16297 - Catching radio-mode feedback in action with COS UV absorption spectroscopy

Cycle: 28, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) GALEX-J110717.7+080438	COS/FUV COS/NUV	3	24-Jun-2020 13:00:46.0	yes
02	(1) GALEX-J110717.7+080438	COS/FUV COS/NUV	3	24-Jun-2020 13:00:47.0	yes
03	(1) GALEX-J110717.7+080438	COS/FUV COS/NUV	2	24-Jun-2020 13:00:47.0	yes

8 Total Orbits Used

ABSTRACT

A widely accepted tenant of galaxy formation theory is that red-and-dead galaxies maintain their quiescent status through the sustained impact of radio-mode feedback. Driven by an active galactic nucleus, this feedback is purported to heat gas in the galaxy's surroundings to prevent the accretion and cooling of gas onto the galaxy. Moreover, radio-mode feedback drives gas outflows and may remove a substantive amount of gas from

galaxies. While radio-mode feedback is now a nearly generic feature of numerical simulations of galaxy formation, the physical mechanisms that drive the interaction between radio jets/lobes and gas in galaxies are still poorly known. With this proposal, we will study a galaxy with bright radio jets (i.e. caught in the act) and therefore putatively exhibiting the radio-mode feedback that sustains its absence of star formation. Fortuitously, a UV luminous quasar lies background to this galaxy with its sightline intersecting the system at an impact parameter R ~ 4 kpc. Existing optical spectra of the quasar shows likely CaII absorption associated with the foreground galaxy, i.e. cool and dense gas. The proposed HST/COS observations will extend the analysis to a diverse set of diagnostics -- HI Lya, OI, SiII, SiIII, SiIV, CII, CIV -- to assess the metallicity, kinematics, and multi-phase nature of gas in the galaxy. These data will provide direct insight into the process of radio-mode feedback and offer tests for current and future models.

OBSERVING DESCRIPTION

This observation is designed to obtain COS FUV spectra of a background quasar (z=0.2, FUV=18.3 mag) for probing multiple ISM absorption lines of the targeted foreground galaxy (z=0.0734).

We will use two COS FUV settings, 130M (1291 A) and 160 M(1533 A), to obtain the required wavelength coverage for the targeted lines including HI Lya 1215, SII 1250,1253, OI 1302, SiII 1260/1304, SiIII 1206, SiIV 1393/1402, CII 1334, and CIV 1548/1550. The COS FUV settings are designed to follow the COS 2025 policy and to maximize the wavelength coverage for the science at the same time.

The total exposure times are chosen to obtain spectra with the two settings both having S/N>10, which results ~11,000 s for 130 M (1291 A) and ~9,100 160 M (1533 A).

The corresponding ETC calculations can be found at
130M http://etc.stsci.edu/etc/results/COS.sa.1448703/
160M http://etc.stsci.edu/etc/results/COS.sa.1423410/

Following the suggested visit design, we structure our 8 orbits into three visits (3, 3, 2).

- 1st visit focuses on obtaining spectra with 130 M (1291 A):

1 orbit - Target acquisition [NUV MIRRORA imaging] + FUV 130M [1291 A] exposure (2436 s)
2 orbit - FUV 130M [1291 A] exposure (2689 s)
3 orbit - FUV 130M [1291 A] exposure (2689 s)

- 2nd visit focuses on obtaining spectra with 160M (1533 A):

1 orbit - Target acquisition [NUV MIRRORA imaging] + FUV 160M [1533 A] exposure (2383 s)
2 orbit - FUV 160M [1533 A] exposure (2689 s)
3 orbit - FUV 160M [1533 A] exposure (2689 s)

- 3rd visit will obtain spectra with both settings 130M (1291 A) and 160M (1533 A):

1 orbit - Target acquisition [NUV MIRRORA imaging] + FUV 130M [1291 A] exposure (2436 s)
2 orbit - FUV 130M [1291 A] exposure (966 s) + FUV 160M [1533 A] exposure (1485 s)

The final science exposure time are 11216 for 130M (1291 A) and 9246 s for 160M (1533A), consistent with the original plan.

Visit

Proposal 16297, Visit 01 Wed Jun 24 17:00:48 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

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

Fixed Targets

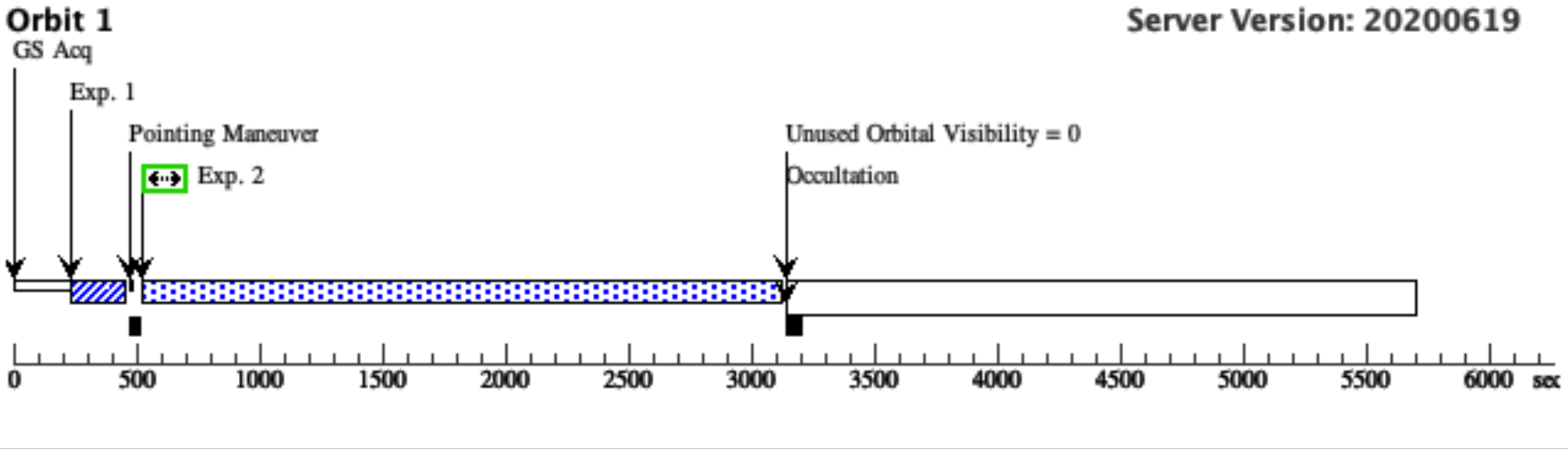
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GALEX-J110717.7+080438	RA: 11 07 17.7864 (166.8241100d) Dec: +08 04 38.10 (8.07725d) Equinox: J2000		V=18.29537+/-0.09 Magnitude is FUV	Reference Frame: ICRS

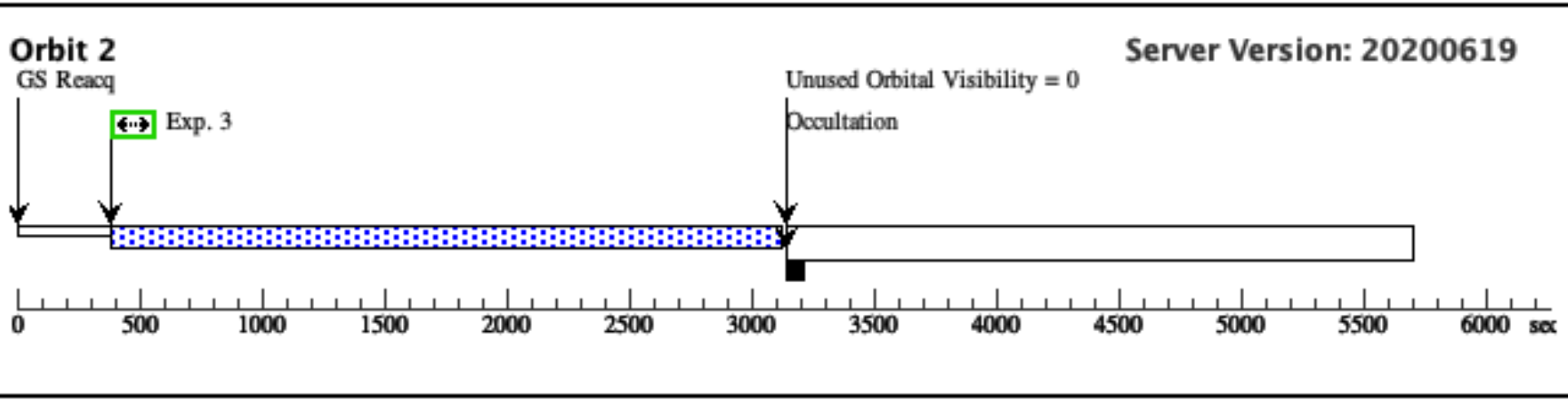
Comments: This object was generated by the targetselector and retrieved from the GALEX database.
Category=ISM
Description=[ABSORPTION LINE SYSTEM, ABSORPTION LINE SYSTEM - EXTRAGALACTIC]
Extended=NO

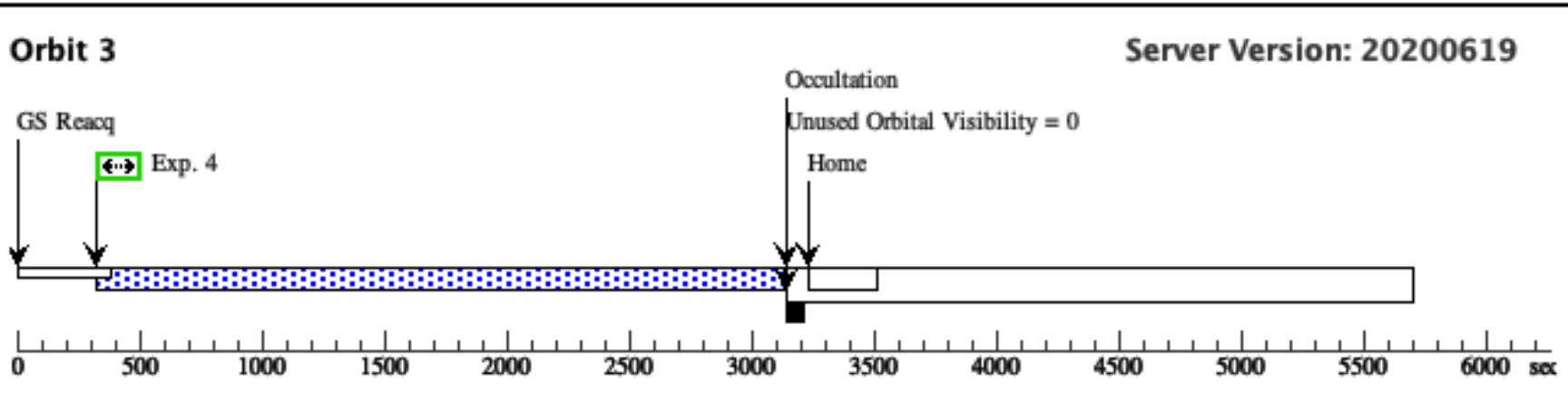
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1450017)	(1) GALEX-J110717.7+080438	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				2 Secs (2 Secs) *[==>]*	*[1]*
2	(1448703)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; SEGMENT=BOTH; BUFFER-TIME=4522			2500 Secs (2436 Secs) *[==>2436.0 Secs]*	*[1]*
3	(1448703)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=4522; FP-POS=4; SEGMENT=BOTH			2800 Secs (2689 Secs) *[==>2689.0 Secs]*	*[2]*
4	(1448703)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=4522; FP-POS=3; SEGMENT=BOTH			2800 Secs (2689 Secs) *[==>2689.0 Secs]*	*[3]*

Orbit Structure







Visit

Proposal 16297, Visit 02 Wed Jun 24 17:00:48 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

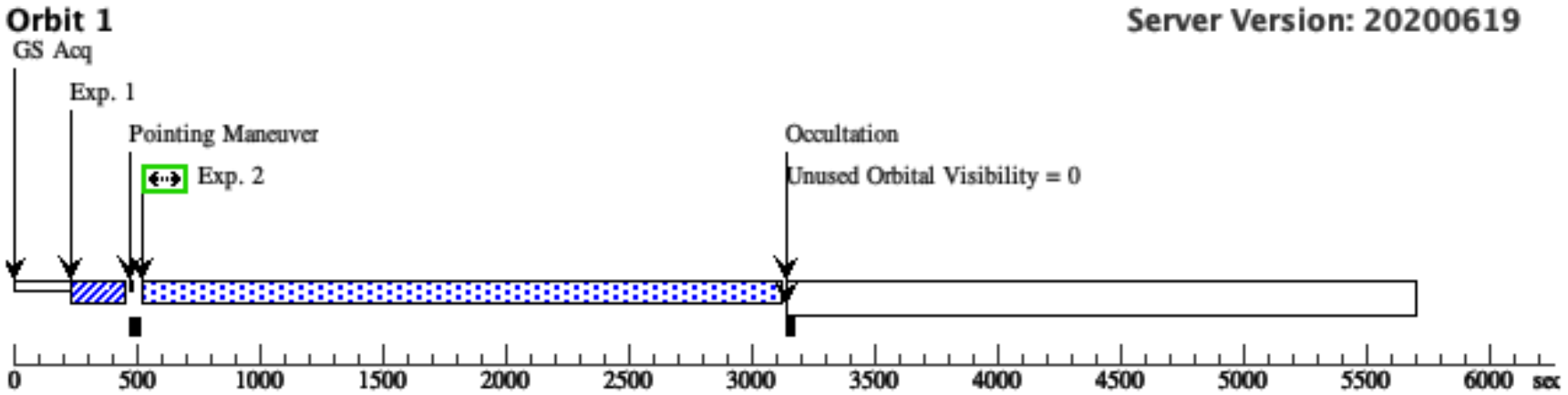
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GALEX-J110717.7+080438	RA: 11 07 17.7864 (166.8241100d) Dec: +08 04 38.10 (8.07725d) Equinox: J2000		V=18.29537+/-0.09 Magnitude is FUV	Reference Frame: ICRS

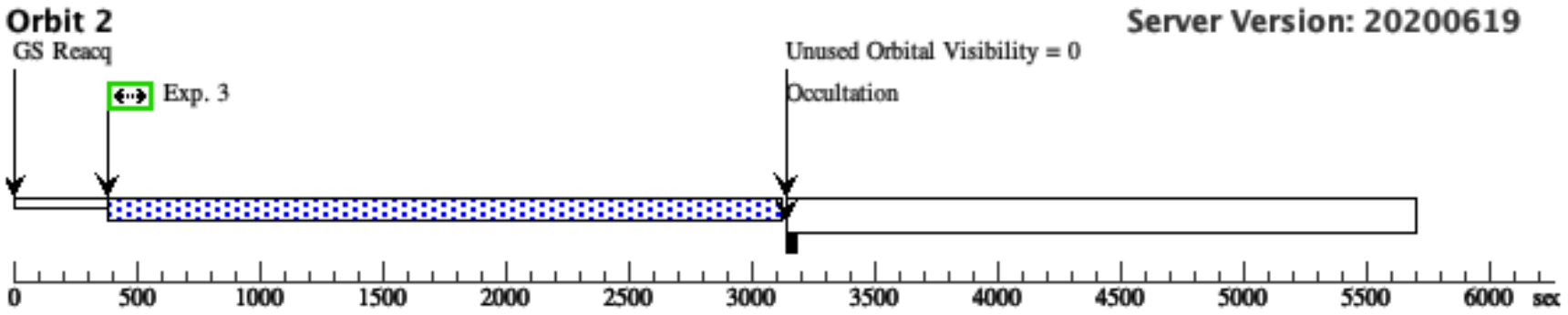
Comments: This object was generated by the targetselector and retrieved from the GALEX database.
Category=ISM
Description=[ABSORPTION LINE SYSTEM, ABSORPTION LINE SYSTEM - EXTRAGALACTIC]
Extended=NO

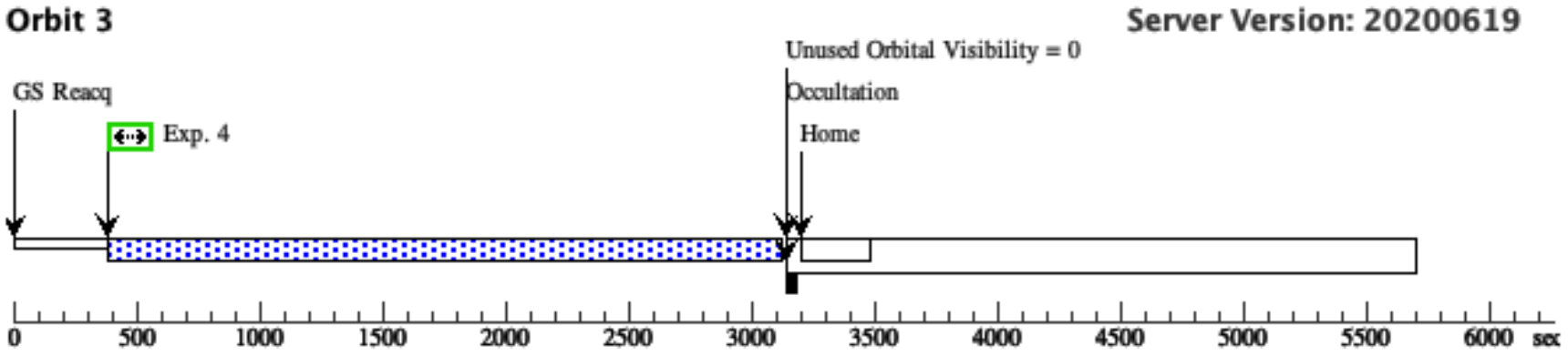
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1450017)	(1) GALEX-J110717.7+080438	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				2 Secs (2 Secs) *[==>]*	 ***[1]***
2	(1423410)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G160M 1533 A	FP-POS=2; SEGMENT=BOTH; BUFFER-TIME=11872			2500 Secs (2383 Secs) *[==>2383.0 Secs]*	 ***[1]***
3	(1423410)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G160M 1533 A	FP-POS=3; SEGMENT=BOTH; BUFFER-TIME=11872			3000 Secs (2689 Secs) *[==>2689.0 Secs]*	 ***[2]***
4	(1423410)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G160M 1533 A	FP-POS=4; SEGMENT=BOTH; BUFFER-TIME=11872			3000 Secs (2689 Secs) *[==>2689.0 Secs]*	 ***[3]***

Orbit Structure







Visit

Proposal 16297, Visit 03 Wed Jun 24 17:00:48 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(Visit 03) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GALEX-J110717.7+080438	RA: 11 07 17.7864 (166.8241100d) Dec: +08 04 38.10 (8.07725d) Equinox: J2000		V=18.29537+/-0.09 Magnitude is FUV	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the GALEX database.
Category=ISM
Description=[ABSORPTION LINE SYSTEM, ABSORPTION LINE SYSTEM - EXTRAGALACTIC]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1450017)	(1) GALEX-J110717.7+080438	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				2 Secs (2 Secs) *[==>]*	 ***[1]***
2	(1448703)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; SEGMENT=BOTH; BUFFER-TIME=4522			2500 Secs (2436 Secs) *[==>2436.0 Secs]*	 ***[1]***
3	(1448703)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=4522; FP-POS=3; SEGMENT=BOTH			982 Secs (966 Secs) *[==>966.0 Secs]*	 ***[2]***
4	(1423410)	(1) GALEX-J110717.7+080438	COS/FUV, TIME-TAG, PSA	G160M 1533 A	FP-POS=1; SEGMENT=BOTH; BUFFER-TIME=11872			1501 Secs (1485 Secs) *[==>1485.0 Secs]*	 ***[2]***

Orbit Structure