12251 - The First Characterization of a Super-Earth Atmosphere

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) GJ1214	WFC3/IR	4	10-Jul-2010 01:58:25.0	yes
02	(1) GJ1214	WFC3/IR	4	10-Jul-2010 02:01:54.0	yes
03	(1) GJ1214	WFC3/IR	4	10-Jul-2010 02:05:18.0	yes

12 Total Orbits Used

ABSTRACT

Our team recently discovered the first transiting super-Earth exoplanet whose atmosphere can be studied with HST. GJ1214b is a 2.7 Earth radius, 6.6 Earth mass exoplanet that transits a low-mass M dwarf located a mere 13 pc away. With only a mass and radius known, structural models show

that GJ1214b may either have an extended H-rich envelope or consist of a body that is mostly water, surrounded by a thin, H-poor atmosphere. We propose to observe the planet in transit with WFC3 IR's G141 grism to measure its transmission spectrum between 1.1 and 1.7 microns. Our primary science goal is to determine the super-Earth's atmospheric scale height, thus distinguishing between its possible bulk compositions. The summed light curve will permit a search for transiting moons around GJ1214b the size of Ganymede. Among the presently known transiting exoplanets, GJ1214b is the smallest, coolest, most Earth-like planet that has a substantial atmosphere. Fortunately, the small radius of the star means studying GJ1214b's atmosphere requires no better precision than has already been demonstrated by HST observations of transiting hot Jupiters.

OBSERVING DESCRIPTION

We propose three separate visits, each consisting of four orbits, to obtain high-precision, high-cadence, low-resolution spectra of exoplanetary transits. Every orbit will consist of an identical exposure sequence of G141 grism exposures, bracketed before and after by direct images in F130N.

The ETC lists a time to saturation for GJ1214 (H=9.09, Pickles M5V) of 8.77 seconds. Comparison between an actual G102 grism exposure and the ETC for the transiting planet host WASP-3 (H=9.41, F5V, GO/DD-11495) confirms that the ETC gives accurate predictions in this regime. Our proposed instrument configuration for G141 grism exposures (512x512 subarray, SAMP-SEQ=RAPID, NSAMP=7, EXPTIME=5.971 seconds) minimizes the overhead loss to serial buffer dumps while avoiding saturation (68% of full well), keeping the 1st-order spectrum in one amplifier quadrant, and allowing the 0th-order image to be tracked for positional shifts. In this configuration, 48 exposures can be obtained in a single orbit, for 4.78 minutes of total "open shutter" exposure time.

Theoretical noise limits for each grism exposure, dominated by photon counts from the source, are 2890 ppm in a 1 pixel wide spectral channel at 1.4 microns, 1290 ppm in a 5 pixel wide spectral channel centered at 1.4 microns, and 274 ppm in the integrated spectrum.

Serial WFC3 buffer dumps are forced by the 100 image header limit after each of four sets of 12 grism exposures (96 images). By filling a buffer that must be dumped anyway before another grism exposure, NSAMP=3 direct images taken at the start and end of each orbit are virtually free. In addition to providing wavelength calibration, the direct images will both aid inter-orbit systematics corrections and act as diagnostics to identify misbehaving pixels or anomalously bright persistent images on the detector. Except for buffer read-outs, the instrument configuration will be unchanged between each orbit's bracketing direct images. (No direct image is taken at the end of the 1st orbit of each visit; due to the initial guide star acquisition overhead, this substantially improves the target visibility.)

We position our target such that the direct image is located at pixels (505 px, 532 px). As described by L. Petro (TIR 2010-03), this location optimally avoids known bad pixels and IR blobs while keeping both the 1st order spectrum from crossing an amplifier boundary and the 0th order spectrum in view on the subarray. As calculated in TIR 2010-03, we introduce a POS TARG of (-2.303", 1.202") to offset the target from (522 px, 522 px), the fiducial pixel for the IRSUB512 aperture we are using.

No dithering will be employed on any of these observations. Lacking flat fields accurate to the necessary precision, we need to keep the target in the same position on the detector for this differential measurement.

REAL TIME JUSTIFICATION

As the transmission spectroscopy signal we aim to measure is only present when the planet is in front of the star (50 minutes per 1.58 day orbit), we require strict scheduling constraints to ensure the scientific return of the project. Each visit, we require 3/4 of the third orbit overlaps with the transit. The implied phase constraints amount to 1.2% of the orbital period or a 27 minute window for the start of the first exposure of each visit. If such phase constraints prove unscheduable, they could be relaxed slightly but with an associated loss of observational efficiency.

Visit

Proposal 12251, Visit 01 Sat Jul 10 06:05:34 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 50%; ORIENT 31D TO 181 D; ORIENT 211D TO 1 D; Period 1.5804075 D AND ZERO-PHASE HJD2454983.908864

Comments: We require orientation constraints to avoid partial overlap of the target's 1st order spectrum with a faint but nearby companion star. In 2011, the companion will be located 16" away from GJ1214 with a position angle of 151 degrees. The specified ORIENT ranges correspond to >15 degrees from alignment in the dispersion direction, ensuring the spectra will be separated vertically on the detector by at least 30 pixels.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ1214	RA: 17 15 18.9180 (258.8288250d) Dec: +04 57 50.09 (4.96391d) Equinox: J2000	Proper Motion RA: 0.039146824351016615s/yr Proper Motion Dec: -0.752"/yr Parallax: 0.0772" Epoch of Position: 2000	V=14.67+/-0.1 J=9.75, H=9.09, K=8.78	Reference Frame: ICRS

Comments: R.A. and Dec. (equinox = J2000.0, epoch = 2000.000) and proper motions are taken from the LSPM-North Catalog (Lepine & Shara, 2005). Accounting for proper motion, this position agrees with the 2MASS position quoted in SIMBAD (equinox = J2000.0, epoch ~ 2000.5) to within 0.1".

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG -2.303,1.202; PHASE 0.900 TO 0.912	Sequence 1-2 Non-Int	*[==>]*	***[1]***

Comments: The phase constraints are necessary to ensure that the planet is in transit for at least 3/4 of the third orbit of the visit. The timing of this first exposure of the visit was calculated under the assumption that an HST orbit is 96.0 minutes long.

2	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 1-2 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[1]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
3	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int	*[==>]*	***[2]***

	4	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 3-5 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[2]***

									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
5	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int		*[==>]*	***[2]***
6	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int		*[==>]*	***[3]***

7	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 6-8 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[3]***

									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
8	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int		*[==>]*	***[3]***
9	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int		*[==>]*	***[4]***

10	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 9-11 Non-Int			

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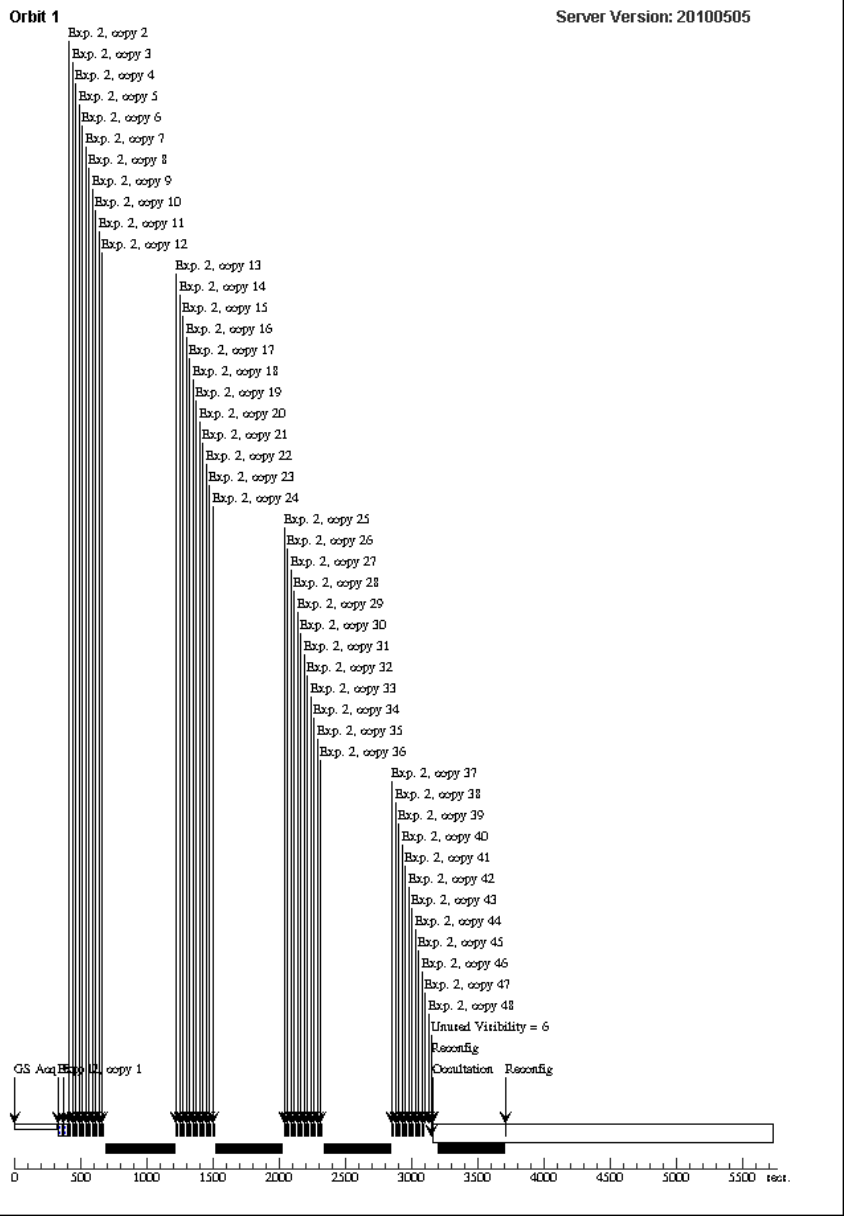
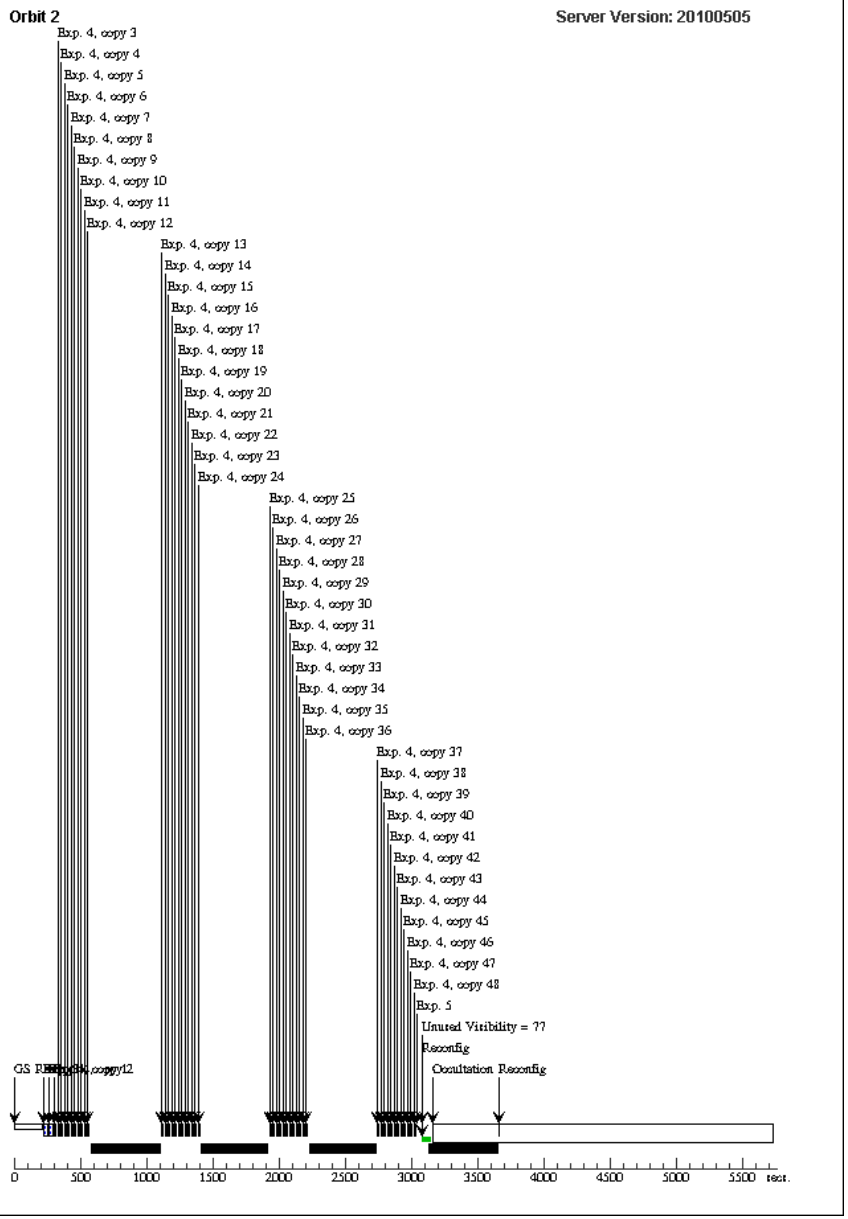
									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
	11	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int	*[==>]*	***[4]***

Orbit Structure

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Exp. 5
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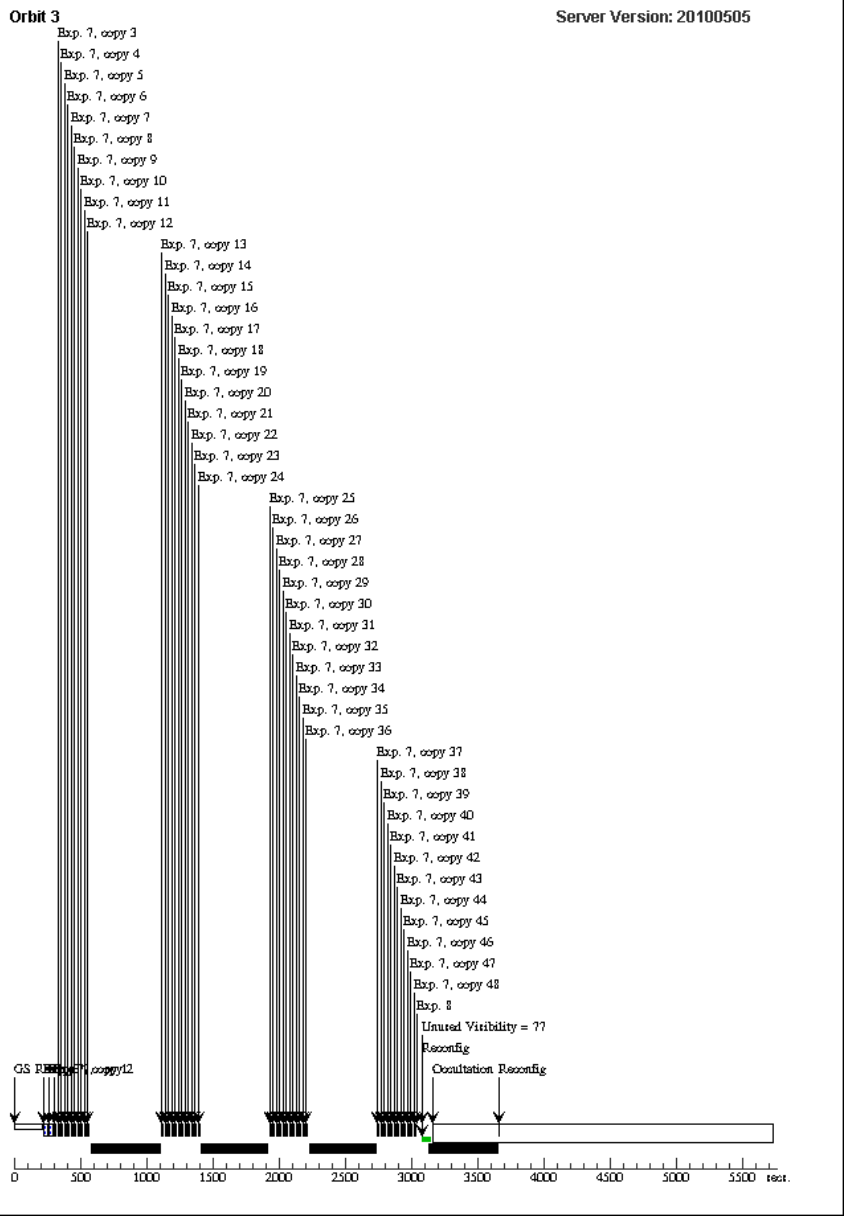
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Unused Visibility = ??
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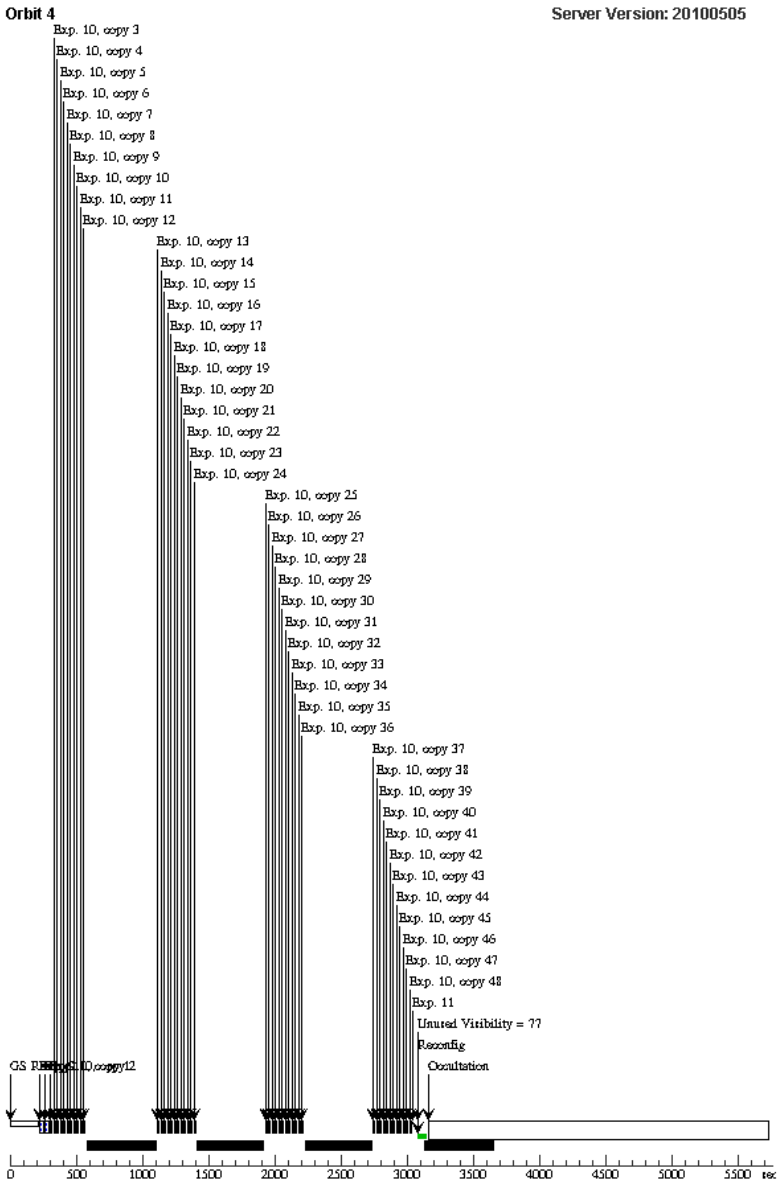
Orbit 4
Server Version: 20100505
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Unused Viribility = ??
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Occultation
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Visit

Proposal 12251, Visit 02 Sat Jul 10 06:05:40 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 50%; ORIENT 31D TO 181 D; ORIENT 211D TO 1 D; Period 1.5804075 D AND ZERO-PHASE HJD2454983.908864

Comments: We require orientation constraints to avoid partial overlap of the target's 1st order spectrum with a faint but nearby companion star. In 2011, the companion will be located 16" away from GJ1214 with a position angle of 151 degrees. The specified ORIENT ranges correspond to >15 degrees from alignment in the dispersion direction, ensuring the spectra will be separated vertically on the detector by at least 30 pixels.

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Comments: R.A. and Dec. (equinox = J2000.0, epoch = 2000.000) and proper motions are taken from the LSPM-North Catalog (Lepine & Shara, 2005). Accounting for proper motion, this position agrees with the 2MASS position quoted in SIMBAD (equinox = J2000.0, epoch ~ 2000.5) to within 0.1".

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
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Comments: The phase constraints are necessary to ensure that the planet is in transit for at least 3/4 of the third orbit of the visit. The timing of this first exposure of the visit was calculated under the assumption that an HST orbit is 96.0 minutes long.

	2	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 1-2 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[1]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
3	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int	*[==>]*	***[2]***

	4	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 3-5 Non-Int		

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[2]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
5	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int	*[==>]*	***[2]***
6	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int	*[==>]*	***[3]***

	7	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 6-8 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[3]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
8	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int	*[==>]*	***[3]***
9	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int	*[==>]*	***[4]***

10	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 9-11 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[4]***

									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
	11	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int	*[==>]*	***[4]***

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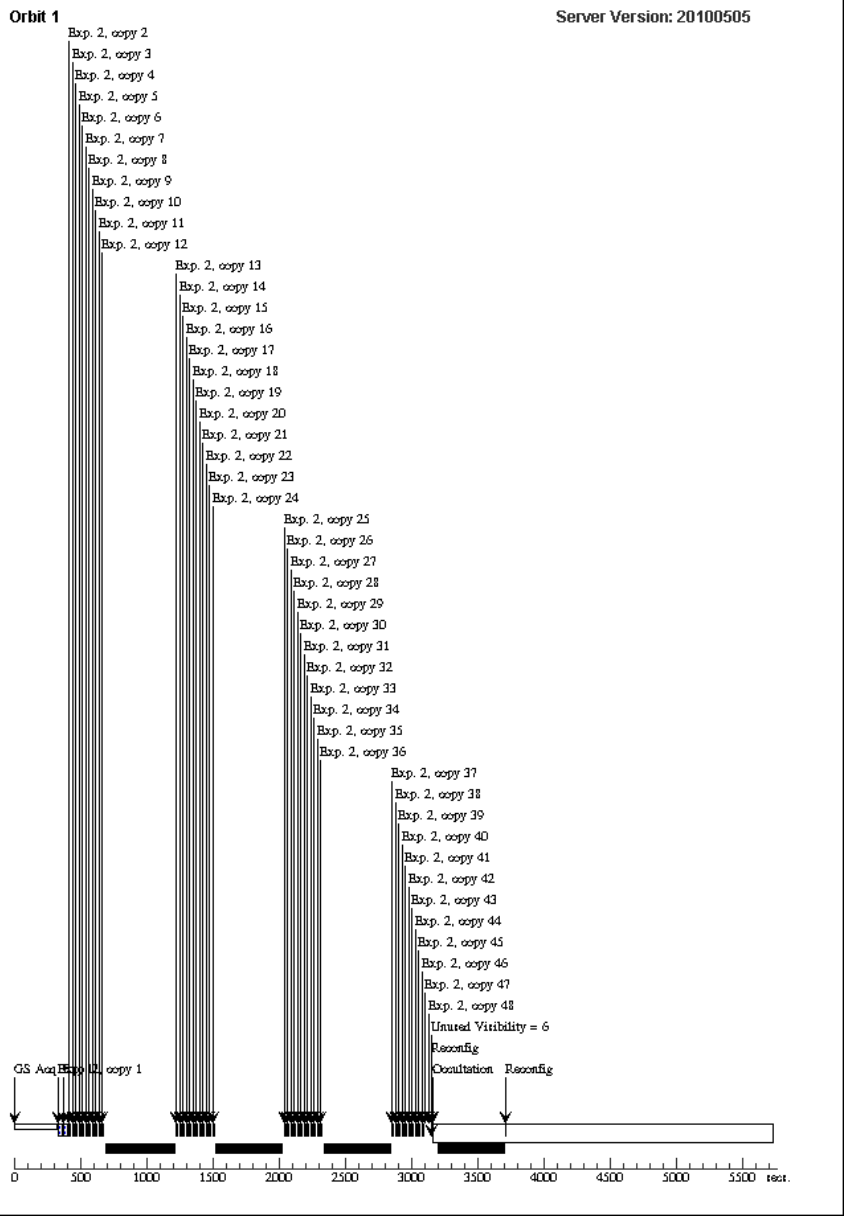

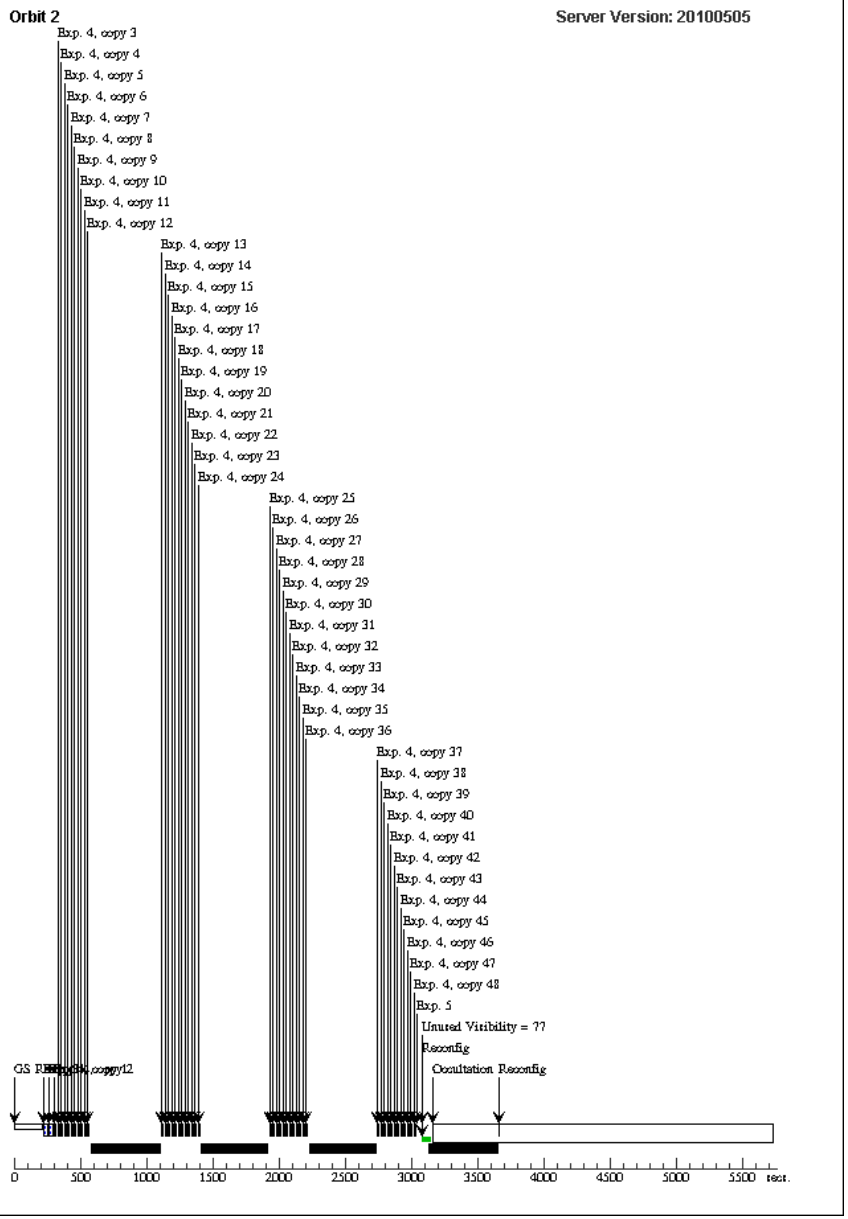
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Exp. 5
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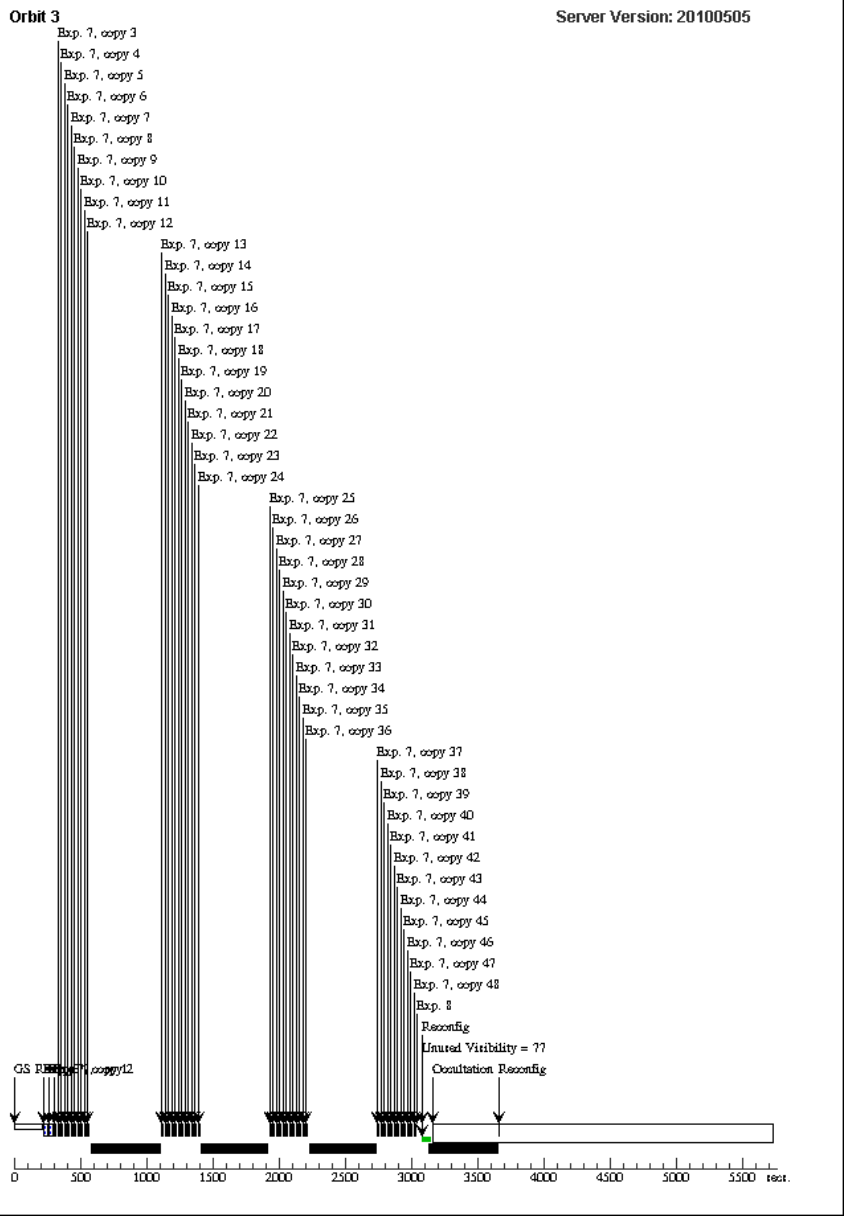
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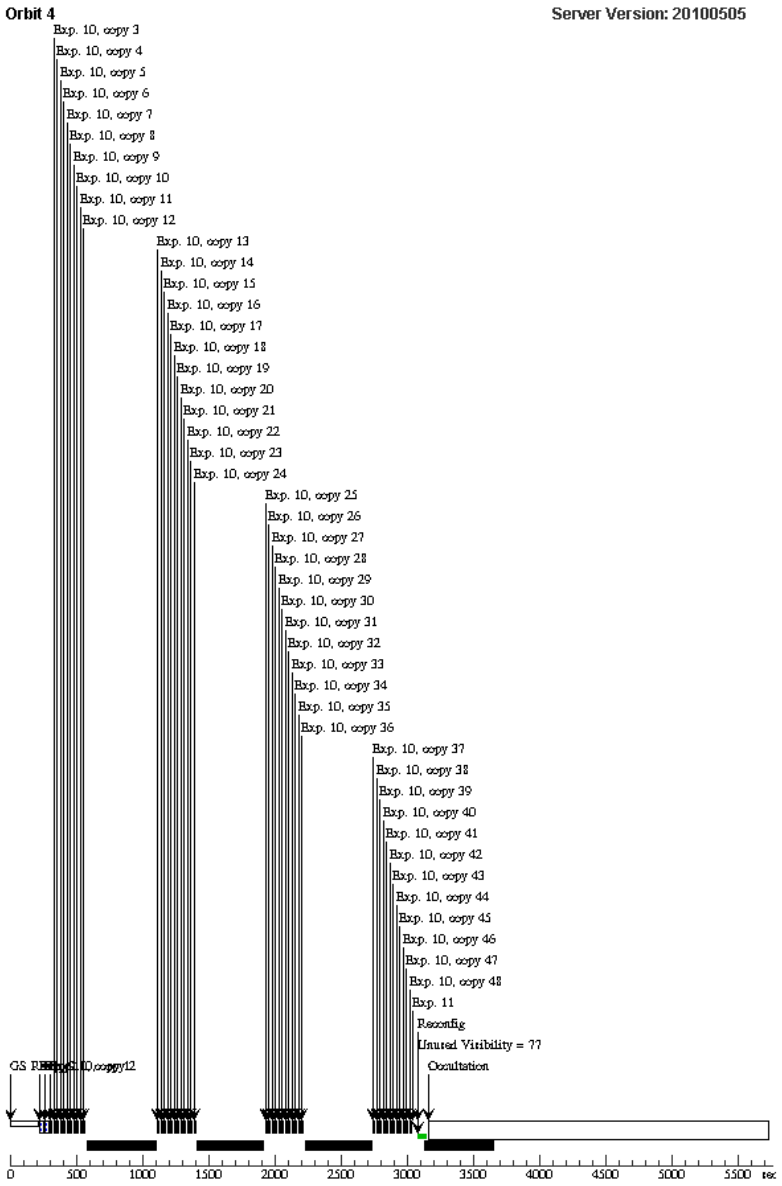
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Exp. 11
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Unused Vitibility = ??
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Visit

Proposal 12251, Visit 03 Sat Jul 10 06:05:44 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 50%; ORIENT 31D TO 181 D; ORIENT 211D TO 1 D; Period 1.5804075 D AND ZERO-PHASE HJD2454983.908864

Comments: We require orientation constraints to avoid partial overlap of the target's 1st order spectrum with a faint but nearby companion star. In 2011, the companion will be located 16" away from GJ1214 with a position angle of 151 degrees. The specified ORIENT ranges correspond to >15 degrees from alignment in the dispersion direction, ensuring the spectra will be separated vertically on the detector by at least 30 pixels.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ1214	RA: 17 15 18.9180 (258.8288250d) Dec: +04 57 50.09 (4.96391d) Equinox: J2000	Proper Motion RA: 0.039146824351016615s/yr Proper Motion Dec: -0.752"/yr Parallax: 0.0772" Epoch of Position: 2000	V=14.67+/-0.1 J=9.75, H=9.09, K=8.78	Reference Frame: ICRS

Comments: R.A. and Dec. (equinox = J2000.0, epoch = 2000.000) and proper motions are taken from the LSPM-North Catalog (Lepine & Shara, 2005). Accounting for proper motion, this position agrees with the 2MASS position quoted in SIMBAD (equinox = J2000.0, epoch ~ 2000.5) to within 0.1".

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG -2.303,1.202; PHASE 0.900 TO 0.912	Sequence 1-2 Non-Int	*[==>]*	***[1]***

Comments: The phase constraints are necessary to ensure that the planet is in transit for at least 3/4 of the third orbit of the visit. The timing of this first exposure of the visit was calculated under the assumption that an HST orbit is 96.0 minutes long.

	2	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 1-2 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[1]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
	3	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int	*[==>]*

[2]

	4	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 3-5 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[2]***

									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
	5	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 3-5 Non-Int	*[==>]*	***[2]***
	6	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int	*[==>]*	***[3]***

	7	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 6-8 Non-Int		

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[3]***

								[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
8	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 6-8 Non-Int	*[==>]*	***[3]***
9	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int	*[==>]*	***[4]***

10	48 Grisms	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	G141	SAMP-SEQ=RAPID ; NSAMP=7	SAME POS AS 1	Sequence 9-11 Non-Int			

		[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]* *[==>(Copy 26)]* *[==>(Copy 27)]* *[==>(Copy 28)]* *[==>(Copy 29)]* *[==>(Copy 30)]* *[==>(Copy 31)]* *[==>(Copy 32)]* *[==>(Copy 33)]* *[==>(Copy 34)]* *[==>(Copy 35)]* *[==>(Copy 36)]* *[==>(Copy 37)]* *[==>(Copy 38)]* *[==>(Copy 39)]* *[==>(Copy 40)]* *[==>(Copy 41)]* *[==>(Copy 42)]* *[==>(Copy 43)]* *[==>(Copy 44)]* *[==>(Copy 45)]*	***[4]***

									[==>(Copy 46)] *[==>(Copy 47)]* *[==>(Copy 48)]*	
	11	Direct Image	(1) GJ1214	WFC3/IR, MULTIACCUM, IRSUB512	F130N	NSAMP=3; SAMP-SEQ=RAPID	SAME POS AS 1	Sequence 9-11 Non-Int	*[==>]*	***[4]***

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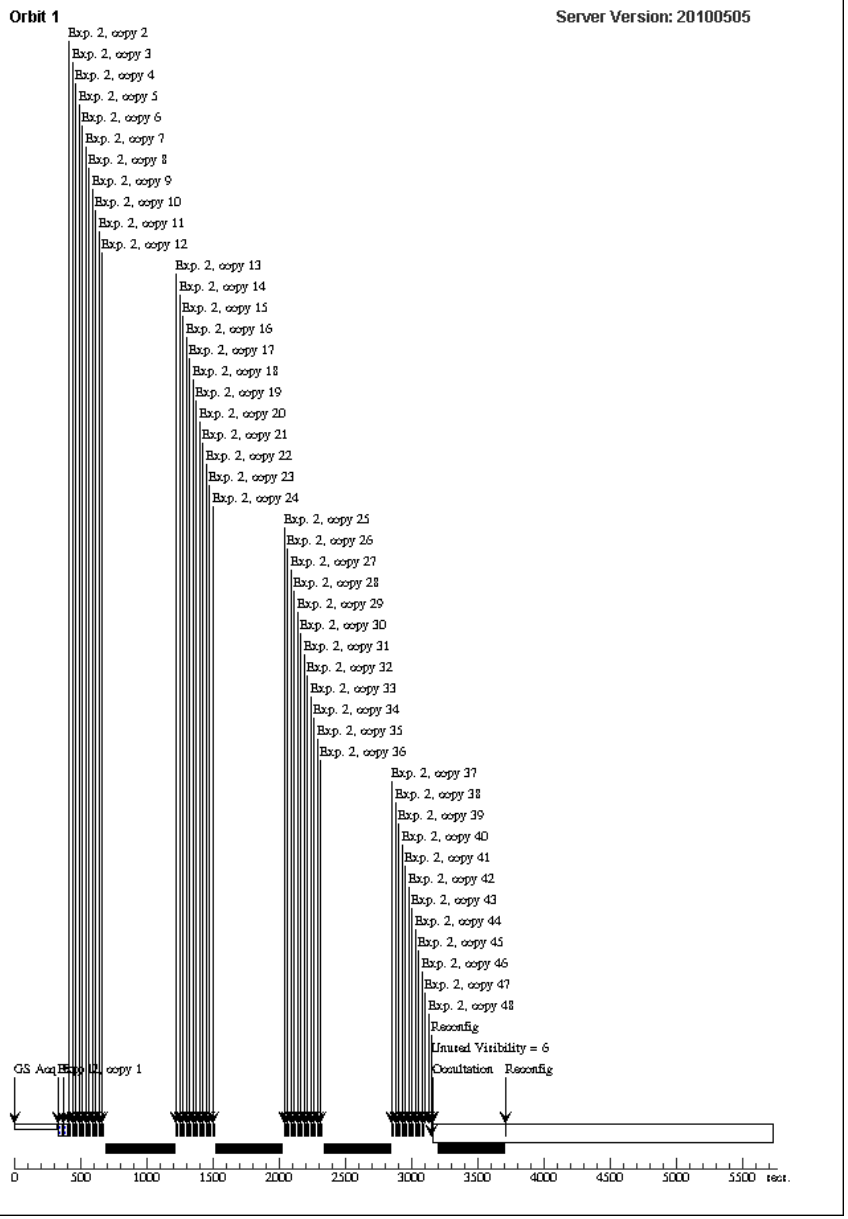

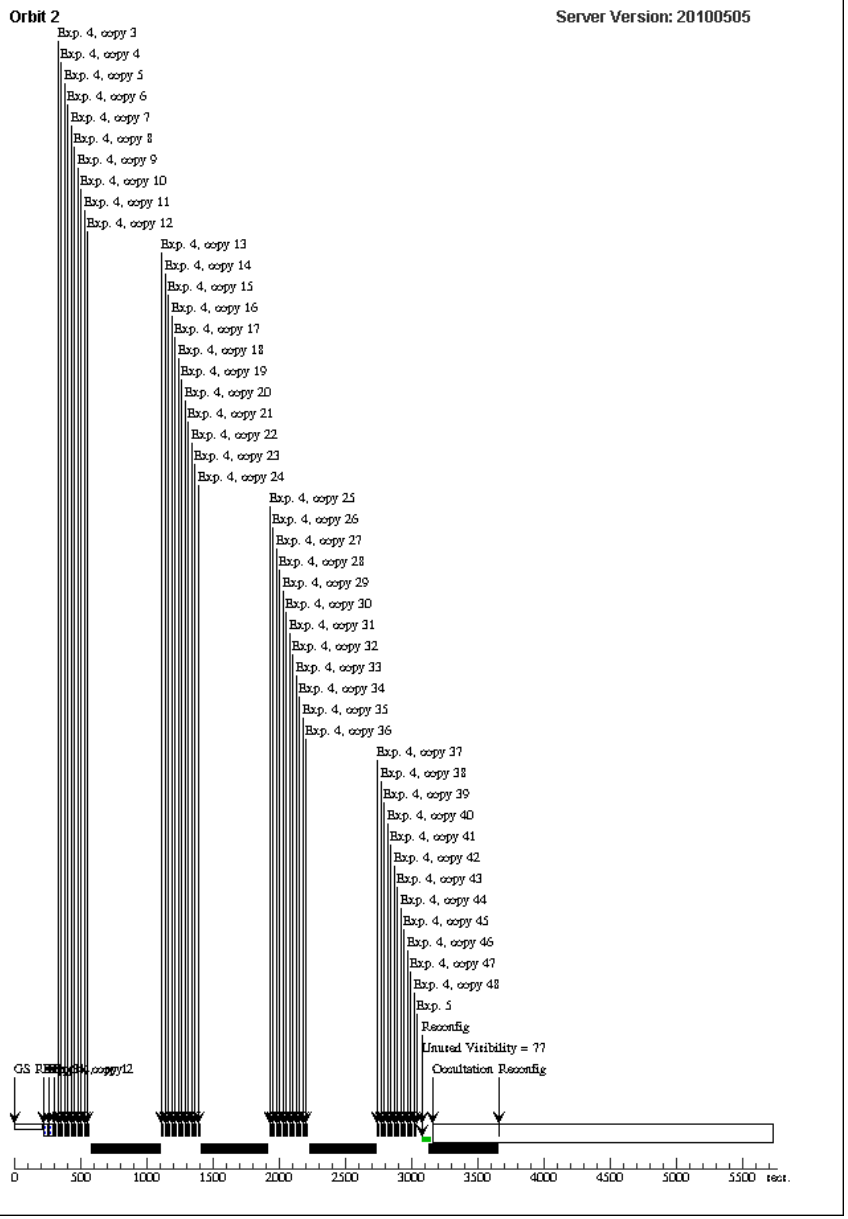
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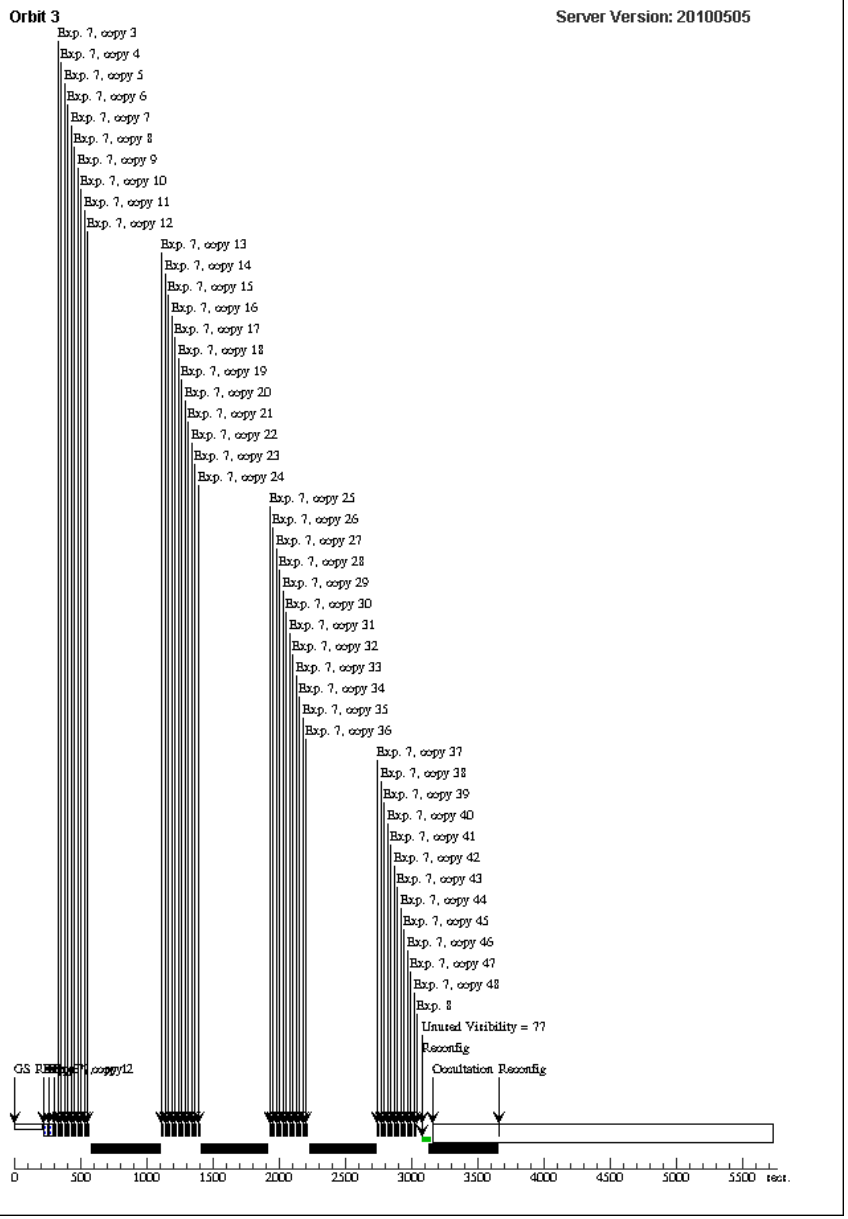
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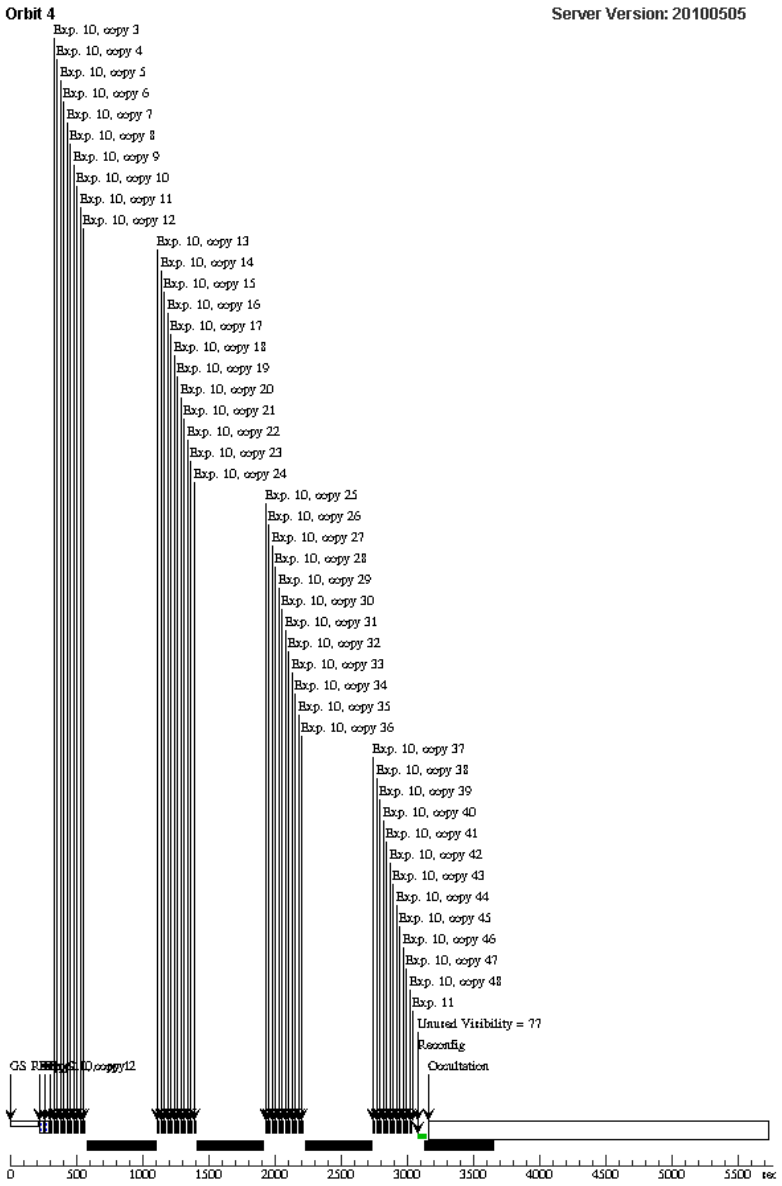
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