16715 - Coronagraphic Imaging of the Iconic Quasar 3C 273

Cycle: 29, 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) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:46.0	yes
02	(1) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:47.0	yes
03	(2) PSF-TYC-287-284-1	STIS/CCD	1	02-Mar-2022 17:01:48.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:48.0	yes
05	(1) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:49.0	yes
06	(1) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:50.0	yes
07	(3) PSF-TYC-292-743-1	STIS/CCD	1	02-Mar-2022 17:01:51.0	yes
08	(1) 3C-273	STIS/CCD	1	02-Mar-2022 17:01:52.0	yes

8 Total Orbits Used

ABSTRACT

Recent understanding of HST/STIS coronagraphic high contrast imaging mode can enable the study of quasar surroundings in visible light at high-contrast and high-resolution. We request 8 orbits of coronagraphic imaging mode to observe the surrounding environments for quasar 3C 273 with STIS as a first extragalactic science demonstration of this mode. Using the recently commissioned BAR5 occulter, we can probe the host galaxy morphology and features of the quasar's circumnuclear environment down to 0.2 arcsec, or ~520 pc. In our preparatory work, on the one hand, we have discovered new host galaxy structures at ~1 arcsec in the re-analysis of non-coronagraphic STIS observations of 3C 273; on the other hand, our pilot Keck/NIRC2 near-IR observation has revealed a candidate circumnuclear disk with a diameter of ~1 kpc. Coronagraphic observations with STIS will not only help characterize this candidate structure, provide critical constraints for determining whether the host galaxy is undergoing a merger, but also provide an unprecedented view of the surroundings of 3C 273 in visible light. Moreover, combined with archival re-analysis, we can establish a ~20 year baseline to study apparent motion for its jet. This project further demonstrates the necessity of multi-instrument coronagraphic imaging from visble to near-infrared in understanding the surrounding environments of quasars.

OBSERVING DESCRIPTION

We use 8 orbits of STIS coronagraphic observations to explore the surrounding environments for 3C 273, a V = 12.7 quasar (Gaia EDR3 G = 12.84). In each orbit, we use a combination of both the BAR5 occulter and the WEDGEA0.6 occulter to achive our goal.

There are two sets of observations (V1 to V4, then V5 to V8). In each set, we have 4 "back-to-back" orbits.

a. Reference-point Orbit: In each set, we orient the telescope with respect to the 2nd visit (i.e., V2 and V6). The other two 3C 273 visits are +/- 30 deg from V2 (and +/- 15 deg from V6).

b. Point Spread Function (PSF) Orbit: To capture the PSF of 3C 273, we use the 3rd visit in each set (i.e., V3 and V7) to observe a nearby color-matching star that has a similar visible magnitude. In this way, the thermal settling of the telescope can be achieved after a slew (which happens usually within 1 orbit) and permit optimal PSF stability.

c. Telescope Roll Range: In the 1st set, the absolute orientation in V2 is constrained to be within 111 deg to 302 deg. In this way, we can position the visible quasar jet (on-sky position angle = 222 deg at 12.7 arcsec to 23 arcsec, see a previous STIS 50CCD observation on 2000-04-03 in Program GO-8233) on the STIS detector when observed with BAR5 (all relative on-detector +x axis not imaged) while avoiding obstruction by occulters including BAR10 and WedgeB. The U3 Ref orient is thus 111 deg to 391 deg. Note: we cannot put the 3C 273 jet on the right of WedgeA0.6, since it requires a roll range that cannot be accessed by HST (-30 deg to 10 deg) duing Cycle 29.

d. Loose constraints in the 2nd set. The absolute orientation in V6 is not constrained. In comparison with the 1st set where the telescope roll is +/- 30 deg, the telescope roll of V5 and V8 is only +/- 15 deg from V6 (for easier schedulability). These relatively loose constraints can enable STIS to image 3C 273 from late-December to late-June.

e. *Observation window for the 2nd 4-orbit set* (V5-V8; accessible between late-December and late-June): if schedulable, we would like to carry out the observation as early as possible. Using the VISIT-STIS-Coron coverage simulation tool (https://github.com/seawander/VISIT-STIS-Coron), we find that early observations of V5-V8 have U3 angles of ~300 deg that would help reach a complete view of the 3C 273 surroundings, when we combine them with the coverage offered by the 1st 4-orbit set (V1-V4; accessible from late-March to mid-April; U3 angle ~100 deg). As a result, such observations (i.e., two sets of 4-orbit observations with ~180 deg relative roll) cover regions that are inaccessible in V1-V4 alone. In this way, we can offer a 360 deg view from ~0.2 arcsec (inner working angle of BAR5) to ~70 arcsec (diagonal length of the STIS detector) and maximize the impact for STIS coronagraph's first extragalactic science demo.

Exposure Information: In each 3C 273 visit, we evenly distribute the observations to the BAR5 occulter and the WEDGEA0.6 occulter.

a. Angular Coverage: the two occulters are nearly perpendicular to each other, so that we can probe the 3C 273 surroundings with a more than 330 deg coverage (270 + 30 + 30 = 330) within one observation set. The exception regions which make our acutal angular coverage less than 330 deg are: the diffraction spikes, the on-detector fourth quadrant whose coordinate center is located at our target. In the second observation set, we loosen the relative roll to +/- 15 deg, so that it would be easier to schedule while giving more opportunity to cover the leftover 30 angular range beyond ~3 arcsec.

b. Readout Number: At each occulter location, we have three readouts with CR-SPLIT = 3 for 3C 273. With this observation strategy, the single readout time is 315s for our science target (i.e., 3C 273). This is below the 80% potential well for STIS CCD, but it permits cosmic ray rejection and enables adequate single-readout time and CR-SPLIT for PSF star 2 (i.e., TYC 292-743-1) .

PSF Star Selection: We identify two PSF stars, which are close targets of similar brightness as 3C 273 (within 7 degree and similar Gaia G-band magnitude). The two PSF stars also have good Gaia Bp-Rp and G-Rp color match to 3C 273, and thus efficiently sample the PSF of 3C 273. To better sample non-Nyquist-sampled STIS PSF by accounting for the non-repeatability of STIS centering, we dither the observations for the two PSF stars.

a. Science Target (3C 273) has Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.

b. PSF star 1 (TYC 287-284-1) has Gaia EDR3 Gmag = 12.77 (excellent match), Bp - Rp = 0.515 (excellent match), G - Rp = 0.327 (good match).

The dithering strategy for this faint PSF star does not allow CR-SPLIT of 2 or more to perform cosmic ray rejction. Nevertheless, we will utilize the entire STIS coronagraphic archive to achive similar goals.

c. PSF star 2 (TYC 292-743-1) has Gmag = 11.488 (brighter PSF star), Bp - Rp = 0.536 (good match), G - Rp = 0.340 (excellent match).

Even with the dithering strategy, we can use CR-SPLIT = 2 to perform cosmic ray rejection, since this PSF star is 0.7 mag brighter in Gaia EDR3 G-band than 3C 273.

d. With two PSF stars, we can also minimize the possibility of unknown contamination such as background galaxies.

Additional note: the choice of two different PSF stars is different from original our Phase 1 choice (which was a brighter PSF star). Nevertheless, our current strategy is optimal not just in science goals, but also in understanding the response of the STIS detector on faint objects with coronagraphy.

Visit

Proposal 16715, V1-3C273 (01), implementation Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; ORIENT 5D TO 45D FROM 02

Comments: 3C 273
First of two sets of visits, each containing three visits of 3C 273 at different relative orientations with one PSF calibration observation interleaved.
This is the first 3C 273 visit (V1) in the first set (V1 to V4).
The four visits within each set must be executed sequentially in contiguous orbits interrupted only for Earth occultation.

Orientation: We wish to schedule this visit (1) at at least +30 deg from Visit 2, with the absolute orientation of Visit 2 constrained. The constrained orient ranges can place the quasar jet, which has a position angle of ~220 degrees, on the STIS detector.

We allow a relative orientation tolerence from +30 deg to +45 deg to assist in guide star selection and scheduling.

Relative Timing: This visit (1) should immediately preceed visit (2). I.e., They should be executed sequentially in "back-to-back" orbits.

The central source is relatively faint (V = 12.7), we thus design BAR5 and WEDGEA0.6 exposure times to maximize exposure time with the ability to perform cosmic ray rejection.

Fixed Targets

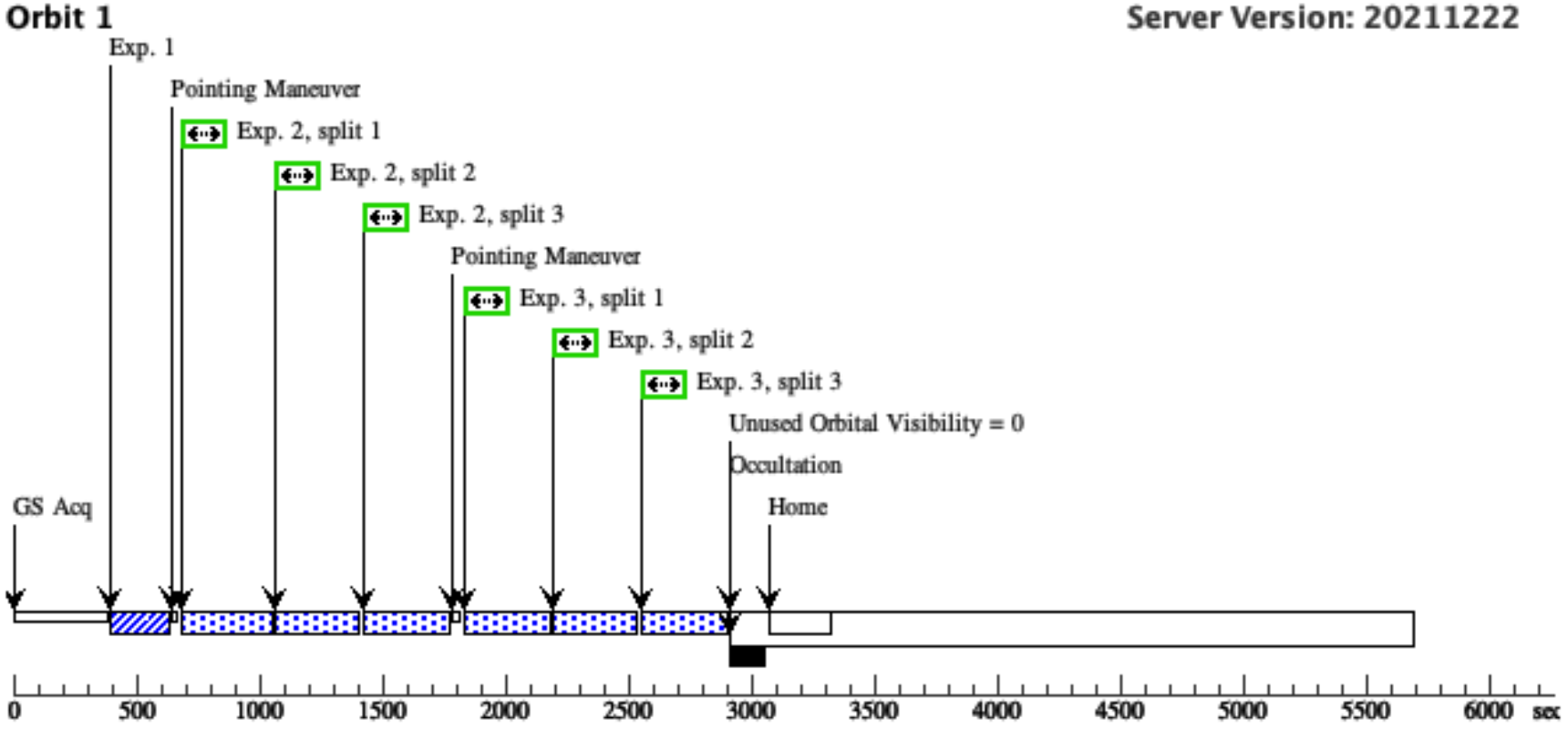
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.1523013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V1-3C273 (01)	3 Secs (3 Secs) *[==>]*	*[1]*
Comments: F28X50LP recommeded for V = 10 to 23 at https://www.stsci.edu/itt/APT_help/STIS_Cycle21/c08_acq3.html									
2	3C273_BAR5_CENTER (STIS.im.1528071)	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V1-3C273 (01)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*
3	3C273_A06_CENTER (STIS.im.1528071)	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V1-3C273 (01)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*

Orbit Structure



Visit

Proposal 16715, V2-3C273 (02), implementation Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; ORIENT 111D TO 302 D; AFTER 01 BY 0.5 Orbits TO 1.5 Orbits

Comments: 3C 273
three visits of 3C 273 at different relative orientations with one PSF calibration observation interleaved.
This is the second 3C 273 visit (V2) in the first set (V1 to V4).
The four visits within the set must be executed sequentially in contiguous orbits interrupted only for Earth occultation.

Orientation: There are orientation constraint on this visit (2) to put the quasar jet (position angle ~ 220 deg, extends from 12.7 arcsec to 23 arcsec) on the STIS detector.
Visits 1, 3, 4 carry relative orientation constraints w.r.t. this visit.
Additional Orientation Note: although there are two intervals that can put the jet on the detector, only the one that is between 111 deg and 391 deg can be accessed by HST. This interval can put the jet on the left of BAR5 without worrying about BAR10 or WEDGEA blockage. Taking into account of the accessible U3 ranges on 3C 273 during Cycle 29, the ORIENT constraint is 111 deg to 302 deg.

Relative Timing: This visit (2) should immediately follow Visit 1 and immediately preceed Visit 3 in back-to-back orbits.

Fixed Targets

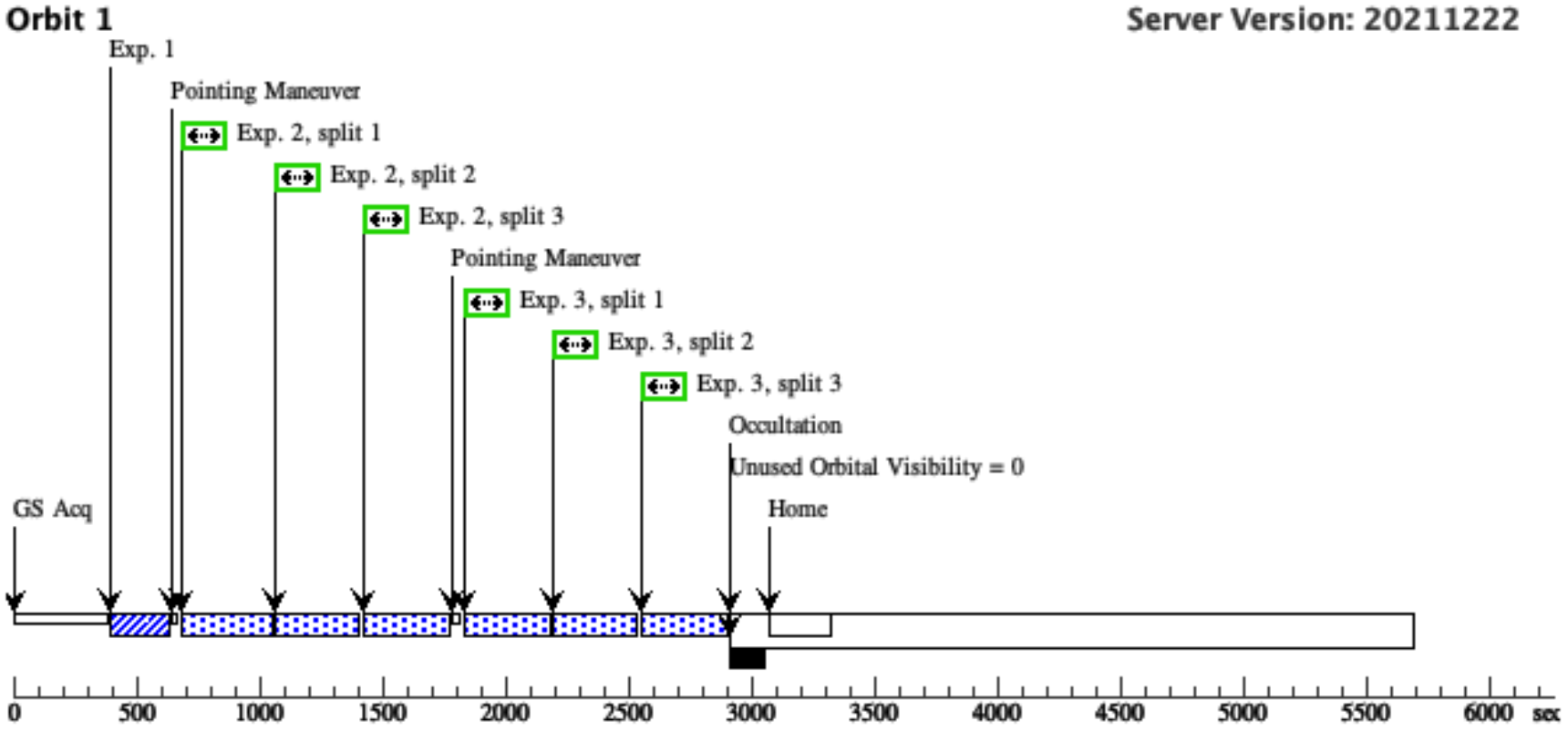
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.153013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V2-3C273 (02)	3 Secs (3 Secs) *[==>]*	***[1]***
2	3C273_BAR5_CENTER	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V2-3C273 (02)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
3	3C273_A06_CENTER	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V2-3C273 (02)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 16715, V3-3C273-PSF1 (03), implementation Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; AFTER 02 BY 0.5 Orbits TO 1.5 Orbits

Comments: PSF star 1 (TYC 287-284-1). First PSF calibration target for 3C 273. Gaia EDR3 Gmag = 12.77, Bp - Rp = 0.515 (excellent match), G - Rp = 0.327. Spectral Type F0V.

This is the PSF star calibrator for the flanking visits (1-4). We have no orientation constraints on this visit (3). Visits 2 and 3 must be scheduled in sequential contiguous orbits. Nevertheless, we expect absolute orientations of Visits 2 and 3 to be very similar (within a few degrees), and thus we can maintain similar Sun and Beta angles for the science target (3C 273) and its 1st PSF calibrator (TYC 287-284-1).

Relative Timing: This visit (3) should immediately follow visit 2 and immediately precede visit 4. I.e., they should be executed sequentially in "back-to-back" orbits.

Fixed Targets

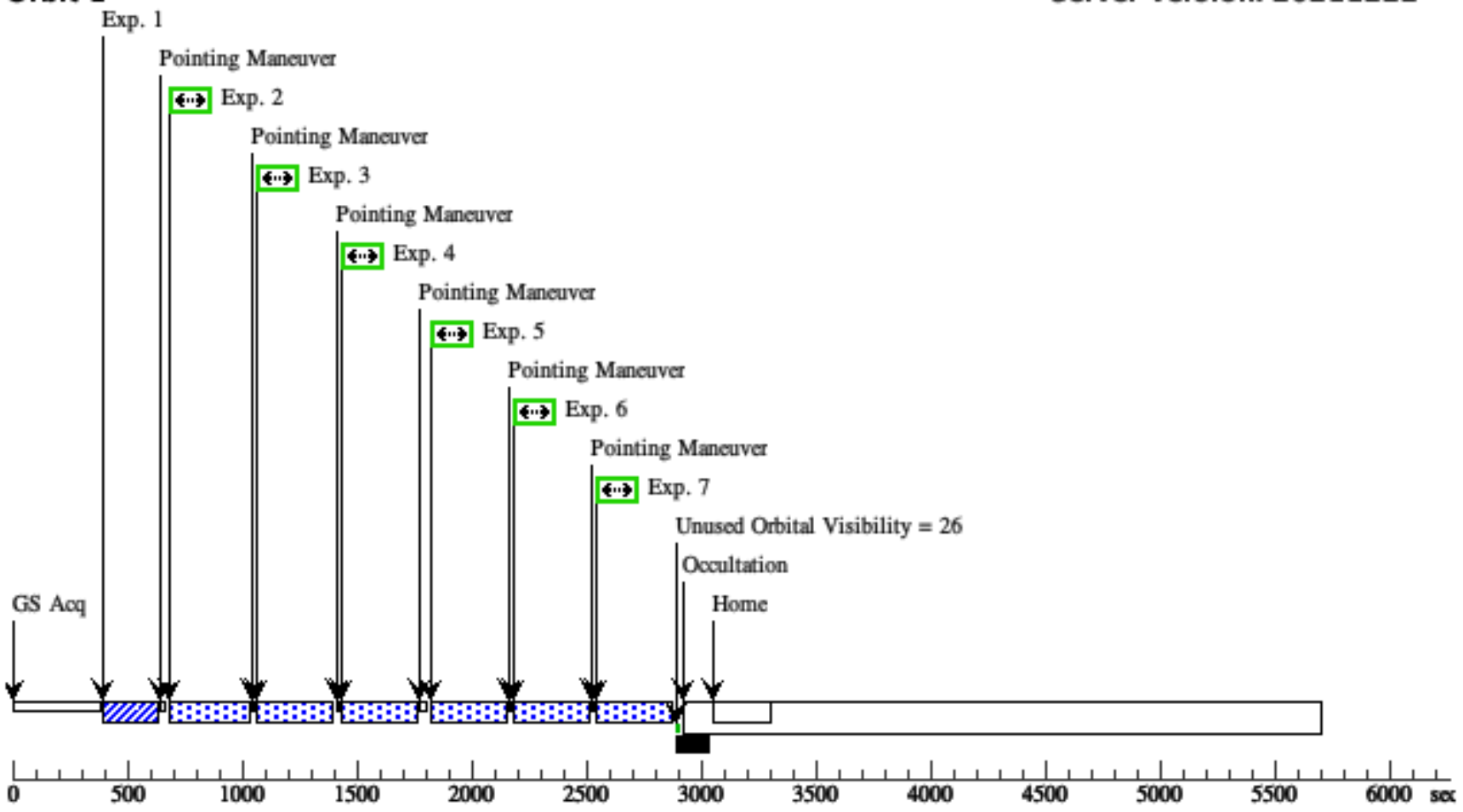
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	PSF-TYC-287-284-1	RA: 12 19 46.7745 (184.9448938d) Dec: +06 05 32.53 (6.09237d) Equinox: J2000	Proper Motion RA: -6.678384023291124E-4 sec of time/yr Proper Motion Dec: -0.029794999977639236 arcsec/yr Epoch of Position: 2015.5	V=12.49+/-0.23	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database, ICRS coordinates are Gaia DR2 values on Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.77, Bp - Rp = 0.515 (excellent match), G - Rp = 0.327 (good match). Spectral type = F0 in 2018ApJS..235...16B
Category=STAR
Description=[F0-F2]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PSF1_3C273_ACQ (STIS.ta.1528074)	(2) PSF-TYC-287-284-1	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	3 Secs (3 Secs) *[==>]*	*[1]*
2	PSF1_3C273_BAR5_CENTER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=NO		Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*
3	PSF1_3C273_BAR5_PLUSDITHER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=NO	POS TARG 0.0024795,0.0124497	Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*
4	PSF1_3C273_BAR5_MINUSDITHER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=NO	POS TARG -0.0024795,0.0124497	Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*
5	PSF1_3C273_A06_CENTER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=NO		Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*
6	PSF1_3C273_A06_PLUSDITHER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=NO	POS TARG 0.0024795,0.0124497	Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*
7	PSF1_3C273_A06_MINUSDITHER (STIS.im.1528076)	(2) PSF-TYC-287-284-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=NO	POS TARG -0.0024795,0.0124497	Sequence 1-7 Non-Int in V3-3C273-PSF1 (03)	294 Secs (294 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16715, V4-3C273 (04), implementation Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; ORIENT -30D TO -5D FROM 02; AFTER 03 BY 0.5 Orbits TO 1.5 Orbits

Comments: Orientation: We wish to schedule this visit (4) at -30 deg from Visit 2.
We allow a relative orientation tolerence from -45 deg to -30 deg to assist in guide star selection and scheduling.

Relative Timing: This visit (4) should immediately follow Visit 3. I.e., They should be executed sequentially in "back-to-back" orbits.

Fixed Targets

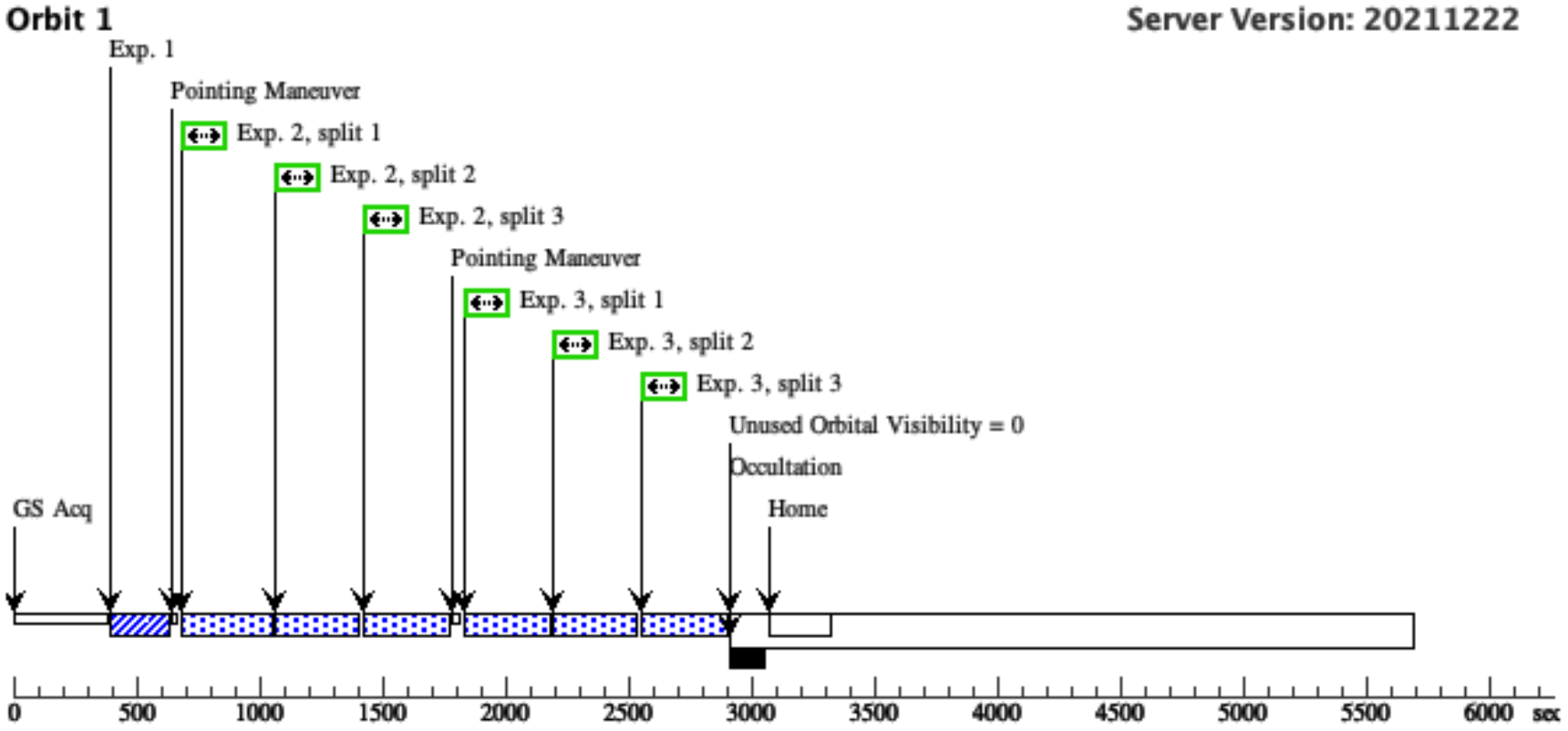
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.1523013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V4-3C273 (04)	3 Secs (3 Secs) *[==>]*	***[1]***
2	3C273_BAR5_CENTER	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V4-3C273 (04)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
3	3C273_A06_CENTER	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V4-3C273 (04)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 16715, V5-3C273 (05), completed Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; ORIENT 15D TO 30D FROM 06

Comments: 3C 273
Second of two sets of visits, each containing three visits of 3C 273 at different relative orientations with one PSF calibration observation interleaved.
This is the first 3C 273 visit (V5) in the second set (V5 to V8).
The four visits within each set must be executed sequentially in contiguous orbits interrupted only for Earth occultation.

Orientation: We wish to schedule this visit (V5) at at least +15 deg from Visit 6, with the absolute orientation of Visit 6 unconstrained.
We allow a relative orientation tolerence from +15 deg to +30 deg to assist in guide star selection and scheduling.

Relative Timing: This visit (5) should immediately preceed visit (6). I.e., They should be executed sequentially in "back-to-back" orbits.

V5 has an idential exposure time and observation strategy as V1.

If schedulable, we would like to carry out the V5-V8 observations as early as possible. Using the VISIT-STIS-Coron coverage simulation tool (https://github.com/seawander/VISIT-STIS-Coron), we find that early observations of V5-V8 have U3 angles of ~300 deg that would help reach a complete view of the 3C 273 surroundings, when we combine them with the coverage offered by the 1st 4-orbit set (V1-V4; accessible from late-March to mid-April; U3 angle ~100 deg). As a result, such observations (i.e., two sets of 4-orbit observations with ~180 deg relative roll) cover regions that are inaccessible in V1-V4 alone. In this way, we can offer a 360 deg view from ~0.2 arcsec (inner working angle of BAR5) to ~70 arcsec (diagonal length of the STIS detector) and maximize the impact for STIS coronagraph's first extragalactic science demo.

Fixed Targets

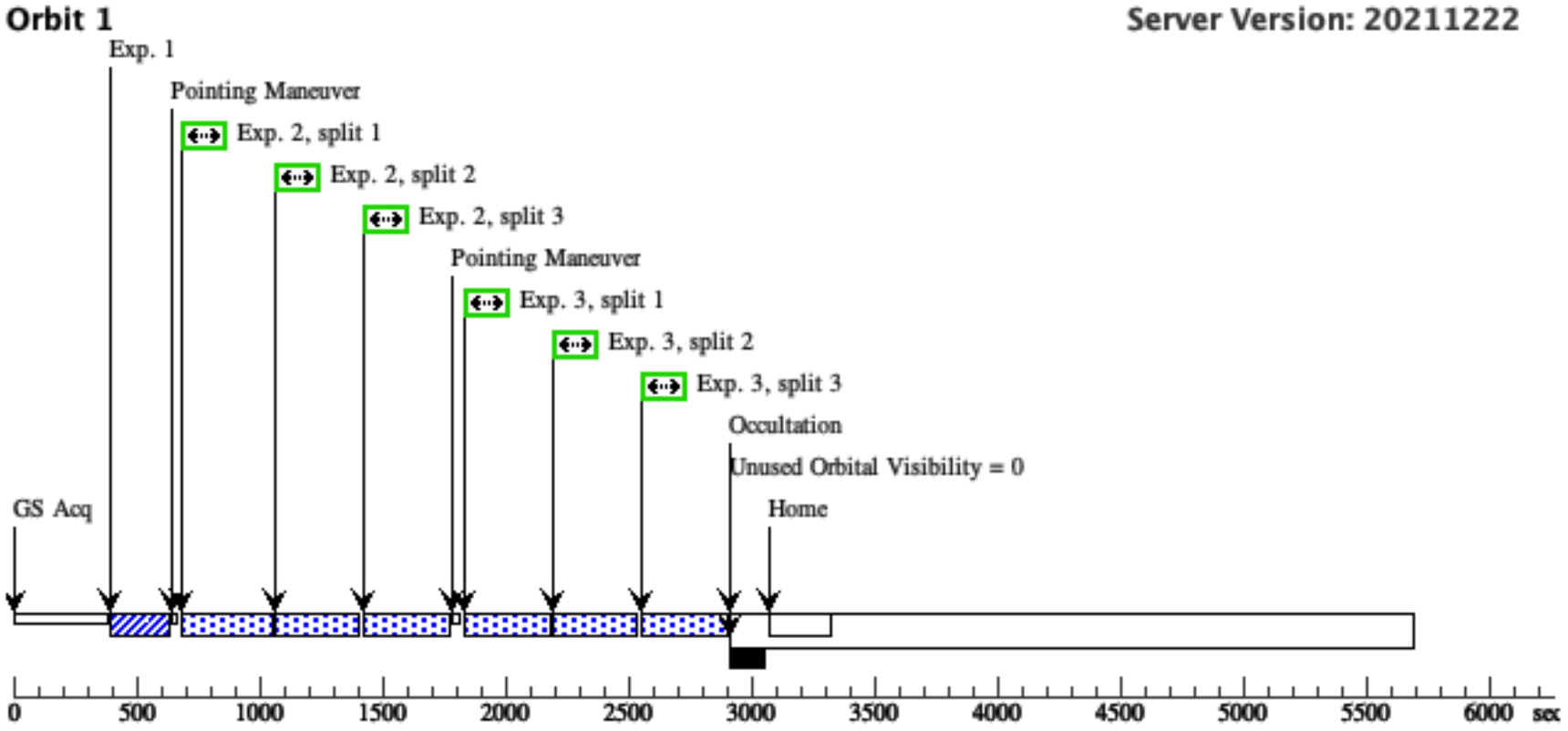
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.1523013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V5-3C273 (05)	3 Secs (3 Secs) *[==>]*	***[1]***
2	3C273_BAR5_CENTER	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V5-3C273 (05)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
3	3C273_A06_CENTER	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V5-3C273 (05)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 16715, V6-3C273 (06), completed Wed Mar 02 22:01:52 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; AFTER 05 BY 0.5 Orbits TO 1.5 Orbits

Comments: 3C 273
three visits of 3C 273 at different relative orientations with one PSF calibration observation interleaved.
This is the second 3C 273 visit (V6) in the second set (V5 to V8).
The four visits within the set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation: the absolute orientation of Visit 6 is unconstrained.
Visits 5, 7, 8 carry relative orientation constraints w.r.t. this visit.

Relative Timing: This visit (6) should immediately follow Visit 5 and immediately preceed Visit 7 in back-to-back orbits.

Fixed Targets

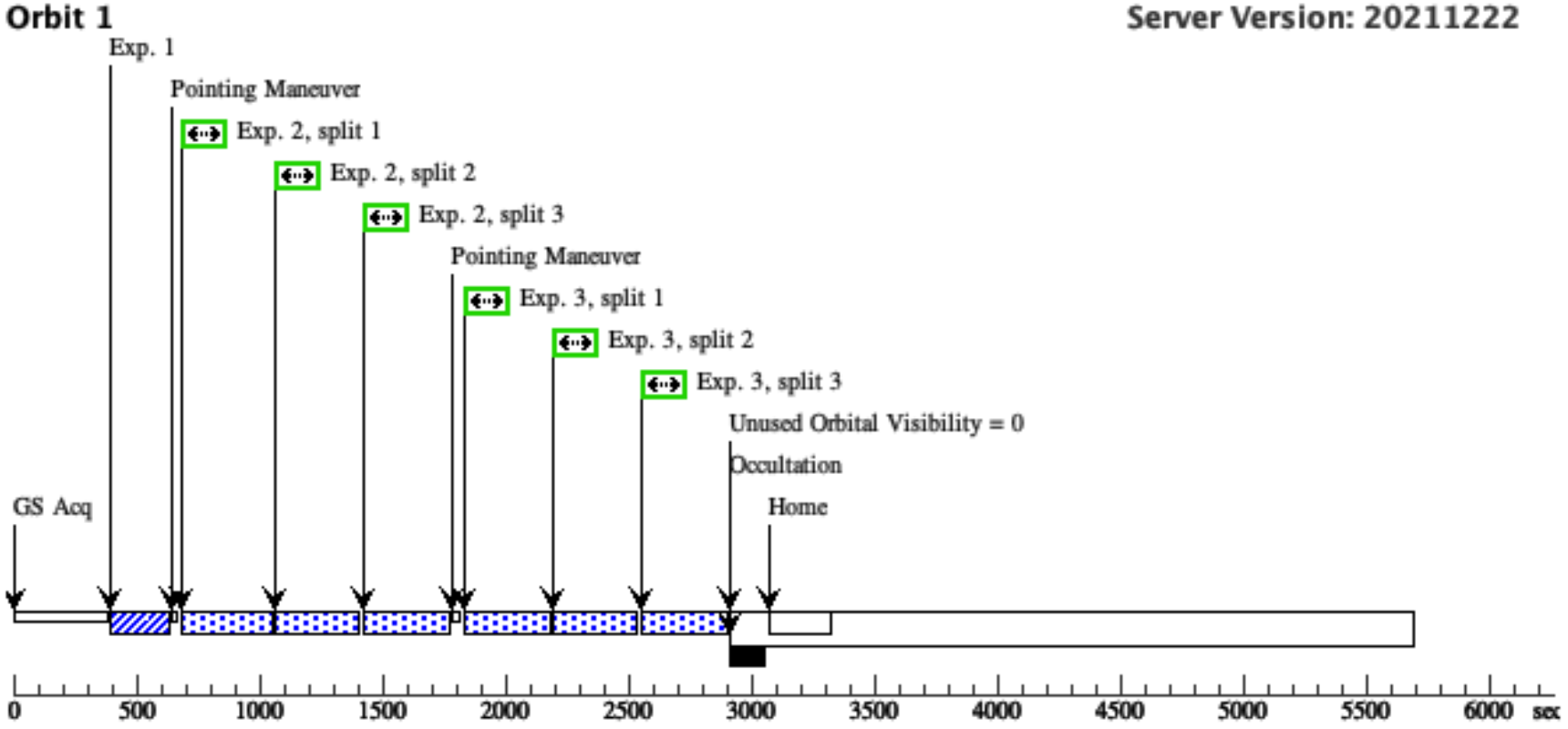
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.1523013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V6-3C273 (06)	3 Secs (3 Secs) *[==>]*	***[1]***
2	3C273_BAR5_CENTER	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V6-3C273 (06)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
3	3C273_A06_CENTER	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V6-3C273 (06)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 16715, V7-3C273-PSF2 (07), completed Wed Mar 02 22:01:53 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; AFTER 06 BY 0.5 Orbits TO 1.5 Orbits

Comments: PSF star 2 (TYC 292-743-1). Second PSF calibration target for 3C 273. Gaia EDR3 Gmag = 11.488 (bright), Bp - Rp = 0.537 (good match), G - Rp = 0.340 (excellent match).

This is the PSF star calibrator for the flanking visits (5-8). We have no orientation constraints on this visit (7). Visits 6 and 7 must be scheduled in sequential contiguous orbits. Nevertheless, we expect absolute orientations of Visits 6 and 7 to be very similar (within a few degrees), and thus we can maintain similar Sun and Beta angles for the science target (3C 273) and its 2nd PSF calibrator (TYC 292-743-1).

Relative Timing: This visit (7) should immediately follow visit 6 and immediately precede visit 8. I.e., they should be executed sequentially in "back-to-back" orbits.

Fixed Targets

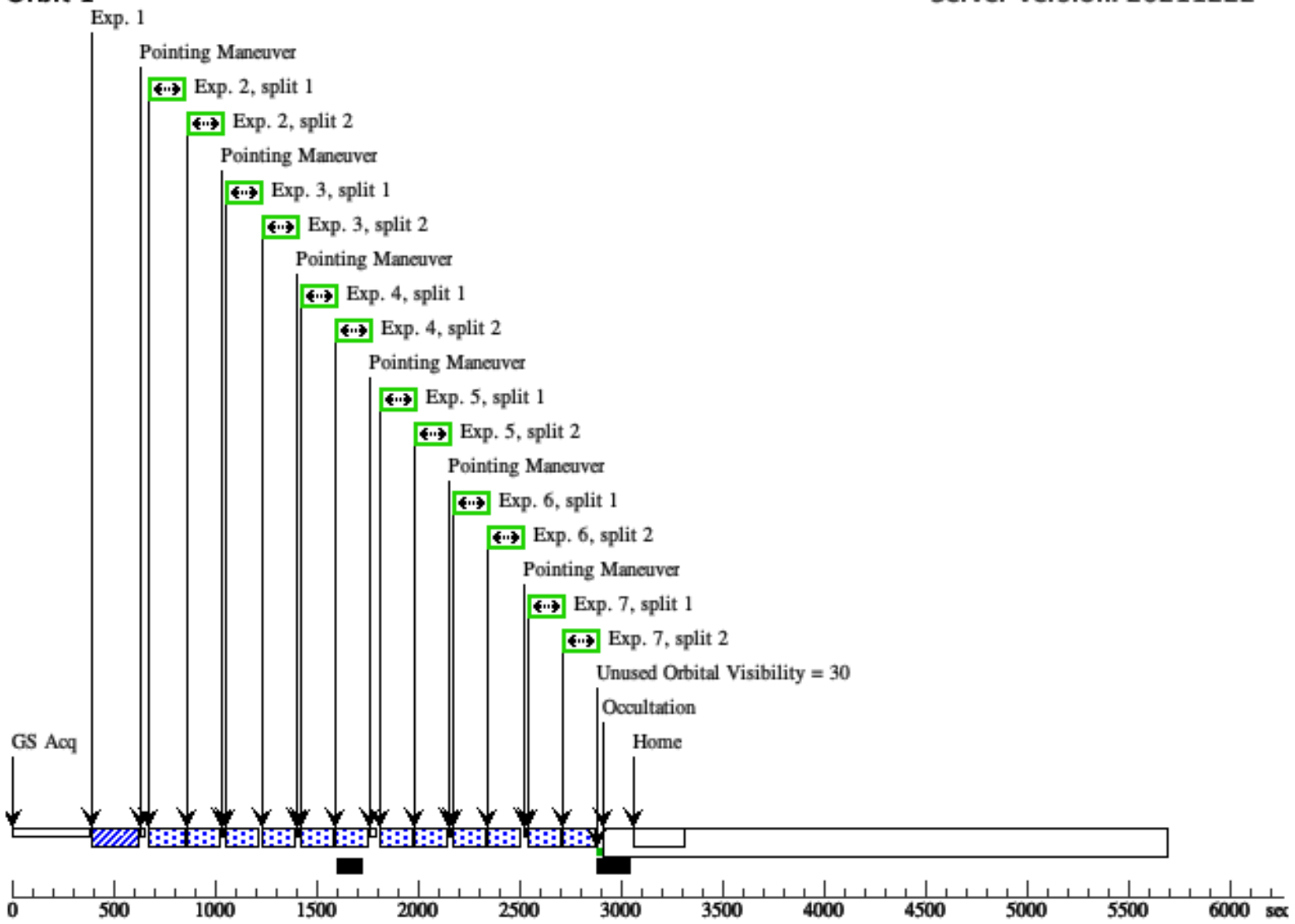
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PSF-TYC-292-743-1	RA: 12 37 53.9314 (189.4747142d) Dec: +03 34 5.77 (3.56827d) Equinox: J2000	Proper Motion RA: -0.001428168719782513 sec of time/yr Proper Motion Dec: -4.079999825989944E-4 arcsec/yr Epoch of Position: 2015.5	V=11.72	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database, ICRS coordinates are Gaia DR2 values on Simbad. Additional note by proposer: Gaia EDR3 Gmag = 11.488, Bp - Rp = 0.536 (good match), G - Rp = 0.340 (excellent match). Spectral type unknown in literature, but its spectral energy distribution does not have detectable infrared excess (in WISE W4 band).
Category=STAR
Description=[F0-F2]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PSF2_3C273_ACQ (STIS.ta.1528082)	(3) PSF-TYC-292-743-1	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	1 Secs (1 Secs) *[==>]*	***[1]***
2	PSF2_3C273_BAR5_CENTER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2		Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3	PSF2_3C273_BAR5_PLUSDITHER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2	POS TARG 0.0024795,0.0124497	Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
4	PSF2_3C273_BAR5_MINUSDITHER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2	POS TARG -0.0024795,0.0124497	Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
5	PSF2_3C273_A06_CENTER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=2		Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
6	PSF2_3C273_A06_PLUSDITHER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=2	POS TARG 0.0024795,0.0124497	Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
7	PSF2_3C273_A06_MINUSDITHER (STIS.im.1528080)	(3) PSF-TYC-292-743-1	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	GAIN=4; CR-SPLIT=2	POS TARG -0.0024795,0.0124497	Sequence 1-7 Non-Int in V7-3C273-PSF2 (07)	250 Secs (250 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***

Orbit Structure



Visit

Proposal 16715, V8-3C273 (08), completed Wed Mar 02 22:01:53 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 100%; ORIENT -30D TO -15D FROM 06; AFTER 07 BY 0.5 Orbits TO 1.5 Orbits

Comments: Orientation: We wish to schedule this visit (8) at -15 deg from Visit 6, with the absolute orientation of Visit 6 loosely constrained.
We allow a relative orientation tolerence from -30 deg to -15 deg to assist in guide star selection and scheduling.

Relative Timing: This visit (8) should immediately follow Visit 7. I.e., They should be executed sequentially in "back-to-back" orbits.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C-273	RA: 12 29 6.6997 (187.2779154d) Dec: +02 03 8.60 (2.05239d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0	V=12.7+/-0.6	Reference Frame: ICRS

Comments: ICRS coordinates are Gaia DR2 values retrieved from Simbad. Additional note by proposer: Gaia EDR3 Gmag = 12.84, Bp - Rp = 0.494, G - Rp = 0.348.
Category=GALAXY
Description=[ACCRETION DISK, ELLIPTICAL, JET, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	3C273_ACQ (STIS.ta.1523013)	(1) 3C-273	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-3 Non-Int in V8-3C273 (08)	3 Secs (3 Secs) *[==>]*	*[1]*
2	3C273_BAR5_CENTER	(1) 3C-273	STIS/CCD, ACCUM, BAR5	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V8-3C273 (08)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*
3	3C273_A06_CENTER	(1) 3C-273	STIS/CCD, ACCUM, WEDGEA0.6	MIRROR	CR-SPLIT=3; GAIN=4		Sequence 1-3 Non-Int in V8-3C273 (08)	945 Secs (945 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	*[1]*

Orbit Structure