10522 - Calibrating Star Formation: The Link between Feedback and Galaxy Evolution

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Daniela Calzetti (PI)	**Space Telescope Science Institute**	**calzetti@stsci.edu**
Prof. John S. Gallagher III (CoI)	University of Wisconsin - Madison	jsg@astro.wisc.edu
Dr. Jason Harris (CoI)	University of Arizona	jharris@as.arizona.edu
Dr. Robert C. Kennicutt Jr. (CoI)	University of Arizona	robk@as.arizona.edu
Dr. Crystal Martin (CoI)	University of California - Santa Barbara	cmartin@physics.ucsb.edu
Dr. Anne Pellerin (CoI)	Space Telescope Science Institute	pellerin@stsci.edu
Dr. Denise A. Smith (CoI)	Space Telescope Science Institute	dsmith@stsci.edu
Dr. David Strickland (CoI)	The Johns Hopkins University	dks@pha.jhu.edu

VISITS

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC4449-ACS	ACS/WFC	2	10-Jan-2006 21:01:10.0	yes
02	(3) NGC4449-WFPC2	WFPC2	1	10-Jan-2006 21:01:18.0	yes
03	(2) HOLMBERGII-ACS	ACS/WFC	3	10-Jan-2006 21:01:31.0	yes
04	(4) HOLMBERGII-WFPC2	WFPC2	2	10-Jan-2006 21:01:44.0	yes
52	(5) NGC4449-WFPC2-2	WFPC2	1	10-Jan-2006 21:01:48.0	yes

9 Total Orbits Used

ABSTRACT

Stellar feedback - the return of mass and energy from star formation to the interstellar medium - is one of the primary engines of galaxy evolution. Yet, the theoretical foundation of mechanical feedback is, to date, unconstrained by observations. We propose to investigate this fundamental aspect of star formation on a sample of two local actively star-forming galaxies, NGC4449, and Holmberg II. The two galaxies have been selected to occupy an unexplored, yet crucial for quantifying mechanical feedback, niche in the two-parameter space of star formation intensity and galaxy mass. ACS/WFC and WFPC2 narrow-band observations in the light of H-beta, [OIII], H-alpha, and [NII] will be obtained for both galaxies, in order to: (1) discriminate the feedback-induced shock fronts from the photoionization regions; (2) map the shocks inside and around the starburst regions; and (3) measure the energy budget of the star-formation-produced shocks. These observations, complemented by existing data, will yield: (1) the efficiency of the feedback, i.e. the fraction of the star formation's mechanical energy that is transported out of the starburst volume rather than confined or radiated away; (2) the dependence of this efficiency on the two fundamental parameters of star formation intensity and stellar mass. The high angular resolution of HST is crucial for separating the spatially narrow shock fronts (~5 pc, ~0.25" at 4 Mpc) from the more extended photoionization fronts. The legacy from this project will be the most complete quantitative measurement of the energetics associated with feedback processes. We will secure the first milestone for placing feedback mechanisms on a solid physical ground, and for understanding quantitatively their role on the energetics, structure, and star formation history of galaxies at all redshifts.

OBSERVING DESCRIPTION

The two galaxies, NGC4449 and HombergII, will be observed with ACS (filters: F502N, F658N, F660N, F550M, and F814W) and WFPC2 (F487N). No images in F658N will be obtained for NGC4449, as these images will be coming from another GO program.

For NGC4449: 2 orbits are devoted to the ACS observations, and 1 orbit to the WFPC2 observations.

Each F502N and F660N will be obtained with 3 exposures stepped by about 30 pixels in the Y direction, and about 5 pixels in the X direction, to remove cosmic rays, hot pixels, and to cover the gap between the ACS CCDs (using one of the available ACS PATTERNs). The end result will be a field mostly covered with 3 exposures; the equivalent of 1 gap covered with one exposure, and another 1-gap-equivalent with only 1 exposure. For the F550M and F814W images, only 2 exposures could be fit into the orbits, implying a 2-gap-equivalent with one exposure; for these exposures, the stepping is done with POS TARG. The ORIENT constraints imposed on the ACS images prevent the gap from landing onto regions of interest for this project.
Three exposures (1 orbit) are used for WFPC2/F487N. The ORIENT constraints ensure the interesting regions to land within the WFPC2 chips.

