



## 13844 - Unveiling the Black Hole Growth Mechanisms in the Protocluster

### Environment at $z \sim 3$

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

#### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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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) TARGET1	WFC3/IR	2	22-Jul-2014 21:20:38.0	yes
02	(2) TARGET2	WFC3/IR	2	22-Jul-2014 21:20:40.0	yes
03	(3) TARGET3	WFC3/IR	2	22-Jul-2014 21:20:41.0	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) TARGET4	WFC3/IR	2	22-Jul-2014 21:20:43.0	yes
05	(5) TARGET5	WFC3/IR	2	22-Jul-2014 21:20:44.0	yes
06	(6) TARGET6	WFC3/IR	2	22-Jul-2014 21:20:45.0	yes

12 Total Orbits Used

### **ABSTRACT**

We are studying the conditions leading to the enhanced growth of black holes (BHs) and galaxies observed in the  $z = 3.1$  SSA22 protocluster, a progenitor of a rich galaxy cluster (Coma-like). With WFC3 near-IR imaging, we will measure the rest-frame optical properties (sizes, morphologies, and stellar masses) of 8 protocluster AGN host galaxies and a sample of 40 protocluster star-forming galaxies. We will compare these properties with those of  $> 100$  AGN and  $> 1000$  non-AGN host galaxies at  $z \sim 3$  in field environments (via CANDELS), and clarify the role that environment plays in driving BH and galaxy growth at high redshift.

