



17467 - An HST + JWST Investigation of Two Protostellar Outflows in Orion: Tracing Jets From 100 au to 100,000 au

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
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Dr. Elise Furlan (CoI)	California Institute of Technology
Dr. Joel David Green (CoI)	Space Telescope Science Institute
Dr. Robert Gutermuth (CoI)	University of Massachusetts - Amherst
Nolan Habel (CoI)	Jet Propulsion Laboratory
Dr. Lee W. Hartmann (CoI)	University of Michigan
Dr. Nicole Karnath (CoI)	Space Science Institute
Dr. Pamela Klaassen (CoI) (ESA Member)	United Kingdom Astronomy Technology Centre
Dr. Hendrik Linz (CoI) (ESA Member)	Max Planck Institute for Astronomy
Dr. Leslie Looney (CoI)	University of Illinois at Urbana - Champaign
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Proposal 17467 (STScI Edit Number: 0, Created: Thursday, September 14, 2023 at 2:02:45 PM Eastern Standard Time) - Overview

<i>Name</i>	<i>Institution</i>
Dr. Mayra Osorio (CoI) (ESA Member)	Instituto de Astrofísica de Andalucía (IAA)
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Mr. Himanshu Tyagi (CoI)	Tata Institute of Fundamental Research, Bombay
Dr. John Tobin (CoI)	Associated Universities, Inc.
Dr. Scott J. Wolk (CoI)	Smithsonian Institution Astrophysical Observatory

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	(2) HOPS-153-OUTFLOW-EAST	WFC3/IR	1	14-Sep-2023 15:02:38.0	yes
02	(2) HOPS-153-OUTFLOW-EAST	WFC3/IR	1	14-Sep-2023 15:02:39.0	yes
03	(2) HOPS-153-OUTFLOW-EAST	WFC3/IR	1	14-Sep-2023 15:02:39.0	yes
04	(2) HOPS-153-OUTFLOW-EAST	WFC3/IR	1	14-Sep-2023 15:02:40.0	yes
05	(2) HOPS-153-OUTFLOW-EAST	WFC3/IR	1	14-Sep-2023 15:02:40.0	yes
06	(3) HOPS-153-OUTFLOW-WEST	WFC3/IR	1	14-Sep-2023 15:02:41.0	yes
07	(3) HOPS-153-OUTFLOW-WEST	WFC3/IR	1	14-Sep-2023 15:02:41.0	yes
08	(3) HOPS-153-OUTFLOW-WEST	WFC3/IR	1	14-Sep-2023 15:02:41.0	yes
09	(3) HOPS-153-OUTFLOW-WEST	WFC3/IR	1	14-Sep-2023 15:02:42.0	yes
10	(3) HOPS-153-OUTFLOW-WEST	WFC3/IR	1	14-Sep-2023 15:02:42.0	yes
11	(4) HOPS370-OUTFLOW-NORTH	WFC3/IR	1	14-Sep-2023 15:02:43.0	yes
12	(4) HOPS370-OUTFLOW-NORTH	WFC3/IR	1	14-Sep-2023 15:02:43.0	yes
13	(4) HOPS370-OUTFLOW-NORTH	WFC3/IR	1	14-Sep-2023 15:02:43.0	yes
14	(4) HOPS370-OUTFLOW-NORTH	WFC3/IR	1	14-Sep-2023 15:02:44.0	yes
15	(4) HOPS370-OUTFLOW-NORTH	WFC3/IR	1	14-Sep-2023 15:02:44.0	yes

15 Total Orbits Used

ABSTRACT

Leveraging existing JWST IFU and HST WFC3/IR data, we propose to observe the jets of two young protostars in Orion: the low mass protostar HOPS153 and the intermediate mass protostar HOPS 370. Collimated jets from low to intermediate mass protostars shape the IMF and lower the star formation efficiency by carving cavities in the infalling envelopes of gas feeding the protostars. The jets then propagate into the surrounding cloud, stirring up gas, and likely regulating or lowering the rate of star formation in molecular clouds. JWST NIRSpec and MIRI MRS > 3 micron IFU observations of HOPS 153 and 370 shows jets traced by [FeII] in the inner 1200 au of the protostars, with spatial resolutions down to 80 au. At distances of 30,000 to 100,000 au from the protostar, where the extinction no longer hides the jets from 1-2 micron observations, the proposed HST WFC3/IR observations will trace shocks in jets launched by these protostars using narrow band filters covering the [FeII] 1.66 and 1.26 micron lines, and the Paschen Beta HI line. By comparing the [FeII] 1.64 um maps to F160W observations from 2010 and 2019, we will measure the proper motion of the shocks. By comparing the [FeII] 1.66 um to Paschen Beta line ratio to models, we will measure the velocity of the pre-shock (jet) gas relative to the shocks. We will also determine the propagation timescale between shocks in the jet, and thereby the interval being accretion events thought to drive the shocks. This program will trace the flow of mass, momentum and energy in jets of representative young protostars from 100 to 100,000 au, providing new constraints on the role of jets in shaping the IMF and regulating SF.

OBSERVING DESCRIPTION

We observe three fields with WFC3/IR, in five narrowband filters necessary to produce continuum subtracted images of [Fe II] 1.26 micron, H I PaBeta 1.28 micron, and [Fe II] 1.64 micron: F126N, F128N, F130N, F164N and F167N. The three fields cover key parts of the HOPS 153 and HOPS 370 outflows and correspond to fields in which there are first-epoch images taken in 2010 using WFC3+F160W.

Our baseline observations call for 2400 second exposures for each field and filter. Assuming the crude extinction estimates above, and referring to our model grid, the first-epoch image leads to good estimates of signal-to-noise ratio. Using this information in ETC estimates that S/N should be typically 100-300 for continuum-subtracted compact structures in [Fe II] 1.64 micron in all three fields. Since we will use this wavelength for proper motion measurements, we need S/N to be particularly large (> 100). For the other two lines, S/N is smaller, but is large enough that accurate extinction and shock-speed measurements will result. In HOPS 153 we estimate typical S/N of 100-220 and 50-70 respectively for [Fe II] 1.26 micron and H I PaBeta 1.28 micron. In HOPS 370 we estimate the corresponding S/N ranges to be 50-200 and 30-100. Given that we can observe about 2400 s per orbit, we ask for a program length of 15 orbits.

The observations are set so that the orientation of the five filters in for each source is the same as the F164N filter.

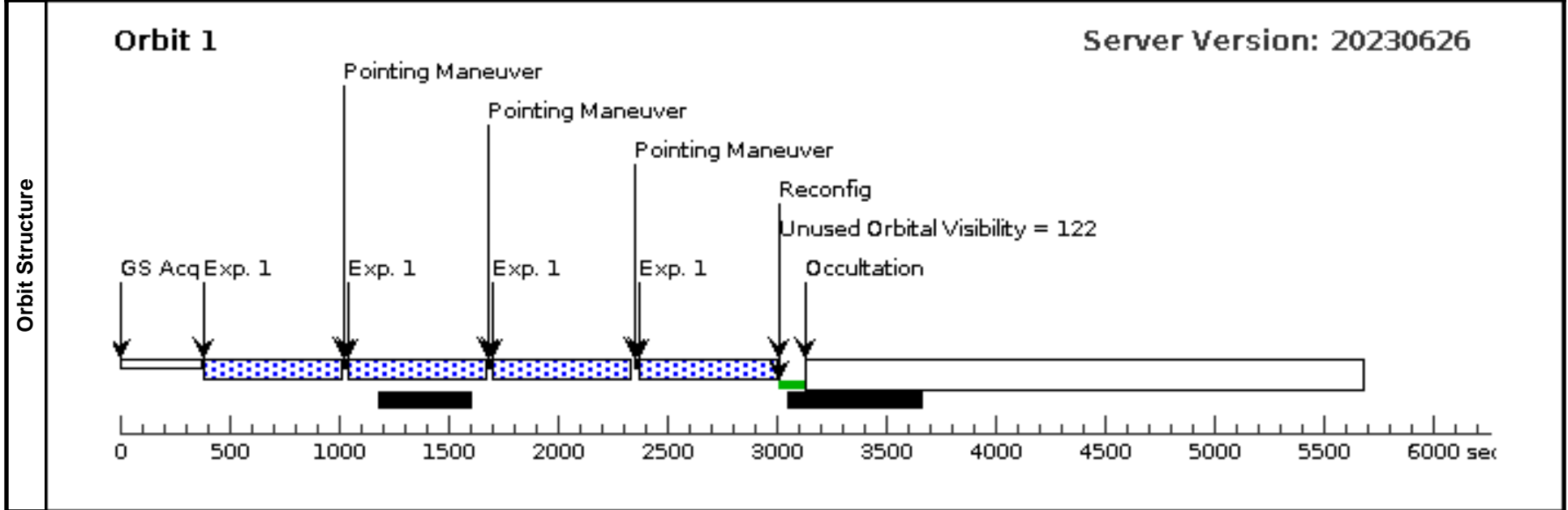
Visit	Proposal 17467, Visit 01		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/IR		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	HOPS-153-OUTFLOW-EAST	RA: 05 38 10.1969 (84.5424871d) Dec: -07 09 18.67 (-7.15519d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) HOPS-153-OUTFLOW-EAST	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=12; SAMP-SEQ=STEP100			Pattern 1, Exps 1-1 in Visit 01 (1)	599.232292 Secs (2396.929 Secs)



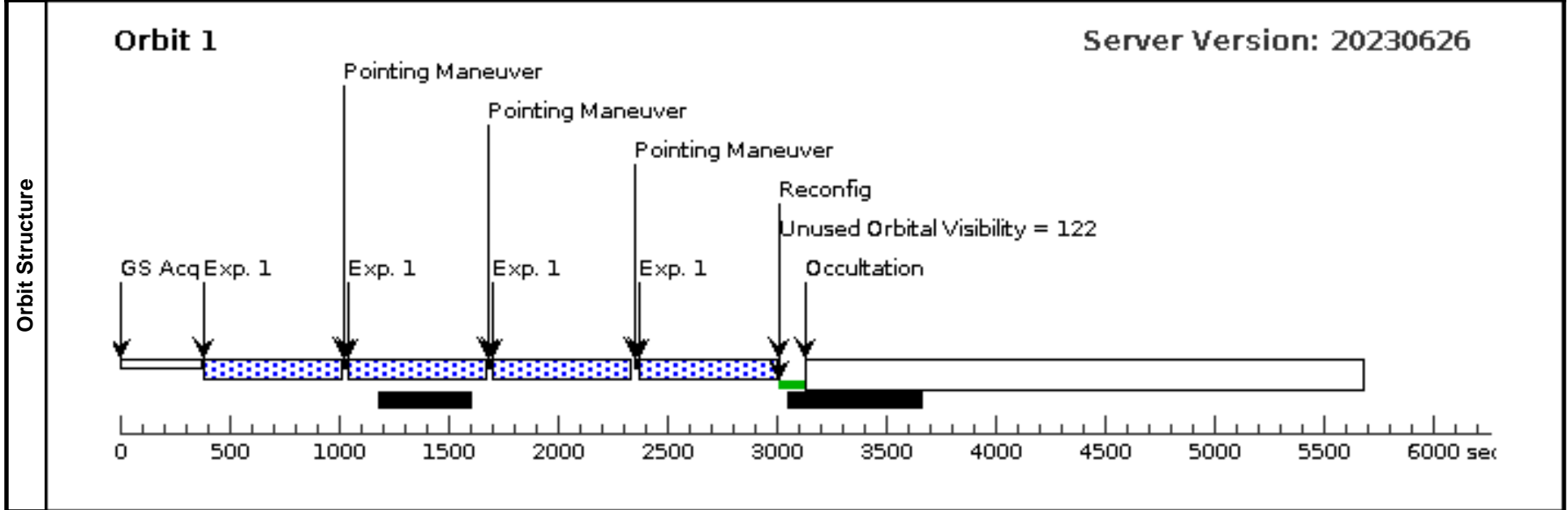
Visit	Proposal 17467, Visit 02 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 01		
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Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	HOPS-153-OUTFLOW-EAST	RA: 05 38 10.1969 (84.5424871d) Dec: -07 09 18.67 (-7.15519d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) HOPS-153-OUTFLOW-EAST	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 02 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



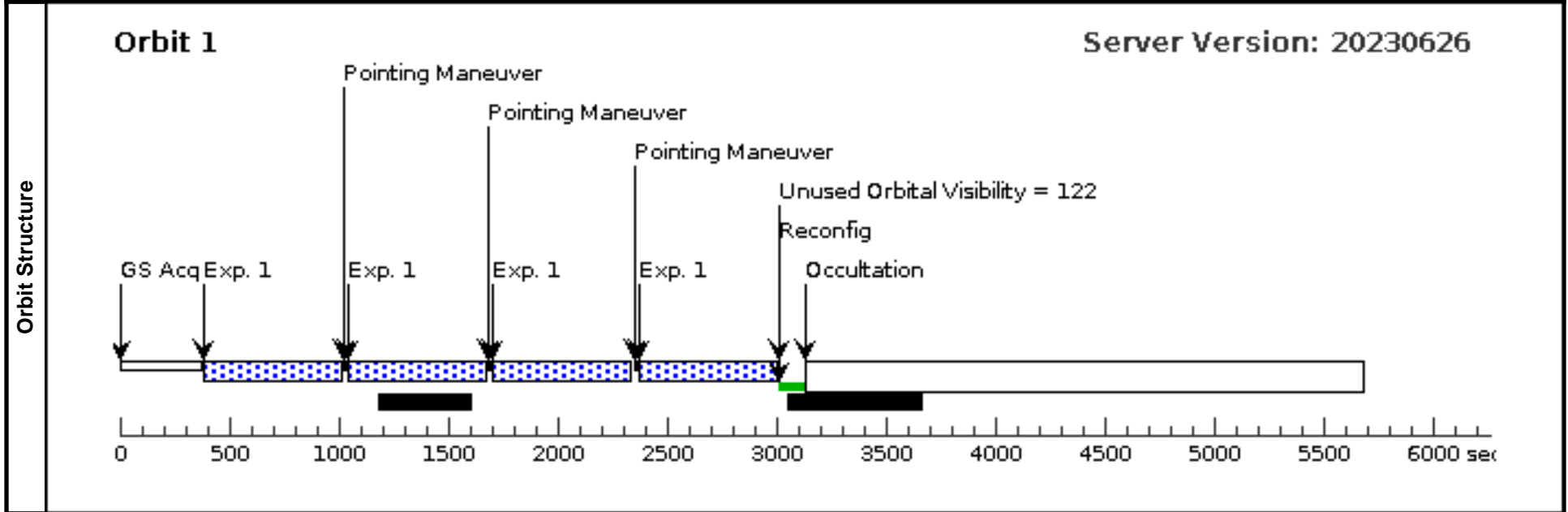
Visit	Proposal 17467, Visit 03 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 01		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	HOPS-153-OUTFLOW-EAST	RA: 05 38 10.1969 (84.5424871d) Dec: -07 09 18.67 (-7.15519d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) HOPS-153-OUTFLOW-EAST	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 03 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



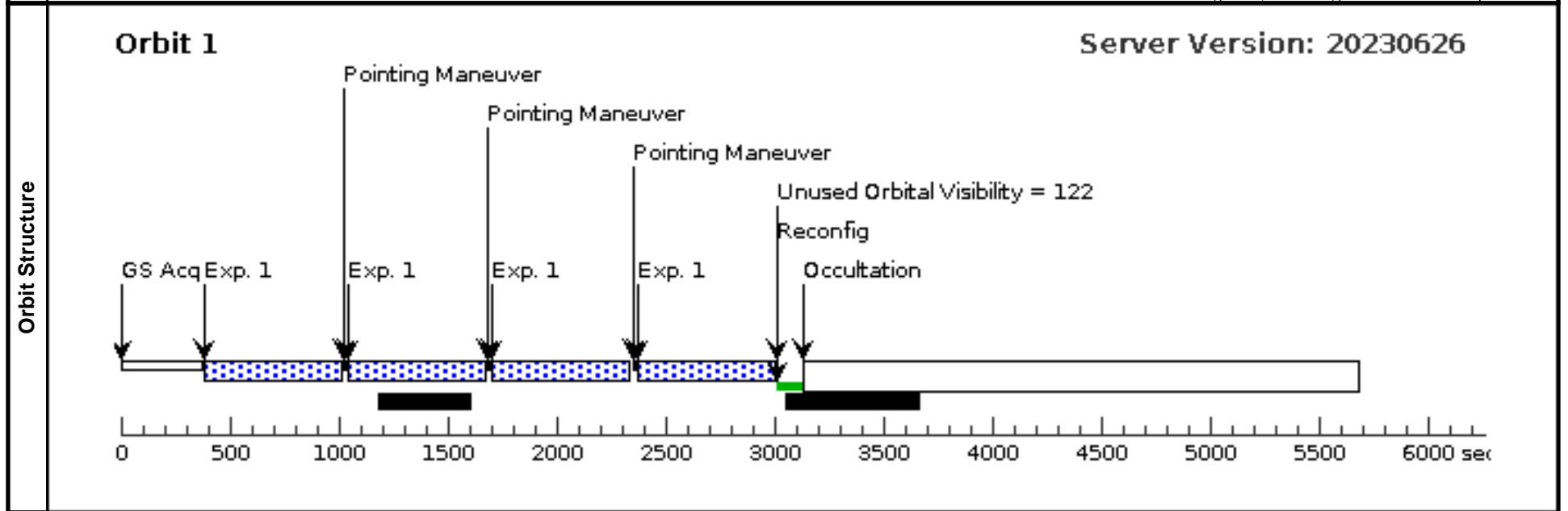
Visit	Proposal 17467, Visit 04		
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	Scientific Instruments: WFC3/IR		
	Special Requirements: SAME ORIENT AS 01		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	HOPS-153-OUTFLOW-EAST	RA: 05 38 10.1969 (84.5424871d) Dec: -07 09 18.67 (-7.15519d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) HOPS-153-OUTFLOW-EAST	WFC3/IR, MULTIACCUM, IR	F128N	NSAMP=12; SAMP-SEQ=STEP100			Pattern 1, Exps 1-1 in Visit 04 (1)	599.232292 Secs (2396.929 Secs)



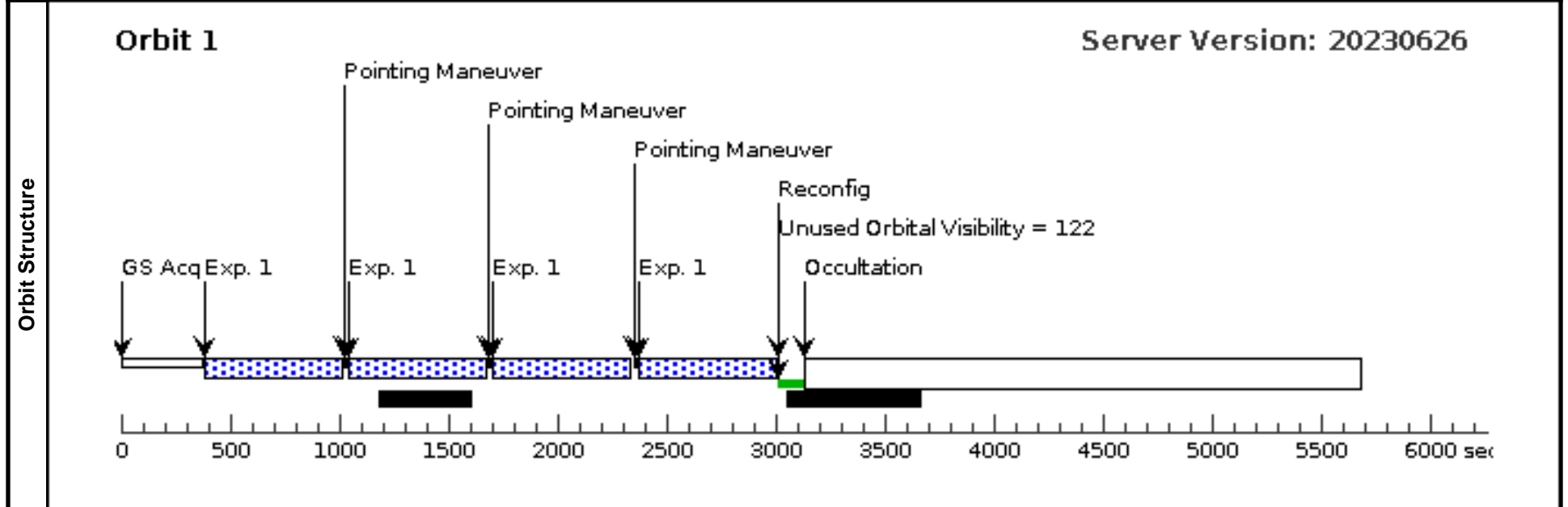
Visit	Proposal 17467, Visit 05 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 01		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	HOPS-153-OUTFLOW-EAST	RA: 05 38 10.1969 (84.5424871d) Dec: -07 09 18.67 (-7.15519d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) HOPS-153-OUTFLOW-EAST	WFC3/IR, MULTIACCUM, IR	F130N	NSAMP=12; SAMP-SEQ=STEP100			Pattern 1, Exps 1-1 in Visit 05 (1)	599.232292 Secs (2396.929 Secs)



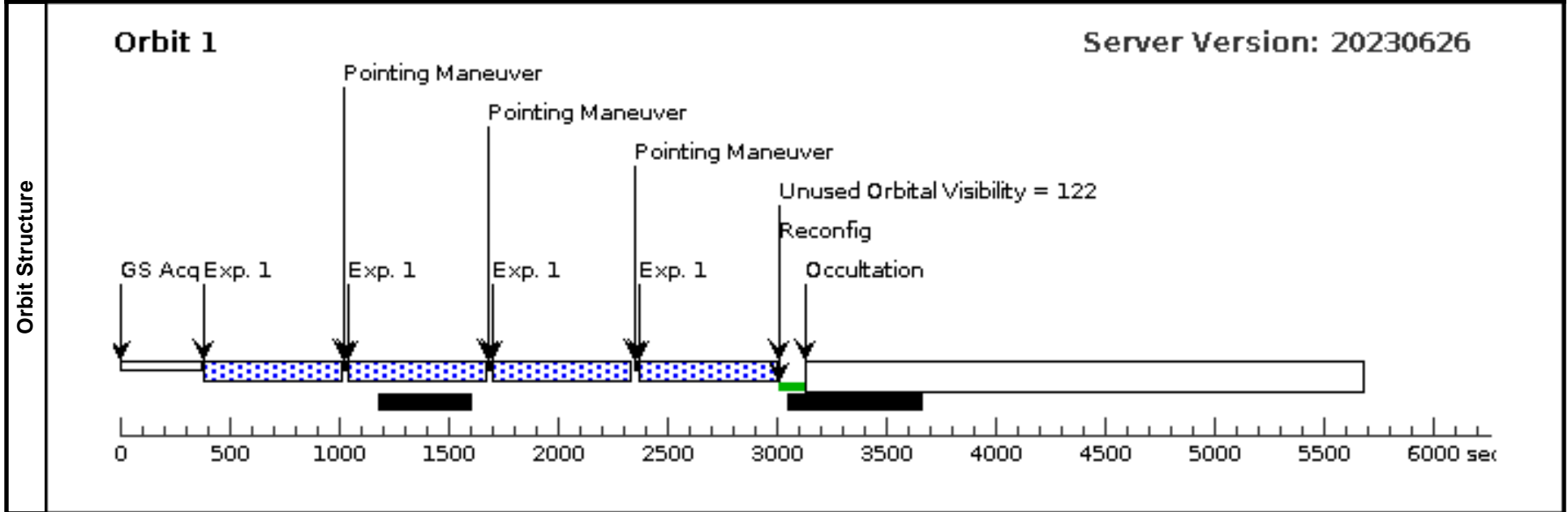
Visit	Proposal 17467, Visit 06		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/IR		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	HOPS-153-OUTFLOW-WEST	RA: 05 38 2.8418 (84.5118408d) Dec: -07 07 55.49 (-7.13208d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) HOPS-153-OUTFLOW-WEST	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 06 (1)	599.232292 Secs (2396.929 Secs)	[1]



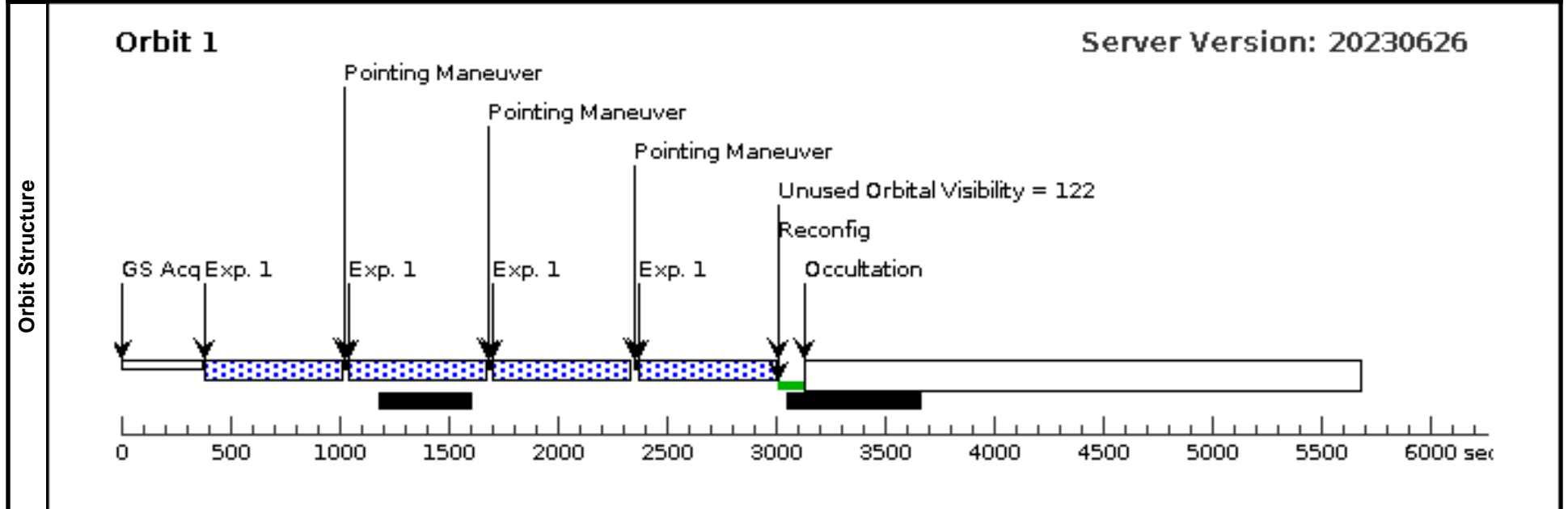
Visit	Proposal 17467, Visit 07 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 06		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	HOPS-153-OUTFLOW-WEST	RA: 05 38 2.8418 (84.5118408d) Dec: -07 07 55.49 (-7.13208d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) HOPS-153-OUTFLOW-WEST	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 07 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



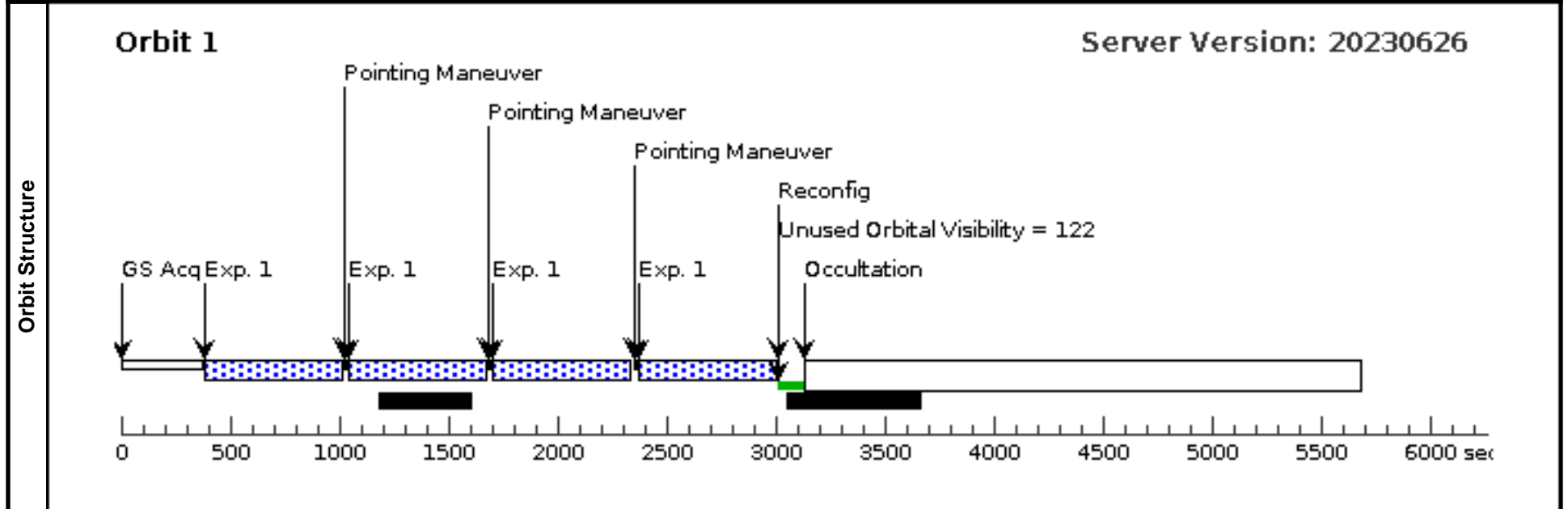
Visit	Proposal 17467, Visit 08 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 06		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	HOPS-153-OUTFLOW-WEST	RA: 05 38 2.8418 (84.5118408d) Dec: -07 07 55.49 (-7.13208d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) HOPS-153-OUTFLOW-WEST	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 08 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



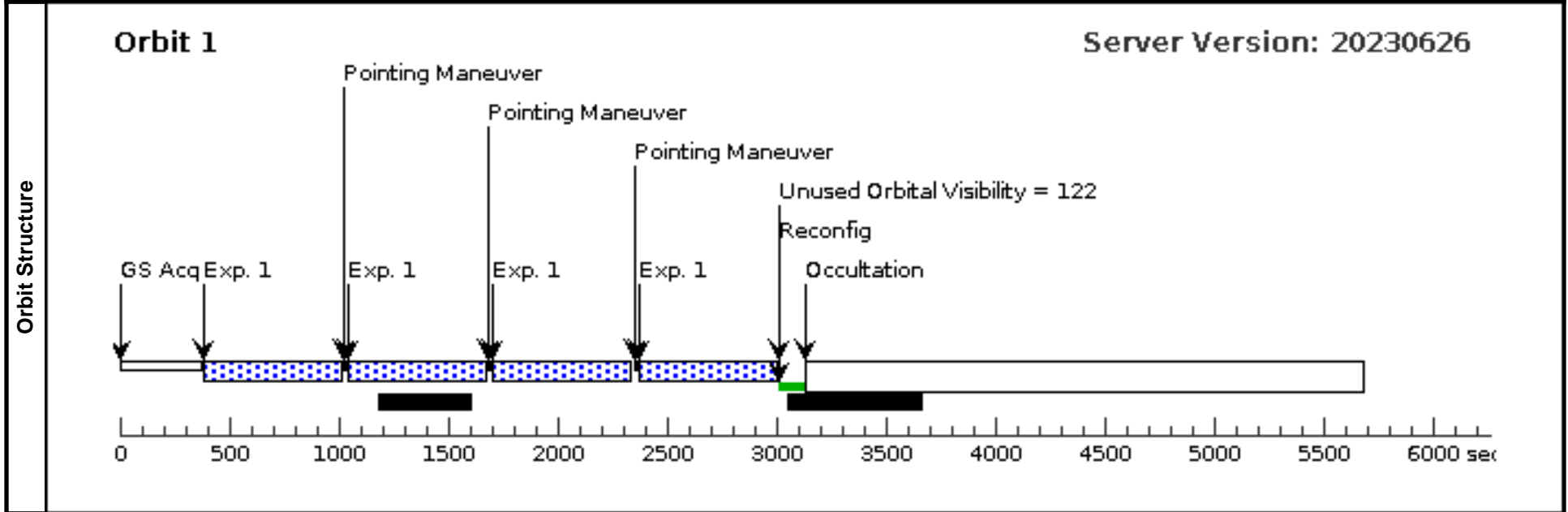
Visit	Proposal 17467, Visit 09		
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	Scientific Instruments: WFC3/IR		
	Special Requirements: SAME ORIENT AS 06		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	HOPS-153-OUTFLOW-WEST	RA: 05 38 2.8418 (84.5118408d) Dec: -07 07 55.49 (-7.13208d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) HOPS-153-OUTFLOW-WEST	WFC3/IR, MULTIACCUM, IR	F128N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 09 (1)	599.232292 Secs (2396.929 Secs)	[1]



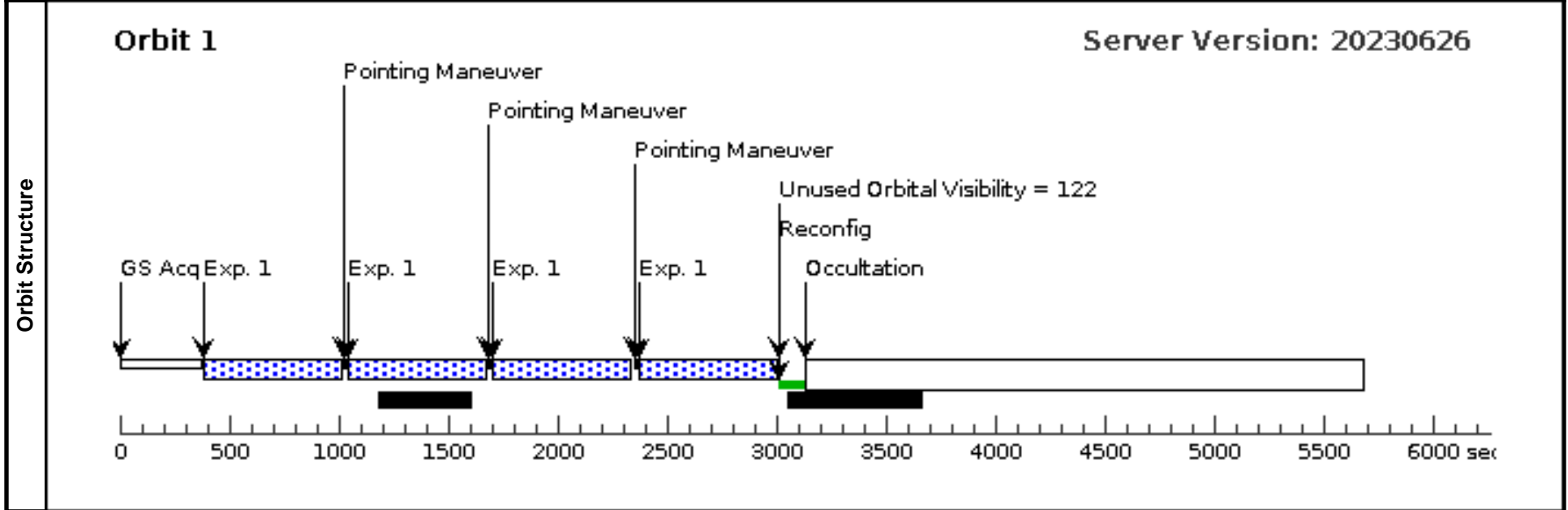
Visit	Proposal 17467, Visit 10 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 06		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(3)	HOPS-153-OUTFLOW-WEST	RA: 05 38 2.8418 (84.5118408d) Dec: -07 07 55.49 (-7.13208d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) HOPS-153-OUTFLOW-WEST	WFC3/IR, MULTIACCUM, IR	F130N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 10 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



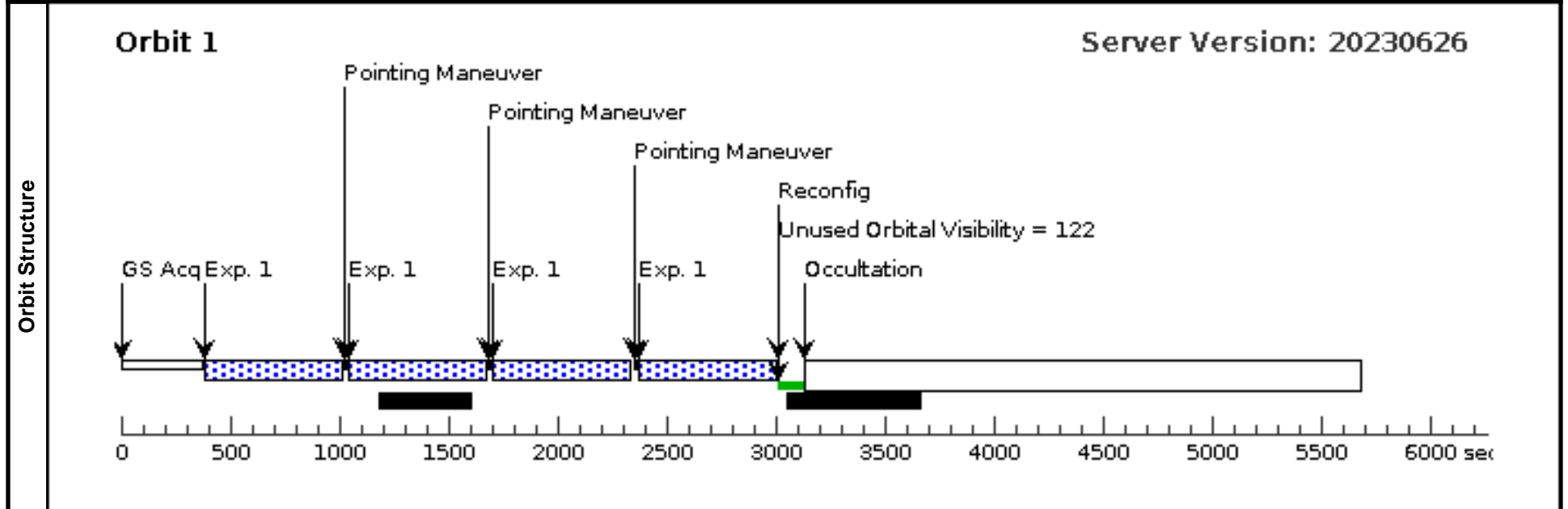
Visit	Proposal 17467, Visit 11 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	HOPS370-OUTFLOW-NORTH	RA: 05 35 28.2818 (83.8678408d) Dec: -05 08 55.10 (-5.14864d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) HOPS370-OUTFLOW-NORTH	WFC3/IR, MULTIACCUM, IR	F164N	NSAMP=12; SAMP-SEQ=STEP100			Pattern 1, Exps 1-1 in Visit 11 (1)	599.232292 Secs (2396.929 Secs)



Visit	Proposal 17467, Visit 12 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 11		
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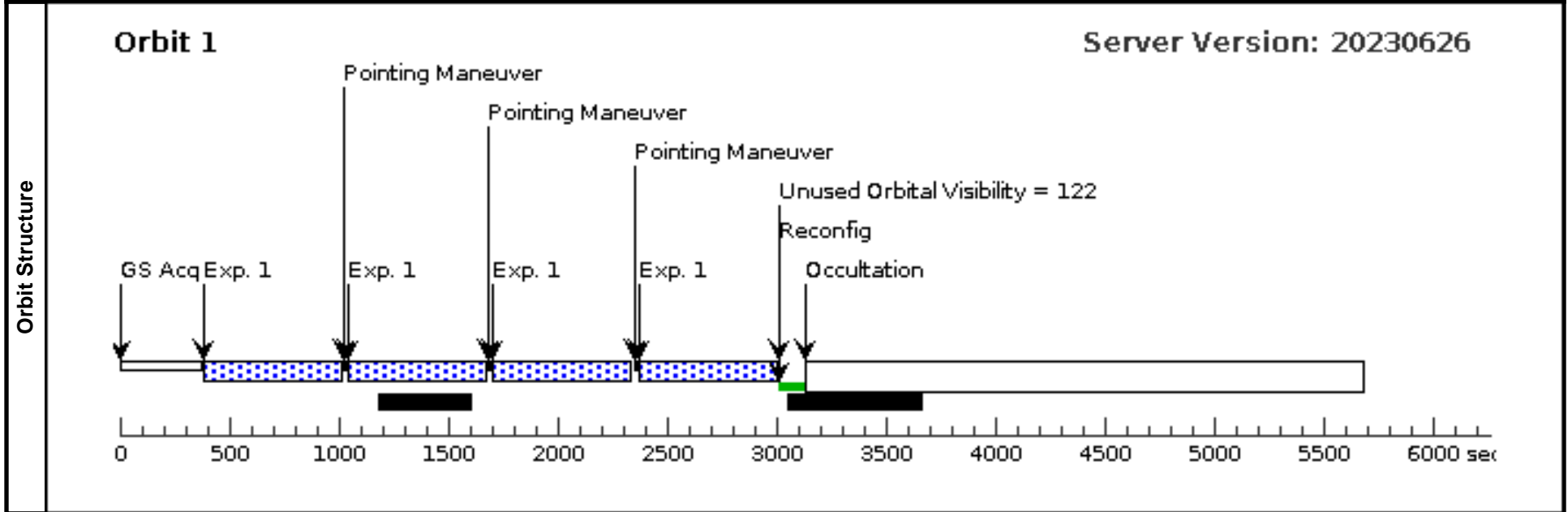
Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	HOPS370-OUTFLOW-NORTH	RA: 05 35 28.2818 (83.8678408d) Dec: -05 08 55.10 (-5.14864d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) HOPS370-OUTFLOW-NORTH	WFC3/IR, MULTIACCUM, IR	F167N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 12 (1)	599.232292 Secs (2396.929 Secs)	[1]

[==>(Pattern 1)]
 [==>(Pattern 2)]
 [==>(Pattern 3)]
 [==>(Pattern 4)]

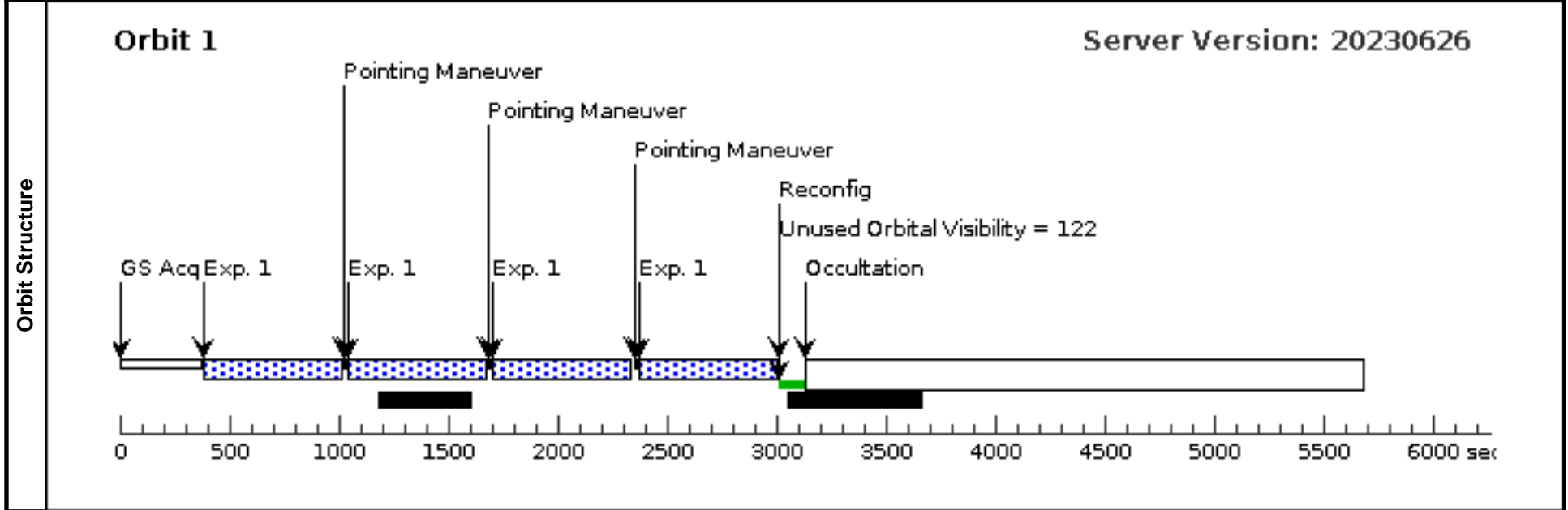


Visit	Proposal 17467, Visit 13 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 11		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
		(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
		(4)	HOPS370-OUTFLOW-NORTH	RA: 05 35 28.2818 (83.8678408d) Dec: -05 08 55.10 (-5.14864d) Equinox: J2000	Epoch of Position: 2015.5	V=35
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=ISM Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]						

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
		1		(4) HOPS370-OUTFLOW-NORTH	WFC3/IR, MULTIACCUM, IR	F126N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 13 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]



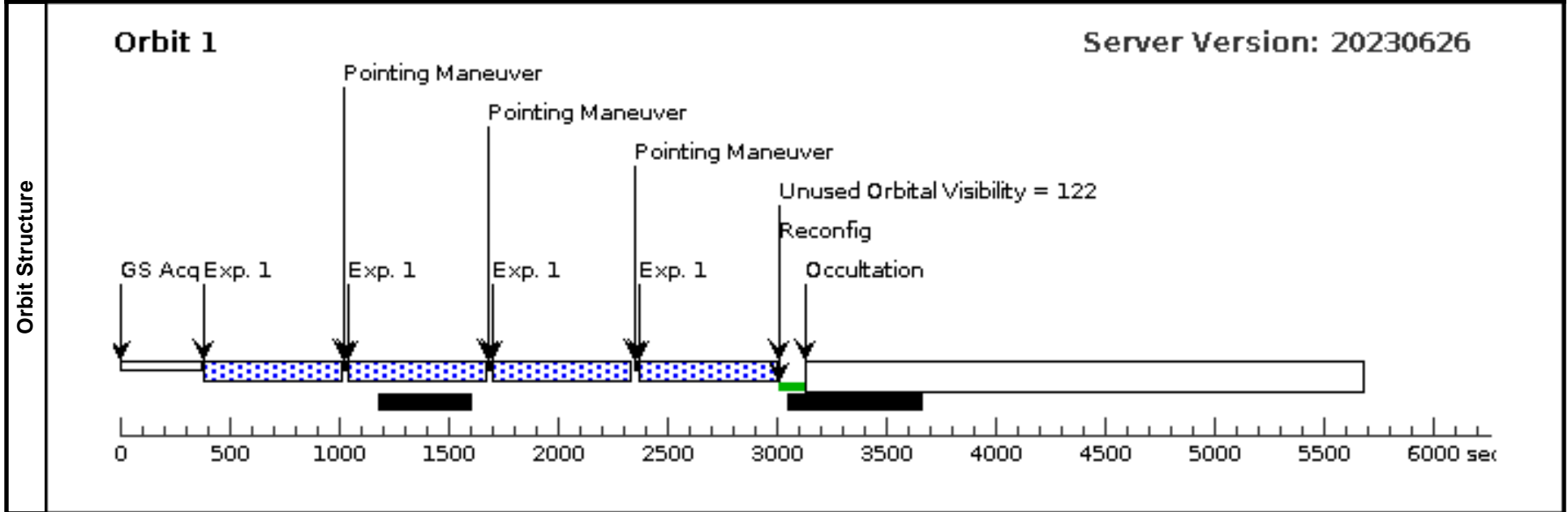
Visit	Proposal 17467, Visit 14 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 11		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	HOPS370-OUTFLOW-NORTH	RA: 05 35 28.2818 (83.8678408d) Dec: -05 08 55.10 (-5.14864d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) HOPS370-OUTFLOW-NORTH	WFC3/IR, MULTIACCUM, IR	F128N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 14 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



Visit	Proposal 17467, Visit 15 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 11		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=1.858 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	HOPS370-OUTFLOW-NORTH	RA: 05 35 28.2818 (83.8678408d) Dec: -05 08 55.10 (-5.14864d) Equinox: J2000	Epoch of Position: 2015.5	V=35	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=ISM
 Description=[HERBIG-HARO OBJECT, JET, KNOT, SHOCK FRONT, STAR FORMING REGION]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) HOPS370-OUTFLOW-NORTH	WFC3/IR, MULTIACCUM, IR	F130N	NSAMP=12; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 in Visit 15 (1)	599.232292 Secs (2396.929 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]

