15412 - Observing the final part of the beta Pic Hill Sphere Transit in the far-UV

Cycle: 25, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Paul A. Wilson (PI) (ESA Member) (Contact)	**Universiteit Leiden**	**paw@strw.leidenuniv.nl**
Dr. Alain Lecavelier des Etangs (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	lecaveli@iap.fr
Dr. Alfred Vidal-Madjar (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	vidalmadjar@iap.fr
Dr. Carlo F. Manara (CoI) (ESA Member)	European Southern Observatory - Germany	cmanara@eso.org
Dr. Ernst de Mooij (CoI) (ESA Member)	Dublin City University	ernst.demooij@dcu.ie
Mr. Jason J. Wang (CoI) (AdminUSPI)	University of California - Berkeley	jwang@astro.berkeley.edu
Dr. Flavien Kiefer (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	flavien.kiefer@iap.fr
Dr. Paul George Kalas (CoI)	University of California - Berkeley	kalas@berkeley.edu
Dr. Ignas Snellen (CoI) (ESA Member)	Universiteit Leiden	snellen@strw.leidenuniv.nl
Mr. Blaine Lomberg (CoI)	South African Astronomical Observatory	blaine@saao.ac.za

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) -BET-PIC	COS/FUV	3	04-Jan-2018 21:00:36.0	yes
02	(1) -BET-PIC	COS/FUV	3	04-Jan-2018 21:00:39.0	yes

6 Total Orbits Used

ABSTRACT

The Hill sphere of the directly-imaged planet Beta Pic b is currently transiting its host-star, Beta Pic. During this event, material in the Hill sphere (e.g. left-over debris from planet formation, rings, gas torus around satellites, etc.) could transit the star. With Cycle 24 HST/COS observations which probed the first half of the Hill sphere transit from April to August 2017, we detected a significant flux decrease in the blue and red wings of the HI Ly-alpha emission line and the 1334.53 CII absorption line. This is consistent with the first ever detection of an extended envelope of hydrogen and carbon surrounding Beta Pic b. With the upcoming Director's Discretionary Program #15396 we will observe the second half of the Hill sphere transit.

We propose to monitor the final part of the Hill sphere transit (the expected trailing Hill sphere gas) and post-transit baseline (for Hill sphere transit verification), using the same instrument setup and observation strategy. As with the previous 2017 observations, we will again use the "Airglow Virtual Motion" technique, which is an extremely powerful technique to observe Lyman-alpha with COS. This is a very unique opportunity to monitor the transit of the environment of a ~20 million years old young planet that has been directly imaged orbiting a 4th magnitude star; the next such transit will not happen again for another 22 years. The aims for this proposal are to 1) obtain a post-transit baseline for transit verification 2) probe the shape and the dynamics of the gas trailing the Hill sphere, and 3) probe the composition of the gas trailing the Hill sphere.

OBSERVING DESCRIPTION

We have a total of two visits scheduled. Each visit consists of three orbits. Each visit has an identical observing strategy.

For each visit:
Orbit 1: Observe target centered in the aperture
Orbit 2: The target (Beta Pictoris) is to be offset -1.1 arcseconds in the dispersion direction
Orbit 3: The target (Beta Pictoris) is to be offset +1.1 arcseconds in the dispersion direction

The 1.1 arcsecond offsets shifts are important for the detection of hydrogen, nitrogen and oxygen which are all affected by airglow contamination. An increase in the off-axis target distance along the dispersion axis effectively shifts the line emission feature in wavelength relative to the airglow emission.

Proposal 15412 - Visit 1 (01) - Observing the final part of the beta Pic Hill Sphere Transit in the far-UV

Visit

Proposal 15412, Visit 1 (01), implementation Fri Jan 05 02:00:40 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: BETWEEN 04-MAR-2018:00:00:00 AND 01-APR-2018:23:59:00

Comments: Orbit 1: Observe target centered in the aperture
Orbit 2: The target (Beta Pictoris) is to be offset -1.1 arcseconds in the dispersion direction
Orbit 3: The target (Beta Pictoris) is to be offset +1.1 arcseconds in the dispersion direction

Diagnostics

(Visit 1 (01)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

(Visit 1 (01)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	-BET-PIC	RA: 05 47 17.0877 (86.8211988d) Dec: -51 03 59.44 (-51.06651d) Equinox: J2000	Proper Motion RA: 4.65 mas/yr Proper Motion Dec: 83.10 mas/yr Parallax: 0.051" Epoch of Position: 2000	V=3.861	Reference Frame: ICRS

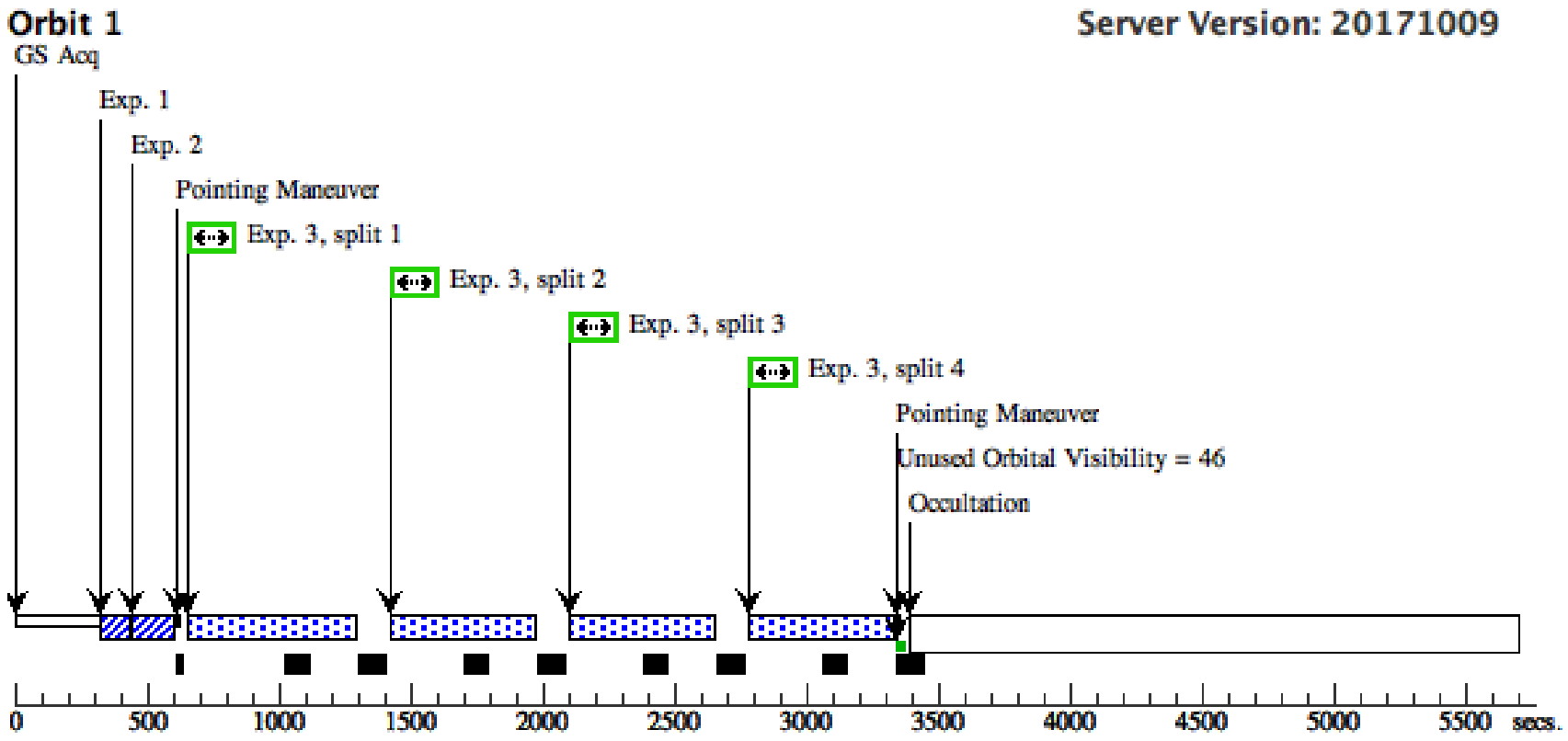
Comments:
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, EXTRA-SOLAR PLANET]
Extended=NO

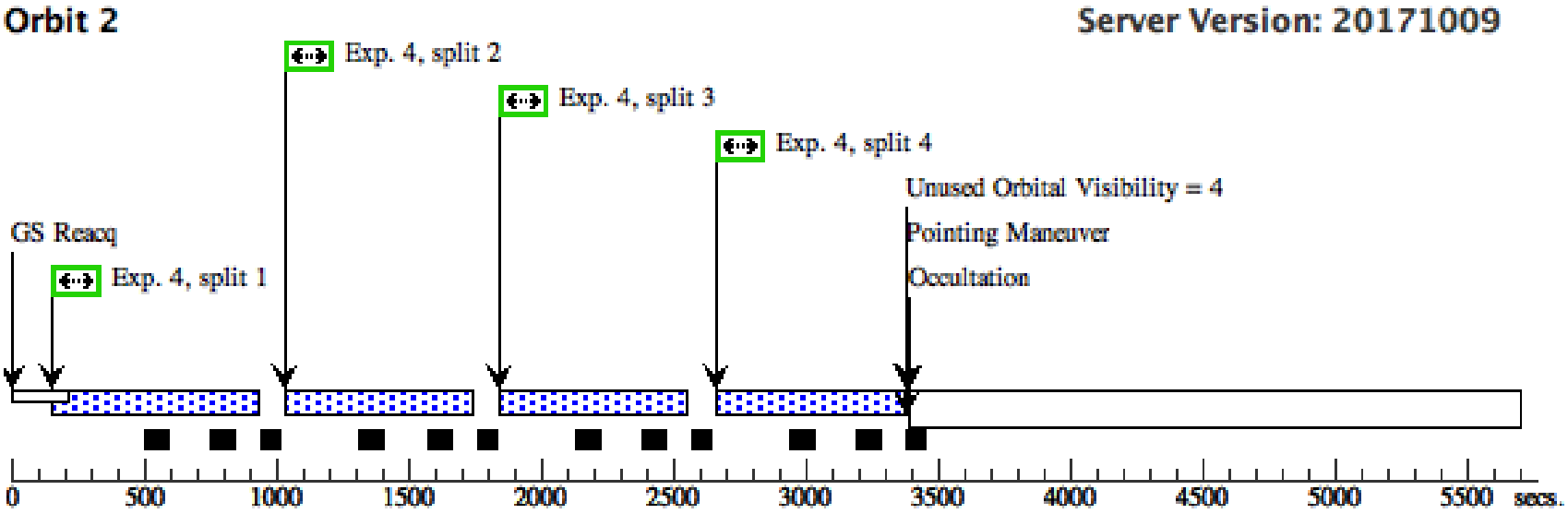
Proposal 15412 - Visit 1 (01) - Observing the final part of the beta Pic Hill Sphere Transit in the far-UV

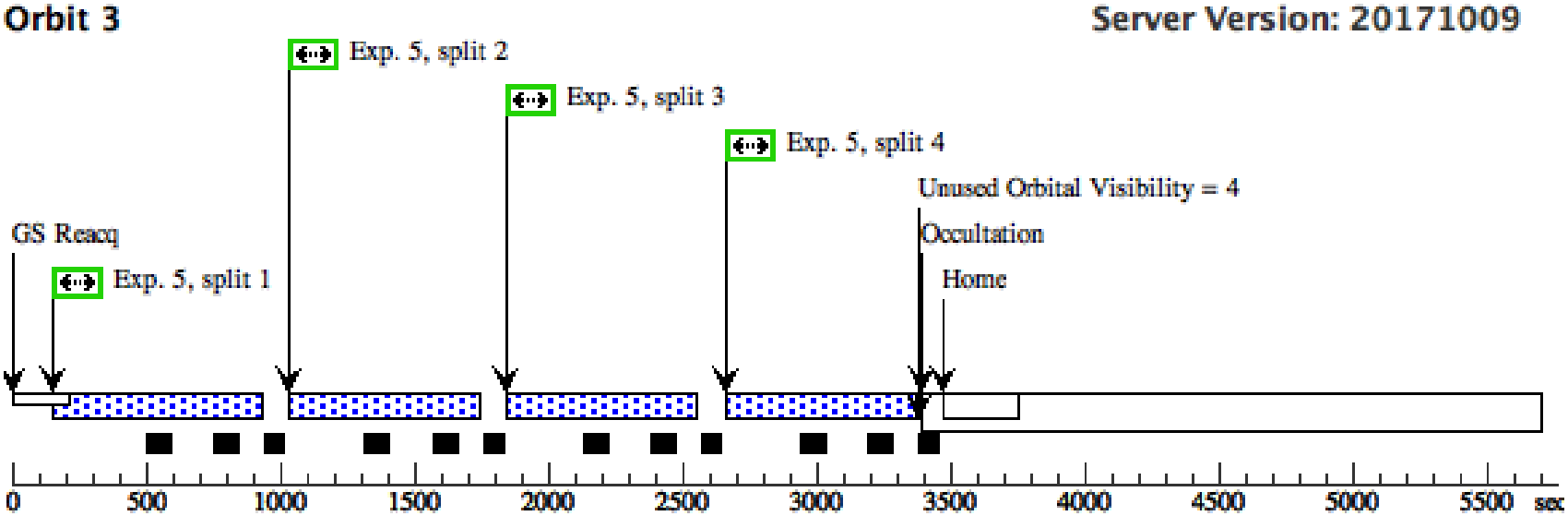
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Positioning (COS.sa.729672)	(1) -BET-PIC	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A	LIFETIME-POS=LP4; SEGMENT=BOTH		Sequence 1-3 Non-Int in Visit 1 (01)	1.4 Secs (1.4 Secs) *[==>]*	***[1]***
2	Max-Light (COS.sa.729672)	(1) -BET-PIC	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	CENTER=DEF; NUM-POS=5; STEP-SIZE=0.9; LIFETIME-POS=LP4		Sequence 1-3 Non-Int in Visit 1 (01)	1.4 Secs (1.4 Secs) *[==>]*	***[1]***
3	Center (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=250; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3		Sequence 1-3 Non-Int in Visit 1 (01)	534 Secs (1996 Secs) *[==>499.0 Secs (Split 1)]* *[==>499.0 Secs (Split 2)]* *[==>499.0 Secs (Split 3)]* *[==>499.0 Secs (Split 4)]*	***[1]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									
4	Blueward-1.1arcsec (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=250; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3	POS TARG -1.1,null	Sequence 4-4 Non-Int in Visit 1 (01)	534 Secs (2644 Secs) *[==>661.0 Secs (Split 1)]* *[==>661.0 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]* *[==>661.0 Secs (Split 4)]*	***[2]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									
5	Redward+1.1arcsec (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=250; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3	POS TARG 1.1,null	Sequence 5-5 Non-Int in Visit 1 (01)	534 Secs (2644 Secs) *[==>661.0 Secs (Split 1)]* *[==>661.0 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]* *[==>661.0 Secs (Split 4)]*	***[3]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									

Orbit Structure




Orbit 2
Server Version: 20171009
Exp. 4, split 2
Exp. 4, split 3
Exp. 4, split 4
Unused Orbital Visibility = 4
GS Reacq
Pointing Maneuver
Exp. 4, split 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20171009
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Unused Orbital Visibility = 4
GS Reacq
Occultation
Exp. 5, split 1
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 15412 - Visit 2 (02) - Observing the final part of the beta Pic Hill Sphere Transit in the far-UV

Visit

Proposal 15412, Visit 2 (02), implementation Fri Jan 05 02:00:41 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: BETWEEN 05-MAY-2018:00:00:00 AND 15-JUL-2018:23:59:00

Comments: Orbit 1: Observe target centered in the aperture
Orbit 2: The target (Beta Pictoris) is to be offset -1.1 arcseconds in the dispersion direction
Orbit 3: The target (Beta Pictoris) is to be offset +1.1 arcseconds in the dispersion direction

Diagnostics

(Visit 2 (02)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

(Visit 2 (02)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

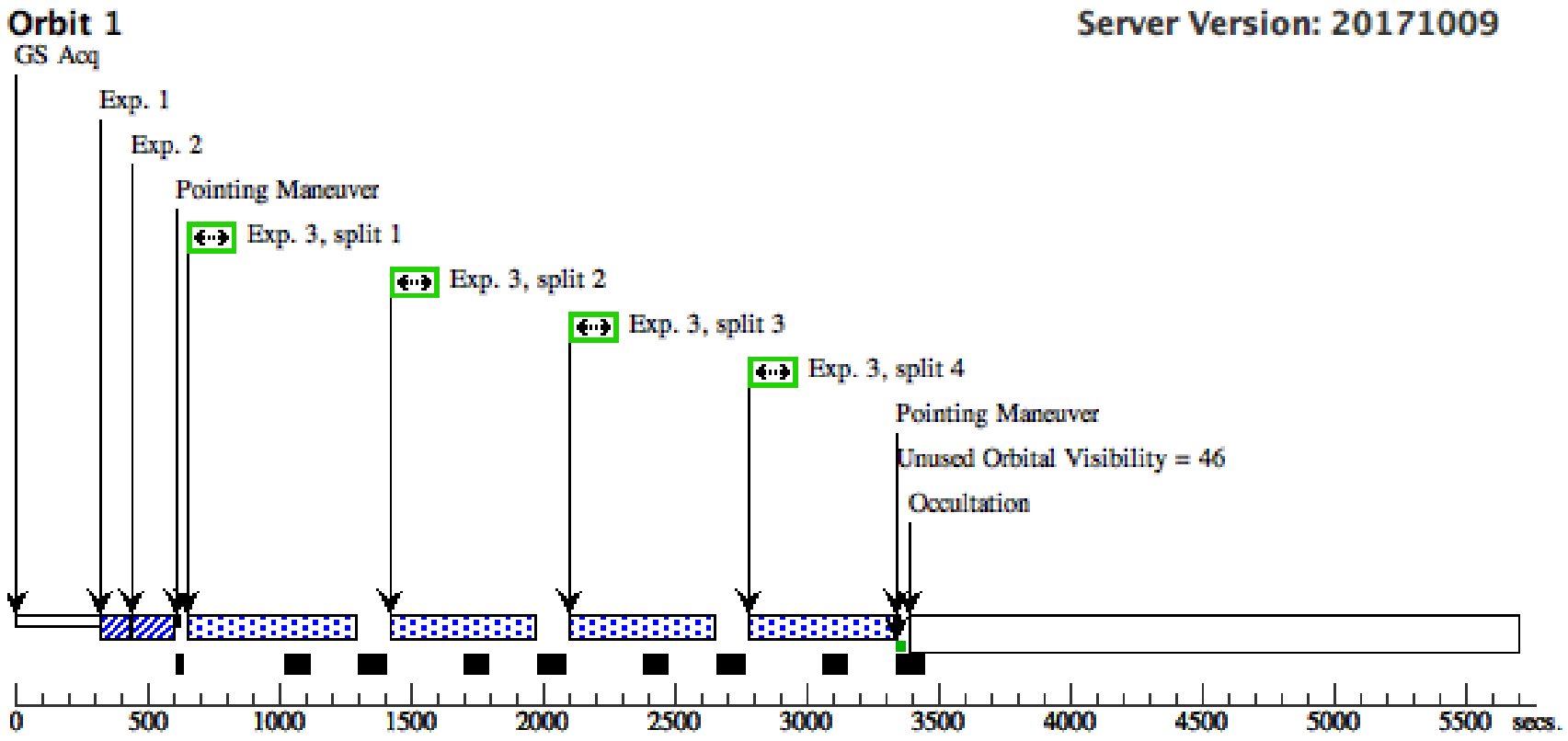
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	-BET-PIC	RA: 05 47 17.0877 (86.8211988d) Dec: -51 03 59.44 (-51.06651d) Equinox: J2000	Proper Motion RA: 4.65 mas/yr Proper Motion Dec: 83.10 mas/yr Parallax: 0.051" Epoch of Position: 2000	V=3.861	Reference Frame: ICRS

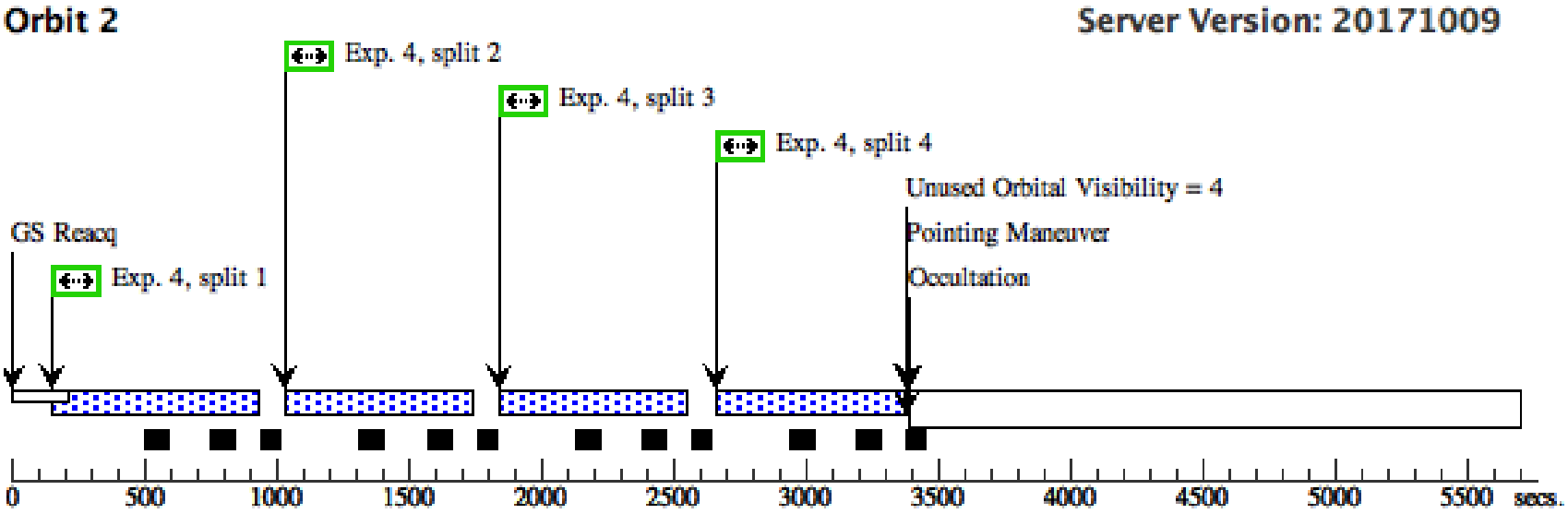
Comments:
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, EXTRA-SOLAR PLANET]
Extended=NO

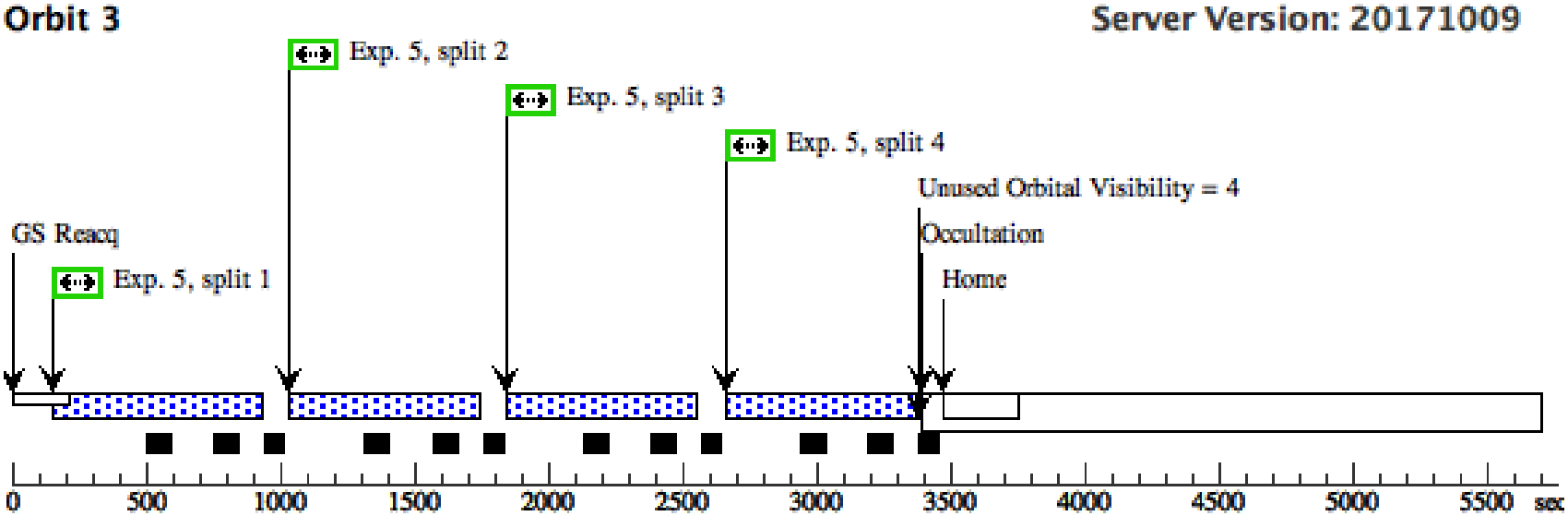
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Positioning (COS.sa.729672)	(1) -BET-PIC	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A	LIFETIME-POS=LP4; SEGMENT=BOTH		Sequence 1-3 Non-Int in Visit 2 (02)	1.4 Secs (1.4 Secs) *[==>]*	***[1]***
2	Max-Light (COS.sa.729672)	(1) -BET-PIC	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	CENTER=DEF; NUM-POS=5; STEP-SIZE=0.9; LIFETIME-POS=LP4		Sequence 1-3 Non-Int in Visit 2 (02)	1.4 Secs (1.4 Secs) *[==>]*	***[1]***
3	Center (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=2500; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3		Sequence 1-3 Non-Int in Visit 2 (02)	534 Secs (1996 Secs) *[==>499.0 Secs (Split 1)]* *[==>499.0 Secs (Split 2)]* *[==>499.0 Secs (Split 3)]* *[==>499.0 Secs (Split 4)]*	***[1]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									
4	Blueward-1.1arcsec (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=2500; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3	POS TARG -1.1,null	Sequence 4-4 Non-Int in Visit 2 (02)	534 Secs (2644 Secs) *[==>661.0 Secs (Split 1)]* *[==>661.0 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]* *[==>661.0 Secs (Split 4)]*	***[2]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									
5	Redward+1.1arcsec (COS.sp.848182)	(1) -BET-PIC	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=2500; FLASH=YES; FP-POS=ALL; LIFETIME-POS=LP3	POS TARG 1.1,null	Sequence 5-5 Non-Int in Visit 2 (02)	534 Secs (2644 Secs) *[==>661.0 Secs (Split 1)]* *[==>661.0 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]* *[==>661.0 Secs (Split 4)]*	***[3]***
Comments: The strength of the Stellar Lyman-alpha line has been set to an conservative upper limit to calculate the Buffer-time and check the Bright Objects Limit (FWHM=5 Angstrom, Flux=1e-11).									

Orbit Structure




Orbit 2
Server Version: 20171009
Exp. 4, split 2
Exp. 4, split 3
Exp. 4, split 4
Unused Orbital Visibility = 4
GS Reacq
Pointing Maneuver
Exp. 4, split 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20171009
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Unused Orbital Visibility = 4
GS Reacq
Occultation
Exp. 5, split 1
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec