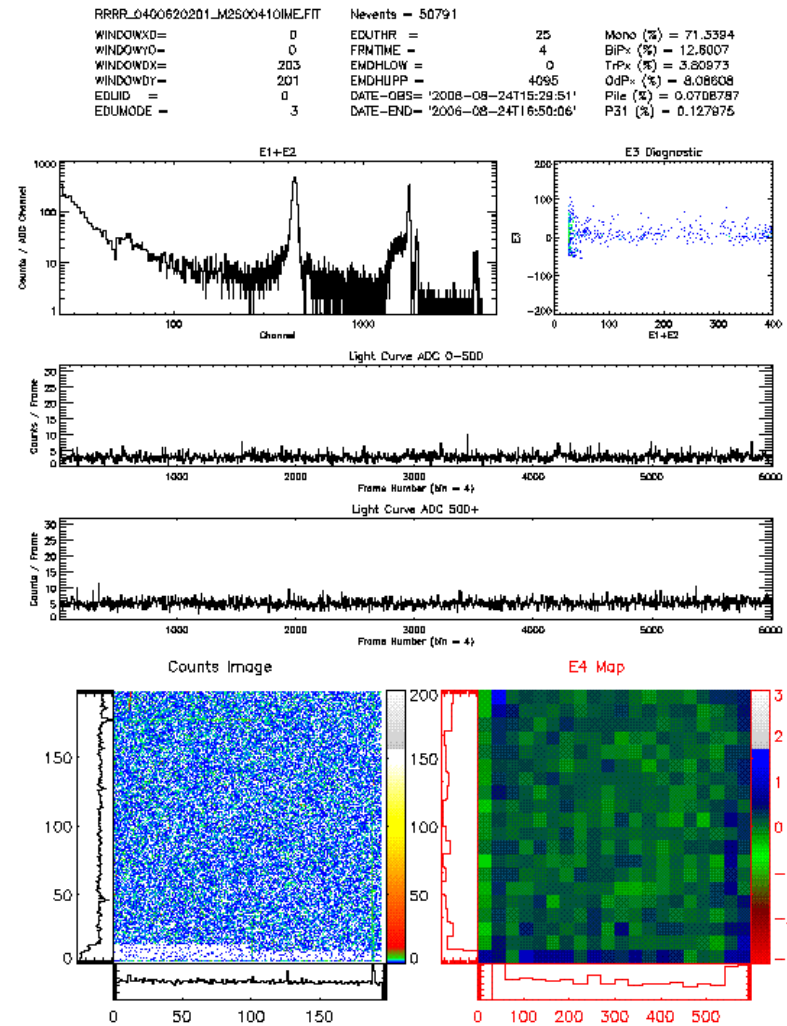
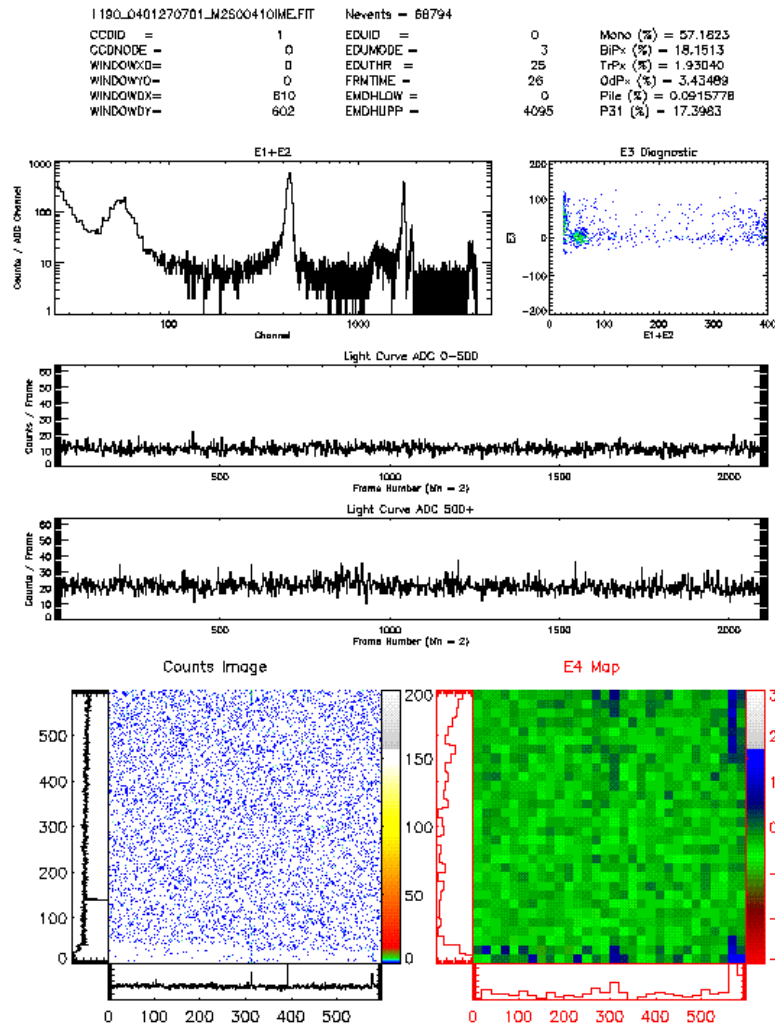


