15154 - Tracing Gas Flows from Halo to Disk: Observing the Milky Way's Galactic Fountain

Cycle: 25, Proposal Category: GO

(UV Initiative)

(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) SDSS-J000302.70-001541.4	COS/FUV	3	06-Dec-2018 06:00:20.0	yes
02	(1) SDSS-J000302.70-001541.4	COS/FUV	2	06-Dec-2018 06:00:22.0	yes
03	(2) SDSS-J002622.16-185031.0	COS/FUV	3	06-Dec-2018 06:00:24.0	yes
04	(2) SDSS-J002622.16-185031.0	COS/FUV	2	06-Dec-2018 06:00:25.0	yes
05	(3) SDSS-J000546.14-042149.0	COS/FUV	3	06-Dec-2018 06:00:27.0	yes
06	(3) SDSS-J000546.14-042149.0	COS/FUV	4	06-Dec-2018 06:00:28.0	yes

17 Total Orbits Used

ABSTRACT

Galactic-scale winds are a common feature of galaxy formation models, and are observed ubiquitously across the star-forming sequence down to ~0.5 Msun/yr. However, empirical constraints on the radial density profile and total spatial extent of these winds have been very challenging to obtain. At the same time, direct empirical evidence is scarce for the flows of gas onto galaxy disks that are critical for maintaining star formation. We have devised a simple experiment using blue horizontal branch (BHB) stars in the halo of the Milky Way that will directly map the location and density of diffuse, ionized gas flows between the Galactic disk and halo. This experiment, initiated in Cycle 23, obtains COS FUV spectra of halo BHB stars that sample a range of scale heights to 13 kpc towards the Northern Galactic pole. In this Cycle, we propose to observe 3 additional BHB stars along the complementary sightline to the South, effectively doubling our sightline sample size and permitting a novel test of the symmetry of gas flows at the disk-halo interface. This program allows us to unambiguously track inflowing and outflowing material from the Milky Way via absorption component blueshifts and redshifts. With BHBs at a range of known distances, we will directly determine changes in the gas density and metal mass as it travels through the disk-halo interface. Our experiment will yield the most detailed constraints on the physical state and energetics of the gas in the Milky Way's Galactic Fountain to date. Such constraints are fundamental to understanding the role of feedback in building the Galactic gaseous halo and the extent to which ongoing gas accretion fuels the ISM.

OBSERVING DESCRIPTION

From Phase I:

We are targeting blue horizontal branch stars in the halo of the Milky Way toward the South Galactic Pole extending 10 kpc into the halo. Our catalog of blue horizontal branch stars comes from Xue et al. (2011), who selected these stars from SDSS DR8 stars with fiber spectra. Halo blue horizontal branch stars are good `beacons' for four primary reasons: (1) they are blue point sources and therefore have bright continua in the optical over the wavelength range of interest; (2) their UV spectra are characterized by a fairly featureless bright continuum with broad Lyman series lines (Brown et al. 2012) because they are quite metal poor; (3) they are approximate ``standard candles'' since their distances can be estimated from multi-band photometry with an accuracy of ~10\% (Deason et al. 2011); and (4) many of them are moving with vradial > 100 km/s which allows us to cleanly separate any absorption features intrinsic to the star from the disk/halo interface gas.

There are three primary requirements that define our Southern sample: (1) The stars must have FUV magnitudes that are bright enough to achieve our required S/N (below) in a reasonable number of orbits (i.e. mFUV < 18.5); (2) The stars must lie at a high absolute galactic latitude (l < -60 deg);

and (3) The heliocentric velocity of the stars must have an absolute value greater than 100 km/s to minimize confusion with any lower-velocity features we hope to detect. Criterion 1 limits us to 126 stars and criterion 2 winnows the group to 8 potential stellar targets; criterion 3 limits us to only 4 potential BHB stars (Figure 1A). Ideally, we would like to span a narrow range of x, y values (coordinates in the 2D plane of the disk) such that we are always probing lines of sight within a kpc of each other in the same layer to minimize variations due to differing locations above the disk. This final criterion is crucial for a direct measure of how the properties of gas outside the disk depend on scale height and allows us to guage whether gas is flowing into or out of the disk directly.Only three Southern BHB stars meet these criteria. We are proposing to observe all three, and Table 1 lists their relevant properties.

To achieve our primary goal of detecting the weak FUV absorption features redshifted or blueshifted with respect to strong Galactic absorption features, we require a S/N of 15 - 20 over our wavelength range, and the highest spectral resolution of COS (G160M) with a central wavelength of 1577 Angstroms. These requirements are to ensure an accurate measurement of this weak component and to avoid blending with the disk of the Milky Way. We expect to detect 15 mA features of CIV 1548 at 3sigma, consistent with previous detections of this transition in the halo of the Milky Way and in our own Cycle 23 data. Assessing the signatures of gas inflow and outflow will require an analysis of the absorption line profiles, using two-component models that include the ISM component of the Galaxy (Rubin et al. 2012). This is another reason we require S/N of at least 15 across our spectral range.

Phase II Observing Strategy:

We are taking COS/FUV spectra of blue horizontal branch stars with G160M centered at 1577 Angstroms. We require only one CENWAVE setting for this experiment since we are targeting specific absorption lines that will not fall near the gap between segments. Because we have coordinates that are accurate to within 0.1", we skip the ACQ/SEARCH step, and acquire the targets with a PEAKXD exposure followed by a PEAKD exposure. The Exposure times for these acquisitions are set by requiring a S/N of 40 for both segments and both types of acquistions, respectively.

Two of our three targets require 5 orbits, and one requires 7 orbits. In general, the buffer times are quite long, and we thus set the buffer time in the exposure manually to be 100 seconds shorter than the target's exposure time. We proceed by attempting to maximize exposure times while keeping to a minimum of four FP-POS settings per visit.

In our final set-up we achieve S/N of between 13 - 22 across our full wavelength range for all of our targets, which is generally in line with the

requirements we outlined in the science case of Phase 1.

Visit

Proposal 15154, BHBS-1 (01), completed Thu Dec 06 11:00:28 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the closest southern BHB at 6.3 kpc. It requires 5 orbits. Per guidelines, and to increase schedulability, I am splitting the 5 orbits into 2 visits -- one of 3 orbits and the other of 2 orbits. both visits will cover all 4 FP-POS and pack the orbits completely with one grating setting and no dither.

Diagnostics

(BHBS-1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(BHBS-1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(BHBS-1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

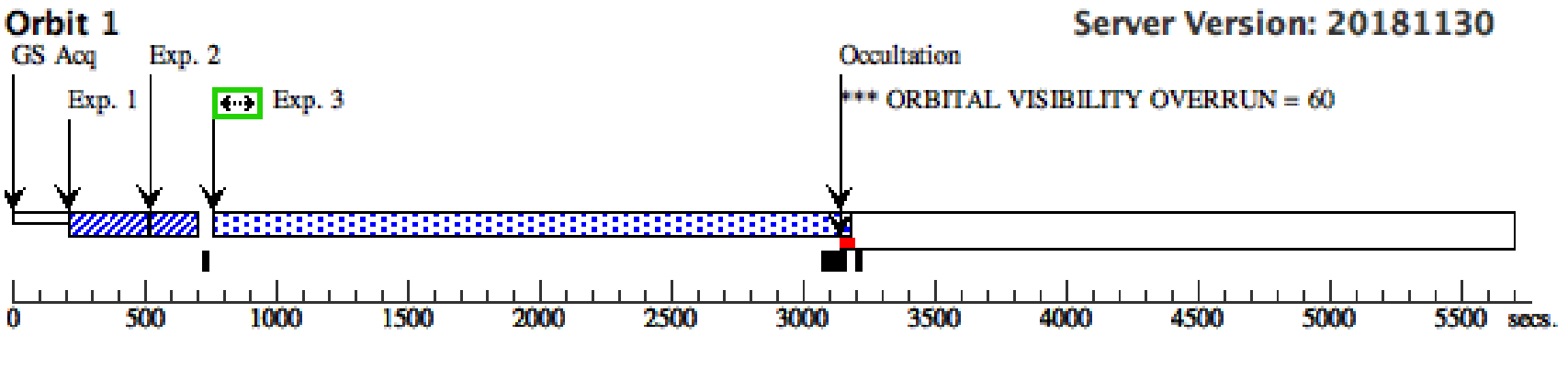
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J000302.70-001541.4	RA: 00 03 2.7050 (.7612708d) Dec: -00 15 41.50 (-.26153d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Epoch of Position: 2000 Radial Velocity: -194 km/sec	V=15.2+/-0.005 FUV =17.89	Reference Frame: ICRS

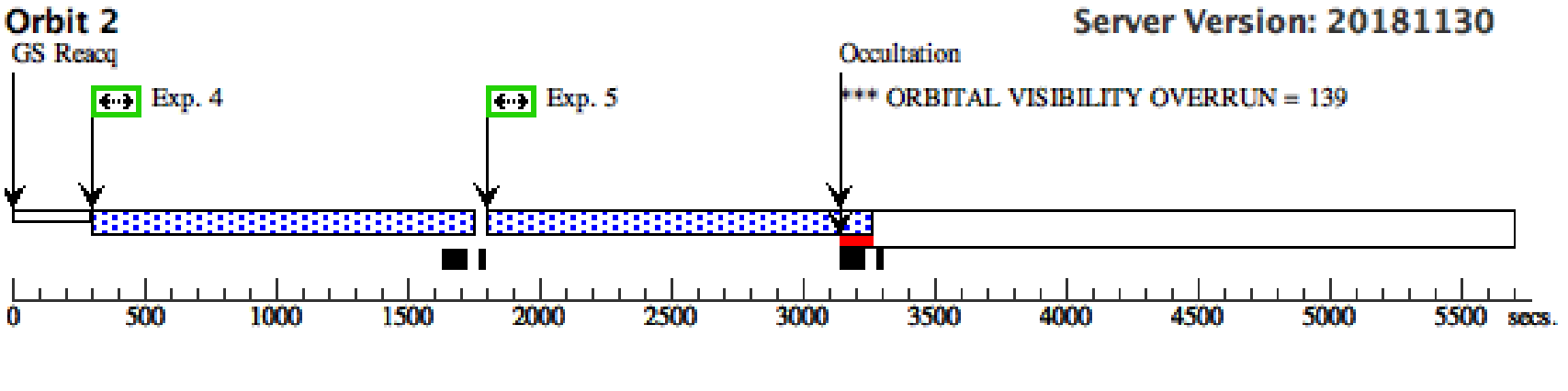
Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

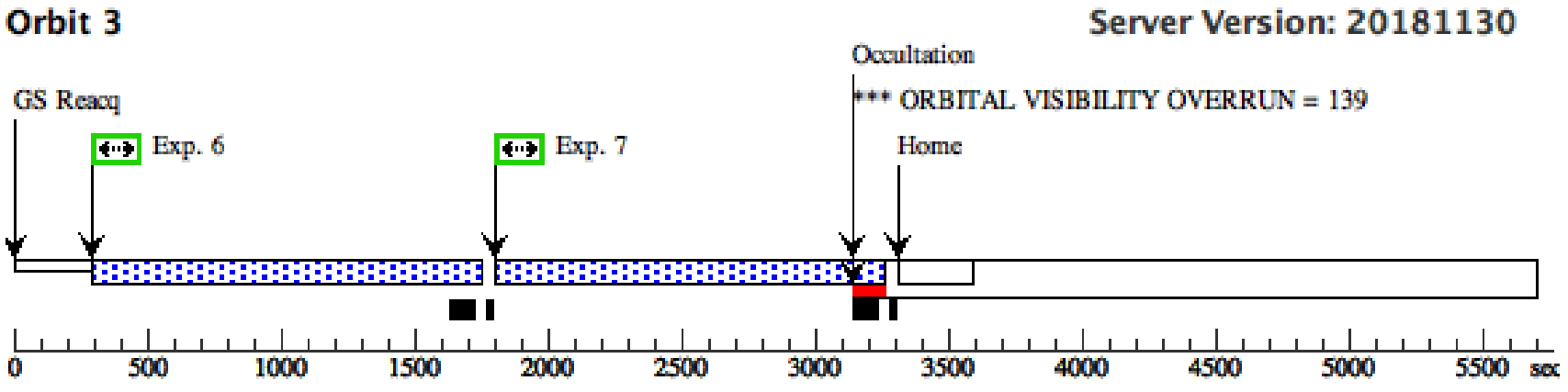
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006212)	(1) SDSS-J000302.70-001541.4	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				30 Secs (30 Secs) *[==>]*	*[1]*
2	(COS.sa.1006212)	(1) SDSS-J000302.70-001541.4	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			30 Secs (30 Secs) *[==>]*	*[1]*
3	(COS.sp.1006231)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2204; FP-POS=1			2304 Secs (2304 Secs) *[==>]*	*[1]*
4	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1300; FP-POS=1			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	*[2]*
5	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1300; FP-POS=2			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	*[2]*
6	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1300; FP-POS=3			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	*[3]*
7	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1300; FP-POS=4			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	*[3]*

Orbit Structure







Visit

Proposal 15154, BHBS-1 (02), completed Thu Dec 06 11:00:29 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the second visit on BHBS-1 target. Only 2 orbits. Will hit all 4 FP-POS in 2 orbits.

Diagnostics

(BHBS-1 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(BHBS-1 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

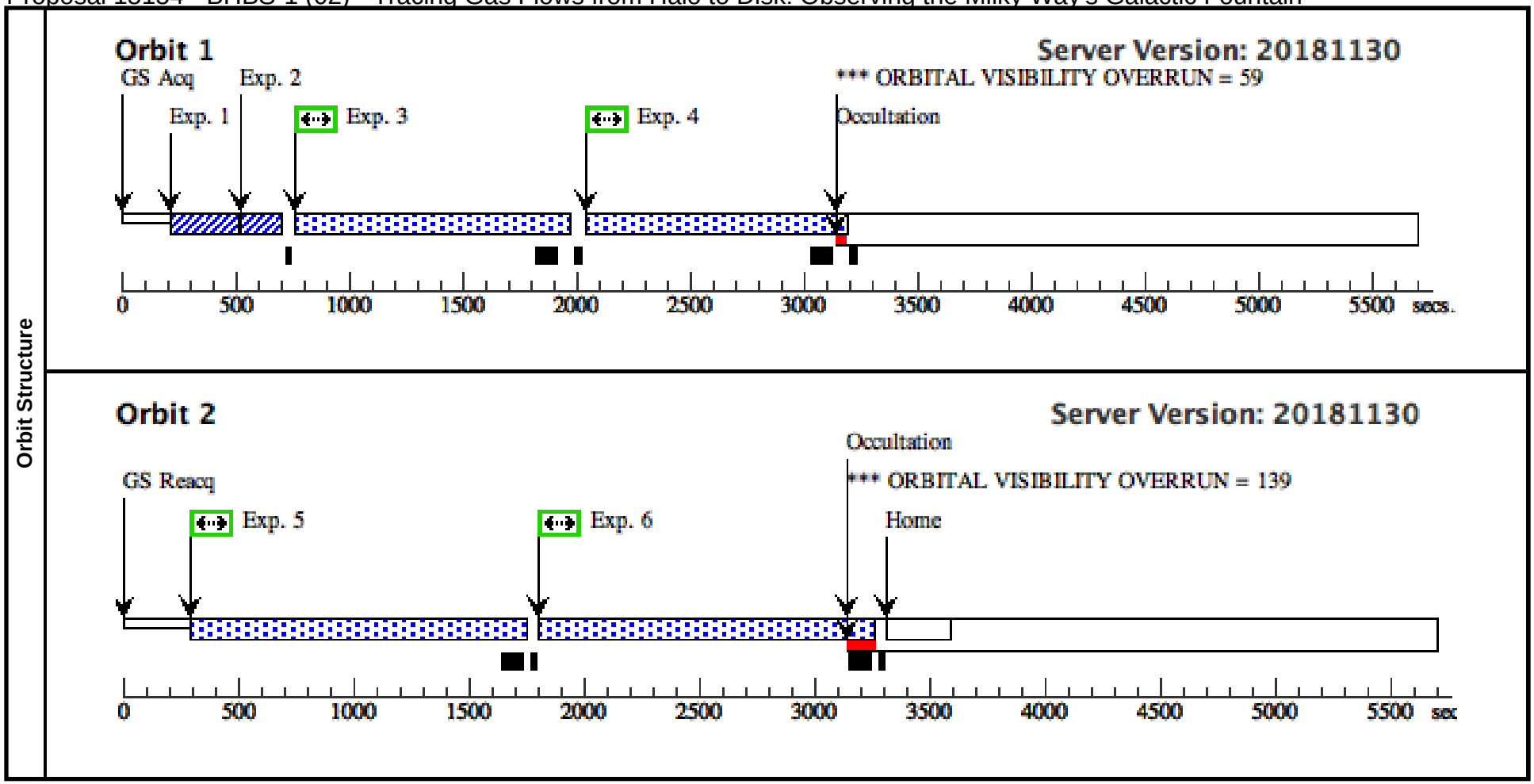
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J000302.70-001541.4	RA: 00 03 2.7050 (.7612708d) Dec: -00 15 41.50 (-.26153d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Epoch of Position: 2000 Radial Velocity: -194 km/sec	V=15.2+/-0.005 FUV =17.89	Reference Frame: ICRS

Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006212)	(1) SDSS-J000302.70-001541.4	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				30 Secs (30 Secs) *[==>]*	***[1]***
2	(COS.sa.1006212)	(1) SDSS-J000302.70-001541.4	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			30 Secs (30 Secs) *[==>]*	***[1]***
3	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=956; FP-POS=1			1000 Secs (1094 Secs) *[==>1094.0 Secs]*	***[1]***
4	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=956; FP-POS=2			1000 Secs (1094 Secs) *[==>1094.0 Secs]*	***[1]***
5	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1305; FP-POS=3			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	***[2]***
6	(COS.sp.1006232)	(1) SDSS-J000302.70-001541.4	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1305; FP-POS=4			1400 Secs (1405 Secs) *[==>1405.0 Secs]*	***[2]***


Orbit Structure
Orbit 1
Server Version: 20181130
GS Acq
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 59
Exp. 1
Exp. 3
Exp. 4
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 2
Server Version: 20181130
Occultation
GS Reacq
*** ORBITAL VISIBILITY OVERRUN = 139
Exp. 5
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15154, BHBS-2 (03), implementation Thu Dec 06 11:00:29 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the second-closest southern BHB at 7.0 kpc. It requires 5 orbit, just like the first one. Per guidelines, and to increase schedulability, I am splitting the 5 orbits into 2 visits -- one of 3 orbits and the other of 2 orbits. both visits will cover all 4 FP-POS and pack the orbits completely with one grating setting and no dither.

Fixed Targets

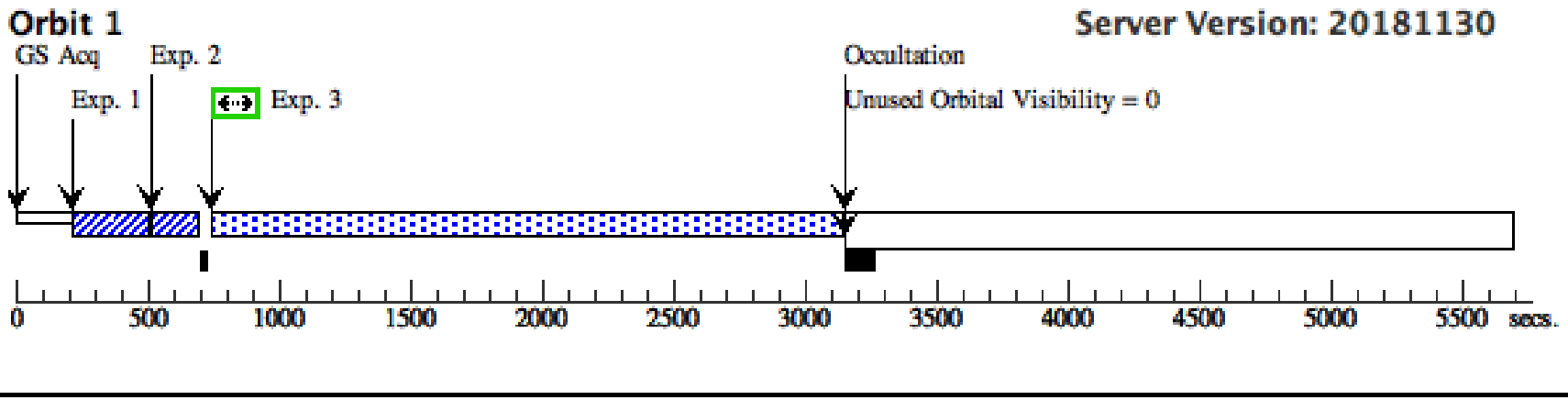
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSS-J002622.16-185031.0	RA: 00 26 22.1530 (6.5923042d) Dec: -18 50 31.02 (-18.84195d) Equinox: J2000	Epoch of Position: 2000 Radial Velocity: -174 km/sec	V=15.1+/-0.003 FUV = 17.8	Reference Frame: ICRS

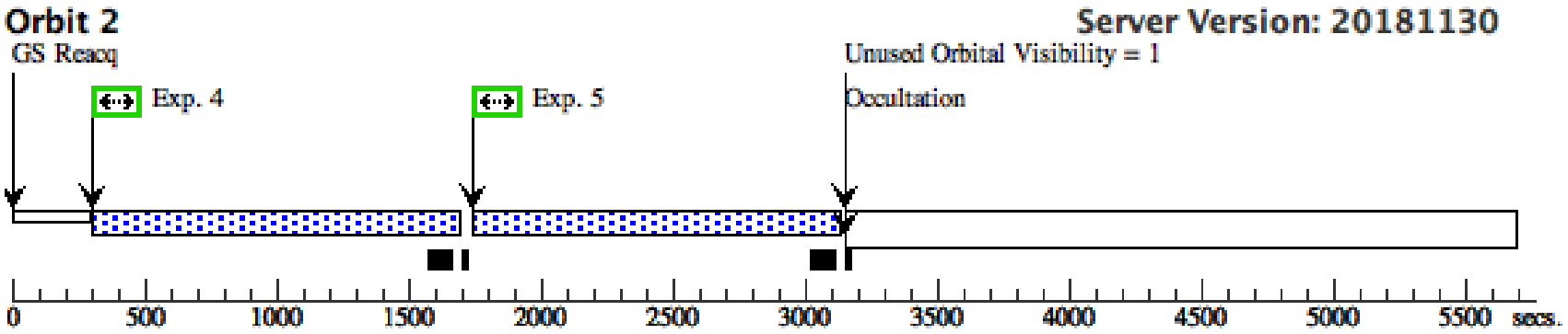
Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

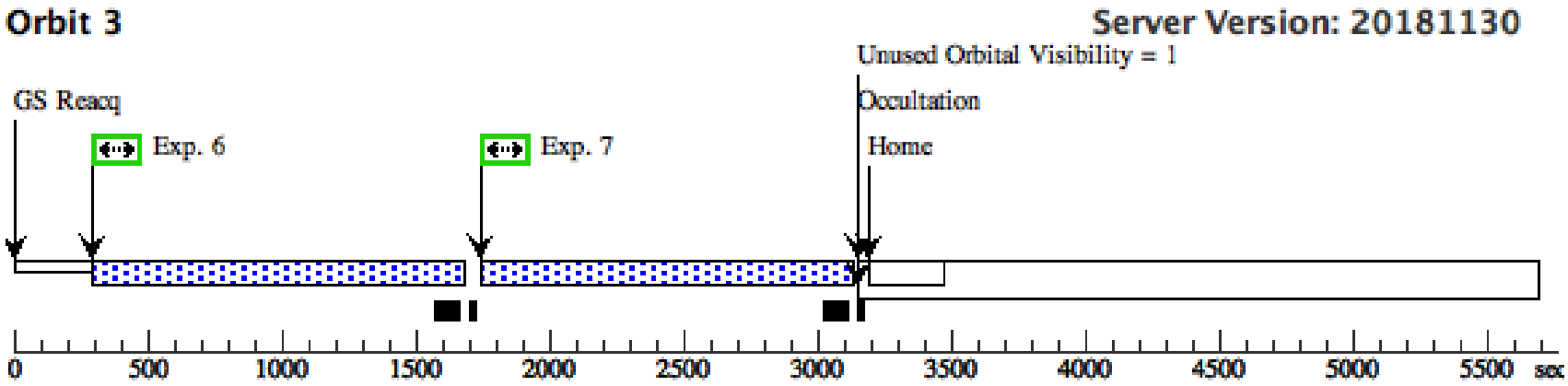
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006240)	(2) SDSS-J002622.16-185031.0	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				27 Secs (27 Secs) *[==>]*	*[1]*
2	(COS.sa.1006240)	(2) SDSS-J002622.16-185031.0	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			27 Secs (27 Secs) *[==>]*	*[1]*
3	(COS.sp.1006241)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2218; FP-POS=1			2304 Secs (2276 Secs) *[==>2276.0 Secs]*	*[1]*
4	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=1			1400 Secs (1342 Secs) *[==>1342.0 Secs]*	*[2]*
5	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=2			1400 Secs (1342 Secs) *[==>1342.0 Secs]*	*[2]*
6	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=3			1400 Secs (1342 Secs) *[==>1342.0 Secs]*	*[3]*
7	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=4			1400 Secs (1342 Secs) *[==>1342.0 Secs]*	*[3]*

Orbit Structure







Visit

Proposal 15154, BHBS-2 (04), scheduled Thu Dec 06 11:00:29 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the second visit on BHBS-2 target. Only 2 orbits. Will hit all 4 FP-POS in 2 orbits.

Diagnostics

(BHBS-2 (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(BHBS-2 (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

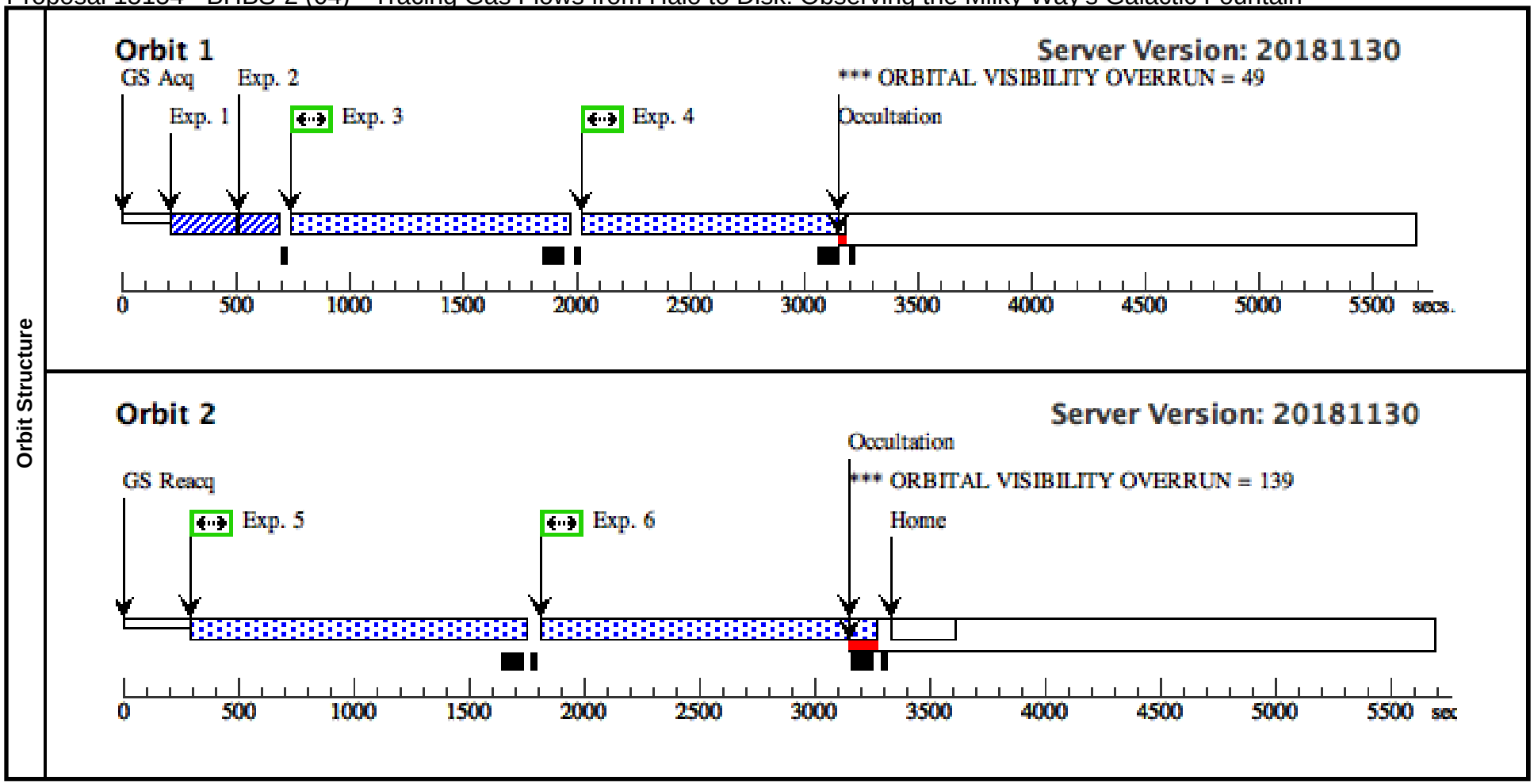
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSS-J002622.16-185031.0	RA: 00 26 22.1530 (6.5923042d) Dec: -18 50 31.02 (-18.84195d) Equinox: J2000	Epoch of Position: 2000 Radial Velocity: -174 km/sec	V=15.1+/-0.003 FUV = 17.8	Reference Frame: ICRS

Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006240)	(2) SDSS-J002622.16-185031.0	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				27 Secs (27 Secs) *[==>]*	***[1]***
2	(COS.sa.1006240)	(2) SDSS-J002622.16-185031.0	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			27 Secs (27 Secs) *[==>]*	***[1]***
3	(COS.sp.1006243)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1001; FP-POS=1			1000 Secs (1110 Secs) *[==>1110.0 Secs]*	***[1]***
4	(COS.sp.1006243)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1001; FP-POS=2			1000 Secs (1110 Secs) *[==>1110.0 Secs]*	***[1]***
5	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1312; FP-POS=3			1400 Secs (1412 Secs) *[==>1412.0 Secs]*	***[2]***
6	(COS.sp.1006242)	(2) SDSS-J002622.16-185031.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1312; FP-POS=4			1400 Secs (1412 Secs) *[==>1412.0 Secs]*	***[2]***


Orbit Structure
Orbit 1
Server Version: 20181130
GS Acq
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 49
Exp. 1
Exp. 3
Exp. 4
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 2
Server Version: 20181130
Occultation
GS Reacq
*** ORBITAL VISIBILITY OVERRUN = 139
Exp. 5
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15154, BHBS-3 (05), implementation Thu Dec 06 11:00:29 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the third (and last) southern BHB at 10.0 kpc. It requires 7 orbits. I am splitting the 7 orbits into 2 visits -- one of 3 orbits and the other of 4 orbits. This gives better S/N and better achieves our goals than a 3-2-2 scenario. Both visits will cover all 4 FP-POS and pack the orbits completely with one grating setting and no dither.

Fixed Targets

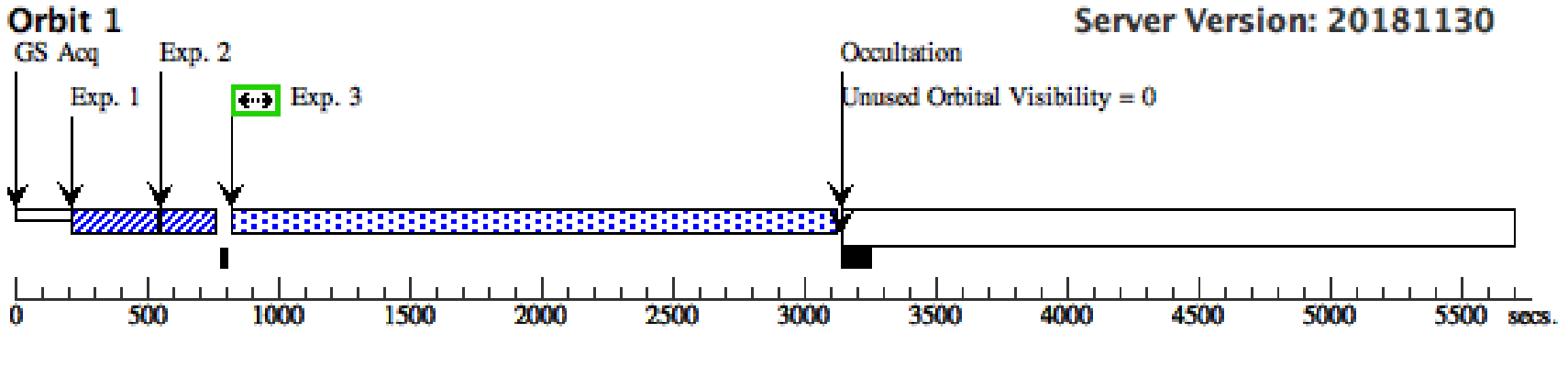
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSS-J000546.14-042149.0	RA: 00 05 46.1400 (1.4422500d) Dec: -04 21 49.00 (-4.36361d) Equinox: J2000	Radial Velocity: -190 km/sec	V=15.90+/-0.004 FUV = 18.19	Reference Frame: ICRS

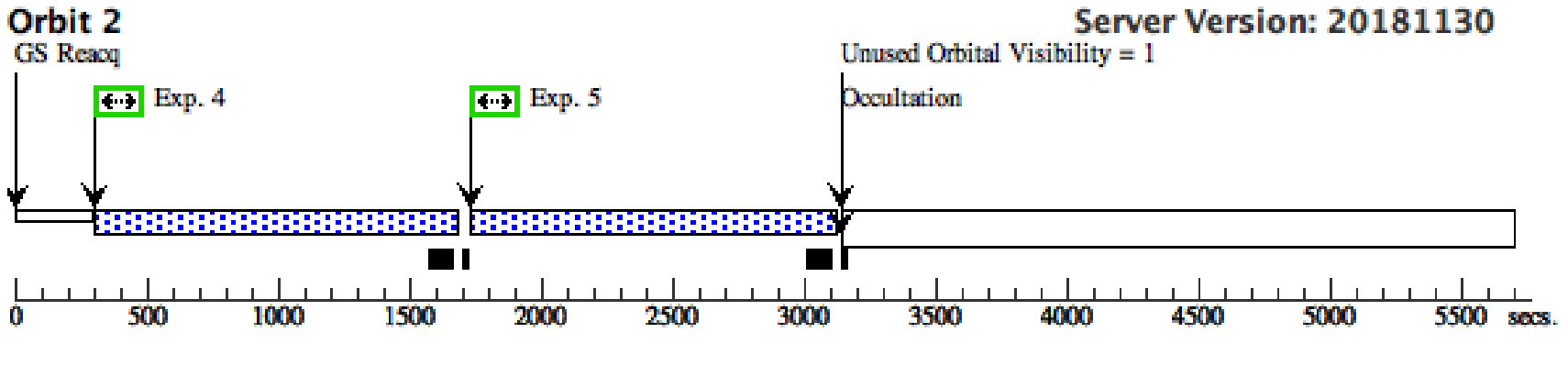
Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

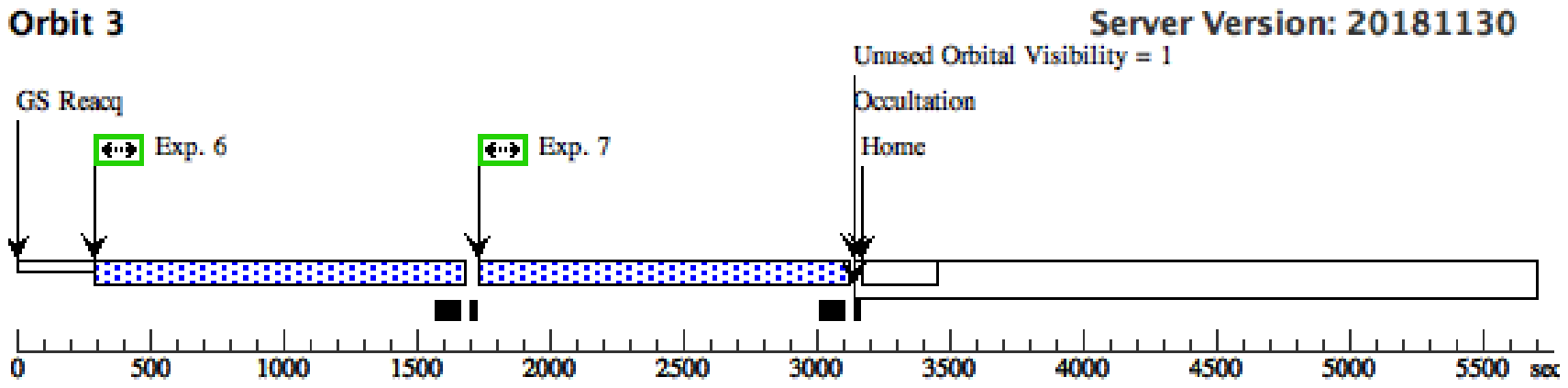
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006251)	(3) SDSS-J000546.14-042149.0	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				40 Secs (40 Secs) *[==>]*	*[1]*
2	(COS.sa.1006251)	(3) SDSS-J000546.14-042149.0	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			40 Secs (40 Secs) *[==>]*	*[1]*
3	(COS.sp.1006260)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2144; FP-POS=1			2150 Secs (2184 Secs) *[==>2184.0 Secs]*	*[1]*
4	(COS.sp.1006259)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=1			1300 Secs (1335 Secs) *[==>1335.0 Secs]*	*[2]*
5	(COS.sp.1006259)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=2			1300 Secs (1335 Secs) *[==>1335.0 Secs]*	*[2]*
6	(COS.sp.1006259)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=3			1300 Secs (1335 Secs) *[==>1335.0 Secs]*	*[3]*
7	(COS.sp.1006259)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1240; FP-POS=4			1300 Secs (1335 Secs) *[==>1335.0 Secs]*	*[3]*

Orbit Structure







Visit

Proposal 15154, BHBS-3 (06), implementation Thu Dec 06 11:00:29 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: (none)

Comments: This is the third (and last) southern BHB at 10.0 kpc. It requires 7 orbits. I am splitting the 7 orbits into 2 visits -- one of 3 orbits and the other of 4 orbits. This gives better S/N and better achieves our goals than a 3-2-2 scenario. Both visits will cover all 4 FP-POS and pack the orbits completely with one grating setting and no dither.
This is the second visit of 4 orbits.

Fixed Targets

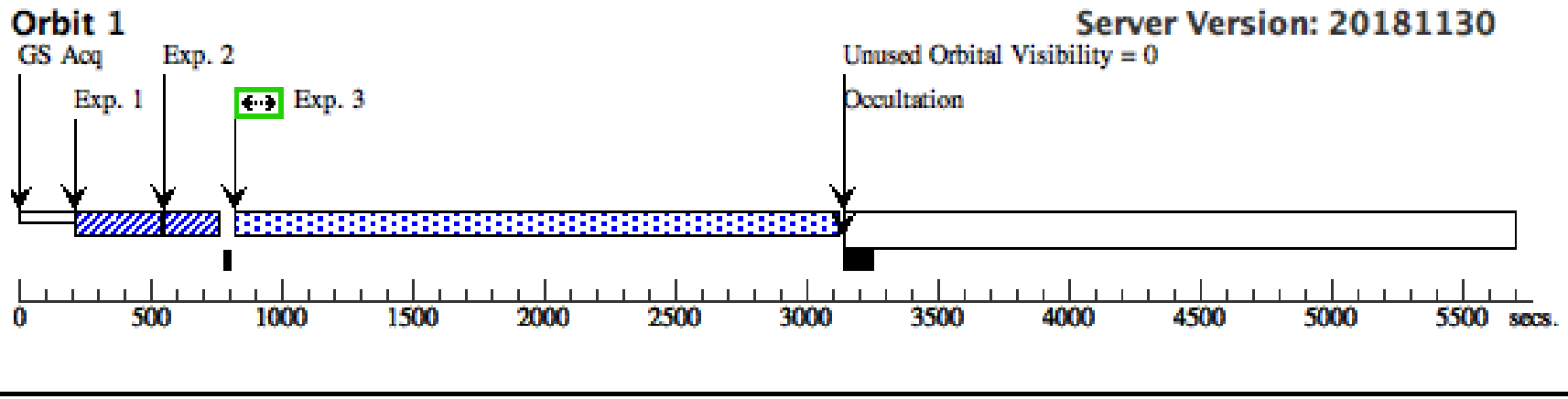
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSS-J000546.14-042149.0	RA: 00 05 46.1400 (1.4422500d) Dec: -04 21 49.00 (-4.36361d) Equinox: J2000	Radial Velocity: -190 km/sec	V=15.90+/-0.004 FUV = 18.19	Reference Frame: ICRS

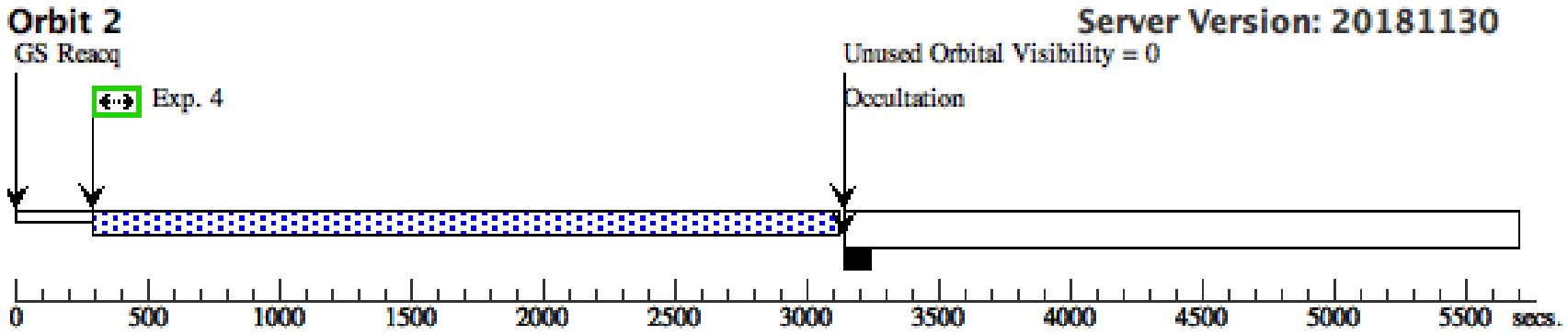
Comments:
Category=STAR
Description=[A0-A3 III-I, HORIZONTAL BRANCH STAR]
Extended=NO

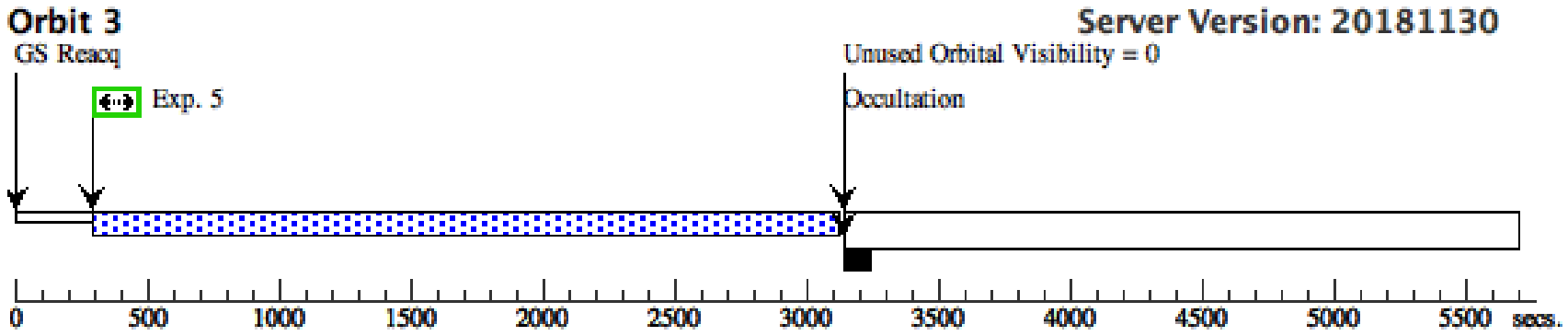
Exposures

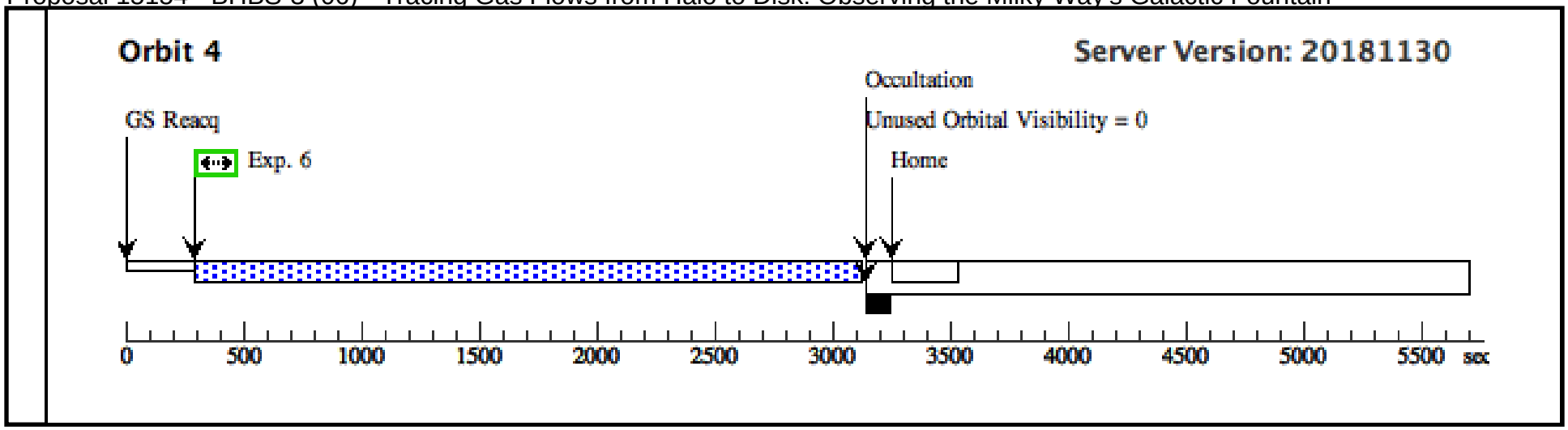
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.1006251)	(3) SDSS-J000546.14-042149.0	COS/FUV, ACQ/PEAKXD, PSA	G160M 1577 A				40 Secs (40 Secs) *[==>]*	 ***[1]***
2	(COS.sa.1006251)	(3) SDSS-J000546.14-042149.0	COS/FUV, ACQ/PEAKD, PSA	G160M 1577 A	STEP-SIZE=1.3; CENTER=FLUX-WT; NUM-POS=3			40 Secs (40 Secs) *[==>]*	 ***[1]***
3	(COS.sp.1006260)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2144; FP-POS=1			2150 Secs (2184 Secs) *[==>2184.0 Secs]*	 ***[1]***
4	(COS.sp.1006261)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2816; FP-POS=2			2900 Secs (2776 Secs) *[==>2776.0 Secs]*	 ***[2]***
5	(COS.sp.1006261)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2816; FP-POS=3			2900 Secs (2776 Secs) *[==>2776.0 Secs]*	 ***[3]***
6	(COS.sp.1006261)	(3) SDSS-J000546.14-042149.0	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2816; FP-POS=4			2900 Secs (2776 Secs) *[==>2776.0 Secs]*	 ***[4]***

Orbit Structure





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