13281 - Illuminating the Dark Phases of Galaxy-Formation with the Help of a z=2.4 Quasar

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) CLH12-WFC3POINTING	WFC3/UVIS	4	31-Jul-2014 21:00:27.0	yes
02	(1) CLH12-WFC3POINTING	WFC3/UVIS	4	31-Jul-2014 21:00:29.0	yes
03	(1) CLH12-WFC3POINTING	WFC3/UVIS	4	31-Jul-2014 21:00:30.0	yes
04	(2) CLH12-ACSPOINTING	ACS/WFC	2	31-Jul-2014 21:00:31.0	yes
05	(2) CLH12-ACSPOINTING	ACS/WFC	2	31-Jul-2014 21:00:32.0	yes
06	(2) CLH12-ACSPOINTING	ACS/WFC	2	31-Jul-2014 21:00:32.0	yes
07	(2) CLH12-ACSPOINTING	ACS/WFC	2	31-Jul-2014 21:00:33.0	yes
08	(2) CLH12-ACSPOINTING	ACS/WFC	2	31-Jul-2014 21:00:34.0	yes

22 Total Orbits Used

ABSTRACT

Galaxy formation occurs along the densest regions of the Intergalactic Medium (IGM) where the gas can collapse and form stars. However, despite their importance, the phases preceding substantial star formation are usually unobservable and thus poorly constrained. How is the IGM converted into stars at high-z and what is the efficiency of this process? The aim of this project is to answer these questions taking advantage of a new and, so far, unique dataset: "dark" galaxies fluorescently illuminated by a bright quasar at z=2.4, recently discovered by Cantalupo et al. with deep Ly-alpha imaging on the VLT. Differently from any previous Ly-alpha survey, fluorescent emission provides a direct constraint on the gas distribution independent of any associated star formation. We have discovered a large number of high Equivalent Width (>240A) objects for which the emission is likely powered by fluorescence. These are the best candidates for "dark" galaxies currently known. Unfortunately they are spatially unresolved in our ground-based observations: the study of this new category of objects requires space-based imaging for any major advancement. A direct measurement of the star formation efficiency (SFE) of these clouds would represent a major breakthrough in the study of galaxy-formation. HST imaging will provide the key elements to achieve this goal: i) resolved Ly-alpha imaging with WFC3, providing the source sizes and gas mass; ii) ACS imaging at rest-frame 1500A, providing a measurement of recent SFR. Combined together, these observations will provide the first direct constraint on the size, gas mass and SFE of the lowest mass haloes at high-z.

OBSERVING DESCRIPTION

The program consists of 12 WFC3/UVIS (filter F410M) and 10 ACS/WFC (filter F606W) orbits on a single pointing with orientation optimized to obtain Ly-alpha and continuum imaging of a sample of 8 of the 12 dark galaxies discovered in our ground-based survey (Cantalupo et al. 2012).

We will use full-orbit exposures for F410M and half-orbit exposures for F606W. The long exposure allow us to reach a 12e background and therefore avoiding post-flashing for CTE. The large number of expsoures, 12 for F410M and 20 for F606W, will allow to efficiently remove cosmic rays during image combination. Full-orbit exposures have been already used with success in the past cycle by other groups.

Dithering with random position within a 2"x2" box has been implemented using different values of POS TARG for each exposure. We allow 4 different orientation ranges (each rotated by 90deg with respect ot each other) to increase scheduling flexibility.

Visit

Proposal 13281, WFC3_visit1 (01), implementation Fri Aug 01 01:00:35 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 264D TO 275 D; ORIENT 84D TO 95 D; ORIENT 0D TO 6 D; ORIENT 180D TO 186 D

Fixed Targets

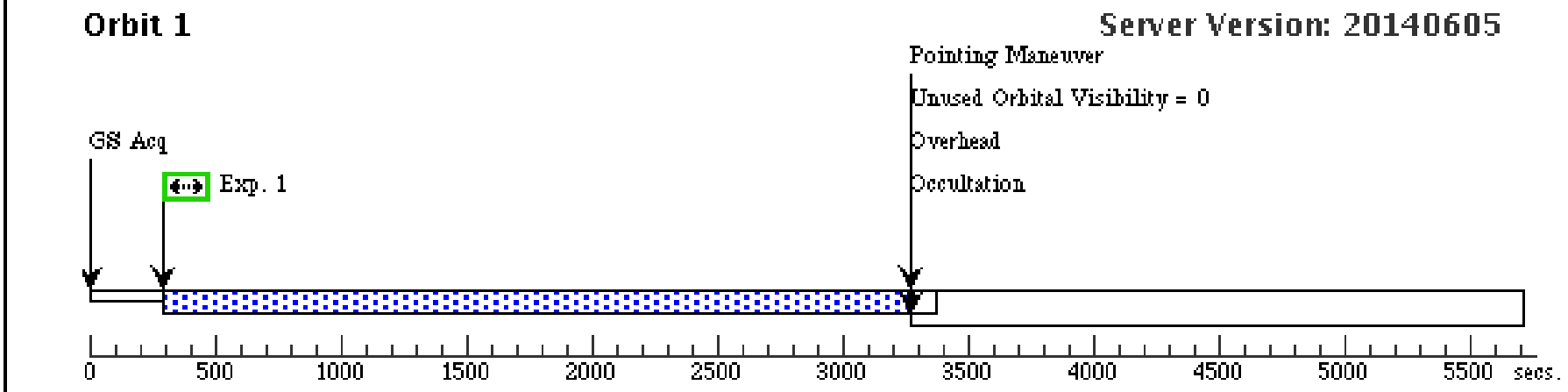
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CLH12-WFC3POINTING Alt Name1: QSO-B0109-353	RA: 01 11 43.7000 (17.9320833d) Dec: -35 03 42.00 (-35.06167d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

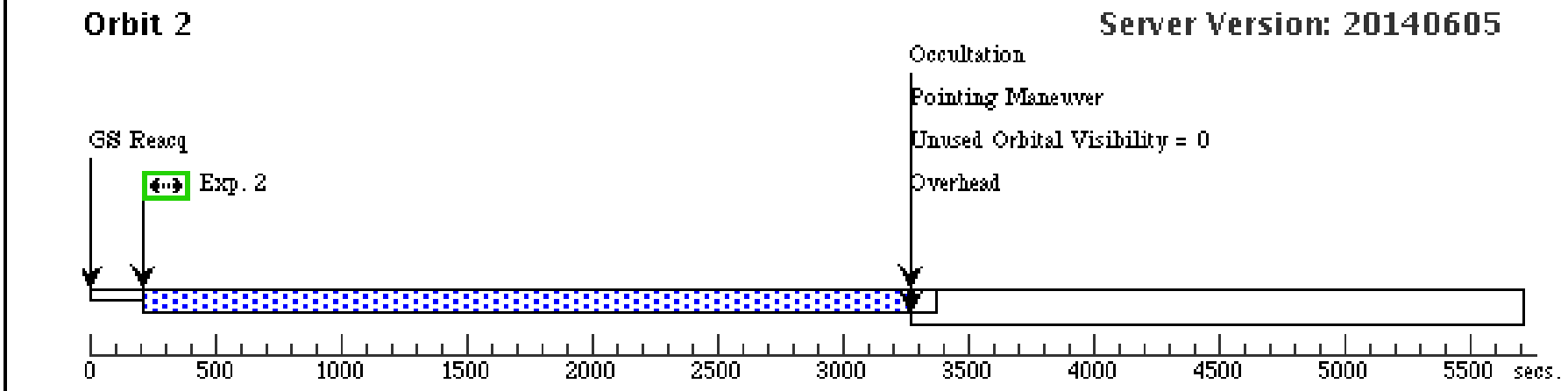
Comments: base pointing of CLH12 dark galaxy field for WFC3/UVIS around QSO-B0109-353 (offset from center).

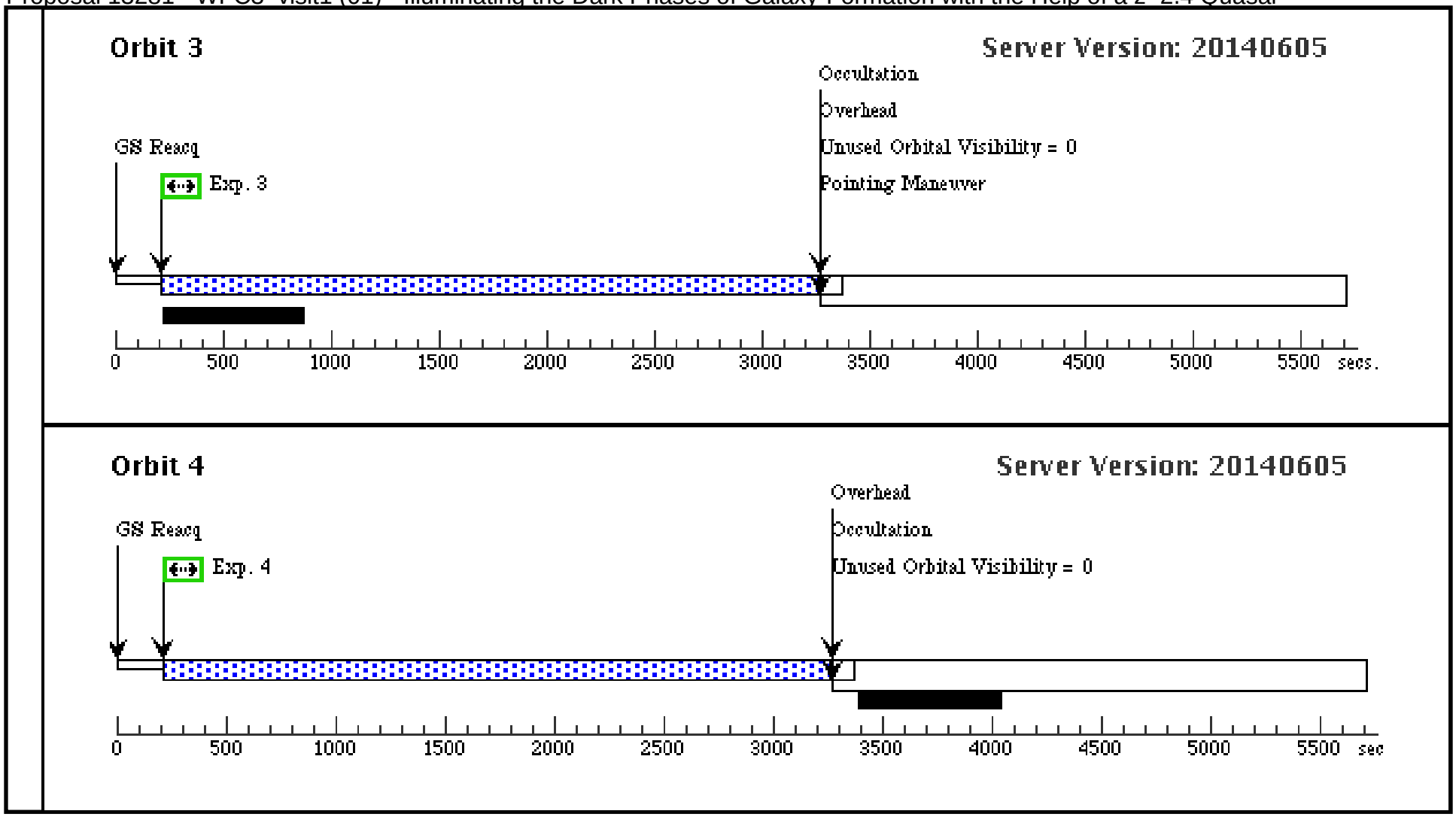
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	WFC3-dither1	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -0.5,0.0; GS ACQ SCENARIO BASE1B3		2700 Secs (2937 Secs) *[==>2937.0 Secs]*	 ***[1]***
2	WFC3-dither2	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -0.2,0.8		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[2]***
3	WFC3-dither3	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.7,-0.2		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[3]***
4	WFC3-dither4	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.3,0.7		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[4]***

Orbit Structure



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Exp. 3
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2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20140605
Overhead
Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 4
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13281, WFC3_visit2 (02), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

Fixed Targets

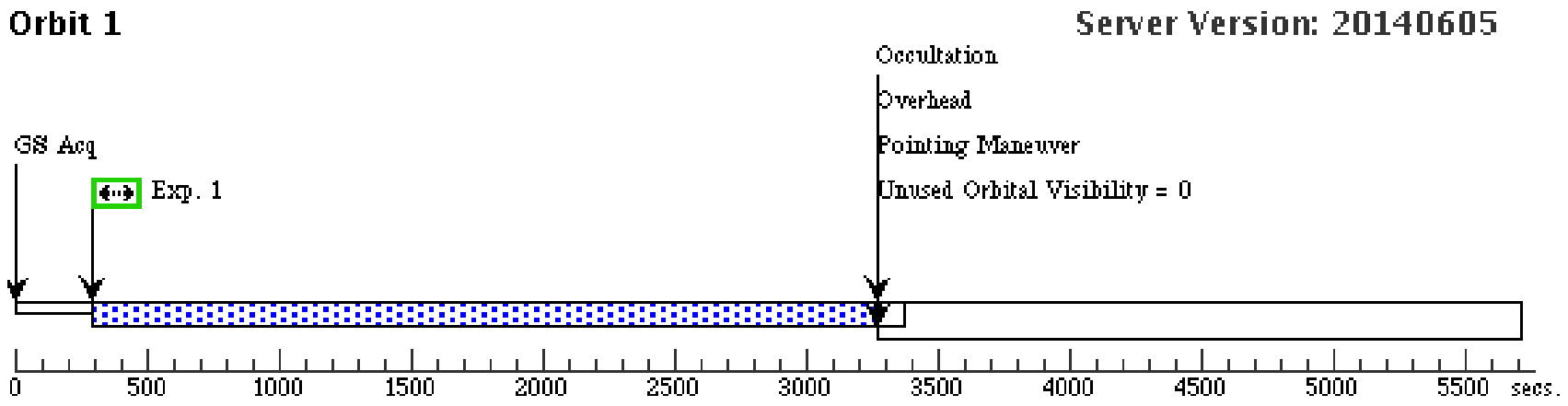
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CLH12-WFC3POINTING Alt Name1: QSO-B0109-353	RA: 01 11 43.7000 (17.9320833d) Dec: -35 03 42.00 (-35.06167d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

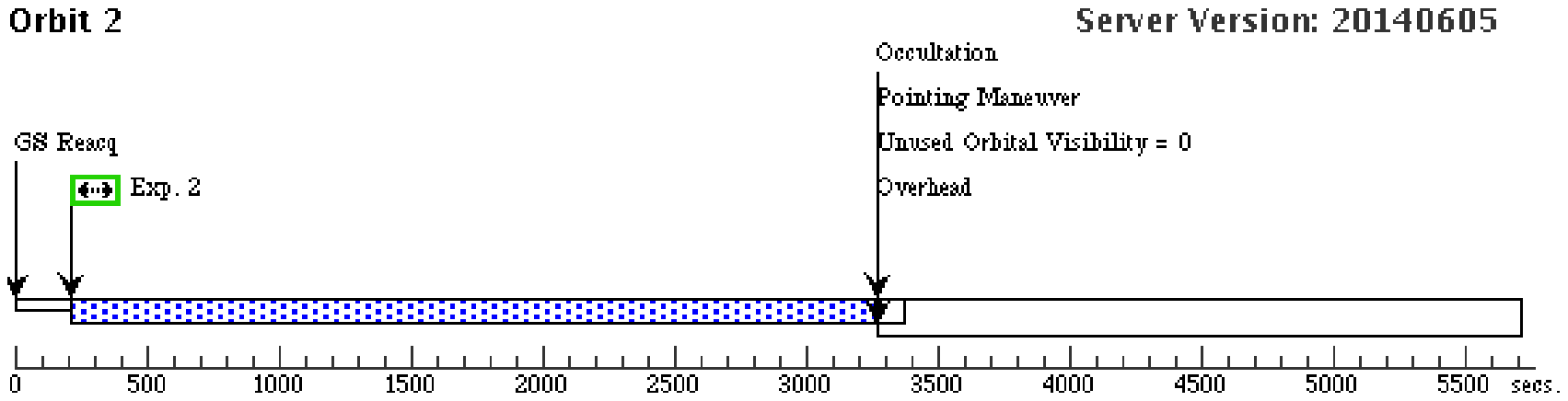
Comments: base pointing of CLH12 dark galaxy field for WFC3/UVIS around QSO-B0109-353 (offset from center).

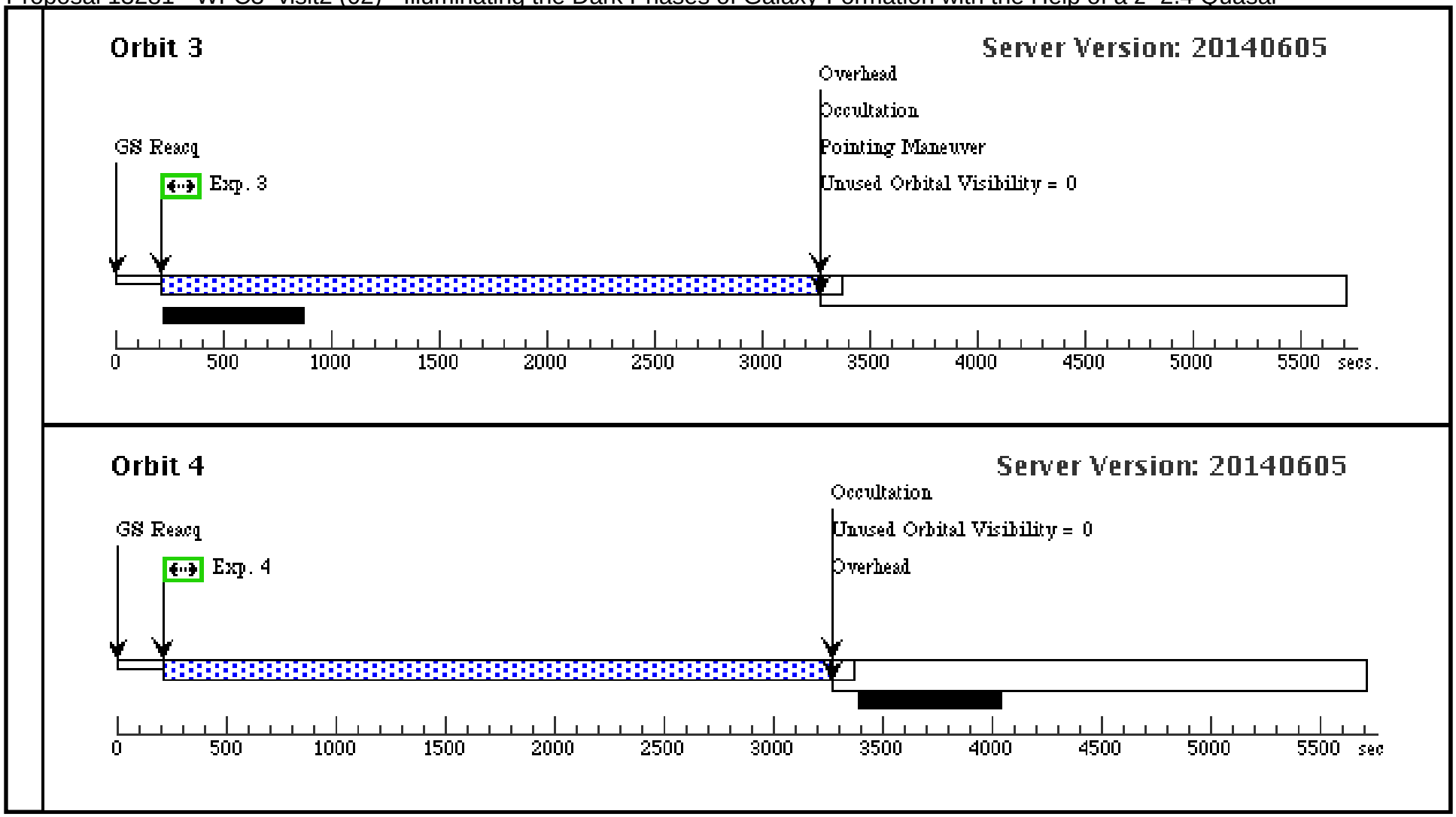
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	WFC3-dither5	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -0.5,-0.8 ; GS ACQ SCENARIO BASE1B3		2700 Secs (2937 Secs) *[==>2937.0 Secs]*	 ***[1]***
2	WFC3-dither6	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.1,0.1		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[2]***
3	WFC3-dither7	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.9,-0.3		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[3]***
4	WFC3-dither8	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -1.0,-0.1		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[4]***

Orbit Structure



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Occultation
Pointing Maneuver
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GS Reacq
Exp. 3
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20140605
Occultation
Unused Orbital Visibility = 0
Overhead
GS Reacq
Exp. 4
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13281, WFC3_visit3 (03), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

Fixed Targets

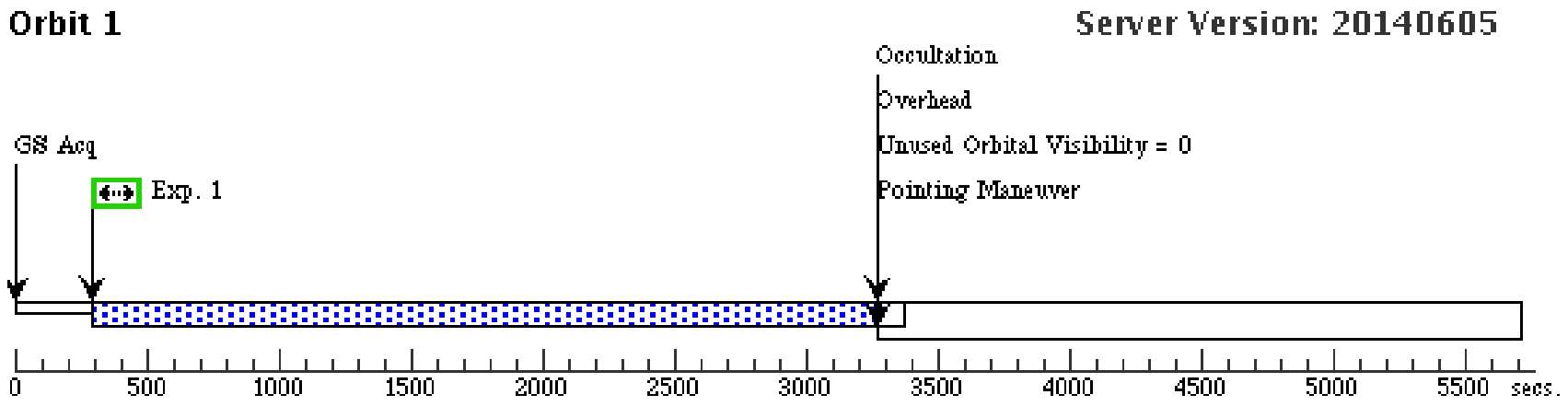
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CLH12-WFC3POINTING Alt Name1: QSO-B0109-353	RA: 01 11 43.7000 (17.9320833d) Dec: -35 03 42.00 (-35.06167d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

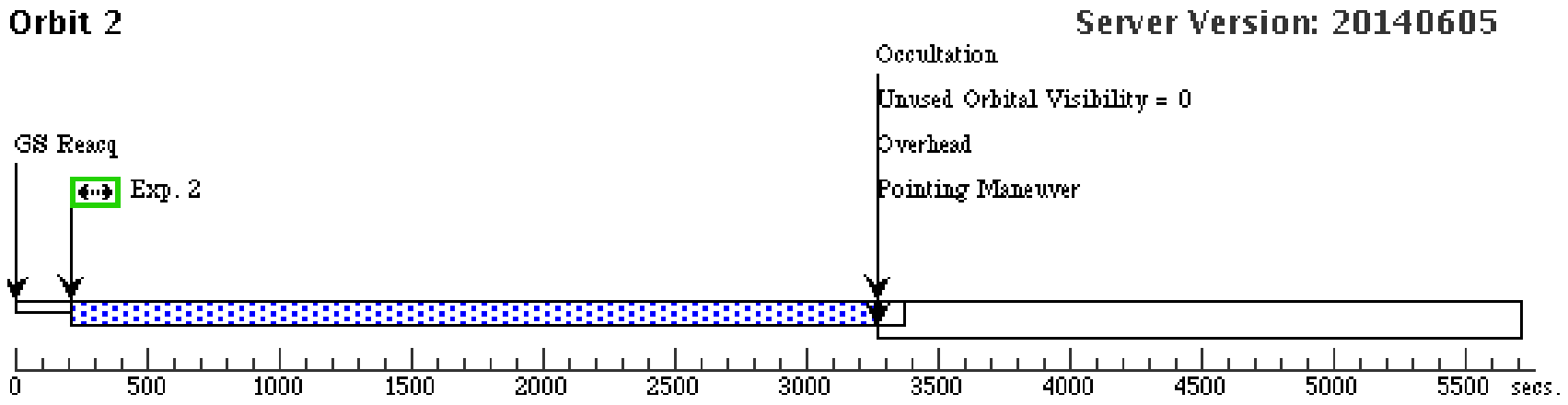
Comments: base pointing of CLH12 dark galaxy field for WFC3/UVIS around QSO-B0109-353 (offset from center).

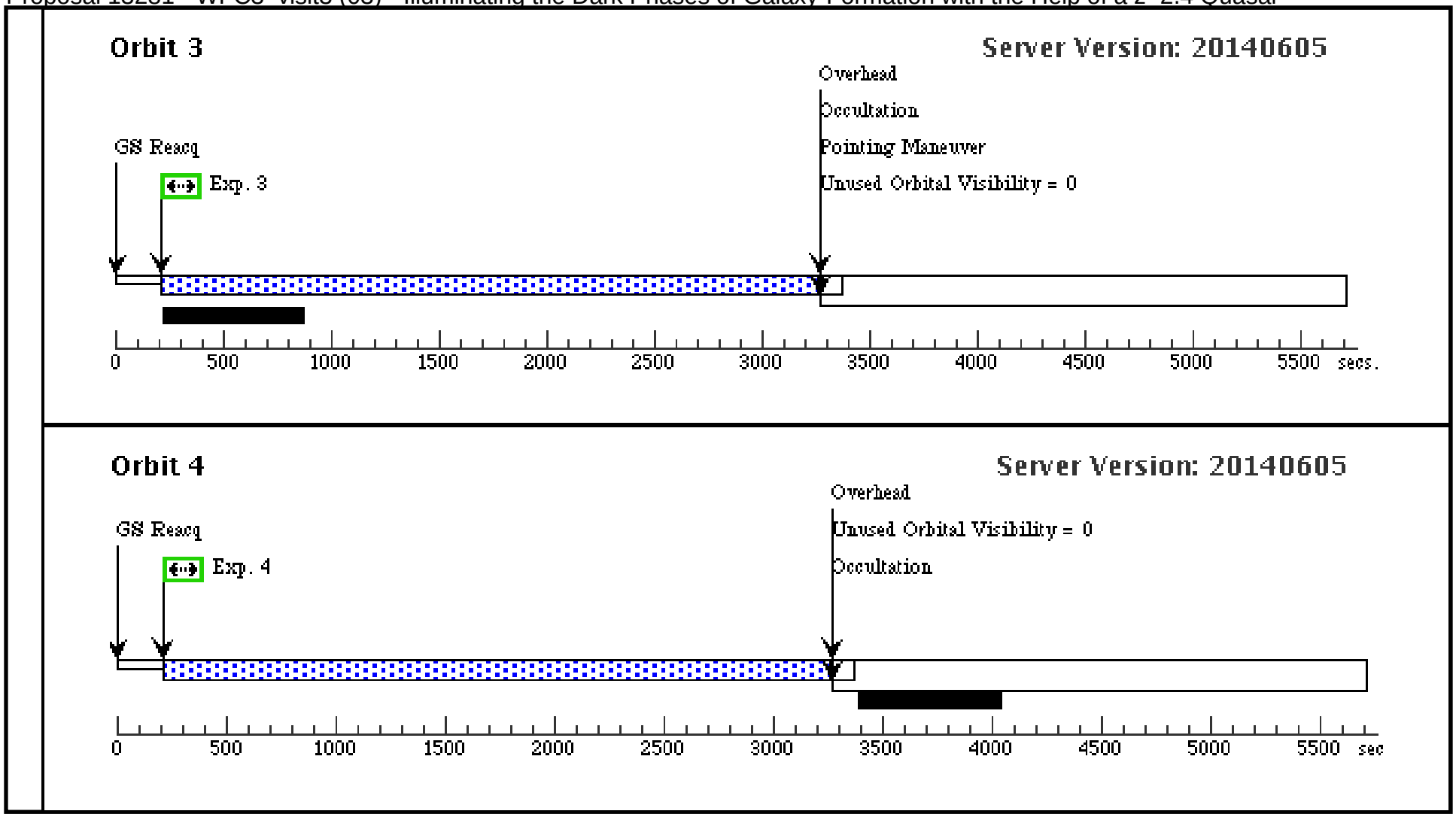
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	WFC3-dither9	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.4,0.9; GS ACQ SCENARIO BASE1B3		2700 Secs (2937 Secs) *[==>2937.0 Secs]*	 ***[1]***
2	WFC3-dither10	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -0.6,0.5		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[2]***
3	WFC3-dither11	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG -0.3,-0.5		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[3]***
4	WFC3-dither12	(1) CLH12-WFC3POINTING	WFC3/UVIS, ACCUM, UVIS-CENTER	F410M		POS TARG 0.5,-0.9		2700 Secs (3048 Secs) *[==>3048.0 Secs]*	 ***[4]***

Orbit Structure






Orbit 3
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Occultation
Pointing Maneuver
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4500
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secs.
Orbit 4
Server Version: 20140605
Overhead
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 4
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500
1000
1500
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2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13281, ACS_visit1 (04), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 315D TO 328 D; ORIENT 135D TO 148 D; ORIENT 40D TO 55 D; ORIENT 220D TO 235 D

Fixed Targets

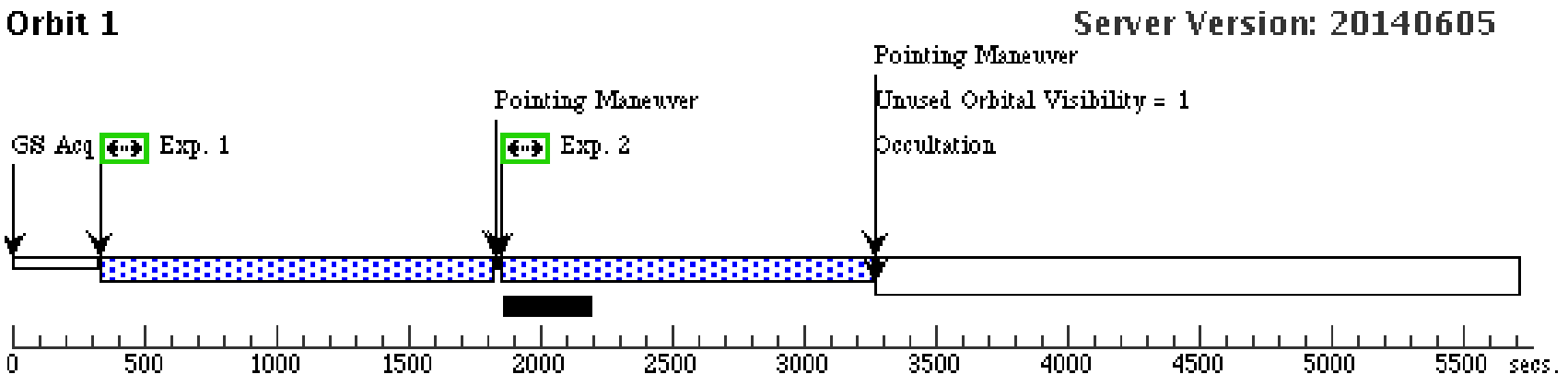
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CLH12-ACSPOINTING Alt Name1: QSO-B0109-353	RA: 01 11 45.2000 (17.9383333d) Dec: -35 03 43.00 (-35.06194d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

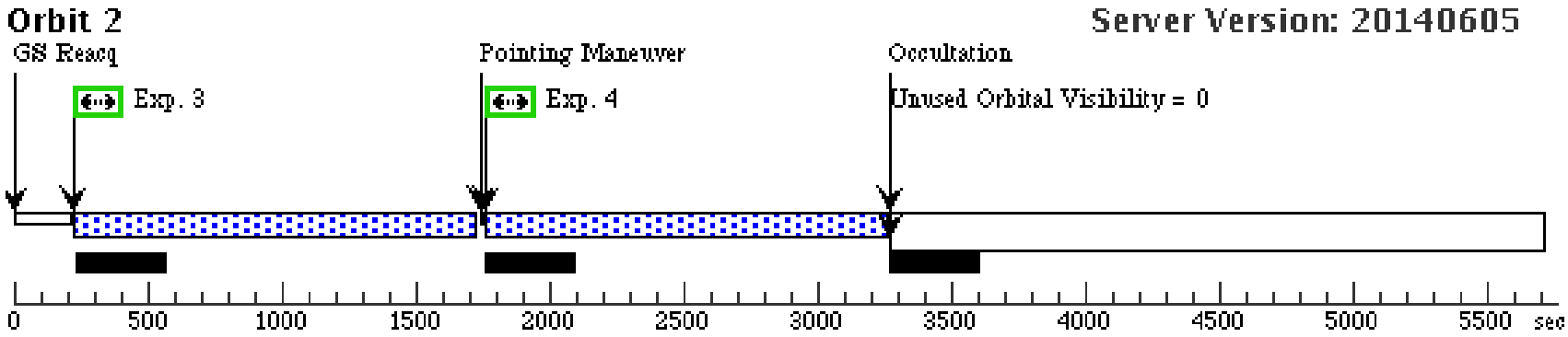
Comments: base pointing of CLH12 dark galaxy field for ACS/WFC around QSO-B0109-353 (offset from center).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.5,0.0		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
2		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.2,0.8		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
3		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.7,-0.2		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***
4		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.3,0.7		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 13281, ACS_visit2 (05), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 04

Fixed Targets

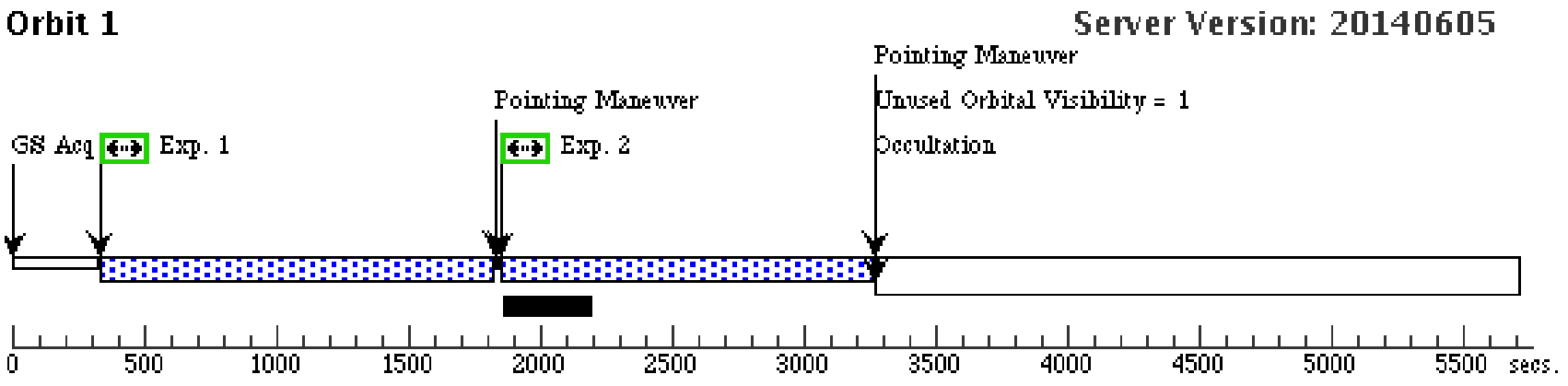
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CLH12-ACSPOINTING Alt Name1: QSO-B0109-353	RA: 01 11 45.2000 (17.9383333d) Dec: -35 03 43.00 (-35.06194d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

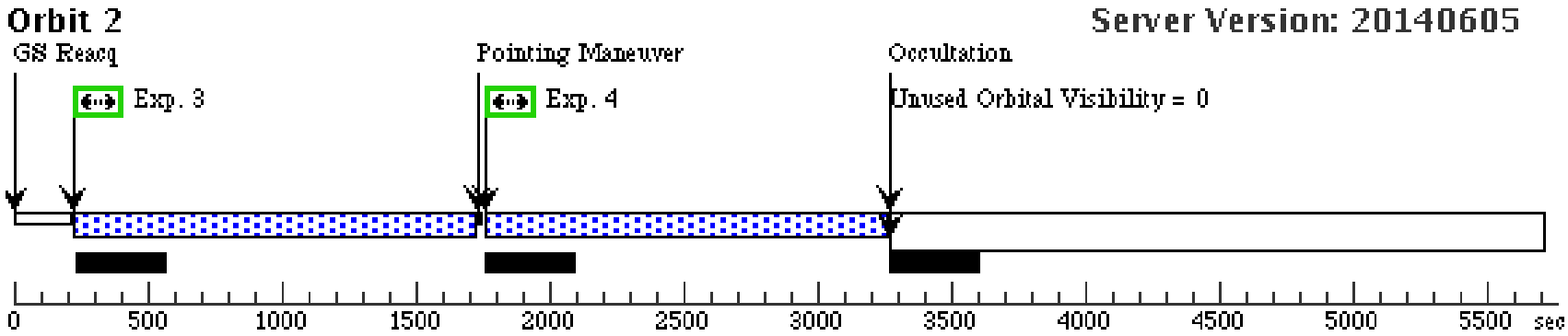
Comments: base pointing of CLH12 dark galaxy field for ACS/WFC around QSO-B0109-353 (offset from center).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.5,-0.8		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
2		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.1,0.1		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
3		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.9,-0.3		1260 Secs (1379 Secs)	
								[==>1379.0 Secs]	***[2]***
4		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -1.0,-0.1		1260 Secs (1379 Secs)	
								[==>1379.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 13281, ACS_visit3 (06), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 04

Fixed Targets

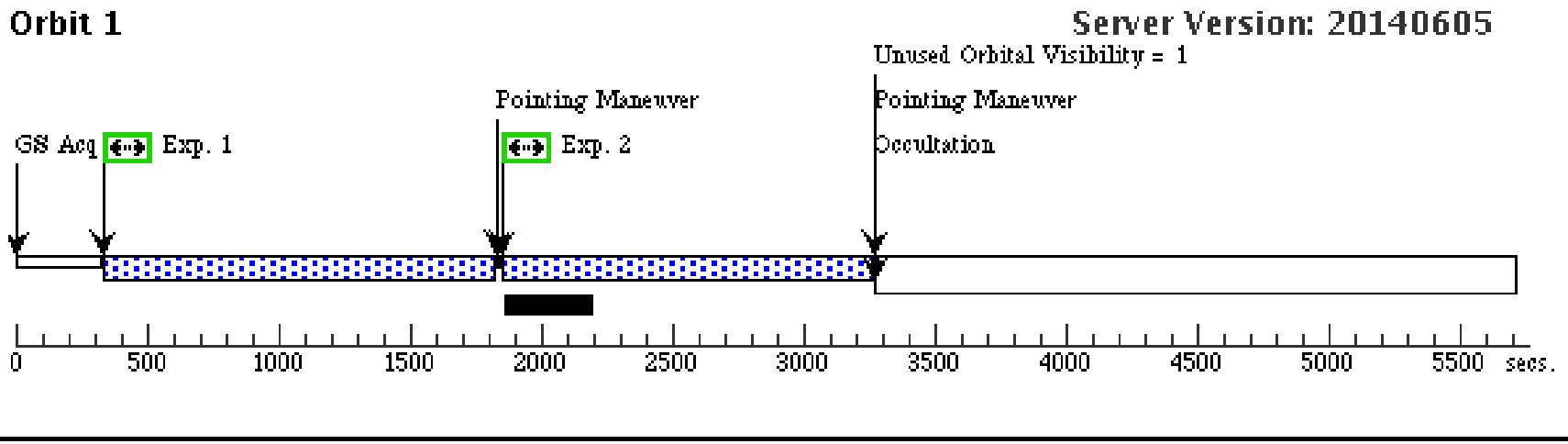
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CLH12-ACSPOINTING Alt Name1: QSO-B0109-353	RA: 01 11 45.2000 (17.9383333d) Dec: -35 03 43.00 (-35.06194d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

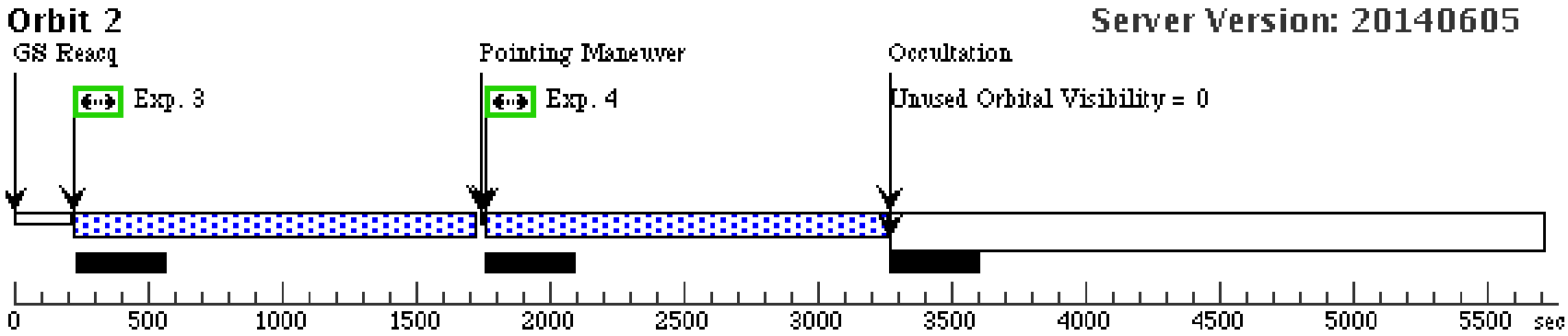
Comments: base pointing of CLH12 dark galaxy field for ACS/WFC around QSO-B0109-353 (offset from center).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.4,0.9		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
2		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.6,0.5		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
3		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.3,-0.5		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***
4		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.5,-0.9		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 13281, ACS_visit4 (07), implementation Fri Aug 01 01:00:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 04

Fixed Targets

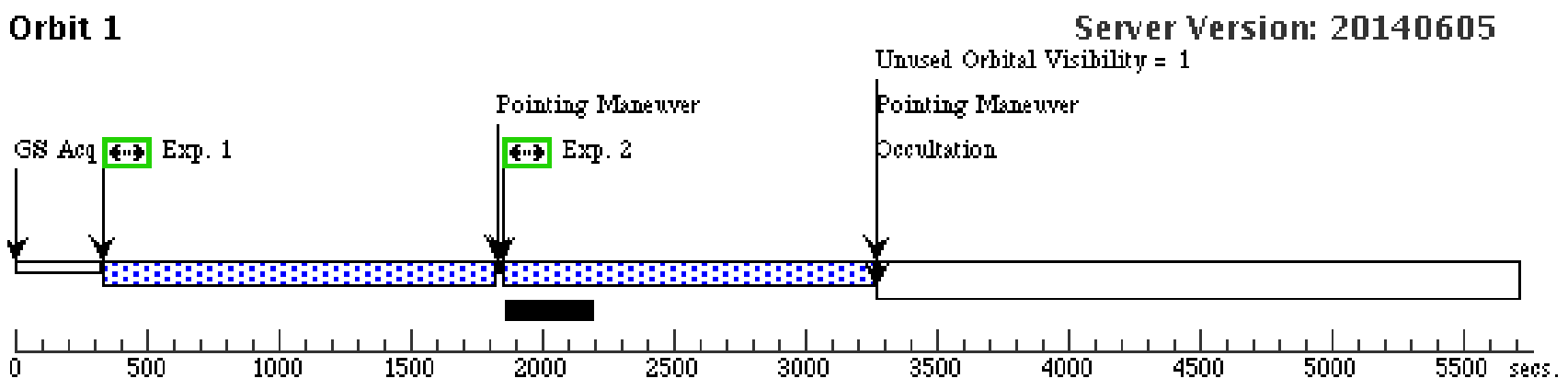
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CLH12-ACSPOINTING Alt Name1: QSO-B0109-353	RA: 01 11 45.2000 (17.9383333d) Dec: -35 03 43.00 (-35.06194d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

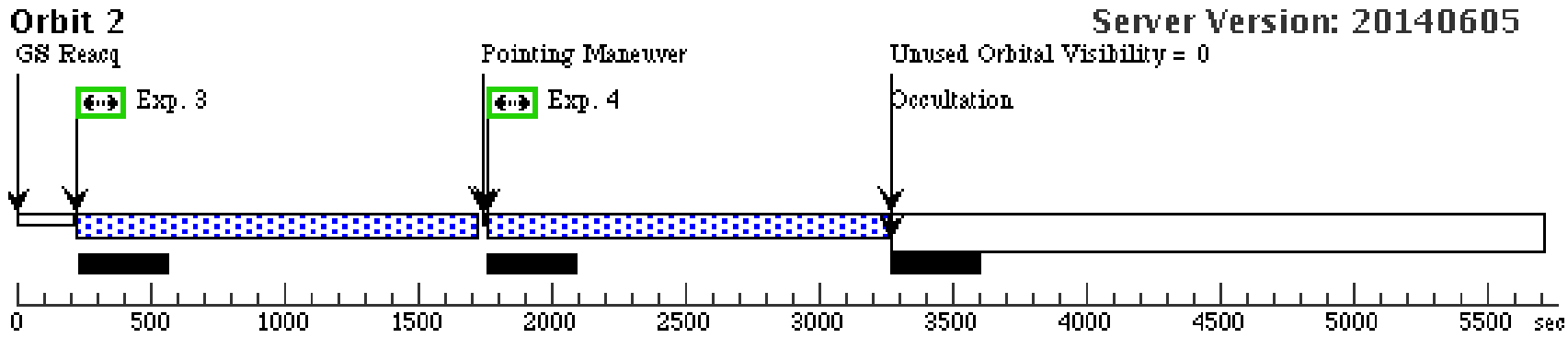
Comments: base pointing of CLH12 dark galaxy field for ACS/WFC around QSO-B0109-353 (offset from center).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.5,0.0		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
2		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.2,-0.8		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
3		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.7,0.2		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***
4		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.3,-0.7		1260 Secs (1380 Secs)	
								[==>1380.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 13281, ACS_visit5 (08), implementation Fri Aug 01 01:00:37 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SAME ORIENT AS 04

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CLH12-ACSPOINTING Alt Name1: QSO-B0109-353	RA: 01 11 45.2000 (17.9383333d) Dec: -35 03 43.00 (-35.06194d) Equinox: J2000	Epoch of Position: 2000	V=16.2	Reference Frame: ICRS

Comments: base pointing of CLH12 dark galaxy field for ACS/WFC around QSO-B0109-353 (offset from center).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0.5,0.8		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
2		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.1,-0.1		1260 Secs (1283 Secs)	
								[==>1283.0 Secs]	***[1]***
3		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG -0.9,0.3		1260 Secs (1379 Secs)	
								[==>1379.0 Secs]	***[2]***
4		(2) CLH12-ACSPOINTING	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 1.0,0.1		1260 Secs (1379 Secs)	
								[==>1379.0 Secs]	***[2]***

Orbit Structure