



15257 - Proper Motions, Shear, Mass-Loss Rates and C-Shocks in the HH 7-11 Jet

Cycle: 25, 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) HH7-11	WFC3/UVIS	2	19-Jul-2017 23:00:30.0	yes
02	(1) HH7-11	WFC3/UVIS	2	19-Jul-2017 23:00:31.0	yes
03	(1) HH7-11	WFC3/UVIS	2	19-Jul-2017 23:00:32.0	yes
04	(1) HH7-11	WFC3/UVIS	2	19-Jul-2017 23:00:33.0	yes
05	(2) HH7-11QUAD	WFC3/UVIS	2	19-Jul-2017 23:00:34.0	yes

10 Total Orbits Used

ABSTRACT

We propose to obtain the first complete set of narrow band HST images of the iconic HH 7-11 protostellar jet. Owing to positional errors, both previous attempts to image the system failed to capture the HH 7 bow shock, arguably the best example we have of a well-resolved, strong shock in molecular gas. The proposed observations will tie together the optical and the IR emission in HH 7 and establish whether the molecular gas is heated by a continuous shock or a jump shock, physics of direct relevance to upcoming JWST observations of protostars. HST is needed to measure proper motions, to detect offsets between H-alpha and the forbidden lines that define the directions of shock propagation throughout the flow, and to resolve small scale structures present in the previous images. The portions of the jet imaged in 1995 and 1998 show several curious features, including two

'rings' that may result from the jet penetrating through preexisting sheets or filaments. I

f this explanation is correct, the shocks in the rings will have expanded perpendicular to the axis of the jet by measurable amounts in the last 20 years. Any shear or entrainment along the jet will manifest itself as differential motions in the shocked gas. Our proposal employs a WFC3 quad filter to measure electron densities at each pixel. Combined with proper motion measurements, these observations will allow us to separate jet material from shocked gas along the cavity, observe dynamical instabilities if they exist behind the shock, and assess the accuracy of simple mass loss calculations that depend solely upon integrated line luminosities.

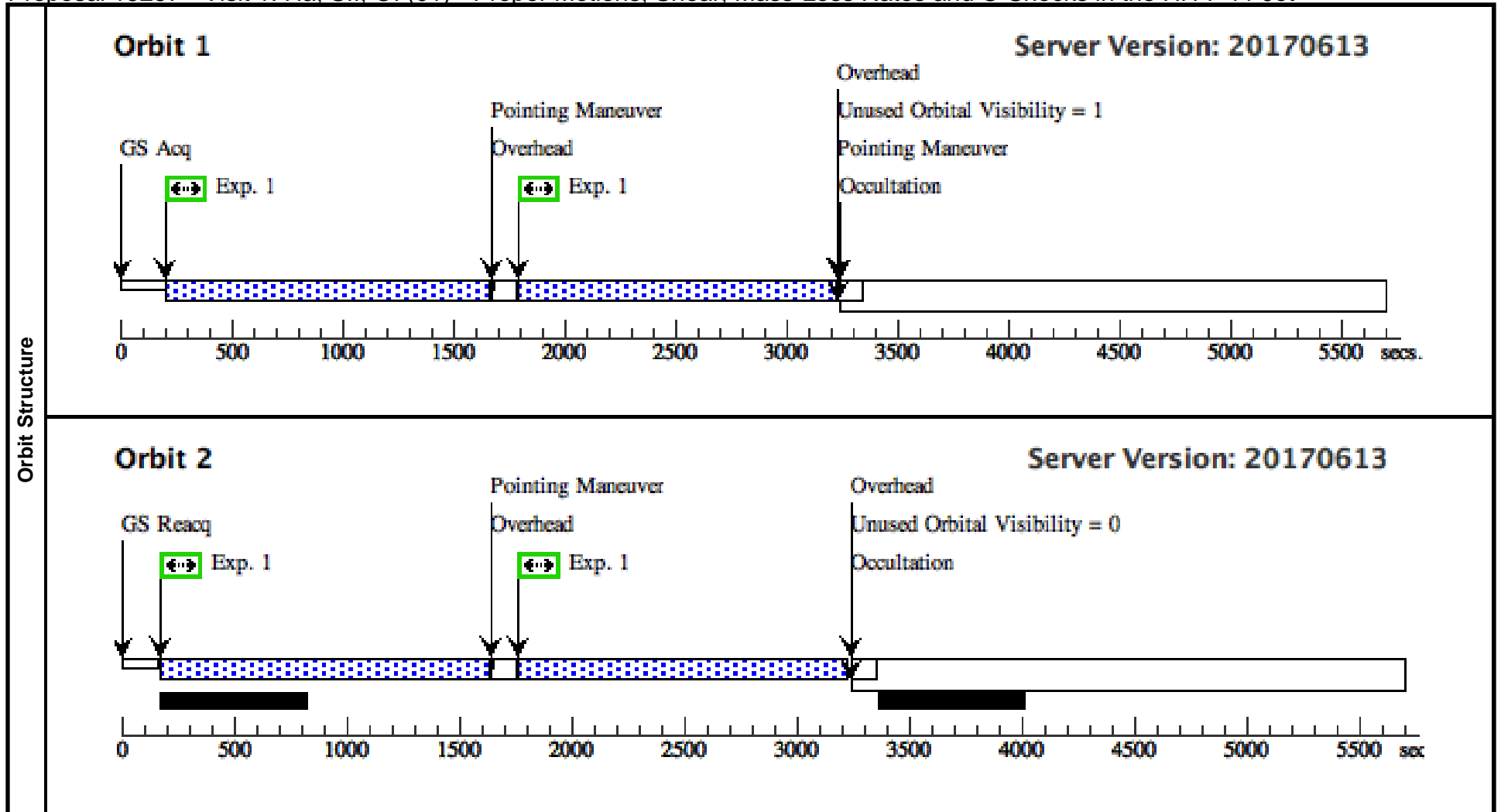
OBSERVING DESCRIPTION

New images in F656N, F631N, F673N will be used in part to define proper motions relative to their counterparts taken as part of GTO 6868 in 1998, and GTO 5779 in 1995. Two orbits in each filter are needed to reach the same depth as the GTO data. The near-IR continuum image was quite useful for identifying cavities in Fig 1, so we would like to redo that as well to see if the cavities have changed. Finally, we plan to use the standard [S II] 6716/ [S II] 6731 line ratio to determine electron densities. Ground-based spectra integrated over the emission imply Ne ranges between about 200 and 1500 cm⁻³, within the range of the [S II] density diagnostic. The F673N filter includes both [S II] 6716 and [S II] 6731, so to isolate [S II] 6716 (and extract [S II] 6731 from the difference) we propose to use the quad filter FQ672N. This filter has a smaller FOV, but it is just large enough to include all the emission.

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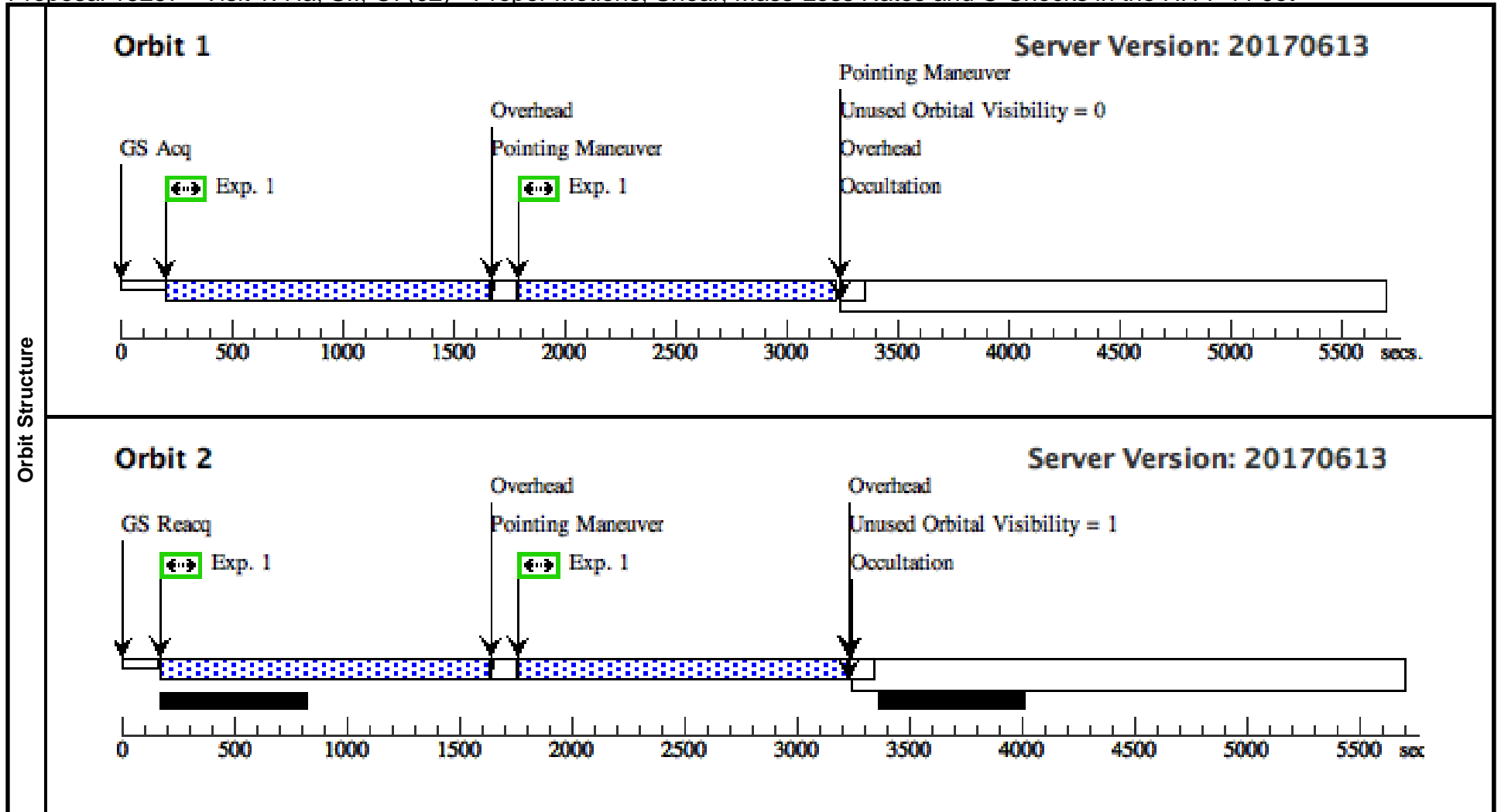
Visit	Proposal 15257, Visit 1: Ha, SII, OI (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 99D TO 100 D: GROUP 01.02.03 WITHIN 60D										
	Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
		(3)	Pattern Type=WFC3-UVIS-DITHER- LINE Purpose=DITHER Number Of Points=4 Point Spacing=2.648 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=45.511 Angle Between Sides= Center Pattern=false						(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	HH7-11	RA: 03 29 3.6223 (52.2650929d) Dec: +31 15 56.61 (31.26572d) Equinox: J2000		Epoch of Position: 2000		V=(?) 1e-15		Reference Frame: SIMBAD		
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=YES										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	h-alpha	(1) HH7-11	WFC3/UVIS, ACCUM, UVIS-CENTER	F656N	FLASH=10	GS ACQ SCENARI O SINGLE	Pattern 3, Exps 1-1 i n Visit 1: Ha, SII, OI (01) (3)	900 Secs (5778 Secs)		
									[==>1428.0 Secs (Pattern 1)]	[1]	
									[==>1428.0 Secs (Pattern 2)]		
									[==>1461.0 Secs (Pattern 3)]		
									[==>1461.0 Secs (Pattern 4)]	[2]	



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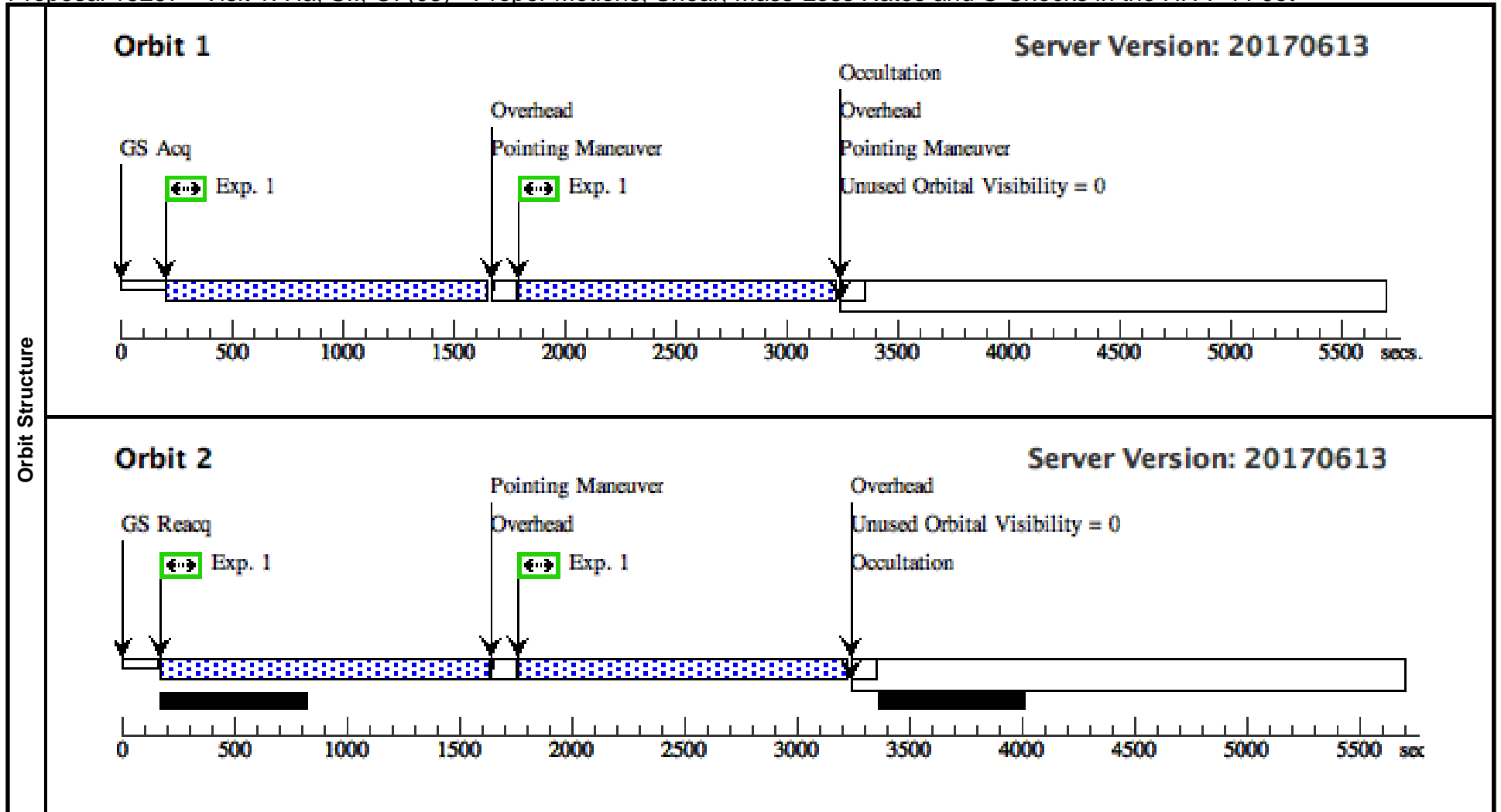
Visit	Proposal 15257, Visit 1: Ha, SII, OI (02), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 99D TO 100 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(3)	Pattern Type=WFC3-UVIS-DITHER- LINE Purpose=DITHER Number Of Points=4 Point Spacing=2.648 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=45.511 Angle Between Sides= Center Pattern=false		(1)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	HH7-11	RA: 03 29 3.6223 (52.2650929d) Dec: +31 15 56.61 (31.26572d) Equinox: J2000	Epoch of Position: 2000	V=(?) 1e-15	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=YES									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	S II	(1) HH7-11	WFC3/UVIS, ACCUM, UVIS-CENTER	F673N	FLASH=7	GS ACQ SCENARI O SINGLE	Pattern 3, Exps 1-1 i n Visit 1: Ha, SII, OI (02) (3)	900 Secs (5780 Secs) [==>1429.0 Secs (Pattern 1)] [==>1429.0 Secs (Pattern 2)] [==>1461.0 Secs (Pattern 3)] [==>1461.0 Secs (Pattern 4)]	[1] [2]



Proposal 15257 - Visit 1: Ha, SII, OI (03) - Proper Motions, Shear, Mass-Loss Rates and C-Shocks in the HH 7-11 Jet

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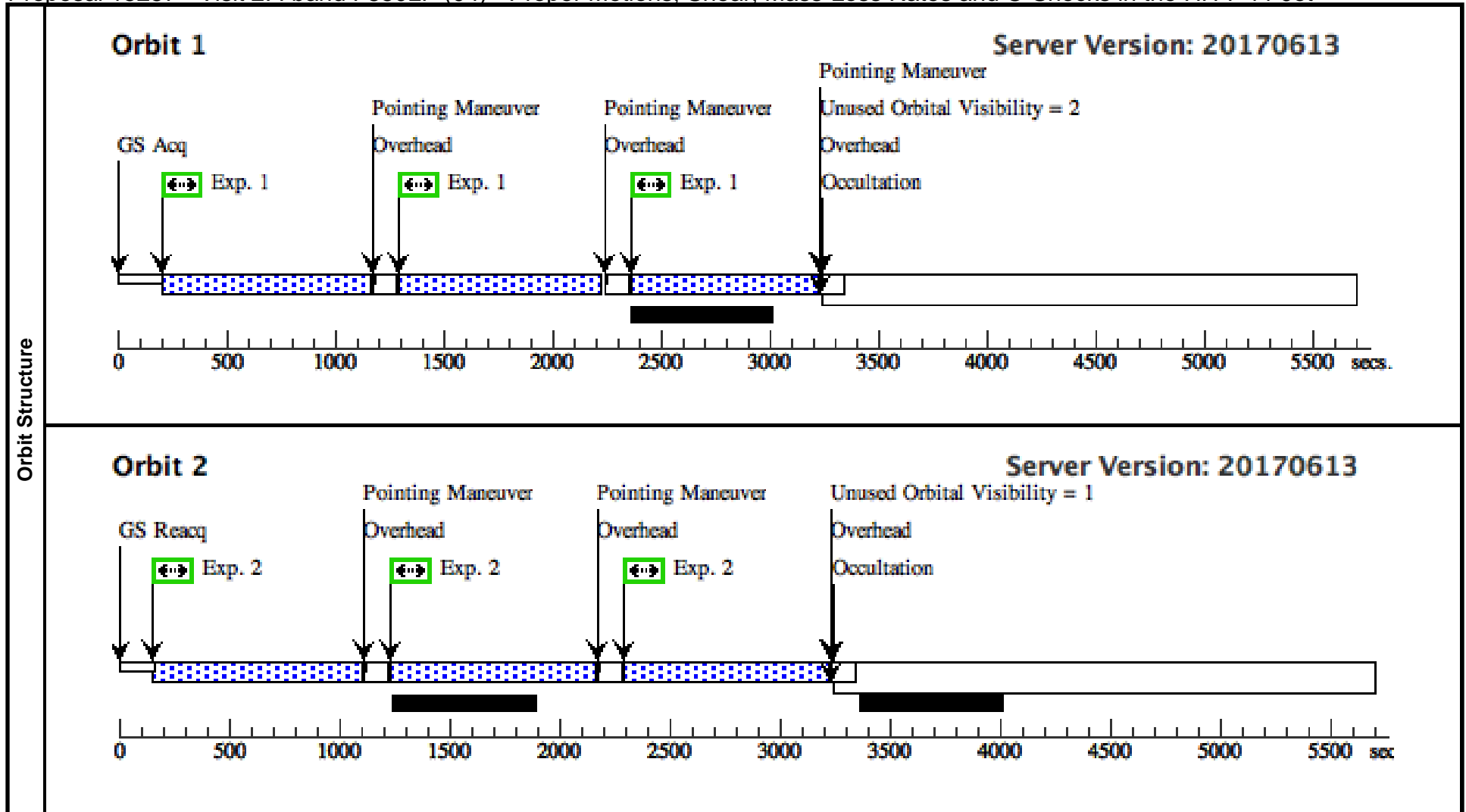
Visit	Proposal 15257, Visit 1: Ha, SII, OI (03), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 99D TO 100 D										
	Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
		(3)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=2.648 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=45.511 Angle Between Sides= Center Pattern=false						(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	HH7-11	RA: 03 29 3.6223 (52.2650929d) Dec: +31 15 56.61 (31.26572d) Equinox: J2000		Epoch of Position: 2000		V=(?) 1e-15		Reference Frame: SIMBAD		
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=YES										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	OI	(1) HH7-11	WFC3/UVIS, ACCUM, UVIS-CENTER	F631N	FLASH=8	GS ACQ SCENARI O SINGLE	Pattern 3, Exps 1-1 in Visit 1: Ha, SII, OI (03) (3)	900 Secs (5779 Secs) [==>1425.0 Secs (Pattern 1)] [==>1432.0 Secs (Pattern 2)] [==>1461.0 Secs (Pattern 3)] [==>1461.0 Secs (Pattern 4)]		[1] [2]



Proposal 15257 - Visit 2: I band F850LP (04) - Proper Motions, Shear, Mass-Loss Rates and C-Shocks in the HH 7-11 Jet

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Visit	Proposal 15257, Visit 2: I band F850LP (04), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 99D TO 100 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=2.806 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.11 Angle Between Sides= Center Pattern=false		(1), (2)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	HH7-11	RA: 03 29 3.6223 (52.2650929d) Dec: +31 15 56.61 (31.26572d) Equinox: J2000	Epoch of Position: 2000	V=(?) 1e-15	Reference Frame: SIMBAD				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=YES										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	I band F850 LP	(1) HH7-11	WFC3/UVIS, ACCUM, UVIS-CENTER	F850LP	FLASH=5	GS ACQ SCENARIO SINGLE	Pattern 2, Exps 1-1 in Visit 2: I band F850LP (04) (2)	900 Secs (2725 Secs) [==>930.0 Secs (Pattern 1)] [==>930.0 Secs (Pattern 2)] [==>865.0 Secs (Pattern 3)]	[1]
2	F645N Cont inuum	(1) HH7-11	WFC3/UVIS, ACCUM, UVIS-CENTER	F645N	FLASH=9		Pattern 2, Exps 2-2 in Visit 2: I band F850LP (04) (2)	900 Secs (2787 Secs) [==>929.0 Secs (Pattern 1)] [==>929.0 Secs (Pattern 2)] [==>929.0 Secs (Pattern 3)]	[2]	



Proposal 15257 - Visit 3: Quad SII (05) - Proper Motions, Shear, Mass-Loss Rates and C-Shocks in the HH 7-11 Jet

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Visit	Proposal 15257, Visit 3: Quad SII (05), implementation Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 102D TO 103 D										
	(SII Quad (05.001)) Warning (Form): POS TARG & PATTERN should be used carefully with WFC3 quad filters to avoid placing the target on the vignetted part of the field of view or moving it to another quadrant.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(3)	Pattern Type=WFC3-UVIS-DITHER- LINE Purpose=DITHER Number Of Points=4 Point Spacing=2.648 Line Spacing=				Coordinate Frame=POS-TARG Pattern Orientation=45.511 Angle Between Sides= Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	HH7-11QUAD	RA: 03 29 6.8083 (52.2783679d) Dec: +31 15 38.70 (31.26075d) Equinox: J2000				V=(?) 1e-15		Reference Frame: ICRS		
<i>Comments: Extended=YES</i>											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	SII Quad	(2) HH7-11QUAD	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ672N	FLASH=10	GS ACQ SCENARI O SINGLE	Pattern 3, Exps 1-1 i n Visit 3: Quad SII (05) (3)	900 Secs (5778 Secs)		
										[==>1428.0 Secs (Pattern 1)]	[1]
										[==>1428.0 Secs (Pattern 2)]	
									[==>1461.0 Secs (Pattern 3)]		
									[==>1461.0 Secs (Pattern 4)]	[2]	

