

# V&V Reference Report

## L2 ASCDS Version : 10.6.3

Observation 20171 - L2 Version 1  
Chandra X-Ray Center

L2 Processing Date : Jun 12 2018

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# 1 Front

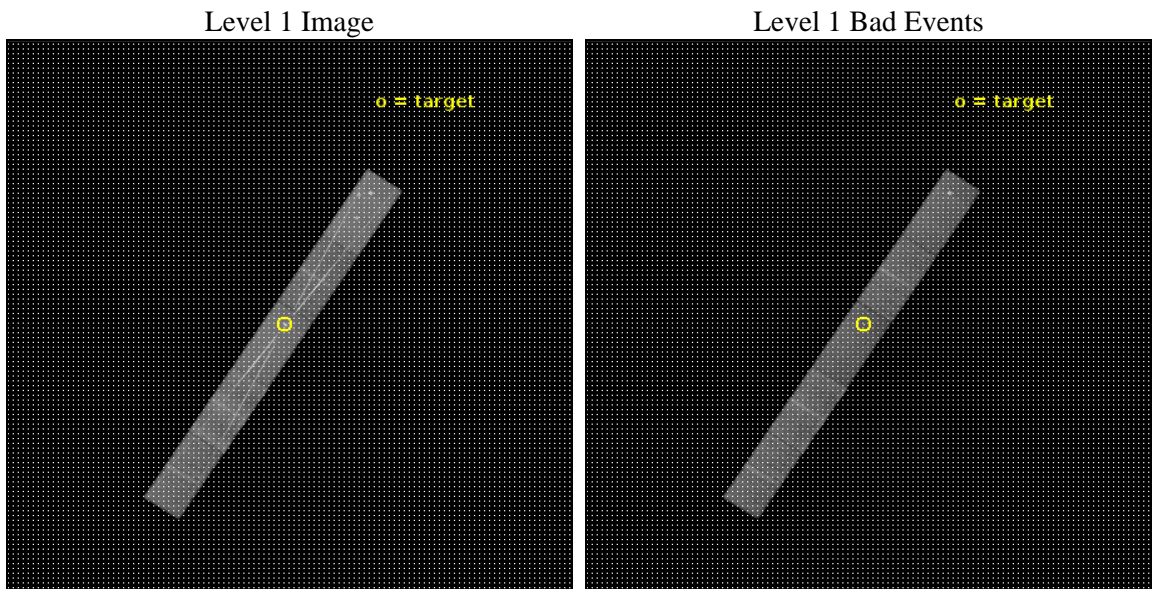
|          |  |   |
|----------|--|---|
| seq_num  | 401899   | Sequence number                             |
| obs_id   | 20171  | Observation id                              |
| title    | An X-ray Outflow in an Ultracompact X-ray Binary | Proposal title                              |
| observer | Jon Miller                                       | Principal investigator                      |
| object   | 4U 1916-053                                      | Source name                                 |
| dtcycle  | 0  | &#160                                       |
| cycle    | P  | events from which exps?<br>Prim/Second/Both |
| ra_targ  | 289.699583                                       | Observer's specified<br>target RA [deg]     |
| dec_targ | -5.238083  | Observer's specified<br>target Dec [deg]    |
| ra_nom   | 289.69255916876                                  | Nominal RA [deg]                            |
| dec_nom  | -5.2365564495194                                 | Nominal Dec [deg]                           |
| roll_nom | 123.15598281712                                  | Nominal Roll [deg]                          |
| revision | 1  | Processing version of data                  |
| ontime   | 22085.721590638                                  | Sum of GTIs [s]                             |
| livetime | 21565.114359282                                  | Livetime [s]                                |
| ontime5  | 22085.680550694                                  | Sum of GTIs [s]                             |
| ontime6  | 22085.639510632                                  | Sum of GTIs [s]                             |
| ontime7  | 22085.721590638                                  | Sum of GTIs [s]                             |
| ontime8  | 22085.598470688                                  | Sum of GTIs [s]                             |
| ontime9  | 22085.557430625                                  | Sum of GTIs [s]                             |
| l2events | 284097   | Number of level 2 events                    |



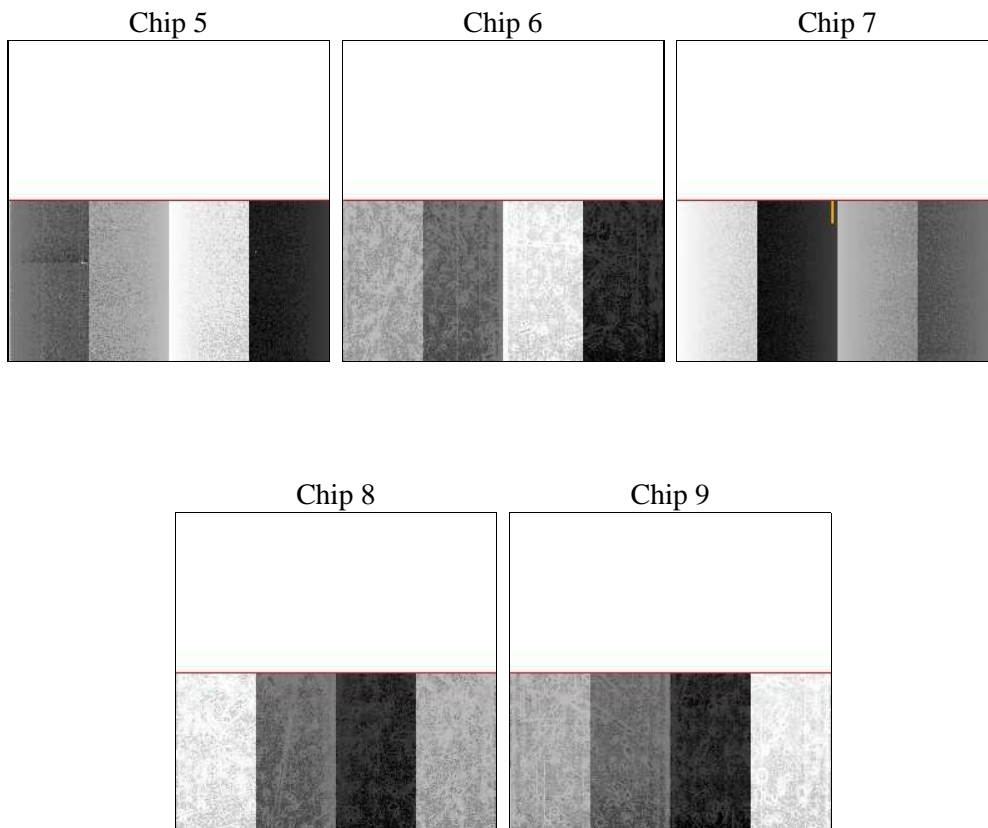
## 2 OBI

### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias



### 2.1.3 Parameters

|          |                     |                                |                |                    |   |
|----------|---------------------|--------------------------------|----------------|--------------------|---|
| obi_num  | 0                   | Obi number                     | sched_exp_time | 22000.000000       | [s] Scheduled observation exposure time |
| ascdsver | 10.6.3              | Processing system revision     | ontime         | 22085.721590638    | Sum of GTIs [s]                         |
| caldbver | 4.7.8               | &#160                          | ontime5        | 22085.680550694    | Sum of GTIs [s]                         |
| date     | 2018-06-12T23:16:41 | Date and time of file creation | ontime6        | 22085.639510632    | Sum of GTIs [s]                         |
| revision | 1                   | Processing version of data     | ontime7        | 22085.721590638    | Sum of GTIs [s]                         |
|          |                     |                                | ontime8        | 22085.598470688    | Sum of GTIs [s]                         |
|          |                     |                                | ontime9        | 22085.557430625    | Sum of GTIs [s]                         |
|          |                     |                                | l1events       | 716749             | Number of level 1 events                |
|          |                     |                                | tgmethod       | FINDZO             | Method used to create src1a file        |
|          |                     |                                | zo_pos         | (4045.50, 4084.60) | src1a sky pixel position                |

### 2.1.4 Events

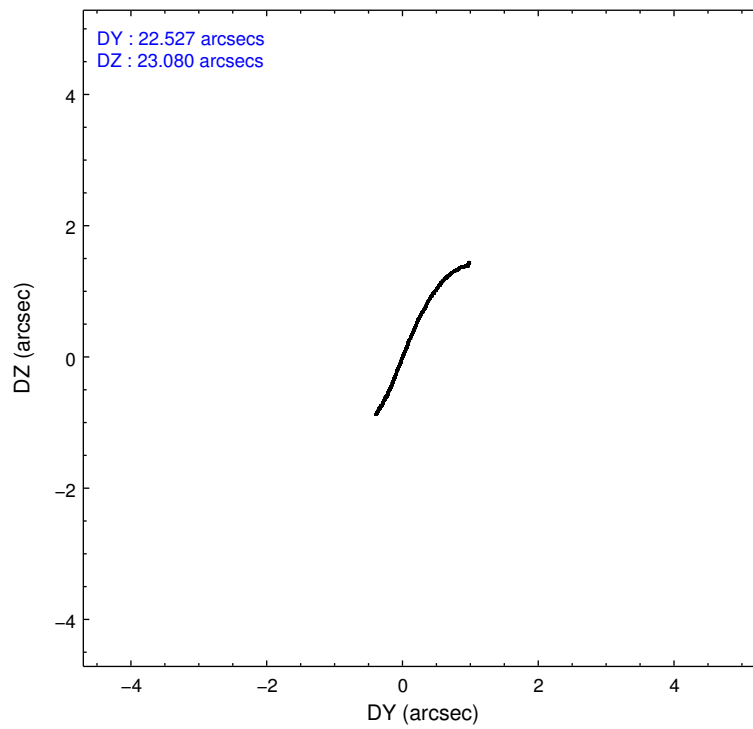
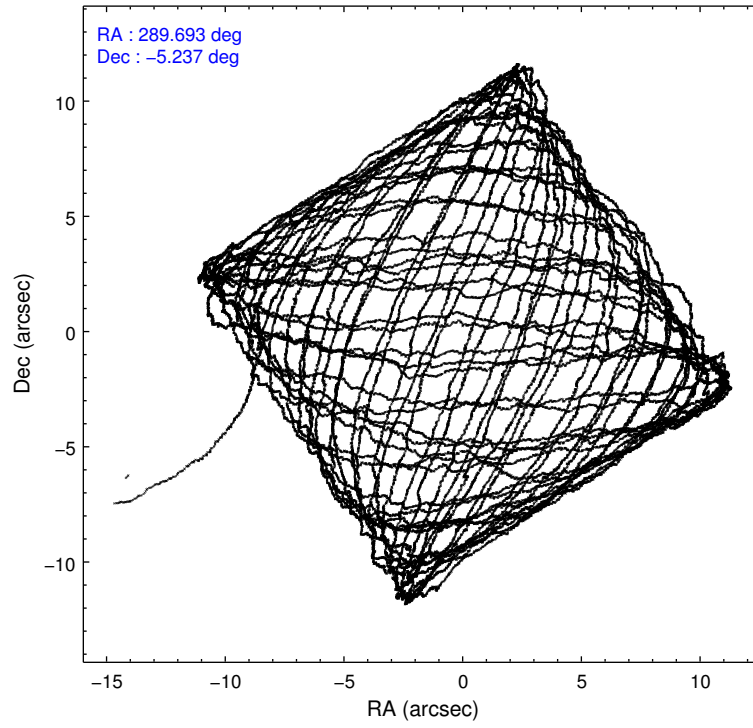
|                 | ccd 5  | ccd 6  | ccd 7  | ccd 8  | ccd 9 |
|-----------------|--------|--------|--------|--------|-------|
| level 1 events  | 160198 | 143068 | 179382 | 138425 | 95676 |
| rejected events | 74593  | 80636  | 66789  | 86354  | 81141 |
| rejected %      | 46%    | 56%    | 37%    | 62%    | 84%   |

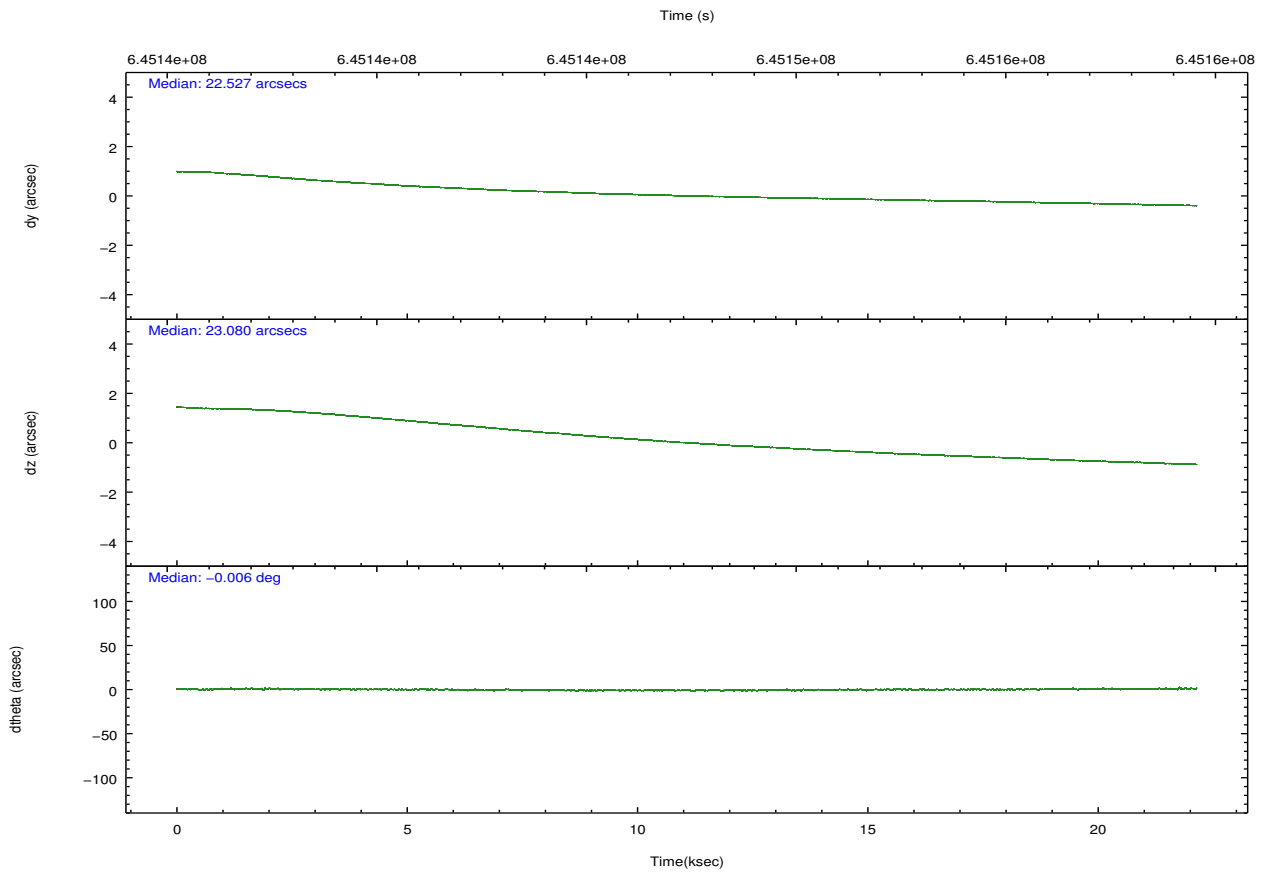
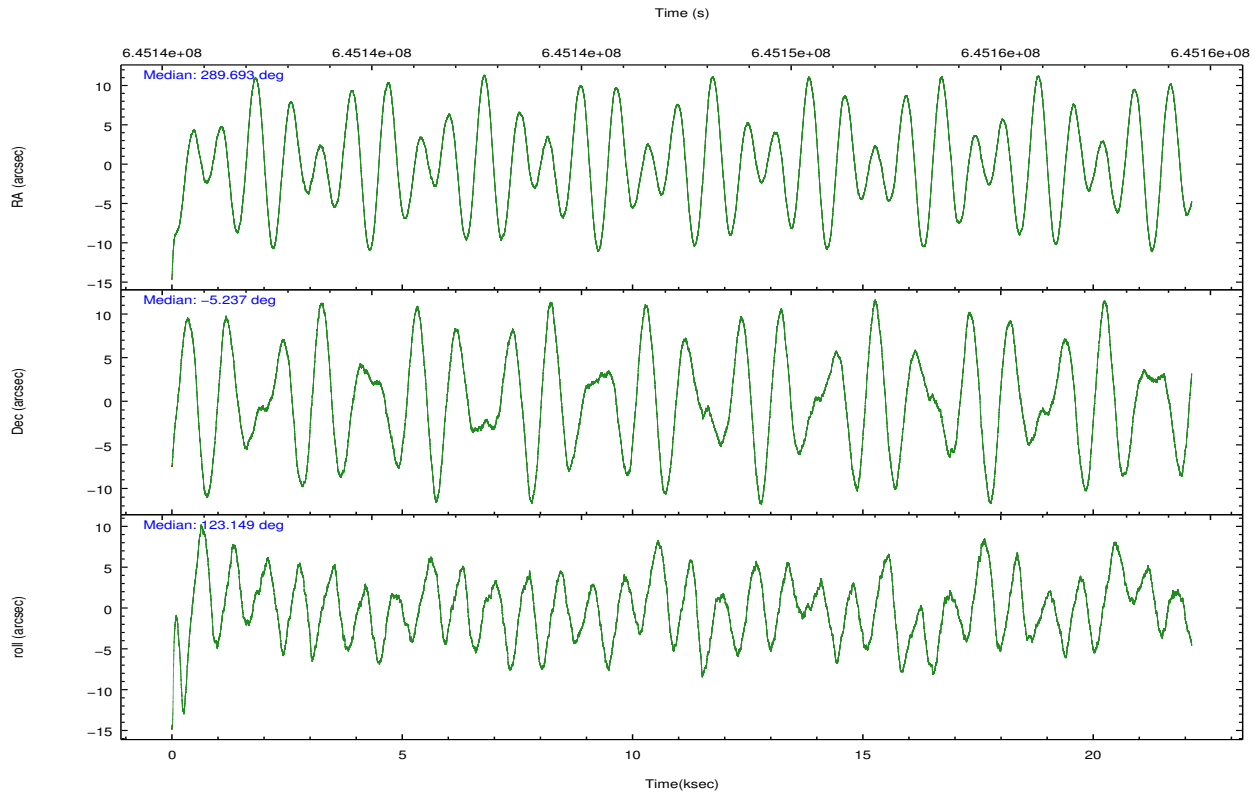
|                | ccd 5 | ccd 6 | ccd 7 | ccd 8 | ccd 9 |
|----------------|-------|-------|-------|-------|-------|
| grade 0 events | 14807 | 42726 | 18002 | 24378 | 6504  |
|                | 9%    | 29%   | 10%   | 17%   | 6%    |
| grade 1 events | 319   | 244   | 432   | 130   | 56    |
|                | 0%    | 0%    | 0%    | 0%    | 0%    |
| grade 2 events | 24880 | 8804  | 26063 | 9859  | 2801  |
|                | 15%   | 6%    | 14%   | 7%    | 2%    |
| grade 3 events | 4549  | 3269  | 11332 | 4374  | 1458  |
|                | 2%    | 2%    | 6%    | 3%    | 1%    |
| grade 4 events | 3938  | 3218  | 11401 | 4216  | 1386  |
|                | 2%    | 2%    | 6%    | 3%    | 1%    |
| grade 5 events | 12977 | 3983  | 12995 | 5994  | 4345  |
|                | 8%    | 2%    | 7%    | 4%    | 4%    |
| grade 6 events | 37451 | 4430  | 45813 | 9252  | 2391  |
|                | 23%   | 3%    | 25%   | 6%    | 2%    |
| grade 7 events | 61277 | 76394 | 53344 | 80222 | 76735 |
|                | 38%   | 53%   | 29%   | 57%   | 80%   |

## 2.2 Compared Parameters

| Parameter                         | Planned             | Actual               | Parameter                             | Planned   | Actual  |
|-----------------------------------|---------------------|----------------------|---------------------------------------|-----------|---------|
| Instrument                        | ACIS                | ACIS                 | Obspar format version number          | 7         | 7       |
| Detector                          | ACIS-56789          | ACIS-56789           | Obspar file type                      | PREDICTED | ACTUAL  |
| Grating                           | HETG                | HETG                 | Obspar update status                  | NONE      | UPDATED |
| Data mode                         | FAINT               | FAINT                | CCD I0 on                             | N         | N       |
| Observation mode                  | POINTING            | POINTING             | CCD I1 on                             | N         | N       |
| [deg] Pointing RA                 | 289.717336          | 289.6925591687646    | CCD I2 on                             | N         | N       |
| [deg] Pointing Dec                | -5.248616           | -5.236556449519443   | CCD I3 on                             | N         | N       |
| [deg] Pointing Roll               | 123.001619          | 123.1559828171188    | CCD S0 on                             | O1        | N       |
| [mm] SIM focus pos                | -0.684267           | -0.6828225247311905  | CCD S1 on                             | Y         | Y       |
| [mm] SIM defocus                  | 0                   | 0.001444936568705701 | CCD S2 on                             | Y         | Y       |
| [mm] SIM translation stage pos    | -183.992523         | -183.9875365069546   | CCD S3 on                             | Y         | Y       |
| [mm] SIM translation stage offset | -6.14               | -6.144986076053243   | CCD S4 on                             | Y         | Y       |
| [s] Observation start time (MET)  | 645136452.184000    | 645135188.00186      | CCD S5 on                             | Y         | Y       |
| Observation start date            | 2018-06-11T20:33:03 | 2018-06-11T20:13:08  | Number of optional ACIS chips dropped | 1         | 1       |
| [s] Observation end time (MET)    | 645158452.184000    | 645159477.4283       | On-chip summing requested             | N         | N       |
| Observation end date              | 2018-06-12T02:39:43 | 2018-06-12T02:57:57  | Subarray requested                    | CUSTOM    | 1/2     |
| Read mode                         | TIMED               | TIMED                | 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





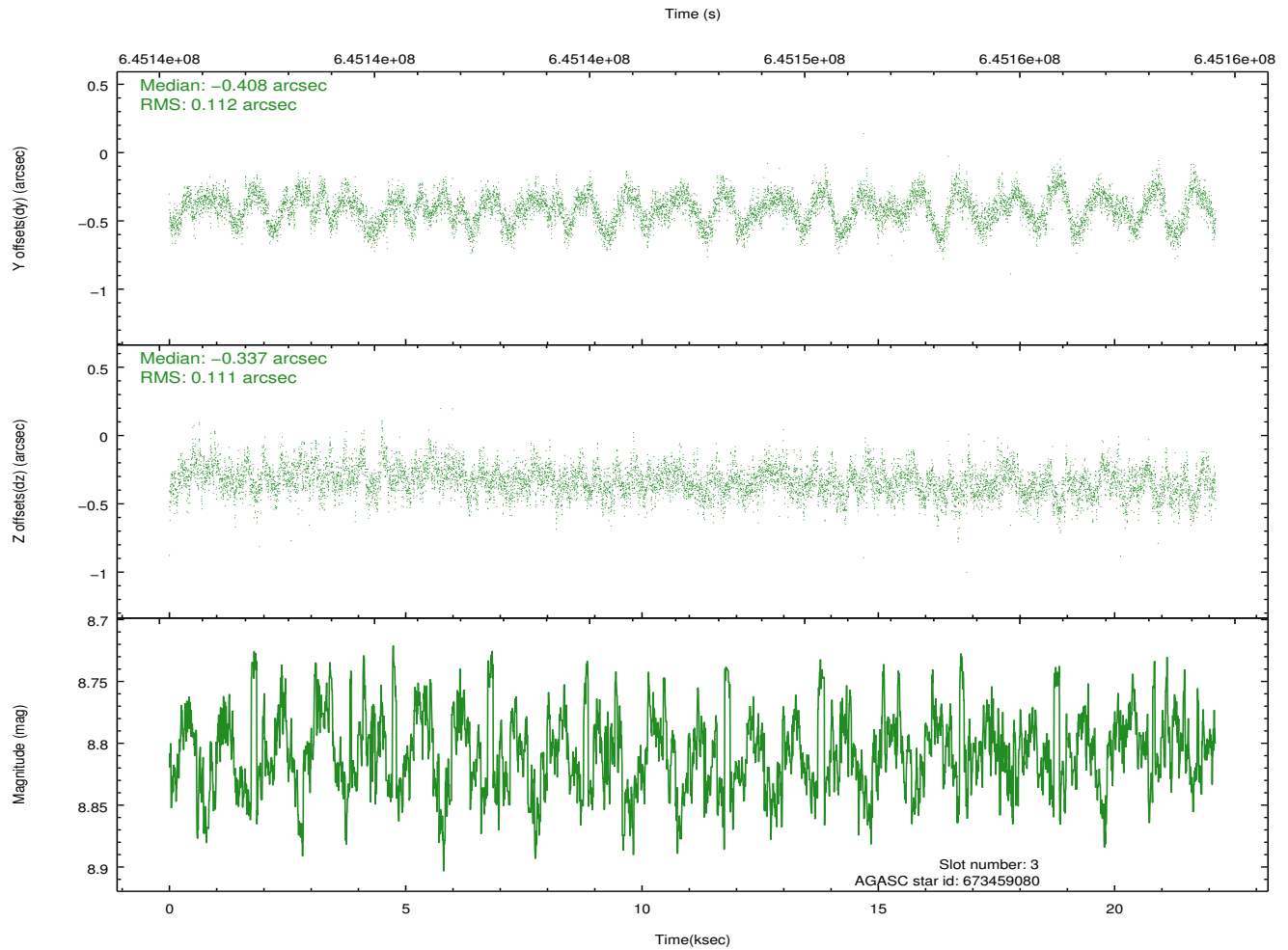
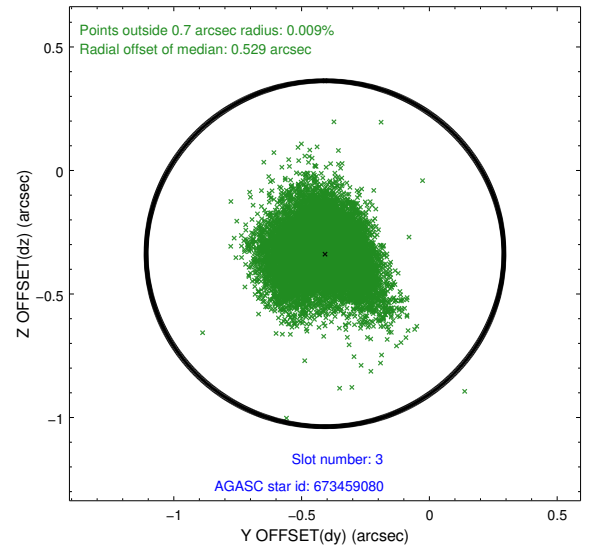
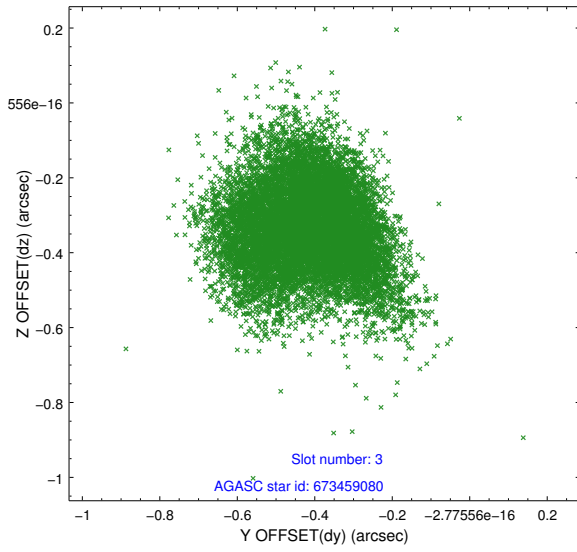
### Slot Statistics

| slot | status | used | id        | mag  | n_pts | frac_pts | med_dy | med_dz | dr1   | dr2   | ra         | dec       | mean_y   | mean_x |
|------|--------|------|-----------|------|-------|----------|--------|--------|-------|-------|------------|-----------|----------|--------|
| 0    | FID    |      | ACIS-S-2  | 7.05 | 5400  | 1.000    | -0.305 | -0.094 | 0.033 | 0.086 | 0.000000   | 0.000000  | -775.61  | -1871  |
| 1    | FID    |      | ACIS-S-4  | 7.15 | 5400  | 1.000    | 0.602  | 0.172  | 0.016 | 0.042 | 0.000000   | 0.000000  | 2138.43  | 37     |
| 2    | FID    |      | ACIS-S-5  | 7.19 | 5400  | 1.000    | -0.331 | -0.068 | 0.020 | 0.061 | 0.000000   | 0.000000  | -1828.36 | 30     |
| 3    | GUIDE  | used | 673459080 | 8.81 | 10792 | 1.000    | -0.408 | -0.337 | 0.167 | 0.270 | 289.246637 | -5.373686 | 540.59   | 1660   |
| 4    | GUIDE  | used | 673463704 | 8.94 | 10789 | 1.000    | 0.064  | 0.099  | 0.161 | 0.265 | 289.894494 | -4.869892 | 797.54   | -1275  |
| 5    | GUIDE  | used | 673466464 | 9.21 | 10768 | 1.000    | 0.296  | 0.123  | 0.179 | 0.300 | 289.850458 | -5.613937 | -1362.12 | 315    |
| 6    | GUIDE  | used | 673460992 | 8.29 | 10793 | 1.000    | -0.053 | 0.332  | 0.140 | 0.225 | 289.799374 | -5.232721 | -111.89  | -277   |
| 7    | GUIDE  | used | 673455744 | 9.52 | 10781 | 1.000    | 0.100  | -0.211 | 0.223 | 0.376 | 289.673010 | -4.488976 | 2380.32  | -1356  |

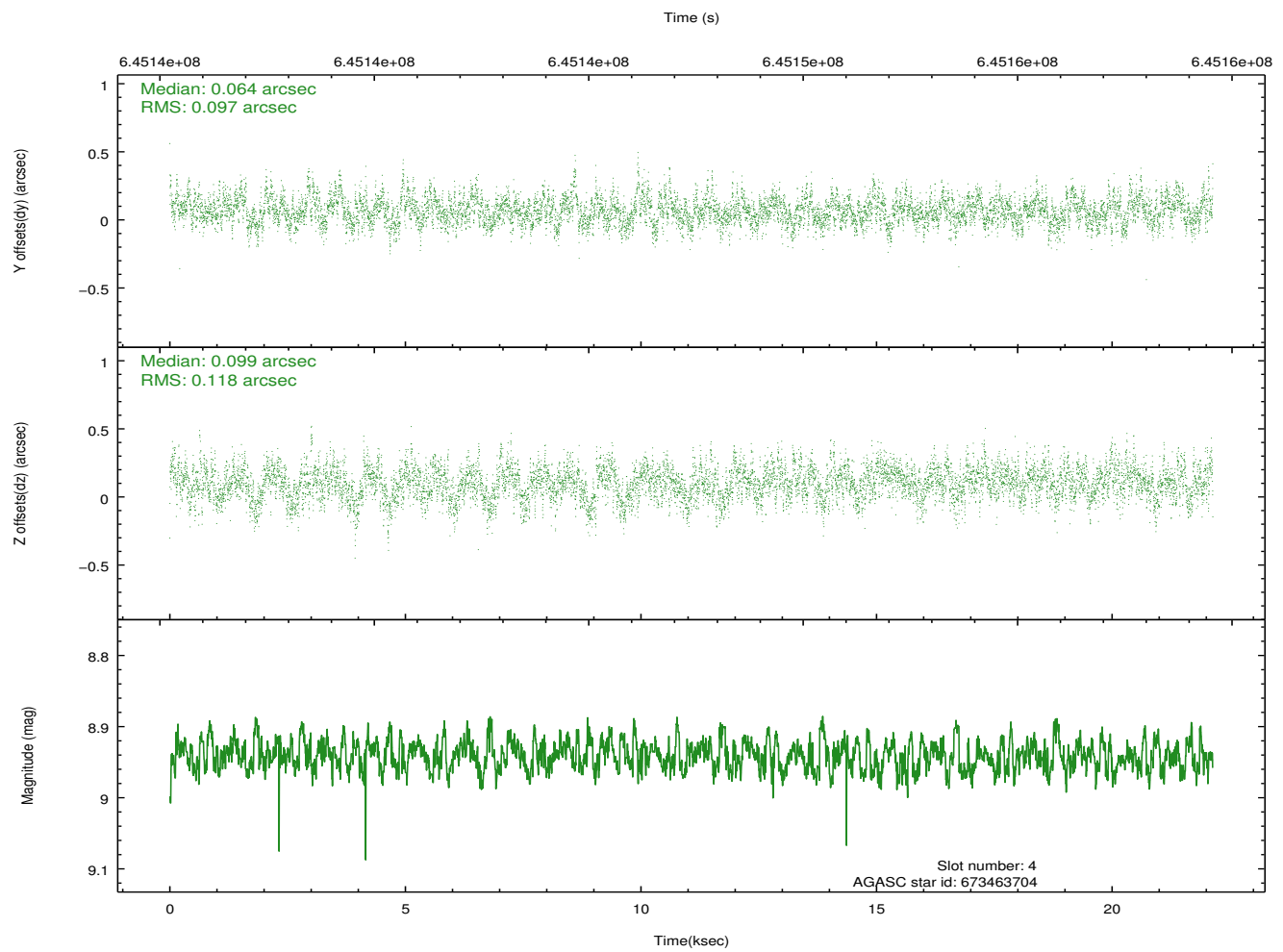
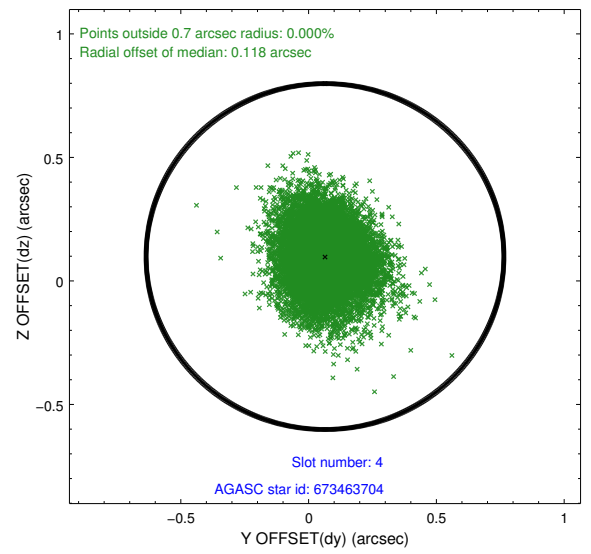
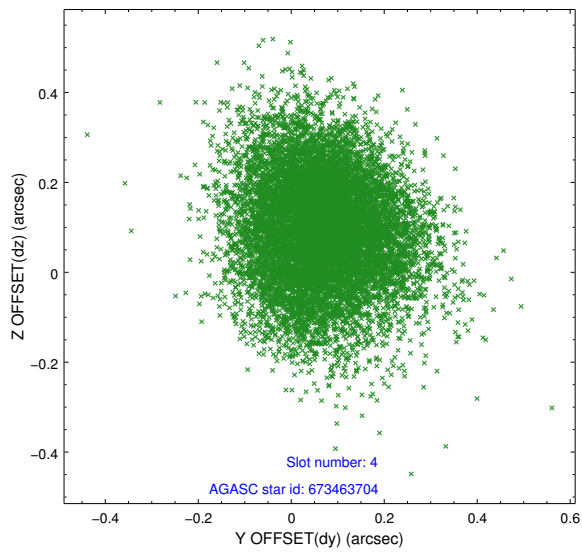
∞

## 2.4 Star Slots

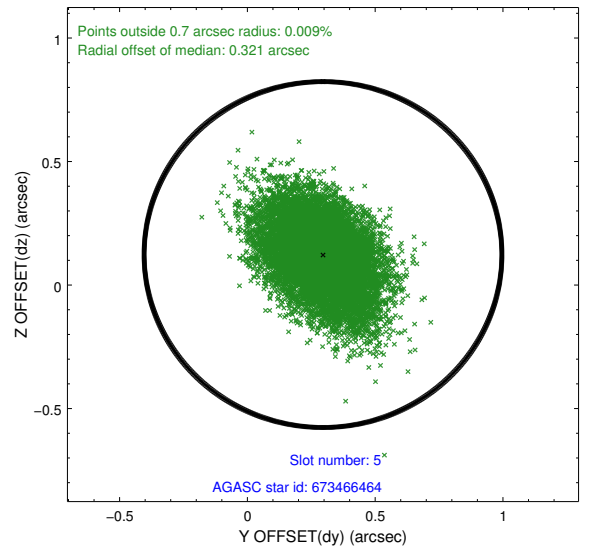
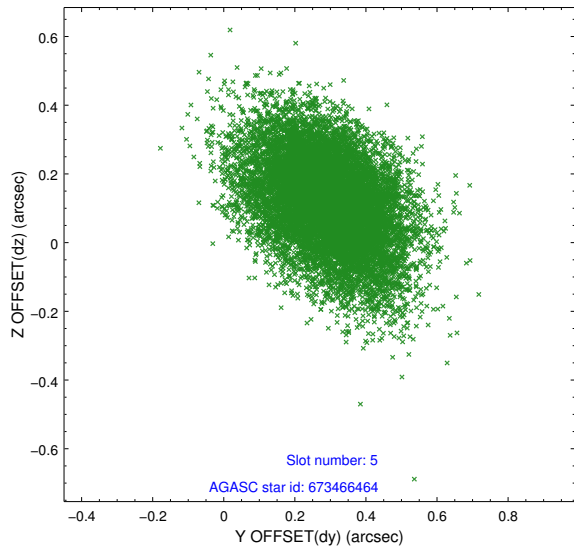
### 2.4.1 Slot 3



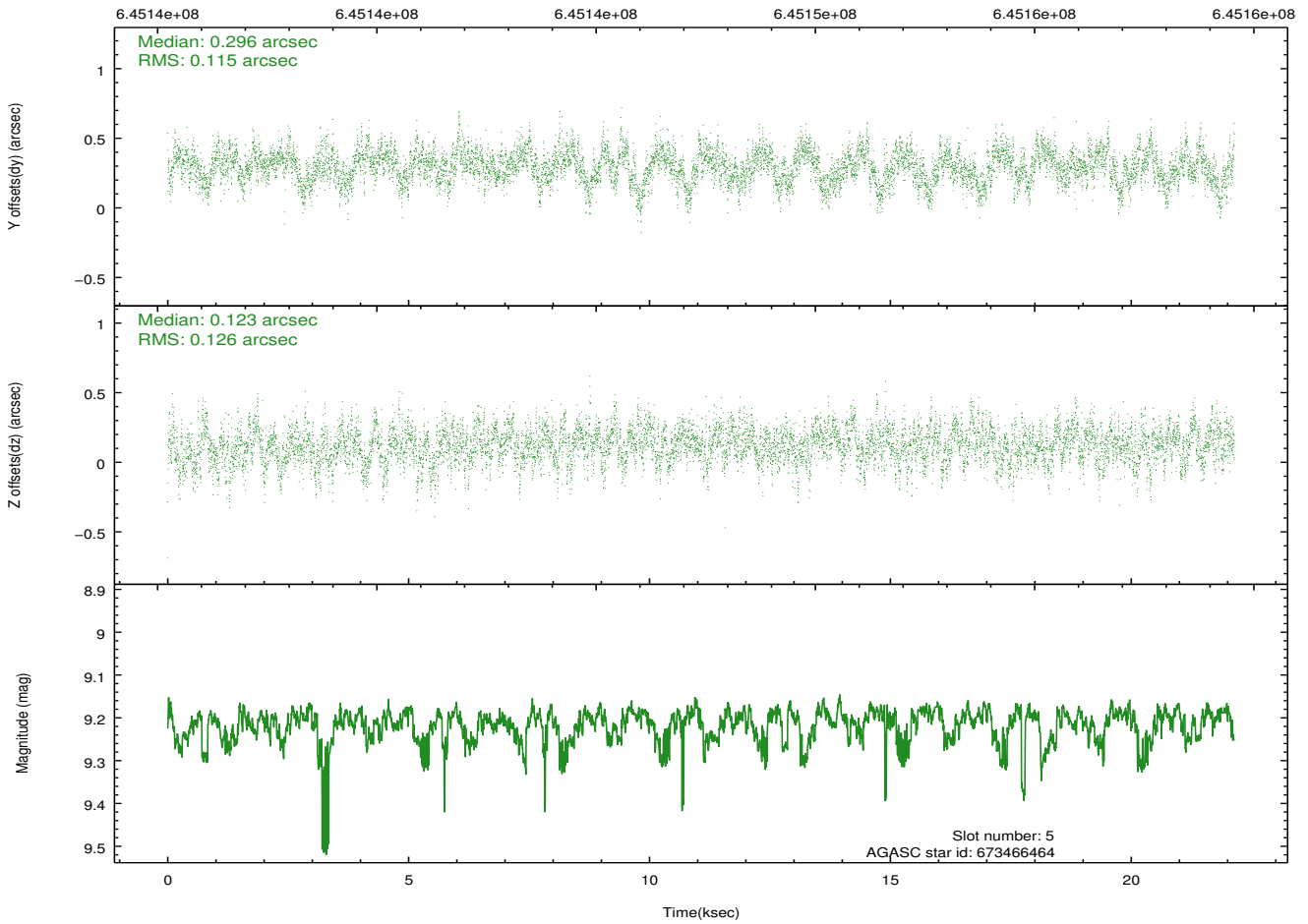
## 2.4.2 Slot 4



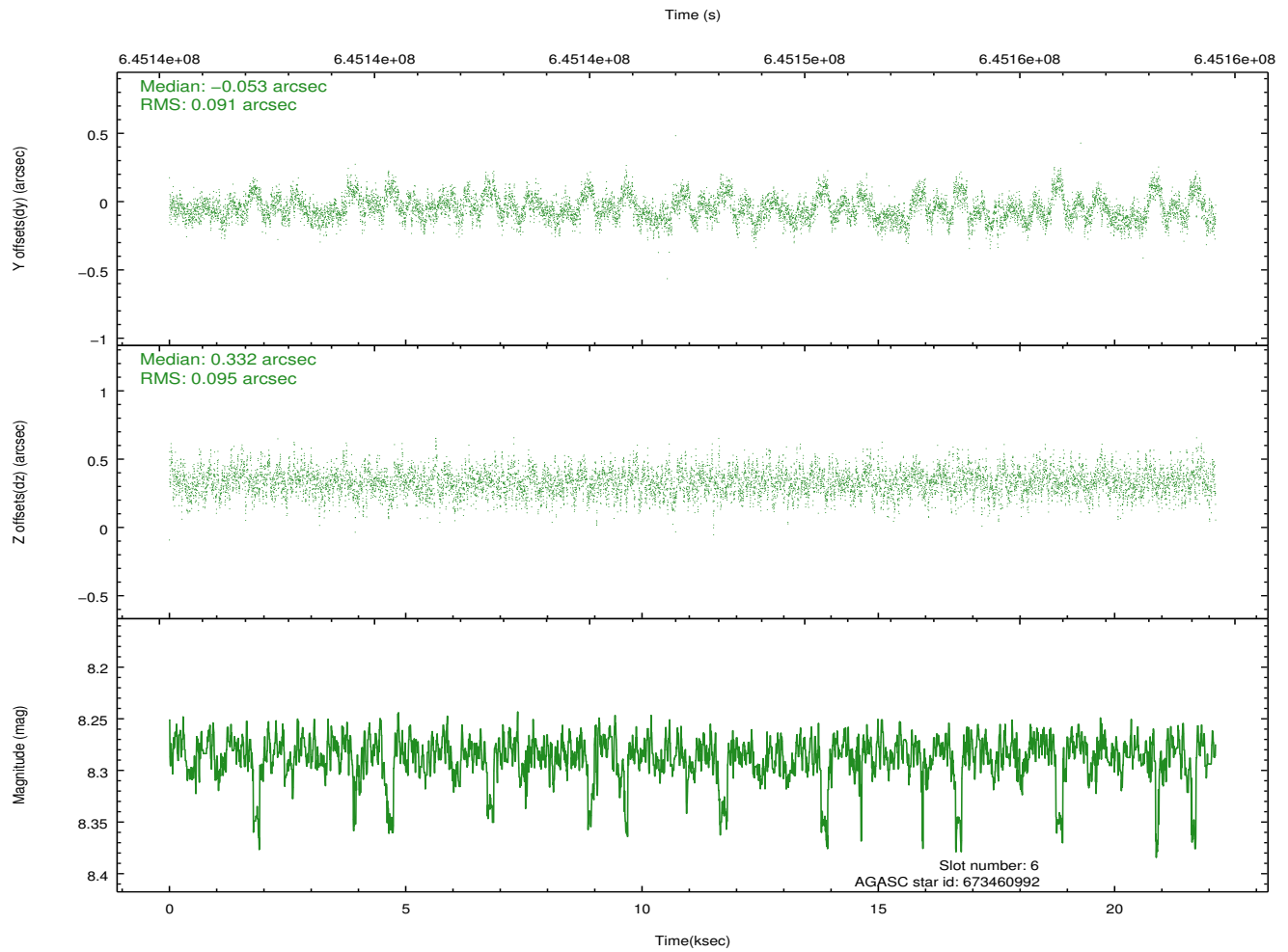
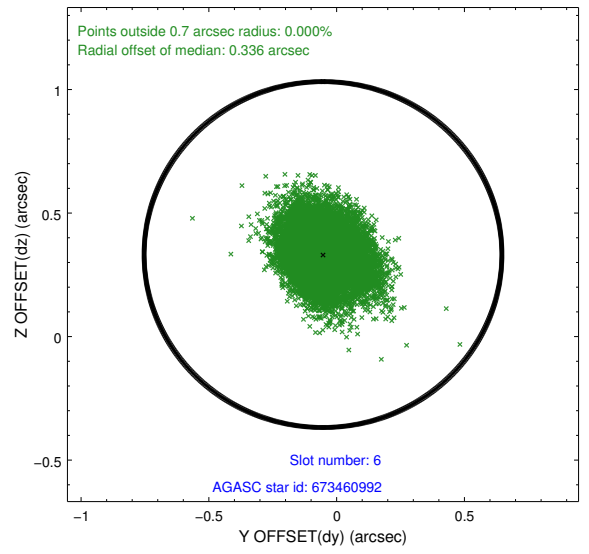
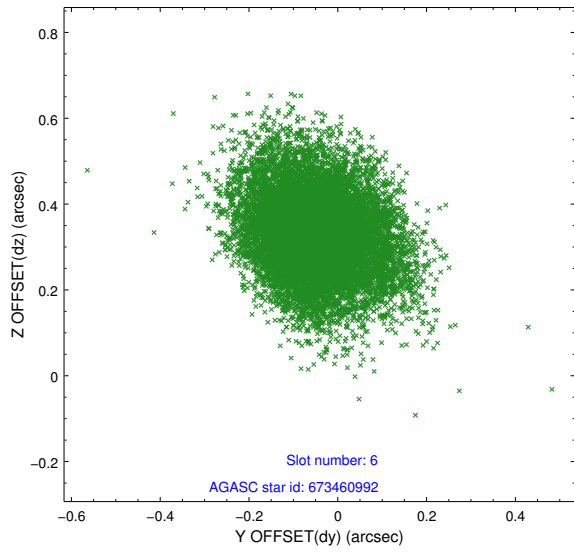
### 2.4.3 Slot 5



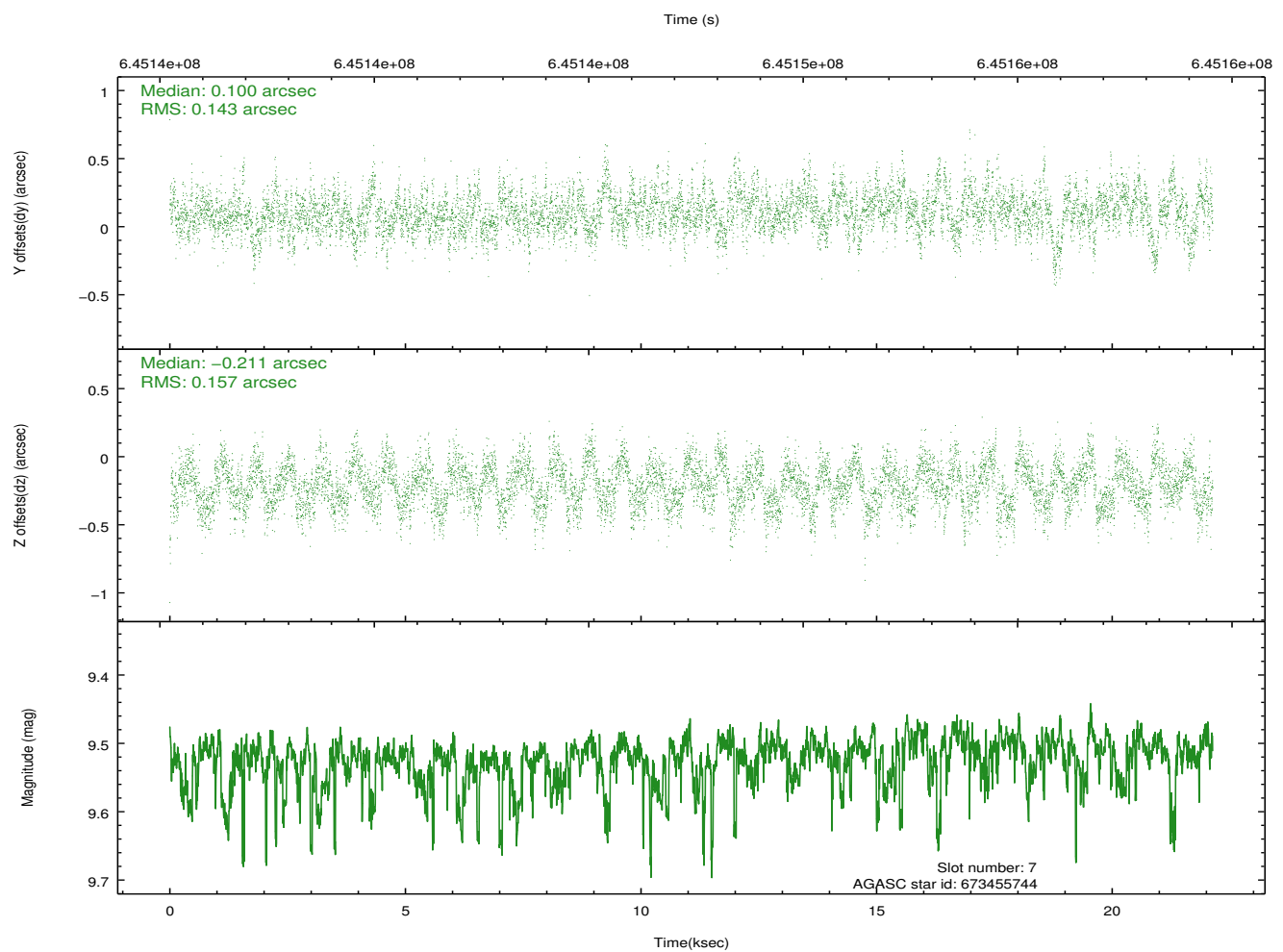
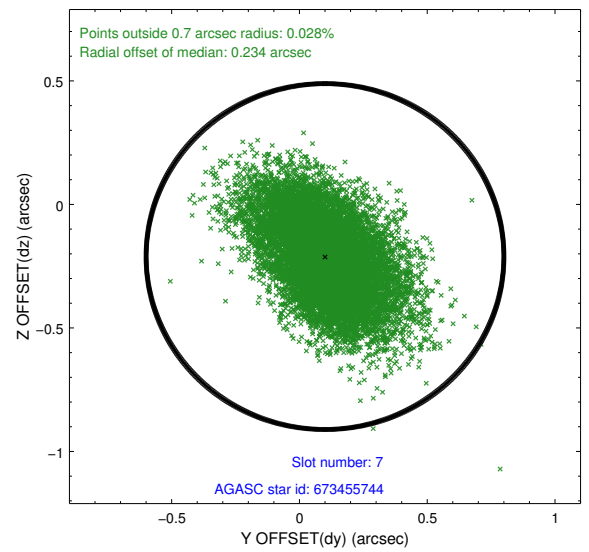
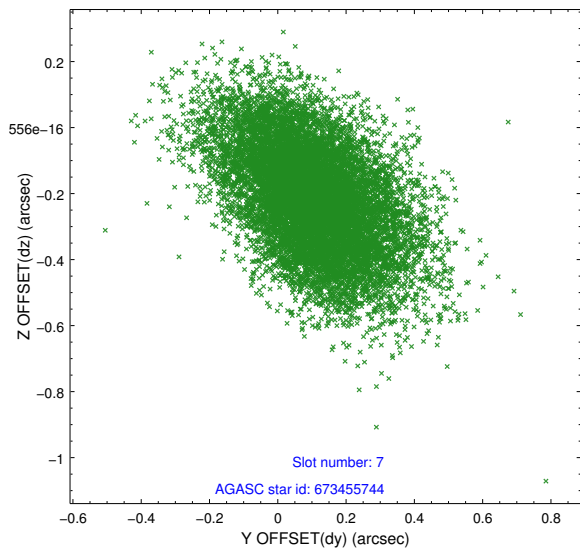
Time (s)



## 2.4.4 Slot 6

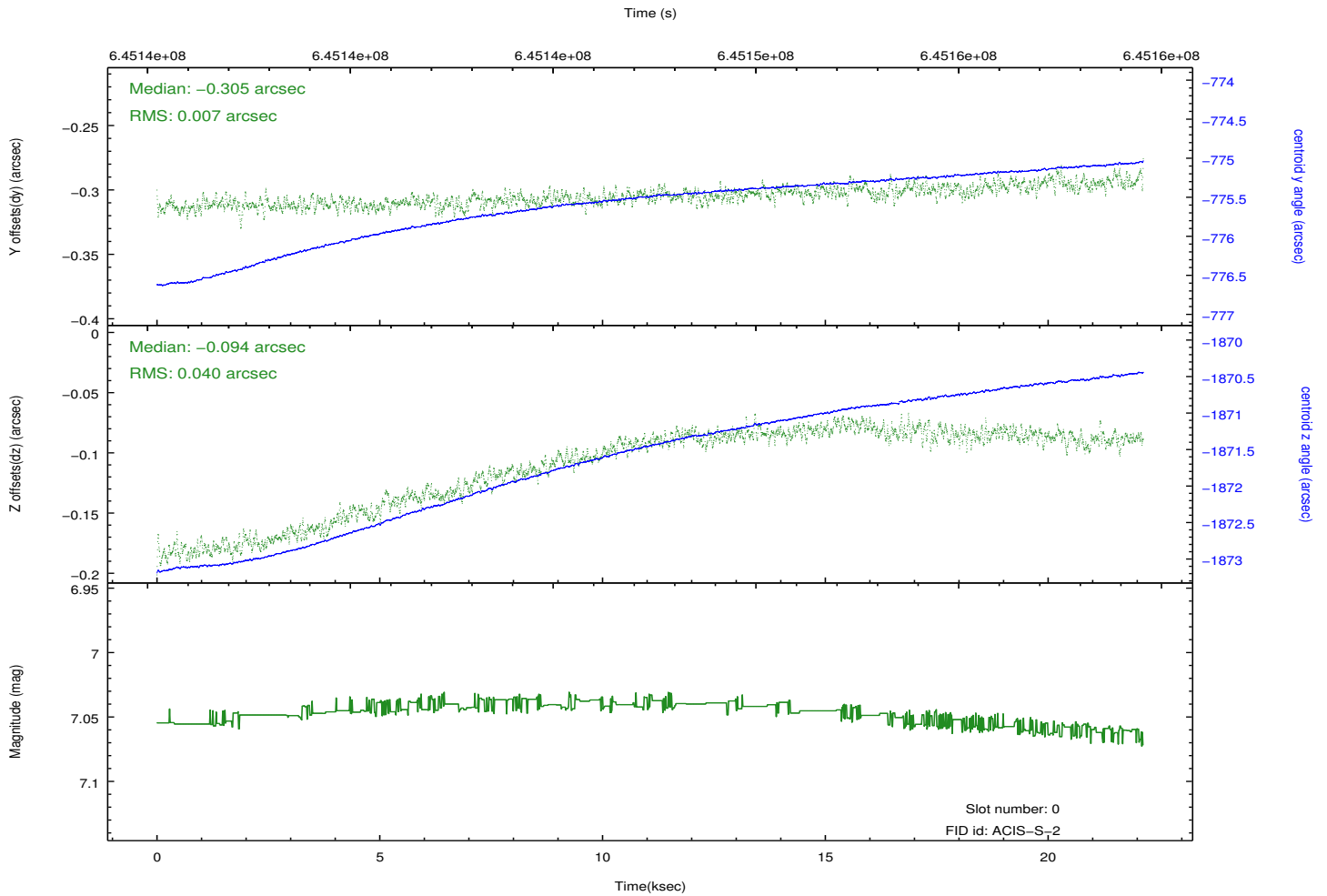
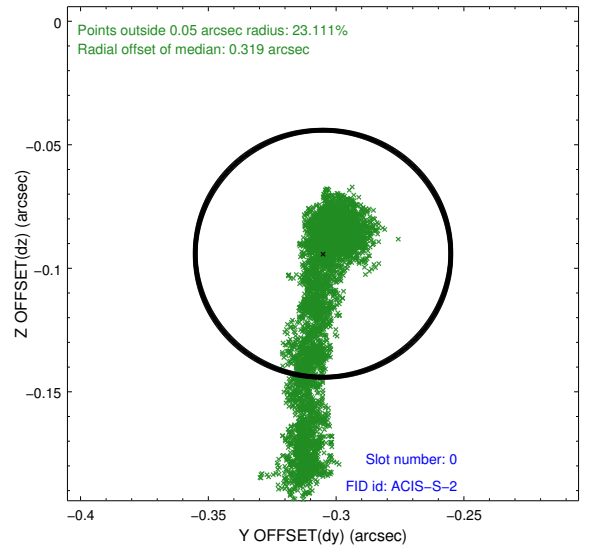
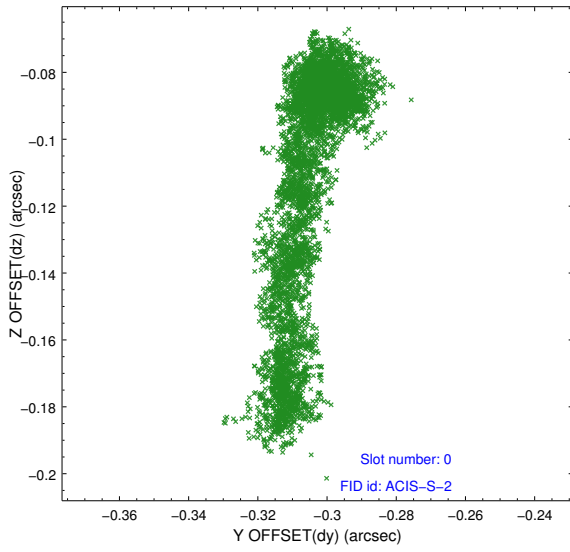


## 2.4.5 Slot 7

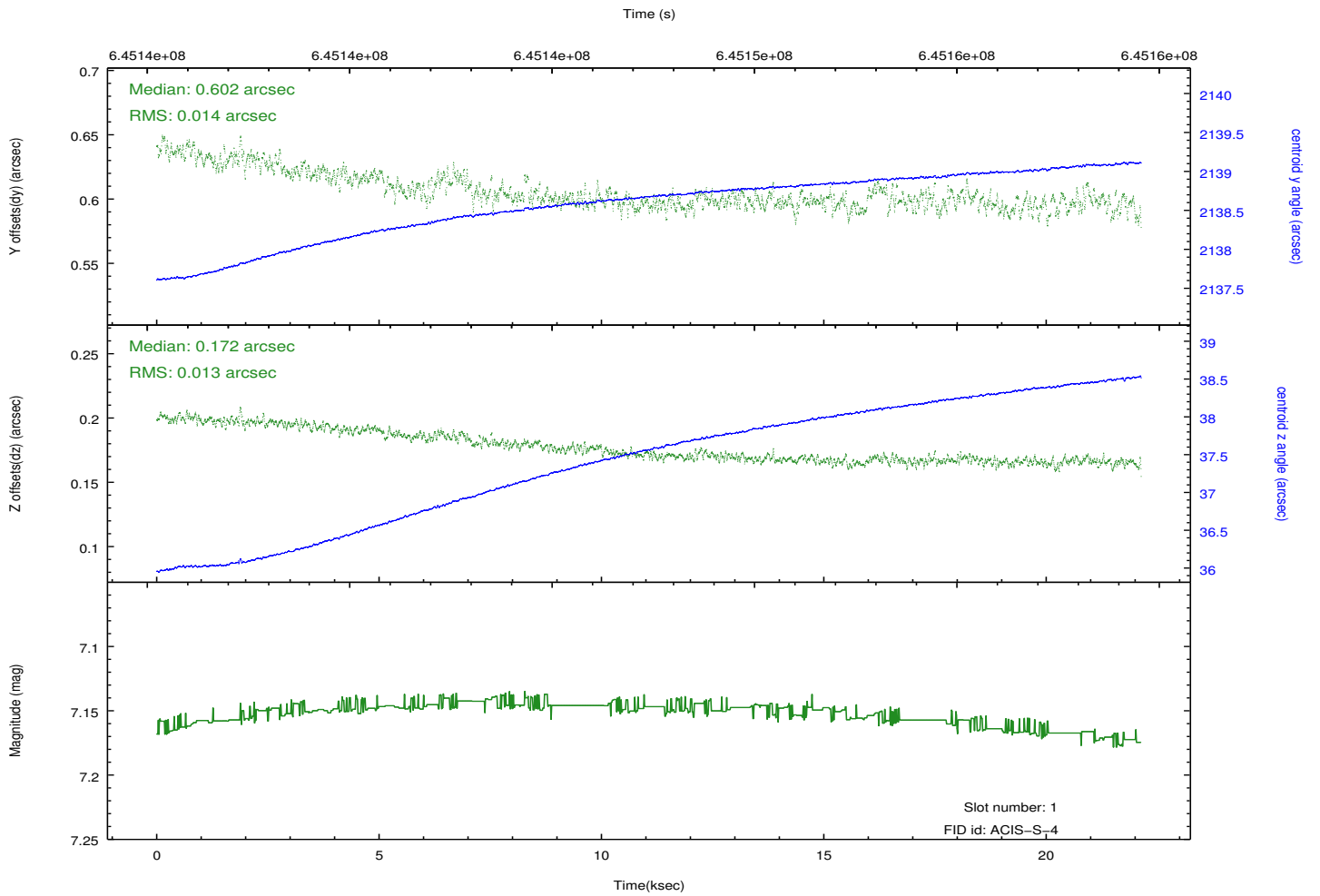
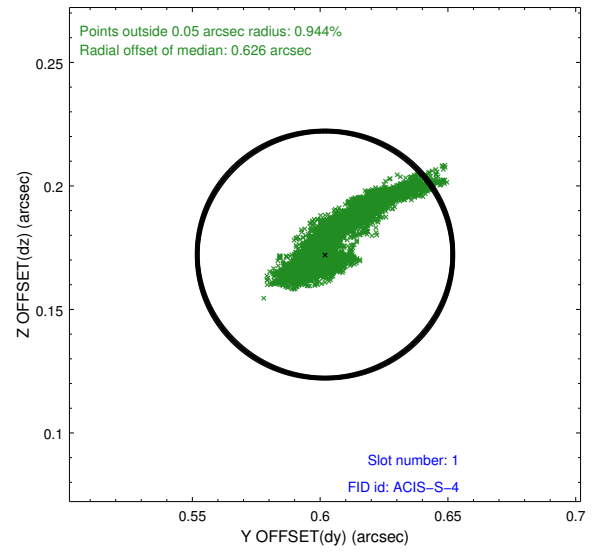
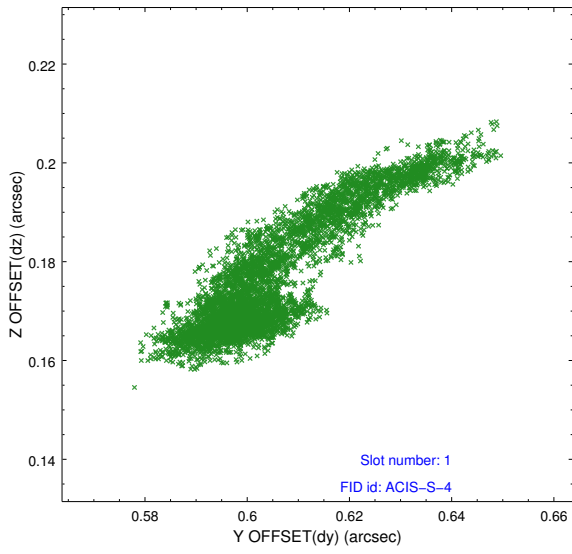


## 2.5 FID Slots

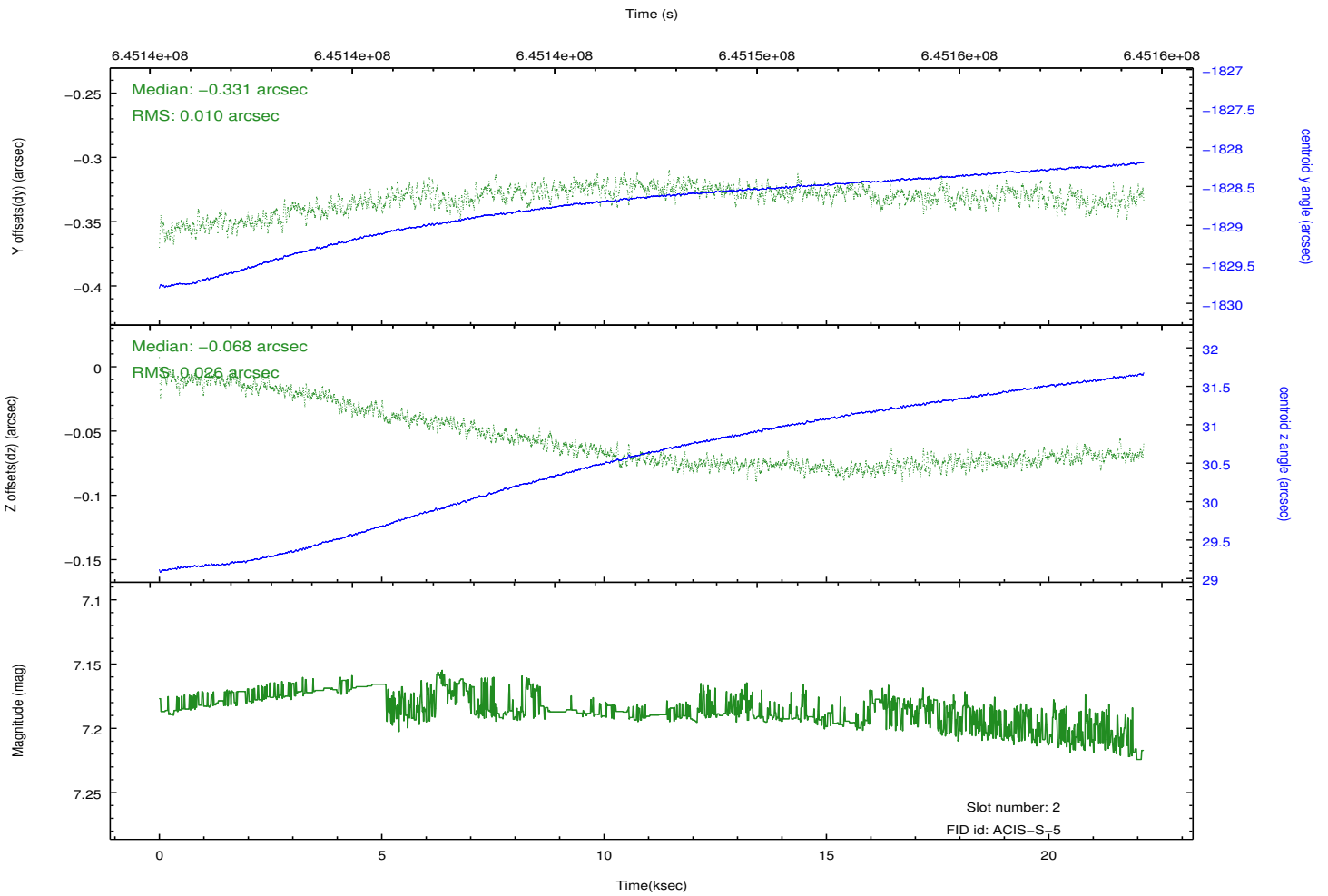
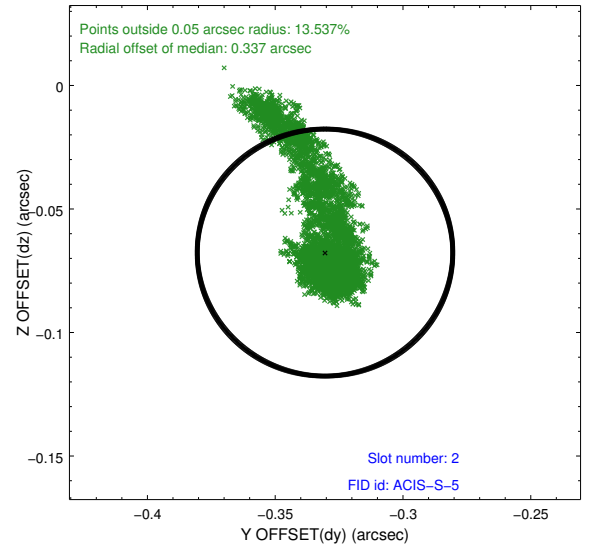
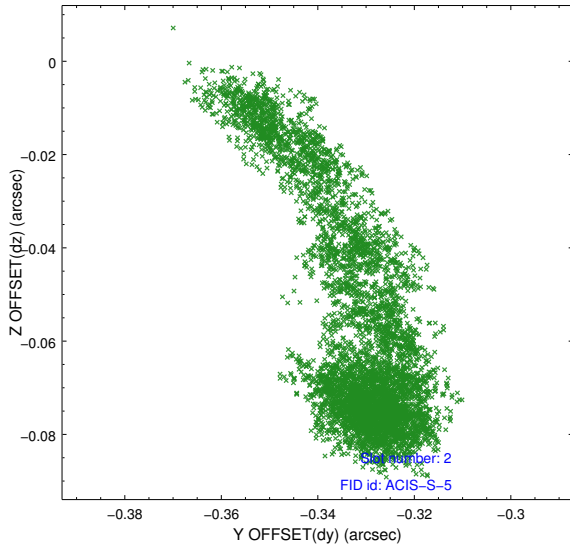
### 2.5.1 Slot 0



## 2.5.2 Slot 1

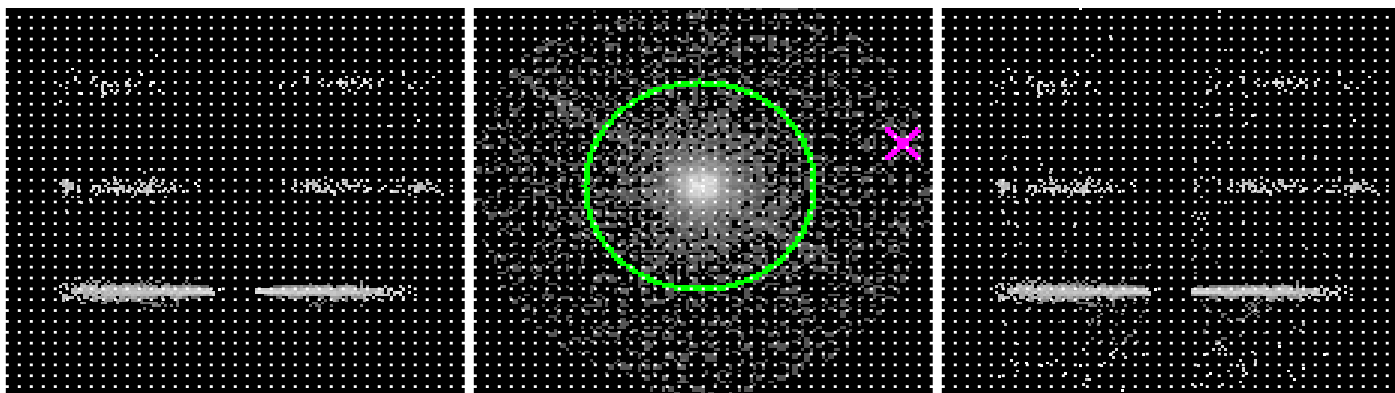


### 2.5.3 Slot 2



### 3 Gratings

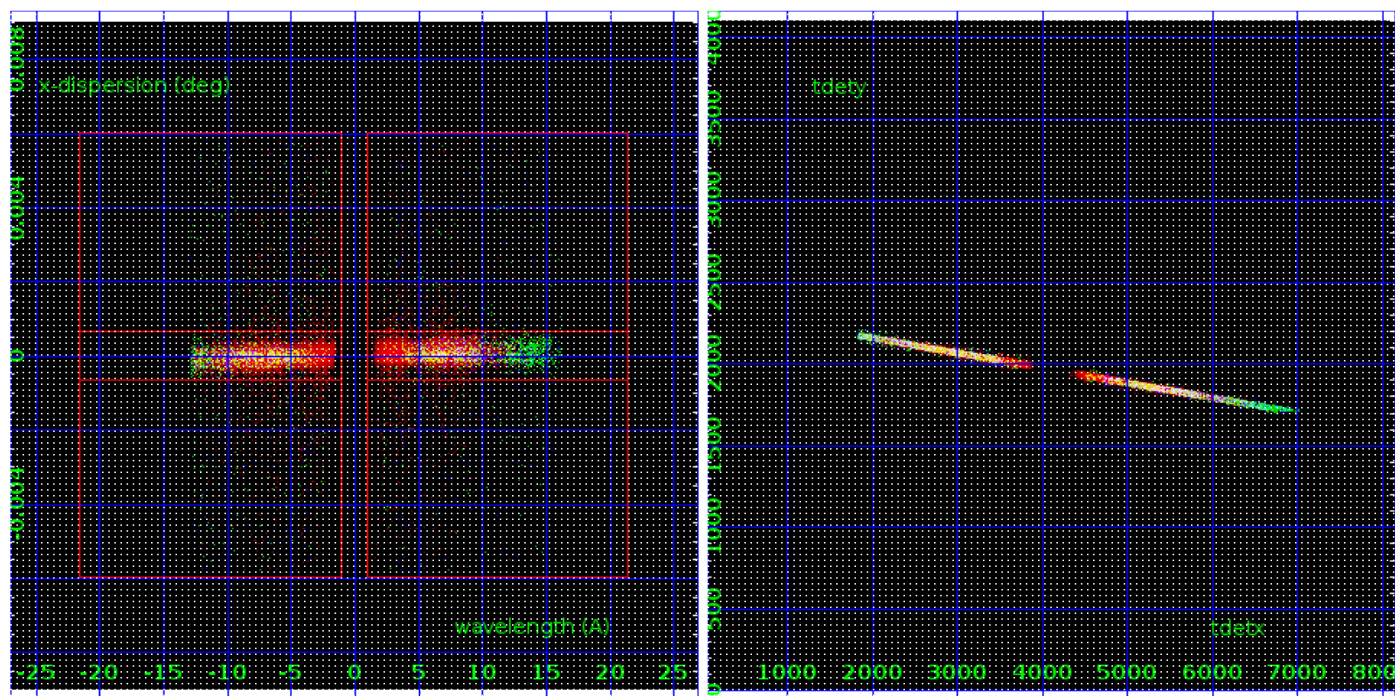
#### 3.1 HEG Arm



HEG Order Sort 123

HEG Zero Order

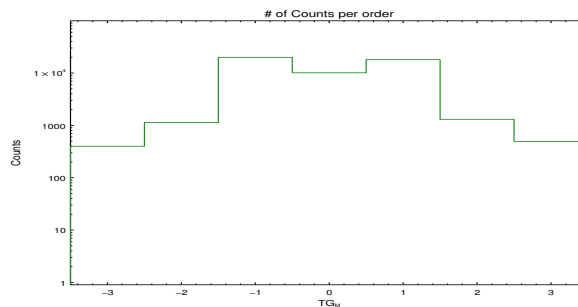
HEG Order Sort ALL



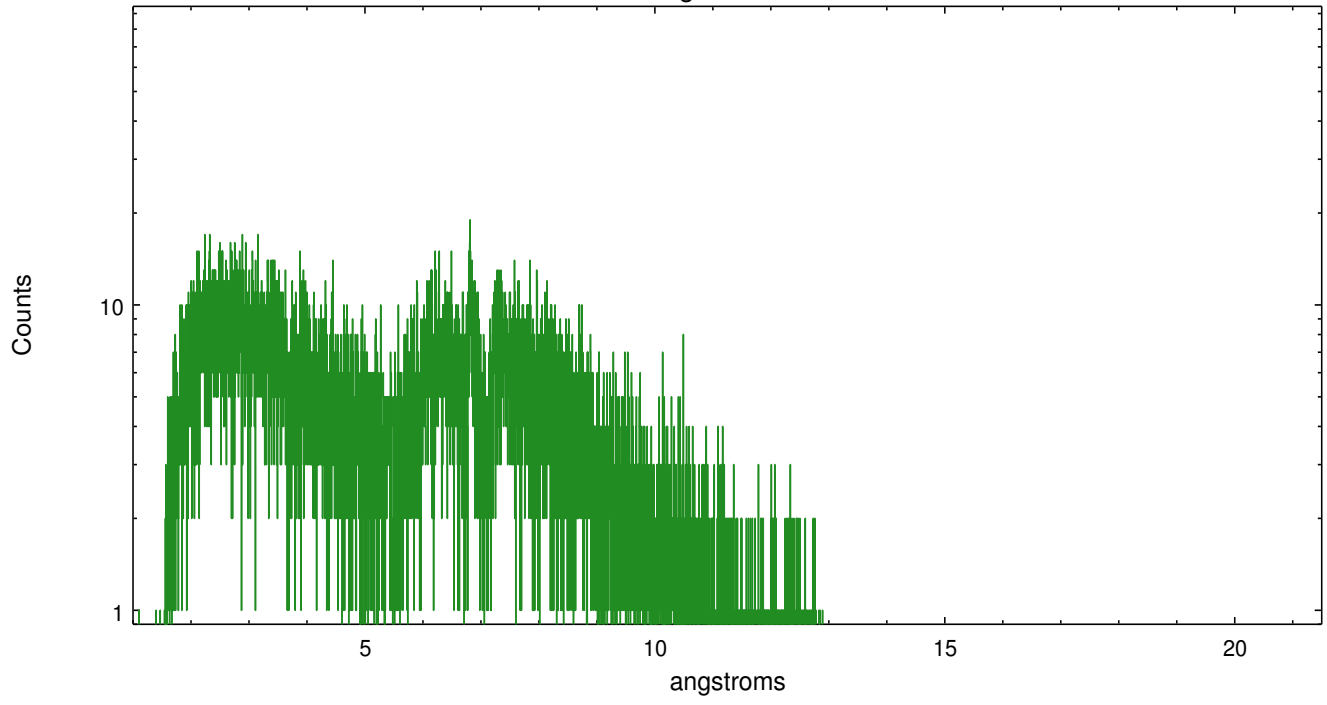
Spot Image HEG

Full Detector HEG

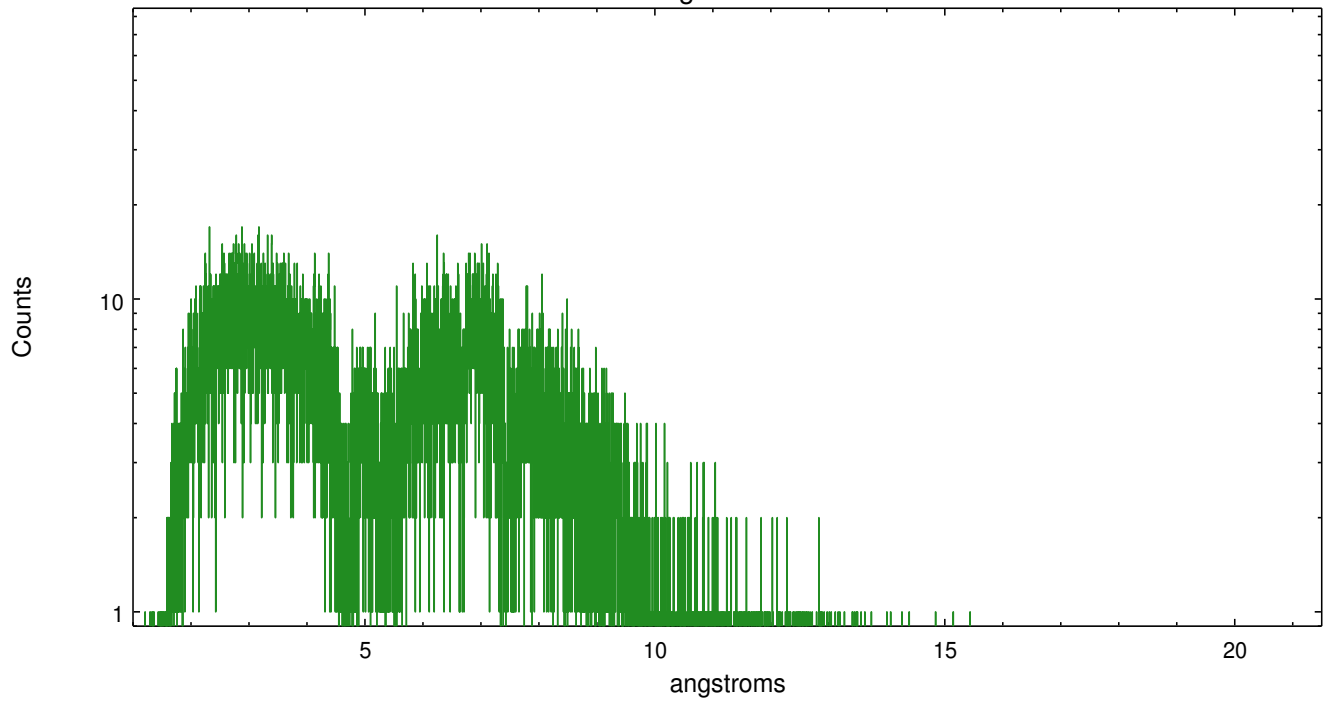
|        | order -3 | order -2 | order -1 | order 0 | order 1 | order 2 | order 3 |
|--------|----------|----------|----------|---------|---------|---------|---------|
| Events | 399      | 1133     | 19914    | 10118   | 18030   | 1305    | 494     |



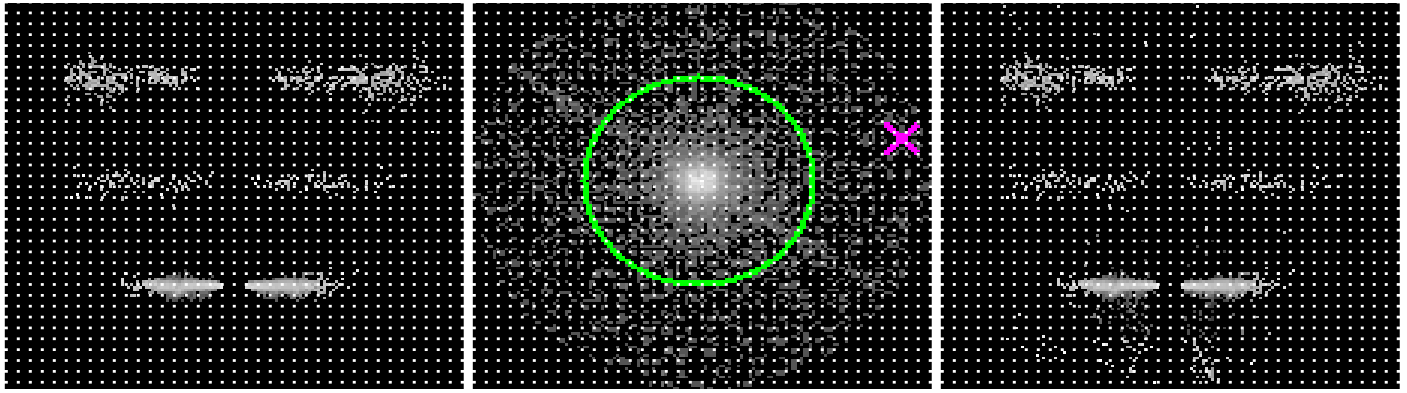
heg order -1



heg order +1



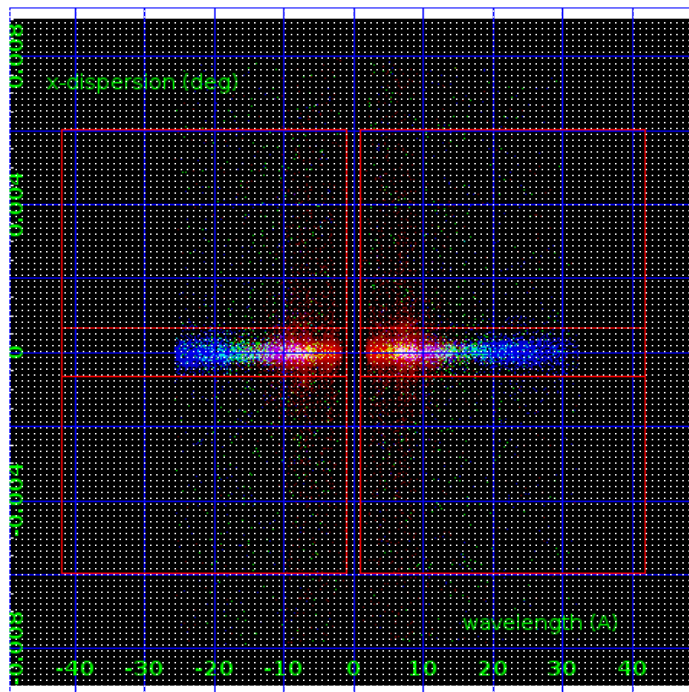
### 3.2 MEG Arm



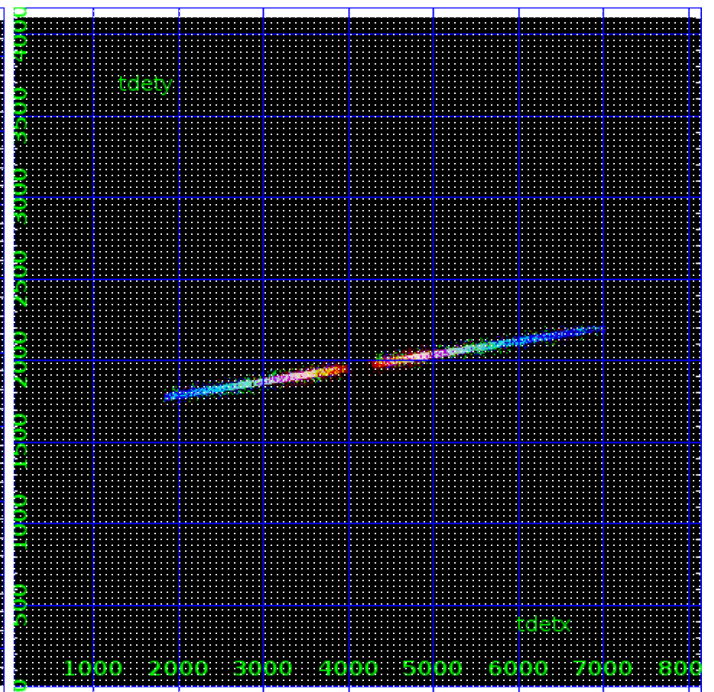
MEG Order Sort 123

MEG Zero Order

MEG Order Sort ALL

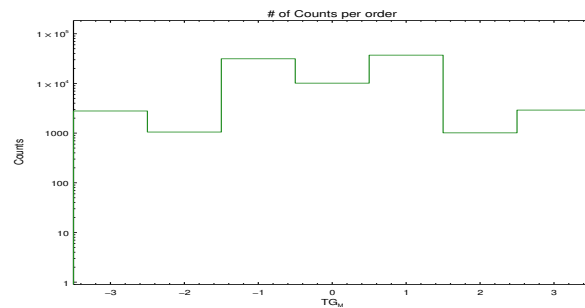


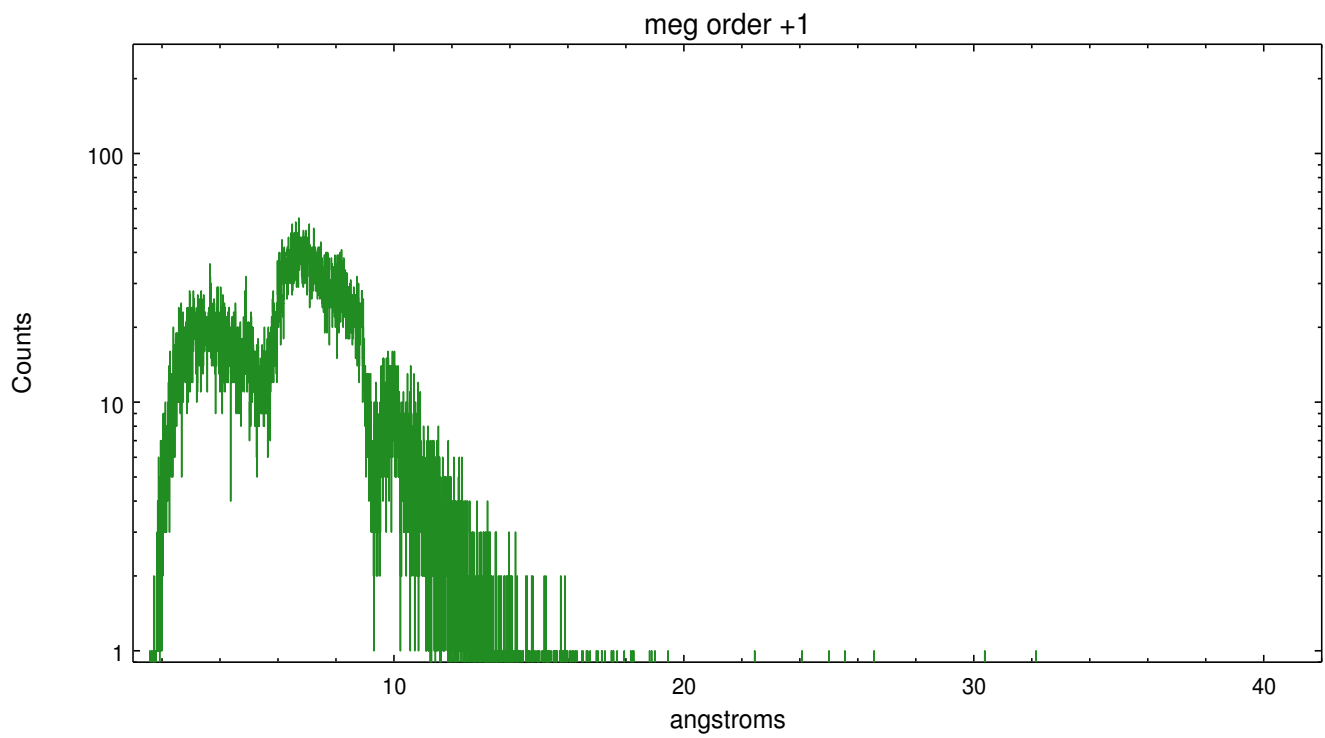
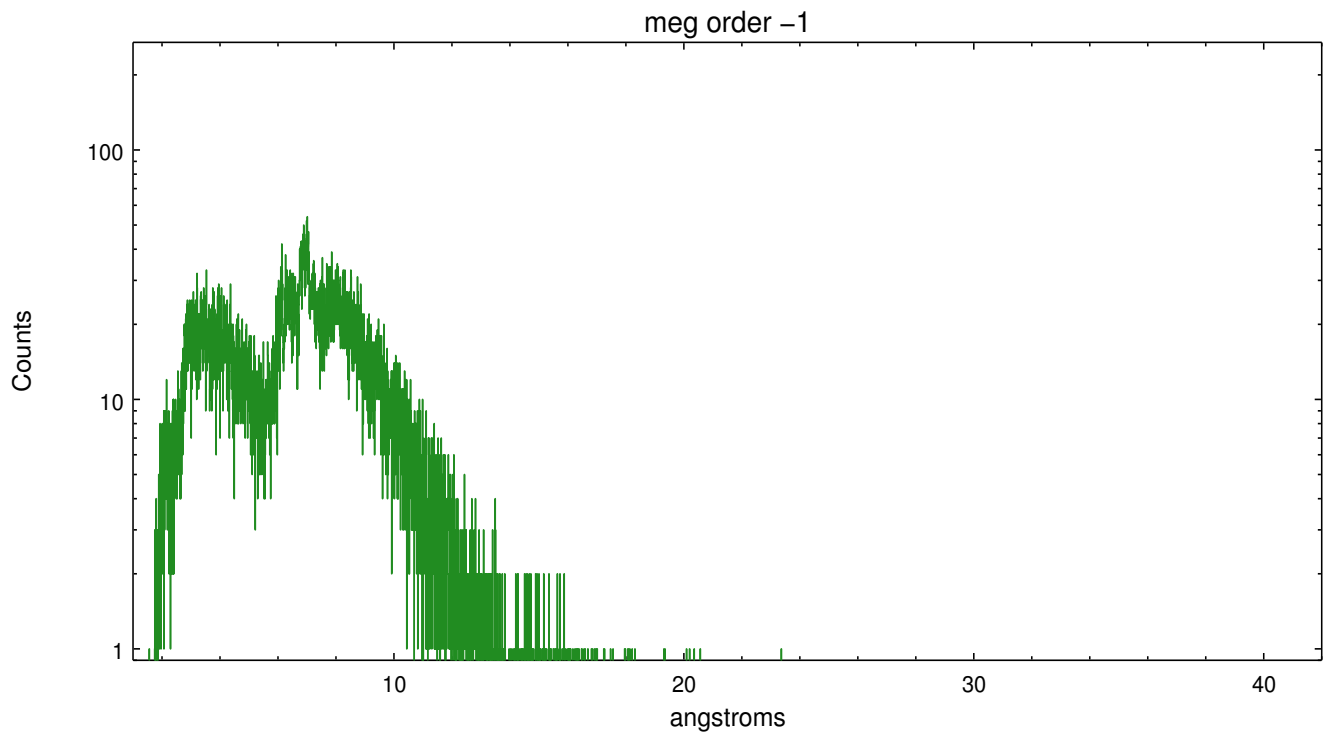
Spot Image MEG



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 | 2787        | 1050        | 31332       | 10118      | 37069      | 1012       | 2906       |





# A Summary

## A.1 Status

|                            |                 |
|----------------------------|-----------------|
| V&V Scientist              | Joy Nichols     |
| V&V Date (YYYY-MM-DD)      | 2018.06.13      |
| V&V Edition                | 1               |
| V&V Disposition and Status | OK              |
| V&V Charge Time            | 22.085721590638 |

## A.2 Comments

Zeroth order piled up. The zeroth order sky position was determined using a software tool developed by CXC called findzero, which is available in CIAO as part of the tgdetect2 tool. The tool calculates the point of intersection of the readout streak on the ACIS CCD and the meg or leg dispersed spectral arm, rather than using a centroid position of the source. The findzero results are more accurate than source centroid in this case.