

# V&V Reference Report

## L2 ASCDS Version : 10.6

Observation 19856 - L2 Version 1  
Chandra X-Ray Center

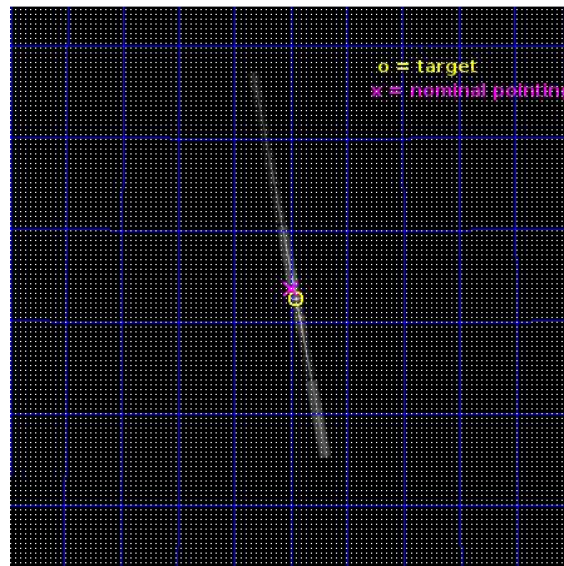
L2 Processing Date : Jun 23 2017

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# 1 Front

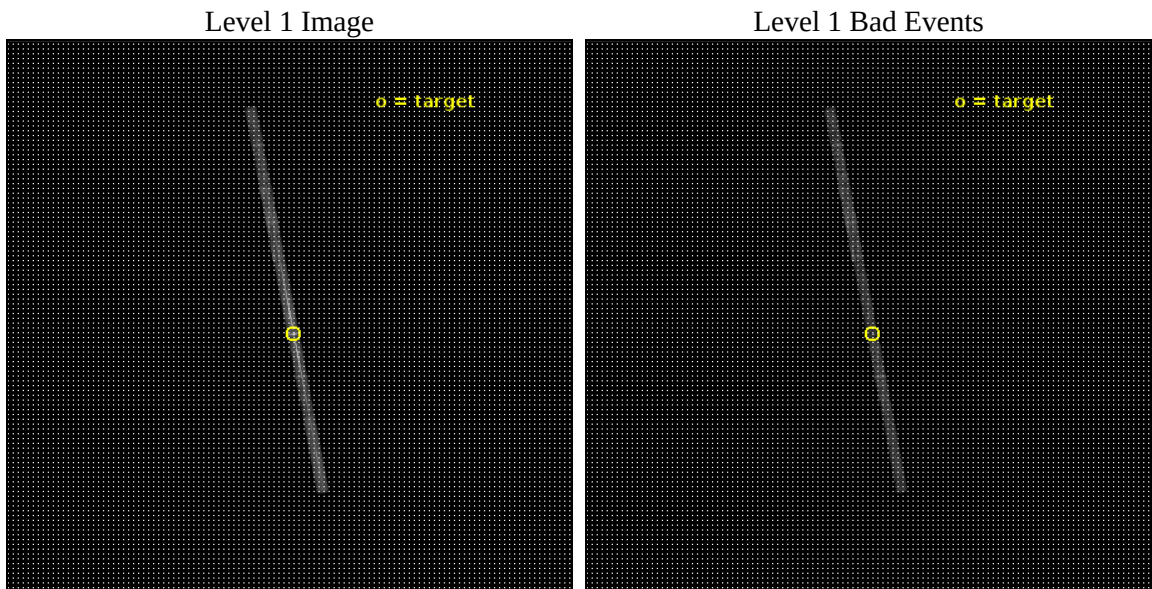
|          |                                          |                                             |
|----------|------------------------------------------|---------------------------------------------|
| seq_num  | 790296                                   | Sequence number                             |
| obs_id   | 19856                                    | Observation id                              |
| title    | AO-18 Calibration Observations of Mkn421 | Proposal title                              |
| observer | CXC Calibration                          | Principal investigator                      |
| object   | MKN421                                   | Source name                                 |
| dtcycle  | 0                                        | &#160                                       |
| cycle    | P                                        | events from which exps?<br>Prim/Second/Both |
| ra_targ  | 166.113333                               | Observer's specified target RA [deg]        |
| dec_targ | 38.208806                                | Observer's specified target Dec [deg]       |
| ra_nom   | 166.12331483875                          | Nominal RA [deg]                            |
| dec_nom  | 38.226930662879                          | Nominal Dec [deg]                           |
| roll_nom | 259.72212981328                          | Nominal Roll [deg]                          |
| revision | 1                                        | Processing version of data                  |
| ontime   | 9781.8006663322                          | Sum of GTIs [s]                             |
| livetime | 9240.0686419526                          | Livetime [s]                                |
| ontime5  | 9781.8006663322                          | Sum of GTIs [s]                             |
| ontime6  | 9781.8006663322                          | Sum of GTIs [s]                             |
| ontime7  | 9781.8006663322                          | Sum of GTIs [s]                             |
| ontime8  | 9781.8006663322                          | Sum of GTIs [s]                             |
| ontime9  | 9781.8006663322                          | Sum of GTIs [s]                             |
| l2events | 109441                                   | Number of level 2 events                    |



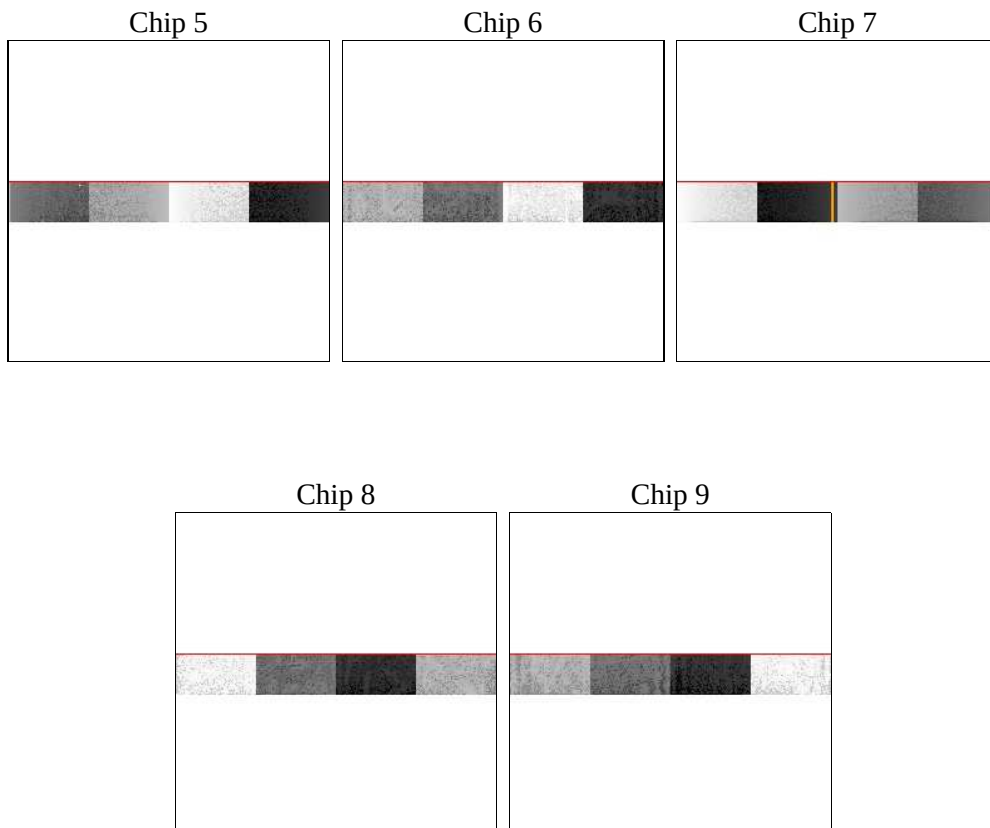
## 2 OBI

### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias



### 2.1.3 Parameters

|          |                     |                                |                |                    |                                         |
|----------|---------------------|--------------------------------|----------------|--------------------|-----------------------------------------|
| obi_num  | 0                   | Obi number                     | sched_exp_time | 10000.000000       | [s] Scheduled observation exposure time |
| ascdsver | 10.6                | Processing system revision     | ontime         | 9781.8006663322    | Sum of GTIs [s]                         |
| caldsver | 4.7.5               | &#160                          | ontime5        | 9781.8006663322    | Sum of GTIs [s]                         |
| date     | 2017-06-23T14:59:57 | Date and time of file creation | ontime6        | 9781.8006663322    | Sum of GTIs [s]                         |
| revision | 1                   | Processing version of data     | ontime7        | 9781.8006663322    | Sum of GTIs [s]                         |
|          |                     |                                | ontime8        | 9781.8006663322    | Sum of GTIs [s]                         |
|          |                     |                                | ontime9        | 9781.8006663322    | Sum of GTIs [s]                         |
|          |                     |                                | l1events       | 171052             | Number of level 1 events                |
|          |                     |                                | tgmethod       | FINDZO             | Method used to create src1a file        |
|          |                     |                                | zo_pos         | (4151.32, 3964.17) | src1a sky pixel position                |
|          |                     |                                |                |                    | src1a sky pixel position via            |

### 2.1.4 Events

|                 | ccd 5 | ccd 6 | ccd 7 | ccd 8 | ccd 9 |
|-----------------|-------|-------|-------|-------|-------|
| level 1 events  | 20284 | 41760 | 78521 | 19082 | 11405 |
| rejected events | 7999  | 10306 | 15962 | 12791 | 9229  |
| rejected %      | 39%   | 24%   | 20%   | 67%   | 80%   |

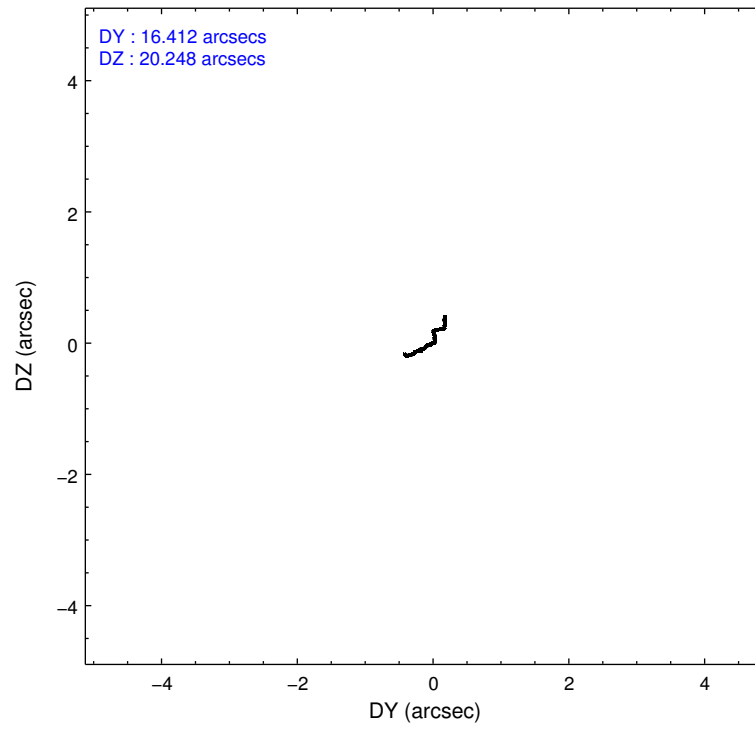
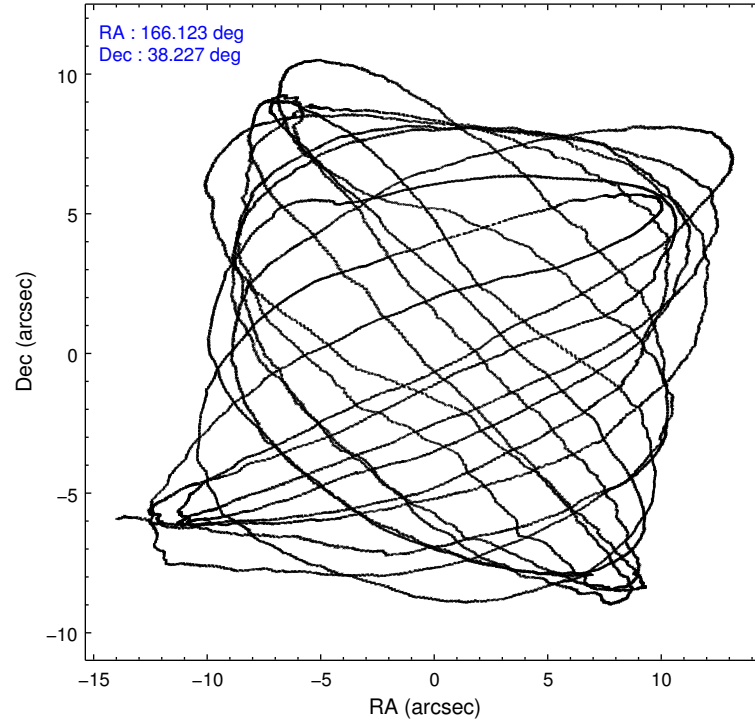
|                | ccd 5 | ccd 6 | ccd 7 | ccd 8 | ccd 9 |
|----------------|-------|-------|-------|-------|-------|
| grade 0 events | 3484  | 25167 | 17069 | 3103  | 1129  |
|                | 17%   | 60%   | 21%   | 16%   | 9%    |
| grade 1 events | 58    | 80    | 697   | 8     | 3     |
|                | 0%    | 0%    | 0%    | 0%    | 0%    |
| grade 2 events | 3168  | 3231  | 15574 | 1011  | 324   |
|                | 15%   | 7%    | 19%   | 5%    | 2%    |
| grade 3 events | 822   | 1061  | 6880  | 485   | 233   |
|                | 4%    | 2%    | 8%    | 2%    | 2%    |
| grade 4 events | 756   | 1127  | 6931  | 491   | 226   |
|                | 3%    | 2%    | 8%    | 2%    | 1%    |
| grade 5 events | 1510  | 480   | 3905  | 675   | 464   |
|                | 7%    | 1%    | 4%    | 3%    | 4%    |
| grade 6 events | 4055  | 872   | 16113 | 1201  | 264   |
|                | 19%   | 2%    | 20%   | 6%    | 2%    |
| grade 7 events | 6431  | 9742  | 11352 | 12108 | 8762  |
|                | 31%   | 23%   | 14%   | 63%   | 76%   |

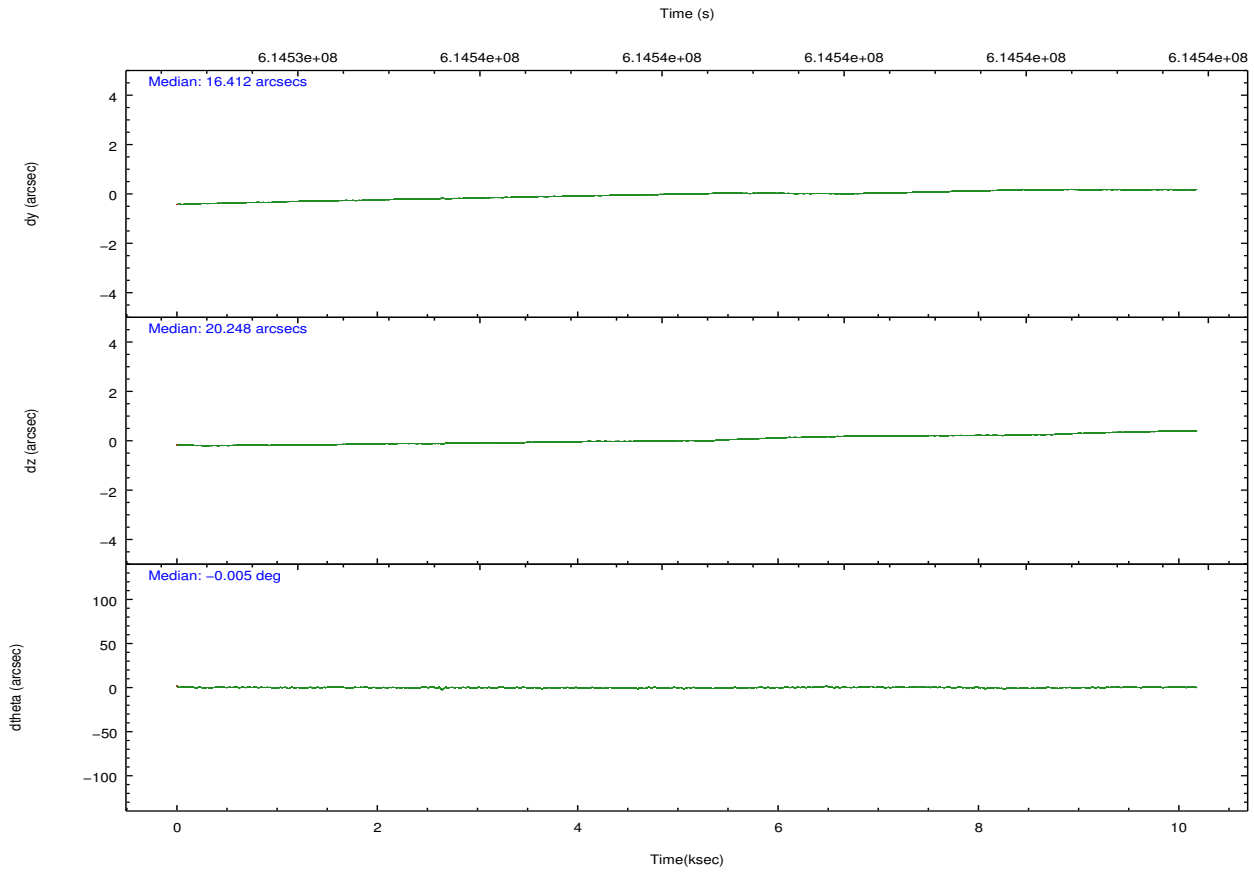
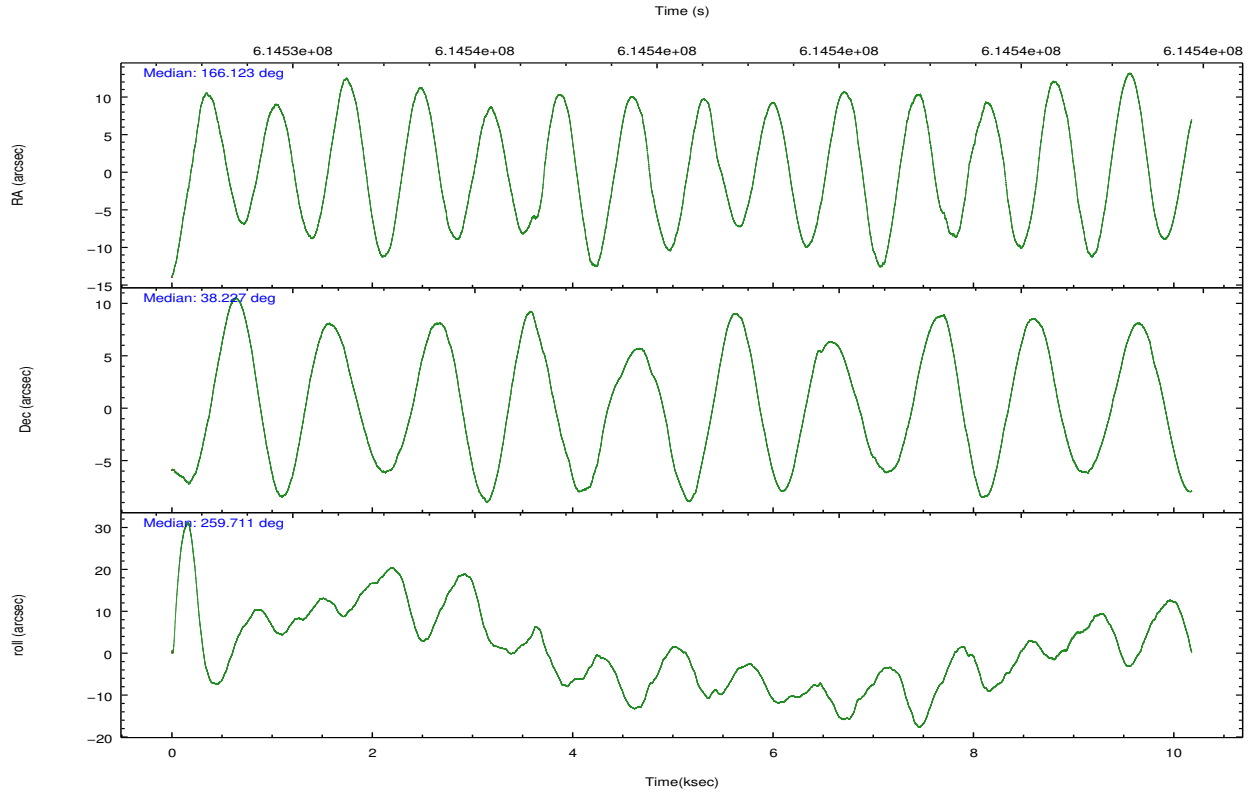


## 2.2 Compared Parameters

| 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                           | LETG                | LETG                 | 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                 | 166.111099          | 166.1233148387488    | CCD I2 on                             | N         | N       |
| [deg] Pointing Dec                | 38.252656           | 38.22693066287908    | CCD I3 on                             | N         | N       |
| [deg] Pointing Roll               | 259.573110          | 259.7221298132756    | CCD S0 on                             | N         | 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    | -190.132523         | -190.1400660498719   | CCD S3 on                             | Y         | Y       |
| [mm] SIM translation stage offset | 0                   | 0.00754346686406393  | CCD S4 on                             | Y         | Y       |
| [s] Observation start time (MET)  | 614533336.184000    | 614532829.76673      | CCD S5 on                             | O1        | Y       |
| Observation start date            | 2017-06-22T15:41:07 | 2017-06-22T15:33:49  | Number of optional ACIS chips dropped | 0         | 0       |
| [s] Observation end time (MET)    | 614543336.184000    | 614543567.15485      | On-chip summing requested             | N         | N       |
| Observation end date              | 2017-06-22T18:27:47 | 2017-06-22T18:32:47  | Subarray requested                    | CUSTOM    | 1/8     |
| Read mode                         | TIMED               | TIMED                | Subarray start row                    | 448       | 448     |
|                                   |                     |                      | Subarray row count                    | 128       | 128     |
|                                   |                     |                      | Alternating exposures requested       | N         | N       |
|                                   |                     |                      | [s] Primary exposure time             | 0.000000  | 0.7     |

## 2.3 Aspect



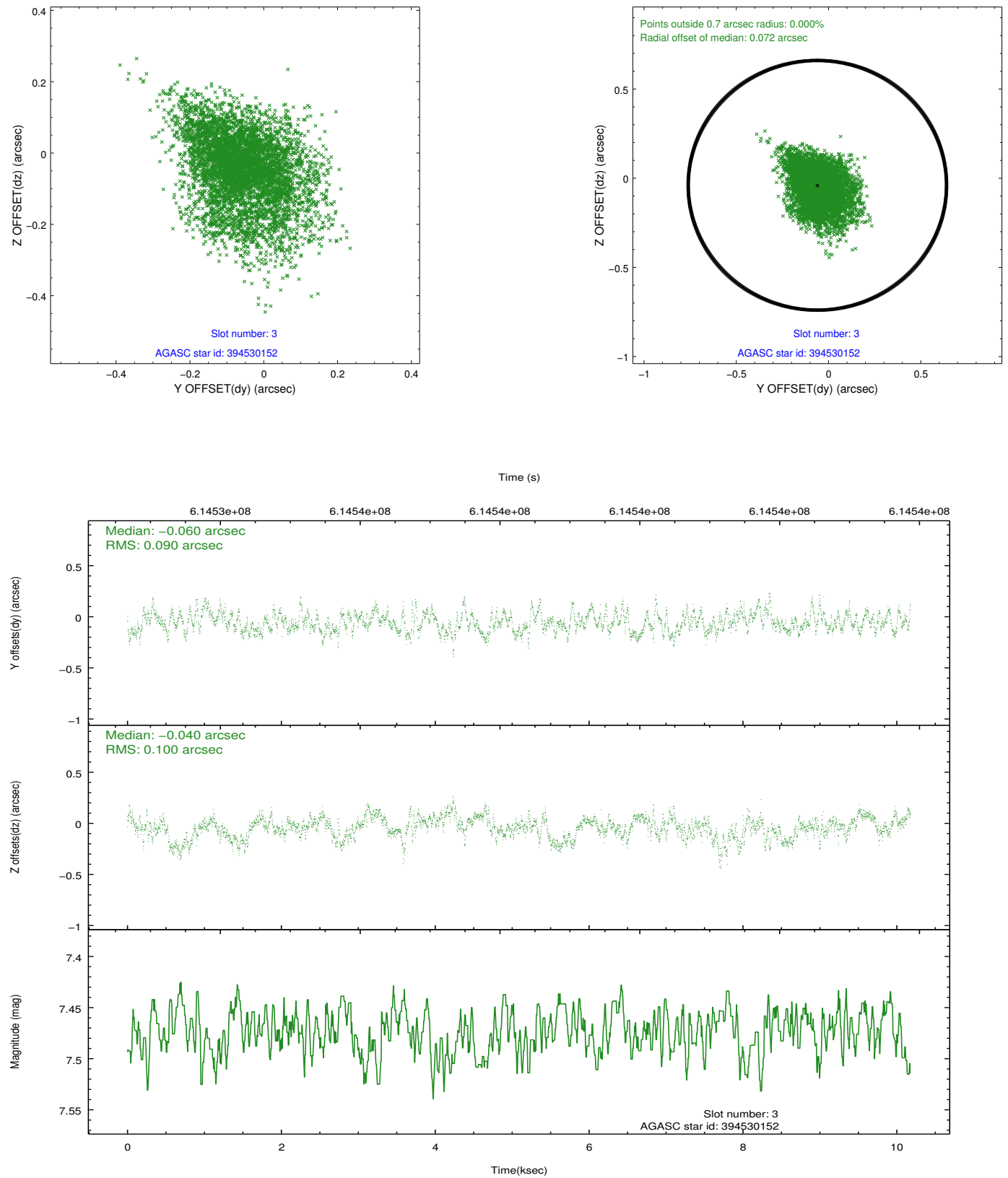


# Slot Statistics

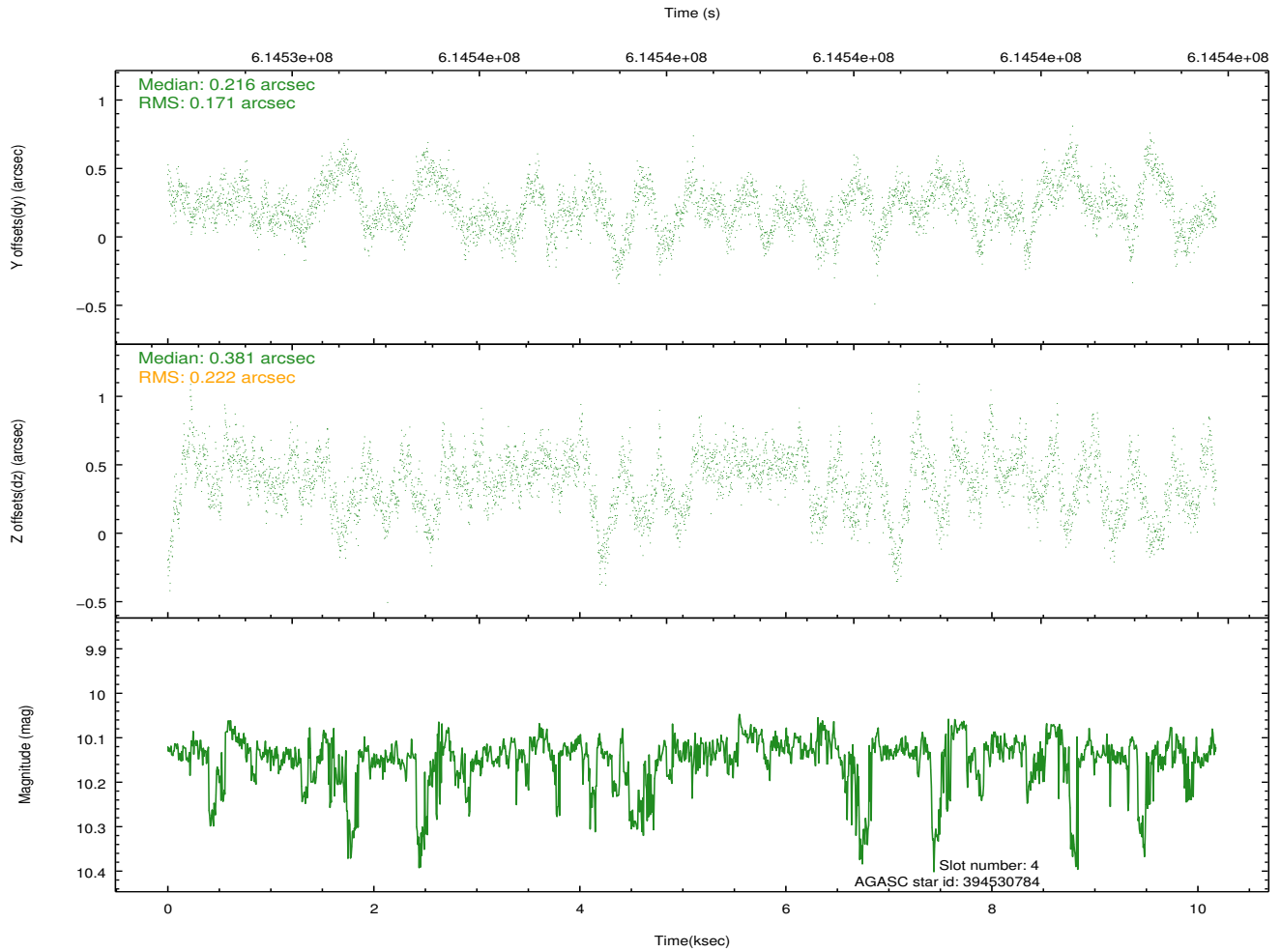
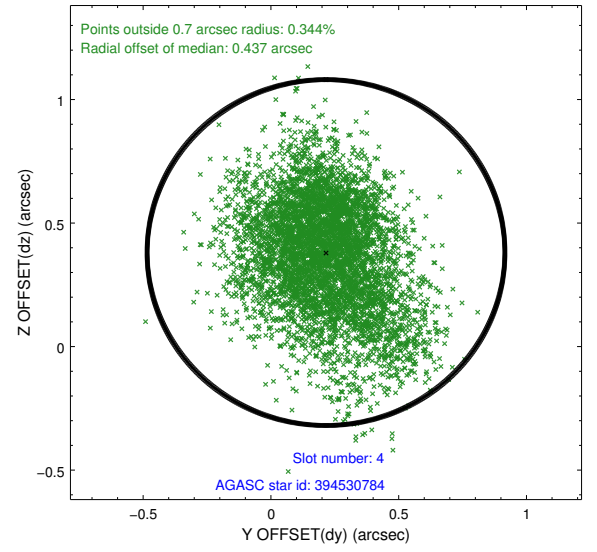
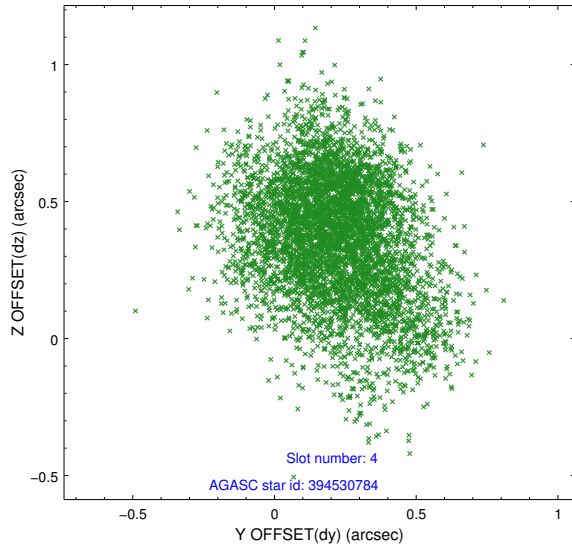
| slot | status | used | id        | mag   | n_pts | med_dy | med_dz | dr1   | dr2   | ra         | dec       | mean_y   | mean_z   |
|------|--------|------|-----------|-------|-------|--------|--------|-------|-------|------------|-----------|----------|----------|
| 0    | FID    |      | ACIS-S-2  | 6.94  | 2483  | -0.206 | -0.053 | 0.008 | 0.013 | 0.000000   | 0.000000  | -769.53  | -1741.90 |
| 1    | FID    |      | ACIS-S-4  | 7.05  | 2483  | 0.441  | 0.114  | 0.006 | 0.011 | 0.000000   | 0.000000  | 2144.11  | 166.28   |
| 2    | FID    |      | ACIS-S-5  | 7.04  | 2483  | -0.266 | -0.052 | 0.007 | 0.012 | 0.000000   | 0.000000  | -1821.81 | 160.28   |
| 3    | GUIDE  | used | 394530152 | 7.47  | 4966  | -0.060 | -0.040 | 0.143 | 0.238 | 166.075805 | 38.868252 | -2161.33 | -498.36  |
| 4    | GUIDE  | used | 394530784 | 10.14 | 4943  | 0.216  | 0.381  | 0.290 | 0.500 | 165.569172 | 38.418674 | -315.16  | -1611.55 |
| 5    | GUIDE  | used | 394533848 | 8.70  | 4961  | 0.066  | -0.012 | 0.120 | 0.203 | 166.382906 | 38.276007 | -222.64  | 734.22   |
| 6    | GUIDE  | used | 394543960 | 9.75  | 4958  | 0.059  | -0.291 | 0.201 | 0.319 | 165.802757 | 37.787371 | 1805.13  | -559.18  |
| 7    | GUIDE  | used | 394546712 | 6.58  | 4965  | -0.289 | -0.002 | 0.118 | 0.197 | 166.451462 | 38.394357 | -676.50  | 850.86   |

## 2.4 Star Slots

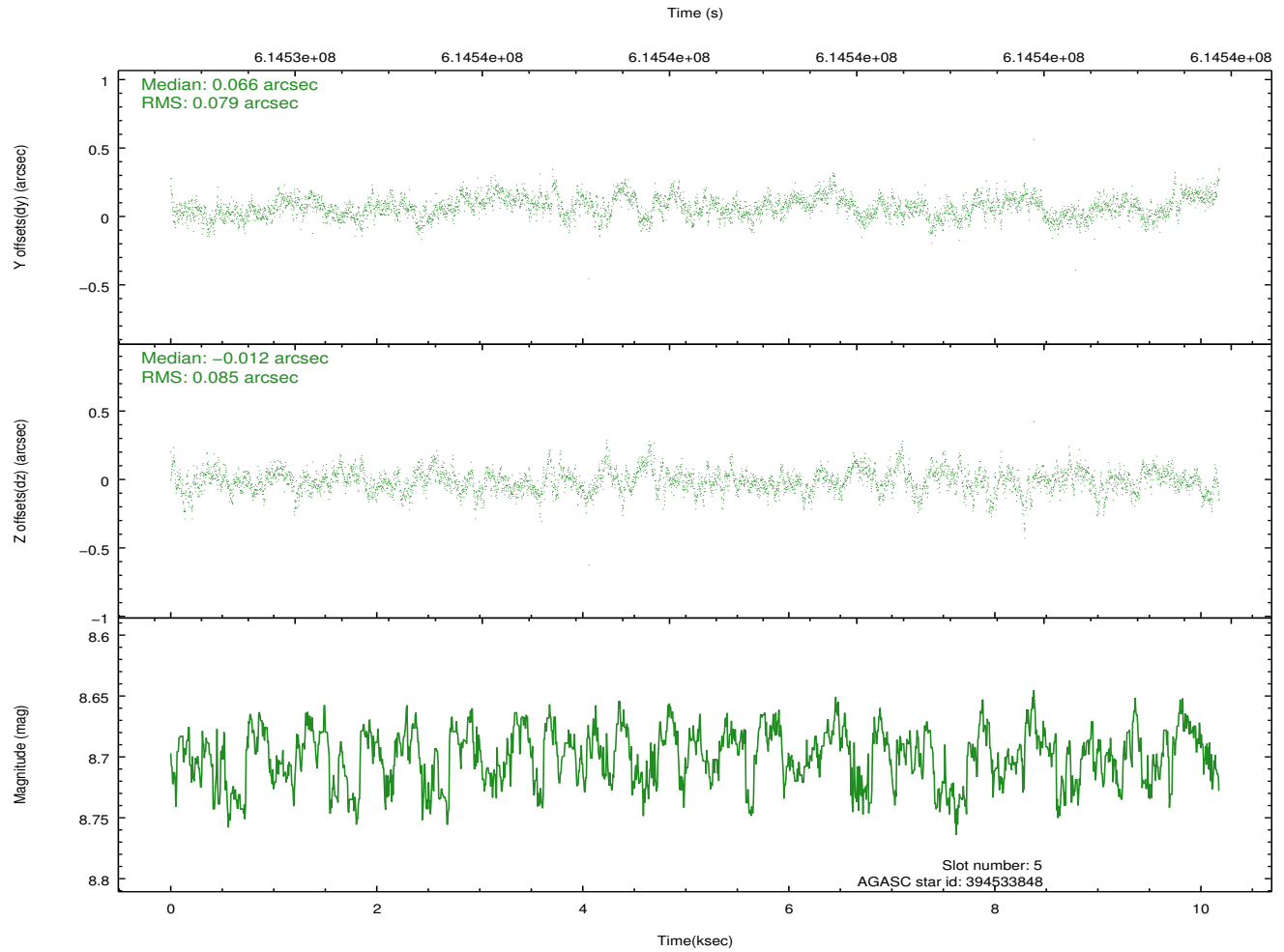
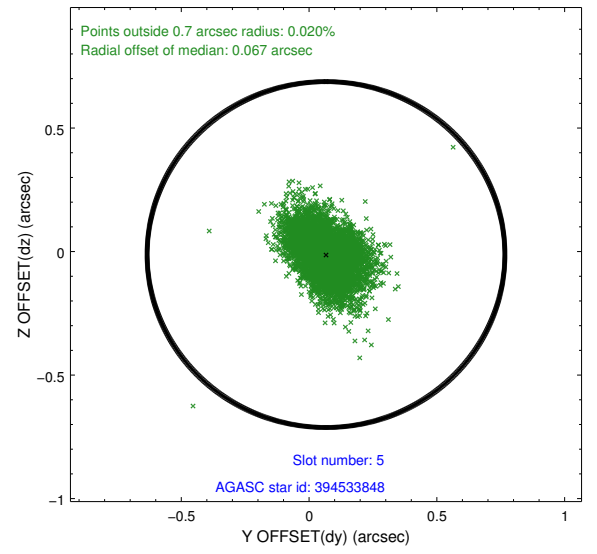
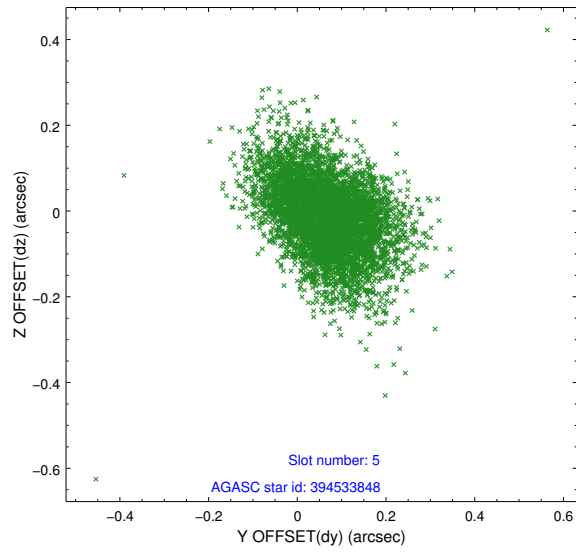
### 2.4.1 Slot 3



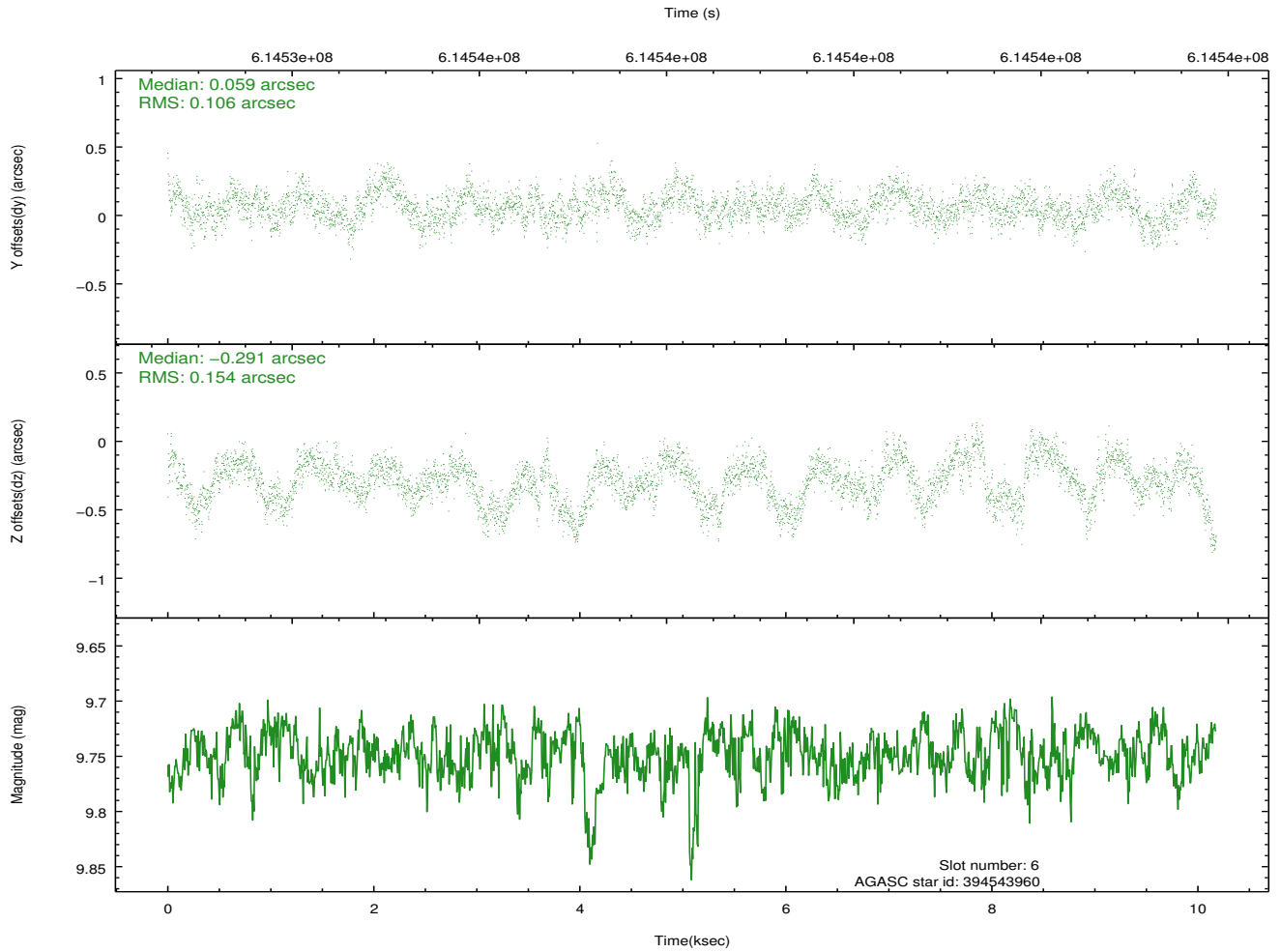
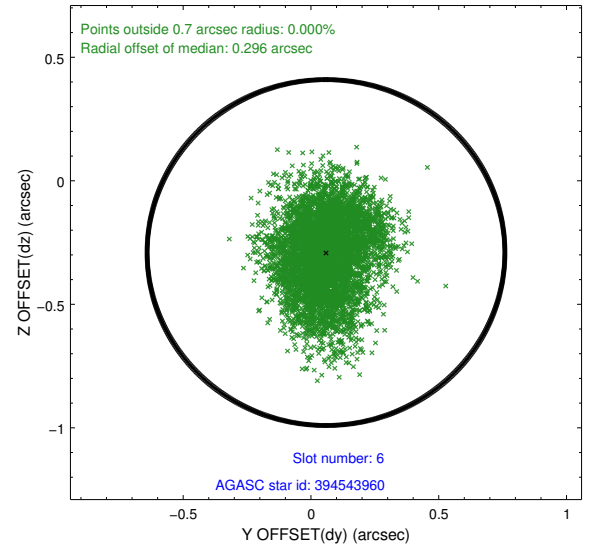
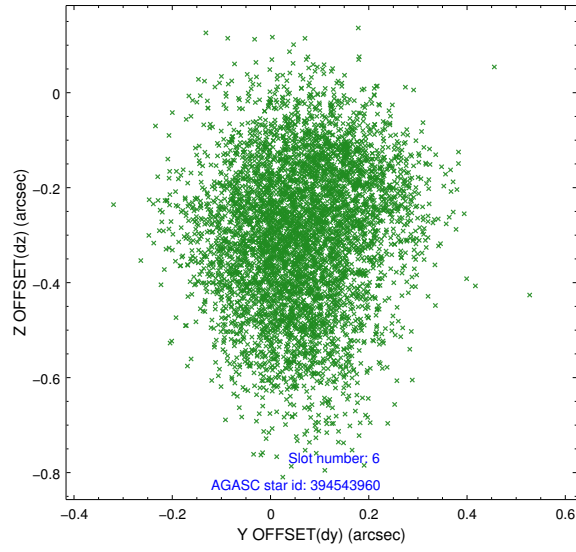
## 2.4.2 Slot 4



### 2.4.3 Slot 5

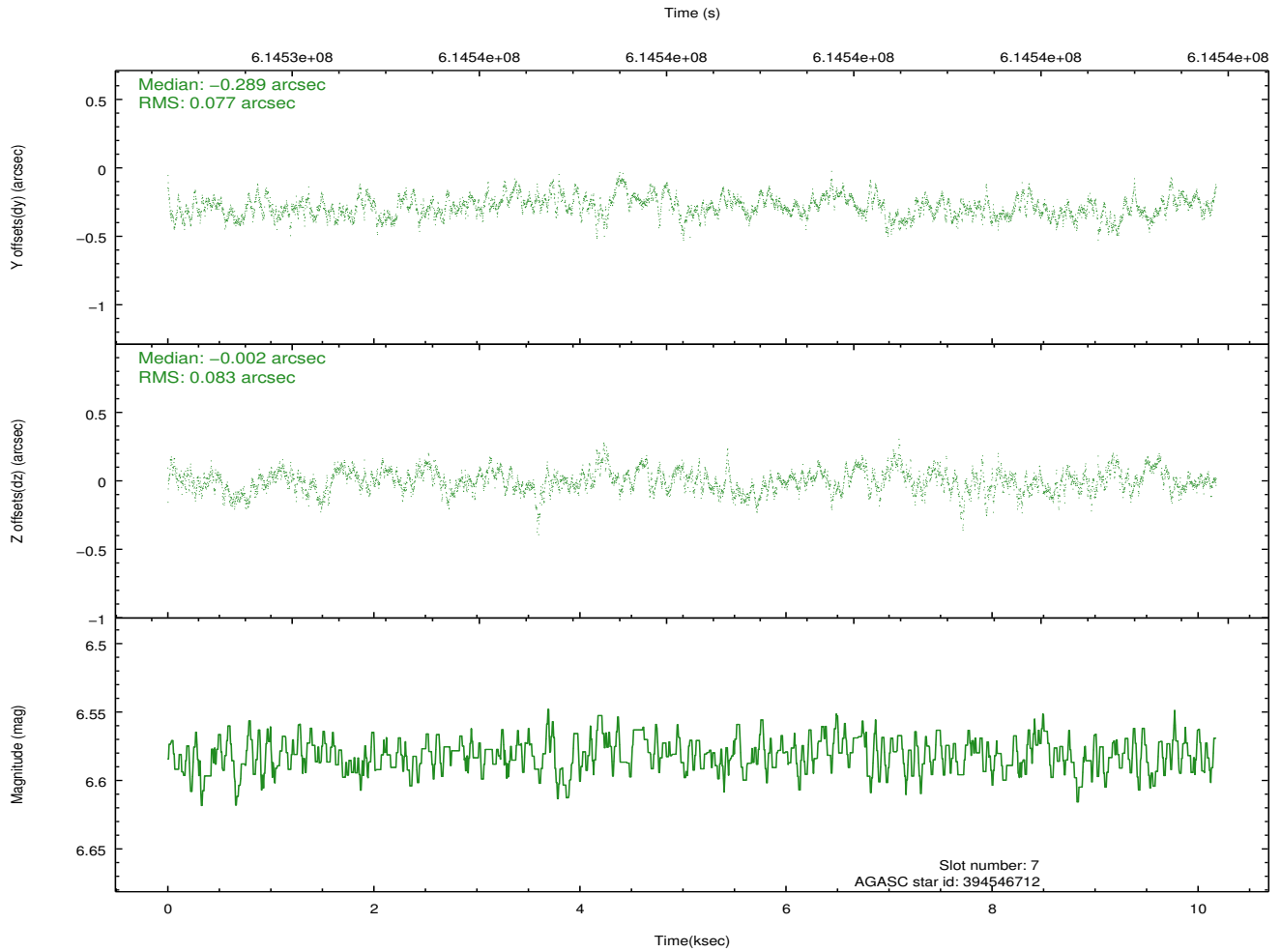
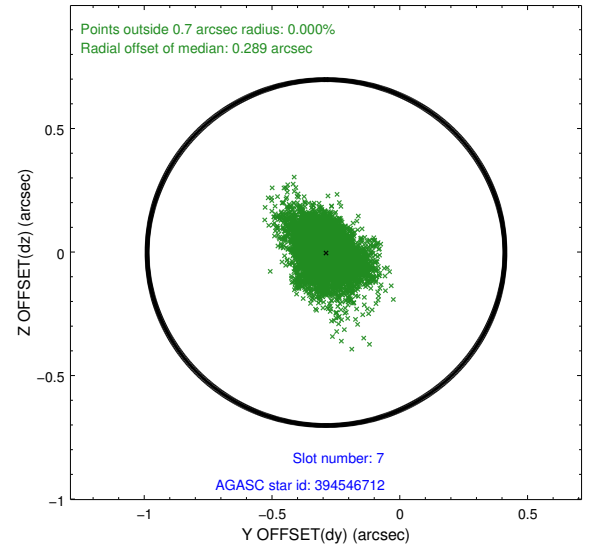
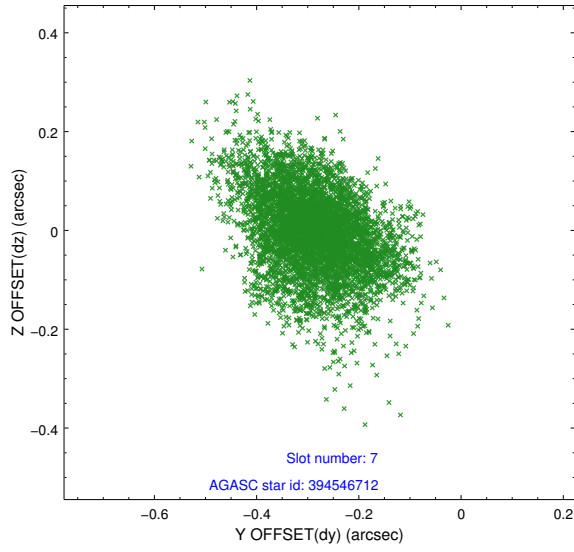


## 2.4.4 Slot 6



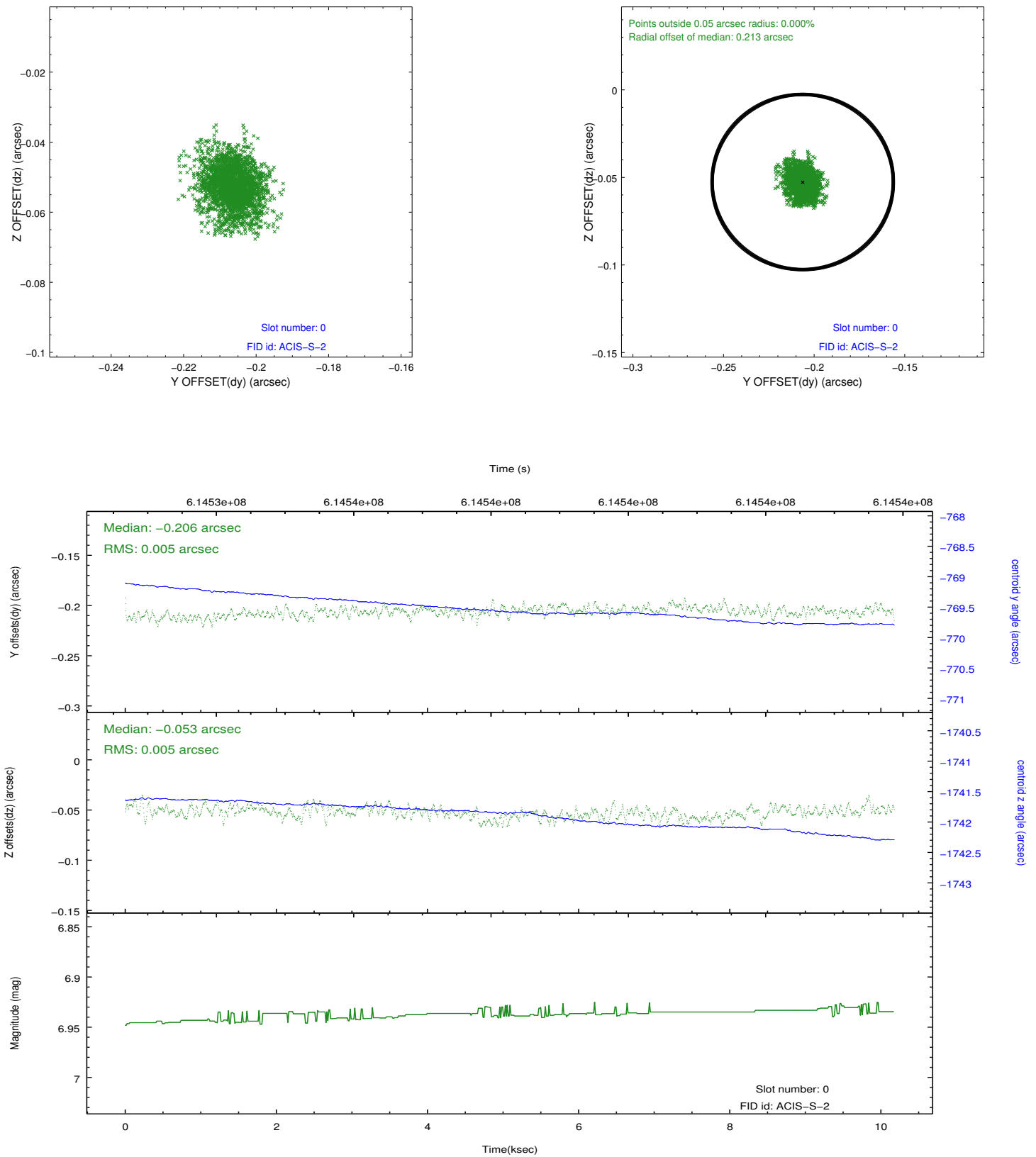


## 2.4.5 Slot 7

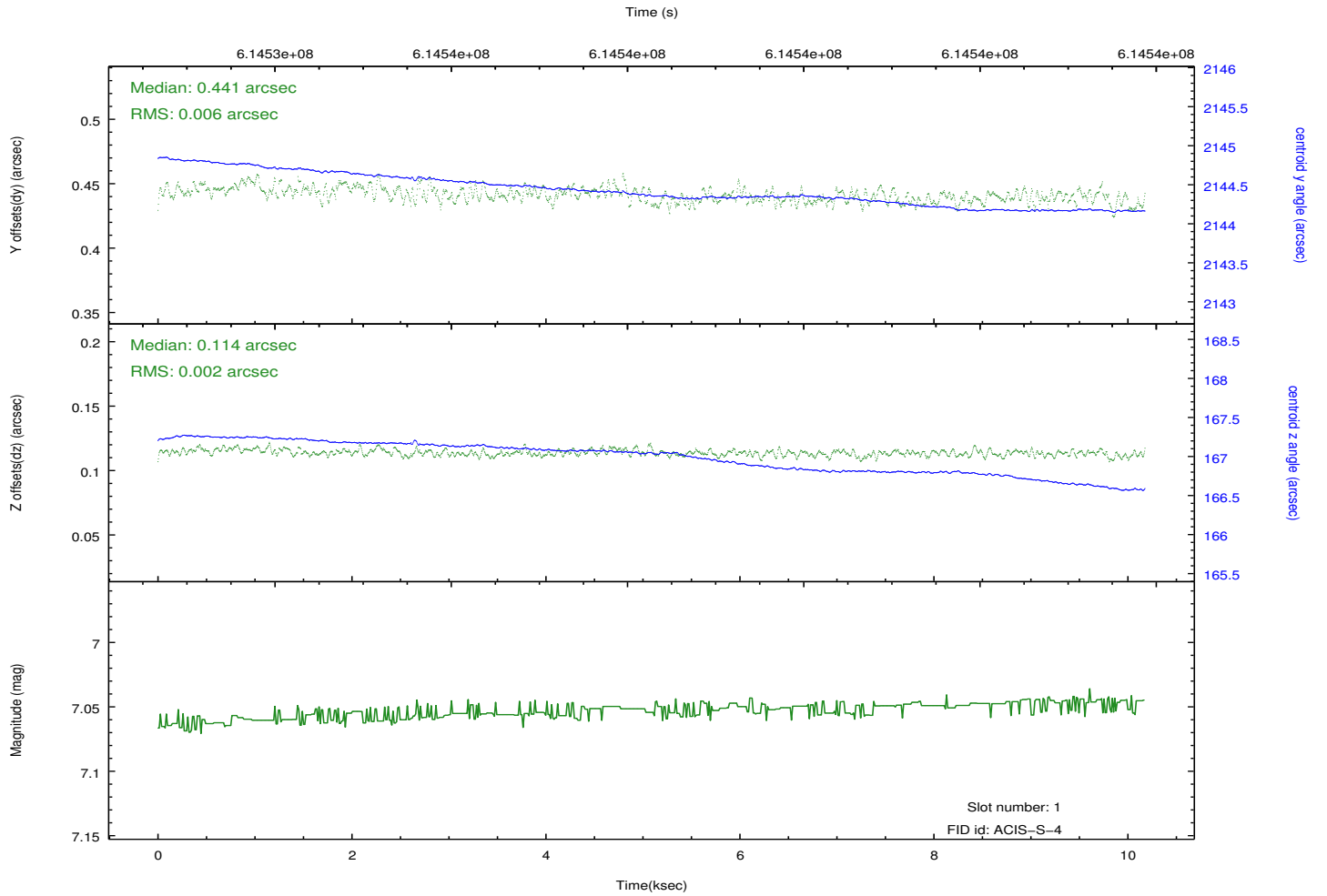
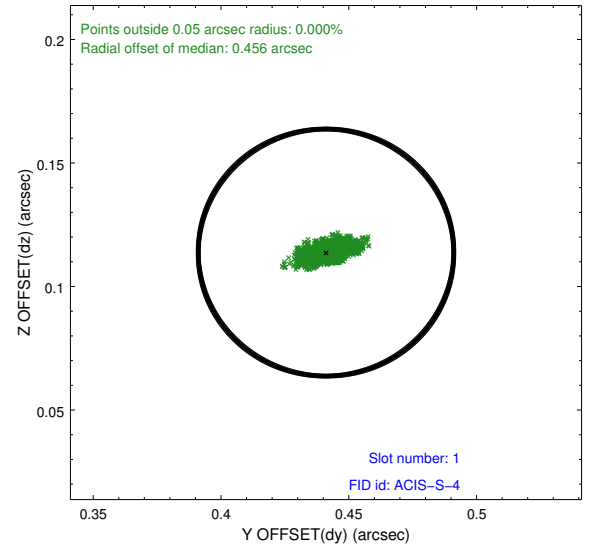
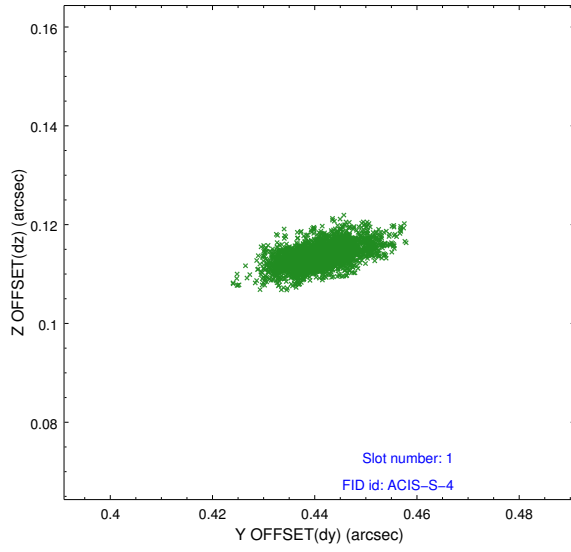


## 2.5 FID Slots

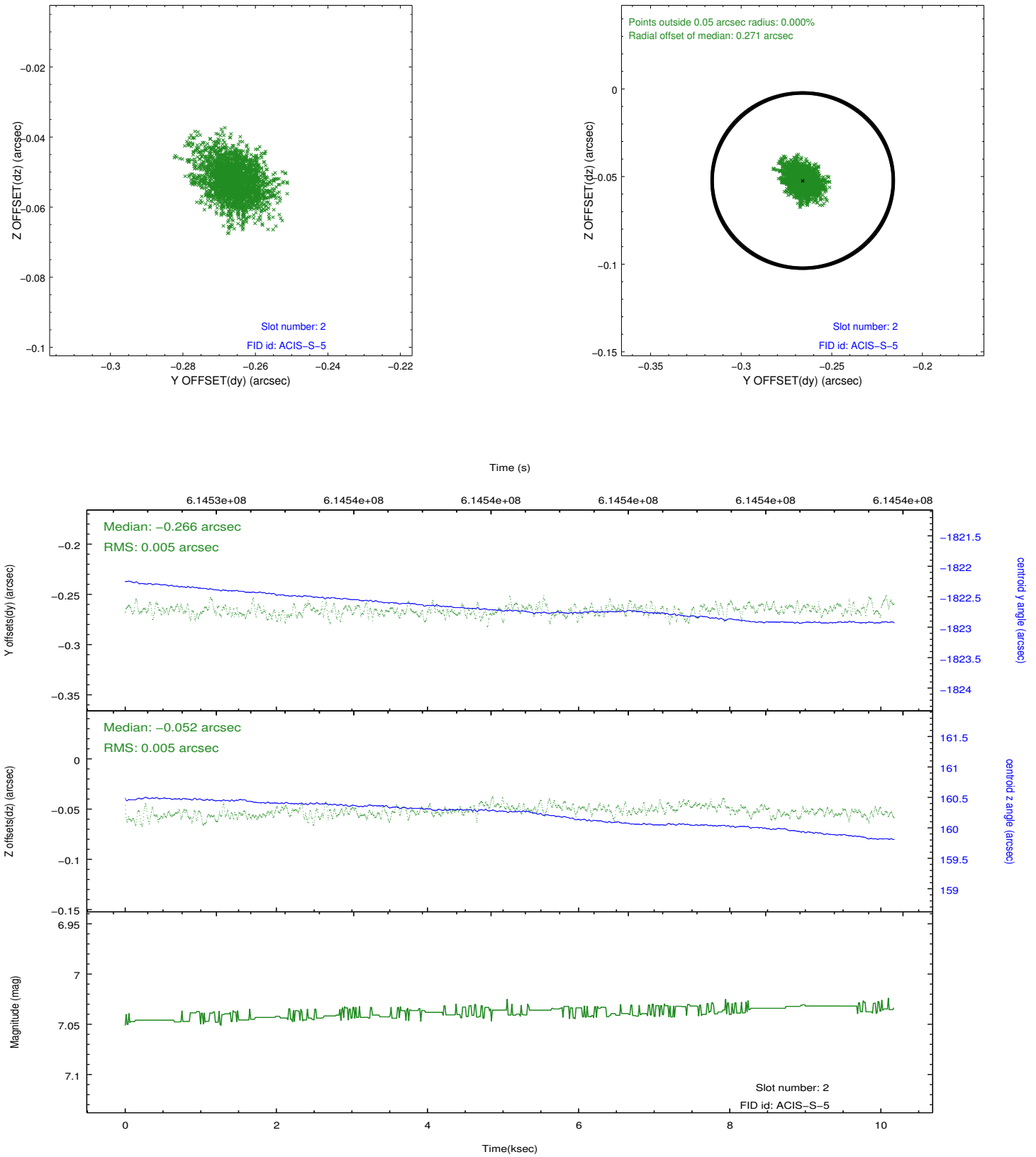
### 2.5.1 Slot 0



## 2.5.2 Slot 1

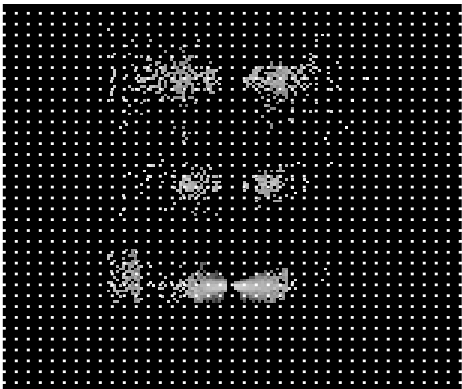


### 2.5.3 Slot 2

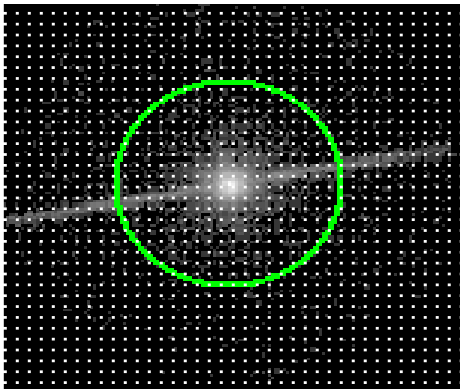


# 3 Gratings

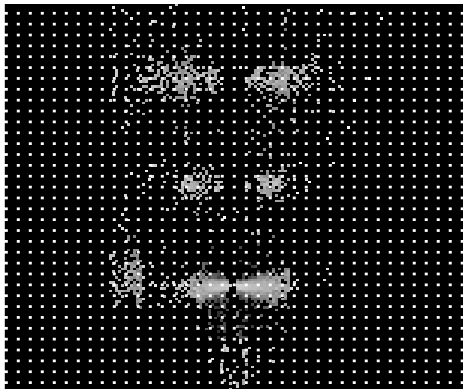
## 3.1 LETG Arm



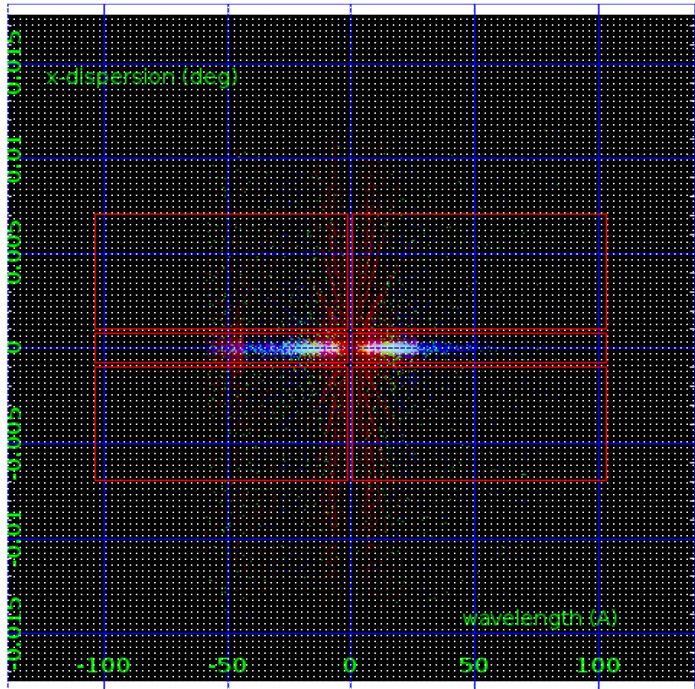
LETG Order Sort 123



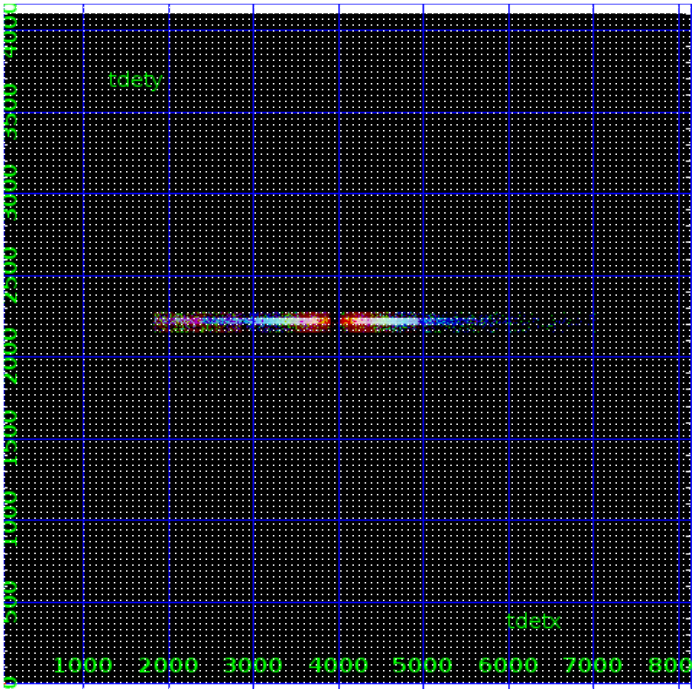
LETG Zero Order



LETG Order Sort ALL

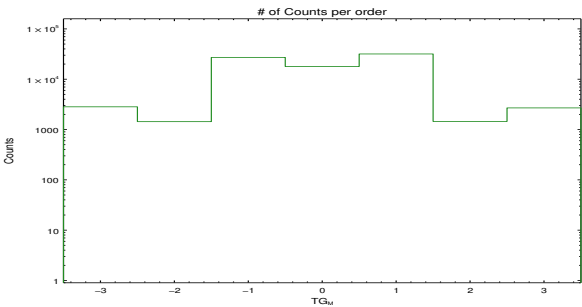


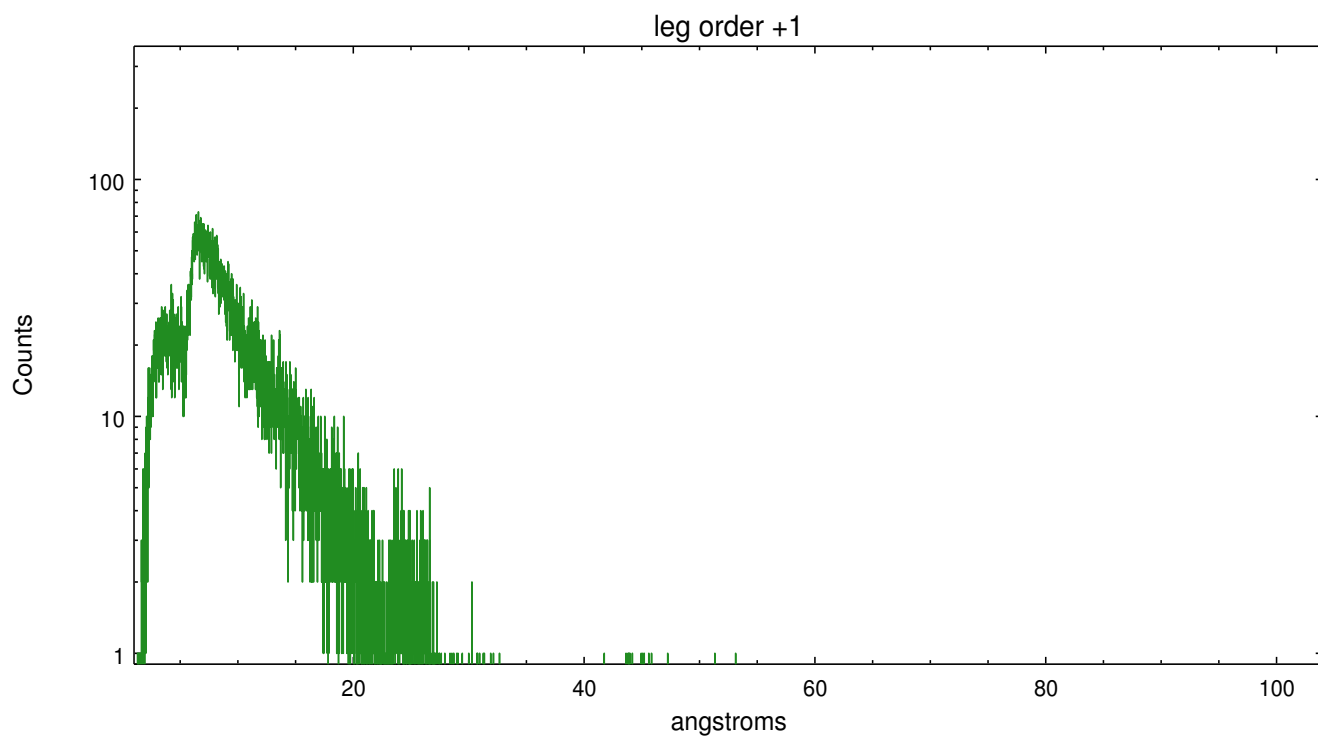
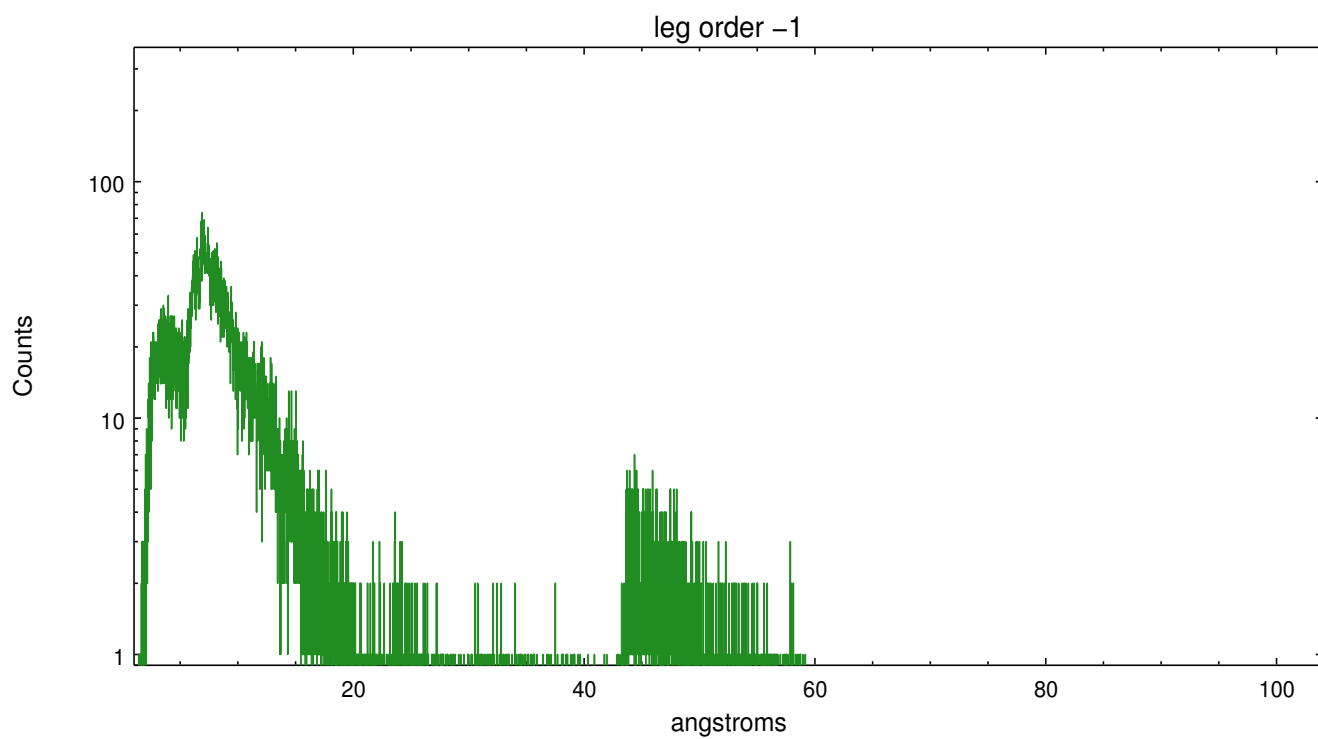
Spot Image LETG



Full Detector LETG

|        | order<br>-3 | order<br>-2 | order<br>-1 | order<br>0 | order<br>1 | order<br>2 | order<br>3 |
|--------|-------------|-------------|-------------|------------|------------|------------|------------|
| Events | 2829        | 1435        | 27137       | 17901      | 31767      | 1449       | 2691       |





# A Summary

## A.1 Status

|                            |                    |
|----------------------------|--------------------|
| V&V Scientist              | David Huenemoerder |
| V&V Date (YYYY-MM-DD)      | 2017.06.23         |
| V&V Edition                | 1                  |
| V&V Disposition and Status | OK                 |
| V&V Charge Time            | 9.7818006663322    |

## A.2 Comments

Comments for Obi 0

Star in slot 4 has an RMS deviation > 0.200000 arcsec