# 17541 - Completing the uncharted baryon cycle at the ISM/CGM interface to determine how galaxies get their gas

Cycle: 31, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

**INVESTIGATORS**

| *Name* | *Institution* |
|---|---|
| **Prof. Glenn G. Kacprzak (PI) (Contact)** | **Swinburne University of Technology** |
| Dr. Benjamin Darwin Oppenheimer (CoI) (CoPI) (AdminUSPI) | University of Colorado at Boulder |
| Prof. Christopher W. Churchill (CoI) (Contact) | New Mexico State University |
| Dr. Nikki Nielsen (CoI) | Swinburne University of Technology |
| Allison Morton (CoI) | Swinburne University of Technology |
| Dr. Robert Crain (CoI) (ESA Member) | Liverpool John Moores University |
| Ms. Hasti Nateghi (CoI) | Swinburne University of Technology |
| Prof. Joseph Neil Burchett (CoI) | New Mexico State University |
| Antonia Isabel Fernandez-Figueroa (CoI) | Swinburne University of Technology |
| Dr. Bart P. Wakker (CoI) | Eureka Scientific Inc. |

**VISITS**

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 01 | (1) G1 | COS/FUV<br>COS/NUV | 4 | 16-Jul-2024 15:01:33.0 | yes |
| 02 | (2) G2 | COS/FUV<br>COS/NUV | 2 | 16-Jul-2024 15:01:33.0 | yes |

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 03 | (3) G3 | COS/FUV<br>COS/NUV | 5 | 16-Jul-2024 15:01:34.0 | yes |
| 04 | (4) G4 | COS/FUV<br>COS/NUV | 3 | 16-Jul-2024 15:01:35.0 | yes |
| 05 | (5) G5 | COS/FUV<br>COS/NUV | 6 | 16-Jul-2024 15:01:36.0 | yes |
| 06 | (6) G6 | COS/FUV<br>COS/NUV | 6 | 16-Jul-2024 15:01:37.0 | yes |
| 07 | (7) G7 | COS/FUV<br>COS/NUV | 1 | 16-Jul-2024 15:01:37.0 | yes |
| 08 | (8) G8 | COS/FUV<br>COS/NUV | 3 | 16-Jul-2024 15:01:38.0 | yes |
| 58 | (8) G8 | COS/FUV<br>COS/NUV | 2 | 16-Jul-2024 15:01:39.0 | yes |
| 09 | (9) G9 | COS/FUV<br>COS/NUV | 4 | 16-Jul-2024 15:01:39.0 | yes |
| 59 | (9) G9 | COS/FUV<br>COS/NUV | 4 | 16-Jul-2024 15:01:40.0 | yes |

40 Total Orbits Used

**ABSTRACT**

COS has not yet been fully exploited to address the crucial and unanswered question of galaxy formation and evolution theory: how do galaxies acquire their gas? However, COS UV initiatives have drastically increased our knowledge of this multi-phase circumgalactic medium (CGM), where gas geometrically prefers to reside along the major and minor axes of galaxies while exhibiting co-rotation/accretion and outflow kinematics along these axes respectively.

Here, we propose a survey of the inner CGM, which targets 9 star-forming disk galaxies where a background quasar lies 15-35 kpc from the galaxy along the major axis of the disk -- directly probing gas accretion across the CGM/extra-planar/disk interface. The proposed COS/G130M spectra

covering a range of low to high metal ions and HI. Using the CGM absorption line data, along with in-hand galaxy spectra, we will quantify relative gas-galaxy kinematics, internal absorption kinematics, gas-phase metallicities, and multi-phase gas physics. When combined with the existing outer CGM (35-100 kpc) major axis sample, for which we have the same COS and ground-based data all in-hand, we will finally close the loop on what may be the primary channel of gas accretion. Our low-risk, high-yield observing sample will be complemented by the theoretical insight of the latest cosmological hydrodynamic simulations to interpret this unique and rich dataset. Our proposed program will reveal an uncharted regime of the baryon cycle: gas accretion across the boundary between the CGM and the galaxy, which represents the final phase of how galaxies get their gas.

**OBSERVING DESCRIPTION**

QSO Spectroscopy with COS: Our science analysis is focused on measuring (a) the kinematics of low, intermediate, and high-ionization CGM gas using both the pixel-velocity two-point correlation function (TPCF) and Voigt profile (VP) fitting and (b) measuring the metallicities from VP column densities and ionization modeling. From these measurements, we will then quantitatively characterize the differences and/or similarities of the inner and outer CGM, with 10 inner (those proposed for here) and 17 outer galaxies (from previous work, which we have in-hand in science ready form).

We use the G130M grating with a single optimized central wavelength per target to cover a diverse range of low-ionization metal lines (OI, CII, NII, FeII, SiII), intermediate-ionization lines (NIII and CIII) and the OVI high-ionization lines. For 9 galaxies, we cover the entire Lyman series from Ly-beta to the break and for one galaxy from Ly-gamma to the Lyman break. Since all absorbers are expected to have logN(HI) > 17, we would gain little-to-no constraints from the highly-saturated Ly-alpha lines. We used the COS ETC to estimate exposure times required to achieve signal-to-noise ratios (S/N) of 15 per resolution element after binning by three in the dispersion direction, yielding 2.7 pixels per resolution element. For our binning at S/N = 15, COS delivers a 3-sigma detection threshold of 20 mA.

The coordinates of our point-source targets are much better then 0.4". We thus adopt the minimal approach to target acquisition. We use the NUV imager with MIRRORA (except for G7, we use MIRRORB due to brightness) in ACQ IMAGE mode through the PSA aperture. Exposure times were determined using the COS ETC to ensure we achieve the recommended SNR of 20 for target acquisitions. The NUV magnitudes were obtain from GALEX.

Our targets are observed using both A and B stripes of the G130 M. Most targets use the 1222 grating center. Two of our targets are optimal with the 1096 centering (G3, G5) and two are optimal for the 1291 center (G8, G9). For all gratings, we obtain exposures at all FP-POS setting. We move

these in the forward direction in order to minimize overhead. For the 1291 center, we use only FP-POS=3,4 in order to avoid segment reconfiguration overhead. For all exposures, we adopt the recommended TIME-TAG photon counting with FLASH=yes, and adopt a standard BUFFER-TIME=6000 seconds based on the count rates of our targets. All targets are exposed through the PSA aperture and guidance is set to FINE. For Phase I, exposure time estimates were obtained using the COS ETC for a point source with published GALEX FUV fluxes, and employed average Galactic extinction, standard zodiacal light normalizations, standard earth-shine light normalizations, and average air glow.

## Visit

**Proposal 17541, G1 (01), scheduling** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: No Diagnostics**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Fixed Targets

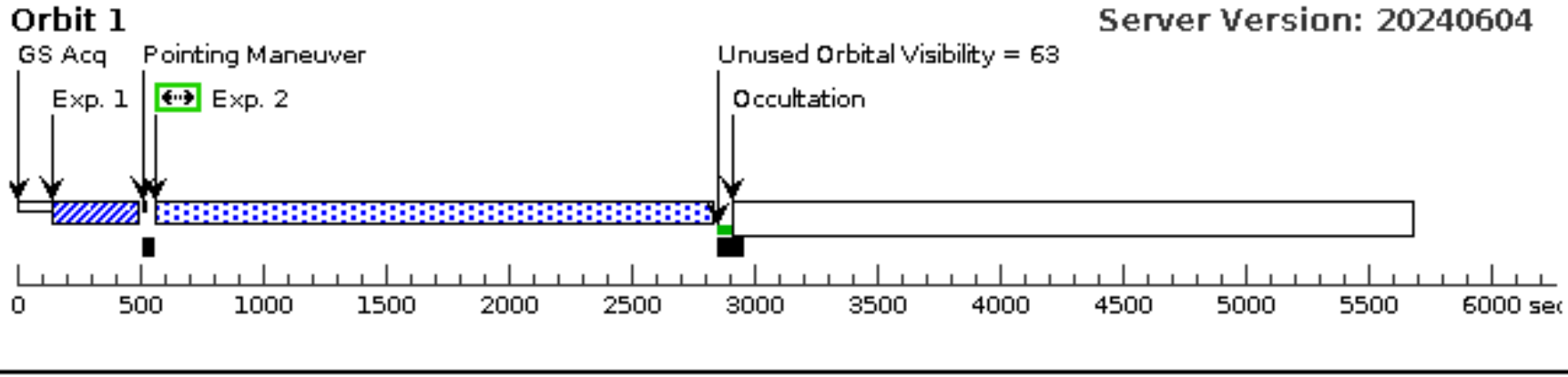
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | G1<br>Alt Name1: J003340.21-005525.5 | RA: 00 33 40.2155 (8.4175646d)<br>Dec: -00 55 25.58 (-.92377d)<br>Equinox: J2000 | | V=17.82<br>FUV(GALEX AB) = 19.23 | Reference Frame: ICRS |

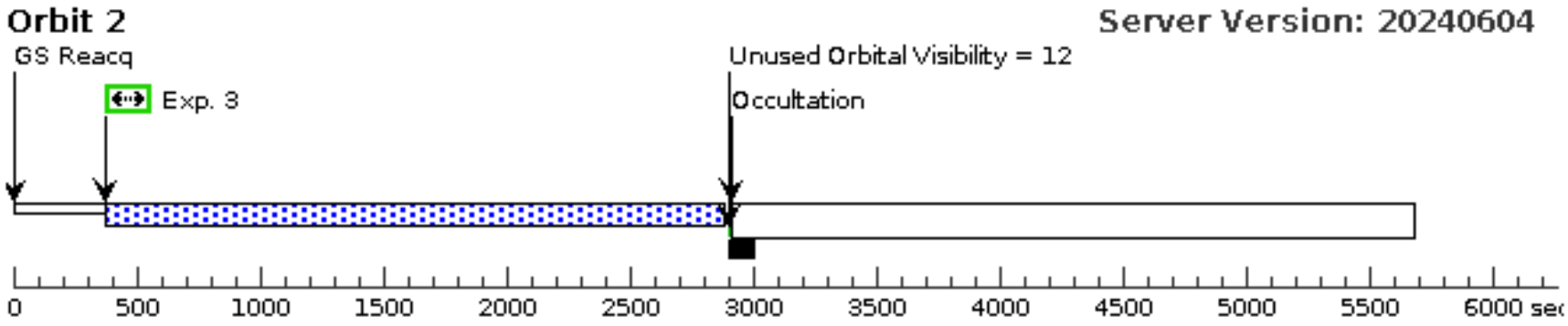
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

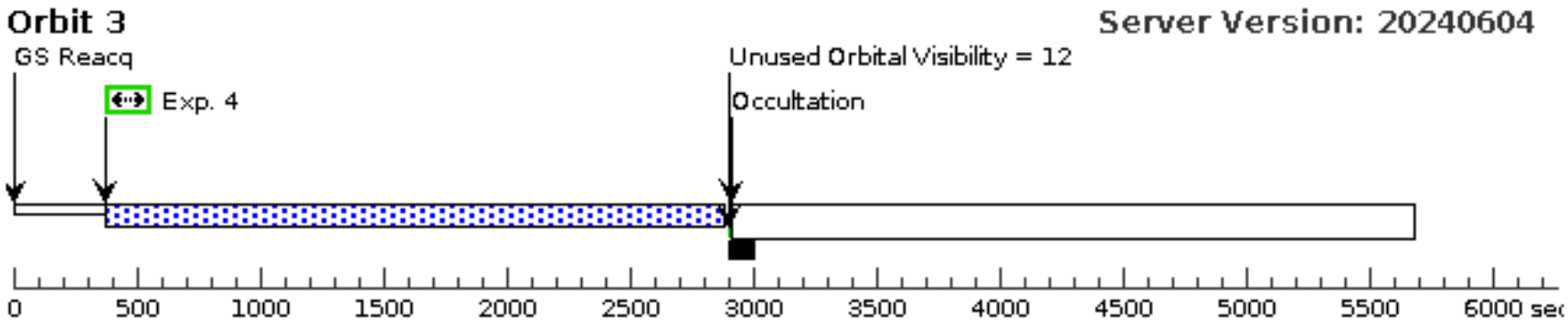
## Exposures

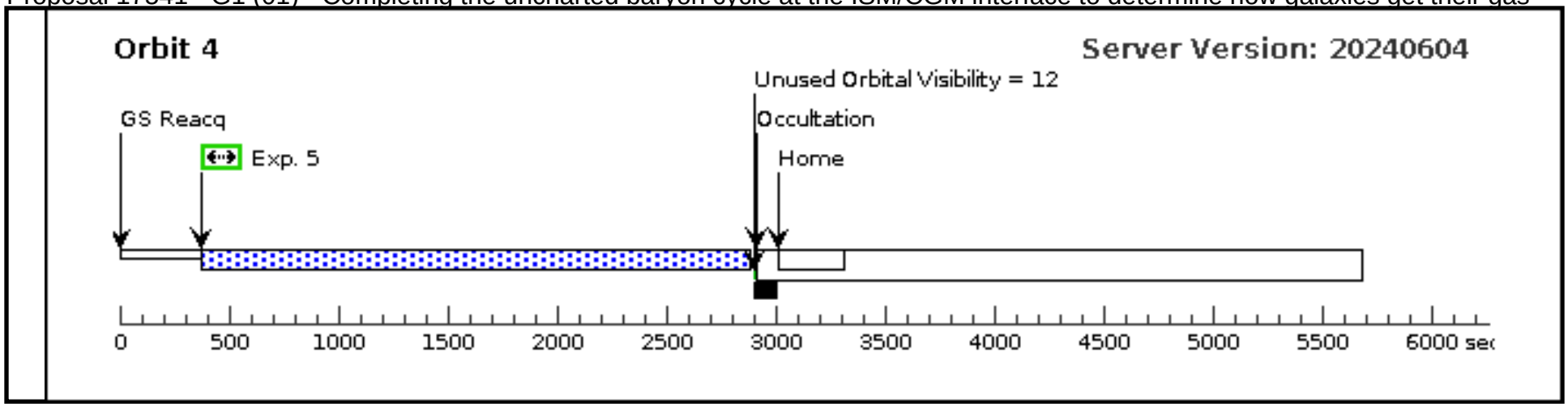
| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G1 ACQ IMAGE (COS.ta.1898834) | (1) G1 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 29 Secs (29 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: NUV = 17.95 SNR=20 in 1.78 sec*<br>*OLD ETC RUN: COS.im.1890892* | | | | | | | | | |
| 2 | G1 1222_1 (COS.sp.1892526) | (1) G1 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=1; FLASH=YES; BUFFER-TIME=2085 | | | 2085 Secs (2085 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: FP=1*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G1 1222_2 (COS.sp.1892527) | (1) G1 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=2; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[2]*** |
| *Comments: FP=2*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 4 | G1 1222_3 (COS.sp.1892527) | (1) G1 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=3; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[3]*** |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 5 | G1 1222_4 (COS.sp.1892527) | (1) G1 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=4; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[4]*** |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |

Orbit Structure




Orbit 4
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

## Visit

**Proposal 17541, G2 (02), completed** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: No Diagnostics**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Fixed Targets

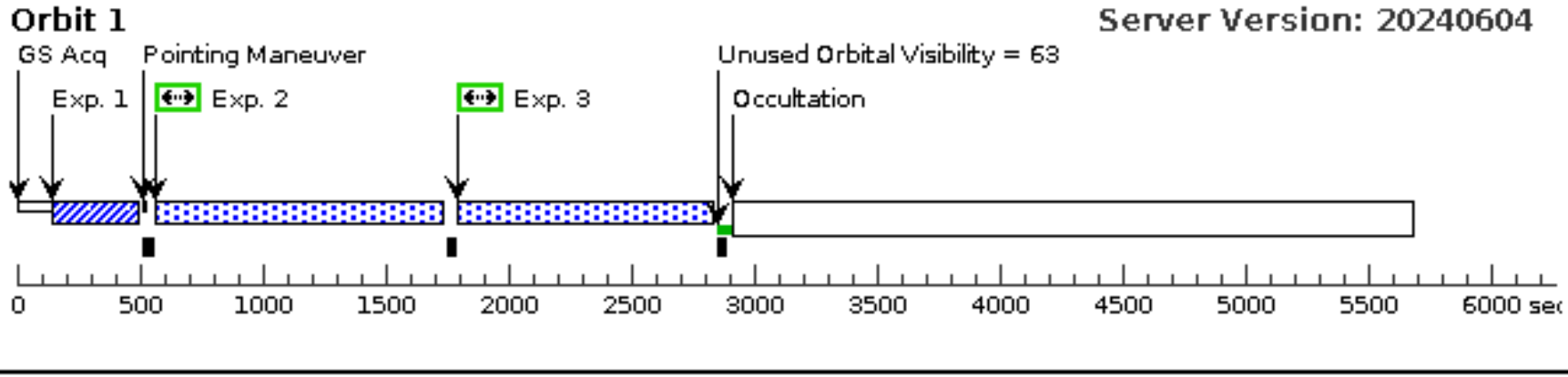
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (2) | G2<br>Alt Name1: J003413.04-010026.9 | RA: 00 34 13.0400 (8.5543333d)<br>Dec: -01 00 26.90 (-1.00747d)<br>Equinox: J2000 | | V=17.2<br>FUV(GALEX AB) = 18.66 | Reference Frame: ICRS |

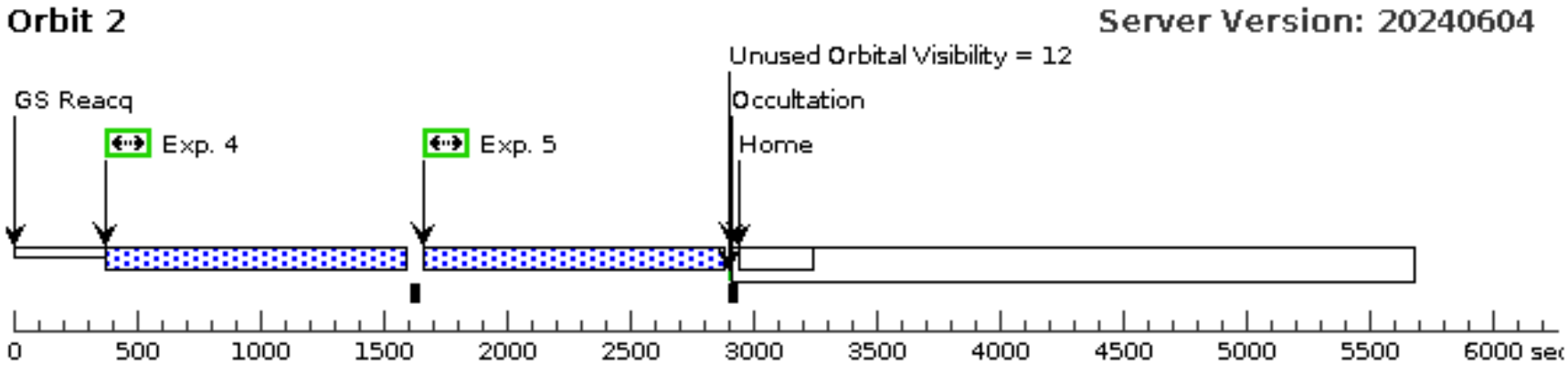
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G2 ACQ IMAGE (COS.ta.1898835) | (2) G2 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 30 Secs (30 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 17.98 SNR=20 in 1.82 sec*<br>*OLD ETC = COS.im.1890896* | | | | | | | | | |
| 2 | G2 1222_1A (COS.sp.1892528) | (2) G2 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=1; FLASH=YES; BUFFER-TIME=7860 | | | 984 Secs (984 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=1*<br>*BFT = 11,790 BT = (2/3)*BFT = 7860* | | | | | | | | | |
| 3 | G2 1222_1B (COS.sp.1892529) | (2) G2 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=2; FLASH=YES; BUFFER-TIME=7860 | | | 984 Secs (984 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=2*<br>*BFT = 11,790 BT = (2/3)*BFT = 7860* | | | | | | | | | |
| 4 | G2 1222_2A (COS.sp.1892530) | (2) G2 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=3; FLASH=YES; BUFFER-TIME=7860 | | | 1171 Secs (1171 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=3*<br>*BFT = 11,790 BT = (2/3)*BFT = 7860* | | | | | | | | | |
| 5 | G2 1222_2B (COS.sp.1892530) | (2) G2 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=4; FLASH=YES; BUFFER-TIME=7860 | | | 1171 Secs (1171 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=4*<br>*BFT = 11,790 BT = (2/3)*BFT = 7860* | | | | | | | | | |

Orbit Structure



## Visit

**Proposal 17541, G3 (03), scheduling** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Diagnostics

(G3 (03)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

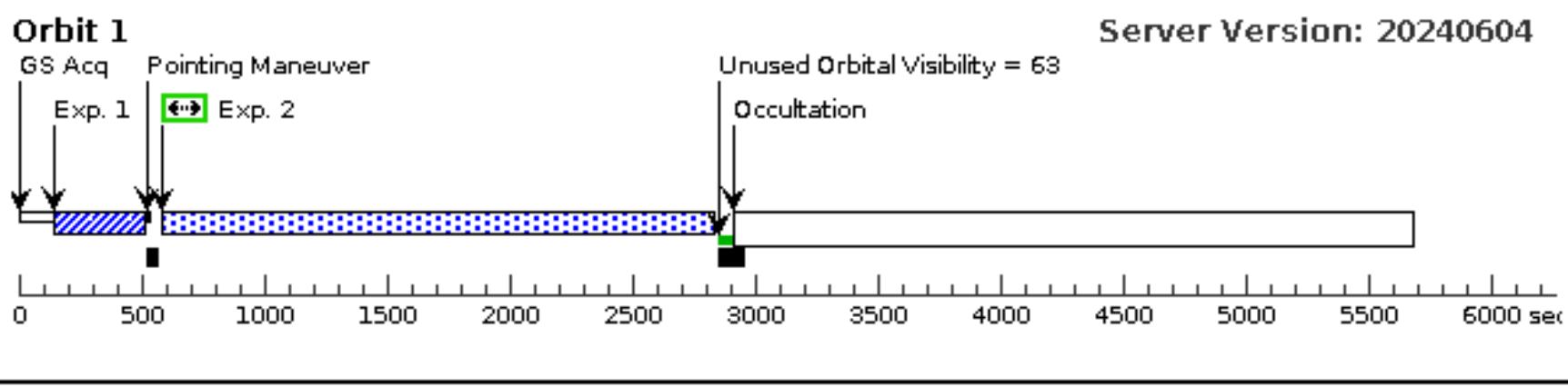
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (3) | G3 | RA: 01 01 56.3119 (15.4846329d) | | V=18.19 | Reference Frame: ICRS |
| | Alt Name1: J010156.32-084401.7 | Dec: -08 44 1.76 (-8.73382d) | | FUV(GALEX AB) = 19.09 | |
| | | Equinox: J2000 | | | |

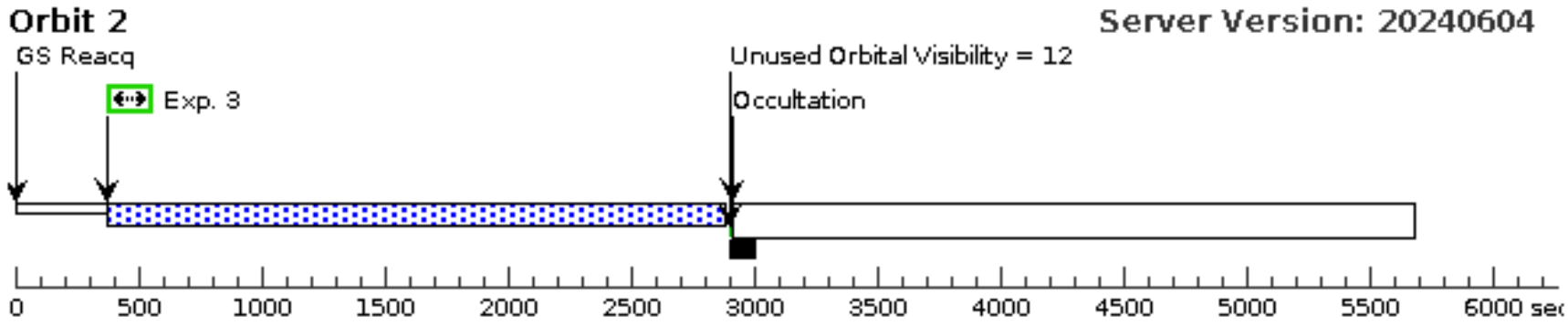
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

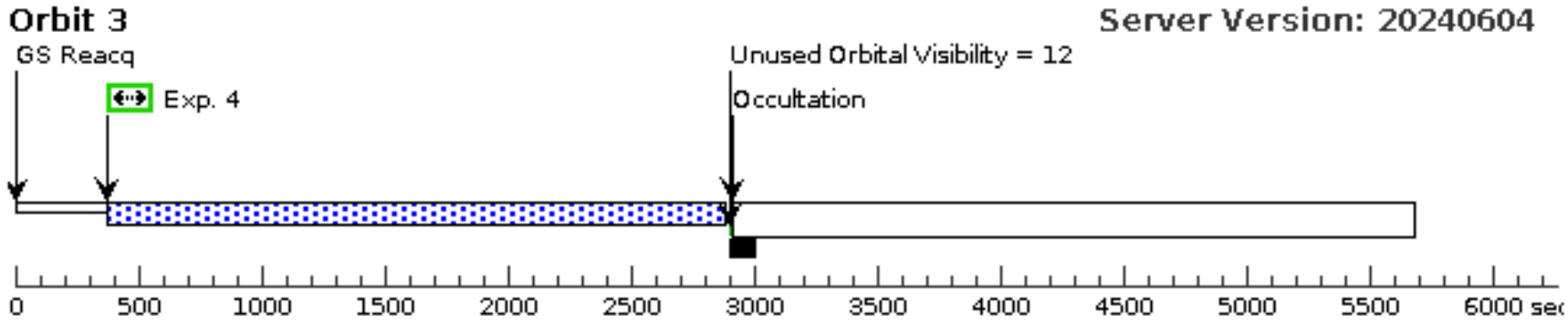
**Exposures**

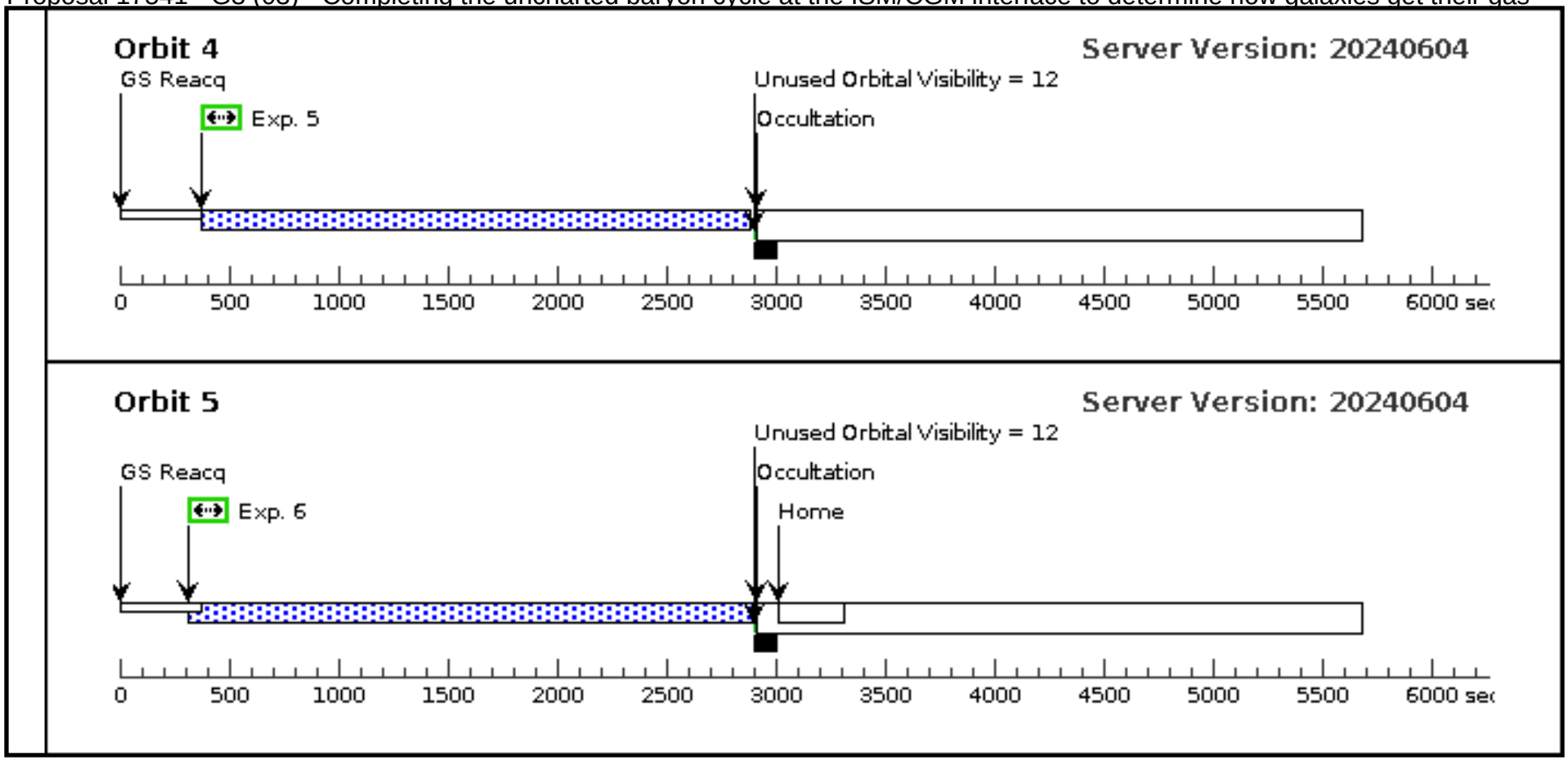
| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G3 ACQ IMAGE (COS.ta.1898836) | (3) G3 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 38 Secs (38 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: NUV = 18.24 SNR=20 in 2.3 sec*<br>*OLD ETC = COS.im.1890899* | | | | | | | | | |
| 2 | G3 1096_1 (COS.sp.1892531) | (3) G3 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=2042 | | | 2042 Secs (2042 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: FP=1*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G3 1096_2 (COS.sp.1892532) | (3) G3 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=2;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[2]*** |
| *Comments: FP=2*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 4 | G3 1096_3 (COS.sp.1892532) | (3) G3 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[3]*** |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 5 | G3 1096_4 (COS.sp.1892532) | (3) G3 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[4]*** |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 6 | G3 1096_5 (COS.sp.1892532) | (3) G3 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[5]*** |
| *Comments: FP=1*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |

Orbit Structure




Orbit 4
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GS Reacq
Exp. 5
Unused Orbital Visibility = 12
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 5
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

**Visit**

**Proposal 17541, G4 (04), completed** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: No Diagnostics**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (4) | G4 | RA: 12 13 9.1100 (183.2879583d) | | V=16.5 | Reference Frame: ICRS |
| | Alt Name1: J121309.11+140832.2 | Dec: +14 08 32.25 (14.14229d) | | FUV(GALEX AB) = 19.08 | |
| | | Equinox: J2000 | | | |

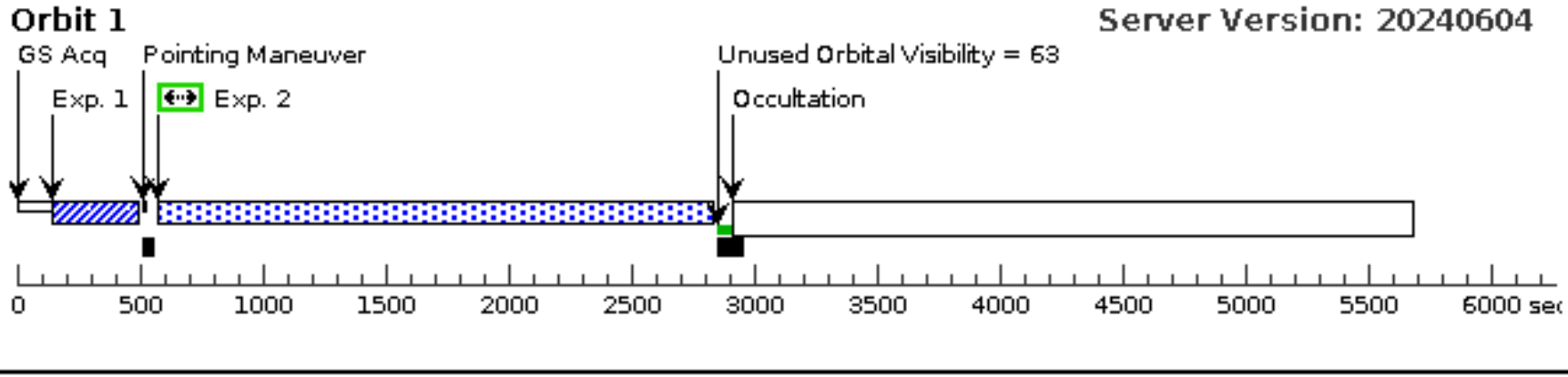
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

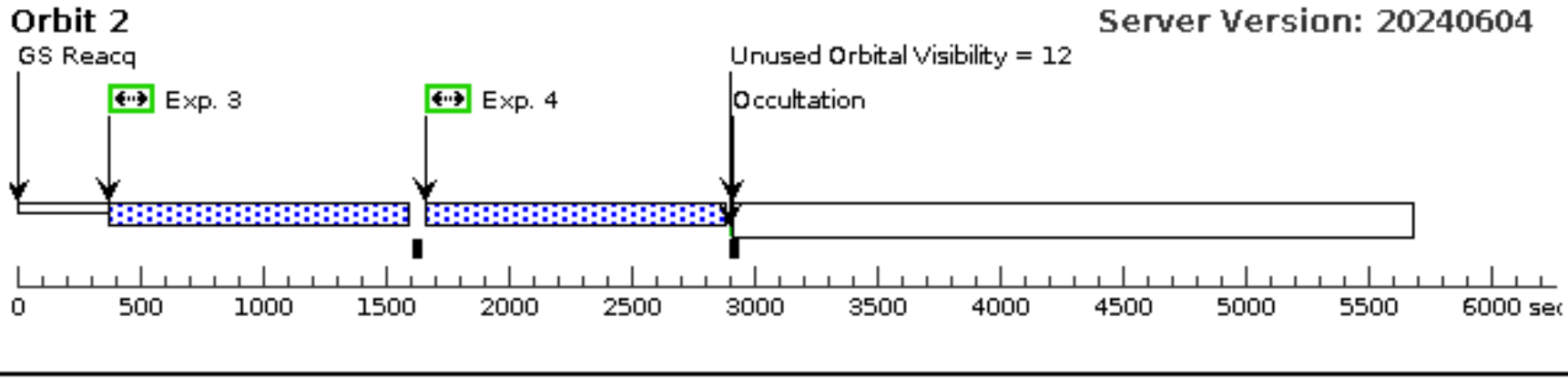
*In the Phase I proposal, this target (G4) was entered incorrectly. It was an accidental duplication of target G7 for this proposal. We have rectified this error in this Phase II proposal. Because of this, the cenwave of the Phase I (incorrect) "G4" target was also changed to match our science goals for the intended target G4.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

