



13006 - Measuring the Albedo of HD189733b at Optical Wavelengths

Cycle: 20, Proposal Category: GO

(Availability Mode: AVAILABLE)

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) HD-189733 WAVE	STIS/CCD	4	12-Jul-2012 21:32:09.0	yes

4 Total Orbits Used

ABSTRACT

The hot Jupiters HD 189733b and HD 209458b are the cornerstones of our current understanding of exoplanetary atmospheres, having been well-observed across a broad range of wavelengths. Significant differences exist between them: the transmission spectrum of HD 209458b reveals a transparent atmosphere dominated by alkali metal lines, in stark contrast to the haze-covered atmosphere of HD 189733b. An exoplanetary atmosphere dominated by optical scattering, due to haze, is expected to possess a relatively high albedo. Measuring the albedo requires detecting the

optical secondary eclipse, which has never been accomplished for HD 189733b. We propose to measure the planetary albedo of HD 189733b, thereby elucidating the importance of the observed haze on determining the energy budget of the exoplanet. We require HST STIS observations to not only detect the albedo, but also to measure how it varies with wavelength as expected from Rayleigh scattering. The first step towards detailed, comparative exoplanetology needs to be built upon a full comparison of the two best-studied exoplanets. Our proposed observations constitute a key part of the global picture of HD 189733b and will elucidate the importance of clouds and hazes on atmospheric chemistry and dynamics.

OBSERVING DESCRIPTION

One secondary transit of HD 189733 will be observed using STIS/G430L. The visit will consist of 4 HST orbits, with orbit 3 roughly centered on the planet transit, and orbits 2 and 4 outside of transit to establish the baseline.

The first orbit is assumed not to be useful (instrument settling).

Set Wavecal=No for all STIS observations (as in previous similar programs such as GO 11740, 12473) such that the duty cycle and photometric precision is maximized.

With STIS G430L the wavelength range of 2900-5700 angstroms is covered.

We use a broad 52x2" slit to minimize slit losses and variations. STIS is perfectly conserving past saturation with use of GAIN=4, see e.g. Bohlin and Gilliland 2004, AJ, 127, 3508 describing observations of the 0th mag star Vega. We adopt an exposure time of 66 seconds, with a sub-array size of 128 -- sufficiently large to enable tracking sky variations. This will lead to roughly 2x oversaturation.

Photon-limited precisions of 0.00017 per resolution element, per HST orbit are expected.

ADDITIONAL COMMENTS

Set Wavecal=No (Availability=Available) for all STIS observations such that the duty cycle and photometric precision is maximized, as done in previous similar programs such as GO 11740, 12473 .

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Visit	<p>Proposal 13006, HD189733b G430L (01) (01) Fri Jul 13 01:32:44 GMT 2012</p> <p>Diagnostic Status: No Diagnostics</p> <p>Scientific Instruments: STIS/CCD</p> <p>Special Requirements: Period 2.21857578 D AND ZERO-PHASE HJD2454399.23990</p> <p><i>Comments: It is essential that the four orbits be scheduled in a continuous block.</i></p>												
	Fixed Targets	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7000 (300.1820833d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000</td> <td>Proper Motion RA: -2.14 mas/yr Proper Motion Dec: -251.4 mas/yr Epoch of Position: 2000</td> <td>V=7.67</td> <td>Reference Frame: ICRS</td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	HD-189733	RA: 20 00 43.7000 (300.1820833d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000	Proper Motion RA: -2.14 mas/yr Proper Motion Dec: -251.4 mas/yr Epoch of Position: 2000	V=7.67
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#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ, phase constrained	(1) HD-189733	STIS/CCD, ACQ, F28X500II	MIRROR		PHASE 0.426 TO 0.4359121		5.0 Secs [==>]	[1]
2	HD189733b G430L Orbit 1	(1) HD-189733	STIS/CCD, ACCUM, 52X2	G430L 4300 A	SIZEAXIS2=128; CR-SPLIT=NO; GAIN=4; WAVECAL=NO			64 Secs X 29 [==>(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)]	[1]
3	HD189733b G430L Orbit 2	(1) HD-189733	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=NO; GAIN=4; SIZEAXIS2=128; WAVECAL=NO			1 Secs [==>]	[2]
<p>Comments: Short exposure to minimize instrument systematic of first exposure in each orbit.</p>									

Exposures

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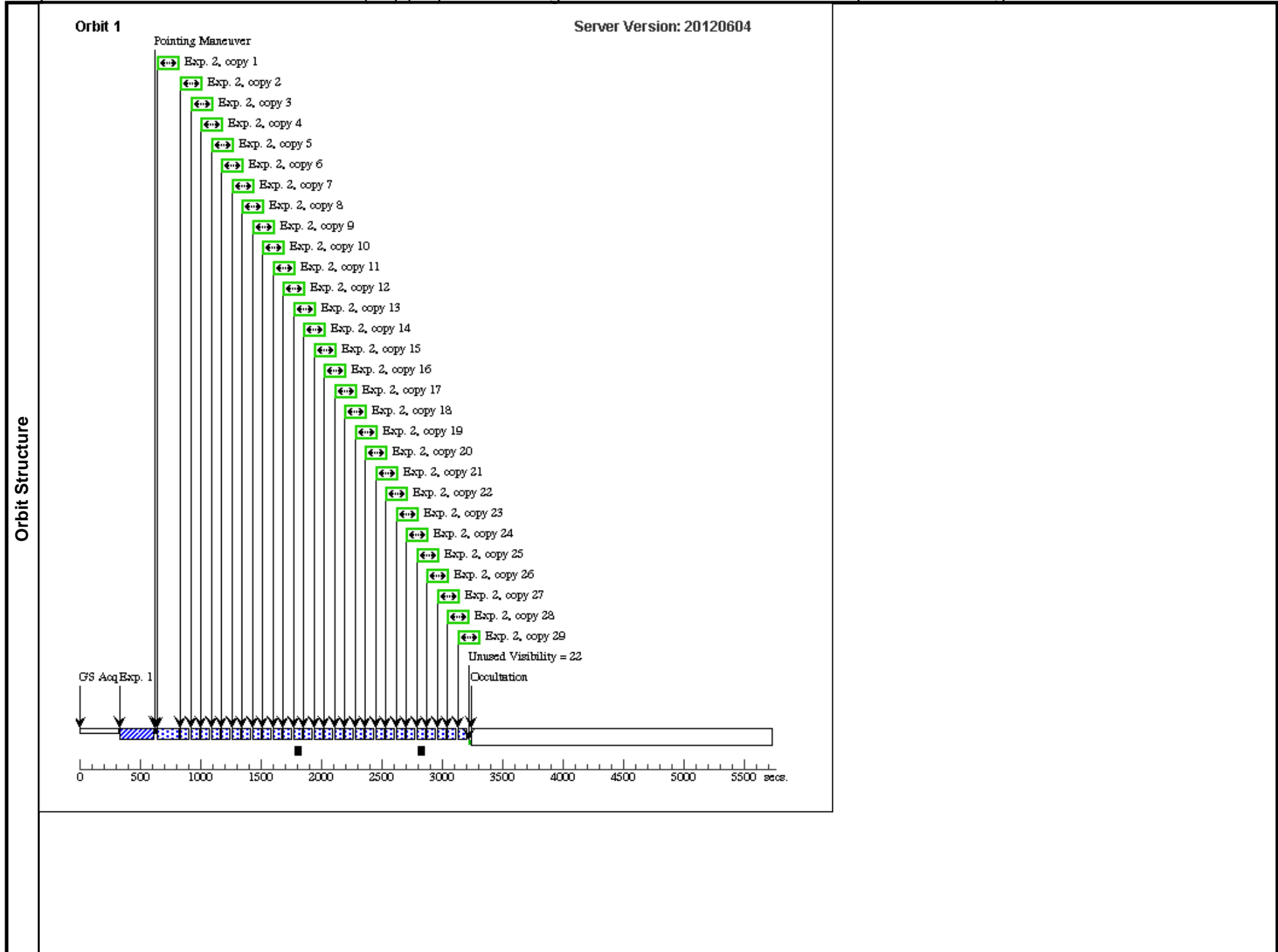
4	HD189733b (1) HD-189733 G430L Orbit 2	STIS/CCD, ACCUM, 52X2	G430L 4300 A	SIZEAXIS2=128; CR-SPLIT=NO; GAIN=4; WAVECAL=NO	64 Secs X 35	[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 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)]	[2]
5	HD189733b (1) HD-189733 G430L Orbit 3	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=NO; GAIN=4; SIZEAXIS2=128; WAVECAL=NO	1 Secs	[==>]	[3]
<i>Comments: Short exposure to minimize instrument systematic of first exposure in each orbit.</i>							

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6	HD189733b (1) HD-189733 G430L Orbit 3	STIS/CCD, ACCUM, 52X2	G430L 4300 A	SIZEAXIS2=128; CR-SPLIT=NO; GAIN=4; WAVECAL=NO	64 Secs X 35	[==>(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)]	[3]
7	HD189733b (1) HD-189733 G430L Orbit 4	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=NO; GAIN=4; SIZEAXIS2=128; WAVECAL=NO	1 Secs	[==>]	[4]
<i>Comments: Short exposure to minimize instrument systematic of first exposure in each orbit.</i>							

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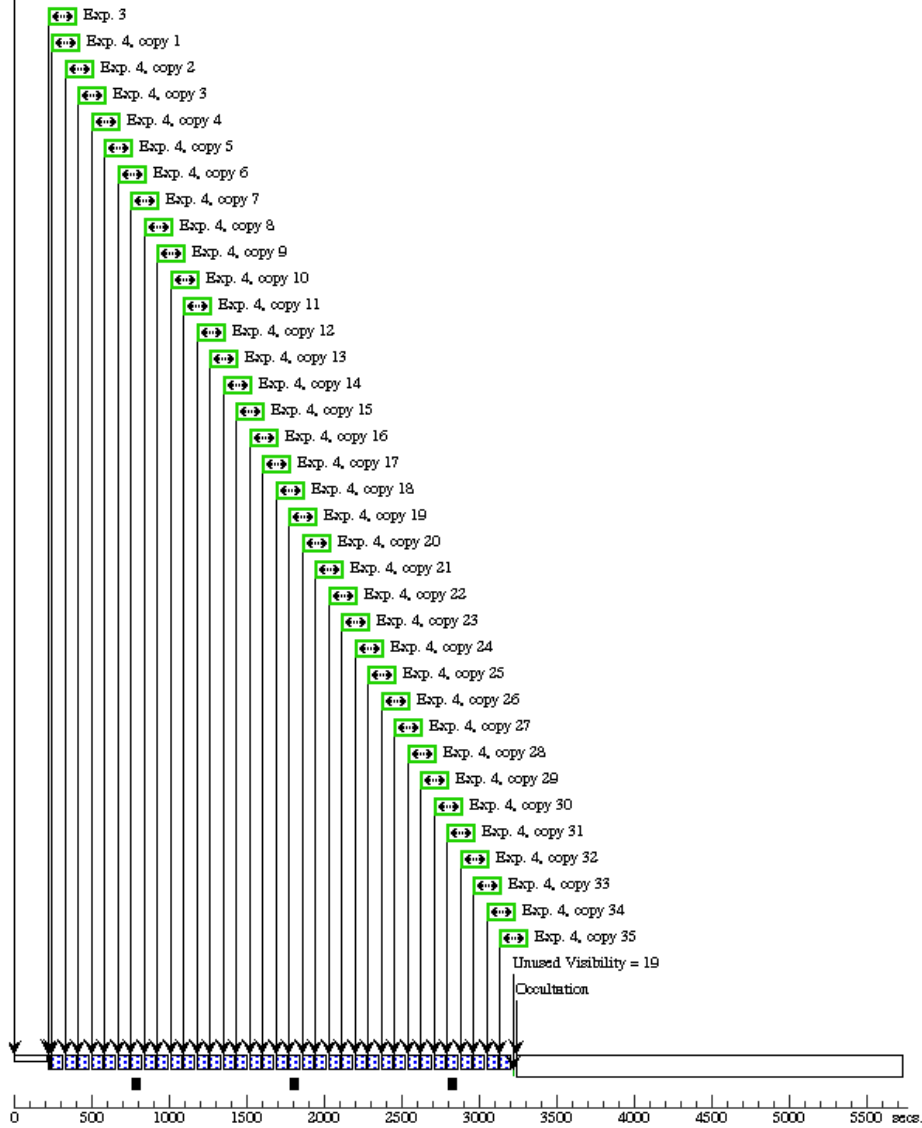
8	HD189733b (1) HD-189733 G430L Orbit 4	STIS/CCD, ACCUM, 52X2	G430L 4300 A	SIZEAXIS2=128; CR-SPLIT=NO; GAIN=4; WAVECAL=NO	64 Secs X 35	[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 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)]	[4]
9	HD189733b WAVE G430L WA VECAL	STIS/CCD, ACCUM, 52X0.2	G430L 4300 A		[==>]	[4]	
<i>Comments: Explicit WAVECAL, auto-waves disabled</i>							



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Orbit 2
G3 Reuq

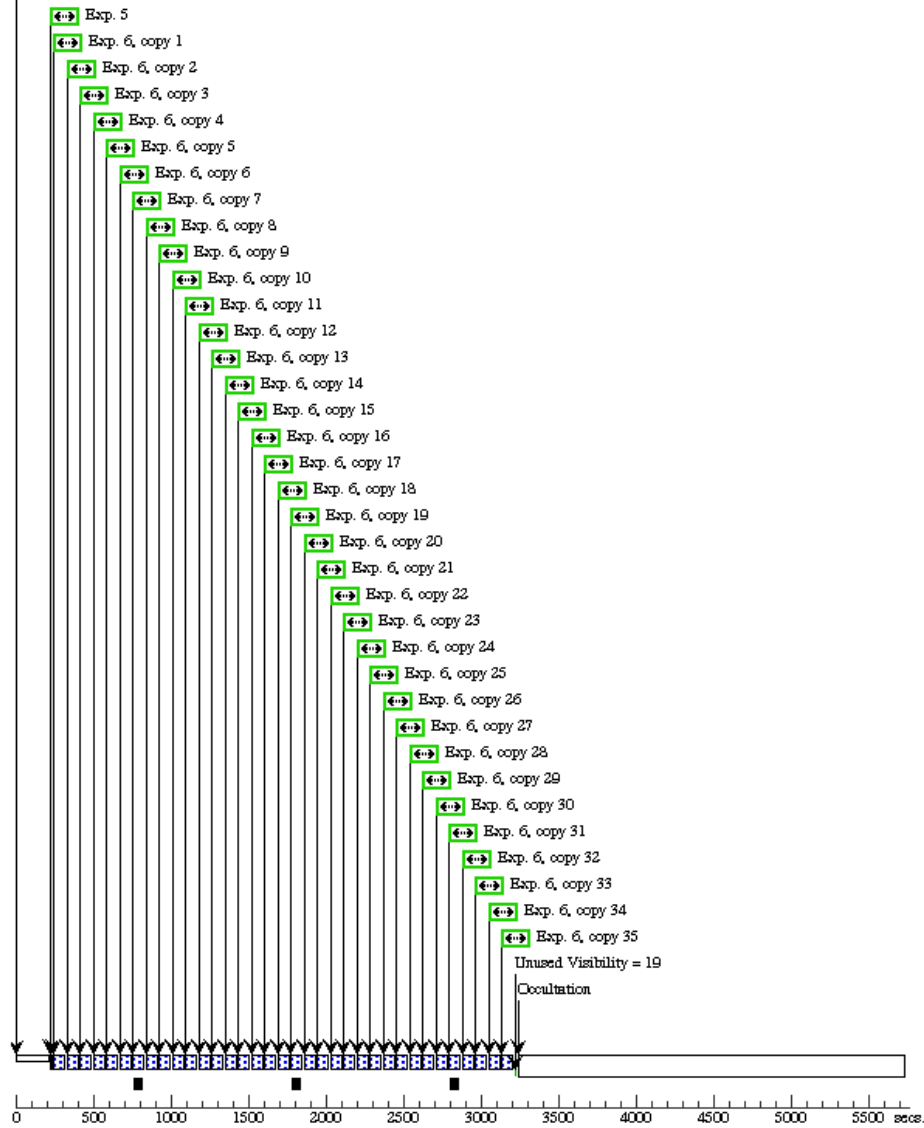
Server Version: 20120604



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Orbit 3
G3 Reuq

Server Version: 20120604



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