



17451 - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Cycle: 31, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Ravi Sankrit (PI) (Contact)	Space Telescope Science Institute
Dr. Thomas B. Ake (CoI)	Space Telescope Science Institute
Dr. Manuel Bautista (CoI)	NASA Headquarters
Dr. Steven Goldman (CoI)	Space Telescope Science Institute
Dr. Uma Gorti (CoI)	SETI Institute
Prof. Shazrene S. Mohamed (CoI)	The University of Virginia
Mr. Eric Omelian (CoI) (Contact)	Space Science Institute

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) V-R-AQR	COS/FUV COS/NUV	3	04-Aug-2026 10:00:16.0	yes
51	(1) V-R-AQR	COS/FUV COS/NUV	3	04-Aug-2026 10:00:18.0	yes
52	(1) V-R-AQR	COS/FUV COS/NUV	3	04-Aug-2026 10:00:20.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
53	(1) V-R-AQR	COS/FUV COS/NUV	3	04-Aug-2026 10:00:22.0	yes

12 Total Orbits Used

ABSTRACT

The much anticipated eclipse of R Aquarii (R Aqr) in its 44 year binary orbit is underway. The hot White Dwarf (WD) and accretion disk have moved in front of the cool, dusty mass losing AGB companion giving us a direct view of the accretion flow. The system has just passed periastron, and is in a high state of binary activity, with material being injected near the base of the bipolar jet into a fast collimated flow. Fast shocks with speeds of up to, perhaps, 250 km/s are being driven into the surrounding photoionized nebula and into the pre-existing jet material. These shocks will raise the ionization levels of the gas and produce bright high-ionization emission lines in the ultraviolet (UV). We propose to use COS to obtain UV spectra (spanning 1135-3200 Ang.) of the region immediately surrounding the binary, and use the emission lines to identify and measure the various processes energizing the inner nebula during this extremely active phase. We will study the evolution of the UV emission and their causes by comparing our data with IUE spectra obtained over half an orbital period ago.

During this critical phase in its binary orbit, R Aqr is being intensively monitored from the ground, and has been observed at all wavelengths from the radio to the X-ray except that no UV spectra have been obtained. This eclipse will end in a few years time, and there is an urgent imperative that COS spectra be obtained to unravel key physical processes underlying the accretion and jet formation in this nearby object. The insights gained will have wide applicability, in many astronomical systems where accretion and jets are present.

OBSERVING DESCRIPTION

The program consists of one 3-orbit visit with a single pointing centered on the R Aqr symbiotic binary. The source spectrum consists of a relatively weak continuum and a number of emission lines of varying strength as detected in several IUE observations, e.g. Kafatos et al. 1986 ApJ Supp. 62, 853; Meier and Kafatos 1995 ApJ 451, 359 (MK95). It is expected that the continuum is dominated by the central source comprising the AGB, WD and accretion disk, while the emission lines arise in an extended, yet compact, nebula surrounding the binary.

Our proposed visit starts with an NUV ACQ/IM exposure. The co-ordinates are well known, and since the NUV bandpass will be dominated by the continuum we expect the target to be well centered. Following the acquisition are a series of spectroscopic exposures listed below.

NUV: G185M/1913, G225M/2325, G230L/2635, G230L/2950

FUV: G130M/1291, G160M/1611

Each NUV mode will be observed at the two extreme FP-POS (1, 4) for wavelength coverage.

The G160M/1611 exposures should be obtained at LP4 in order to maximize S/N without the large overheads for split wavecal. (This was requested in our Phase I proposal.)

The ETC calculations used for both Phase I and Phase II use IUE fluxes reported in MK95. For Phase I, we mainly used fluxes of the weaker lines in order to estimate the required exposure times. Here, we instead use the highest observed fluxes. In Phase II calculations we have used a continuum surface brightness of $5E-14$ cgs, which is five times the value used in Phase I. This is primarily to show that the count-rates are well below the bright object limits, and secondarily to estimate suitable BUFFER TIME values. In most cases the BUFFER TIMES have been chosen for maximizing efficiency.

July 31, 2026 update: the G160M observations have been moved to LP10, the new default lifetime position for the grating. LP10 does not require split wavecal, and has slightly better spectral resolution than LP4.

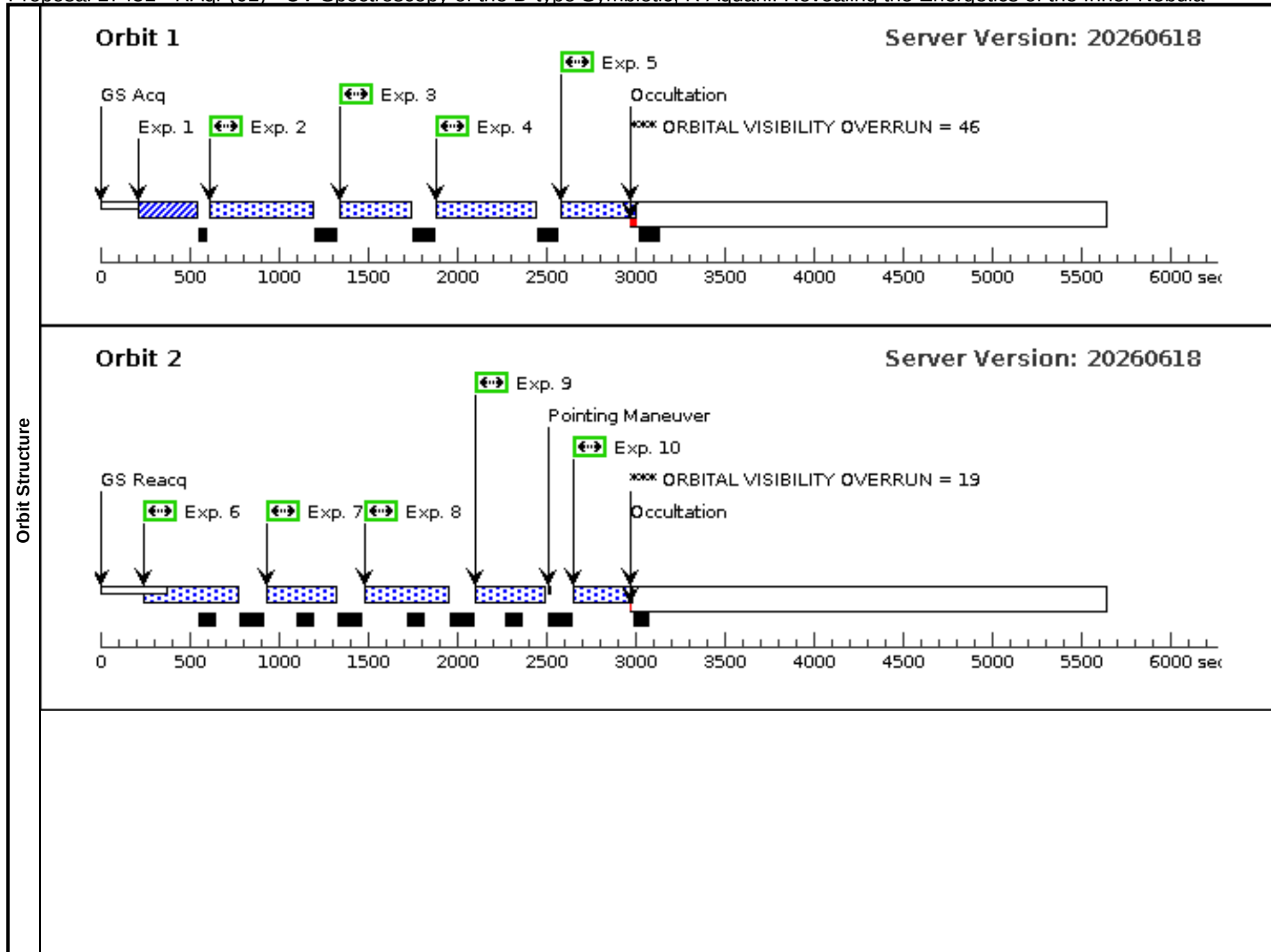
Proposal 17451 - RAqr (01) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

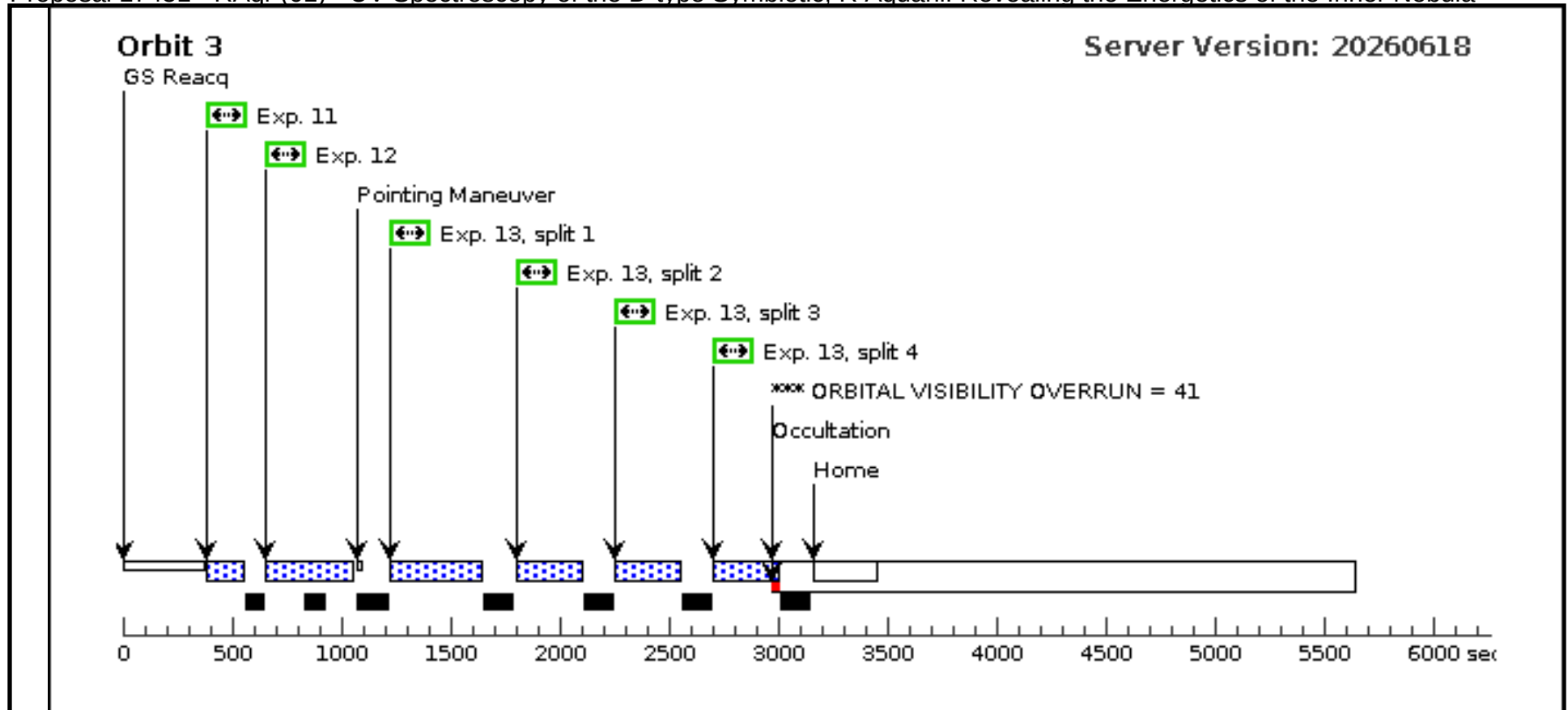
Visit	Proposal 17451, RAqr (01), failed Tue Aug 04 14:00:23 GMT 2026				
	Diagnostic Status: Warning Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)				
Diagnostics	(RAqr (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (RAqr (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (RAqr (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (G130M/1291/FPPOS3-i (01.010)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS3-ii (01.011)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS4 (01.012)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G160M/1611 (01.013)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	V-R-AQR	RA: 23 43 49.4634 (355.9560975d) Dec: -15 17 4.18 (-15.28449d) Equinox: J2000	Proper Motion RA: 26.879 mas/yr Proper Motion Dec: -30.411 mas/yr Epoch of Position: 2000.0	V=8.8
	Miscellaneous Reference Frame: ICRS				
	<i>Comments: Co-ordinates and proper motions obtained from SIMBAD, which uses Gaia DR3.</i> Category=STAR Description=[SYMBIOTIC STAR] Extended=YES				

Proposal 17451 - RAqr (01) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	AcqIm (COS.ta.188 8582)	(1) V-R-AQR	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				52 Secs (52 Secs) [==>]	[1]
	Comments: Used December 1991 IUE spectrum to estimate exposure time. Increased the exposure time from the calculation result by a factor of 4 in order to get a higher S/N image of the field, and also to guard against the flux having decreased.									
	2	G185M/191 3/FPPOS1 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=1			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	Comments: The C III] line is described as saturated in MK95; we use twice their reported flux in our calculation and show it is still safe.									
	3	G185M/191 3/FPPOS4 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=4			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	4	G225M/232 5/FPPOS1 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=1			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	5	G225M/232 5/FPPOS4 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=4			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	6	G230L/2635 /FPPOS1 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	7	G230L/2635 /FPPOS4 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	8	G230L/2950 /FPPOS1 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	9	G230L/2950 /FPPOS4 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	10	G130M/129 1/FPPOS3-i (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=22 8; LIFETIME-POS=L P5			228 Secs (156 Secs) [==>156.0 Secs]	[2]
	11	G130M/129 1/FPPOS3-ii (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=17 2; LIFETIME-POS=L P5			172 Secs (119 Secs) [==>119.0 Secs]	[3]
	12	G130M/129 1/FPPOS4 (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=14 5; LIFETIME-POS=L P5			400 Secs (347 Secs) [==>347.0 Secs]	[3]

Proposal 17451 - RAgr (01) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula								
	13	G160M/161 1 (COS.sp.188 8996)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=ALL; BUFFER-TIME=18 6; LIFETIME-POS=L P4	296 Secs (972 Secs)	[3]
							[==>243.0 Secs (Split 1)]	
							[==>243.0 Secs (Split 2)]	
							[==>243.0 Secs (Split 3)]	
							[==>243.0 Secs (Split 4)]	
Comments: The ETC run includes the total CIV 1548,1552 doublet flux as a single line, and both OIII] 1663 and NIII] 1750. Calculation COS.sp.1888995 includes the CIV lines separately and the OIII].								





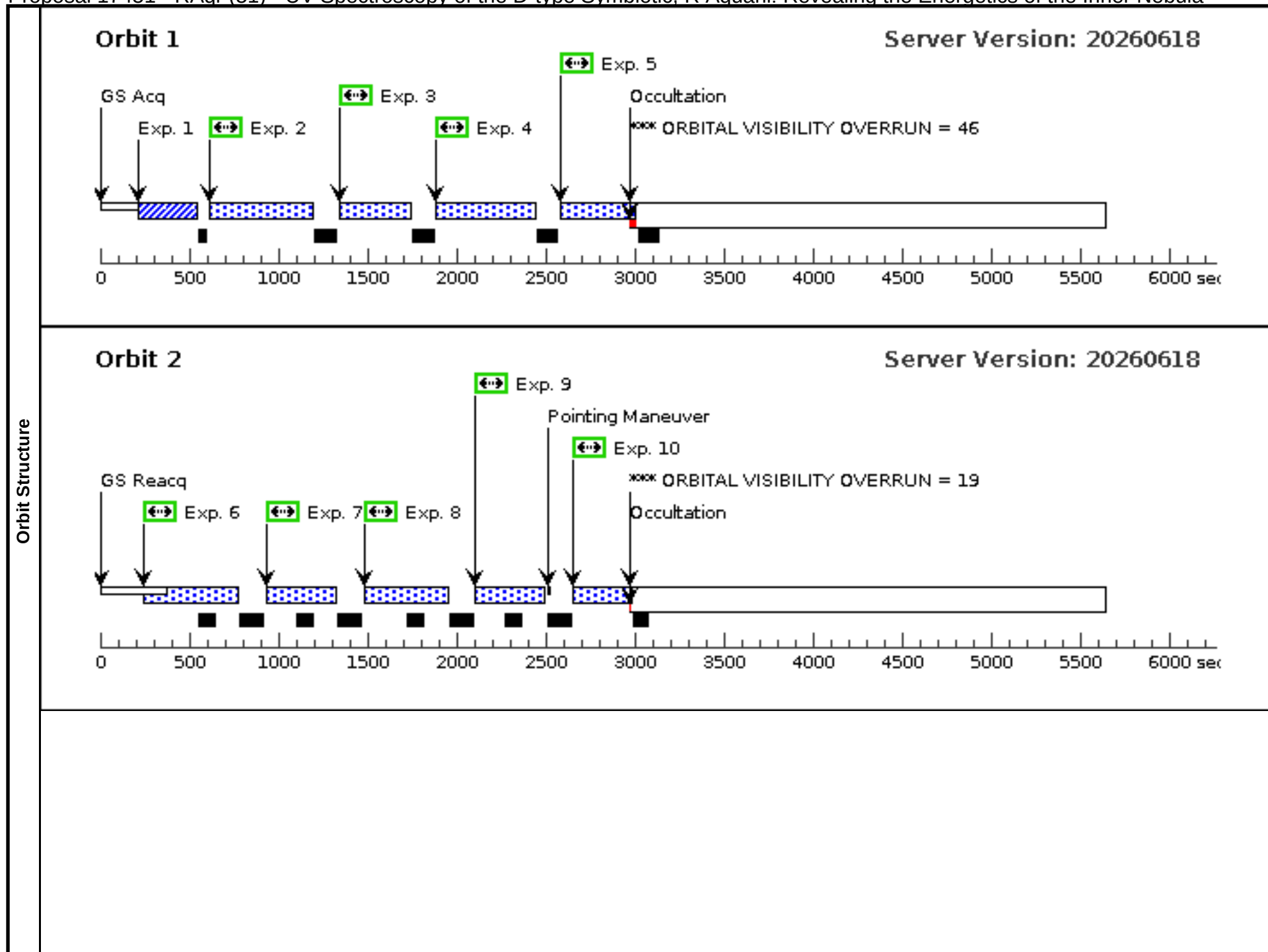
Proposal 17451 - RAgr (51) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

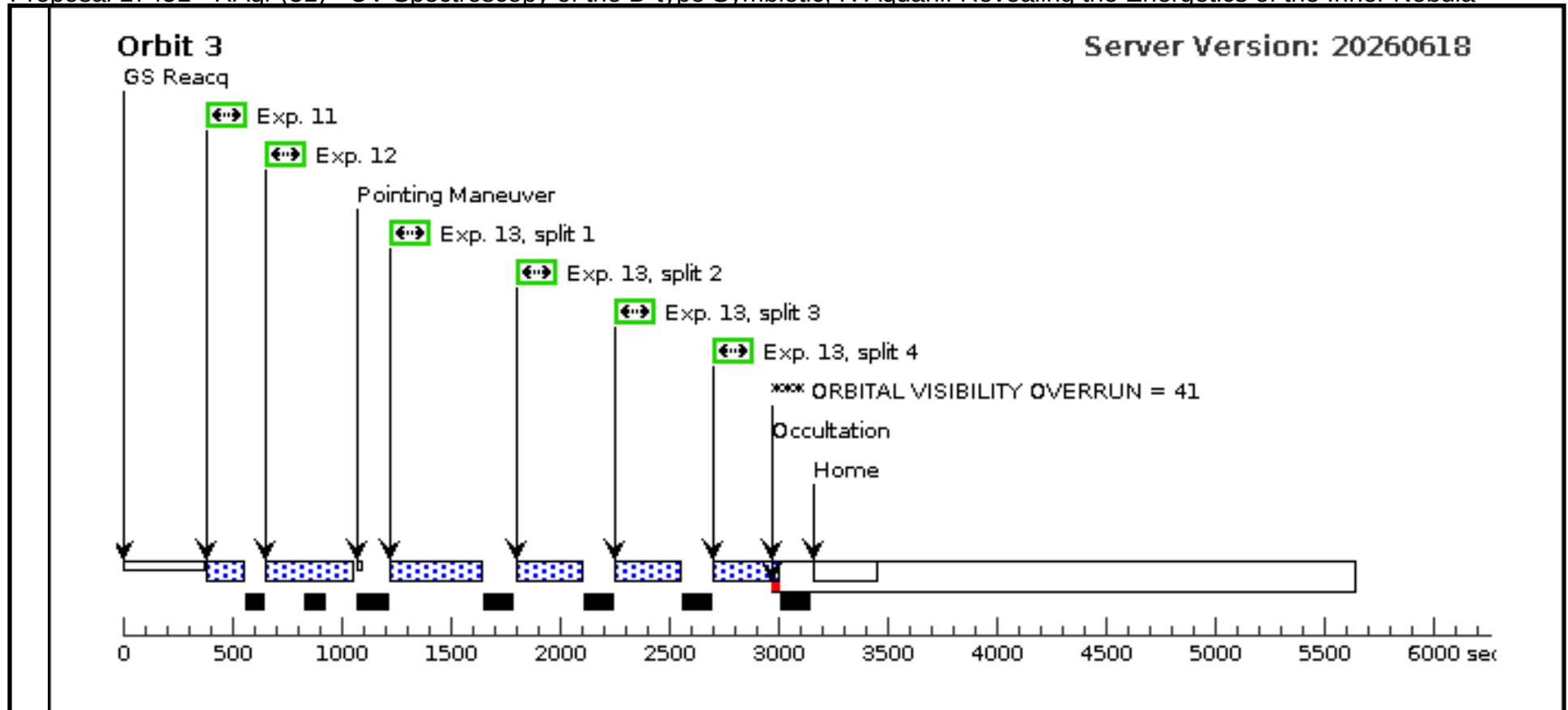
Visit	Proposal 17451, RAqr (51), failed					Tue Aug 04 14:00:23 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: (none)					
	Comments: Repeat of failed visit 01.					
Diagnostics	(RAqr (51)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
	(RAqr (51)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
	(RAqr (51)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
	(G130M/1291/FPPOS3-i (51.010)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.					
	(G130M/1291/FPPOS3-ii (51.011)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.					
	(G130M/1291/FPPOS4 (51.012)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.					
Fixed Targets	(G160M/1611 (51.013)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.					
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	V-R-AQR	RA: 23 43 49.4634 (355.9560975d)	Proper Motion RA: 26.879 mas/yr	V=8.8	Reference Frame: ICRS
			Dec: -15 17 4.18 (-15.28449d)	Proper Motion Dec: -30.411 mas/yr		
			Equinox: J2000	Epoch of Position: 2000.0		
	Comments: Co-ordinates and propermotions obtained from SIMBAD, which uses Gaia DR3.					
Category=STAR						
Description=[SYMBIOTIC STAR]						
Extended=YES						

Proposal 17451 - RAqr (51) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	AcqIm (COS.ta.188 8582)	(1) V-R-AQR	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				52 Secs (52 Secs) [==>]	[1]
	Comments: Used December 1991 IUE spectrum to estimate exposure time. Increased the exposure time from the calculation result by a factor of 4 in order to get a higher S/N image of the field, and also to guard against the flux having decreased.									
	2	G185M/191 3/FPPOS1 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=1			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	Comments: The C III] line is described as saturated in MK95; we use twice their reported flux in our calculation and show it is still safe.									
	3	G185M/191 3/FPPOS4 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=4			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	4	G225M/232 5/FPPOS1 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=1			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	5	G225M/232 5/FPPOS4 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=4			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	6	G230L/2635 /FPPOS1 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	7	G230L/2635 /FPPOS4 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	8	G230L/2950 /FPPOS1 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	9	G230L/2950 /FPPOS4 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	10	G130M/129 1/FPPOS3-i (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=22 8; LIFETIME-POS=L P5			228 Secs (156 Secs) [==>156.0 Secs]	[2]
	11	G130M/129 1/FPPOS3-ii (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=17 2; LIFETIME-POS=L P5			172 Secs (119 Secs) [==>119.0 Secs]	[3]
	12	G130M/129 1/FPPOS4 (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=14 5; LIFETIME-POS=L P5			400 Secs (347 Secs) [==>347.0 Secs]	[3]

Proposal 17451 - RAqr (51) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula								
	13	G160M/161 1 (COS.sp.188 8996)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=ALL; BUFFER-TIME=18 6; LIFETIME-POS=L P4	296 Secs (972 Secs)	[3]
							[==>243.0 Secs (Split 1)]	
							[==>243.0 Secs (Split 2)]	
							[==>243.0 Secs (Split 3)]	
							[==>243.0 Secs (Split 4)]	
Comments: The ETC run includes the total CIV 1548,1552 doublet flux as a single line, and both OIII] 1663 and NIII] 1750. Calculation COS.sp.1888995 includes the CIV lines separately and the OIII].								





Proposal 17451 - RAqr (52) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

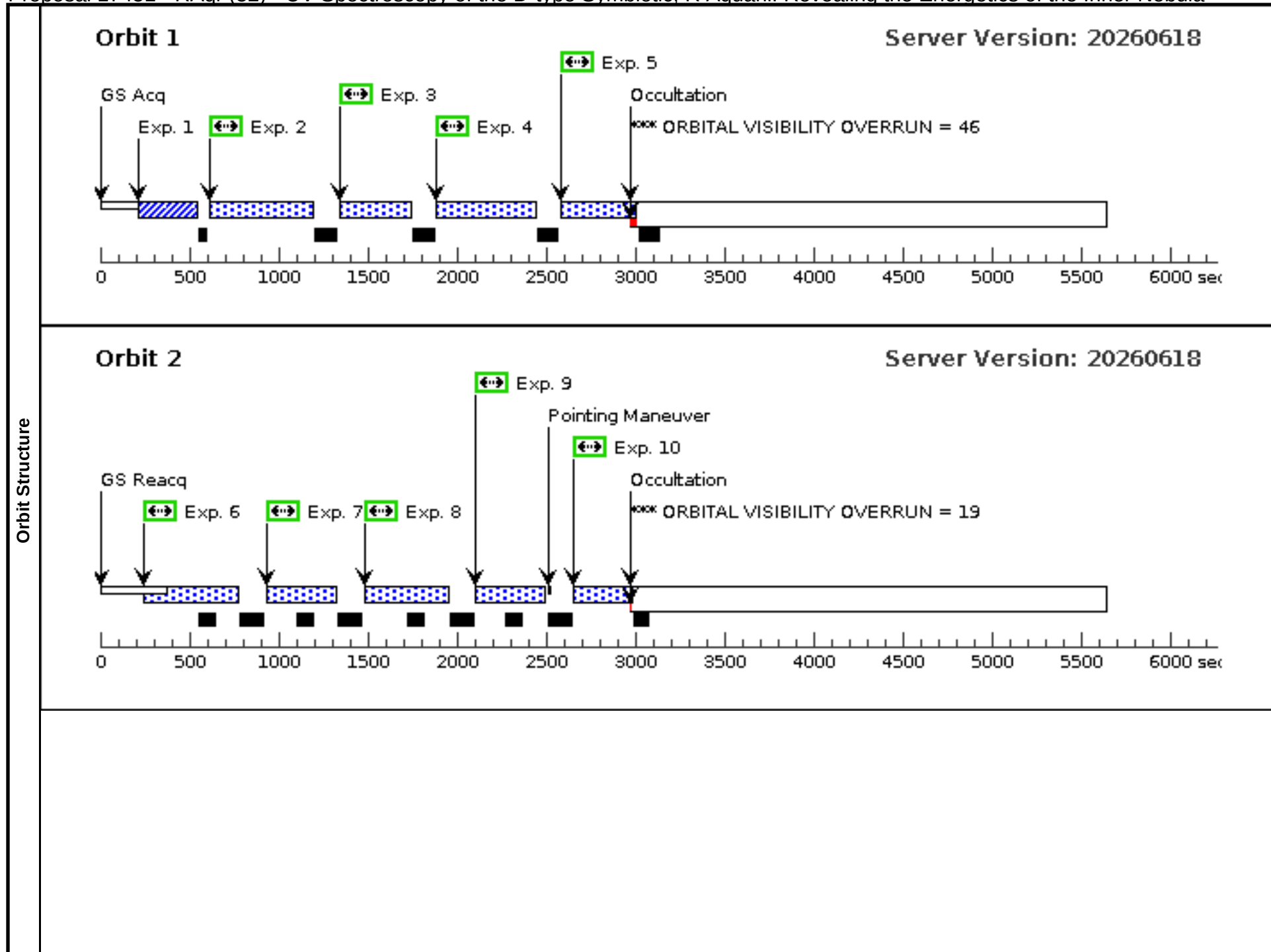
Visit	Proposal 17451, RAqr (52), failed Tue Aug 04 14:00:23 GMT 2026				
	Diagnostic Status: Warning Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none) <i>Comments: Repeat of failed visit 51.</i>				
Diagnostics	(RAqr (52)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (RAqr (52)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (RAqr (52)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (G130M/1291/FPPOS3-i (52.010)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS3-ii (52.011)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS4 (52.012)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G160M/1611 (52.013)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	V-R-AQR	RA: 23 43 49.4634 (355.9560975d) Dec: -15 17 4.18 (-15.28449d) Equinox: J2000	Proper Motion RA: 26.879 mas/yr Proper Motion Dec: -30.411 mas/yr Epoch of Position: 2000.0	V=8.8
Fixed Targets	Miscellaneous Reference Frame: ICRS				
	<i>Comments: Co-ordinates and proper motions obtained from SIMBAD, which uses Gaia DR3.</i> Category=STAR Description=[SYMBIOTIC STAR] Extended=YES				

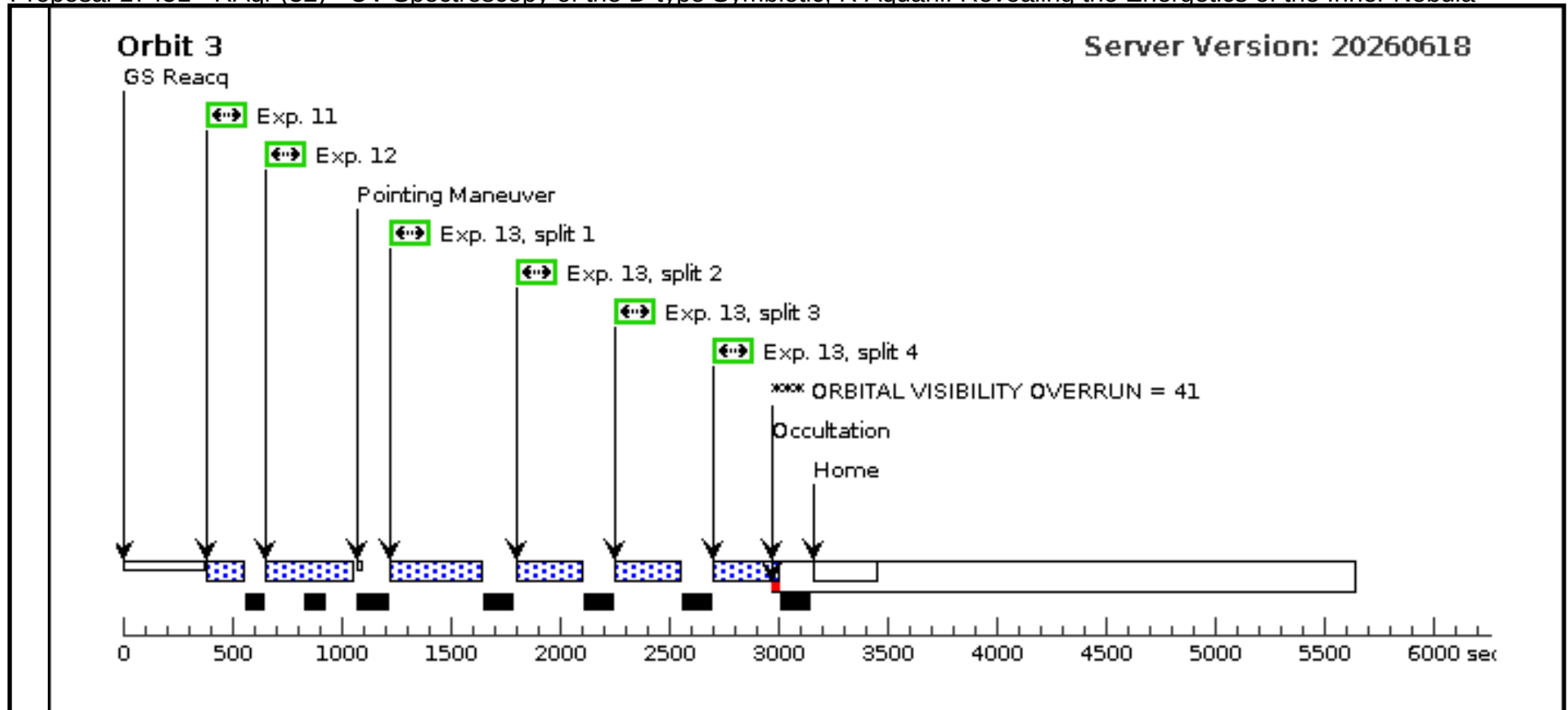
Proposal 17451 - RAqr (52) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	AcqIm (COS.ta.188 8582)	(1) V-R-AQR	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				52 Secs (52 Secs) [==>]	[1]
	Comments: Used December 1991 IUE spectrum to estimate exposure time. Increased the exposure time from the calculation result by a factor of 4 in order to get a higher S/N image of the field, and also to guard against the flux having decreased.									
	2	G185M/191 3/FPPOS1 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=1			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	Comments: The C III] line is described as saturated in MK95; we use twice their reported flux in our calculation and show it is still safe.									
	3	G185M/191 3/FPPOS4 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=4			450 Secs (382 Secs) [==>382.0 Secs]	[1]
	4	G225M/232 5/FPPOS1 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=1			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	5	G225M/232 5/FPPOS4 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=4			477 Secs (409 Secs) [==>409.0 Secs]	[1]
	6	G230L/2635 /FPPOS1 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	7	G230L/2635 /FPPOS4 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	8	G230L/2950 /FPPOS1 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	9	G230L/2950 /FPPOS4 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (378 Secs) [==>378.0 Secs]	[2]
	10	G130M/129 1/FPPOS3-i (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=22 8; LIFETIME-POS=L P5			228 Secs (156 Secs) [==>156.0 Secs]	[2]
	11	G130M/129 1/FPPOS3-ii (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=17 2; LIFETIME-POS=L P5			172 Secs (119 Secs) [==>119.0 Secs]	[3]
	12	G130M/129 1/FPPOS4 (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=14 5; LIFETIME-POS=L P5			400 Secs (347 Secs) [==>347.0 Secs]	[3]

Proposal 17451 - RAqr (52) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

13	G160M/161 1 (COS.sp.188 8996)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=ALL; BUFFER-TIME=18 6; LIFETIME-POS=L P4	296 Secs (972 Secs)	[3]
						[==>243.0 Secs (Split 1)]	
						[==>243.0 Secs (Split 2)]	
						[==>243.0 Secs (Split 3)]	
						[==>243.0 Secs (Split 4)]	
Comments: The ETC run includes the total CIV 1548,1552 doublet flux as a single line, and both OIII] 1663 and NIII] 1750. Calculation COS.sp.1888995 includes the CIV lines separately and the OIII].							





Proposal 17451 - RAqr (53) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Visit	Proposal 17451, RAqr (53), implementation Tue Aug 04 14:00:23 GMT 2026				
	Diagnostic Status: Warning Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none) <i>Comments: Repeat of failed visit 52.</i>				
Diagnostics	(G130M/1291/FPPOS3-i (53.010)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS3-ii (53.011)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G130M/1291/FPPOS4 (53.012)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G160M/1611 (53.013)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	V-R-AQR	RA: 23 43 49.4634 (355.9560975d) Dec: -15 17 4.18 (-15.28449d) Equinox: J2000	Proper Motion RA: 26.879 mas/yr Proper Motion Dec: -30.411 mas/yr Epoch of Position: 2000.0	V=8.8 Reference Frame: ICRS
Fixed Targets	<i>Comments: Co-ordinates and proper motions obtained from SIMBAD, which uses Gaia DR3.</i> Category=STAR Description=[SYMBIOTIC STAR] Extended=YES				

Proposal 17451 - RAqr (53) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	AcqIm (COS.ta.188 8582)	(1) V-R-AQR	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				52 Secs (52 Secs) [==>]	[1]
	Comments: Used December 1991 IUE spectrum to estimate exposure time. Increased the exposure time from the calculation result by a factor of 4 in order to get a higher S/N image of the field, and also to guard against the flux having decreased.									
	2	G185M/191 3/FPPOS1 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=1			450 Secs (375 Secs) [==>375.0 Secs]	[1]
	Comments: The C III] line is described as saturated in MK95; we use twice their reported flux in our calculation and show it is still safe.									
	3	G185M/191 3/FPPOS4 (COS.sp.188 9151)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G185M 1913 A	BUFFER-TIME=34 0; FP-POS=4			450 Secs (375 Secs) [==>375.0 Secs]	[1]
	4	G225M/232 5/FPPOS1 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=1			477 Secs (402 Secs) [==>402.0 Secs]	[1]
	5	G225M/232 5/FPPOS4 (COS.sp.188 9152)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G225M 2325 A	BUFFER-TIME=37 7; FP-POS=4			477 Secs (402 Secs) [==>402.0 Secs]	[1]
	6	G230L/2635 /FPPOS1 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (376 Secs) [==>376.0 Secs]	[2]
	7	G230L/2635 /FPPOS4 (COS.sp.188 9153)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (376 Secs) [==>376.0 Secs]	[2]
	8	G230L/2950 /FPPOS1 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=1			450 Secs (376 Secs) [==>376.0 Secs]	[2]
	9	G230L/2950 /FPPOS4 (COS.sp.188 9170)	(1) V-R-AQR	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=17 0; FP-POS=4			450 Secs (376 Secs) [==>376.0 Secs]	[2]
	10	G130M/129 1/FPPOS3-i (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=22 8; LIFETIME-POS=L P5			228 Secs (154 Secs) [==>154.0 Secs]	[2]
	11	G130M/129 1/FPPOS3-ii (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=17 2; LIFETIME-POS=L P5			172 Secs (112 Secs) [==>112.0 Secs]	[3]
	12	G130M/129 1/FPPOS4 (COS.sp.188 8993)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=14 5; LIFETIME-POS=L P5			400 Secs (340 Secs) [==>340.0 Secs]	[3]

Proposal 17451 - RAqr (53) - UV Spectroscopy of the D-type Symbiotic, R Aquarii: Revealing the Energetics of the Inner Nebula								
	13	G160M/161 1 (COS.sp.188 8996)	(1) V-R-AQR	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=ALL; BUFFER-TIME=18 6; LIFETIME-POS=L P10	296 Secs (944 Secs)	[3]
							[>=>236.0 Secs (Split 1)]	
							[>=>236.0 Secs (Split 2)]	
							[>=>236.0 Secs (Split 3)]	
							[>=>236.0 Secs (Split 4)]	
Comments: The ETC run includes the total CIV 1548,1552 doublet flux as a single line, and both OIII] 1663 and NIII] 1750. Calculation COS.sp.1888995 includes the CIV lines separately and the OIII].								

[3]

