11691 - Using Massive Star Clusters in Merger Remnants To Provide Reference Colors of Intermediate-Age Stellar Populations

Cycle: 17, 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) NGC3921 ANY	ACS/WFC WFC3/IR WFC3/UVIS	3	01-Jul-2008 21:53:03.0	yes
02	(2) NGC7252 ANY	ACS/WFC WFC3/IR WFC3/UVIS	3	01-Jul-2008 21:53:26.0	yes
03	(3) NGC1316 ANY	ACS/WFC WFC3/IR WFC3/UVIS	3	01-Jul-2008 21:53:46.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(4) NGC3610 ANY	ACS/WFC WFC3/IR WFC3/UVIS	2	01-Jul-2008 21:54:05.0	yes

11 Total Orbits Used

ABSTRACT

Much current research in cosmology and galaxy formation relies on an accurate interpretation of colors of galaxies in terms of their evolutionary state, i.e., in terms of ages and metallicities. One particularly important topic is the ability to identify early-type galaxies at "intermediate" ages (~ 500 Myr - 5 Gyr), i.e., the period between the end of star formation and ~ half the age of the universe. Currently, integrated-light studies must rely on population synthesis models which rest upon spectral libraries of stars in the solar neighborhood. These models have a difficult time correctly incorporating short-lived evolutionary phases such as thermally pulsing AGB stars, which produce up to 80% of the flux in the near-IR in this age range. Furthermore, intermediate-age star clusters in the Local Group do not represent proper templates against which to calibrate population synthesis models in this age range, because their masses are too low to render the effect of stochastic fluctuations due to the number of bright RGB and AGB stars negligible. As a consequence, current population synthesis models have trouble reconciling the evolutionary state of high-redshift galaxies from optical versus near-IR colors. We propose a simple and effective solution to this issue, namely obtaining high-quality EMPIRICAL colors of massive globular clusters in galaxy merger remnants which span this important age range. These colors should serve as relevant references, both to identify intermediate-age objects in the local and distant universe and as calibrators for population synthesis modellers.

OBSERVING DESCRIPTION

The Wide Field Camera 3 is used with the broad-band filters F336W, F438W, F110W, and F160W for four target galaxies, all of which are established remnants of dissipative galaxy mergers. To allow us to address all goals of this project as mentioned in the Scientific Justification, we obtain the following data. (i) For all target merger remnants, we need to to reach S/N = 15 for GCs 3 mag fainter than the brightest GC in those galaxies in all filters. (ii) For the intermediate-age merger remnants NGC 1316 and NGC 3610, we have an additional need to reach S/N = 15 for

globular clusters (GCs) at the calculated turnover magnitude of the LF of ‘old’ GCs (M_V = -7.3) in the F160W filter only. This will yield F110W-F160W color indices with an accuracy that is adequate to constrain the age distribution of GCs in the ‘red’ peak. To evaluate the necessary exposure times as a function of the surface brightness of the diffuse light of the host galaxy, we wrote a custom exposure time calculator (ETC) based on count rates given by the STScI ETCs, but including the ability to take into account a given background surface brightness (due to diffuse light from the host galaxy). Sub-exposures in each filter are positioned so as to allow cosmic-ray removal and dithering. The WFC3 UVIS subexposures are positioned several tens of pixels apart from one another in order to mitigate the potentially negative effects of the 'droplets' that were recently identified during WFC3 ground testing. For the near-IR imaging, we use logarithmically spaced MULTIACCUM read sequences to avoid saturated pixels near the galaxy centers and to yield high S/N ratios for both faint and bright GCs superposed onto the rapidly changing background (i.e., the diffuse light of the host galaxies).

ADDITIONAL COMMENTS

(a) We will utilize ACS/WFC in parallel to the WFC3 observations (using the F555W and F814W filters of ACS) in order to measure the V-I colors of globular clusters in the target galaxies over a range of galactocentric distances. These colors provide important constraints on the metallicities and ages of the globular clusters, and the parallel ACS/WFC data will extend these over a much greater range of radii than previously observed for any merger remnant galaxy.

(b) We will have the observations of NGC 3610 conducted during CVZ orbits. This will constitute a very efficient use of HST, and seems to be well possible: Its declination (DEC ~ +59 degrees) allows a total of 7 two-day CVZ opportunities per year according to APT version 17.2.1.

Visit

Proposal 11691, Visit 01 Wed Jul 02 01:54:10 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, ACS/WFC, WFC3/UVIS

Special Requirements: PCS MODE FINE

Comments: NGC 3921 visit

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=2.4 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.754 Angle Between Sides= Center Pattern=false		(3-4)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC3921	RA: 11 51 7.0100 (177.7792083d) Dec: +55 04 43.50 (55.07875d) Equinox: J2000	Radial Velocity: 4828 km/sec	V=12.64	Reference Frame: ICRS

Comments: Converted GSC-I coordinates to GSC-II reference frame using http://gsss.stsci.edu/webservices/GSCconvert/WebForm.aspx

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	NGC3921-F438W-POS1	(1) NGC3921	WFC3/UVIS, ACCUM, UVIS	F438W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 1-2	450 Secs *[==>]*	***[1]***
Comments: POS TARG 0,0									
2	N3921-PARAL-F814W-POS1	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 1-2	400 Secs *[==>]*	***[1]***
Comments: Parallel to F438W line pattern, step 1									
3	NGC3921-F336W-POS1_2	(1) NGC3921	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0,0	Pattern 3-4 (1) Prime + Parallel Group 3-4	1150 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4	N3921-PARAL-F555W-POS1_2	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Pattern 3-4 (1) Prime + Parallel Group 3-4	1100 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
Comments: Parallel to F336W line pattern									
5	NGC3921-F438W-POS2	(1) NGC3921	WFC3/UVIS, ACCUM, UVIS	F438W	CR-SPLIT=NO	POS TARG 0.178,3.565	Prime + Parallel Group 5-6	500 Secs *[==>]*	***[2]***
Comments: POS TARG'ed over chip gap									
6	N3921-PARAL-F814W-POS2	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 5-6	450 Secs *[==>]*	***[2]***
Comments: Parallel to F438W line pattern, step 2									

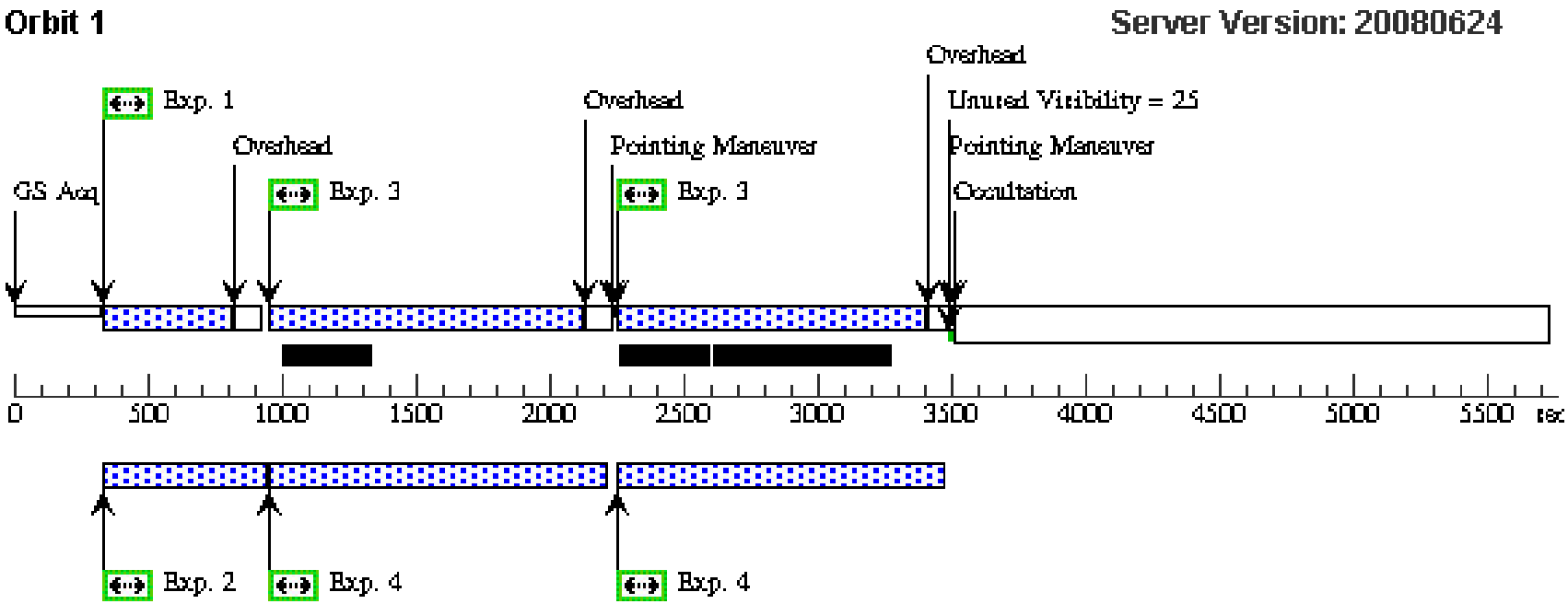
Exposures (continued)

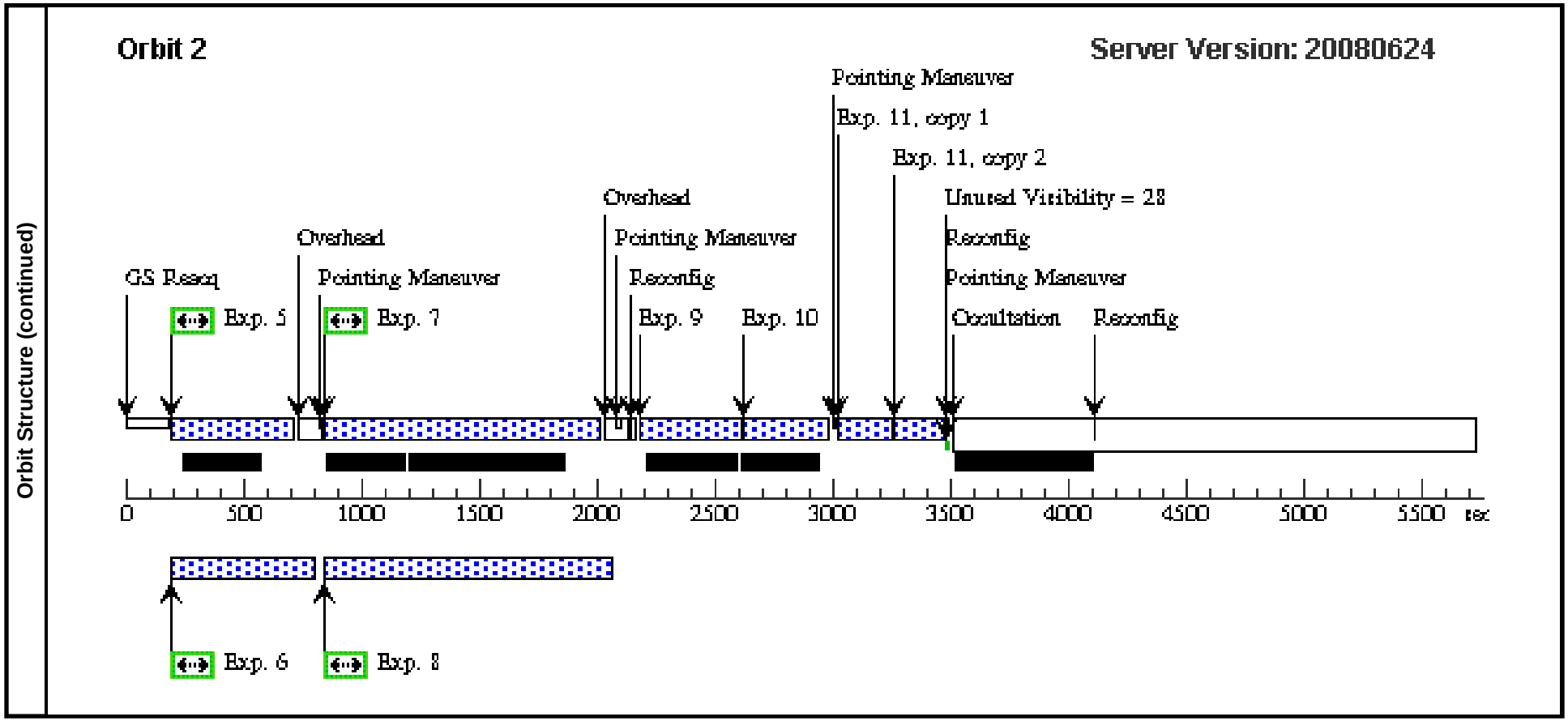
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7	NGC3921-F336W-POS3	(1) NGC3921	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.55,0.138	Prime + Parallel Group 7-8	1150 Secs *[==>]*	 ***[2]***
Comments: 3rd F336W exposure, 100 pix. away from 1st (stepping over any Droplets)									
8	N3921-PARAL-F814W-POS3	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 7-8	1100 Secs *[==>]*	 ***[2]***
9	NGC3921-F110W-POS1-1i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=9	POS TARG 0.0,0.0		*[==>]*	***[2]***
Comments: 1st F110W exp, POS TARG 0,0									
10	NGC3921-F110W-POS1-2i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=8	SAME POS AS 9		*[==>]*	***[2]***
Comments: 2nd F110W exp, same pos as 1st									
11	NGC3921-F110W-POS2i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=5	POS TARG 0.403,0.450		*[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***
Comments: 3rd F110W exp, offset by 3.3, 3.3 pix from 1st									
12	NGC3921-F110W-POS3i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=5	POS TARG 0.807,0.900	Prime + Parallel Group 12-13	*[==>(Copy 1)]* *[==>(Copy 2)]*	***[3]***
Comments: 4th F110W exp, POS TARG 6.7, 6.7 pix from 1st									
13	N3921-PARAL-F814W-POS3i	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 12-13	320 Secs *[==>]*	 ***[3]***
14	NGC3921-F160W-POS1i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS50; NSAMP=9	POS TARG 0.0,0.0	Prime + Parallel Group 14-15	*[==>(Copy 1)]* *[==>(Copy 2)]*	***[3]***
Comments: F160W exp's at pos targ 0,12									
15	N3921-PARAL-F814W-POS1i	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 14-15	700 Secs *[==>]*	 ***[3]***
16	NGC3921-F160W-POS2i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS50; NSAMP=9	POS TARG 0.403,0.450	Prime + Parallel Group 16-17	*[==>(Copy 1)]* *[==>(Copy 2)]*	***[3]***
Comments: F160W exp,'s, offset by 3.3, 3.3 pix from 1st									
17	N3921-PARAL-F555W-POS2i	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 16-17	700 Secs *[==>]*	 ***[3]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
18	NGC3921-F160W-POS3i	(1) NGC3921	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS50; NSAMP=7	POS TARG 0.807,0.900	Prime + Parallel Group 18-19	*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[3]***
Comments: F160W exp's, offset by 6.7, 6.7 pix from 1st									
19	N3921-PARAL-F555W-POS3i	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 18-19	850 Secs *[==>]*	***[3]***

Orbit Structure

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GS Reacq
Pointing Maneuver
Reconfig
Pointing Maneuver
Exp. 5
Exp. 7
Exp. 9
Exp. 10
Occultation
Reconfig
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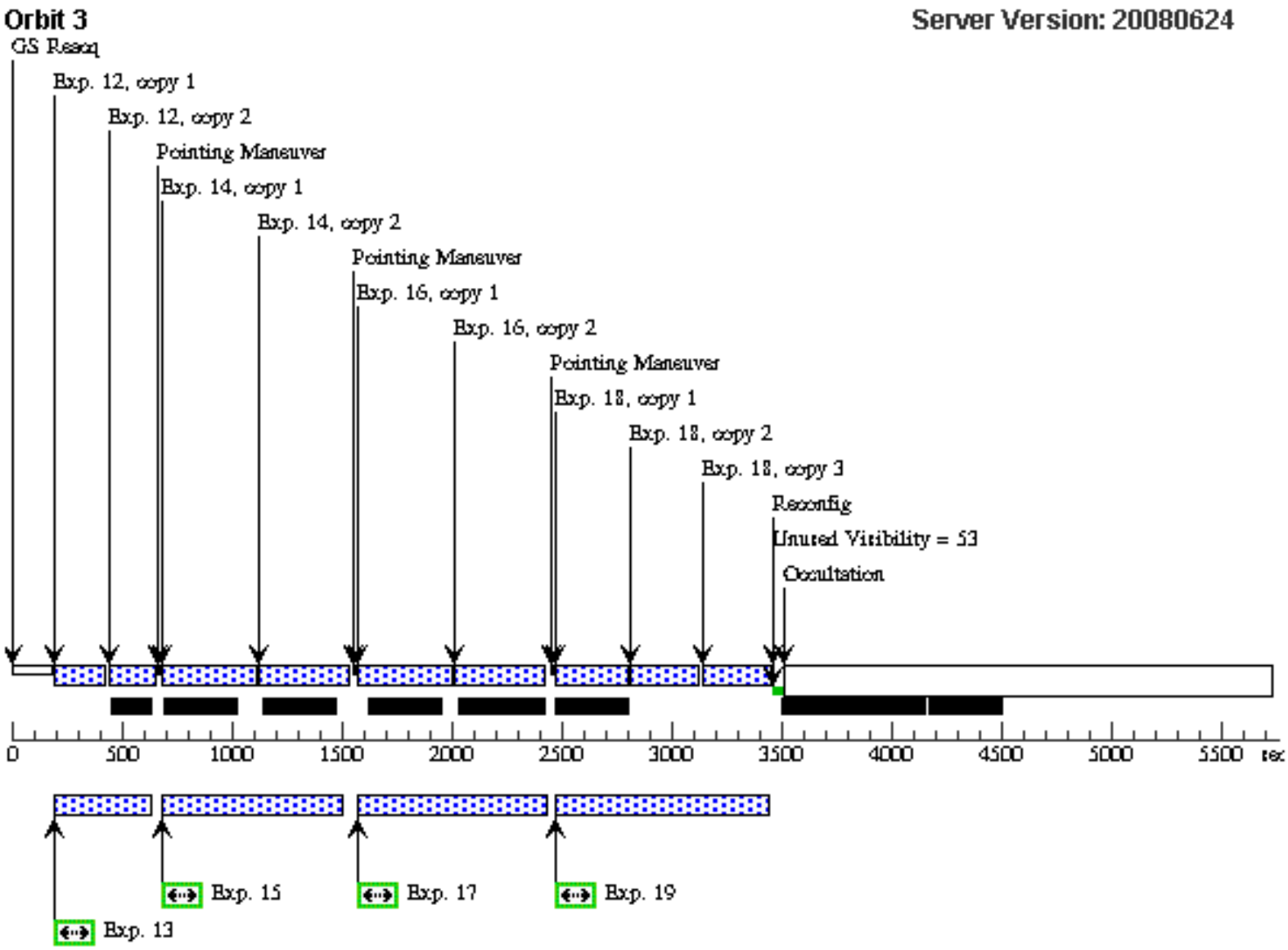
sec
Exp. 6
Exp. 8

Orbit Structure (continued)



Visit

Proposal 11691, Visit 02 Wed Jul 02 01:54:15 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, ACS/WFC, WFC3/UVIS

Special Requirements: PCS MODE FINE

Comments: NGC 7252 visit

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(10-11), (13)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC7252	RA: 22 20 44.7800 (335.1865833d) Dec: -24 40 41.83 (-24.67829d) Equinox: J2000	Radial Velocity: 4792 km/sec	V=12.09	Reference Frame: ICRS

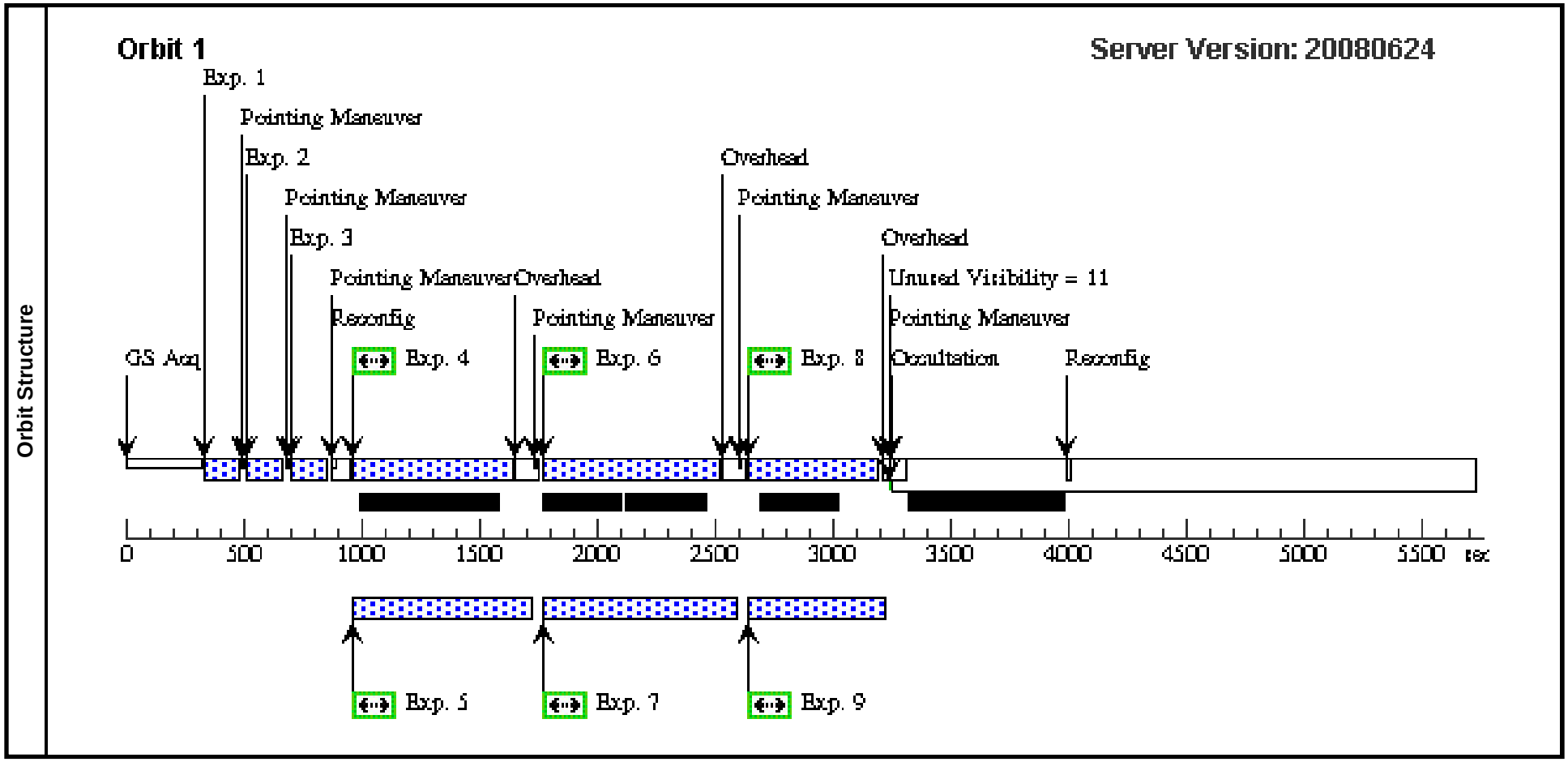
Comments: Converted GSC-I coordinates to GSC-II reference frame using http://gsss.stsci.edu/webservices/GSCconvert/WebForm.aspx

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	NGC7252-F110Wshort-POS1i	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=9	POS TARG 0.0,0.0		*[==>]*	***[1]***
	Comments: 1st short F110W exp, POS TARG 0,0								
2	NGC7252-F110Wshort-POS2i	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=9	POS TARG 0.484,0.203		*[==>]*	***[1]***
	Comments: 2nd short F110W exp, POS TARG 4.0, 1.5 pix from 1st								
3	NGC7252-F110Wshort-POS3i	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=9	POS TARG 0.302,0.540		*[==>]*	***[1]***
	Comments: 3rd short F110W exp, POS TARG 2.5, 4.0 pix from 1st								
4	NGC7252-F336W-POS1	(2) NGC7252	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 4-5	650 Secs *[==>]*	***[1]***
	Comments: Nominal position								
5	N7252-PARAL-F814W-POS1	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 4-5	550 Secs *[==>]*	***[1]***
	Comments: Parallel to F336W line pattern								
6	NGC7252-F336W-POS2	(2) NGC7252	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.6,1.18	Prime + Parallel Group 6-7	750 Secs *[==>]*	***[1]***
	*Comments: POS TARG 4.5, 1.5 pixels * 20 (i.e., ~100 pix step, to mitigate effects of droplets)*								

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7	N7252-PARAL-F814W-POS2	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 6-7	700 Secs *[==>]*	 ***[1]***
Comments: Parallel to F336W line pattern									
8	NGC7252-F336W-POS3	(2) NGC7252	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 1.96,3.16	Prime + Parallel Group 8-9	550 Secs *[==>]*	 ***[1]***
*Comments: POS TARG 2.5, 4.0 pixels * 20 (to mitigate effects of droplets)*									
9	N7252-PARAL-F555W-POS3	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 8-9	420 Secs *[==>]*	 ***[1]***
Comments: Parallel to F336W line pattern									
10	NGC7252-F160W-BOXPATT	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP100; NSAMP=13		Pattern 10-11 (4) Prime + Parallel Group 10-11	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
Comments: F160W exp's with IR pattern (4 posns)									
11	N7252-PARAL-F555W-BOXPATT	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Pattern 10-11 (4) Prime + Parallel Group 10-11	600 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[2]***
12	NGC7252-F110Wshort-POS4i	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=9	POS TARG -0.181,0.338		*[==>]*	***[3]***
Comments: 4th short F160W exp, POS TARG -1.5, 2.5 pix from 1st									
13	NGC7252-F110W-BOXPATT	(2) NGC7252	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=12	POS TARG 0.807,0.900	Pattern 13-13 (4)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***
Comments: Longer F110W exp, BOX pattern									
14	NGC7252-F336W-POS4	(2) NGC7252	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG -3.16,-1.18	Prime + Parallel Group 14-15	1100 Secs *[==>]*	 ***[3]***
*Comments: POS TARG -4.0, 1.5 pix * 20 (to mitigate effects of droplets)*									
15	N7252-PARAL-F814W-POS4	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 14-15	960 Secs *[==>]*	 ***[3]***
Comments: Parallel to 4th F336W exp.									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Server Version: 20080624
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Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 3
Pointing Maneuver
Reconfig
Exp. 4
Overhead
Pointing Maneuver
Exp. 6
Overhead
Pointing Maneuver
Exp. 8
Overhead
Pointing Maneuver
Occultation
Unused Visibility = 11
Reconfig
GS Acq
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3000
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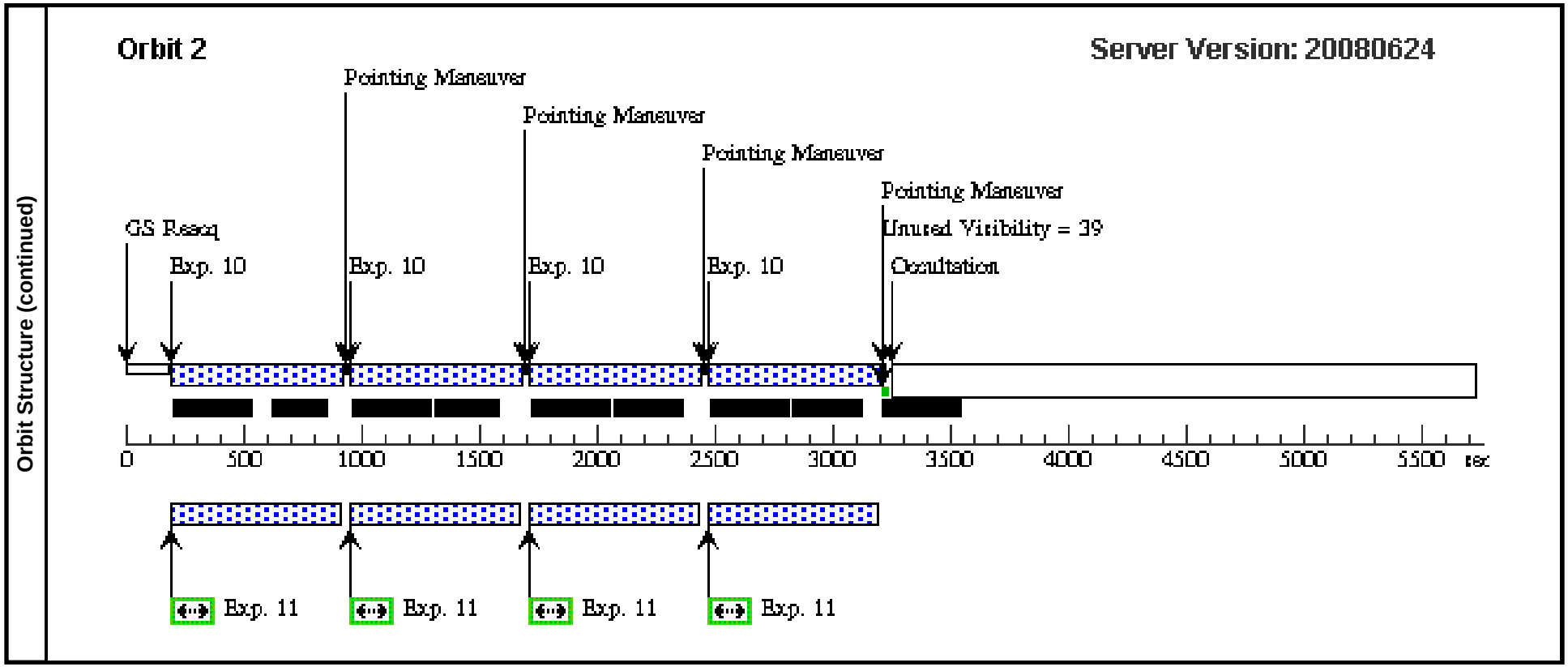
5500
sec
Exp. 5
Exp. 7
Exp. 9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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
GS Reacq
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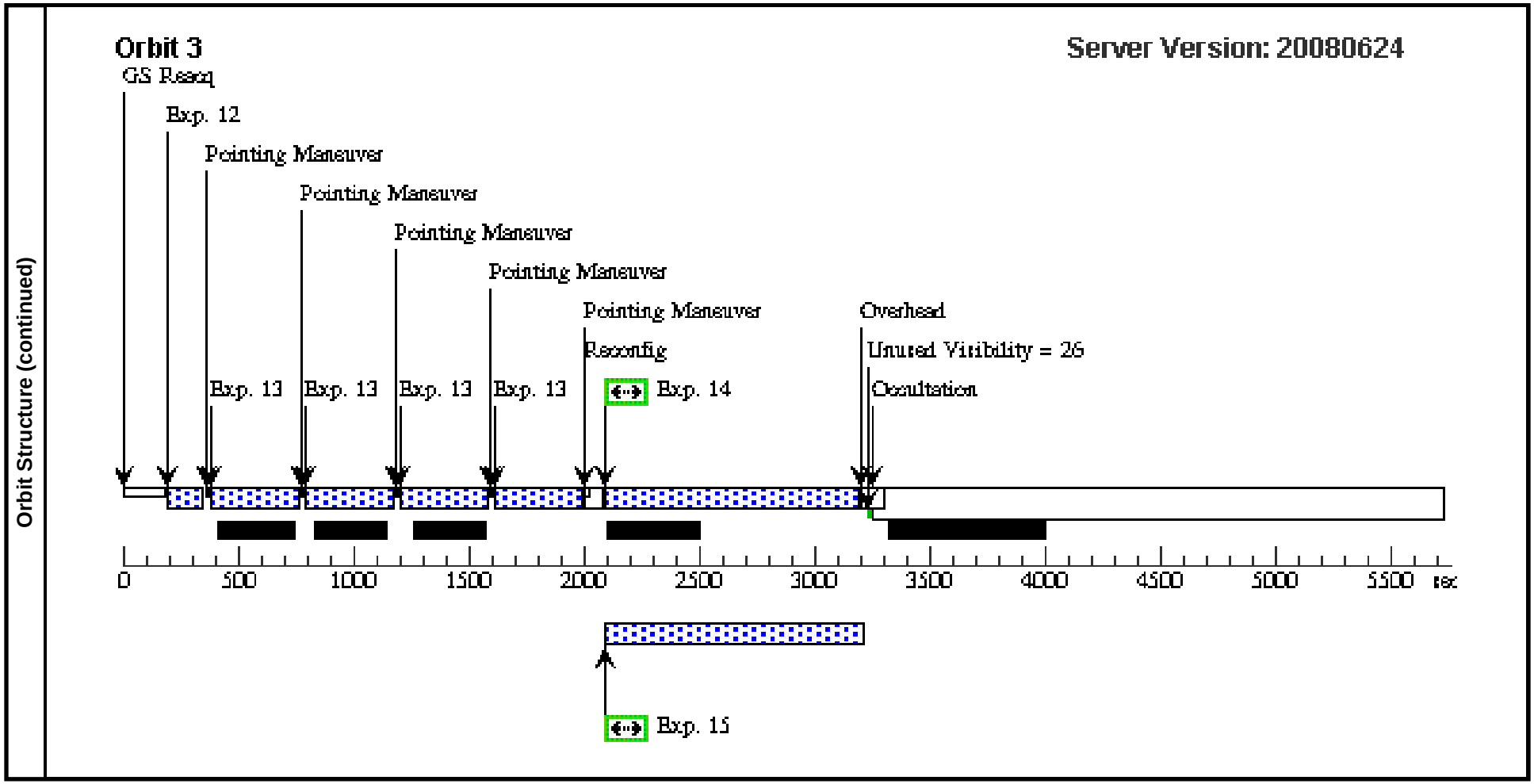
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GS Reacq
Exp. 12
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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Overhead
Unused Visibility = 26
Occultation
Exp. 13
Exp. 13
Exp. 13
Exp. 13
Exp. 14
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 15

Visit

Proposal 11691, Visit 03 Wed Jul 02 01:54:17 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, ACS/WFC, WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 37.0D TO 90. D; ORIENT 220D TO 245 D; ORIENT 260D TO 350 D

Comments: NGC 1316 visit. ORIENT ranges to avoid very bright stars or galaxy NGC 1317 in parallel ACS images

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(10-11), (13)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	NGC1316	RA: 03 22 41.6800 (50.6736667d) Dec: -37 12 29.20 (-37.20811d) Equinox: J2000	Radial Velocity: 1760 km/sec	V=8.77	Reference Frame: ICRS

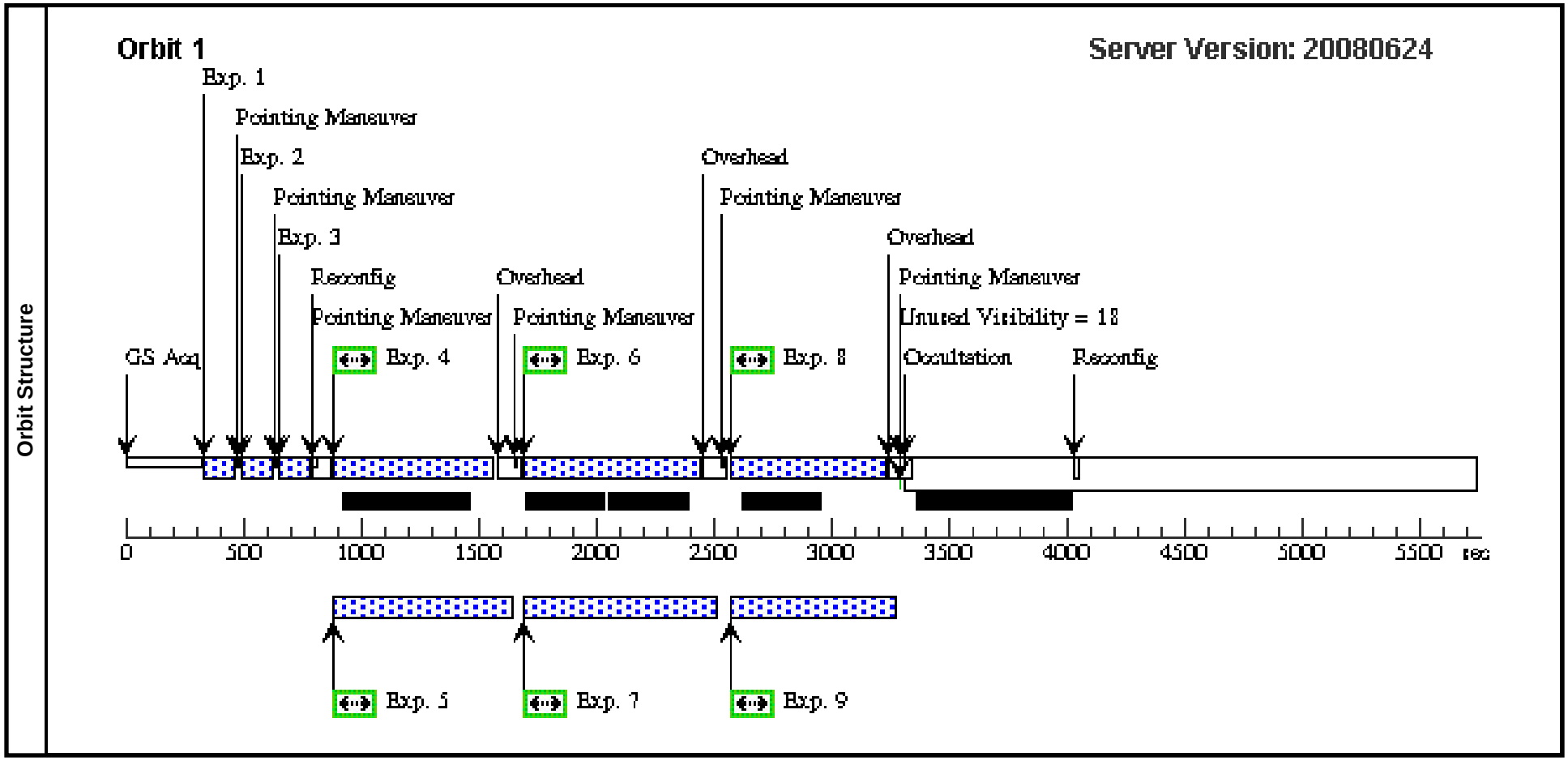
Comments: Converted GSC-I coordinates to GSC-II reference frame using http://gsss.stsci.edu/webservices/GSCconvert/WebForm.aspx

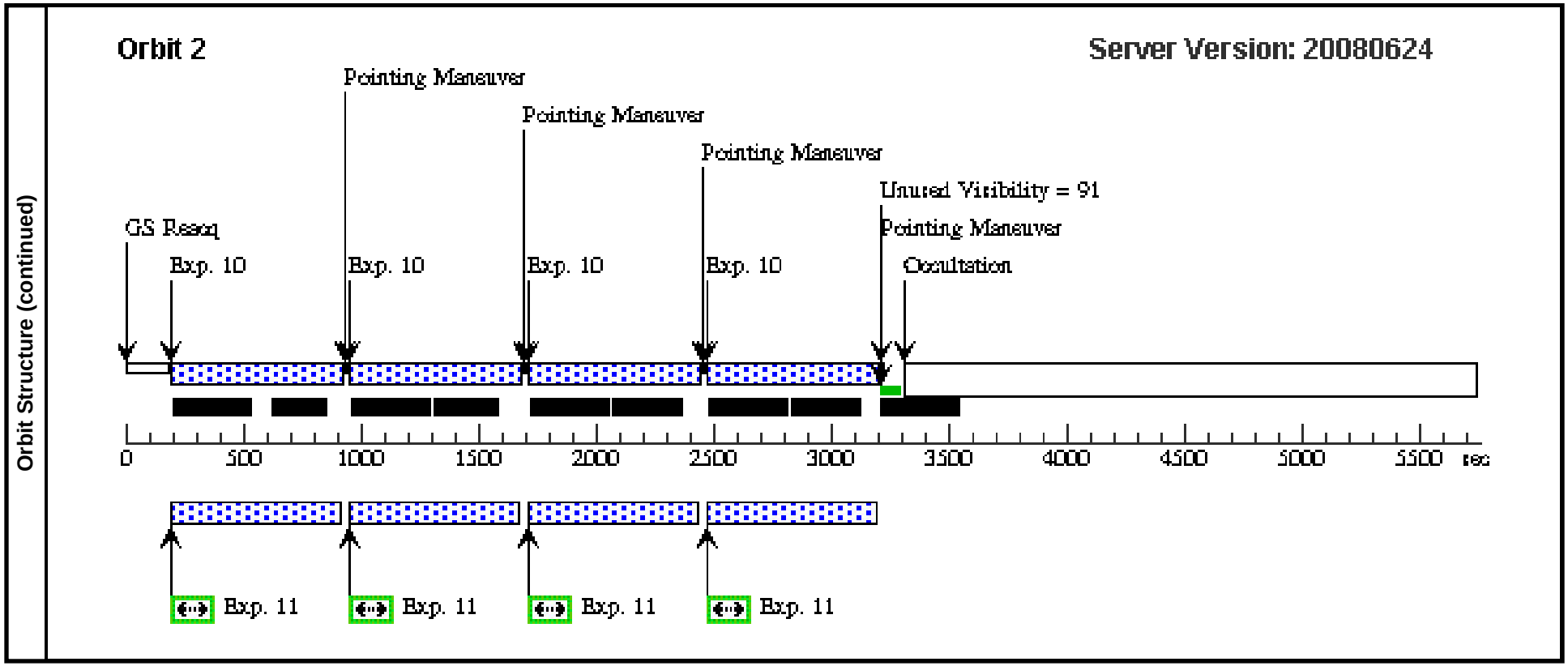
Exposures

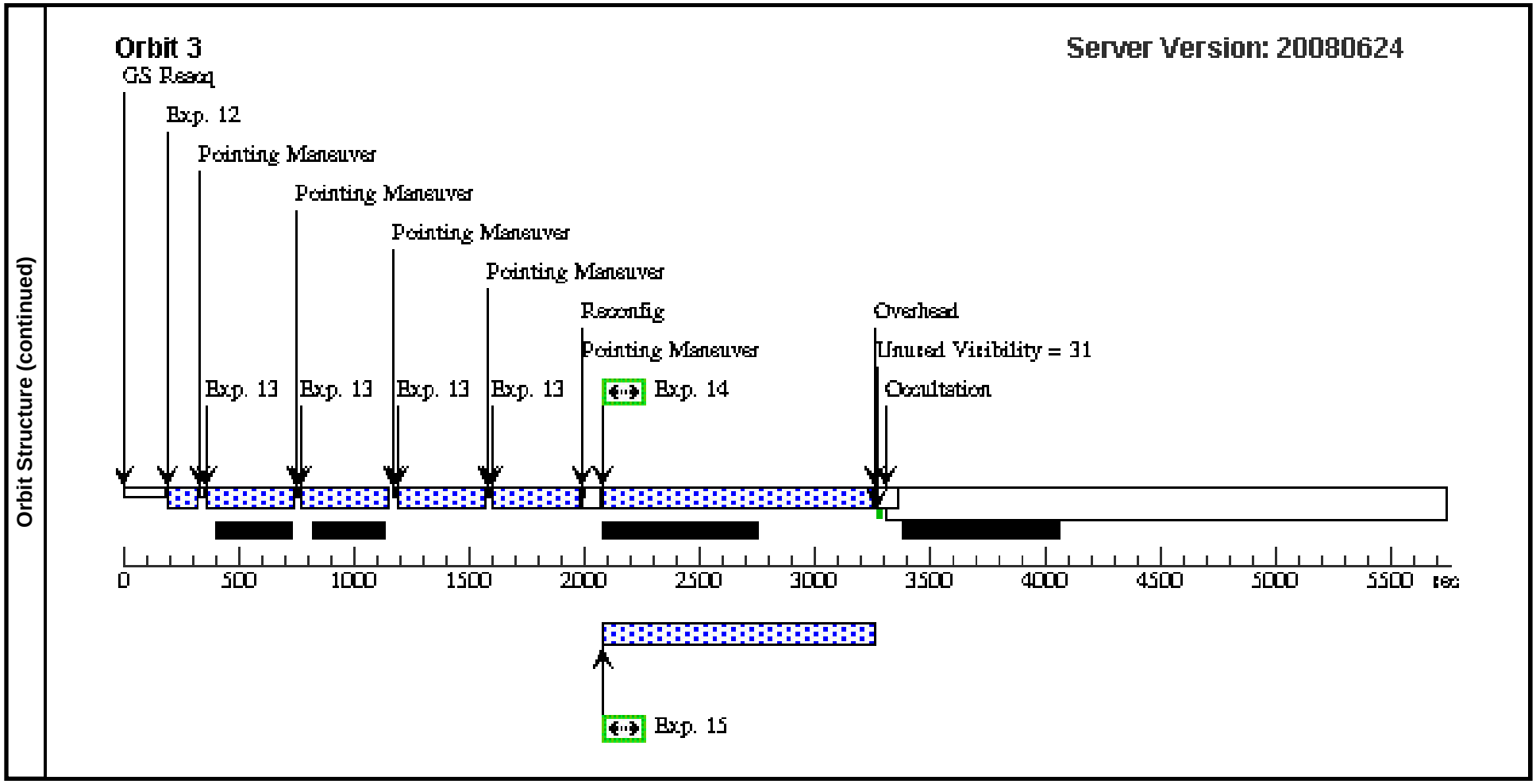
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	NGC1316-F110Wshort-POS1i	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=8	POS TARG 0.0,0.0		*[==>]*	***[1]***
Comments: 1st short F110W exp, POS TARG 0,0									
2	NGC1316-F110Wshort-POS2i	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=8	POS TARG 0.484,0.203		*[==>]*	***[1]***
Comments: 2nd short F110W exp, POS TARG 4.0, 1.5 pix									
3	NGC1316-F110Wshort-POS3i	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=8	POS TARG 0.302,0.540		*[==>]*	***[1]***
Comments: 3rd short F110W exp, POS TARG 2.5, 4.0 pix									
4	NGC1316-F336W-POS1	(3) NGC1316	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 4-5	650 Secs *[==>]*	***[1]***
Comments: Nominal position									
5	N1316-PARAL-F814W-POS1	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 4-5	550 Secs *[==>]*	***[1]***
Comments: Parallel to F336W exp #1									
6	NGC1316-F336W-POS2	(3) NGC1316	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.6,1.18	Prime + Parallel Group 6-7	750 Secs *[==>]*	***[1]***
*Comments: POS TARG 4.5, 1.5 pixels * 20 (to mitigate effects of droplets)*									

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7	N1316-PARAL-F814W-POS2	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 6-7	700 Secs *[==>]*	 ***[1]***
Comments: Parallel to F336W exp #2									
8	NGC1316-F336W-POS3	(3) NGC1316	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0.178,2.380	Prime + Parallel Group 8-9	660 Secs *[==>]*	 ***[1]***
Comments: POS TARG 4.5, 60.25 pixels (across chip gap)									
9	N1316-PARAL-F555W-POS3	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 8-9	540 Secs *[==>]*	 ***[1]***
Comments: Parallel to F336W exp #3									
10	NGC1316-F160W-BOXPATT	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP100; NSAMP=13	POS TARG 0.0,0.0	Pattern 10-11 (4) Prime + Parallel Group 10-11	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
Comments: F160W exp's with IR pattern (4 posns)									
11	N1316-PARAL-F555W-BOXPATT	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Pattern 10-11 (4) Prime + Parallel Group 10-11	600 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[2]***
12	NGC1316-F110Wshort-POS4i	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP25; NSAMP=8	POS TARG -0.181,0.338		*[==>]*	***[3]***
Comments: 4th short F160W exp, POS TARG -1.5, 2.5 pix									
13	NGC1316-F110W-BOXPATT	(3) NGC1316	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=12	POS TARG 0.0,12.0	Pattern 13-13 (4)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***
Comments: Longer F110W exp, BOX pattern									
14	NGC1316-F336W-POS4	(3) NGC1316	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.778,3.56	Prime + Parallel Group 14-15	1170 Secs *[==>]*	 ***[3]***
Comments: POS TARG 3.778, 3.56 (2nd across chip gap, ~100 pix away from 1st to mitigate effects of droplets)									
15	N1316-PARAL-F555W-POS4	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 14-15	1020 Secs *[==>]*	 ***[3]***
Comments: Parallel to F336W exp #4									


Orbit Structure
Orbit 1
Server Version: 20080624
Exp. 1
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 3
Reconfig
Pointing Maneuver
Exp. 4
Overhead
Pointing Maneuver
Exp. 6
Overhead
Pointing Maneuver
Exp. 8
Overhead
Pointing Maneuver
Unused Visibility = 18
Occultation
Reconfig
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 5
Exp. 7
Exp. 9


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 91
Pointing Maneuver
GS Reacq
Occultation
Exp. 10
Exp. 10
Exp. 10
Exp. 10
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 11
Exp. 11
Exp. 11
Exp. 11


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
GS Reacq
Exp. 12
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Pointing Maneuver
Overhead
Unused Visibility = 31
Occultation
Exp. 13
Exp. 13
Exp. 13
Exp. 13
Exp. 14
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 15

Visit

Proposal 11691, Visit 04 Wed Jul 02 01:54:18 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, ACS/WFC, WFC3/UVIS

Special Requirements: PCS MODE FINE; CVZ; ORIENT 0.0D TO 40.0 D; ORIENT 74.0D TO 169.0 D; ORIENT 187.0D TO 359.9 D

Comments: NGC 3610 visit. ORIENT ranges to avoid very bright stars falling in parallel ACS images.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (3-4)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC3610	RA: 11 18 25.1600 (169.6048333d) Dec: +58 47 10.70 (58.78631d) Equinox: J2000	Radial Velocity: 1696 km/sec	V=11.4	Reference Frame: ICRS

Comments: Converted GSC-I coordinates to GSC-II reference frame using http://gsss.stsci.edu/webservices/GSCconvert/WebForm.aspx

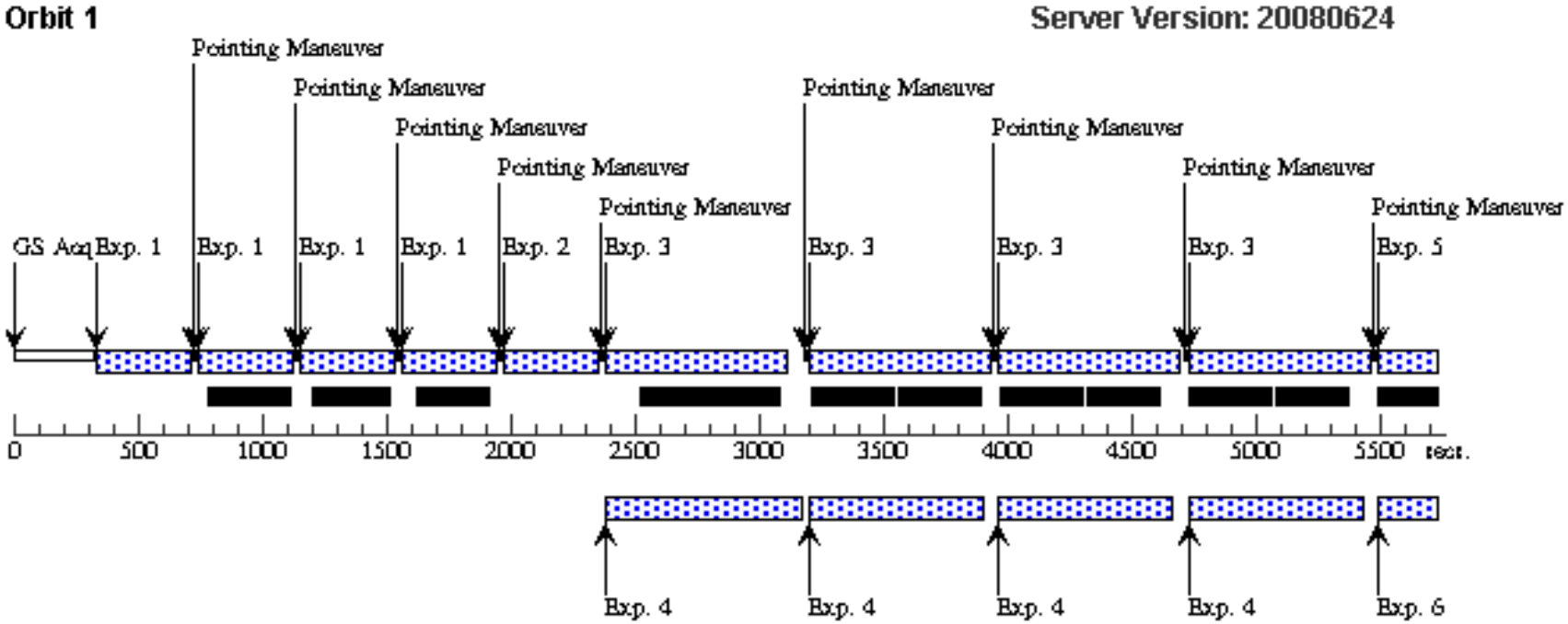
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	NGC3610-F110W-BOXPATT	(4) NGC3610	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=12	POS TARG 0.0,0.0	Pattern 1-1 (4)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
Comments: Longer F110W exp, BOX pattern									
2	NGC3610-F110Wshort-POS5i	(4) NGC3610	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=12	POS TARG -0.484,-0.203		*[==>]*	***[1]***
Comments: 5th F110W exp, POS TARG -4.5, -1.5 pix									
3	NGC3610-F160W-BOXPATT	(4) NGC3610	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP100; NSAMP=13	POS TARG 0.0,0.0	Pattern 3-4 (4) Prime + Parallel Group 3-4	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
Comments: F160W exp's with BOX pattern (4 posns)									
4	N3610-PARAL-F814W-BOXPATT	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Pattern 3-4 (4) Prime + Parallel Group 3-4	580 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
Comments: Parallel to F160W BOX pattern									

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
5	NGC3610-F160W-POS5i	(4) NGC3610	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP100; NSAMP=13	POS TARG -0.484,-0.203	Prime + Parallel Group 5-6	*[==>]*	***[1]***
	Comments: 5th F160W exp, POS TARG -4.0, -1.5 pix								
6	N3610-PARAL-F814W-POS5i	ANY	ACS/WFC, ACCUM, WFC	F814W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 5-6	580 Secs *[==>]*	***[1]***
	Comments: Parallel to F160W position #5								
7	NGC3610-F336W-POS1	(4) NGC3610	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0,0	Prime + Parallel Group 7-8	900 Secs *[==>]*	***[2]***
	Comments: Nominal position								
8	N3610-PARAL-F555W-POS1	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 7-8	820 Secs *[==>]*	***[2]***
	Comments: Parallel to F336W #1								
9	NGC3610-F336W-POS2	(4) NGC3610	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.6,1.18	Prime + Parallel Group 9-10	900 Secs *[==>]*	***[2]***
	*Comments: POS TARG 4.5, 1.5 pixels * 20 (to mitigate effects of droplets)*								
10	N3610-PARAL-F555W-POS2	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 9-10	820 Secs *[==>]*	***[2]***
	Comments: Parallel to F336W exp #2								
11	NGC3610-F336W-POS3	(4) NGC3610	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 0.178,2.380	Prime + Parallel Group 11-12	900 Secs *[==>]*	***[2]***
	Comments: POS TARG 4.5, 60.25 pix (jumping chip gap)								
12	N3610-PARAL-F555W-POS3	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 11-12	820 Secs *[==>]*	***[2]***
	Comments: Parallel to F336W exp #3								
13	NGC3610-F336W-POS4	(4) NGC3610	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=NO	POS TARG 3.778,3.56	Prime + Parallel Group 13-14	900 Secs *[==>]*	***[2]***
	Comments: POS TARG 3.778, 3.56 (2nd exp across chip gap, ~100 pix away from 1st to mitigate effects of droplets)								
14	N3610-PARAL-F555W-POS4	ANY	ACS/WFC, ACCUM, WFC	F555W	CR-SPLIT=NO; GAIN=2.0		Prime + Parallel Group 13-14	820 Secs *[==>]*	***[2]***
	Comments: Parallel to 4th F336W exp.								

Orbit Structure



Orbit Structure (continued)