

# V&V Reference Report

## L2 ASCDS Version : 10.7.1

Observation 22118 - L2 Version 1  
Chandra X-Ray Center

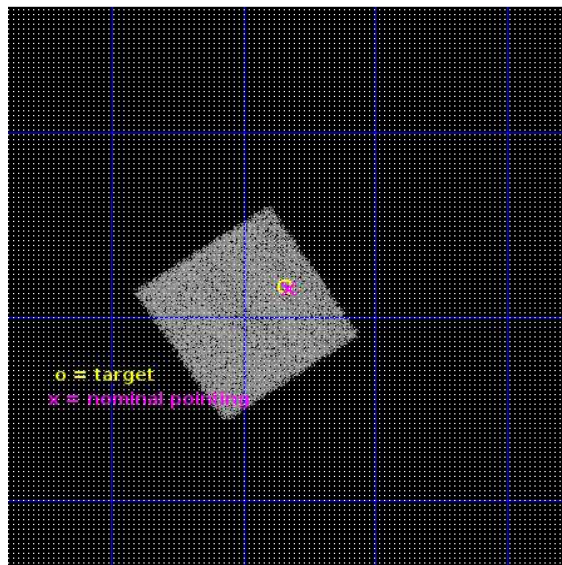
L2 Processing Date : Feb 21 2019

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# 1 Front

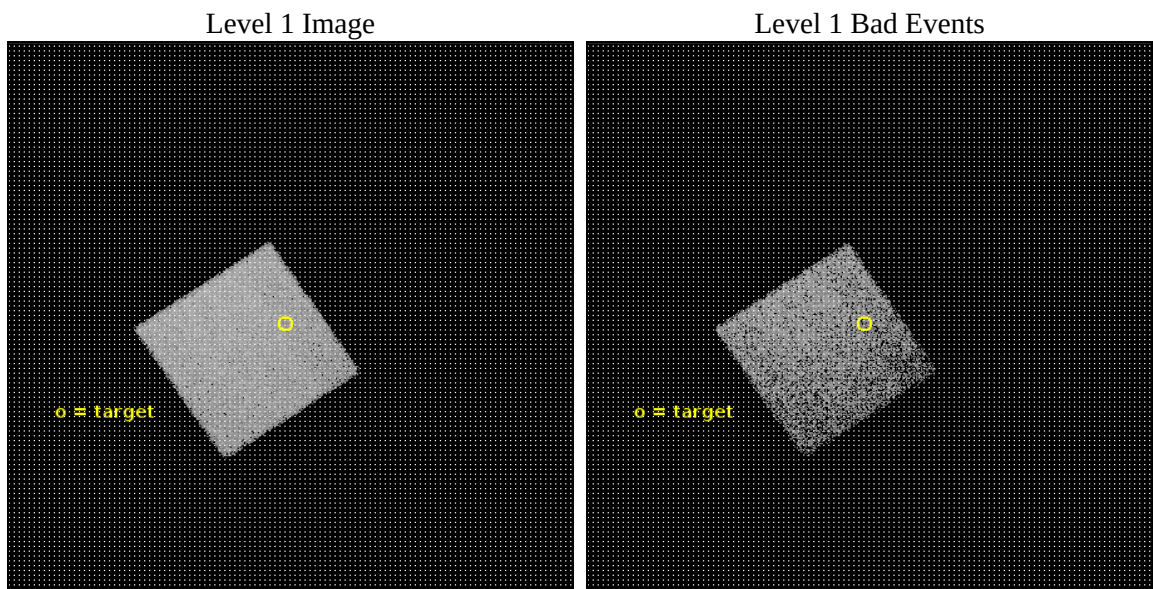
|          |                                                           |                                             |
|----------|-----------------------------------------------------------|---------------------------------------------|
| seq_num  | 703868                                                    | Sequence number                             |
| obs_id   | 22118                                                     | Observation id                              |
| title    | Chandra-NuSTAR synergy in the NuSTAR serendipitous survey | Proposal                                    |
| observer | Dr David Alexander                                        | Principal investigator                      |
| object   | Mrk417_s2                                                 | Source name                                 |
| dtcycle  | 0                                                         | &#160                                       |
| cycle    | P                                                         | events from which exps?<br>Prim/Second/Both |
| ra_targ  | 162.460175                                                | Observer's specified target RA [deg]        |
| dec_targ | 23.02739                                                  | Observer's specified target Dec [deg]       |
| ra_nom   | 162.45617360899                                           | Nominal RA [deg]                            |
| dec_nom  | 23.025477435736                                           | Nominal Dec [deg]                           |
| roll_nom | 146.28065565718                                           | Nominal Roll [deg]                          |
| revision | 1                                                         | Processing version of data                  |
| ontime   | 10091.015248537                                           | Sum of GTIs [s]                             |
| livetime | 9954.8331313009                                           | Livetime [s]                                |
| ontime7  | 10091.015248537                                           | Sum of GTIs [s]                             |
| l2events | 41781                                                     | Number of level 2 events                    |



## 2 OBI

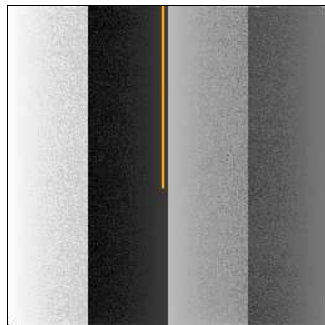
### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias

Chip 7



### 2.1.3 Parameters

|          |                     |                                |                |                 |                                         |
|----------|---------------------|--------------------------------|----------------|-----------------|-----------------------------------------|
| obi_num  | 0                   | Obi number                     | sched_exp_time | 10000.662000    | [s] Scheduled observation exposure time |
| ascdsver | 10.7.1              | Processing system revision     | ontime         | 10091.015248537 | Sum of GTIs [s]                         |
| caldbver | 4.8.2               | &#160                          | ontime7        | 10091.015248537 | Sum of GTIs [s]                         |
| date     | 2019-02-21T19:29:58 | Date and time of file creation | l1events       | 99652           | Number of level 1 events                |
| revision | 1                   | Processing version of data     |                |                 |                                         |

### 2.1.4 Events

|                 |              |
|-----------------|--------------|
|                 | <b>ccd 7</b> |
| level 1 events  | 99652        |
| rejected events | 56732        |
| rejected %      | 56%          |

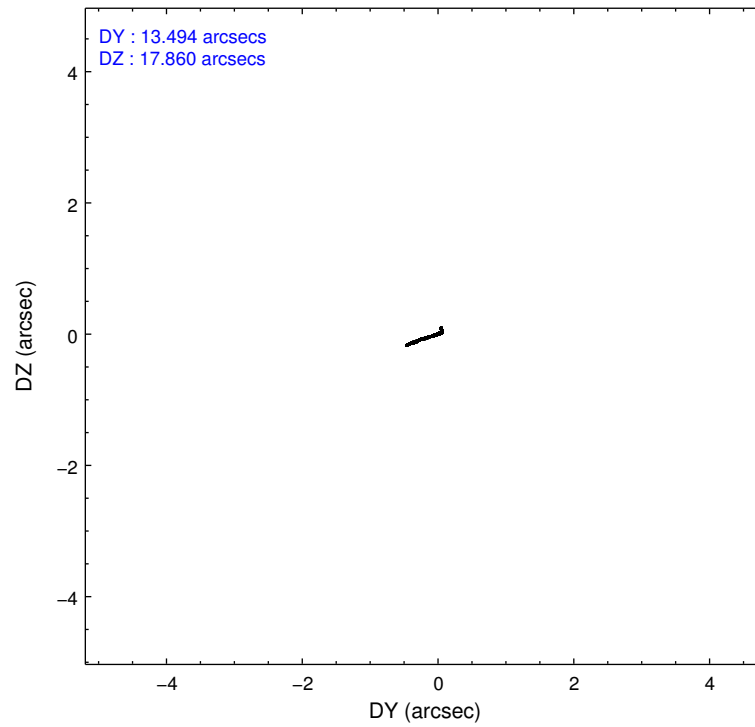
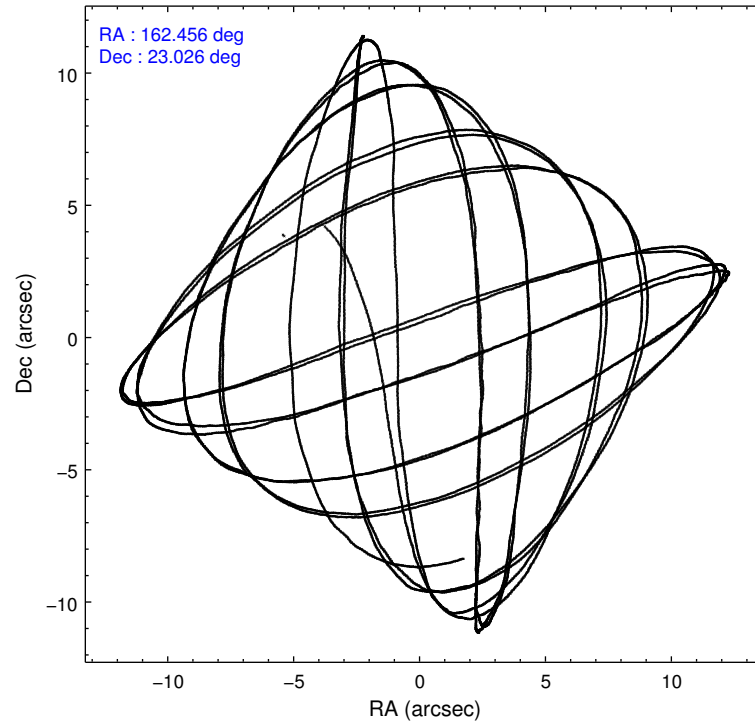
|                |              |
|----------------|--------------|
|                | <b>ccd 7</b> |
| grade 0 events | 3594         |
|                | 3%           |
| grade 1 events | 133          |
|                | 0%           |
| grade 2 events | 8783         |
|                | 8%           |
| grade 3 events | 3417         |
|                | 3%           |
| grade 4 events | 3192         |
|                | 3%           |
| grade 5 events | 9376         |
|                | 9%           |
| grade 6 events | 23958        |
|                | 24%          |
| grade 7 events | 47199        |
|                | 47%          |

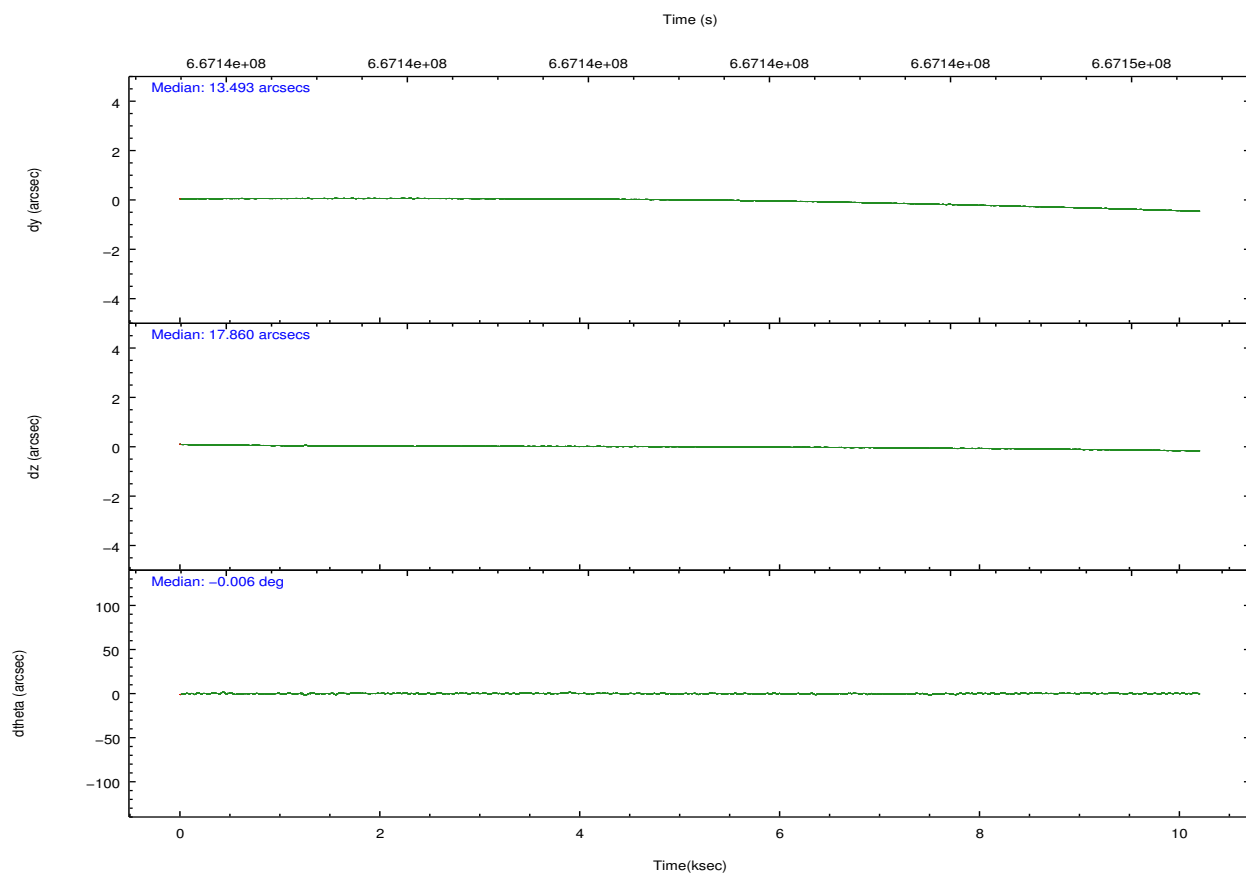
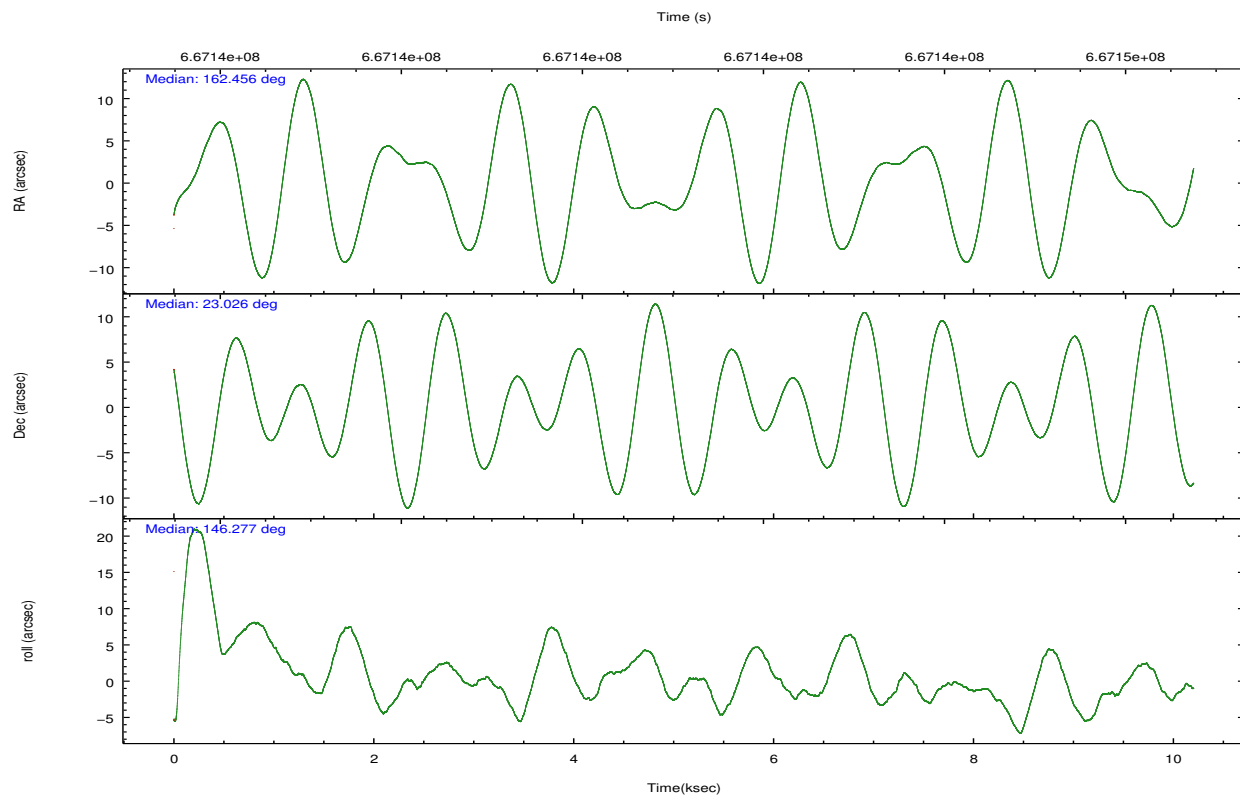


## 2.2 Compared Parameters

| Parameter                         | Planned             | Actual               | Parameter                             | Planned   | Actual  |
|-----------------------------------|---------------------|----------------------|---------------------------------------|-----------|---------|
| Instrument                        | ACIS                | ACIS                 | Obspar format version number          | 7         | 7       |
| Detector                          | ACIS-7              | ACIS-7               | Obspar file type                      | PREDICTED | ACTUAL  |
| Grating                           | NONE                | NONE                 | Obspar update status                  | NONE      | UPDATED |
| Data mode                         | VFAINT              | VFAINT               | Number of optional ACIS chips dropped | 0         | 0       |
| Observation mode                  | POINTING            | POINTING             | On-chip summing requested             | N         | N       |
| [deg] Pointing RA                 | 162.485975          | 162.456173608986     | Subarray requested                    | NONE      | NONE    |
| [deg] Pointing Dec                | 23.024102           | 23.02547743573556    | Alternating exposures requested       | N         | N       |
| [deg] Pointing Roll               | 146.112369          | 146.2806556571777    | [s] Primary exposure time             | 0.000000  | 3       |
| [mm] SIM focus pos                | -0.684267           | -0.6828225247311905  |                                       |           |         |
| [mm] SIM defocus                  | 0                   | 0.001444936568705701 |                                       |           |         |
| [mm] SIM translation stage pos    | -190.132523         | -190.1425803651734   |                                       |           |         |
| [mm] SIM translation stage offset | 0                   | 0.01005778216563158  |                                       |           |         |
| [s] Observation start time (MET)  | 667136229.184000    | 667135536.7278       |                                       |           |         |
| Observation start date            | 2019-02-21T11:36:00 | 2019-02-21T11:25:36  |                                       |           |         |
| [s] Observation end time (MET)    | 667146230.184000    | 667147084.89099      |                                       |           |         |
| Observation end date              | 2019-02-21T14:22:41 | 2019-02-21T14:38:04  |                                       |           |         |
| Read mode                         | TIMED               | TIMED                |                                       |           |         |

