16694 - Confirming the first outbursting AM CVn in a globular cluster

Cycle: 29, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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Prof. Leandro Gabriel Althaus (CoI)	Universidad Nacional de La Plata (UNLP)	leandroalthaus@gmail.com

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(2) AM1-SHIFTED-2	ACS/SBC	2	05-Nov-2021 09:00:57.0	yes
02	(2) AM1-SHIFTED-2	ACS/SBC	2	05-Nov-2021 09:01:00.0	yes
03	(2) AM1-SHIFTED-2	ACS/SBC	2	05-Nov-2021 09:01:02.0	yes
04	(2) AM1-SHIFTED-2	ACS/SBC	2	05-Nov-2021 09:01:04.0	yes

8 Total Orbits Used

ABSTRACT

AM CVns are double white dwarf binaries with orbital periods ~5-65 mins. They have been predicted to exist in large amounts in globular clusters due to stellar interactions, but while binaries harboring neutron stars and even black holes have been previously identified, no single AM CVn has

ever been confirmed to reside in any Galactic globular cluster. We propose to use 8 HST orbits to obtain FUV photometry and determine the sub-hour orbital period of a recently detected, He-rich, accreting binary in the globular cluster 47 Tuc. The system has multiwavelength characteristics that match well those expected for AM CVns. The confirmation of a sub-hour period, as expected for AM CVns, has profound implications for the dynamical evolution of globular clusters and whether they might be factories of SN Ia and ultracompact binaries that emit gravitational waves.

OBSERVING DESCRIPTION

For this program we are using imaging with ACS/SBC in the FUV filter F140LP to look for periodicities. We are pointing the center of the detector towards a region shifted from AM1 (the target of interest) for 2 reasons: 1) reduce the effects of dark currents in the FUV, which are worst at the center of the detector, 2) maximize the usage of HST by obtaining infomation of many other stars in the cluster that harbor stellar remnants. Note that AM1 is always within the FOV.

We are considering only 2 orbits per visit to reduce the effects of temperature and dark currents on the detector. Giving the cooling that the detector needs to obtain optimal images, scheduling visits contiguously is not suggested. However, we suggest to schedule at least 2 visits within the same day and/or consecutive days after the first observation. This is to optimize the search for coherent periodicity in the binary AM1, which is the aim of the program. If possible to schedule the observations in the CVZ that would further benefit the program.

We are not considering acquisition images previous to the science images, because we were informed that ACS/SBC does not require those.

Visit

Proposal 16694, Visit 01, implementation Fri Nov 05 13:01:05 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 285D TO 45 D; ORIENT 213D TO 240 D; ORIENT 100D TO 115 D

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	AM1-SHIFTED-2	RA: 00 23 59.4376 (5.9976567d) Dec: -72 04 52.38 (-72.08122d) Equinox: J2000		V=23.3	Reference Frame: ICRS

Comments: pointing falls in a white part of the image, so the magnitude provided here is just to avoid a system error.
Category=STELLAR CLUSTER
Description=[ACCRETION DISK, GLOBULAR CLUSTER]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1528386)	(2) AM1-SHIFTED-2	ACS/SBC, ACCUM, SBC	F140LP				123 Secs X 38 (4714 Secs)	
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								[==>123.0 Secs (Copy 9)]	
								[==>123.0 Secs (Copy 10)]	***[1]***
								[==>123.0 Secs (Copy 11)]	
								[==>123.0 Secs (Copy 12)]	
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								[==>125.0 Secs (Copy 28)]	
								[==>125.0 Secs (Copy 29)]	***[2]***
								[==>125.0 Secs (Copy 30)]	
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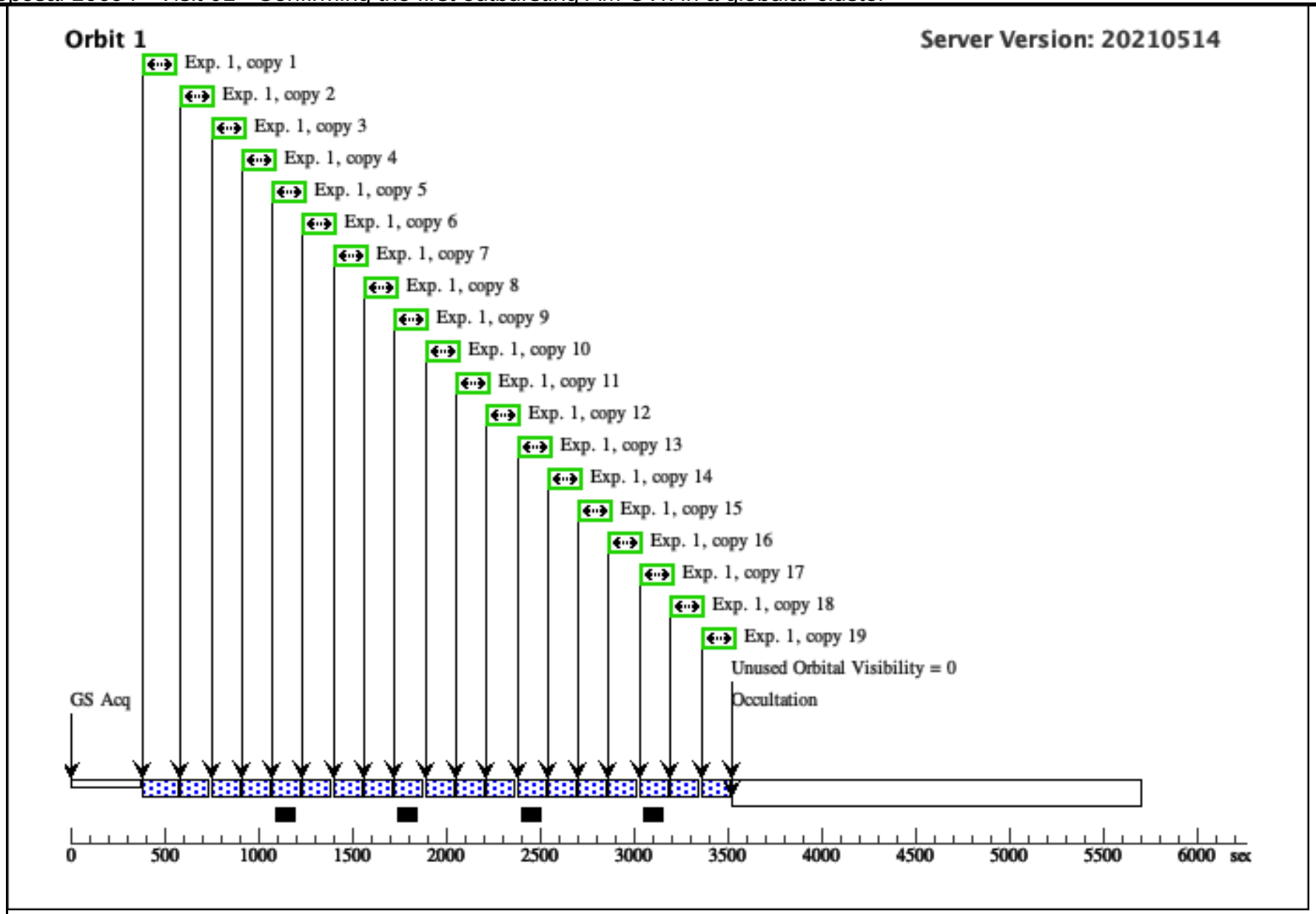
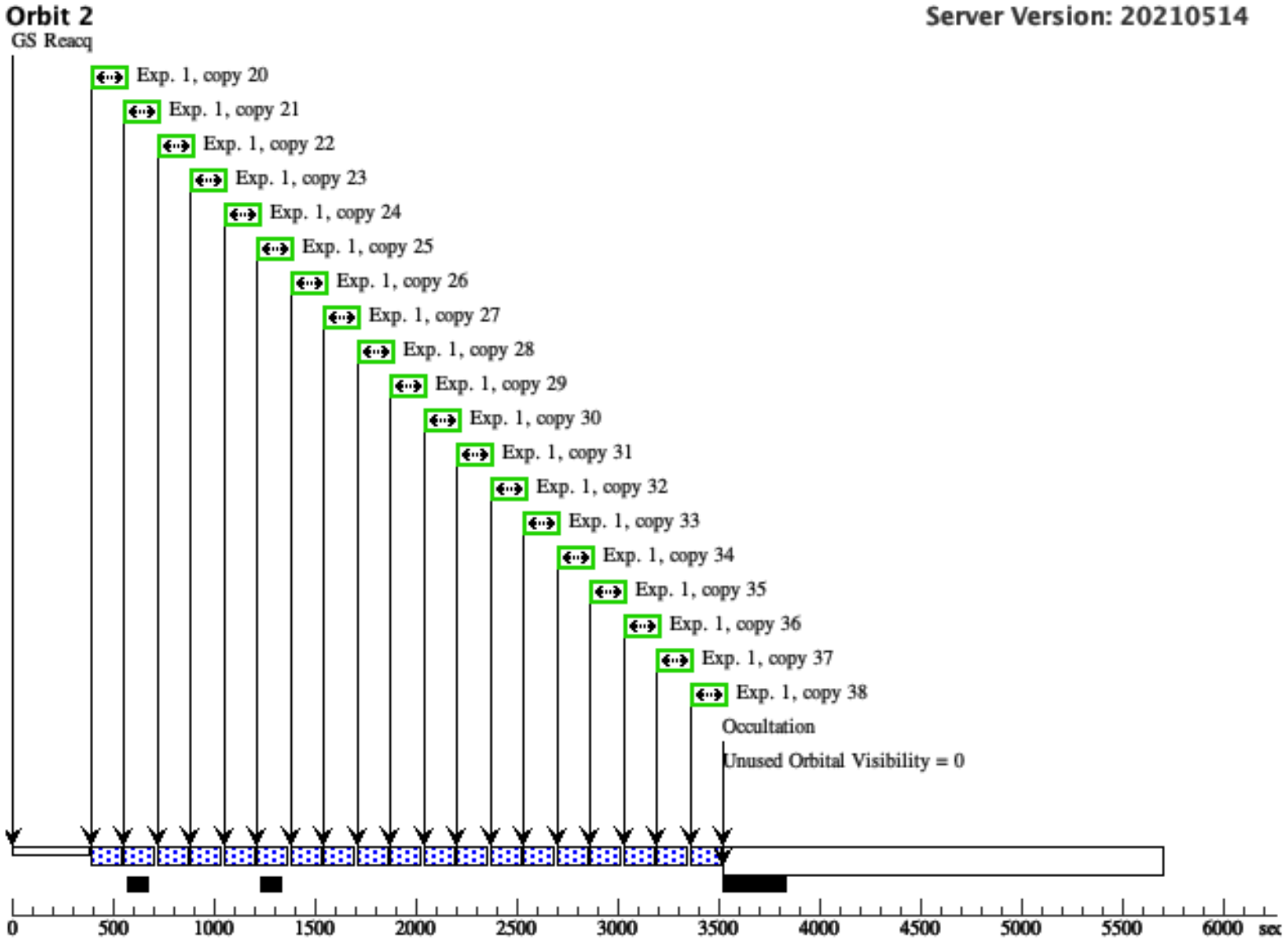
Orbit Structure

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Exp. 1, copy 36
Exp. 1, copy 37
Exp. 1, copy 38
Occultation
Unused Orbital Visibility = 0
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sec

Proposal 16694 - Visit 02 - Confirming the first outbursting AM CVn in a globular cluster

Visit

Proposal 16694, Visit 02, implementation Fri Nov 05 13:01:05 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 285D TO 45 D; ORIENT 213D TO 240 D; ORIENT 100D TO 115 D

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	AM1-SHIFTED-2	RA: 00 23 59.4376 (5.9976567d) Dec: -72 04 52.38 (-72.08122d) Equinox: J2000		V=23.3	Reference Frame: ICRS

Comments: pointing falls in a white part of the image, so the magnitude provided here is just to avoid a system error.
Category=STELLAR CLUSTER
Description=[ACCRETION DISK, GLOBULAR CLUSTER]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1528386)	(2) AM1-SHIFTED-2	ACS/SBC, ACCUM, SBC	F140LP				123 Secs X 38 (4714 Secs)	
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								[==>123.0 Secs (Copy 9)]	
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								[==>125.0 Secs (Copy 30)]	
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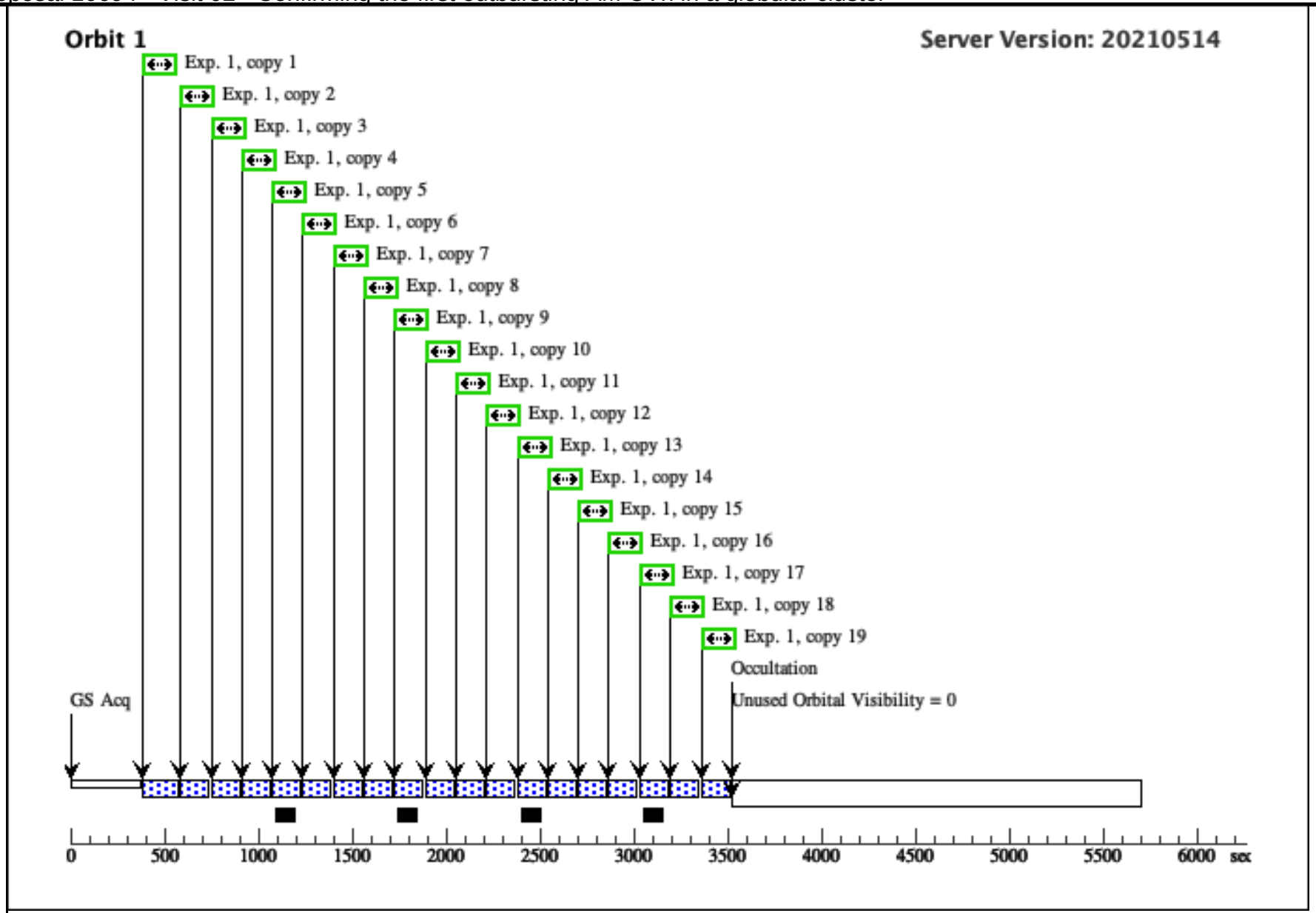
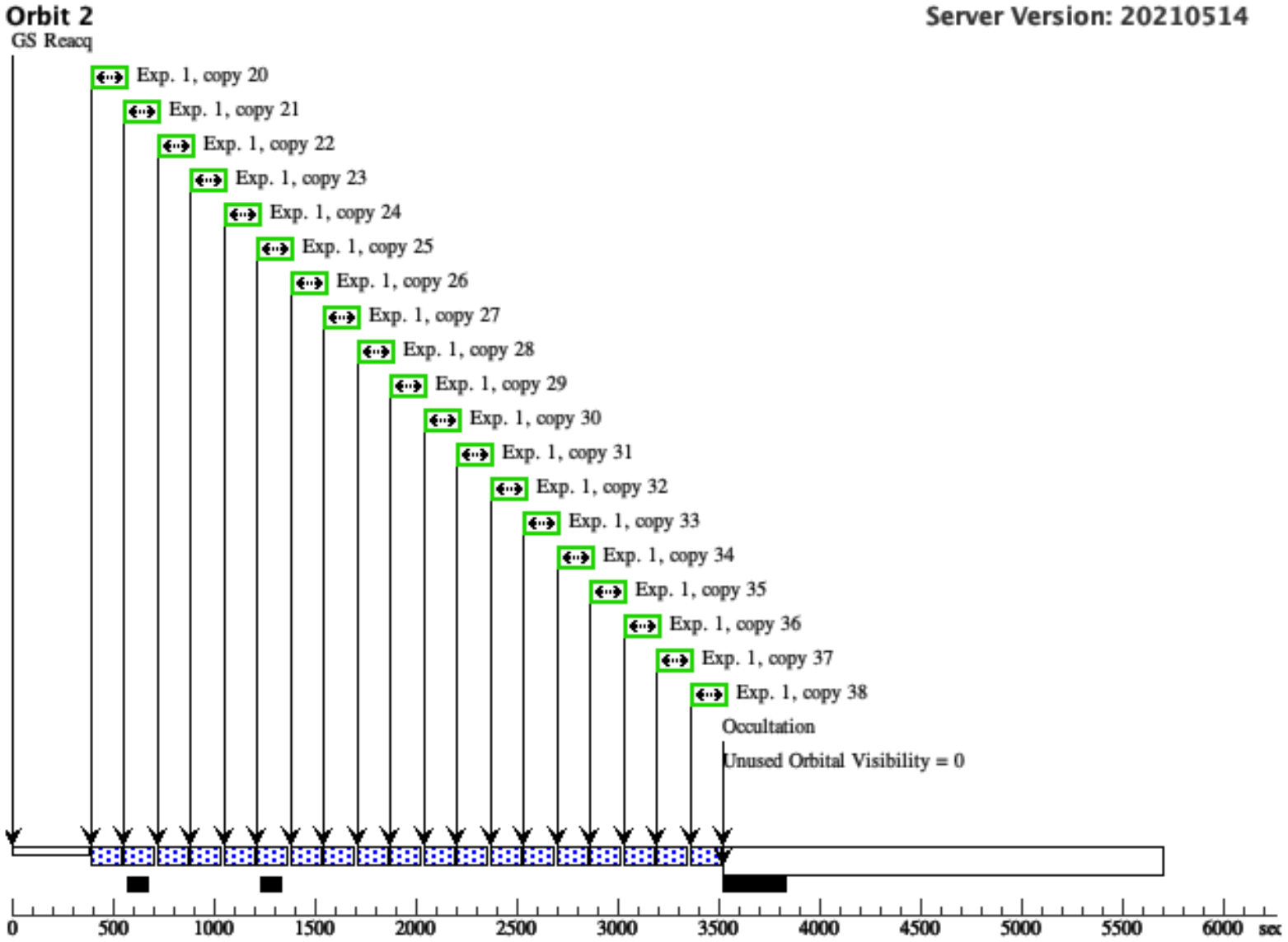
Orbit Structure

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Occultation
Unused Orbital Visibility = 0
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Visit

Proposal 16694, Visit 03, implementation Fri Nov 05 13:01:06 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 285D TO 45 D; ORIENT 213D TO 240 D; ORIENT 100D TO 115 D

Fixed Targets

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(2)	AM1-SHIFTED-2	RA: 00 23 59.4376 (5.9976567d) Dec: -72 04 52.38 (-72.08122d) Equinox: J2000		V=23.3	Reference Frame: ICRS

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Extended=NO

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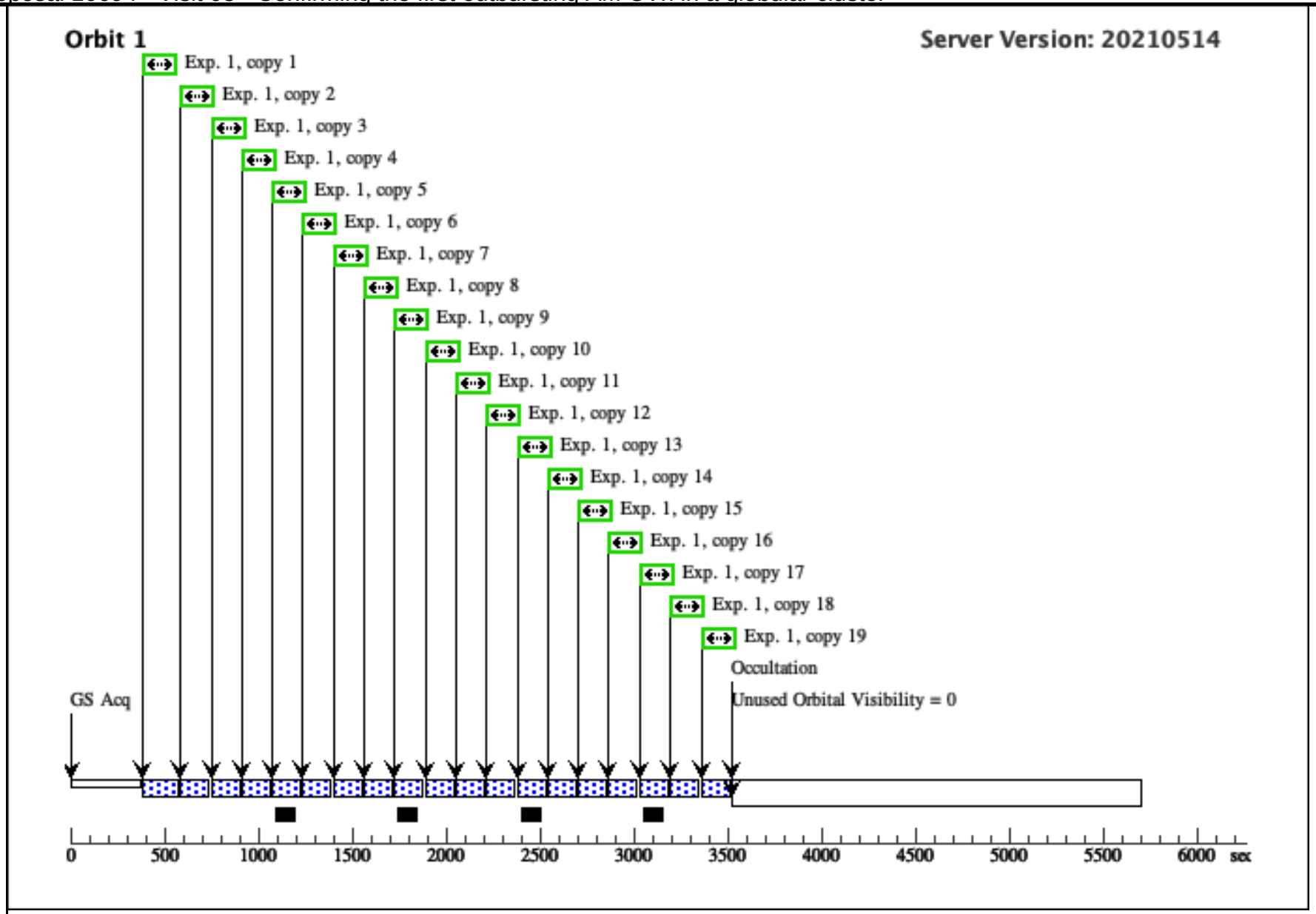
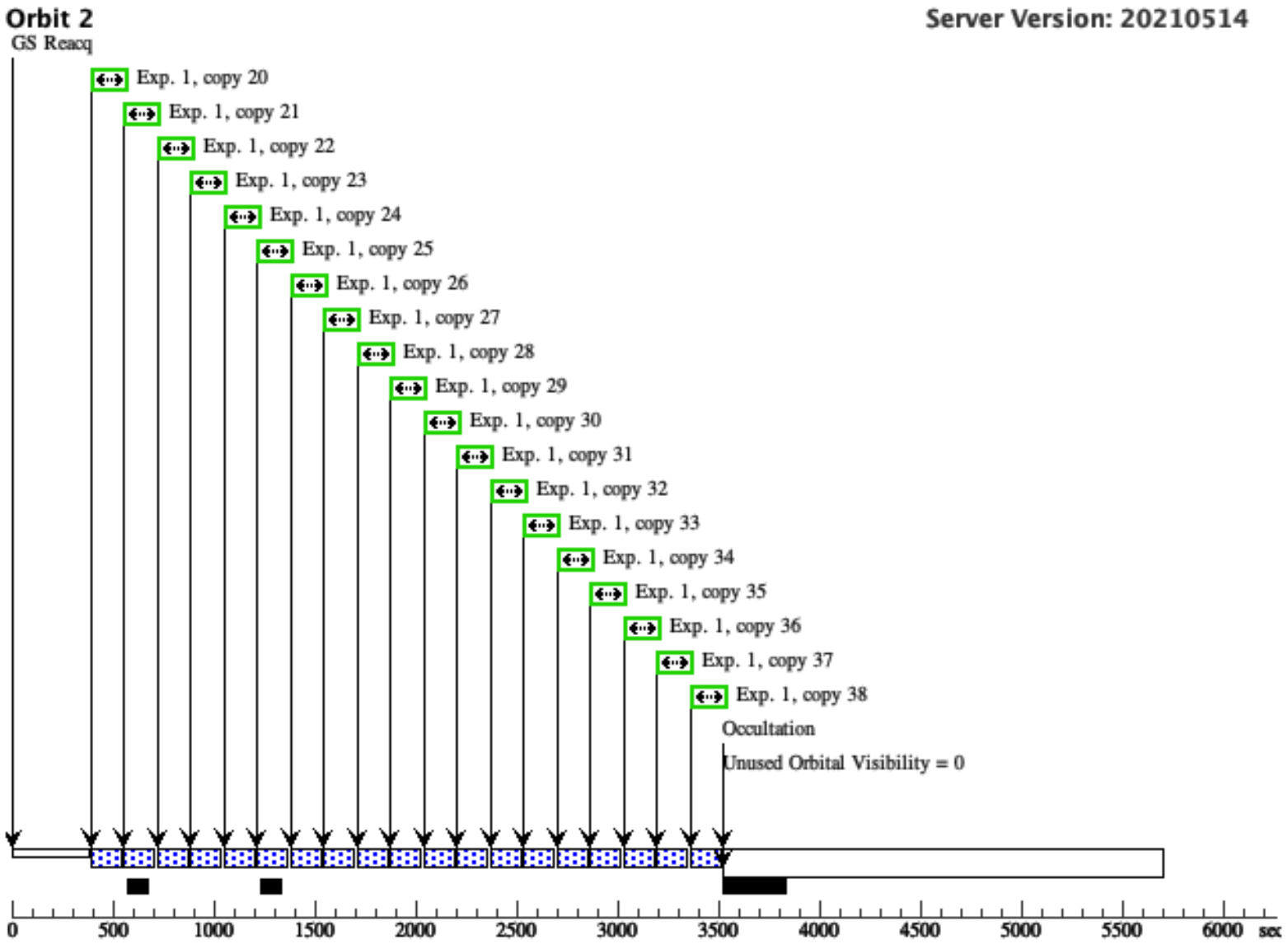
Orbit Structure

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Exp. 1, copy 35
Exp. 1, copy 36
Exp. 1, copy 37
Exp. 1, copy 38
Occultation
Unused Orbital Visibility = 0
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Visit

Proposal 16694, Visit 04, implementation Fri Nov 05 13:01:06 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 285D TO 45 D; ORIENT 213D TO 240 D; ORIENT 100D TO 115 D

Fixed Targets

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								[==>123.0 Secs (Copy 1)]	
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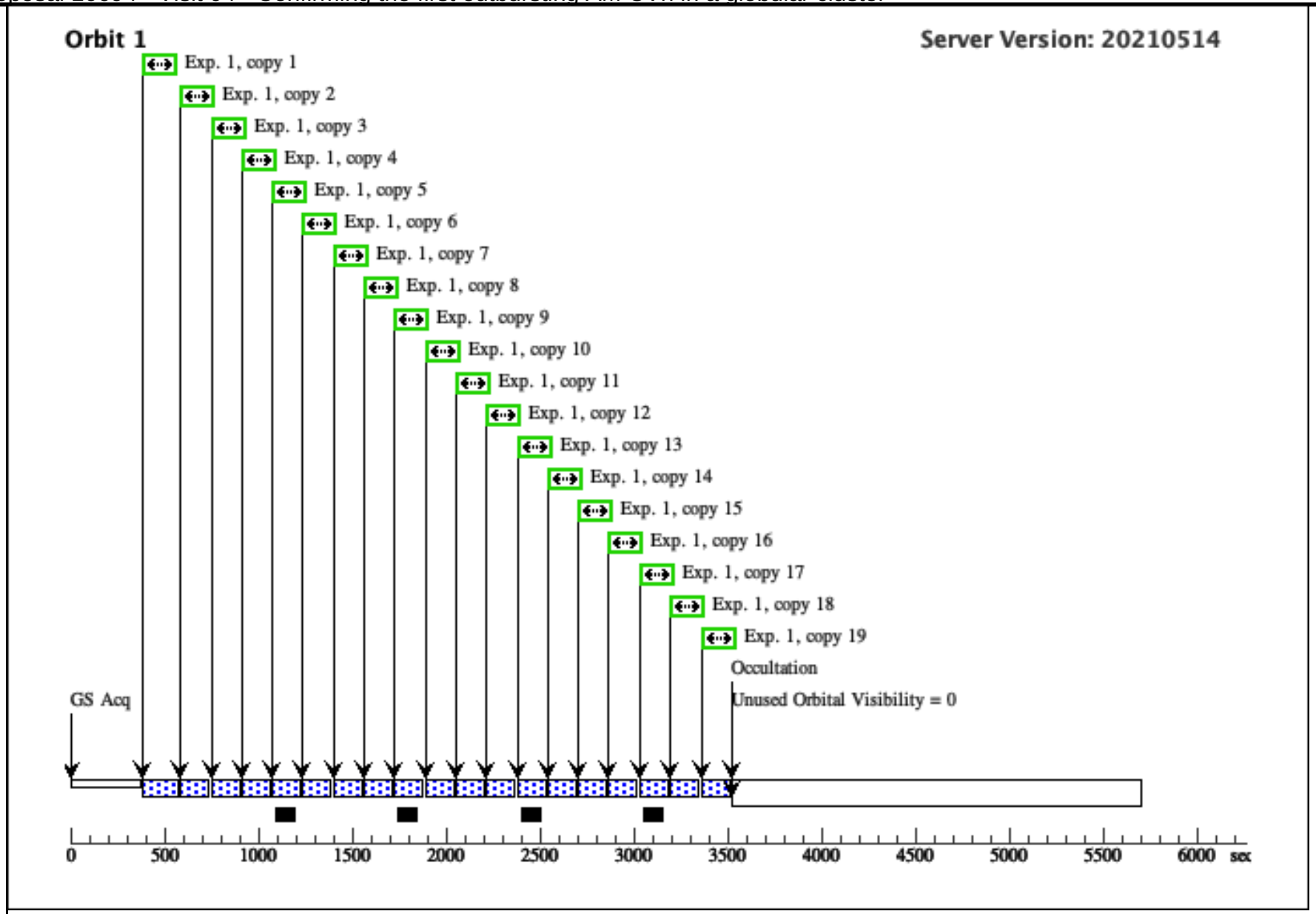
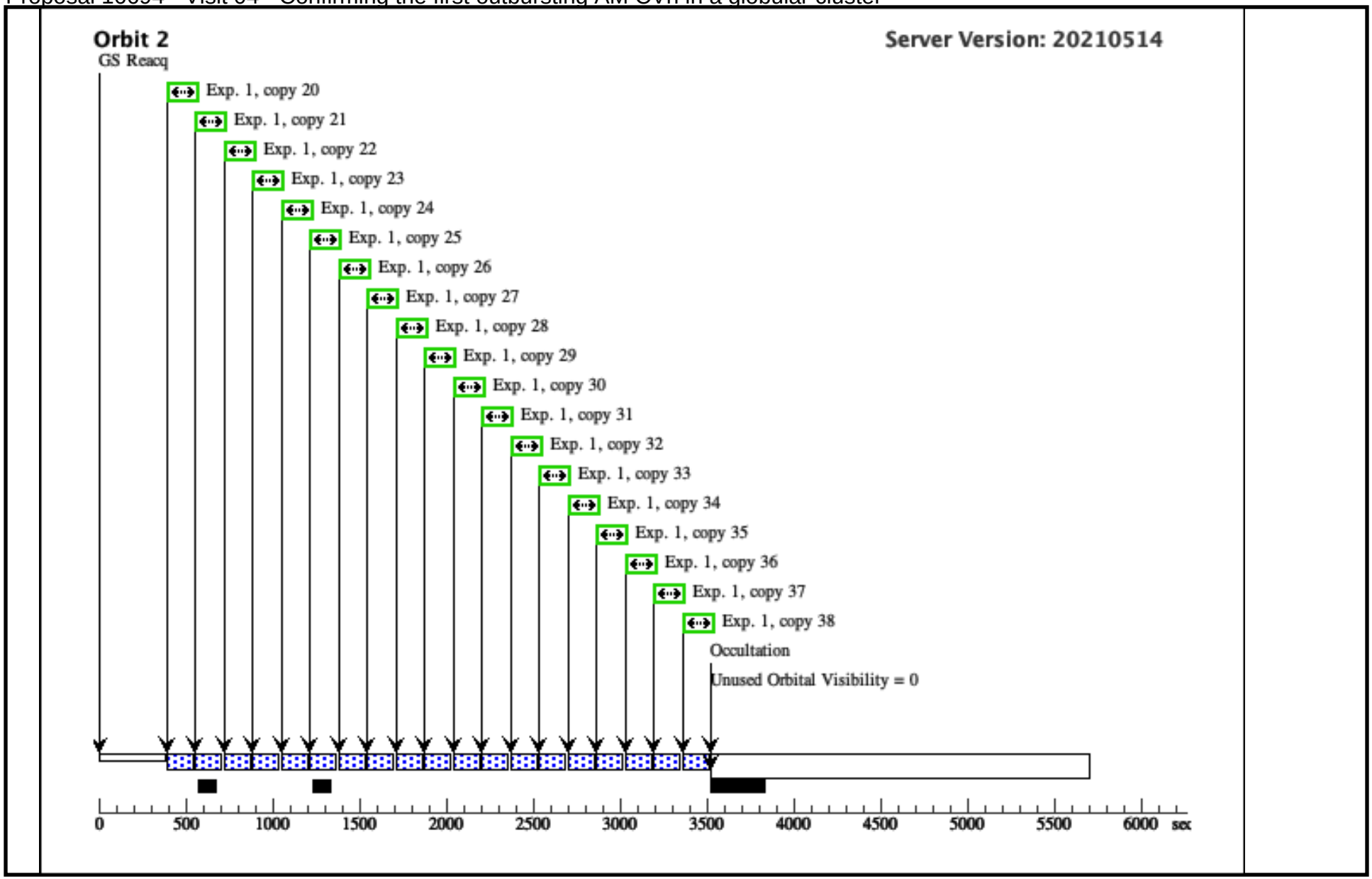
Orbit Structure

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Exp. 1, copy 37
Exp. 1, copy 38
Occultation
Unused Orbital Visibility = 0
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