13406 - Hydrogen, Deuterium and Nitrogen in the Beta Pictoris disk

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

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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) BETA-PIC (2) BETA-PIC-OFFSET	COS/FUV	2	31-Jan-2014 21:10:18.0	yes

2 Total Orbits Used

ABSTRACT

The Beta Pictoris system is a young planetary system (about 10 million years old), likely at the end of the telluric planets formation phases. It is embedded in a disk which is the prototype of debris disks where both gas and dust are continuously replenished via collision and evaporation of planetesimals and comet-like bodies. Because of its edge-on inclination, the gas component of the disk can be observed in great details through absorption spectroscopy.

FUSE far UV observations allowed the discovery that the Beta Pictoris debris disk is extremely carbon rich. This unexpected carbon over-abundance is due to either a peculiar composition of the original protoplanetary system, to radiation forces blowing-out radiation-sensitives species, or to condensation/evaporation processes. Fortunately, hydrogen, deuterium and nitrogen are key volatiles sensitive to the radiation, condensation and evaporation processes. They can serve as diagnostics of the still puzzling gaseous disk history. Using COS far-UV capabilities, we propose to search for those species, which have up to now never been observed in this system. We will measure the HI, DI, and NI column density to trace the gas disk origin and provide constraints on its dynamics. The measurement of N/C ratio will also provide key information for the understanding of the observed carbon excess. These observations will bring new informations on the physical processes taking place in this active system during the last stages of the planet formation.

OBSERVING DESCRIPTION

In the first orbit, we will observe using the G130M/1291A setup with the target Beta Pictoris centered in the aperture.

The second orbit will be used to obtain a T-Tag image of the Lyman-alpha airglow contamination by observing off-target (1 arcmin), just one orbit after the first orbit. The exposures have been ajusted to obtain the same exposures (same FP-Split positions) for the off-target offset position as for the on-target AT THE SAME ORBITAL POSITION OF THE TELESCOPE to correctly map the airglow contamination.

A single on-target (FP-Split position=1) is required at the beginning of orbit #2 :

- (1) to obtain the off-target exposures of orbit #2 at the same telescope's orbital position as for the on-target exposures of orbit #1
- (2) obtain additional science exposure on the target

ADDITIONAL COMMENTS

Beta Pictoris is at opposition near December 15. The observations should be scheduled close to the opposition in order to reduce the Airglow contamination. In that purpose, we used the time constraints defined by the Period (365.25 days), Zero Phase (2456658.5 = 1 Jan 2014) and Phase Constraints of the 1st exposure (Phase 0.833 = 1 Nov to 0.165 = 28 Feb) for the observations to be scheduled within 2.5 months from opposition.

The "auto-adjust" has not be used to keep the observation for the off-target offset position as for the on-target AT THE SAME ORBITAL POSITION, and to keep the total time below 54 minutes per orbit (and to schedulable in February 2014).

Visit

Proposal 13406, Visit 01, implementation Sat Feb 01 02:10:30 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: Period 365.25 D AND ZERO-PHASE HJD2456293.5; VISIBILITY INTERVAL 54 M

Diagnostics

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

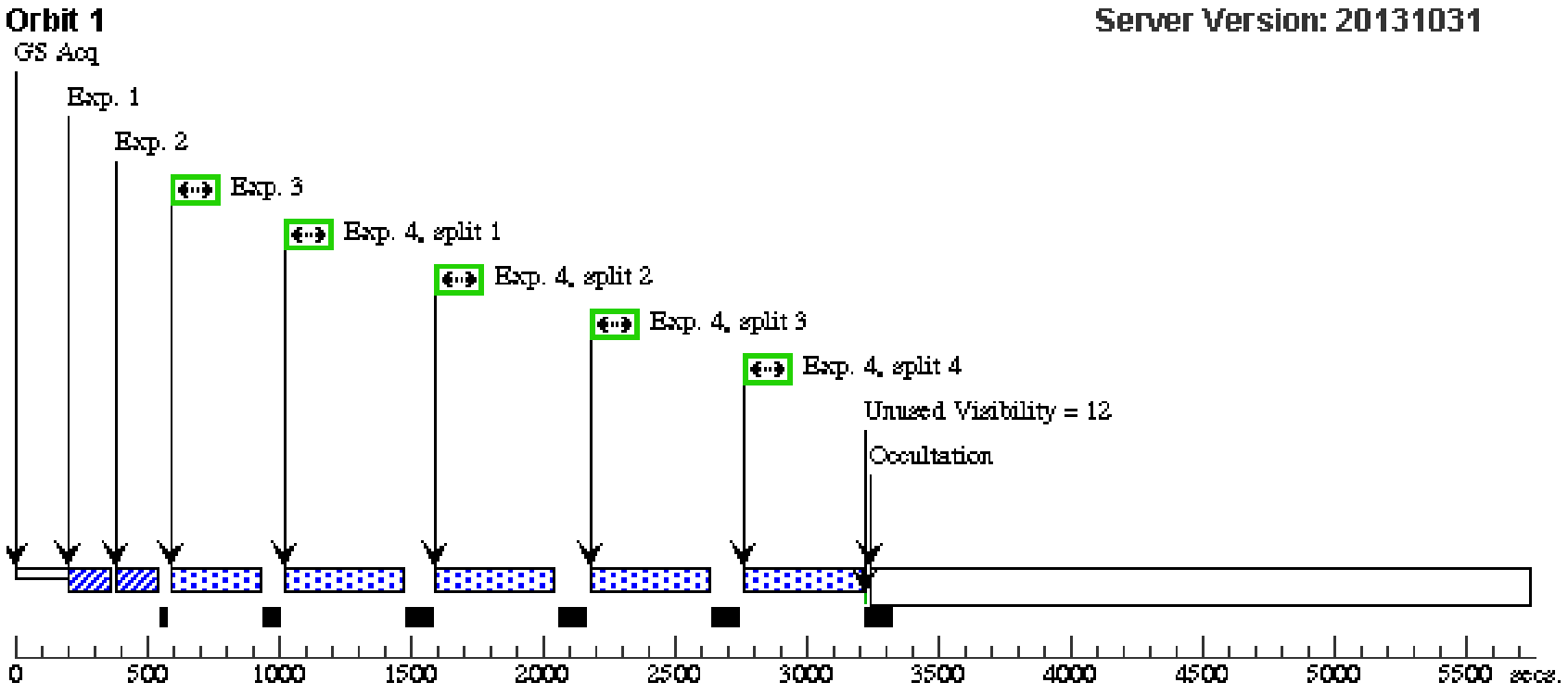
Fixed Targets

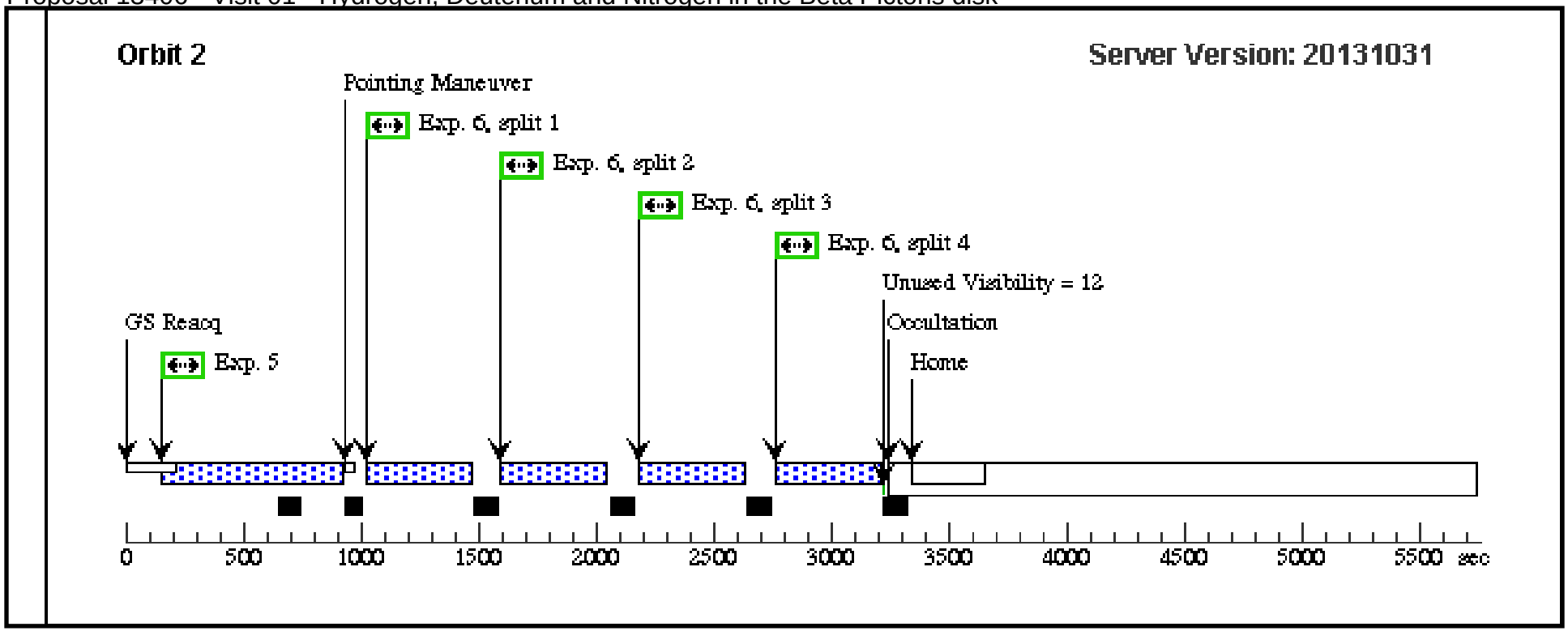
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	BETA-PIC	RA: 05 47 17.0877 (86.8211988d) Dec: -51 03 59.44 (-51.06651d) Equinox: J2000	Proper Motion RA: 4.65 mas/yr Proper Motion Dec: 83.10 mas/yr Parallax: 0.051" Epoch of Position: 2000	V=3.861	Reference Frame: ICRS
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Target Coordinates and proper motion are from Hipparcos, the New Reduction (van Leeuwen, 2007)					
(2)	BETA-PIC-OFFSET	Offset from BETA-PIC RA Offset: 0.0 Secs Dec Offset: 60.0 Arcsec		V=20 ~5e-13 erg /s/cm2/A at 1216A (Earth airglow at Lyman-alpha)	Offset Position (BETA-PIC-OFFSET)
Comments: This is a background direction to measure the geocoronal airglow, off the science target. V -magnitude is arbitrarily set to 20 (required for "Bright Object Sensitive Detectors")					

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.sa.509 943)	(1) BETA-PIC	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A		PHASE 0.833 TO 0.165	Sequence 1-4 Non-Int in Visit 01	1.6 Secs (1.6 Secs) *[==>]*	 ***[1]***
2	(COS.sa.509 943)	(1) BETA-PIC	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	CENTER=DEF; NUM-POS=5; STEP-SIZE=0.9		Sequence 1-4 Non-Int in Visit 01	1.6 Secs (1.6 Secs) *[==>]*	 ***[1]***
3	(COS.sp.509 951)	(1) BETA-PIC	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=400; FLASH=YES; FP-POS=1		Sequence 1-4 Non-Int in Visit 01	220 Secs (220 Secs) *[==>]*	 ***[1]***
4	(COS.sp.509 951)	(1) BETA-PIC	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=400; FLASH=YES; FP-POS=ALL		Sequence 1-4 Non-Int in Visit 01	400 Secs (1600 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	 ***[1]***
Comments: In the ETC run, the strength of the Stellar Lyman-alpha line has been set to an extremely conservative upper limit to calculate the Buffer-time and check the Bright Object Limit (FWHM=2 Angstrom., Flux =4e-12).									
5	(COS.sp.509 951)	(1) BETA-PIC	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=400; FLASH=YES; FP-POS=1		Sequence 5-6 Non-Int in Visit 01	649 Secs (649 Secs) *[==>]*	 ***[2]***
6	(COS.sp.509 951)	(2) BETA-PIC-OFFSET	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=400; FLASH=YES; FP-POS=ALL		Sequence 5-6 Non-Int in Visit 01	400 Secs (1600 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	 ***[2]***

Orbit Structure




Orbit 2
Server Version: 20131031
Pointing Maneuver
Exp. 6, split 1
Exp. 6, split 2
Exp. 6, split 3
Exp. 6, split 4
Unused Visibility = 12
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec