



# 17198 - First look at the high-ionization UV nebular emission powered by the youngest stellar populations below 5% solar metallicity: the missing link to the reionization era?

Cycle: 30, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

## INVESTIGATORS

| <i>Name</i>                              | <i>Institution</i>                        |
|------------------------------------------|-------------------------------------------|
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| Dr. Jacopo Chevallard (CoI) (ESA Member) | CNRS, Institut d'Astrophysique de Paris   |
| Dr. Adele Plat (CoI)                     | University of Arizona                     |

## VISITS

| <i>Visit</i> | <i>Targets used in Visit</i> | <i>Configurations used in Visit</i> | <i>Orbits Used</i> | <i>Last Orbit Planner Run</i> | <i>OP Current with Visit?</i> |
|--------------|------------------------------|-------------------------------------|--------------------|-------------------------------|-------------------------------|
| 01           | (1) J104609.23+404707.0      | COS/FUV<br>COS/NUV                  | 3                  | 22-Jun-2023 23:00:35.0        | yes                           |
| 02           | (2) J135340.78+164920.9      | COS/FUV<br>COS/NUV                  | 2                  | 22-Jun-2023 23:00:36.0        | yes                           |

| <i>Visit</i> | <i>Targets used in Visit</i> | <i>Configurations used in Visit</i> | <i>Orbits Used</i> | <i>Last Orbit Planner Run</i> | <i>OP Current with Visit?</i> |
|--------------|------------------------------|-------------------------------------|--------------------|-------------------------------|-------------------------------|
| 52           | (2) J135340.78+164920.9      | COS/FUV<br>COS/NUV                  | 1                  | 22-Jun-2023 23:00:38.0        | yes                           |
| 03           | (3) J210455.39-003519.3      | COS/FUV<br>COS/NUV                  | 2                  | 22-Jun-2023 23:00:39.0        | yes                           |

8 Total Orbits Used

## ABSTRACT

Despite a substantial investment of HST orbits over the last five years, the intense nebular CIV detected at  $z > 6$  remains mysteriously without precedent among star-forming galaxies in the local Universe. The persistent difficulty in interpreting this emission with the launch of JWST looming foreshadows potentially significant challenges in the coming years. Uncertain photoionization models suggest that extraordinarily metal-poor massive stellar populations at  $< 5\%$  solar are likely to be the most efficient engines for this high-ionization emission. However, UV and most optical observations have so far been restricted to relatively bright and unfortunately low specific star-formation rate regions at these lowest metallicities. The relatively recent unveiling of a significant population of extremely metal-deficient galaxies dominated by young stars below the detection limits of previous surveys promises to at last open a window onto the highly uncertain ionizing spectrum of massive stellar populations below 5% solar. Here we propose G160M observations to constrain CIV and HeII at gas-phase oxygen abundances below 5% and effective ages  $< \sim 5$  Myr for the first time, targeting the only three systems known in this regime which are sufficiently bright and low-redshift to be amenable to relatively inexpensive UV spectroscopic follow-up. These data will provide unique insight onto the high-energy radiation fields powered by very low-metallicity massive stars, immediately either resolving or significantly heightening the tension between local galaxy populations and the first systems targeted with rest-UV spectroscopy in the reionization era.

## OBSERVING DESCRIPTION

This program will acquire FUV spectroscopy designed to constrain high-ionization nebular emission in C IV and He II for three extremely metal-deficient nearby dwarf galaxies dominated by very young stellar populations. The targets are each covered by SDSS and GALEX imaging which we leverage in planning their observation.

Coordinates and acquisition: Each target is a compact source unresolved in ground-based imaging. The target coordinates are determined from the SDSS photometric outputs and confirmed to agree precisely with the peak of u-band emission for each target in the ICRS-aligned SDSS imaging.

## Proposal 17198 (STScI Edit Number: 1, Created: Thursday, June 22, 2023 at 10:00:39 PM Eastern Standard Time) - Overview

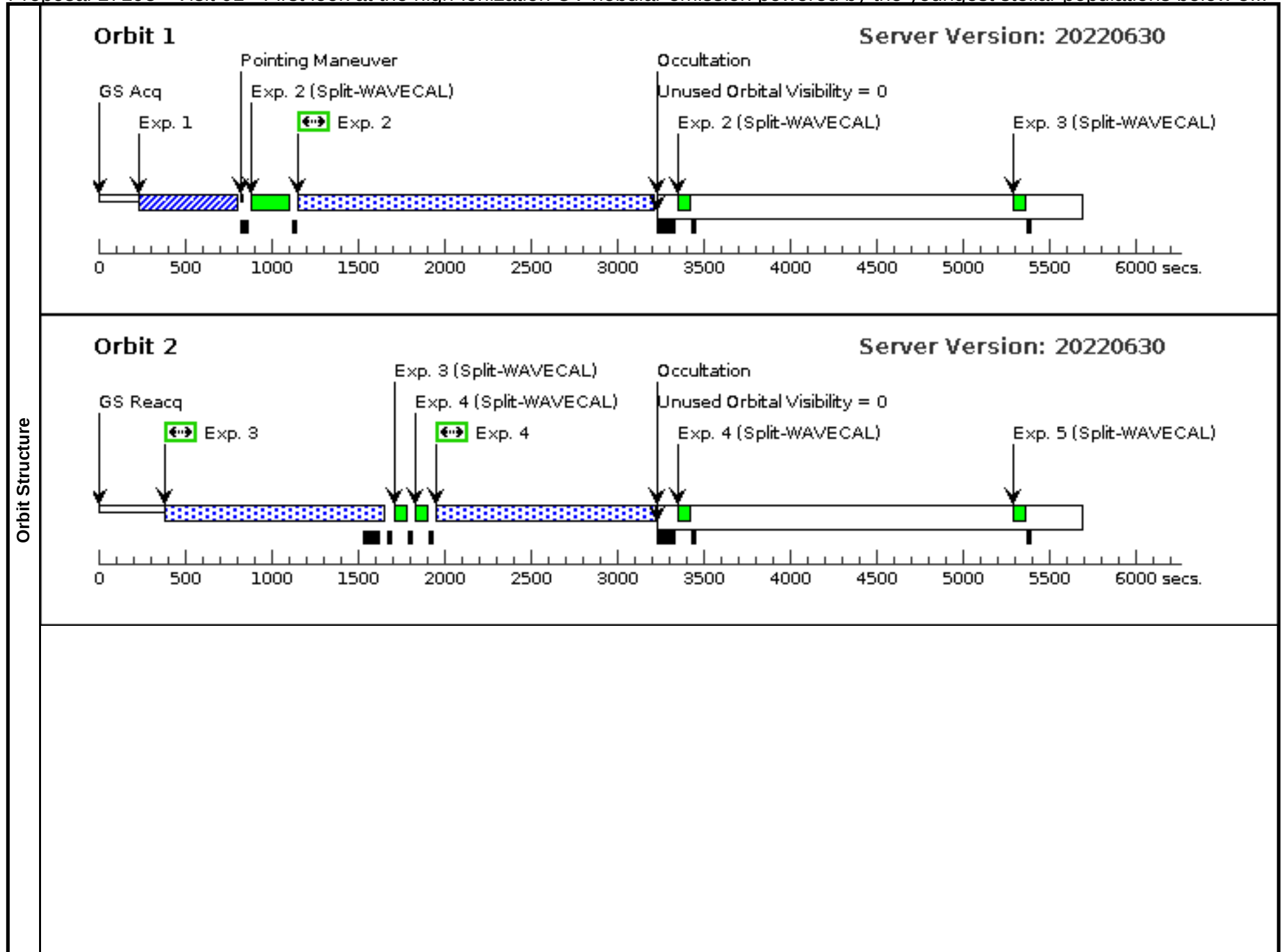
Each target is thus acquired with a standard ACQ/IMAGE exposure, with exposure time chosen to deliver  $S/N=50$  for a point source with an NUV AB magnitude equal to the faintest of the u-band fiber and cModel magnitudes (assuming a flat continuum in  $F_{\text{nu}}$ , appropriate for such sources). We confirm that all three have GALEX/NUV magnitudes in-excess of this conservative estimate; and to ensure detector safety, we likewise confirm that no warnings are raised for a Mirror A+PSA observation of a point source with the brightest GALEX/NUV magnitude among the three. Based upon previous observations of similar sources (and existing HST optical imagery for J210455), we expect these targets to be more extended than a point source, but with FWHM at NUV wavelengths significantly smaller than 0.6"; given this, the large requested S/N provides an appropriate buffer to ensure accurate acquisition of such targets.

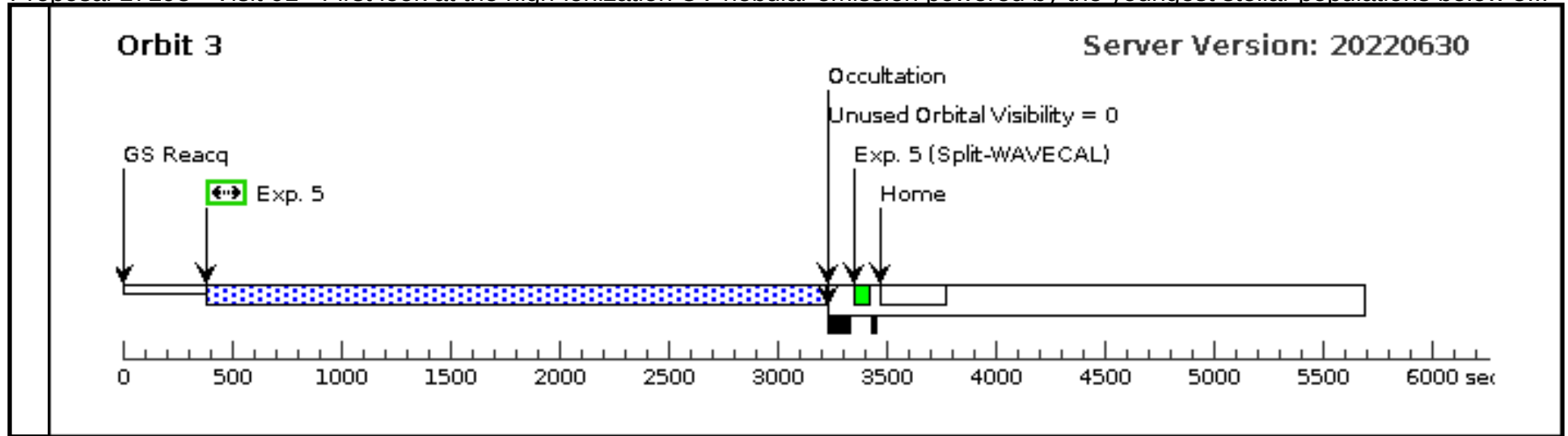
Observing plan: Our primary objective is nebular line measurement; our observations are thus in the low-S/N regime ( $<5$  /resel in the continuum). To maximize the exposure time on-source, we thus devote each orbit to a single spectroscopic exposure, which enables us to relegate most of the buffer dump and expensive SPLIT wavecal overheads to occultation. Thus, 2-3 FP-POS positions are observed for each object (always including FP-POS=1 and 4), as allowed under the updated Cycle 30 requirements. A full buffer dump is requested for each exposure given the uncertain FUV countrates and the unimportant impact on overheads. A warning is generated and acknowledged for the full-orbit spectroscopic exposures which exceed 2400s; the potentially reduced wavelength calibration accuracy is unlikely to impact our primary science, and the follow-up wavecal will allow us to correct for some drift in the mechanism settings. For the 3-orbit Visit 1, we choose to observe FP-POS=3 for the short orbit 1 integration and the primary FP-POS=1+4 in the subsequent orbits; the resulting warning about inefficient FP-POS ordering is ignored as the grating shifts occur during occultation.

Safety: The only health and safety warning presented is associated with J210455, which has a bright ( $V \sim 16$  according to the BOT) neighbor star. This exposures presents a potential danger only under the incorrect default assumption that it has an O5 spectrum. The SDSS imaging confirms that this star is located 3.77" to the W of the target, and GAIA position and PM measurements indicate that it is moving further away to the SW; thus we are confident that it will be outside the PSA extent given typical pointing uncertainties. In addition, the SDSS photometry for this source (u,g,r,i,z = 20.49, 18.03, 17.01, 16.66, 16.47) is consistent with a  $\sim 4500\text{K}$  K-type star, which places the expected AB NUV magnitude negligibly faint ( $>26$ ). GALEX NUV and FUV imaging, while low-resolution, confirms that there is no excess detected UV flux consistent with the position of this nearby star. Existing WFC3/F336W imaging for this source further confirms that the target star-forming region is well-isolated from both this star (located at a similar distance to that measured from SDSS) and from the remaining extent of the galaxy, and is compact relative to the PSA at blue wavelengths as expected. Thus, we proceed with a standard target acquisition for this source.

# Proposal 17198 - Visit 01 - First look at the high-ionization UV nebular emission powered by the youngest stellar populations below 5...

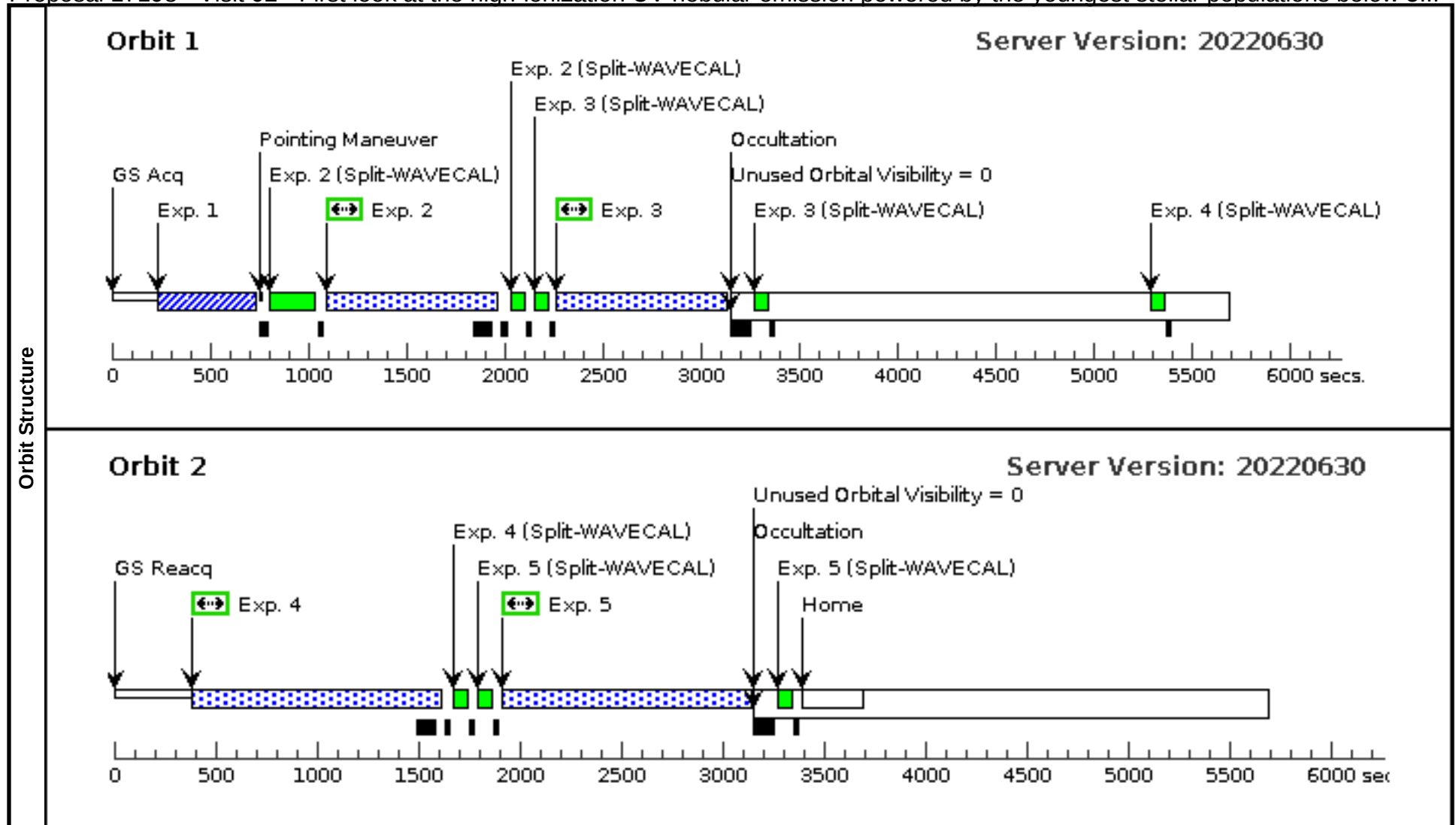
|               |                                                                                                                       |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|-------------------------|--------------------------|----------------------|----------------------|---------------|-----------------------|---------------------------------|------------------------------|-------|--|--|
| Visit         | Proposal 17198, Visit 01, scheduling                                                                                  |                      |                                 |                         |                          |                      |                      |               |                       |                                 | Fri Jun 23 03:00:39 GMT 2023 |       |  |  |
|               | Diagnostic Status: Warning                                                                                            |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
|               | Scientific Instruments: COS/FUV, COS/NUV                                                                              |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
|               | Special Requirements: (none)                                                                                          |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
| Diagnostics   | (Visit 01) Warning (Orbit Planner): COS LP6 EXPOSURE WITH MORE THAN 2400 SECONDS VISIBILITY                           |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
| Fixed Targets | #                                                                                                                     | Name                 | Target Coordinates              |                         | Targ. Coord. Corrections |                      | Fluxes               |               | Miscellaneous         |                                 |                              |       |  |  |
|               | (1)                                                                                                                   | J104609.23+404707.0  | RA: 10 46 9.2300 (161.5384583d) |                         | Redshift: 0.049          |                      | V=20.9               |               | Reference Frame: ICRS |                                 |                              |       |  |  |
|               |                                                                                                                       |                      | Dec: +40 47 7.07 (40.78530d)    |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
|               |                                                                                                                       |                      | Equinox: J2000                  |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
|               | Comments:<br>Category=GALAXY<br>Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION]<br>Extended=NO |                      |                                 |                         |                          |                      |                      |               |                       |                                 |                              |       |  |  |
| Exposures     | #                                                                                                                     | Label<br>(ETC Run)   | Target                          | Config,Mode,Aperture    |                          | Spectral Els.        | Opt. Params.         | Special Reqs. | Groups                | Exp. Time (Total)/[Actual Dur.] |                              | Orbit |  |  |
|               | 1                                                                                                                     | (COS.ta.181<br>4928) | (1) J104609.23+404<br>707.0     | COS/NUV, ACQ/IMAGE, PSA |                          | MIRRORA              |                      |               |                       | 180 Secs (180 Secs)             |                              |       |  |  |
|               |                                                                                                                       |                      |                                 |                         |                          |                      |                      |               |                       | [>=>]                           |                              | [1]   |  |  |
|               | 2                                                                                                                     | (COS.sp.181<br>4972) | (1) J104609.23+404<br>707.0     | COS/FUV, TIME-TAG, PSA  |                          | G160M                | FP-POS=1;            |               |                       | 2000 Secs (2014 Secs)           |                              |       |  |  |
|               |                                                                                                                       |                      |                                 |                         |                          | 1589 A               | BUFFER-TIME=20<br>14 |               |                       | [>=>2014.0 Secs ]               |                              | [1]   |  |  |
|               | 3                                                                                                                     | (COS.sp.181<br>4972) | (1) J104609.23+404<br>707.0     | COS/FUV, TIME-TAG, PSA  |                          | G160M                | FP-POS=2;            |               |                       | 1000 Secs (1222 Secs)           |                              |       |  |  |
|               |                                                                                                                       |                      |                                 |                         |                          | 1589 A               | BUFFER-TIME=11<br>12 |               |                       | [>=>1222.0 Secs ]               |                              | [2]   |  |  |
|               | 4                                                                                                                     | (COS.sp.181<br>4972) | (1) J104609.23+404<br>707.0     | COS/FUV, TIME-TAG, PSA  |                          | G160M                | FP-POS=3;            |               |                       | 1000 Secs (1222 Secs)           |                              |       |  |  |
|               |                                                                                                                       |                      |                                 |                         |                          | 1589 A               | BUFFER-TIME=12<br>22 |               |                       | [>=>1222.0 Secs ]               |                              | [2]   |  |  |
|               | 5                                                                                                                     | (COS.sp.181<br>4972) | (1) J104609.23+404<br>707.0     | COS/FUV, TIME-TAG, PSA  |                          | G160M                | FP-POS=4;            |               |                       | 2700 Secs (2786 Secs)           |                              |       |  |  |
|               |                                                                                                                       |                      |                                 |                         | 1589 A                   | BUFFER-TIME=27<br>86 |                      |               | [>=>2786.0 Secs ]     |                                 | [3]                          |       |  |  |





# Proposal 17198 - Visit 02 - First look at the high-ionization UV nebular emission powered by the youngest stellar populations below 5...

|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
|---------------|-----------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------|-------------------------|--|--------------------------|-----------------------------------|---------------|-------------------|---------------------------------|------------------------------|-------|
| Visit         | Proposal 17198, Visit 02, failed                                                                                      |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 | Fri Jun 23 03:00:40 GMT 2023 |       |
|               | Diagnostic Status: No Diagnostics                                                                                     |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
|               | Scientific Instruments: COS/FUV, COS/NUV                                                                              |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
|               | Special Requirements: (none)                                                                                          |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
| Fixed Targets | #                                                                                                                     | Name                | Target Coordinates                                                                  |                         |  | Targ. Coord. Corrections |                                   | Fluxes        |                   | Miscellaneous                   |                              |       |
|               | (2)                                                                                                                   | J135340.78+164920.9 | RA: 13 53 40.7800 (208.4199167d)<br>Dec: +16 49 20.91 (16.82248d)<br>Equinox: J2000 |                         |  | Redshift: 0.084          |                                   | V=20.4        |                   | Reference Frame: ICRS           |                              |       |
|               | Comments:<br>Category=GALAXY<br>Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION]<br>Extended=NO |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   |                                 |                              |       |
| Exposures     | #                                                                                                                     | Label (ETC Run)     | Target                                                                              | Config,Mode,Aperture    |  | Spectral Els.            | Opt. Params.                      | Special Reqs. | Groups            | Exp. Time (Total)/[Actual Dur.] |                              | Orbit |
|               | 1                                                                                                                     | (COS.ta.181 4964)   | (2) J135340.78+164 920.9                                                            | COS/NUV, ACQ/IMAGE, PSA |  | MIRRORA                  |                                   |               |                   | 143 Secs (143 Secs)             |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   | [==>]                           |                              | [1]   |
|               | 2                                                                                                                     | (COS.sp.181 4973)   | (2) J135340.78+164 920.9                                                            | COS/FUV, TIME-TAG, PSA  |  | G160M<br>1623 A          | FP-POS=1;<br>BUFFER-TIME=71<br>3  |               |                   | 600 Secs (823 Secs)             |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   | [==>823.0 Secs ]                |                              | [1]   |
|               | 3                                                                                                                     | (COS.sp.181 4973)   | (2) J135340.78+164 920.9                                                            | COS/FUV, TIME-TAG, PSA  |  | G160M<br>1623 A          | FP-POS=2;<br>BUFFER-TIME=82<br>2  |               |                   | 600 Secs (822 Secs)             |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   | [==>822.0 Secs ]                |                              | [1]   |
|               | 4                                                                                                                     | (COS.sp.181 4973)   | (2) J135340.78+164 920.9                                                            | COS/FUV, TIME-TAG, PSA  |  | G160M<br>1623 A          | FP-POS=3;<br>BUFFER-TIME=10<br>71 |               |                   | 1000 Secs (1181 Secs)           |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               |                   | [==>1181.0 Secs ]               |                              | [2]   |
|               | 5                                                                                                                     | (COS.sp.181 4973)   | (2) J135340.78+164 920.9                                                            | COS/FUV, TIME-TAG, PSA  |  | G160M<br>1623 A          | FP-POS=4;<br>BUFFER-TIME=11<br>81 |               |                   | 1000 Secs (1181 Secs)           |                              |       |
|               |                                                                                                                       |                     |                                                                                     |                         |  |                          |                                   |               | [==>1181.0 Secs ] |                                 | [2]                          |       |



# Proposal 17198 - Visit 52 - First look at the high-ionization UV nebular emission powered by the youngest stellar populations below 5...

|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|-------------------------------------------------------------------------------------|-----------------|--------------------------|----------------------------------|----------------------------------|--|-----------------------|------------------------------|--------|---------------------|---------------------------------|-------|--|--|-------|-----|--|
| Visit           | Proposal 17198, Visit 52                                                                                                                                                                                                                                       |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       | Fri Jun 23 03:00:40 GMT 2023 |        |                     |                                 |       |  |  |       |     |  |
|                 | Diagnostic Status: Warning                                                                                                                                                                                                                                     |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
|                 | Scientific Instruments: COS/FUV, COS/NUV                                                                                                                                                                                                                       |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
|                 | Special Requirements: (none)                                                                                                                                                                                                                                   |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
| Diagnos         | (Visit 52) 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)                                                                                                                                                                                                                                                            | J135340.78+164920.9      |                          | RA: 13 53 40.7800 (208.4199167d)<br>Dec: +16 49 20.91 (16.82248d)<br>Equinox: J2000 |                 | Redshift: 0.084          |                                  | V=20.4                           |  | Reference Frame: ICRS |                              |        |                     |                                 |       |  |  |       |     |  |
|                 | Comments:<br>Category=GALAXY<br>Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION]<br>Extended=NO                                                                                                                                          |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
| Exposures       | #                                                                                                                                                                                                                                                              | Label (ETC Run)          | Target                   | Config,Mode,Aperture                                                                |                 | Spectral Els.            |                                  | Opt. Params.                     |  | Special Reqs.         |                              | Groups |                     | Exp. Time (Total)/[Actual Dur.] |       |  |  | Orbit |     |  |
|                 | 1                                                                                                                                                                                                                                                              | (COS.ta.181 4964)        | (2) J135340.78+164 920.9 | COS/NUV, ACQ/IMAGE, PSA                                                             |                 | MIRRORA                  |                                  |                                  |  |                       |                              |        |                     | 143 Secs (143 Secs)             |       |  |  |       |     |  |
|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 | [==>] |  |  |       | [1] |  |
|                 | 2                                                                                                                                                                                                                                                              | (COS.sp.181 4973)        | (2) J135340.78+164 920.9 | COS/FUV, TIME-TAG, PSA                                                              |                 | G160M<br>1623 A          |                                  | FP-POS=3;<br>BUFFER-TIME=71<br>3 |  |                       |                              |        |                     | 823 Secs (823 Secs)             |       |  |  |       |     |  |
|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 | [==>] |  |  |       | [1] |  |
| 3               | (COS.sp.181 4973)                                                                                                                                                                                                                                              | (2) J135340.78+164 920.9 | COS/FUV, TIME-TAG, PSA   |                                                                                     | G160M<br>1623 A |                          | FP-POS=4;<br>BUFFER-TIME=82<br>2 |                                  |  |                       |                              |        | 822 Secs (822 Secs) |                                 |       |  |  |       |     |  |
|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     | [==>]                           |       |  |  | [1]   |     |  |
| Orbit Structure | <div><div>Orbit 1</div><div>Server Version: 20220630</div></div>                                                                                                                                                                                               |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |
|                 |                                                                                                                                                                                                                                                                |                          |                          |                                                                                     |                 |                          |                                  |                                  |  |                       |                              |        |                     |                                 |       |  |  |       |     |  |

# Proposal 17198 - Visit 03 - First look at the high-ionization UV nebular emission powered by the youngest stellar populations below 5...

|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
|---------------|----------------------------------------------------------------------------------------------------------|---------------------|--------------------------|------------------------------------------------------------------------------------|--|--------------------------|-----------------------------------|---------------|-------------------|---------------------------------|------------------------------|-------|
| Visit         | Proposal 17198, Visit 03, completed                                                                      |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 | Fri Jun 23 03:00:40 GMT 2023 |       |
|               | Diagnostic Status: No Diagnostics                                                                        |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
|               | Scientific Instruments: COS/FUV, COS/NUV                                                                 |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
|               | Special Requirements: (none)                                                                             |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
| Fixed Targets | #                                                                                                        | Name                |                          | Target Coordinates                                                                 |  | Targ. Coord. Corrections |                                   | Fluxes        |                   | Miscellaneous                   |                              |       |
|               | (3)                                                                                                      | J210455.39-003519.3 |                          | RA: 21 04 55.3900 (316.2307917d)<br>Dec: -00 35 19.30 (-.58869d)<br>Equinox: J2000 |  | Redshift: 0.0048         |                                   | V=20.6        |                   | Reference Frame: ICRS           |                              |       |
|               | Comments:                                                                                                |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
|               | Category=GALAXY<br>Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION]<br>Extended=NO |                     |                          |                                                                                    |  |                          |                                   |               |                   |                                 |                              |       |
| Exposures     | #                                                                                                        | Label (ETC Run)     | Target                   | Config,Mode,Aperture                                                               |  | Spectral Els.            | Opt. Params.                      | Special Reqs. | Groups            | Exp. Time (Total)/[Actual Dur.] |                              | Orbit |
|               | 1                                                                                                        | (COS.ta.181 4965)   | (3) J210455.39-0035 19.3 | COS/NUV, ACQ/IMAGE, PSA                                                            |  | MIRRORA                  |                                   |               |                   | 148 Secs (148 Secs)             |                              |       |
|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               |                   | [==>]                           |                              | [1]   |
|               | 2                                                                                                        | (COS.sp.181 4974)   | (3) J210455.39-0035 19.3 | COS/FUV, TIME-TAG, PSA                                                             |  | G160M<br>1533 A          | FP-POS=1;<br>BUFFER-TIME=69<br>7  |               |                   | 600 Secs (807 Secs)             |                              |       |
|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               |                   | [==>807.0 Secs ]                |                              | [1]   |
|               | 3                                                                                                        | (COS.sp.181 4974)   | (3) J210455.39-0035 19.3 | COS/FUV, TIME-TAG, PSA                                                             |  | G160M<br>1533 A          | FP-POS=2;<br>BUFFER-TIME=80<br>8  |               |                   | 600 Secs (808 Secs)             |                              |       |
|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               |                   | [==>808.0 Secs ]                |                              | [1]   |
|               | 4                                                                                                        | (COS.sp.181 4974)   | (3) J210455.39-0035 19.3 | COS/FUV, TIME-TAG, PSA                                                             |  | G160M<br>1533 A          | FP-POS=3;<br>BUFFER-TIME=10<br>64 |               |                   | 600 Secs (1174 Secs)            |                              |       |
|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               |                   | [==>1174.0 Secs ]               |                              | [2]   |
|               | 5                                                                                                        | (COS.sp.181 4974)   | (3) J210455.39-0035 19.3 | COS/FUV, TIME-TAG, PSA                                                             |  | G160M<br>1533 A          | FP-POS=4;<br>BUFFER-TIME=11<br>74 |               |                   | 600 Secs (1174 Secs)            |                              |       |
|               |                                                                                                          |                     |                          |                                                                                    |  |                          |                                   |               | [==>1174.0 Secs ] |                                 | [2]                          |       |