For HolmbergII: 3 orbits are devoted to ACS observations, and 2 orbits to the WFPC2 observations. The approach adopted for this galaxy (including the ORIENT constraints) is similar to that of NGC4449. The main difference is that for HolmbergII the F550M and F814W observations are obtained with three exposures instead of 2, ensuring a better coverage of the gap between the CCDs. POS TARGs are used for these exposures.

Visit

Proposal 10522, Visit 01 Wed Jan 11 02:01:50 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 310.0D TO 325.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(3), (5)

Fixed Targets

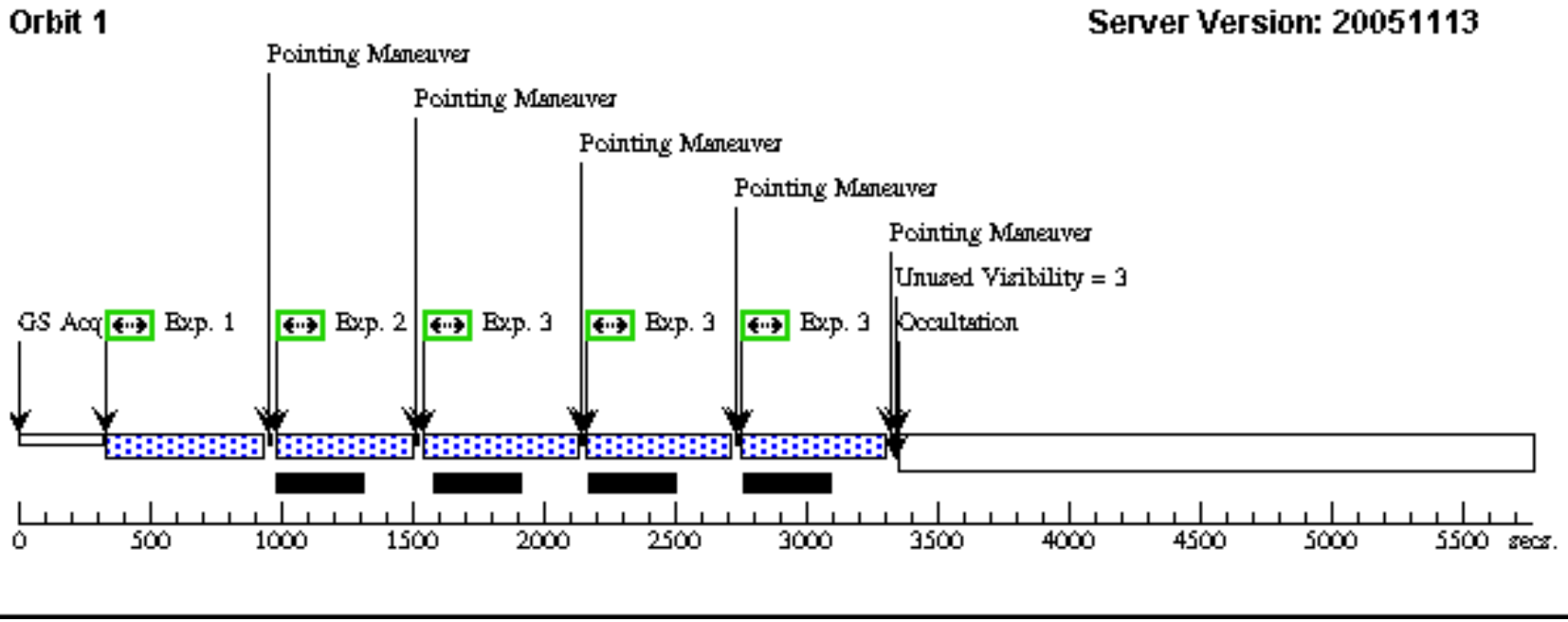
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC4449-ACS Alt Name1: UGC7592	RA: 12 28 12.1516 (187.0506317d) Dec: +44 05 45.40 (44.09594d) Equinox: J2000 Plate Id: 00XX	Radial Velocity: 207.0 km/sec	V=9.99	Coordinate Source: GSC_SURVEY_PLATE

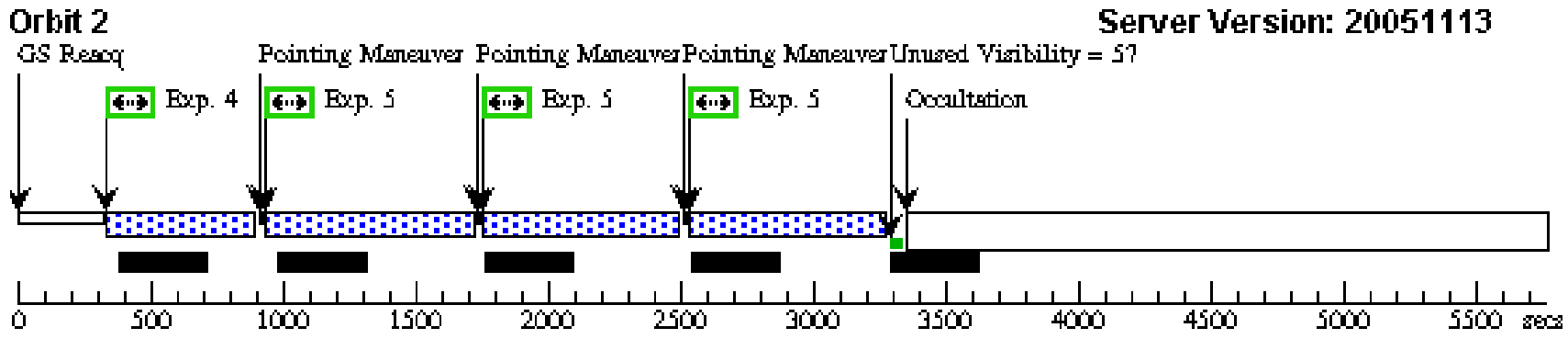
Comments: Position adjusted to fit galaxy within ACS/WFPC2 FOVs. Interest is in low-surface brightness narrow-line emitting regions surrounding the main visible body of the galaxy.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NGC4449-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO			400.0 Secs	
								[==>]	***[1]***
2		(1) NGC4449-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO	POS TARG -0.25,3		400.0 Secs	
								[==>]	***[1]***
3		(1) NGC4449-ACS	ACS/WFC, ACCUM, WFCENTER	F502N	CR-SPLIT=NO	POS TARG -0.24,-3	Pattern 3-3 (1)	428.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
4		(1) NGC4449-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO	POS TARG 0.25,-3		400.0 Secs	
								[==>]	***[2]***
5		(1) NGC4449-ACS	ACS/WFC, ACCUM, WFCENTER	F660N	CR-SPLIT=NO	POS TARG -0.24,-3	Pattern 5-5 (1)	620.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 10522, Visit 02 Wed Jan 11 02:01:51 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 120.0D TO 170.0 D; ORIENT 260.0D TO 280.0 D

Fixed Targets

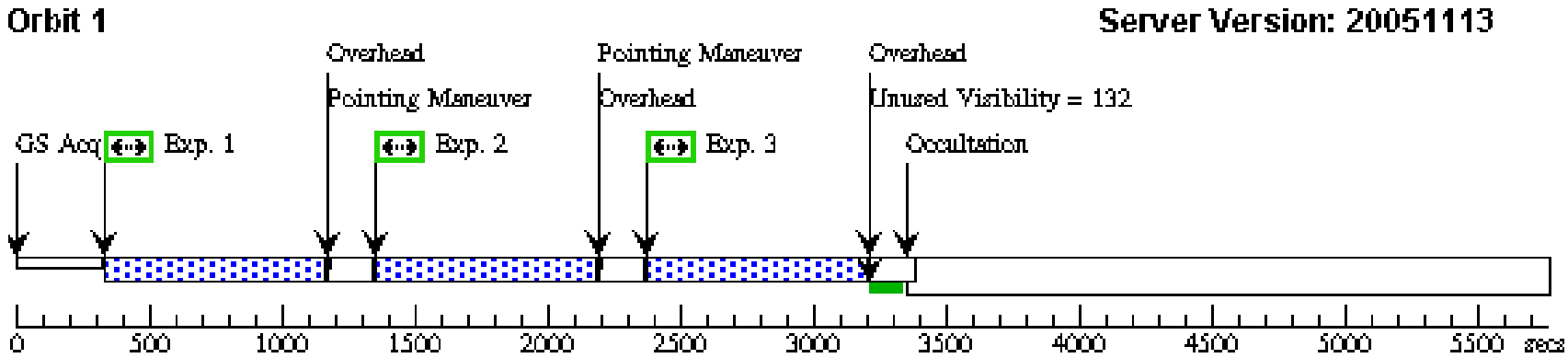
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	NGC4449-WFPC2 Alt Name1: UGC7592	RA: 12 28 13.2000 (187.0550000d) Dec: +44 06 15.00 (44.10417d) Equinox: J2000 Plate Id: 00XX	Radial Velocity: 207.0 km/sec	V=9.99	Coordinate Source: GSC_SURVEY_PLATE

Comments: Position adjusted to fit galaxy within ACS/WFPC2 FOVs.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(3) NGC4449-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO			700.0 Secs	
								[==>700.0 Secs]	***[1]***
2		(3) NGC4449-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG 0.5,0.5		700.0 Secs	
								[==>700.0 Secs]	***[1]***
3		(3) NGC4449-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG 0.5,-0.5		700.0 Secs	
								[==>700.0 Secs]	***[1]***

Orbit Structure



Visit

Proposal 10522, Visit 03 Wed Jan 11 02:01:51 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 150.0D TO 160.0 D; ORIENT 330.0D TO 340.0 D; ORIENT 210.0D TO 230.0 D; ORIENT 35.0D TO 50.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(3), (6), (9)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HOLMBERGII-ACS Alt Name1: UGC4305	RA: 08 19 14.0238 (124.8084325d) Dec: +70 42 41.42 (70.71151d) Equinox: J2000 Plate Id: 01L1	Radial Velocity: 142.0 km/sec	V=11.1	Coordinate Source: GSC_SURVEY_PLATE

Comments: Position adjusted to fit within the ACS/WFPC2 FOVs.

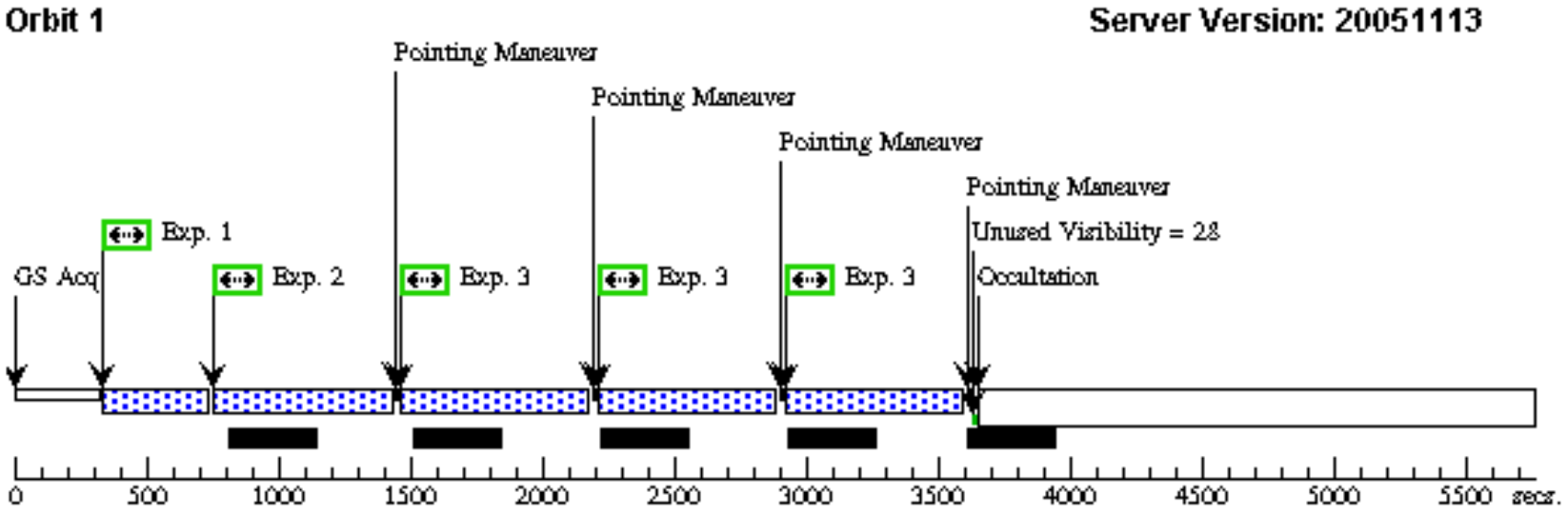
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG 0.25,-3		200.0 Secs *[==>]*	 ***[1]***
2		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO	SAME POS AS 1		502.0 Secs *[==>]*	 ***[1]***
3		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F502N	CR-SPLIT=NO	POS TARG -0.24,-3	Pattern 3-3 (1)	550.0 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
4		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG -0.25,3		200.0 Secs *[==>]*	 ***[2]***
5		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO	SAME POS AS 4		516.0 Secs *[==>]*	 ***[2]***
6		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F658N	CR-SPLIT=NO	POS TARG -0.24,-3	Pattern 6-6 (1)	560.0 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[2]***
7		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO			200.0 Secs *[==>]*	 ***[3]***
8		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F550M	CR-SPLIT=NO			487.0 Secs *[==>]*	 ***[3]***

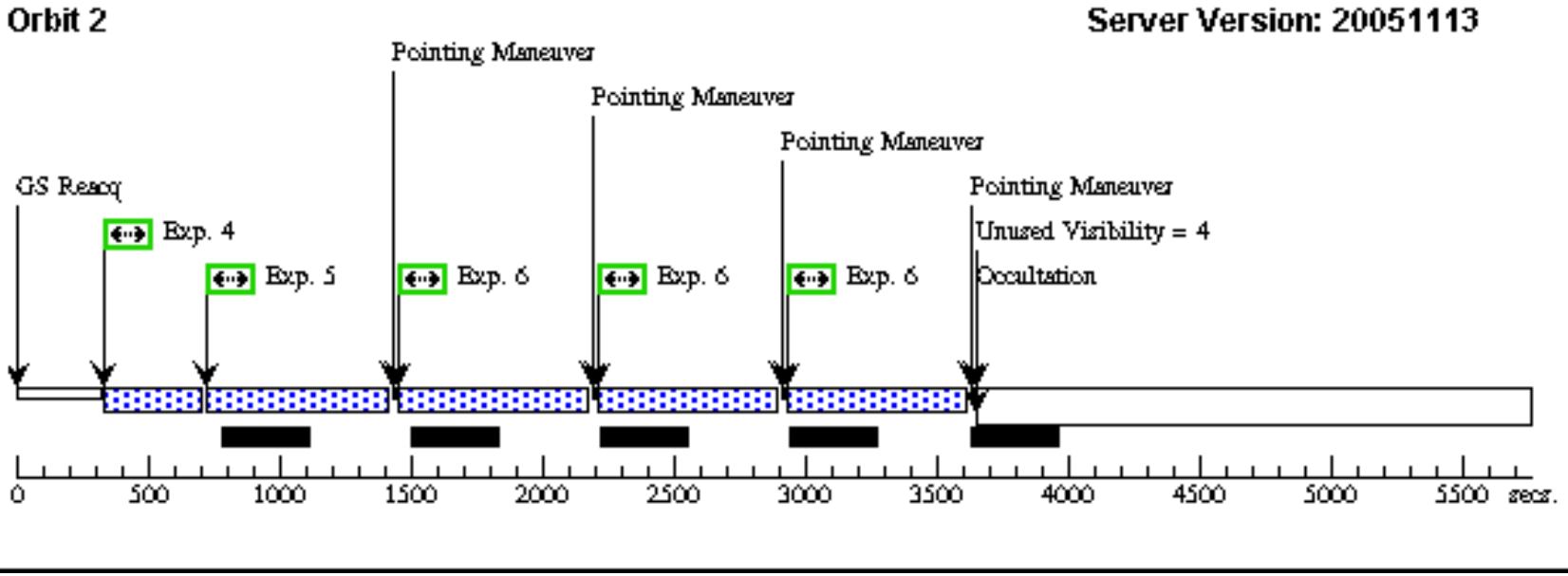
Exposures (continued)

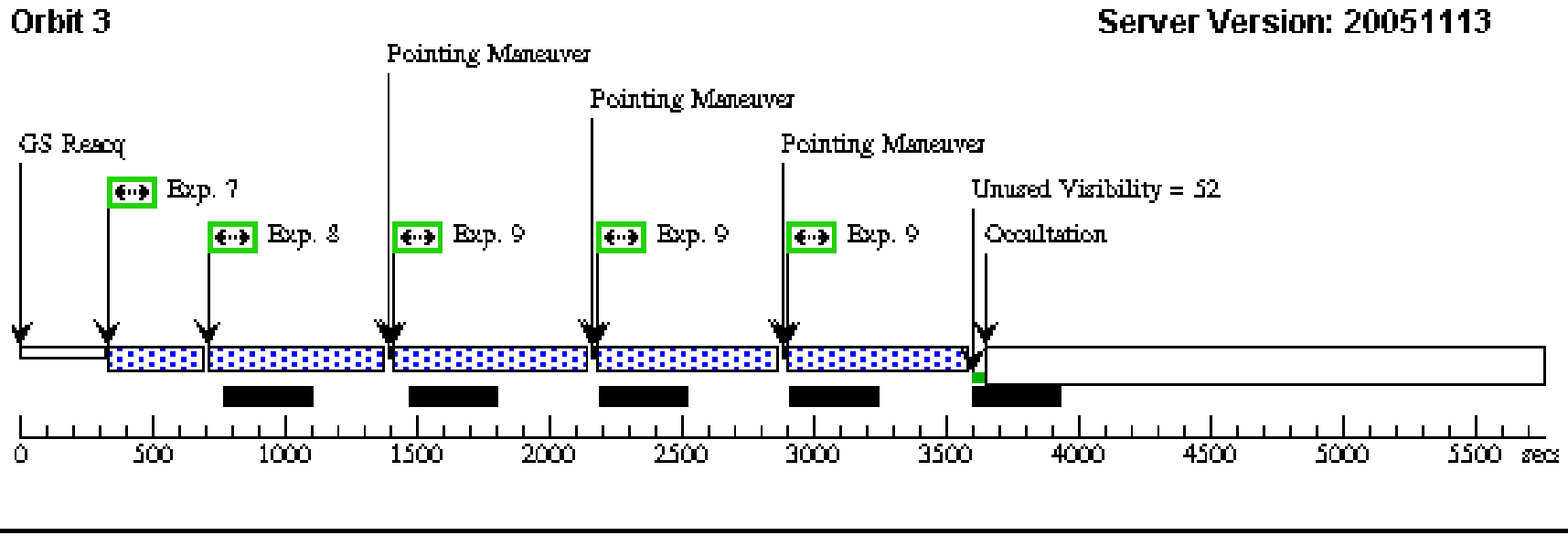
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
9		(2) HOLMBERGII-ACS	ACS/WFC, ACCUM, WFCENTER	F660N	CR-SPLIT=NO	POS TARG -0.24,-3	Pattern 9-9 (1)	562.0 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[3]***

Orbit Structure



Orbit Structure (continued)





Visit

Proposal 10522, Visit 04 Wed Jan 11 02:01:53 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 10.0D TO 25.0 D; ORIENT 45.0D TO 55.0 D; ORIENT 210.0D TO 260.0 D

Fixed Targets

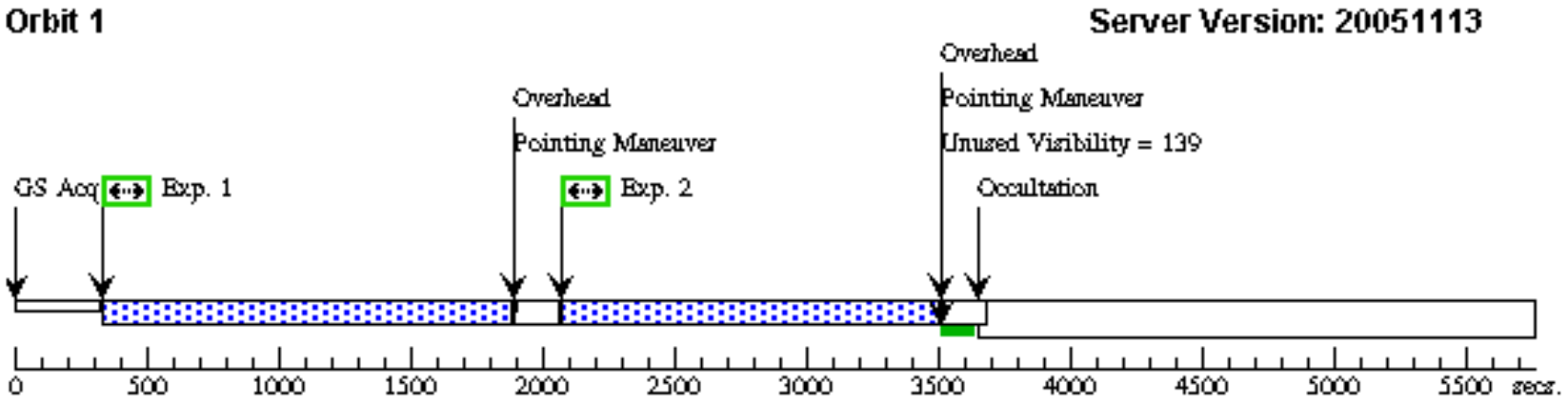
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	HOLMBERGII-WFPC2 Alt Name1: UGC4305	RA: 08 19 20.9300 (124.8372083d) Dec: +70 42 41.30 (70.71147d) Equinox: J2000 Plate Id: 01L1	Radial Velocity: 142.0 km/sec	V=11.1	Coordinate Source: GSC_SURVEY_PLATE

Comments: Position adjusted to fit within the ACS/WFPC2 FOVs.

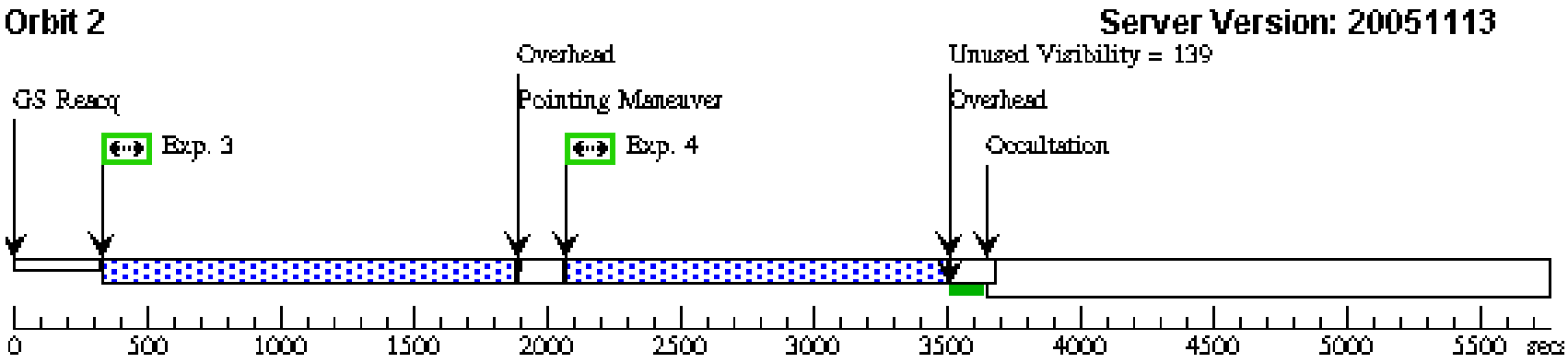
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) HOLMBERGII-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG 0.2,0.3		1400.0 Secs	
								[==>1400.0 Secs]	***[1]***
2		(4) HOLMBERGII-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG 0.3,-0.2		1300.0 Secs	
								[==>1300.0 Secs]	***[1]***
3		(4) HOLMBERGII-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG -0.2,-0.3		1400.0 Secs	
								[==>1400.0 Secs]	***[2]***
4		(4) HOLMBERGII-WFPC2	WFPC2, IMAGE, WFALL-FIX	F487N	CR-SPLIT=NO	POS TARG -0.3,0.2		1300.0 Secs	
								[==>1300.0 Secs]	***[2]***

Orbit Structure



Orbit Structure (continued)



Visit

Proposal 10522, Visit 52 Wed Jan 11 02:01:54 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 120.0D TO 170.0 D; ORIENT 260.0D TO 280.0 D

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	NGC4449-WFPC2-2 Alt Name1: UGC7592	RA: 12 28 11.1400 (187.0464167d) Dec: +44 05 31.50 (44.09208d) Equinox: J2000 Plate Id: 00XX	Radial Velocity: 207.0 km/sec	V=9.99	Coordinate Source: GSC_SURVEY_PLATE

Comments: Position adjusted to fit galaxy within ACS/WFPC2 FOVs.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(5) NGC4449-WFPC 2-2	WFPC2, IMAGE, WF3-FIX	F487N	CR-SPLIT=NO			700.0 Secs	
								[==>700.0 Secs]	***[1]***
2		(5) NGC4449-WFPC 2-2	WFPC2, IMAGE, WF3-FIX	F487N	CR-SPLIT=NO	POS TARG 0.5,0.5		700.0 Secs	
								[==>700.0 Secs]	***[1]***
3		(5) NGC4449-WFPC 2-2	WFPC2, IMAGE, WF3-FIX	F487N	CR-SPLIT=NO	POS TARG 0.5,-0.5		700.0 Secs	
								[==>700.0 Secs]	***[1]***

Orbit Structure