



14086 - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Cycle: 23, Proposal Category: GO
(Availability Mode: AVAILABLE)

INVESTIGATORS

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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) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:49.0	yes
03	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:50.0	yes
04	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:51.0	yes

Proposal 14086 (STScI Edit Number: 2, Created: Wednesday, September 7, 2016 3:57:00 PM EST) - Overview

<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>
05	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:52.0	yes
06	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:53.0	yes
02	(1) M62-VLA1 (2) M62-VLA1-OFFSET CCDFLAT WAVE	STIS/CCD	2	07-Sep-2016 16:56:54.0	yes
07	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:55.0	yes
08	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:55.0	yes
09	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:56.0	yes
10	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:57.0	yes
11	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:58.0	yes
12	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:59.0	yes
13	(1) M62-VLA1 (2) M62-VLA1-OFFSET WAVE	STIS/CCD	1	07-Sep-2016 16:56:59.0	yes

14 Total Orbits Used

ABSTRACT

Using radio, X-ray, and optical observations, we have discovered the first candidate black holes in Milky Way globular clusters. The existence of stellar-mass black holes in globular clusters would have broad implications: (a) globular clusters would become important hunting grounds for stellar-mass black holes, of which few are still known; (b) black holes in globular clusters would offer good tests of the physics of low-luminosity accretion; (c) globular clusters might offer a less biased view of the black hole mass function than the field; and (d) the prospects for detecting gravitational wave sources such as black hole--black hole binaries would be improved. The black hole candidate in the Milky Way globular cluster M62 is the first with a bright red giant secondary. We propose multi-epoch STIS spectroscopy of this star to obtain the first dynamical confirmation of a black hole in a globular cluster.

OBSERVING DESCRIPTION

The goal of the observations is to measure the radial velocity variations of the red giant secondary to a candidate stellar-mass black hole in the globular cluster M62. In each of 10 visits, there will be one orbit of STIS spectroscopy using the G430L grating (in one of the 10 visits, there will be an additional orbit of spectroscopy using the G750L grating for the purpose of obtaining a broadband spectrum of the object to examine the morphology of the H-alpha emission line and to model the contribution of the accretion disk to the spectrum).

Since the target object has $V \sim 18.1$ and is not the brightest star within the STIS acquisition box, we will first acquire a bright red giant about 8" away and then do an offset to the main target, after which we will pickup using the 52x0.1E1 aperture. The orientation angle is restricted because of the presence of nearby stars, but we do not require that all observations be taken at the same orientation. Each G430L orbit will be CR-SPLIT into two exposures. Since we desire the best possible wavelength calibration, we have added a GO-WAVECAL during occultation so that the G430L observations are bracketed by arcs. For the single orbit with the G750L grating, we use 3 CR-SPLIT exposures rather than two given the shorter overheads and so longer total exposure time, and also added a fringe flat.

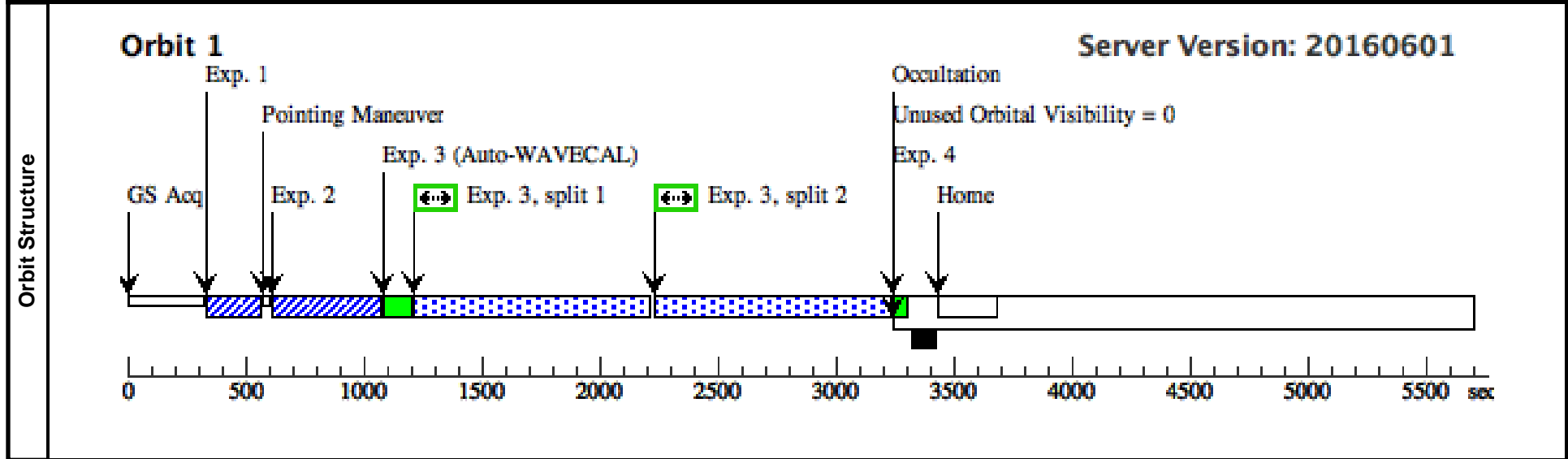
Proposal 14086 - standard visit 1 (01) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:00 GMT 2016

Visit	Proposal 14086, standard visit 1 (01), failed				
	Diagnostic Status: No Diagnostics				
	Scientific Instruments: STIS/CCD				
	Special Requirements: ORIENT 35D TO 80 D; ORIENT 215D TO 260 D				

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000			V=18.1+/-0.2
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>						
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000			V=13.1+/-0.2	Reference Frame: ICRS
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>						

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)		
										[==>]	[1]
	2	PEAKUP	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				20 Secs (20 Secs)		
										[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1932 Secs (1932 Secs)			
									[==>(Split 1)]	[1]	
									[==>(Split 2)]		
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]		



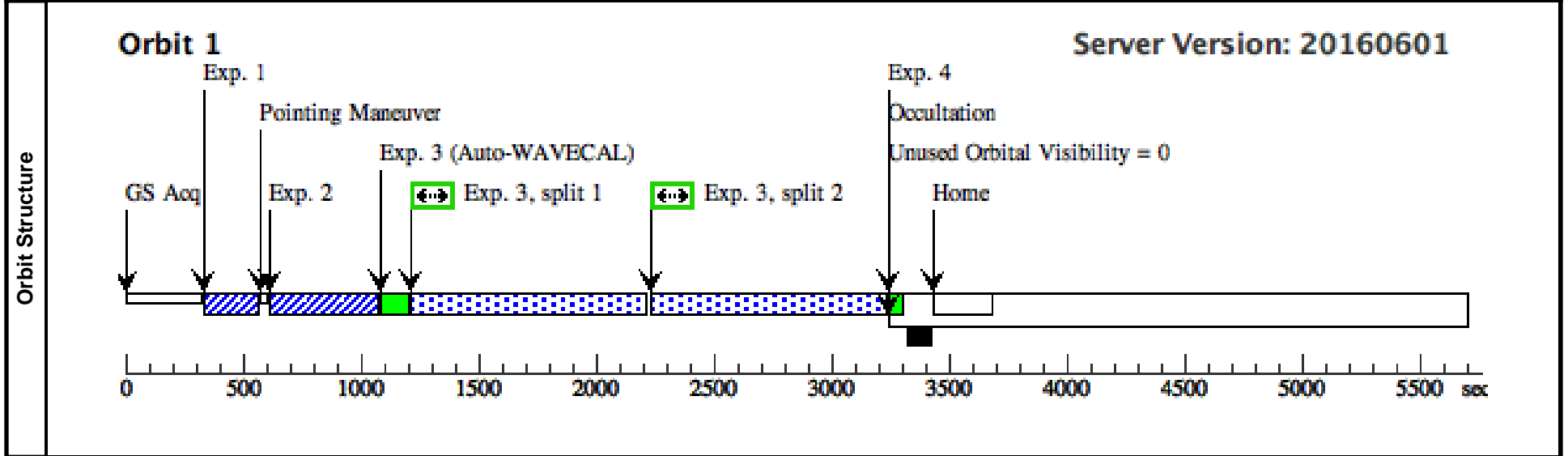
Proposal 14086 - standard visit 2 (03) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:00 GMT 2016

Visit	Proposal 14086, standard visit 2 (03), failed			
	Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 35D TO 80 D; ORIENT 215D TO 260 D; AFTER 01 BY 0.5 D TO 1000 D			

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS
	<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>					
	(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>						

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
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	2	PEAKUP	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				20 Secs (20 Secs)	
									[==>]	[1]
	3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1932 Secs (1932 Secs)	
									[==>(Split 1)]	[1]
									[==>(Split 2)]	[1]
	4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]



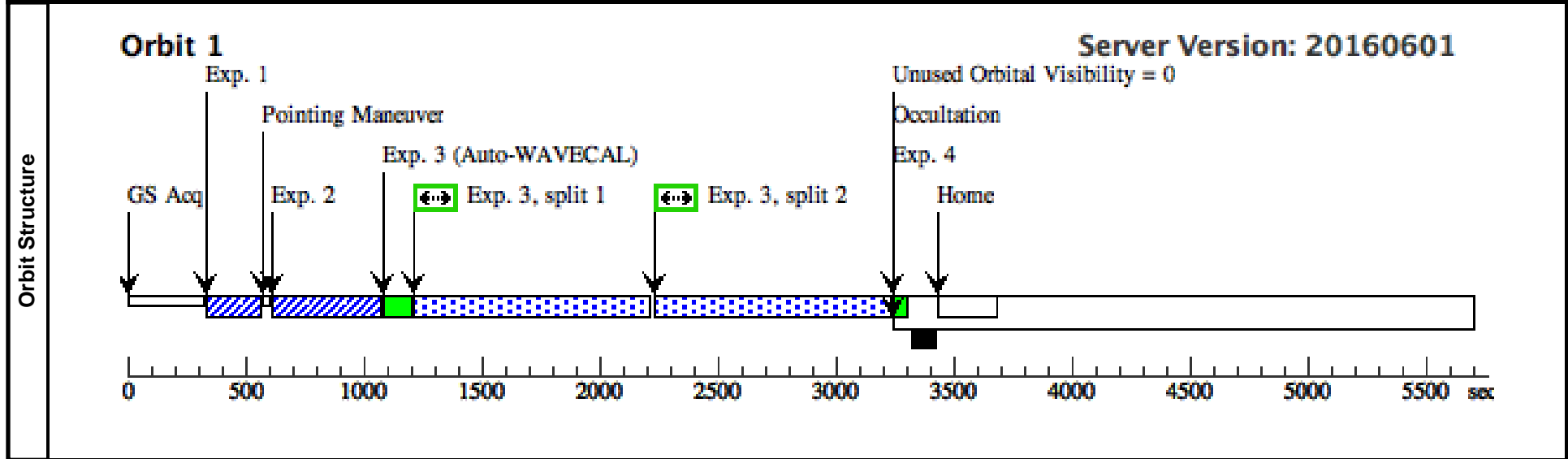
Proposal 14086 - standard visit 3 (04) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

Visit	Proposal 14086, standard visit 3 (04), failed			
	Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 35D TO 80 D; ORIENT 215D TO 260 D; AFTER 03 BY 0.5 D TO 1000 D			

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS
	<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>					
	(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>						

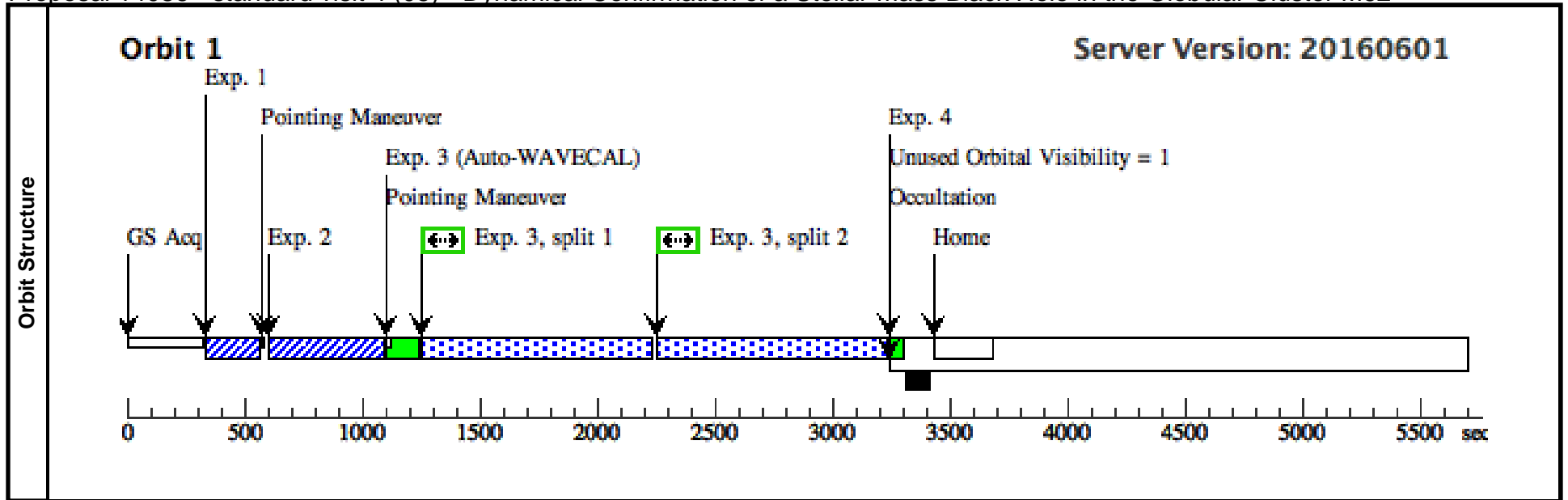
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				20 Secs (20 Secs)	
									[==>]	[1]
	3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1932 Secs (1932 Secs)	
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									[==>(Split 2)]	[1]
	4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]



Proposal 14086 - standard visit 4 (05) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

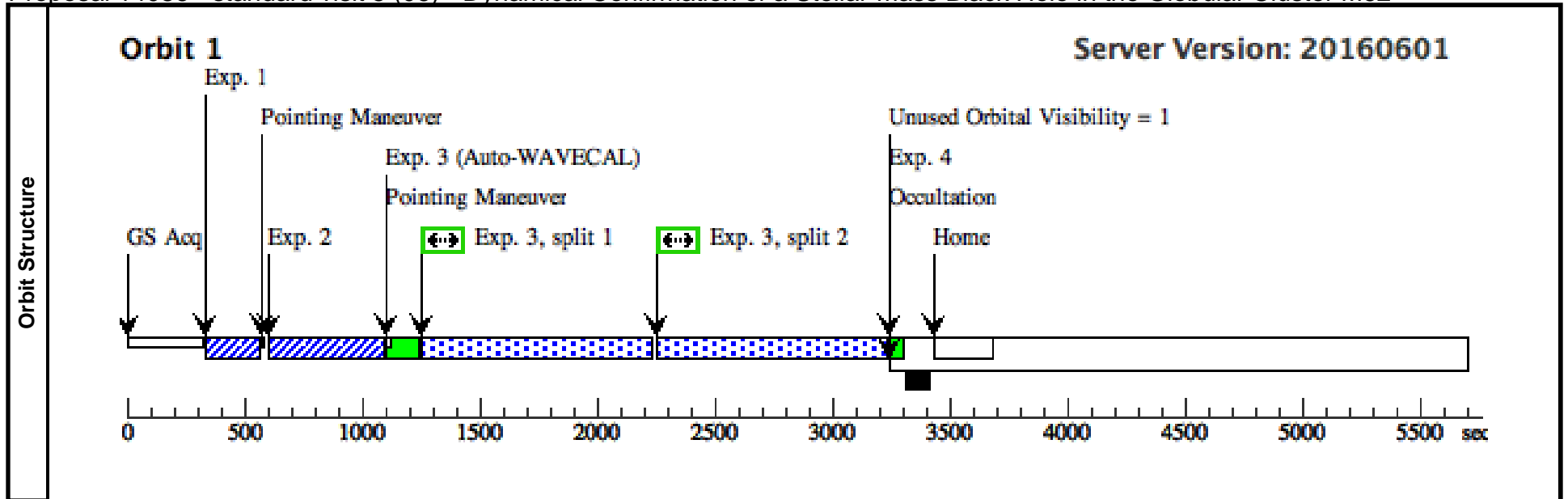
Visit	Proposal 14086, standard visit 4 (05), completed Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D; AFTER 04 BY 0.5 D TO 1000 D										
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000			V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000			V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)		
									[==>]	[1]	
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)		
									[==>]	[1]	
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)			
								[==>(Split 1)]	[1]		
								[==>(Split 2)]	[1]		
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]		



Proposal 14086 - standard visit 5 (06) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

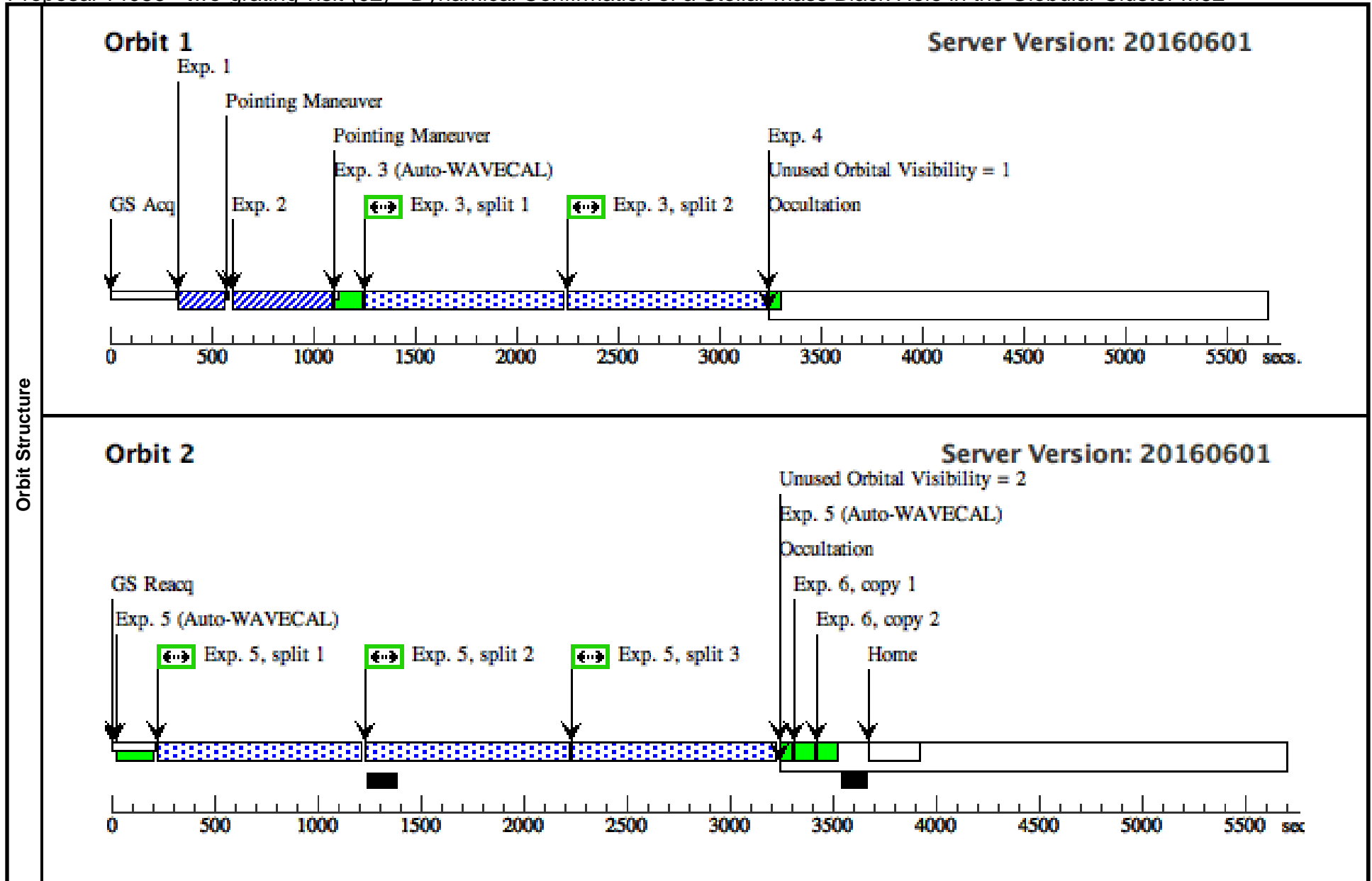
Visit	Proposal 14086, standard visit 5 (06), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D										
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000			V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000			V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)		
									[==>]	[1]	
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)		
									[==>]	[1]	
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)			
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4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]		



Proposal 14086 - two-grating visit (02) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

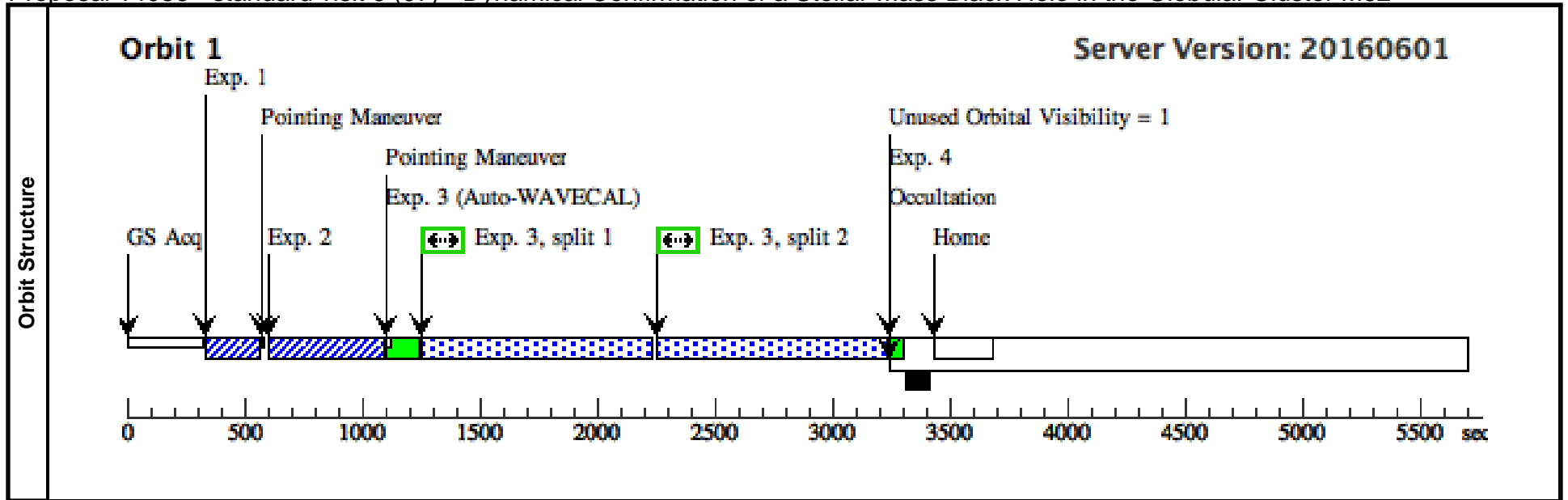
Visit	Proposal 14086, two-grating visit (02), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
	3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)	
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4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	
5	M62-VLA1 SCI G750L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G750L 7751 A	CR-SPLIT=3			2883 Secs (2883 Secs)		
								[==>(Split 1)] [==>(Split 2)] [==>(Split 3)]	[2]	
6		CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A				[==>(Copy 1)] [==>(Copy 2)]	[2]	



Proposal 14086 - standard visit 6 (07) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

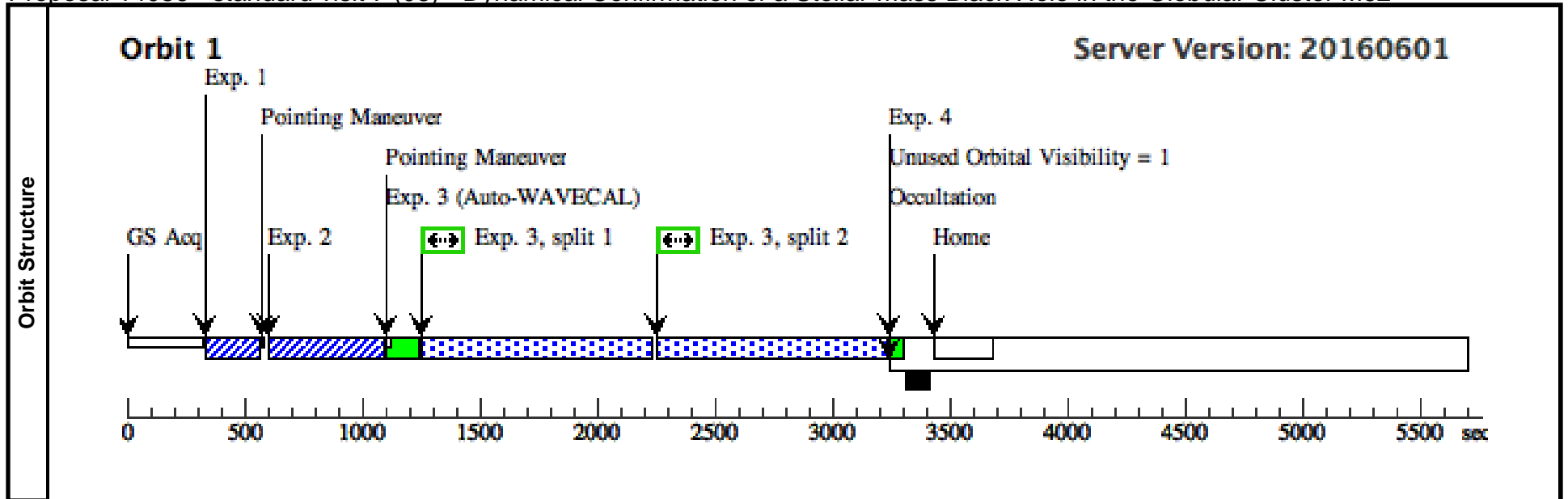
Visit	Proposal 14086, standard visit 6 (07), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
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4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	



Proposal 14086 - standard visit 7 (08) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

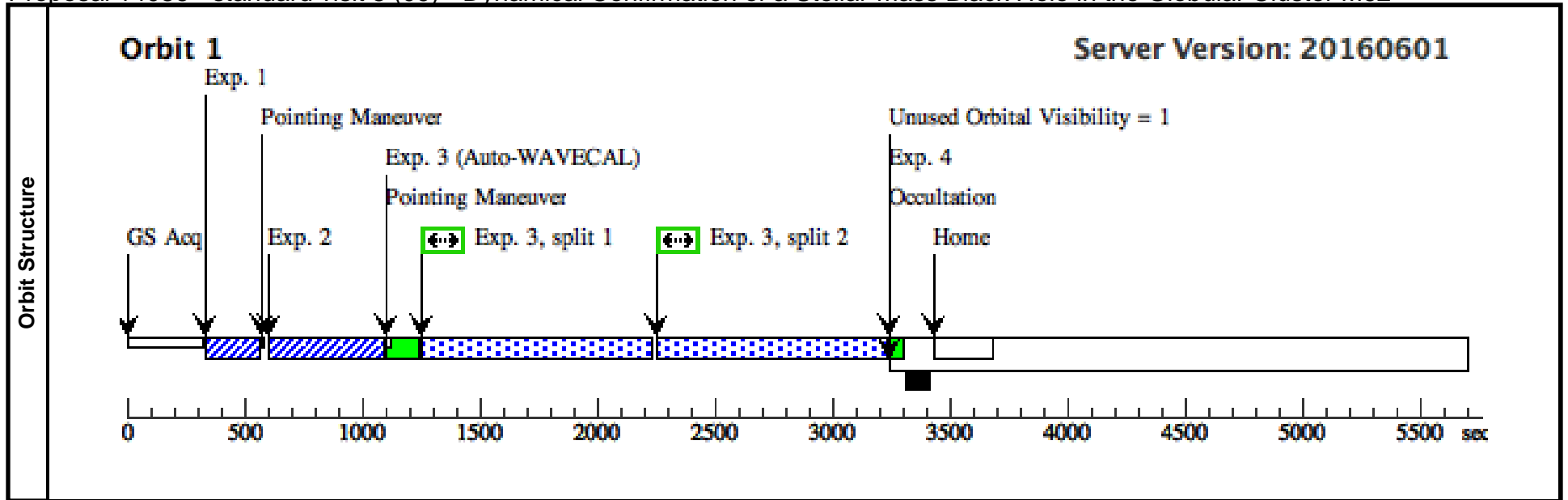
Visit	Proposal 14086, standard visit 7 (08), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
								[==>(Split 1)]	[1]	
								[==>(Split 2)]	[1]	
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	



Proposal 14086 - standard visit 8 (09) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

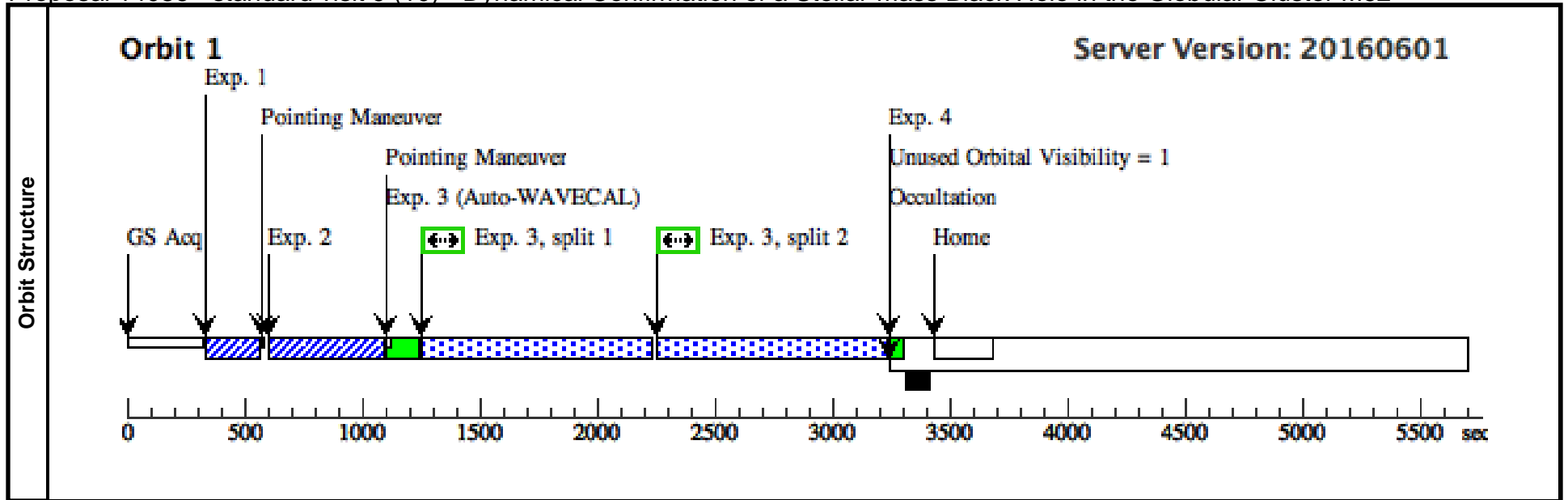
Visit	Proposal 14086, standard visit 8 (09), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
								[==>(Split 1)]	[1]	
								[==>(Split 2)]	[1]	
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	



Proposal 14086 - standard visit 9 (10) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

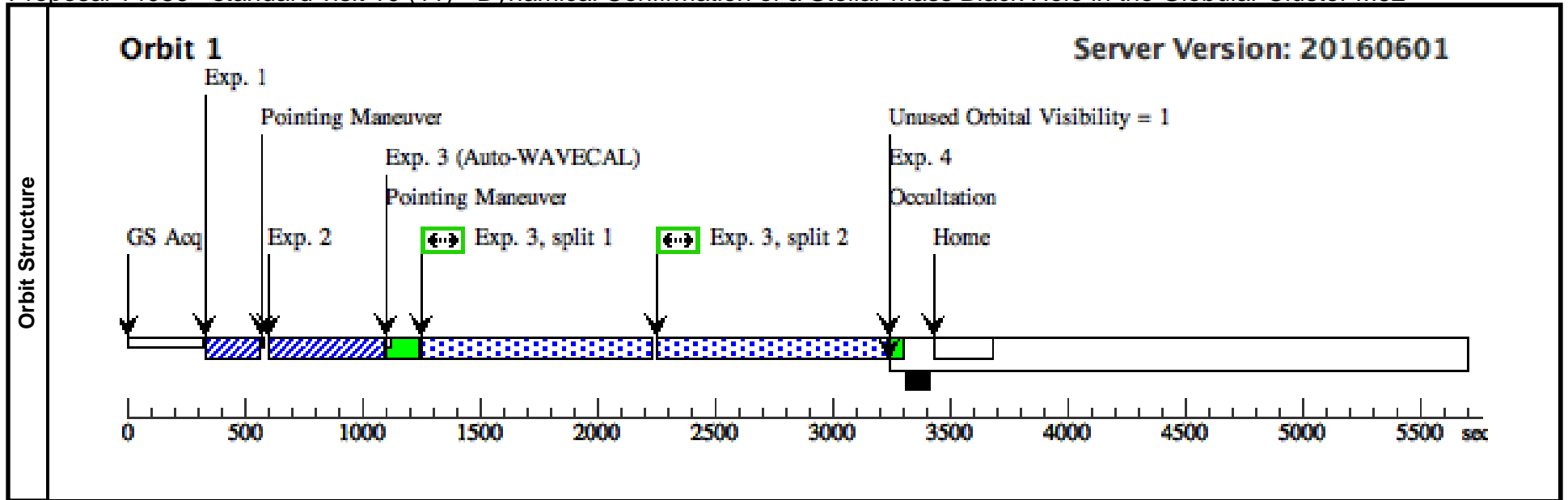
Visit	Proposal 14086, standard visit 9 (10), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D										
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000			V=18.1+/-0.2	Reference Frame: ICRS				
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000			V=13.1+/-0.2	Reference Frame: ICRS					
<i>Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO</i>											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	ACQ	(2) M62-VLA1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)		
									[==>]	[1]	
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)		
									[==>]	[1]	
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)			
								[==>(Split 1)]	[1]		
								[==>(Split 2)]	[1]		
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]		



Proposal 14086 - standard visit 10 (11) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

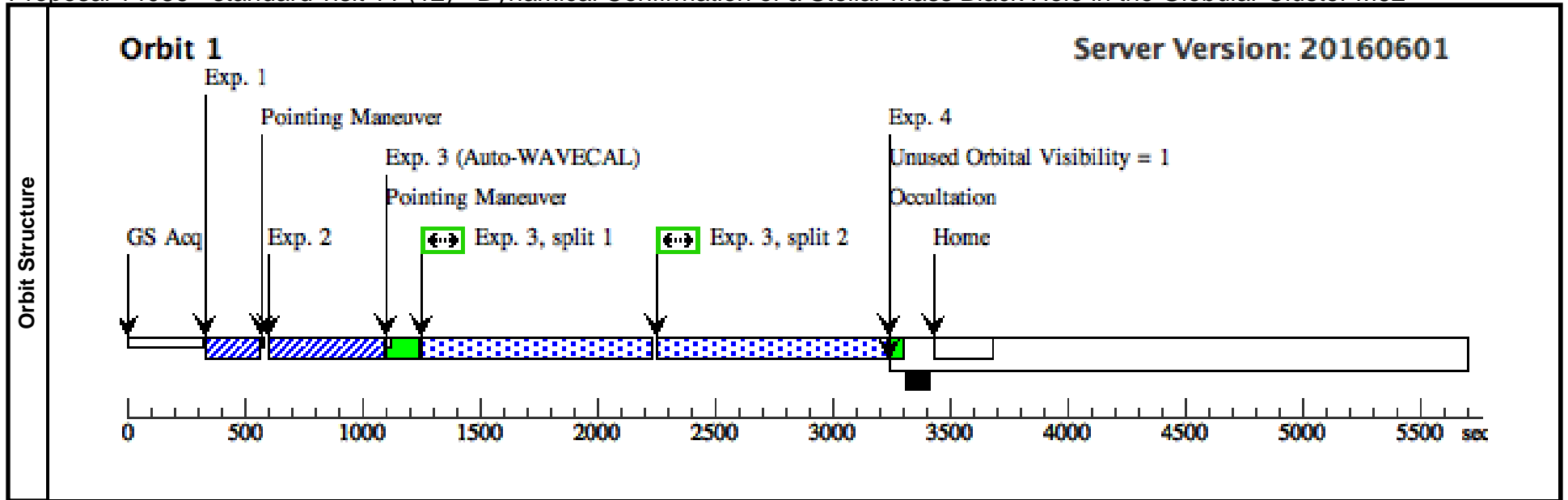
Visit	Proposal 14086, standard visit 10 (11), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D Comments: This is the HOPR repeat for visit 01									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFF SET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
								[==>(Split 1)]	[1]	
								[==>(Split 2)]	[1]	
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	



Proposal 14086 - standard visit 11 (12) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

Visit	Proposal 14086, standard visit 11 (12), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D Comments: This is the HOPR repeat for visit 03									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFF SET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
								[==>(Split 1)]	[1]	
								[==>(Split 2)]	[1]	
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	



Proposal 14086 - standard visit 12 (13) - Dynamical Confirmation of a Stellar-mass Black Hole in the Globular Cluster M62

Wed Sep 07 20:57:01 GMT 2016

Visit	Proposal 14086, standard visit 12 (13), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD Special Requirements: ORIENT 80D TO 80 D Comments: This is the HOPR repeat for visit 04									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(1)		M62-VLA1	RA: 17 01 13.2191 (255.3050796d) Dec: -30 06 50.58 (-30.11405d) Equinox: J2000		V=18.1+/-0.2	Reference Frame: ICRS				
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
(2)	M62-VLA1-OFFSET	RA: 17 01 13.8420 (255.3076750d) Dec: -30 06 50.05 (-30.11390d) Equinox: J2000		V=13.1+/-0.2	Reference Frame: ICRS					
Comments: Coordinates from HST/ACS image in F435W with WCS corrected to ICRS using a large set of 2MASS stars. Extended=NO										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) M62-VLA1-OFF SET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2	PEAKUP (STIS.ta.830 292)	(1) M62-VLA1	STIS/CCD, ACQ/PEAK, 0.2X0.09	MIRROR	SEARCH=LINEAR AXIS1; NUM-POS=5; STEP-SIZE=69			23 Secs (23 Secs)	
									[==>]	[1]
3	M62-VLA1 SCI G430L	(1) M62-VLA1	STIS/CCD, ACCUM, 52X0.1E1	G430L 4300 A	CR-SPLIT=2			1892 Secs (1892 Secs)		
								[==>(Split 1)]	[1]	
								[==>(Split 2)]	[1]	
4	GO-WAVE CAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				[==>]	[1]	

