

# V&V Reference Report

## L2 ASCDS Version : 10.8

Observation 22732 - L2 Version 1  
Chandra X-Ray Center

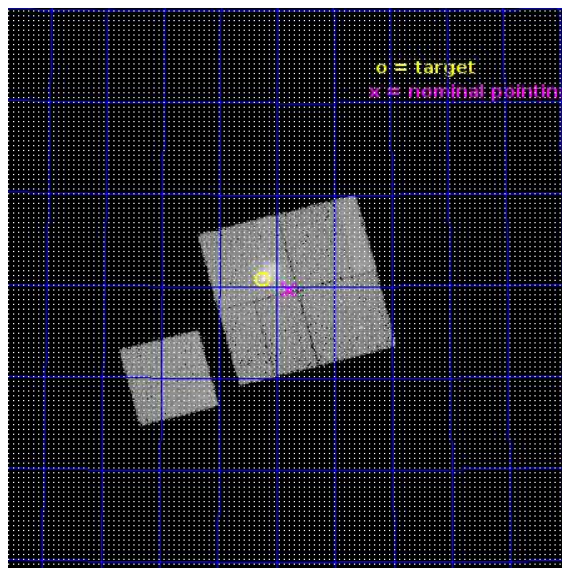
L2 Processing Date : Aug 23 2019

## 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 6 . . . . .	11
2.4.4	Slot 7 . . . . .	12
2.5	FID Slots . . . . .	13
2.5.1	Slot 0 . . . . .	13
2.5.2	Slot 1 . . . . .	14
2.5.3	Slot 2 . . . . .	15
<b>A</b>	<b>Summary</b>	<b>16</b>
A.1	Status . . . . .	16
A.2	Comments . . . . .	16

# 1 Front

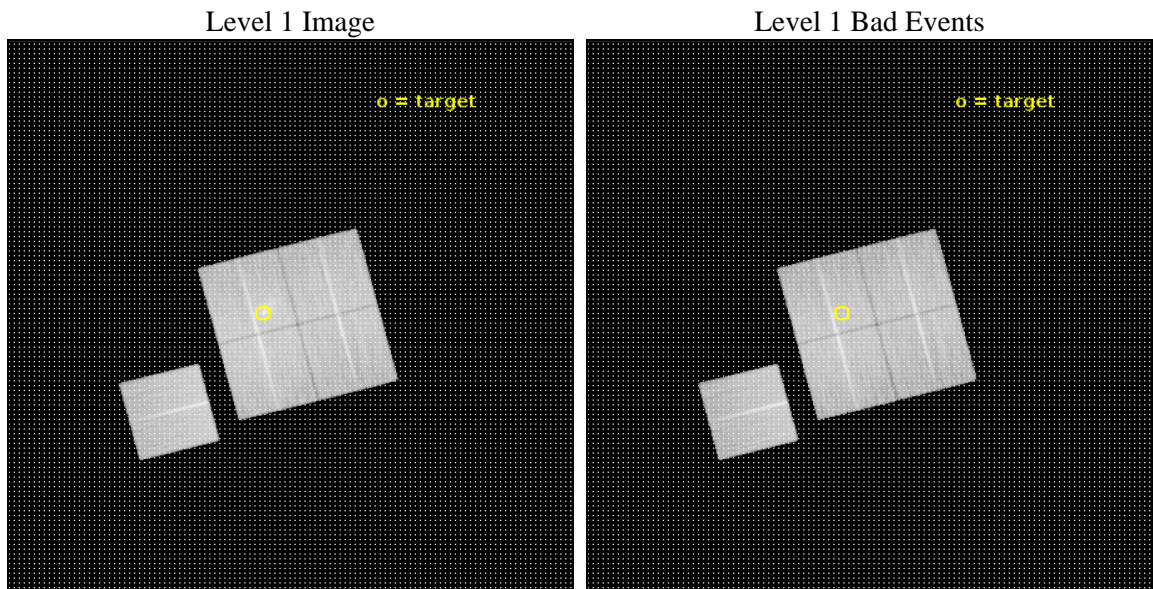
seq_num	801762	Sequence number
obs_id	22732	Observation id
title	Shock structure, the electron-ion equilibration timescale and the disintegrating cool core in A2146	Proposal title
observer	Helen Russell	Principal investigator
object	Abell 2146	Source name
dtcycle	0	&#160
cycle	P	events from which exps? Prim/Second/Both
ra_targ	239.06125	Observer's specified target RA [deg]
dec_targ	66.346917	Observer's specified target Dec [deg]
ra_nom	238.94479073789	Nominal RA [deg]
dec_nom	66.32781812343	Nominal Dec [deg]
roll_nom	255.31538014923	Nominal Roll [deg]
revision	1	Processing version of data
ontime	29062.459233522	Sum of GTIs [s]
livetime	28682.736808165	Livetime [s]
ontime0	29056.177222967	Sum of GTIs [s]
ontime1	29059.318263412	Sum of GTIs [s]
ontime2	29062.459223628	Sum of GTIs [s]
ontime3	29062.459233522	Sum of GTIs [s]
ontime6	29062.459233642	Sum of GTIs [s]
l2events	119986	Number of level 2 events



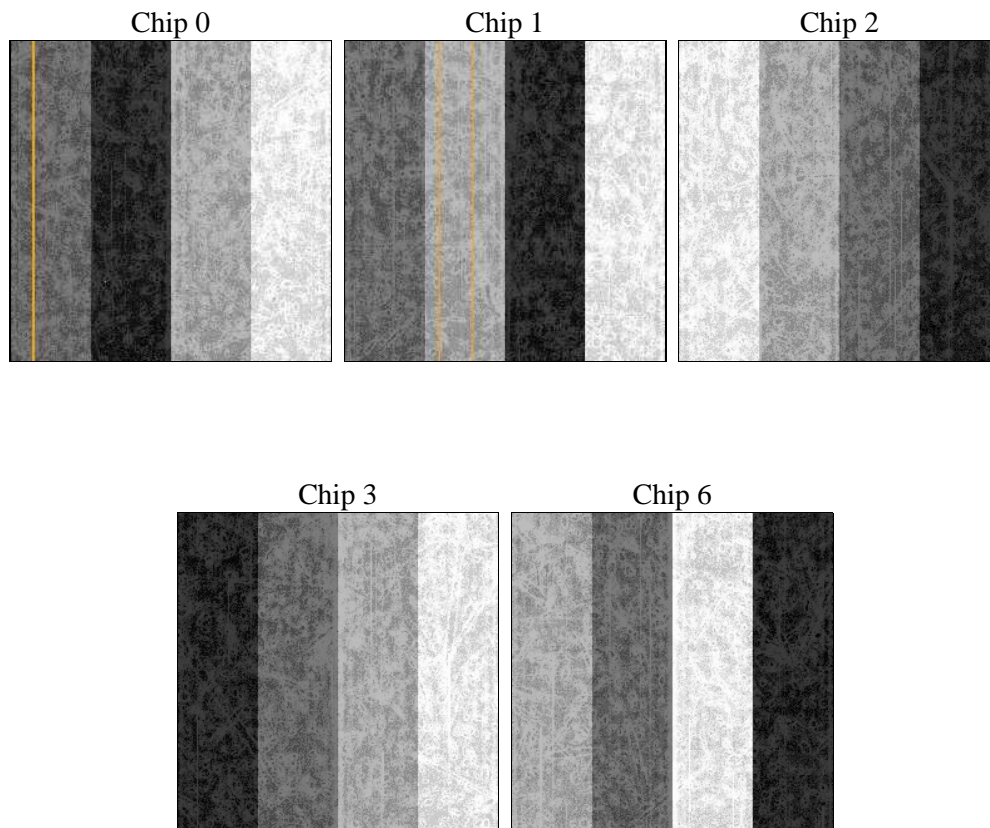
## 2 OBI

### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias



### 2.1.3 Parameters

obi_num	0	Obi number	sched_exp_time	29000.000000	[s] Scheduled observation exposure time
ascdsver	10.8	Processing system revision	ontime	29062.459233522	Sum of GTIs [s]
caldbver	4.8.3.1	&#160	ontime0	29056.177222967	Sum of GTIs [s]
date	2019-08-23T04:11:59	Date and time of file creation	ontime1	29059.318263412	Sum of GTIs [s]
revision	1	Processing version of data	ontime2	29062.459223628	Sum of GTIs [s]
			ontime3	29062.459233522	Sum of GTIs [s]
			ontime6	29062.459233642	Sum of GTIs [s]
			l1events	1124602	Number of level 1 events

### 2.1.4 Events

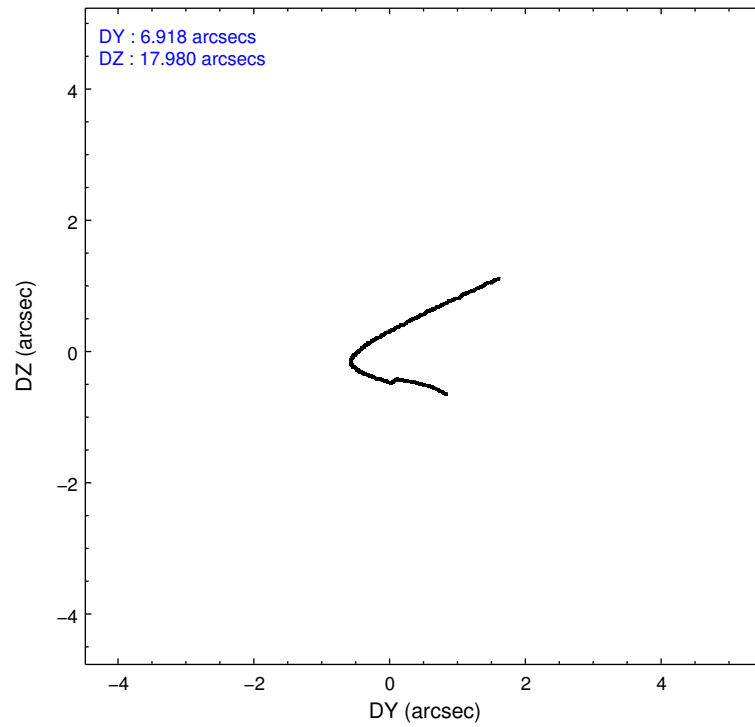
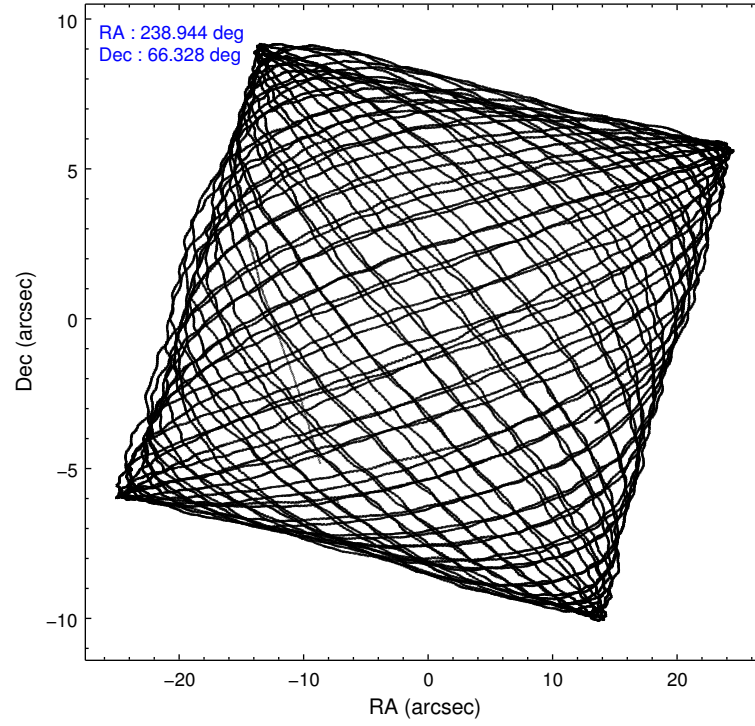
	ccd 0	ccd 1	ccd 2	ccd 3	ccd 6
level 1 events	209704	212944	235086	237030	229838
rejected events	184360	185018	210677	199899	204277
rejected %	87%	86%	89%	84%	88%

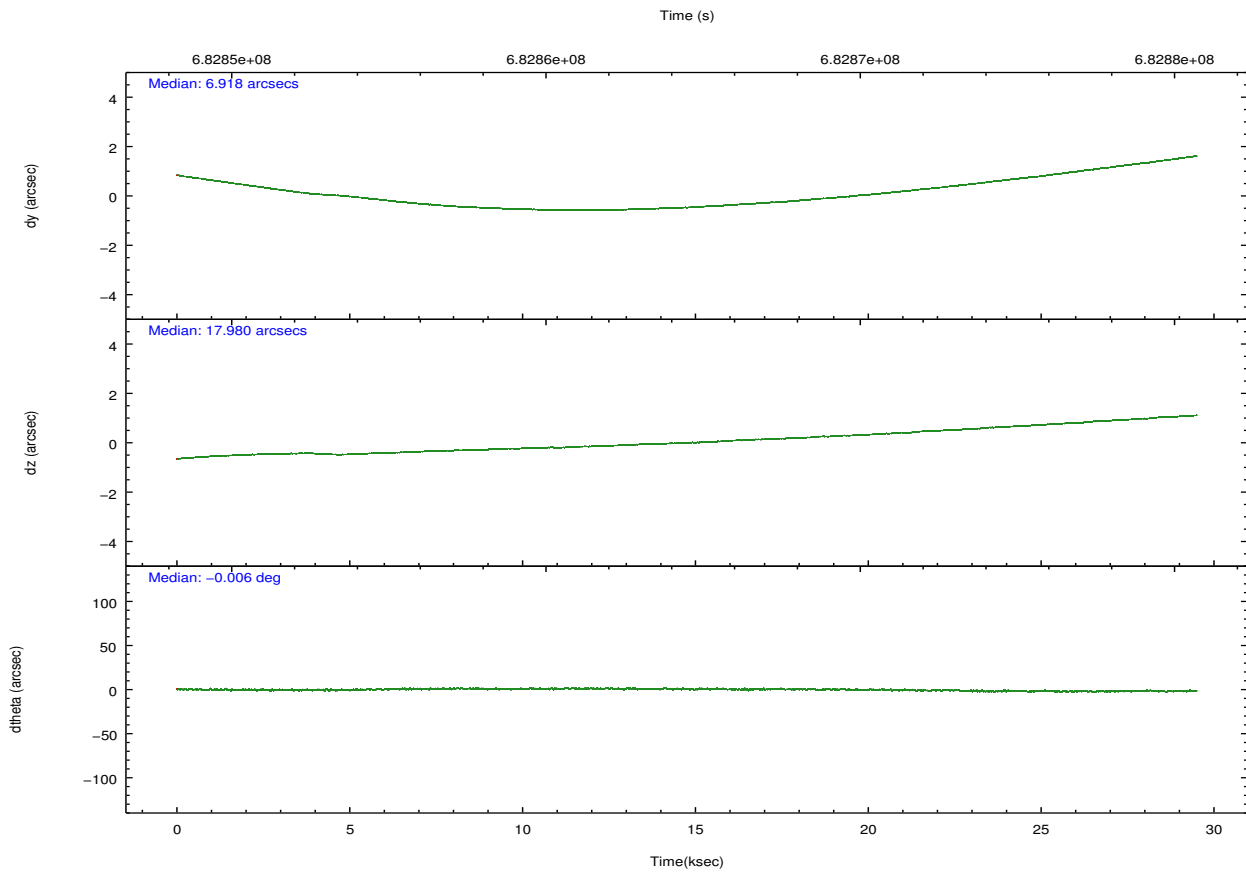
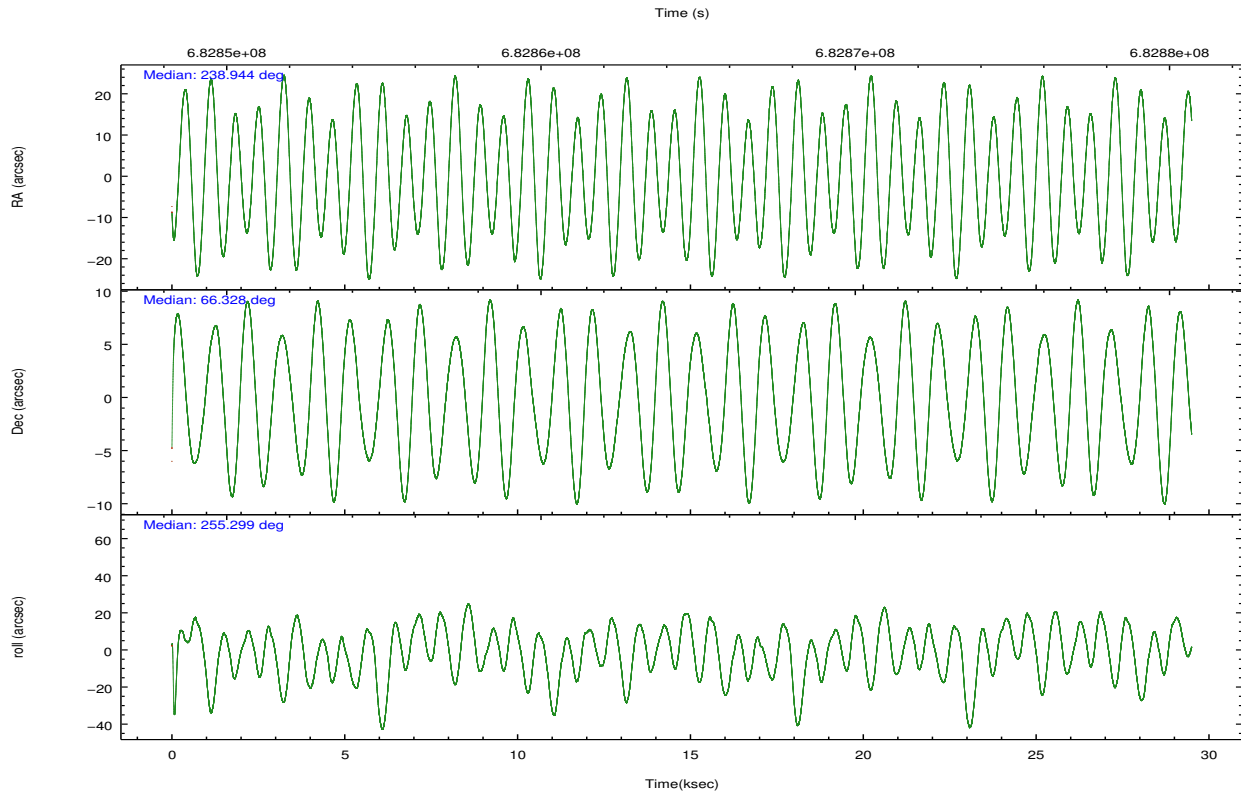
	ccd 0	ccd 1	ccd 2	ccd 3	ccd 6
grade 0 events	8718	8622	8589	19096	7979
	4%	4%	3%	8%	3%
grade 1 events	113	133	131	206	99
	0%	0%	0%	0%	0%
grade 2 events	6567	7831	6088	6706	6344
	3%	3%	2%	2%	2%
grade 3 events	2420	2499	2343	2894	2362
	1%	1%	0%	1%	1%
grade 4 events	2263	2448	2476	2948	2467
	1%	1%	1%	1%	1%
grade 5 events	9420	9506	8939	10556	10043
	4%	4%	3%	4%	4%
grade 6 events	5378	6530	4914	5490	6412
	2%	3%	2%	2%	2%
grade 7 events	174825	175375	201606	189134	194132
	83%	82%	85%	79%	84%

## 2.2 Compared Parameters

Parameter	Planned	Actual	Parameter	Planned	Actual
Instrument	ACIS	ACIS	Obspar format version number	7	7
Detector	ACIS-01236	ACIS-01236	Obspar file type	PREDICTED	ACTUAL
Grating	NONE	NONE	Obspar update status	NONE	UPDATED
Data mode	VFAINT	VFAINT	CCD I0 on	Y	Y
Observation mode	POINTING	POINTING	CCD I1 on	Y	Y
[deg] Pointing RA	238.926360	238.9447907378853	CCD I2 on	Y	Y
[deg] Pointing Dec	66.354383	66.32781812343043	CCD I3 on	Y	Y
[deg] Pointing Roll	255.123560	255.3153801492347	CCD S0 on	N	N
[mm] SIM focus pos	-0.782348	-0.7809083437167272	CCD S1 on	N	N
[mm] SIM defocus	0	0.001439871863259334	CCD S2 on	O1	Y
[mm] SIM translation stage pos	-233.592463	-233.5874344608287	CCD S3 on	N	N
[mm] SIM translation stage offset	0	-0.005018542100998502	CCD S4 on	N	N
[s] Observation start time (MET)	682850228.184000	682849120.7948	CCD S5 on	N	N
Observation start date	2019-08-22T08:35:59	2019-08-22T08:18:40	Number of optional ACIS chips dropped	0	0
[s] Observation end time (MET)	682879228.184000	682880317.18417	On-chip summing requested	N	N
Observation end date	2019-08-22T16:39:19	2019-08-22T16:58:37	Subarray requested	NONE	NONE
Read mode	TIMED	TIMED	Alternating exposures requested	N	N
			[s] Primary exposure time	0.000000	3.1

## 2.3 Aspect



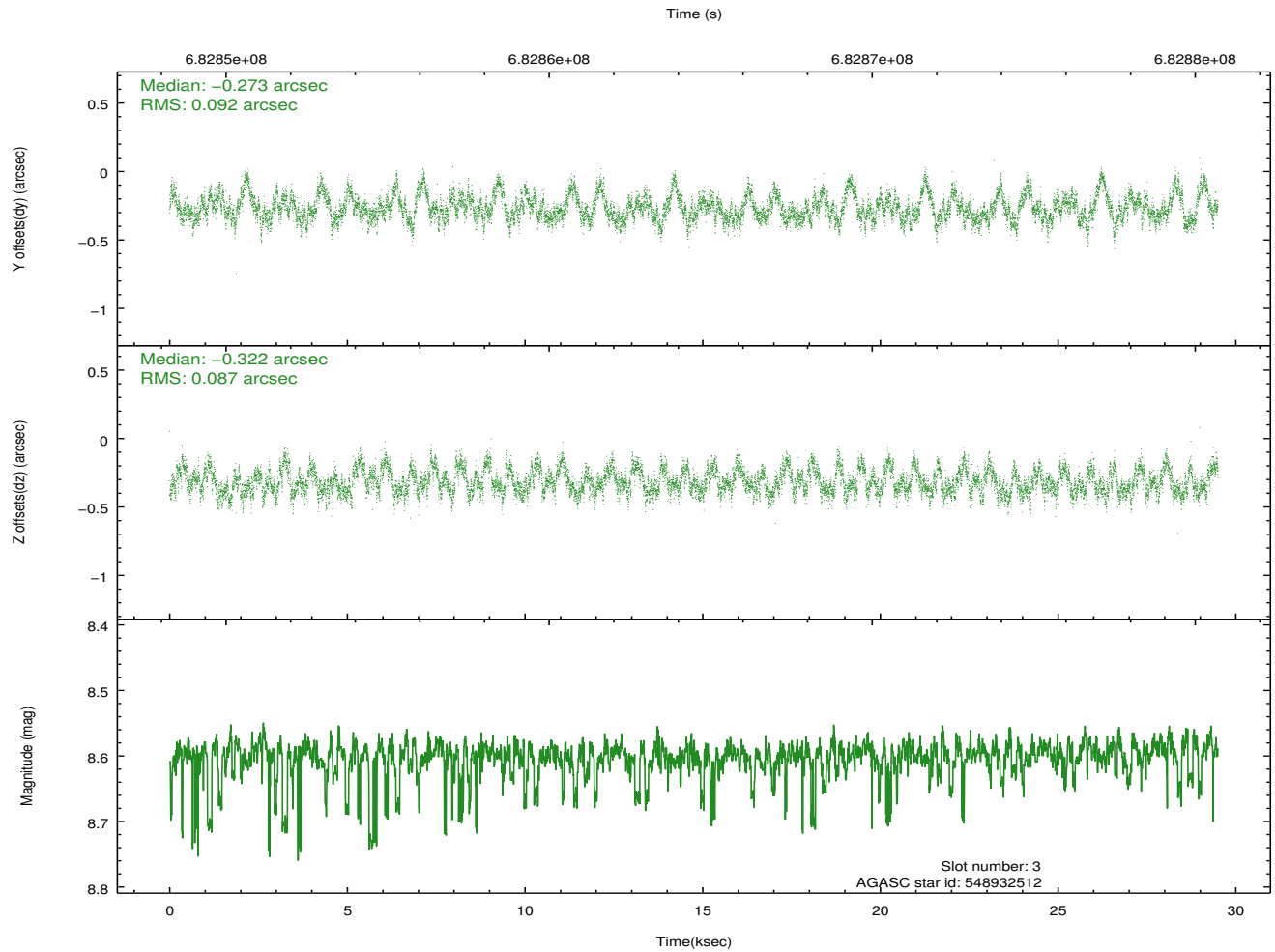
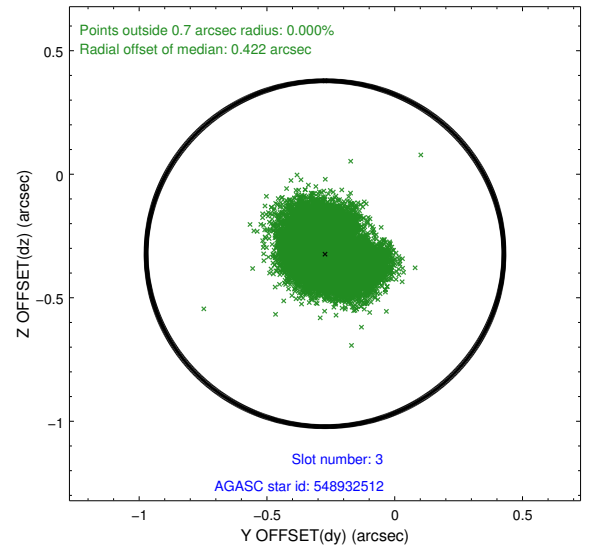
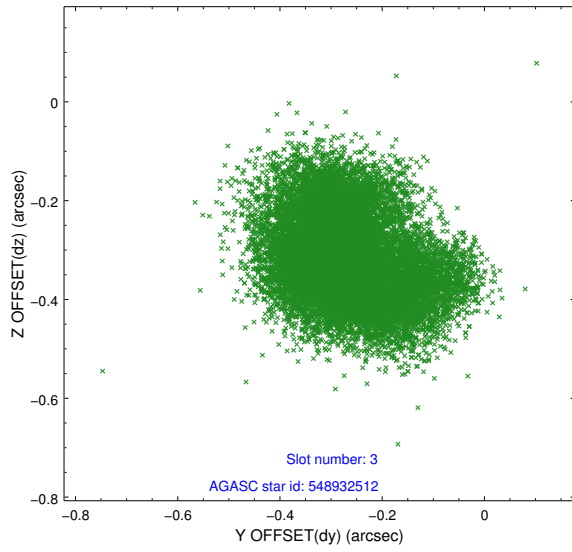


### Slot Statistics

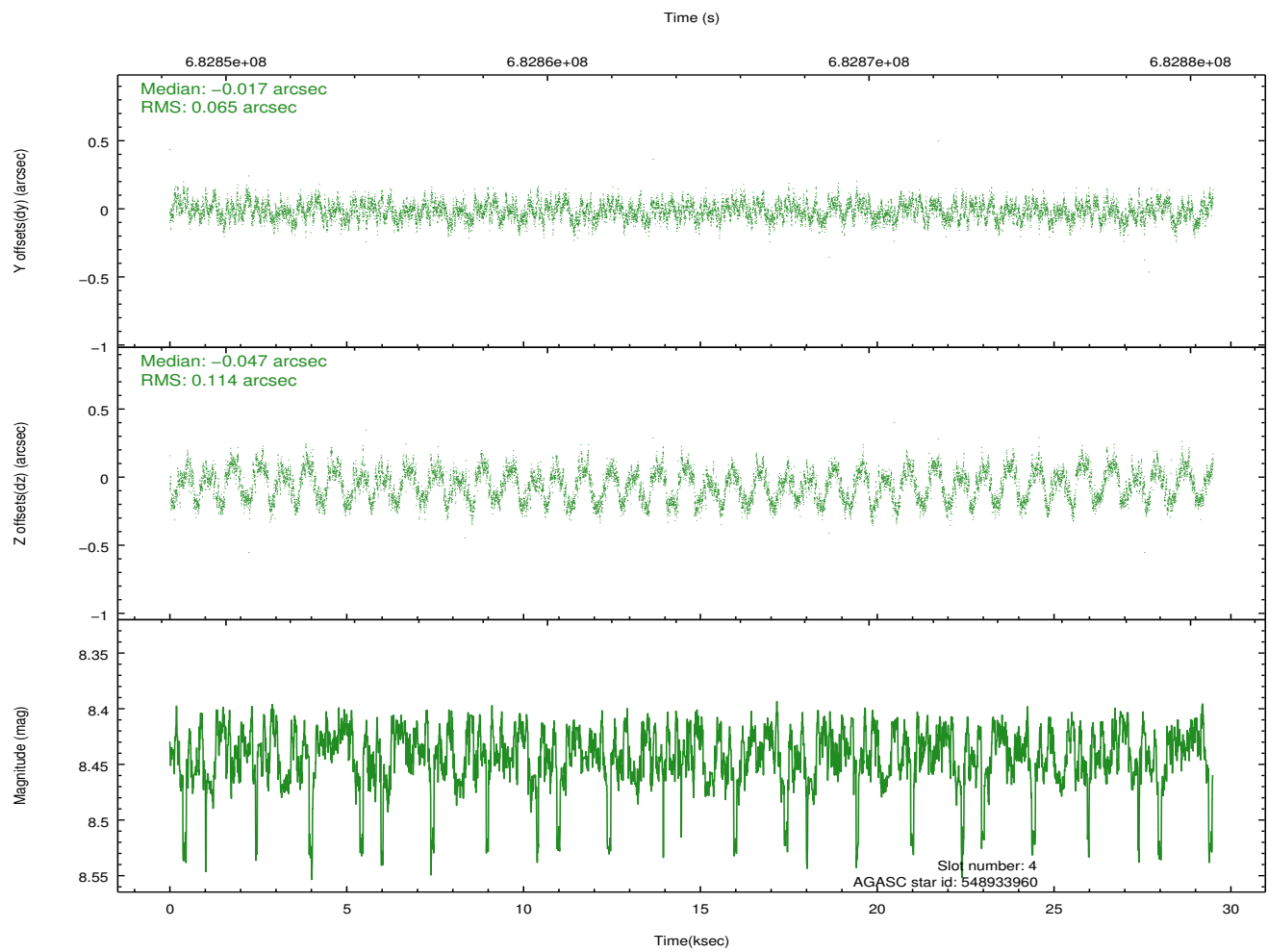
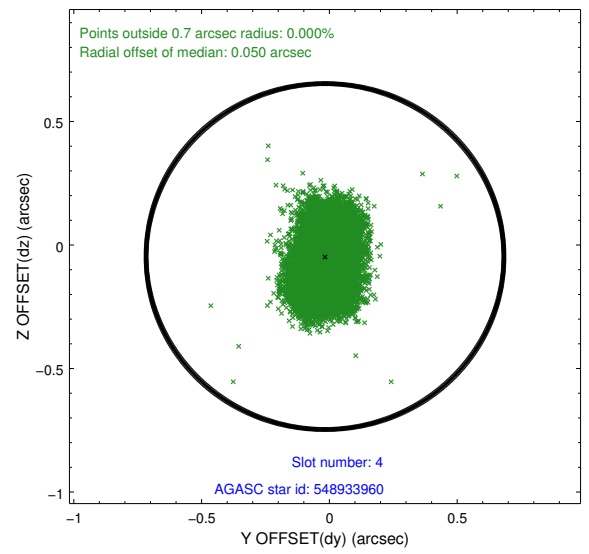
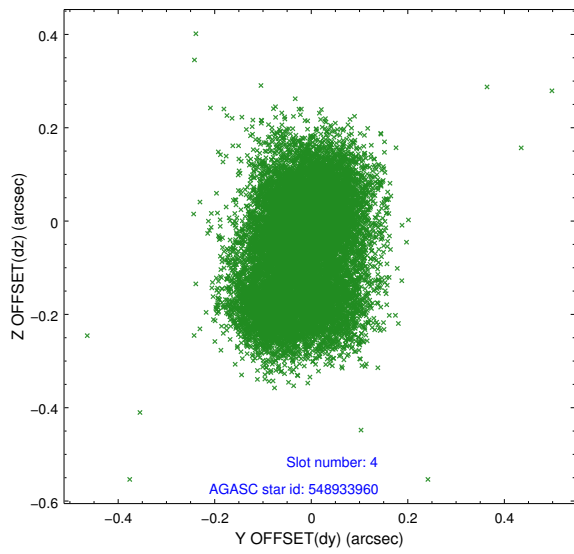
slot	status	used	id	mag	n_pts	frac_pts	med_dy	med_dz	dr1	dr2	ra	dec	mean_y	mean_x
0	FID		ACIS-I-1	7.28	7195	1.000	0.126	-0.055	0.034	0.058	0.000000	0.000000	932.81	-841
1	FID		ACIS-I-5	7.24	7196	1.000	-0.449	0.060	0.019	0.029	0.000000	0.000000	-1815.96	1055
2	FID		ACIS-I-6	7.23	7193	1.000	0.237	0.066	0.023	0.062	0.000000	0.000000	398.20	1700
3	GUIDE	used	548932512	8.60	14378	1.000	-0.273	-0.322	0.137	0.214	239.727627	66.054972	733.18	1406
4	GUIDE	used	548933960	8.44	14376	1.000	-0.017	-0.047	0.144	0.216	237.671184	66.428675	190.12	-1818
5	OMITTED			0.00	0	0.000	0.000	0.000	0.000	0.000	0.000000	0.000000	0.00	0
6	GUIDE	used	548937184	9.87	14347	1.000	0.356	0.289	0.222	0.363	238.771821	66.565432	-676.95	-408
7	GUIDE	used	549849072	9.18	14365	1.000	-0.074	0.062	0.152	0.266	240.420863	66.802816	-2128.93	1626

## 2.4 Star Slots

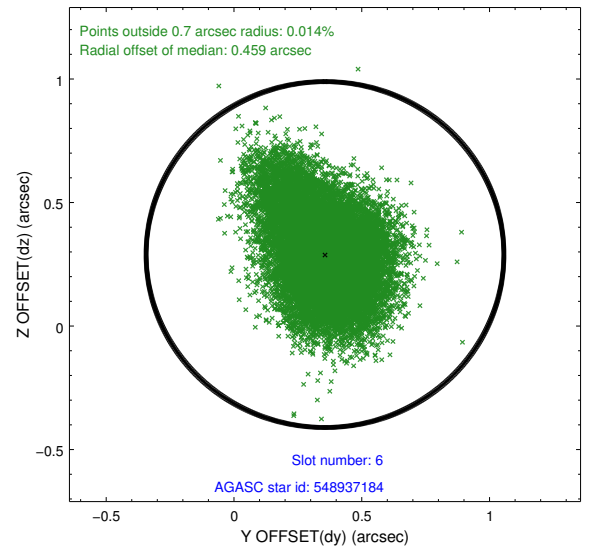
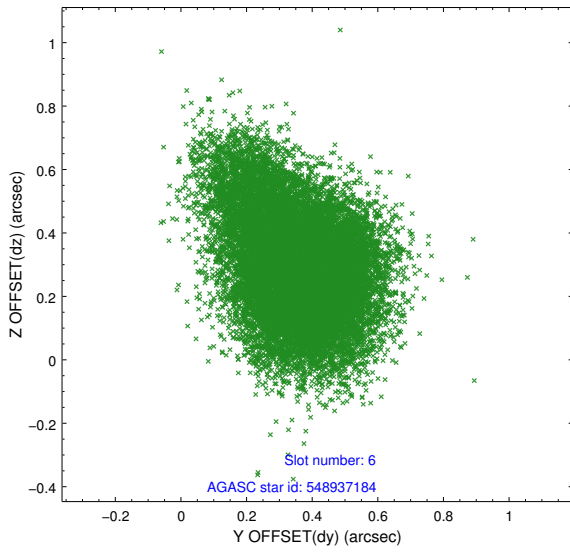
### 2.4.1 Slot 3



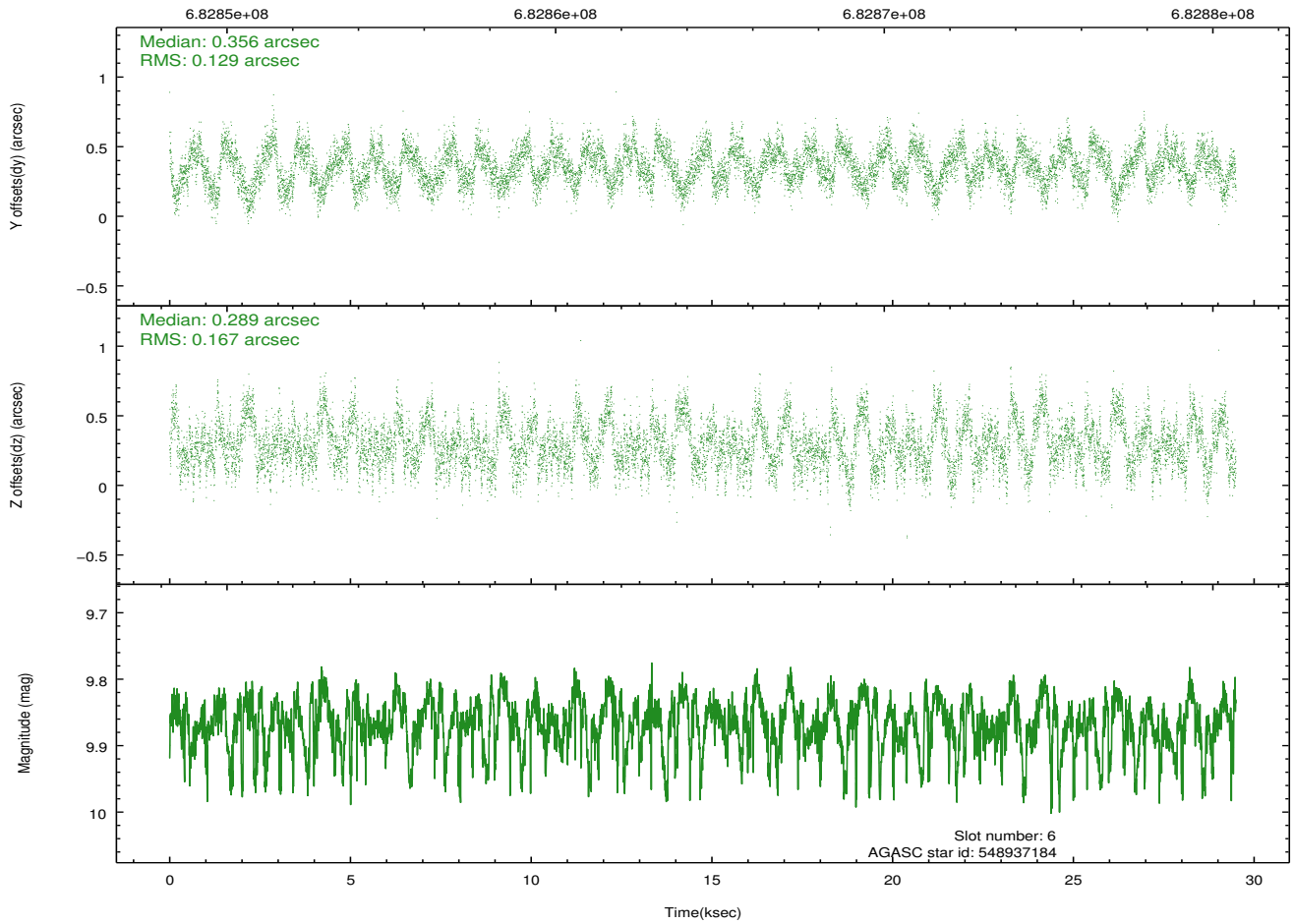
## 2.4.2 Slot 4



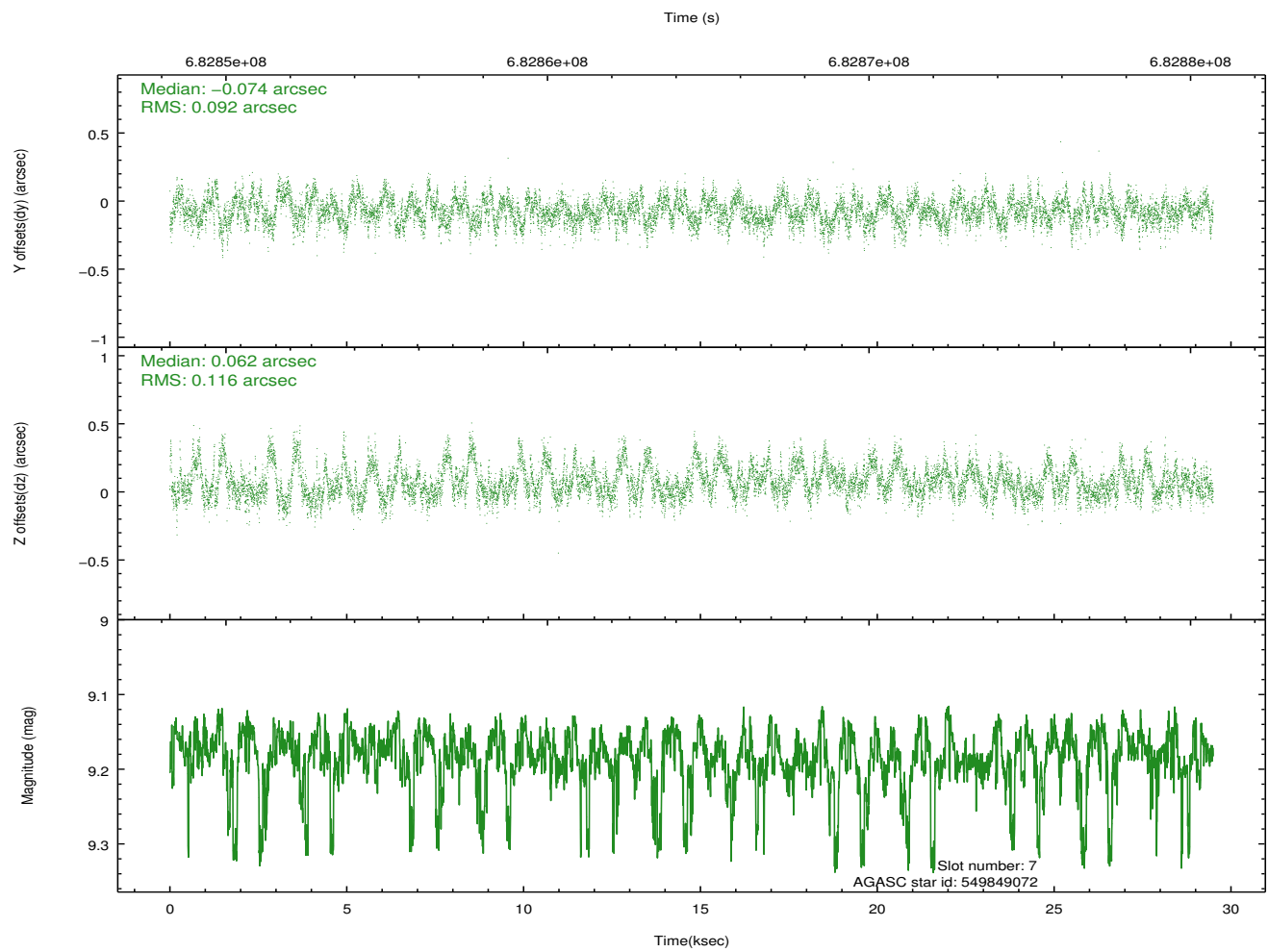
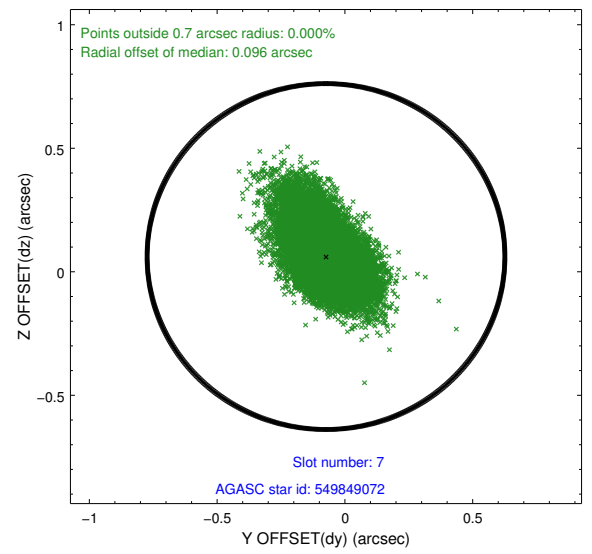
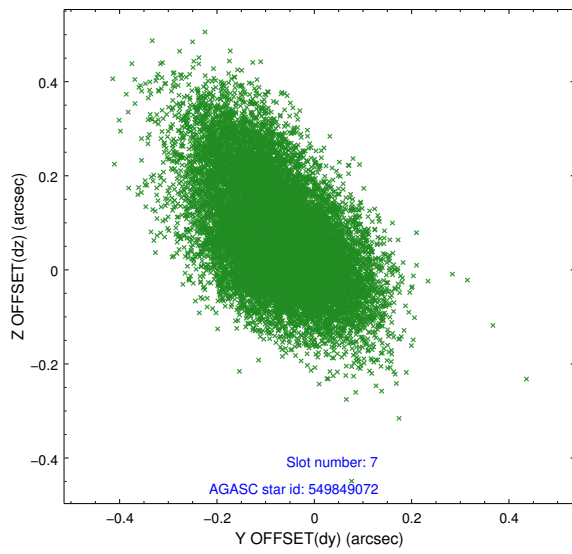
### 2.4.3 Slot 6



Time (s)

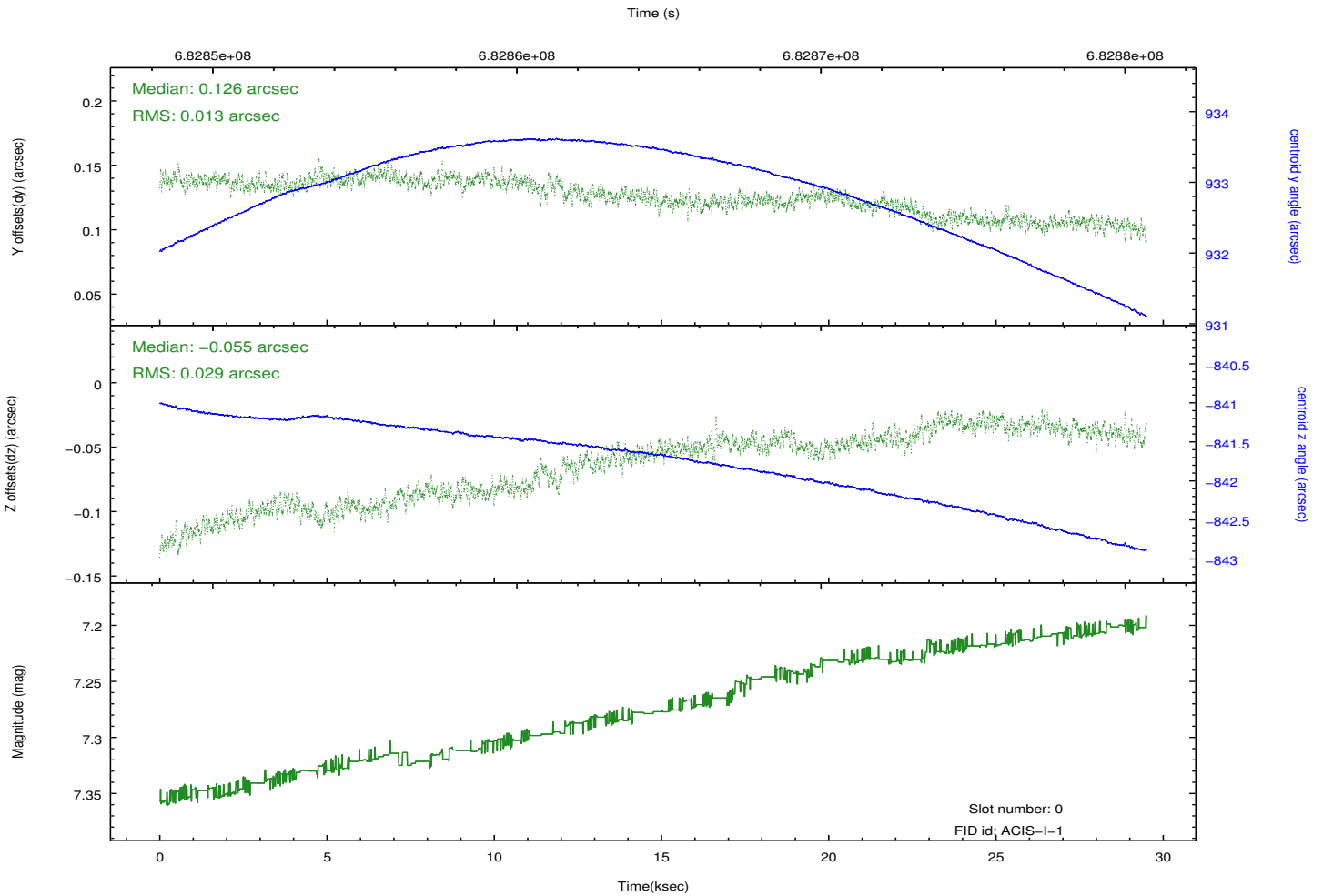
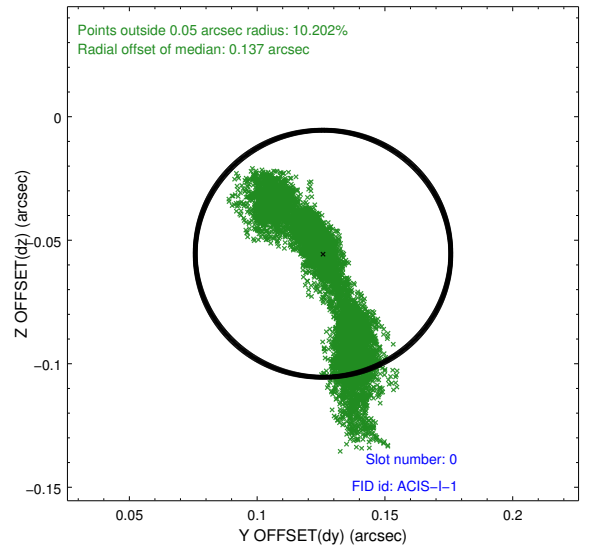
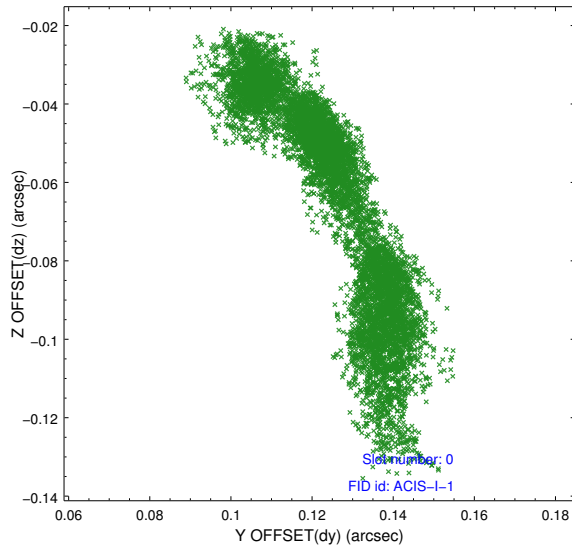


## 2.4.4 Slot 7

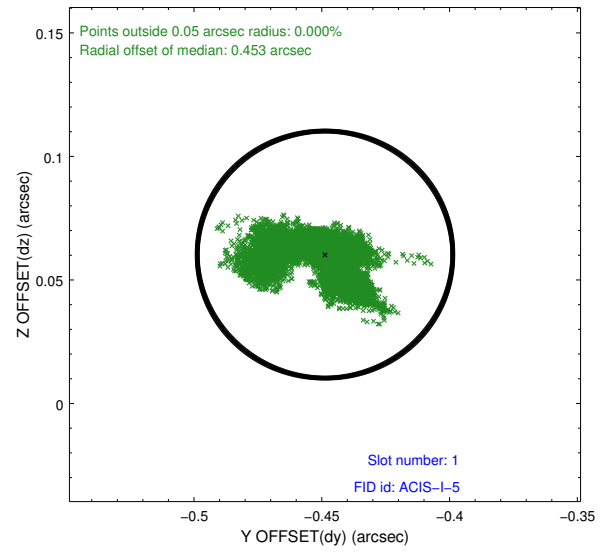
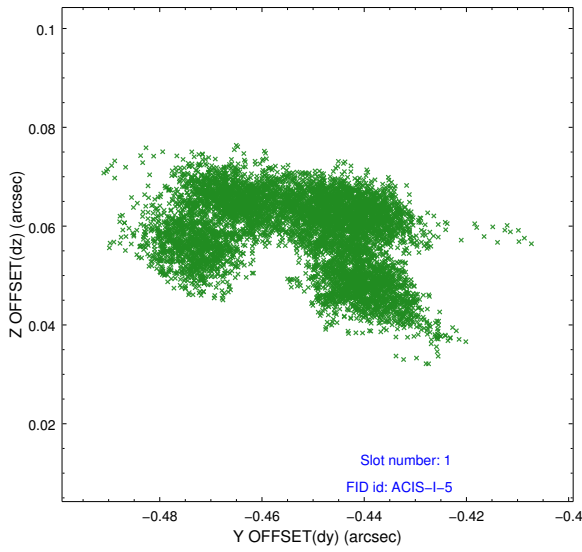


## 2.5 FID Slots

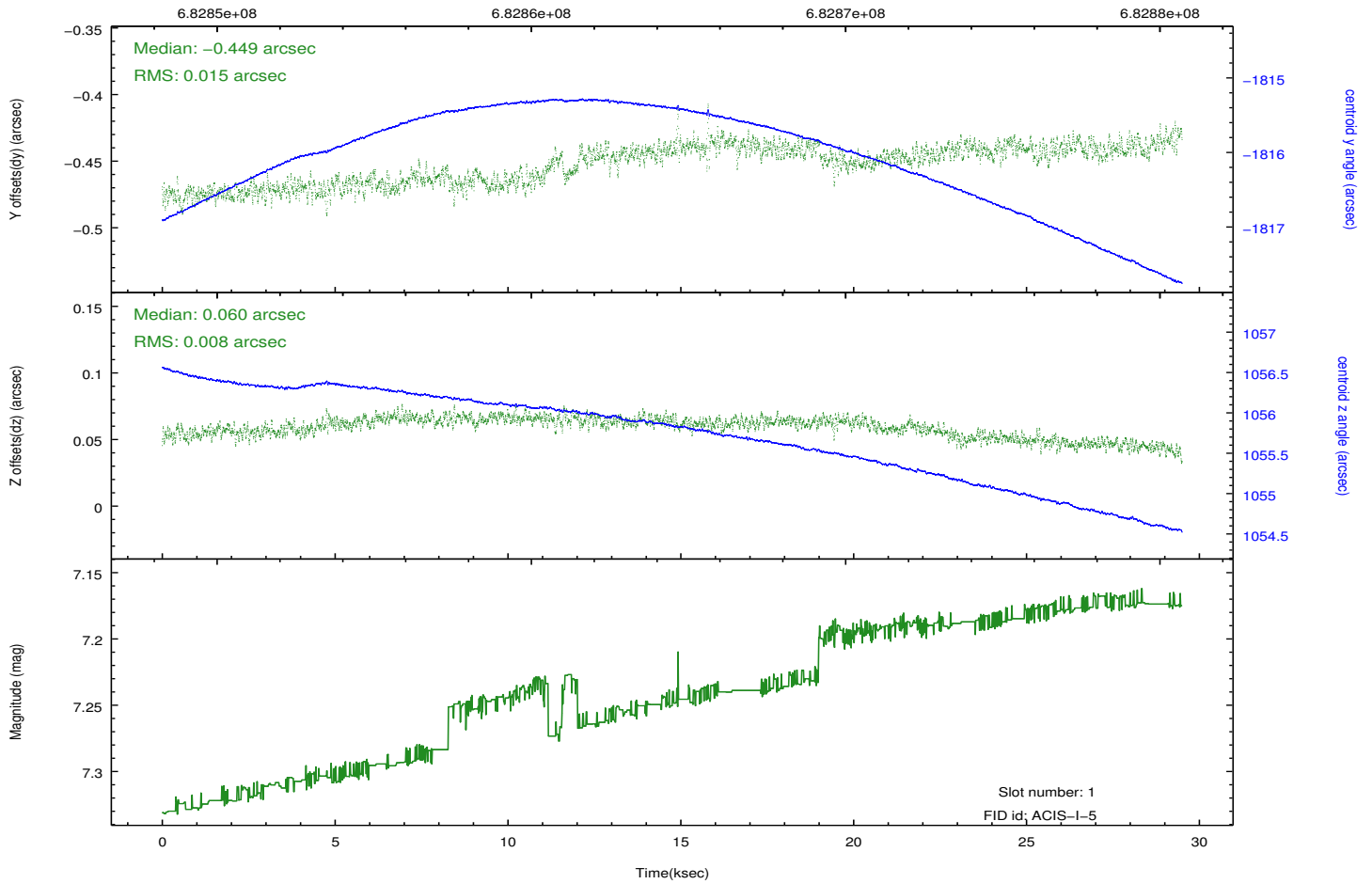
### 2.5.1 Slot 0



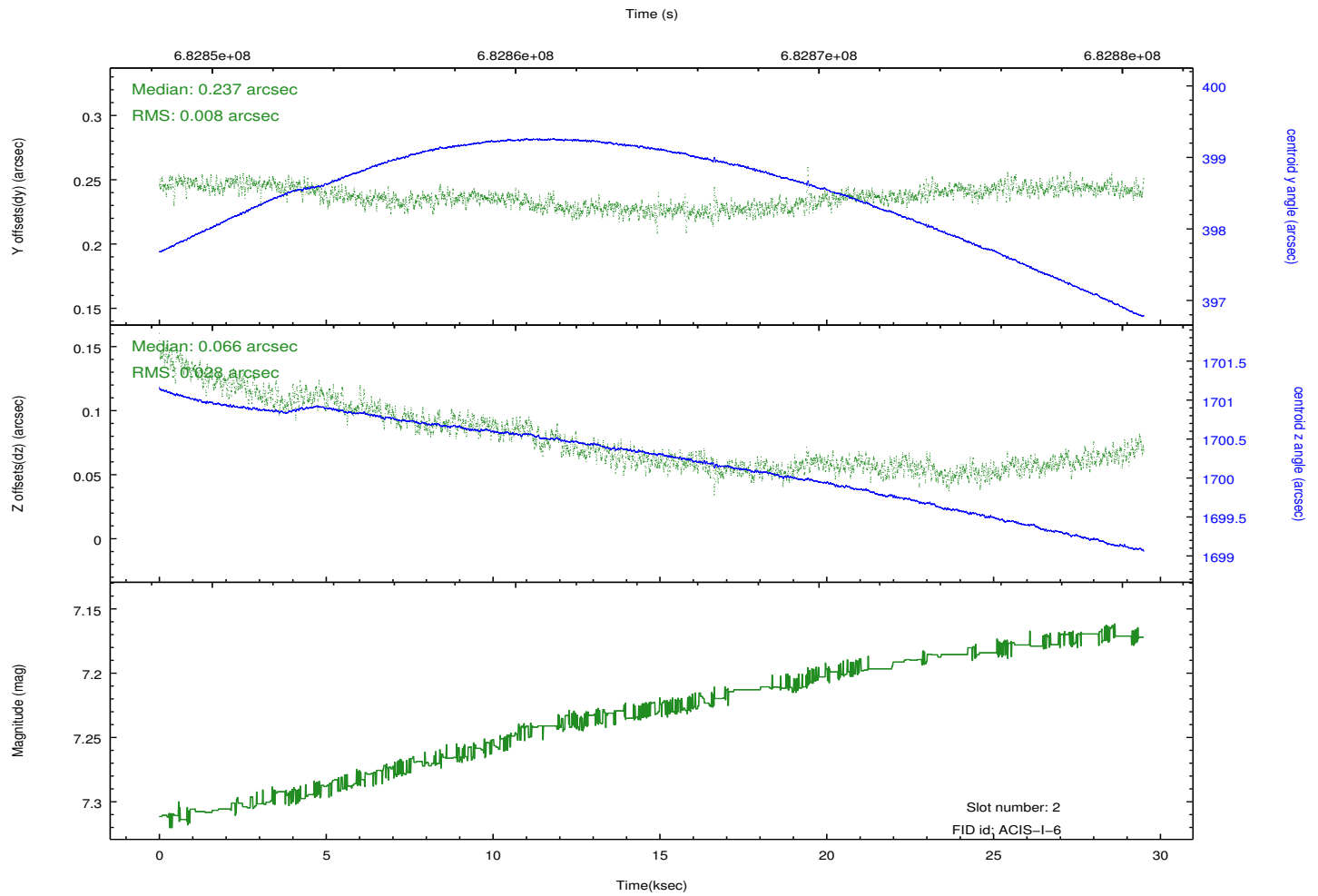
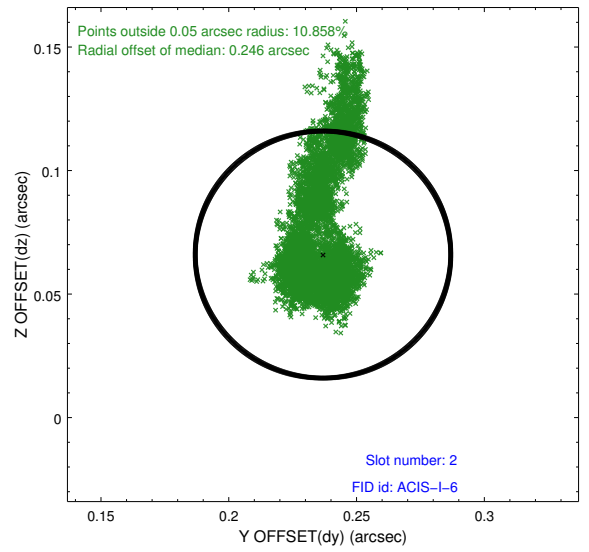
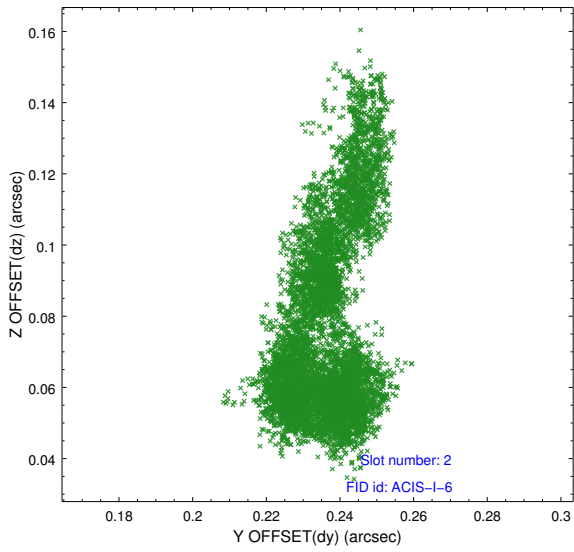
## 2.5.2 Slot 1



Time (s)



### 2.5.3 Slot 2



# A Summary

## A.1 Status

V&V Scientist	Beth Sundheim
V&V Date (YYYY-MM-DD)	2020.04.02
V&V Edition	2
V&V Disposition and Status	OK
V&V Charge Time	29.062459233522

## A.2 Comments

The guide star in slot 5 was removed from the aspect solution due to poor data quality. The aspect solution is improved by the removal of this slot from the solution.

===

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

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/A\\_CIS\\_response\\_summary.html](http://asc.harvard.edu/cal/Acis/Cal_prods/Gain_and_Spectral_Resolution/A_CIS_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.