13064 - Investigating the nature of GJ 3470b, the missing link between super-Earths and Neptunes

Cycle: 19, Proposal Category: GO/DD

(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) GJ-3470	WFC3/IR	5	30-Aug-2012 21:54:12.0	yes

5 Total Orbits Used

ABSTRACT

Between February and April 2012, we have detected and confirmed a new exoplanet transiting the bright (J=8.8, H=8.2) M dwarf GJ 3470 (Bonfils et al., submitted): with a mass of 13.3+/-1.6 M_Earth and a radius of 4.2+/-0.7 R_Earth, this exoplanet is a rare beast at the boundary between super-Earths and Neptunes. Its weak density suggests that it can have a thick hydrogen and helium atmosphere, and thus a large atmospheric scale height. Combined with the proximity and brightness of its red dwarf host, this makes the planet an excitingly favorable target for atmospheric characterization with HST. In particular, the 1.4-µm water band defining the boundary between J and H bands for ground-based observations, thus non-detectable from the ground, is well detectable with WFC3 in case of an H/He atmosphere with solar composition, which is the favored hypothesis for a sub-Neptune. In contrast, a non-detection of this water band would imply (i) a surprisingly water-rich atmosphere - in which case GJ 3470b would rather be a giant ocean-planet, bridging together the super-Earth and Neptune classes, or (ii) the presence of high-altitude clouds or hazes. A non-detection would thus motivate complementary observations of scattering signatures in the optical.

OBSERVING DESCRIPTION

These observations consist in one visit of 5 consecutive orbits aimed at obtaining a low-resolution transit spectrum of the exoplanet GJ 3470b. The first exposure in the first orbit of the visit has timing constraints set so that the third HST orbit precisely occurs during the transit of the exoplanet.

In each orbit, we will observe a sequence of G141 grism exposures. F130N direct images will also be taken at the start and end of each orbit. Both grism and direct images will be taken with the GRISM512 aperture.

No dithering is to be done at any point during these observations: we need to keep the target in the same position on the detector to obtain the best possible accuracy for this differential measurement.

Visit

Proposal 13064, Visit 01, implementation Fri Aug 31 01:55:08 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: Period 3.3369556 D AND ZERO-PHASE HJD2456090.4761252

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GJ-3470	RA: 07 59 5.8700 (119.7744583d)	Proper Motion RA: -175 mas/yr	V=12.33	Reference Frame: ICRS
		Dec: +15 23 29.50 (15.39153d)	Proper Motion Dec: -52 mas/yr	J=8.79 mag,	
		Equinox: J2000	Parallax: 0.040"	H=8.21 mag,	
			Epoch of Position: 2000	K=7.99 mag	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Direct image #1 (WFC3IR.im.423931)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	PHASE 0.952 TO 0.958	Sequence 1-4 Non-Int in Visit 01	*[==>]*	***[1]***
2	Grism exposure series #1 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3		Sequence 1-4 Non-Int in Visit 01	*[==>(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)]*	***[1]***

	3	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 1-4 Non-Int in Visit 01	*[==>(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)]*	***[1]***
	4	Direct image #2	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 1-4 Non-Int in Visit 01	*[==>]*	***[1]***
	5	Direct image #1 (WFC3IR.im.423931)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 5-9 Non-Int in Visit 01	*[==>]*	***[2]***

	6	Grism exposure series #1 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 5-9 Non-Int in Visit 01	*[==>(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)]*	***[2]***

	7	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 5-9 Non-Int in Visit 01	*[==>(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)]*	***[2]***
	8	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 5-9 Non-Int in Visit 01	*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]*	***[2]***
	9	Direct image #2	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 5-9 Non-Int in Visit 01	*[==>]*	***[2]***

	10	Direct image #1 (WFC3IR.im.423931)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 10-14 Non-Int in Visit 01	*[==>]*	***[3]***
	11	Grism exposure series #1 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 10-14 Non-Int in Visit 01	*[==>(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)]*	***[3]***

	12	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 10-14 Non-Int in Visit 01	*[==>(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)]*	***[3]***
	13	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 10-14 Non-Int in Visit 01	*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]*	***[3]***
	14	Direct image #2	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 10-14 Non-Int in Visit 01	*[==>]*	***[3]***

	15	Direct image #1 (WFC3IR.im.423931)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 15-19 Non-Int in Visit 01	*[==>]*	***[4]***
	16	Grism exposure series #1 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 15-19 Non-Int in Visit 01	*[==>(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)]*	***[4]***

	17	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 15-19 Non-Int in Visit 01	*[==>(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)]*	***[4]***
	18	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 15-19 Non-Int in Visit 01	*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]*	***[4]***
	19	Direct image #2	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 15-19 Non-Int in Visit 01	*[==>]*	***[4]***

	20	Direct image #1 (WFC3IR.im.423931)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 20-24 Non-Int in Visit 01	*[==>]*	***[5]***
	21	Grism exposure series #1 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 20-24 Non-Int in Visit 01	*[==>(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)]*	***[5]***

	22	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 20-24 Non-Int in Visit 01	*[==>(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)]*	***[5]***
	23	Grism exposure series #2 (WFC3IR.sp.423930)	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=RAPID; NSAMP=3	Sequence 20-24 Non-Int in Visit 01	*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]*	***[5]***
	24	Direct image #2	(1) GJ-3470	WFC3/IR, MULTIACCUM, GRISM512	F130N	NSAMP=1; SAMP-SEQ=RAPID	Sequence 20-24 Non-Int in Visit 01	*[==>]*	***[5]***

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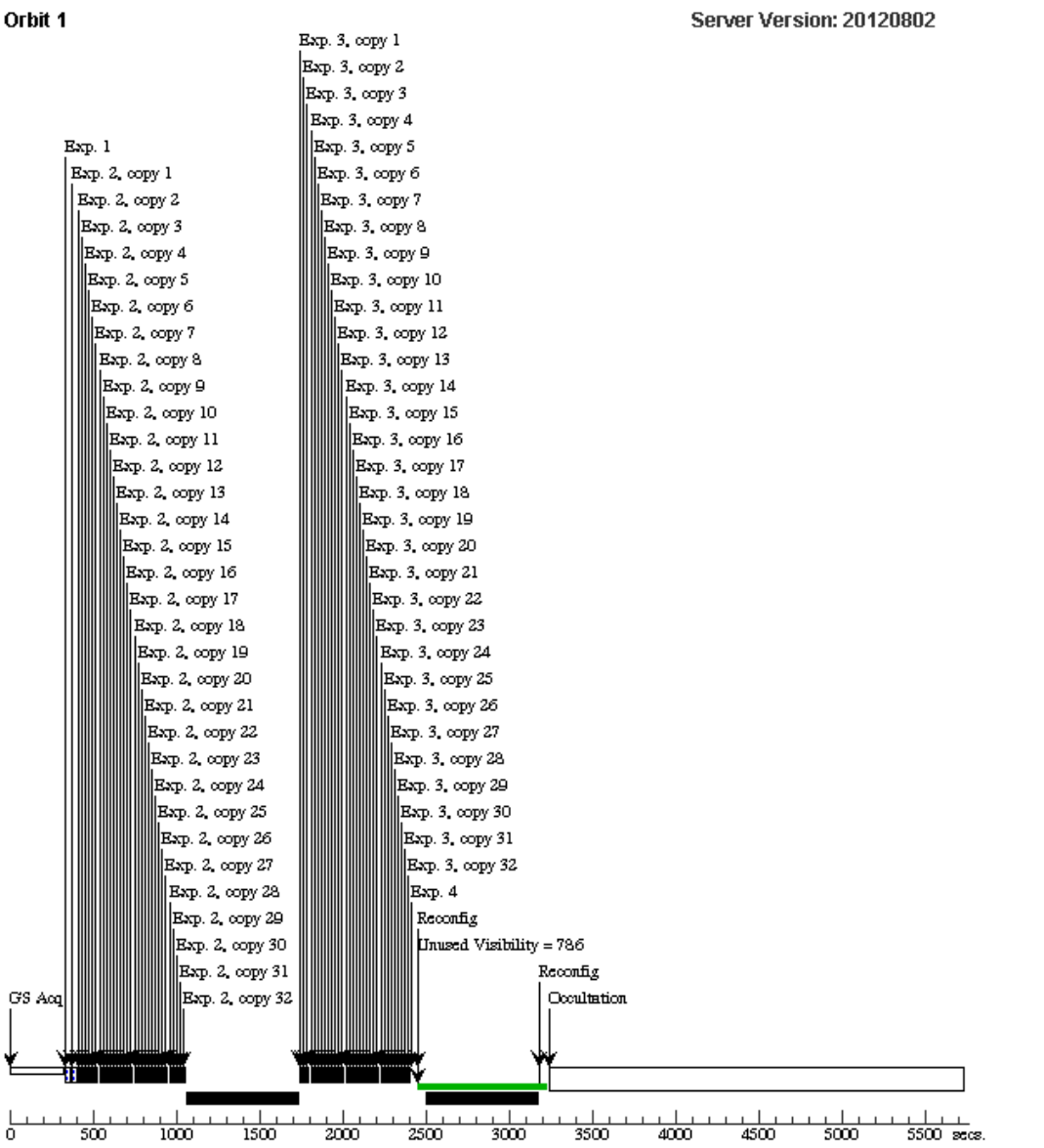

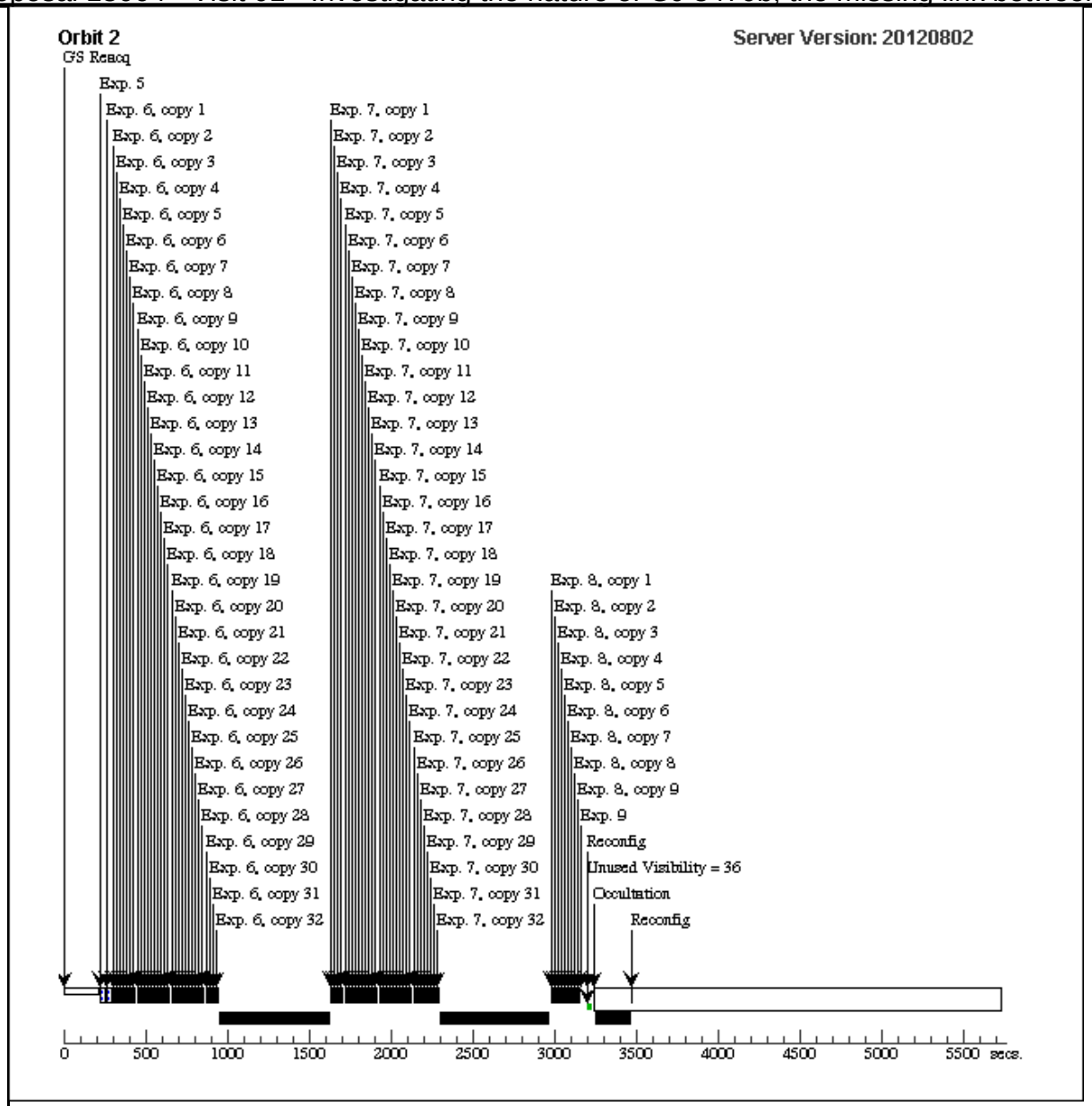
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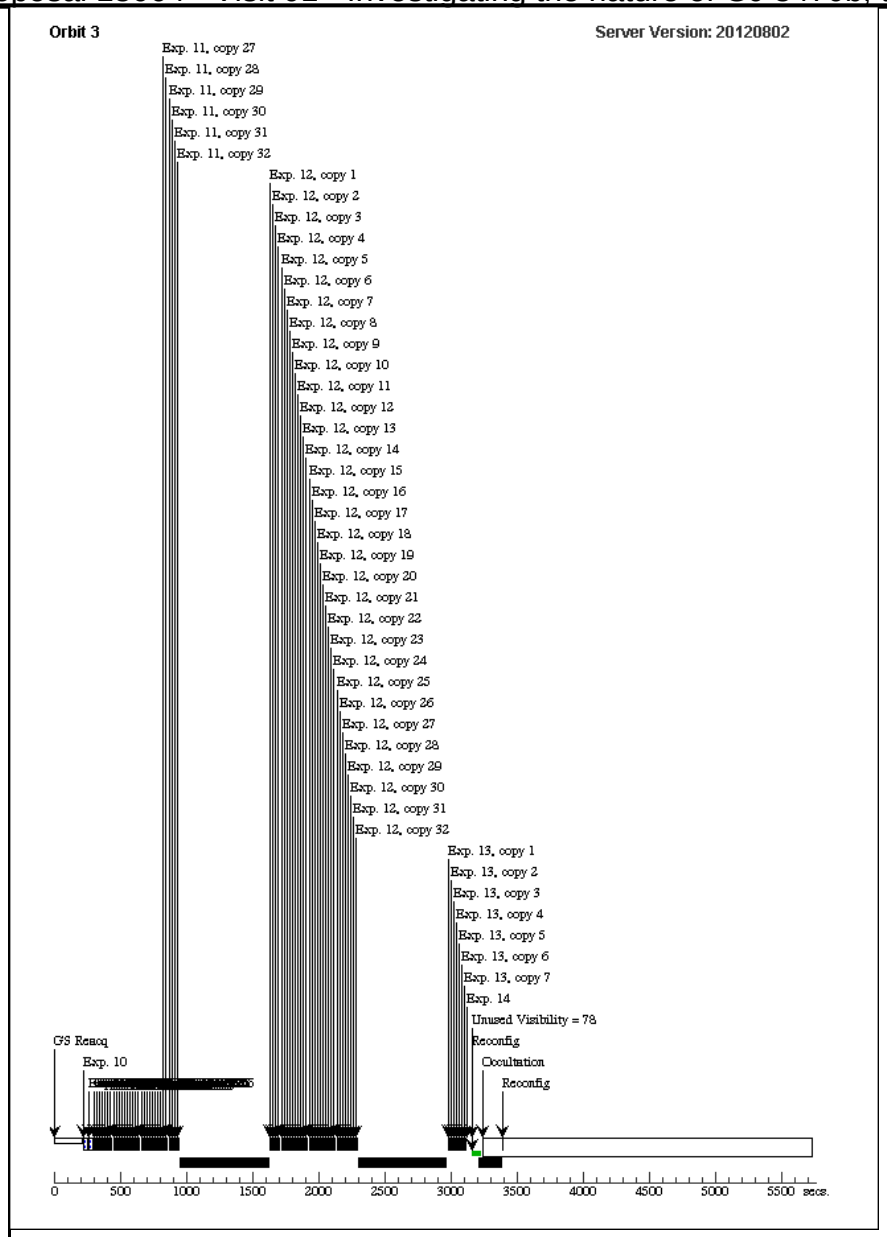
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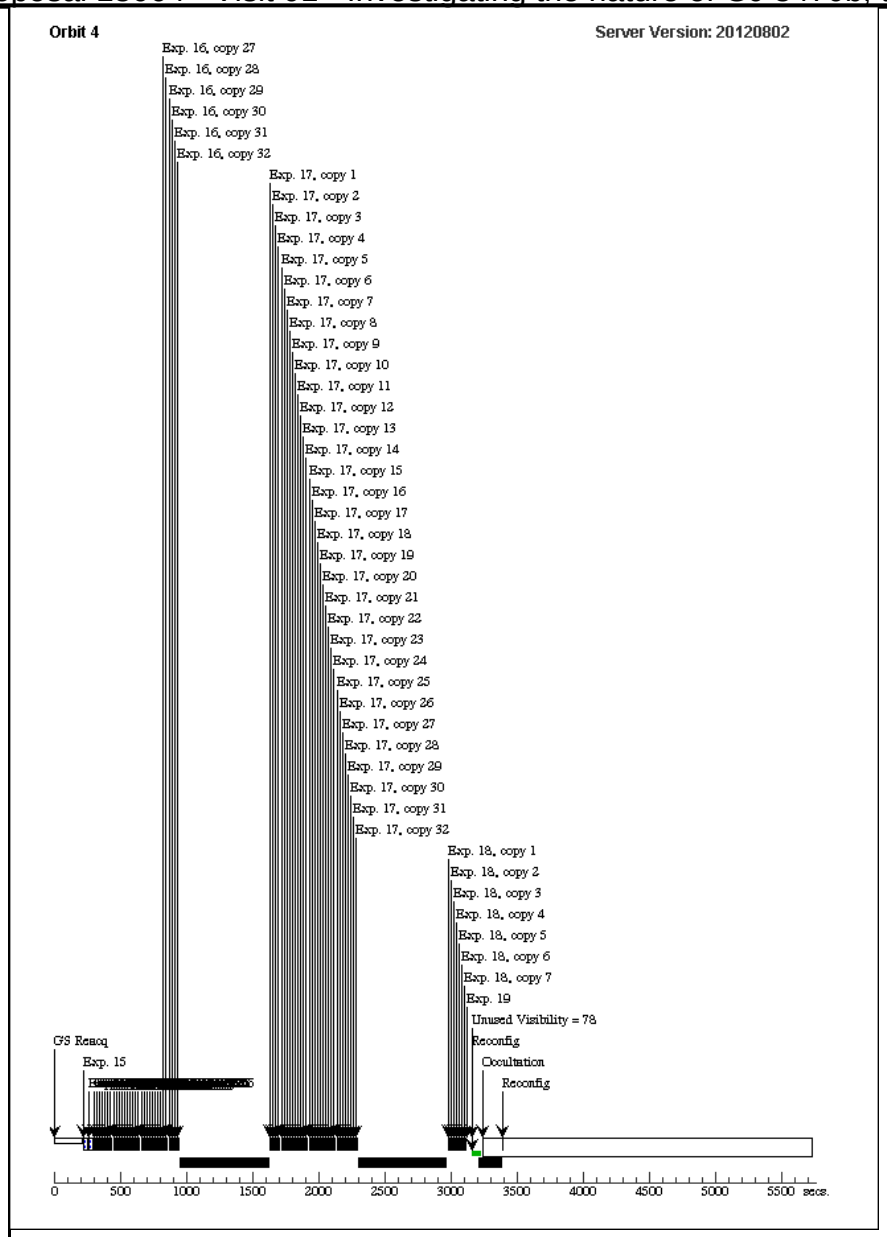
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Exp. 19