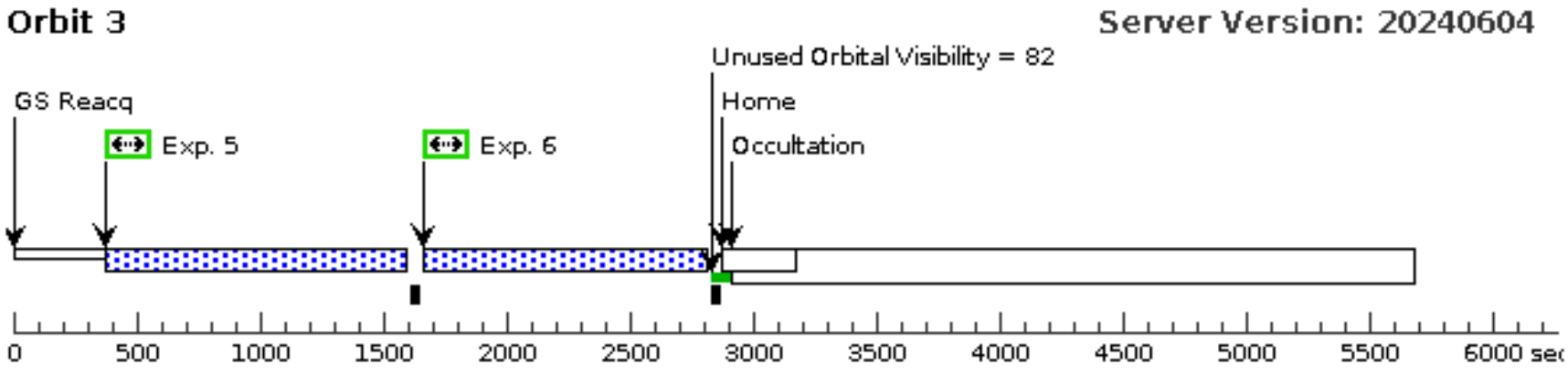
**Exposures**

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G4 ACQ IMAGE (COS.ta.1898837) | (4) G4 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 32 Secs (32 Secs)<br>*[==>]* | ***[1]*** |
| | *Comments: NIV = 18.06 SNR=20 in 1.96 sec*<br>*OLD ETC = COS.im.1890905* | | | | | | | | |
| 2 | G4 1222_1 (COS.sp.1892533) | (4) G4 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=2079 | | | 2079 Secs (2079 Secs)<br>*[==>]* | ***[1]*** |
| | *Comments: FP=1*<br>*BT = EXP TIME* | | | | | | | | |
| 3 | G4 1222_2A (COS.sp.1892534) | (4) G4 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=2;<br>FLASH=YES;<br>BUFFER-TIME=8353 | | | 1171 Secs (1171 Secs)<br>*[==>]* | ***[2]*** |
| | *Comments: FP=2*<br>*BFT = 12,529 BT = (2/3)*BFT = 8353* | | | | | | | | |
| 4 | G4 1222_2B (COS.sp.1892534) | (4) G4 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=8353 | | | 1171 Secs (1171 Secs)<br>*[==>]* | ***[2]*** |
| | *Comments: FP=3*<br>*BFT = 12,529 BT = (2/3)*BFT = 8353* | | | | | | | | |
| 5 | G4 1222_3A (COS.sp.1892534) | (4) G4 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=8353 | | | 1171 Secs (1171 Secs)<br>*[==>]* | ***[3]*** |
| | *Comments: FP=4*<br>*BFT = 12,529 BT = (2/3)*BFT = 8353* | | | | | | | | |
| 6 | G4 1222_3B (COS.sp.1892535) | (4) G4 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=8353 | | | 1104 Secs (1104 Secs)<br>*[==>]* | ***[3]*** |
| | *Comments: FP=4*<br>*BFT = 12,529 BT = (2/3)*BFT = 8353* | | | | | | | | |

Orbit Structure



## Visit

**Proposal 17541, G5 (05), scheduling** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Diagnostics

(G5 (05)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (5) | G5 | RA: 08 23 40.1726 (125.9173858d) | | V=18.34 | Reference Frame: ICRS |
| | Alt Name1: J082340.17+074801.6 | Dec: +07 48 1.70 (7.80047d) | | FUV(GALEX AB) = 19.60 | |
| | | Equinox: J2000 | | | |

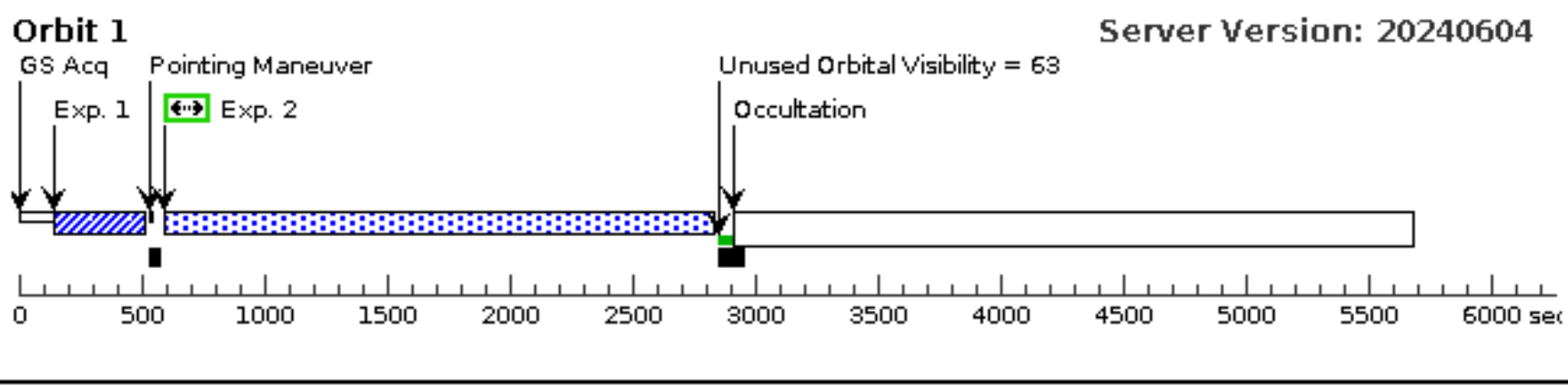
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

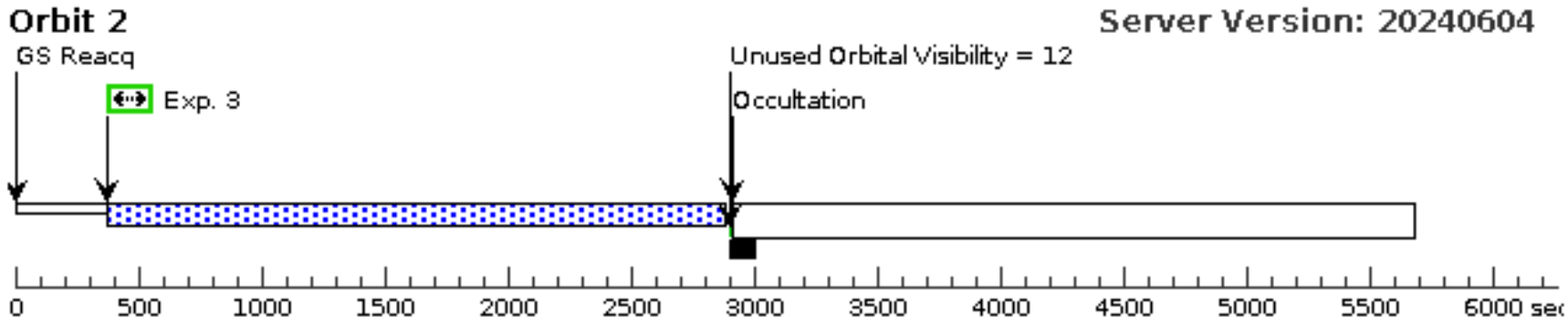
*For the Phase I proposal, we had requested the 1222 cenwave; however, we have changed the cenwave to 1096. During the Phase I proposal feasibility analysis, we believed that the optimal setting to capture as many transition as possible was the 1222 settin. However, in re-evaulation of the configuration and further discussion of the relative importance of the absorption line transitions to be captured, we decided that the 1096 cenwave is the most optimal for our science goals.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

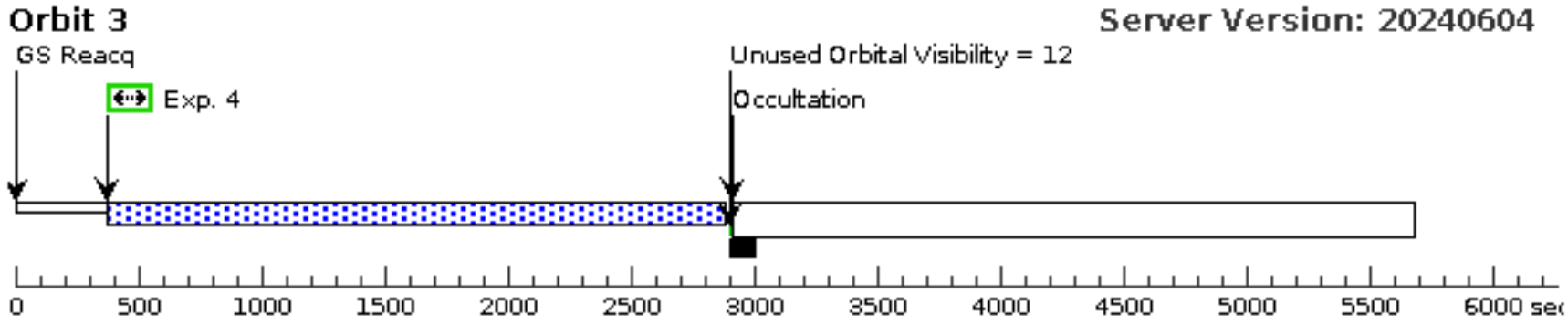
**Exposures**

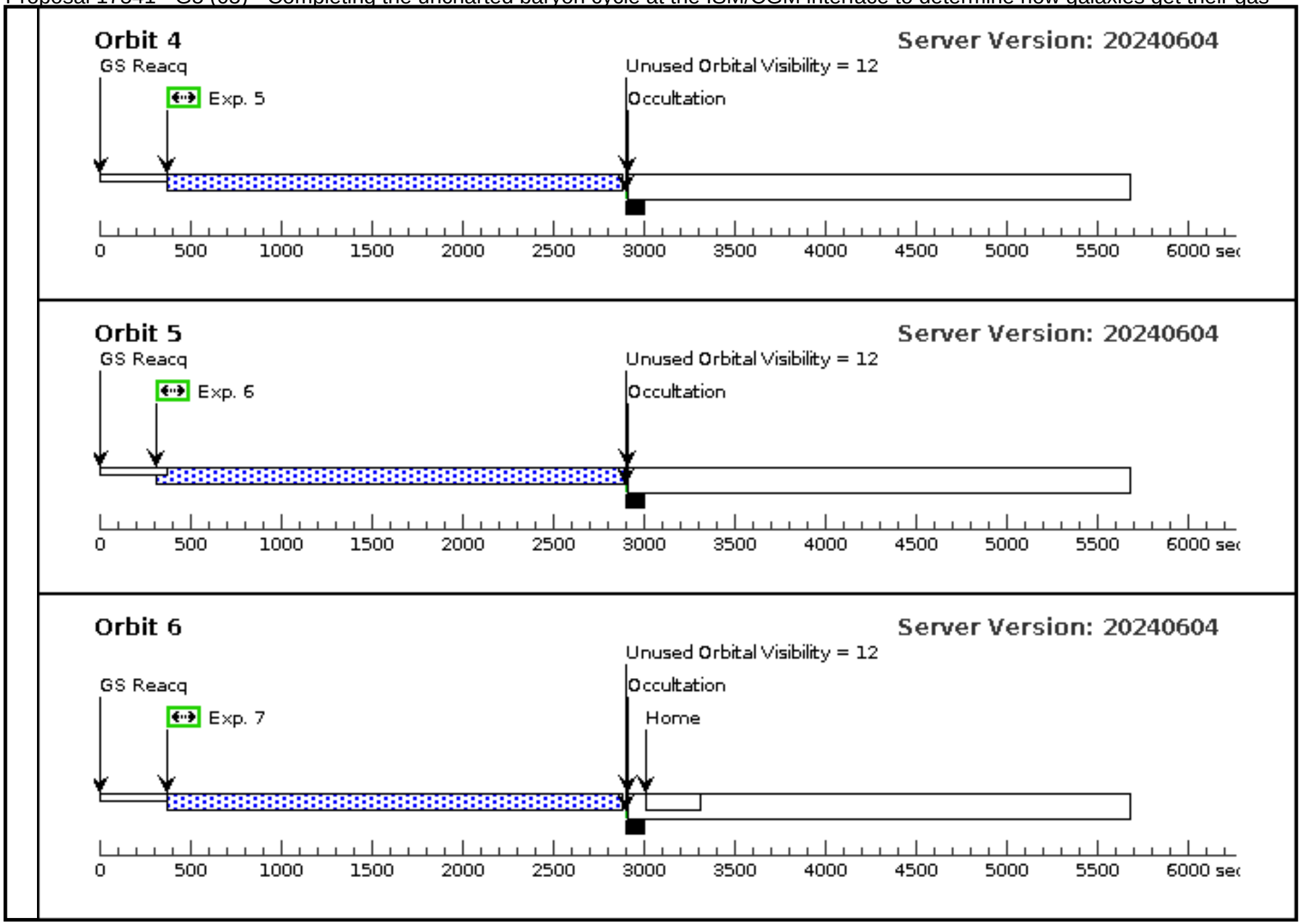
| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G5 ACQ IMAGE (COS.ta.1898838) | (5) G5 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 42 Secs (42 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: NUV = 18.24 SNR=20 in 2.32 sec*<br>*OLD ETC = COS.im.1890909* | | | | | | | | | |
| 2 | G5 1096_1 (COS.sp.1892537) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=2034 | | | 2034 Secs (2034 Secs)<br>*[==>]* | ***[1]*** |
| *Comments: FP=1*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 3 | G5 1096_2 (COS.sp.1892538) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=2;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[2]*** |
| *Comments: FP=2*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 4 | G5 1096_3 (COS.sp.1892538) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[3]*** |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 5 | G5 1096_4 (COS.sp.1892538) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[4]*** |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 6 | G5 1096_5 (COS.sp.1892538) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[5]*** |
| *Comments: FP=1*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 7 | G5 1096_6 (COS.sp.1892538) | (5) G5 | COS/FUV, TIME-TAG, PSA | G130M<br>1096 A | FP-POS=2;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | ***[6]*** |
| *Comments: FP=2*<br>*BUFFER-TIME = EXP=TIME* | | | | | | | | | |

Orbit Structure




Orbit 4
Server Version: 20240604
GS Reacq
Exp. 5
Unused Orbital Visibility = 12
Occultation
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec
Orbit 5
Server Version: 20240604
GS Reacq
Exp. 6
Unused Orbital Visibility = 12
Occultation
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec
Orbit 6
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 7
Home
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec

## Visit

**Proposal 17541, G6 (06), completed** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Diagnostics

(G6 (06)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

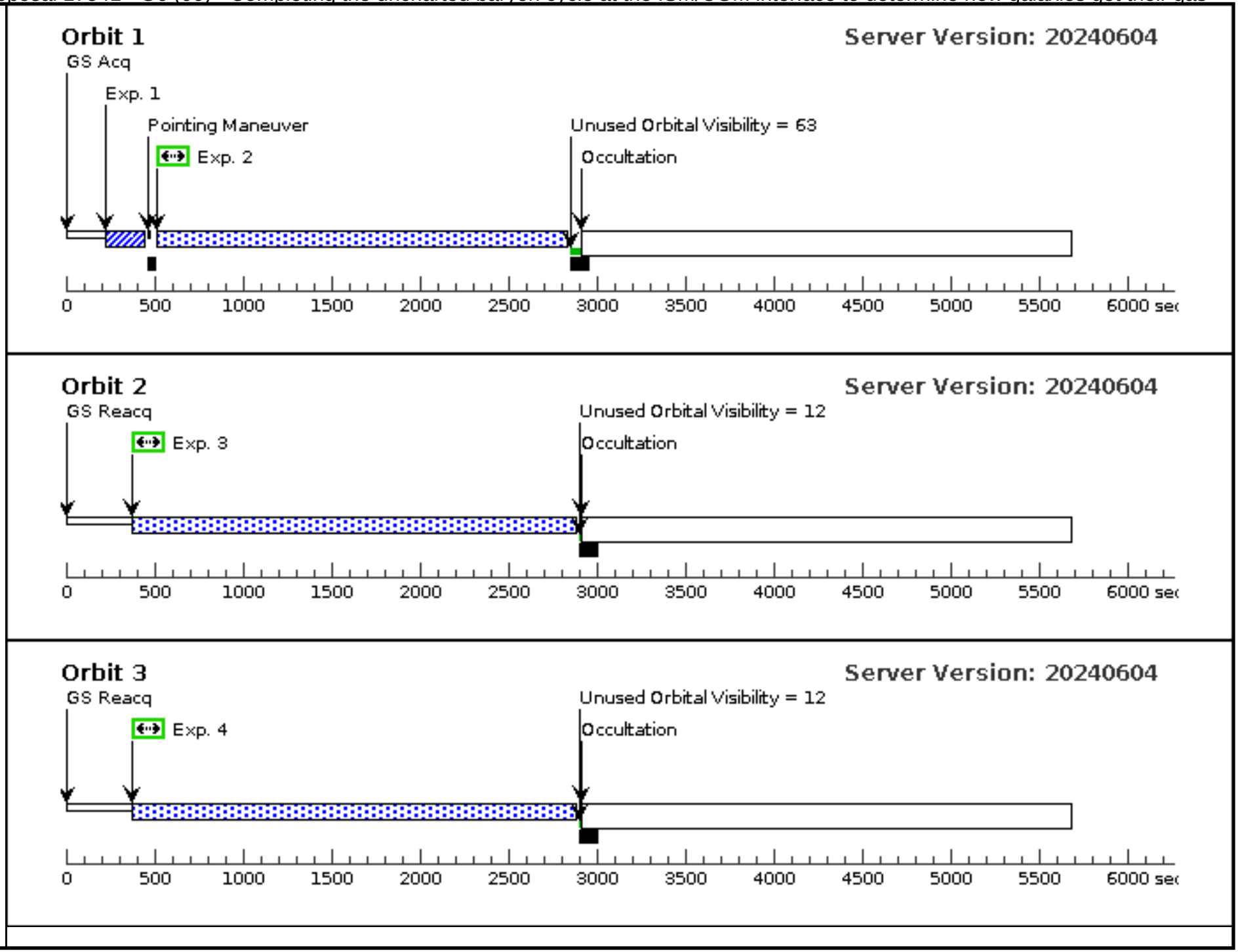
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (6) | G6 | RA: 13 27 57.4069 (201.9891954d) | | V=18.21 | Reference Frame: ICRS |
| | Alt Name1: J132757.40+101141.7 | Dec: +10 11 41.75 (10.19493d) | | FUV(GALEX AB) = 19.71 | |
| | | Equinox: J2000 | | | |

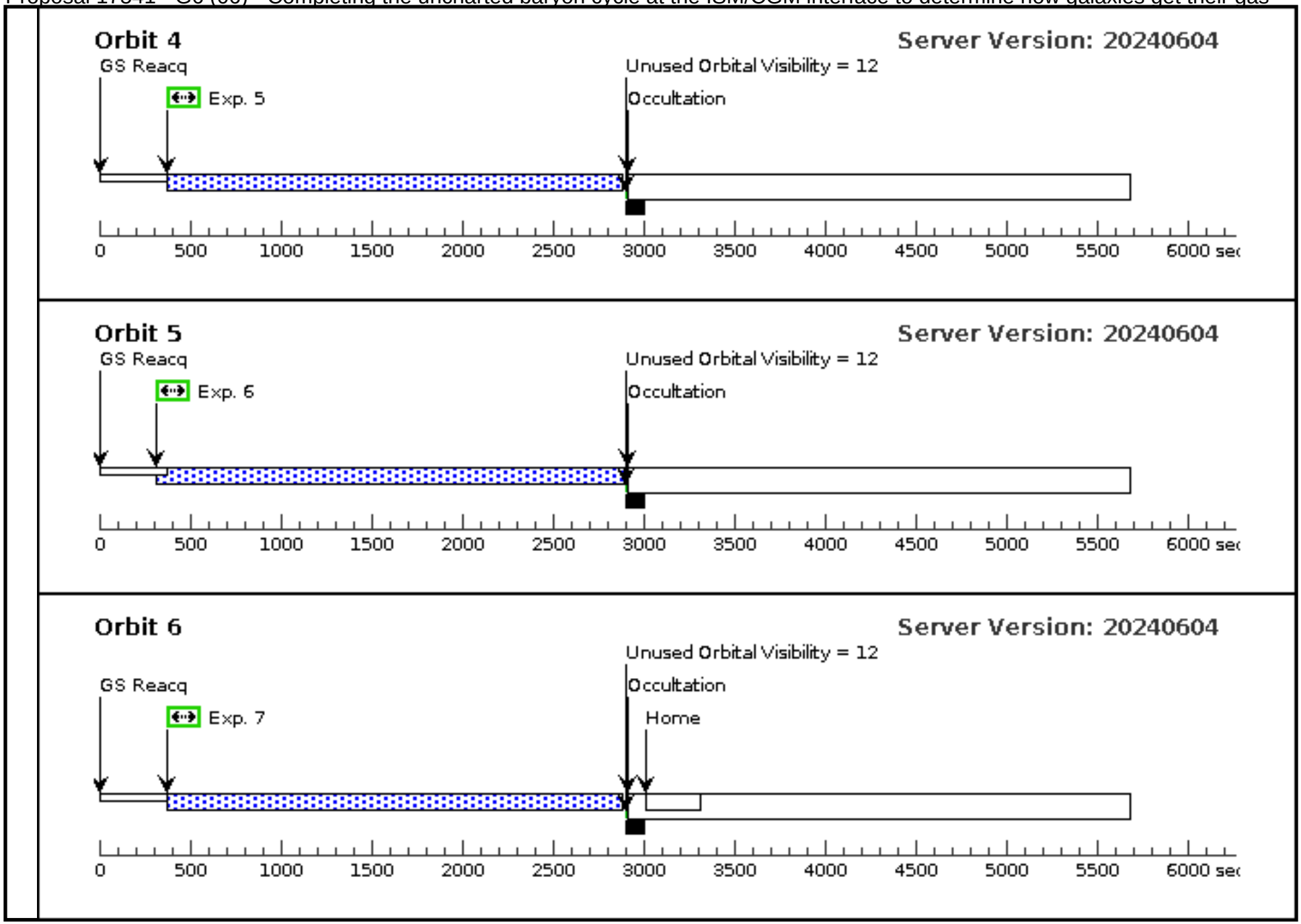
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

**Exposures**

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G6 ACQ IMAGE (COS.im.1890915) | (6) G6 | COS/NUV, ACQ/IMAGE, PSA | MIRRORA | | | | 4 Secs (4 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 18.89 SNR=20 in 4..22 sec* | | | | | | | | | |
| 2 | G6 1222_1 (COS.sp.1892539) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=1; FLASH=YES; BUFFER-TIME=2135 | | | 2135 Secs (2135 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=1 BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 3 | G6 1222_2 (COS.sp.1892540) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=2; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=2 BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 4 | G6 1222_3 (COS.sp.1892540) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=3; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[3]* |
| *Comments: FP=3 BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 5 | G6 1222_4 (COS.sp.1892540) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=4; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[4]* |
| *Comments: FP=4 BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 6 | G6 1222_5 (COS.sp.1892540) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=1; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[5]* |
| *Comments: FP=1 BUFFER-TIME = EXP=TIME* | | | | | | | | | |
| 7 | G6 1222_6 (COS.sp.1892540) | (6) G6 | COS/FUV, TIME-TAG, PSA | G130M 1222 A | FP-POS=2; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[6]* |
| *Comments: FP=2 BUFFER-TIME = EXP=TIME* | | | | | | | | | |

Orbit Structure




Orbit 4
Server Version: 20240604
GS Reacq
Exp. 5
Unused Orbital Visibility = 12
Occultation
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec
Orbit 5
Server Version: 20240604
GS Reacq
Exp. 6
Unused Orbital Visibility = 12
Occultation
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec
Orbit 6
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 7
Home
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec

## Visit

**Proposal 17541, G7 (07), completed** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: No Diagnostics**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Fixed Targets

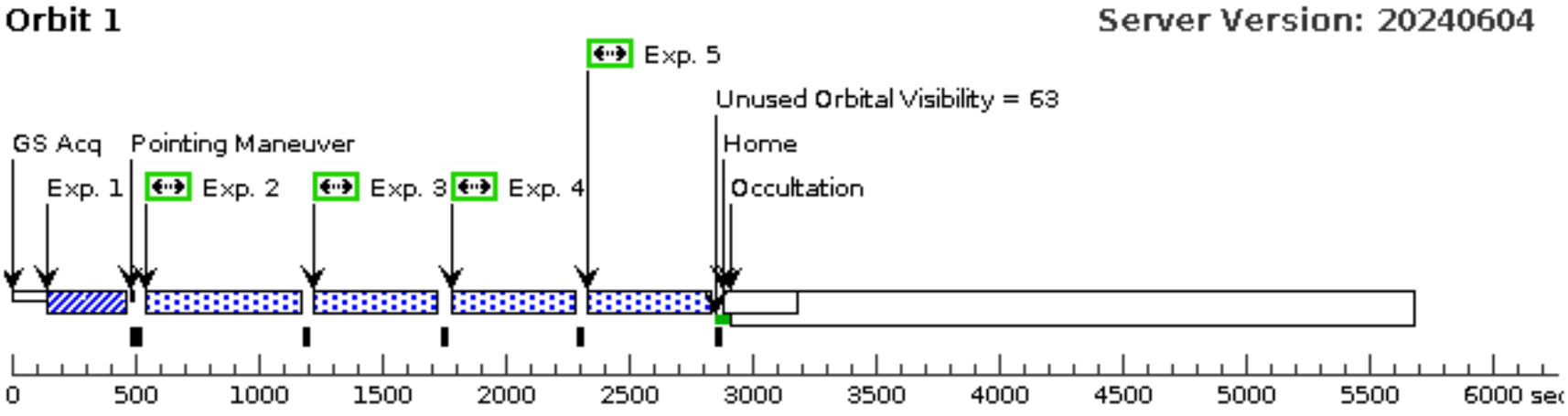
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (7) | G7<br>Alt Name1: J121640.56+071224.2 | RA: 12 16 40.5600 (184.1690000d)<br>Dec: +07 12 24.27 (7.20674d)<br>Equinox: J2000 | | V=16.5<br>FUV(GALEX AB) = 19.84 | Reference Frame: ICRS |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G7 ACQ IMAGE (COS.im.1890929) | (7) G7 | COS/NUV, ACQ/IMAGE, PSA | MIRRORB | | | | 17 Secs (17 Secs)<br>*[==>]* | *[1]* |
| | *Comments: NUV = 17.13 MIRROR A Bright Warnings. Using MIRROR B. SNR=20 in 16.82 sec* | | | | | | | | |
| 2 | G7 1222_1A (COS.sp.1892541) | (7) G7 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=1;<br>FLASH=YES;<br>BUFFER-TIME=6509 | | | 448 Secs (448 Secs)<br>*[==>]* | *[1]* |
| | *Comments: FP=1*<br>*BFT = 9764 BT = (2/3)*BFT = 6509* | | | | | | | | |
| 3 | G7 1222_1B (COS.sp.1892542) | (7) G7 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=2;<br>FLASH=YES;<br>BUFFER-TIME=6509 | | | 449 Secs (449 Secs)<br>*[==>]* | *[1]* |
| | *Comments: FP=2*<br>*BFT = 9764 BT = (2/3)*BFT = 6509* | | | | | | | | |
| 4 | G7 1222_1C (COS.sp.1892541) | (7) G7 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=6509 | | | 448 Secs (448 Secs)<br>*[==>]* | *[1]* |
| | *Comments: FP=3*<br>*BFT = 9764 BT = (2/3)*BFT = 6509* | | | | | | | | |
| 5 | G7 1222_1D (COS.sp.1892542) | (7) G7 | COS/FUV, TIME-TAG, PSA | G130M<br>1222 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=6509 | | | 449 Secs (449 Secs)<br>*[==>]* | *[1]* |
| | *Comments: FP=4*<br>*BFT = 9764 BT = (2/3)*BFT = 6509* | | | | | | | | |

Orbit Structure



## Visit

**Proposal 17541, G8 (08), failed**

Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Diagnostics

(G8 (08)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

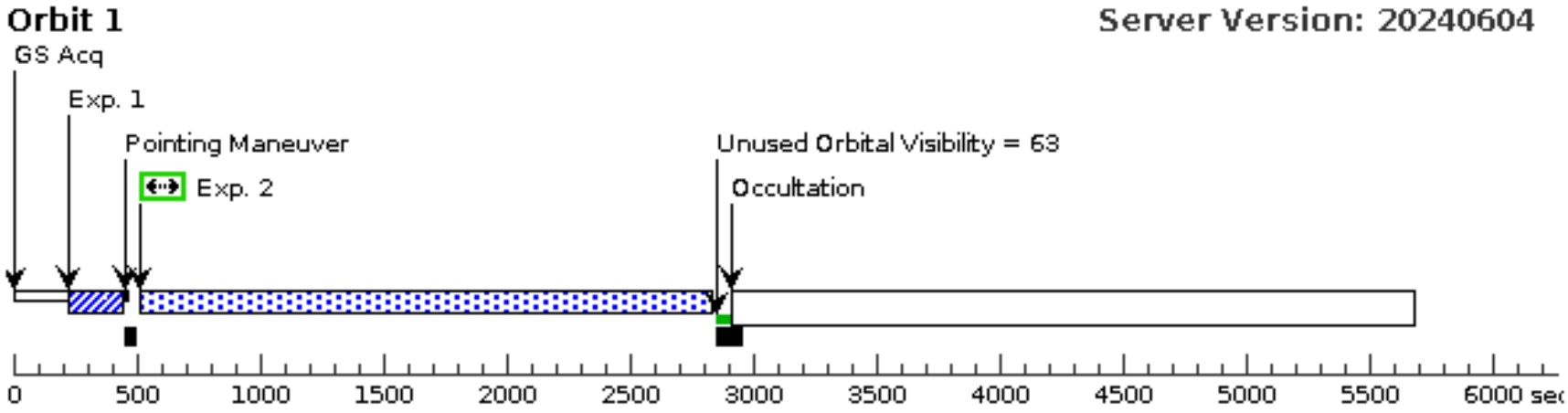
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (8) | G8<br>Alt Name1: J212938.58-063801.8 | RA: 21 29 38.5887 (322.4107863d)<br>Dec: -06 38 1.85 (-6.63385d)<br>Equinox: J2000 | | V=17.82<br>FUV(GALEX AB) = 19.11 | Reference Frame: ICRS |

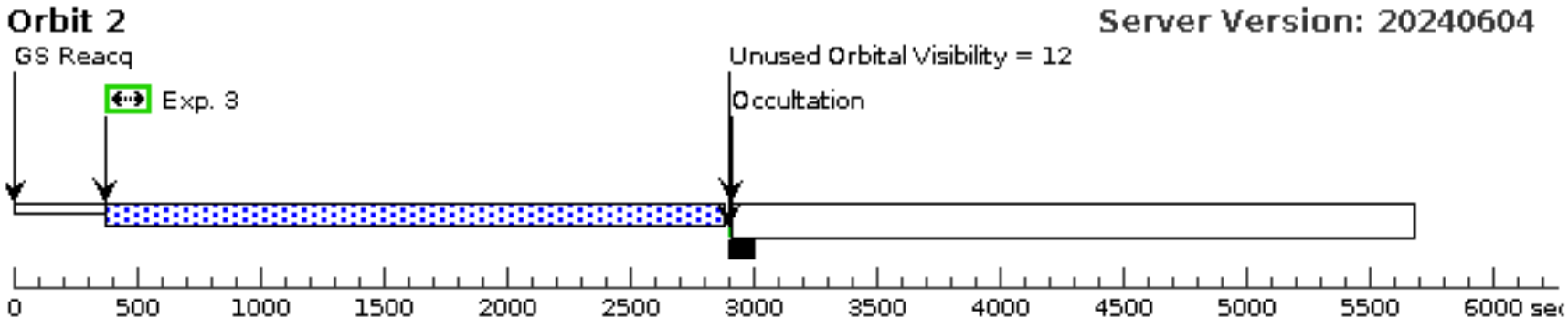
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

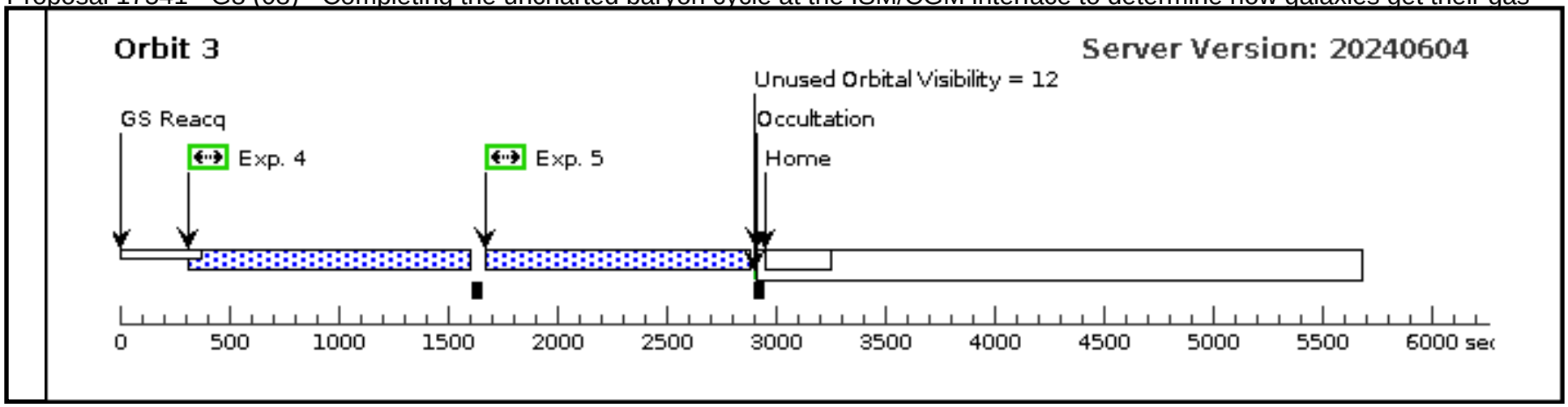
## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G8 ACQ IMAGE (COS.im.1890938) | (8) G8 | COS/NUV, ACQ/IMAGE, PSA | MIRRORA | | | | 3 Secs (3 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 18.4 SNR=20 in 2.69 sec; FP-POS Warning is beacsuse using 3,4 only as allowed* | | | | | | | | | |
| 2 | G8 1291_1 (COS.sp.1892566) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=3; FLASH=YES; BUFFER-TIME=2151 | | | 2151 Secs (2151 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G8 1291_2 (COS.sp.1892567) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=4; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 4 | G8 1291_3A (COS.sp.1892568) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=3; FLASH=YES; BUFFER-TIME=4157 | | | 1171 Secs (1171 Secs)<br>*[==>]* | *[3]* |
| *Comments: FP=3*<br>*BFT = 6235 BT = (2/3)*BFT = 4157* | | | | | | | | | |
| 5 | G8 1291_3B (COS.sp.1892568) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=4; FLASH=YES; BUFFER-TIME=4157 | | | 1162 Secs (1162 Secs)<br>*[==>]* | *[3]* |
| *Comments: FP=4*<br>*BFT = 6235 BT = (2/3)*BFT = 4157* | | | | | | | | | |

Orbit Structure




Orbit 3
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 4
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

## Visit

**Proposal 17541, G8 (58), scheduling** Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: No Diagnostics**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

*Comments: HOPR copy of orbits 1-2 of visit 8*

## Fixed Targets

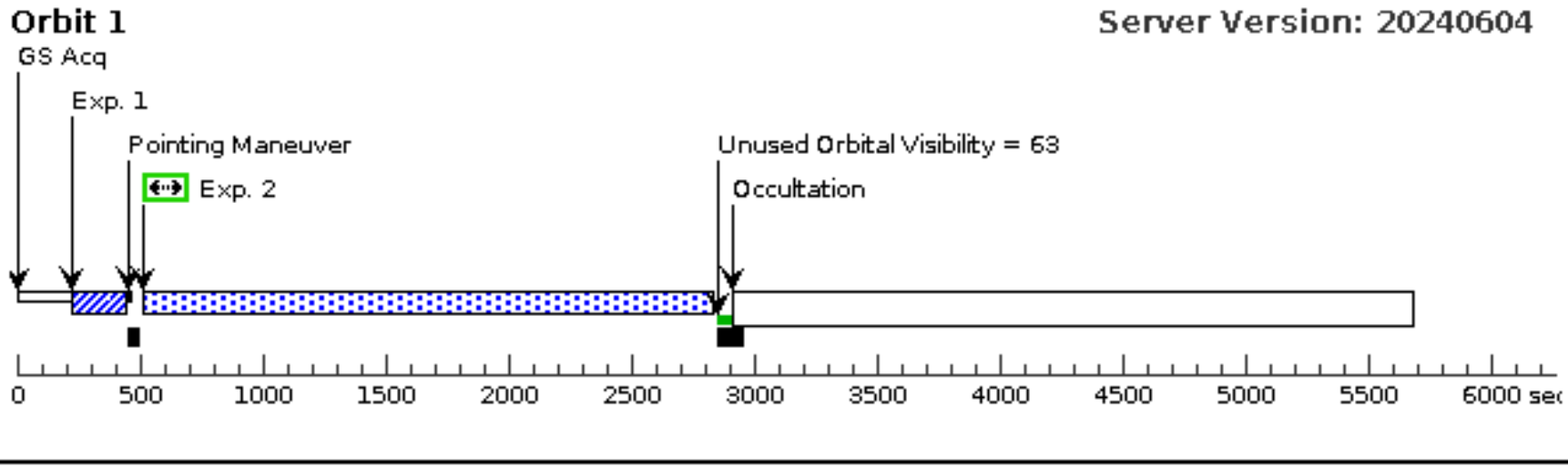
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (8) | G8<br>Alt Name1: J212938.58-063801.8 | RA: 21 29 38.5887 (322.4107863d)<br>Dec: -06 38 1.85 (-6.63385d)<br>Equinox: J2000 | | V=17.82<br>FUV(GALEX AB) = 19.11 | Reference Frame: ICRS |

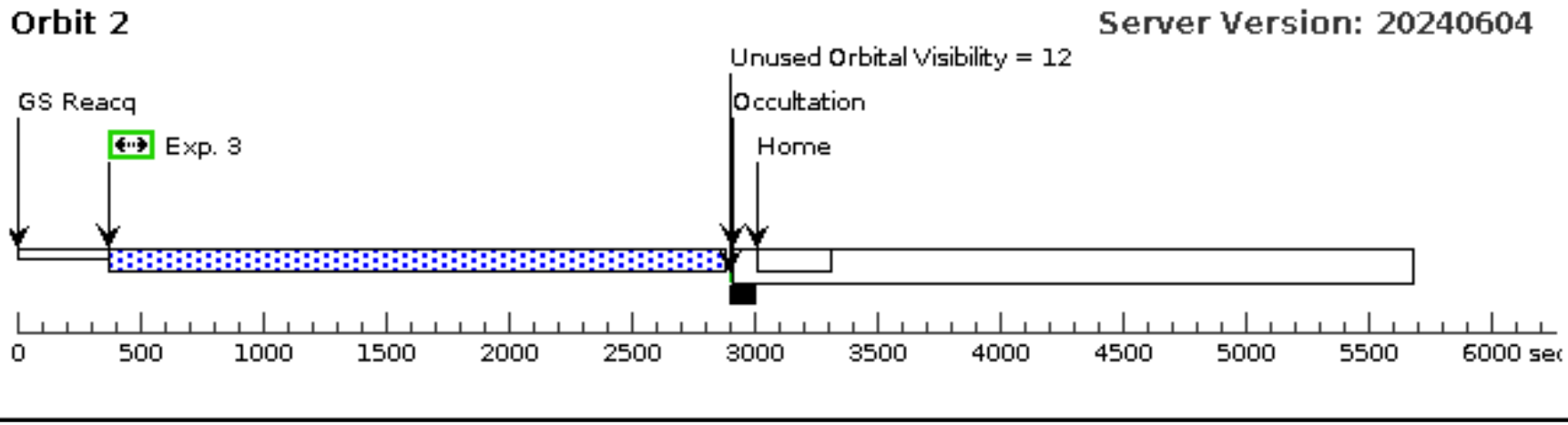
*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G8 ACQ IMAGE (COS.im.1890938) | (8) G8 | COS/NUV, ACQ/IMAGE, PSA | MIRRORA | | | | 3 Secs (3 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 18.4 SNR=20 in 2.69 sec; FP-POS Warning is beacsuse using 3,4 only as allowed* | | | | | | | | | |
| 2 | G8 1291_1 (COS.sp.1892566) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=2151 | | | 2151 Secs (2151 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G8 1291_2 (COS.sp.1892567) | (8) G8 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |

Orbit Structure



## Visit

**Proposal 17541, G9 (09), failed**

Tue Jul 16 19:01:41 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

## Diagnostics

(G9 (09)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

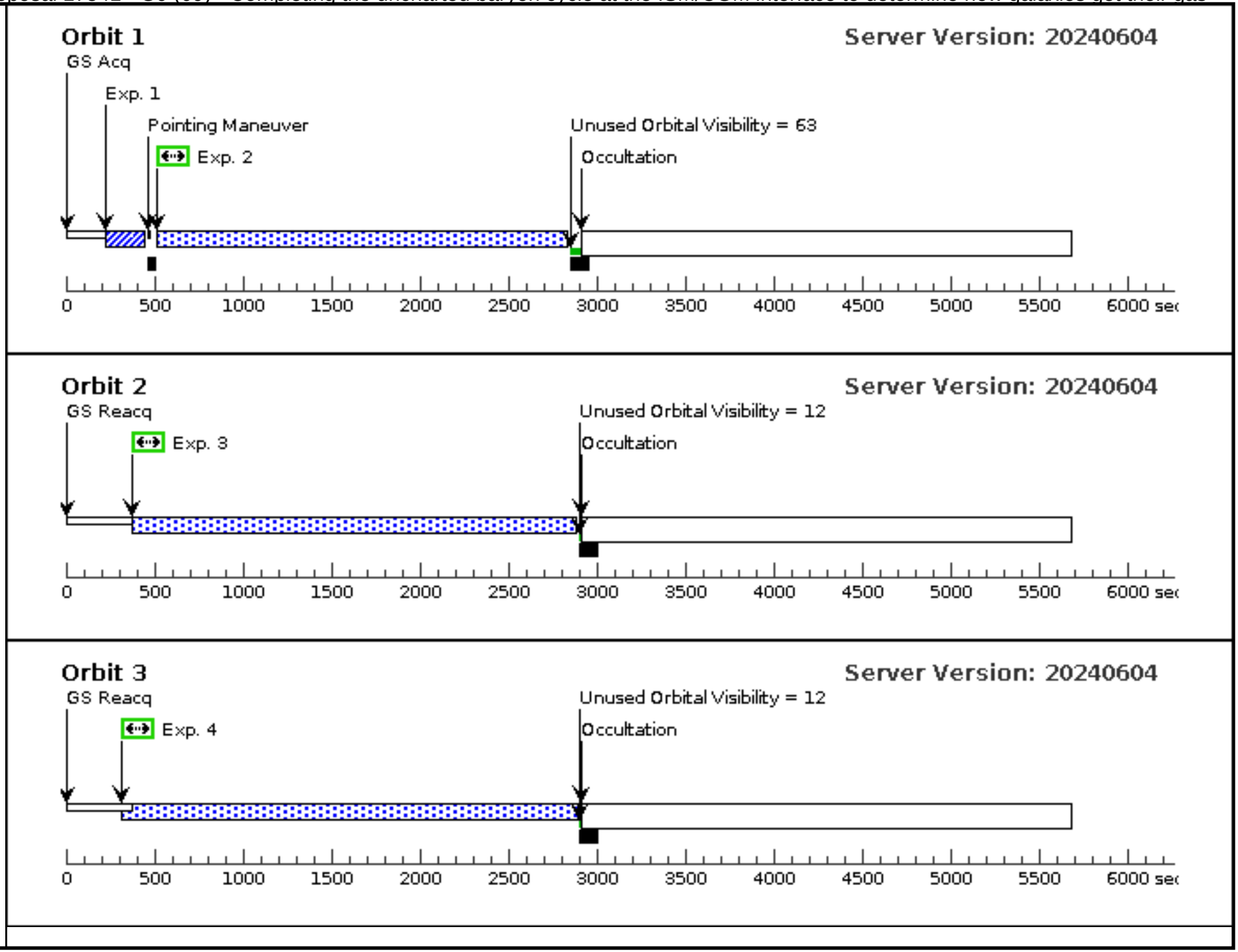
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (9) | G9<br>Alt Name1: J234949.61+003535.3 | RA: 23 49 49.6152 (357.4567300d)<br>Dec: +00 35 35.34 (.59315d)<br>Equinox: J2000 | | V=19.58<br>FUV(GALEX AB) = 19.58 | Reference Frame: ICRS |

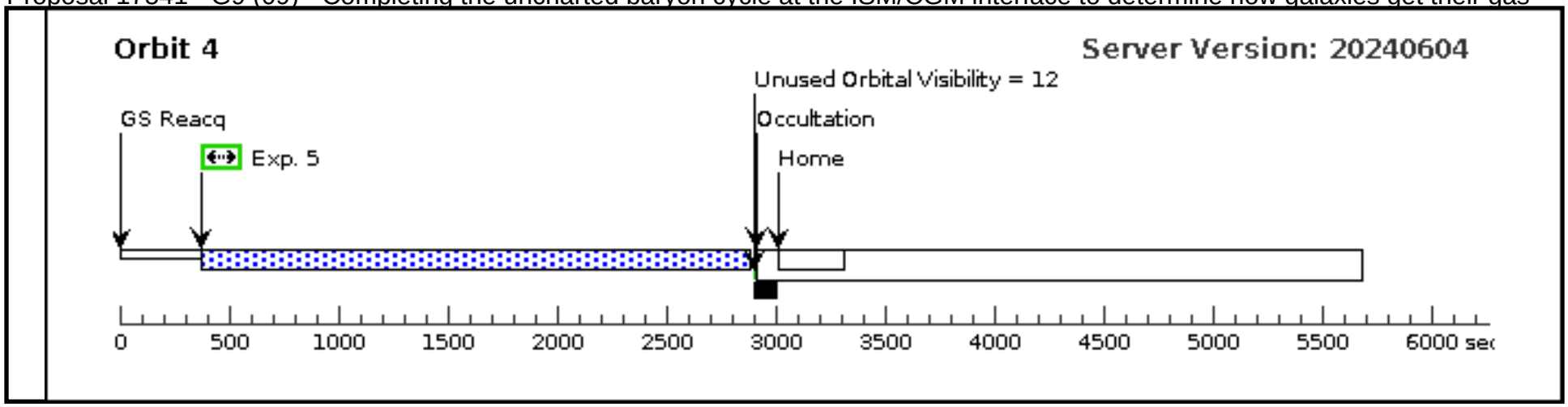
*Comments: This object was generated by the targetselector and retrieved from the NED database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G9 ACQ IMAGE (COS.im.1890945) | (9) G9 | COS/NUV, ACQ/IMAGE, PSA | MIRRORA | | | | 4 Secs (4 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 18.76 SNR=20 in 3.74 sec* | | | | | | | | | |
| 2 | G9 1291_1 (COS.sp.1892569) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=3; FLASH=YES; BUFFER-TIME=2149 | | | 2149 Secs (2149 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G9 1291_2 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=4; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 4 | G9 1291_3 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=3; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[3]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 5 | G9 1291_4 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M 1291 A | FP-POS=4; FLASH=YES; BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[4]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |

Orbit Structure

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Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

## Visit

**Proposal 17541, G9 (59)** Tue Jul 16 19:01:42 GMT 2024

**Diagnostic Status: Warning**

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: PCS MODE FINE; SCHED 100%

*Comments: HOPR repeat of visit 9*

## Diagnostics

(G9 (59)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

## Fixed Targets

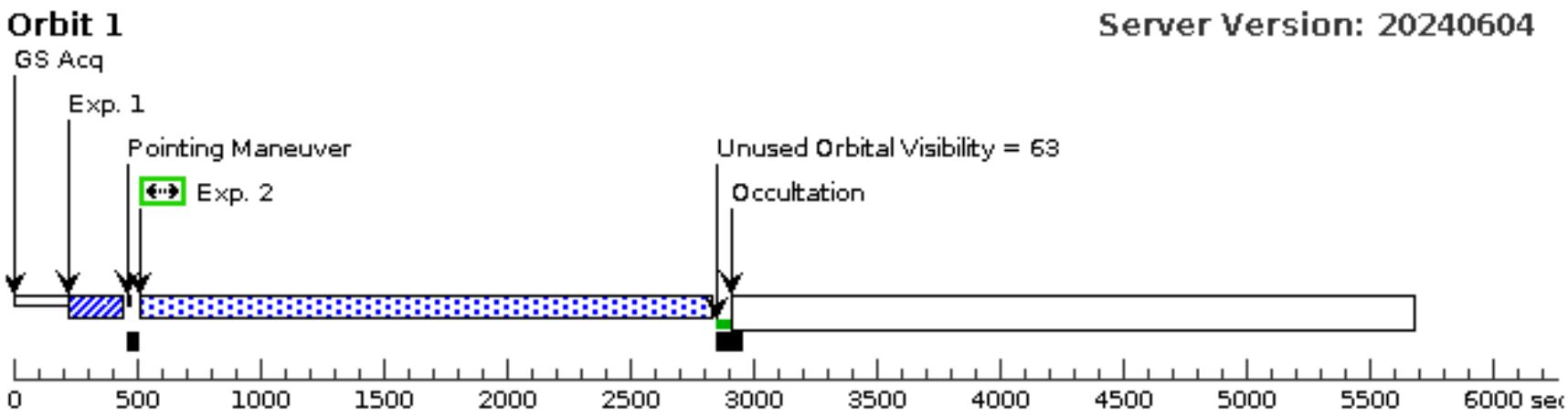
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (9) | G9<br>Alt Name1: J234949.61+003535.3 | RA: 23 49 49.6152 (357.4567300d)<br>Dec: +00 35 35.34 (.59315d)<br>Equinox: J2000 | | V=19.58<br>FUV(GALEX AB) = 19.58 | Reference Frame: ICRS |

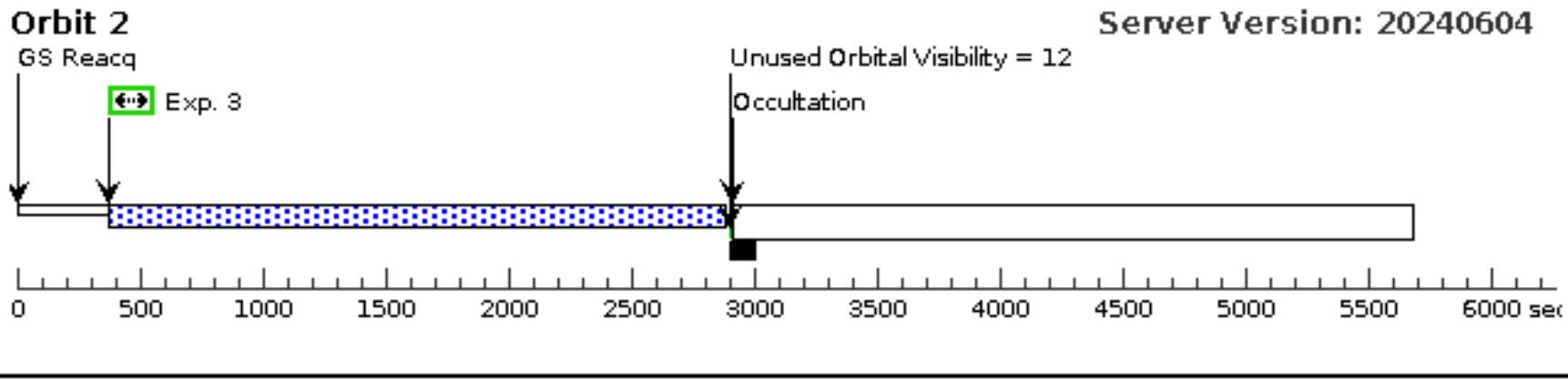
*Comments: This object was generated by the targetselector and retrieved from the NED database.*
*Category=GALAXY*
*Description=[QSO]*
*Extended=NO*

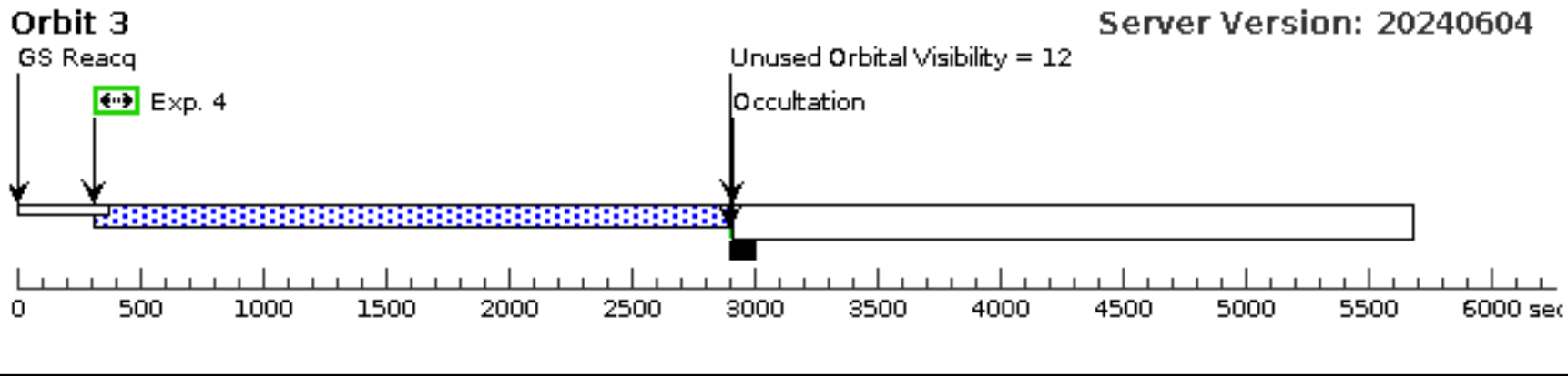
## Exposures

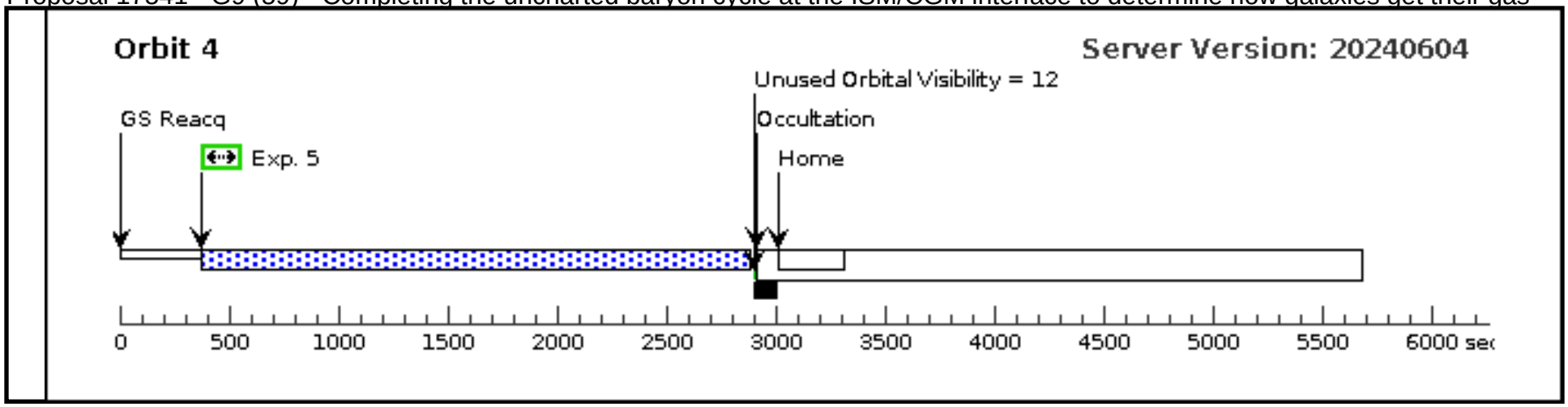
| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G9 ACQ IMAGE (COS.im.1890945) | (9) G9 | COS/NUV, ACQ/IMAGE, PSA | MIRRORA | | | | 4 Secs (4 Secs)<br>*[==>]* | *[1]* |
| *Comments: NUV = 18.76 SNR=20 in 3.74 sec* | | | | | | | | | |
| 2 | G9 1291_1 (COS.sp.1892569) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=2149 | | | 2149 Secs (2149 Secs)<br>*[==>]* | *[1]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 3 | G9 1291_2 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[2]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 4 | G9 1291_3 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=3;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[3]* |
| *Comments: FP=3*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |
| 5 | G9 1291_4 (COS.sp.1892570) | (9) G9 | COS/FUV, TIME-TAG, PSA | G130M<br>1291 A | FP-POS=4;<br>FLASH=YES;<br>BUFFER-TIME=2457 | | | 2457 Secs (2457 Secs)<br>*[==>]* | *[4]* |
| *Comments: FP=4*<br>*BUFFER-TIME = EXP-TIME* | | | | | | | | | |

Orbit Structure




Orbit 4
Server Version: 20240604
Unused Orbital Visibility = 12
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec