16826 - ULLYSES LMC B2-B3 Supergiants - 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?*
1C	(1) SK-67D78	COS/FUV COS/NUV	1	17-Mar-2022 17:00:21.0	yes
1S	(1) SK-67D78 WAVE	STIS/CCD STIS/NUV-MAMA	1	17-Mar-2022 17:00:22.0	yes
2C	(2) SK-69D52	COS/FUV COS/NUV	1	17-Mar-2022 17:00:23.0	yes
2S	(2) SK-69D52 WAVE	STIS/CCD STIS/NUV-MAMA	1	17-Mar-2022 17:00:24.0	yes
3C	(3) SK-70D50	COS/FUV COS/NUV	1	17-Mar-2022 17:00:25.0	yes
3S	(3) SK-70D50 WAVE	STIS/CCD STIS/NUV-MAMA	1	17-Mar-2022 17:00:26.0	yes

6 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 16826, SK-67D78-COS (1C) Thu Mar 17 21:00:26 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: vstatus; 1C; SK-67D78; P/COS ready for internal review; P/RS 04/02/22 ; intrev: approved for submission ; P/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-67D78 ; COS ; RS
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No ...
count rate limit for irregularly variable sources violated
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ...
NUV Imaging ACQ with MIRROR B and BOA since local count rate limit violated for MIRROR A cos.ta.1688797
vcheck; Possible ACQ or Sci spoilers?; No
vcheck; Field BOT clear?; Yes ...
BOT warning because of O5V assumption
vcheck; Visual BOT check for stars not in catalog?; Yes ...
there are two unknown stars reported by GSCII and the Zaritsky catalog shows these have (V,B,U) = (15.36, 16.91, 18.36) and (19.5, 20.4, 20.8) respectively ...
another unreported star 7" to the south is also in the Zaritsky catalog with (V,B,U) = (16.61, 17.57, 17.98), so all three are spectral type G or K ...
for IMAGING with MIRRROR B and PSA B3V and later stars are safe (COS.ta.1728850) so these do not pose a problem
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes ...
the buffer time for the c1291 exposures was set to 15 sec lower than the Buffer Fill Time in the ETC rather than taking the 2/3 factor which was necessary for the most efficient use of the orbit
vcheck; Verify visit grouping correct; N/A
vcheck; Is visit ready for int. review?; Yes
Allocated COS orbits = 1

Fixed Targets

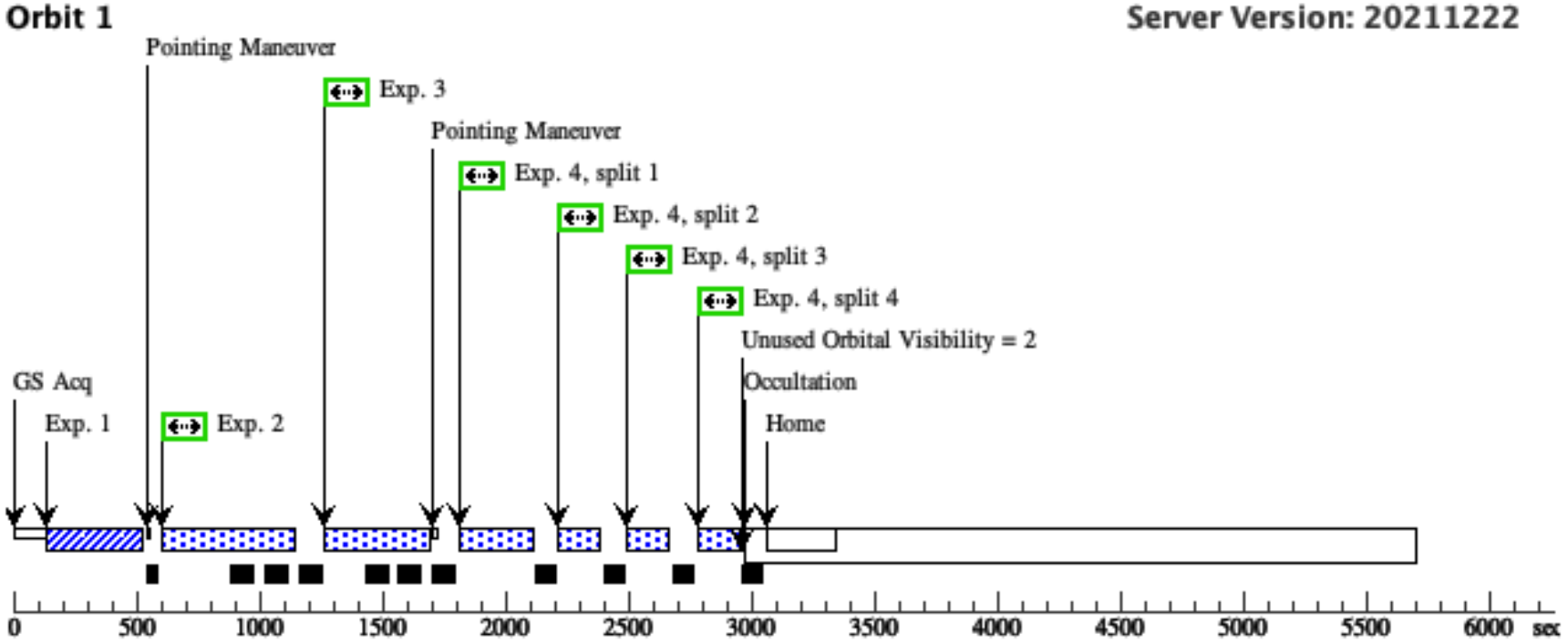
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SK-67D78	RA: 05 20 19.0830 (80.0795125d)	Proper Motion RA: 1.671 mas/yr	V=11.26	Reference Frame: ICRS
	Alt Name1: HD269371	Dec: -67 18 5.68 (-67.30158d)	Proper Motion Dec: 0.274 mas/yr	SpT=B3 Ia; E(B-V)=0.09; U=10.49; B=11.22; V=11.26; F1160=4.520e-13; F1360=7.280e-13; F1700=5.840e-13; F2200=4.300e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-67D78 : SK -67 78
Previous name : SK-67 78
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B3 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.3e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=5.8e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.3e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:40, v0.9
---
tstatus; SK-67D78; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-67D78 'SK -67 78'
tcheck; Target info verification status?; Ok
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
The PoWR SEDs for c1291 and c1611 are about the same and match the IUE and FUSE data
Category=STAR
Description=[B3-B5 III-I]
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.1689018)	(1) SK-67D78	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				40.0 Secs (40 Secs) *[==>]*	***[1]***
	Comments: there are two unknown stars reported by GSCII and the Zaritsky catalog shows these have (V,B,U) = (15.36, 16.91, 18.36) and (19.5, 20.4, 20.8) respectively ... another unreported star 7" to the south is also in the Zaritsky catalog with (V,B,U) = (16.61, 17.57, 17.98), so all three are spectral type G or K ... for IMAGING with MIRRROR B and PSA B3V and later stars are safe (COS.ta.1728850) so these do not pose a problem								
2	G130M/1291-3 (COS.sp.1688794)	(1) SK-67D78	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=132; FP-POS=3			374 Secs (374 Secs) *[==>]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.3e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv Spectral type: B3 Ia SED = SK-67D78_COS_G130M_c1291_sed.fits For exptime=624.4 s, spectral region: 1150.0 +- 0.5 A achieves SNR=30.0/resel global countrate (brightest segment): 8625.8 cts/s/segment brightest pixel: 0.188 cts/s/pix at 1274.5 A Calculation performed 2021-10-25T01:01:42, v0.9								
3	G130M/1291-4 (COS.sp.1688794)	(1) SK-67D78	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=132; FP-POS=4			374 Secs (374 Secs) *[==>]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.3e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv Spectral type: B3 Ia SED = SK-67D78_COS_G130M_c1291_sed.fits For exptime=624.4 s, spectral region: 1150.0 +- 0.5 A achieves SNR=30.0/resel global countrate (brightest segment): 8625.8 cts/s/segment brightest pixel: 0.188 cts/s/pix at 1274.5 A Calculation performed 2021-10-25T01:01:42, v0.9								
4	G160M/1611 (COS.sp.1688795)	(1) SK-67D78	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=155; FP-POS=ALL			120.0 Secs (480 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=5.8e-13 Flam); cos,fuv,g160m,c1611,psa,mjd#59670; fp-pos=None, segment=None) From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv Spectral type: B3 Ia SED = SK-67D78_COS_G160M_c1611_sed.fits For exptime=455.9 s, spectral region: 1590.0 +- 0.5 A achieves SNR=30.0/resel global countrate (brightest segment): 7760.7 cts/s/segment brightest pixel: 0.145 cts/s/pix at 1437.0 A Calculation performed 2021-10-25T01:01:44, v0.9								

Orbit Structure



Visit

Proposal 16826, SK-67D78-STIS (1S) Thu Mar 17 21:00:27 GMT 2022

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%

Comments: vstatus; 1S; SK-67D78; S/STIS ready for internal review; S/DW 08/02/22 ; intrev: approved for submission ; S/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-67D78 ; STIS ; DW
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 -- DSS, 2MASS
vcheck; Selected ACQ strategy?; F28x50LP, 0.2s should yield S/N~164
vcheck; Possible ACQ or Sci spoilers?; no -- no other objects within 5" in Gaia EDR3
vcheck; Field BOT clear?; yes -- Gaia EDR3 has one G=16.1 red star at 6.7", one G=14.9 red star at 18.0", all others within 20" have G>17
vcheck; Visual BOT check for stars not in catalog?; yes
vcheck; Orbit packing finalized?; yes
vcheck; Buffer times optimized?; yes -- set to minimum of values for SED, IUE
vcheck; Verify visit grouping correct; n/a
vcheck; Is visit ready for int. review?; yes
Allocated STIS orbits = 1

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SK-67D78	RA: 05 20 19.0830 (80.0795125d)	Proper Motion RA: 1.671 mas/yr	V=11.26	Reference Frame: ICRS
	Alt Name1: HD269371	Dec: -67 18 5.68 (-67.30158d)	Proper Motion Dec: 0.274 mas/yr	SpT=B3 Ia; E(B-V)=0.09; U=10.49; B=11.22; V=11.26; F1160=4.520e-13; F1360=7.280e-13; F1700=5.840e-13; F2200=4.300e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-67D78 : SK -67 78
Previous name : SK-67 78
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B3 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.3e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=5.8e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.3e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:40, v0.9

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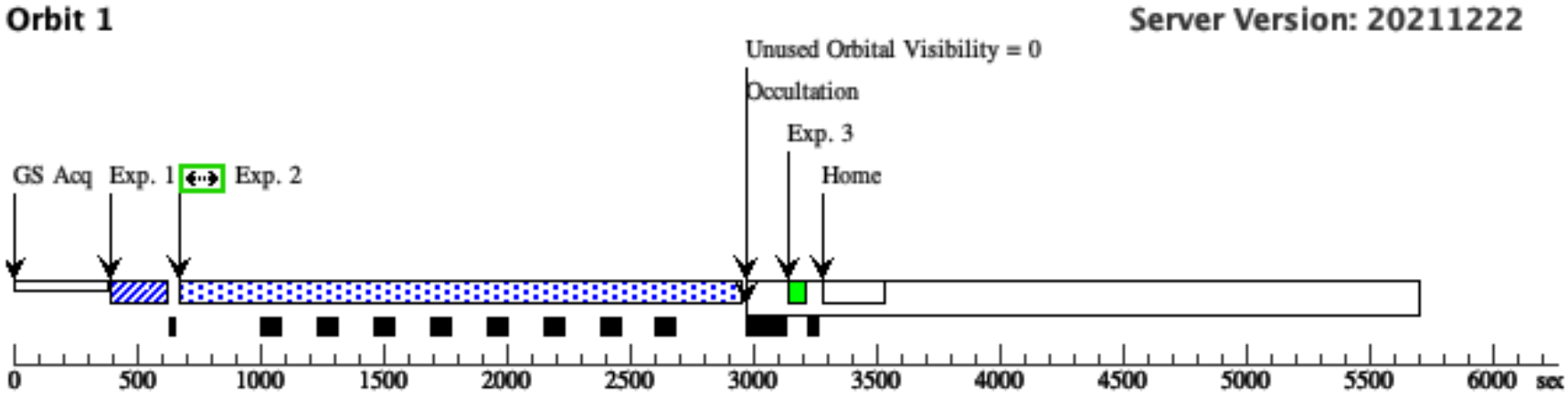
tstatus; SK-67D78; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-67D78 'SK -67 78'
tcheck; Target info verification status?; Ok
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
The PoWR SEDs for c1291 and c1611 are about the same and match the IUE and FUSE data
Category=STAR
Description=[B3-B5 III-I]
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 (1685396)	(1) SK-67D78	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
	Comments: predict S/N~164 in 0.2s (saturation in 2.2s) for Castelli-Kurucz B0 I, EBV=0.1, V=11.27								
2	E230M/1978 (1685400)	(1) SK-67D78	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 1978 A	WAVECAL=NO; BUFFER-TIME=229			2166 Secs (2166 Secs) *[==>]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.3e-13 Flam); stis,nuvmama,e230m,c1978,0.2x0.2,mjd#59670 *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B3 Ia* *SED = SK-67D78_STIS_E230M_c1978_sed.fits* *For exptime=2137.9 s, spectral region:* *1800.0 +- 0.5 A achieves SNR=20.0/resel* *global countrate (brightest segment): 6913.4 cts/s/segment* *brightest pixel: 0.187 cts/s/pix at 2317.5 A* *Calculation performed 2021-10-25T01:01:49, v0.9* *for t_exp=2166s* *default SED: brightest pix 0.187 cts/s (2317.5A), entire detector 6.9k cts/s, buf time=290s, S/N~22 at 1800A (1685399)* *IUE spectrum: brightest pix 0.188 cts/s (2320.5A), entire detector 7.0k cts/s, but fime=286s, S/N~21 at 1800A (1685400)* *buffer time set to 0.8*286s=229s*								
3	E230M/1978 WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 1978 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16826, SK-69D52-COS (2C) Thu Mar 17 21:00:27 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: vstatus; 2C; SK-69D52; P/COS ready for internal review; P/RS 04/02/22 ; intrev: approved for submission ; P/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-69D52 ; COS ; RS
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No ...
count rate limit for irregularly variable sources violated
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ...
NUV Imaging ACQ with MIRROR B and BOA since local count rate limit violated for MIRROR A cos.ta.1688905
vcheck; Possible ACQ or Sci spoilers?; No
vcheck; Field BOT clear?; Yes ...
BOT warning because of O5V assumption
vcheck; Visual BOT check for stars not in catalog?; Ok ...
Zaritsky catalog shows that nearest bright stars are just beyond the larger macroaperture
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; N/A
vcheck; Is visit ready for int. review?; Yes
Allocated COS orbits = 1

Fixed Targets

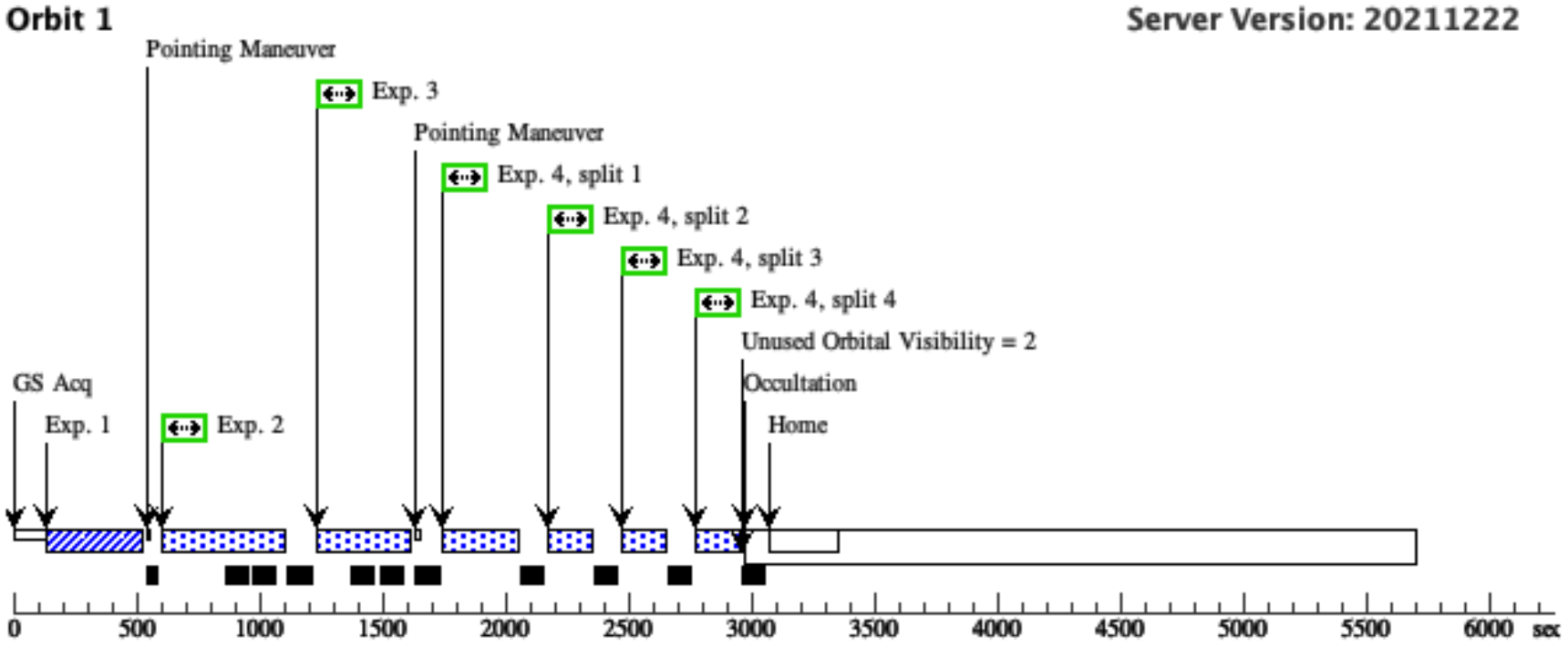
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SK-69D52	RA: 04 57 48.9013 (74.4537554d)	Proper Motion RA: 2.153 mas/yr	V=11.5	Reference Frame: ICRS
	Alt Name1: HD268867	Dec: -69 52 22.50 (-69.87292d)	Proper Motion Dec: -0.078 mas/yr	SpT=B2 Ia; E(B-V)=0.22; U=10.73; B=11.55; V=11.50; F1160=5.500e-13; F1360=7.000e-13; F1700=6.000e-13; F2200=4.000e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-69D52 : SK -69 52
Previous name : SK-69 52
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B2 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1360 +- 2.0A flux=7e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1700 +- 2.0A flux=6e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux2200 +- 2.0A flux=4e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:21, v0.9
---
tstatus; SK-69D52; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-69D52 'SK -69 52'
tcheck; Target info verification status?; Okay
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
this is the PoWR model recalculated by DW with E(B-V)=0.11 sk69d52_new_sed.fits
Category=STAR
Description=[B0-B2 III-I]
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.1688907)	(2) SK-69D52	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				40.0 Secs (40 Secs) *[==>]*	*[1]*
2	G130M/1291-3 (COS.sp.1688903)	(2) SK-69D52	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=11 1.0; FP-POS=3			332 Secs (332 Secs) *[==>]*	*[1]*
	Comments: rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1360 +- 2.0A flux=7e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B2 Ia* *SED = SK-69D52_COS_G130M_c1291_sed.fits* *For exptime=649.5 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 8084.9 cts/s/segment* *brightest pixel: 0.157 cts/s/pix at 1275.5 A* *Calculation performed 2021-10-25T01:01:24, v0.9*								
3	G130M/1291-4 (COS.sp.1688903)	(2) SK-69D52	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=11 1.0; FP-POS=4			332 Secs (332 Secs) *[==>]*	*[1]*
	Comments: rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1360 +- 2.0A flux=7e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B2 Ia* *SED = SK-69D52_COS_G130M_c1291_sed.fits* *For exptime=649.5 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 8084.9 cts/s/segment* *brightest pixel: 0.157 cts/s/pix at 1275.5 A* *Calculation performed 2021-10-25T01:01:24, v0.9*								
4	G160M/1611 (COS.sp.1688904)	(2) SK-69D52	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=153.0; FP-POS=ALL			129.0 Secs (516 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
	Comments: rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1700 +- 2.0A flux=6e-13 Flam); cos,fuv,g160m,c1611,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B2 Ia* *SED = SK-69D52_COS_G160M_c1611_sed.fits* *For exptime=500.7 s, spectral region:* *1590.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 7394.8 cts/s/segment* *brightest pixel: 0.134 cts/s/pix at 1437.0 A* *Calculation performed 2021-10-25T01:01:25, v0.9*								

Orbit Structure



Visit

Proposal 16826, SK-69D52-STIS (2S) Thu Mar 17 21:00:27 GMT 2022

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%

Comments: vstatus; 2S; SK-69D52; S/STIS ready for internal review; S/DW 08/02/22 ; intrev: approved for submission ; S/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-69D52 ; STIS ; DW
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 -- DSS, 2MASS, GALEX
vcheck; Selected ACQ strategy?; F28x50LP, 0.2s should yield S/N~145
vcheck; Possible ACQ or Sci spoilers?; no
vcheck; Field BOT clear?; yes -- Gaia EDR3 indicates all other objects within 20" have G>17
vcheck; Visual BOT check for stars not in catalog?; yes
vcheck; Orbit packing finalized?; yes
vcheck; Buffer times optimized?; yes -- using minimum of values for SEDs, IUE
vcheck; Verify visit grouping correct; n/a
vcheck; Is visit ready for int. review?; yes
Allocated STIS orbits = 1

Fixed Targets

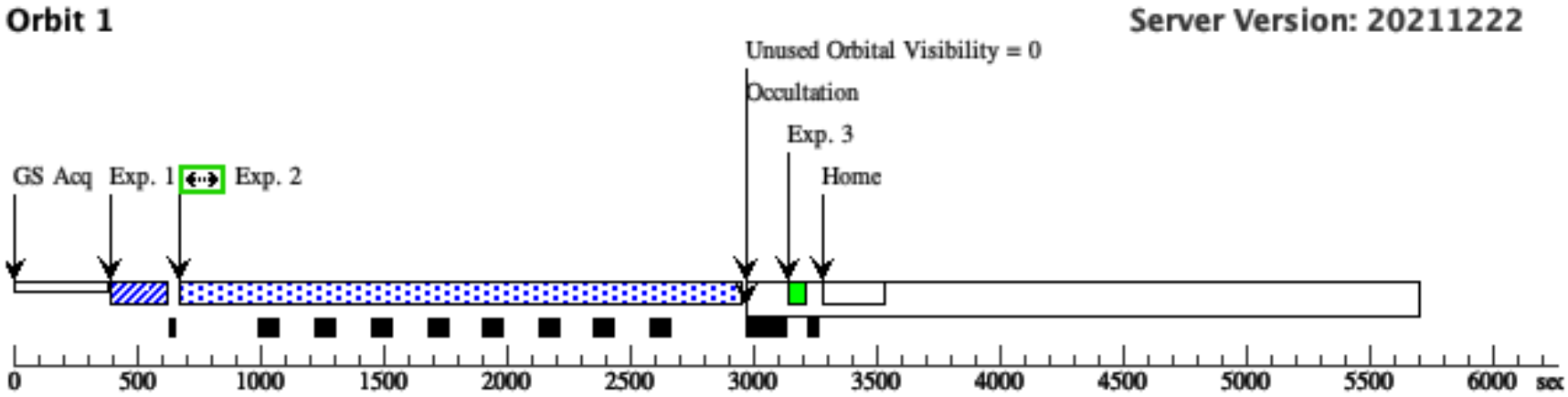
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SK-69D52	RA: 04 57 48.9013 (74.4537554d)	Proper Motion RA: 2.153 mas/yr	V=11.5	Reference Frame: ICRS
	Alt Name1: HD268867	Dec: -69 52 22.50 (-69.87292d)	Proper Motion Dec: -0.078 mas/yr	SpT=B2 Ia; E(B-V)=0.22; U=10.73; B=11.55; V=11.50; F1160=5.500e-13; F1360=7.000e-13; F1700=6.000e-13; F2200=4.000e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-69D52 : SK -69 52
Previous name : SK-69 52
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B2 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1360 +- 2.0A flux=7e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux1700 +- 2.0A flux=6e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux2200 +- 2.0A flux=4e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:21, v0.9
---
tstatus; SK-69D52; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-69D52 'SK -69 52'
tcheck; Target info verification status?; Okay
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
this is the PoWR model recalculated by DW with E(B-V)=0.11 sk69d52_new_sed.fits
Category=STAR
Description=[B0-B2 III-I]
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 (1685397)	(2) SK-69D52	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
Comments: predict S/N~145 in 0.2s (saturation in 2.7s) for Castelli-Kurucz B0 I, EBV=0.1, V=11.52									
2	E230M/1978 (1685403)	(2) SK-69D52	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 1978 A	WAVECAL=NO; BUFFER-TIME=226.0			2166 Secs (2166 Secs) *[==>]*	***[1]***
Comments: rn(PoWR-OB-new(PoWR_18000_2.20_m7.00_Z0.50.fits, lmc-ob-i 18-22, Z=0.500 solar, Teff=18000, log_lum=5.87, log_g=2.20, log_mdot=-7.00) (extinction lmcavg=0.220), flux2200 +- 2.0A flux=4e-13 Flam); stis,nuvmama,e230m,c1978,0.2x0.2,mjd#59670 *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B2 Ia* *SED = SK-69D52_STIS_E230M_c1978_sed.fits* *For exptime=1765.5 s, spectral region:* *1800.0 +- 0.5 A achieves SNR=20.0/resel* *global countrate (brightest segment): 7073.8 cts/s/segment* *brightest pixel: 0.197 cts/s/pix at 2321.0 A* *Calculation performed 2021-10-25T01:01:30, v0.9* *new SED has EBV=0.11 (vs 0.22 for default SED)* *for t_exp=2166s* *default SED: brightest pix 0.197 cts/s (2321.0A), entire detector 7.1k cts/s, buf time=283s, S/N~25 at 1800A (1685401)* *new SED: brightest pix 0.178 cts/s (2317.5A), entire detector 6.7k cts/s, buf time=297s, S/N~23 at 1800A (1685402)* *IUE spectrum: brightest pix 0.273 cts/s (2293.2A), entire detector 6.9k cts/s, but fime=288s, S/N~21 at 1800A (1685403)* *buffer time set to 0.8*283s=226s*									
3	E230M/1978 WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 1978 A				*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16826, SK-70D50-COS (3C) Thu Mar 17 21:00:27 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: vstatus; 3C; SK-70D50; P/COS ready for internal review; P/RS 04/02/22 ; intrev: approved for submission ; P/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-70D50 ; COS ; RS
vcheck; ETC numbers entered in APT?; Yes
vcheck; Any screening violations?; No ...
count rate limit for irregularly variable sources violated
vcheck; S/N ETC calcs done & documented?; Yes
vcheck; Field images checked & saved?; Yes
vcheck; Selected ACQ strategy?; Yes ...
NUV Imaging ACQ with MIRROR B and BOA since local count rate limit violated for MIRROR A cos.ta.1689004
vcheck; Possible ACQ or Sci spoilers?; No
vcheck; Field BOT clear?; Yes ...
Galex and GSCII report global B and global B and A count rate violation due to O5V star assumption
vcheck; Visual BOT check for stars not in catalog?; Yes ...
one unknown field star is reported for the ACQ which the Zaritsky catalog shows has (V, B, U) = (16.82, 18.10, 19.60) which indicates it is spectral type G or K ...
for IMAGING with MIRRROR B and PSA B3V and later stars are safe (COS.ta.1728850) so it does not pose a problem
vcheck; Orbit packing finalized?; Yes
vcheck; Buffer times optimized?; Yes
vcheck; Verify visit grouping correct; N/A
vcheck; Is visit ready for int. review?; Yes
Allocated COS orbits = 1

Fixed Targets

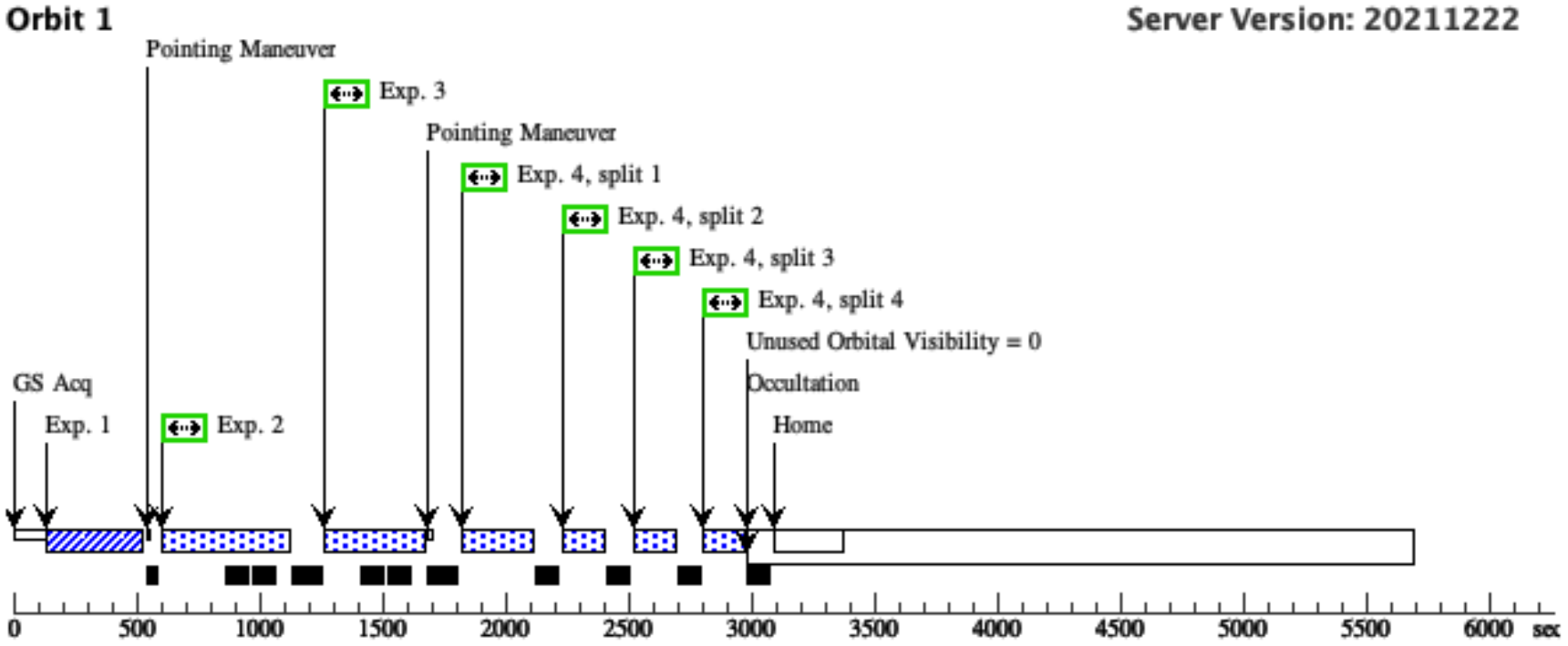
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SK-70D50	RA: 05 03 45.8861 (75.9411921d)	Proper Motion RA: 2.083 mas/yr	V=11.2	Reference Frame: ICRS
	Alt Name1: HD269009	Dec: -70 11 57.49 (-70.19930d)	Proper Motion Dec: 0.022 mas/yr	SpT=B3 Ia; E(B-V)=0.09; U=10.45; B=11.16; V=11.20; F1160=6.550e-13; F1360=7.770e-13; F1700=6.610e-13; F2200=4.850e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-70D50 : SK -70 50
Previous name : SK-70 50
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B3 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.8e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=6.6e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.8e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:31, v0.9
---
tstatus; SK-70D50; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-70D50 'SK -70 50'
tcheck; Target info verification status?; Ok
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
The PoWR SEDs for c1291 and c1611 are about the same and match the IUE data and are about 2/3 to 3/4 the level of the FUSE data
Category=STAR
Description=[B3-B5 III-I]
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.1689005)	(3) SK-70D50	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				40.0 Secs (40 Secs) *[==>]*	***[1]***
2	G130M/1291-3 (COS.sp.1689001)	(3) SK-70D50	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=1101.0; FP-POS=3			350 Secs (350 Secs) *[==>]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.8e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B3 Ia* *SED = SK-70D50_COS_G130M_c1291_sed.fits* *For exptime=585.0 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 9203.0 cts/s/segment* *brightest pixel: 0.201 cts/s/pix at 1274.5 A* *Calculation performed 2021-10-25T01:01:33, v0.9*								
3	G130M/1291-4 (COS.sp.1689001)	(3) SK-70D50	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=1101.0; FP-POS=4			353 Secs (353 Secs) *[==>]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.8e-13 Flam); cos,fuv,g130m,c1291,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B3 Ia* *SED = SK-70D50_COS_G130M_c1291_sed.fits* *For exptime=585.0 s, spectral region:* *1150.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 9203.0 cts/s/segment* *brightest pixel: 0.201 cts/s/pix at 1274.5 A* *Calculation performed 2021-10-25T01:01:33, v0.9*								
4	G160M/1611 (COS.sp.1689002)	(3) SK-70D50	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=1401; FP-POS=ALL			115.0 Secs (460 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	***[1]***
	Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=6.6e-13 Flam); cos,fuv,g160m,c1611,psa,mjd#59670; fp-pos=None, segment=None) *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B3 Ia* *SED = SK-70D50_COS_G160M_c1611_sed.fits* *For exptime=402.8 s, spectral region:* *1590.0 +- 0.5 A achieves SNR=30.0/resel* *global countrate (brightest segment): 8780.2 cts/s/segment* *brightest pixel: 0.164 cts/s/pix at 1437.0 A* *Calculation performed 2021-10-25T01:01:35, v0.9*								

Orbit Structure



Visit

Proposal 16826, SK-70D50-STIS (3S) Thu Mar 17 21:00:27 GMT 2022

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%

Comments: vstatus; 3S; SK-70D50; S/STIS not started; S/DW 08/02/22 ; intrev: approved for submission ; S/JRD 17/03/22
vcheck; Enter targ name & Inst. & Resp. Sci.; SK-70D50 ; STIS ; DW
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 -- DSS, 2MASS, GALEX
vcheck; Selected ACQ strategy?; F28x50LP, 0.2s should yield S/N~168
vcheck; Possible ACQ or Sci spoilers?; no -- Gaia EDR3 has one G=14.9 blue star at 4.7"
vcheck; Field BOT clear?; yes -- all other objects within 20" have G>17
vcheck; Visual BOT check for stars not in catalog?; yes
vcheck; Orbit packing finalized?; yes
vcheck; Buffer times optimized?; yes -- set to minimum of values for SED, IUE
vcheck; Verify visit grouping correct; n/a
vcheck; Is visit ready for int. review?; yes
Allocated STIS orbits = 1

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SK-70D50	RA: 05 03 45.8861 (75.9411921d)	Proper Motion RA: 2.083 mas/yr	V=11.2	Reference Frame: ICRS
	Alt Name1: HD269009	Dec: -70 11 57.49 (-70.19930d)	Proper Motion Dec: 0.022 mas/yr	SpT=B3 Ia; E(B-V)=0.09; U=10.45; B=11.16; V=11.20; F1160=6.550e-13; F1360=7.770e-13; F1700=6.610e-13; F2200=4.850e-13	
		Equinox: J2000	Parallax: 0"		
			Epoch of Position: 2000		

Comments: SK-70D50 : SK -70 50
Previous name : SK-70 50
Input file: ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv
SpT = B3 Ia
COS/G130M/c1291 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1360 +- 2.0A flux=7.8e-13 Flam)
COS/G160M/c1611 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux1700 +- 2.0A flux=6.6e-13 Flam)
STIS/E230M/c1978 : rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.8e-13 Flam)
Coordinate pedigree: Gaia DR2
Calculation performed 2021-10-25T01:01:31, v0.9
---
tstatus; SK-70D50; P/COS ready for internal review; S/STIS ready for internal review; P/RS 04/02/22; S/DW 08/02/22
tcheck; APT/SIMBAD target names: ; SK-70D50 'SK -70 50'
tcheck; Target info verification status?; Ok
tcheck; Coordinates & P.M. verified, epoch checked?; Yes
tcheck; Adopted SED compared to Observations?; Yes ...
The PoWR SEDs for c1291 and c1611 are about the same and match the IUE data and are about 2/3 to 3/4 the level of the FUSE data
Category=STAR
Description=[B3-B5 III-I]
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 (1685398)	(3) SK-70D50	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs) *[==>]*	 ***[1]***
Comments: predict S/N~168 in 0.2s (saturation in 2.1s) for Castelli-Kurucz B0 I, EBV=0.1, V=11.21									
2	E230M/1978 (1685406)	(3) SK-70D50	STIS/NUV-MAMA, TIME-TAG, 0.2X0.2	E230M 1978 A	WAVECAL=NO; BUFFER-TIME=210			2185 Secs (2185 Secs) *[==>]*	 ***[1]***
Comments: rn(PoWR-OB-new(PoWR_16000_2.00_m7.00_Z0.50.fits, lmc-ob-i 16-20, Z=0.500 solar, Teff=16000, log_lum=5.84, log_g=2.00, log_mdot=-7.00) (extinction lmcavg=0.090), flux2200 +- 2.0A flux=4.8e-13 Flam); stis,nuvmama,e230m,c1978,0.2x0.2,mjd#59670 *From file ULLYSES_Cycle29_MassiveStar_ProgramInput_v5.csv* *Spectral type: B3 Ia* *SED = SK-70D50_STIS_E230M_c1978_sed.fits* *For exptime=1868.4 s, spectral region:* *1800.0 +- 0.5 A achieves SNR=20.0/resel* *global countrate (brightest segment): 7502.6 cts/s/segment* *brightest pixel: 0.211 cts/s/pix at 2317.5 A* *Calculation performed 2021-10-25T01:01:39, v0.9* *for t_exp=2185s* *default SED: brightest pix 0.210 cts/s (2317.5A), entire detector 7.5k cts/s, buf time=267s, S/N~24 at 1800A (1685404)* *IUE spectrum: brightest pix 0.241 cts/s (2293.2A), entire detector 7.6k cts/s, but fime=262s, S/N~22 at 1800A (1685406)* *buffer time set to 0.8*262s=210s*									
3	E230M/1978 WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 1978 A				*[==>]*	***[1]***

Orbit Structure