16815 - ULLYSES LMC O5-O6 Dwarfs - COS and STIS

Cycle: 29, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
1S	(1) N11-ELS-048 (3) N11-ELS-048-OFFSET WAVE	STIS/CCD STIS/FUV-MAMA	3	11-Nov-2022 12:00:37.0	yes
1T	(1) N11-ELS-048 (3) N11-ELS-048-OFFSET WAVE	STIS/CCD STIS/FUV-MAMA	2	11-Nov-2022 12:00:39.0	yes
2C	(2) VFTS-406	COS/FUV COS/NUV	2	11-Nov-2022 12:00:39.0	yes
2D	(2) VFTS-406	COS/FUV COS/NUV	2	11-Nov-2022 12:00:40.0	yes

9 Total Orbits Used

ABSTRACT

The Space Telescope Science Institute (STScI) Director has decided to devote up to 1000 orbits of Director's Discretionary time in observing Cycles 27-29 to a new Hubble Ultraviolet Legacy program focused on star formation and associated stellar physics. This new program, ULLYSES (UV Legacy Library of Young Stars as Essential Standards), will provide a UV spectroscopic reference sample of young (< 10 Myr) high- and low-mass

stars. It will target over ~150 OB stars in the Magellanic Clouds and lower metallicity galaxies in the Local Group, and ~40 T Tauri stars and brown dwarfs in the Milky Way. In addition, ULLYSES will monitor 4 typical T Tauri stars over different rotational phases through at least three rotation periods, and over timescales of months to years. The resulting library will provide template spectra of massive stars at metallicities substantially below the well studied, while the low mass sample will cover a wide range of ages, accretion rates, and masses, including objects down to well below 0.5 M_sun. The legacy of this large UV dataset on the first 10 Myr of stellar evolution will be enhanced by complementary datasets obtained by the scientific community. In addition to the core goals of the program related to stellar astrophysics of low and high mass stars, this data will also enable exciting science in the fields of ISM, CGM, jets, and exoplanets. ULLYSES will be modeled after the Frontier Fields program: all data obtained will be non-proprietary. The implementation team at STScI is developing high-level science data products and a sophisticated database and website for disseminating data from the ULLYSES program and ancillary datasets for the ULLYSES target sample from space and ground-based facilities.

OBSERVING DESCRIPTION

This proposal includes a subset of the massive ULLYSES stars being observed in the Magellanic clouds.

Depending on target brightness, the main FUV spectral range will generally use either the STIS E140M setting or the combination of the COS c1291 + c1611 settings. Sufficiently bright stars without good FUSE data in the archive will also be observed with the COS c1096 setting to provide coverage at shorter wavelengths. Where time permits, stars of type O9 or later will also be observed with STIS E230M/1978, while for supergiants of spectral type B5 or later E230M/2707 may also be included. Where possible, targets of a given spectral type were selected to span both a range in extinction and in rotation rates to support a variety of stellar and ISM studies.

Signal-to-noise requirements used to determine the desired exposures times were defined as follows:
COS/G130M/c1096: 20 / nine-pixel resel at 1080 A
COS/G130M/c1291: 30 / six-pixel resel at 1150 A
COS/G160M/c1611: 30 / six-pixel resel at 1590 A
COS/G185M/c1953: 30 / three-pixel resel at 1860 A
COS/G185M/c1986: 30 / three-pixel resel at 1980 A
STIS/E140M/c1425: 20 / two-pixel resel at 1200 A
STIS/E230M/c1978: 20 / two-pixel resel at 1800 A
STIS/E230M/c2707: 20 / two-pixel resel at 2800 A
The actual implemented exposure times may be adjusted to efficiently use HST orbits, but should always provide at least 80% of the desired time as

defined by the above requirements.

Additional details about the scientific motivation and technical implementation strategy of the ULLYSES observations can be found at http://www.stsci.edu/stsci-research/research-topics-and-programs/ullyses. The ULLYSES program is based on the recommendations of a working group led by Sally Oey; the full text of that group's report can be found at http://www.stsci.edu/files/live/sites/www/files/home/stsci-research/research-topics-and-programs/ullyses/_documents/HSTUV-report-ULLYSES.pdf.

Visit

Proposal 16815, N11-ELS-048-STIS (1S), implementation Fri Nov 11 17:00:41 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; GROUP 1S,1T WITHIN 14D

Comments: vstatus; 1S; N11-ELS-048; P/STIS approved for submission; P/RP 04/08/22 ; intrev: complete ; P/AF 02/08/22
vcheck; Enter targ name & Inst. & Resp. Sci.; N11-ELS-048 ; STIS ; RP
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ... Offset target selected.
vcheck; Possible ACQ or Sci spoilers?; Yes ... An offset target was selected to avoid two possible spoiler stars in the field less than 5" away.
vcheck; Field BOT clear?; Yes ... all stars in the field are fainter than V=10.13 of an O5V star using E140M with STIS.
vcheck; Visual BOT check for stars not in catalog?; Yes ...
There are two stars within 5" that were of concern with V=12.73 and V=14.49. These stars are classified by Parker et al. as O7 V and O3 III(f) respectively.*
These could not be cleared with COS, which is why we are using STIS E140M.
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; Yes ... A loose grouping of 2 weeks was placed on visits 1S and 1T to counter any variability in the target.
vcheck; Is visit ready for int. review?; Yes
Allocated STIS orbits = 3

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	N11-ELS-048 Alt Name1: ELS2006-N11-048 Alt Name2: PGMW-3204	RA: 04 56 58.7979 (74.2449912d) Dec: -66 24 40.84 (-66.41134d) Equinox: J2000	Proper Motion RA: 5.1033885299 mas/yr Proper Motion Dec: -1.4173454308 mas/yr Parallax: 0" Epoch of Position: 2016	V=14.02 SpT=O6.5 V((f)); E(B-V)=0.10; U=12.87; B=13.85; V=14.02; F1160=6.440e-13	Reference Frame: ICRS

