16305 - Witnessing giant planet formation in action: a unique view of the emblematic PDS 70 system with HST

Cycle: 28, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Elodie Choquet (PI) (ESA Member) (Contact)	**Laboratoire d'Astrophysique de Marseille**	**elodie.choquet@lam.fr**
Dr. Arthur Vigan (CoI) (ESA Member)	CNRS, Laboratoire d'Astrophysique de Marseille	arthur.vigan@lam.fr
Dr. Gilles Otten (CoI) (ESA Member)	Laboratoire d'Astrophysique de Marseille	gilles.otten@lam.fr
Mathis Houlle (CoI) (ESA Member)	Laboratoire d'Astrophysique de Marseille	mathis.houlle@lam.fr

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
11	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:16.0	yes
12	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:17.0	yes
13	(2) UCAC4-203-088985-PSF-CALIB	STIS/CCD	1	18-Mar-2021 11:00:18.0	yes
14	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:18.0	yes
21	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:19.0	yes
22	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:19.0	yes
52	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:20.0	yes
23	(2) UCAC4-203-088985-PSF-CALIB	STIS/CCD	1	18-Mar-2021 11:00:21.0	yes
53	(2) UCAC4-203-088985-PSF-CALIB	STIS/CCD	1	18-Mar-2021 11:00:21.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
24	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:22.0	yes
31	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:23.0	yes
32	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:23.0	yes
33	(2) UCAC4-203-088985-PSF-CALIB	STIS/CCD	1	18-Mar-2021 11:00:24.0	yes
34	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:24.0	yes
41	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:25.0	yes
42	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:26.0	yes
43	(2) UCAC4-203-088985-PSF-CALIB	STIS/CCD	1	18-Mar-2021 11:00:26.0	yes
44	(1) PDS70	STIS/CCD	1	18-Mar-2021 11:00:27.0	yes

18 Total Orbits Used

ABSTRACT

We propose STIS coronagraphic imaging of an emblematic transition disk system, PDS 70, known to be hosting a transition disk with a large cavity, a dust ring with an asymmetric brightness distribution and two forming giant proto-planets that are still in their gas accretion phase. PDS 70 is currently the only known system where giant planet formation can be witnessed and studied directly. With this program we propose to obtained the deepest images ever obtained of this system, with the same spatial resolution as ground-based 8-m telescope in the near-infrared. With these optical images showing light scattered by submicron particles that follow gas drag in the system, we will study 1/ gas accretion by the forming protoplanets carving the cavity, and 2/ the extended structure of the disk beyond 80au that has never been resolved from the ground.

OBSERVING DESCRIPTION

GO 16305:

0/ EXECUTIVE SUMMARY

This is a 16-orbit program to obtain deep STIS coronagraphic images of the PDS 70 systems, which hosts a young K7 star, a protoplanetary disk, and two giant planets imaged with ground based telescopes.

Along with the Science target(PDS 70), we will also observe a PSF target (UCAC4-203-088985). This second target is a calibration target used to subtract the PSF in the science exposures during data processing and allow the observation of the fainter circumstellar objects.

We will obtain 12 orbits on the science target at 6 different orientations of the spacecraft to obtain a full 360D unobstructed view of the disk down to the smallest separations possible to the star. We will also obtain 4 orbits on the PSF target to allow starlight subtraction.
Each orbit combines short exposures on the BAR5 mask to reach the sensitivty required to analyse the nearby circumstellar disk, then a longer exposure on the wider WEDGEA1.0 position to observe possible fainter material at larger separation.

1/ VISIT STRUCTURE AND LINKAGE:

We will obtain observations on the science target PDS 70 at 6 different telescope orientations (rolls), interleaved with contemporaneous PSF star observations (timing constaints).
To facilitate the scheduling of the observations with both timing and orient constraints, we split the 16 orbits in four sets of 4 orbits.

For clarity, we number the visits with the first digit referencing the index of the set (1* to 4*), and the second digit referencing the orbit number within the set (*1 to *4).

The visit structure is the same for the four sets:
On set has 3 visits to the science target at 3 different orientations, and one interleaved visit to the PSF target.
The visit to the PSF target always comes after two visits to the science target and before the third science visit of the set, and is thus always numbered *3 (so visits 13, 23, 33, 43 are the visits to the PSF target).
The four visits within one set must be executed in back to back orbits (Timing Requirements: "AFTER VISIT #(n-1) BY 0.5 orbits to 1.5 orbits").

There is no timing requirement between the four sets and can be executed separately (however the have relative orient constraints, see next section).

2/ORIENTATION CONSTRAINTS:

The visits to the PSF target (numbers *3) don't have any orient constraints.
The visits to the science target all have relative orient constraints between them, but no absolute orient constraint.

Within each set:
We define the second visit to the science target (number *2) as the reference orient.
The two other science visits have relative orient constraints form this reference orient #*2:
- ORIENT FROM this reference orient (#*2) BY -30D to -20D for the first science visit (#*1),
- ORIENT FROM this reference orient (#*2) BY +30D to +20D for the 3rd science visit (#*4).
We provide a 10D range to ease scheduling, but have a preference for larger roll angles (-30D and +30D) over smaller ones (-20D and +20D).

Between the four sets:
We define the reference orient of the first set (visit #12) as reference orient for the three other sets, and we put relative orient constraints for visits #22, #32, and #42 from this visit.
The first two sets must have similar orientations: for visit #22, we put ORIENT FROM #12 BY -2D to +2D.
The 3rd set must have a +100D or -100D roll angle from the two first sets: for visit #32, we put ORIENT FROM #12 BY 98 to 102D. We don't have to possibility to add the -100D option: we equally accept ORIENT FROM #12 BY -102D to -98D.
The 4rth set mus have a similar orientation as the 3rd set: for visit #42, we put ORIENT FROM #12 BY 98 to 102D. As for visit #32, we equally accept ORIENT FROM #12 BY -102D to -98D.
The tolerence of 4D may be somewhat relaxed if scheduling is difficult.

3/ GUIDE STARS:

We require pointing and roll control with 2-FGS guiding. Single-FGS guiding does not offer sufficient target position stability for coronagraphy.

4/ EXPOSURE LAYOUT WITHIN AN ORBIT:

All 16 orbits have the same exposure structure:
- after the guide stars acquisition, each orbits begins with a TARGET ACQ exposure, used to precisely position the target behind the coronagraphic masks; We use the F25ND3 for all target ACQ exposures.

- The target is the moved to the BAR5 coronagraph position, and a short exposure is obtained with CR-SPLIT=2.
- The target is then moved to the WEDGEA1.0 position, and a long exposure filling the rest of the visibility period is acquired.

5/ EXPOSURE TIMES

All coronagraphic exposures use GAIN=4.

For the TARGET ACQ, the exposure time is computed with the target acquisition ETC to have SNR ~100.
The BAR5 exposure times are computed to reach ~80% of the full-well capacity just outside the mask (assuming a 1.9e-3 starlight attenuation at the edge of the mask) for each CR-SPLIT acquisition.
The total exposure time and number of CR-SPLIT on the science target is defined to reach a 5sigma contrast limit of 5e-4 after 2x2 pixel binning on the disk for each roll. The number of BAR5 exposures for the PSF target is set to mimic those on the science target.
The WEDGEA1.0 exposure times are simply set to fill up the rest of the orbits. We simply ensure that the longer exposure don't saturate (saturation limit at the edge of WEDGEA1.0 is 5100s for PDS70, and 4700s for the PSF star).

6/ SUBARRAYS

We use Subarrays for all coronagraphic exposures to minimise the readout time and gain on exposure time.
All subarrays must be centered on the selected aperture.
For the BAR5 exposures, we use SIZEAXIS2=140 to have a field of view of about 7".
For the WEDGEA1.0 exposures, we use SIZEAXIS2=427, giving a large field of view of about 21".

7/ REFERENCE STAR

NOTE: this target was changed from phase 1 to allow a better calibration of the science exposures and have a better schedulability with the science target PDS 70.

We selected out reference star to have the best color match and V magnitude match as our science target.
Our PSF star matches the B-V color of PDS70 by 0.02mag (B and V magnitudes from UCAC4 catalog, Zacharias+2012), and its V-I color by 0.01mag (V and I magnitudes from the ROSAT catalog, Kigara+2012).
Its V magnitude matches the science target V magnitude by 0.1mag.
It is 11D away from PDS70.

8/ REDUCED GYRO OPERATIONS

In the eventuallity of reduced gyro operations, we anticipate difficulties to schedule our observations and satisfy our orient constraints, as well as an increased jitter. The increased jitter may lower the sensitivity of our observations but should not prevent the main scientific outcome.
The scheduling difficulties may be more problematic and may require discussions with the PC to decide mitigation scenarios.

Visit

Proposal 16305, Set 1 - Roll 1 (11), completed Thu Mar 18 15:00:27 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT -30D TO -20D FROM 12

Comments: First of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the first PDS70 visit in the first set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of -30 to -20D from the reference orient of the first set (visit #12).
A 10D range is provided to facilitate scheduling, however and relative orient close to -30D is prefered over -20D.

Relative Timing: This visit (#11) should immediately preceed visit #12 (back-to-back orbits).

Fixed Targets

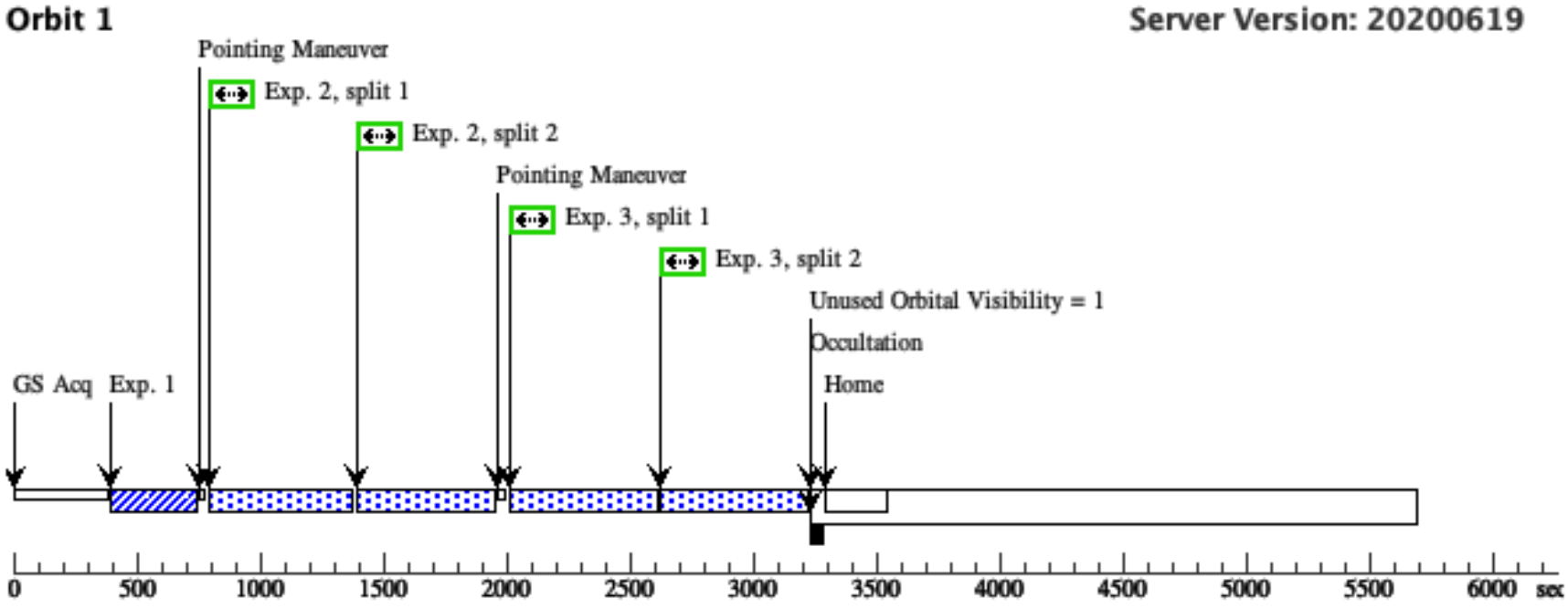
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 1 - Roll 1 (11)	15.6 Secs (15.6 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 1 - Roll 1 (11)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 1 - Roll 1 (11)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 1 - Roll 2 (12), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 11 BY 0.5 Orbits TO 1.5 Orbits

Comments: First of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 2nd PDS70 visit in the first set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
There are no orientation constraints on this visit.
The two other visits to PDS70 in the first set (#11 and #14) carry relative orientation constraints with respect to this visit.
The reference orient of the 3 other sets (#22, #32, #42) also carry relative orientation constraints with respect to this visit.

Relative Timing: This visit (#12) should immediately preceed visit #13 and should immediately follow Visit #11 (back-to-back orbits).

Fixed Targets

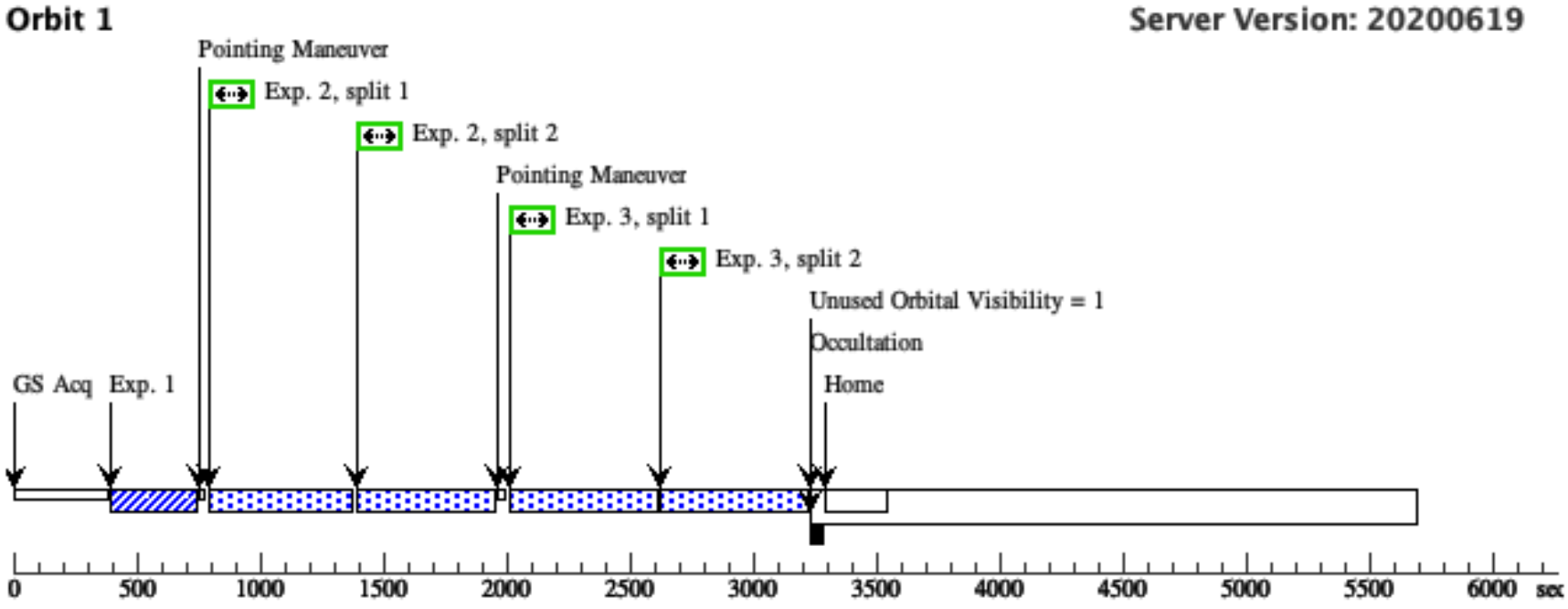
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 1 - Roll 2 (12)	15.6 Secs (15.6 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 1 - Roll 2 (12)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 1 - Roll 2 (12)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 1 - PSF (13), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 12 BY 0.5 Orbits TO 1.5 Orbits

Comments: First of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the PSF visit in the first set.
The four visits within each set must be executed sequentially in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set no orient constraint on the PSF orientations. However, as we selected the PSF target to be near the science target and given the sequential orbit sequence, we expect to have an absolute orientation very similar to visit #12 within a few degrees. This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.

Relative Timing: This visit (#13) should immediately preceed visit #14 and should immediately follow Visit #12 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	UCAC4-203-088985-PSF-CALIB	RA: 14 37 49.0375 (219.4543229d) Dec: -49 28 26.85 (-49.47413d) Equinox: J2000	Proper Motion RA: -24.488 mas/yr Proper Motion Dec: -24.619 mas/yr Parallax: 0.0083404" Epoch of Position: 2000 Radial Velocity: 3.52 km/sec	V=12.097+/-0.04	Reference Frame: ICRS

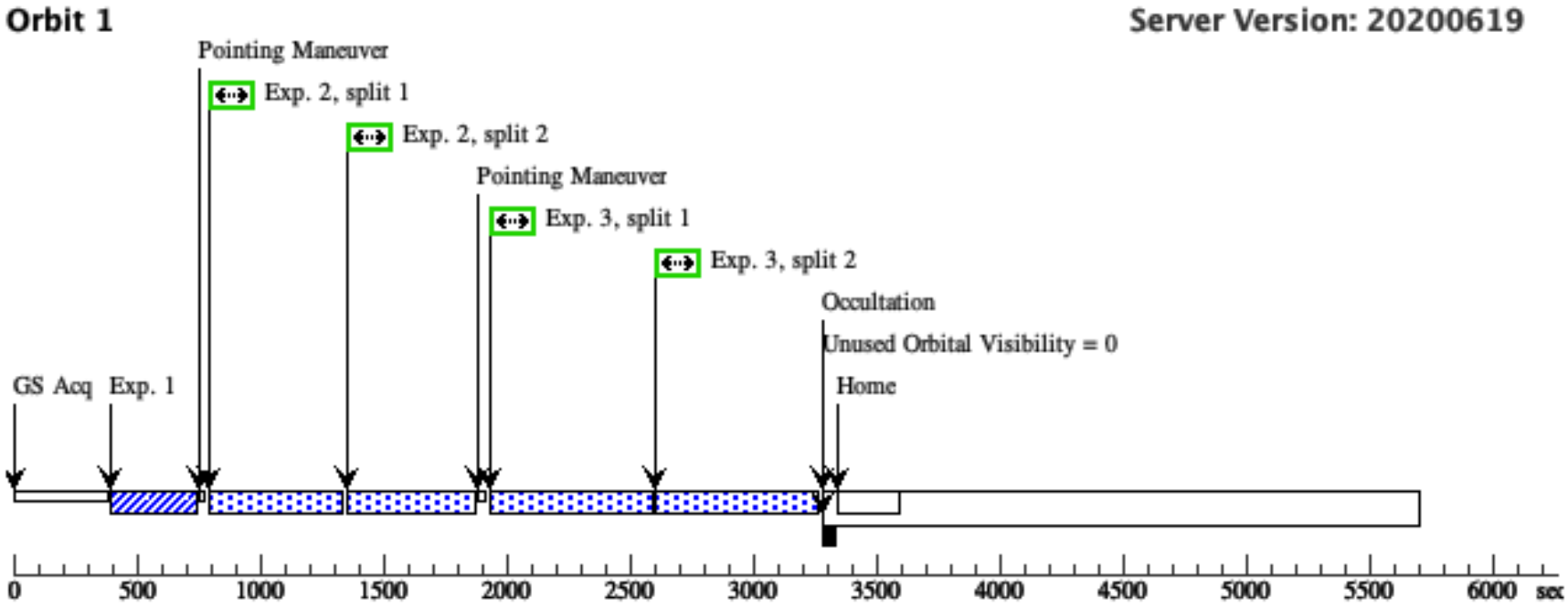
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Vmag from UCAC4 catalog (Zacharias+2012).

Comparison to the science target PDS70:
Distance = 11"
deltaV = 0.1 (UCAC4 catalog (Zacharias+2012).
deltaG = 0.06 (Gaia)
delta(abs(B-V)) = 0.02 (UCAC4 catalog (Zacharias+2012).
deta(abs(V-I)) = 0.01 (ROSAT catalogKigara+2012).
delta(abs(V-G)) = 0.02 (gaia + UCAC4)
Category=STAR
Description=[K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UCAC4-203 - ACQ (STIS.im.14 50510)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-In t in Set 1 - PSF (13)	14.5 Secs (14.5 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.097 with F25ND3 filter.								
2	UCAC4-203 - SHORT (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-In t in Set 1 - PSF (13)	1019 Secs (1019 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We use the same number of exposure and the same saturation limit as for the science target to obtain similar readout noise and photon noise on the reference star. *The 80% Full well capacity is Tint = 509.5s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.*								
3	UCAC4-203 - LONG (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-In t in Set 1 - PSF (13)	1287 Secs (1287 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We use the same parameters as for the science star and we fill up the rest of the orbit with one exposure (saturation limit at the edge of WEDGEA1.0=4790s)								

Orbit Structure



Visit

Proposal 16305, Set 1 - Roll 3 (14), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT 20D TO 30D FROM 12; AFTER 13 BY 0.5 Orbits TO 1.5 Orbits

Comments: First of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 3rd PDS70 visit in the first set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of 20 to 30D from the reference orient of the first set (visit #12).
A 10D range is provided to facilitate scheduling, however and relative orient close to 30D is prefered over 20D.

Relative Timing: This visit (#14) should immediately follow Visit #13 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 1 - Roll 3 (14)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***

Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.

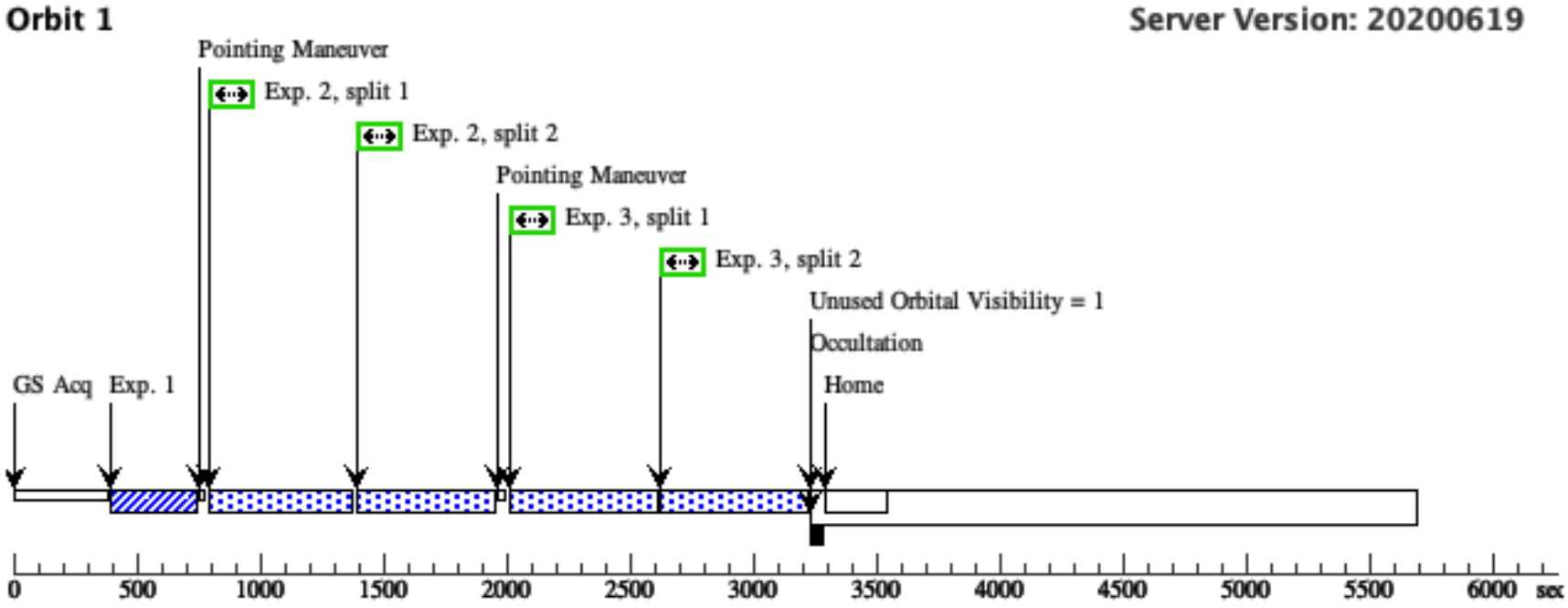
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 1 - Roll 3 (14)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***

Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.
We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).
Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").
Clear view X axis: -55pix -- +969pix
Clear view Y axis: -70pix -- +70pix

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 1 - Roll 3 (14)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***

Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle.
The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.
Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.
We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.

Orbit Structure



Visit

Proposal 16305, Set 2 - Roll 1 (21), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT -30D TO -20D FROM 22

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the first PDS70 visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of -30 to -20D from the reference orient of the 2nd set (visit #22).
A 10D range is provided to facilitate scheduling, however and relative orient close to -30D is prefered over -20D.

Relative Timing: This visit (#21) should immediately preceed visit #22 (back-to-back orbits).

Fixed Targets

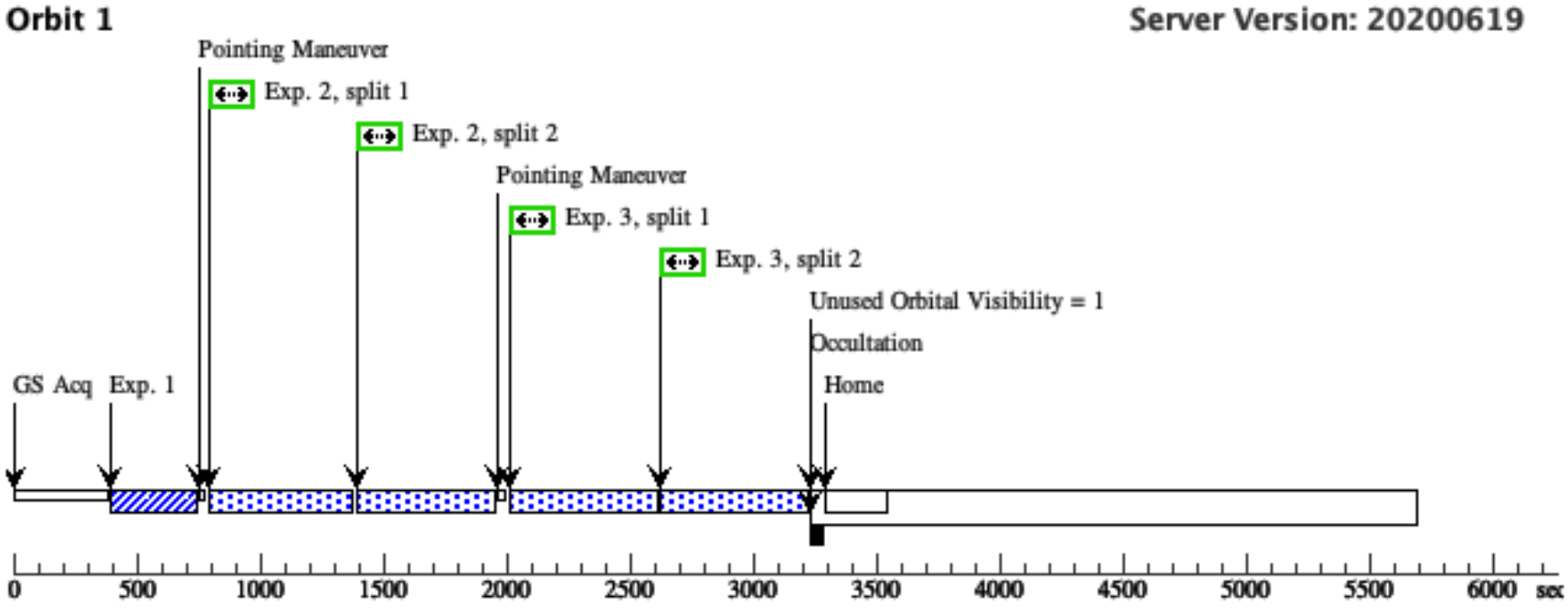
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 2 - Roll 1 (21)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 2 - Roll 1 (21)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 2 - Roll 1 (21)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 2 - Roll 2 (22), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT -2D TO 2D FROM 12; AFTER 21 BY 0.5 Orbits TO 1.5 Orbits

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 2nd PDS70 visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
This visit must have the same orient as visit #12 (reference orient from the first set) within +/-2D.
This constaint can be relaxed a bit if needed for schedulability.
The two other visits to PDS70 in the 2nd set (#21 and #24) carry relative orientation constraints with respect to this visit.

Relative Timing: This visit (#22) should immediately preceed visit #23 and should immediately follow Visit #21 (back-to-back orbits).

Fixed Targets

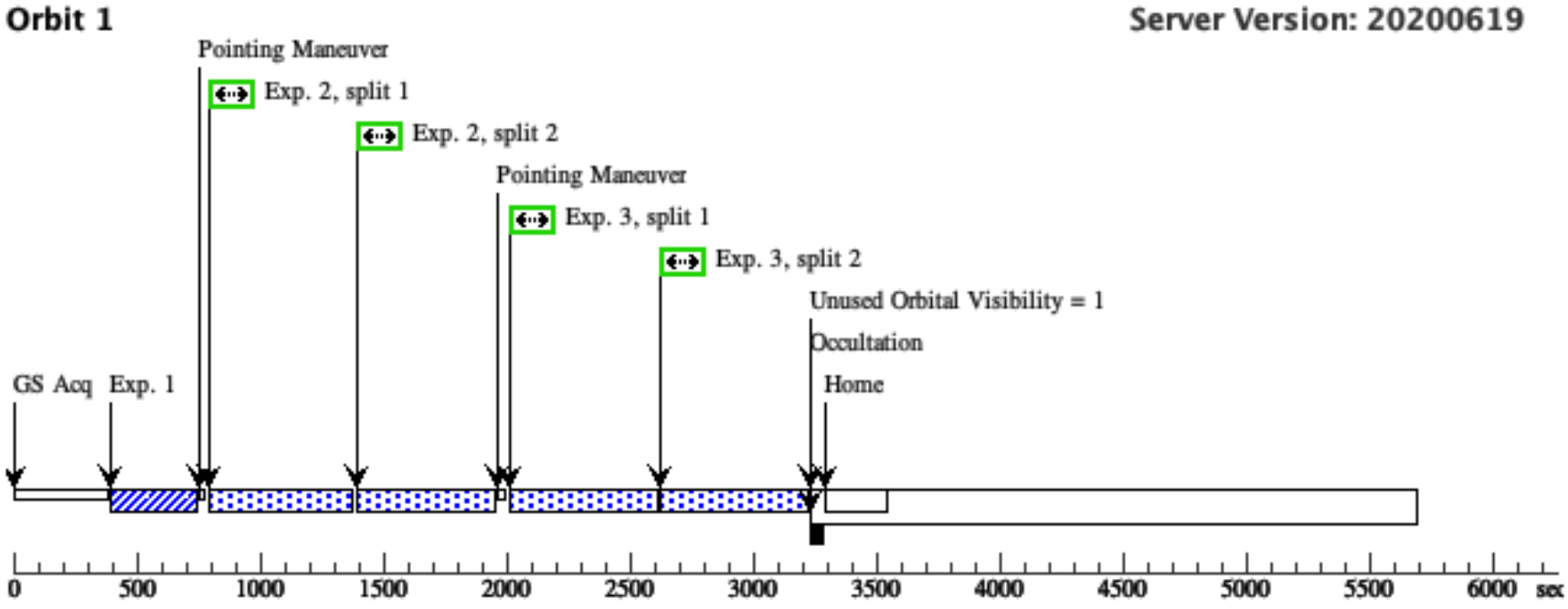
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 2 - Roll 2 (22)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 2 - Roll 2 (22)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 2 - Roll 2 (22)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 2 - Roll 2 (52), implementation Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SAME ORIENT AS 22

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 2nd PDS70 visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
This visit must have the same orient as visit #12 (reference orient from the first set) within +/-2D.
This constaint can be relaxed a bit if needed for schedulability.
The two other visits to PDS70 in the 2nd set (#21 and #24) carry relative orientation constraints with respect to this visit.

Relative Timing: This visit (#22) should immediately preceed visit #23 and should immediately follow Visit #21 (back-to-back orbits).

Fixed Targets

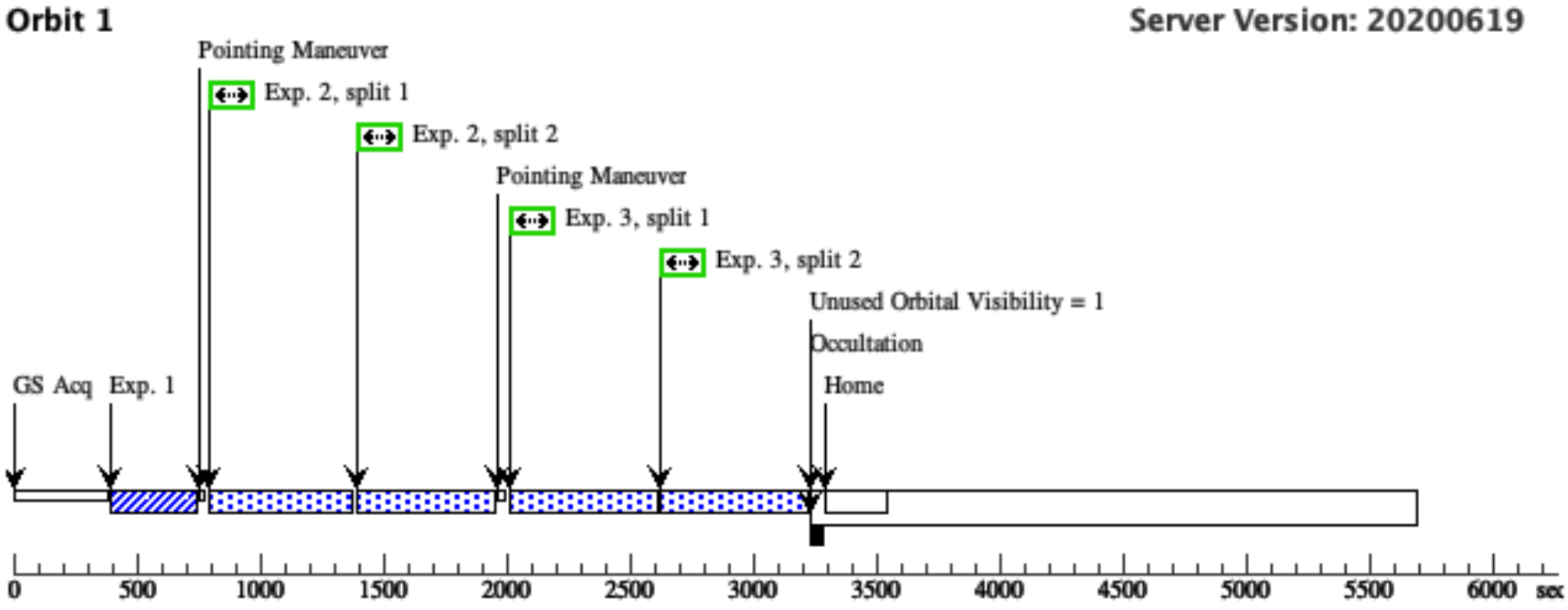
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 2 - Roll 2 (52)	15.6 Secs (15.6 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 2 - Roll 2 (52)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 2 - Roll 2 (52)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 2 - PSF (23), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 22 BY 0.5 Orbits TO 1.5 Orbits

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the PSF visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set no orient constraint on the PSF orientations. However, as we selected the PSF target to be near the science target and given the sequential orbit sequence, we expect to have an absolute orientation very similar to visit #22 within a few degrees. This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.

Relative Timing: This visit (#23) should immediately preceed visit #24 and should immediately follow Visit #22 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	UCAC4-203-088985-PSF-CALIB	RA: 14 37 49.0375 (219.4543229d) Dec: -49 28 26.85 (-49.47413d) Equinox: J2000	Proper Motion RA: -24.488 mas/yr Proper Motion Dec: -24.619 mas/yr Parallax: 0.0083404" Epoch of Position: 2000 Radial Velocity: 3.52 km/sec	V=12.097+/-0.04	Reference Frame: ICRS

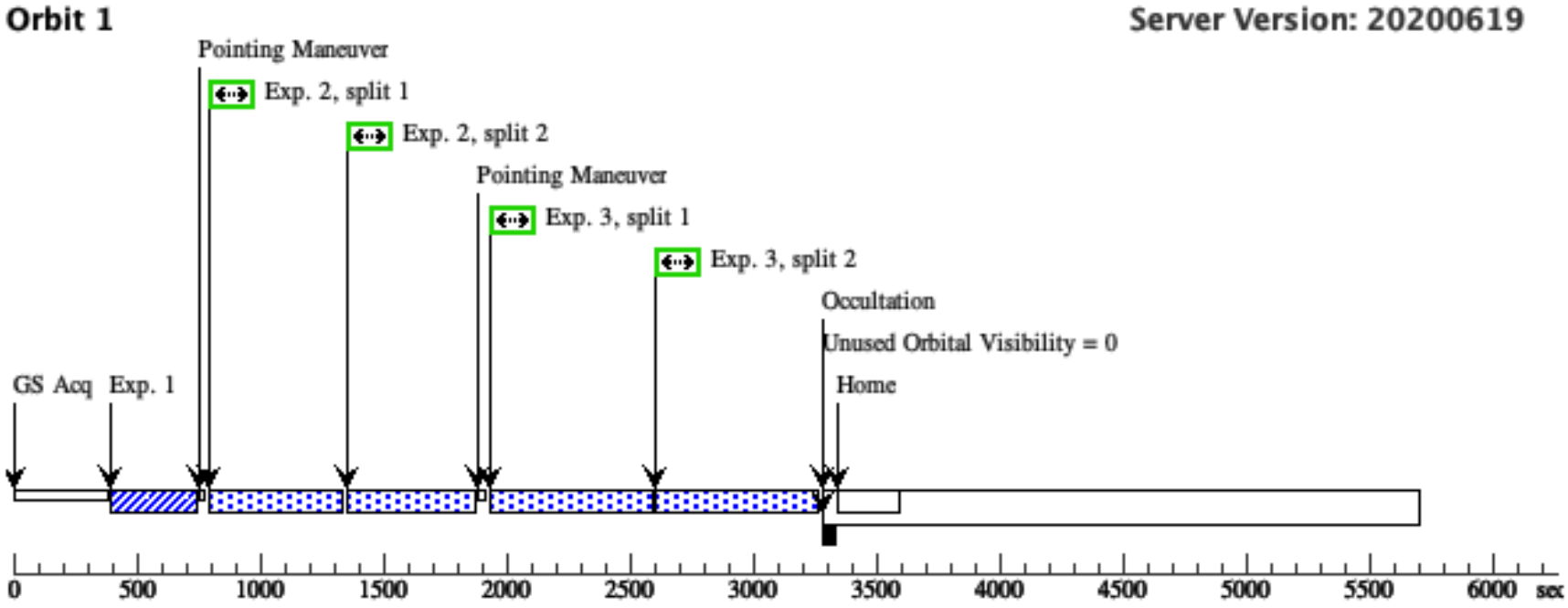
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Vmag from UCAC4 catalog (Zacharias+2012).

Comparison to the science target PDS70:
Distance = 11"
deltaV = 0.1 (UCAC4 catalog (Zacharias+2012).
deltaG = 0.06 (Gaia)
delta(abs(B-V)) = 0.02 (UCAC4 catalog (Zacharias+2012).
deta(abs(V-I)) = 0.01 (ROSAT catalogKigara+2012).
delta(abs(V-G)) = 0.02 (gaia + UCAC4)
Category=STAR
Description=[K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UCAC4-203 - ACQ (STIS.im.14 50510)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-In t in Set 2 - PSF (23)	14.5 Secs (14.5 Secs) *[==>]*	 ***[1]***
	Comments: SNR = 100 for a K7 star with V=12.097 with F25ND3 filter.								
2	UCAC4-203 - SHORT (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-In t in Set 2 - PSF (23)	1019 Secs (1019 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
	Comments: We use the same number of exposure and the same saturation limit as for the science target to obtain similar readout noise and photon noise on the reference star. *The 80% Full well capacity is Tint = 509.5s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.*								
3	UCAC4-203 - LONG (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-In t in Set 2 - PSF (23)	1287 Secs (1287 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
	Comments: We use the same parameters as for the science star and we fill up the rest of the orbit with one exposure (saturation limit at the edge of WEDGEA1.0=4790s)								

Orbit Structure



Visit

Proposal 16305, Set 2 - PSF (53), implementation Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; AFTER 52 BY 0.5 Orbits TO 1.5 Orbits

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the PSF visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set no orient constraint on the PSF orientations. However, as we selected the PSF target to be near the science target and given the sequential orbit sequence, we expect to have an absolute orientation very similar to visit #22 within a few degrees. This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.

Relative Timing: This visit (#23) should immediately preceed visit #24 and should immediately follow Visit #22 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	UCAC4-203-088985-PSF-CALIB	RA: 14 37 49.0375 (219.4543229d) Dec: -49 28 26.85 (-49.47413d) Equinox: J2000	Proper Motion RA: -24.488 mas/yr Proper Motion Dec: -24.619 mas/yr Parallax: 0.0083404" Epoch of Position: 2000 Radial Velocity: 3.52 km/sec	V=12.097+/-0.04	Reference Frame: ICRS

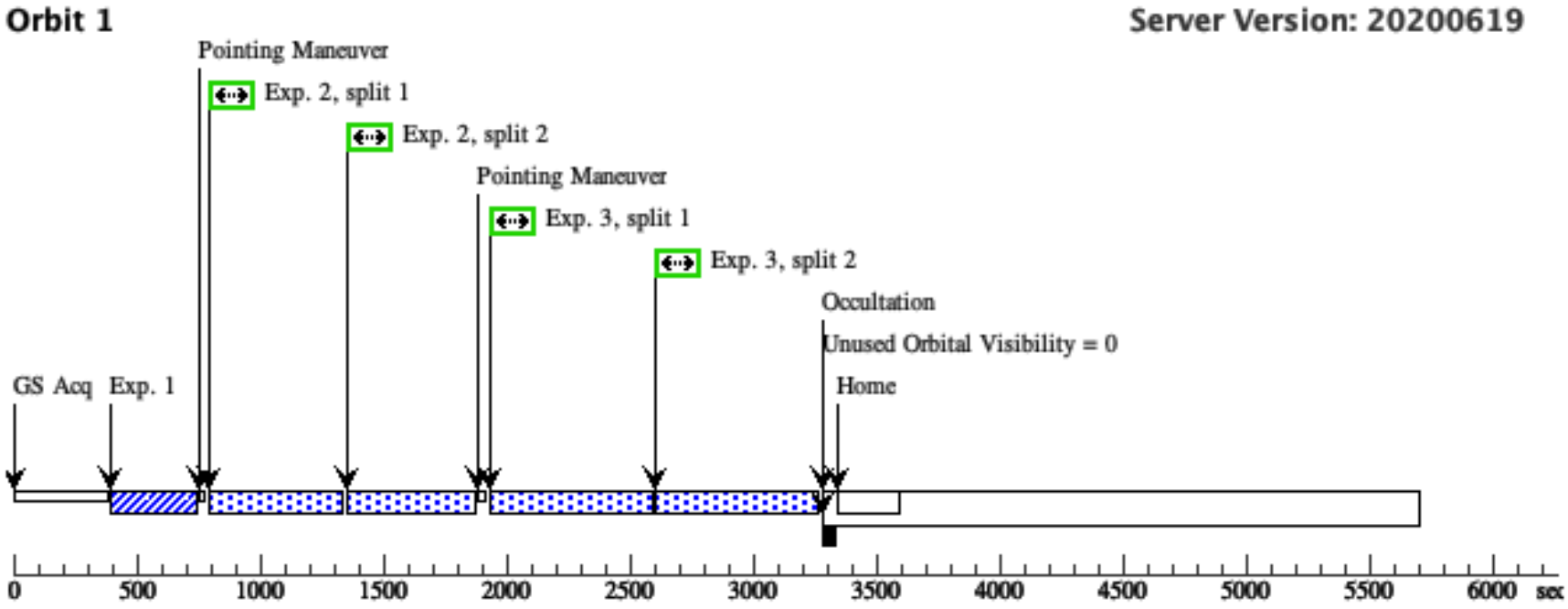
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Vmag from UCAC4 catalog (Zacharias+2012).

Comparison to the science target PDS70:
Distance = 11"
deltaV = 0.1 (UCAC4 catalog (Zacharias+2012).
deltaG = 0.06 (Gaia)
delta(abs(B-V)) = 0.02 (UCAC4 catalog (Zacharias+2012).
deta(abs(V-I)) = 0.01 (ROSAT catalogKigara+2012).
delta(abs(V-G)) = 0.02 (gaia + UCAC4)
Category=STAR
Description=[K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UCAC4-203 - ACQ (STIS.im.14 50510)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-In t in Set 2 - PSF (53)	14.5 Secs (14.5 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.097 with F25ND3 filter.								
2	UCAC4-203 - SHORT (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-In t in Set 2 - PSF (53)	1019 Secs (1019 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We use the same number of exposure and the same saturation limit as for the science target to obtain similar readout noise and photon noise on the reference star. *The 80% Full well capacity is Tint = 509.5s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.*								
3	UCAC4-203 - LONG (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-In t in Set 2 - PSF (53)	1287 Secs (1287 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	*[1]*
	Comments: We use the same parameters as for the science star and we fill up the rest of the orbit with one exposure (saturation limit at the edge of WEDGEA1.0=4790s)								

Orbit Structure



Visit

Proposal 16305, Set 2 - Roll 3 (24), completed Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; ORIENT 20D TO 30D FROM 22; AFTER 23 BY 0.5 Orbits TO 1.5 Orbits

Comments: Second of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 3rd PDS70 visit in the second set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of 20 to 30D from the reference orient of the 2nd set (visit #22).
A 10D range is provided to facilitate scheduling, however and relative orient close to 30D is prefered over 20D.

Relative Timing: This visit (#24) should immediately follow Visit #23 (back-to-back orbits).

Fixed Targets

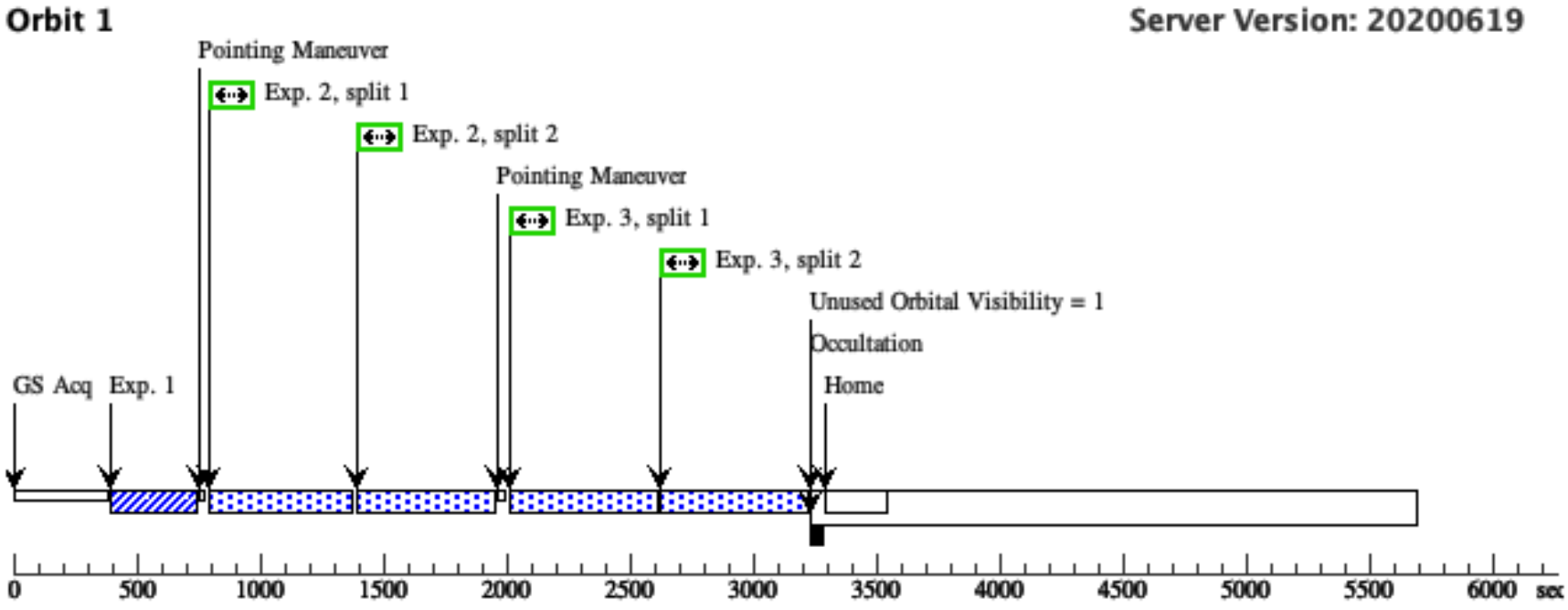
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 2 - Roll 3 (24)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 2 - Roll 3 (24)	1100 Secs (1100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 2 - Roll 3 (24)	1156 Secs (1156 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 3 - Roll 1 (31), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT -30D TO -20D FROM 32

Comments: Third of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the first PDS70 visit in the third set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of -30 to -20D from the reference orient of the 3rd set (visit #32).
A 10D range is provided to facilitate scheduling, however and relative orient close to -30D is prefered over -20D.

Relative Timing: This visit (#31) should immediately preceed visit #32 (back-to-back orbits).

Fixed Targets

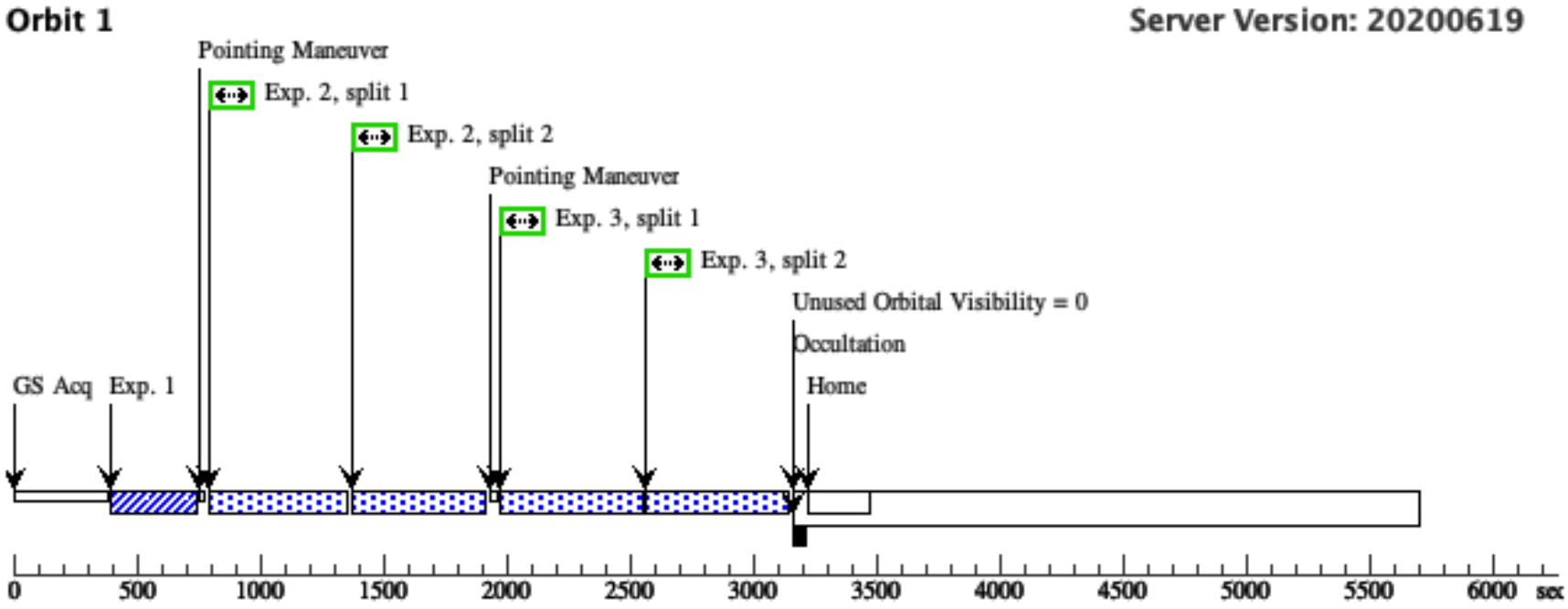
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 3 - Roll 1 (31)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 3 - Roll 1 (31)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 3 - Roll 1 (31)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 3 - Roll 2 (32), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT 98D TO 102D FROM 12; AFTER 31 BY 0.5 Orbits TO 1.5 Orbits

Comments: Third of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 2nd PDS70 visit in the third set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
This visit must have a relative ORIENT of 100D (+/-2D) FROM visit #12 (reference orient from the first set).
It can equally have an ORIENT FROM visit #12 by -100D instead of +100D, although APT doesn't allow this option.
We have no preference between the two options.
The two other visits to PDS70 in the 3rd set (#31 and #34) carry relative orientation constraints with respect to this visit.

Relative Timing: This visit (#32) should immediately preceed visit #33 and should immediately follow Visit #31 (back-to-back orbits).

Fixed Targets

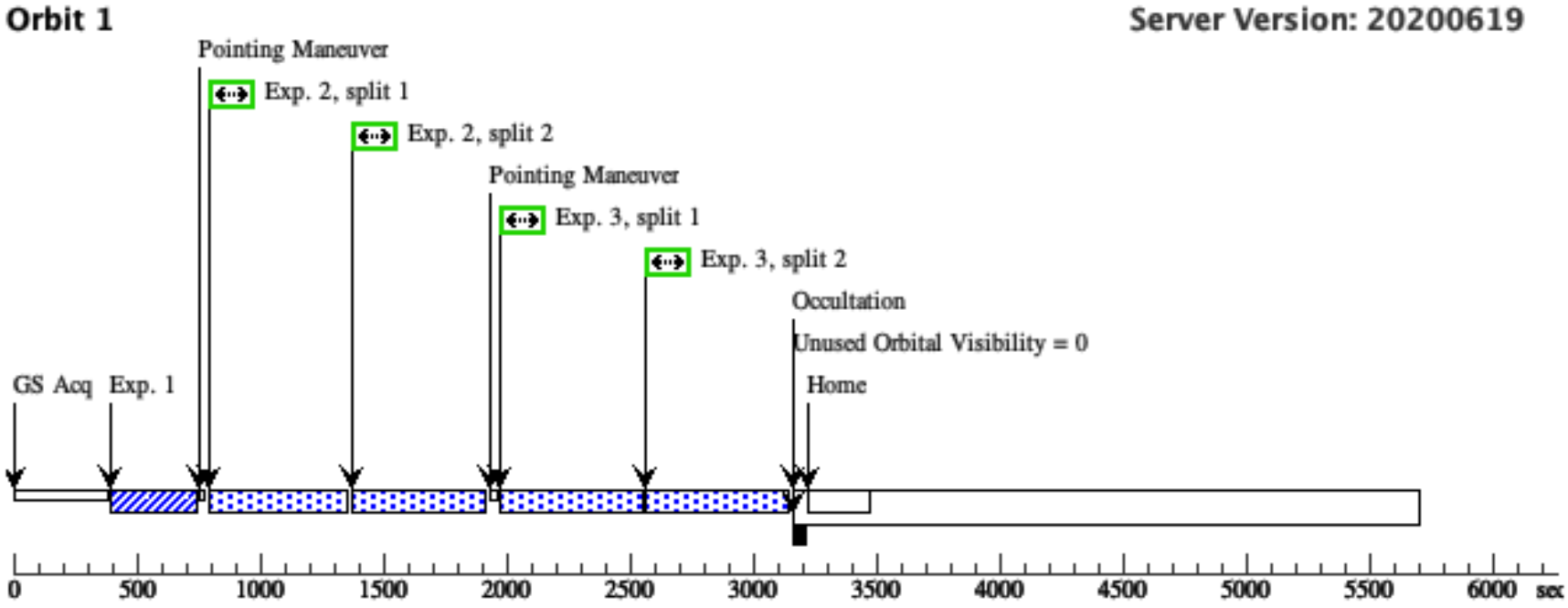
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 3 - Roll 2 (32)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 3 - Roll 2 (32)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 3 - Roll 2 (32)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 3 - PSF (33), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; AFTER 32 BY 0.5 Orbits TO 1.5 Orbits

Comments: Third of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the PSF visit in the third set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set no orient constraint on the PSF orientations. However, as we selected the PSF target to be near the science target and given the sequential orbit sequence, we expect to have an absolute orientation very similar to visit #32 within a few degrees. This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.

Relative Timing: This visit (#33) should immediately preceed visit #34 and should immediately follow Visit #32 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	UCAC4-203-088985-PSF-CALIB	RA: 14 37 49.0375 (219.4543229d) Dec: -49 28 26.85 (-49.47413d) Equinox: J2000	Proper Motion RA: -24.488 mas/yr Proper Motion Dec: -24.619 mas/yr Parallax: 0.0083404" Epoch of Position: 2000 Radial Velocity: 3.52 km/sec	V=12.097+/-0.04	Reference Frame: ICRS

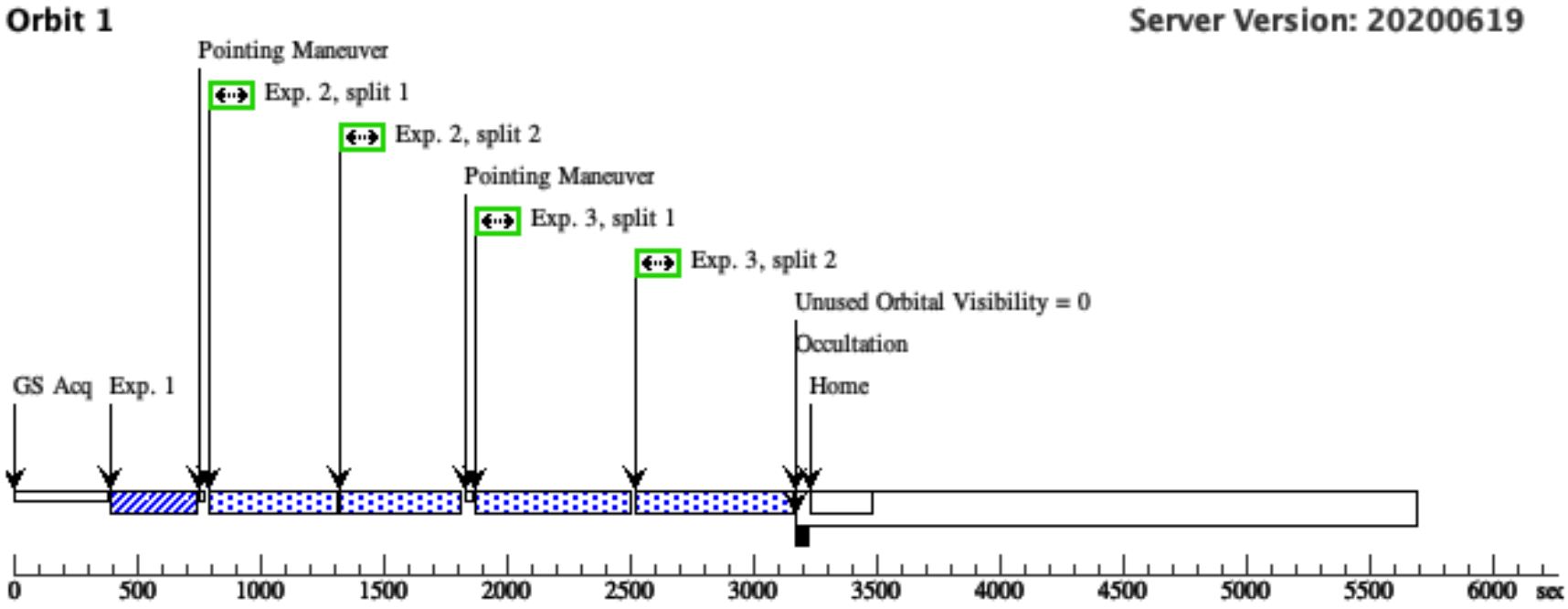
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Vmag from UCAC4 catalog (Zacharias+2012).

Comparison to the science target PDS70:
Distance = 11"
deltaV = 0.1 (UCAC4 catalog (Zacharias+2012).
deltaG = 0.06 (Gaia)
delta(abs(B-V)) = 0.02 (UCAC4 catalog (Zacharias+2012).
deta(abs(V-I)) = 0.01 (ROSAT catalogKigara+2012).
delta(abs(V-G)) = 0.02 (gaia + UCAC4)
Category=STAR
Description=[K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UCAC4-203 - ACQ (STIS.im.14 50510)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-In t in Set 3 - PSF (33)	14.5 Secs (14.5 Secs) *[==>]*	*[1]*
Comments: SNR = 100 for a K7 star with V=12.097 with F25ND3 filter.									
2	UCAC4-203 - SHORT (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-In t in Set 3 - PSF (33)	1019 Secs (965 Secs) *[==>482.5 Secs (Split 1)]* *[==>482.5 Secs (Split 2)]*	*[1]*
Comments: We use the same number of exposure and the same saturation limit as for the science target to obtain similar readout noise and photon noise on the reference star. *The 80% Full well capacity is Tint = 509.5s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.*									
3	UCAC4-203 - LONG (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-In t in Set 3 - PSF (33)	1287 Secs (1233 Secs) *[==>616.5 Secs (Split 1)]* *[==>616.5 Secs (Split 2)]*	*[1]*
Comments: We use the same parameters as for the science star and we fill up the rest of the orbit with one exposure (saturation limit at the edge of WEDGEA1.0=4790s)									

Orbit Structure



Visit

Proposal 16305, Set 3 - Roll 3 (34), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT 20D TO 30D FROM 32; AFTER 33 BY 0.5 Orbits TO 1.5 Orbits

Comments: Third of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 3rd PDS70 visit in the third set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of 20 to 30D from the reference orient of the 3rd set (visit #32).
A 10D range is provided to facilitate scheduling, however and relative orient close to 30D is prefered over 20D.

Relative Timing: This visit (#34) should immediately follow Visit #33 (back-to-back orbits).

Fixed Targets

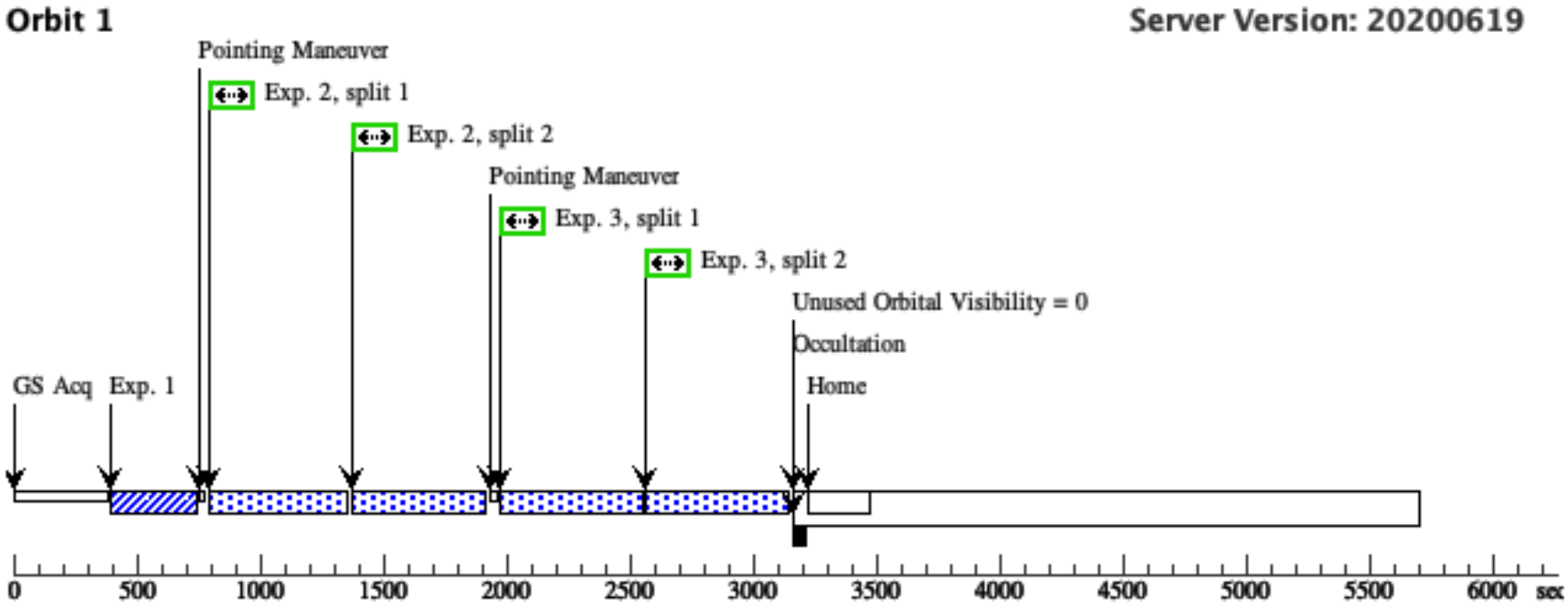
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 3 - Roll 3 (34)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 3 - Roll 3 (34)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 3 - Roll 3 (34)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 4 - Roll 1 (41), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT -30D TO -20D FROM 42

Comments: Fourth of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the first PDS70 visit in the fourth set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of -30 to -20D from the reference orient of the 4th set (visit #42).
A 10D range is provided to facilitate scheduling, however and relative orient close to -30D is prefered over -20D.

Relative Timing: This visit (#41) should immediately preceed visit #42 (back-to-back orbits).

Fixed Targets

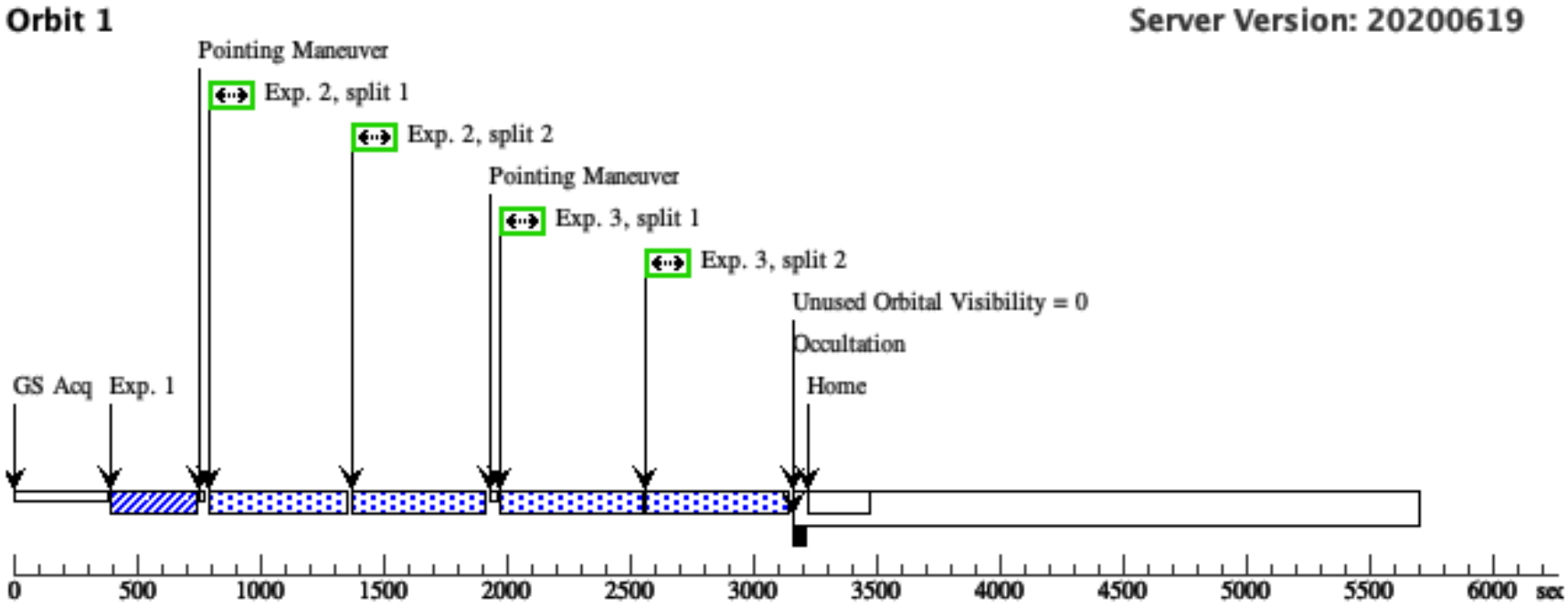
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d) Dec: -41 23 52.58 (-41.39794d) Equinox: J2000	Proper Motion RA: -29.661 mas/yr Proper Motion Dec: -23.823 mas/yr Parallax: 0.0088159" Epoch of Position: 2000 Radial Velocity: 3.13 km/sec	V=12.18+/-0.06	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 4 - Roll 1 (41)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 4 - Roll 1 (41)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 4 - Roll 1 (41)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 4 - Roll 2 (42), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT 98D TO 102D FROM 12; AFTER 41 BY 0.5 Orbits TO 1.5 Orbits

Comments: Fourth of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 2nd PDS70 visit in the fourth set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
This visit must have a relative ORIENT of 100D (+/-2D) FROM visit #12 (reference orient from the first set).
It can equally have an ORIENT FROM visit #12 by -100D instead of +100D, although APT doesn't allow this option.
We have no preference between the two options.
The two other visits to PDS70 in the 4th set (#41 and #44) carry relative orientation constraints with respect to this visit.

Relative Timing: This visit (#42) should immediately preceed visit #43 and should immediately follow Visit #41 (back-to-back orbits).

Fixed Targets

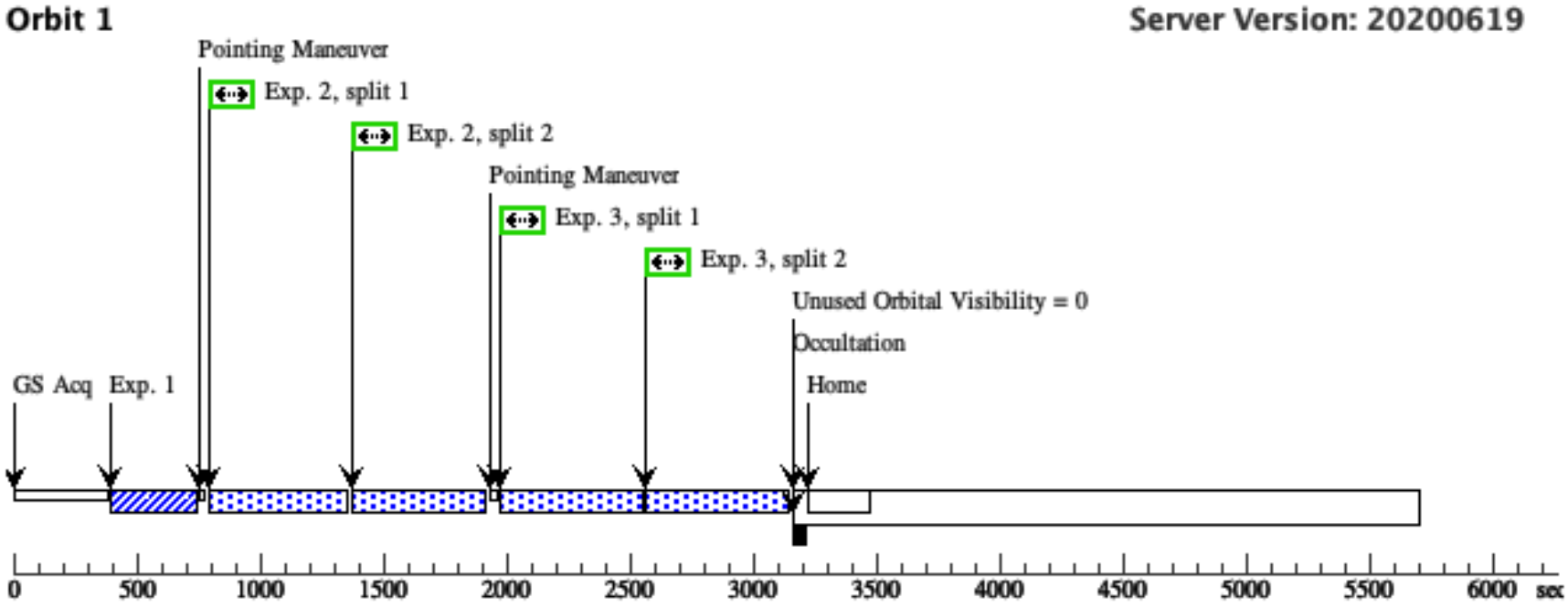
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 4 - Roll 2 (42)	15.6 Secs (15.6 Secs) *[==>]*	*[1]*
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 4 - Roll 2 (42)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	*[1]*
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 4 - Roll 2 (42)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	*[1]*
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								

Orbit Structure



Visit

Proposal 16305, Set 4 - PSF (43), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; AFTER 42 BY 0.5 Orbits TO 1.5 Orbits

Comments: Fourth of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the PSF visit in the fourth set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set no orient constraint on the PSF orientations. However, as we selected the PSF target to be near the science target and given the sequential orbit sequence, we expect to have an absolute orientation very similar to visit #42 within a few degrees. This is important so we maintain similar Sun and Beta angles for the science target and its PSF calibrator.

Relative Timing: This visit (#43) should immediately preceed visit #44 and should immediately follow Visit #42 (back-to-back orbits).

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	UCAC4-203-088985-PSF-CALIB	RA: 14 37 49.0375 (219.4543229d) Dec: -49 28 26.85 (-49.47413d) Equinox: J2000	Proper Motion RA: -24.488 mas/yr Proper Motion Dec: -24.619 mas/yr Parallax: 0.0083404" Epoch of Position: 2000 Radial Velocity: 3.52 km/sec	V=12.097+/-0.04	Reference Frame: ICRS

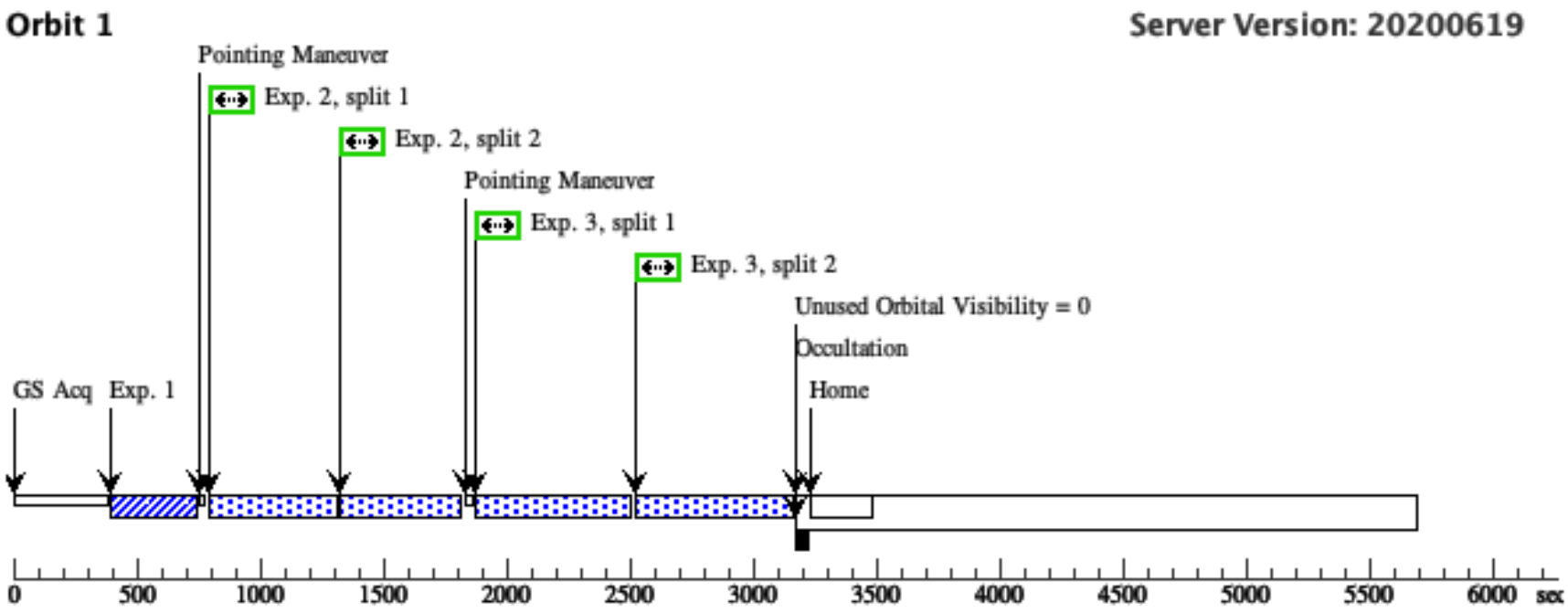
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Vmag from UCAC4 catalog (Zacharias+2012).

Comparison to the science target PDS70:
Distance = 11"
deltaV = 0.1 (UCAC4 catalog (Zacharias+2012).
deltaG = 0.06 (Gaia)
delta(abs(B-V)) = 0.02 (UCAC4 catalog (Zacharias+2012).
deta(abs(V-I)) = 0.01 (ROSAT catalogKigara+2012).
delta(abs(V-G)) = 0.02 (gaia + UCAC4)
Category=STAR
Description=[K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	UCAC4-203 - ACQ (STIS.im.14 50510)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-In t in Set 4 - PSF (43)	14.5 Secs (14.5 Secs) *[==>]*	*[1]*
Comments: SNR = 100 for a K7 star with V=12.097 with F25ND3 filter.									
2	UCAC4-203 - SHORT (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-In t in Set 4 - PSF (43)	1019 Secs (965 Secs) *[==>482.5 Secs (Split 1)]* *[==>482.5 Secs (Split 2)]*	*[1]*
Comments: We use the same number of exposure and the same saturation limit as for the science target to obtain similar readout noise and photon noise on the reference star. *The 80% Full well capacity is Tint = 509.5s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5.*									
3	UCAC4-203 - LONG (STIS.im.14 50511)	(2) UCAC4-203-088 985-PSF-CALIB	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-In t in Set 4 - PSF (43)	1287 Secs (1233 Secs) *[==>616.5 Secs (Split 1)]* *[==>616.5 Secs (Split 2)]*	*[1]*
Comments: We use the same parameters as for the science star and we fill up the rest of the orbit with one exposure (saturation limit at the edge of WEDGEA1.0=4790s)									

Orbit Structure



Visit

Proposal 16305, Set 4 - Roll 3 (44), scheduling Thu Mar 18 15:00:28 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; GUID TOL 0.005"; GYRO MODE 3GOBAD; SCHED 50%; ORIENT 20D TO 30D FROM 42; AFTER 43 BY 0.5 Orbits TO 1.5 Orbits

Comments: Fourth of four sets of visits, each containing three visits to PDS70 at three different relative orientations and one PSF observation interleaved.
This is the 3rd PDS70 visit in the fourth set.
The four visits within each set must be executed sequentally in contiguous orbits interrupted only for Earth occultation.

Orientation:
We set an ORIENT FROM constraint of 20 to 30D from the reference orient of the 4th set (visit #42).
A 10D range is provided to facilitate scheduling, however and relative orient close to 30D is prefered over 20D.

Relative Timing: This visit (#44) should immediately follow Visit #43 (back-to-back orbits).

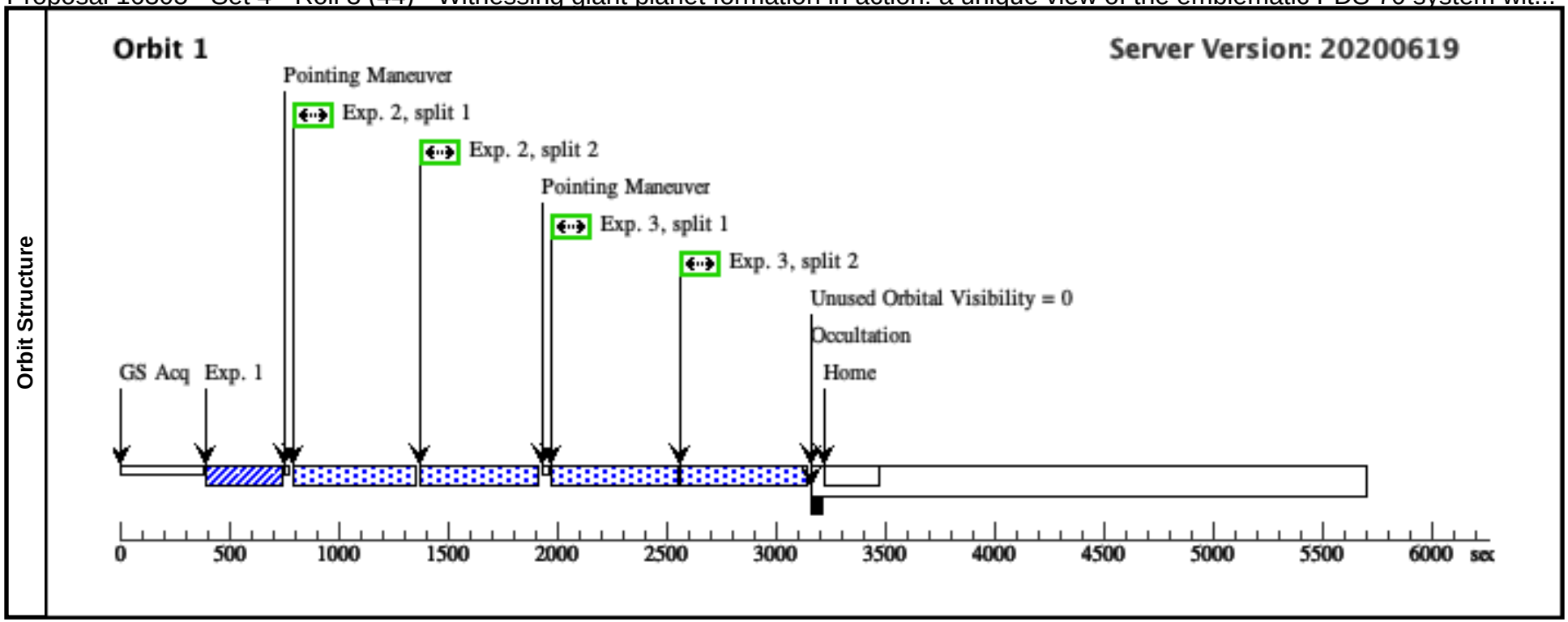
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PDS70	RA: 14 08 10.1545 (212.0423104d)	Proper Motion RA: -29.661 mas/yr	V=12.18+/-0.06	Reference Frame: ICRS
		Dec: -41 23 52.58 (-41.39794d)	Proper Motion Dec: -23.823 mas/yr		
		Equinox: J2000	Parallax: 0.0088159"		
			Epoch of Position: 2000		
			Radial Velocity: 3.13 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Verified and Updated manually after conversion to phase 2.
Vmag from UCAC4 catalog (Zacharias+2012).
Category=STAR
Description=[DISK, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PDS70 - ACQ (STIS.im.1448820)	(1) PDS70	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Set 4 - Roll 3 (44)	15.6 Secs (15.6 Secs) *[==>]*	***[1]***
	Comments: SNR = 100 for a K7 star with V=12.18 with F25ND3 filter.								
2	PDS70 - SHORT (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, BAR5	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=140		Sequence 1-3 Non-Int in Set 4 - Roll 3 (44)	1100 Secs (1062 Secs) *[==>531.0 Secs (Split 1)]* *[==>531.0 Secs (Split 2)]*	***[1]***
	Comments: The 80% Full well capacity is Tint = 550s, computed from the stellar flux at the brightest pixel and a raw contrast of 1.9e-3 just at the edge of BAR5. *We use a total of 4 integrations (CR-SPLIT=2 times two orbits), which corresponds to a contrast limit of 6e-4 arcsec^-2 (5sigma, 2x2 pixel binning).* *Given that the main disk has a radius of 1", we use a SIZEAXIS2=140 to speed up the readout time while allowing observations of the disk (FOV=7.1").* *Clear view X axis: -55pix -- +969pix* *Clear view Y axis: -70pix -- +70pix*								
3	PDS70 - LONG (STIS.im.1448821)	(1) PDS70	STIS/CCD, ACCUM, WEDGEA1.0	MIRROR	GAIN=4; CR-SPLIT=2; SIZEAXIS2=427		Sequence 1-3 Non-Int in Set 4 - Roll 3 (44)	1156 Secs (1118 Secs) *[==>559.0 Secs (Split 1)]* *[==>559.0 Secs (Split 2)]*	***[1]***
	Comments: We changed the Wedge position from WEDGEA0.6 described in the proposal to WEDGEA1.0 to allow for a larger field-of-view, albeit a slightly larger inner working angle. *The 80% Full well capacity is Tint = 5173s, computed from the stellar flux at the brightest pixel and a raw contrast of 2e-4 just at the edge of WEDGEA1.0.* *Given that the time before occultation is shorter than this saturation limit, we simply fill the orbit with one long exposure for the remaining visibility.* *We set SIZEAXIS2 to the maximum size allowed by the detector size given the A1.0 position on the detector.*								


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