15971 - Investigating the origins of large-scale spiral arms around a T Tauri star

Cycle: 27, Proposal Category: GO

(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-RU-LUP	STIS/CCD	1	22-Feb-2021 13:00:13.0	yes
02	(1) V-RU-LUP	STIS/CCD	1	22-Feb-2021 13:00:14.0	yes
03	(2) HD-142709	STIS/CCD	1	22-Feb-2021 13:00:15.0	yes
04	(1) V-RU-LUP	STIS/CCD	1	22-Feb-2021 13:00:17.0	yes
05	(1) V-RU-LUP	STIS/CCD	1	22-Feb-2021 13:00:17.0	yes
06	(1) V-RU-LUP	STIS/CCD	1	22-Feb-2021 13:00:18.0	yes
07	(2) HD-142709	STIS/CCD	1	22-Feb-2021 13:00:20.0	yes

7 Total Orbits Used

ABSTRACT

Despite the steadily increasing number of detections of spiral arms in protoplanetary disks over the past two decades, their origins remain enigmatic. The leading hypotheses are that the arms are due to perturbations from massive protoplanets or from gravitational instabilities, but neither mechanism has been confirmed for any protoplanetary disk. Recent ALMA observations of the T Tauri star RU Lup reveal multiple spiral arms in 12CO emission stretching out to nearly 1000 au from the star. The clumpy arms and large-scale non-Keplerian kinematics are suggestive of origins in gravitational instabilities. To investigate this possibility further, we propose for STIS coronagraphic observations to trace the large-scale distribution of material around RU Lup in scattered light. In particular, we are searching for 1) evidence of infalling remnant envelope material that may be responsible for the non-Keplerian kinematics and 2) dust counterparts of the molecular spiral arms, which can place constraints on the orientation of the arms relative to the disk based on how they are illuminated by starlight. A combined analysis of the deep ALMA CO maps and HST scattered light maps of RU Lup would provide the best opportunity yet to study how material may be transported from the large-scale circumstellar environment to small disk scales and induce disk instabilities.

OBSERVING DESCRIPTION

To image the RU Lup system, the proposed program follows a procedure similar to that employed by HST Program 12228 to image PDS 66 and other circumstellar disks. The program consists of 3 orbits with RU Lup as the target and one orbit dedicated to observing the PSF reference star, HD 142709.

For each orbit, guide star acquisition takes 6m33s, and the coronagraphic acquisition takes 4-5 minutes. For acquisition of RU Lup, we use the F28x50LP filter and an exposure time of 0.2 seconds to achieve a S/N of 184. For acquisition of the brighter HD 142709, we use the F24ND3 filter to achieve S/N=120 in 1.2 seconds. The first science observations are three short exposures of 203 s each under the WEDGEA0.6 coronagraph, with an inner working angle of 0.3". The integration time is set to avoid exceeding 80% full well at the edge of the wedge. We will use a subarray readout of SIZEAXIS=136 pixels, centered on the target. The inner working angle of WEDGEA0.6 is necessary for imaging the disk-halo transition region (as constrained by published SPHERE observations of this source), but the outer working angle is not large enough to overlap with all of the CO emission around RU Lup, which extends to 8". Therefore, we will move to the WEDGEA1.0 location (requiring another 29 s) because this aperture provides a larger field of view (>10" in every direction from the star) and enables longer exposures without saturation. Because the WedgeA1.0 aperture is 214 pixels from the edge of the CCD, we will use a subarray readout of SIZEAXIS=426 pixels, centered on the target, to reduce the CCD read time and avoid doing a buffer dump until the end of the orbital visibility.

Note: We obtain a "subarray off detector warning" when using SIZEAXIS=136 pixels for the WEDGEA0.6 position. Communication with our contact scientist indicates that this is an APT software issue that does not pose an issue for the flight software.

The coronagraphic wedges and diffraction spikes, under which good PSF subtraction cannot be performed, block a substantial portion of the field of view. Therefore, we have to take observations at multiple telescope orientations. This also acts as a rotational dither and allows us to verify that structures seen at one orientation are truly from RU Lup. At any given time, the maximum roll available is ~30 degrees. Three orientations with as much roll as possible will produce the cleanest image. We seek rolls of 24-30 degrees to produce an image without occulted areas in the outer disk and in the spiral arm region. Each orbit will be contained in a separate visit due to changes in orientation/target.

The three coronagraphic orbits at different orientations must be executed sequentially to minimize PSF-subtraction residuals due to the time-variation in the HST optical assembly (often referred to as "breathing"). Similarly,
we must observe a PSF reference star, HD 142709, in another sequential orbit. The PSF star, which is relatively close to RU Lup in the sky and chosen to be a nearly perfect color match based on Gaia photometry, is required because of the unfiltered large bandpass of the STIS/CCD. The PSF observations should follow the RU Lup observations in case the initial orbit is affected by the "breathing." Each orbit will be contained in a separate visit due to changes in orientation/target.

Impact of reduced gyro mode: Based on Space Telescope's May 2016 report on reduced gyro mode implications, the main concern for the present program would be that scheduling the observations would become more difficult due to the necessity of performing sequential, contiguous visits with different roll angles. Although there is no absolute orientation requirement, roll angles between 24-30 degrees between orbits are sought in order to image areas that would otherwise be occulted by the coronagraph at a single orientation. However, for the sake of schedulability in the event of gyroscopic problems, roll angle requirements may be relaxed to 20 degrees.

Visit

Proposal 15971, V1-RULUP (01), completed Mon Feb 22 18:00:20 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT -30D TO -24D FROM 02

Comments: First of three visits to RU Lup, with one visit to a PSF interleaved. The visits must be executed sequentially.

Orientation: The first visit should have a relative orientation of -30 to -24 degrees from the second visit, with no absolute orientation constraint on the second visit. Ideally, the relative orientation should be as close to -30 degrees as possible.

Timing: This visit should come immediately before visit 2.

Diagnostics

(V1-RULUP (01)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V1-RULUP (01)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V1-RULUP (01)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

Fixed Targets

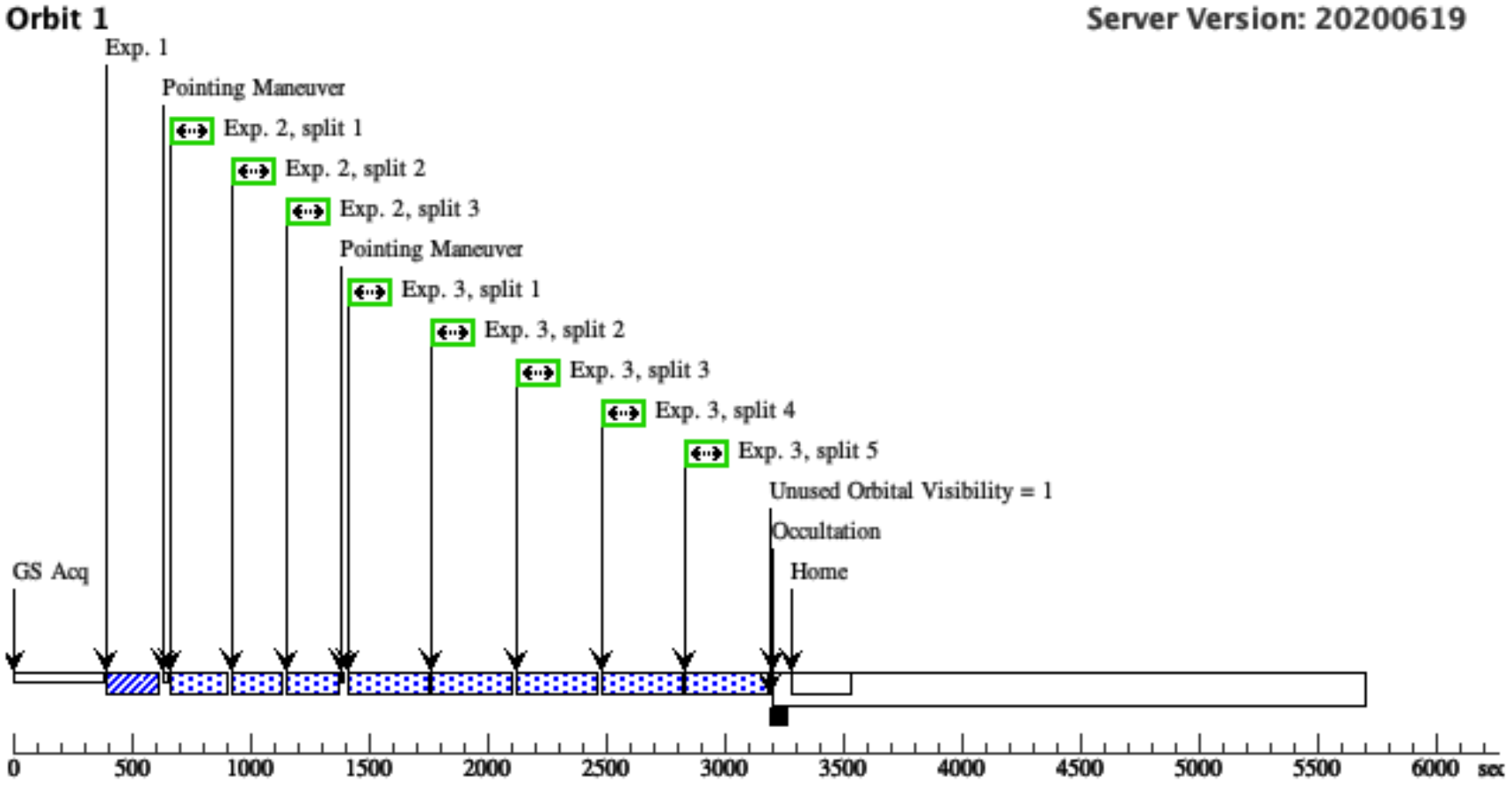
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-RU-LUP	RA: 15 56 42.3110 (239.1762958d) Dec: -37 49 15.47 (-37.82096d) Equinox: J2000	Proper Motion RA: -11.546 mas/yr Proper Motion Dec: -23.234 mas/yr Epoch of Position: 2000	V=11.1	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. The V magnitude is taken from Gahm et al. 1993.
Category=EXT-STAR
Description=[CIRCUMSTELLAR MATTER, PRE-MAIN SEQUENCE STAR, PROTOPLANETARY DISK]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RULUP_ACQ (STIS.ta.1430937)	(1) V-RU-LUP	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.2 Secs (0.2 Secs) *[==>]*	***[1]***
	Comments: V=11.1, Spectral Type = K7, SNR=184								
2	RULUP_SHORT	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4; SIZEAXIS2=136			618 Secs (618 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
	Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). RU Lup is V=11.1.								
3	RULUP_LONG	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=5; GAIN=4; SIZEAXIS2=426			1635 Secs (1635 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]*	***[1]***
	Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 s for V=7.96. RU Lup is V=11.1, so 80% of full-well is expected in 1330 seconds. In order to divide the remaining orbit visibility time evenly by 5 sub-exposures, we set the time for each sub-exposure to 320 seconds.								

Orbit Structure



Visit

Proposal 15971, V2-RULUP (02), failed Mon Feb 22 18:00:20 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 01 BY 0.5 Orbits TO 1.5 Orbits

Comments: Second of three visits to RU Lup, with one visit to a PSF interleaved. The visits must be executed sequentially.

Orientation: There is no absolute orientation for this visit, but the preceding visit should have a relative orientation of -30 to -24 degrees from this visit.

Timing: This visit should come immediately after visit 1 and immediately before visit 3.

Diagnostics

(V2-RULUP (02)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V2-RULUP (02)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V2-RULUP (02)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

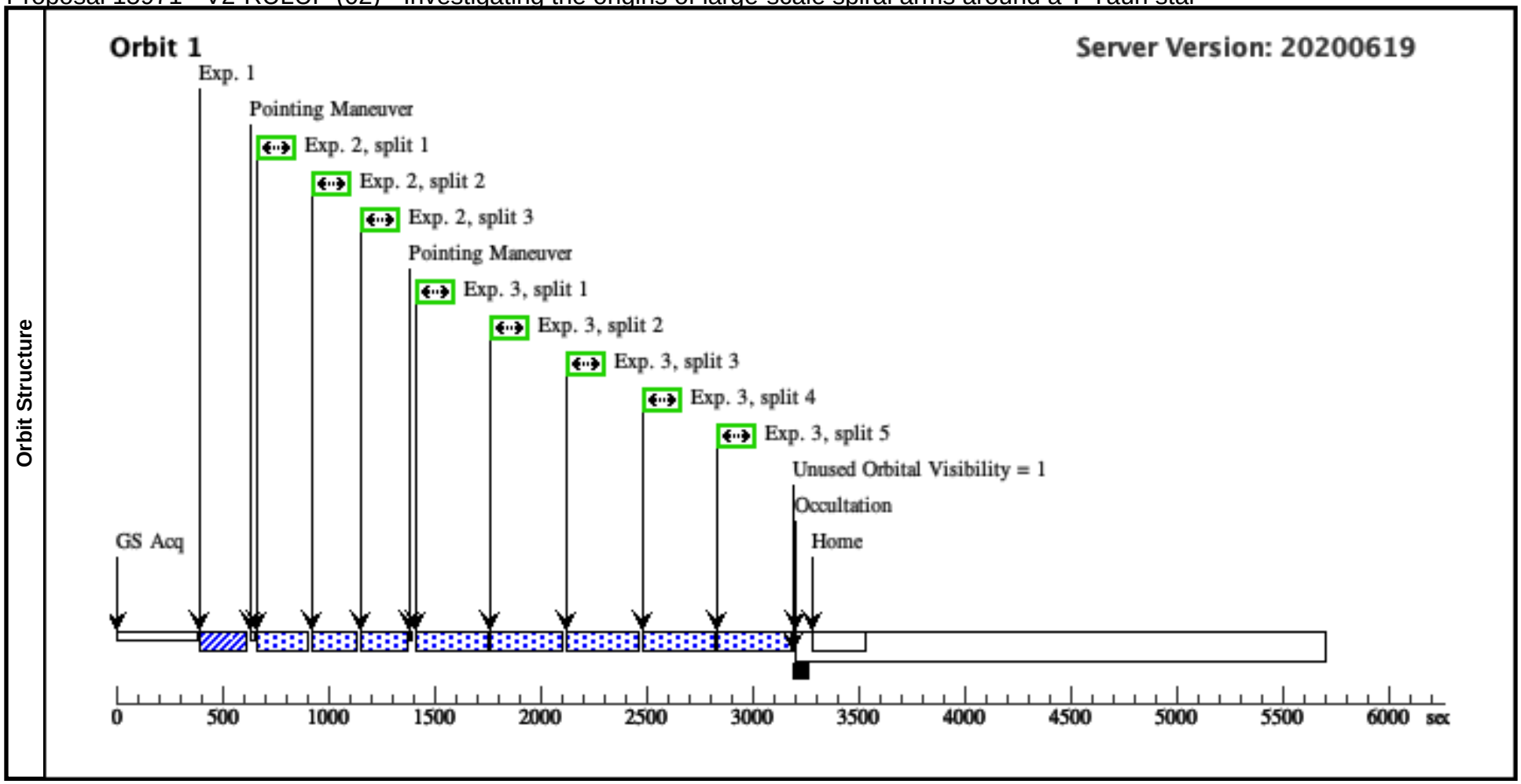
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-RU-LUP	RA: 15 56 42.3110 (239.1762958d) Dec: -37 49 15.47 (-37.82096d) Equinox: J2000	Proper Motion RA: -11.546 mas/yr Proper Motion Dec: -23.234 mas/yr Epoch of Position: 2000	V=11.1	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. The V magnitude is taken from Gahm et al. 1993.
Category=EXT-STAR
Description=[CIRCUMSTELLAR MATTER, PRE-MAIN SEQUENCE STAR, PROTOPLANETARY DISK]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RULUP_ACQ (STIS.ta.1430937)	(1) V-RU-LUP	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.2 Secs (0.2 Secs) *[==>]*	***[1]***
	Comments: V=11.1, Spectral Type = K7, SNR=184								
2	RULUP_SHORT	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4; SIZEAXIS2=136			618 Secs (618 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
	Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). RU Lup is V=11.1.								
3	RULUP_LONG	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=5; GAIN=4; SIZEAXIS2=426			1635 Secs (1635 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]*	***[1]***
	Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 s for V=7.96. RU Lup is V=11.1, so 80% of full-well is expected in 1330 seconds. In order to divide the remaining orbit visibility time evenly by 5 sub-exposures, we set the time for each sub-exposure to 320 seconds.								


Orbit Structure
Orbit 1
Server Version: 20200619
Exp. 1
Pointing Maneuver
Exp. 2, split 1
Exp. 2, split 2
Exp. 2, split 3
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Exp. 3, split 3
Exp. 3, split 4
Exp. 3, split 5
Unused Orbital Visibility = 1
Occultation
Home
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15971, V3-PSF-RULUP (03), failed Mon Feb 22 18:00:21 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 02 BY 0.5 Orbits TO 1.5 Orbits

Comments: Visit to PSF reference star (HD 142709), interleaved between visits to the science target (RU Lup). The visits must be executed sequentially.

Orientation: There is no absolute orientation for this visit.

Timing: This visit should come immediately after visit 2 and immediately before visit 4.

Diagnostics

(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP (03)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

Fixed Targets

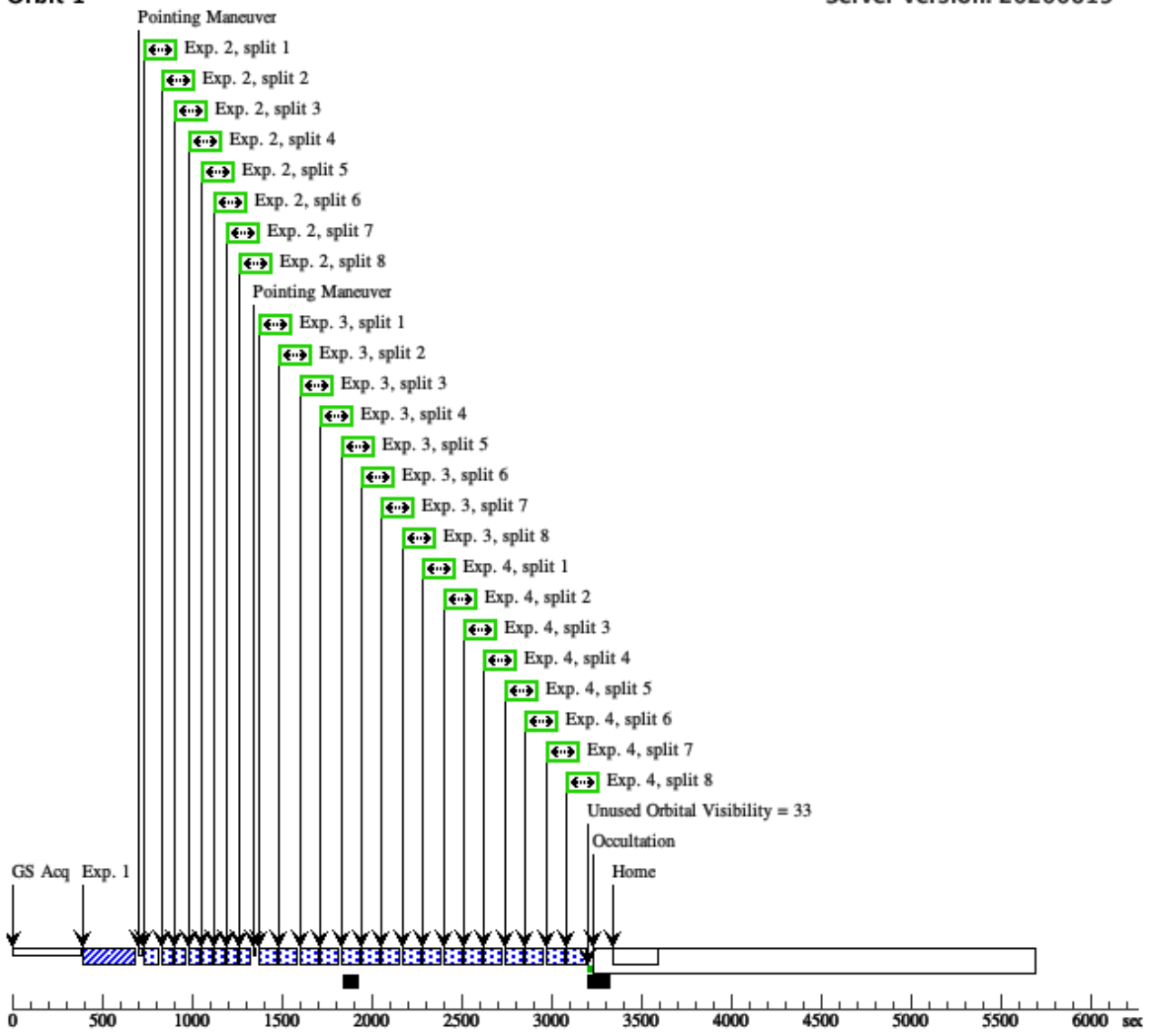
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HD-142709	RA: 15 57 40.7430 (239.4197625d)	Proper Motion RA: -256.919 mas/yr	V=8.055	Reference Frame: ICRS
		Dec: -42 37 27.24 (-42.62423d)	Proper Motion Dec: -190.894 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[K V-IV]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1368142)	(2) HD-142709	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT			1.2 Secs (1.2 Secs)	
								[==>]	***[1]***
Comments: V=8.1, Spectral Type = K4, SNR=120, exposure time rounded to nearest 0.1 seconds									
2		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=136			400 Secs (400 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). HD 142709 is V=8.1.									
3		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=426			680 Secs (680 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 seconds for V=7.96. HD 142709 is V=8.1, so 80% of fulll-well is expected in 85 seconds.									
4		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=426			680 Secs (680 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 seconds for V=7.96. HD 142709 is V=8.1, so 80% of full-well is expected in 85 seconds.									

Orbit Structure



Visit

Proposal 15971, V4-RULUP (04), failed Mon Feb 22 18:00:21 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT 23D TO 30D FROM 02; AFTER 03 BY 0.5 Orbits TO 1.5 Orbits

Comments: Last of three visits to RU Lup, with one visit to a PSF interleaved. The visits must be executed sequentially.

Orientation: This visit should have a relative orientation of 20 to 30 degrees from the second visit, with no absolute orientation constraint on the second visit. Ideally, the relative orientation should be as close to 30 degrees as possible.

Timing: This visit should come immediately after visit 3.

Diagnostics

(V4-RULUP (04)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V4-RULUP (04)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V4-RULUP (04)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

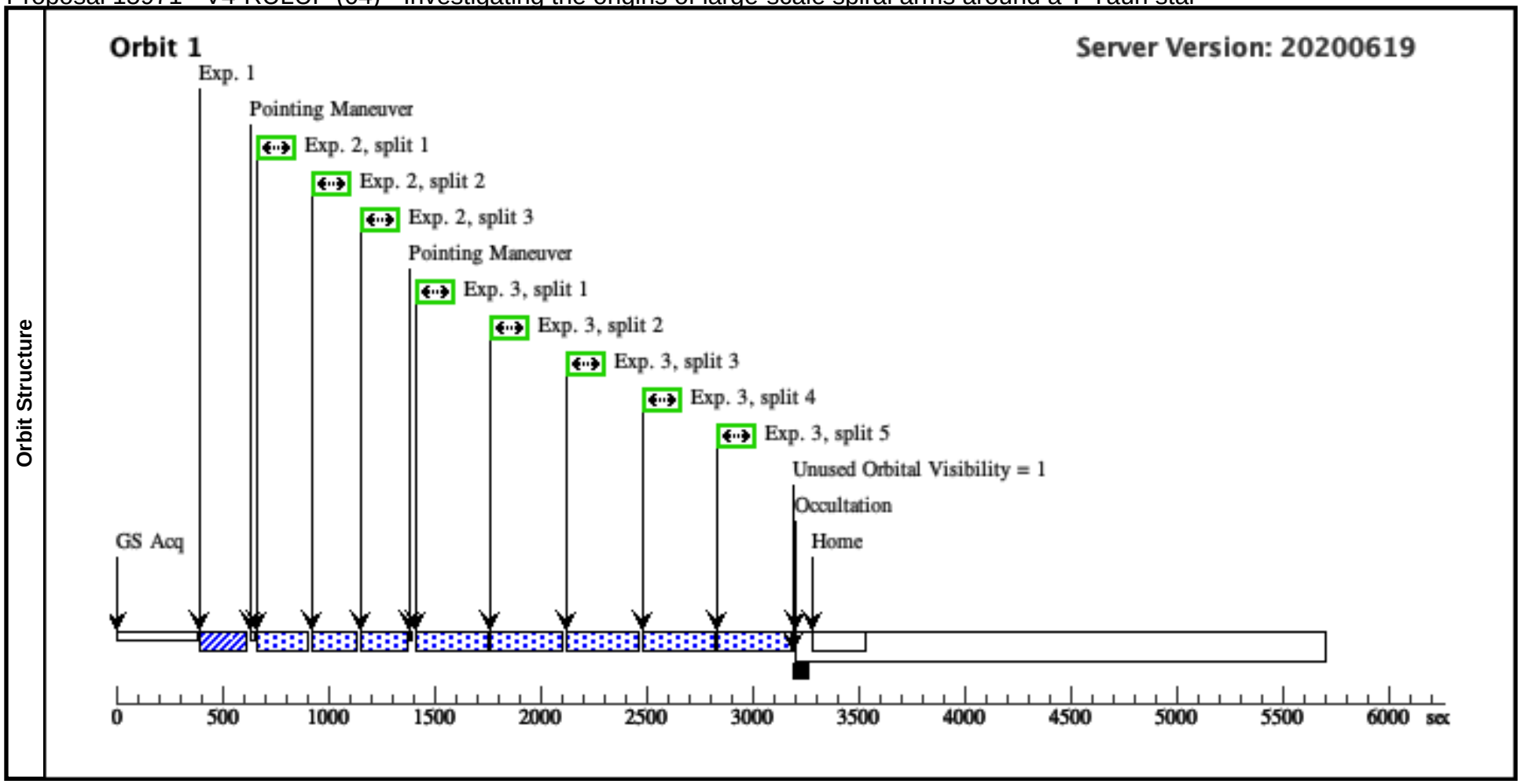
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-RU-LUP	RA: 15 56 42.3110 (239.1762958d)	Proper Motion RA: -11.546 mas/yr	V=11.1	Reference Frame: ICRS
		Dec: -37 49 15.47 (-37.82096d)	Proper Motion Dec: -23.234 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. The V magnitude is taken from Gahm et al. 1993.
Category=EXT-STAR
Description=[CIRCUMSTELLAR MATTER, PRE-MAIN SEQUENCE STAR, PROTOPLANETARY DISK]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RULUP_ACQ (STIS.ta.1430937)	(1) V-RU-LUP	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.2 Secs (0.2 Secs) *[==>]*	***[1]***
	Comments: V=11.1, Spectral Type = K7, SNR=184								
2	RULUP_SHORT	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4; SIZEAXIS2=136			618 Secs (618 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
	Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). RU Lup is V=11.1.								
3	RULUP_LONG	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=5; GAIN=4; SIZEAXIS2=426			1635 Secs (1635 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]*	***[1]***
	Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 s for V=7.96. RU Lup is V=11.1, so 80% of full-well is expected in 1330 seconds. In order to divide the remaining orbit visibility time evenly by 5 sub-exposures, we set the time for each sub-exposure to 320 seconds.								


Orbit Structure
Orbit 1
Server Version: 20200619
Exp. 1
Pointing Maneuver
Exp. 2, split 1
Exp. 2, split 2
Exp. 2, split 3
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Exp. 3, split 3
Exp. 3, split 4
Exp. 3, split 5
Unused Orbital Visibility = 1
Occultation
Home
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15971, V2-RULUP-repeat (05), scheduling Mon Feb 22 18:00:21 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT -30D TO -24D FROM 06; BEFORE 27-MAY-2021:00:00:00

Comments: First of two repeated visits to RU Lup, followed by a PSF visit. The visits must be executed sequentially.

Orientation: This visit should be offset by at least +/- 24 degrees from V1-RULup (previously executed successfully at 71 degrees)

Timing: This visit should come immediately before the repeat of visit 04 (V4-RULup-repeat (06)).

Diagnostics

(V2-RULUP-repeat (05)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V2-RULUP-repeat (05)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V2-RULUP-repeat (05)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

Fixed Targets

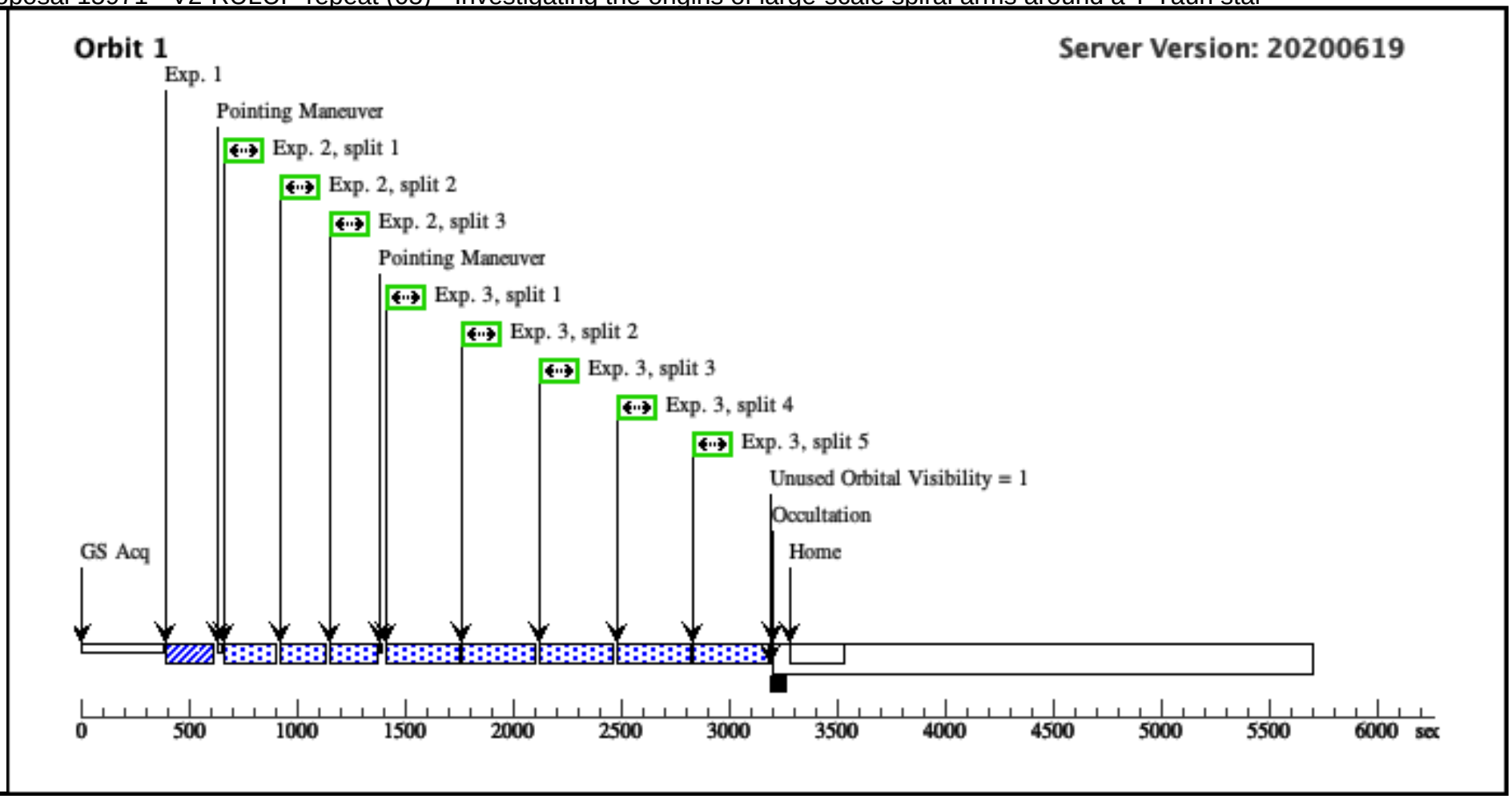
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-RU-LUP	RA: 15 56 42.3110 (239.1762958d)	Proper Motion RA: -11.546 mas/yr	V=11.1	Reference Frame: ICRS
		Dec: -37 49 15.47 (-37.82096d)	Proper Motion Dec: -23.234 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. The V magnitude is taken from Gahm et al. 1993.
Category=EXT-STAR
Description=[CIRCUMSTELLAR MATTER, PRE-MAIN SEQUENCE STAR, PROTOPLANETARY DISK]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RULUP_ACQ (STIS.ta.1430937)	(1) V-RU-LUP	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.2 Secs (0.2 Secs)	
								[==>]	***[1]***
	Comments: V=11.1, Spectral Type = K7, SNR=184								
2	RULUP_SHORT	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3;			618 Secs (618 Secs)	
					GAIN=4;			*[==>(Split 1)]*	
					SIZEAXIS2=136			*[==>(Split 2)]*	***[1]***
								[==>(Split 3)]	
	Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). RU Lup is V=11.1.								
3	RULUP_LONG	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=5;			1635 Secs (1635 Secs)	
					GAIN=4;			*[==>(Split 1)]*	
					SIZEAXIS2=426			*[==>(Split 2)]*	
								[==>(Split 3)]	***[1]***
								[==>(Split 4)]	
								[==>(Split 5)]	
	Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 s for V=7.96. RU Lup is V=11.1, so 80% of full-well is expected in 1330 seconds. In order to divide the remaining orbit visibility time evenly by 5 sub-exposures, we set the time for each sub-exposure to 320 seconds.								

Orbit Structure



Visit

Proposal 15971, V4-RULUP-repeat (06), scheduling Mon Feb 22 18:00:21 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT 318D TO 318 D; AFTER 05 BY 0.5 Orbits TO 1.5 Orbits; BEFORE 27-MAY-2021:00:00:00

Comments: Second of two repeated visits to RU Lup, with one visit to a PSF following. The visits must be executed sequentially.

Orientation: This visit should have a relative orientation of at least +/- 24 degrees from the successfully executed Visit 01 (V1-RULUP) and +/- 24 to 30 degrees from the repeat of visit 02 (V2-RULup-repeat (05)). A relative offset closer to +/- 30 degrees from the repeat of visit 02 (V2-RULup-repeat (05)) is preferred.

Timing: This visit should come immediately after the repeat of Visit 02 (V2-RULup-repeat (05)).

Diagnostics

(V4-RULUP-repeat (06)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V4-RULUP-repeat (06)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

(V4-RULUP-repeat (06)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

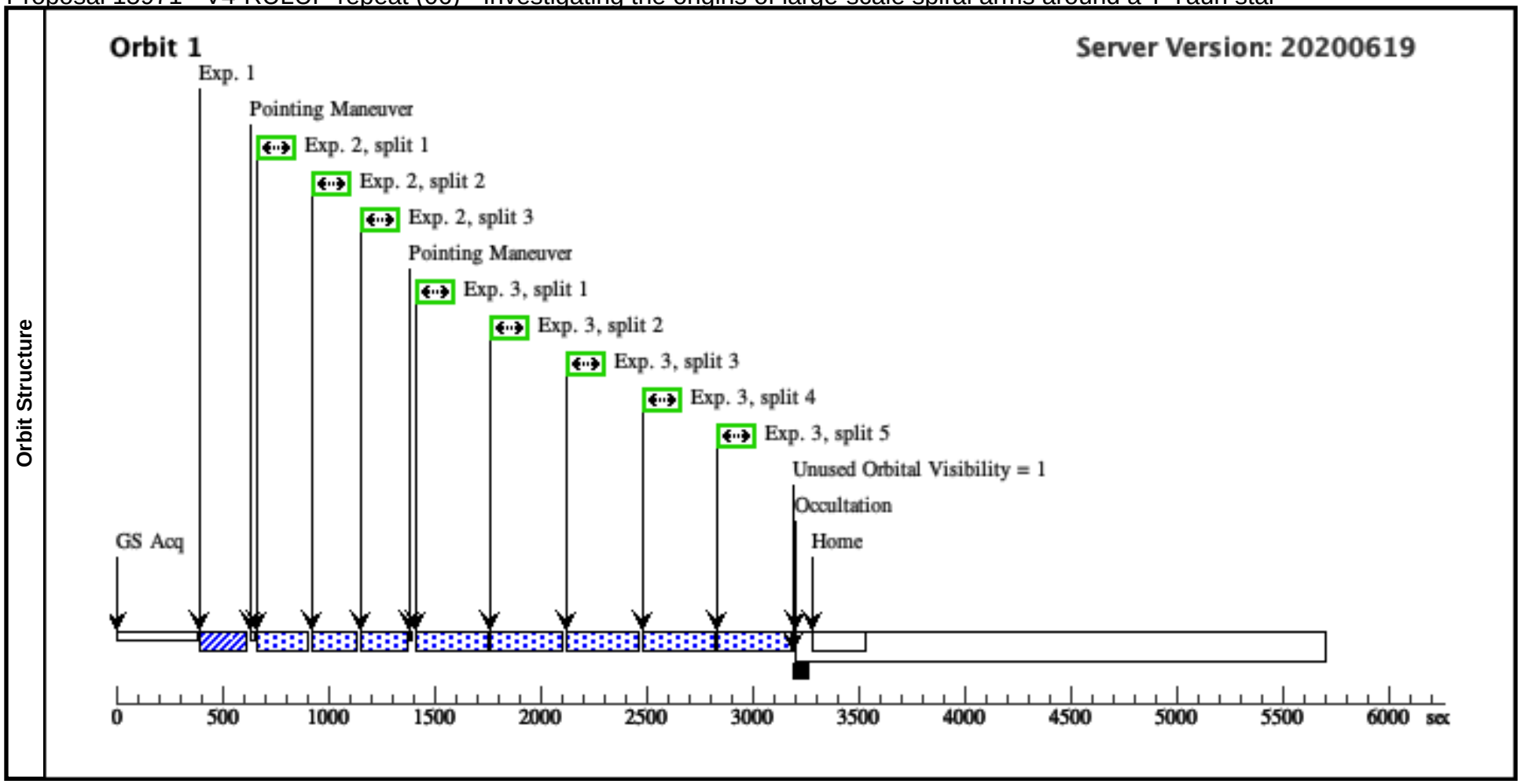
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-RU-LUP	RA: 15 56 42.3110 (239.1762958d)	Proper Motion RA: -11.546 mas/yr	V=11.1	Reference Frame: ICRS
		Dec: -37 49 15.47 (-37.82096d)	Proper Motion Dec: -23.234 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. The V magnitude is taken from Gahm et al. 1993.
Category=EXT-STAR
Description=[CIRCUMSTELLAR MATTER, PRE-MAIN SEQUENCE STAR, PROTOPLANETARY DISK]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RULUP_ACQ (STIS.ta.1430937)	(1) V-RU-LUP	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			0.2 Secs (0.2 Secs) *[==>]*	*[1]*
	Comments: V=11.1, Spectral Type = K7, SNR=184								
2	RULUP_SHORT	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4; SIZEAXIS2=136			618 Secs (618 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*
	Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). RU Lup is V=11.1.								
3	RULUP_LONG	(1) V-RU-LUP	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=5; GAIN=4; SIZEAXIS2=426			1635 Secs (1635 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]*	*[1]*
	Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 s for V=7.96. RU Lup is V=11.1, so 80% of full-well is expected in 1330 seconds. In order to divide the remaining orbit visibility time evenly by 5 sub-exposures, we set the time for each sub-exposure to 320 seconds.								


Orbit Structure
Orbit 1
Server Version: 20200619
Exp. 1
Pointing Maneuver
Exp. 2, split 1
Exp. 2, split 2
Exp. 2, split 3
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Exp. 3, split 3
Exp. 3, split 4
Exp. 3, split 5
Unused Orbital Visibility = 1
Occultation
Home
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15971, V3-PSF-RULUP-repeat (07), scheduling Mon Feb 22 18:00:21 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 06 BY 0.5 Orbits TO 1.5 Orbits; BEFORE 27-MAY-2021:00:00:00

Comments: Visit to PSF reference star (HD 142709), following the two repeated visits to the science target (RU Lup). The visits must be executed sequentially.

Orientation: There is no absolute orientation constraint for this visit.

Timing: This visit should come immediately after the repeat of visit 04 (V4-RULup-repeat (06)).

Diagnostics

(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR
(V3-PSF-RULUP-repeat (07)) Warning (Orbit Planner): SUBARRAY OFF OF DETECTOR

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HD-142709	RA: 15 57 40.7430 (239.4197625d)	Proper Motion RA: -256.919 mas/yr	V=8.055	Reference Frame: ICRS
		Dec: -42 37 27.24 (-42.62423d)	Proper Motion Dec: -190.894 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[K V-IV]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1368142)	(2) HD-142709	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT			1.2 Secs (1.2 Secs)	
								[==>]	***[1]***
Comments: V=8.1, Spectral Type = K4, SNR=120, exposure time rounded to nearest 0.1 seconds									
2		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=136			400 Secs (400 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: Exposure time selected to avoid exceeding 80% of full well at 0.3", scaled from counts measured for PDS 66 (V=10.35) from Program 12228 and Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019). HD 142709 is V=8.1.									
3		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=426			680 Secs (680 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 seconds for V=7.96. HD 142709 is V=8.1, so 80% of fulll-well is expected in 85 seconds.									
4		(2) HD-142709	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	CR-SPLIT=8; GAIN=4; SIZEAXIS2=426			680 Secs (680 Secs)	
								[==>(Split 1)] *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]* *[==>(Split 5)]* *[==>(Split 6)]* *[==>(Split 7)]* *[==>(Split 8)]*	***[1]***
Comments: According to Table 1 in J. of Astronomical Telescopes, Instruments, and Systems, 5(3), 035003 (2019), 80% of full-well at 0.5" is achieved in 74 seconds for V=7.96. HD 142709 is V=8.1, so 80% of full-well is expected in 85 seconds.									

Orbit Structure