## 2.3 Aspect



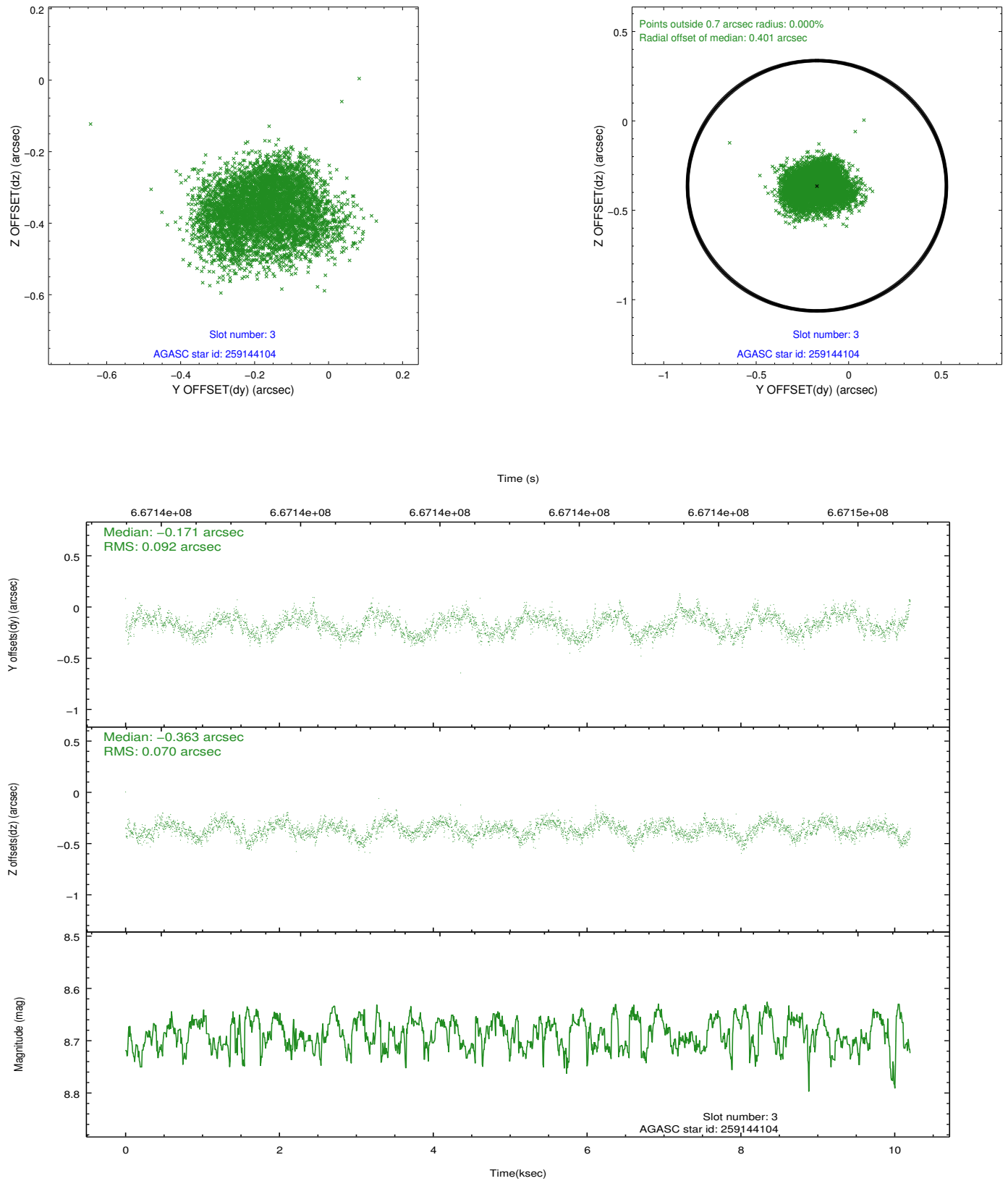


# Slot Statistics

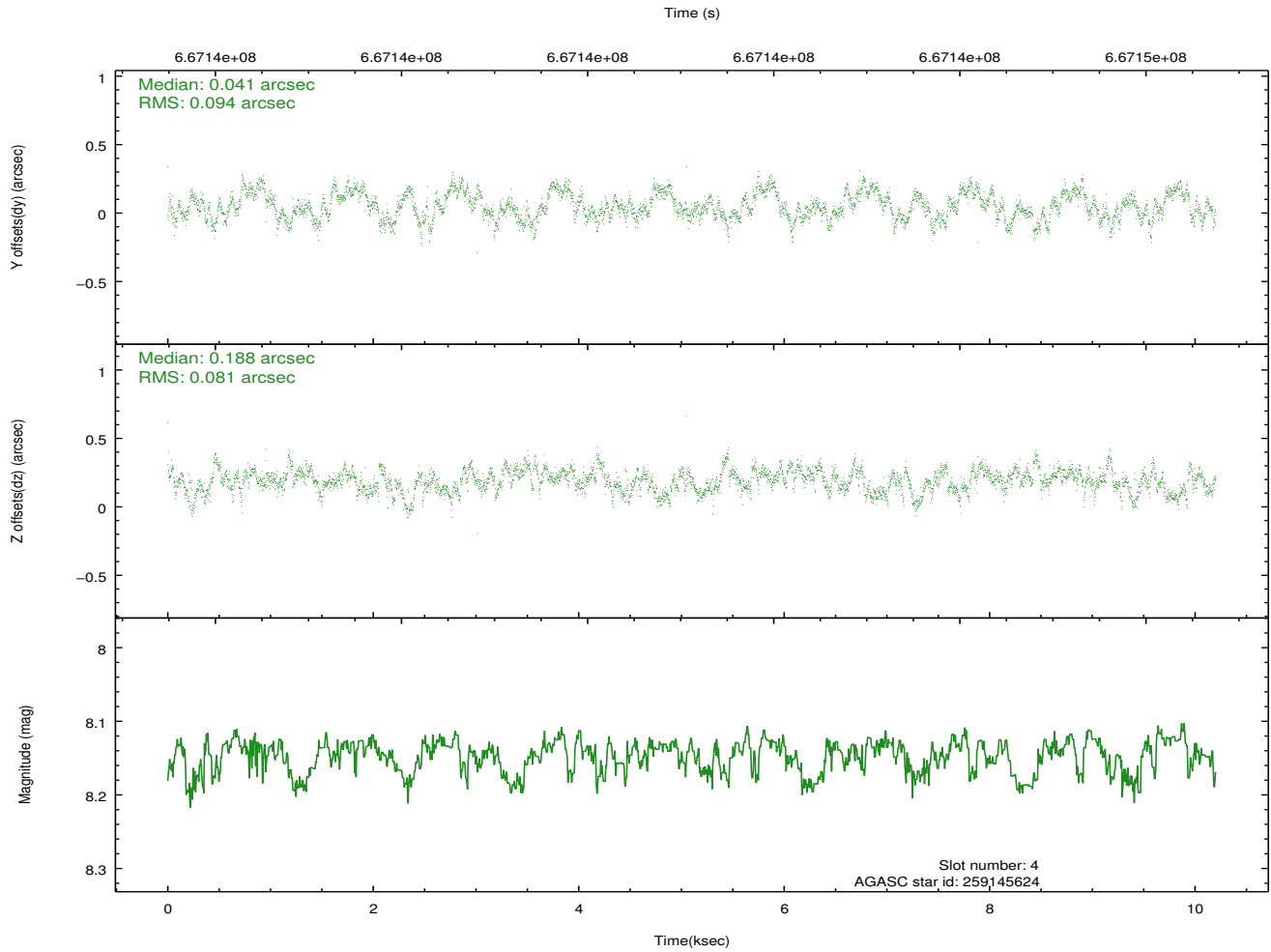
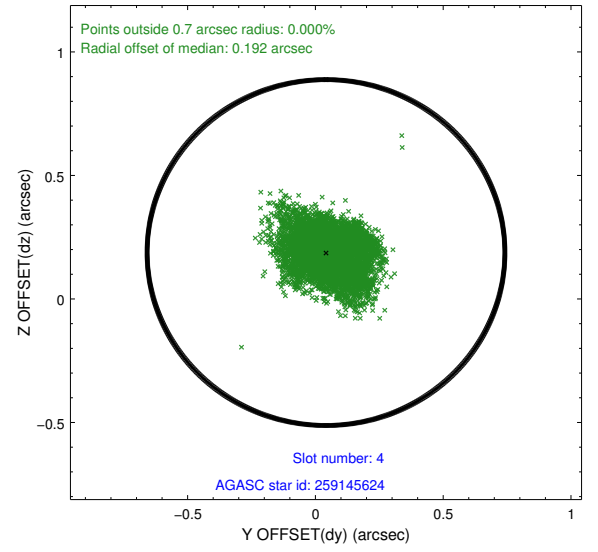
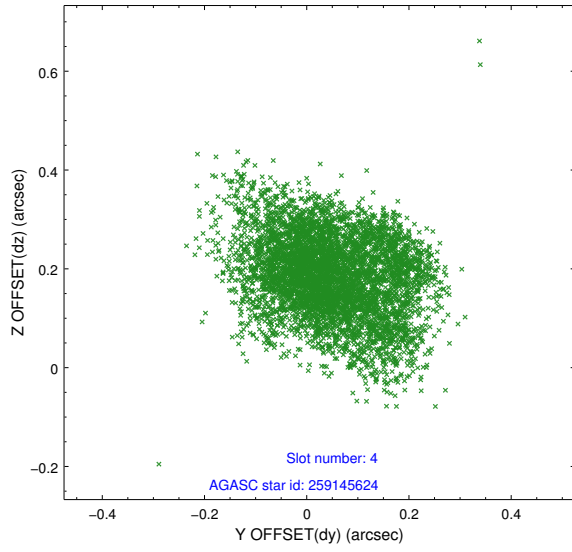
| pt | status | used | id        | mag  | n_pts | frac_pts | med_dy | med_dz | dr1   | dr2   | ra         | dec       | mean_y   | mea   |
|----|--------|------|-----------|------|-------|----------|--------|--------|-------|-------|------------|-----------|----------|-------|
| 0  | FID    |      | ACIS-S-2  | 7.15 | 2489  | 1.000    | -0.261 | -0.242 | 0.012 | 0.020 | 0.000000   | 0.000000  | -766.54  | -1739 |
| 1  | FID    |      | ACIS-S-4  | 7.28 | 2489  | 1.000    | 0.779  | 0.191  | 0.008 | 0.020 | 0.000000   | 0.000000  | 2147.47  | 168   |
| 2  | FID    |      | ACIS-S-5  | 7.25 | 2489  | 1.000    | -0.549 | 0.061  | 0.009 | 0.017 | 0.000000   | 0.000000  | -1819.08 | 162   |
| 3  | GUIDE  | used | 259144104 | 8.69 | 4976  | 1.000    | -0.171 | -0.363 | 0.125 | 0.190 | 161.981388 | 23.335280 | 2009.15  | -1    |
| 4  | GUIDE  | used | 259145624 | 8.15 | 4976  | 1.000    | 0.041  | 0.188  | 0.134 | 0.211 | 162.462213 | 23.162648 | 342.79   | -368  |
| 5  | GUIDE  | used | 259146168 | 9.15 | 4967  | 1.000    | -0.400 | -0.459 | 0.144 | 0.247 | 161.604167 | 22.896784 | 2176.32  | 2003  |
| 6  | GUIDE  | used | 259150008 | 6.89 | 4977  | 1.000    | 0.092  | 0.220  | 0.114 | 0.190 | 162.652357 | 23.406288 | 312.65   | -1447 |
| 7  | GUIDE  | used | 259150088 | 8.80 | 4968  | 1.000    | 0.429  | 0.424  | 0.105 | 0.178 | 162.865934 | 23.399919 | -286.84  | -1823 |

## 2.4 Star Slots

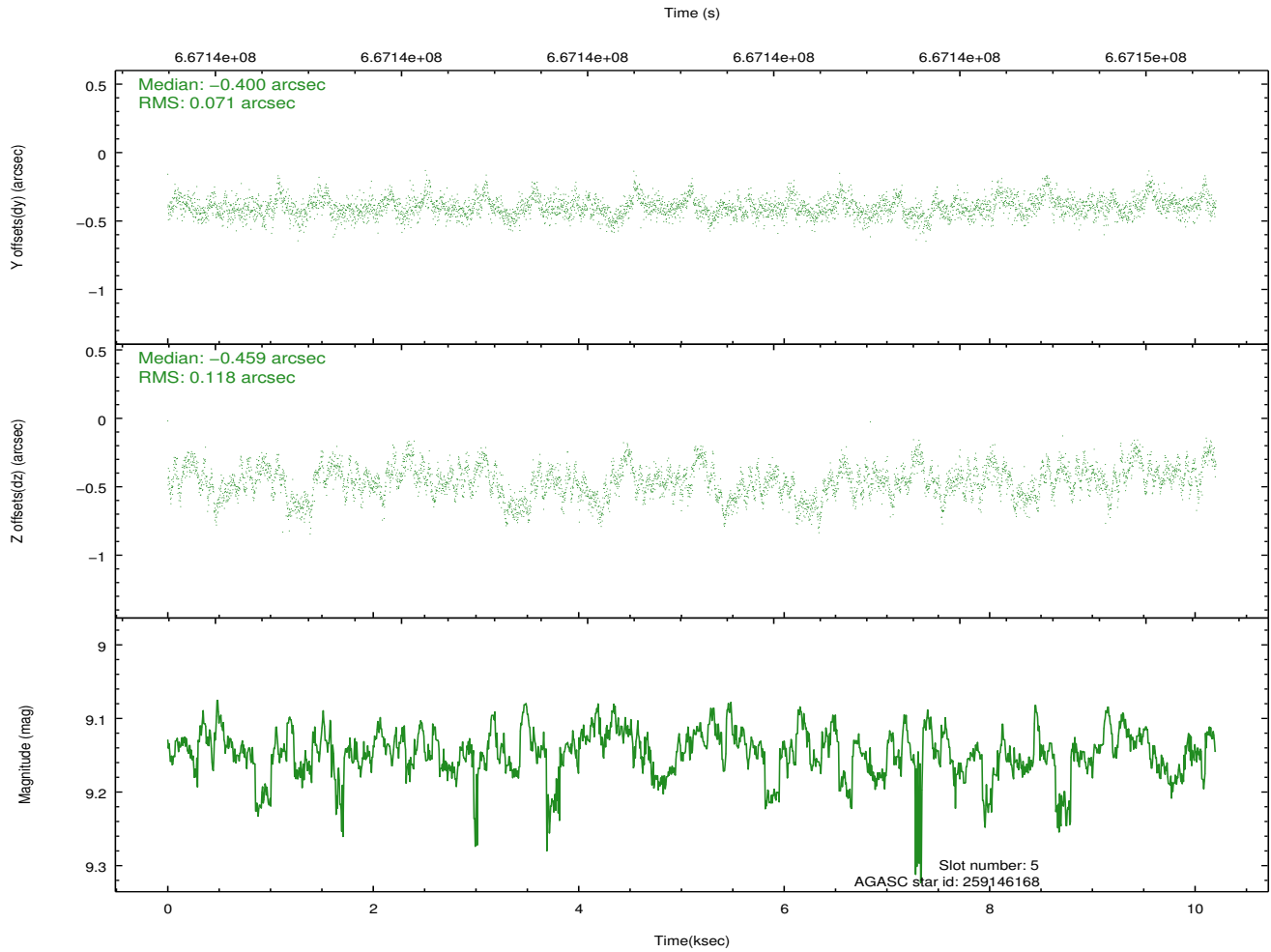
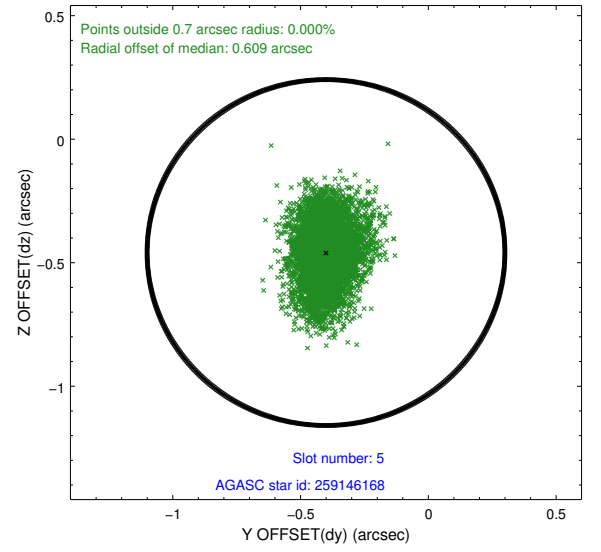
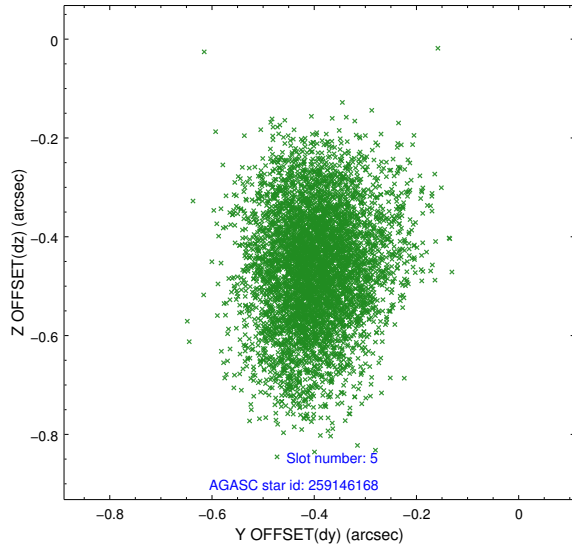
### 2.4.1 Slot 3



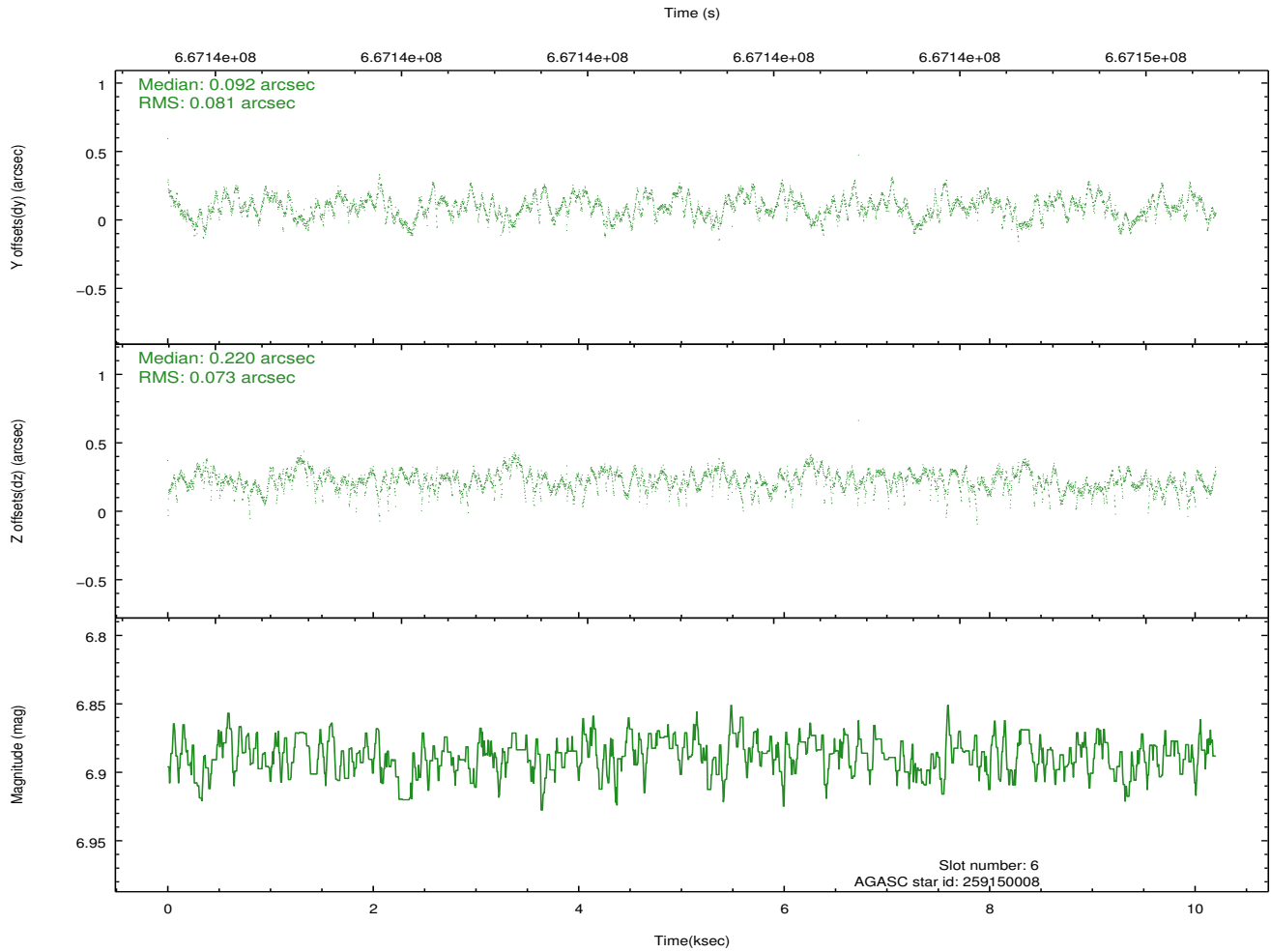
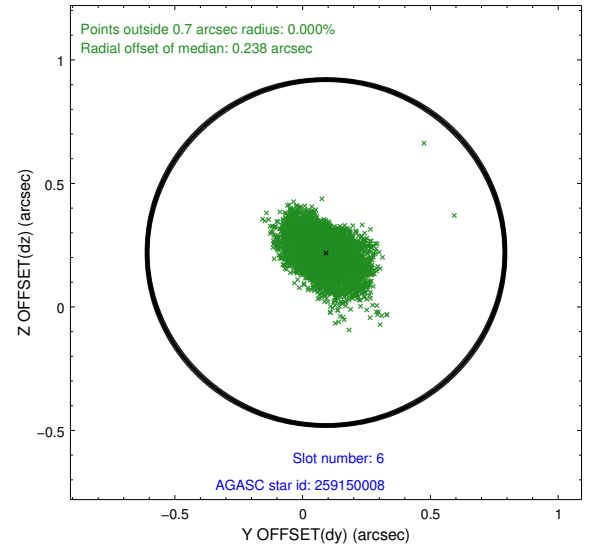
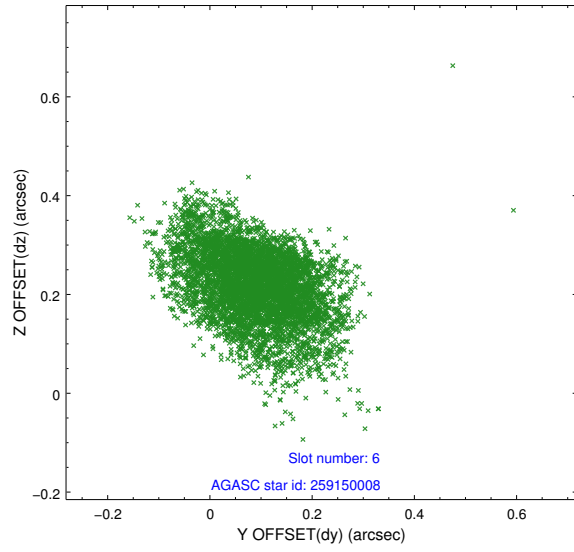
## 2.4.2 Slot 4



### 2.4.3 Slot 5

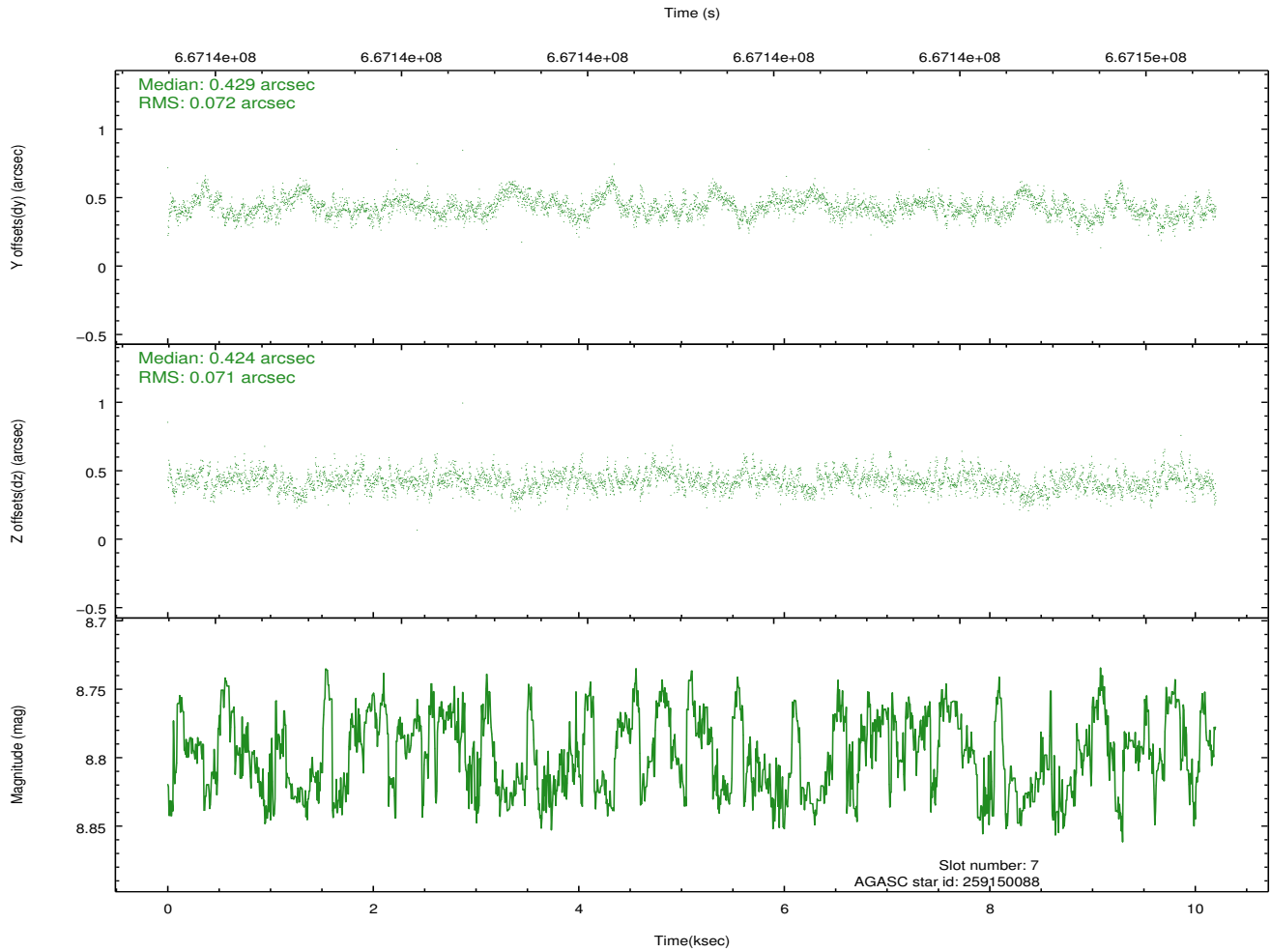
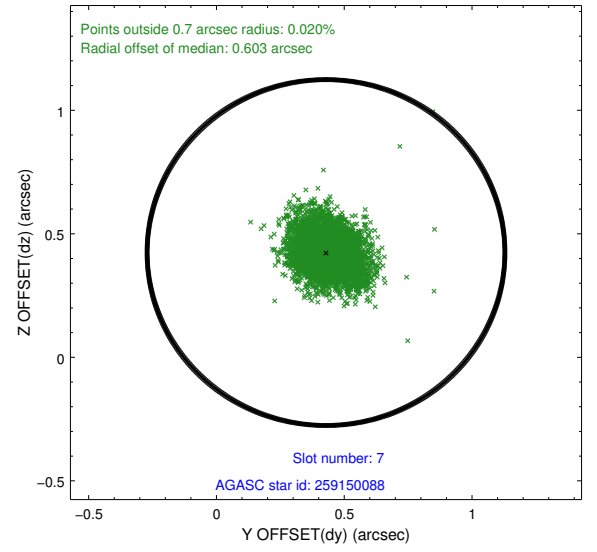
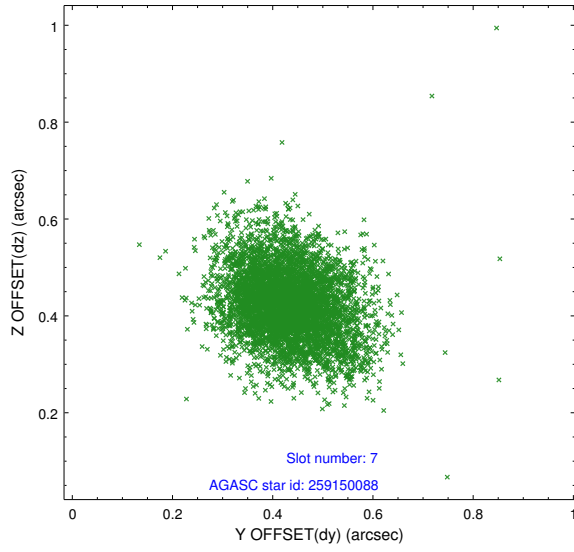


## 2.4.4 Slot 6



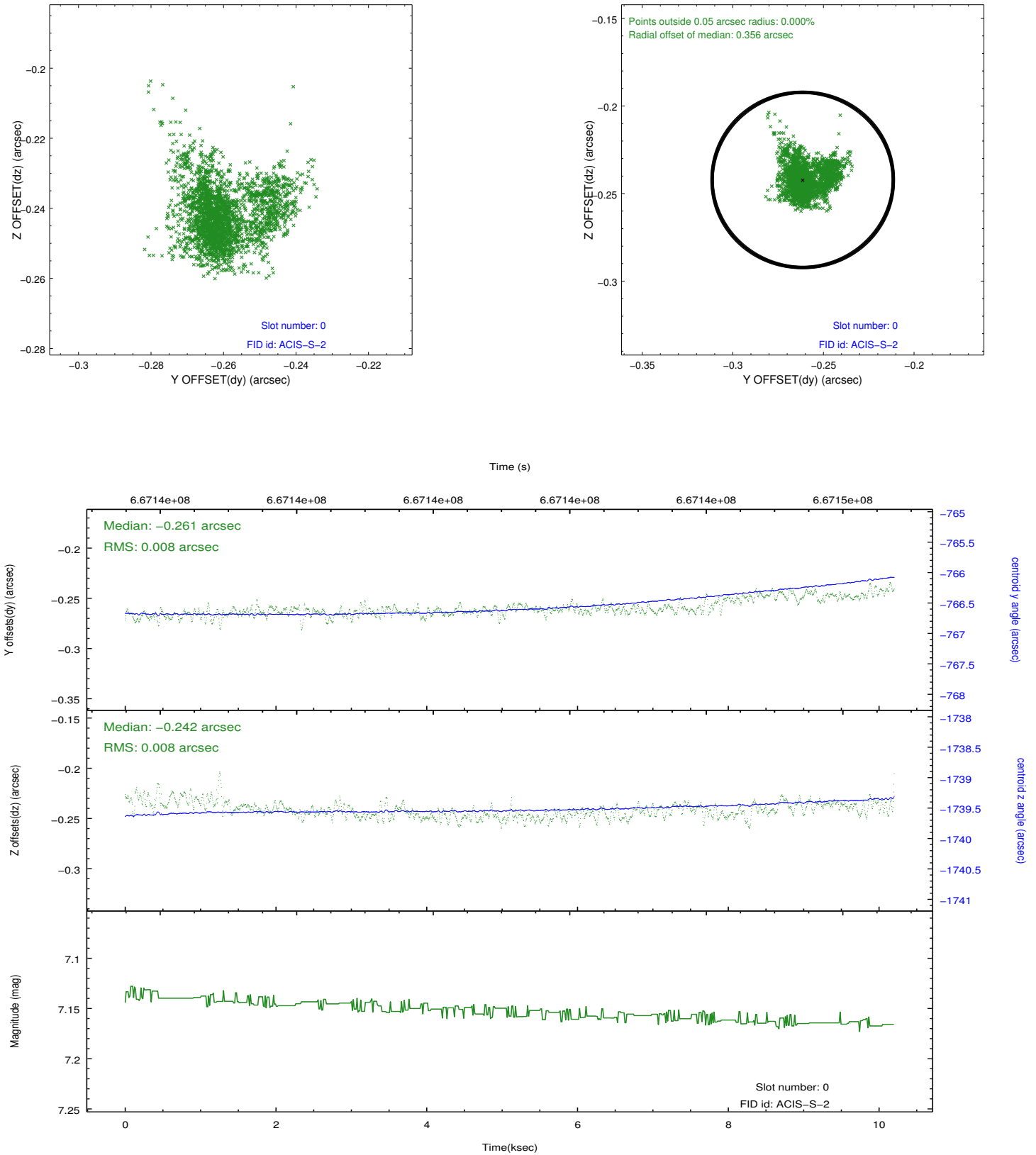


### 2.4.5 Slot 7

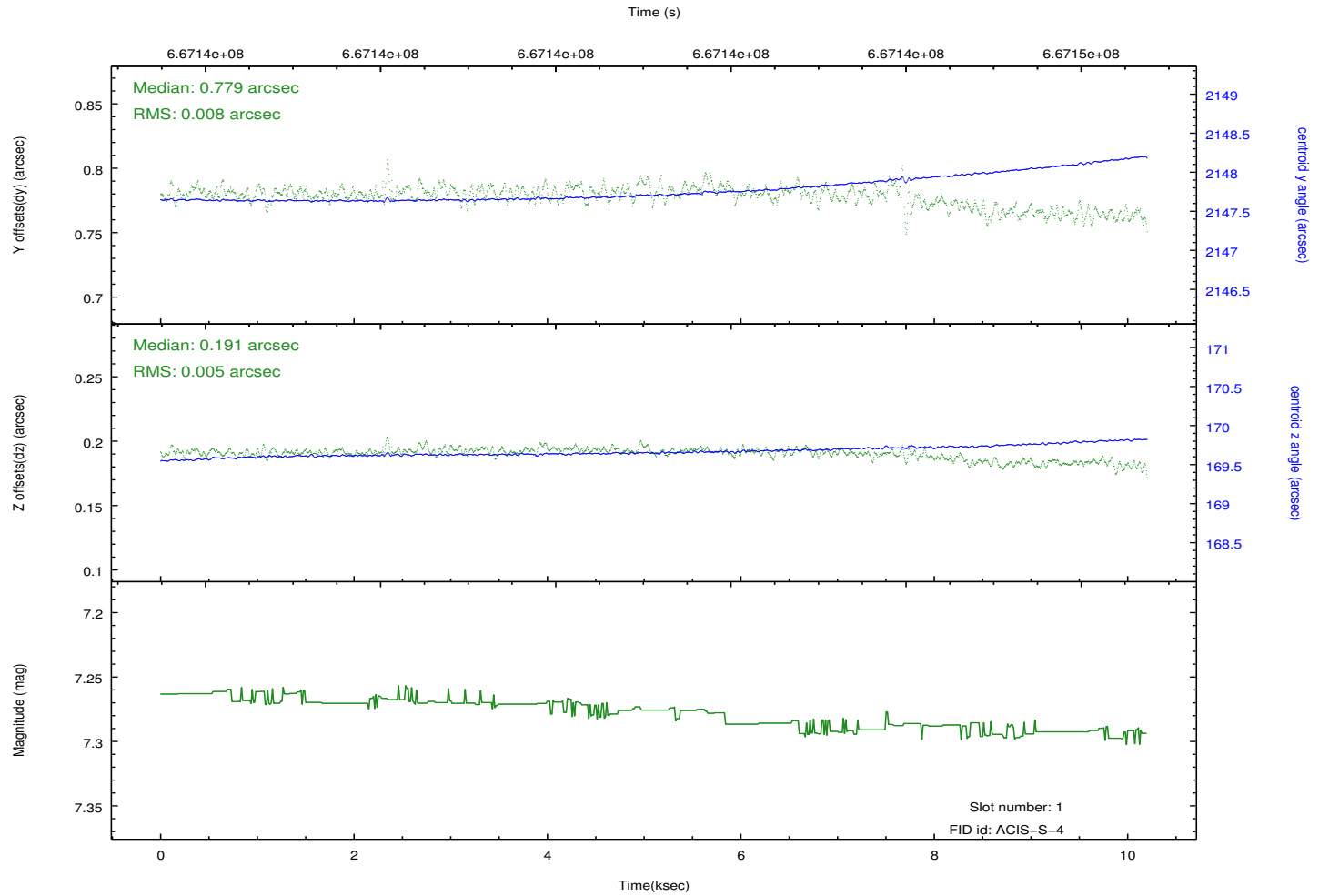
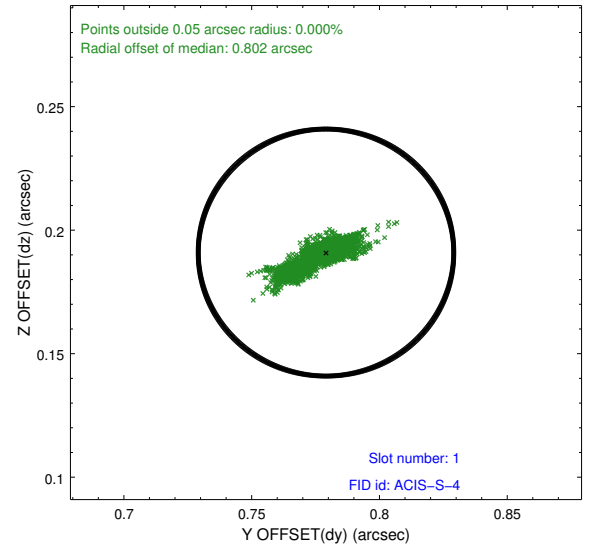
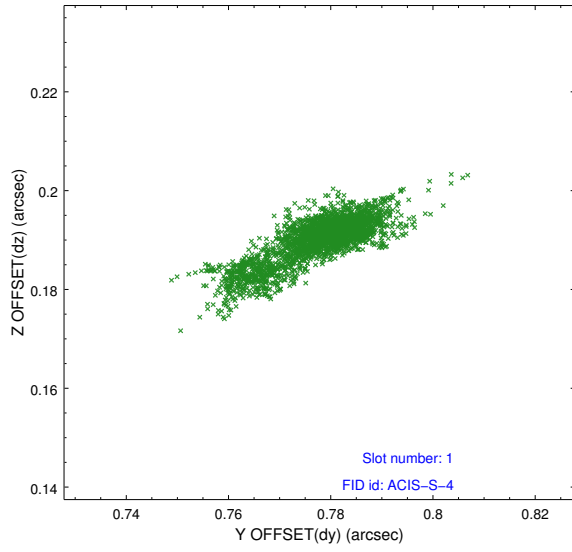


## 2.5 FID Slots

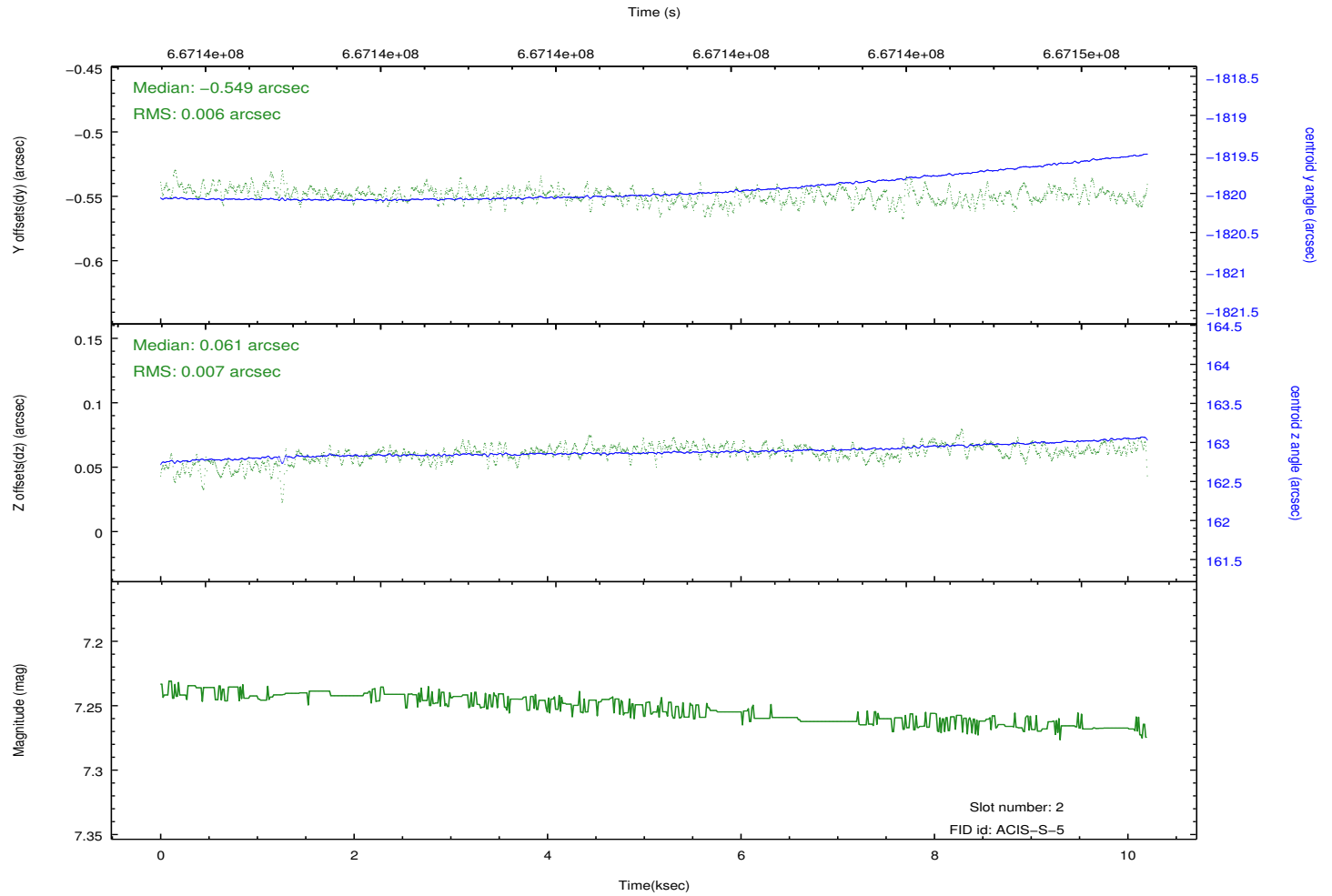
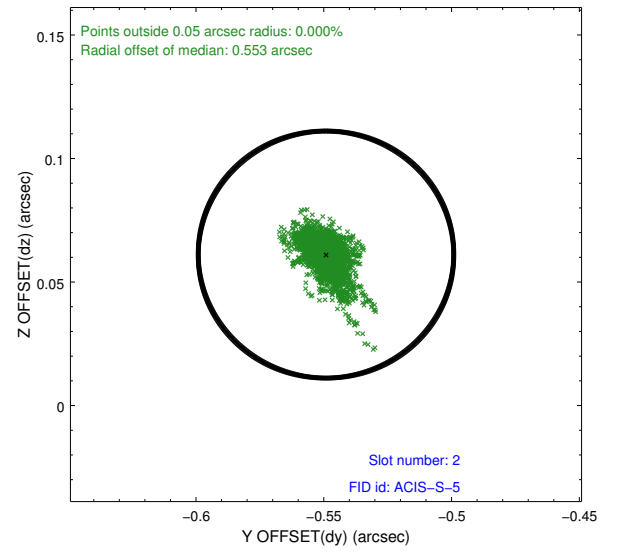
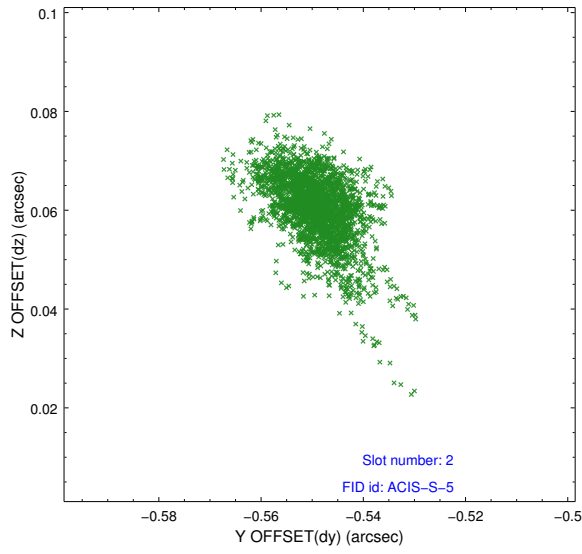
### 2.5.1 Slot 0



## 2.5.2 Slot 1



### 2.5.3 Slot 2



# A Summary

## A.1 Status

|                            |                 |
|----------------------------|-----------------|
| V&V Scientist              | Beth Sundheim   |
| V&V Date (YYYY-MM-DD)      | 2019.02.21      |
| V&V Edition                | 1               |
| V&V Disposition and Status | OK              |
| V&V Charge Time            | 10.091015248537 |

## A.2 Comments

The focal plane temperature during part of this observation was warmer than the upper limit for optimum calibration of the ACIS gain and spectral resolution (i.e., -114.0 C for ACIS-I and -112.0 C for ACIS-S).

The Chandra calibration team calibrates the ACIS gain and spectral resolution using data from the external calibration source (ECS). ECS data show that the frontside-illuminated (FI) CCDs are more temperature sensitive than the backside-illuminated (BI) CCDs.

A summary of the current calibration status of the ACIS gain and spectral resolution can be found at:

[http://asc.harvard.edu/cal/Acis/Cal\\_prods/Gain\\_and\\_Spectral\\_Resolution/ACIS\\_response\\_summary.html](http://asc.harvard.edu/cal/Acis/Cal_prods/Gain_and_Spectral_Resolution/ACIS_response_summary.html)

The main points are:

- 1) The gain on BI chips remains within 0.3% (i.e., the systematic uncertainty in the ACIS gain quoted on the Chandra Calibration Status Summary web page) at all measured temperatures.
  - 2) The gain on FI chips remains within 0.3% below row 600 at all measured temperatures.
  - 3) The gain on FI chips above row 600 can be underestimated by as much as 1% for focal plane temperatures exceeding -116 C.
  - 4) The spectral resolution (i.e., FWHM) on BI chips is insensitive to the focal plane temperature.
  - 5) Warmer focal plane temperatures increase the FWHM on FI chips by up to 30 eV near row 512 and by up to 70 eV near the top of the chips.
- In summary, the user should be cautious in the spectral analysis of high S/N emission lines detected on the top half of FI chips in this observation. Default processing with the current version of the CALDB will underestimate photon energies by up to 1% and broaden emission lines by up to 70 eV.