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Reconfig
Occultation
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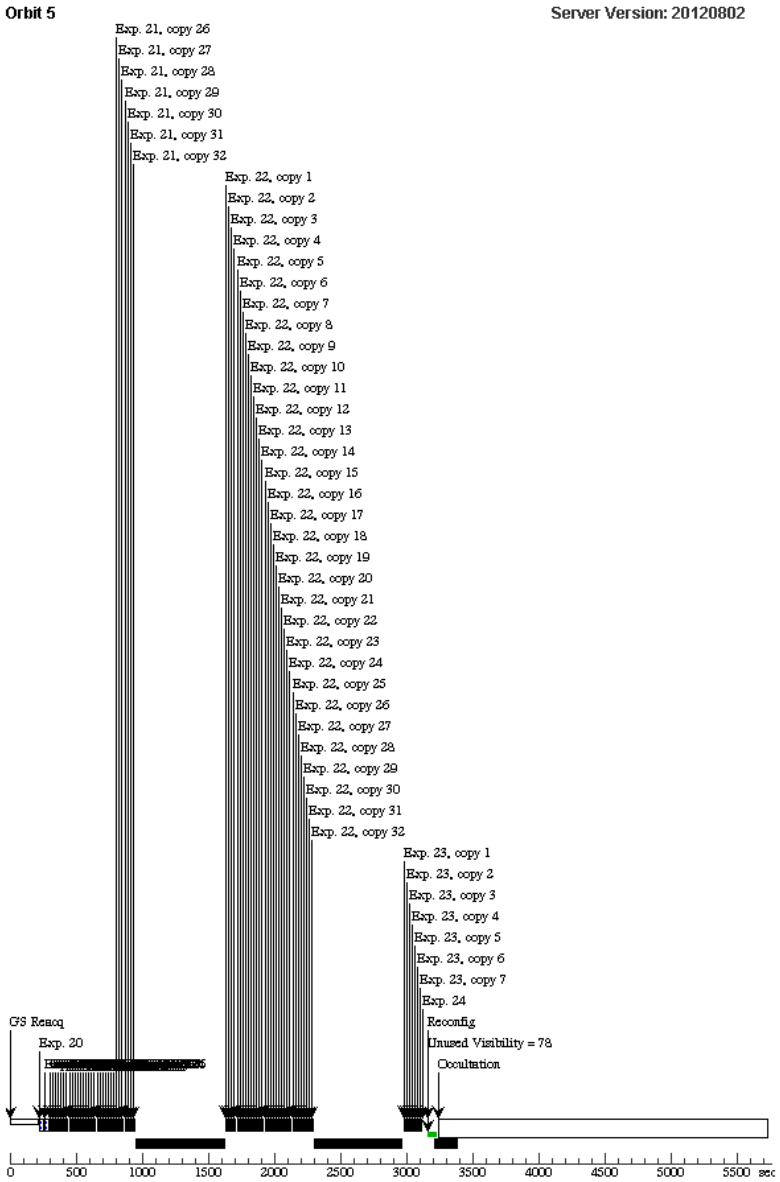
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Exp. 22, copy 3
Exp. 22, copy 4
Exp. 22, copy 5
Exp. 22, copy 6
Exp. 22, copy 7
Exp. 22, copy 8
Exp. 22, copy 9
Exp. 22, copy 10
Exp. 22, copy 11
Exp. 22, copy 12
Exp. 22, copy 13
Exp. 22, copy 14
Exp. 22, copy 15
Exp. 22, copy 16
Exp. 22, copy 17
Exp. 22, copy 18
Exp. 22, copy 19
Exp. 22, copy 20
Exp. 22, copy 21
Exp. 22, copy 22
Exp. 22, copy 23
Exp. 22, copy 24
Exp. 22, copy 25
Exp. 22, copy 26
Exp. 22, copy 27
Exp. 22, copy 28
Exp. 22, copy 29
Exp. 22, copy 30
Exp. 22, copy 31
Exp. 22, copy 32
Exp. 23, copy 1
Exp. 23, copy 2
Exp. 23, copy 3
Exp. 23, copy 4
Exp. 23, copy 5
Exp. 23, copy 6
Exp. 23, copy 7
Exp. 24
Reconfig
Unused Visibility = 78
Occultation
GS Reacq
Exp. 20
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec