

# V&V Reference Report

## L2 ASCDS Version : 10.6

Observation 20322 - L2 Version 1  
Chandra X-Ray Center

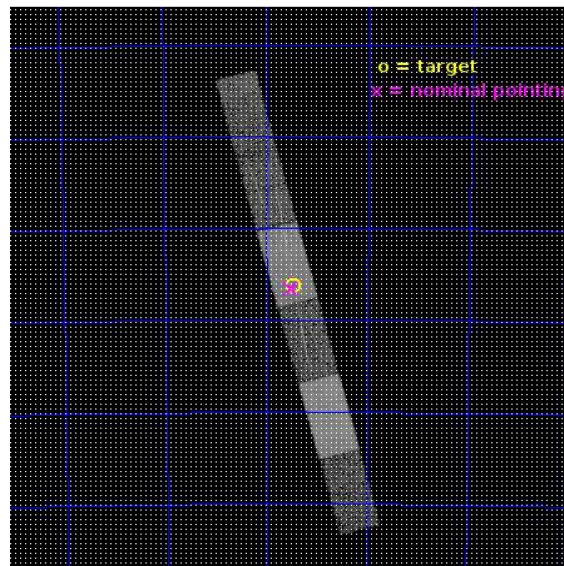
L2 Processing Date : Mar 20 2018

## Contents

|          |                               |           |
|----------|-------------------------------|-----------|
| <b>1</b> | <b>Front</b>                  | <b>2</b>  |
| <b>2</b> | <b>OBI</b>                    | <b>3</b>  |
| 2.1      | OBI . . . . .                 | 3         |
| 2.1.1    | Images . . . . .              | 3         |
| 2.1.2    | Bias . . . . .                | 3         |
| 2.1.3    | Parameters . . . . .          | 4         |
| 2.1.4    | Events . . . . .              | 4         |
| 2.2      | Compared Parameters . . . . . | 5         |
| 2.3      | Aspect . . . . .              | 6         |
| 2.4      | Star Slots . . . . .          | 9         |
| 2.4.1    | Slot 3 . . . . .              | 9         |
| 2.4.2    | Slot 4 . . . . .              | 10        |
| 2.4.3    | Slot 5 . . . . .              | 11        |
| 2.4.4    | Slot 6 . . . . .              | 12        |
| 2.4.5    | Slot 7 . . . . .              | 13        |
| 2.5      | FID Slots . . . . .           | 14        |
| 2.5.1    | Slot 0 . . . . .              | 14        |
| 2.5.2    | Slot 1 . . . . .              | 15        |
| 2.5.3    | Slot 2 . . . . .              | 16        |
| <b>3</b> | <b>Gratings</b>               | <b>17</b> |
| 3.1      | HEG Arm . . . . .             | 17        |
| 3.2      | MEG Arm . . . . .             | 19        |
| <b>A</b> | <b>Summary</b>                | <b>21</b> |
| A.1      | Status . . . . .              | 21        |
| A.2      | Comments . . . . .            | 21        |

# 1 Front

|          |                                          |                                             |
|----------|------------------------------------------|---------------------------------------------|
| seq_num  | 503016                                   | Sequence number                             |
| obs_id   | 20322                                    | Observation id                              |
| title    | High Resolution Spectroscopy of SN 1987A | Proposal title                              |
| observer | SANGWOOK PARK                            | Principal investigator                      |
| object   | SN 1987A                                 | Source name                                 |
| dtcycle  | 0                                        | &#160                                       |
| cycle    | P                                        | events from which exps?<br>Prim/Second/Both |
| ra_targ  | 83.866667                                | Observer's specified target<br>RA [deg]     |
| dec_targ | -69.26975                                | Observer's specified target<br>Dec [deg]    |
| ra_nom   | 83.876661023635                          | Nominal RA [deg]                            |
| dec_nom  | -69.27603149767                          | Nominal Dec [deg]                           |
| roll_nom | 255.16595151699                          | Nominal Roll [deg]                          |
| revision | 1                                        | Processing version of data                  |
| ontime   | 15521.000435352                          | Sum of GTIs [s]                             |
| livetime | 15155.137584489                          | Livetime [s]                                |
| ontime4  | 15521.000435352                          | Sum of GTIs [s]                             |
| ontime5  | 15521.000435352                          | Sum of GTIs [s]                             |
| ontime6  | 15521.000435352                          | Sum of GTIs [s]                             |
| ontime7  | 15521.000435352                          | Sum of GTIs [s]                             |
| ontime8  | 15521.000435352                          | Sum of GTIs [s]                             |
| ontime9  | 15521.000435352                          | Sum of GTIs [s]                             |
| l2events | 104800                                   | Number of level 2 events                    |

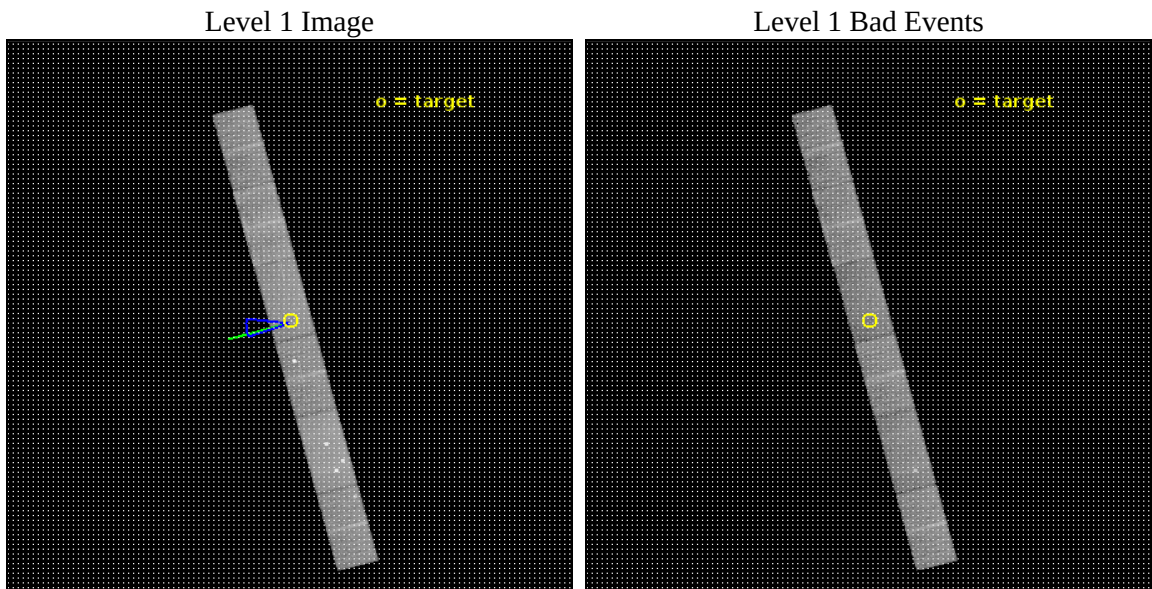




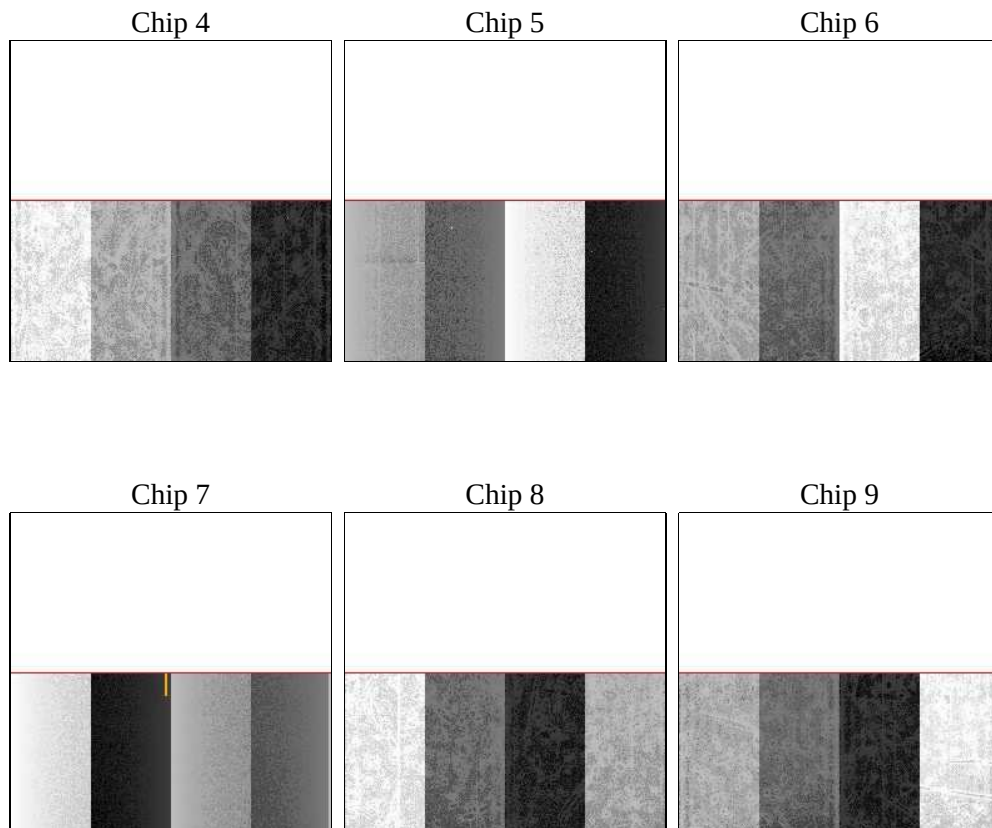
## 2 OBI

### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias



### 2.1.3 Parameters

|          |                     |                                |                |                    |                                         |
|----------|---------------------|--------------------------------|----------------|--------------------|-----------------------------------------|
| obi_num  | 0                   | Obi number                     | sched_exp_time | 15481.832000       | [s] Scheduled observation exposure time |
| ascdsver | 10.6                | Processing system revision     | ontime         | 15521.000435352    | Sum of GTIs [s]                         |
| caldbver | 4.7.8               | &#160                          | ontime4        | 15521.000435352    | Sum of GTIs [s]                         |
| date     | 2018-03-20T15:16:33 | Date and time of file creation | ontime5        | 15521.000435352    | Sum of GTIs [s]                         |
| revision | 1                   | Processing version of data     | ontime6        | 15521.000435352    | Sum of GTIs [s]                         |
|          |                     |                                | ontime7        | 15521.000435352    | Sum of GTIs [s]                         |
|          |                     |                                | ontime8        | 15521.000435352    | Sum of GTIs [s]                         |
|          |                     |                                | ontime9        | 15521.000435352    | Sum of GTIs [s]                         |
|          |                     |                                | l1events       | 472654             | Number of level 1 events                |
|          |                     |                                | tgmethod       | TGDETECT           | Method used to create src1a file        |
|          |                     |                                | src1a_pos      | (4122.10, 4142.17) | src1a sky pixel position                |

### 2.1.4 Events

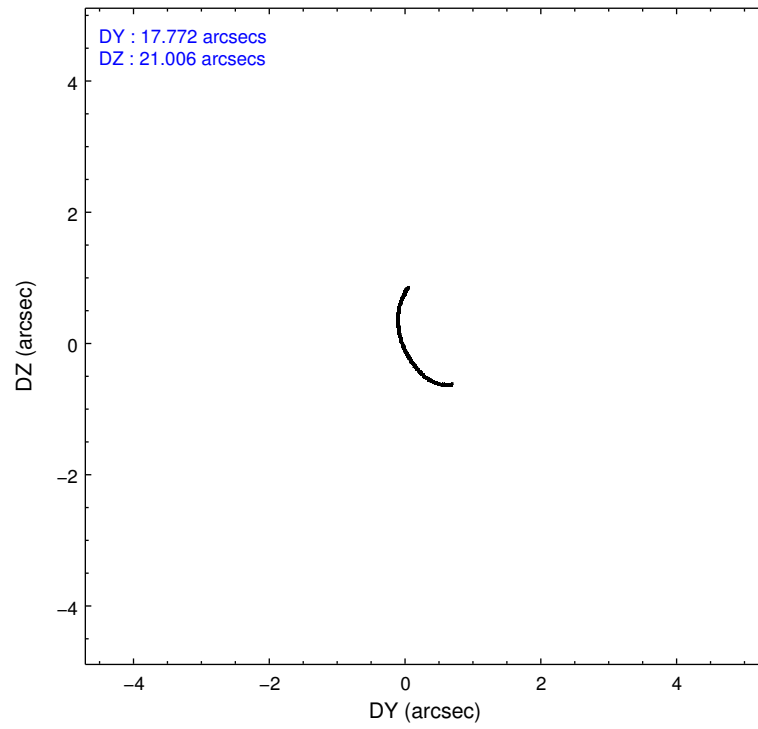
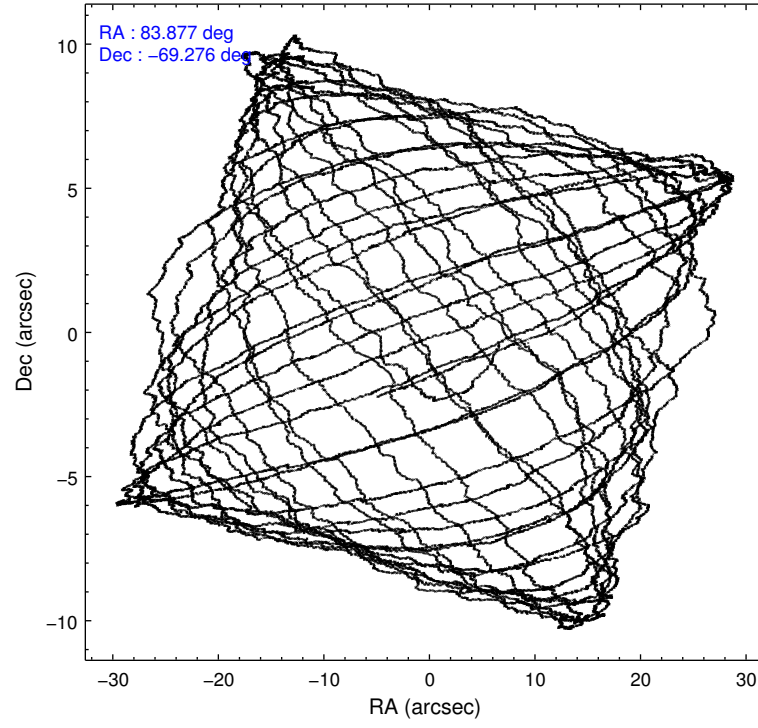
|                 | ccd 4 | ccd 5  | ccd 6 | ccd 7 | ccd 8 | ccd 9 |                | ccd 4 | ccd 5 | ccd 6 | ccd 7 | ccd 8 | ccd 9 |
|-----------------|-------|--------|-------|-------|-------|-------|----------------|-------|-------|-------|-------|-------|-------|
| level 1 events  | 70379 | 111602 | 74719 | 76997 | 79163 | 59794 | grade 0 events | 3672  | 16252 | 11995 | 3592  | 6328  | 2628  |
| rejected events | 61873 | 50094  | 57596 | 40995 | 57544 | 52181 |                | 5%    | 14%   | 16%   | 4%    | 7%    | 4%    |
| rejected %      | 87%   | 44%    | 77%   | 53%   | 72%   | 87%   | grade 1 events | 43    | 1750  | 52    | 94    | 31    | 30    |
|                 |       |        |       |       |       |       |                | 0%    | 1%    | 0%    | 0%    | 0%    | 0%    |
|                 |       |        |       |       |       |       | grade 2 events | 1749  | 16925 | 1800  | 7516  | 4983  | 1654  |
|                 |       |        |       |       |       |       |                | 2%    | 15%   | 2%    | 9%    | 6%    | 2%    |
|                 |       |        |       |       |       |       | grade 3 events | 857   | 2087  | 870   | 3336  | 2232  | 877   |
|                 |       |        |       |       |       |       |                | 1%    | 1%    | 1%    | 4%    | 2%    | 1%    |
|                 |       |        |       |       |       |       | grade 4 events | 829   | 1919  | 804   | 3278  | 2129  | 824   |
|                 |       |        |       |       |       |       |                | 1%    | 1%    | 1%    | 4%    | 2%    | 1%    |
|                 |       |        |       |       |       |       | grade 5 events | 2513  | 6564  | 2542  | 7359  | 3834  | 2852  |
|                 |       |        |       |       |       |       |                | 3%    | 5%    | 3%    | 9%    | 4%    | 4%    |
|                 |       |        |       |       |       |       | grade 6 events | 1401  | 24331 | 1659  | 18286 | 5948  | 1631  |
|                 |       |        |       |       |       |       |                | 1%    | 21%   | 2%    | 23%   | 7%    | 2%    |
|                 |       |        |       |       |       |       | grade 7 events | 59315 | 41774 | 54997 | 33536 | 53678 | 49298 |
|                 |       |        |       |       |       |       |                | 84%   | 37%   | 73%   | 43%   | 67%   | 82%   |

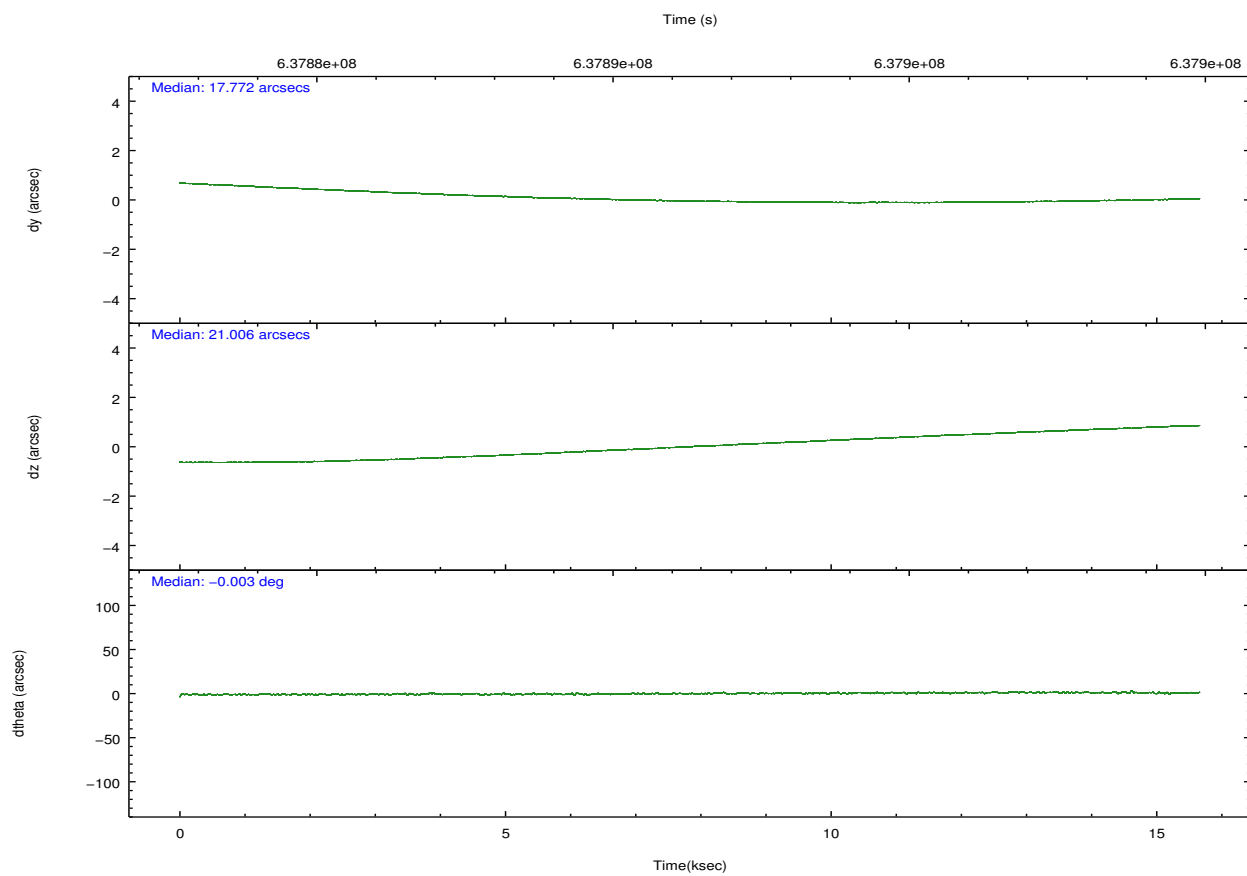
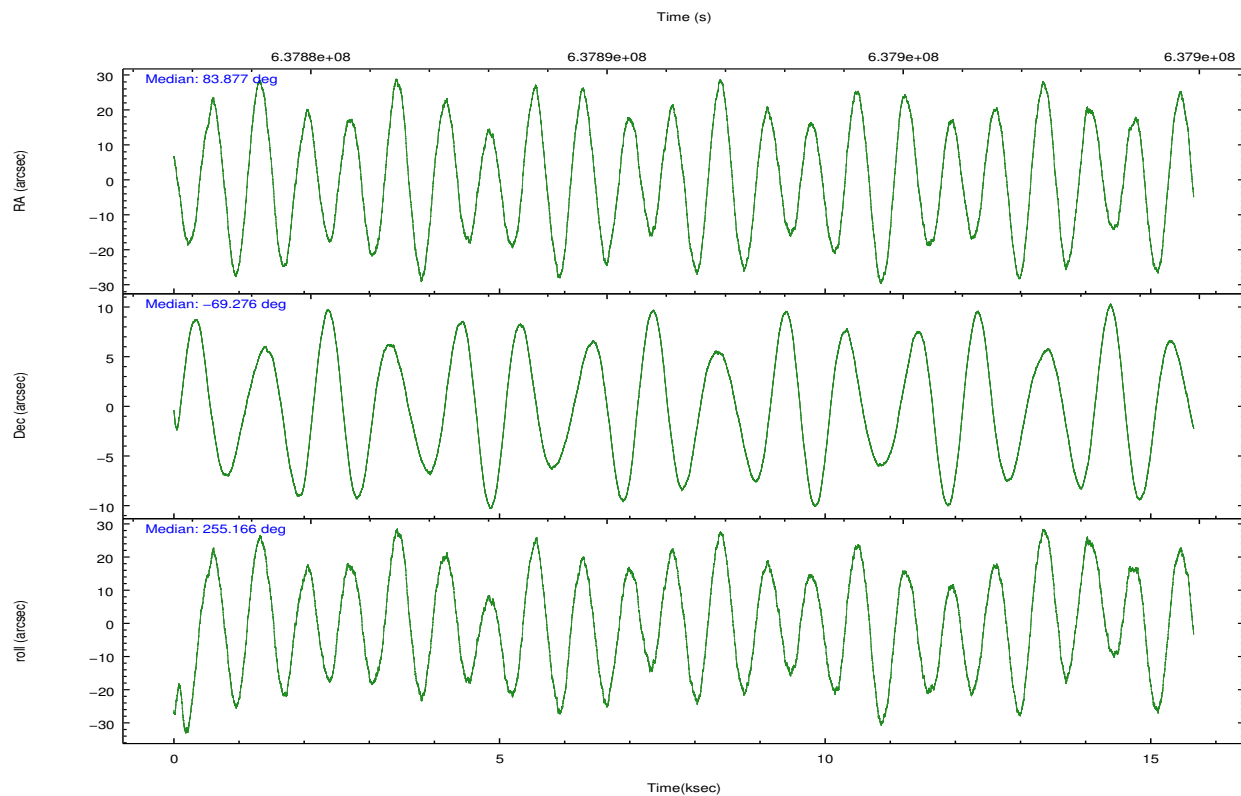
## 2.2 Compared Parameters

| Parameter                            | Planned             | Actual               |
|--------------------------------------|---------------------|----------------------|
| Instrument                           | ACIS                | ACIS                 |
| Detector                             | ACIS-456789         | ACIS-456789          |
| Grating                              | HETG                | HETG                 |
| Data mode                            | FAINT               | FAINT                |
| Observation mode                     | POINTING            | POINTING             |
| [deg] Pointing RA                    | 83.855391           | 83.87666102363534    |
| [deg] Pointing Dec                   | -69.249670          | -69.27603149767013   |
| [deg] Pointing Roll                  | 254.989461          | 255.1659515169928    |
| [deg] Roll angle                     | 264.000000          | 264.000000           |
| [deg] Roll tolerance                 | 12.000000           | 12.000000            |
| Roll constraint allows 180D rotation | N                   | N                    |
| [s] Window start time (MET)          | 636940869.184000    | 636940869.184000     |
| [s] Window stop time (MET)           | 639014469.184000    | 639014469.184000     |
| [mm] SIM focus pos                   | -0.684267           | -0.6828225247311905  |
| [mm] SIM defocus                     | 0                   | 0.001444936568705701 |
| [mm] SIM translation stage pos       | -183.992523         | -183.9875365069546   |
| [mm] SIM translation stage offset    | -6.14               | -6.144986076053243   |
| [s] Observation start time (MET)     | 637883669.184000    | 637882667.3359801    |
| Observation start date               | 2018-03-19T21:53:20 | 2018-03-19T21:37:47  |
| [s] Observation end time (MET)       | 637899151.184000    | 637899961.137        |
| Observation end date                 | 2018-03-20T02:11:22 | 2018-03-20T02:26:01  |
| Read mode                            | TIMED               | TIMED                |

| Parameter                             | Planned   | Actual  |
|---------------------------------------|-----------|---------|
| Obspar format version number          | 7         | 7       |
| Obspar file type                      | PREDICTED | ACTUAL  |
| Obspar update status                  | NONE      | UPDATED |
| CCD I0 on                             | N         | N       |
| CCD I1 on                             | N         | N       |
| CCD I2 on                             | N         | N       |
| CCD I3 on                             | N         | N       |
| CCD S0 on                             | O1        | Y       |
| CCD S1 on                             | Y         | Y       |
| CCD S2 on                             | Y         | Y       |
| CCD S3 on                             | Y         | Y       |
| CCD S4 on                             | Y         | Y       |
| CCD S5 on                             | Y         | Y       |
| Number of optional ACIS chips dropped | 0         | 0       |
| On-chip summing requested             | N         | N       |
| Subarray requested                    | CUSTOM    | 1/2     |
| Subarray start row                    | 1         | 1       |
| Subarray row count                    | 512       | 512     |
| Alternating exposures requested       | N         | N       |
| [s] Primary exposure time             | 0.000000  | 1.7     |

## 2.3 Aspect



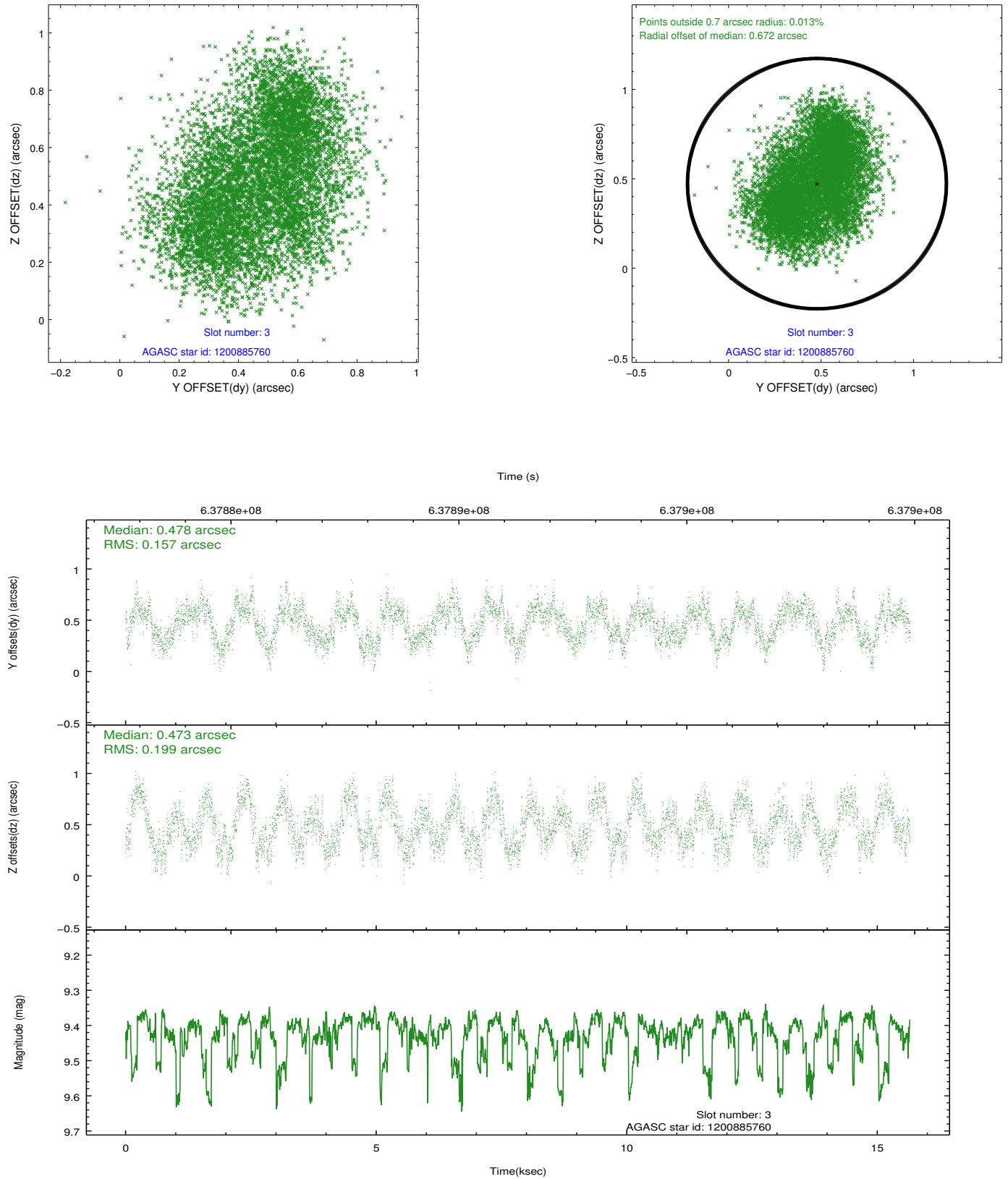


# Slot Statistics

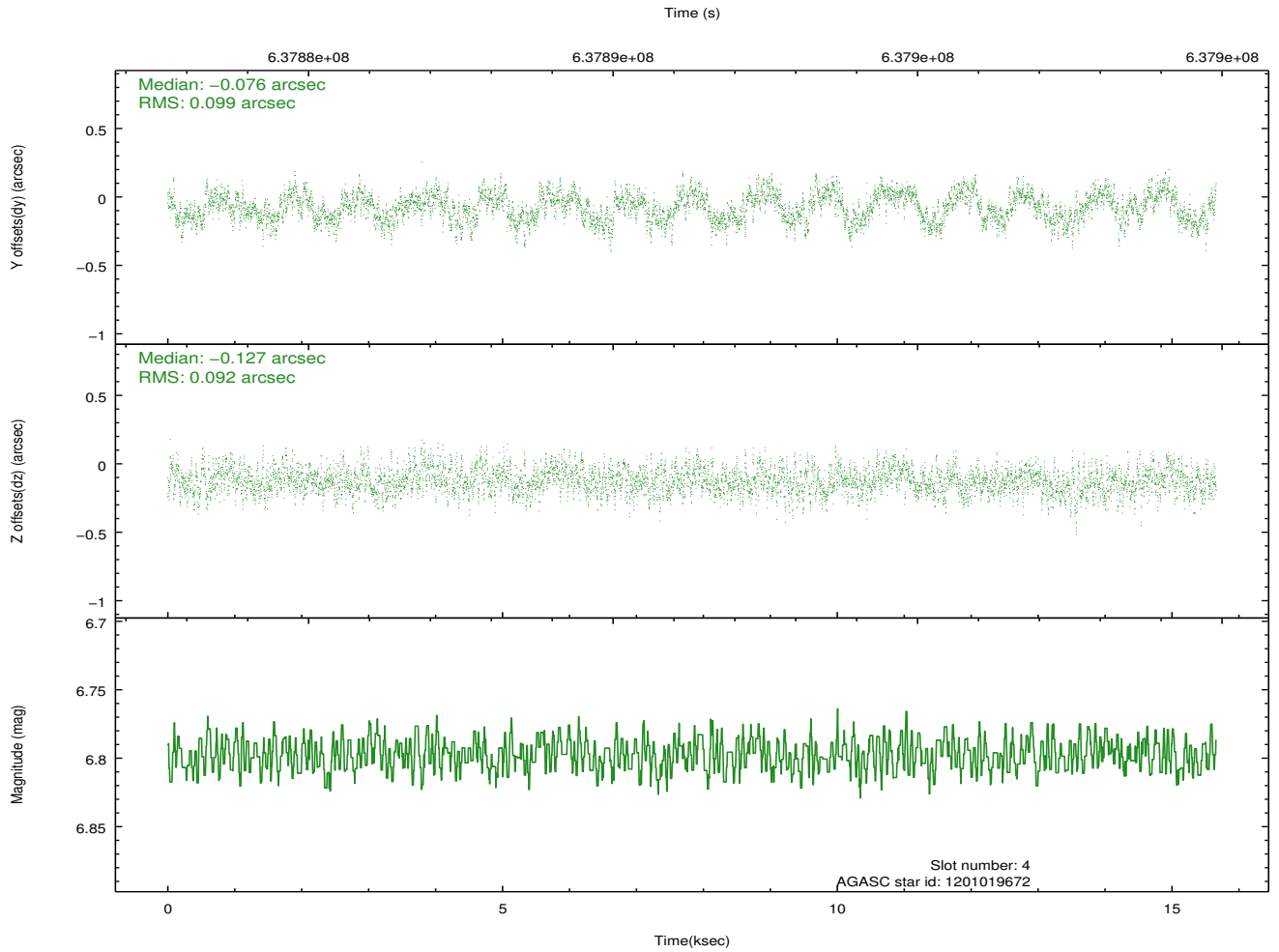
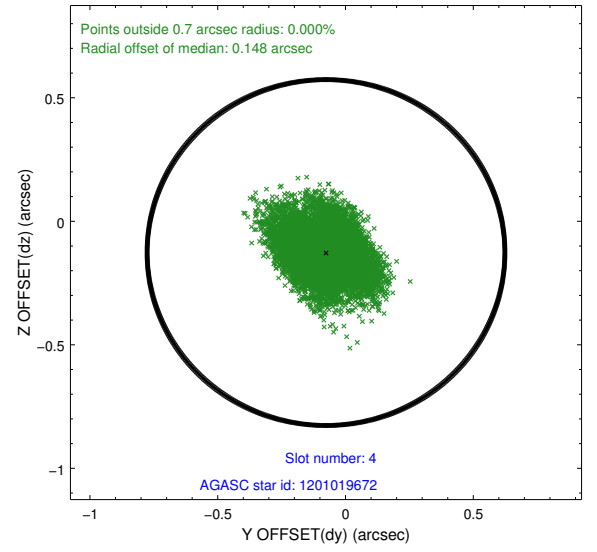
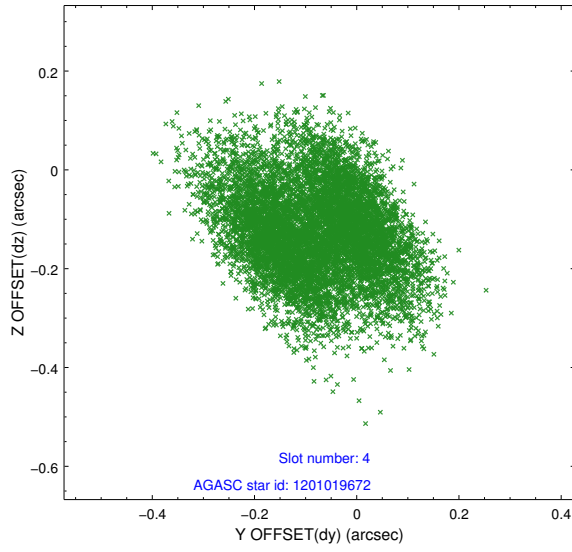
| slot | status | used | id         | mag  | n_pts | med_dy | med_dz | dr1   | dr2   | ra        | dec        | mean_y   | mean_z   |
|------|--------|------|------------|------|-------|--------|--------|-------|-------|-----------|------------|----------|----------|
| 0    | FID    |      | ACIS-S-1   | 7.22 | 3819  | 0.072  | 0.132  | 0.031 | 0.048 | 0.000000  | 0.000000   | 925.53   | -1864.77 |
| 1    | FID    |      | ACIS-S-2   | 7.12 | 3820  | -0.387 | -0.257 | 0.023 | 0.033 | 0.000000  | 0.000000   | -770.68  | -1869.95 |
| 2    | FID    |      | ACIS-S-4   | 7.22 | 3819  | 0.293  | 0.130  | 0.016 | 0.023 | 0.000000  | 0.000000   | 2142.95  | 39.00    |
| 3    | GUIDE  | used | 1200885760 | 9.42 | 7632  | 0.478  | 0.473  | 0.280 | 0.411 | 83.723637 | -68.777667 | -1595.65 | -605.07  |
| 4    | GUIDE  | used | 1201019672 | 6.80 | 7640  | -0.076 | -0.127 | 0.143 | 0.229 | 85.312192 | -68.770187 | -2137.30 | 1392.87  |
| 5    | GUIDE  | used | 1201020040 | 8.55 | 7635  | 0.114  | -0.193 | 0.138 | 0.238 | 85.379163 | -68.879396 | -1775.58 | 1570.27  |
| 6    | GUIDE  | used | 1201542672 | 8.17 | 7639  | -0.338 | -0.356 | 0.137 | 0.230 | 84.492488 | -69.957531 | 2258.25  | 1420.49  |
| 7    | GUIDE  | used | 1201410616 | 9.27 | 7610  | -0.160 | 0.186  | 0.221 | 0.363 | 82.516808 | -69.784406 | 2308.65  | -1104.54 |

## 2.4 Star Slots

### 2.4.1 Slot 3

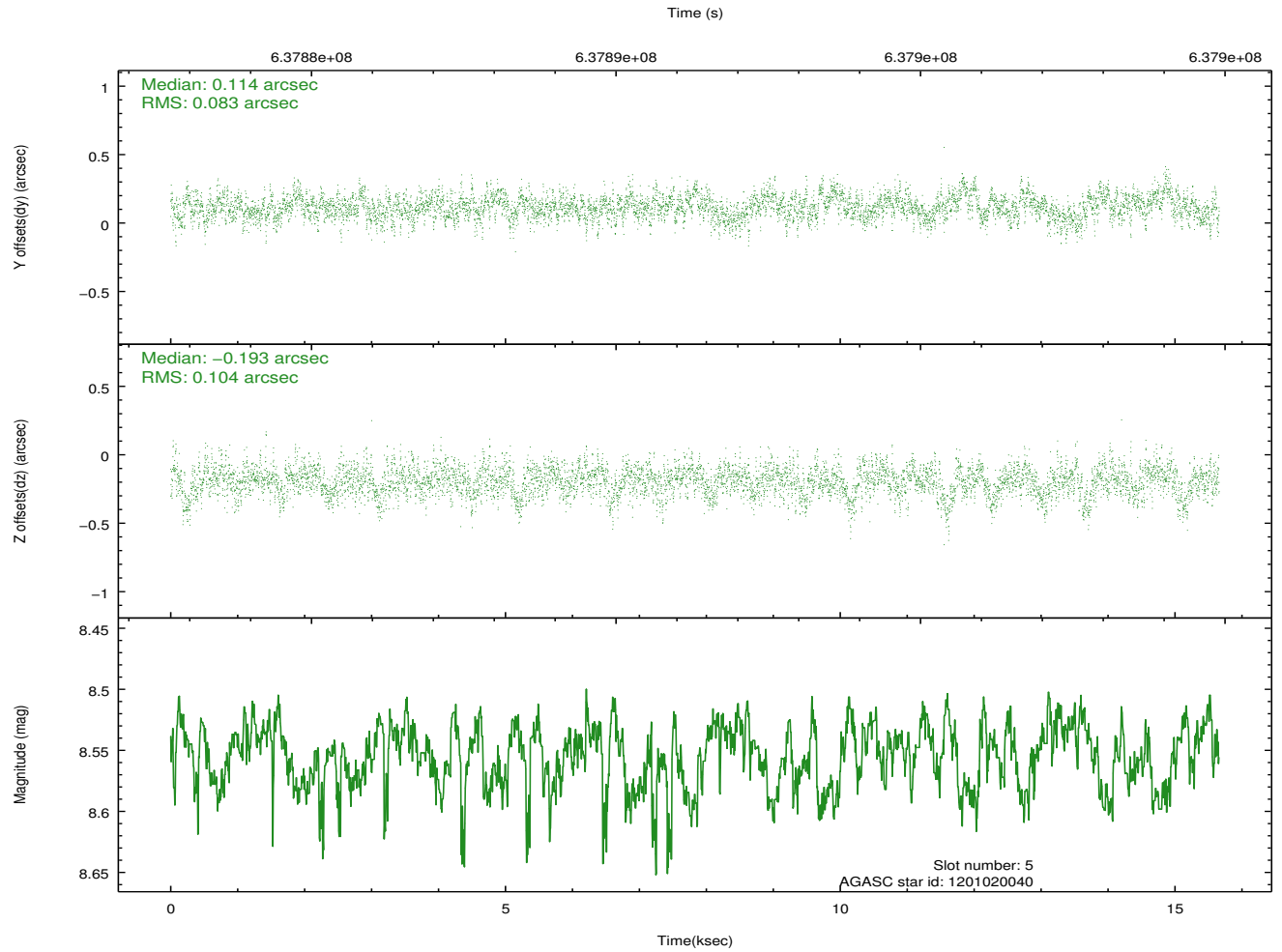
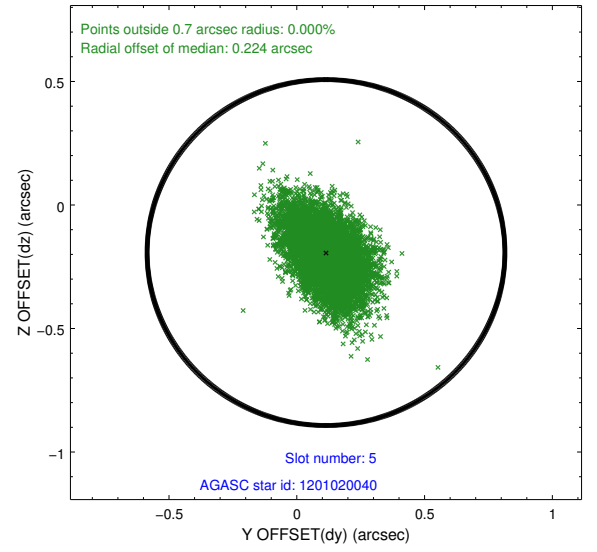
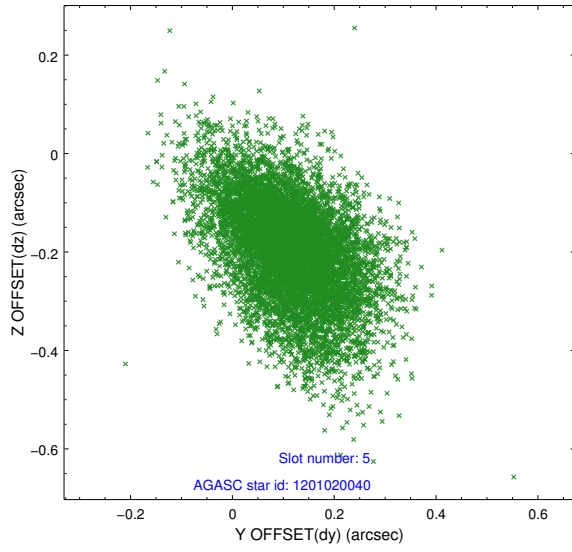


## 2.4.2 Slot 4

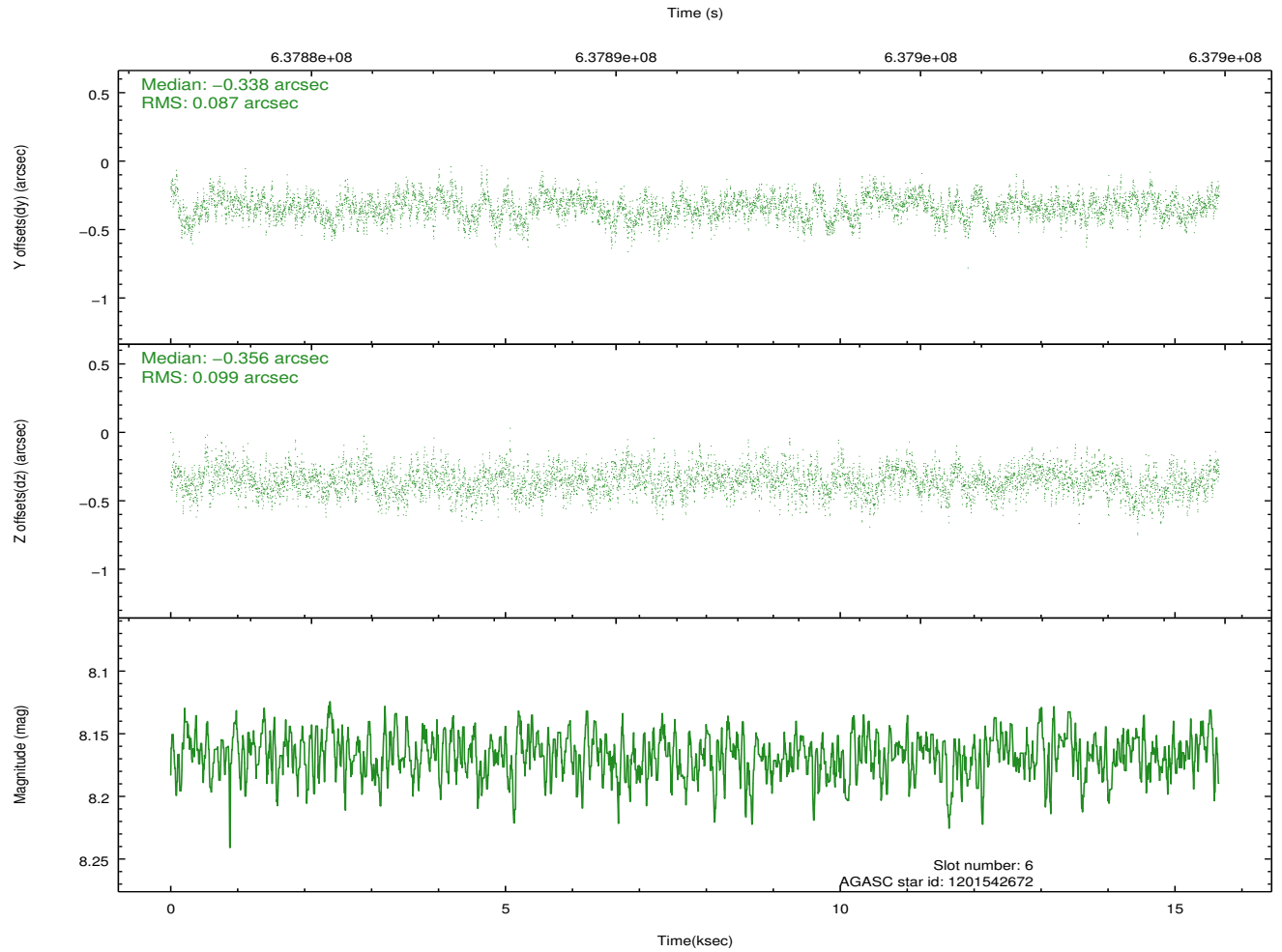
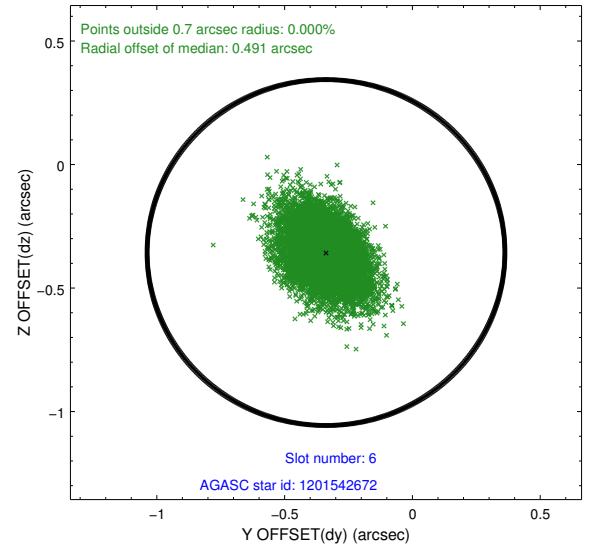
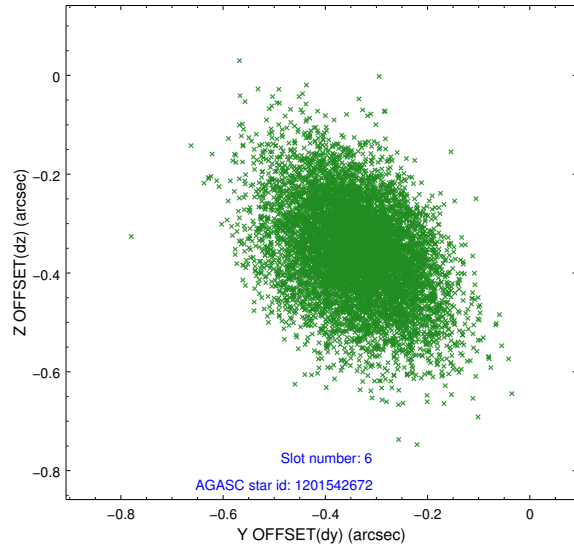




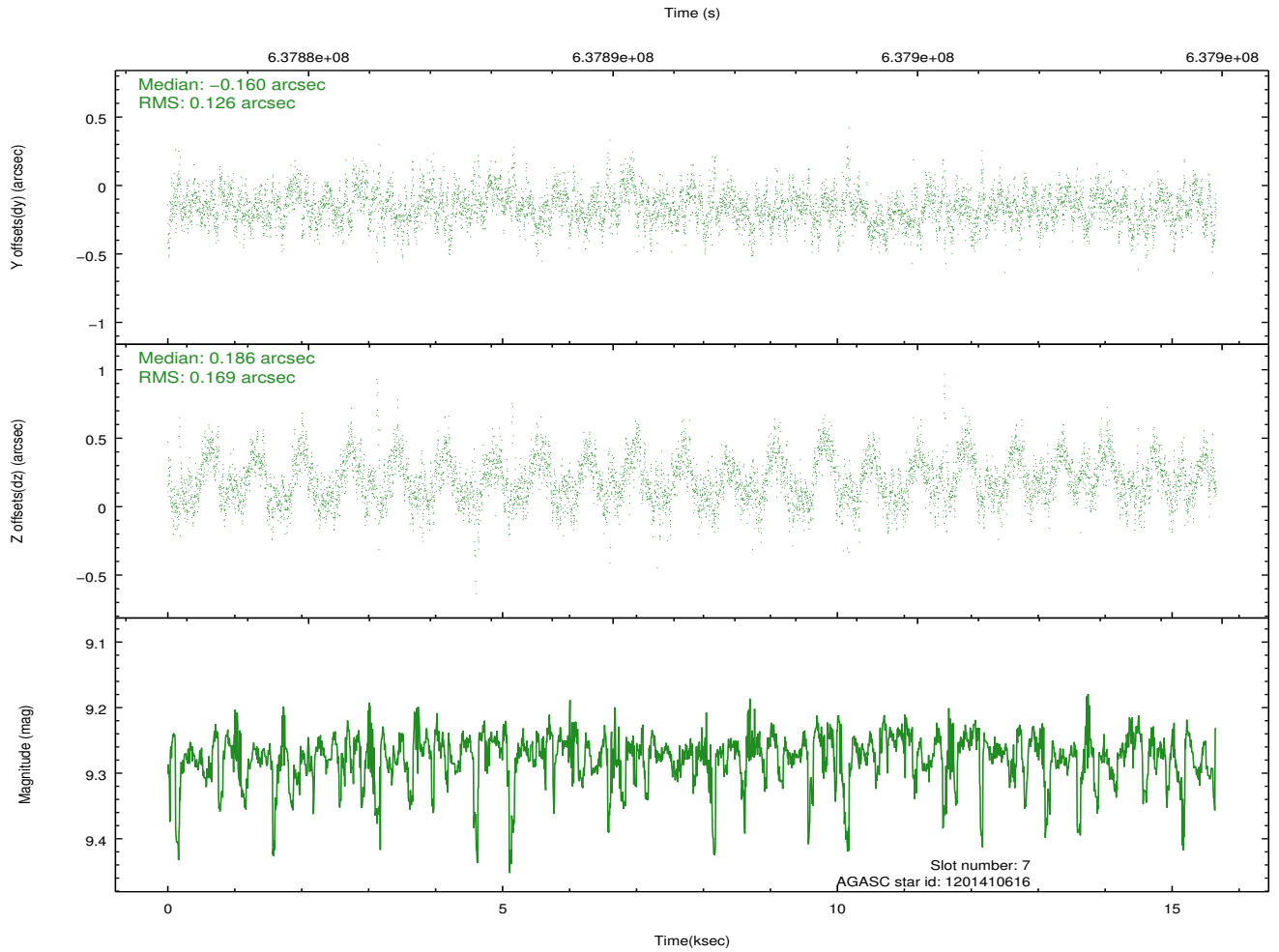
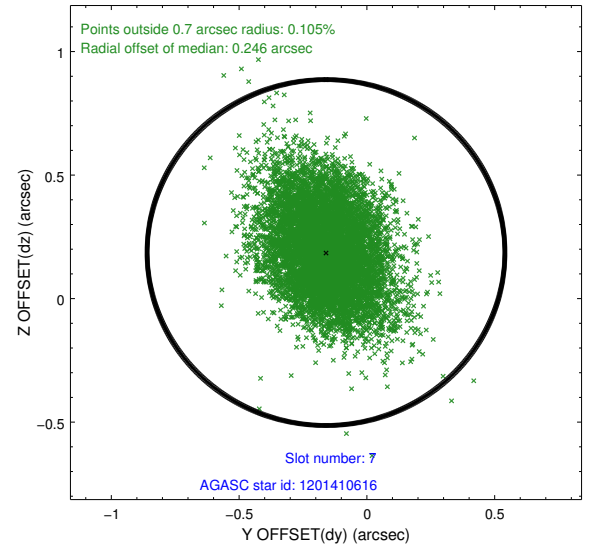
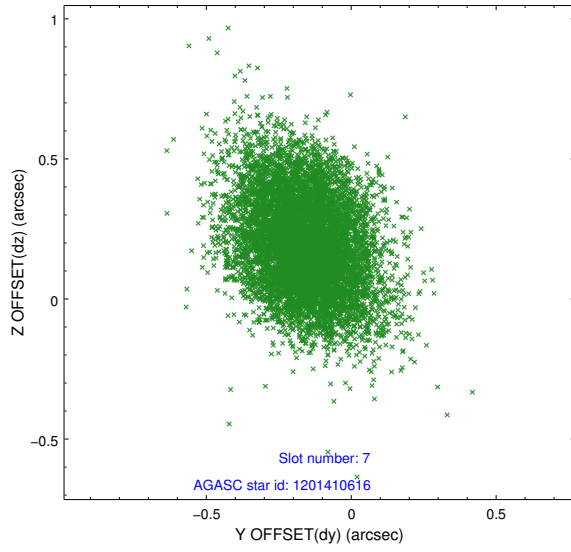
### 2.4.3 Slot 5



## 2.4.4 Slot 6

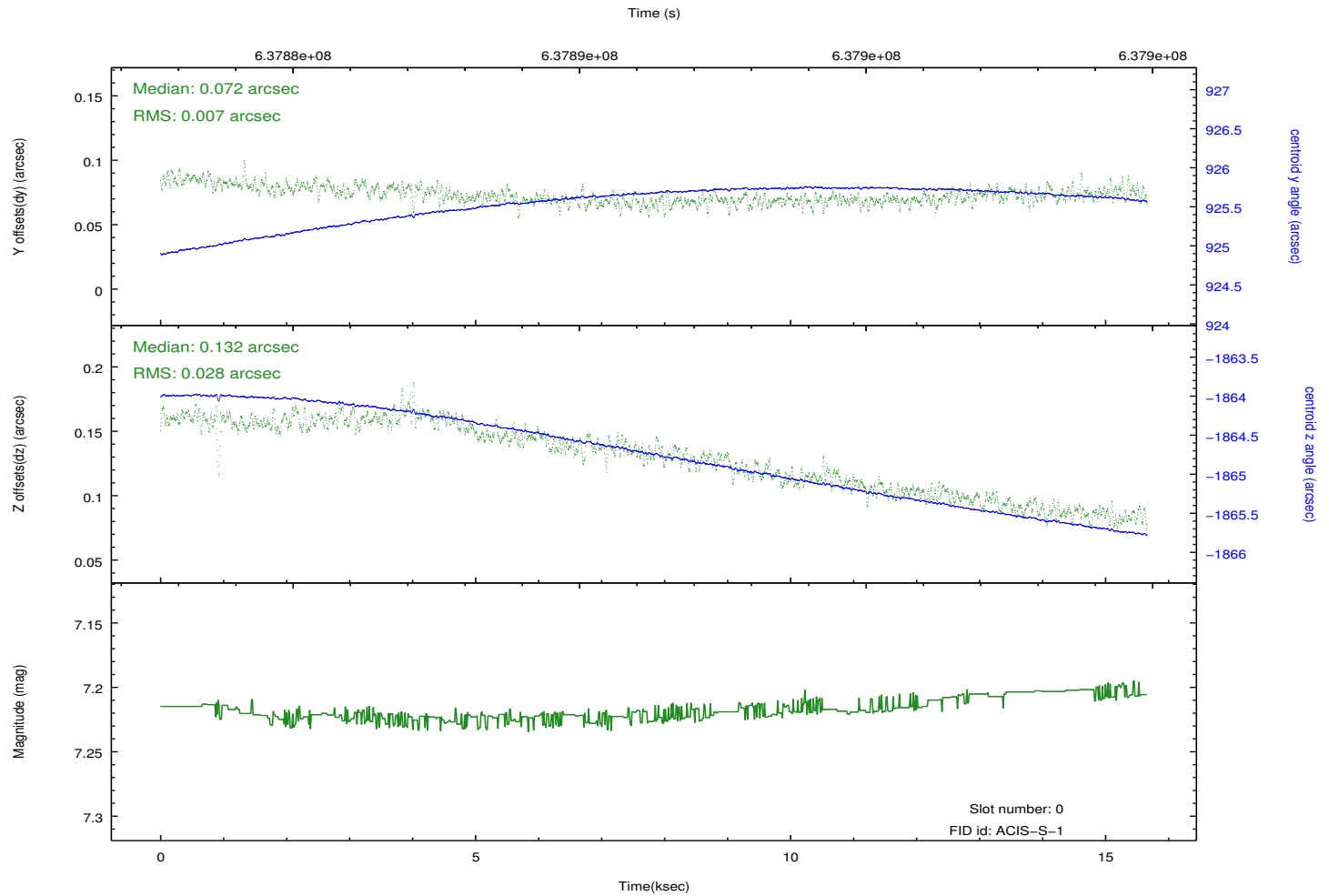
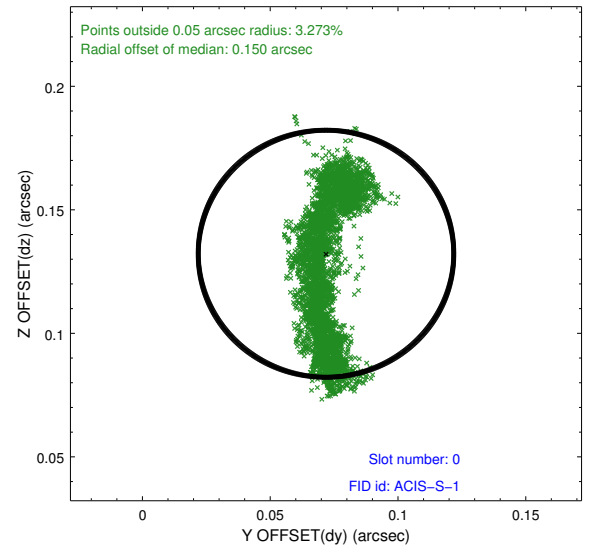
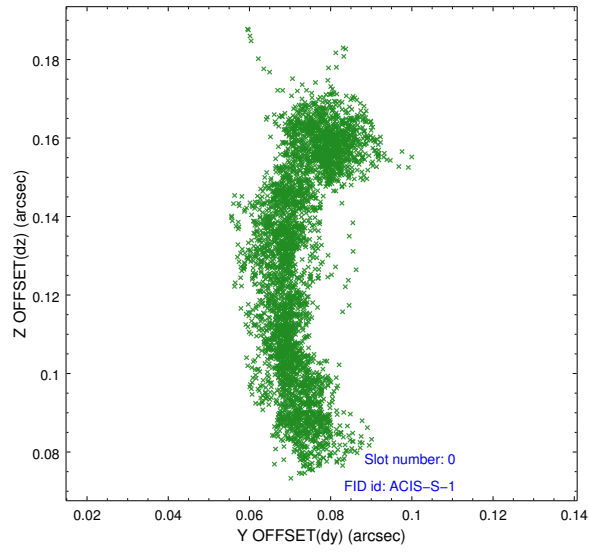


## 2.4.5 Slot 7

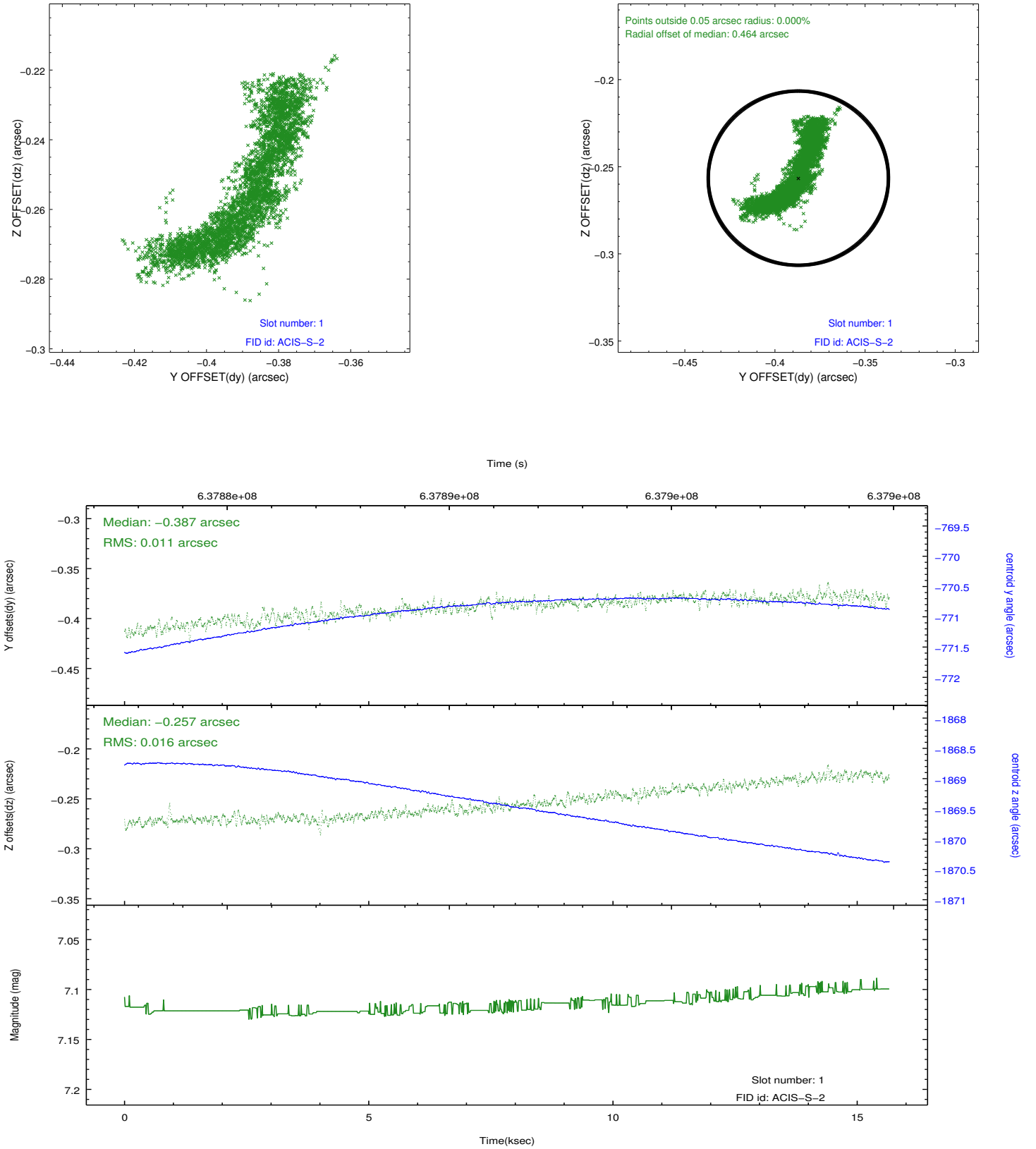


## 2.5 FID Slots

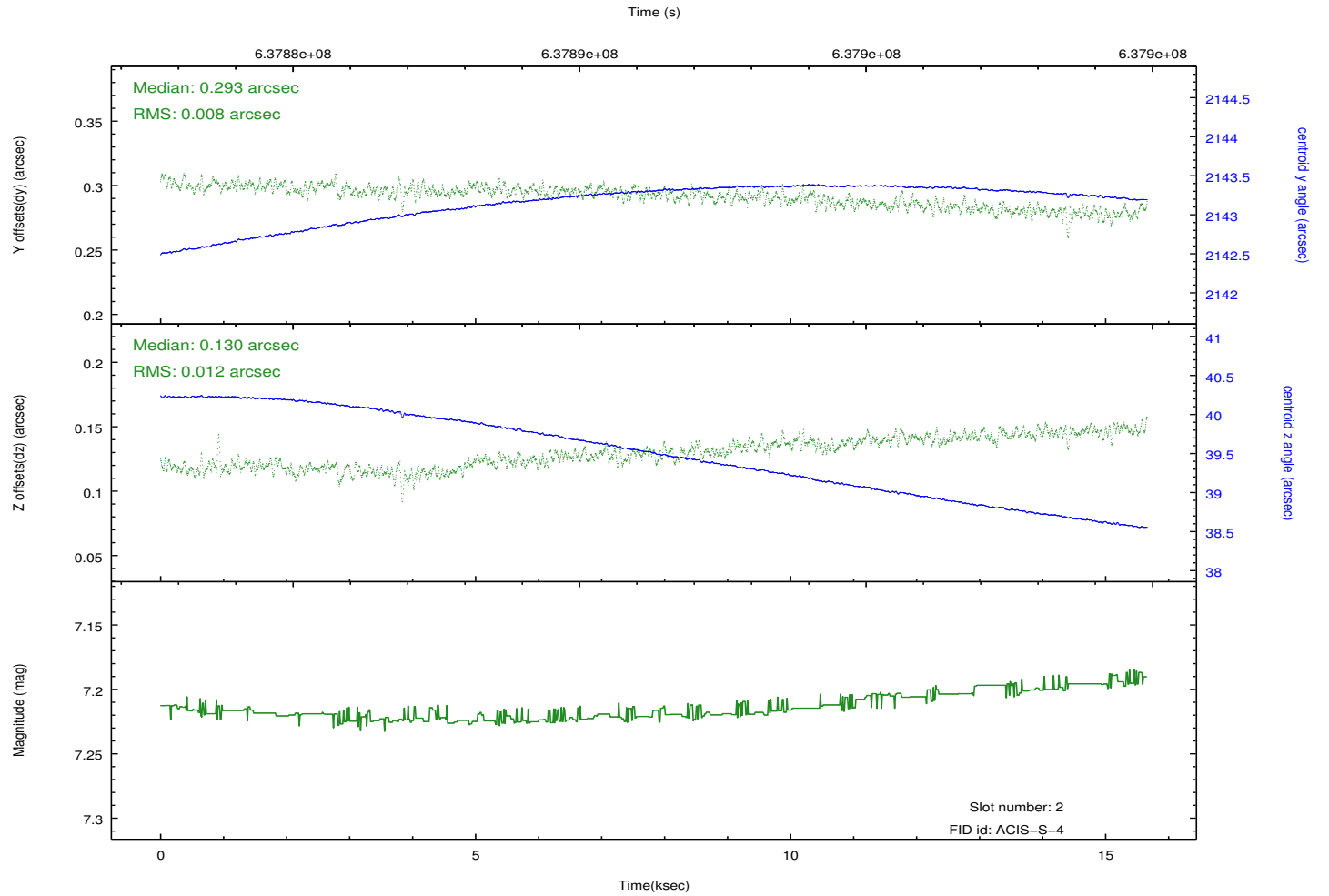
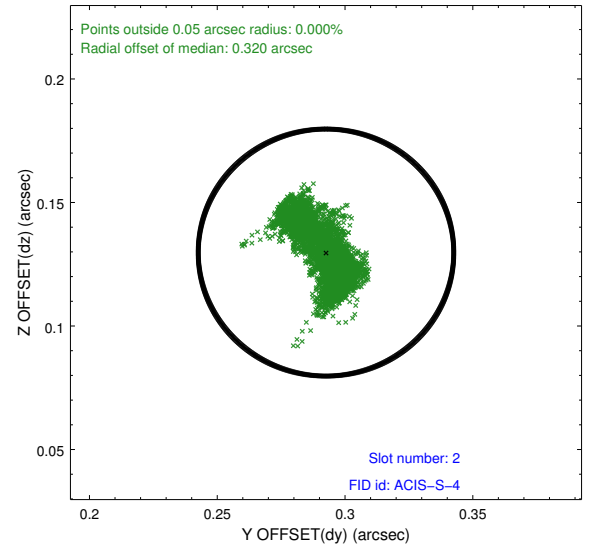
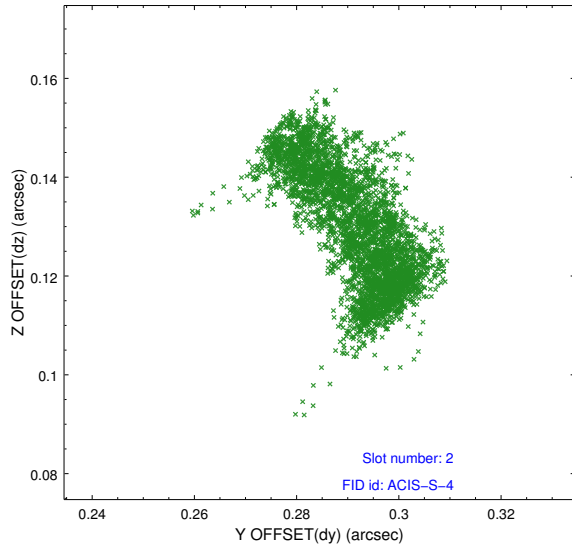
### 2.5.1 Slot 0



## 2.5.2 Slot 1

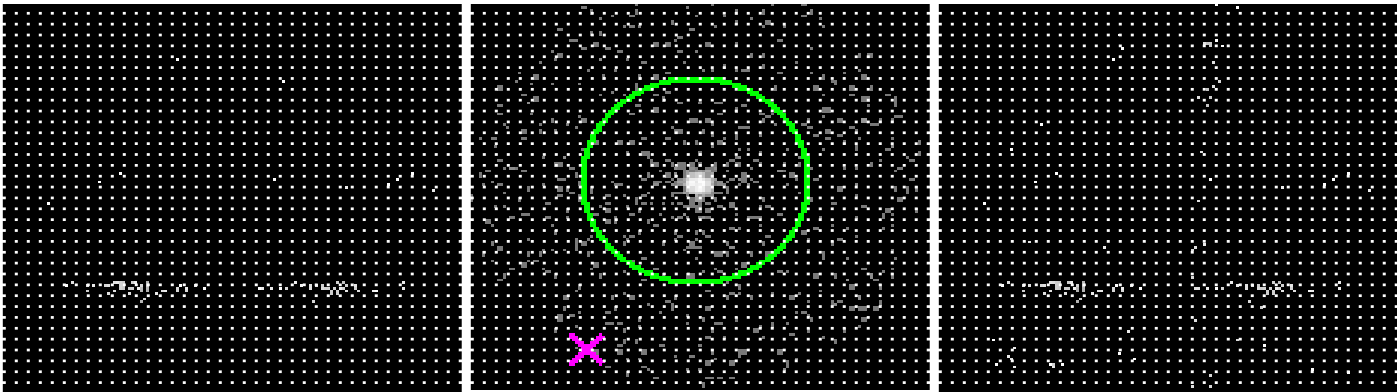


### 2.5.3 Slot 2



# 3 Gratings

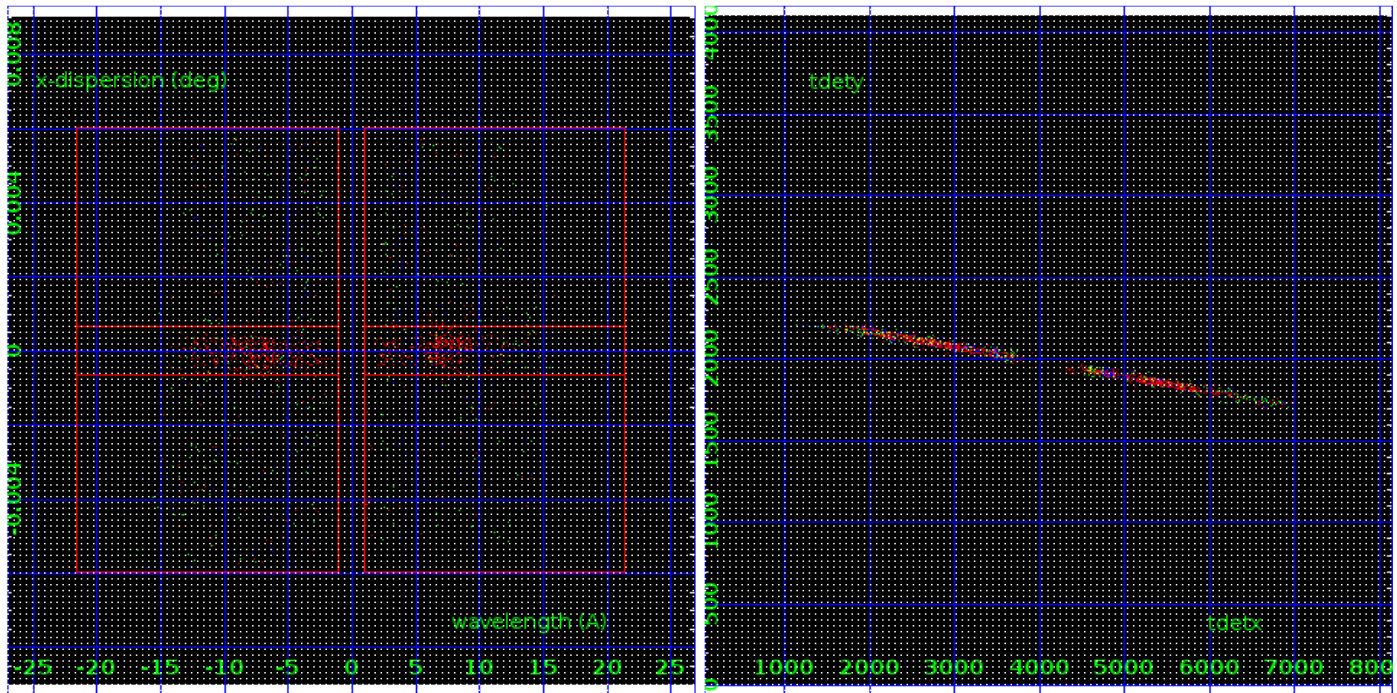
## 3.1 HEG Arm



HEG Order Sort 123

HEG Zero Order

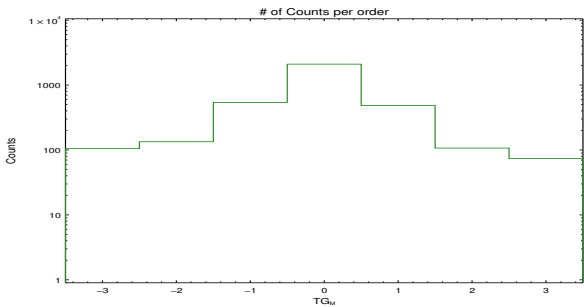
HEG Order Sort ALL

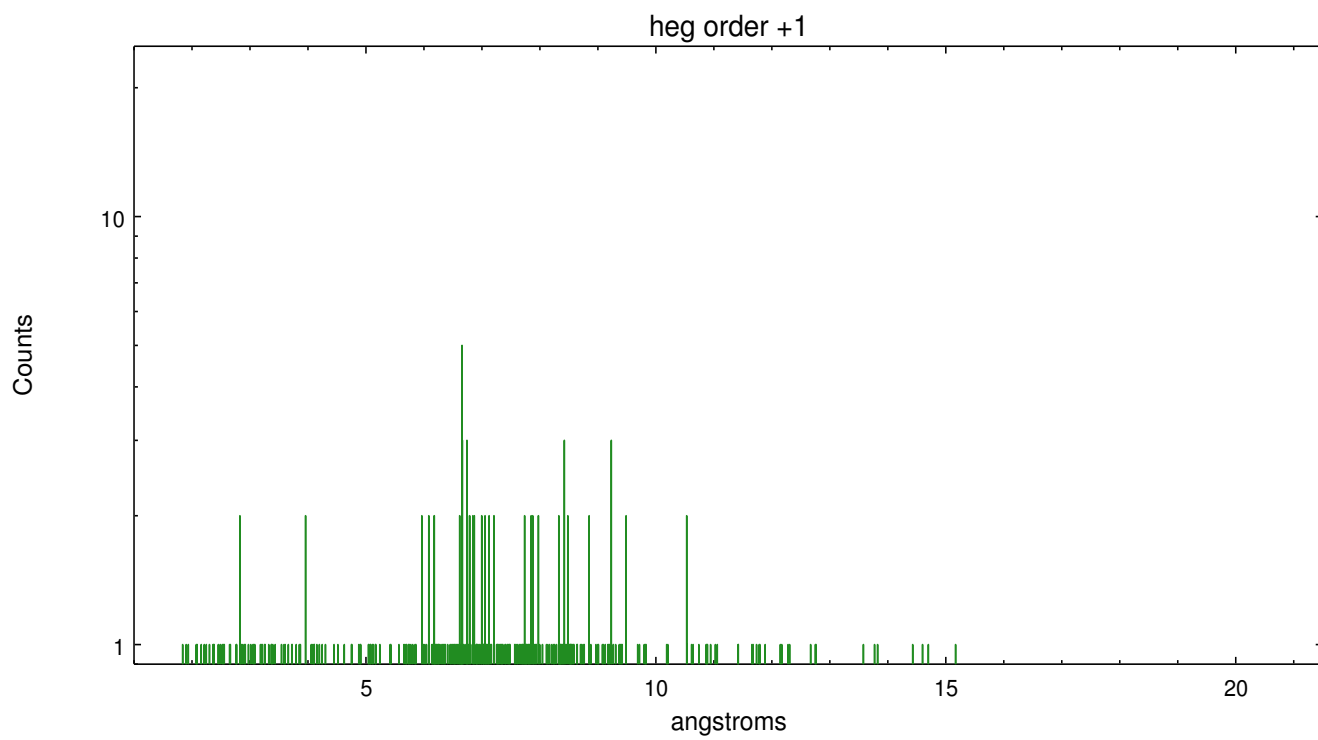
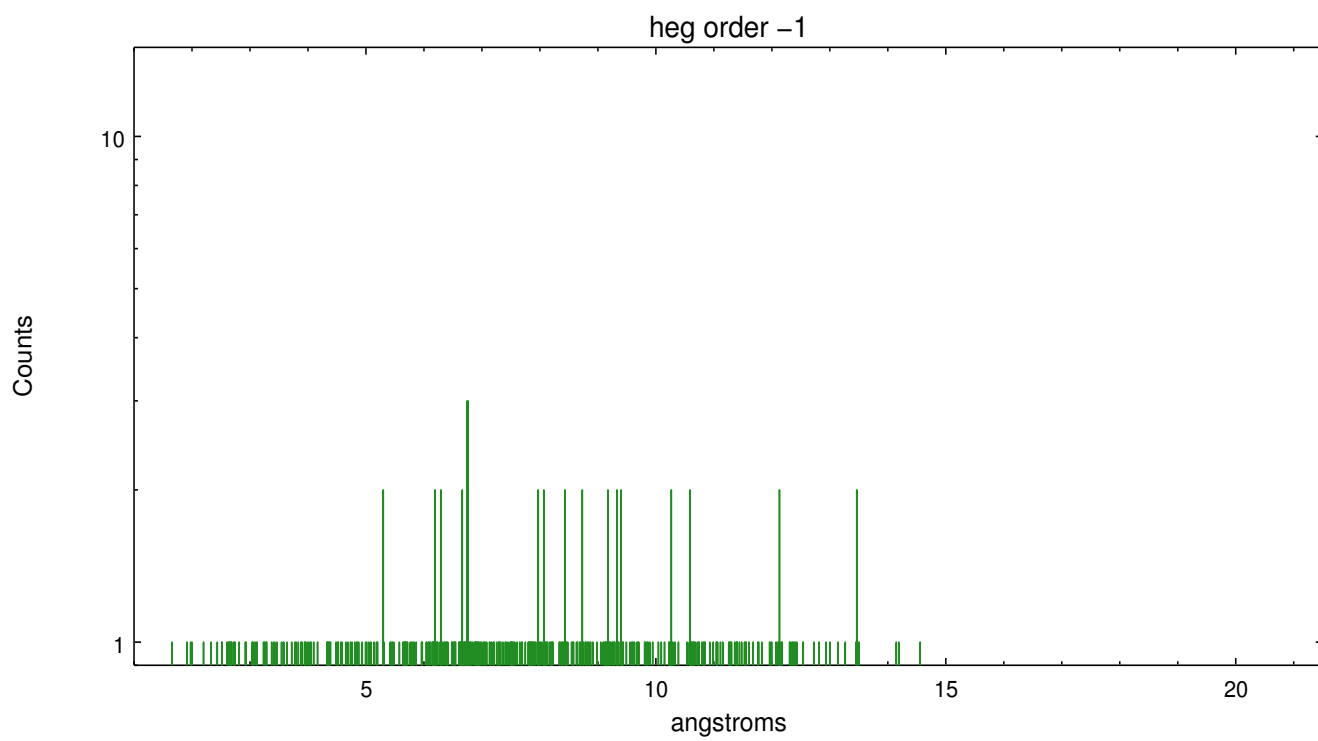


Spot Image HEG

Full Detector HEG

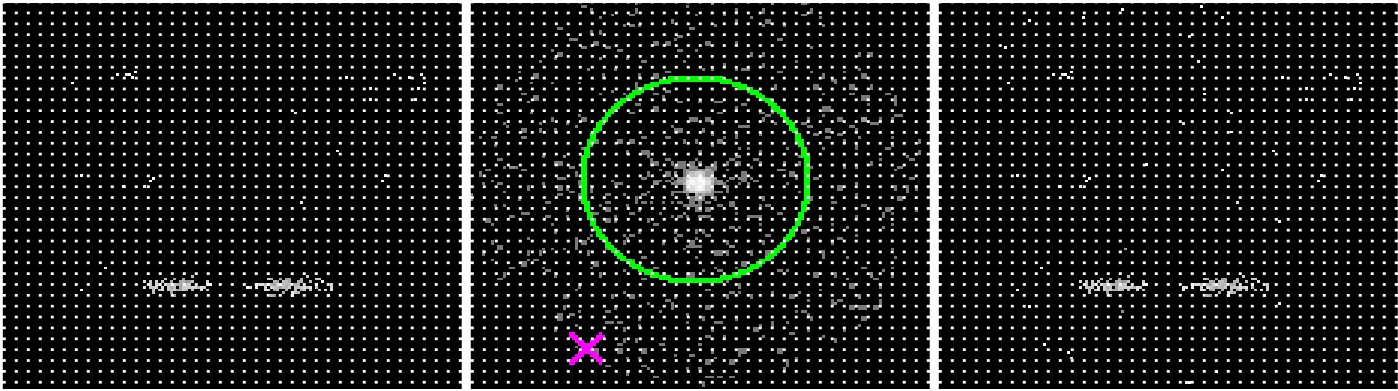
|        | order<br>-3 | order<br>-2 | order<br>-1 | order<br>0 | order<br>1 | order<br>2 | order<br>3 |
|--------|-------------|-------------|-------------|------------|------------|------------|------------|
| Events | 105         | 134         | 540         | 2100       | 484        | 107        | 74         |







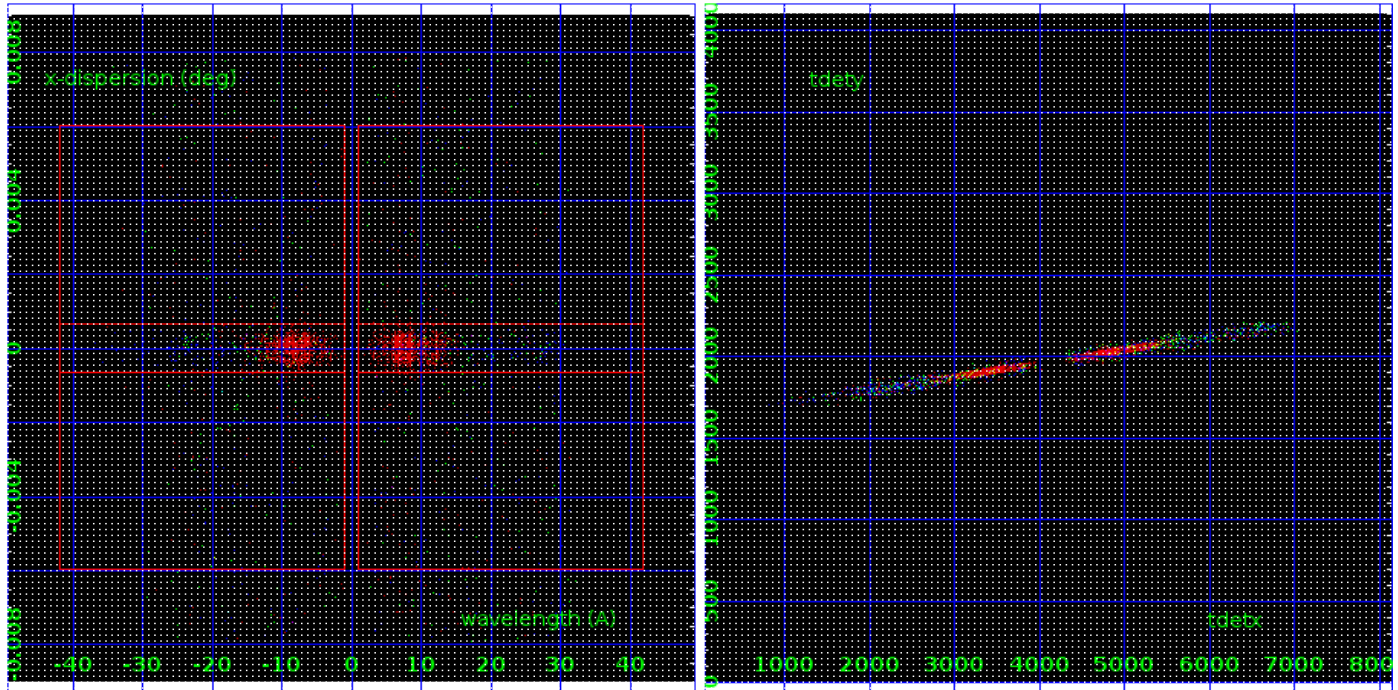
3.2 MEG Arm



MEG Order Sort 123

MEG Zero Order

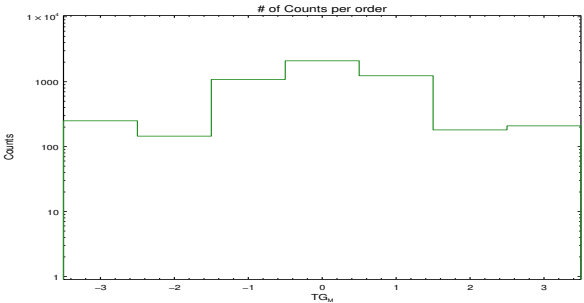
MEG Order Sort ALL

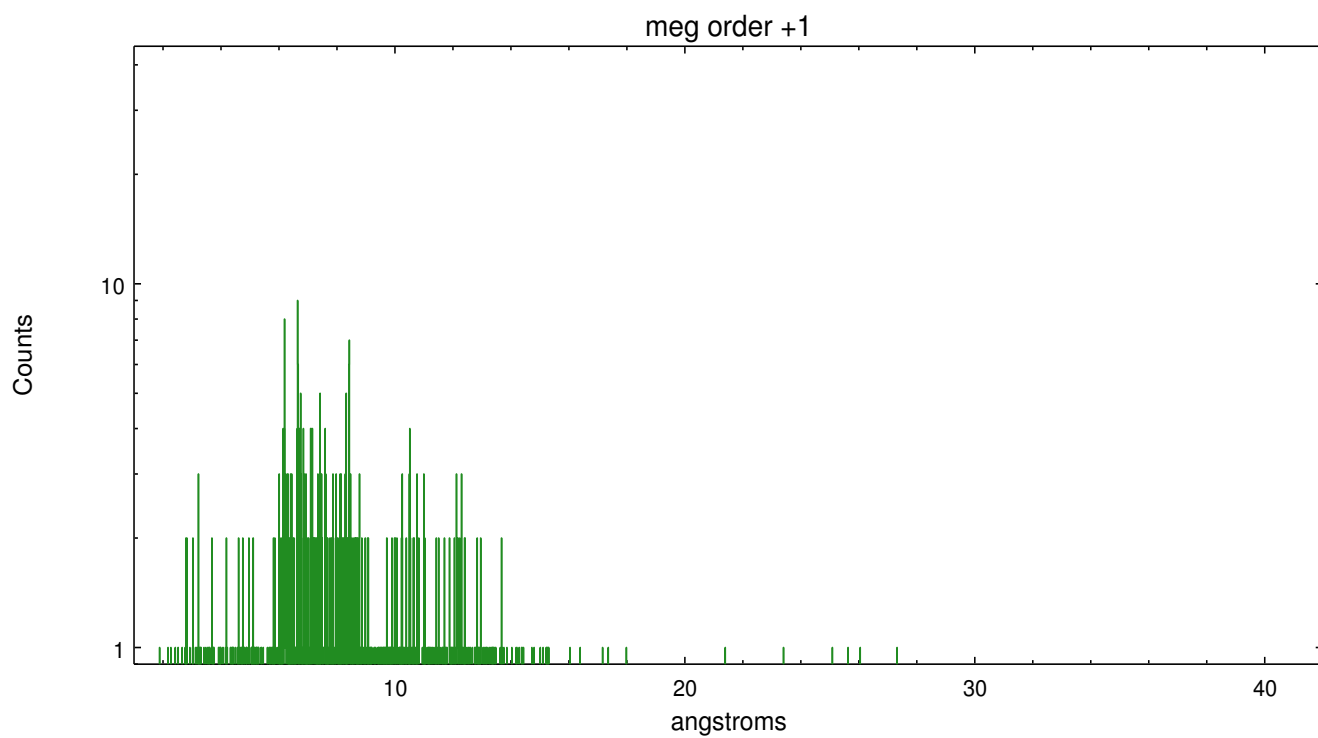
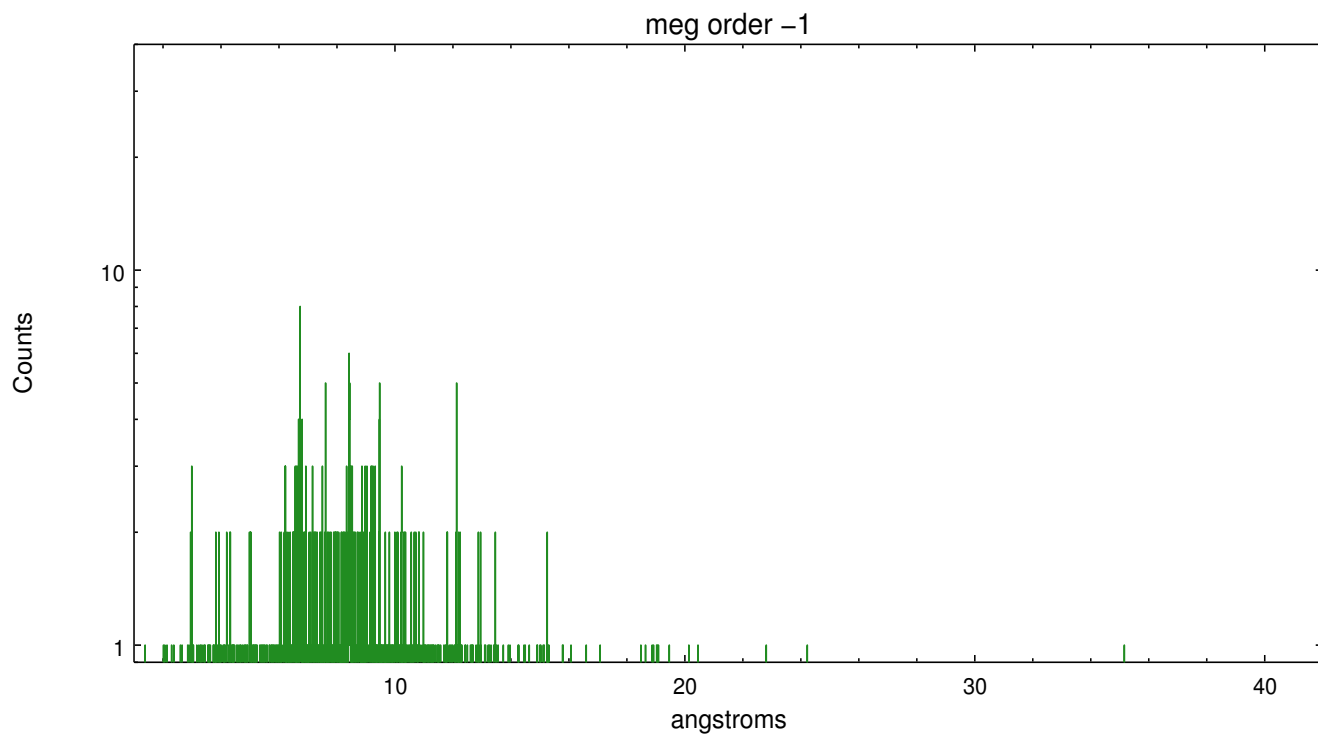


Spot Image MEG

Full Detector MEG

|        | order<br>-3 | order<br>-2 | order<br>-1 | order<br>0 | order<br>1 | order<br>2 | order<br>3 |
|--------|-------------|-------------|-------------|------------|------------|------------|------------|
| Events | 250         | 145         | 1083        | 2100       | 1236       | 181        | 209        |





# A Summary

## A.1 Status

|                            |                 |
|----------------------------|-----------------|
| V&V Scientist              | Joy Nichols     |
| V&V Date (YYYY-MM-DD)      | 2018.03.20      |
| V&V Edition                | 1               |
| V&V Disposition and Status | OK              |
| V&V Charge Time            | 15.521000435352 |

## A.2 Comments

Roll constraint met====

WARNING: there are no standard ciao tools for analysis of grating spectra from extended sources. The shape of an emission 'line' will be the shape of the zero order spatial structure convolved with the instrumental LSF. Grating extractions can be used, but need to be combined with custom spatial-spectral analysis, since wavelength is multi-valued at any particular diffraction angle.

===

WARNING: Zeroth order selected by pipeline tools is well-centered in the supernova remnant but is not at the position(s) of brightest emission. The user may want to select a region or source of interest, then use software tools such as CIAO to specify the coordinates of the zeroth order source of interest before running the tools to resolve the dispersed events.