



# 14893 - The evolutionary history and accretion geometry of the eclipsing binary CSS1621+4412

Cycle: 24, Proposal Category: GO  
(Availability Mode: AVAILABLE)

## INVESTIGATORS

| <i>Name</i>                                        | <i>Institution</i>               | <i>E-Mail</i>                 |
|----------------------------------------------------|----------------------------------|-------------------------------|
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## 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) CRTSJ1621+4412             | COS/FUV<br>COS/NUV                  | 3                  | 04-Jan-2017 21:04:23.0        | yes                           |
| 03           | (2) CRTSJ1621+4412-SAFE-TARGET | COS/FUV<br>COS/NUV                  | 3                  | 04-Jan-2017 21:04:25.0        | yes                           |
| 02           | (1) CRTSJ1621+4412             | S/C                                 | 1                  | 04-Jan-2017 21:04:25.0        | yes                           |

7 Total Orbits Used

## ABSTRACT

The Catalina Real Time Transient survey recently observed an optical outburst from a binary long thought to be a contact binary, and therefore not expected to display large outbursts. Optical follow-up observations proved it to be a cataclysmic variable, a white dwarf accreting from a K star. However, with an orbital period of 5h, the Roche radius would be too small to contain a main sequence K star, suggesting that the system has undergone nuclear evolution prior to the onset of mass transfer. We apply for COS spectroscopy to measure the temperature of the white dwarf, the average accretion rate of the binary, as well as the chemical composition of the donor star.

## **OBSERVING DESCRIPTION**

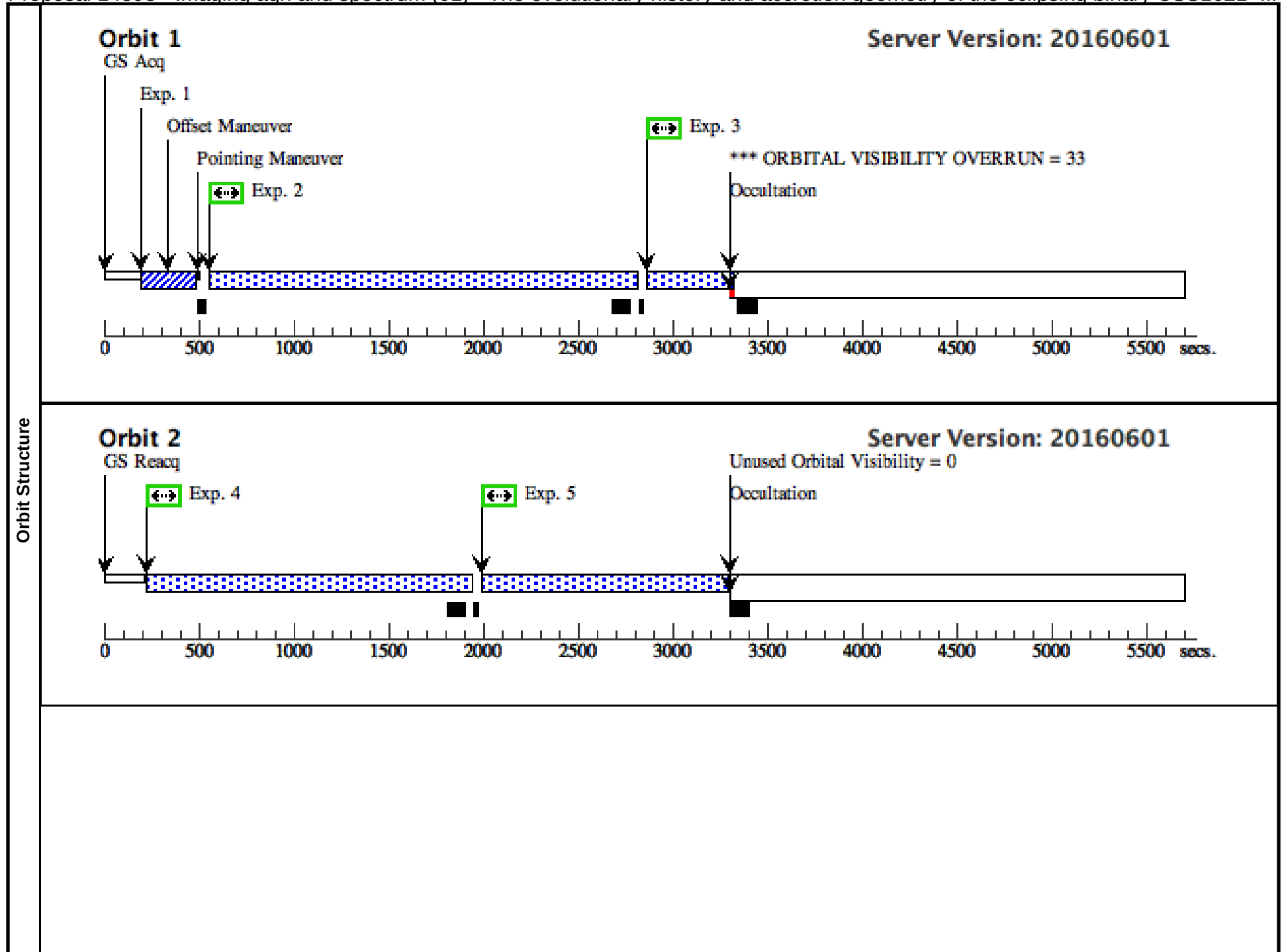
We will use COS/G140L to obtain a UV spectrum of this binary to be able to carry out spectral fitting of the white dwarf to determine its temperature, investigate the emission line ratios (e.g. C/N) as a measure of the evolutionary state of the donor star, i.e. the accretion of CNO-processed material and search for photospheric metal lines from the accretor in the spectrum.

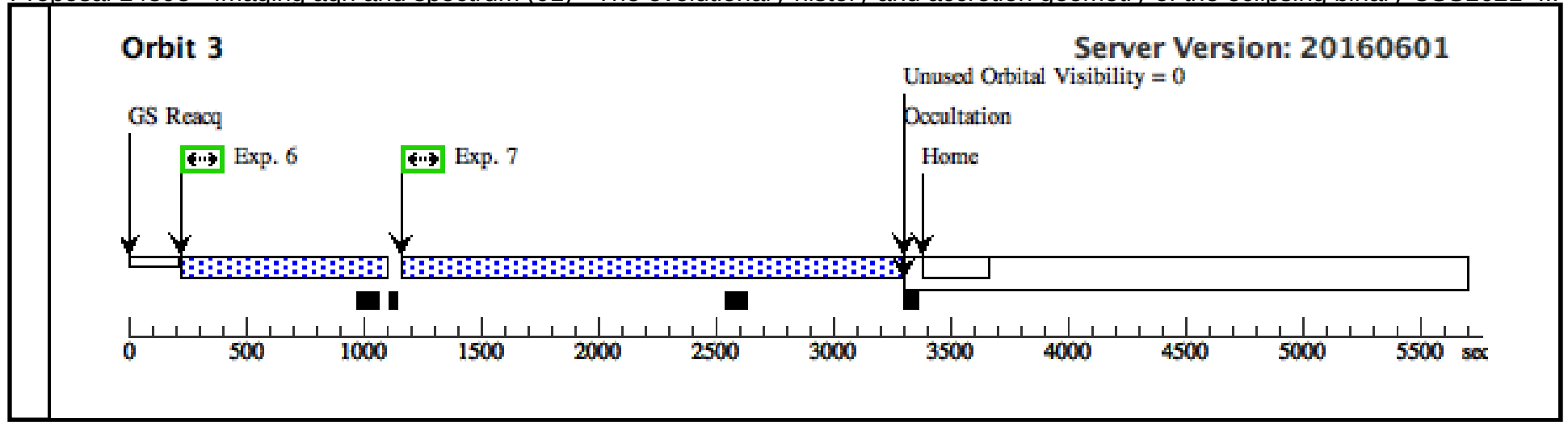
The exposure time in each orbit is adjusted to get the maximum exposure time on each FP-POS.

The binary is eclipsing, so we will use the TIME-TAG mode in case the observations include the eclipse. This is not the primary aim of the observations, so we do not require any special scheduling to observe the eclipse. The orbital period is 5hr, so much longer than the HST orbit.

# Proposal 14893 - Imaging aqn and spectrum (01) - The evolutionary history and accretion geometry of the eclipsing binary CSS1621+...

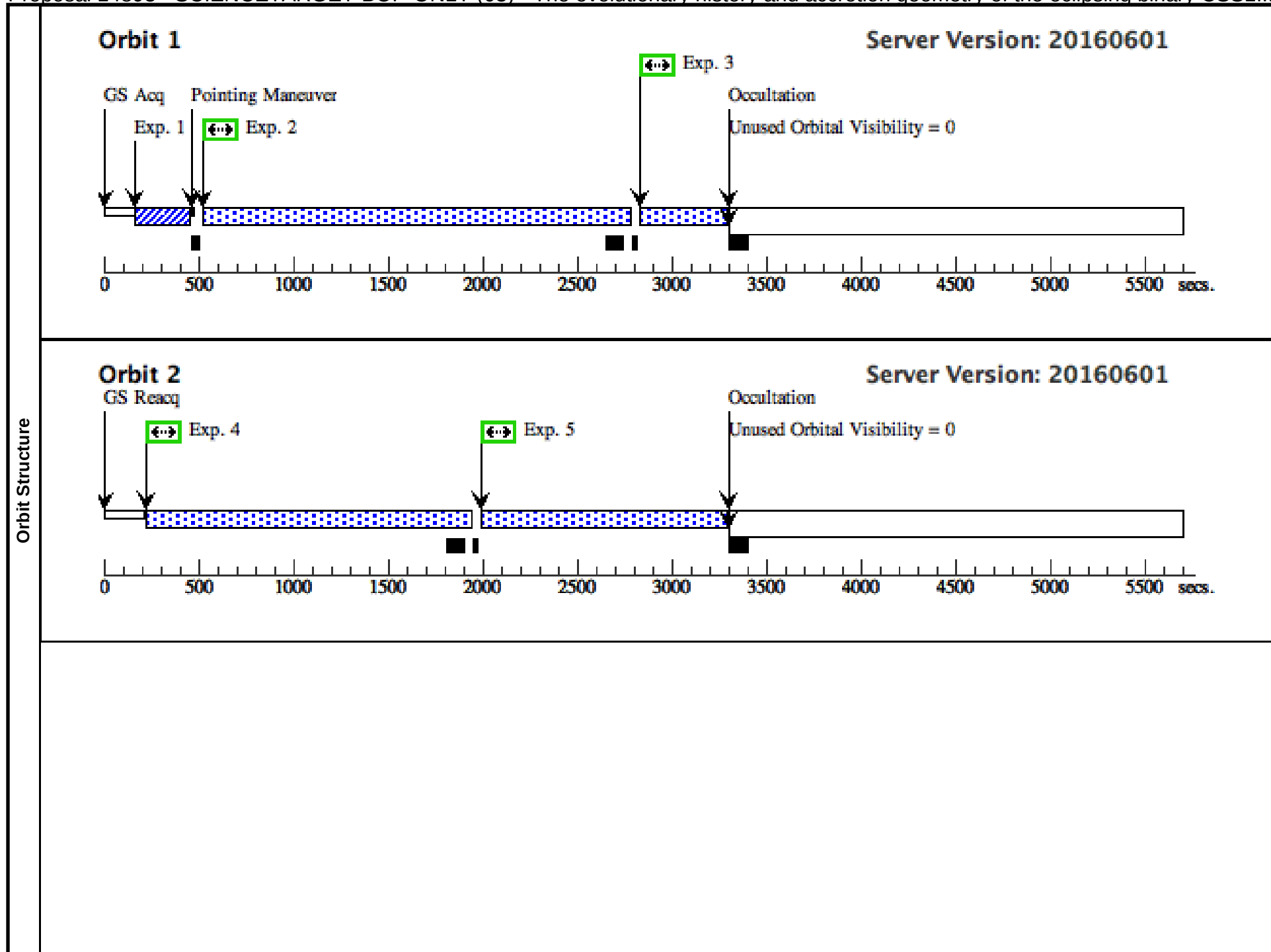
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------|-----------------------|--------|---------------------------------|-------|
| Visit                                                                                                  | Proposal 14893, Imaging aqn and spectrum (01), implementation                                                                                                                                                                                                                                                                                  |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | Thu Jan 05 02:04:26 GMT 2017    |       |
|                                                                                                        | Diagnostic Status: Warning                                                                                                                                                                                                                                                                                                                     |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
|                                                                                                        | Scientific Instruments: COS/FUV, COS/NUV                                                                                                                                                                                                                                                                                                       |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
|                                                                                                        | Special Requirements: ORIENT 250D TO 291 D; AFTER 15-FEB-2017:00:00:00                                                                                                                                                                                                                                                                         |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
|                                                                                                        | Comments: Changes in this version: (1) updated acquisition exposure time (2) adjusted exposure times to get equal exposures on the four FP-POS positions (3) slight restriction of the scheduling window to allow us to monitor the target from the ground in the run-up to the HST observations (HST observations to occur after 15-Feb-2017) |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
| I am also applying for a Swift UVOT TOO to confirm the UV brightness and check for any UV variability. |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
| This should be scheduled in evening local time. Flags need to be cleared during the work day.          |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
| Diagnostics                                                                                            | (Imaging aqn and spectrum (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN                                                                                                                                                                                                                                                            |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
| Fixed Targets                                                                                          | #                                                                                                                                                                                                                                                                                                                                              | Name                           | Target Coordinates                                                                  | Targ. Coord.                                                                             | Corrections     | Fluxes                                                                   | Miscellaneous         |        |                                 |       |
|                                                                                                        | (1)                                                                                                                                                                                                                                                                                                                                            | CRTSJ1621+4412                 | RA: 16 21 17.3580 (245.3223250d)<br>Dec: +44 12 54.15 (44.21504d)<br>Equinox: J2000 | Proper Motion RA: 7 mas/yr<br>Proper Motion Dec: -15.6 mas/yr<br>Epoch of Position: 2000 |                 | V=15.8+/-0.5<br>GALEX FUV = 20.13 +/- 0.18<br>GALEX NUV = 19.65 +/- 0.10 | Reference Frame: ICRS |        |                                 |       |
| Comments: Extended=NO                                                                                  |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        |                                 |       |
| Exposures                                                                                              | #                                                                                                                                                                                                                                                                                                                                              | Label (ETC Run)                | Target                                                                              | Config,Mode,Aperture                                                                     | Spectral Els.   | Opt. Params.                                                             | Special Reqs.         | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|                                                                                                        | 1                                                                                                                                                                                                                                                                                                                                              | Acquisition (COS.ta.848 2 980) | (1) CRTSJ1621+441                                                                   | COS/NUV, ACQ/IMAGE, PSA                                                                  | MIRRORA         |                                                                          | USE OFFSET V02S AF    |        | 30 Secs (30 Secs)               |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [1]   |
|                                                                                                        | 2                                                                                                                                                                                                                                                                                                                                              | FP-POS=1 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=19 65;<br>FP-POS=1                                           | USE OFFSET V02S AF    |        | 2075 Secs (2075 Secs)           |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [1]   |
|                                                                                                        | 3                                                                                                                                                                                                                                                                                                                                              | FP-POS=2 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=40 8;<br>FP-POS=2                                            | USE OFFSET V02S AF    |        | 408 Secs (408 Secs)             |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [1]   |
|                                                                                                        | 4                                                                                                                                                                                                                                                                                                                                              | FP-POS=2 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=15 57;<br>FP-POS=2                                           | USE OFFSET V02S AF    |        | 1667 Secs (1667 Secs)           |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [2]   |
|                                                                                                        | 5                                                                                                                                                                                                                                                                                                                                              | FP-POS=3 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=12 49;<br>FP-POS=3                                           | USE OFFSET V02S AF    |        | 1249 Secs (1249 Secs)           |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [2]   |
|                                                                                                        | 6                                                                                                                                                                                                                                                                                                                                              | FP-POS=3 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=72 1;<br>FP-POS=3                                            | USE OFFSET V02S AF    |        | 831 Secs (831 Secs)             |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [3]   |
|                                                                                                        | 7                                                                                                                                                                                                                                                                                                                                              | FP-POS=4 (COS.sp.848 2 395)    | (1) CRTSJ1621+441                                                                   | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A | BUFFER-TIME=13 48;<br>FP-POS=4                                           | USE OFFSET V02S AF    |        | 2075 Secs (2075 Secs)           |       |
|                                                                                                        |                                                                                                                                                                                                                                                                                                                                                |                                |                                                                                     |                                                                                          |                 |                                                                          |                       |        | [==>]                           | [3]   |

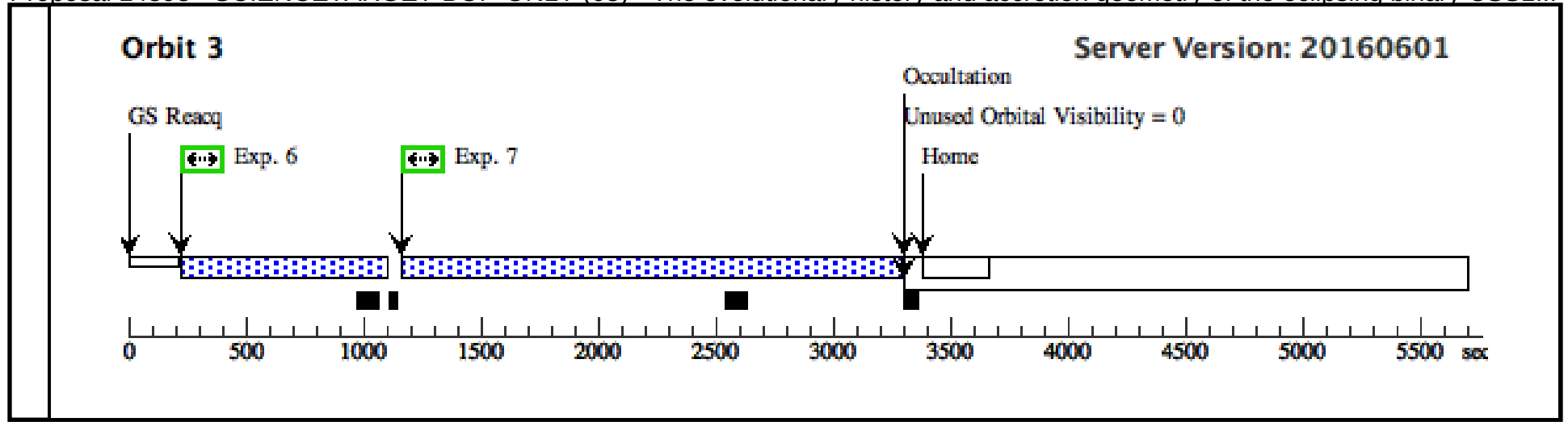




# Proposal 14893 - SCIENCETARGET-BOP-ONLY (03) - The evolutionary history and accretion geometry of the eclipsing binary CSS1...

|                                                                                                                                                                          |                                                                                                   |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------|---------------|--------|---------------------------------|-------|
| Visit                                                                                                                                                                    | Proposal 14893, SCIENCETARGET-BOP-ONLY (03), implementation                                       |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        | Thu Jan 05 02:04:26 GMT 2017    |       |
|                                                                                                                                                                          | Diagnostic Status: No Diagnostics                                                                 |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
|                                                                                                                                                                          | Scientific Instruments: COS/FUV, COS/NUV                                                          |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
|                                                                                                                                                                          | Special Requirements: ORIENT 250D TO 291 D; AFTER 15-FEB-2017:00:00:00; ON HOLD                   |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
|                                                                                                                                                                          | Comments: This visit is for BOP checking the safe target only and should not execute onboard HST. |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
| On Hold Comments: This visit will not execute as it is for BOP checking the safe target. This visit will be withdrawn after the science visit is placed on the calendar. |                                                                                                   |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
| Fixed Targets                                                                                                                                                            | #                                                                                                 | Name                         | Target Coordinates                                                                  | Targ. Coord. Corrections                                                                 | Fluxes                                                                   | Miscellaneous                                |               |        |                                 |       |
|                                                                                                                                                                          | (1)                                                                                               | CRTSJ1621+4412               | RA: 16 21 17.3580 (245.3223250d)<br>Dec: +44 12 54.15 (44.21504d)<br>Equinox: J2000 | Proper Motion RA: 7 mas/yr<br>Proper Motion Dec: -15.6 mas/yr<br>Epoch of Position: 2000 | V=15.8+/-0.5<br>GALEX FUV = 20.13 +/- 0.18<br>GALEX NUV = 19.65 +/- 0.10 | Reference Frame: ICRS                        |               |        |                                 |       |
|                                                                                                                                                                          | Comments: Extended=NO                                                                             |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
|                                                                                                                                                                          | (2)                                                                                               | CRTSJ1621+4412-SAFE-TARGET   | Offset from CRTSJ1621+4412<br>RA Offset: 0.82 Secs<br>Dec Offset: 4.302 Arcsec      |                                                                                          | V=15.8+/-0.5                                                             | Offset Position (CRTSJ1621+4412-SAFE-TARGET) |               |        |                                 |       |
| Comments: This target is a blank piece of sky, which is the bright object safe pointing and is 9.81" away at a PA 64.0 degs from CRTSJ1621+4412.                         |                                                                                                   |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
| Extended=NO                                                                                                                                                              |                                                                                                   |                              |                                                                                     |                                                                                          |                                                                          |                                              |               |        |                                 |       |
| Exposures                                                                                                                                                                | #                                                                                                 | Label (ETC Run)              | Target                                                                              | Config,Mode,Aperture                                                                     | Spectral Els.                                                            | Opt. Params.                                 | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|                                                                                                                                                                          | 1                                                                                                 | Acquisition (COS.ta.848 980) | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/NUV, ACQ/IMAGE, PSA                                                                  | MIRRORA                                                                  |                                              |               |        | 30 Secs (30 Secs)<br>[==>]      | [1]   |
|                                                                                                                                                                          | 2                                                                                                 | FP-POS=1 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=19 65;<br>FP-POS=1               |               |        | 2075 Secs (2075 Secs)<br>[==>]  | [1]   |
|                                                                                                                                                                          | 3                                                                                                 | FP-POS=2 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=40 8;<br>FP-POS=2                |               |        | 408 Secs (408 Secs)<br>[==>]    | [1]   |
|                                                                                                                                                                          | 4                                                                                                 | FP-POS=2 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=15 57;<br>FP-POS=2               |               |        | 1667 Secs (1667 Secs)<br>[==>]  | [2]   |
|                                                                                                                                                                          | 5                                                                                                 | FP-POS=3 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=12 49;<br>FP-POS=3               |               |        | 1249 Secs (1249 Secs)<br>[==>]  | [2]   |
|                                                                                                                                                                          | 6                                                                                                 | FP-POS=3 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=72 1;<br>FP-POS=3                |               |        | 831 Secs (831 Secs)<br>[==>]    | [3]   |
|                                                                                                                                                                          | 7                                                                                                 | FP-POS=4 (COS.sp.848 395)    | (2) CRTSJ1621+441 2-SAFE-TARGET                                                     | COS/FUV, TIME-TAG, PSA                                                                   | G140L<br>1105 A                                                          | BUFFER-TIME=13 48;<br>FP-POS=4               |               |        | 2075 Secs (2075 Secs)<br>[==>]  | [3]   |





# Proposal 14893 - S/C (02) - The evolutionary history and accretion geometry of the eclipsing binary CSS1621+4412

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                                                                                     |                                                                                          |                                                                          |                              |                                                                                                                                                               |        |                                 |       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------------------|-------|
| Visit                 | Proposal 14893, S/C (02), implementation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                                                                                     |                                                                                          |                                                                          | Thu Jan 05 02:04:26 GMT 2017 |                                                                                                                                                               |        |                                 |       |
|                       | Diagnostic Status: No Diagnostics<br>Scientific Instruments: S/C<br>Special Requirements: ORIENT 250D TO 291 D<br><br>Comments: This visit allocates and sets up the safe position offset slot for visit 01 (labeled: Imaging aqn and spectrum), which will use that slot. This S/C visit should go earlier in the week while visit 01 (labeled: Imaging aqn and spectrum) will be at least 3 days later. The S/C visit will contain only 1 exposure. NOTE: Weekends are to be avoided since the CS must clear the target within 24 hours of HST execution. |                |                                                                                     |                                                                                          |                                                                          |                              |                                                                                                                                                               |        |                                 |       |
| Fixed Targets         | #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Name           | Target Coordinates                                                                  | Targ. Coord. Corrections                                                                 | Fluxes                                                                   | Miscellaneous                |                                                                                                                                                               |        |                                 |       |
|                       | (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CRTSJ1621+4412 | RA: 16 21 17.3580 (245.3223250d)<br>Dec: +44 12 54.15 (44.21504d)<br>Equinox: J2000 | Proper Motion RA: 7 mas/yr<br>Proper Motion Dec: -15.6 mas/yr<br>Epoch of Position: 2000 | V=15.8+/-0.5<br>GALEX FUV = 20.13 +/- 0.18<br>GALEX NUV = 19.65 +/- 0.10 | Reference Frame: ICRS        |                                                                                                                                                               |        |                                 |       |
| Comments: Extended=NO |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                                                                                     |                                                                                          |                                                                          |                              |                                                                                                                                                               |        |                                 |       |
| Exposures             | #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Label          | Target                                                                              | Config,Mode,Aperture                                                                     | Spectral Els.                                                            | Opt. Params.                 | Special Reqs.                                                                                                                                                 | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                | (1) CRTSJ1621+441<br>2                                                              | S/C, DATA, V1                                                                            |                                                                          |                              | POS TARG 232.723<br>00000,-237.5150000<br>0;<br>SAVE OFFSET V02<br>SAF;<br>SPEC COM INSTR<br>ECSLOTSET;<br>QESIPARM ANGL<br>E 64.0;<br>QESIPARM DIST 9.<br>81 |        | 5 Secs (5 Secs)<br>[==>]        | [1]   |
| Orbit Structure       | <div>Orbit 1<div>Server Version: 20160601</div><div><div><div>GS Acq</div><div>Unused Orbital Visibility = 2969</div><div>Exp. 1</div></div><div>Occultation</div><div><div></div><div></div></div><div><div>0</div><div>500</div><div>1000</div><div>1500</div><div>2000</div><div>2500</div><div>3000</div><div>3500</div><div>4000</div><div>4500</div><div>5000</div><div>5500</div><div>sec</div></div></div></div>                                                                                                                                    |                |                                                                                     |                                                                                          |                                                                          |                              |                                                                                                                                                               |        |                                 |       |