Any Spectrum Changes CCD1 MOS1?



Note how the pattern ratio for mono-pixel events improve with binning from 65 to 72%

Any Spectrum Changes CCD1 MOS2?

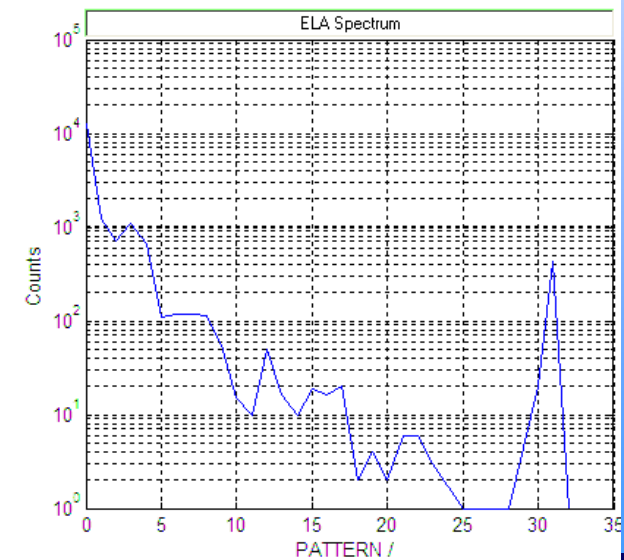
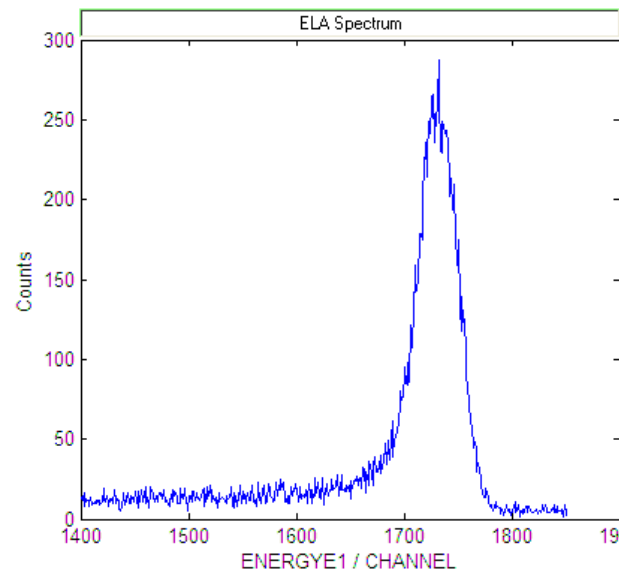
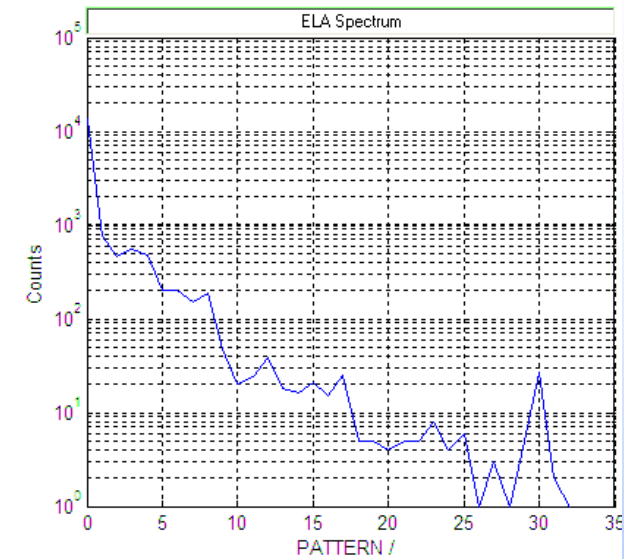
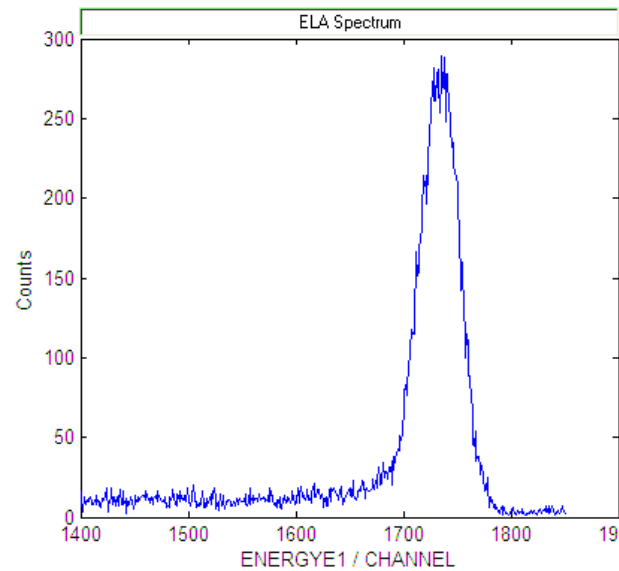


Note how the pattern ratio for mono-pixel events improve with binning from 57 to 71%

Event Pattern Distributions – Mn-ka

Top plots are Mn-ka peak from 3x3 and bottom are from normal 1x1 mode.

As expected, there are proportionally less events with patterns 1 – 4 in 3x3 mode, but rather strangely, 1x1 shows less events from 5 onwards – more work needed to understand this



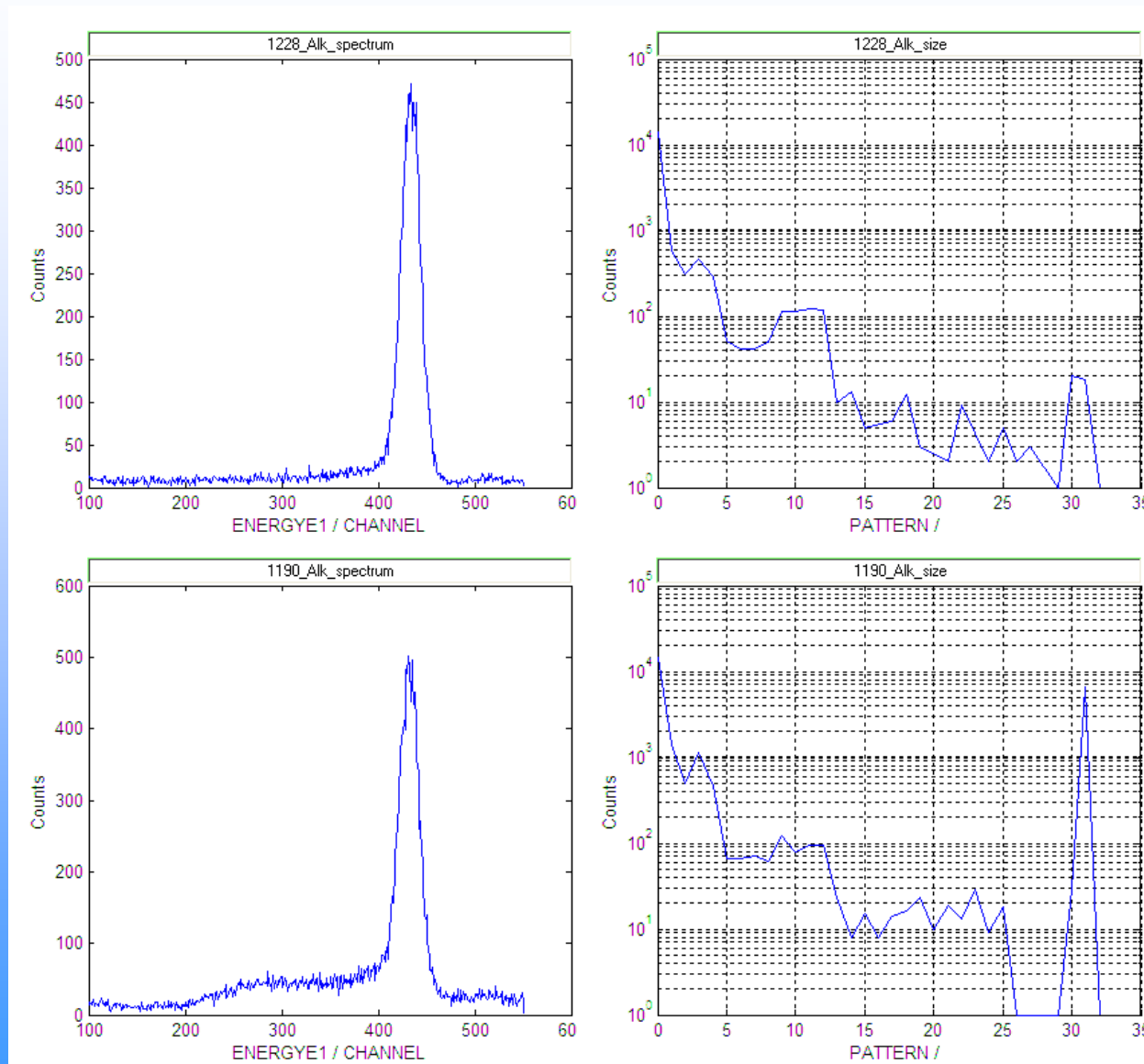
Event Pattern Distributions – Al-k

Top plots are Al-ka peak from 3x3 and bottom are from normal 1x1 mode.

As expected, there are proportionally less events with patterns 1 – 4 in 3x3 mode, but there are slightly more in the 8 – 12 region and then less above 15 - not yet understood.

Note how the low energy shoulder is much reduced in 3x3 mode

This is due to the fact that these plots were made using just E1. – see next slide

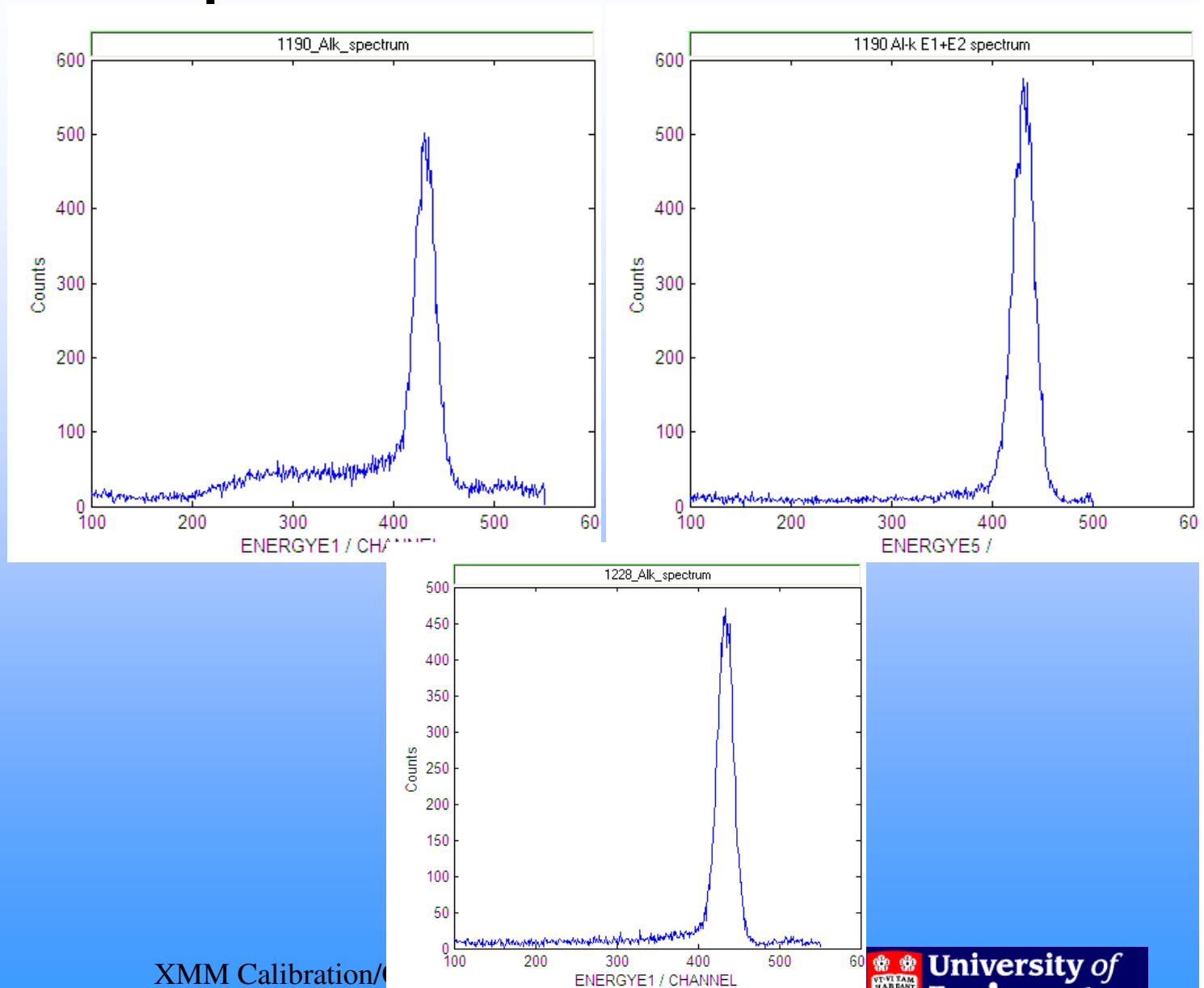


Spectra – Al-k

In 1X1 mode the low energy shoulder is not present when the normal E1+E2 is histogrammed

Compare with 3X3 mode for E1 only, where the equivalent peak looks a little narrower.

Again – more cal effort needed for this.

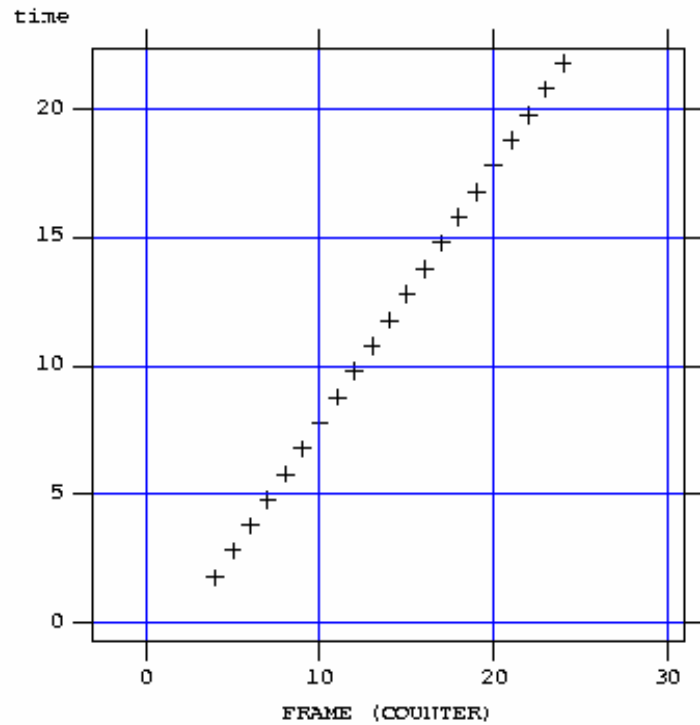


Summary

- 3X3 binned imaging mode works
- There are small changes in spectral response which need further investigation
- I believe that the current response files for now can be used to process the data
- Caveat – newly discovered problem:
 - The ‘aux’ files have just been looked at after a problem reported by R Saxton, and for both the 0.4 and 0.5 original tests, the EMCR was reporting extended frame time. In both cases, the frame time had been doubled to 0.8 and 1.0 sec respectively – see next slide
 - Currently we do not know if this is a setup problem due to typos, or a non-understanding of the sequencer readout time or EDU/EMCR set-up requirements – further work needed

Frame times

```
rrrr_0401260201_mls00300aux.fit(time_7-9...)_1
```



```
rrrr_0401260201_mlv00200aux.fit(time_13-17...)_0
```