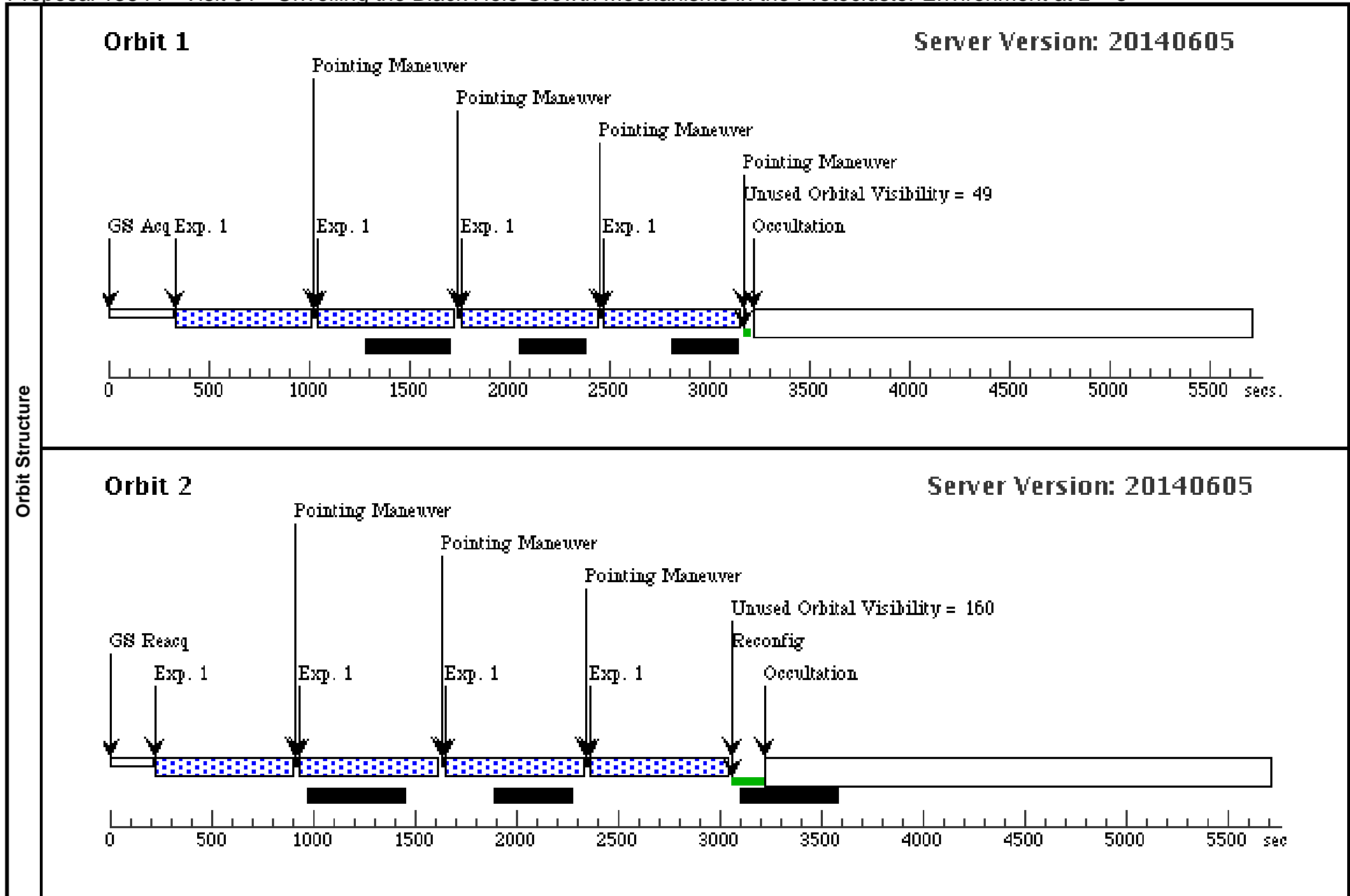
### **OBSERVING DESCRIPTION**

We are observing six unique fields with WFC3 IR (F160W) at 2-orbit depths. Our goal is to obtain sensitive imaging of  $z = 3.1$  AGN and galaxies to constrain morphologies of the sources.

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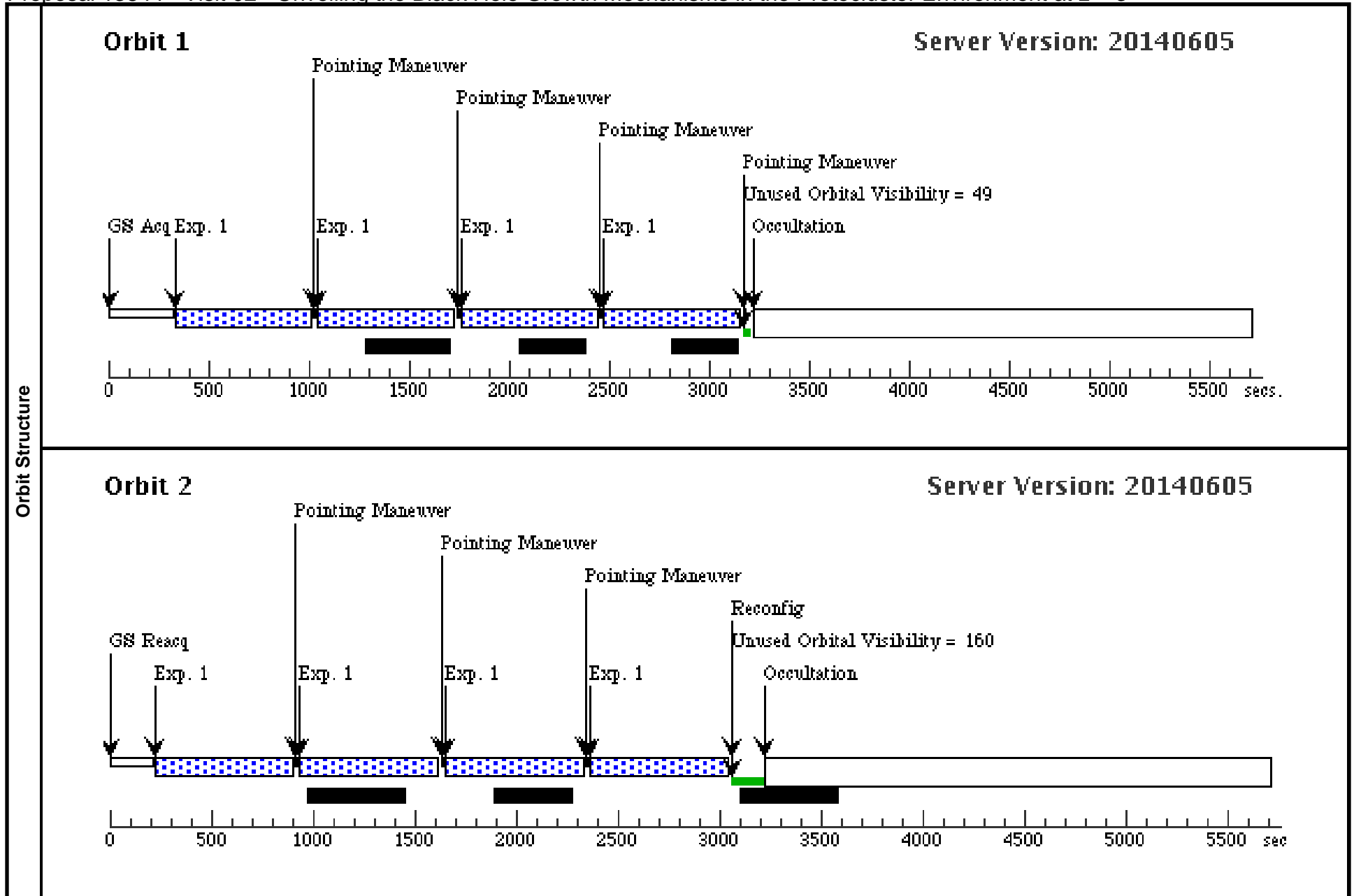
Visit	<b>Proposal 13844, Visit 01, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	TARGET1	RA: 22 17 8.9160 (334.2871500d) Dec: +00 18 16.44 (.30457d) Equinox: J2000		V=25.5+/-0.5	Reference Frame: ICRS				
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) TARGET1	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-1 i n Visit 01 (1)	652.938154 Secs (5223.505 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 1,4)]	[1]
								[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)] [==>(Pattern 2,4)]	[2]	



Proposal 13844 - Visit 02 - Unveiling the Black Hole Growth Mechanisms in the Protocluster Environment at z ~ 3

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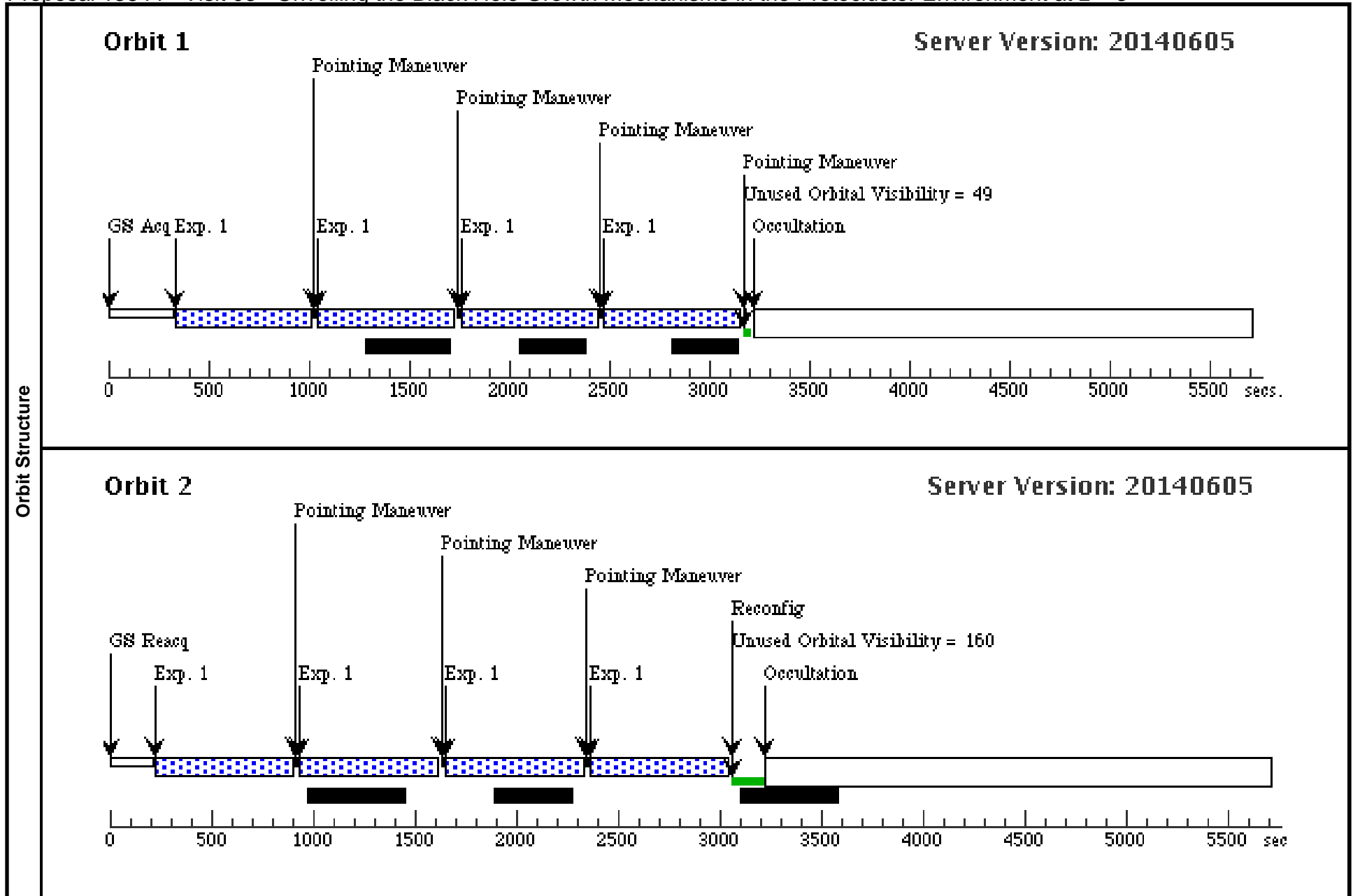
Visit	<b>Proposal 13844, Visit 02, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	TARGET2	RA: 22 17 17.9688 (334.3248700d) Dec: +00 18 0.21 (.30006d) Equinox: J2000		V=25.5+/-0.5	Reference Frame: ICRS				
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) TARGET2	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-1 i n Visit 02 (1)	652.938154 Secs (5223.505 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 1,4)]	[1]
								[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)] [==>(Pattern 2,4)]	[2]	



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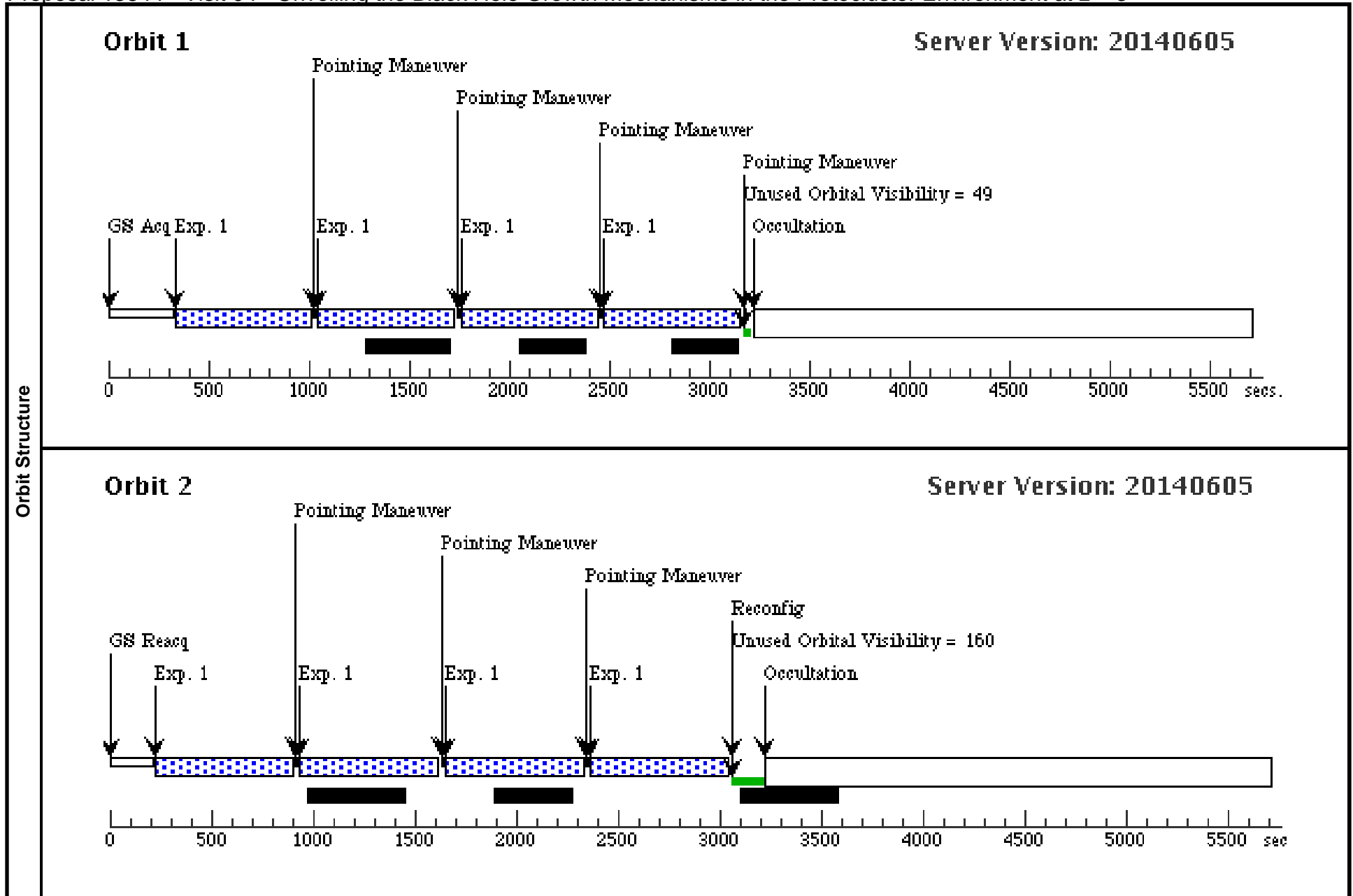
Visit	<b>Proposal 13844, Visit 03, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	TARGET3	RA: 22 17 20.3304 (334.3347100d) Dec: +00 20 13.54 (.33709d) Equinox: J2000		V=25.5+/-0.5	Reference Frame: ICRS				
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) TARGET3	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14	GS ACQ SCENARI O BASE1B3	Pattern 1, Exps 1-1 i n Visit 03 (1)	652.938154 Secs (5223.505 Secs)	
									[==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 1,4)]	[1]
									[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)] [==>(Pattern 2,4)]	[2]



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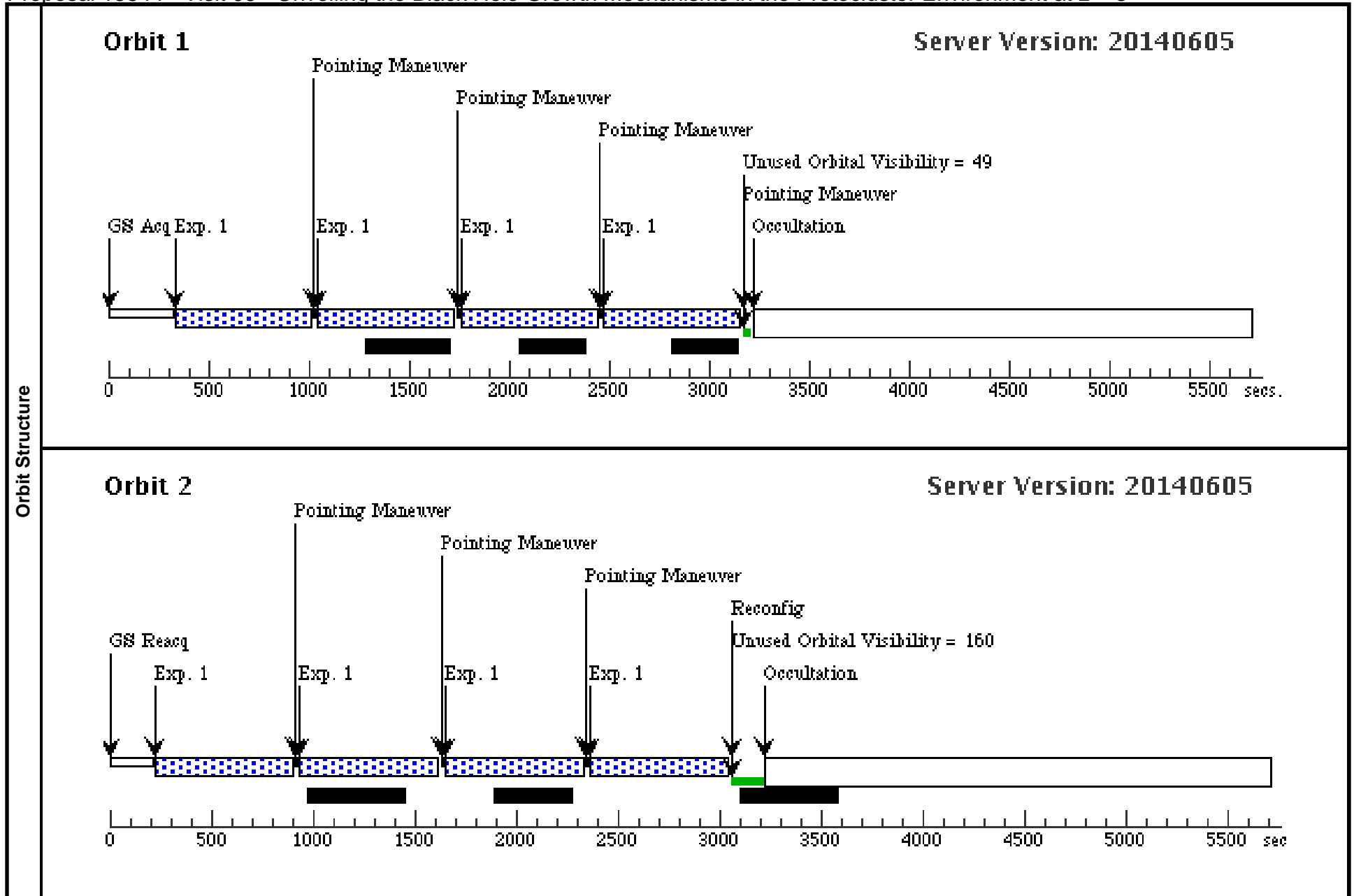
Visit	<b>Proposal 13844, Visit 04, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	TARGET4	RA: 22 17 34.3848 (334.3932700d) Dec: +00 16 24.27 (.27341d) Equinox: J2000		V=25.5+/-0.5	Reference Frame: ICRS				
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) TARGET4	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-1 i n Visit 04 (1)	652.938154 Secs (5223.505 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 1,4)]	[1]
								[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)] [==>(Pattern 2,4)]	[2]	



Proposal 13844 - Visit 05 - Unveiling the Black Hole Growth Mechanisms in the Protocluster Environment at z ~ 3

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Visit	<b>Proposal 13844, Visit 05, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	TARGET5	RA: 22 17 37.0584 (334.4044100d) Dec: +00 13 6.48 (.21847d) Equinox: J2000		V=25.5+/-0.5	Reference Frame: ICRS				
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(5) TARGET5	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-1 i n Visit 05 (1)	652.938154 Secs (5223.505 Secs)	
									[=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 1,4)]	[1]
									[=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)] [=>(Pattern 2,4)]	[2]



Proposal 13844 - Visit 06 - Unveiling the Black Hole Growth Mechanisms in the Protocluster Environment at z ~ 3

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Visit	<b>Proposal 13844, Visit 06, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: BETWEEN 2014.254:00:00:00 AND 2014.364:00:00:00; BETWEEN 2015.119:00:00:00 AND 2015.365:00:00:00									
	Patterns	#	Primary Pattern			Secondary Pattern			Exposures	
		(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	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)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(6)	TARGET6	RA: 22 17 57.3312 (334.4888800d) Dec: +00 15 2.59 (.25072d) Equinox: J2000			V=25.5+/-0.5	Reference Frame: ICRS			
<i>Comments: This is a survey field with multiple sources. Target coordinates represent the field center.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(6) TARGET6	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-1 i n Visit 06 (1)	652.938154 Secs (5223.505 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 1,3)] [==>(Pattern 1,4)]	[1]
								[==>(Pattern 2,1)] [==>(Pattern 2,2)] [==>(Pattern 2,3)] [==>(Pattern 2,4)]	[2]	

