14735 - Observation of OH in Beta Pictoris exocomets

Cycle: 24, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Flavien Kiefer (PI) (ESA Member) (Contact)	**CNRS, Institut d'Astrophysique de Paris**	**flavien.kiefer@iap.fr**
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. Roger D. Ferlet (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	ferlet@iap.fr
Dr. Guillaume Hebrard (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	hebrard@iap.fr
Dr. Paul A. Wilson (CoI) (ESA Member)	Universiteit Leiden	paw@strw.leidenuniv.nl
Dr. Vincent Bourrier (CoI) (ESA Member)	Observatoire de Geneve	bourrier@iap.fr

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) BETA-PIC WAVE	STIS/CCD STIS/NUV-MAMA	1	02-Feb-2018 20:00:13.0	yes
02	(1) BETA-PIC WAVE	STIS/CCD STIS/NUV-MAMA	1	02-Feb-2018 20:00:14.0	yes
03	(1) BETA-PIC WAVE	STIS/CCD STIS/NUV-MAMA	1	02-Feb-2018 20:00:15.0	yes
52	(1) BETA-PIC WAVE	STIS/CCD STIS/NUV-MAMA	1	02-Feb-2018 20:00:17.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
62	(1) BETA-PIC WAVE	STIS/CCD STIS/NUV-MAMA	1	02-Feb-2018 20:00:18.0	yes

5 Total Orbits Used

ABSTRACT

The Beta Pictoris system is a young planetary system embedded in a debris disk that is continually replenished by the collision and evaporation of planetesimals and exocomets. As a result of the edge-on inclination of the debris disk, transiting exocomets can be observed in great detail using absorption spectroscopy. Our previous COS observations yielded the first detection of exocomets in the far-UV, with the discovery of several new exocometary species including HI, CII, NI, OI and several ionization states of Si. Interestingly, the C/O ratio in the exocomets seems to also distinguish the two dynamically different exocomet populations known to exist in the Beta Pictoris system.

Here we propose to search for OH variable absorptions at 3085 Ang. to measure the abundance of water and to identify if water is the key volatile in the exocomets of Beta Pictoris. Positive detections of OH in the exocomets would be the first indirect discovery of water in the Beta Pictoris disk. Moreover, we will investigate the possibility that the two dynamically different exocomet populations have different compositions and origins. These objectives can be achieved by the acquisition of STIS Echelle spectra at different epochs.

Measuring the abundance of OH and the OH/Mg ratio in the Beta Pic evaporating exocomets will enable us to trace the condensation and evaporation processes and their location in the late stages of planetary formation. This will provide valuable insights into the origins of the exocomets of the Beta Pictoris system.

OBSERVING DESCRIPTION

Observation strategy

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We wish to observe Beta Pictoris once at 3 different epochs separated by at least 2 weeks. The objective of this program is to put forward transient absorptions in the UV due to transit of exo-cometary clouds in front of Beta Pic. For this purpose it is essential that the system is observed at different well separated epochs. In order to unravel flux dimming due to exocomet transit, we need to compare spectral regions when they present absorption signatures to when they only present the quiet stellar continuum. Our observations of the numerous exo-cometary transits in the Ca II doublet lines of

Beta Pic have shown that the rate of exocometary transit fluctuates aperiodically by as much as a factor of 2 during a year. Therefore, the largest possible time separation between our 3 different visits (15 to 90 days) would maximize our chance to get spectra at both low and high exocometary transit rates. It would guaranty the best scientific return for this program, allowing for an unbiased estimation of the abundance of the absorbing elements evaporated from the transiting comets.

Since Beta Pic is very bright (V~3.86), we choose to use the 31x0.05NDA slit that guaranties a limited illumination of the STIS-MAMA. It was selected over the 0.1x0.03 aperture, based on simpler target acquisition overheads, while with similar optical properties. We will divide the unique orbit of each 3 visits into 2 exposures, and make use for both exposures of the E230H-STIS grating.

-- The first ~475s exposure will be dedicated to observe the Mg II line at 2800 Ang. with the E230H/2812 order, aiming at S/N~40.
-- The second ~1204s exposure will be dedicated to observe the OH line at 3085 Ang. with the E230H/2962 order. aiming at S/N>65.

Our main objective is the observation of OH line at 3085 Ang., which was never observed for transiting exocomets, and could be as shallow as a few percent. So it is essential for us to maximize the S/N for the second exposure. The exocomet transit signatures in the Mg II line (2800 Ang.) on the other hand are usually deep and a minimum S/N (~40) will be enough for detection, and accurate abundance measurements.

Visit

Proposal 14735, First Visit (01), completed Sat Feb 03 01:00:19 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: (none)

Comments: First observation of Beta Pic.

1 orbit separated in 2 exposures with E230H grating at
-- 2812 Ang. (475s)
-- 2962 Ang. (1204s)

Diagnostics

(First Visit (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

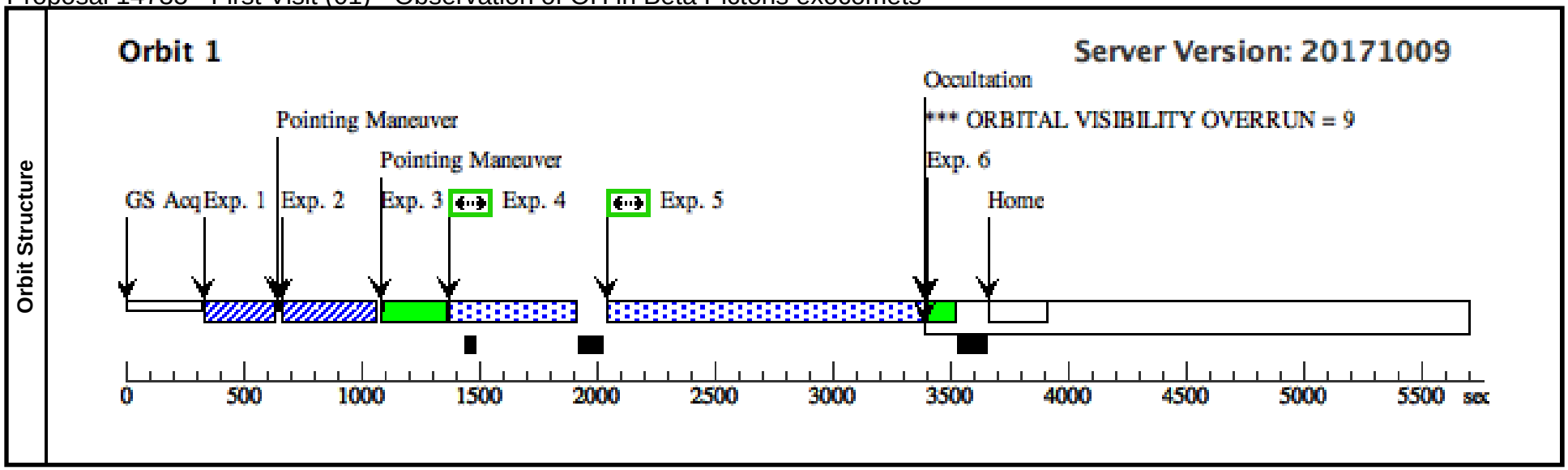
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d)	Proper Motion RA: 4.65 mas/yr	V=3.86	Reference Frame: ICRS
	Alt Name1: HD39060	Dec: -51 03 59.44 (-51.06651d)	Proper Motion Dec: 83.10 mas/yr		
	Alt Name2: HR2020	Equinox: J2000	Parallax: 0.05144"		
			Epoch of Position: 2000		
			Radial Velocity: 20 km/sec		

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, LOW MASS COMPANION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	TA-ACQ (STIS.ta.821996)	(1) BETA-PIC	STIS/CCD, ACQ, F25ND5	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
2	TA-ACQ/PEAK (STIS.sp.824492)	(1) BETA-PIC	STIS/CCD, ACQ/PEAK, 31X0.05NDA	G430M 4451 A				1 Secs (1 Secs) *[==>]*	*[1]*
3	WAVECAL E230H/2812	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2812 A				*[==>]*	*[1]*
4	E230H/2812 (STIS.sp.826937)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2812 A				475 Secs (475 Secs) *[==>]*	*[1]*
5	E230H/2962 (STIS.sp.826939)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2962 A	WAVECAL=NO			1204 Secs (1204 Secs) *[==>]*	*[1]*
6	WAVECAL E230H/2962	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2962 A				*[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20171009
Occultation
*** ORBITAL VISIBILITY OVERRUN = 9
Pointing Maneuver
Pointing Maneuver
Exp. 6
GS
Acq
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14735, Second Visit (02), failed Sat Feb 03 01:00:19 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: AFTER 01 BY 15 D TO 90 D

Comments: Second observation of Beta Pic. Should be done at least 15 days after the first visit.

1 orbit separated in 2 exposures with E230H grating at
-- 2812 Ang. (475s)
-- 2962 Ang. (1204s)

Diagnostics

(Second Visit (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

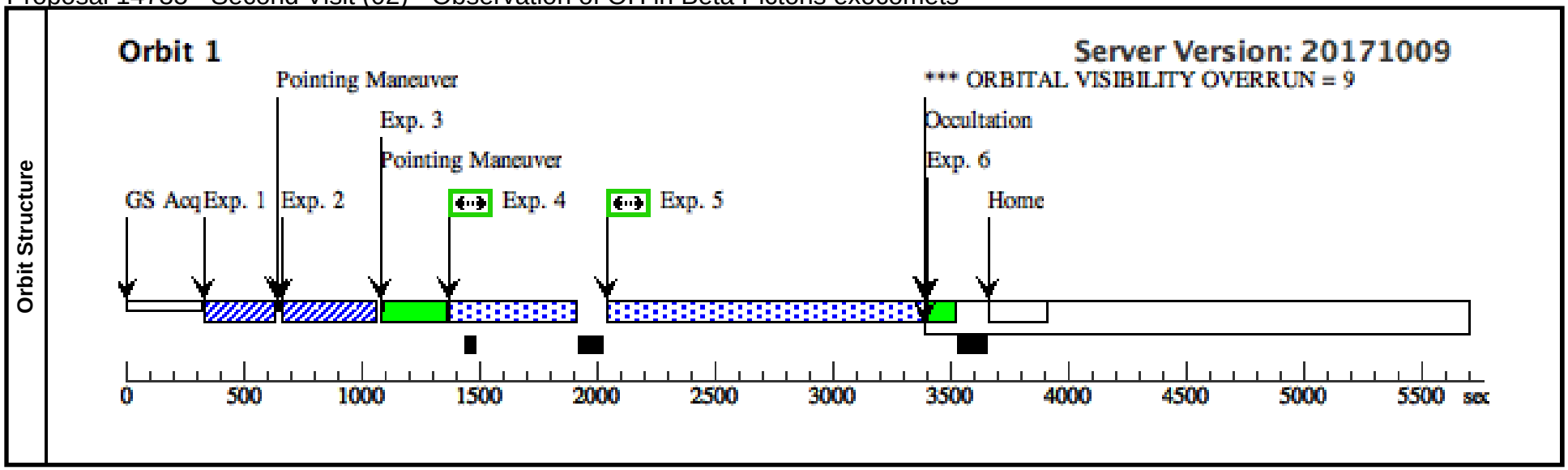
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d)	Proper Motion RA: 4.65 mas/yr	V=3.86	Reference Frame: ICRS
	Alt Name1: HD39060	Dec: -51 03 59.44 (-51.06651d)	Proper Motion Dec: 83.10 mas/yr		
	Alt Name2: HR2020	Equinox: J2000	Parallax: 0.05144"		
			Epoch of Position: 2000		
			Radial Velocity: 20 km/sec		

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, LOW MASS COMPANION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	TA-ACQ (STIS.ta.821996)	(1) BETA-PIC	STIS/CCD, ACQ, F25ND5	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
2	TA-ACQ/PEAK (STIS.sp.824492)	(1) BETA-PIC	STIS/CCD, ACQ/PEAK, 31X0.05NDA	G430M 4451 A				1 Secs (1 Secs) *[==>]*	*[1]*
3	WAVECAL E230H/2812	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2812 A				*[==>]*	*[1]*
4	E230H/2812 (STIS.sp.826937)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2812 A				475 Secs (475 Secs) *[==>]*	*[1]*
5	E230H/2962 (STIS.sp.826939)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2962 A	WAVECAL=NO			1204 Secs (1204 Secs) *[==>]*	*[1]*
6	WAVECAL E230H/2962	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2962 A				*[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20171009
Pointing Maneuver
*** ORBITAL VISIBILITY OVERRUN = 9
Exp. 3
Occultation
Pointing Maneuver
Exp. 6
GS Acq
Exp. 1
Exp. 2
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14735, Third Visit (03), completed Sat Feb 03 01:00:19 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: (none)

Comments: Third and last observation of Beta Pic. Should be done at least 15 days after the second visit.

1 orbit separated in 2 exposures with E230H grating at
-- 2812 Ang. (475s)
-- 2962 Ang. (1204s)

Diagnostics

(Third Visit (03)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

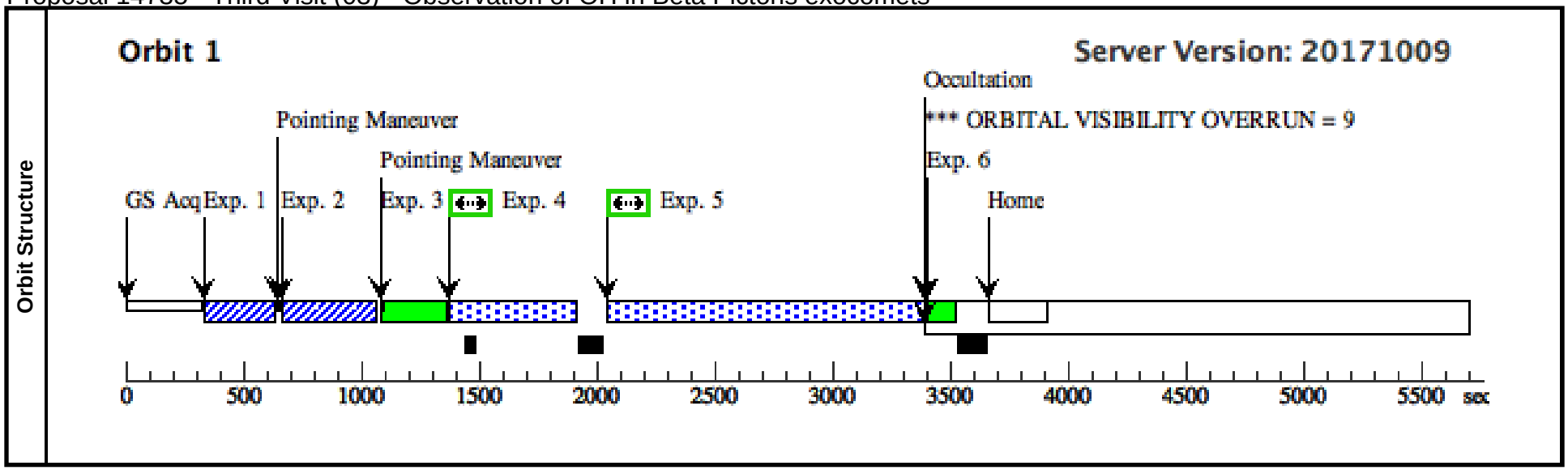
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d)	Proper Motion RA: 4.65 mas/yr	V=3.86	Reference Frame: ICRS
	Alt Name1: HD39060	Dec: -51 03 59.44 (-51.06651d)	Proper Motion Dec: 83.10 mas/yr		
	Alt Name2: HR2020	Equinox: J2000	Parallax: 0.05144"		
			Epoch of Position: 2000		
			Radial Velocity: 20 km/sec		

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, LOW MASS COMPANION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	TA-ACQ (STIS.ta.821996)	(1) BETA-PIC	STIS/CCD, ACQ, F25ND5	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
2	TA-ACQ/PEAK (STIS.sp.824492)	(1) BETA-PIC	STIS/CCD, ACQ/PEAK, 31X0.05NDA	G430M 4451 A				1 Secs (1 Secs) *[==>]*	*[1]*
3	WAVECAL E230H/2812	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2812 A				*[==>]*	*[1]*
4	E230H/2812 (STIS.sp.826937)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2812 A				475 Secs (475 Secs) *[==>]*	*[1]*
5	E230H/2962 (STIS.sp.826939)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2962 A	WAVECAL=NO			1204 Secs (1204 Secs) *[==>]*	*[1]*
6	WAVECAL E230H/2962	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2962 A				*[==>]*	*[1]*


Orbit Structure
Orbit 1
Server Version: 20171009
Occultation
*** ORBITAL VISIBILITY OVERRUN = 9
Pointing Maneuver
Pointing Maneuver
Exp. 6
GS Acq Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14735, Second Visit (52), failed Sat Feb 03 01:00:19 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: AFTER 03 BY 15 D TO 90 D

Comments: Second observation of Beta Pic. Should be done at least 15 days after the first visit.

1 orbit separated in 2 exposures with E230H grating at
-- 2812 Ang. (475s)
-- 2962 Ang. (1204s)

Diagnostics

(Second Visit (52)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

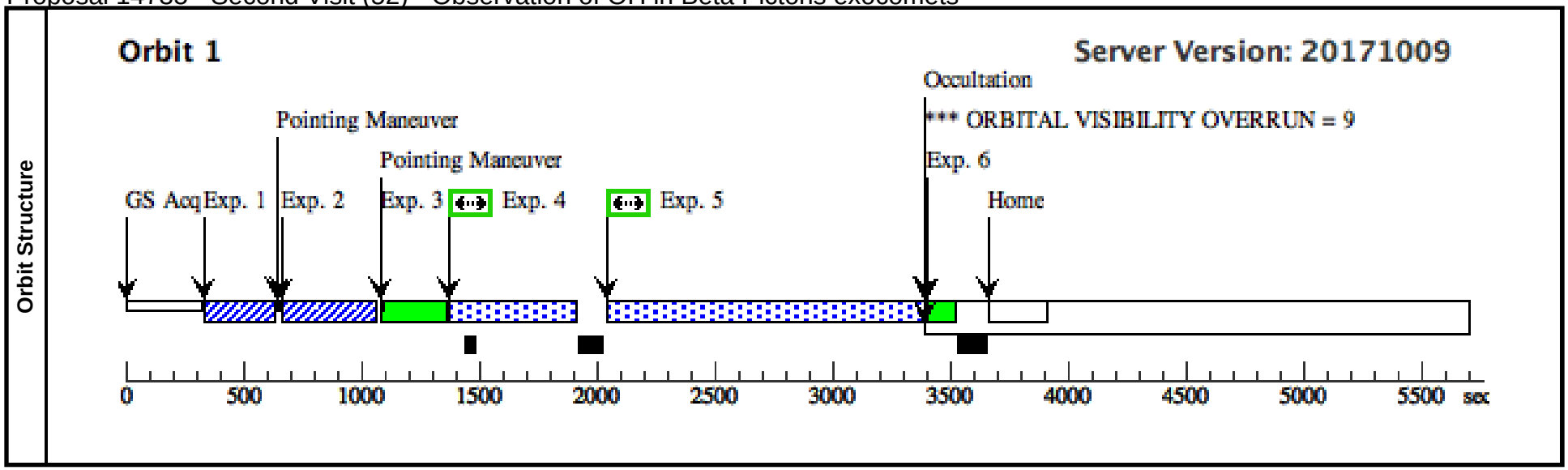
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d)	Proper Motion RA: 4.65 mas/yr	V=3.86	Reference Frame: ICRS
	Alt Name1: HD39060	Dec: -51 03 59.44 (-51.06651d)	Proper Motion Dec: 83.10 mas/yr		
	Alt Name2: HR2020	Equinox: J2000	Parallax: 0.05144"		
			Epoch of Position: 2000		
			Radial Velocity: 20 km/sec		

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, LOW MASS COMPANION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	TA-ACQ (STIS.ta.821996)	(1) BETA-PIC	STIS/CCD, ACQ, F25ND5	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	TA-ACQ/PEAK (STIS.sp.824492)	(1) BETA-PIC	STIS/CCD, ACQ/PEAK, 31X0.05NDA	G430M 4451 A				1 Secs (1 Secs) *[==>]*	 ***[1]***
3	WAVECAL E230H/2812	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2812 A				*[==>]*	***[1]***
4	E230H/2812 (STIS.sp.826937)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2812 A				475 Secs (475 Secs) *[==>]*	 ***[1]***
5	E230H/2962 (STIS.sp.826939)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2962 A	WAVECAL=NO			1204 Secs (1204 Secs) *[==>]*	 ***[1]***
6	WAVECAL E230H/2962	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2962 A				*[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20171009
Occultation
*** ORBITAL VISIBILITY OVERRUN = 9
Pointing Maneuver
Pointing Maneuver
Exp. 6
GS Acq Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14735, Second Visit (62) Sat Feb 03 01:00:19 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: AFTER 03 BY 15 D TO 90 D

Comments: Second observation of Beta Pic. Should be done at least 15 days after the first visit.

1 orbit separated in 2 exposures with E230H grating at
-- 2812 Ang. (475s)
-- 2962 Ang. (1204s)

Diagnostics

(Second Visit (62)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

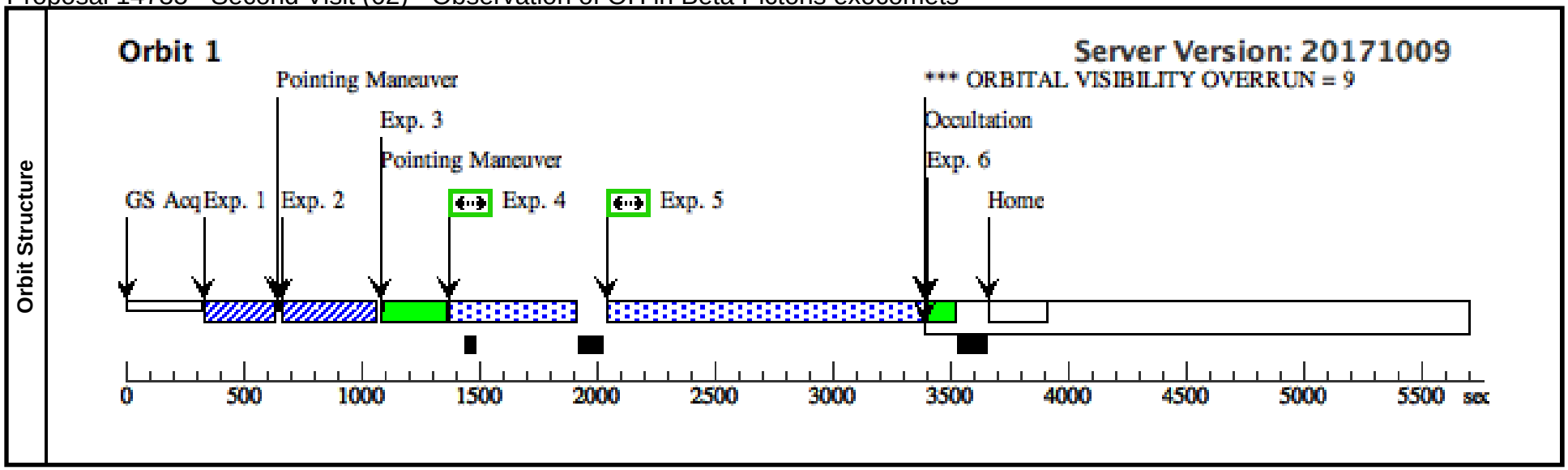
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d)	Proper Motion RA: 4.65 mas/yr	V=3.86	Reference Frame: ICRS
	Alt Name1: HD39060	Dec: -51 03 59.44 (-51.06651d)	Proper Motion Dec: 83.10 mas/yr		
	Alt Name2: HR2020	Equinox: J2000	Parallax: 0.05144"		
			Epoch of Position: 2000		
			Radial Velocity: 20 km/sec		

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=STAR
Description=[A4-A9 V-IV, CIRCUMSTELLAR MATTER, DISK, LOW MASS COMPANION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	TA-ACQ (STIS.ta.821996)	(1) BETA-PIC	STIS/CCD, ACQ, F25ND5	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	TA-ACQ/PEAK (STIS.sp.824492)	(1) BETA-PIC	STIS/CCD, ACQ/PEAK, 31X0.05NDA	G430M 4451 A				1 Secs (1 Secs) *[==>]*	 ***[1]***
3	WAVECAL E230H/2812	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2812 A				*[==>]*	***[1]***
4	E230H/2812 (STIS.sp.826937)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2812 A				475 Secs (475 Secs) *[==>]*	 ***[1]***
5	E230H/2962 (STIS.sp.826939)	(1) BETA-PIC	STIS/NUV-MAMA, ACCUM, 31X0.05NDA	E230H 2962 A	WAVECAL=NO			1204 Secs (1204 Secs) *[==>]*	 ***[1]***
6	WAVECAL E230H/2962	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.09	E230H 2962 A				*[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20171009
Pointing Maneuver
*** ORBITAL VISIBILITY OVERRUN = 9
Exp. 3
Occultation
Pointing Maneuver
Exp. 6
GS Acq
Exp. 1
Exp. 2
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec