



12255 - Probing Ultracool Atmospheres and Substellar Interiors with Dynamical Masses

Cycle: 18, Proposal Category: GO
(Availability Mode: SUPPORTED)

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) LP349-25 CCDFLAT	STIS/CCD	3	17-May-2011 21:24:20.0	yes
02	(2) GL569B (5) GL569A CCDFLAT	STIS/CCD	3	17-May-2011 21:24:31.0	yes
03	(3) HD130948B (4) HD130948A	STIS/CCD	4	17-May-2011 21:24:43.0	yes

10 Total Orbits Used

ABSTRACT

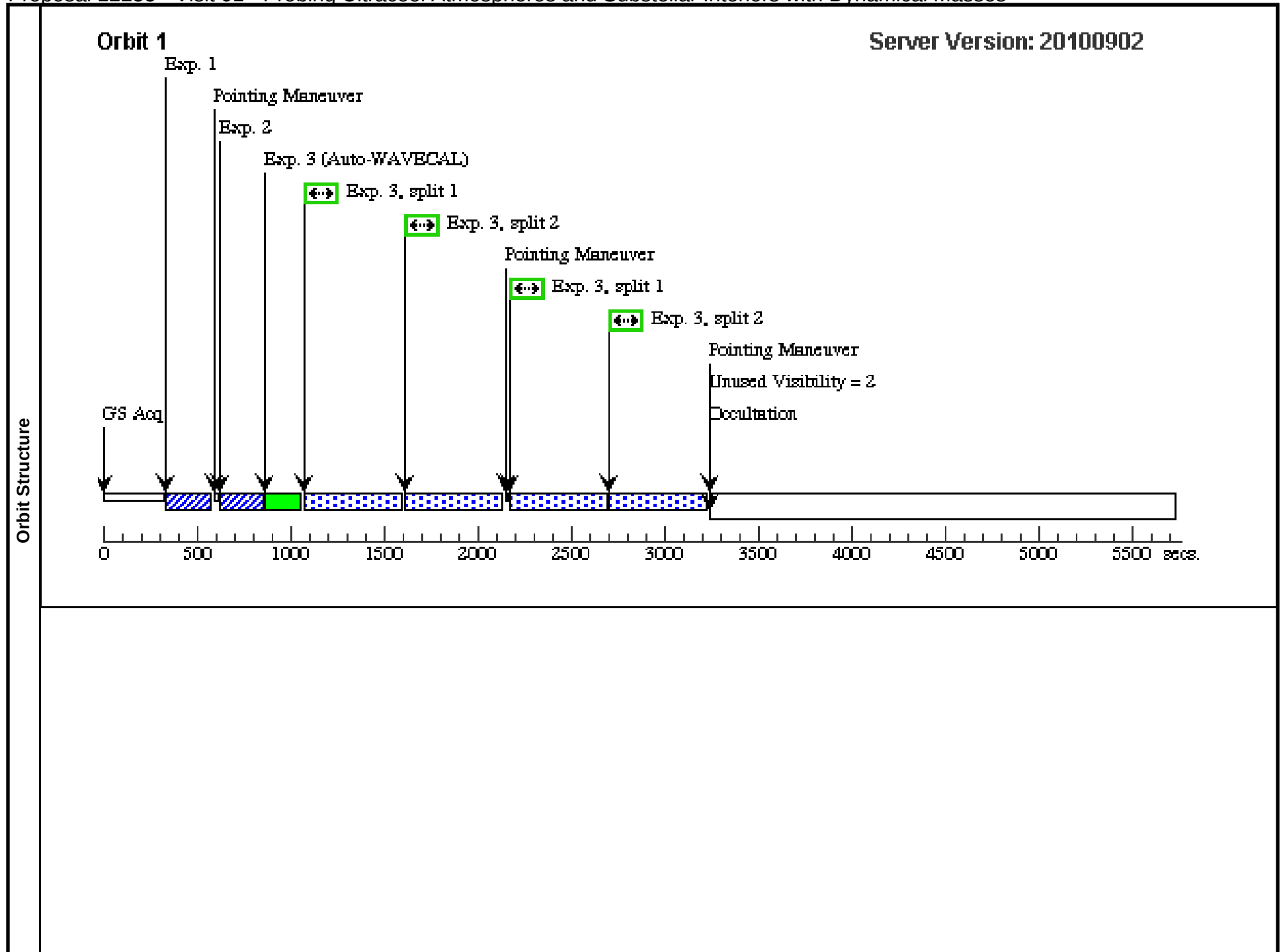
After years of patient orbital monitoring, there is now a large sample of very low-mass stars and brown dwarfs with precise ($\sim 5\%$) dynamical masses. These binaries represent the gold standard for testing substellar theoretical models. Work to date has identified problems with the model-predicted broad-band colors, effective temperatures, and possibly even luminosity evolution with age. However, our ability to test models is currently limited by how well the individual components of these highly prized binaries are characterized. To solve this problem, we propose to use NICMOS and STIS to characterize this first large sample of ultracool binaries with well-determined dynamical masses. We will use NICMOS multi-band photometry to measure the SEDs of the binary components and thereby precisely estimate their spectral types and effective temperatures. We will use STIS to obtain resolved spectroscopy of the Li I doublet at 6708 Å for a subset of three binaries whose masses lie very near the theoretical mass limit for lithium burning. The STIS data will provide the first ever resolved lithium measurements for brown dwarfs of known mass, enabling a direct probe of substellar interiors. Our proposed HST observations to characterize the components of these binaries is much less daunting in comparison to the years of orbital monitoring needed to yield dynamical masses, but these HST data are equally vital for robust tests of theory.

OBSERVING DESCRIPTION

STIS medium-resolution spectroscopy of 3 brown dwarf binaries. The highest resolution grating (G750M) will be used to measure lithium absorption at 6708 Å. Two of the targets are relatively bright late-M dwarf binaries (3 orbits each), and one is a fainter L dwarf binary (4 orbits). Two of our targets are near (2.6" and 5") very bright stars, so their coordinates are specified as precise offsets from these stars. Rather than specify orientation constraints to align the binaries along the slit, we have specified time constraints excluding any dates when it would not be possible to do so. This is because the binaries' position angles are changing significantly over Cycle 18. We will need to specify the ORIENT angle once our observations are actually scheduled.

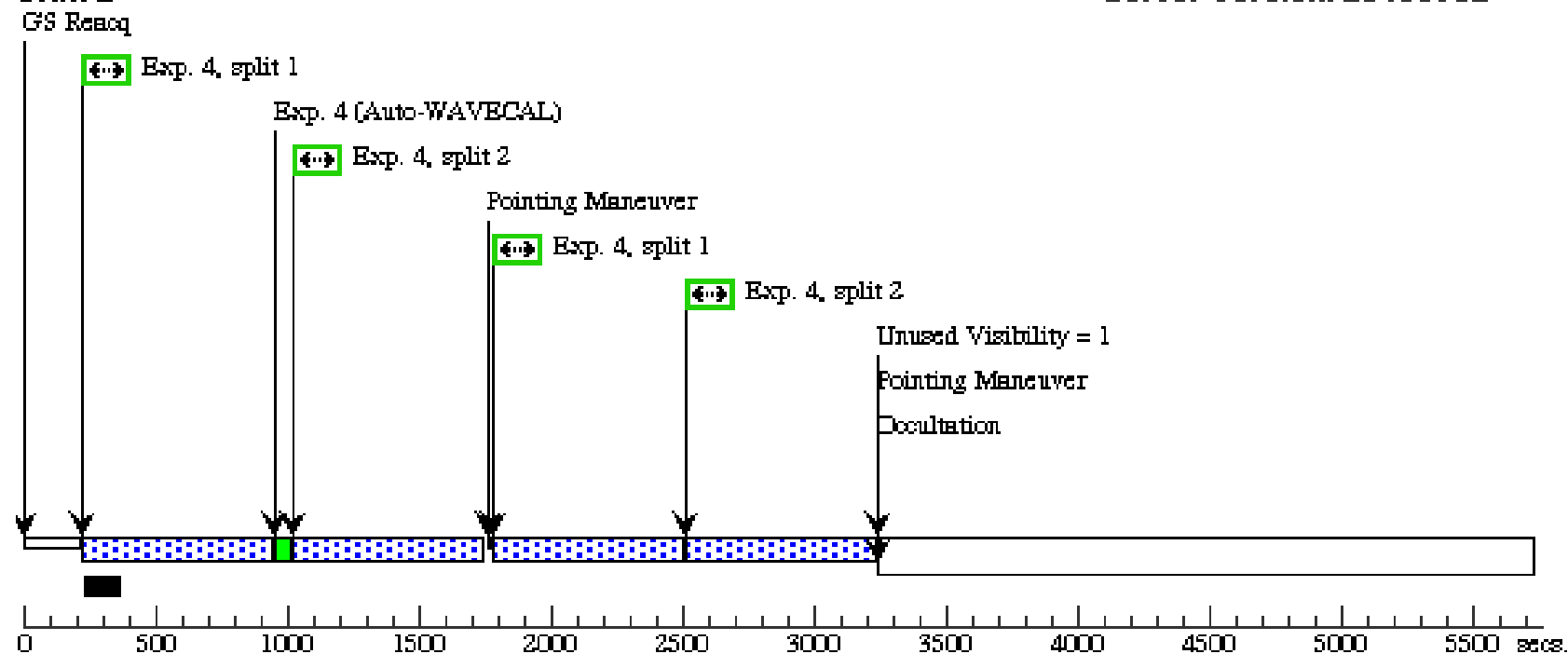
Proposal 12255 - Visit 01 - Probing Ultracool Atmospheres and Substellar Interiors with Dynamical Masses

Visit	Proposal 12255, Visit 01, implementation						Wed May 18 01:24:49 GMT 2011			
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD									
	Special Requirements: ORIENT 248D TO 268 D; BETWEEN 11-OCT-2010:00:00:00 AND 26-JAN-2011:00:00:00; BETWEEN 25-MAY-2011:00:00:00 AND 31-AUG-2011:00:00:00									
Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
	(1)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=2 Angle Between Sides= Point Spacing=0.6 Center Pattern=false Line Spacing=							(3), (4), (5)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	LP349-25	RA: 00 27 55.9300 (6.9830417d) Dec: +22 19 32.80 (22.32578d) Equinox: J2000		Proper Motion RA: 0.4484 arcsec/yr Proper Motion Dec: -0.1529 arcsec/yr Parallax: 0.07582" Epoch of Position: 1997.75		V=(?) SDSS i = 14.5 mag		Reference Frame: ICRS	
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	LP349-25 A CQ	(1) LP349-25	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Visit 01	5 Secs [==>]	[1]
	2	LP349-25 P EAKUP	(1) LP349-25	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR			Sequence 1-3 Non-Int in Visit 01	1 Secs [==>]	[1]
	3	LP 349-25 S PEC	(1) LP349-25	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 1-3 Non-Int in Visit 01 Pattern 1, Exps 3-3 in Sequence 1-3 Non-Int in Visit 01 (1)	2076 Secs [==>491.0 Secs (Pattern 1, Split 1)] [==>491.0 Secs (Pattern 1, Split 2)] [==>491.0 Secs (Pattern 2, Split 1)] [==>491.0 Secs (Pattern 2, Split 2)]	[1]
	4	LP349-25 S PEC	(1) LP349-25	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 4-4 Non-Int in Visit 01 Pattern 1, Exps 4-4 in Sequence 4-4 Non-Int in Visit 01 (1)	1 Secs [==>684.5 Secs (Pattern 1, Split 1)] [==>684.5 Secs (Pattern 1, Split 2)] [==>684.5 Secs (Pattern 2, Split 1)] [==>684.5 Secs (Pattern 2, Split 2)]	[2]
	5	LP 349-25 S PEC	(1) LP349-25	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 5-6 Non-Int in Visit 01 Pattern 1, Exps 5-5 in Sequence 5-6 Non-Int in Visit 01 (1)	2076 Secs [==>685.0 Secs (Pattern 1, Split 1)] [==>685.0 Secs (Pattern 1, Split 2)] [==>685.0 Secs (Pattern 2, Split 1)] [==>685.0 Secs (Pattern 2, Split 2)]	[3]
	6	FLATS	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A			Sequence 5-6 Non-Int in Visit 01	1 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[3]



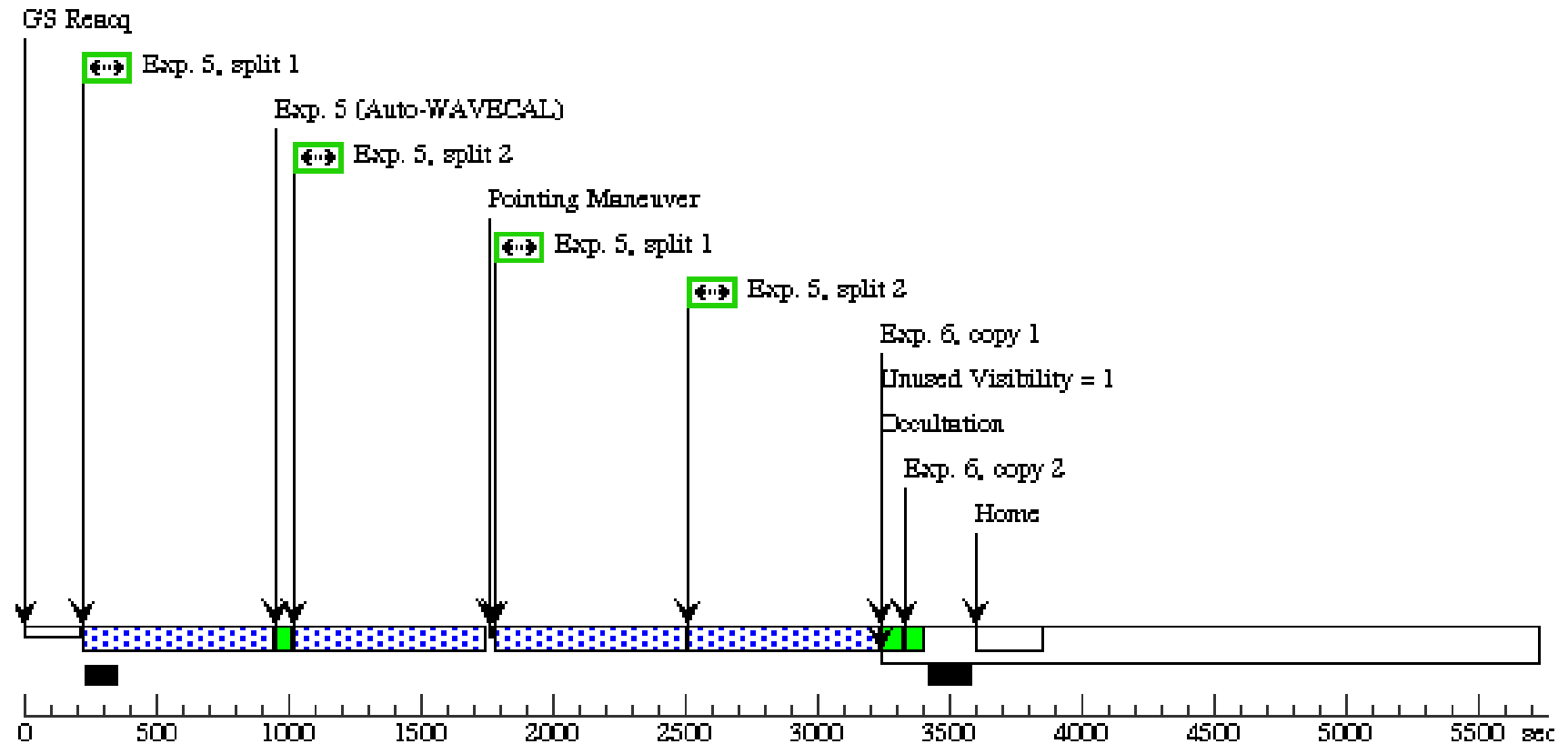
Orbit 2

Server Version: 20100902



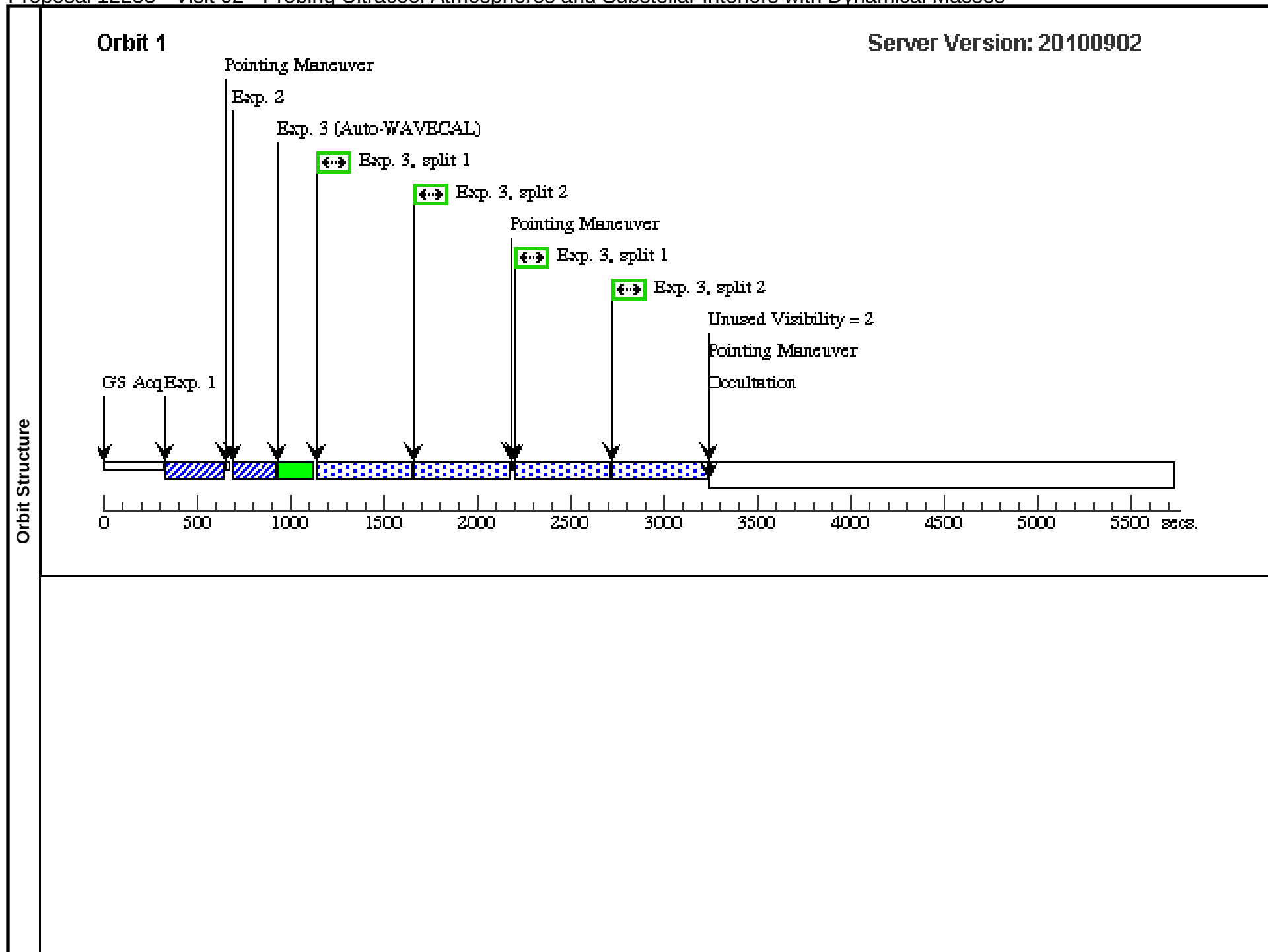
Orbit 3

Server Version: 20100902



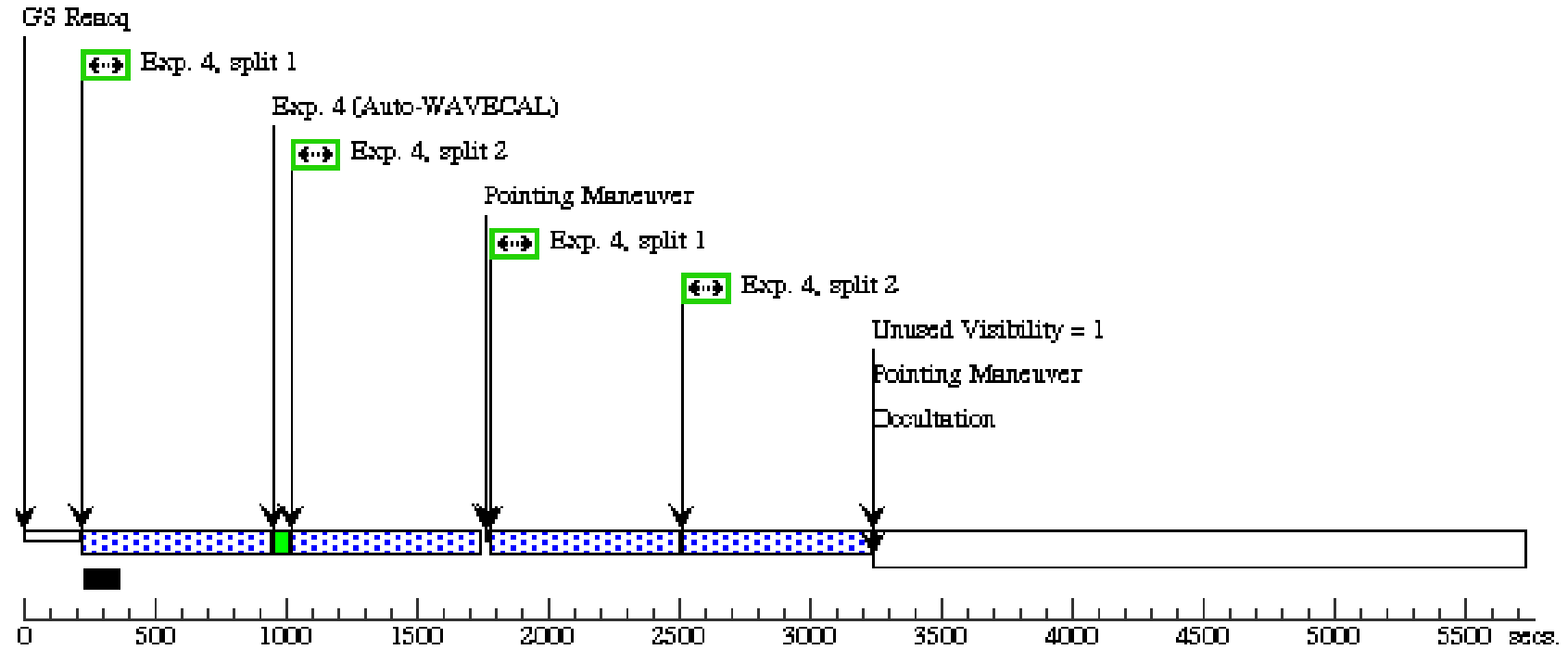
Proposal 12255 - Visit 02 - Probing Ultracool Atmospheres and Substellar Interiors with Dynamical Masses

Visit	Proposal 12255, Visit 02, implementation					Wed May 18 01:24:51 GMT 2011					
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: STIS/CCD										
	Special Requirements: ORIENT 90D TO 110 D; BETWEEN 25-JUL-2011:00:00:00 AND 15-AUG-2011:00:00:00										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.6 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false						(3), (4), (5)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	GL569B	Offset from GL569A by RA Offset: 0.19975 Secs Dec Offset: 3.9656 Arcsec				V=(?) SDSS i = 14.6 mag		Offset Position (GL569B) Reference Frame: ICRS		
	Comments: Offset measured from Keck AO images on 2010 May 22 UT: 4.9703+-0.0026" separation at PA = 37.07+-0.02 deg. This target is a companion to the offset star, so it shares the offset star's proper motion and parallax.										
	(5)	GL569A	RA: 14 54 29.0695 (223.6211229d) Dec: +16 06 4.89 (16.10136d) Equinox: J2000		Proper Motion RA: 0.27600 arcsec/yr Proper Motion Dec: -0.12169 arcsec/yr Parallax: 0.10359" Epoch of Position: 1991.25		V=10.2		Reference Frame: ICRS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1	GL569A AC Q	(5) GL569A	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Visit 02	5 Secs		
									[==>]		[1]
	2	GL569B PE AKUP	(2) GL569B	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR			Sequence 1-3 Non-Int in Visit 02	1 Secs		
									[==>]		[1]
	3	GL569B SPE C	(2) GL569B	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 1-3 Non-Int in Visit 02 Pattern 1, Exps 3-3 in Sequence 1-3 Non-Int in Visit 02 (1)	2076 Secs [==>474.0 Secs (Pattern 1, Split 1)] [==>474.0 Secs (Pattern 1, Split 2)] [==>474.0 Secs (Pattern 2, Split 1)] [==>474.0 Secs (Pattern 2, Split 2)]		[1]
	4	GL569B SPE C	(2) GL569B	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 4-4 Non-Int in Visit 02 Pattern 1, Exps 4-4 in Sequence 4-4 Non-Int in Visit 02 (1)	2076 Secs [==>685.0 Secs (Pattern 1, Split 1)] [==>685.0 Secs (Pattern 1, Split 2)] [==>685.0 Secs (Pattern 2, Split 1)] [==>685.0 Secs (Pattern 2, Split 2)]		[2]
	5	GL569B SPE C	(2) GL569B	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 5-6 Non-Int in Visit 02 Pattern 1, Exps 5-5 in Sequence 5-6 Non-Int in Visit 02 (1)	2076 Secs [==>684.0 Secs (Pattern 1, Split 1)] [==>684.0 Secs (Pattern 1, Split 2)] [==>684.0 Secs (Pattern 2, Split 1)] [==>684.0 Secs (Pattern 2, Split 2)]		[3]
	6	FLATS	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A			Sequence 5-6 Non-Int in Visit 02	1 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]		[3]



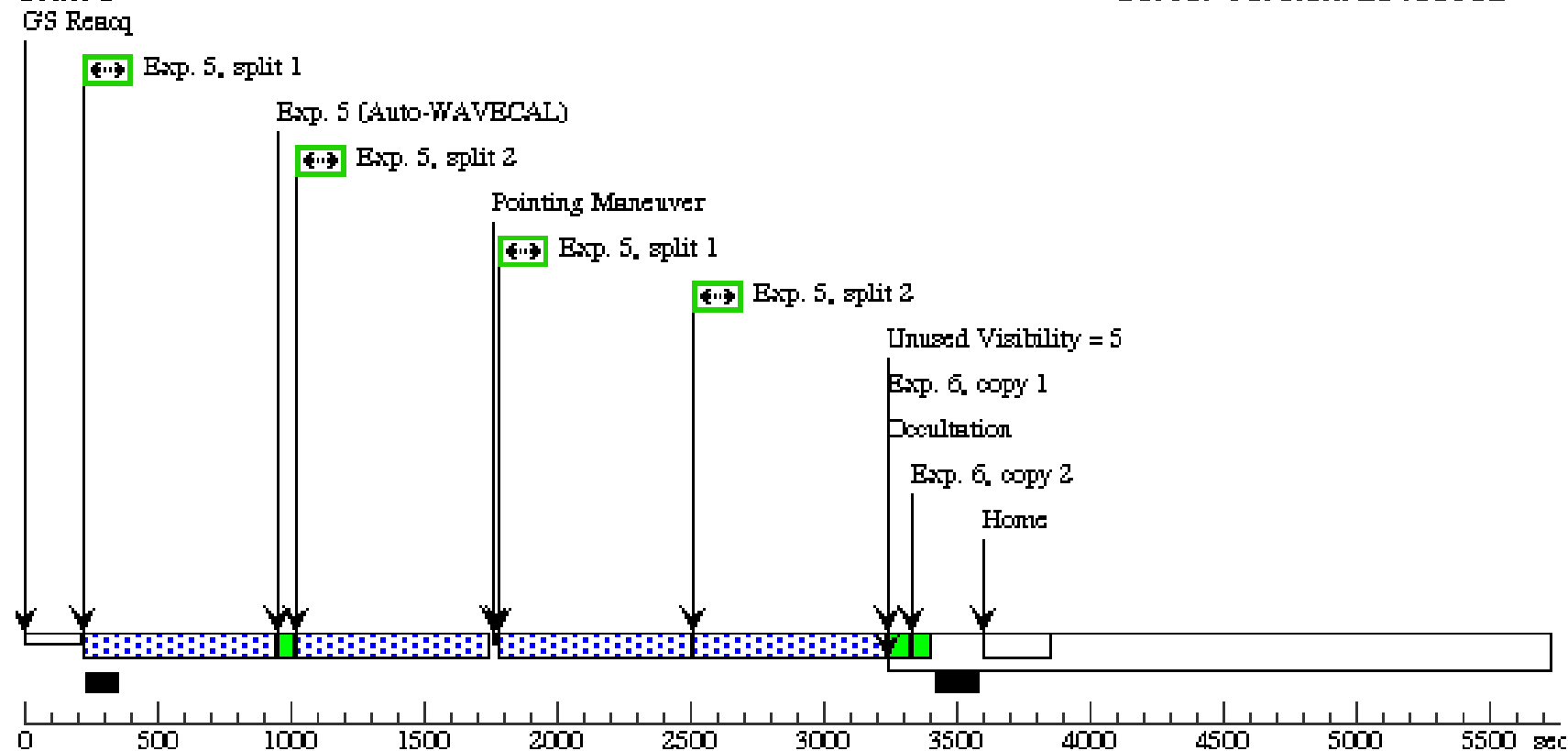
Orbit 2

Server Version: 20100902



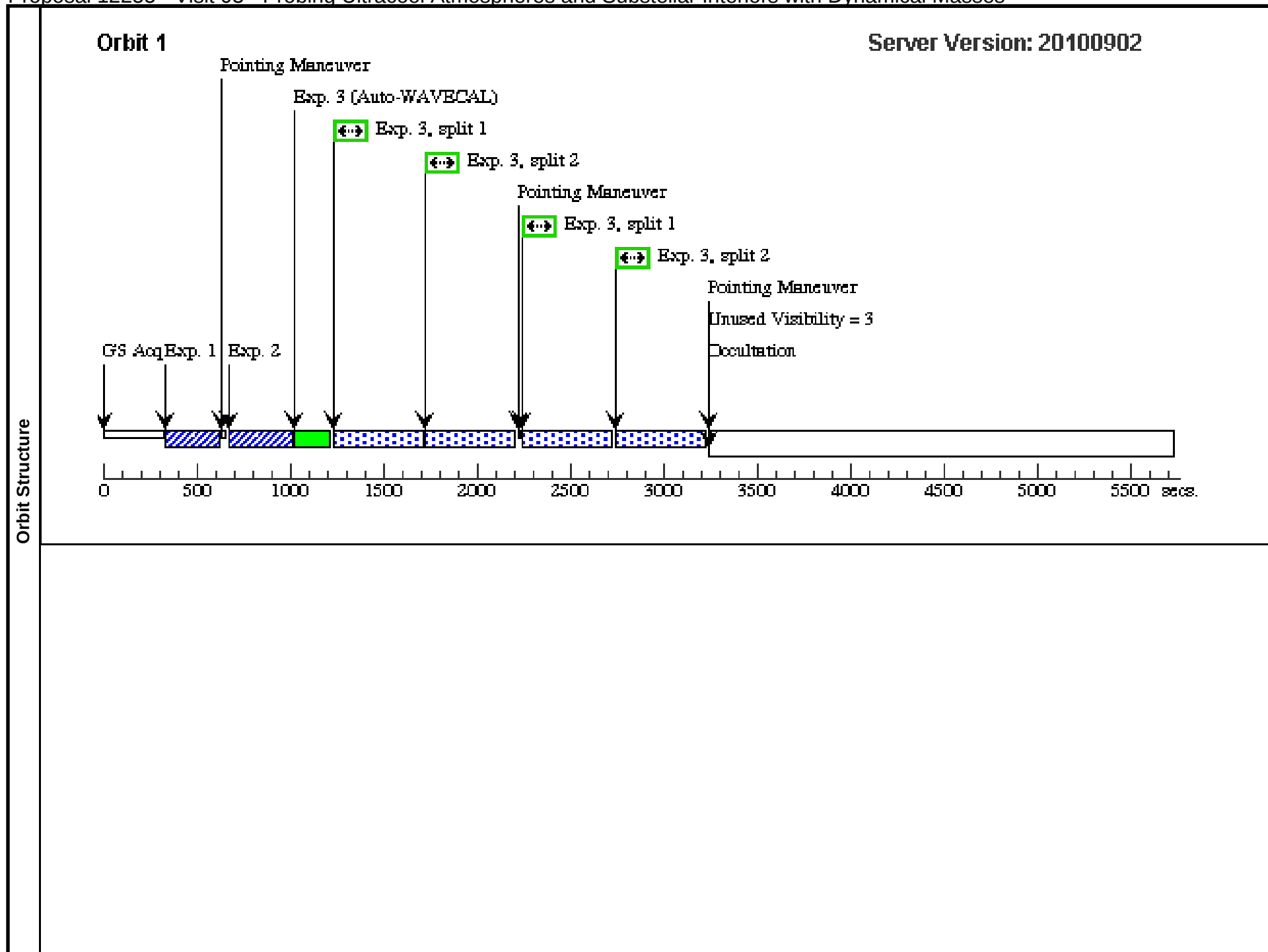
Orbit 3

Server Version: 20100902



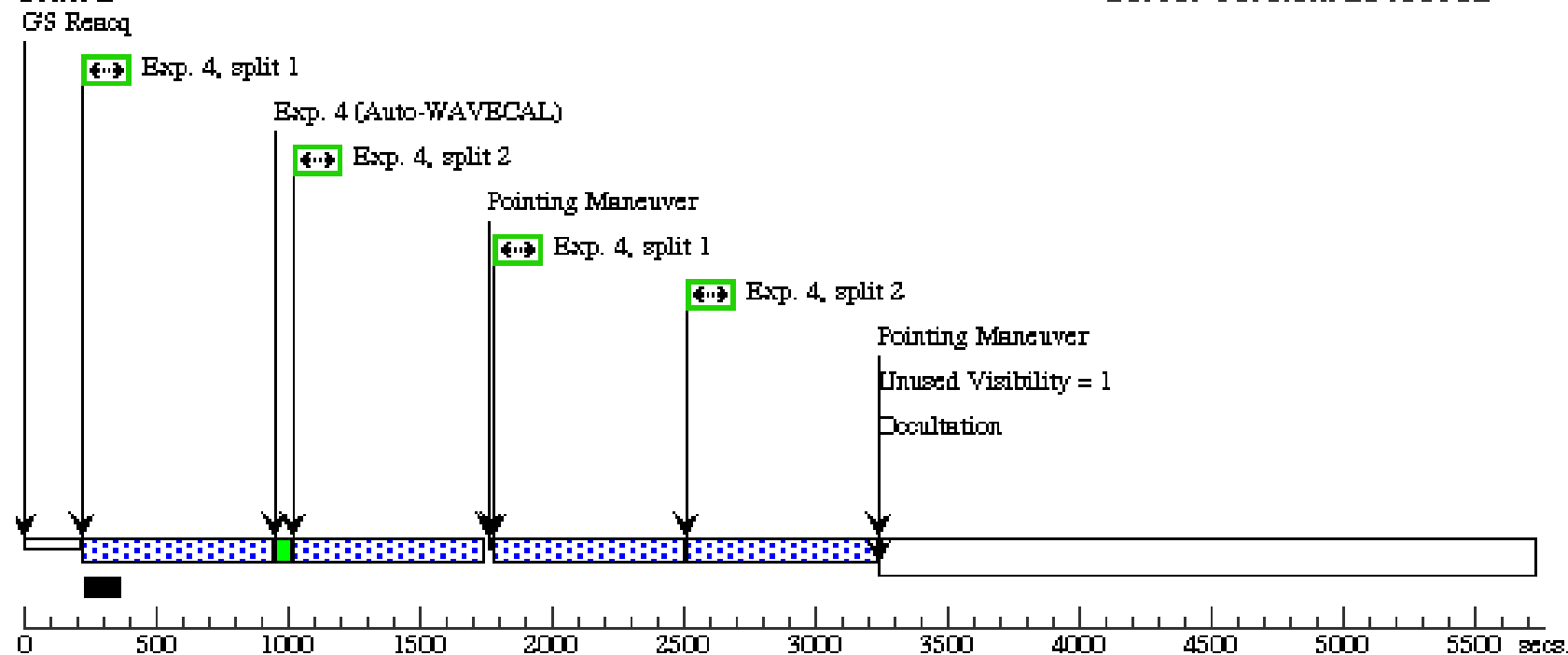
Proposal 12255 - Visit 03 - Probing Ultracool Atmospheres and Substellar Interiors with Dynamical Masses

Visit	Proposal 12255, Visit 03, implementation							Wed May 18 01:24:52 GMT 2011		
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD									
	Special Requirements: ORIENT 167D TO 187 D; BETWEEN 21-APR-2012:00:00:00 AND 19-MAY-2012:00:00:00									
Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
	(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.6 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false					(3), (4), (5), (6)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(3)	HD130948B	Offset from HD130948A by RA Offset: 0.171 Secs Dec Offset: -0.5877 Arcsec			V=(?) SDSS i = 18.3 mag		Offset Position (HD130948B) Reference Frame: ICRS		
	Comments: Offset measured from Keck AO images on 2010 Mar 22 UT: 2.631+-0.005" separation at PA = 102.91+-0.05 deg. This target is a companion to the offset star, so it shares the offset star's proper motion and parallax.									
	(4)	HD130948A	RA: 14 50 15.7188 (222.5654950d) Dec: +23 54 42.36 (23.91177d) Equinox: J2000	Proper Motion RA: 0.14391 arcsec/yr Proper Motion Dec: 0.03269 arcsec/yr Parallax: 0.05503" Epoch of Position: 1991.25		V=5.9		Reference Frame: ICRS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	HD130948A ACQ	(4) HD130948A ACQ	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Visit 03	0.2 Secs [==>]	[1]
	2	HD130948B PEAKUP	(3) HD130948B PEAKUP	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR			Sequence 1-3 Non-Int in Visit 03	10 Secs [==>]	[1]
	3	HD130948B SPEC	(3) HD130948B SPEC	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 1-3 Non-Int in Visit 03 Pattern 1, Exps 3-3 in Sequence 1-3 Non-Int in Visit 03 (1)	2076 Secs [==>452.0 Secs (Pattern 1, Split 1)] [==>452.0 Secs (Pattern 1, Split 2)] [==>452.0 Secs (Pattern 2, Split 1)] [==>452.0 Secs (Pattern 2, Split 2)]	[1]
	4	HD130948B SPEC	(3) HD130948B SPEC	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 4-4 Non-Int in Visit 03 Pattern 1, Exps 4-4 in Sequence 4-4 Non-Int in Visit 03 (1)	2076 Secs [==>685.0 Secs (Pattern 1, Split 1)] [==>685.0 Secs (Pattern 1, Split 2)] [==>685.0 Secs (Pattern 2, Split 1)] [==>685.0 Secs (Pattern 2, Split 2)]	[2]
	5	HD130948B SPEC	(3) HD130948B SPEC	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 5-5 Non-Int in Visit 03 Pattern 1, Exps 5-5 in Sequence 5-5 Non-Int in Visit 03 (1)	2076 Secs [==>685.0 Secs (Pattern 1, Split 1)] [==>685.0 Secs (Pattern 1, Split 2)] [==>685.0 Secs (Pattern 2, Split 1)] [==>685.0 Secs (Pattern 2, Split 2)]	[3]
	6	HD130948B SPEC	(3) HD130948B SPEC	STIS/CCD, ACCUM, 52X0.1E1	G750M 6768 A			Sequence 6-6 Non-Int in Visit 03 Pattern 1, Exps 6-6 in Sequence 6-6 Non-Int in Visit 03 (1)	2076 Secs [==>684.0 Secs (Pattern 1, Split 1)] [==>684.0 Secs (Pattern 1, Split 2)] [==>684.0 Secs (Pattern 2, Split 1)] [==>684.0 Secs (Pattern 2, Split 2)]	[4]



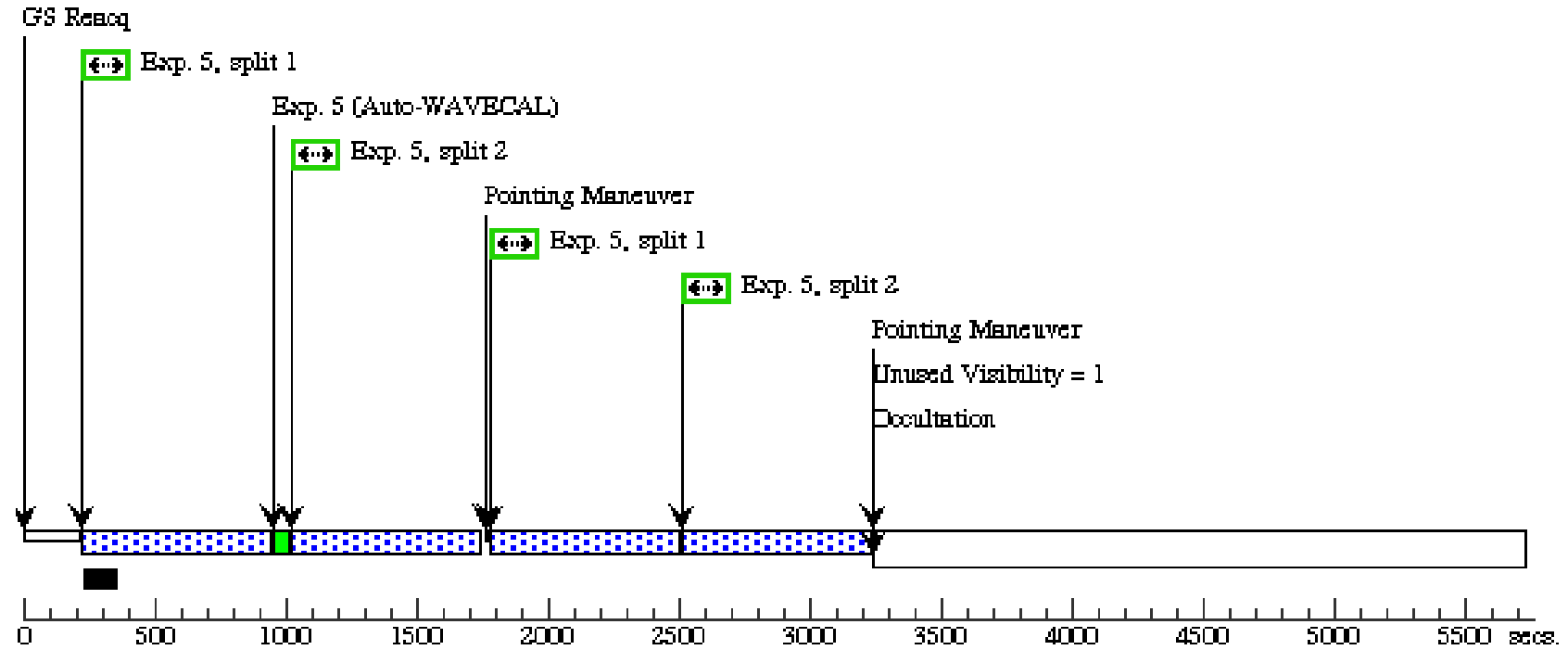
Orbit 2

Server Version: 20100902



Orbit 3

Server Version: 20100902



Orbit 4

Server Version: 20100902

