16220 - An Observational Anchor for Brown Dwarf Models

Cycle: 28, 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) AD3116	WFC3/IR	5	04-Jun-2020 12:00:58.0	yes

5 Total Orbits Used

ABSTRACT

We wish to use 5 orbits of HST/WFC3 time to observe an eclipse spectrum of the only known transiting brown dwarf that has all of its physical properties independently measured at high precision, and that receives a negligible amount of external irradiation. Brown dwarfs evolve in both radius and temperature as they age, changing their atmospheric spectral emission with time. Understanding this evolution is important because it informs us about their interior structure, which ultimately helps constrain where the dividing line is between brown dwarfs that form through "star-like" Jeans-collapse or "planet-like" accretion. However, a fundamental problem in brown dwarf evolution and atmosphere models has been our inability to directly measure their basic physical properties, and no one has yet observed the atmosphere of a non-irradiated brown dwarf where we know all of them. The discovery of our target system finally allows us to conduct just this sort of observation using HST/WFC3 -- in conjuntion with archival Spitzer eclipse observations at 3.6um and 4.5um. Measuring the emission spectrum will allow us to perform a set of tests on brown dwarf

evolution and atmospheres models with an an over-constrained physical system with no major free parameters. The results will provide a one-of-a-kind observational anchor for brown dwarfs.

OBSERVING DESCRIPTION

These observations are to observe a secondary eclipse of AD 3116b using WFC3/G141. These observations will require 5 orbits to complete. The eclipse duration of AD 3116b is 3.1 hours, so we wish to observe for a minimum of 6.2 hours to see a suffcient amount of out-of-transit baseline. 6.2 hours of observations can be completed using 4 orbits, but we are also including 1 additional orbit at the beginning of each visit to allow the spacecraft and detector to settle and remove the initial systematic noise typical in observations using WFC3. We are using staring mode -- rather than scanning -- because AD 3116 is relatively faint.

Visit

Proposal 16220, Visit 01 Thu Jun 04 16:01:00 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 70D TO 100 D; ORIENT 260D TO 290 D; Period 1.9827991909009821 D AND ZERO-PHASE HJD2457179.9807242565

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	AD3116 Alt Name1: EPIC-211946007	RA: 08 42 39.3997 (130.6641654d) Dec: +19 24 51.70 (19.41436d) Equinox: J2000	Proper Motion RA: -0.002601594968354884 sec of time/yr Proper Motion Dec: -0.013132999993104022 arcsec/yr Epoch of Position: 2015.5	V=(?) J=14.348, H=13.769, K = 13.499	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[BROWN DWARF, EXTRA-SOLAR PLANETARY SYSTEM, M V-IV]

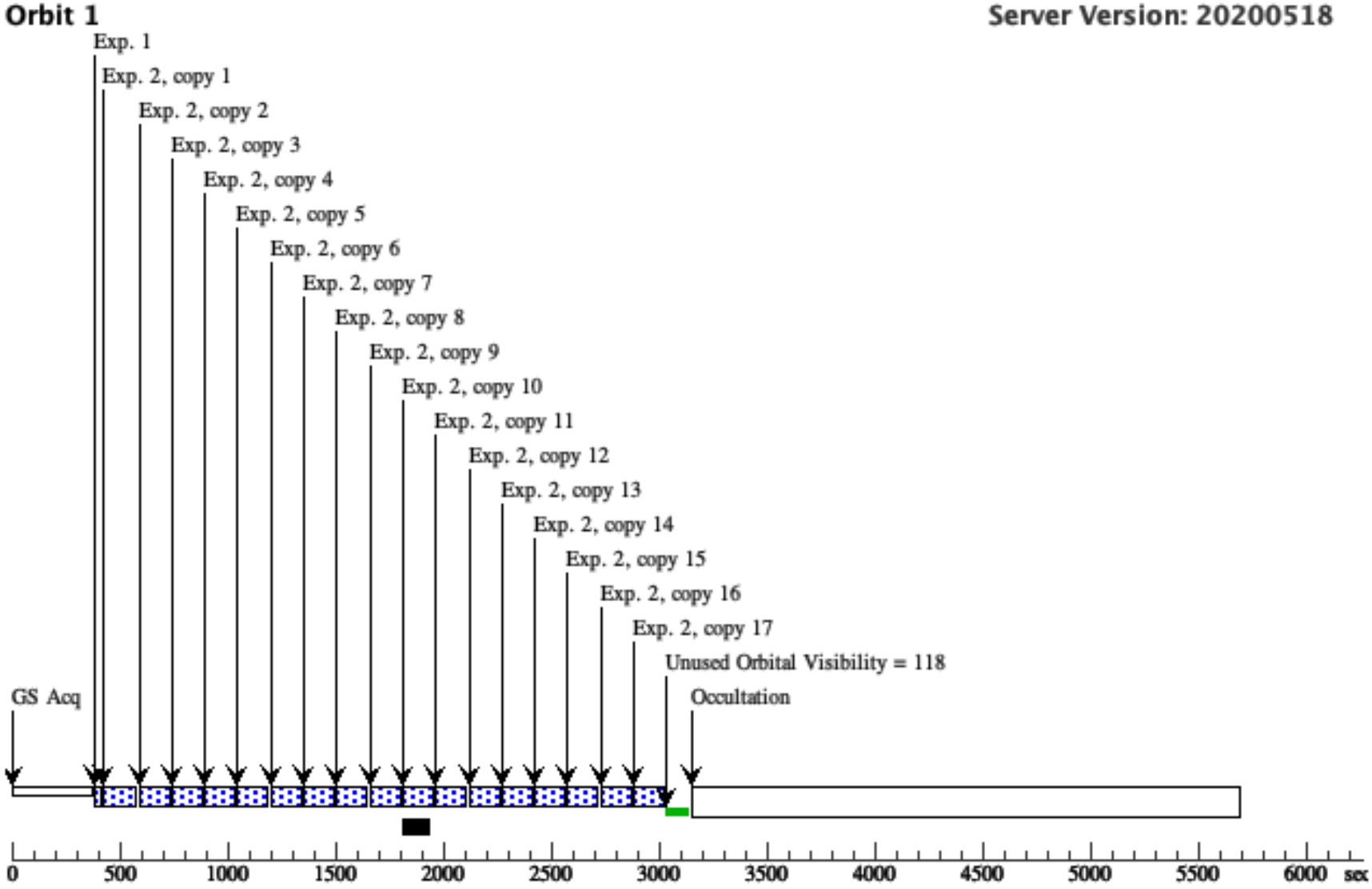
Exposures

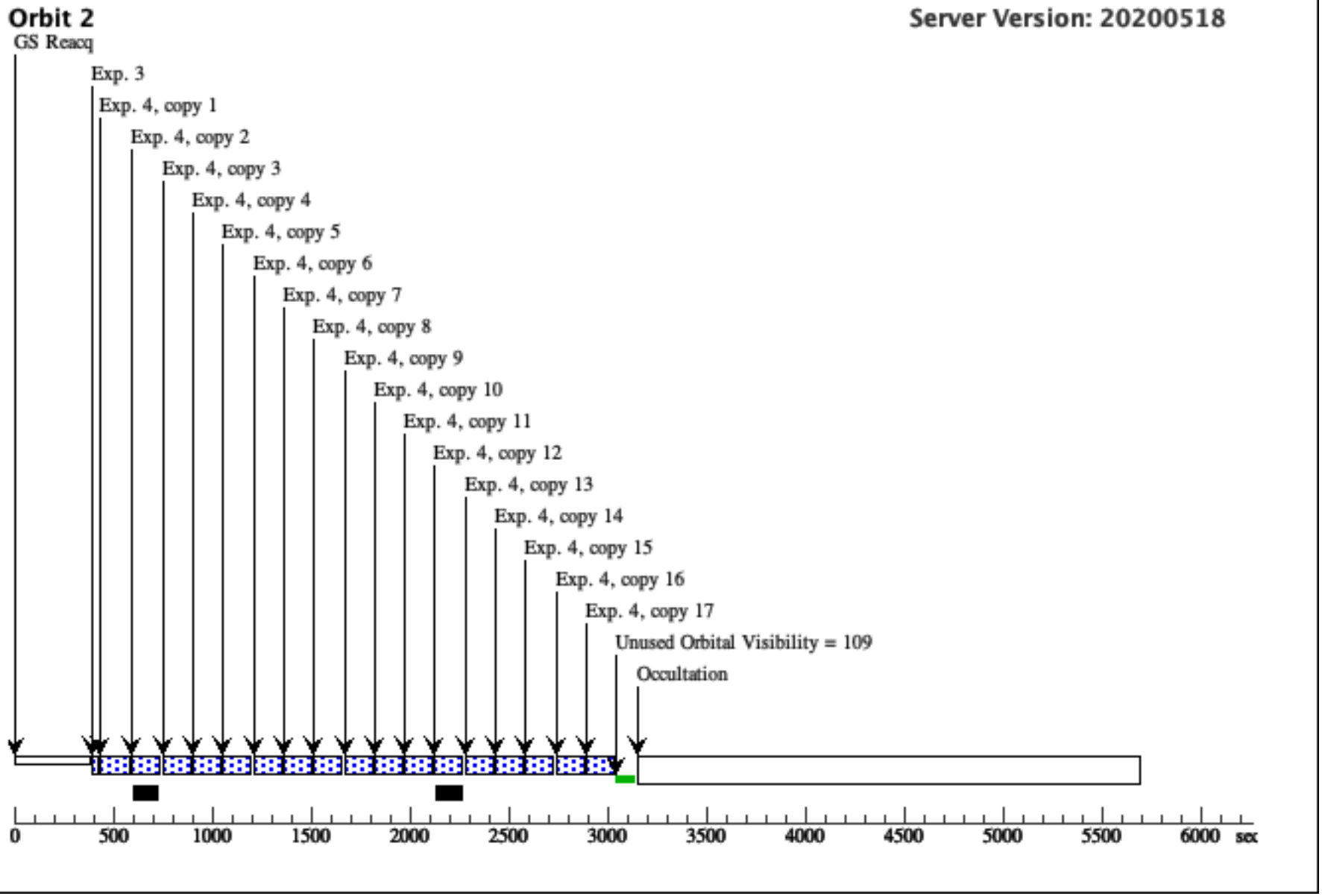
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Image	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	F160W	NSAMP=4; SAMP-SEQ=SPARS5	PHASE 0.884 TO 0.896	Sequence 1-2 Non-Int in Visit 01	7.32736 Secs (7.327 Secs)	
								[==>]	***[1]***
2	Spec	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=7; SAMP-SEQ=SPARS25		Sequence 1-2 Non-Int in Visit 01	134.354049 Secs X 17 (2284.019 Secs)	
								[==>(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)]*	***[1]***
3	Image	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	F160W	NSAMP=4; SAMP-SEQ=SPARS5		Sequence 3-4 Non-Int in Visit 01	7.32736 Secs (7.327 Secs)	
								[==>]	***[2]***
4	Spec	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=7; SAMP-SEQ=SPARS25		Sequence 3-4 Non-Int in Visit 01	134.354049 Secs X 17 (2284.019 Secs)	
								[==>(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)]*	***[2]***

5	Image	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	F160W	NSAMP=4; SAMP-SEQ=SPARS5	Sequence 5-6 Non-Int in Visit 01	7.32736 Secs (7.327 Secs) *[==>]*	 ***[3]***
6	Spec	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=7; SAMP-SEQ=SPARS25	Sequence 5-6 Non-Int in Visit 01	134.354049 Secs X 17 (2284.019 Secs) *[==>(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)]*	 ***[3]***
7	Image	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	F160W	NSAMP=4; SAMP-SEQ=SPARS5	Sequence 7-8 Non-Int in Visit 01	7.32736 Secs (7.327 Secs) *[==>]*	 ***[4]***
8	Spec	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=7; SAMP-SEQ=SPARS25	Sequence 7-8 Non-Int in Visit 01	134.354049 Secs X 17 (2284.019 Secs) *[==>(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)]*	 ***[4]***

	9	Image	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	F160W	NSAMP=4; SAMP-SEQ=SPARS5	Sequence 9-10 Non-Int in Visit 01	7.32736 Secs (7.327 Secs) *[==>]*	 ***[5]***
	10	Spec	(1) AD3116	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=7; SAMP-SEQ=SPARS25	Sequence 9-10 Non-Int in Visit 01	134.354049 Secs X 17 (2284.019 Secs) *[==>(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)]*	 ***[5]***

Orbit Structure

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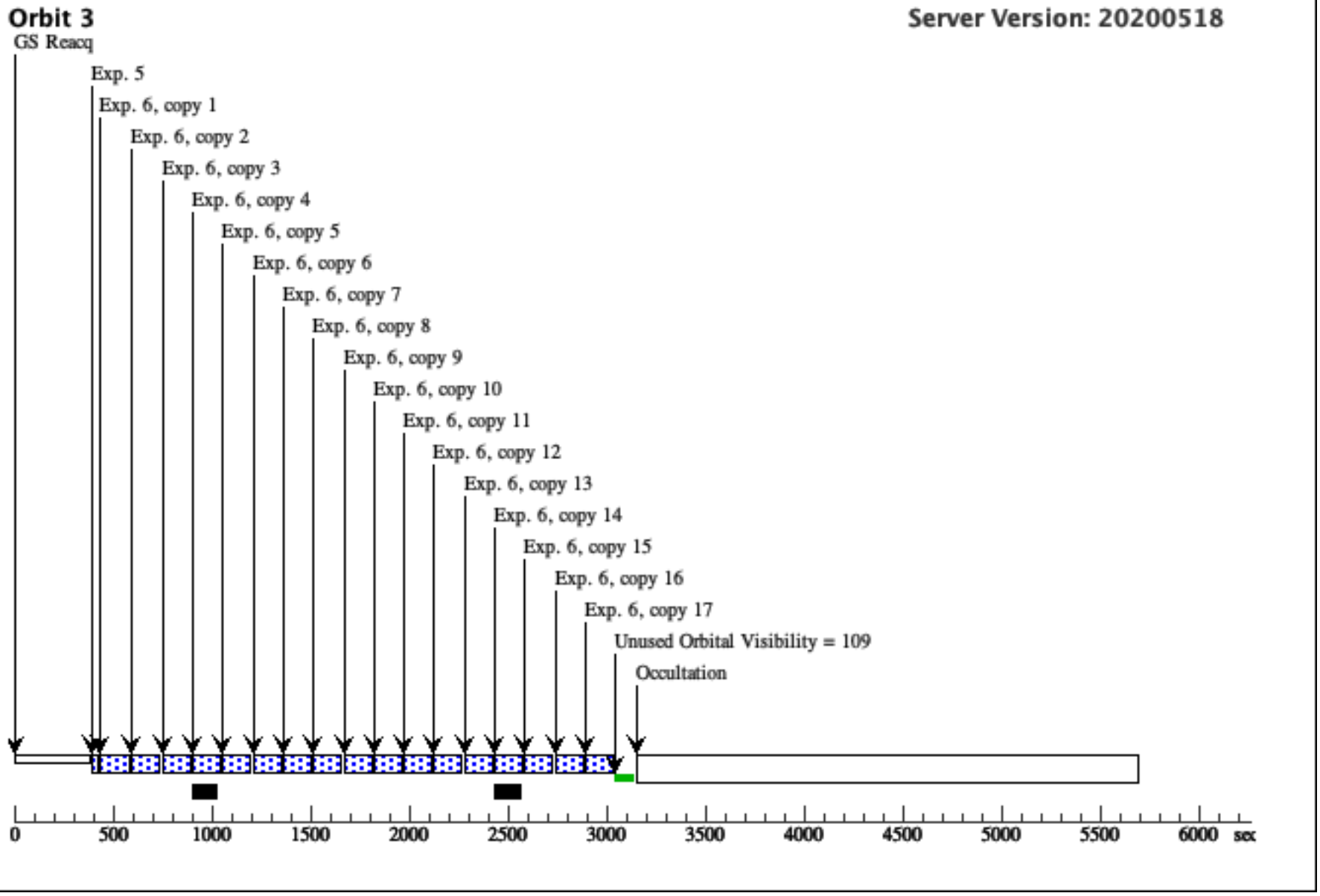
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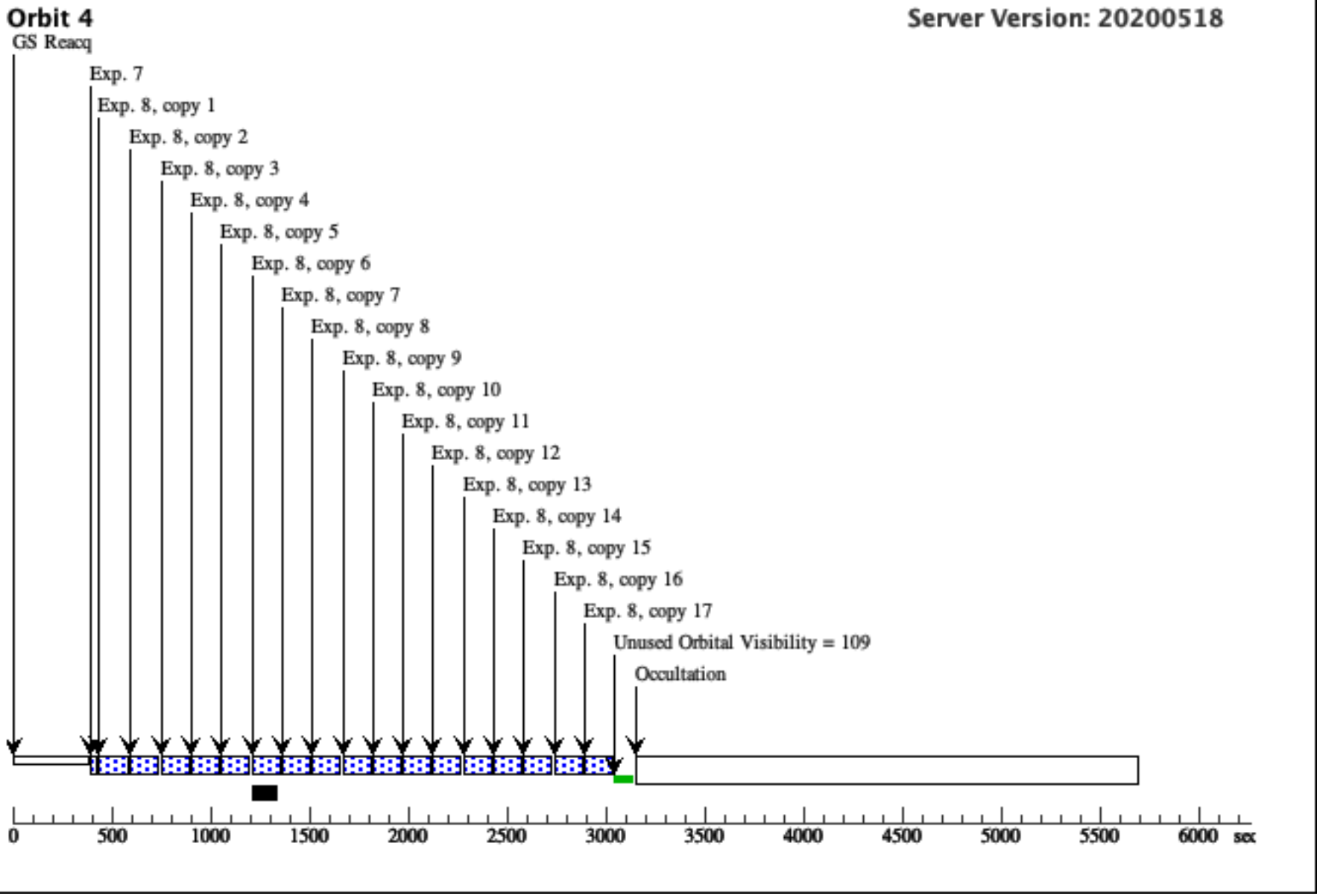
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Exp. 8, copy 16
Exp. 8, copy 17
Unused Orbital Visibility = 109
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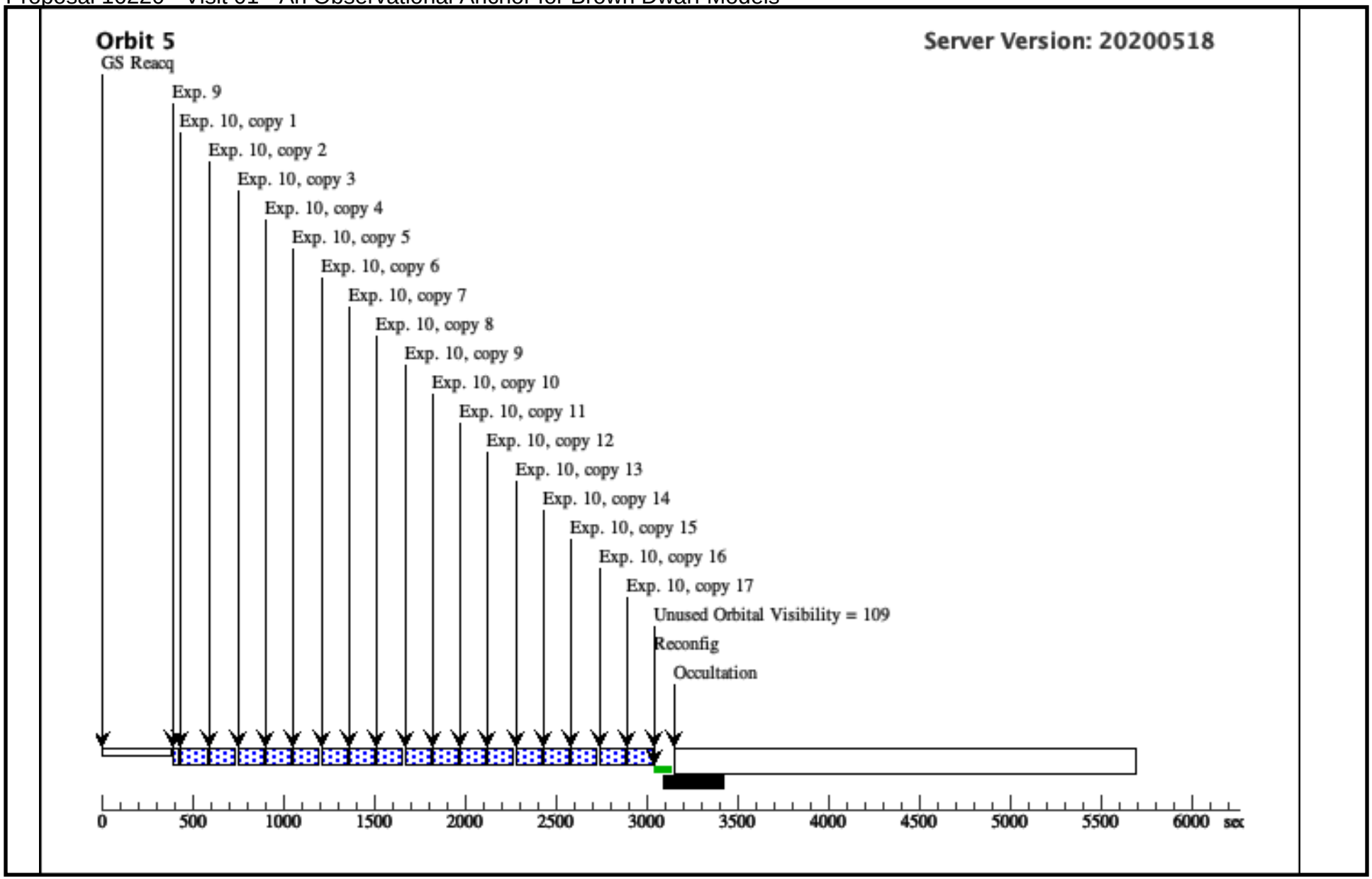
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Unused Orbital Visibility = 109
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