V&V Reference Report
L2 ASCDS Version : 10.4.3

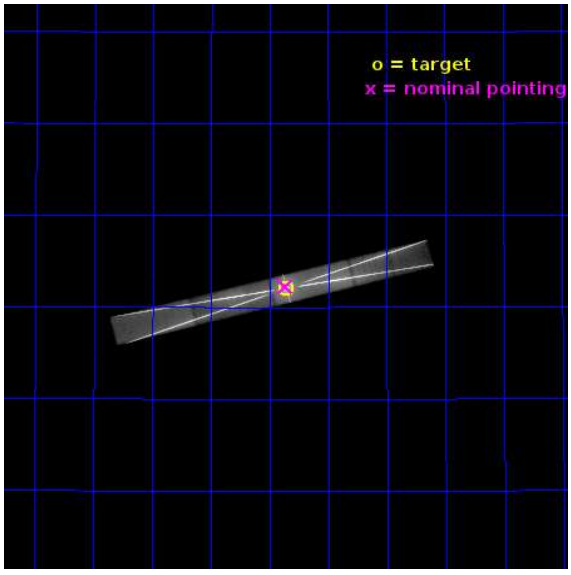
Observation 16735 - L2 Version 1
Chandra X-Ray Center

L2 Processing Date : Jan 6 2016

Contents

1 Front

seq_num	401657	Sequence number
obs_id	16735	Observation id
title	Filling the gap in understanding the wind structure of HDE 226868 /Cyg X-1	Proposal title
observer	Dr. Victoria Grinberg	Principal investigator
object	Cyg X-1	Source name
dtycycle	0	
cycle	P	events from which exps? Prim/Second/Both
ra_targ	299.590417	Observer's specified target RA [deg]
dec_targ	35.201611	Observer's specified target Dec [deg]
ra_nom	299.59130177472	Nominal RA [deg]
dec_nom	35.203899452833	Nominal Dec [deg]
roll_nom	345.56587506966	Nominal Roll [deg]
revision	1	Processing version of data
ontime	18171.193241	Sum of GTIs [s]
livetime	17570.289345388	Livetime [s]
ontime5	24082.62895	Sum of GTIs [s]
ontime6	14923.437514305	Sum of GTIs [s]
ontime7	18171.193241	Sum of GTIs [s]
ontime8	23653.156262875	Sum of GTIs [s]
l2events	3623293	Number of level 2 events

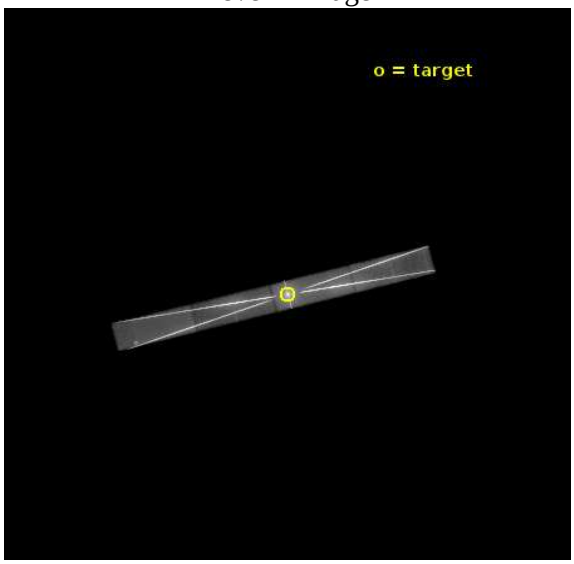


2 OBI

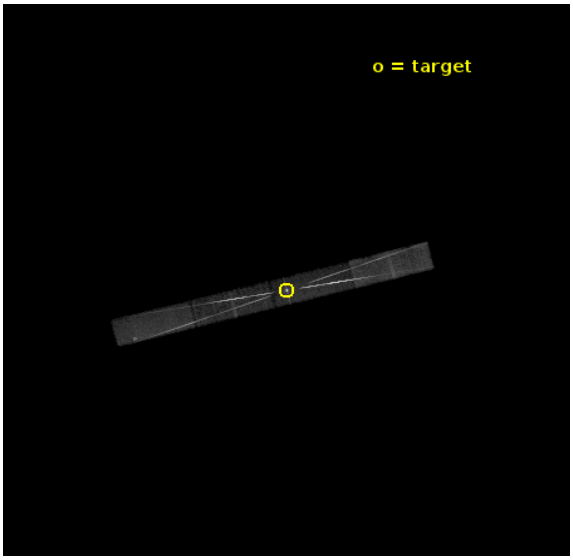
2.1 OBI

2.1.1 Images

Level 1 Image

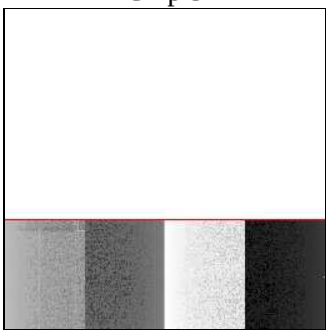


Level 1 Bad Events

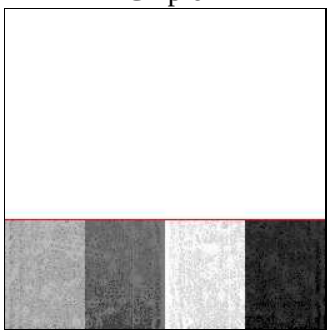


2.1.2 Bias

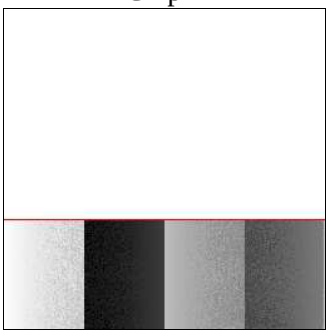
Chip 5



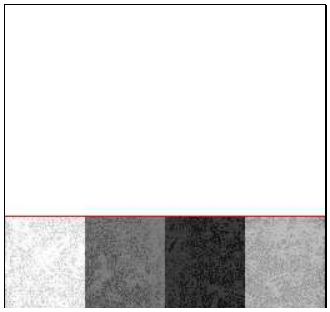
Chip 6



Chip 7



Chip 8



2.1.3 Parameters

obi_num	0	Obi number
ascdsver	10.4.3	Processing system revision
caldbver	4.7.0	
date	2016-01-06T20:42:30	Date and time of file creation
revision	1	Processing version of data

sched_exp_time	24004.651000	[s] Scheduled observation exposure time
ontime	18171.193241	Sum of GTIs [s]
ontime5	24082.62895	Sum of GTIs [s]
ontime6	14923.437514305	Sum of GTIs [s]
ontime7	18171.193241	Sum of GTIs [s]
ontime8	23653.156262875	Sum of GTIs [s]
l1events	4155397	Number of level 1 events
tgmethod	FINDZO	Method used to create src1a file
zo_pos	(4102.68, 4080.10)	src1a sky pixel position
zo_pos_tgd	(4102.44, 4081.20)	src1a sky pixel position via tgdetect

2.1.4 Events

	ccd 5	ccd 6	ccd 7	ccd 8
level 1 events	496448	1199060	1649146	810743
rejected events	52283	84713	159536	66377
rejected %	10%	7%	9%	8%

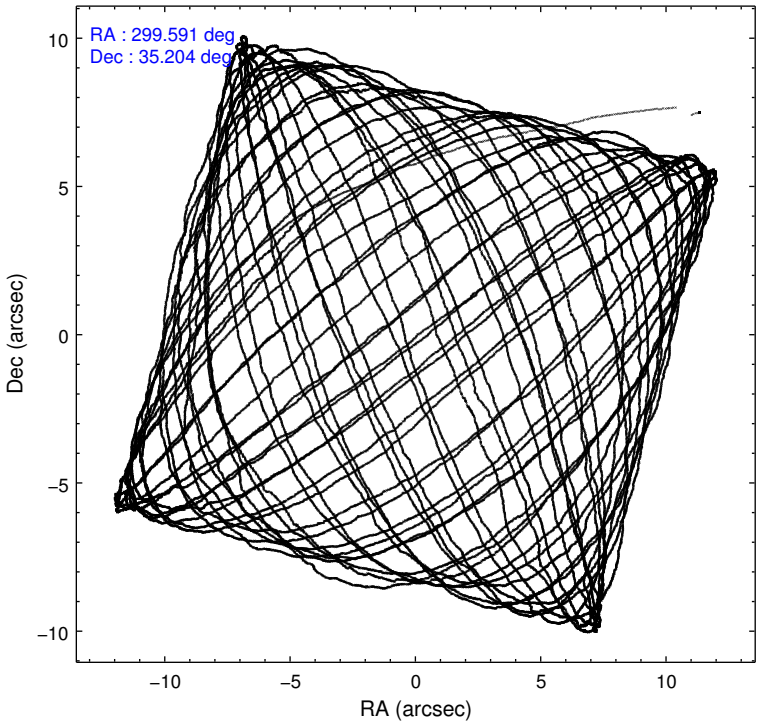
	ccd 5	ccd 6	ccd 7	ccd 8
grade 0 events	151007	819708	303379	591172
	30%	68%	18%	72%
grade 1 events	3077	27942	13947	8389
	0%	2%	0%	1%
grade 2 events	131655	142903	370310	79651
	26%	11%	22%	9%
grade 3 events	39744	52013	164028	26934
	8%	4%	9%	3%
grade 4 events	39871	50593	164236	26672
	8%	4%	9%	3%
grade 5 events	12436	20265	57266	7318
	2%	1%	3%	0%
grade 6 events	81947	49228	487758	20034
	16%	4%	29%	2%
grade 7 events	36711	36408	88222	50573
	7%	3%	5%	6%

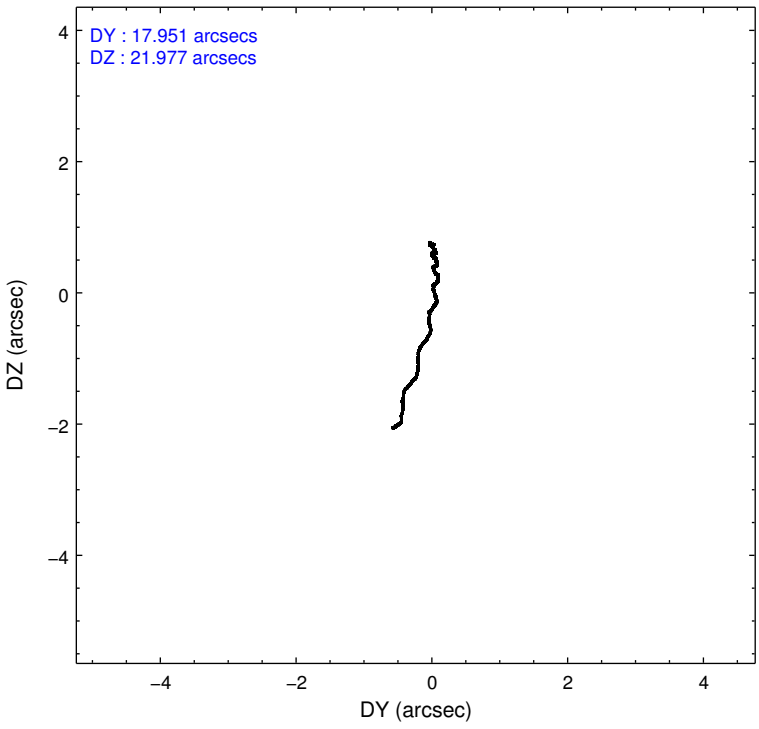
2.2 Compared Parameters

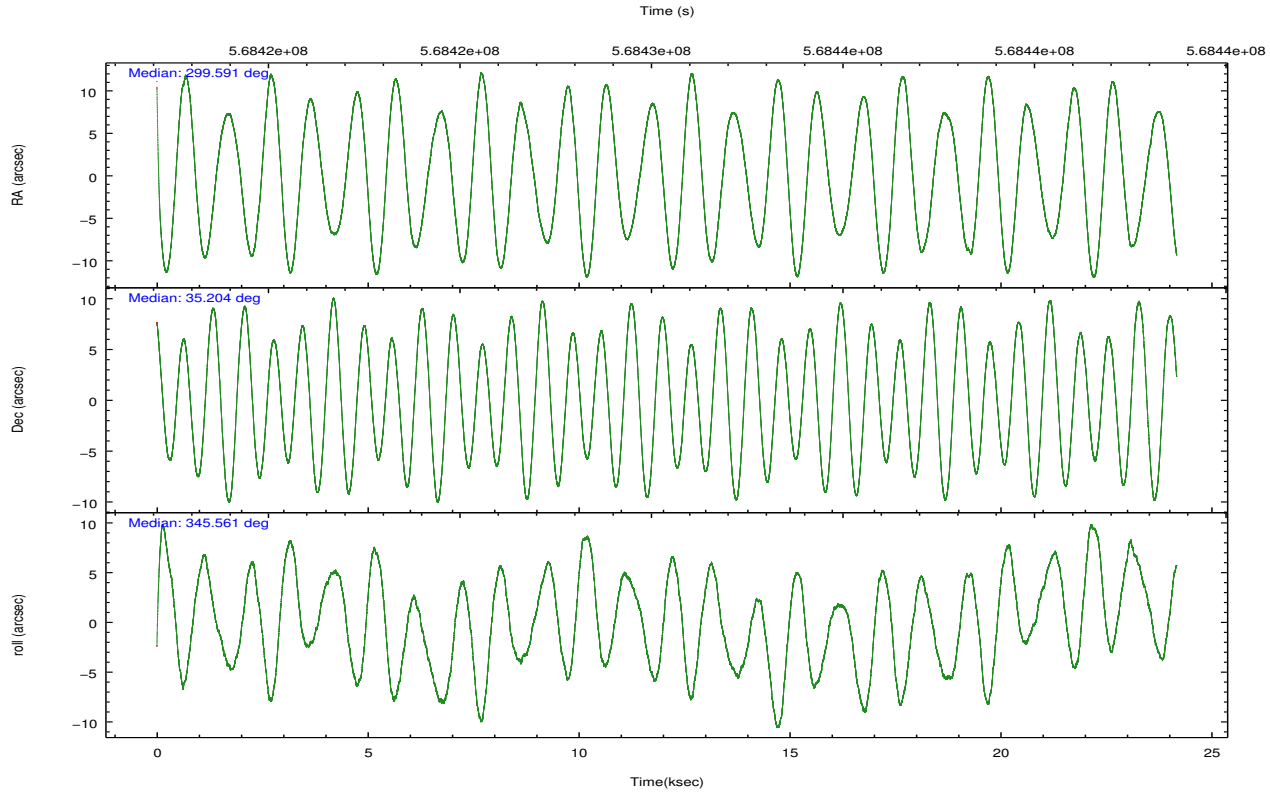
Parameter	Planned	Actual
Instrument	ACIS	ACIS
Detector	ACIS-5678	ACIS-5678
Grating	HETG	HETG
Data mode	FAINT	FAINT
Observation mode	POINTING	POINTING
[deg] Pointing RA	299.559080	299.5913017747234
[deg] Pointing Dec	35.196178	35.20389945283308
[deg] Pointing Roll	345.427822	345.565875069663
[mm] SIM focus pos	-0.684267	-0.6828225247311905
[mm] SIM defocus	0	0.001444936568705701
[mm] SIM translation stage pos	-182.132523	-182.1344861297048
[mm] SIM translation stage offset	-8	-7.998036453302973
Phase constraints	Y	Y
[d] Phase period	5.599829	5.599829
[d] Phase epoch (MJD)	55649.829300	55649.829300
Phase start	0.250000	0.250000
Phase end	0.400000	0.400000
Phase start error	0.050000	0.050000
Phase end error	0.100000	0.100000
[s] Observation start time (MET)	568418463.184000	568417323.80141
Observation start date	2016-01-05T21:59:55	2016-01-05T21:42:03
[s] Observation end time (MET)	568442468.184000	568442692.55285
Observation end date	2016-01-06T04:40:00	2016-01-06T04:44:52
Read mode	TIMED	TIMED

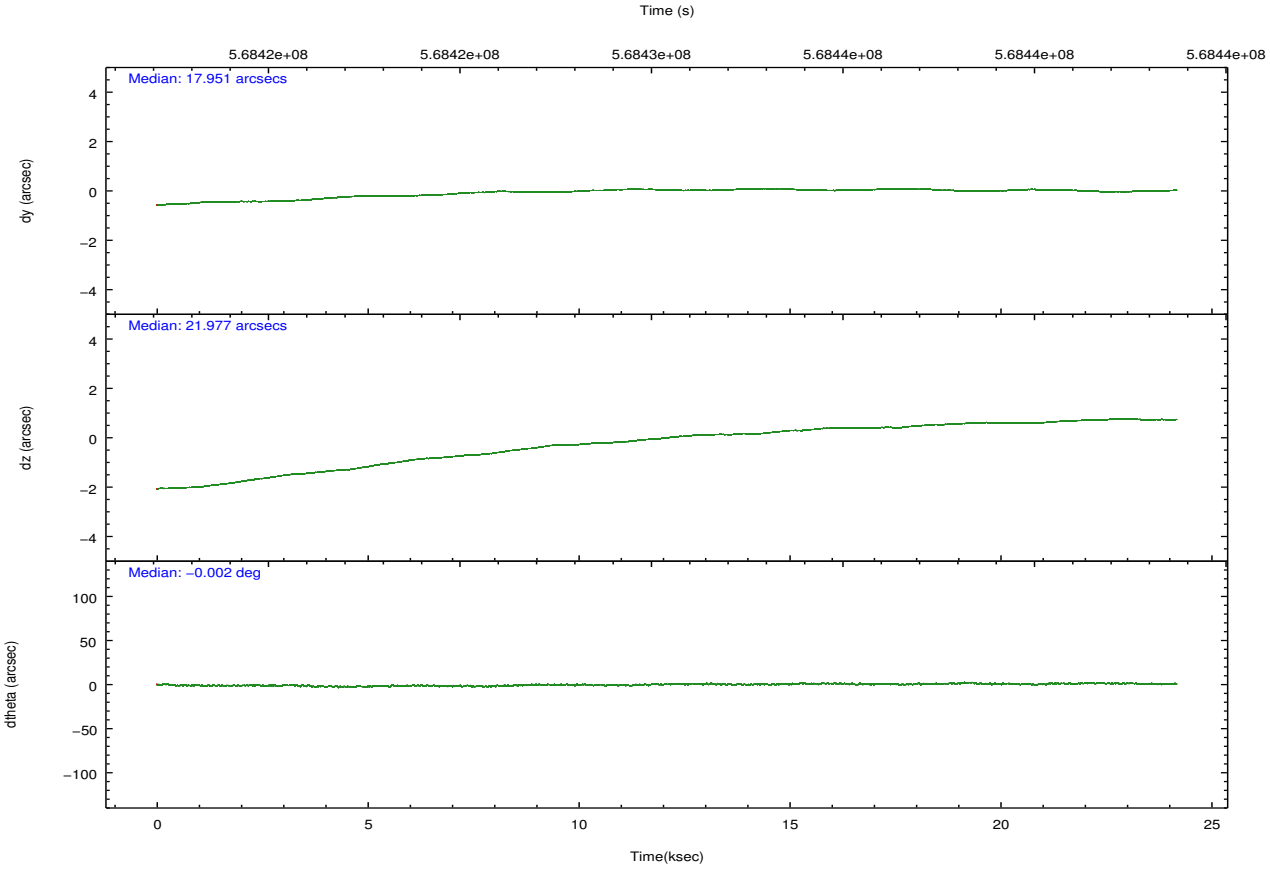
Parameter	Planned	Actual
Obspar format version number	7	7
Obspar file type	PREDICTED	ACTUAL
Obspar update status	NONE	UPDATED
Number of optional ACIS chips dropped	0	0
On-chip summing requested	N	N
Subarray requested	CUSTOM	CUSTOM
Subarray start row	1	1
Subarray row count	350	350
Alternating exposures requested	N	N
[s] Primary exposure time	0.000000	1.2

2.3 Aspect


RA : 299.591 deg
Dec : 35.204 deg
Dec (arcsec)
RA (arcsec)
10
5
0
−5
−10
−10
−5
0
5
10


DY : 17.951 arcsecs
DZ : 21.977 arcsecs
DZ (arcsec)
DY (arcsec)
4
2
0
−2
−4
−4
−2
0
2
4


Time (s)
5.6842e+08
5.6842e+08
5.6843e+08
5.6844e+08
5.6844e+08
5.6844e+08
Median: 299.591 deg
RA (arcsec)
Median: 35.204 deg
Dec (arcsec)
Median: 345.561 deg
roll (arcsec)
Time(ksec)

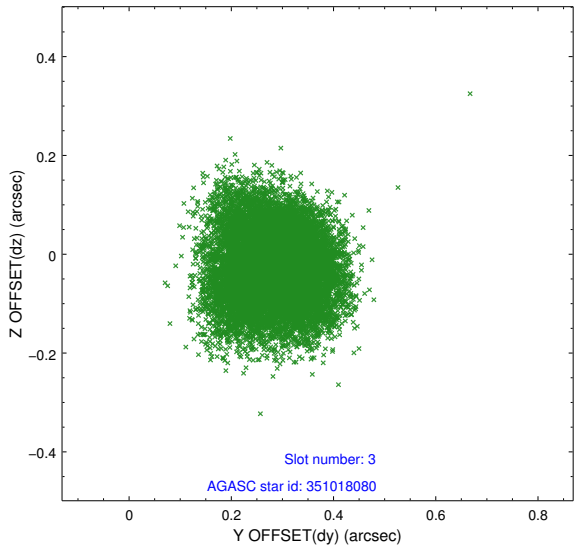

Time (s)
5.6842e+08
5.6842e+08
5.6843e+08
5.6844e+08
5.6844e+08
5.6844e+08
Median: 17.951 arcsecs
dy (arcsec)
Median: 21.977 arcsecs
dz (arcsec)
Median: −0.002 deg
dtheta (arcsec)
Time(ksec)

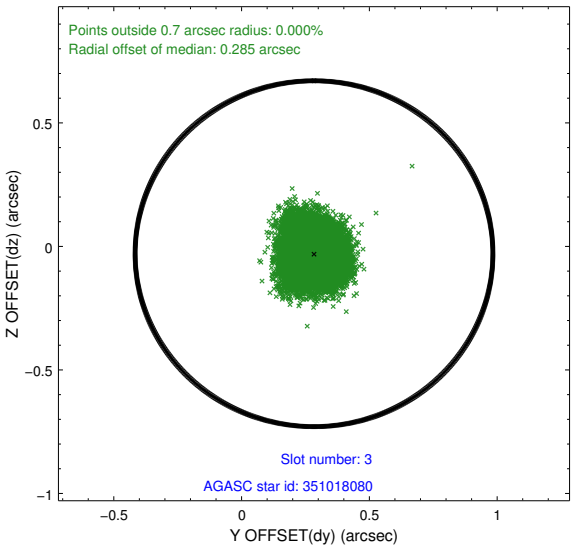
Slot Statistics

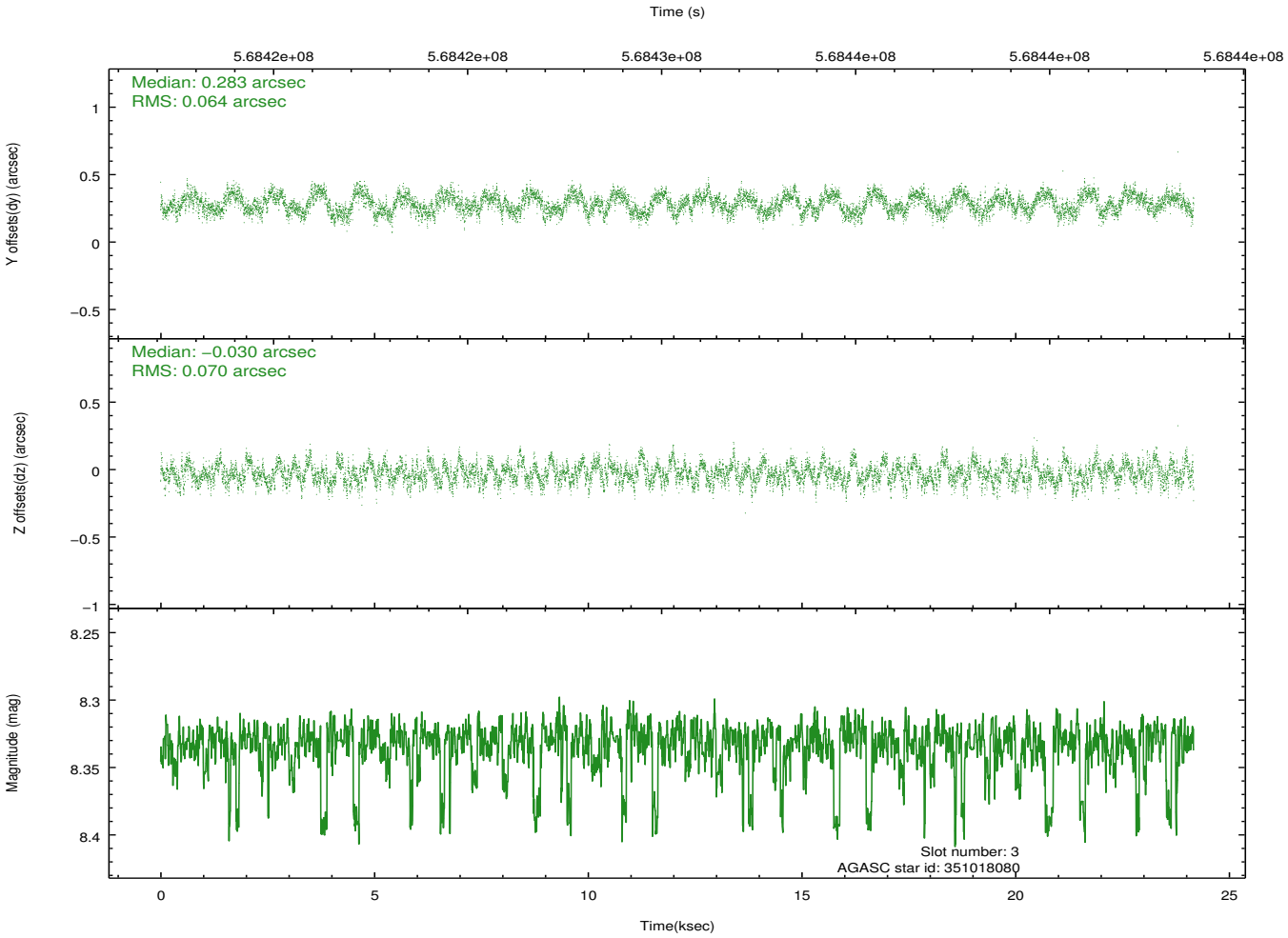
slot	status	used	id	mag	n_pts	med_dy	med_dz	dr1	dr2	ra	dec	mean_y	mean_z
0	FID		ACIS-S-2	7.09	5896	-0.308	-0.226	0.018	0.026	0.000000	0.000000	-770.70	-1908.24
1	FID		ACIS-S-4	7.18	5895	0.315	0.170	0.010	0.020	0.000000	0.000000	2143.19	0.38
2	FID		ACIS-S-6	7.41	5896	-0.035	0.059	0.019	0.032	0.000000	0.000000	391.79	637.86
3	GUIDE	used	351018080	8.33	11792	0.283	-0.030	0.103	0.158	299.327312	34.581247	-107.29	-2314.54
4	GUIDE	used	351406096	8.90	11782	-0.084	0.015	0.220	0.310	299.076637	35.711249	-1832.19	1442.92
5	GUIDE	used	351550592	7.43	11792	-0.306	-0.358	0.094	0.148	300.511890	35.641112	2291.29	2264.73
6	GUIDE	used	350883744	8.55	11787	0.092	0.327	0.094	0.146	298.704367	35.005535	-2268.46	-1287.69
7	GUIDE	used	351029968	8.34	11784	0.005	0.049	0.118	0.195	299.542339	34.721380	382.38	-1666.68

2.4 Star Slots

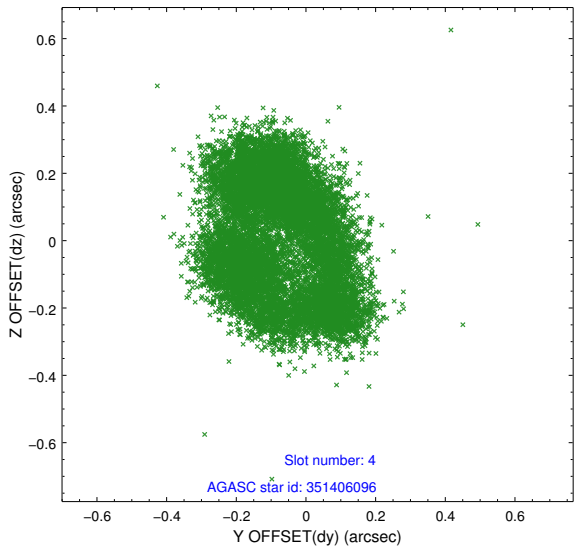
2.4.1 Slot 3

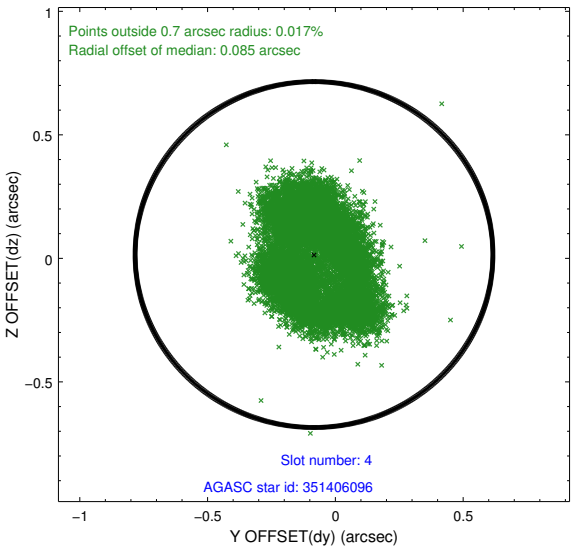


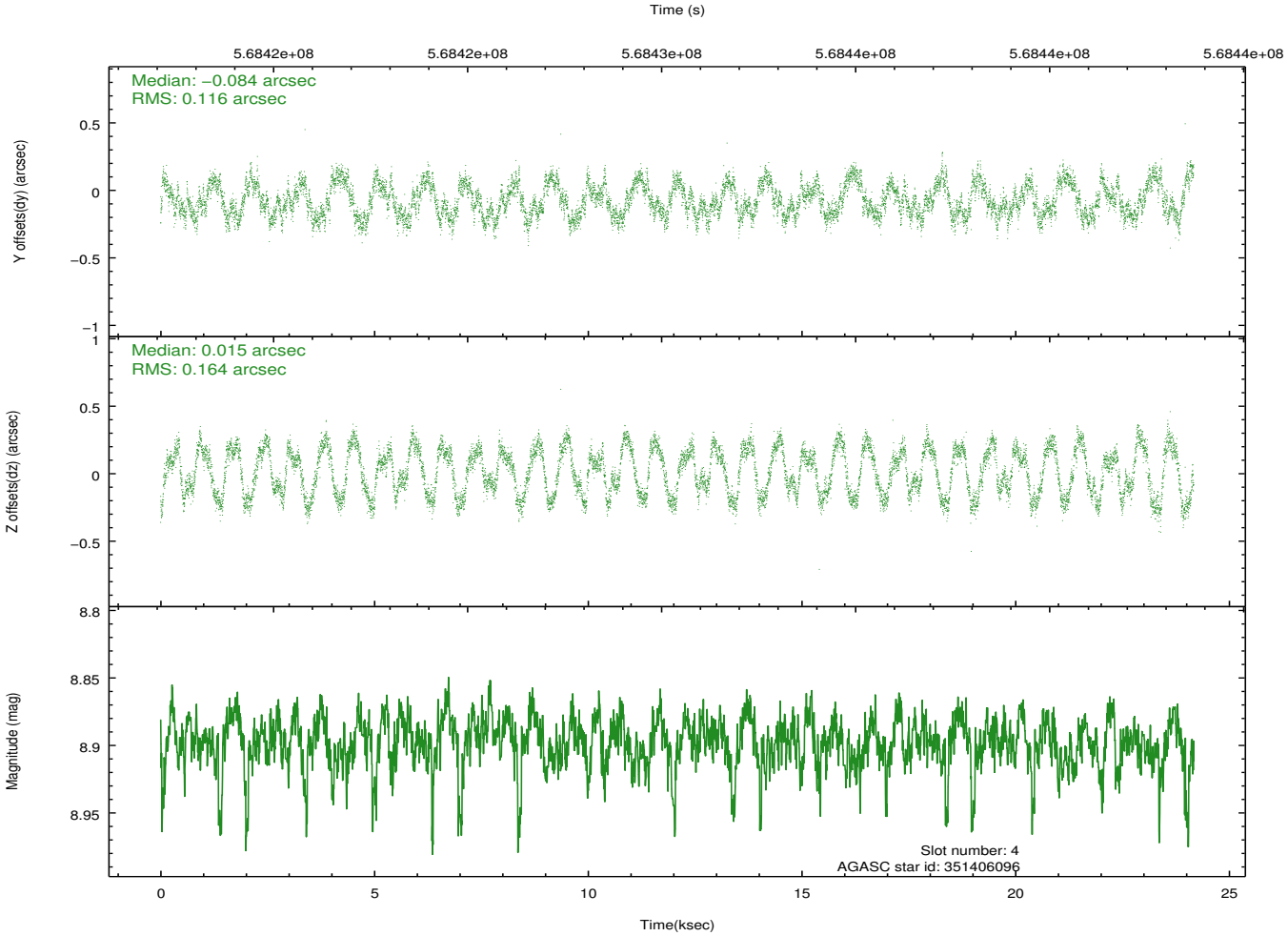




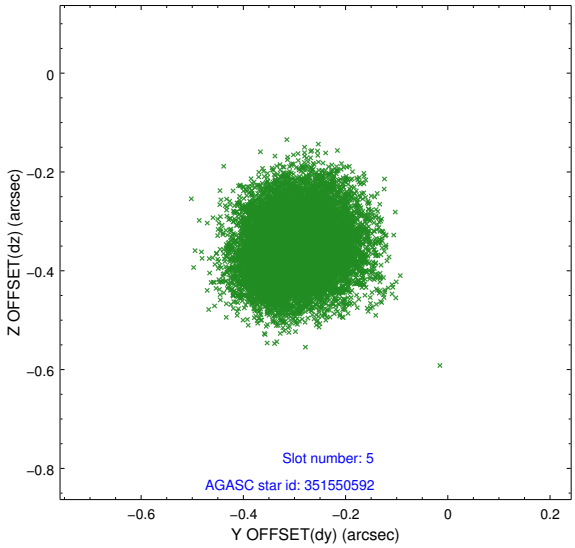
2.4.2 Slot 4

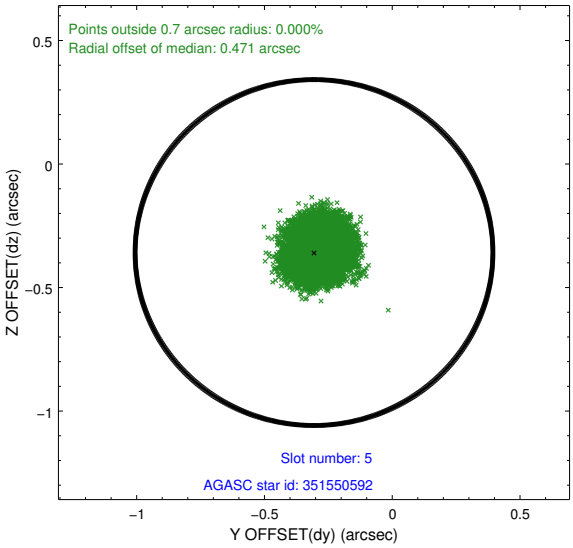

Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 4
AGASC star id: 351406096

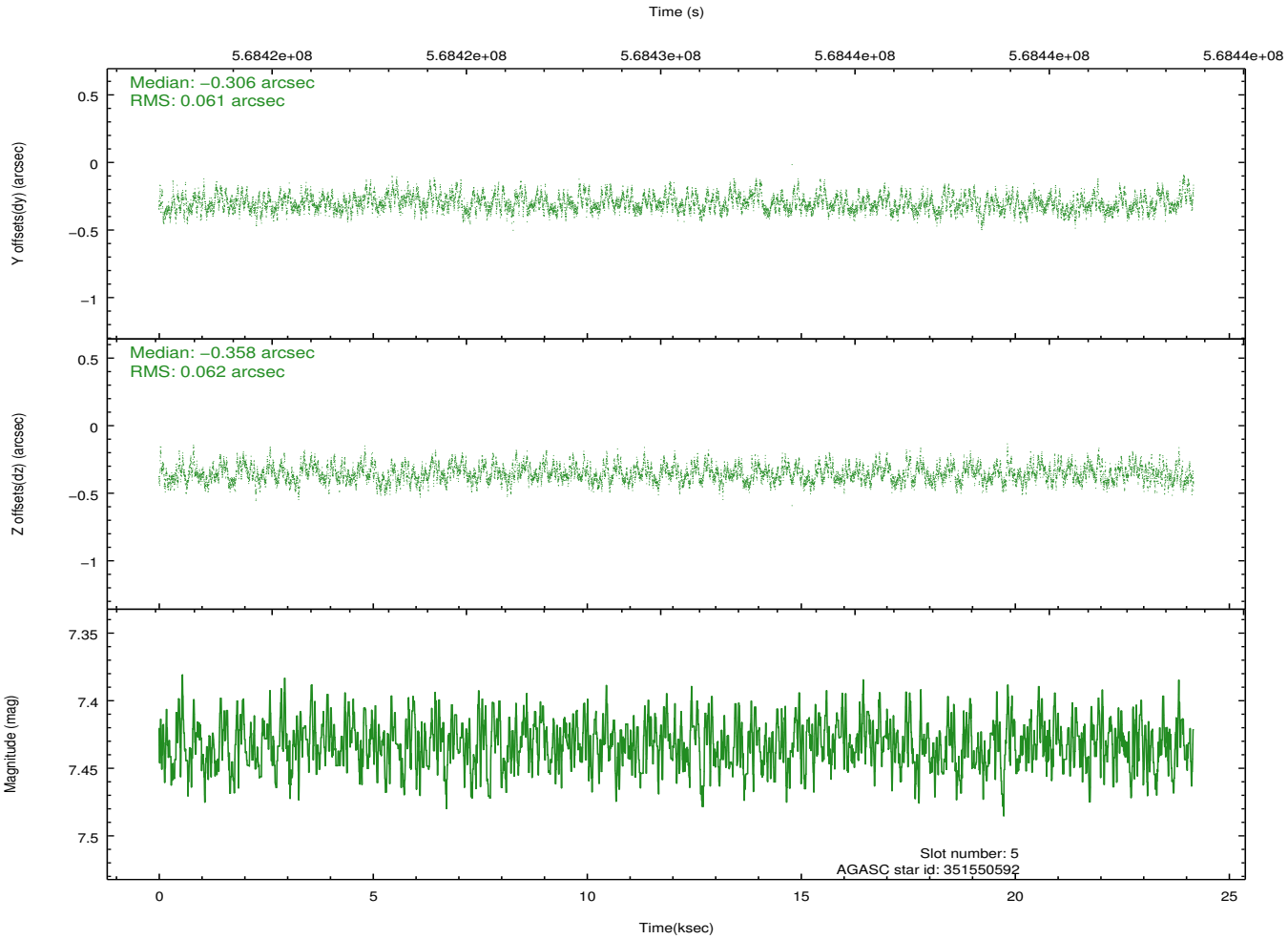

Points outside 0.7 arcsec radius: 0.017%
Radial offset of median: 0.085 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 4
AGASC star id: 351406096


Time (s)
Median: −0.084 arcsec
RMS: 0.116 arcsec
Y offsets(dy) (arcsec)
Median: 0.015 arcsec
RMS: 0.164 arcsec
Z offsets(dz) (arcsec)
Magnitude (mag)
Slot number: 4
AGASC star id: 351406096
Time(ksec)

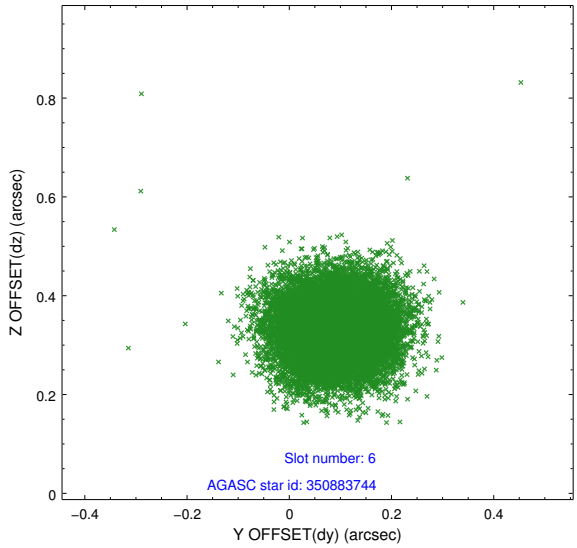
2.4.3 Slot 5

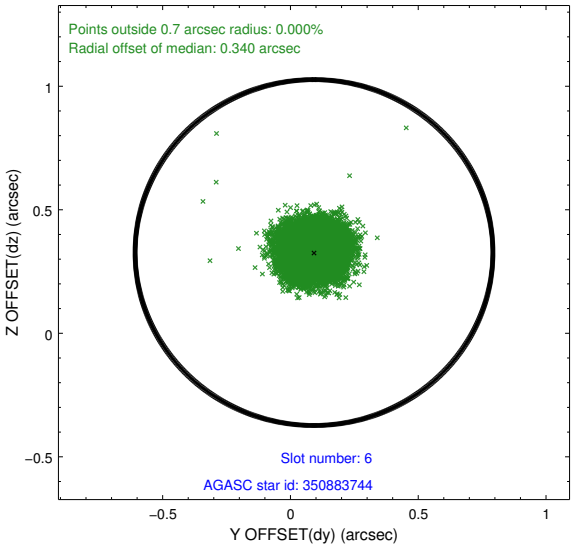

Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 5
AGASC star id: 351550592

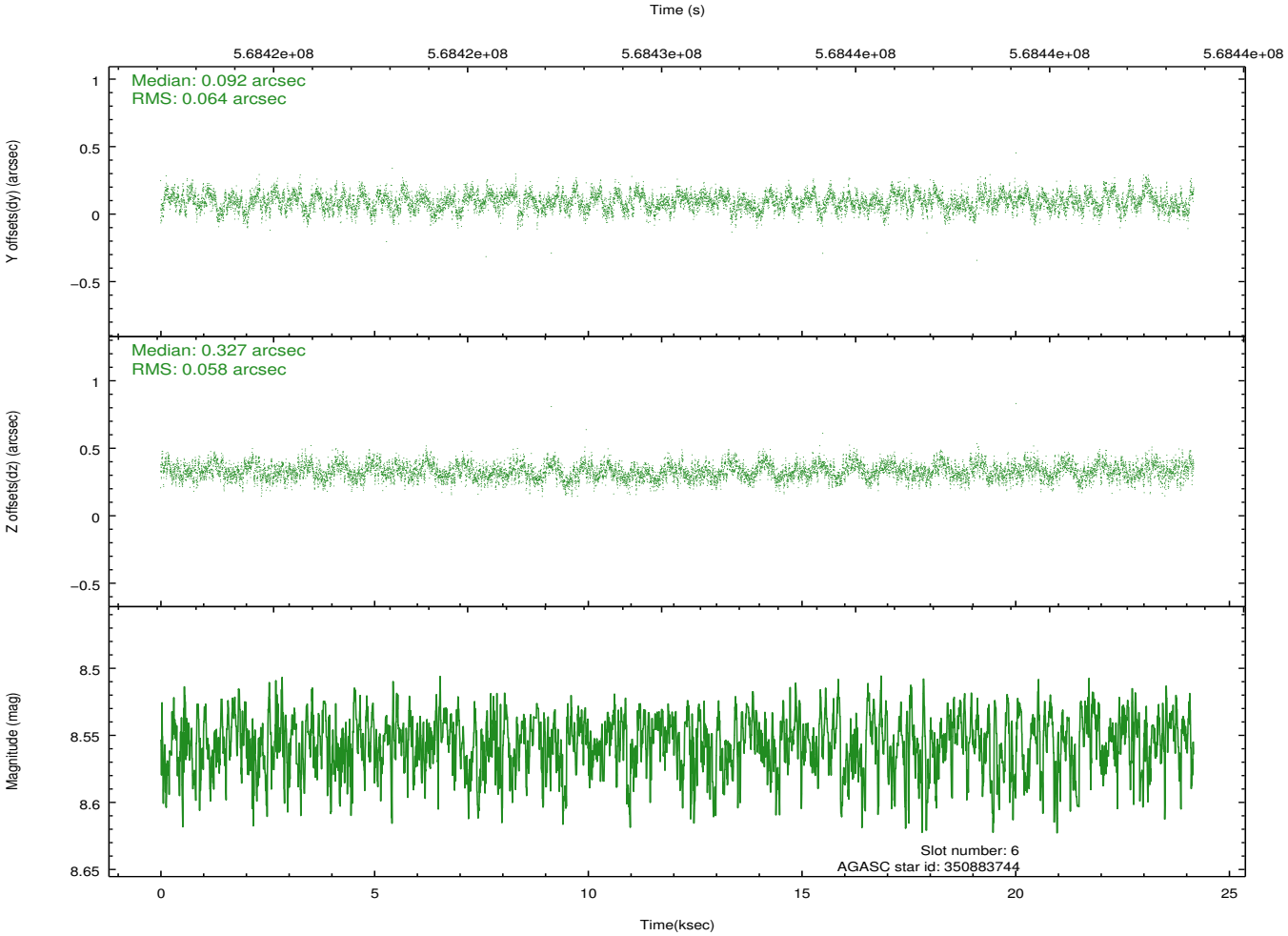

Points outside 0.7 arcsec radius: 0.000%
Radial offset of median: 0.471 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 5
AGASC star id: 351550592


Time (s)
Median: −0.306 arcsec
RMS: 0.061 arcsec
Y offsets(dy) (arcsec)
Median: −0.358 arcsec
RMS: 0.062 arcsec
Z offsets(dz) (arcsec)
Magnitude (mag)
Slot number: 5
AGASC star id: 351550592
Time(ksec)

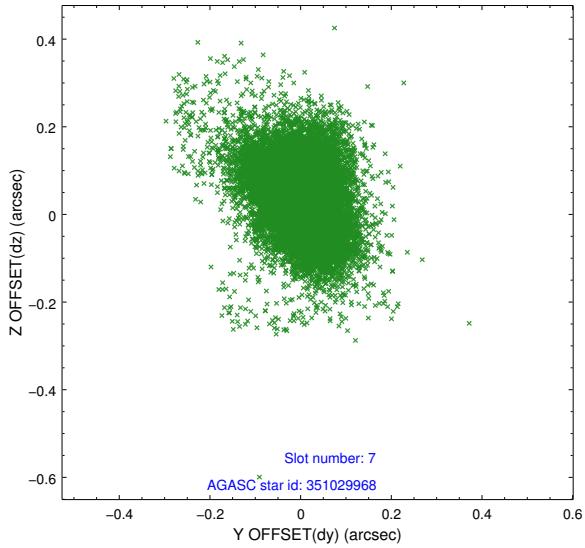
2.4.4 Slot 6

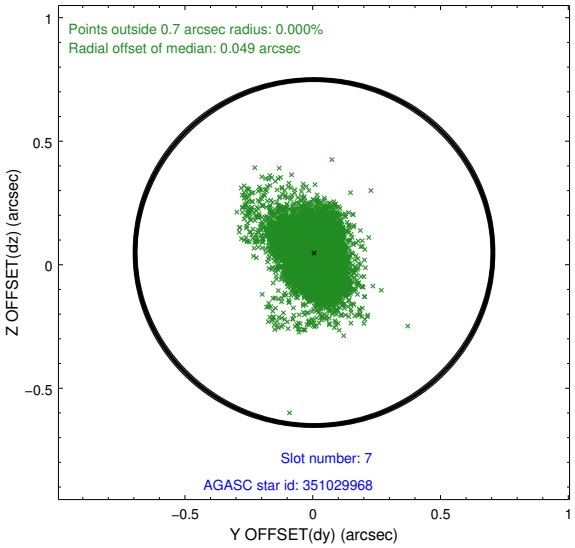

Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 6
AGASC star id: 350883744

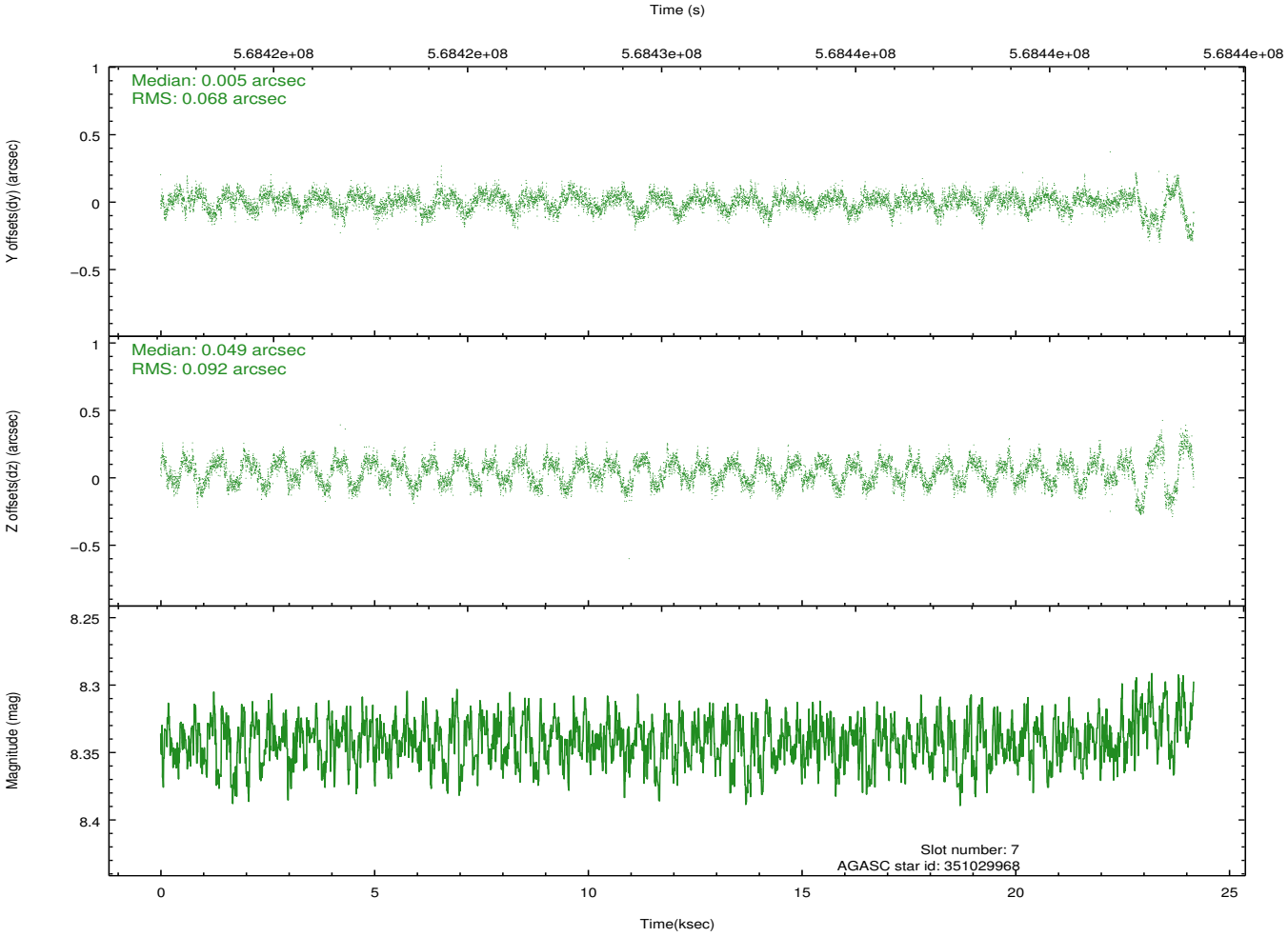

Points outside 0.7 arcsec radius: 0.000%
Radial offset of median: 0.340 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 6
AGASC star id: 350883744


Time (s)
Median: 0.092 arcsec
RMS: 0.064 arcsec
Y offsets(dy) (arcsec)
Median: 0.327 arcsec
RMS: 0.058 arcsec
Z offsets(dz) (arcsec)
Magnitude (mag)
Slot number: 6
AGASC star id: 350883744
Time(ksec)

2.4.5 Slot 7

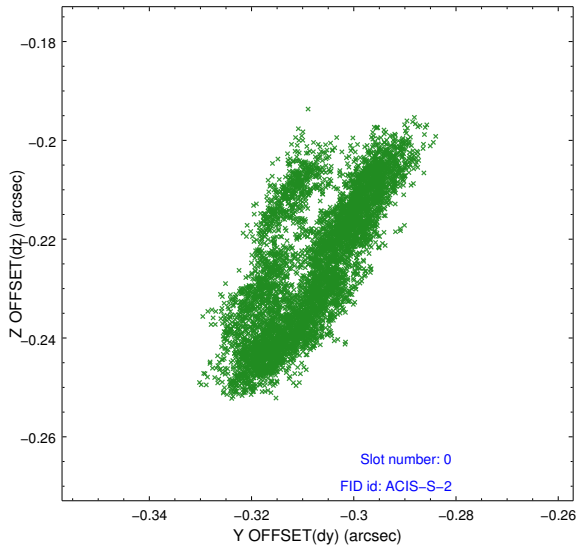

Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 7
AGASC star id: 351029968

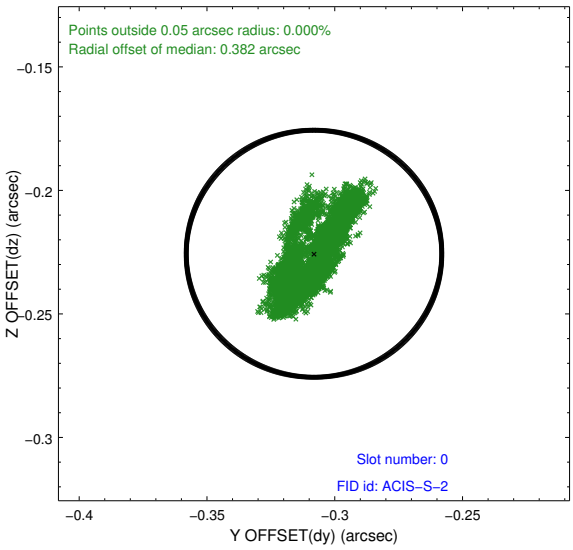

Points outside 0.7 arcsec radius: 0.000%
Radial offset of median: 0.049 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 7
AGASC star id: 351029968

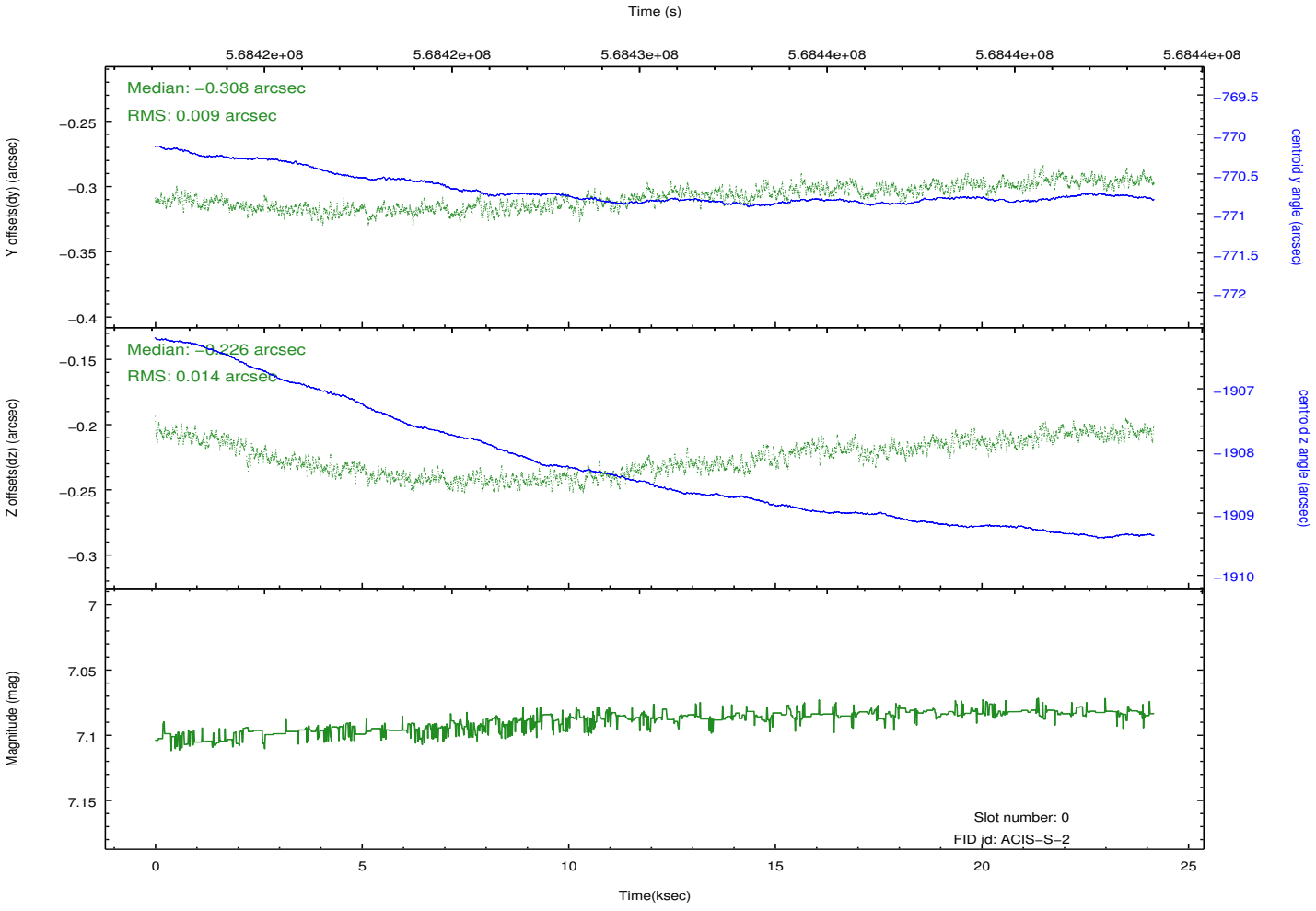

Time (s)
Median: 0.005 arcsec
RMS: 0.068 arcsec
Y offsets(dy) (arcsec)
Median: 0.049 arcsec
RMS: 0.092 arcsec
Z offsets(dz) (arcsec)
Magnitude (mag)
Slot number: 7
AGASC star id: 351029968
Time(ksec)

2.5 FID Slots

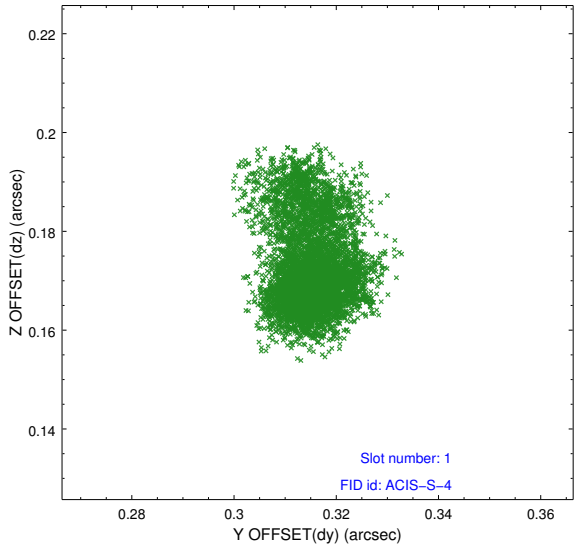
2.5.1 Slot 0

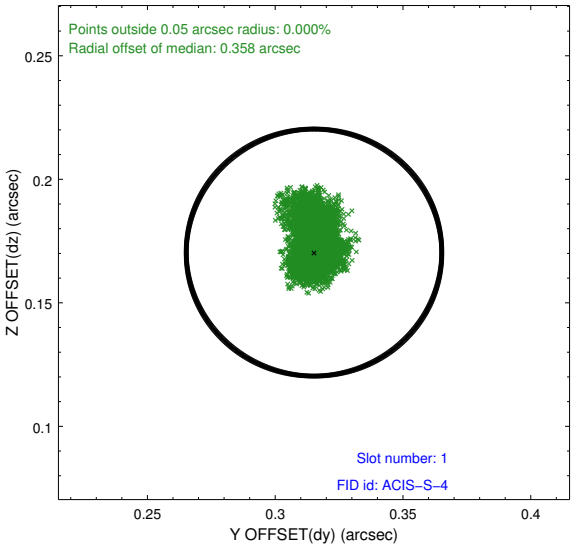


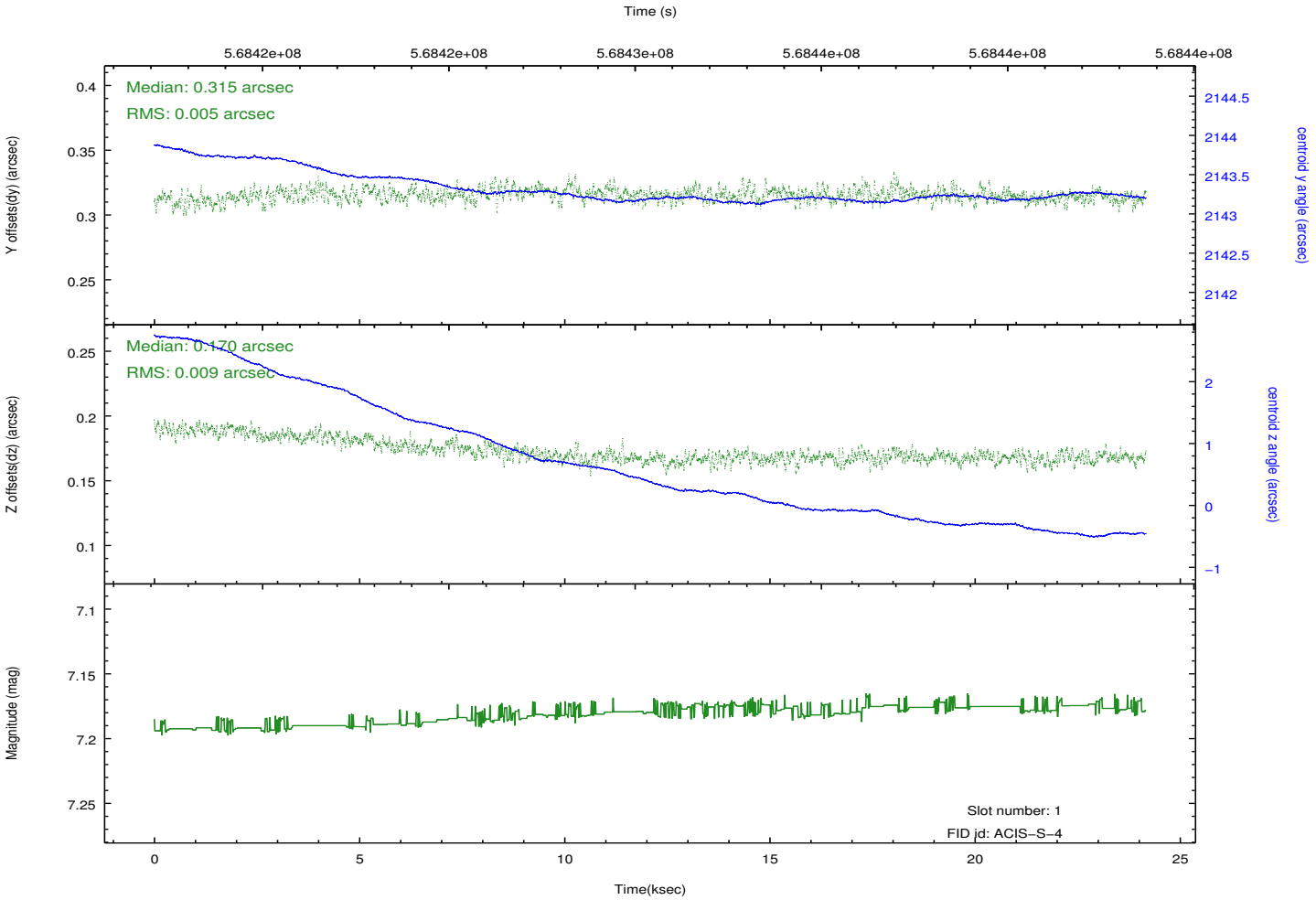




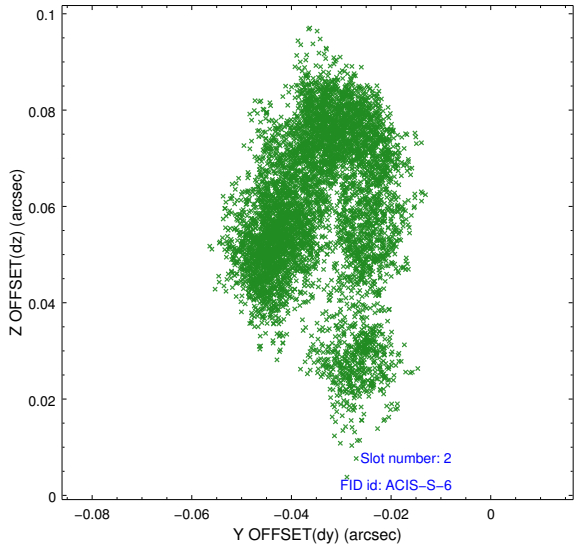
2.5.2 Slot 1

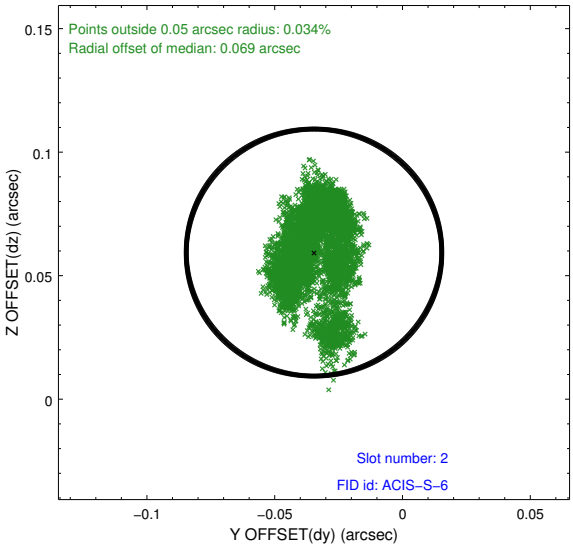

Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 1
FID id: ACIS−S−4

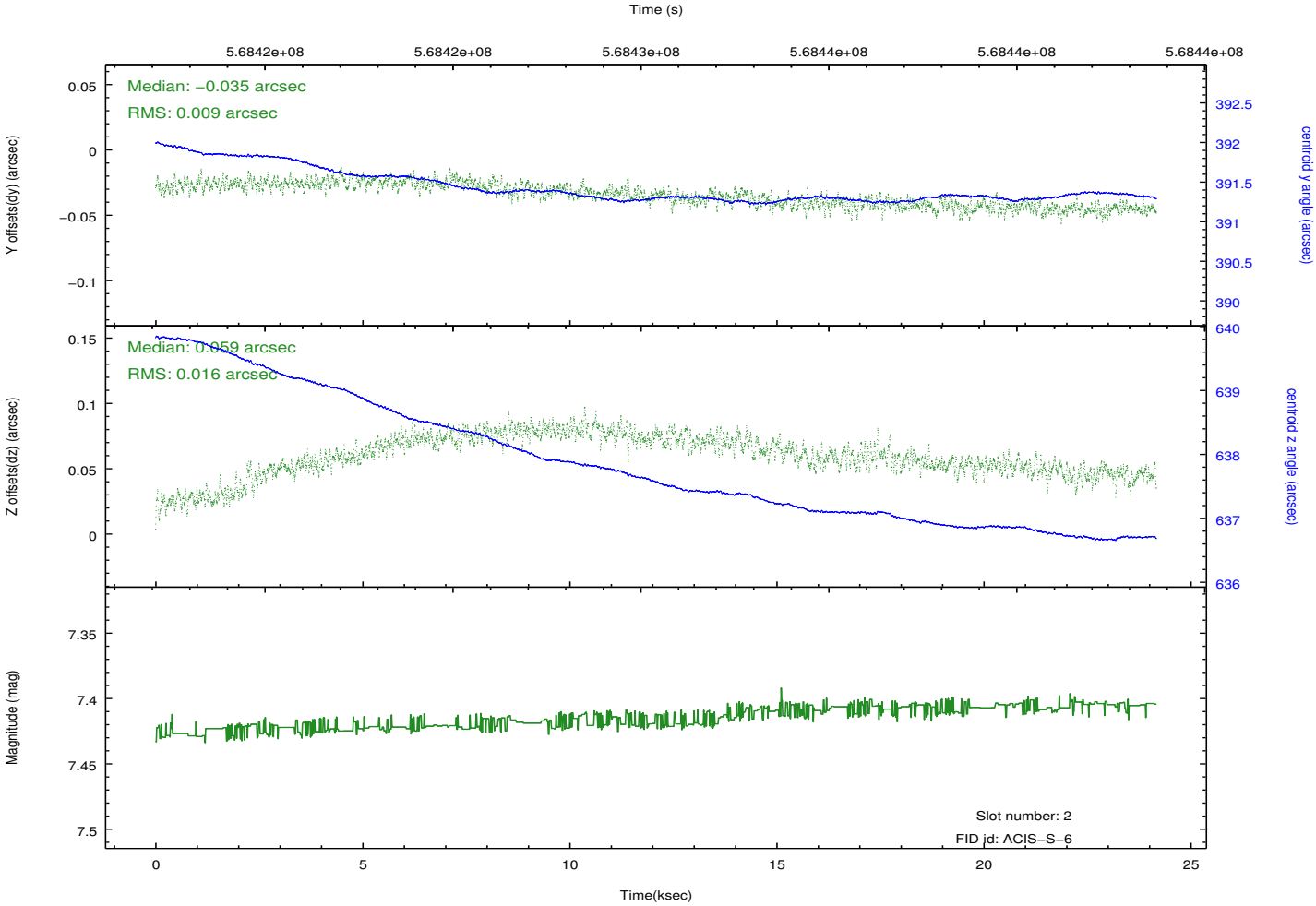

Points outside 0.05 arcsec radius: 0.000%
Radial offset of median: 0.358 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 1
FID id: ACIS−S−4


Time (s)
Median: 0.315 arcsec
RMS: 0.005 arcsec
Y offsets(dy) (arcsec)
centroid y angle (arcsec)
Median: 0.170 arcsec
RMS: 0.009 arcsec
Z offsets(dz) (arcsec)
centroid z angle (arcsec)
Magnitude (mag)
Slot number: 1
FID jd: ACIS−S−4
Time(ksec)

2.5.3 Slot 2


Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 2
FID id: ACIS−S−6

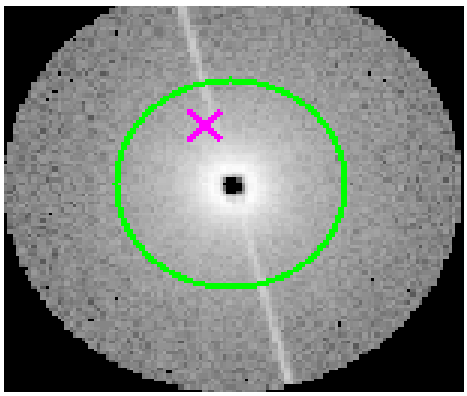

Points outside 0.05 arcsec radius: 0.034%
Radial offset of median: 0.069 arcsec
Z OFFSET(dz) (arcsec)
Y OFFSET(dy) (arcsec)
Slot number: 2
FID id: ACIS−S−6


Time (s)
Median: −0.035 arcsec
RMS: 0.009 arcsec
Y offsets(dy) (arcsec)
centroid y angle (arcsec)
Median: 0.059 arcsec
RMS: 0.016 arcsec
Z offsets(dz) (arcsec)
centroid z angle (arcsec)
Magnitude (mag)
Slot number: 2
FID jd: ACIS−S−6
Time(ksec)

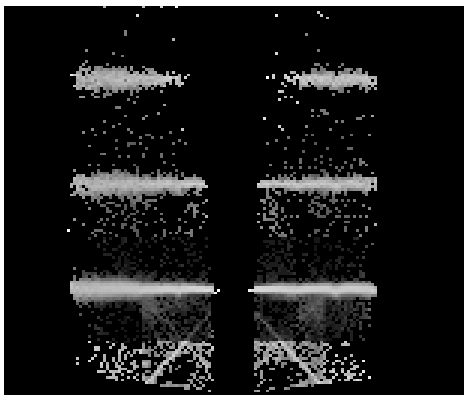
3 Gratings

3.1 HEG Arm

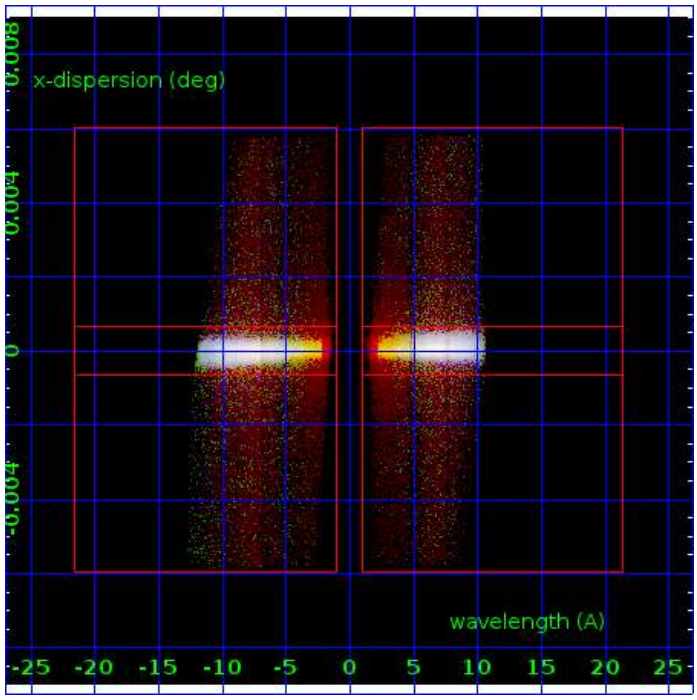
HEG Order Sort 123



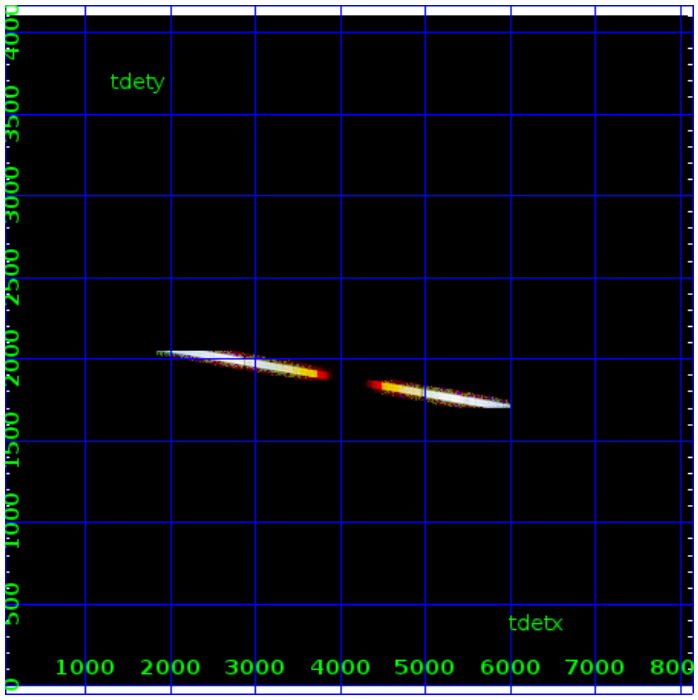
HEG Zero Order



HEG Order Sort ALL

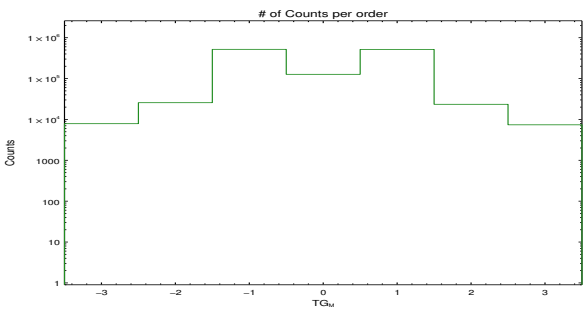


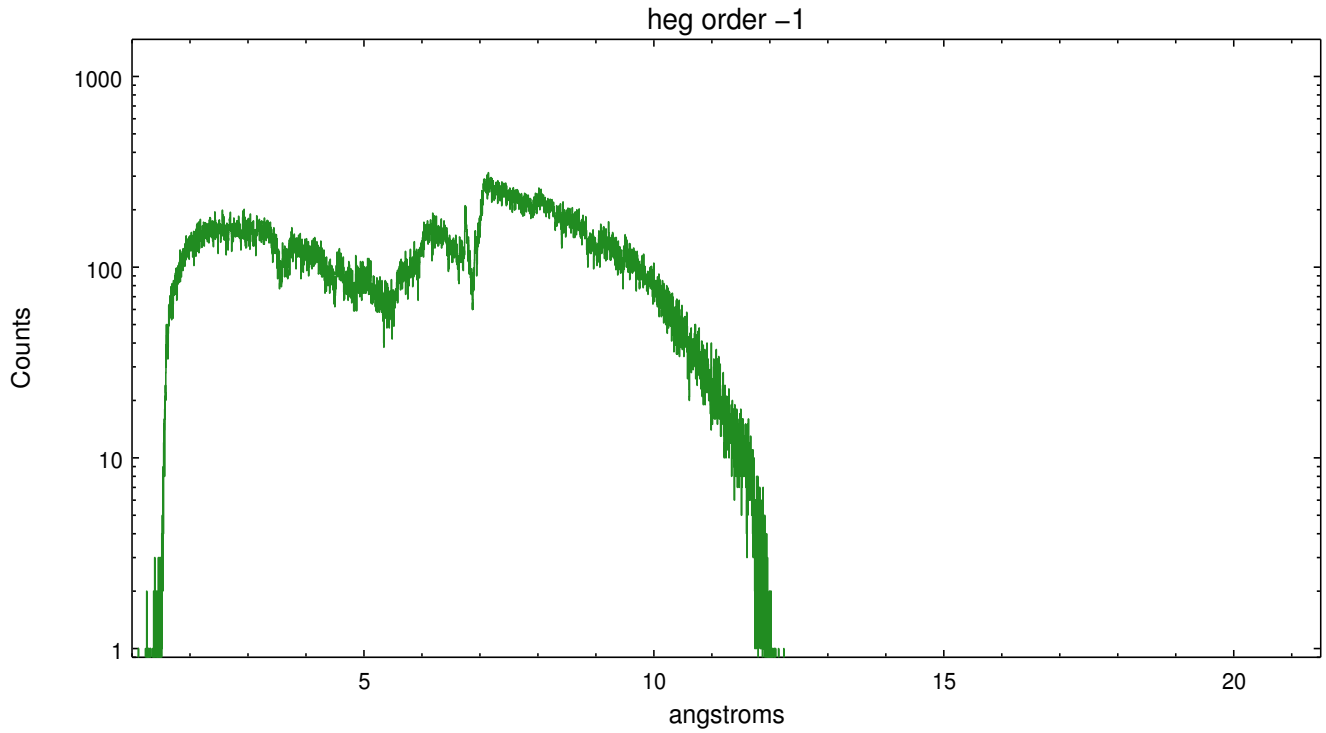
Spot Image HEG

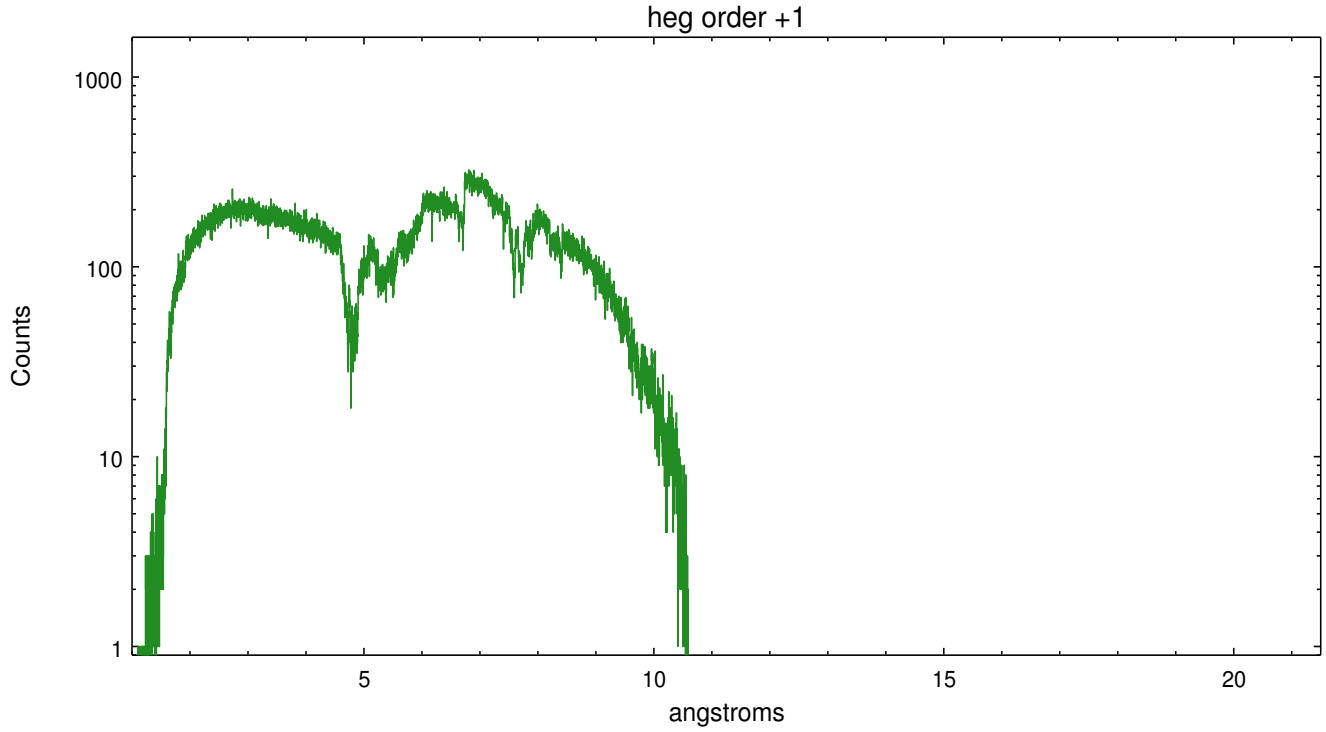


Full Detector HEG

	order -3	order -2	order -1	order 0	order 1	order 2	order 3
Events	7878	25701	518526	126848	517212	23440	7390

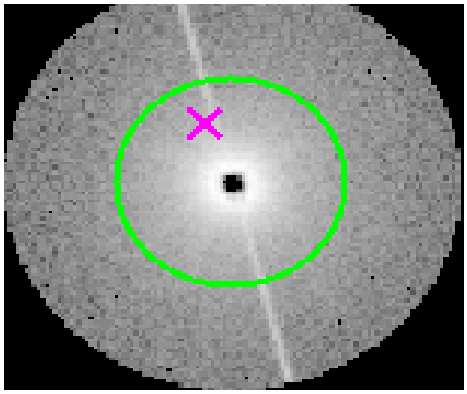



heg order −1
1000
100
10
1
Counts
5
10
15
20
angstroms

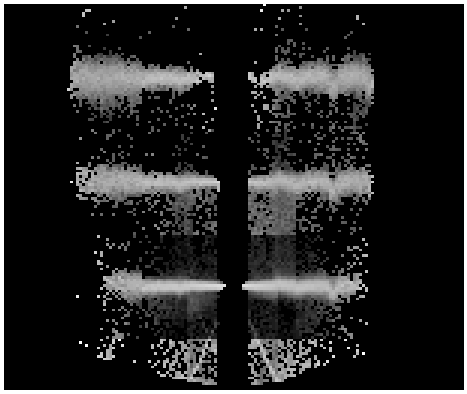

heg order +1
1000
100
10
1
Counts
5
10
15
20
angstroms

3.2 MEG Arm

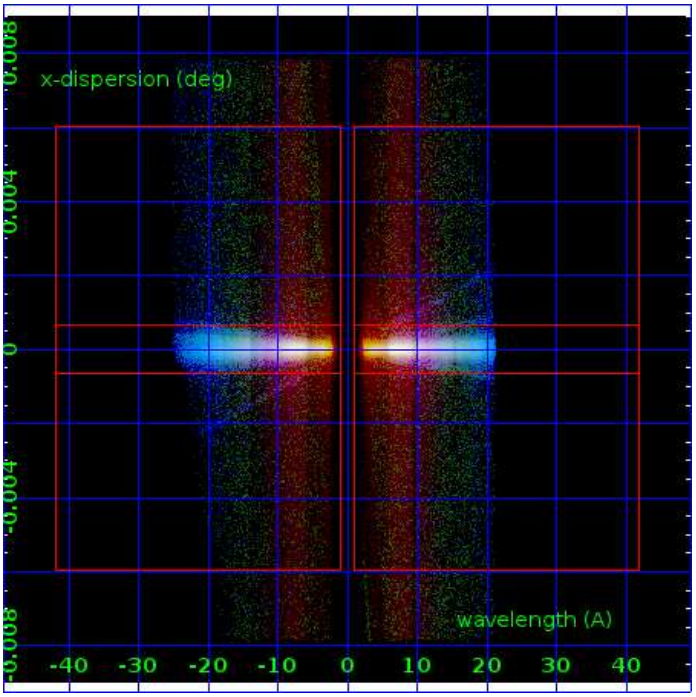
MEG Order Sort 123



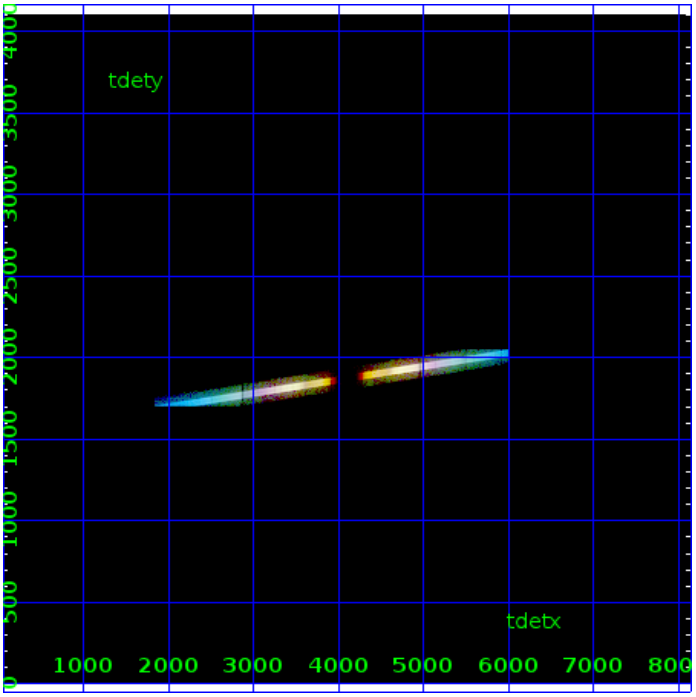
MEG Zero Order



MEG Order Sort ALL

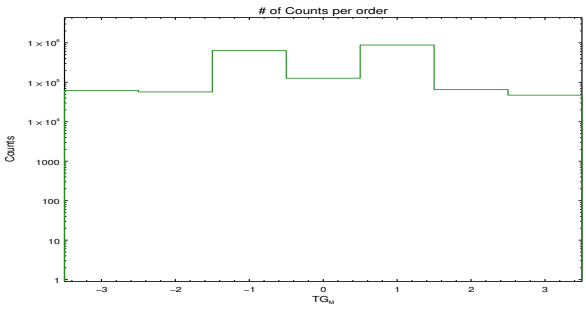


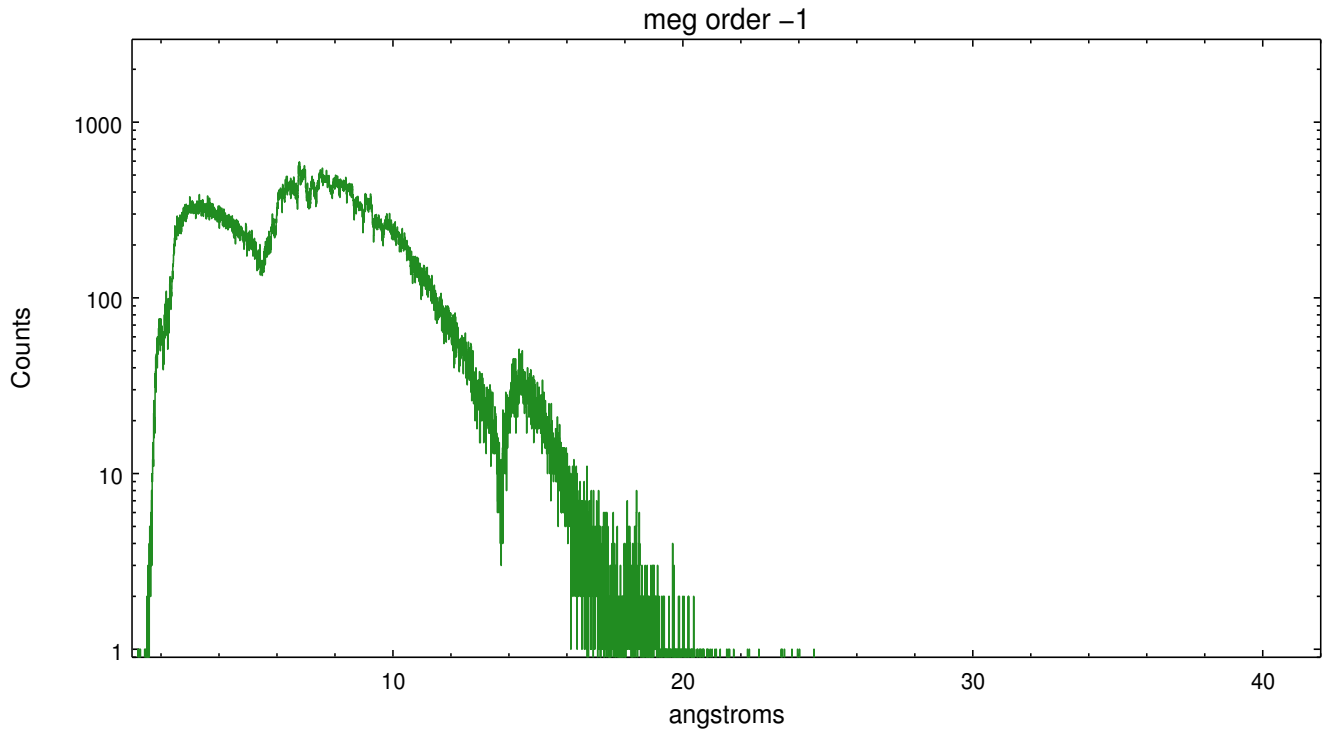
Spot Image MEG

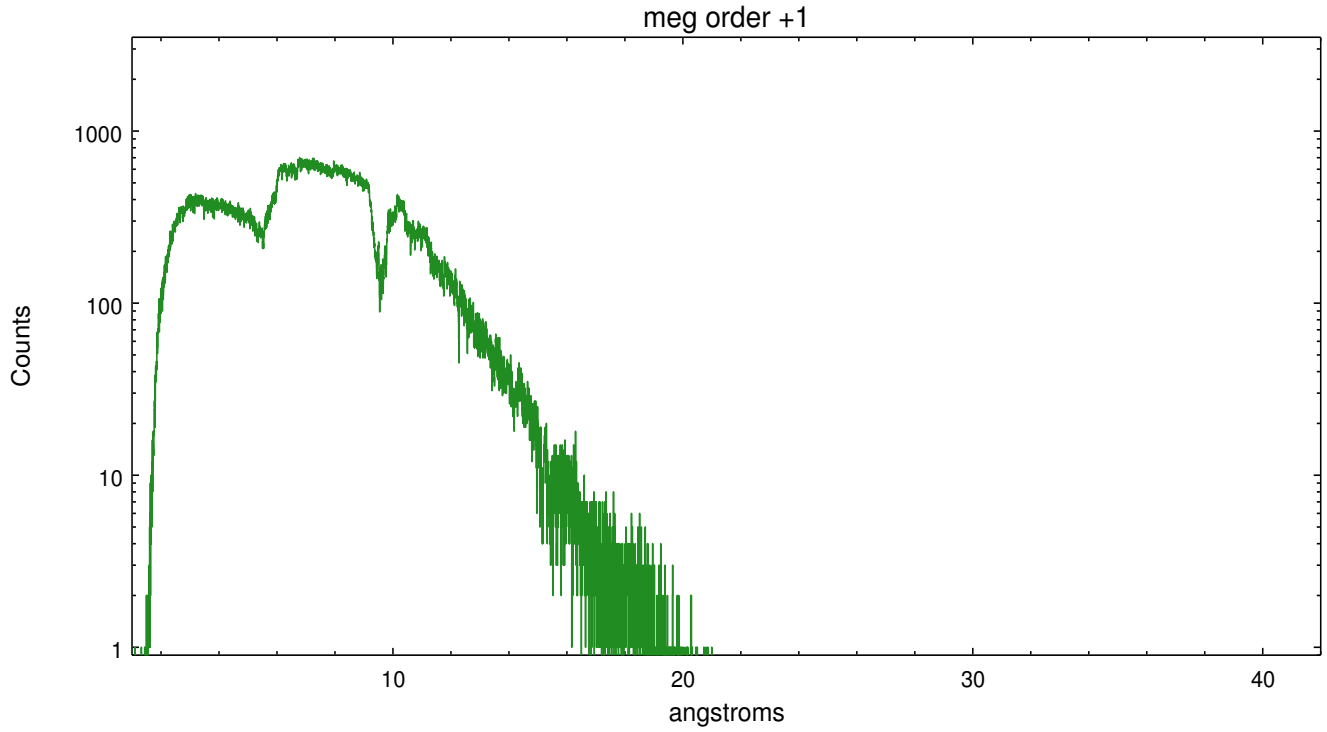


Full Detector MEG

	order -3	order -2	order -1	order 0	order 1	order 2	order 3
Events	62008	56881	633334	126848	878981	65125	47165




meg order −1
Counts
1000
100
10
1
10
20
30
40
angstroms


meg order +1
Counts
1000
100
10
1
10
20
30
40
angstroms

A Summary

A.1 Status

V&V Scientist	Joy Nichols
V&V Date (YYYY-MM-DD)	2016.01.07
V&V Edition	1
V&V Disposition and Status	OK
V&V Charge Time	24.004651

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.
====
The charge time is based on the scheduled exposure time. The high count
rate in this observation resulted in telemetry saturation and a large
number of dropped exposures (events not telemetered to the ground). As a
result, each chip has a different ONTIME. Data analysis should take
this ONTIME variation into account.
====
Chips S6 and S7 have a particularly large number of dropped frames due
to telemetry saturation. The effective exposures for the 4 chips range
from 14.9-24.1 ks.
====
Faint grating spectra can be seen in an image of bad events. This is
probably due to pileup in the spectrum, causing migration to bad grades.
This should be considered in analysis.
===
Phase constraint met.
```