COS Instrument Science Report 2010-04(v1)

SMOV: COS NUV On-orbit Optical Alignment

George F. Hartig[1], Thomas Delker[2] and Charles D. Keyes[1]

[1] Space Telescope Science Institute, Baltimore, MD
[2] Ball Aerospace Technologies Corporation, Boulder, CO

12 February 2010

ABSTRACT

Following its insertion in the HST observatory, we performed a series of measurements, repointings and mechanism adjustments to bring the COS into optical alignment with the telescope and center the NUV channel images and spectra on the detector. We describe the observations, data analysis techniques, coordinate systems and scale factors used for the alignment process. After alignment, the NUV on-orbit optical performance fully meets specifications and expectations.

Contents:

1. Introduction and Overview

The Cosmic Origins Spectrograph was successfully installed in the HST observatory on 16 May 2009, during Servicing Mission 4. After an initial outgassing period, detector high voltage activation and internal functional tests, the first external target was observed on 11 June 2009 with the NUV channel imaging (MIRRORA) mode, initiating the process of aligning COS to the observatory. Although careful alignment testing was performed during the ground verification and calibration programs, on-orbit alignment is required to compensate for uncertainties in the instrument latching and gravity release, as well as any changes that result from launch. This process involves determination of the instrument boresight in the reference frame of the Fine Guidance Sensors (FGSs), and optimization of focus and image quality. Because the instrument must correct for the large amount of third-order spherical aberration presented by the Optical Telescope Assembly (OTA), its entrance pupil must be well-aligned with the OTA exit pupil, or significant coma results. Unlike all of the other HST instruments installed since Servicing Mission 1 in 1993, COS does not incorporate a corrector mechanism to minimize pupil shear, but relies on repointing of the observatory for that function; pupil alignment is achieved at the field point whose chief ray is centered on the selected OSM1 optic, which performs the spherical aberration correction. Once that field location is determined, the COS entrance aperture must be centered on its chief ray using the aperture lateral (X,Y) positioning mechanism.

The target selected for these initial observations is an ordinary F star in the old, open cluster NGC-188, which is an astrometric field that, at declination of +85 deg, is available year-round. With selection of guide stars in the astrometric catalog, the absolute position of the target in the vehicle (V2,V3) frame can be determined, which is essential to our task of finding the optimal pointing in the FGS frame. An additional complication in this process is the need to retain the same target and guide star pair through the successive stages of the alignment, in order to maintain relative pointing. Normally, the instrument aperture location is maintained in the SIAF database file and used to direct observatory pointing, but this file, for programmatic reasons, cannot be rapidly updated with the new locations determined through the alignment stages, so an alternative scheme was implemented. Offsets to the aperture location may be uploaded via real-time command to the spacecraft and used to adjust the pointing from the nominal location in the SMS, as determined by the SIAF. These USE-OFFSET special requirements are given labels in the phase 2 proposals and their values are uplinked prior to execution; this permitted more rapid sequencing, on 48 hr centers, of the alignment observations.

We performed the COS/HST pupil alignment using the NUV channel, the imaging mode (TA1) of which permits use of standard image evaluation and optimization techniques, with the implicit assumption that the field point that maximizes NUV image quality also optimizes FUV performance, i.e., the OSM1 optics (NCM1 and the FUV gratings) are

laterally coaligned, as was verified with ground testing. The NUV alignment process was performed with two SMOV programs, executed in succession, as described below. These were followed by FUV alignment verification and focus activities for each of the three FUV gratings, which are the subject of another ISR (Lennon, et al. 2010).

Although a number of target acquisition (TA) tests were included in these alignment programs, we did not rely on autonomous acquisition for target centration until late in the process, but rather used the previous image offsets and USE-OFFSET special requirements as described above. Results of the TA tests are not further described in this ISR; however, the tests and measurements from these visits successfully led to verification of the on-board TA capabilities in the NUV channel, as described by Penton, et al. (2010).

Figure 1 shows the projections at the detector plane of the various coordinate systems used in the alignment process, indicating the aperture mechanism axes and preferred directions for hysteresis mitigation, the POS-TARG axes used for pointing offsets, and some scale factors. Also shown is the image offset, in detector pixels, of the science aperture (PSA) from the wavelength calibration aperture (WCA); knowledge of this offset permits determination of the PSA center from WCA images obtained with internal PtNe lamp illumination. The V2, V3 spacecraft coordinates, in arcseconds, are used to describe the pointing offsets in the FGS frame and specify the aperture location in the SIAF file.

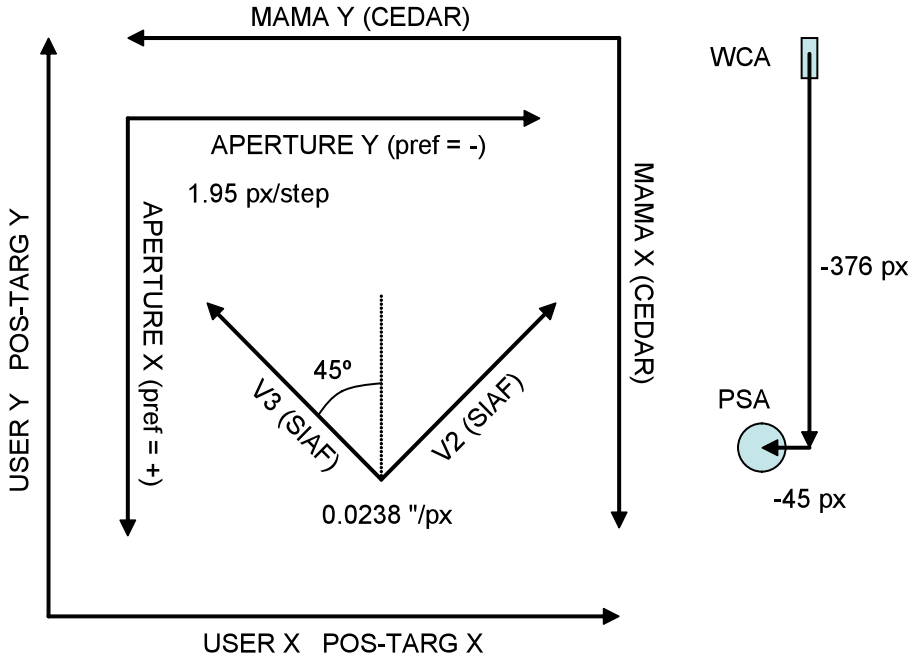

Figure 1: COS/NUV Coordinates, Alignment Information

2. COS-08 "COS to FGS Alignment" (Program 11468)

2.1 Program description

The first step in the NUV alignment process, COS-08 "COS to FGS Alignment", embodied in proposal 11468, obtained the "first light" star images in TA mode using a spiral pattern pointing sequence, effected with the POS-TARG special requirement, to determine the coarse position of the COS aperture in the FGS frame. The underlying assumption was that the aperture location determined during ground alignment is close enough to the on-orbit optimal location to permit acquisition of the star within the range covered by the scan. Images were obtained at 3 focus settings of the OSM1 mechanism, nominal and ±550 steps, to permit phase retrieval analysis of the aberration content, and determination of the amount and direction of defocus.

In addition to the search for the target specified explicitly with POS-TARGs, an initial test of the ACQ/SEARCH autonomous target acquisition was also included, as a "get-ahead" task. The confirmation image following the ACQ/SEARCH was obtained in TIME-TAG mode and included a cal lamp flash, permitting determination of the wavelength calibration aperture image location on the detector, from which the science aperture position could be inferred.

Although only a single visit was originally planned, four were eventually executed. Visit 91, repeating a portion of visit 1, was added to test correction of the reversal of the POS-TARG offsets discovered in visit 1. This was traced to an error in the ground software (TRANS), which specified the parity of the COS POS-TARG coordinate frame as negative, as for all other HST SIs, when in fact it is positive. The error was corrected with PR 62847, released for operations on 15 June 2009. Visit 92 was added to determine the offsets between images obtained with the MIRRORA and MIRRORB configurations, location of the spectral stripes from grating G285M, and to test the ACQ/IMAGE mode. Visit 93 further tested the target acquisition, including an initial test of the PEAKXD mode with grating G230L.

2.2 Measurements and analyses

Appendix A lists the observations for visits 1 and 91 of program 11468, which were used for alignment purposes (visits 92 and 93 being predominantly TA tests).

Analysis of the visit 1 images consisted first of finding the coarse position of the target in POS-TARG space by simply summing the flux in each of the images, plotting, and estimating the offset of the target from the nominal position. The image positions in detector space were also plotted, relative to the location of the PSA aperture image, as inferred from the WCA image, using offsets determined in ground testing. Figure 2 shows the nominal target (asterisk) and aperture centers in USER coordinates, as plotted

by IDL tool *cos_apers*, from visit 1. The star is clearly outside of the aperture, yet some flux was detected in the initial pointing (no POS-TARG offset) image, due to the large, spherically-aberrated PSF at the aperture. Later measurements also showed that the WCA-PSA offset used for this analysis (as determined in ground testing) needed updating for the on-orbit situation, and the aperture is actually ~20 px closer to the initial star location; an apparent ~3 degree rotation of the aperture mask relative to the detector ocurred since the TV#3 testing. Comparison of the POS-TARG and image space plots indicated the parity reversal described above, and visit 91 was implemented to test its correction in the ground system, demonstrating the proper alignment of the USER X and POS-TARG X axes.

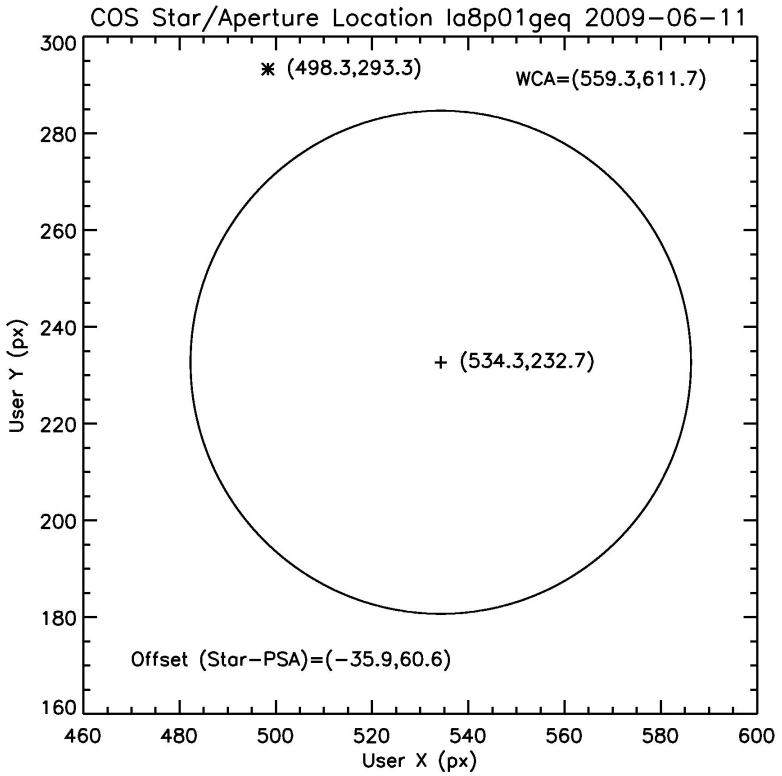

Figure 2: Initial target and aperture locations, 11468, visit 1.

Phase retrieval (PR) analysis was also performed on the set of images produced at the POS-TARG position at which the target was best centered (brightest), fitting the three focus settings simultaneously with IDL tool *cos_pr,* which is a wrapper for *cosfitc*. Using sensitivities determined with CodeV model runs simulating these observations, we then computed the image offset in user and spacecraft (V2, V3) coordinates required to compensate the measured coma. IDL tool *coscor,* which incorporates the required sensitivites, scale factors and coordinate transformations, was used for these computations. The resultant pointing offset, and the aperture mechanism offsets estimated

to center the PSA on the new target position were uplinked to the spacecraft using an Ops-request prior to execution of the first visit of program 11469 (11468 visit 2 is the dummy visit used to schedule this uplink opportunity). Focus was deemed close enough to the nominal starting position that correction was not warranted at this stage. Figure 3 shows the output produced by *cos_pr*, indicating the raw pointing and aperture offsets required to correct coma and improve aperture centration. These offsets were then adjusted to account for the POS-TARG offset of the star in the images used for the analysis and the resulting V2,V3 pointing offsets were specified (with inverted signs, as required) in the USE-OFFSET request. The aperture position was also adjusted to better center it on the new expected star position, based on its inferred location (from the WCA image).

```
cosfitc PR results  Thu Jun 11 13:28:00 2009

 file       star  xctr    yctr   foc(mm)  xcoma   ycoma   0-ast  45-ast
la8p01elq_    0   496.9   222.1  -4.291   0.047   0.042   0.007   0.017

COS alignment corrections for measured X,Y coma of (0.047,0.042) um RMS
POS-TARG offset (X,Y): (2.136,1.903) arcsec
Pointing offset (V2,V3): (2.856,-0.164) arcsec
Aperture mech offset (X,Y): (-40.0,44.9) steps
OSM1 focus offset required: -64 steps
Resulting image offset (X,Y): (80.7,77.7) px
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Figure 3: Raw results of PR analysis of 11468, visit 1.

3. COS-09 "COS NUV Optical Alignment and Focus" (Prog 11469)

3.1 Program description

After initial determination of the COS optical axis in the FGS frame and coarse aperture centration performed with program 11468, the alignment was successively refined using a series of OSM1 focus sweeps to image the same target in the first three visits (1, 3, and 5; the even numbered visit are dummies used to schedule the correction uplinks) of program 11469. In order to retain absolute pointing between visits, the plan was to use the same guide stars for each, but an SI C&DH lock-up on 15 June and subsequent troubleshooting and replanning caused sufficient delay that the initial set of guide stars could not be retained. This necessitated use of visit 93, with a new set of guide stars that would be available for the remainder of the program, back-to-back with visit 3, to determine the pointing offset induced by use of the new guide stars, even though they were selected from the same astrometric catalog.

Once the alignment was optimized with these focus scans, visit 7 was executed to check that the pupil alignment was achieved, using a 9-point raster of small POS-TARG pointing offsets, accompanied by aperture position adjustments designed to keep the target well centered in the aperture. The initial execution of this visit was only partially successful due to errors in the proposal that caused the pointing and aperture moves to be out of synch, so visit 97 was created and executed with proper offsets. Finally, when the optimal pointing had been achieved, visit 9 executed a fine scan in each axis of the aperture mechanism to assure that the PSA is well-centered on that field position.

Because of the focus uncertainty induced by the OTA breathing, an additional fine focus scan (copy of visit 5) was executed with visit 95 on 15 July, to improve focus knowledge. To assure optimal focus was achieved after the OTA SM despace was adjusted to correct its long-term drift and bring each of the SIs to a common focus, another fine focus sweep was executed on 20 July, with visit 94. This final measurement demonstrated that the image quality is excellent and matches model expectations for on-orbit performance.

3.2 Measurements and analysis

A log of the observations from program 11469 used for alignment is contained in Appendix B; visit 99 is not listed since it was created to assess target acquisition.

The focus scans performed with visits 1, 3 and 5 were analyzed with several techniques. Optimal focus was determined by measuring the PSF core encircled energy (EE) within a diameter of 0.15 arcsec, plotting EE against focus position and then fitting a gaussian (or parabola over the region near best focus) to detemine the maximum EE focus setting. The OTA breathing model was used to offset the effective focus position for each image in these sequences; although the model is not accurate enough to compute absolute OTA defocus, it is useful for predicting the relative focus during a visibility period, and improves the focus determination for each scan. Image widths were also measured by fitting (1-D) gaussian profiles to the column and row sums through the images, and plotting against focus setting. PR analysis was also performed to assess the coma content and infer the field offset at which coma would be minimized, as was done for program 11468, but fitting more focus positions simultaneously. IDL tools *cos_ee* and *cos_pr* were used for these analyses.

The final NUV focus adjustment resulted from visit 5, and was applied on 7 July, including an offset for the OTA focus adjustment scheduled for 20 July to optimize observatory focus. An OTA SM despace adjustment of + 3 μ was planned, which was projected to put the OTA focus at +0.5 μ from optimal, with the anticipation that continued slow negative drift would cause focus to move through its optimal setting over the next year or two. The COS focus was therefore adjusted to compensate 2.5 μ of SM despace, corresponding to + 120 steps of OSM1 focus, as determined using the Ball Code V model. The specified COS focus adjustment also included compensation for an OSM1

rotation offset to correct astigmatism (see below); a focus offset of -42 steps corrects for the rotary offset of -1 step.

The NUV channel is also sensitive to misalignment of the corrected beam from NCM1 at the collimator, which is an off-axis convex paraboloid, with astigmatism resulting. This can be diagnosed by plotting the image width in the X and Y directions as a function of focus position; astigmatism is evidenced by an offset in the two FWHM minima. The alignment can then be optimized (in one axis) by adjusting the OSM1 rotation, although this is coarse: one OSM1 step corrects about 180 microns (or 79 focus steps) of offset, corresponding to ~ 8 nm RMS astigmatism. The sense of this correction is that positive OSM1 rotation corrects astigmatism that manifests as optimal focus in the dispersion direction occuring at larger focus step position than that for cross-dispersion. The initial attempt at performing this correction after visit 1 degraded the astigmatism because the correction was inadvertantly applied with the wrong sign. This was rectified in the following visits (3 and 5), after which no further alignment was required.

Figure 4 shows EE and FWHM analysis of the final confirmatory focus sweep of the NUV SMOV alignment process, with dispersion and cross-dispersion widths shown as crosses and asterisks, respectively, with only an uncorrectably small offset between their respective minima. The dotted-line fit on the right hand plot is to the dispersion direction image width, which is more important than the width in the cross-dispersion direction, since it determines spectral resolution. Hence the optimal focus had been set at -89 steps (absolute), within 9 steps of the fit position in the confirmatory visit 94 data, well within the OTA breathing uncertainty. Both FWHM and EE values at the adopted focus settings of the OTA and COS indicate that near-optimal alignment has been achieved and that resolution specifications are readily met.

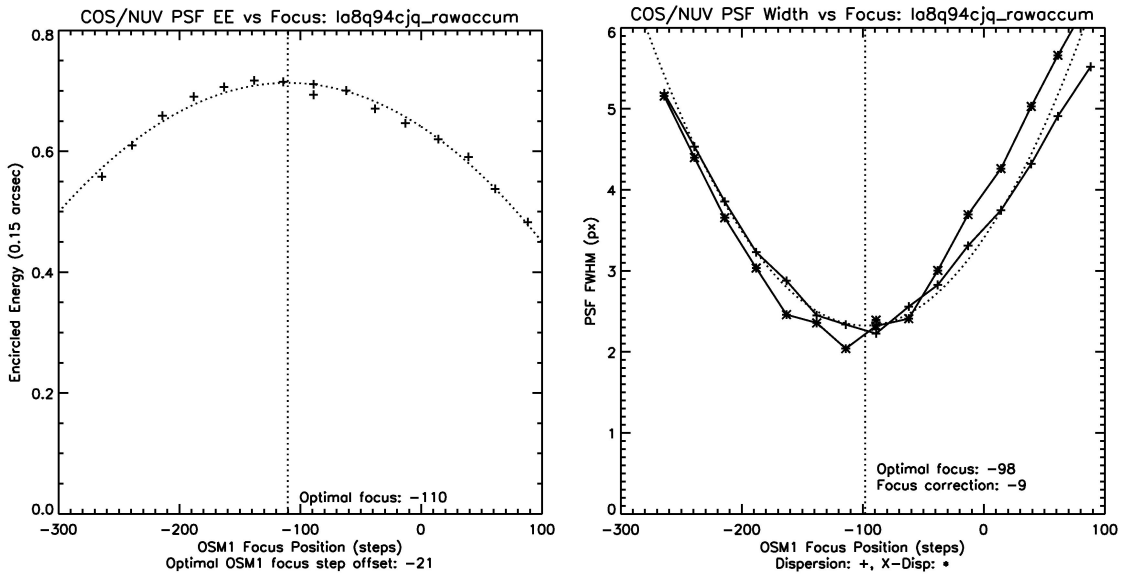

Figure 4: Results of PSF EE and width analyses of 11469, visit 94.

The optimal aperture position was found with the visit 9 aperture mechanism scans to be just one step off in each axis, from (125,21) to (126,22), as shown in Figure 5, which plots the summed counts in the star image vs. aperture mechanism step position. The mirror image about the selected optimal position, shown as a vertical dotted line, is plotted with dotted lines. When these offsets were applied to the onboard mechanism table, it was noticed that, when commanded to the PSA position, the mechanism did not actually move to the new (+1 step) position in Y; this was determined to be due to the deadband (2 steps) used by the flight SW to determine if the mechanism is close enough to its intended position to warrant mechanism motion. The problem was circumvented with manually commanding of oversized moves to achieve the desired +1 step in Y.

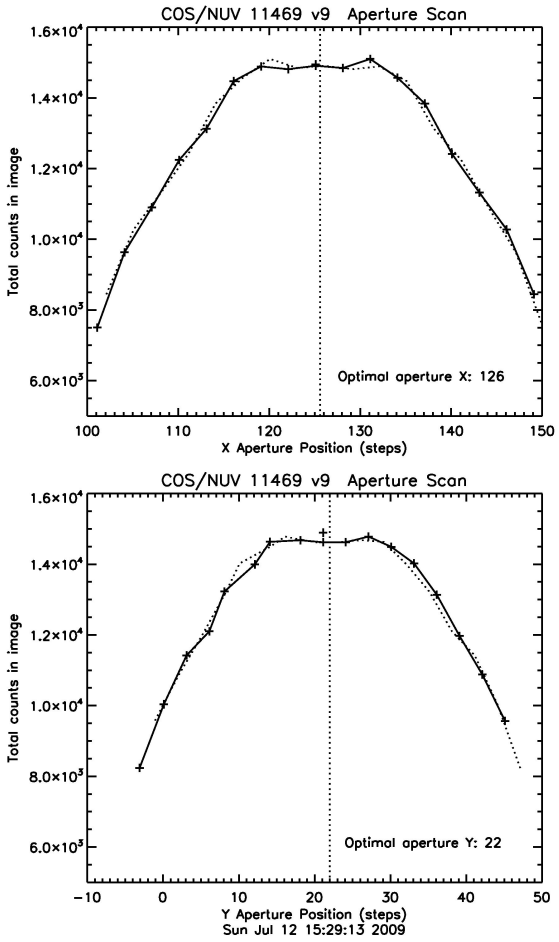

Figure 5: Aperture mechanism scan analysis of 11469, visit 9.

OSM2 rotation is used to place the image at the desired USER X position, and select the wavelength range covered by the detector for the three NUV "stripes". After the

alignment was nearly finalized, we performed this adjustment, adding 5 steps to each OSM2 setting, to approximate the advertised spectral ranges and bring the TA mode images closer to the detector center. Each positive OSM2 step moves the images ~ +49 px in USER X (dispersion), bringing shorter wavelengths onto the detector, while longer wavelengths move off.

Figure 6 shows the target centration relative to the aperture after the autonomous TA at the start of visit 94, demonstrating the fine accuracy of the TA and final placement of the aperture and target location on the detector at the end of the alignment program. The star and aperture location (computed from the WCA image) are coincident within less than 1 px at (533,281). OSM non-repeatability produces considerable (10's of px) scatter in the X location; this is ameliorated with the use of a WCA image in the TA algorithm.

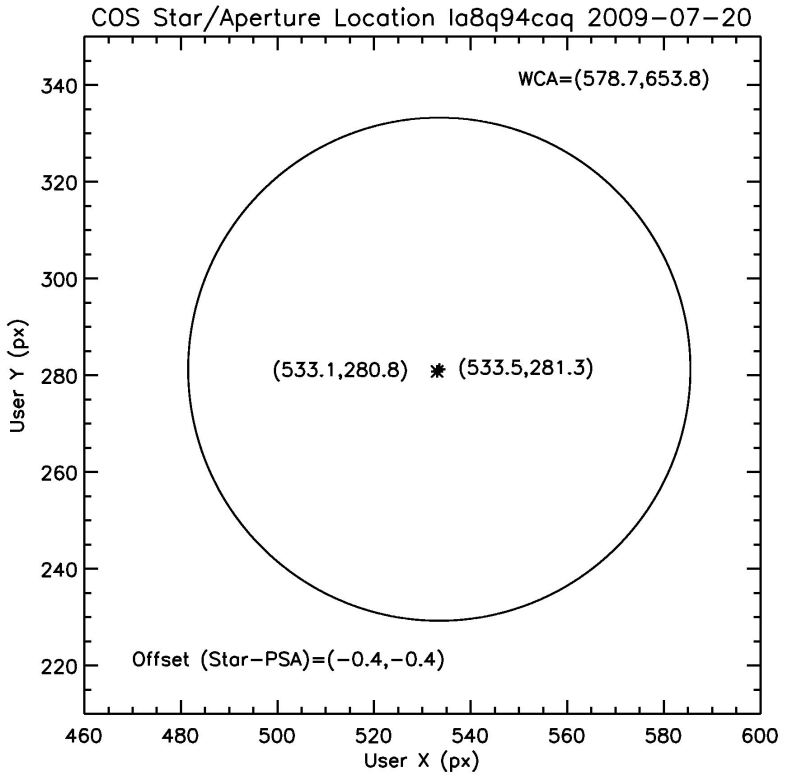

Figure 6: Target/aperture centration for 11469, visit 94.

4. Summary and Alignment Log

The optical performance of the as-aligned NUV channel in imaging mode can be assessed by comparison of the measured PSF with a model including all expected sources of aberration and image blur. Figure 7 displays the unity-normalized column sum of one of the nominal focus images from visit 94 (solid) along with a model computation (dotted) over a 21 px region, on linear and log intensity scales. The model includes the OTA mid-frequency wavefront error (WFE) due to the zonal polishing error in the PM and SM, as determined by Krist and Burrows (1995), the MAMA detector point response function measured by V. Argabright (Ball Aerospace) for the STIS NUV MAMA, and an estimate of the residual low-order WFE terms, amounting to <20 nm RMS. The agreement is very good, demonstrating that alignment and focus are nearly optimal. The FWHM of these LSFs is ~2.3 px, which easily satisfies the NUV resolving power requirement; we can expect that these image-mode results will be indicative of the performance of the NUV grating modes (with exception of grating scatter), since the camera mirror and gratings nominally have no optical power and operate in a collimated beam. The NUV optical performance is evaluated by Goudfrooij, et al. (2010).

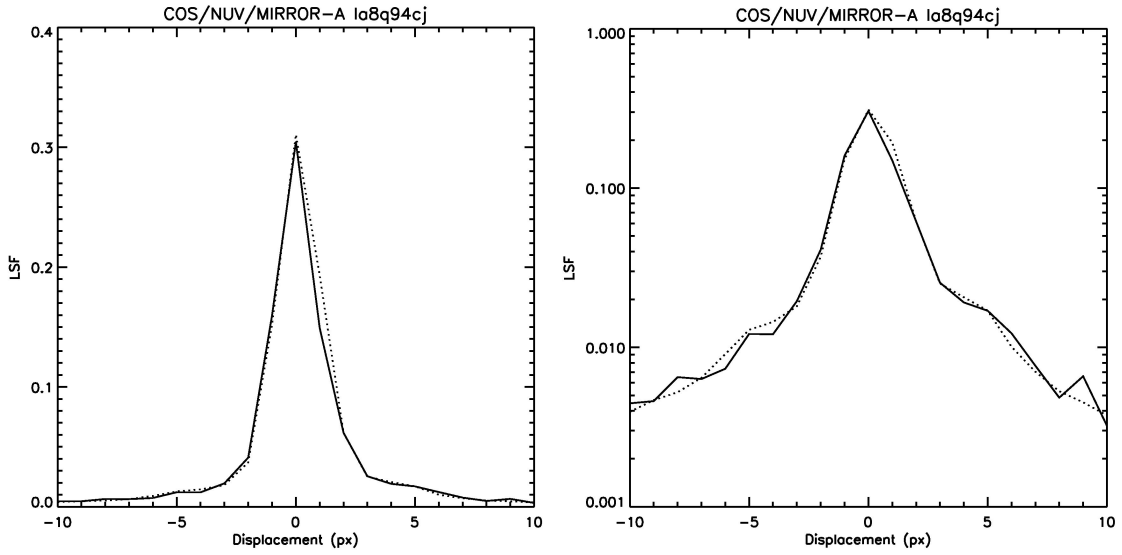

Figure 7: Comparison of LSF with model

Table 1 lists the resultant *cumulative* pointing (arcsec) and mechanism (step) offsets from the initial launch positions, resulting from each visit for which adjustments were made; several visits, especially those near the end of the program did not require any changes.

The final V2,V3 offset was applied (added) to the SIAF aperture positions on 22 July and installed in the ground system on 28 July, after which the USE-OFFSET capability was no longer required.

Table 1: COS On-orbit Alignment Offset Log

Prog:visit	Date	V2	V3	AP X	AP Y	FOC	OSM1	OSM2	comment
11468:1	11-Jun-09	-1.692	1.363	-35	26	0	0	0	first light
11469:1	13-Jun-09	-0.749	1.294	-23	15	42	1	0	
11469:3,93	3-Jul-09	-1.271	1.459	-23	34	0	0	0	new GSs
11469:5	5-Jul-09	-1.112	1.300	-22	30	45	-1	5	focus incl OTA adj
11469:9	12-Jul-09	-1.112	1.300	-21	31	45	-1	5	fine aperture scan

5. Change History for COS ISR 2010-04

Version 1: 12 February 2010 - Original Document

6. References

Krist, J. E. & Burrows, C. J. 1995, Applied Optics, 34, v22, p 4951

Lennon, D., et al. 2010, COS Instrument Science Report 2010-07

Penton, S., and Keyes, C. 2010, COS Instrument Science Report 2010-14

Goudfrooij, P., Burgh, E., Aloisi, A., Hartig, G. and Penton, P. 2010, COS Instrument Science Report 2010-10

Acknowledgements

The authors wish to thank all of the COS team members who contributed to the successful commissioning and alignment of the instrument, especially Steve Osterman, Steve Penton, and Dave Sahnow, who assisted in the alignment planning and preparation of the proposals and provided confirmation of key results as they were achieved on-orbit.

Appendix A: Program 11468 Observation Logs

11468 Visit 1 "First Light"

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8p01dxq	6/11/2009	3:55:00	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8184	(0.000,0.000)	(147,-9)	134
la8p01dyq	6/11/2009	4:40:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4042	(3.400,3.400)	(147,-9)	136
la8p01dzq	6/11/2009	4:42:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4101	(1.700,3.400)	(147,-9)	134
la8p01e0q	6/11/2009	4:43:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4095	(0.000,3.400)	(147,-9)	134
la8p01e1q	6/11/2009	4:45:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4093	(-1.700,3.400)	(147,-9)	134
la8p01e2q	6/11/2009	4:47:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4044	(-3.400,3.400)	(147,-9)	136
la8p01e3q	6/11/2009	4:49:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4029	(-3.400,1.700)	(147,-9)	134
la8p01e4q	6/11/2009	4:50:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4161	(-3.400,0.000)	(147,-9)	134
la8p01e5q	6/11/2009	4:52:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4289	(-3.400,-1.700)	(147,-9)	134
la8p01e7q	6/11/2009	4:57:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4426	(-3.400,-3.400)	(147,-9)	136
la8p01e8q	6/11/2009	4:59:11	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4669	(-1.700,-3.400)	(147,-9)	136
la8p01e9q	6/11/2009	5:00:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5007	(0.000,-3.400)	(147,-9)	134
la8p01eaq	6/11/2009	5:02:41	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5149	(1.700,-3.400)	(147,-9)	136
la8p01ebq	6/11/2009	5:04:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5288	(3.400,-3.400)	(147,-9)	134
la8p01ecq	6/11/2009	5:06:11	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5435	(3.400,-1.700)	(147,-9)	134
la8p01edq	6/11/2009	5:07:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5383	(3.400,0.000)	(147,-9)	136
la8p01eeq	6/11/2009	5:09:41	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5253	(3.400,1.700)	(147,-9)	134
la8p01efq	6/11/2009	5:11:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5074	(1.700,1.700)	(147,-9)	134
la8p01ehq	6/11/2009	5:16:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4425	(0.000,1.700)	(147,-9)	136
la8p01eiq	6/11/2009	5:18:06	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4199	(-1.700,1.700)	(147,-9)	134
la8p01ejq	6/11/2009	5:19:51	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4261	(-1.700,0.000)	(147,-9)	134
la8p01ekq	6/11/2009	5:21:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4383	(-1.700,-1.700)	(147,-9)	134
la8p01elq	6/11/2009	5:23:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18205	(0.000,-1.700)	(147,-9)	134
la8p01emq	6/11/2009	5:25:06	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8461	(1.700,-1.700)	(147,-9)	134
la8p01enq	6/11/2009	5:26:51	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5223	(1.700,0.000)	(147,-9)	134
la8p01eoq	6/11/2009	5:28:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8312	(0.000,0.000)	(147,-9)	134
la8p01epq	6/11/2009	5:30:25	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4152	(3.400,3.400)	(147,-9)	417
la8p01erq	6/11/2009	6:16:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4116	(1.700,3.400)	(147,-9)	417
la8p01esq	6/11/2009	6:17:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4009	(0.000,3.400)	(147,-9)	415
la8p01etq	6/11/2009	6:19:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4031	(-1.700,3.400)	(147,-9)	417
la8p01euq	6/11/2009	6:21:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4127	(-3.400,3.400)	(147,-9)	415

la8p01evq	6/11/2009	6:23:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4137	(-3.400,1.700)	(147,-9)	415
la8p01ewq	6/11/2009	6:24:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4180	(-3.400,0.000)	(147,-9)	415
la8p01exq	6/11/2009	6:26:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4008	(-3.400,-1.700)	(147,-9)	417
la8p01eyq	6/11/2009	6:28:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4047	(-3.400,-3.400)	(147,-9)	415
la8p01ezq	6/11/2009	6:30:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4191	(-1.700,-3.400)	(147,-9)	417
la8p01f1q	6/11/2009	6:34:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4495	(0.000,-3.400)	(147,-9)	417
la8p01f2q	6/11/2009	6:36:41	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4607	(1.700,-3.400)	(147,-9)	417
la8p01f3q	6/11/2009	6:38:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4701	(3.400,-3.400)	(147,-9)	415
la8p01f4q	6/11/2009	6:40:11	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4760	(3.400,-1.700)	(147,-9)	417
la8p01f5q	6/11/2009	6:41:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4762	(3.400,0.000)	(147,-9)	415
la8p01f6q	6/11/2009	6:43:41	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4929	(3.400,1.700)	(147,-9)	417
la8p01f7q	6/11/2009	6:45:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4917	(1.700,1.700)	(147,-9)	415
la8p01f8q	6/11/2009	6:47:11	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4839	(0.000,1.700)	(147,-9)	415
la8p01f9q	6/11/2009	6:48:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4831	(-1.700,1.700)	(147,-9)	415
la8p01fbq	6/11/2009	6:53:51	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4511	(-1.700,0.000)	(147,-9)	417
la8p01fcq	6/11/2009	6:55:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4348	(-1.700,-1.700)	(147,-9)	415
la8p01fdq	6/11/2009	6:57:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17855	(0.000,-1.700)	(147,-9)	415
la8p01feq	6/11/2009	6:59:06	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8014	(1.700,-1.700)	(147,-9)	415
la8p01ffq	6/11/2009	7:00:51	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4821	(1.700,0.000)	(147,-9)	415
la8p01fgq	6/11/2009	7:02:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	9958	(0.000,0.000)	(147,-9)	415
la8p01fhq	6/11/2009	7:51:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3835	(3.400,3.400)	(147,-9)	-690
la8p01fiq	6/11/2009	7:53:30	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3833	(1.700,3.400)	(147,-9)	-690
la8p01fjq	6/11/2009	7:55:15	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3996	(0.000,3.400)	(147,-9)	-690
la8p01flq	6/11/2009	8:00:10	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3873	(-1.700,3.400)	(147,-9)	-690
la8p01fmq	6/11/2009	8:01:55	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4024	(-3.400,3.400)	(147,-9)	-690
la8p01fnq	6/11/2009	8:03:40	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3985	(-3.400,1.700)	(147,-9)	-690
la8p01foq	6/11/2009	8:05:25	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4026	(-3.400,0.000)	(147,-9)	-690
la8p01fpq	6/11/2009	8:07:10	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	3865	(-3.400,-1.700)	(147,-9)	-690
la8p01fqq	6/11/2009	8:08:55	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4007	(-3.400,-3.400)	(147,-9)	-690
la8p01frq	6/11/2009	8:10:40	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4116	(-1.700,-3.400)	(147,-9)	-690
la8p01fsq	6/11/2009	8:12:25	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4240	(0.000,-3.400)	(147,-9)	-690
la8p01ftq	6/11/2009	8:14:10	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4417	(1.700,-3.400)	(147,-9)	-690
la8p01fvq	6/11/2009	8:19:05	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4314	(3.400,-3.400)	(147,-9)	-690
la8p01fwq	6/11/2009	8:20:50	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4385	(3.400,-1.700)	(147,-9)	-690
la8p01fxq	6/11/2009	8:22:35	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4453	(3.400,0.000)	(147,-9)	-690
la8p01fyq	6/11/2009	8:24:20	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4475	(3.400,1.700)	(147,-9)	-690

la8p01fzq	6/11/2009	8:26:05	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4283	(1.700,1.700)	(147,-9)	- 688
la8p01g0q	6/11/2009	8:27:50	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4333	(0.000,1.700)	(147,-9)	- 690
la8p01g1q	6/11/2009	8:29:35	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4321	(-1.700,1.700)	(147,-9)	- 688
la8p01g2q	6/11/2009	8:31:20	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4358	(-1.700,0.000)	(147,-9)	- 690
la8p01g3q	6/11/2009	8:33:05	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4298	(-1.700,-1.700)	(147,-9)	- 688
la8p01g5q	6/11/2009	8:38:00	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17967	(0.000,-1.700)	(147,-9)	- 688
la8p01g6q	6/11/2009	9:27:30	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	7826	(1.700,-1.700)	(147,-9)	- 690
la8p01g7q	6/11/2009	9:29:15	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4538	(1.700,0.000)	(147,-9)	- 688
la8p01g8q	6/11/2009	9:31:00	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8044	(0.000,0.000)	(147,-9)	- 690
la8p01gaq	6/11/2009	9:49:37	PSA	ACQ/SEARCH	ACCUM	0x0	MIRRORA/3	14	3206		(147,-9)	- 136
la8p01gbq	6/11/2009	9:53:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8095	(0.000,0.000)	(147,-9)	- 136
la8p01geq	6/11/2009	9:56:01	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	20896	(0.000,0.000)	(147,-9)	- 134
la8p01ggq	6/11/2009	9:59:22	PSA	ACQ/IMAGE	ACCUM	816x345	MIRRORA/3	7	5262		(147,-9)	- 136
la8p01giq	6/11/2009	10:03:57	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	16659	(0.000,0.000)	(147,-9)	- 136
la8p01gkq	6/11/2009	10:07:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4041	(0.000,0.000)	(147,9)	415
la8p01gmq	6/11/2009	10:09:48	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	55361		(147,9)	415
la8p01goq	6/11/2009	10:12:12	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	56448		(147,-9)	- 690
la8p01gqq	6/11/2009	10:13:58	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4009	(0.000,0.000)	(147,-9)	- 690
la8p01grq	6/11/2009	11:03:13	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORB/3	400	26111	(0.000,0.000)	(147,-9)	- 688
la8p01gtq	6/11/2009	11:10:48	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORB/3	400	25756	(0.000,0.000)	(147,9)	417
la8p01gvq	6/11/2009	11:19:36	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORB/3	320	45493	(0.000,0.000)	(147,-9)	- 134
la8p01gxq	6/11/2009	11:27:21	PSA	ACQ/IMAGE	ACCUM	816x345	MIRRORB/3	30	7035		(147,-9)	- 134
la8p01gzq	6/11/2009	11:43:16	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORB/3	400	50236	(0.000,0.000)	(147,-9)	- 136

11468 Visit 91: Test of POS-TARG correction

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8p91acq	7/3/2009	19:18:15	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17503	(0.000,0.000)	(124,6)	-91
la8p91adq	7/3/2009	19:20:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	5351	(1.700,1.700)	(124,6)	-93
la8p91aeq	7/3/2009	19:21:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	8058	(0.000,1.700)	(124,6)	-93
la8p91agq	7/3/2009	19:23:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4710	(1.700,1.700)	(124,6)	-91
la8p91ahq	7/3/2009	19:25:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4853	(1.700,0.000)	(124,6)	-93
la8p91aiq	7/3/2009	19:27:01	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4938	(1.700,-1.700)	(124,6)	-93
la8p91ajq	7/3/2009	19:28:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4866	(0.000,-1.700)	(124,6)	-93
la8p91akq	7/3/2009	19:30:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	4779	(-1.700,-1.700)	(124,6)	-91
la8p91alq	7/3/2009	19:32:16	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	9522	(1.700,0.000)	(124,6)	-91

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la8p91anq 7/3/2009 19:52:07 PSA ACQ/SEARCH ACCUM   0x0       MIRRORA/3   14   3138              (124,6) -93
la8p91asq 7/3/2009 19:56:47 PSA EXTERNAL   T-TAG   1024x1024 MIRRORA/3   60  33415 (0.000,0.000) (124,6) -93
la8p91auq 7/3/2009 20:00:26 PSA EXTERNAL   T-TAG   1024x1024 MIRRORB/3  260  36861 (0.000,0.000) (124,6) -91
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Appendix B: Program 11469 Observation Log

11469 Visit 1: Coarse focus scan #1

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q01q3q	6/13/2009	14:13:22	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	29003	(0.000,0.000)	(112,16)	-134
la8q01q5q	6/13/2009	14:16:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16456	(0.000,0.000)	(112,16)	-134
la8q01q6q	6/13/2009	14:18:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16309	(0.000,0.000)	(112,16)	-665
la8q01q7q	6/13/2009	14:19:50	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16628	(0.000,0.000)	(112,16)	-589
la8q01q8q	6/13/2009	14:21:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16392	(0.000,0.000)	(112,16)	-513
la8q01q9q	6/13/2009	14:23:02	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16339	(0.000,0.000)	(112,16)	-439
la8q01qaq	6/13/2009	14:24:38	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16355	(0.000,0.000)	(112,16)	-363
la8q01qbq	6/13/2009	14:26:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16556	(0.000,0.000)	(112,16)	-286
la8q01qcq	6/13/2009	14:27:50	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16332	(0.000,0.000)	(112,16)	-210
la8q01qdq	6/13/2009	14:29:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16461	(0.000,0.000)	(112,16)	-136
la8q01qfq	6/13/2009	14:34:23	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	28692	(0.000,0.000)	(112,16)	-136
la8q01qhq	6/13/2009	14:37:38	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16203	(0.000,0.000)	(112,16)	-60
la8q01qiq	6/13/2009	14:39:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16224	(0.000,0.000)	(112,16)	16
la8q01qjq	6/13/2009	14:40:50	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16066	(0.000,0.000)	(112,16)	90
la8q01qkq	6/13/2009	14:42:26	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16009	(0.000,0.000)	(112,16)	166
la8q01qlq	6/13/2009	14:44:02	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16165	(0.000,0.000)	(112,16)	242
la8q01qmq	6/13/2009	14:45:38	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16070	(0.000,0.000)	(112,16)	316
la8q01qnq	6/13/2009	14:47:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16393	(0.000,0.000)	(112,16)	392
la8q01qoq	6/13/2009	14:49:02	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16190	(0.000,0.000)	(112,16)	-136
la8q01qqq	6/13/2009	14:53:40	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	29165	(0.000,0.000)	(112,16)	-134

11469 Visit 3: Coarse focus scan #2

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q03unq	7/3/2009	14:31:29	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	28669	(0.000,0.000)	(124,6)	-93
la8q03uqq	7/3/2009	14:34:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15651	(0.000,0.000)	(124,6)	-93
la8q03urq	7/3/2009	14:36:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15931	(0.000,0.000)	(124,6)	-622
la8q03usq	7/3/2009	14:37:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15907	(0.000,0.000)	(124,6)	-546
la8q03utq	7/3/2009	14:39:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16338	(0.000,0.000)	(124,6)	-470
la8q03uuq	7/3/2009	14:41:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16166	(0.000,0.000)	(124,6)	-395
la8q03uvq	7/3/2009	14:42:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16502	(0.000,0.000)	(124,6)	-319
la8q03uwq	7/3/2009	14:44:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16739	(0.000,0.000)	(124,6)	-243
la8q03uxq	7/3/2009	14:45:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17005	(0.000,0.000)	(124,6)	-169
la8q03uyq	7/3/2009	14:47:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17174	(0.000,0.000)	(124,6)	-93
la8q03vpq	7/3/2009	14:52:30	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	30602	(0.000,0.000)	(124,6)	-91
la8q03vrq	7/3/2009	14:55:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17549	(0.000,0.000)	(124,6)	-17
la8q03vsq	7/3/2009	14:57:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16866	(0.000,0.000)	(124,6)	59
la8q03vtq	7/3/2009	14:58:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16618	(0.000,0.000)	(124,6)	133
la8q03vuq	7/3/2009	15:00:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16487	(0.000,0.000)	(124,6)	209
la8q03vvq	7/3/2009	15:02:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16348	(0.000,0.000)	(124,6)	283
la8q03vwq	7/3/2009	15:03:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16193	(0.000,0.000)	(124,6)	359
la8q03vxq	7/3/2009	15:05:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16433	(0.000,0.000)	(124,6)	434
la8q03vyq	7/3/2009	15:07:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16460	(0.000,0.000)	(124,6)	-93
la8q03w0q	7/3/2009	15:11:47	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	29400	(0.000,0.000)	(124,6)	-91

11469 Visit 93: Coarse focus scan #3, New GS pair

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q93wwq	7/3/2009	16:06:05	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	29578	(0.000,0.000)	(124,6)	-91
la8q93wyq	7/3/2009	16:09:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16207	(0.000,0.000)	(124,6)	-93
la8q93wzq	7/3/2009	16:10:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16449	(0.000,0.000)	(124,6)	-620
la8q93x0q	7/3/2009	16:12:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16489	(0.000,0.000)	(124,6)	-544
la8q93x1q	7/3/2009	16:14:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16589	(0.000,0.000)	(124,6)	-470
la8q93x2q	7/3/2009	16:15:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16591	(0.000,0.000)	(124,6)	-393
la8q93x4q	7/3/2009	16:17:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16559	(0.000,0.000)	(124,6)	-317
la8q93x5q	7/3/2009	16:18:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16815	(0.000,0.000)	(124,6)	-243
la8q93x6q	7/3/2009	16:20:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17133	(0.000,0.000)	(124,6)	-167
la8q93x7q	7/3/2009	16:22:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17273	(0.000,0.000)	(124,6)	-91
la8q93xkq	7/3/2009	16:27:06	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	31586	(0.000,0.000)	(124,6)	-91
la8q93xmq	7/3/2009	16:30:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18259	(0.000,0.000)	(124,6)	-17
la8q93xnq	7/3/2009	16:31:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18147	(0.000,0.000)	(124,6)	59
la8q93xoq	7/3/2009	16:33:33	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18227	(0.000,0.000)	(124,6)	133
la8q93xpq	7/3/2009	16:35:09	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17851	(0.000,0.000)	(124,6)	209
la8q93xqq	7/3/2009	16:36:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17864	(0.000,0.000)	(124,6)	285
la8q93xrq	7/3/2009	16:38:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17717	(0.000,0.000)	(124,6)	359
la8q93xsq	7/3/2009	16:39:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17326	(0.000,0.000)	(124,6)	434
la8q93xtq	7/3/2009	16:41:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17148	(0.000,0.000)	(124,6)	-91
la8q93xvq	7/3/2009	16:46:23	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	30213	(0.000,0.000)	(124,6)	-91

11469 Visit 5: Fine focus scan #1

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q05ewq	7/6/2009	15:56:08	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33313	(0.000,0.000)	(124,25)	-134
la8q05eyq	7/6/2009	15:59:12	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20122	(0.000,0.000)	(124,25)	-134
la8q05f0q	7/6/2009	16:00:54	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20310	(0.000,0.000)	(124,25)	-309
la8q05f1q	7/6/2009	16:02:29	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20123	(0.000,0.000)	(124,25)	-284
la8q05f2q	7/6/2009	16:04:04	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20178	(0.000,0.000)	(124,25)	-260
la8q05f3q	7/6/2009	16:05:39	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20165	(0.000,0.000)	(124,25)	-233
la8q05f4q	7/6/2009	16:07:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20111	(0.000,0.000)	(124,25)	-210
la8q05f5q	7/6/2009	16:08:49	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20216	(0.000,0.000)	(124,25)	-184
la8q05f6q	7/6/2009	16:10:24	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20654	(0.000,0.000)	(124,25)	-159
la8q05f7q	7/6/2009	16:11:59	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20761	(0.000,0.000)	(124,25)	-134
la8q05feq	7/6/2009	16:16:56	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34300	(0.000,0.000)	(124,25)	-134
la8q05fgq	7/6/2009	16:20:10	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21720	(0.000,0.000)	(124,25)	-110
la8q05fhq	7/6/2009	16:21:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21846	(0.000,0.000)	(124,25)	-83
la8q05fiq	7/6/2009	16:23:20	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21496	(0.000,0.000)	(124,25)	-60
la8q05fjq	7/6/2009	16:24:55	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21956	(0.000,0.000)	(124,25)	-33
la8q05fkq	7/6/2009	16:26:30	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21606	(0.000,0.000)	(124,25)	-9
la8q05flq	7/6/2009	16:28:05	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21277	(0.000,0.000)	(124,25)	18
la8q05fmq	7/6/2009	16:29:40	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21276	(0.000,0.000)	(124,25)	43
la8q05fnq	7/6/2009	16:31:22	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21252	(0.000,0.000)	(124,25)	-134
la8q05fpq	7/6/2009	16:36:00	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33774	(0.000,0.000)	(124,25)	-134

11469 Visit 7: Pointing raster

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q07rpq	7/8/2009	17:25:19	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33348	(0.000,0.000)	(124,21)	-87
la8q07rrq	7/8/2009	17:28:27	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	58211		(124,21)	-87
la8q07rtq	7/8/2009	17:30:13	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20086	(0.000,0.000)	(124,21)	-85
la8q07ruq	7/8/2009	17:32:10	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18778	(-0.476,0.476)	(125,21)	-87
la8q07rvq	7/8/2009	17:33:53	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19742	(0.000,0.476)	(125,22)	-85
la8q07rwq	7/8/2009	17:35:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18029	(0.476,0.476)	(125,22)	-87
la8q07rxq	7/8/2009	17:37:23	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19158	(0.476,0.000)	(125,22)	-87
la8q07ryq	7/8/2009	17:39:06	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20239	(0.000,0.000)	(125,21)	-85
la8q07rzq	7/8/2009	17:40:49	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20277	(-0.476,0.000)	(125,20)	-85
la8q07s0q	7/8/2009	17:42:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18555	(-0.476,-0.476)	(125,21)	-85
la8q07s1q	7/8/2009	17:44:19	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19548	(0.000,-0.476)	(125,22)	-85
la8q07s3q	7/8/2009	17:49:32	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18809	(0.476,0.476)	(125,22)	-87
la8q07s4q	7/8/2009	17:51:29	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20928	(0.000,0.000)	(125,20)	-85
la8q07s6q	7/8/2009	17:54:13	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34203	(0.000,0.000)	(125,20)	-87
la8q07s8q	7/8/2009	17:57:21	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	59035		(125,20)	-85

11469 Visit 97: Pointing raster, repeat

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q97egq	7/10/2009	17:30:51	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33140	(0.000,0.000)	(125,21)	-87
la8q97enq	7/10/2009	17:33:59	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	59076		(125,21)	-87
la8q97epq	7/10/2009	17:35:45	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19921	(0.000,0.000)	(125,21)	-89
la8q97eqq	7/10/2009	17:37:40	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20356	(0.476,-0.476)	(135,31)	-87
la8q97erq	7/10/2009	17:39:23	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20610	(0.000,-0.476)	(135,21)	-89
la8q97esq	7/10/2009	17:41:06	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20410	(-0.476,-0.476)	(135,10)	-87
la8q97etq	7/10/2009	17:42:53	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20118	(-0.476,0.000)	(125,10)	-89
la8q97euq	7/10/2009	17:44:36	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20413	(0.000,0.000)	(125,21)	-89
la8q97evq	7/10/2009	17:46:19	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20415	(0.476,0.000)	(125,31)	-87
la8q97ewq	7/10/2009	17:48:06	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20512	(0.476,0.476)	(115,31)	-87
la8q97exq	7/10/2009	17:49:49	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20249	(0.000,0.476)	(115,21)	-87
la8q97ezq	7/10/2009	17:57:25	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20273	(-0.476,0.476)	(115,10)	-87
la8q97f0q	7/10/2009	17:59:22	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20319	(0.000,0.000)	(125,21)	-89
la8q97f8q	7/10/2009	18:47:24	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33551	(0.000,0.000)	(125,21)	-89
la8q97faq	7/10/2009	18:57:26	WCA	WAVE-P1/L	T-TAG	1024x1024	MIRRORA/3	20	58725		(125,21)	-89

11469 Visit 9: Fine aperture mechanism scan

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q09hpq	7/12/2009	7:55:18	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34057	(0.000,0.000)	(125,21)	-89
la8q09hrq	7/12/2009	7:58:22	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20542	(0.000,0.000)	(125,21)	-87
la8q09hsq	7/12/2009	8:00:07	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	13221	(0.000,0.000)	(101,21)	-87
la8q09htq	7/12/2009	8:01:54	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15221	(0.000,0.000)	(104,21)	-87
la8q09huq	7/12/2009	8:03:41	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16600	(0.000,0.000)	(107,21)	-87
la8q09hvq	7/12/2009	8:05:28	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17730	(0.000,0.000)	(110,21)	-87
la8q09hwq	7/12/2009	8:07:15	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18634	(0.000,0.000)	(113,21)	-87
la8q09hxq	7/12/2009	8:09:02	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19897	(0.000,0.000)	(116,21)	-87
la8q09hyq	7/12/2009	8:10:49	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20233	(0.000,0.000)	(119,21)	-87

la8q09hzq	7/12/2009	8:12:36	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19923	(0.000,0.000)	(122,21)	-87
la8q09i1q	7/12/2009	8:17:53	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20242	(0.000,0.000)	(125,21)	-87
la8q09i3q	7/12/2009	8:19:40	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20100	(0.000,0.000)	(128,21)	-87
la8q09i4q	7/12/2009	8:21:27	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20387	(0.000,0.000)	(131,21)	-89
la8q09i5q	7/12/2009	8:23:14	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19789	(0.000,0.000)	(134,21)	-87
la8q09idq	7/12/2009	9:06:02	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19233	(0.000,0.000)	(137,21)	-87
la8q09ieq	7/12/2009	9:07:49	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17899	(0.000,0.000)	(140,21)	-89
la8q09ifq	7/12/2009	9:09:36	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16799	(0.000,0.000)	(143,21)	-89
la8q09igq	7/12/2009	9:11:23	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15708	(0.000,0.000)	(146,21)	-89
la8q09ihq	7/12/2009	9:13:10	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	13888	(0.000,0.000)	(149,21)	-87
la8q09ikq	7/12/2009	9:18:27	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20595	(0.000,0.000)	(125,21)	-87
la8q09ilq	7/12/2009	9:20:07	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15573	(0.000,0.000)	(125,45)	-89
la8q09imq	7/12/2009	9:21:47	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	16935	(0.000,0.000)	(125,42)	-87
la8q09inq	7/12/2009	9:23:27	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18275	(0.000,0.000)	(125,39)	-89
la8q09ioq	7/12/2009	9:25:07	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19742	(0.000,0.000)	(125,36)	-89
la8q09ipq	7/12/2009	9:26:47	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20580	(0.000,0.000)	(125,33)	-89
la8q09iqq	7/12/2009	9:28:27	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21127	(0.000,0.000)	(125,30)	-87
la8q09irq	7/12/2009	9:30:07	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21381	(0.000,0.000)	(125,27)	-89
la8q09isq	7/12/2009	9:31:47	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20940	(0.000,0.000)	(125,24)	-89
la8q09iuq	7/12/2009	9:36:57	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20421	(0.000,0.000)	(125,21)	-89
la8q09ivq	7/12/2009	9:38:37	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20407	(0.000,0.000)	(125,18)	-89
la8q09iwq	7/12/2009	9:40:17	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	20307	(0.000,0.000)	(125,14)	-87
la8q09ixq	7/12/2009	9:41:57	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	19539	(0.000,0.000)	(125,12)	-87
la8q09iyq	7/12/2009	9:43:37	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	18803	(0.000,0.000)	(125,8)	-89
la8q09izq	7/12/2009	9:45:17	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17774	(0.000,0.000)	(125,6)	-87
la8q09j0q	7/12/2009	9:46:57	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	17005	(0.000,0.000)	(125,3)	-89
la8q09j1q	7/12/2009	9:48:37	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	15687	(0.000,0.000)	(125,0)	-87
la8q09j2q	7/12/2009	9:50:17	RMR	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	13641	(0.000,0.000)	(125,-3)	-87
la8q09j4q	7/12/2009	9:55:31	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	33756	(0.000,0.000)	(125,21)	-87
la8q09j6q	7/12/2009	9:59:29	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	40	20580	(0.000,0.000)	(125,21)	-87
la8q09j8q	7/12/2009	10:41:19	PSA	ACQ/IMAGE	ACCUM	816x345	MIRRORA/3	7	4683		(125,21)	-89
la8q09jaq	7/12/2009	10:45:24	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	30	23082	(0.000,0.000)	(125,21)	-87
la8q09jcq	7/12/2009	10:48:43	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORB/3	180	24369	(0.000,0.000)	(125,21)	-89

11469 Visit 95: Fine focus scan #2

rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q95amq	7/15/2009	22:23:44	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34740	(0.000,0.000)	(126,21)	-87
la8q95asq	7/15/2009	22:29:51	PSA	ACQ/IMAGE	ACCUM	816x345	MIRRORA/3	7	16678		(126,21)	-87
la8q95auq	7/15/2009	22:34:26	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34831	(0.000,0.000)	(126,21)	-89
la8q95azq	7/15/2009	23:22:19	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	22082	(0.000,0.000)	(126,21)	-264
la8q95b0q	7/15/2009	23:23:54	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21929	(0.000,0.000)	(126,21)	-239
la8q95b1q	7/15/2009	23:25:29	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21698	(0.000,0.000)	(126,21)	-214
la8q95b2q	7/15/2009	23:27:04	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21714	(0.000,0.000)	(126,21)	-188
la8q95b3q	7/15/2009	23:28:39	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21705	(0.000,0.000)	(126,21)	-163
la8q95b4q	7/15/2009	23:30:14	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21917	(0.000,0.000)	(126,21)	-138
la8q95b5q	7/15/2009	23:31:49	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21773	(0.000,0.000)	(126,21)	-114

la8q95b6q	7/15/2009	23:33:24	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21831	(0.000,0.000)	(126,21)	-89	
la8q95b8q	7/15/2009	23:38:02	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	40	27931	(0.000,0.000)	(126,21)	-89	
la8q95baq	7/15/2009	23:40:37	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21695	(0.000,0.000)	(126,21)	-62	
la8q95bbq	7/15/2009	23:42:12	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21866	(0.000,0.000)	(126,21)	-38	
la8q95bcq	7/15/2009	23:43:47	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21979	(0.000,0.000)	(126,21)	-13	
la8q95bdq	7/15/2009	23:45:22	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21893	(0.000,0.000)	(126,21)	14	
la8q95beq	7/15/2009	23:46:57	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21806	(0.000,0.000)	(126,21)	39	
la8q95bfq	7/15/2009	23:48:32	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21756	(0.000,0.000)	(126,21)	61	
la8q95bgq	7/15/2009	23:50:07	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21829	(0.000,0.000)	(126,21)	88	
la8q95bhq	7/15/2009	23:51:49	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21660	(0.000,0.000)	(126,21)	-87	
la8q95bjq	7/15/2009	23:56:27	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34812	(0.000,0.000)	(126,21)	-89	

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rootname	obs_date	obs_time	ap	obstype	obsmode	imsize	opt_confg	expo	events	X_Pos-Targ_Y	Ap-step	F-stp
la8q94c6q	7/20/2009	15:49:35	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34143	(0.000,0.000)	(126,22)	-89
la8q94c8q	7/20/2009	15:52:56	PSA	ACQ/IMAGE	ACCUM	816x345	MIRRORA/3	7	16466		(126,22)	-87
la8q94caq	7/20/2009	16:41:57	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34282	(0.000,0.000)	(126,22)	-89
la8q94ccq	7/20/2009	16:45:18	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21330	(0.000,0.000)	(126,22)	-264
la8q94cdq	7/20/2009	16:46:53	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21020	(0.000,0.000)	(126,22)	-239
la8q94ceq	7/20/2009	16:48:28	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21230	(0.000,0.000)	(126,22)	-214
la8q94cfq	7/20/2009	16:50:03	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21106	(0.000,0.000)	(126,22)	-188
la8q94cgq	7/20/2009	16:51:38	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21218	(0.000,0.000)	(126,22)	-163
la8q94chq	7/20/2009	16:53:13	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21200	(0.000,0.000)	(126,22)	-138
la8q94ciq	7/20/2009	16:54:48	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21226	(0.000,0.000)	(126,22)	-114
la8q94cjq	7/20/2009	16:56:23	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21216	(0.000,0.000)	(126,22)	-89
la8q94clq	7/20/2009	17:01:01	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	40	27605	(0.000,0.000)	(126,22)	-89
la8q94cnq	7/20/2009	17:03:36	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21505	(0.000,0.000)	(126,22)	-62
la8q94coq	7/20/2009	17:05:11	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21513	(0.000,0.000)	(126,22)	-38
la8q94cpq	7/20/2009	17:06:46	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21455	(0.000,0.000)	(126,22)	-13
la8q94cqq	7/20/2009	17:08:21	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21379	(0.000,0.000)	(126,22)	14
la8q94crq	7/20/2009	17:09:56	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21367	(0.000,0.000)	(126,22)	39
la8q94csq	7/20/2009	17:11:31	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21364	(0.000,0.000)	(126,22)	61
la8q94ctq	7/20/2009	17:13:06	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21396	(0.000,0.000)	(126,22)	88
la8q94cuq	7/20/2009	17:14:48	PSA	EXTERNAL	ACCUM	1024x1024	MIRRORA/3	60	21348	(0.000,0.000)	(126,22)	-89
la8q94cwq	7/20/2009	17:19:26	PSA	EXTERNAL	T-TAG	1024x1024	MIRRORA/3	60	34458	(0.000,0.000)	(126,22)	-87