Comments: N11-ELS-048 : [ELS2006] N11 048
Previous name : N11-048
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = O6.5 V((f))
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_41000_4.20_m7.00_Z0.50.fits, lmc-ob-i 41-42, Z=0.500 solar, Teff=41000, log_lum=5.13, log_g=4.20, log_mdot=-7.00) (extinction lmcavg=0.100), flux1160 +- 2.0A flux=6.4e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_41000_4.20_m7.00_Z0.50.fits, lmc-ob-i 41-42, Z=0.500 solar, Teff=41000, log_lum=5.13, log_g=4.20, log_mdot=-7.00) (extinction lmcavg=0.100), flux1160 +- 2.0A flux=6.4e-13 Flam)
Coordinate pedigree: Gaia DR3
Calculation performed 2021-10-25T00:57:19, v0.9
---
tstatus; N11-ELS-048; P/STIS approved for submission; S/ins not started; P/RP 04/08/22; S/xx DD/MM/YY
tcheck; APT/SIMBAD target names: ; Simbad name: PGMW-3204; GAIA DR3: 4662152953605873152
tcheck; Target info verification status?; Yes
tcheck; Coordinates & P.M. verified, epoch checked?; Yes ... updated to DR3
tcheck; Adopted SED compared to Observations?; Yes ... extinction updated from 0.100 to 0.080 & normalized to the FUSE flux at 1160A
Category=STAR
Description=[MAIN SEQUENCE O, OF]
Extended=NO

(3)	N11-ELS-048-OFFSET Alt Name1: PGMW-3185 Alt Name2: GAIA-DR3-4662153022325341056	RA: 04 56 56.5914 (74.2357975d) Dec: -66 24 52.18 (-66.41449d) Equinox: J2000	Proper Motion RA: 1.9233194204681907 mas/yr Proper Motion Dec: -0.16467809935040012 mas/yr Parallax: 0" Epoch of Position: 2016	V=17.49	Reference Frame: ICRS

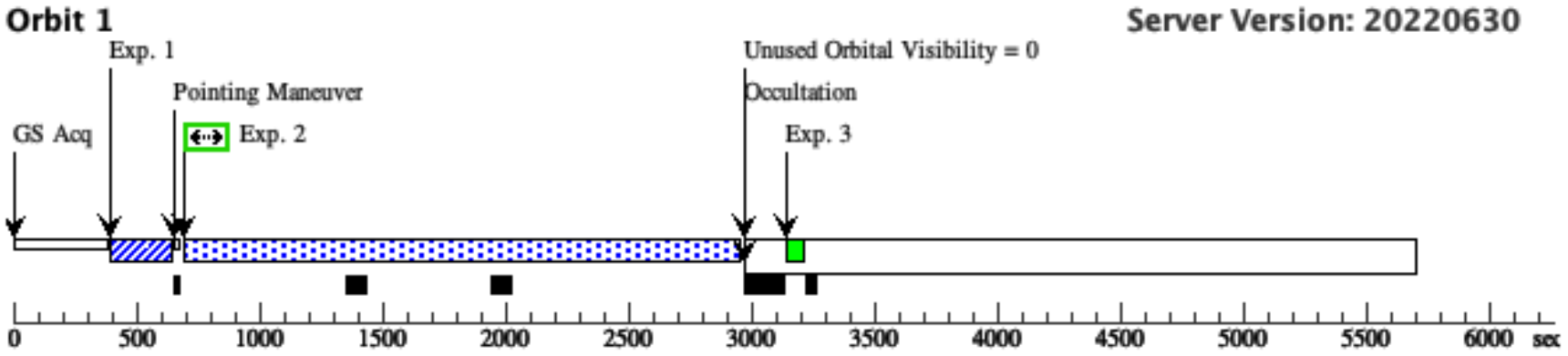
Comments: This target serves as an offset target for N11-ELS-048 and is located about 17.5" away from N11-ELS-048. An offset target is needed is due to two bright spoiler stars within the 5" checkbox for a STIS ACQ.

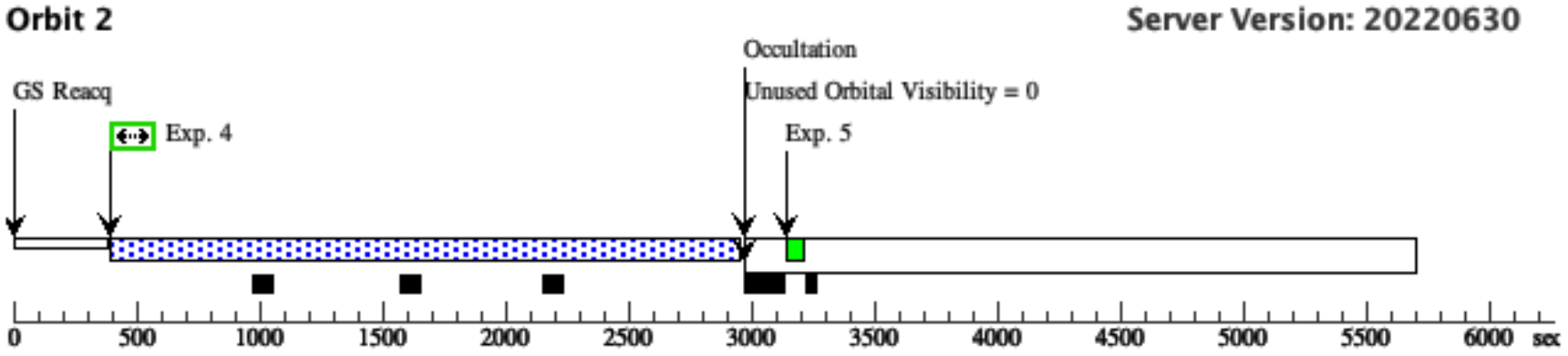
PGMW 3185 is the brightest object within a 5" radius based on Gaia photometry (Gaia mag=17.395). The only other target (Gaia DR3 4662153022326109056) has a Gaia mag=20.671. To account for any pointing error of up to 1", we investigated two additional nearby targets. Both are also fainter than PGMW 3185: 1) Gaia DR3 4662153022326111360; mag=20.991 and 2) Gaia DR3 4662153022325337088; mag=19.648. We are therefore confident that the correct star will be centered in the STIS aperture before slewing to N11-ELS-048.
Category=STAR
Description=[B6-B9.5 V-IV]
Extended=NO

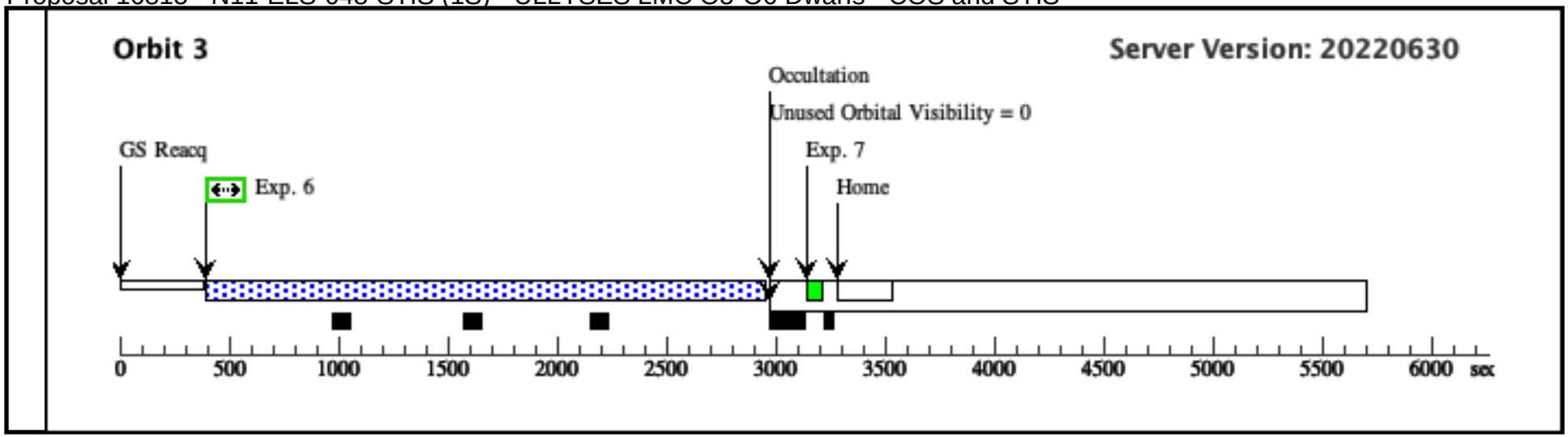
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1816422)	(3) N11-ELS-048-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs) *[==>]*	*[1]*
	Comments: Acquiring on an offset target as to not acquire a spoiler star. For ETC purposes, we used photometry from Parker et al. 1992 which says that PGMW 3185 has V=17.49 and E(B-V) = 0.17. This extinction implies an intrinsic color of (B-V)_0 = -0.21, which is consistent with either a) a B2-B3 dwarf or b) a B0-0.5 I supergiant. By adopting additional calibrations, they estimate Teff = 21.9 kK and log(L/Lsun) = 3.35, which puts it solidly in the B2-B3 V category. A supergiant that belongs to the cluster would be brighter; and the chances of a B supergiant being along the same line of sight but significantly more distant than the cluster is small. Therefore, we use the B3 V Kurucz model in the ETC, reddened by 0.17 and scaled to V=17.49.								
	We expect a S/N ~ 43 with these assumptions.								
2	E140M/1425 (STIS.sp.1816524)	(1) N11-ELS-048	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	WAVECAL=NO; BUFFER-TIME=588			2176 Secs (2176 Secs) *[==>]*	*[1]*
	Comments: An updated model was used where the extinction was changed from 0.100 to 0.080 to more closely fit the observed photometry and FUSE data for the ETC run for these observations.								
	We expect a S/N of ~19.5 at 1200A with the combined STIS E140M data.								
3	E140M/1425 WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	*[1]*
4	E140M/1425 (STIS.sp.1816524)	(1) N11-ELS-048	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	WAVECAL=NO; BUFFER-TIME=588			2548 Secs (2548 Secs) *[==>]*	*[2]*
	Comments: An updated model was used where the extinction was changed from 0.100 to 0.080 to more closely fit the observed photometry and FUSE data for the ETC run for these observations.								
	We expect a S/N of ~19.5 at 1200A with the combined STIS E140M data.								
5	E140M/1425 WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	*[2]*
6	E140M/1425 (STIS.sp.1816524)	(1) N11-ELS-048	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	WAVECAL=NO; BUFFER-TIME=588			2548 Secs (2548 Secs) *[==>]*	*[3]*
	Comments: An updated model was used where the extinction was changed from 0.100 to 0.080 to more closely fit the observed photometry and FUSE data for the ETC run for these observations.								
	We expect a S/N of ~19.5 at 1200A with the combined STIS E140M data.								
7	E140M/1425 WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	*[3]*

Orbit Structure



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Unused Orbital Visibility = 0
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Exp. 7
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3000
3500
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4500
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5500
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sec

Visit

Proposal 16815, N11-ELS-048-STIS (1T), implementation Fri Nov 11 17:00:41 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; GROUP 1T,1S WITHIN 14D

Comments: vstatus; 1T; N11-ELS-048; P/STIS approved for submission; P/RP 04/08/22 ; intrev: complete ; P/AF 02/08/22
vcheck; Enter targ name & Inst. & Resp. Sci.; N11-ELS-048 ; STIS ; RP
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ... Offset target selected.
vcheck; Possible ACQ or Sci spoilers?; Yes ... An offset target was selected to avoid two possible spoiler stars in the field less than 5" away.
vcheck; Field BOT clear?; Yes ... all stars in the field are fainter than V=10.13 of an O5V star using E140M with STIS.
vcheck; Visual BOT check for stars not in catalog?; Yes ...
There are two stars within 5" that were of concern with V=12.73 and V=14.49. These stars are classified by Parker et al. as O7 V and O3 III(f) respectively.*
These could not be cleared with COS, which is why we are using STIS E140M.
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; Yes ... A loose grouping of 2 weeks was placed on visits 1S and 1T to counter any variability in the target.
vcheck; Is visit ready for int. review?; Yes
Allocated STIS orbits = 2

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	N11-ELS-048 Alt Name1: ELS2006-N11-048 Alt Name2: PGMW-3204	RA: 04 56 58.7979 (74.2449912d) Dec: -66 24 40.84 (-66.41134d) Equinox: J2000	Proper Motion RA: 5.1033885299 mas/yr Proper Motion Dec: -1.4173454308 mas/yr Parallax: 0" Epoch of Position: 2016	V=14.02 SpT=O6.5 V((f)); E(B-V)=0.10; U=12.87; B=13.85; V=14.02; F1160=6.440e-13	Reference Frame: ICRS

Comments: N11-ELS-048 : [ELS2006] N11 048
Previous name : N11-048
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = O6.5 V((f))
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_41000_4.20_m7.00_Z0.50.fits, lmc-ob-i 41-42, Z=0.500 solar, Teff=41000, log_lum=5.13, log_g=4.20, log_mdot=-7.00) (extinction lmcavg=0.100), flux1160 +- 2.0A flux=6.4e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_41000_4.20_m7.00_Z0.50.fits, lmc-ob-i 41-42, Z=0.500 solar, Teff=41000, log_lum=5.13, log_g=4.20, log_mdot=-7.00) (extinction lmcavg=0.100), flux1160 +- 2.0A flux=6.4e-13 Flam)
Coordinate pedigree: Gaia DR3
Calculation performed 2021-10-25T00:57:19, v0.9
---
tstatus; N11-ELS-048; P/STIS approved for submission; S/ins not started; P/RP 04/08/22; S/xx DD/MM/YY
tcheck; APT/SIMBAD target names: ; Simbad name: PGMW-3204; GAIA DR3: 4662152953605873152
tcheck; Target info verification status?; Yes
tcheck; Coordinates & P.M. verified, epoch checked?; Yes ... updated to DR3
tcheck; Adopted SED compared to Observations?; Yes ... extinction updated from 0.100 to 0.080 & normalized to the FUSE flux at 1160A
Category=STAR
Description=[MAIN SEQUENCE O, OF]
Extended=NO

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	N11-ELS-048-OFFSET Alt Name1: PGMW-3185 Alt Name2: GAIA-DR3-4662153022325341056	RA: 04 56 56.5914 (74.2357975d) Dec: -66 24 52.18 (-66.41449d) Equinox: J2000	Proper Motion RA: 1.9233194204681907 mas/yr Proper Motion Dec: -0.16467809935040012 mas/yr Parallax: 0" Epoch of Position: 2016	V=17.49	Reference Frame: ICRS

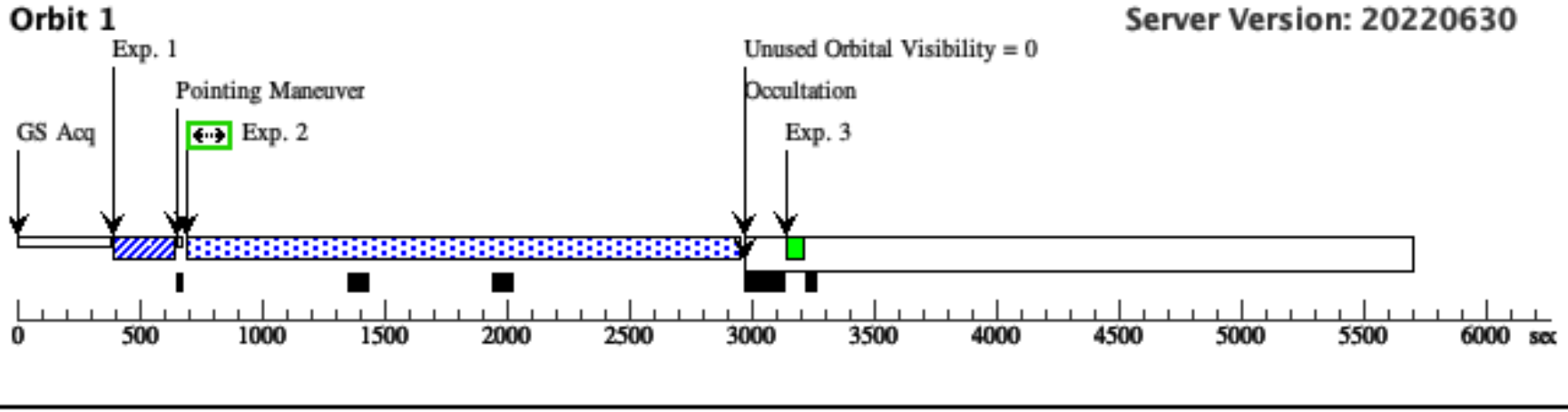
Comments: This target serves as an offset target for N11-ELS-048 and is located about 17.5" away from N11-ELS-048. An offset target is needed is due to two bright spoiler stars within the 5" checkbox for a STIS ACQ.

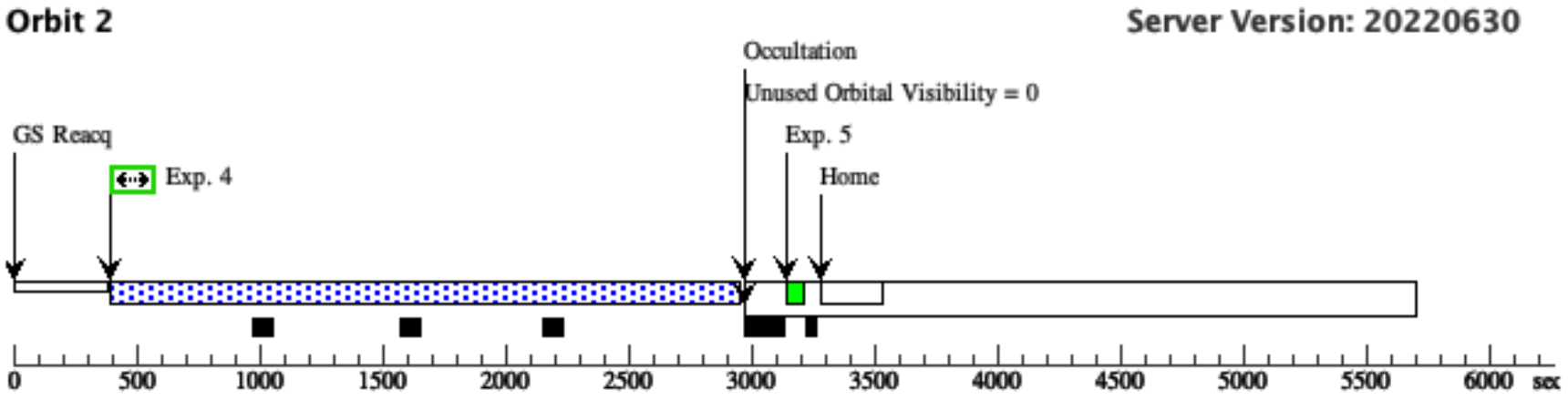
PGMW 3185 is the brightest object within a 5" radius based on Gaia photometry (Gaia mag=17.395). The only other target (Gaia DR3 4662153022326109056) has a Gaia mag=20.671. To account for any pointing error of up to 1", we investigated two additional nearby targets. Both are also fainter than PGMW 3185: 1) Gaia DR3 4662153022326111360; mag=20.991 and 2) Gaia DR3 4662153022325337088; mag=19.648. We are therefore confident that the correct star will be centered in the STIS aperture before slewing to N11-ELS-048.
Category=STAR
Description=[B6-B9.5 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	ACQ (STIS.ta.1816422)	(3) N11-ELS-048-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs) *[==>]*	 ***[1]***
	Comments: Acquiring on an offset target as to not acquire a spoiler star. For ETC purposes, we used photometry from Parker et al. 1992 which says that PGMW 3185 has V=17.49 and E(B-V) = 0.17. This extinction implies an intrinsic color of (B-V)_0 = -0.21, which is consistent with either a) a B2-B3 dwarf or b) a B0-0.5 I supergiant. By adopting additional calibrations, they estimate Teff = 21.9 kK and log(L/Lsun) = 3.35, which puts it solidly in the B2-B3 V category. A supergiant that belongs to the cluster would be brighter; and the chances of a B supergiant being along the same line of sight but significantly more distant than the cluster is small. Therefore, we use the B3 V Kurucz model in the ETC, reddened by 0.17 and scaled to V=17.49. *We expect a S/N ~ 43 with these assumptions.*								
2	E140M/1425 (STIS.sp.1816524)	(1) N11-ELS-048	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	WAVECAL=NO; BUFFER-TIME=588			2176 Secs (2176 Secs) *[==>]*	 ***[1]***
	Comments: An updated model was used where the extinction was changed from 0.100 to 0.080 to more closely fit the observed photometry and FUSE data for the ETC run for these observations. *We expect a S/N of ~19.5 at 1200A with the combined STIS E140M data.*								
3	E140M/1425 WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[1]***
4	E140M/1425 (STIS.sp.1816524)	(1) N11-ELS-048	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	WAVECAL=NO; BUFFER-TIME=588			2548 Secs (2548 Secs) *[==>]*	 ***[2]***
	Comments: An updated model was used where the extinction was changed from 0.100 to 0.080 to more closely fit the observed photometry and FUSE data for the ETC run for these observations. *We expect a S/N of ~19.5 at 1200A with the combined STIS E140M data.*								
5	E140M/1425 WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				*[==>]*	***[2]***

Orbit Structure





Visit

Proposal 16815, VFTS-406-COS (2C), scheduling Fri Nov 11 17:00:41 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%; GROUP 2C,2D WITHIN 14D

Comments: vstatus; 2C; VFTS-406; P/COS approved for submission; P/RP 04/08/22 ; intrev: complete ; P/AF 02/08/22
vcheck; Enter targ name & Inst. & Resp. Sci.; VFTS-406 ; COS ; RP
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ... ACQ/IMAGE with PSA MIRRORB
vcheck; Possible ACQ or Sci spoilers?; No
This is a very crowded field, but the closest star to the target is of much higher magnitude (fainter).
vcheck; Field BOT clear?; Yes
Clearing for FUV spectroscopy:
Within a 22" radius, there are 3 additional stars in the field that are below a predicted Vmag of 14.7 for FUV spectroscopy with the PSA (assuming O5V).
These all fall outside of the PSA 7" radius area of concern, so only are of concern for the BOA which clears with a Vmag of 9.4.
Additional ETC runs were completed still with the spectral types from Walborn et al. 2014 and photometry from Parker et al. 1993:
1) VFTS 389 (Gaia DR3 4657686325109056256); O9.5 IV; V=14.169; ~13" away from PSA
PSA & BOA clear: G130M: COS.sp.1817215; G160M: COS.sp.1817216;
2) VFTS 386 (Gaia DR3 4657686325081277824); O9 IV(n); V=14.753; ~13" away from PSA
PSA & BOA clear: G130M: COS.sp.1817218; G160M: COS.sp.1817217
3) VFTS 398 (Gaia DR3 4657686325102027648); O5.5 V((n))((f))z; V=14.400; ~17.5" away from PSA
PSA & BOA clear: G130M: COS.sp.1818596; G160M: COS.sp.1818597
Clearing for NUV TA:
With the PSA/MIRRORB configuration, only stars with magnitudes of 16.3 and brighter are of concern for the PSA and 10.7 and brighter for the BOA.
There are 8 stars that are brighter than V=16.3 (if assumed as an O5 V star). The closest of these is ~11" away, so we can safely clear these for the BOA only, for which all are fainter than V=10.7.
The photometry and spectral types of the stars of concern are listed below where available from Walborn et al. 2014, Evans et al. 2015, and Parker et al. 1993:
1) VFTS 389 (Gaia DR2 4657686320770729088); O9.5 IV; V=14.169; ~13" away from PSA
2) VFTS 398 (Gaia DR2 4657686325102027648); O5.5 V((n))((f))z; V=14.400; ~17.5" away from PSA
3) VFTS 386 (Gaia DR2 4657686325081277824); O9 IV(n); V=14.753; ~13" away from PSA
4) VFTS 371 (Gaia DR2 4657686325102015360); O9.5 V(n); ~17" away from PSA
5) Gaia DR2 4657686325102017792; V=16.12 if O5V assumed; ~13" away from PSA
6) VFTS 434 (Gaia DR2 4657686320770736384); B1.5; V=16.13; ~18" away from PSA
7) Gaia DR2 4657686320819482112; V=16.29 if O5V assumed; ~14" away from PSA
8) VFTS 421 (Gaia DR2 4657686325102033536); B2:V; 16.42; ~11" away from PSA

While all of these safely clear the BOA based soley on the magnitude, #2 was run through the ETC with the BOA/MIRRORB for clearing as an example O5V V=14.4 star at: COS.ta.1818603
vcheck; Visual BOT check for stars not in catalog?; Yes ... see above
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; Yes ... A loose grouping of 2 weeks was placed on visits 2C and 2D to counter any variability in the target.
vcheck; Is visit ready for int. review?; Yes
Allocated COS orbits = 2

Diagnostics

(VFTS-406-COS (2C)) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions when observing at a given COS cenwave. See the COS Instrument Handbook for exceptions that may apply to observations with G130M/1291 or G160M.

Fixed Targets

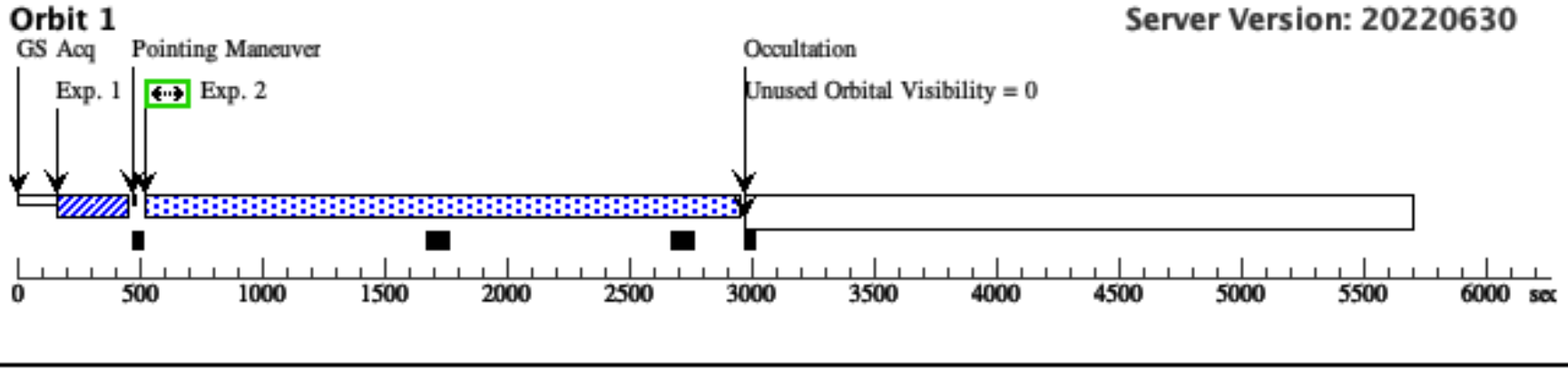
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	VFTS-406	RA: 05 38 33.9806 (84.6415858d)	Proper Motion RA: 1.7907662433 mas/yr	V=14.3	Reference Frame: ICRS
	Alt Name1: P93-0370	Dec: -69 04 21.22 (-69.07256d)	Proper Motion Dec: 0.7367198542 mas/yr	SpT=O6 Vnn; E(B-V)=0.29; U=13.67; B=14.31; V=14.30; F1700=5.100e-14; F2200=2.700e-14	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2016		

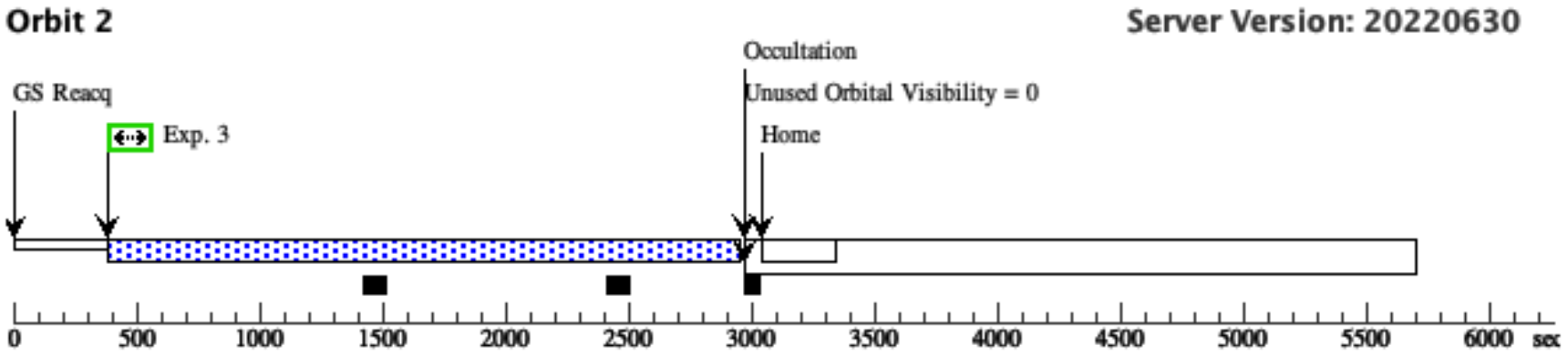
Comments: VFTS-406 : P93-0370, VFTS 406
Previous name : P93-0370
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = O6 Vnn
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +-2.0A flux=5.1e-14 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +-2.0A flux=5.1e-14 Flam)
Coordinate pedigree: Gaia DR3
Calculation performed 2021-10-25T00:57:28, v0.9
---
tstatus; VFTS-406; P/COS approved for submission; S/ins not started; P/RP 04/08/22; S/xx DD/MM/YY
tcheck; APT/SIMBAD target names: ; Cl NGC 2070 MEL 55 in Simbad*
tcheck; Target info verification status?; Yes
tcheck; Coordinates & P.M. verified, epoch checked?; Yes ... updated to DR3
tcheck; Adopted SED compared to Observations?; Yes ... extinction updated from 0.29 to 0.37 & flux normalization changed to +/- 5A instead of 2A
Category=STAR
Description=[MAIN SEQUENCE O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/Image (COS.ta.1809595)	(2) VFTS-406	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				1.5 Secs (1.5 Secs) *[==>]*	 ***[1]***
	Comments: Expected S/N of ~23 with updated model.								
2	G130M/1291-3 (COS.sp.1809593)	(2) VFTS-406	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=995; FP-POS=3			2260 Secs (2260 Secs) *[==>]*	 ***[1]***
	Comments: rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +- 2.0A flux=5.1e-14 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: O6 Vnn* *SED = VFTS-406_COS_G130M_c1291_sed.fits* *For exptime=3852.6 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 1076.5 cts/s/segment* *brightest pixel: 0.019 cts/s/pix at 1243.5 A* *Calculation performed 2021-10-25T00:57:30, v0.9* --- *Compared to above, an updated model was used where the extinction was updated from 0.29 to 0.37 and the flux normalization box was increased from 2A to 5A to more closely fit the observed photometry and STIS data for the ETC run for these observations.* *Expected S/N of ~27 with two FP-POS per resel at 1150A.*								
3	G130M/1291-4 (COS.sp.1809593)	(2) VFTS-406	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=995; FP-POS=4			2514 Secs (2514 Secs) *[==>]*	 ***[2]***
	Comments: rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +- 2.0A flux=5.1e-14 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: O6 Vnn* *SED = VFTS-406_COS_G130M_c1291_sed.fits* *For exptime=3852.6 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 1076.5 cts/s/segment* *brightest pixel: 0.019 cts/s/pix at 1243.5 A* *Calculation performed 2021-10-25T00:57:30, v0.9* --- *Compared to above, an updated model was used where the extinction was updated from 0.29 to 0.37 and the flux normalization box was increased from 2A to 5A to more closely fit the observed photometry and STIS data for the ETC run for these observations.* *Expected S/N of ~27 with two FP-POS per resel at 1150A.*								

Orbit Structure





Visit

Proposal 16815, VFTS-406-COS (2D), scheduling Fri Nov 11 17:00:41 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%; GROUP 2D,2C WITHIN 14D

Comments: vstatus; 2D; VFTS-406; P/COS approved for submission; P/RP 04/08/22 ; intrev: complete ; P/AF 02/08/22
vcheck; Enter targ name & Inst. & Resp. Sci.; VFTS-406 ; COS ; RP
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ... ACQ/IMAGE with PSA MIRRORB
vcheck; Possible ACQ or Sci spoilers?; No
This is a very crowded field, but the closest star to the target is of much higher magnitude (fainter).
vcheck; Field BOT clear?; Yes
Clearing for FUV spectroscopy:
Within a 22" radius, there are 3 additional stars in the field that are below a predicted Vmag of 14.7 for FUV spectroscopy with the PSA (assuming O5V).
These all fall outside of the PSA 7" radius area of concern, so only are of concern for the BOA which clears with a Vmag of 9.4.
Additional ETC runs were completed still with the spectral types from Walborn et al. 2014 and photometry from Parker et al. 1993:
1) VFTS 389 (Gaia DR3 4657686325109056256); O9.5 IV; V=14.169; ~13" away from PSA
PSA & BOA clear: G130M: COS.sp.1817215; G160M: COS.sp.1817216;
2) VFTS 386 (Gaia DR3 4657686325081277824); O9 IV(n); V=14.753; ~13" away from PSA
PSA & BOA clear: G130M: COS.sp.1817218; G160M: COS.sp.1817217
3) VFTS 398 (Gaia DR3 4657686325102027648); O5.5 V((n))((f))z; V=14.400; ~17.5" away from PSA
PSA & BOA clear: G130M: COS.sp.1818596; G160M: COS.sp.1818597
Clearing for NUV TA:
With the PSA/MIRRORB configuration, only stars with magnitudes of 16.3 and brighter are of concern for the PSA and 10.7 and brighter for the BOA.
There are 8 stars that are brighter than V=16.3 (if assumed as an O5 V star). The closest of these is ~11" away, so we can safely clear these for the BOA only, for which all are fainter than V=10.7.
The photometry and spectral types of the stars of concern are listed below where available from Walborn et al. 2014, Evans et al. 2015, and Parker et al. 1993:
1) VFTS 389 (Gaia DR2 4657686320770729088); O9.5 IV; V=14.169; ~13" away from PSA
2) VFTS 398 (Gaia DR2 4657686325102027648); O5.5 V((n))((f))z; V=14.400; ~17.5" away from PSA
3) VFTS 386 (Gaia DR2 4657686325081277824); O9 IV(n); V=14.753; ~13" away from PSA
4) VFTS 371 (Gaia DR2 4657686325102015360); O9.5 V(n); ~17" away from PSA
5) Gaia DR2 4657686325102017792; V=16.12 if O5V assumed; ~13" away from PSA
6) VFTS 434 (Gaia DR2 4657686320770736384); B1.5; V=16.13; ~18" away from PSA
7) Gaia DR2 4657686320819482112; V=16.29 if O5V assumed; ~14" away from PSA
8) VFTS 421 (Gaia DR2 4657686325102033536); B2:V; 16.42; ~11" away from PSA

While all of these safely clear the BOA based soley on the magnitude, #2 was run through the ETC with the BOA/MIRRORB for clearing as an example O5V V=14.4 star at: COS.ta.1818603
vcheck; Visual BOT check for stars not in catalog?; Yes ... see above
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; Yes ... A loose grouping of 2 weeks was placed on visits 2C and 2D to counter any variability in the target.
vcheck; Is visit ready for int. review?; Yes
Allocated COS orbits = 2

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	VFTS-406 Alt Name1: P93-0370	RA: 05 38 33.9806 (84.6415858d) Dec: -69 04 21.22 (-69.07256d) Equinox: J2000	Proper Motion RA: 1.7907662433 mas/yr Proper Motion Dec: 0.7367198542 mas/yr Parallax: 0" Epoch of Position: 2016	V=14.3 SpT=O6 Vnn; E(B-V)=0.29; U=13.67; B=14.31; V=14.30; F1700=5.100e-14; F2200=2.700e-14	Reference Frame: ICRS

Comments: VFTS-406 : P93-0370, VFTS 406
Previous name : P93-0370
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = O6 Vnn
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +- 2.0A flux=5.1e-14 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +- 2.0A flux=5.1e-14 Flam)
Coordinate pedigree: Gaia DR3
Calculation performed 2021-10-25T00:57:28, v0.9
---
tstatus; VFTS-406; P/COS approved for submission; S/ins not started; P/RP 04/08/22; S/xx DD/MM/YY
tcheck; APT/SIMBAD target names: ; Cl NGC 2070 MEL 55 in Simbad*
tcheck; Target info verification status?; Yes
tcheck; Coordinates & P.M. verified, epoch checked?; Yes ... updated to DR3
tcheck; Adopted SED compared to Observations?; Yes ... extinction updated from 0.29 to 0.37 & flux normalization changed to +/- 5A instead of 2A
Category=STAR
Description=[MAIN SEQUENCE O]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/Image (COS.ta.1809595)	(2) VFTS-406	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				1.5 Secs (1.5 Secs) *[==>]*	 ***[1]***
Comments: Expected S/N of ~23 with updated model.									
2	G160M/1611 (COS.sp.1816528)	(2) VFTS-406	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=1700; FP-POS=ALL			1175 Secs (4410 Secs) *[==>1029 Secs (Split 1)]* *[==>1029 Secs (Split 2)]* *[==>1176 Secs (Split 3)]* *[==>1176 Secs (Split 4)]*	 ***[1]*** ***[2]***

Comments: rn(PoWR-OB-new(PoWR_38000_4.00_m7.00_Z0.50.fits, lmc-ob-i 38-40, Z=0.500 solar, Teff=38000, log_lum=5.16, log_g=4.00, log_mdot=-7.00) (extinction lmc30dor=0.290), flux1700 +- 2.0A flux=5.1e-14 Flam); cos,fuv,g160m,c1611,psa,mjd#59670; fp-pos=None, segment=None)
From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
Spectral type: O6 Vnn
SED = VFTS-406_COS_G160M_c1611_sed.fits
For exptime=4270.3 s, spectral region:
1590.0 +- 0.5 A achieves SNR=30.0/resel
global countrate (brightest segment): 788.8 cts/s/segment
brightest pixel: 0.013 cts/s/pix at 1551.5 A
Calculation performed 2021-10-25T00:57:32, v0.9

Compared to above, an updated model was used where the extinction was updated from 0.29 to 0.37 and the flux normalization box was increased from 2A to 5A to more closely fit the observed photometry and STIS data for the ETC run for these observations.

Expected S/N of ~28 with the four combined FP-POS per resel at 1590A.

Orbit Structure