16055 - UNEXPECTED EARLY PERIASTRON PASSAGE AND ECLIPSE IN THE SYMBIOTIC SYSTEM R AQR

Cycle: 27, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) V-R-AQR	WFC3/UVIS	1	31-Dec-2019 16:02:03.0	yes
02	(1) V-R-AQR	WFC3/UVIS	1	31-Dec-2019 16:02:05.0	yes
03	(1) V-R-AQR	WFC3/UVIS	1	31-Dec-2019 16:02:06.0	yes

3 Total Orbits Used

ABSTRACT

We propose ToO/DDT HST WFC3 observation of the R Aqr symbiotic system to obtain high S/N multiwavelength - UV to Optical - images of the binary environment and of the ejecta resulting from the recent - earlier then expected - periastron passage of the WD accretor. This observation is critical for studying this phenomenon (observable only about twice a century, with the next periastron passage expected in about 40 years). The effects of the periastron passage will include enhanced accretion and mass ejections and very likely new jet formation.

OBSERVING DESCRIPTION

We request a total of 3 orbits, in 1 visit.

We plan to carry out HST WFC3/UVIS imaging of R Aqr, using the 4-point dither mode in several filters. This approach will allow us to reach the maximum resolution of 0.025"/pixel and also assist in cosmic ray removal. This will nearly double the number of pixels covering the regions of interest. Furthermore, better sampling of the PSF will allow further enhancement in the resolution using deconvolution techniques such as Richardson-Lucy or EMC2.

We have selected a set of filters to separate line and continuum emission , and to distinguish shocked from photoionized emission. The high-resolution images obtained in the spectral lines e.g., CII] 2326angstroms(A), Mg II 2800A, [OII] 3726A, [OIII] 5007A, H-alpha, and [SII] 6731A, will provide information on the ionization state of the gas. The CII] line can also help determine the (dust) extinction and it is sensitive to carbonatious grain-depletion. The Mg II 2800A line is expected to have a resonant scattering component and will also provide information on the ionization state of the gas. The [OII] 3726A line is a density indicator (the line is bright when the density is low). Furthermore, the [OII] 3726A/[CII] 2326A ratio is a good indicator of temperature and density characteristics of the gas. The SII] 6731A/H-alpha ratio will allow us to identify shocked vs. ionized gas emission, e.g., the ratio will be >=0.4 for shocked gas, and smaller for photoionized gas.

The exposure times are based on the online WFC3 ETC calculations as verified by the 2017 WFC3 observations of R Aqr. We optimize the efficiency of the observing time by using subarray readouts (1024x1024 readout) to minimize the overheads, while still providing a >=40"x40" field of view. The Phase II proposal was generated using the latest APT based on the desired exposure times to avoid saturation and on the use of dither patterns, and makes the most efficient use of the observing time.

We are requesting non-disruptive ToO observations of R Aqr. We request observing within few weeks after the formal activation (of at all possible), other wise , not later then January. In the event a reduced gyro mode will need to be used for this proposal, it will not have any significant impact as long as the target is in the HST field-of-regard when the observations need to be taken in order to catch this time-sensitive behavior of the target since we have no roll constraints for our observations.

Visit

Proposal 16055, Visit 01, implementation Tue Dec 31 21:02:07 GMT 2019

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: BEFORE 31-JAN-2020:00:00:00

Diagnostics

(Visit 01) Warning (Orbit Planner): INVALID GS ACQ SCENARIO SPECIAL REQUIREMENT

(Exposure 1 (Pattern 2, Exps 1-3 in Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Pattern 2, Exps 1-3 in Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 3 (Pattern 2, Exps 1-3 in Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 4 (Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1-3)
	Purpose=DITHER	Pattern Orientation=46.86		
	Number Of Points=4	Angle Between Sides=		
	Point Spacing=0.145	Center Pattern=false		
	Line Spacing=			

Fixed Targets

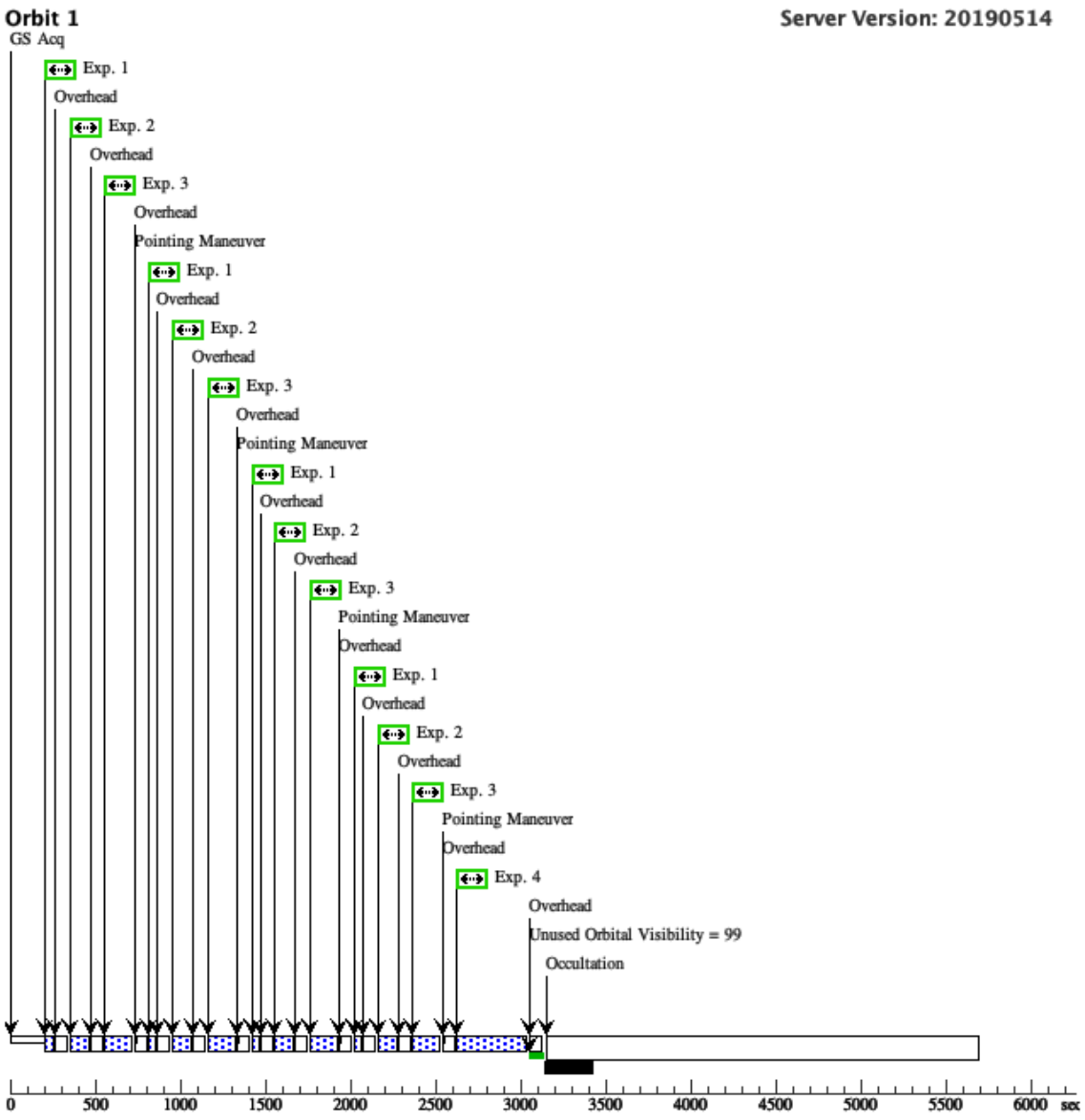
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-R-AQR	RA: 23 43 49.4616 (355.9560900d) Dec: -15 17 4.20 (-15.28450d) Equinox: J2000		V=10+/-3.0	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[ACCRETION DISK, INTERACTING BINARY, JET, SYMBIOTIC STAR]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(WFC3UVIS.im.780074)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F502N	FLASH=20.0	GS ACQ SCENARIO SINGLE	Pattern 2, Exps 1-3 in Visit 01 (2)	15 Secs (60 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	(WFC3UVIS.im.832643)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F373N	FLASH=20		Pattern 2, Exps 1-3 in Visit 01 (2)	90 Secs (360 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3	(WFC3UVIS.im.832644)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F280N	FLASH=20		Pattern 2, Exps 1-3 in Visit 01 (2)	130 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
4	(WFC3UVIS.im.780074)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	FLASH=20	GS ACQ SCENARIO SINGLE		400 Secs (400 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16055, Visit 02, implementation Tue Dec 31 21:02:07 GMT 2019

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 2, Exps 1-4 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Pattern 2, Exps 1-4 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 3 (Pattern 2, Exps 1-4 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 4 (Pattern 2, Exps 1-4 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1-4)
	Purpose=DITHER	Pattern Orientation=46.86		
	Number Of Points=4	Angle Between Sides=		
	Point Spacing=0.145	Center Pattern=false		
	Line Spacing=			

Fixed Targets

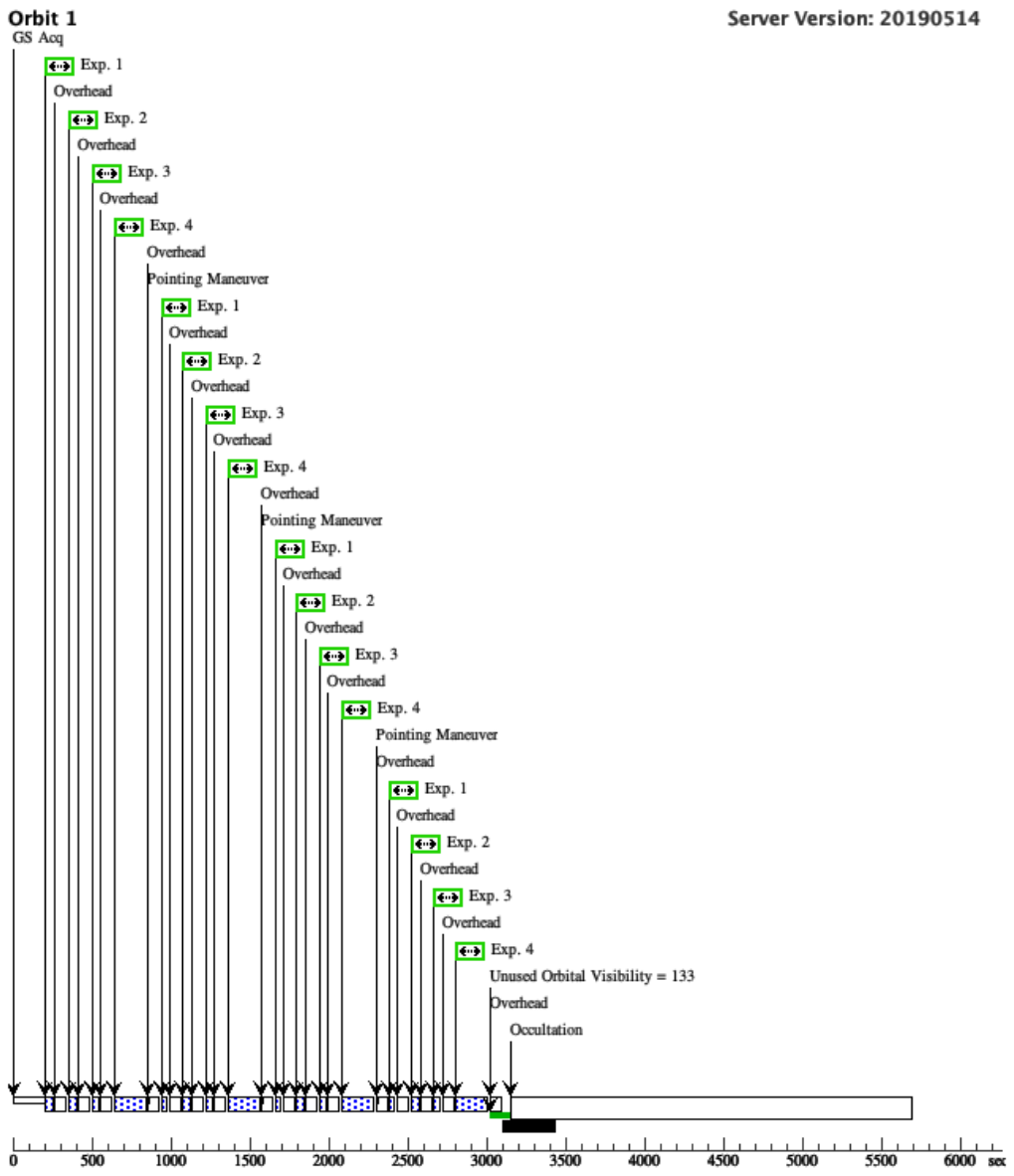
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-R-AQR	RA: 23 43 49.4616 (355.9560900d) Dec: -15 17 4.20 (-15.28450d) Equinox: J2000		V=10+/-3.0	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[ACCRETION DISK, INTERACTING BINARY, JET, SYMBIOTIC STAR]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(WFC3UVIS.im.780078)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	FLASH=20	GS ACQ SCENARIO SINGLE	Pattern 2, Exps 1-4 in Visit 02 (2)	20 Secs (80 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	(WFC3UVIS.im.780079)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F673N	FLASH=20		Pattern 2, Exps 1-4 in Visit 02 (2)	20 Secs (80 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3	(WFC3UVIS.im.780075)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=20		Pattern 2, Exps 1-4 in Visit 02 (2)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
4	(WFC3UVIS.im.780140)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F275W	FLASH=20		Pattern 2, Exps 1-4 in Visit 02 (2)	180 Secs (720 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 16055, Visit 03, implementation Tue Dec 31 21:02:07 GMT 2019

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Visit 03)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Visit 03)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 3 (Visit 03)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 4 (Pattern 2, Exps 4-4 in Visit 03)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 4 (Pattern 2, Exps 4-4 in Visit 03)) Warning (Form): POS TARG & PATTERN should be used carefully with WFC3 quad filters to avoid placing the target on the vignetted part of the field of view or moving it to another quadrant.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=46.86		
	Number Of Points=4	Angle Between Sides=		
	Point Spacing=0.145	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-R-AQR	RA: 23 43 49.4616 (355.9560900d)		V=10+/-3.0	Reference Frame: ICRS
		Dec: -15 17 4.20 (-15.28450d)			
		Equinox: J2000			

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[ACCRETION DISK, INTERACTING BINARY, JET, SYMBIOTIC STAR]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(WFC3UVIS.im.780074)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F280N	FLASH=20	GS ACQ SCENARIO SINGLE		455 Secs (455 Secs) *[==>]*	 ***[1]***
2	(WFC3UVIS.im.780074)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F373N	FLASH=20			250 Secs (250 Secs) *[==>]*	 ***[1]***
3	(WFC3UVIS.im.780074)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F502N	FLASH=20			450 Secs (450 Secs) *[==>]*	 ***[1]***
4	(WFC3UVIS.im.780080)	(1) V-R-AQR	WFC3/UVIS, ACCUM, UVIS-QUAD-SUB	FQ232N	FLASH=20		Pattern 2, Exps 4-4 in Visit 03 (2)	180 Secs (720 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***

Orbit Structure