



12197 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxies

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) MACS1149-ARC	WFC3/IR	2	06-Aug-2010 21:59:19.0	yes
02	(2) A68-ARC	WFC3/IR	2	06-Aug-2010 21:59:24.0	yes
03	(3) A611-ARC	WFC3/IR	2	06-Aug-2010 21:59:27.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
04	(4) A773-ARC	WFC3/IR	2	06-Aug-2010 21:59:31.0	yes
05	(5) MACS0947-ARC	WFC3/IR	3	06-Aug-2010 21:59:35.0	yes
06	(6) MACS0159-ARC	WFC3/IR	3	06-Aug-2010 21:59:40.0	yes
07	(7) MACS1133-ARC	WFC3/IR	3	06-Aug-2010 21:59:44.0	yes

17 Total Orbits Used

ABSTRACT

The gravitational magnification of distant galaxies by foreground clusters has enabled the first measurement of the size-luminosity relation for HII regions at redshift $z \sim 2-5$. A significant offset is seen in this relation with respect to that determined locally. This evolutionary trend has been interpreted as possible evidence for a different mode of star formation in the early universe.

To test this hypothesis, we propose to image a sample of 7 lensed galaxies at intermediate redshifts, $z \sim 1.0-1.5$, carefully chosen so that the H α emission falls precisely within an appropriate narrow-band filter with WFC3/IR. As each galaxy is magnified by a significant factor, this will enable us to resolve and measure the luminosities of ~ 50 individual HII regions as small as 50 pc to a star formation rate limit of 0.015 Mo/year. By tracking the size-luminosity relation over the full redshift range from 0 to 5, we can differentiate between various explanations proposed for the change in this fundamental relationship.

OBSERVING DESCRIPTION

We perform WFC3 imaging of 7 lensed galaxies at $z \sim 1.0$ and $z \sim 1.5$. Each of the targets is extended by 5-20" so entirely fits in a single WFC3 pointing.

To achieve our science goal (H α imaging of HII regions), we will observe each target using the appropriate narrow-band filter matching H α : F126N, F132N, F164N or F167N.

In order to differentiate H α emission from the contribution from the stellar continuum, we will also observe the same targets in the corresponding broad-band filter (F125W at $z \sim 1$, F160W at $z \sim 1.5$) and produce narrow-band excess images to select HII regions. These broad-band images are free of other strong emission lines.

Whenever possible we match the orientation of the narrow-band and the broad-band image to minimize the effect of PSF anisotropy when performing the subtraction.

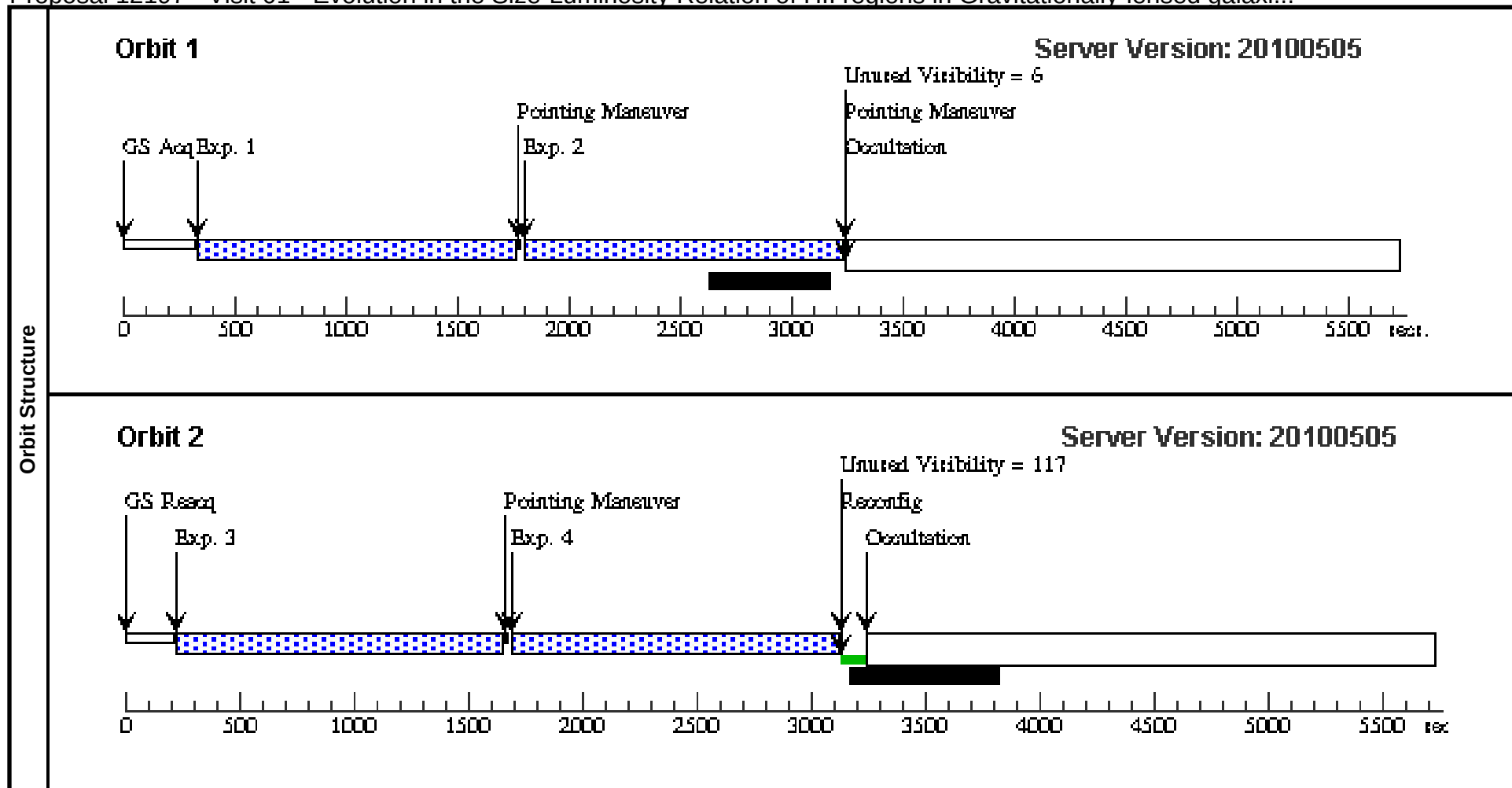
We will detect H α fluxes of 10^{-17} cgs per HII region in two orbits (5 σ , ~ 40 min exposure time per orbit). Adopting a conservative factor of $\times 5$ -20 for the total magnification, this limiting flux corresponds to intrinsic star-formation rates of 0.015-0.05 $M_{\odot}/\text{yr}$ per HII region, at $z \sim 1.0$ -1.5, which will allow us to probe the required parameter space in the size-luminosity diagram.

Similarly, our targets have observed magnitudes of 21-22 AB and extend over ~ 5 -15 arcsec^{-2} . Adopting a (conservative) constant surface brightness $AB = 25 \text{ mag. arcsec}^{-2}$, we are able measure the continuum in the broad-band filter (F125W or F160W) at 5 σ in a single orbit (40 min).

For each WFC3 observation, we will split the orbit into 3 individual exposures and apply a dithering pattern to remove hot/bad pixels and cosmic-ray events.

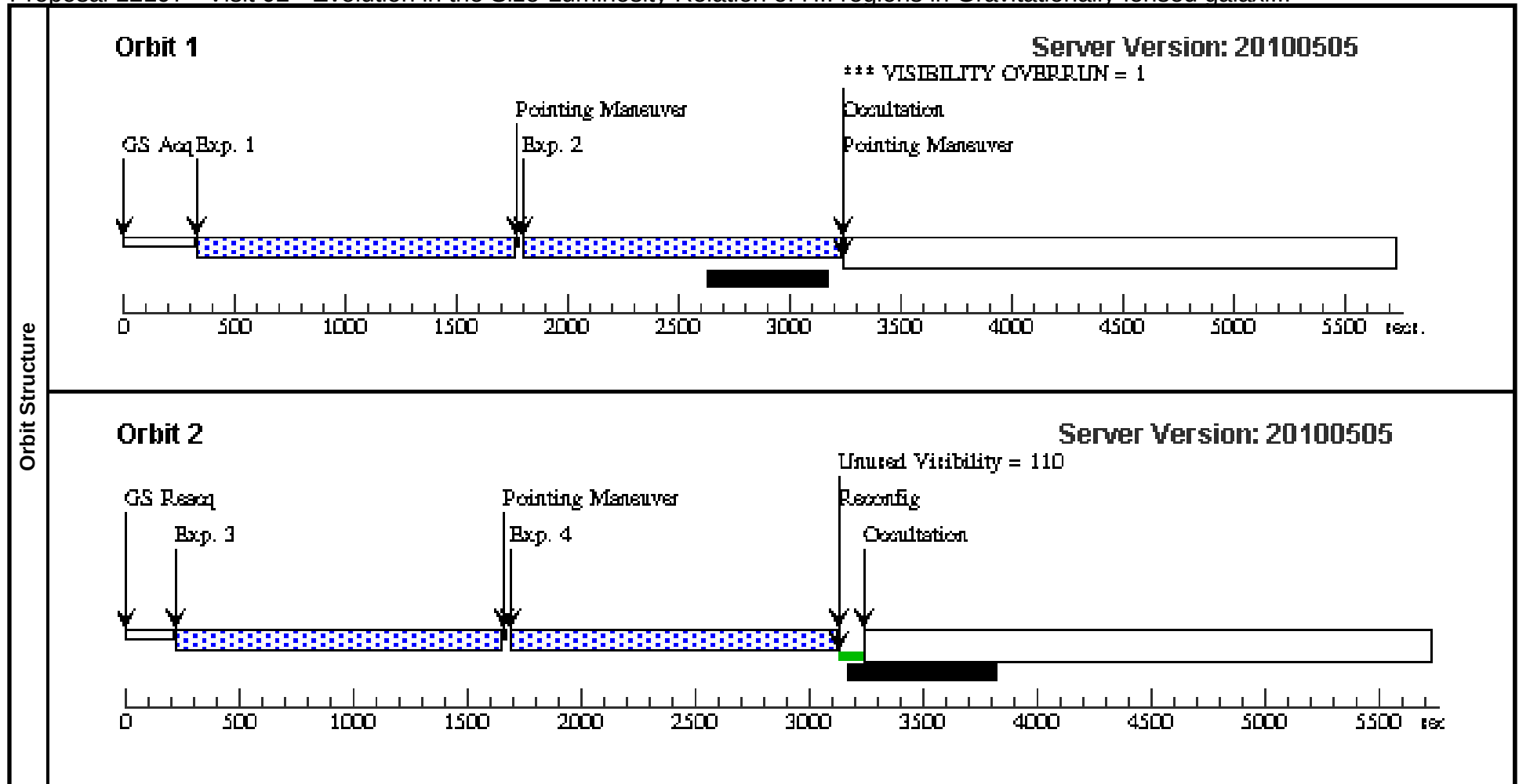
Proposal 12197 (STScI Edit Number: 2, Created: Friday, August 6, 2010 8:59:48 PM EST) - Overview

Visit	Proposal 12197, Visit 01, implementation Sat Aug 07 01:59:49 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	MACS1149-ARC	RA: 11 49 38.5380 (177.4105750d) Dec: +22 23 53.27 (22.39813d) Equinox: J2000	Redshift: 1.491	V=20.6+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) MACS1149-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG -4.995,- 4.961		[==>]	[1]
	2		(1) MACS1149-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[1]
	3		(1) MACS1149-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 4.995,4. 961		[==>]	[2]
	4		(1) MACS1149-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[2]



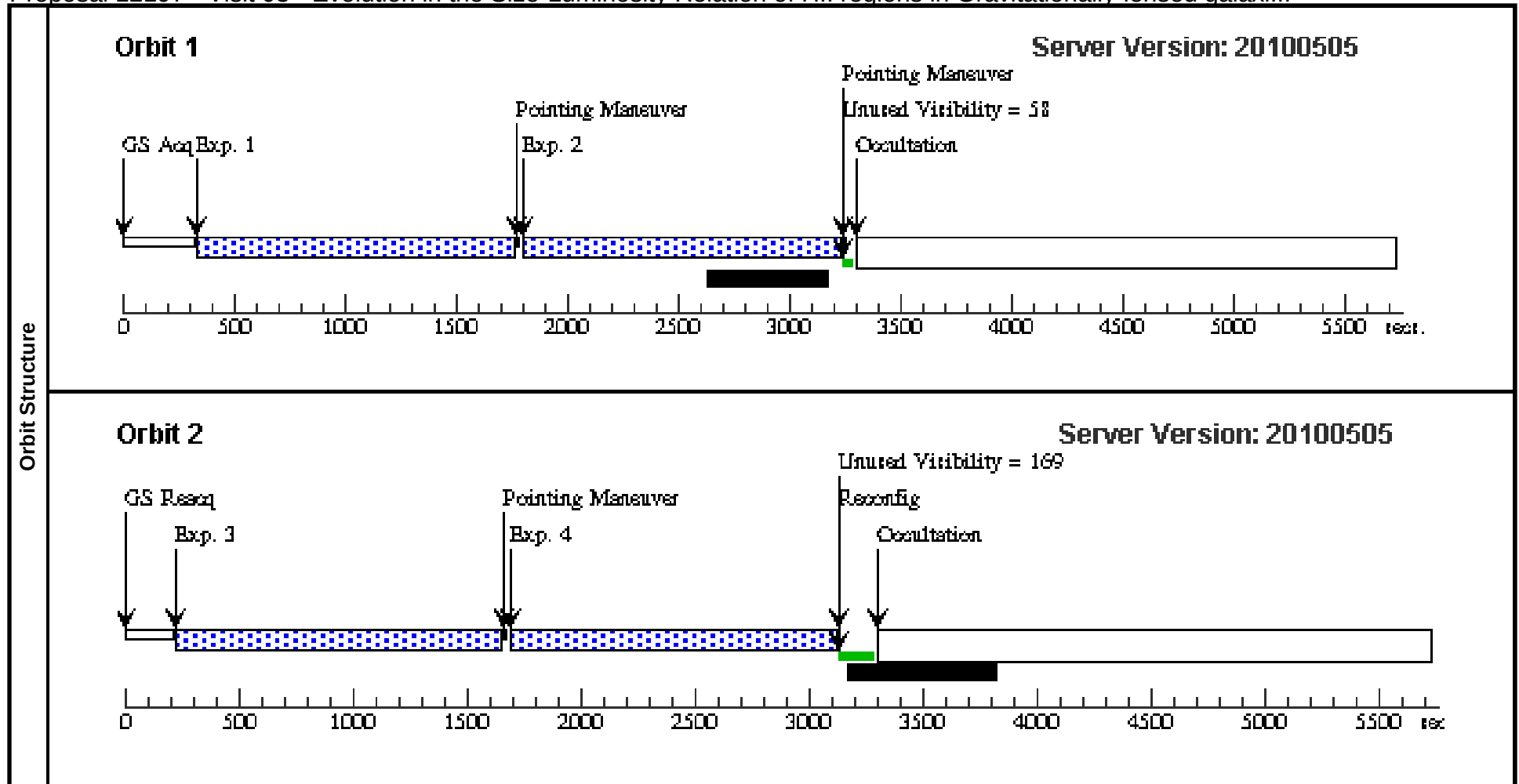
Proposal 12197 - Visit 01 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 02, implementation Sat Aug 07 01:59:50 GMT 2010									
	Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: (none)									
Diagnos	(Visit 02) Warning (Orbit Planner): VISIBILITY OVERRUN									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	A68-ARC	RA: 00 37 4.8800 (9.2703333d) Dec: +09 10 24.71 (9.17353d) Equinox: J2000	Redshift: 1.017	V=21.6+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) A68-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG -4.995,- 4.961		[==>]	[1]
	2		(2) A68-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[1]
	3		(2) A68-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 4.995,4. 961		[==>]	[2]
	4		(2) A68-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[2]



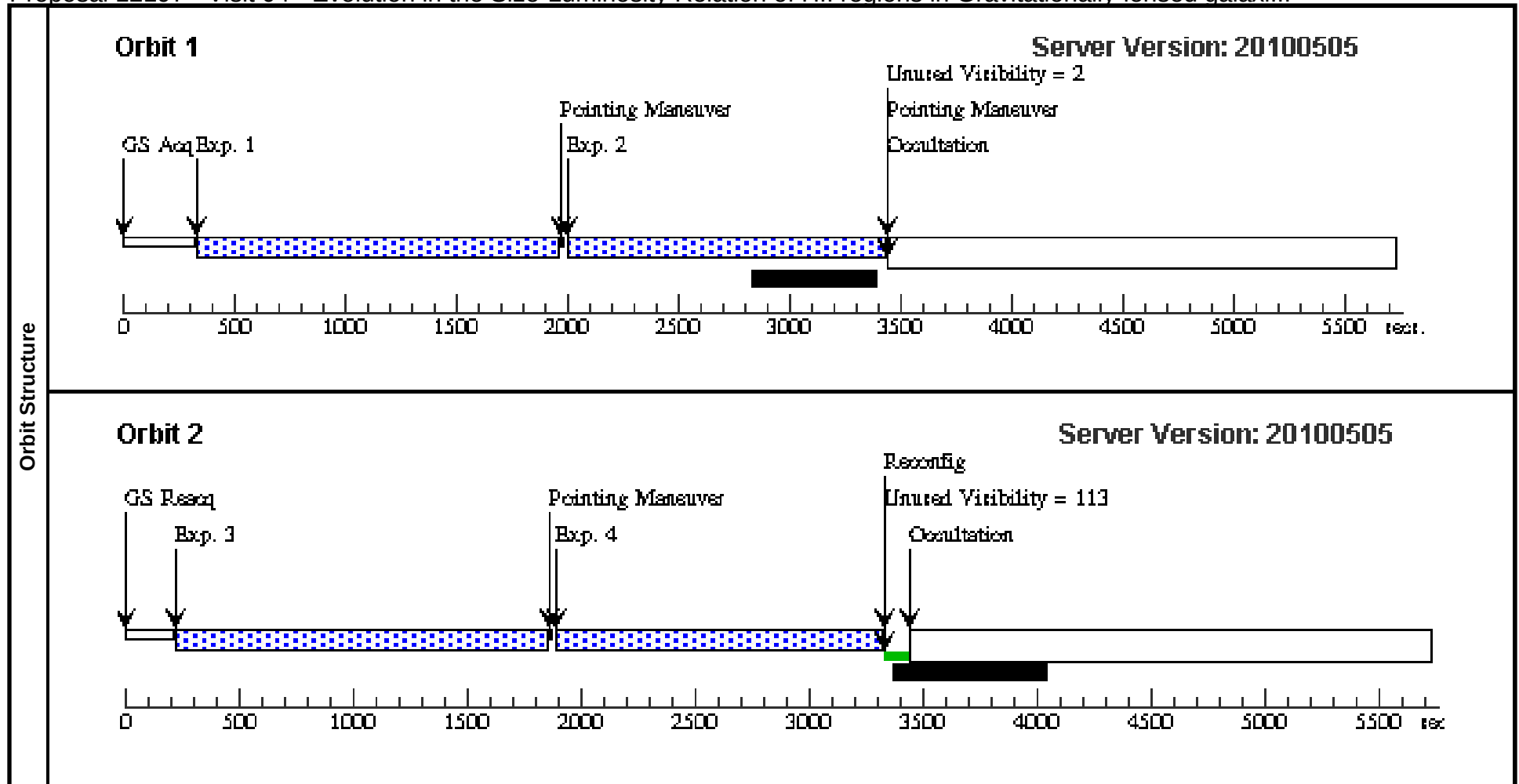
Proposal 12197 - Visit 02 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 03, implementation Sat Aug 07 01:59:50 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	A611-ARC	RA: 08 00 57.5500 (120.2397917d) Dec: +36 03 38.77 (36.06077d) Equinox: J2000	Redshift: 0.908	V=22.0+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(3) A611-ARC	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG -4.995,- 4.961		[==>]	[1]
	2		(3) A611-ARC	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[1]
	3		(3) A611-ARC	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 4.995,4. 961		[==>]	[2]
	4		(3) A611-ARC	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[2]



Proposal 12197 - Visit 03 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 04, implementation Sat Aug 07 01:59:51 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	A773-ARC	RA: 09 17 58.9000 (139.4954167d) Dec: +51 43 48.81 (51.73023d) Equinox: J2000	Redshift: 1.010	V=21.9+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(4) A773-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=15; SAMP-SEQ=STEP2 00	POS TARG -4.995,- 4.961; GS ACQ SCENARI O BASE1B3		[==>]	[1]
	2		(4) A773-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[1]
	3		(4) A773-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=15; SAMP-SEQ=STEP2 00	POS TARG 4.995,4. 961		[==>]	[2]
	4		(4) A773-ARC	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=14; SAMP-SEQ=STEP2 00	POS TARG 0,0		[==>]	[2]

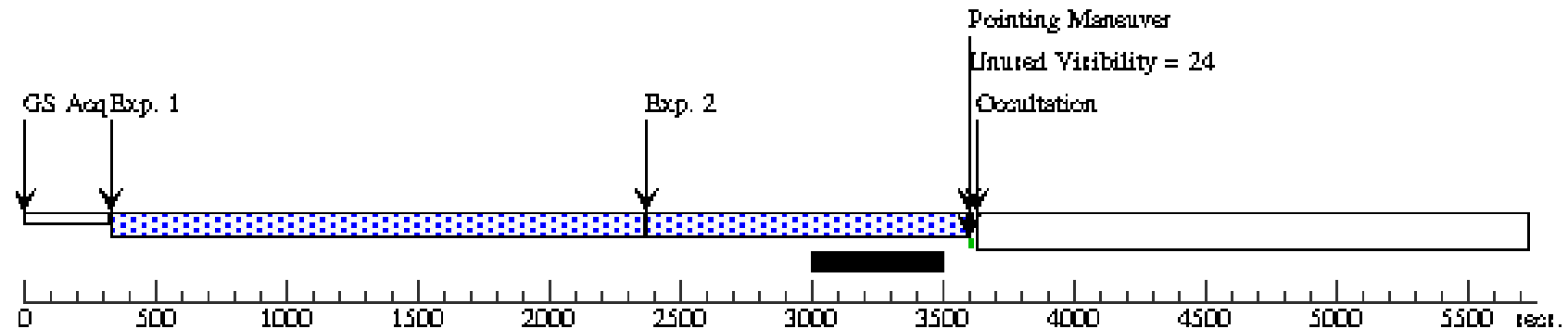


Proposal 12197 - Visit 04 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 05, implementation Sat Aug 07 01:59:51 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	MACS0947-ARC	RA: 09 47 15.9500 (146.8164583d) Dec: +76 23 7.30 (76.38536d) Equinox: J2000	Redshift: 1.012	V=20.6+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG -4.995,- 4.961		[==>]	[1]
	2		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=13; SAMP-SEQ=STEP2 00	SAME POS AS 1		[==>]	[1]
	3		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 0,0		[==>]	[2]
	4		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=13; SAMP-SEQ=STEP2 00	SAME POS AS 3		[==>]	[2]
	5		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F132N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 4.995,4. 961		[==>]	[3]
	6		(5) MACS0947-AR C	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=13; SAMP-SEQ=STEP2 00	SAME POS AS 5		[==>]	[3]

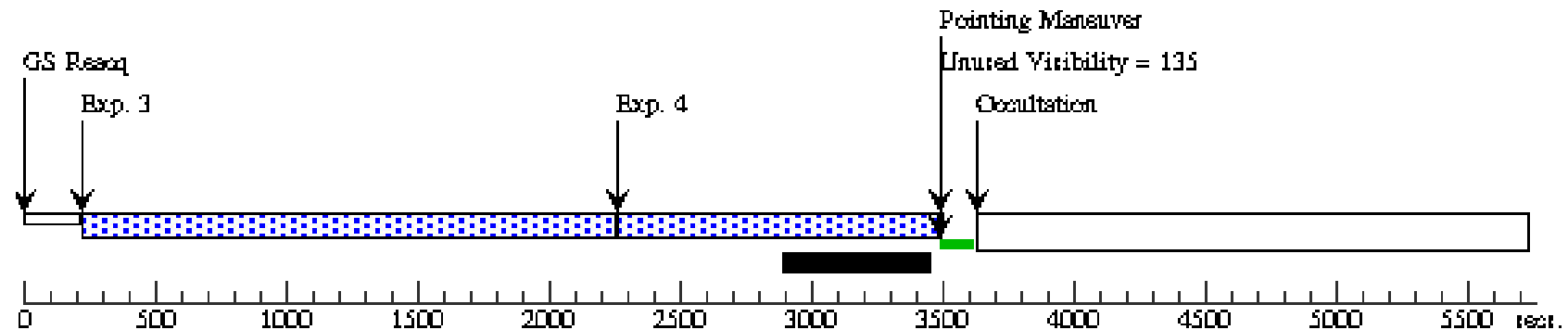
Orbit 1

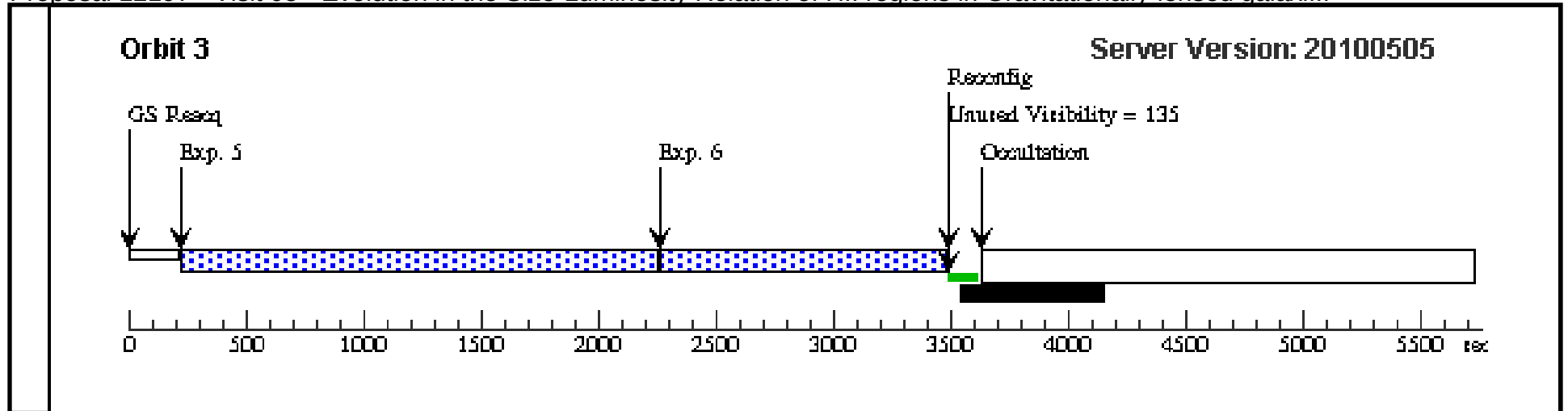
Server Version: 20100505



Orbit 2

Server Version: 20100505



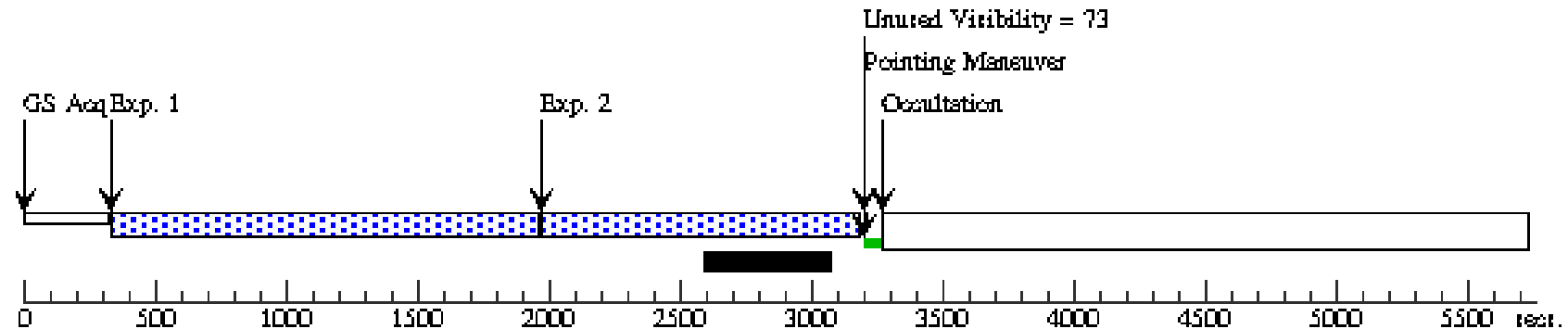


Proposal 12197 - Visit 05 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 06, implementation Sat Aug 07 01:59:52 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(6)	MACS0159-ARC	RA: 01 59 4.9100 (29.7704583d) Dec: -34 12 58.35 (-34.21621d) Equinox: J2000	Redshift: 1.488	V=20.9+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=12; SAMP-SEQ=STEP4 00	POS TARG -4.995,- 4.961		[==>]	[1]
	2		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP2 00	SAME POS AS 1		[==>]	[1]
	3		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 0,0		[==>]	[2]
	4		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=STEP1 00	SAME POS AS 3		[==>]	[2]
	5		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 4.995,4. 961		[==>]	[3]
	6		(6) MACS0159-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=15; SAMP-SEQ=STEP1 00	SAME POS AS 5		[==>]	[3]

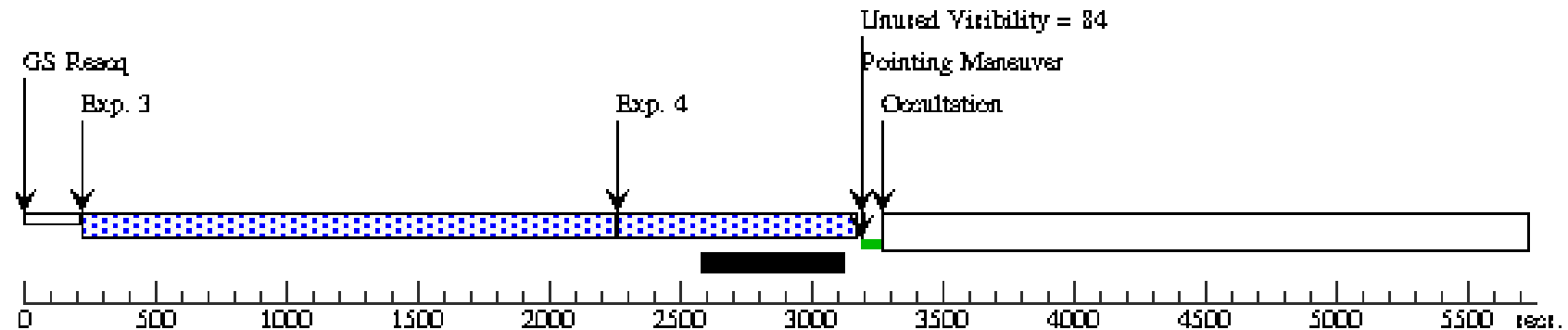
Orbit 1

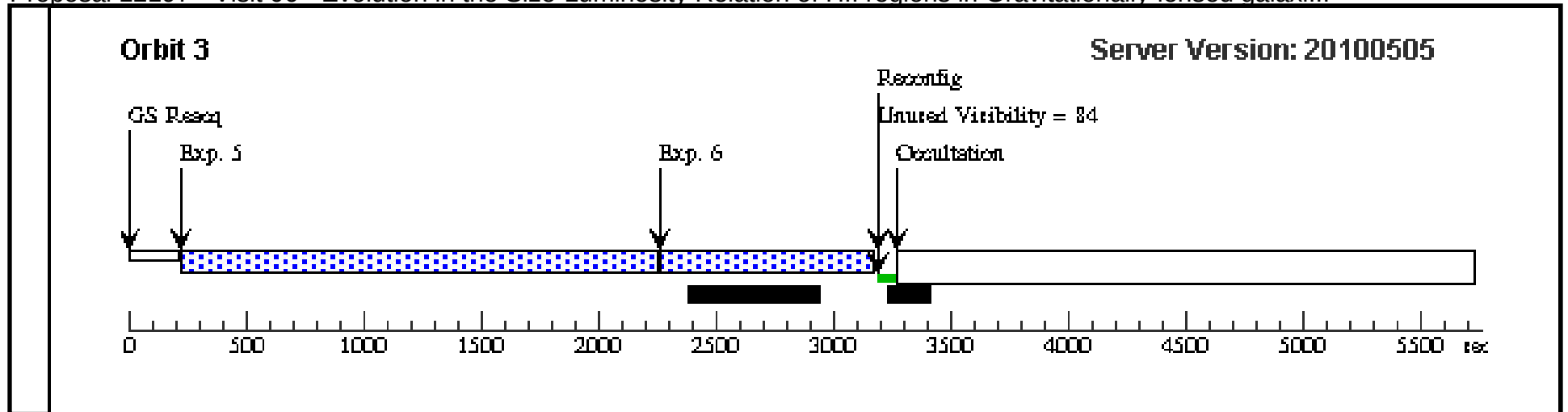
Server Version: 20100505



Orbit 2

Server Version: 20100505



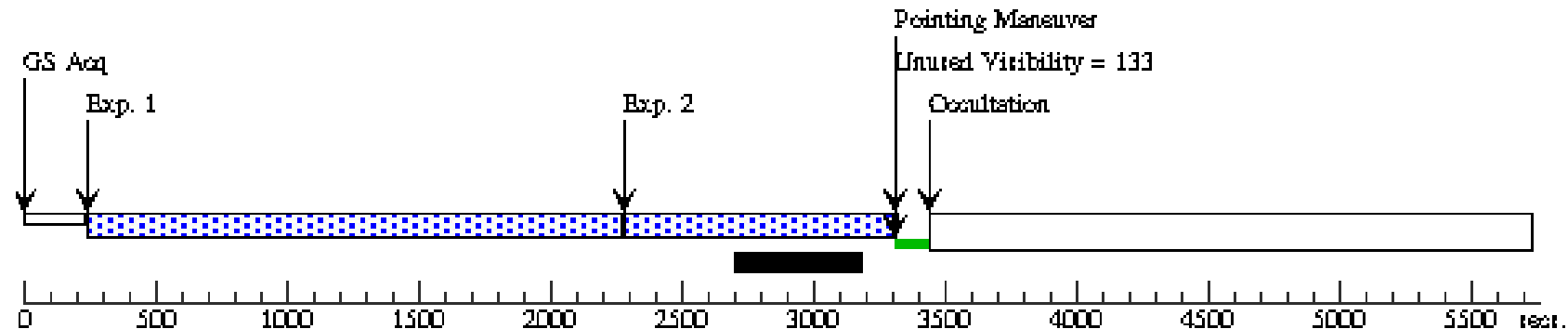


Proposal 12197 - Visit 06 - Evolution in the Size-Luminosity Relation of HII regions in Gravitationally-lensed galaxi...

Visit	Proposal 12197, Visit 07, implementation Sat Aug 07 01:59:53 GMT 2010									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(7)	MACS1133-ARC	RA: 11 33 14.2900 (173.3095417d) Dec: +50 08 46.90 (50.14636d) Equinox: J2000	Redshift: 1.550	V=20.3+/-0.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG -4.995,- 4.961; GS ACQ SCENARI O SINGLE		[==>]	[1]
	2		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP2 00	SAME POS AS 1		[==>]	[1]
	3		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 0,0		[==>]	[2]
	4		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP2 00	SAME POS AS 3		[==>]	[2]
	5		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=13; SAMP-SEQ=STEP4 00	POS TARG 4.995,4. 961		[==>]	[3]
	6		(7) MACS1133-AR C	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP2 00	SAME POS AS 5		[==>]	[3]

Orbit 1

Server Version: 20100505



Orbit 2

Server Version: 20100505

