



14218 - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

Cycle: 23, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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|--|--|---|
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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) KEPLER-51 | WFC3/IR | 8 | 09-Jan-2017 21:02:23.0 | yes |
| 02 | (1) KEPLER-51 | WFC3/IR | 8 | 09-Jan-2017 21:04:15.0 | yes |
| 03 | (1) KEPLER-51 | WFC3/IR | 12 | 09-Jan-2017 21:07:01.0 | yes |
| 04 | (1) KEPLER-51 | WFC3/IR | 12 | 09-Jan-2017 21:10:17.0 | yes |

40 Total Orbits Used

ABSTRACT

Our Solar System hosts no planets with masses between Earth and Uranus, yet such planets abound throughout the Galaxy. Many of these low-mass exoplanets are also low-density, requiring gas-rich envelopes to explain their large sizes. We propose to use WFC3/IR to observe transmission spectra for two planets at the extreme low-density limit of this population: Kepler-51b and Kepler-51d. Despite being less massive than 10 Earth masses, the Kepler-51 planets are almost as big as gas giants. They are 500 Myr old and probably still thermally contracting. Kepler-51 offers the opportunity to observe an early snapshot in the evolutionary histories of two low-mass planets formed from the same protoplanetary disk. These planets have low surface gravities and large atmospheric scale heights, and their atmospheres are easier to observe than any other multiple transiting planet system. Transmission spectra of the Kepler-51 planets will probe chemistry and cloud formation in warm H/He atmospheres, through comparisons both between the two coeval planets and against other exoplanets observed with WFC3. If Kepler-51b and Kepler-51d are not too cloudy, these observations could provide the first detections of molecules (including water, methane, and ammonia) in the atmospheres of exoplanets less massive than Uranus. If we find clouds on neither, either, or both planets, we will push our understanding of cloud processes into unexplored temperature and circulation regimes. Our proposed observations of these two young planets will shed new empirical light on the origins, properties, and evolution of low-mass, low-density exoplanets.

OBSERVING DESCRIPTION

We will use WFC3/IR to gather multiwavelength transit light curves of the exoplanets Kepler-51b and Kepler-51d.

We will use the G141 grism, providing 1.1-1.7 micron wavelength coverage. Visits for Kepler-51b and d will require 8 and 12 HST orbits at times of predicted transits. Each visit includes equal orbits in and out of transit, one orbit for post-slew spacecraft settling, and one extra orbit for Kepler-51d to account for uncertainty in its times of transit. We will take direct images for wavelength calibration at the start of each visit and devote the rest of the visit to gathering high cadence spectra.

At the start of each visit, we will gather direct images in the F140W filter. The ETC (using the same settings as above) lists a time to saturation of 3.79 seconds F140W. Observing in SAMP-SEQ=SPARS5, NSAMP=15, the second sample will be collected before saturation (at 2.6 seconds). The target star will be saturated in subsequent samples, but the deeper imaging will permit the search for fainter nearby companions or background stars. For the sake of this search, we will perform a three-point dither to sample the PSF.

The star Kepler-51 is fainter ($J=13.56$) than typical exoplanet targets, but the signal we aim to detect is much larger. At this brightness, photon noise is likely to dominate over WFC3 systematics in setting the error budget, which is a desirable situation because photon noise is easier to model. The WFC3 Exposure Time Calculator (ETC), using a Pickles G0V spectrum normalized to Kepler-51's J magnitude, predicts the time to saturation to be 249.85 seconds. We will observe with the 256x256 subarray in the SAMP-SEQ=SPARS10, NSAMP=15 readout setting, for an effective exposure time of 103.129 seconds, during which time flux would accumulate to 41% of the full-well. No serial buffer dumps are required within the orbit and the fraction of time WFC3 spends recording photons is 85%.

Observations *must be* completed at predicted times of transit and as continuous visits (of duration either 8 or 12 hours). In APT we used the default SAA contours. If it proves impossible to schedule such long visits subject to the SAA restrictions, we could use less restrictive contours and observe through the SAA -- if it comes to this, we ask that we be allowed to adjust our exposure timing and strategy, to optimize the balance between collecting photons and mitigating the noise penalty from cosmic rays and their persistence artifacts.

We will not use the spatial scan mode, because it would degrade the duty cycle and signal-to-noise for our faint target. Within each visit, our goal is to keep the 1st-order spectrum in as close as possible to the same place on the detector.

We use dynamical transit timing variation models to predict the upcoming transits. Two Co-Is (Fabrycky and Deck) performed independent analyses. Their predictions agreed to better than 8 minutes for both planets, through December 2017. To ease scheduling, we fit a linear ephemeris model to the timing predictions made for dates between 2015-07-23 and 2017-12-31 (using Co-I Deck's times). If the visits are not executed before December 2017, the ephemeris estimates should be updated.

For Kepler-51b, the best linear fit to 20 transit opportunities yields average mid-transit times of $T = 2454992.10846 + 45.1553409296 * E$, where E is an integer. Including both offsets in the mean values due to this approximation (up to 9 minutes) and the 2sigma uncertainties in the individual predictions, the linear model is good to better than 13 minutes until December 2017.

For Kepler-51d, the best linear fit to 7 transit opportunities yields average mid-transit times of $2455044.92184 + 130.183016154 * E$, where E is an integer. Including both offsets due to the linear approximation (up to 6 minutes, relatively small because the roughly sinusoidal TTV model is quite linear over this 1.5 year time span) and the 2sigma uncertainties on the individual predictions (which are larger than for b), the linear model is good to 56 minutes until December 2017. We have an extra orbit budgeted for our Kepler-51d transits to account for this uncertainty.

We aim to center the visibility windows of the $[(N+1)/2]$ th orbit on the mid-transit time prediction, where N is either 8 or 12 for the two planets. Therefore, we set the center of the PHASE constraints of the first exposure of each visit to be $1/4$ of an orbit before $(N+1)/2$ orbits before mid-transit (assuming a 96.0 minute orbit.) We set the range of the phase constraint starting 48.0 minutes before this time and ending 48.0 minutes after this time.

Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

Tue Jan 10 02:10:24 GMT 2017

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|--|--|--|---|---------------------------------|---|-------------------------|
| Visit | Proposal 14218, Kepler 51-b Visit 1 (01), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SCHED 100%; ORIENT 260D TO 50 D; ORIENT 80D TO 230 D; Period 45.155340929 D AND ZERO-PHASE HJD2454992.10846 | | | | | |
| | Patterns | # | Primary Pattern | Secondary Pattern | Exposures | |
| | (1) | Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing= | Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false | | (1) | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
| | (1) | KEPLER-51 | RA: 19 45 55.1460 (296.4797750d) Dec: +49 56 15.66 (49.93768d) Equinox: J2000 | | V=(?) J = 13.562, H=13.291, K = 13.197 | Reference Frame: SIMBAD |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> | | | | | | |

Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|--------------------|---------------|-------------------------------|---------------|-------------------------------|--------------------------------------|---|--------------------------------------|-------|
| 1 | F140W direct | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | F140W | SAMP-SEQ=SPARS5; NSAMP=15 | PHASE 0.99224898988 TO 0.99372537276 | Pattern 1, Exps 1-1 in Kepler 51-b Visit 1 (01) (1) | 33.16592 Secs (99.498 Secs) | |
| | | | | | | | | [==>(Pattern 1)] | [1] |
| 2 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPARS10 | | | 103.128633 Secs X 19 (1959.444 Secs) | |
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| | | | | | | | | [==>(Copy 18)] | |
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Exposures

Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 3 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [2] |
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Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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| 4 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [3] |
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Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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| 5 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [4] |
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Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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| 6 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [5] |
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Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

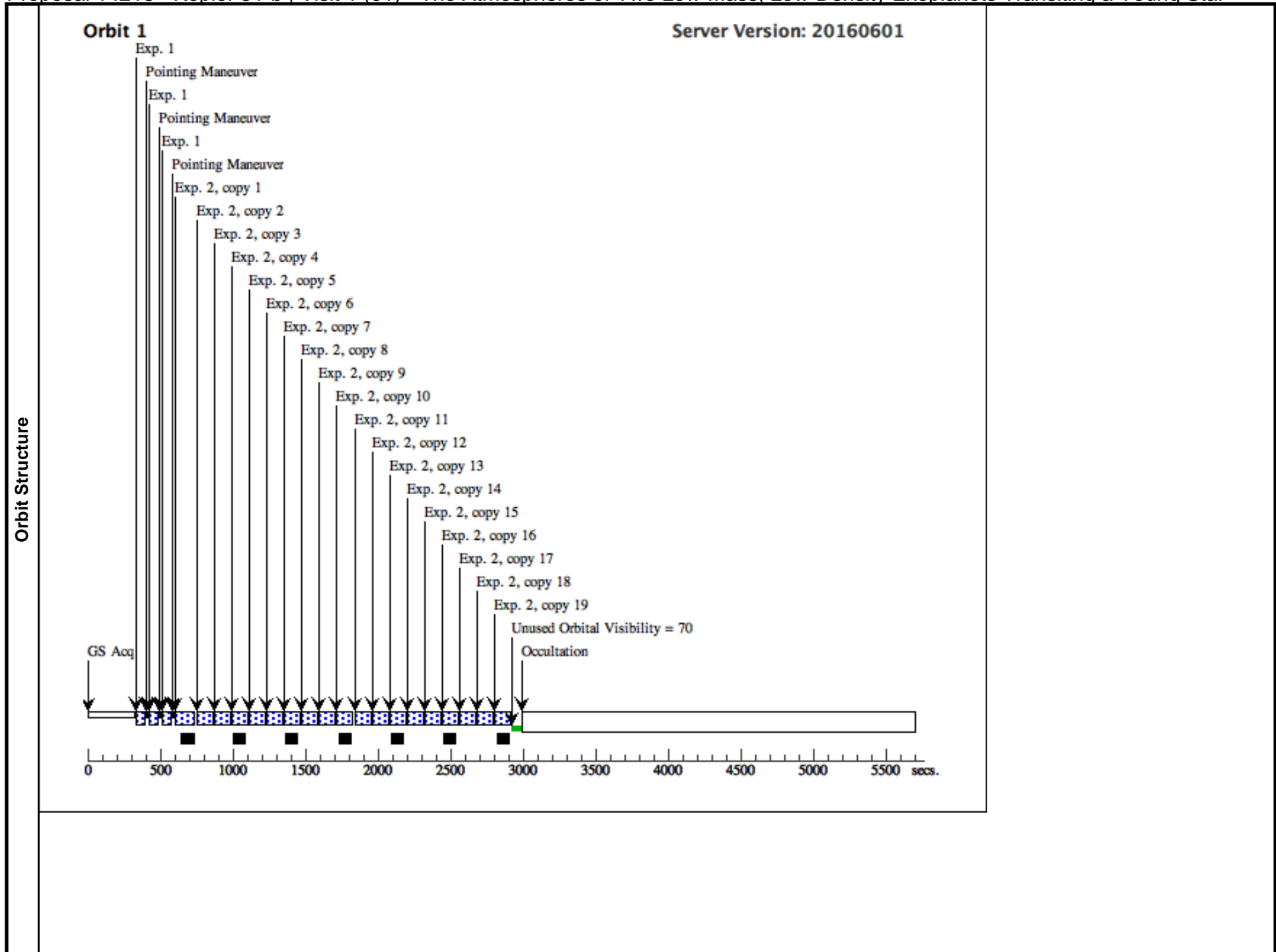
| | | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|-------------------------------------|---|-----|
| 7 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) | <i>[==>(Copy 1)]</i> <i>[==>(Copy 2)]</i> <i>[==>(Copy 3)]</i> <i>[==>(Copy 4)]</i> <i>[==>(Copy 5)]</i> <i>[==>(Copy 6)]</i> <i>[==>(Copy 7)]</i> <i>[==>(Copy 8)]</i> <i>[==>(Copy 9)]</i> <i>[==>(Copy 10)]</i> <i>[==>(Copy 11)]</i> <i>[==>(Copy 12)]</i> <i>[==>(Copy 13)]</i> <i>[==>(Copy 14)]</i> <i>[==>(Copy 15)]</i> <i>[==>(Copy 16)]</i> <i>[==>(Copy 17)]</i> <i>[==>(Copy 18)]</i> <i>[==>(Copy 19)]</i> <i>[==>(Copy 20)]</i> <i>[==>(Copy 21)]</i> <i>[==>(Copy 22)]</i> | [6] |
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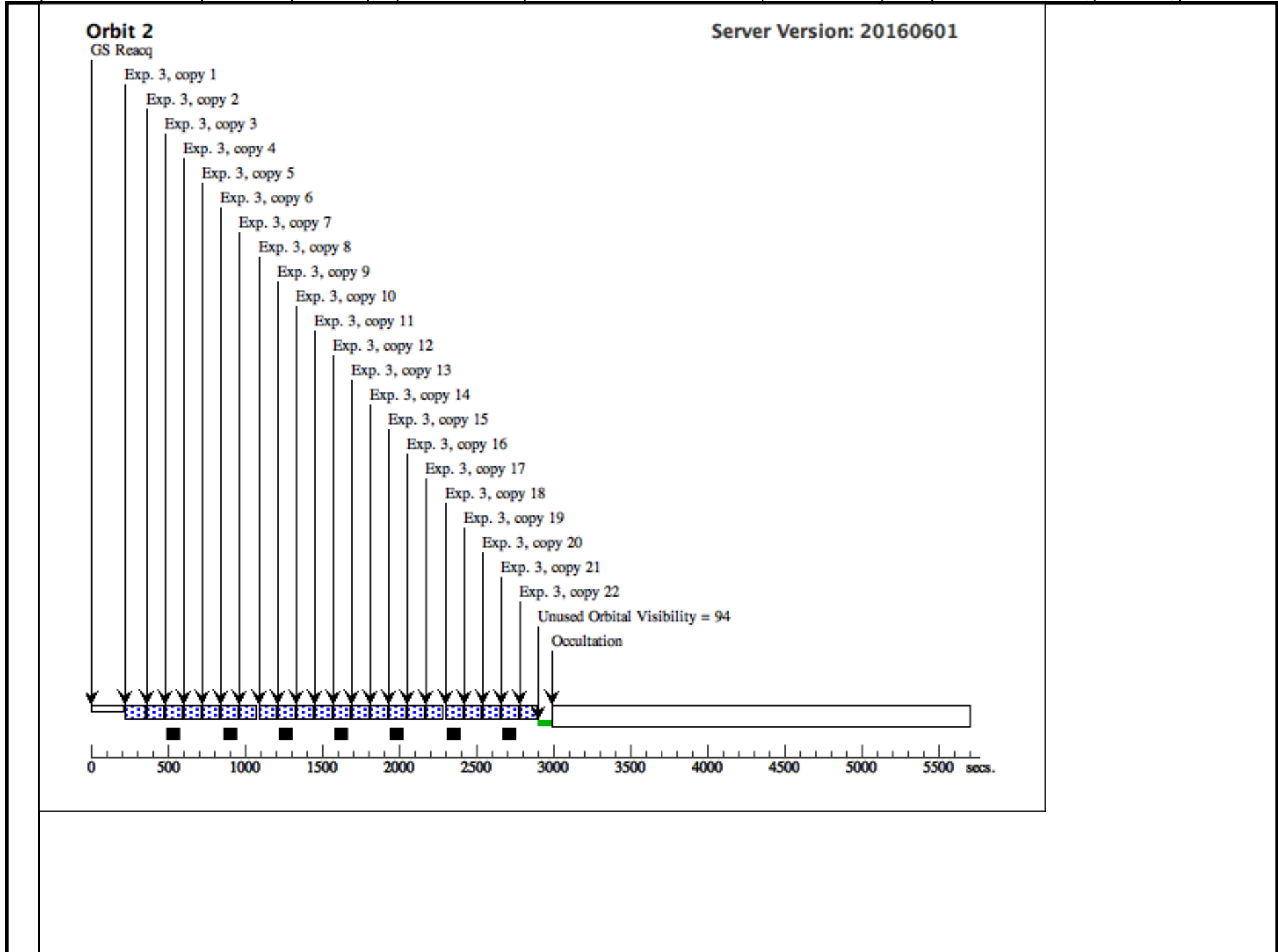
Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

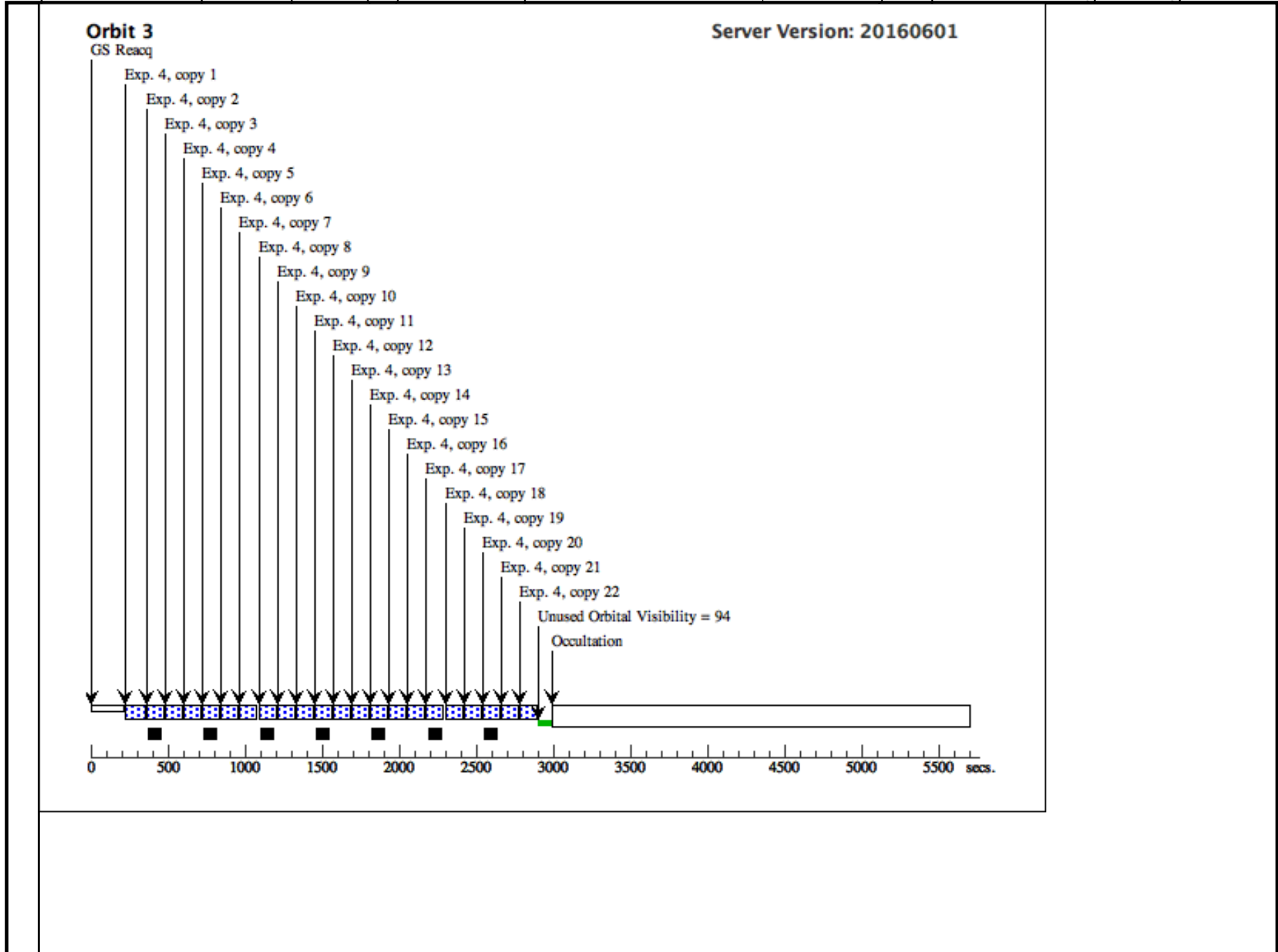
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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 8 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] [==>(Copy 21)] [==>(Copy 22)] | [7] |
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Proposal 14218 - Kepler 51-b | Visit 1 (01) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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| 9 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [8] |
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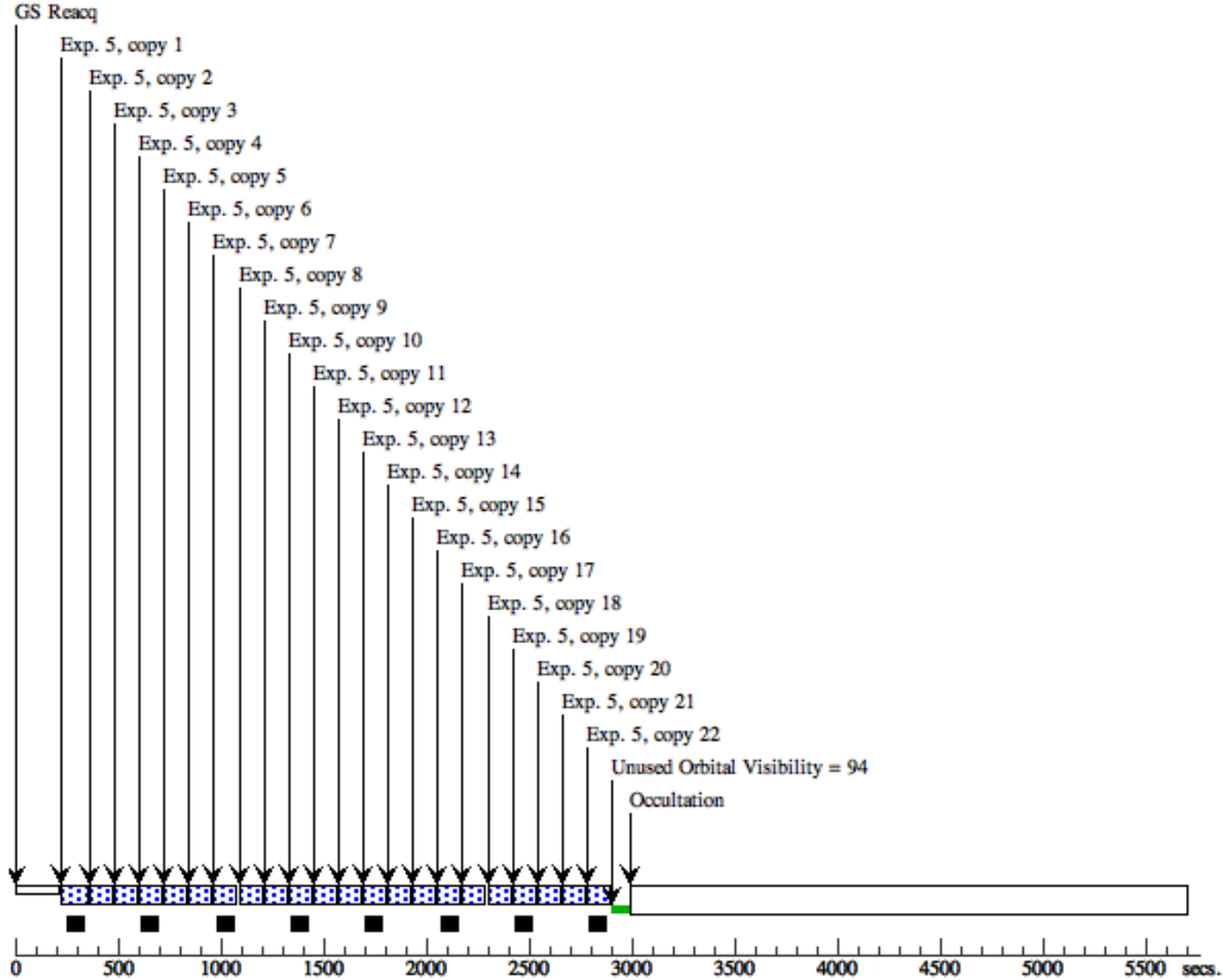


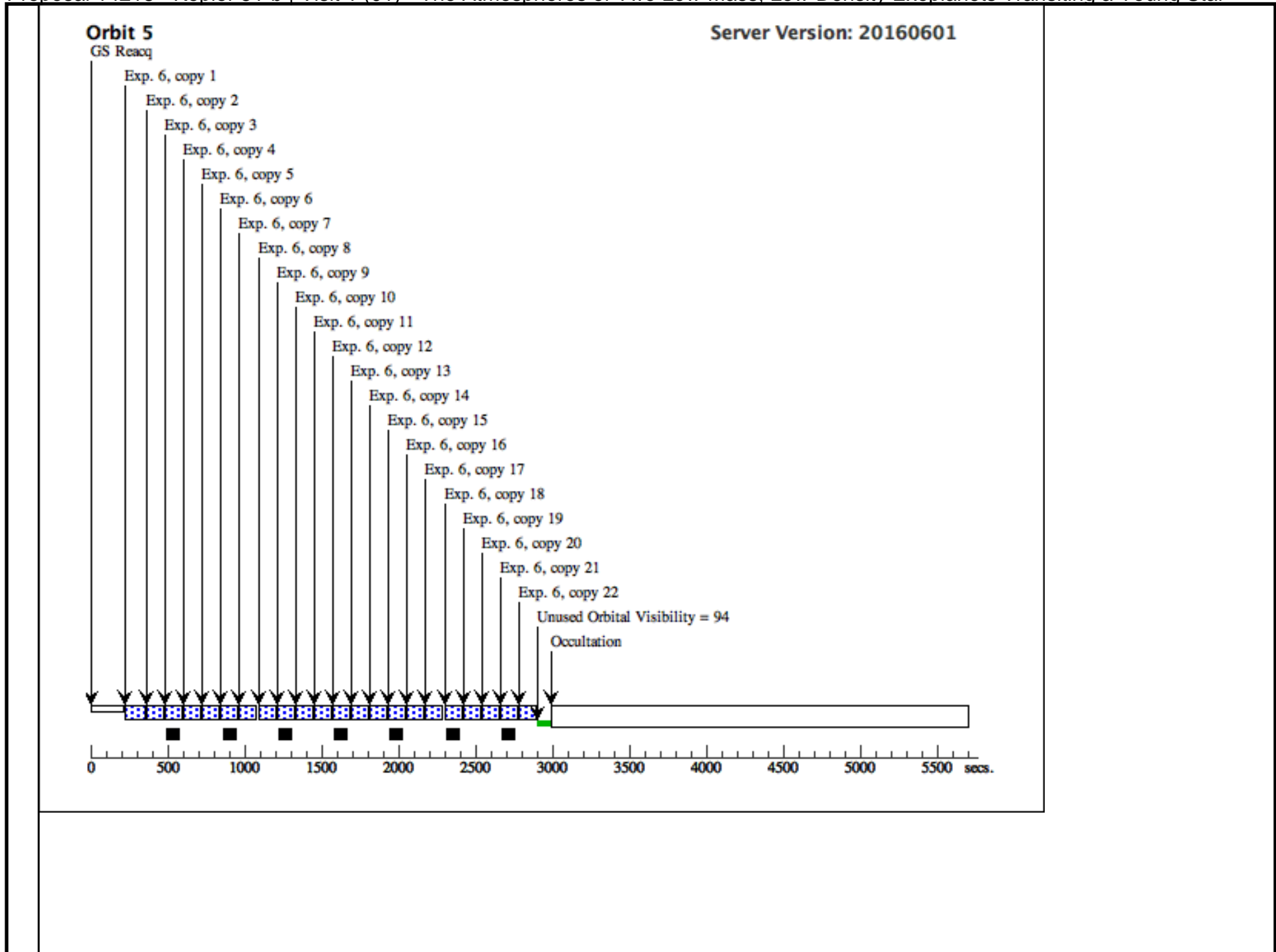




Orbit 4

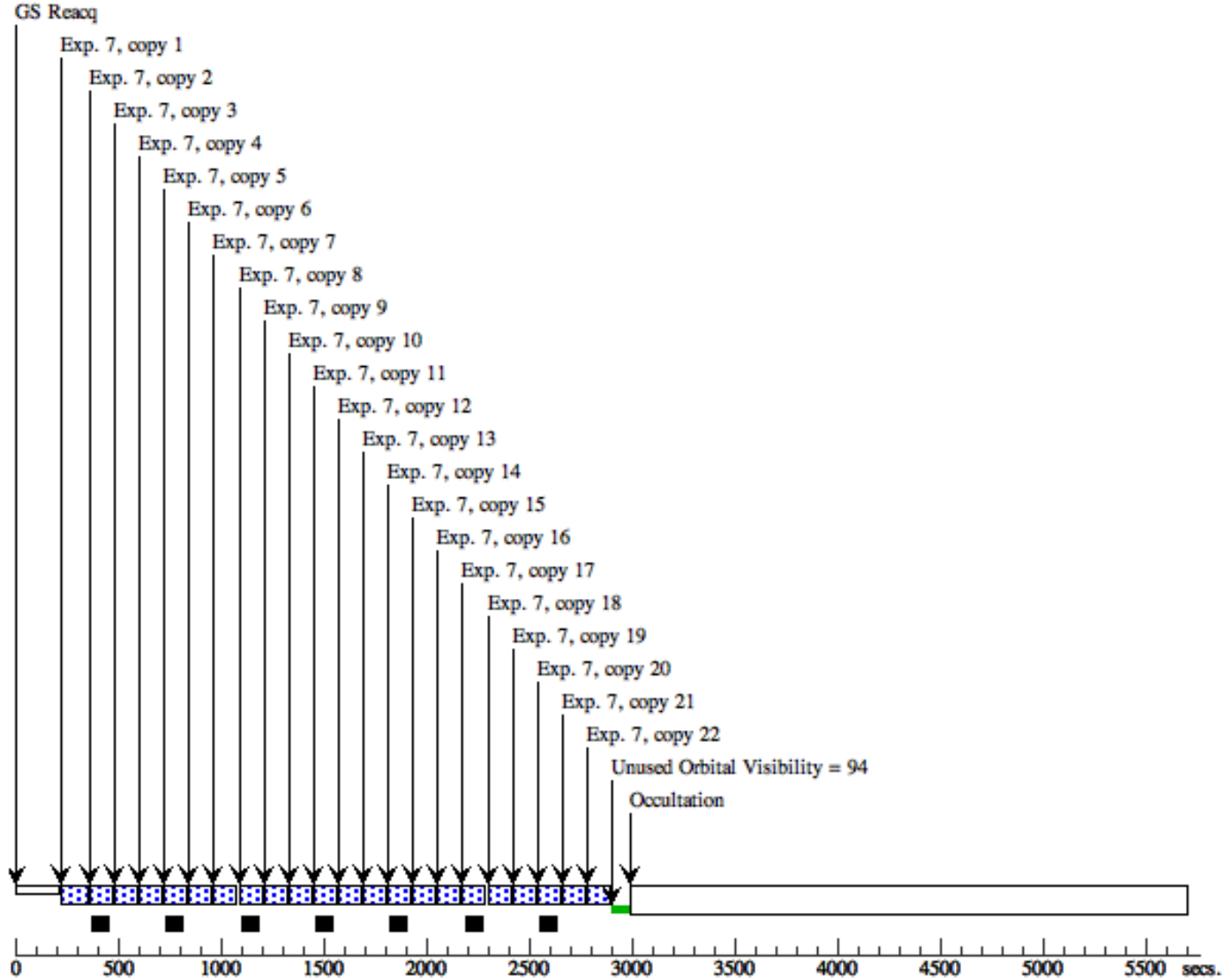
Server Version: 20160601

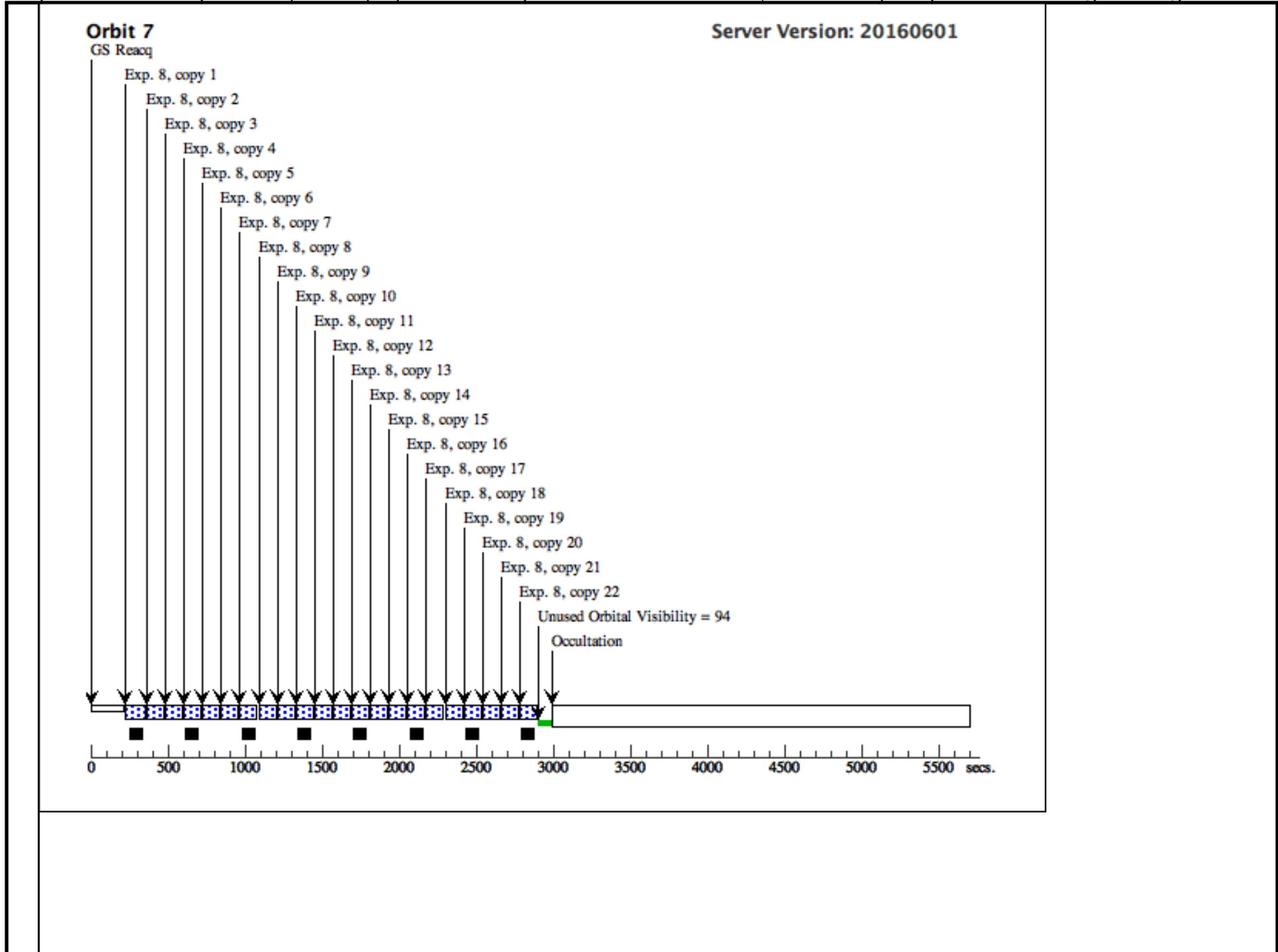


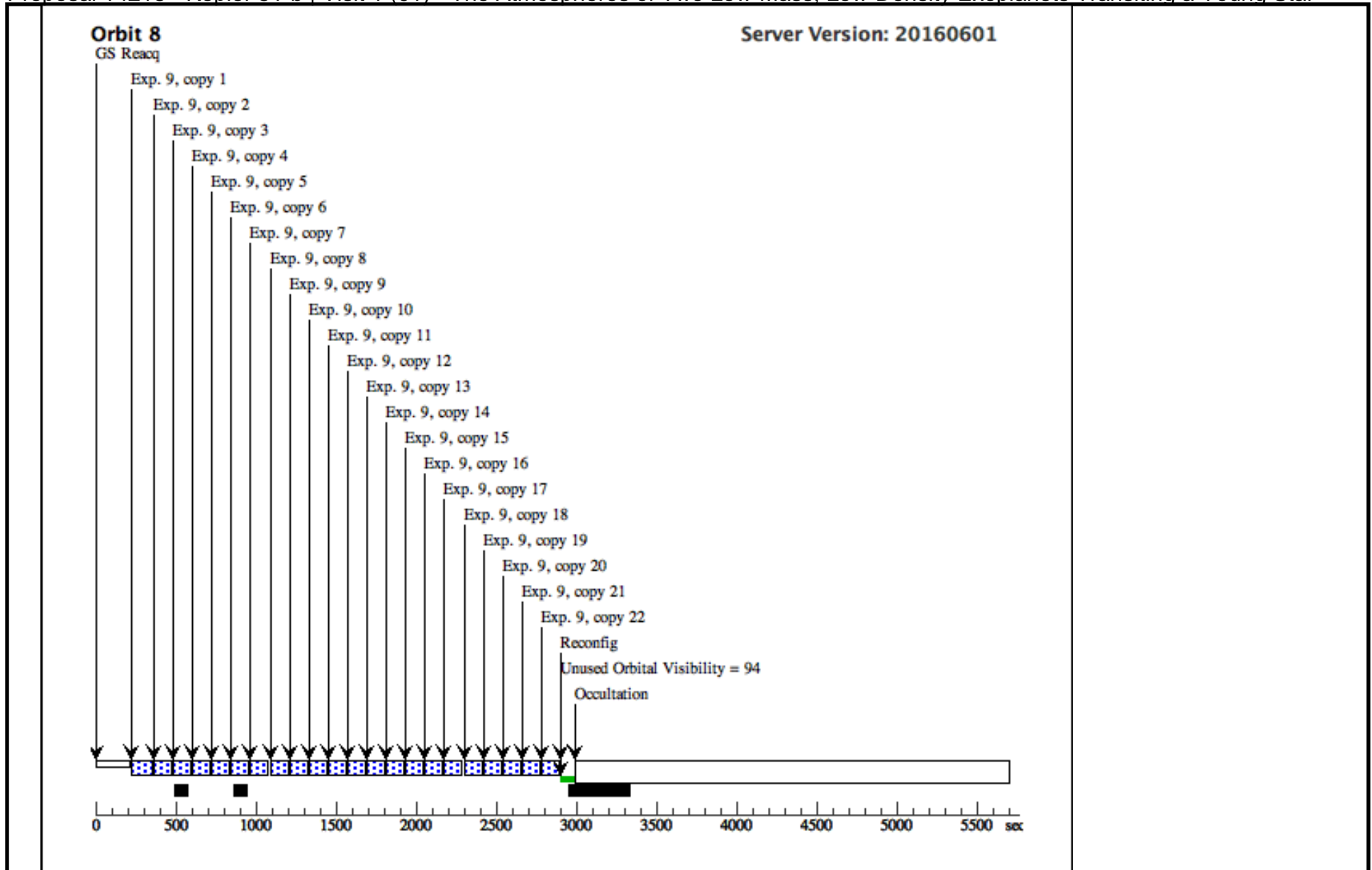


Orbit 6

Server Version: 20160601







Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|--|--|---|---|---------------------------------|---|-------------------------|
| Visit | Proposal 14218, Kepler 51-b Visit 2 (02), completed Tue Jan 10 02:10:24 GMT 2017 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SCHED 100%; ORIENT 260D TO 50 D; ORIENT 80D TO 230 D; Period 45.155340929 D AND ZERO-PHASE HJD2454992.10846 | | | | | |
| | Patterns | # | Primary Pattern | Secondary Pattern | Exposures | |
| (1) | | Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false | | (1) | | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
| | (1) | KEPLER-51 | RA: 19 45 55.1460 (296.4797750d) Dec: +49 56 15.66 (49.93768d) Equinox: J2000 | | V=(?) J = 13.562, H=13.291, K = 13.197 | Reference Frame: SIMBAD |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> | | | | | | |

Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|--------------------|---------------|-------------------------------|---------------|-------------------------------|---|---|---|-------|
| 1 | F140W direct | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | F140W | SAMP-SEQ=SPARS 5; NSAMP=15 | PHASE 0.99224898 988 TO 0.995109483 367 | Pattern 1, Exps 1-1 in Kepler 51-b Visit 2 (02) (1) | 33.16592 Secs (99.498 Secs) | |
| | | | | | | | | [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] | [1] |
| 2 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPARS10 | | | 103.128633 Secs X 19 (1959.444 Secs) | |
| | | | | | | | | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] | [1] |

Exposures

Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 3 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [2] |
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Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 4 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [3] |
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Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 5 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [4] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 6 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] [==>(Copy 21)] [==>(Copy 22)] | [5] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

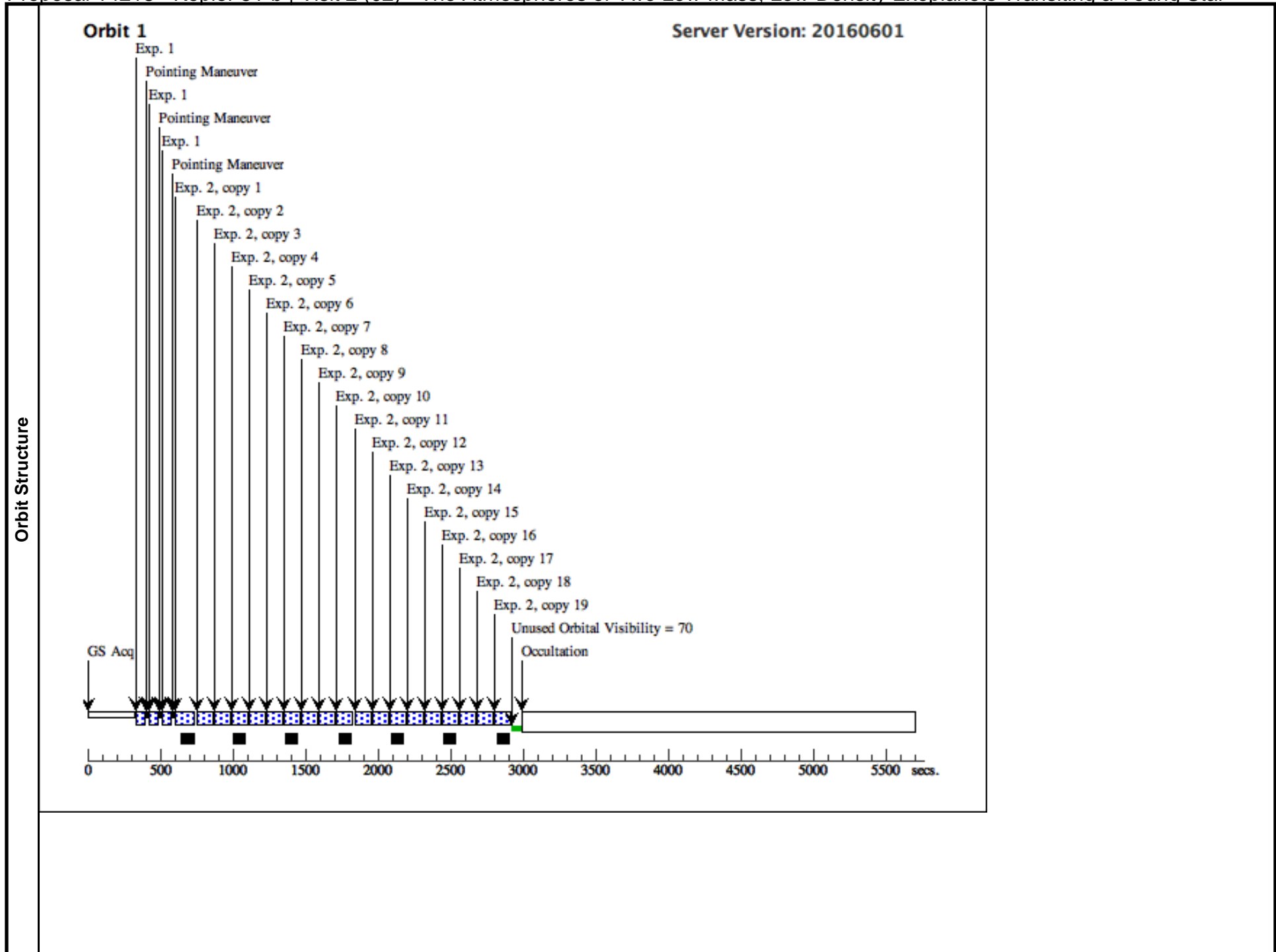
| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 7 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [6] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

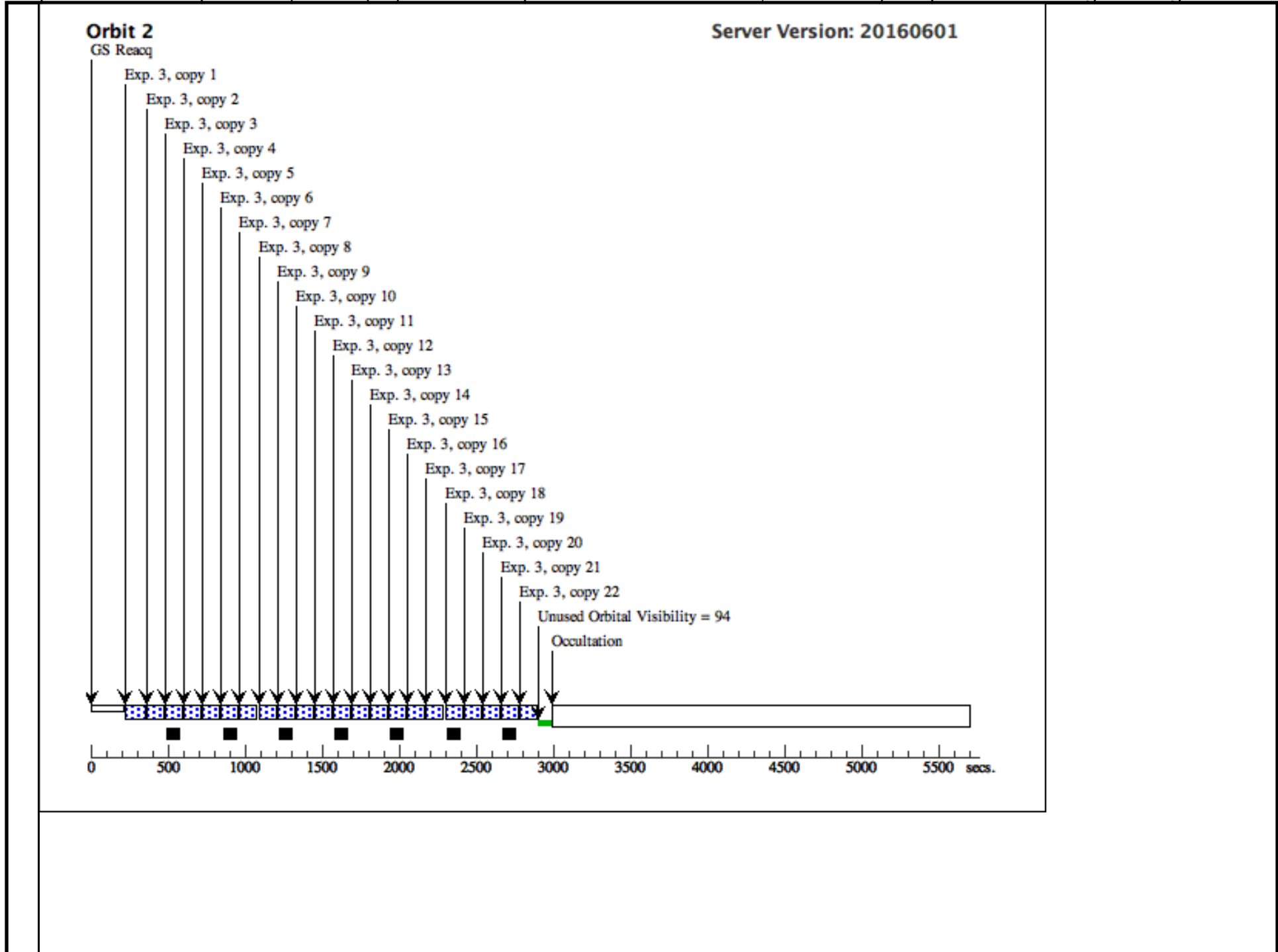
Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 8 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] [==>(Copy 21)] [==>(Copy 22)] | [7] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-b | Visit 2 (02) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

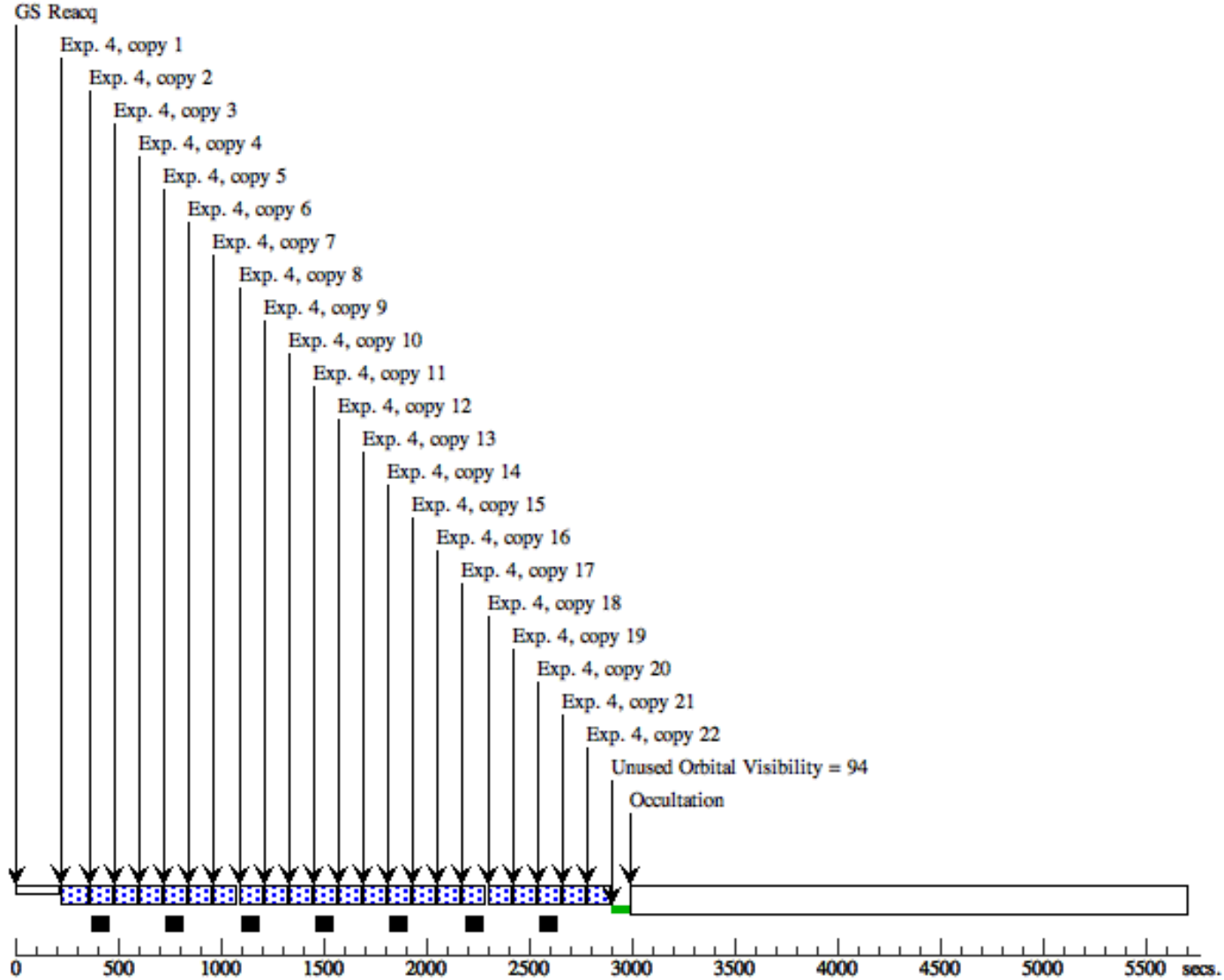
| | | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|-------------------------------------|---|-----|
| 9 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) | <i>[==>(Copy 1)]</i> <i>[==>(Copy 2)]</i> <i>[==>(Copy 3)]</i> <i>[==>(Copy 4)]</i> <i>[==>(Copy 5)]</i> <i>[==>(Copy 6)]</i> <i>[==>(Copy 7)]</i> <i>[==>(Copy 8)]</i> <i>[==>(Copy 9)]</i> <i>[==>(Copy 10)]</i> <i>[==>(Copy 11)]</i> <i>[==>(Copy 12)]</i> <i>[==>(Copy 13)]</i> <i>[==>(Copy 14)]</i> <i>[==>(Copy 15)]</i> <i>[==>(Copy 16)]</i> <i>[==>(Copy 17)]</i> <i>[==>(Copy 18)]</i> <i>[==>(Copy 19)]</i> <i>[==>(Copy 20)]</i> <i>[==>(Copy 21)]</i> <i>[==>(Copy 22)]</i> | [8] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|-------------------------------------|---|-----|





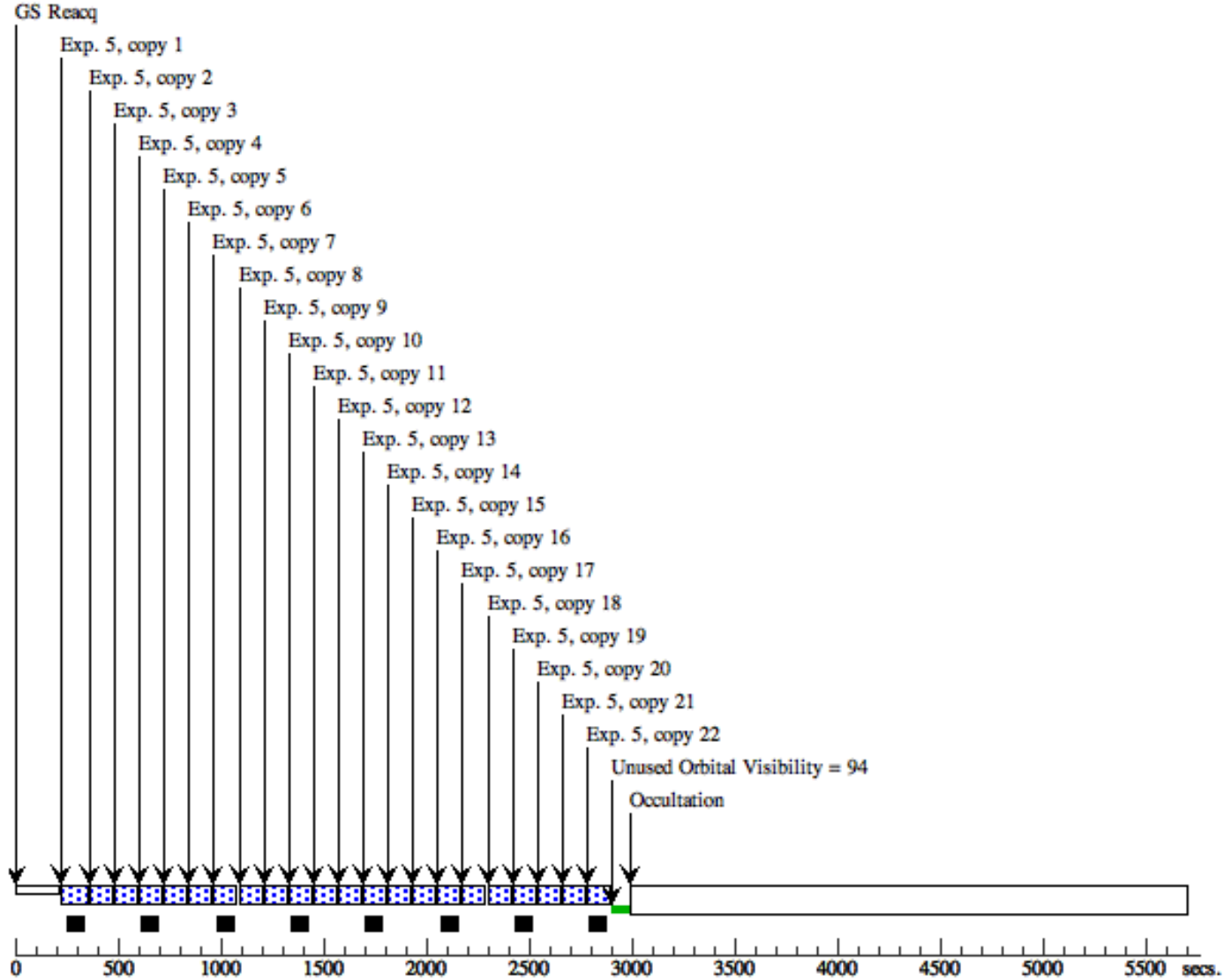
Orbit 3

Server Version: 20160601



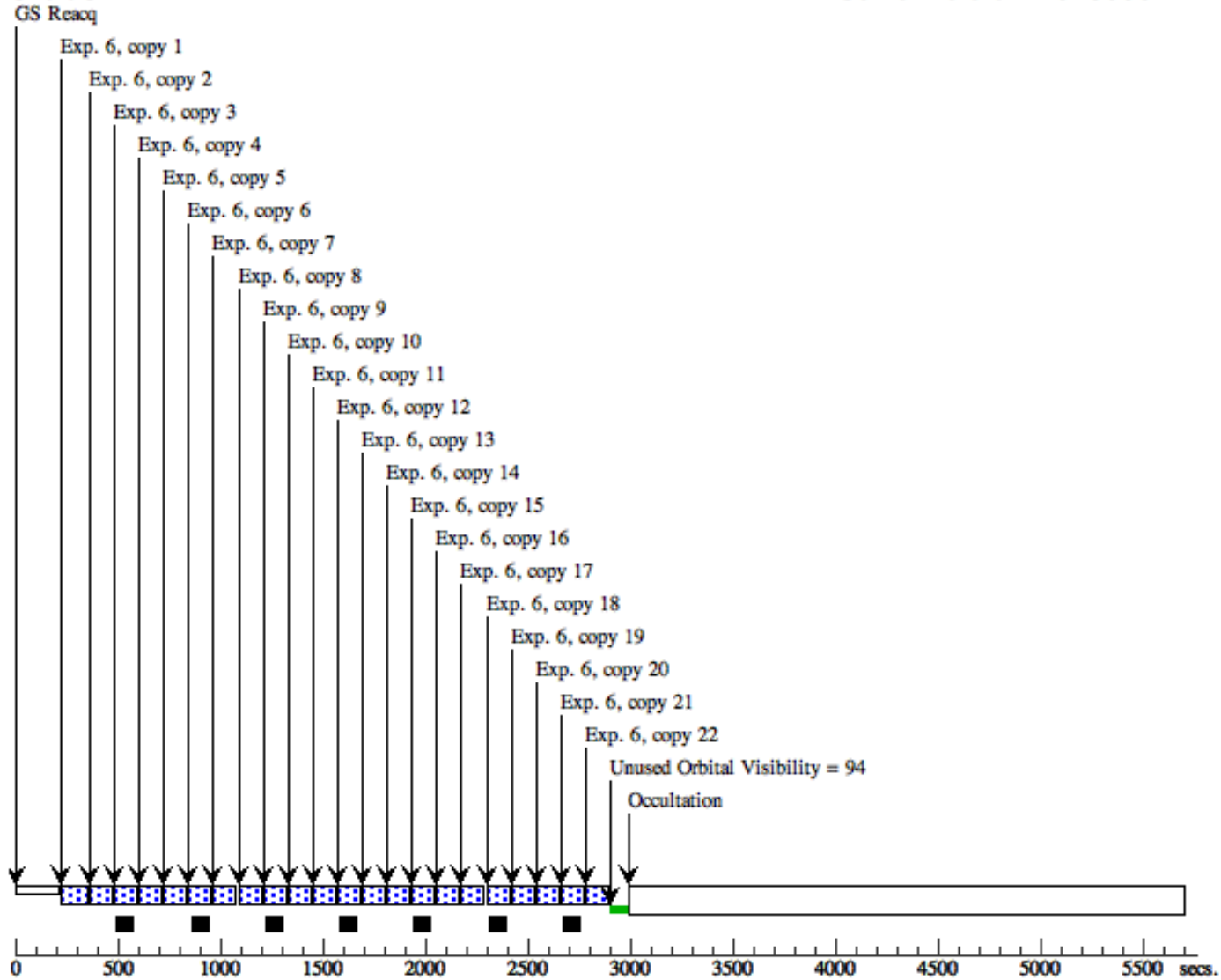
Orbit 4

Server Version: 20160601



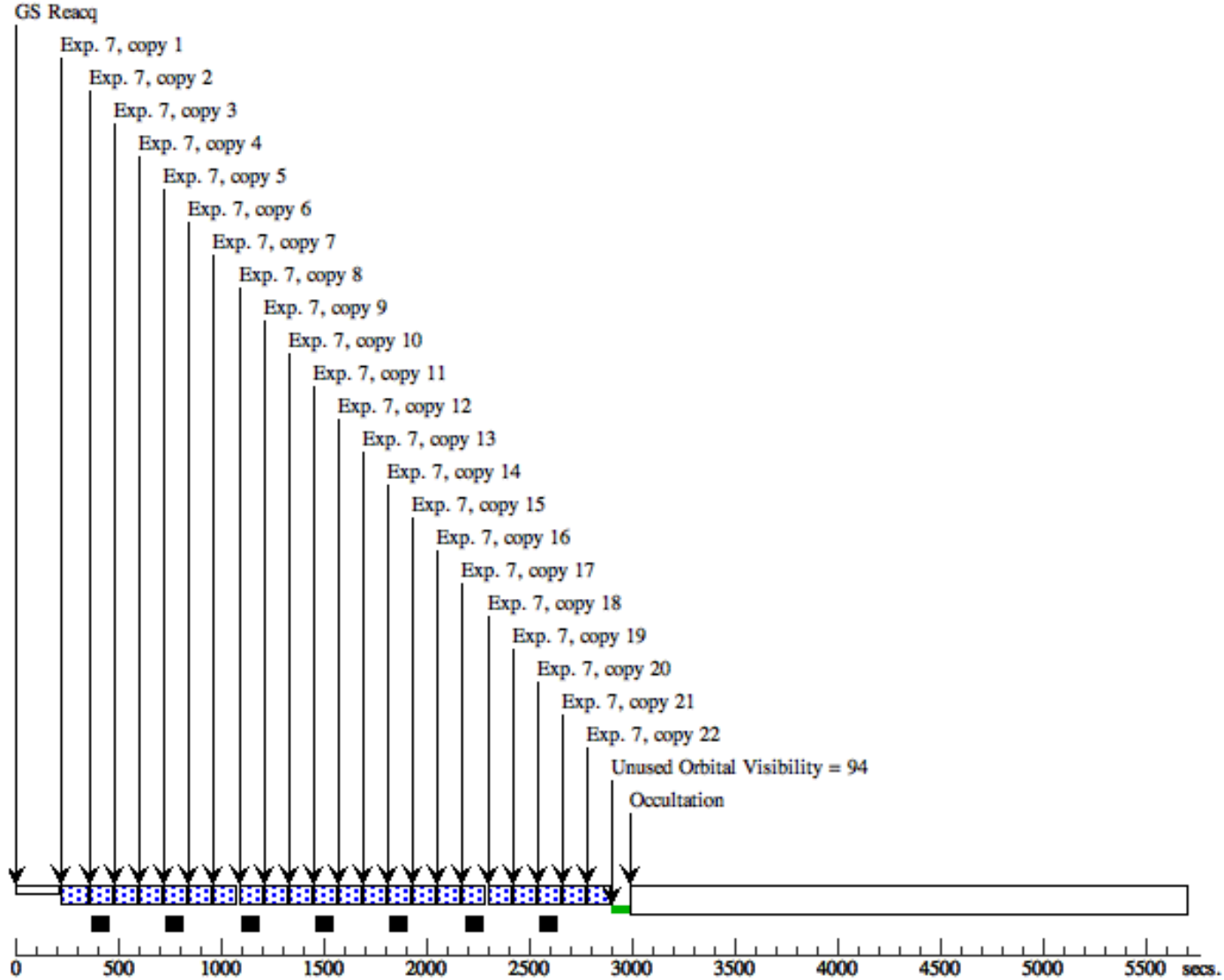
Orbit 5

Server Version: 20160601



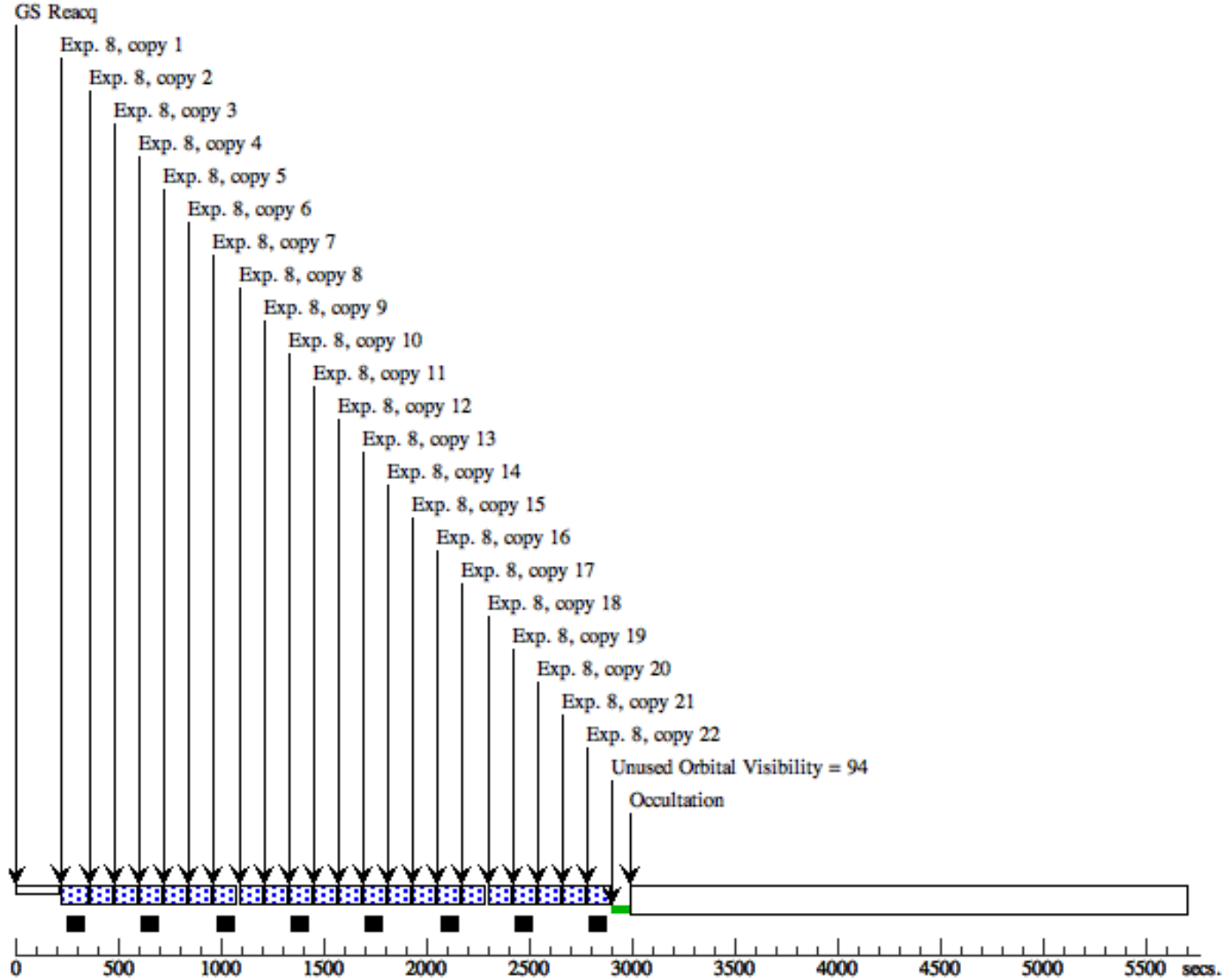
Orbit 6

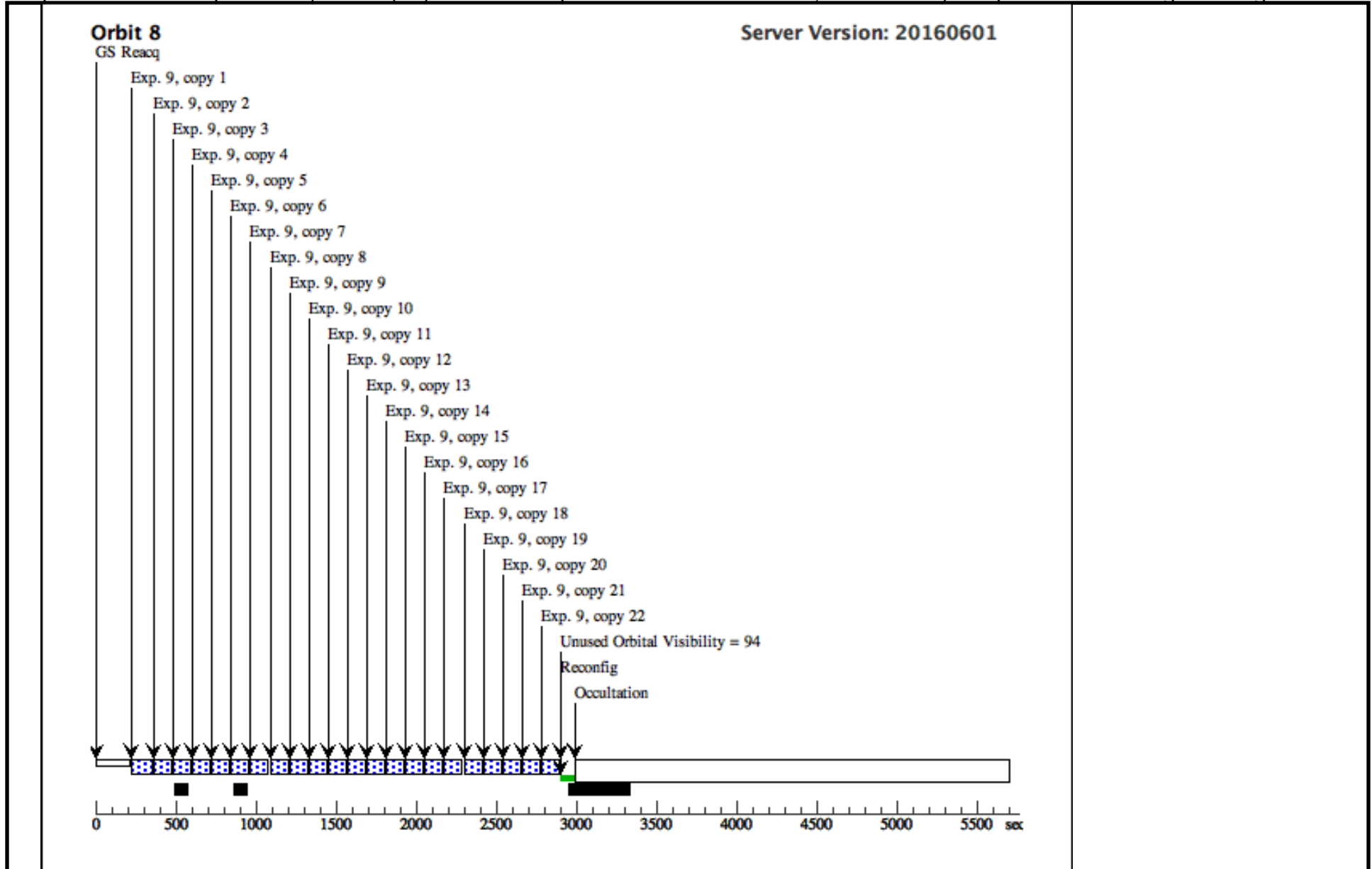
Server Version: 20160601



Orbit 7

Server Version: 20160601





Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | |
|--|---|--|---|---------------------------------|---|-------------------------|
| Visit | Proposal 14218, Kepler 51-d Visit 1 (03), completed Tue Jan 10 02:10:25 GMT 2017 Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: SCHED 100%; ORIENT 260D TO 50 D; ORIENT 80D TO 230 D; Period 130.183016154 D AND ZERO-PHASE HJD2455044.92184 | | | | | |
| | (Kepler 51-d Visit 1 (03)) Warning (Orbit Planner): LONG SU LIKELY TO INTERSECT THE SAA | | | | | |
| Diagnosics | | | | | | |
| | | | | | | |
| Patterns | # | Primary Pattern | Secondary Pattern | Exposures | | |
| | (1) | Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing= | Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false | | (1) | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
| | (1) | KEPLER-51 | RA: 19 45 55.1460 (296.4797750d) Dec: +49 56 15.66 (49.93768d) Equinox: J2000 | | V=(?) J = 13.562, H=13.291, K = 13.197 | Reference Frame: SIMBAD |
| <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> | | | | | | |

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit | |
|---|--------------------|---------------|-------------------------------|---------------|-------------------------------|---------------------------------------|---|--------------------------------------|-------|--|
| 1 | F140W direct | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | F140W | SAMP-SEQ=SPARS5; NSAMP=15 | PHASE 0.996287123411 TO 0.99679924432 | Pattern 1, Exps 1-1 in Kepler 51-d Visit 1 (03) (1) | 33.16592 Secs (99.498 Secs) | | |
| | | | | | | | | [==>(Pattern 1)] | [1] | |
| 2 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPARS10 | | | 103.128633 Secs X 19 (1959.444 Secs) | | |
| | | | | | | | | [==>(Copy 1)] | [1] | |
| | | | | | | | | [==>(Copy 2)] | | |
| | | | | | | | | [==>(Copy 3)] | | |
| | | | | | | | | [==>(Copy 4)] | | |
| | | | | | | | | [==>(Copy 5)] | | |
| | | | | | | | | [==>(Copy 6)] | | |
| | | | | | | | | [==>(Copy 7)] | | |
| | | | | | | | | [==>(Copy 8)] | | |
| | | | | | | | | [==>(Copy 9)] | | |
| | | | | | | | | [==>(Copy 10)] | | |
| | | | | | | | | [==>(Copy 11)] | | |
| | | | | | | | | [==>(Copy 12)] | | |
| | | | | | | | | [==>(Copy 13)] | | |
| | | | | | | | | [==>(Copy 14)] | | |
| | | | | | | | | [==>(Copy 15)] | | |
| | | | | | | | | [==>(Copy 16)] | | |
| | | | | | | | | [==>(Copy 17)] | | |
| | | | | | | | | [==>(Copy 18)] | | |
| | | | | | | | | [==>(Copy 19)] | | |

Exposures

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 3 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [2] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 4 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [3] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--------------------------------------|---|-----|
| 5 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 20 (2062.573 Secs) | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] | [4] |
| 6 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 18 (1856.315 Secs) | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] | [5] |

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--------------------------------------|---|-----|
| 7 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 17 (1753.187 Secs) | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] | [6] |
| 8 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 17 (1753.187 Secs) | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] | [7] |

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 9 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [8] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 10 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [9] |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

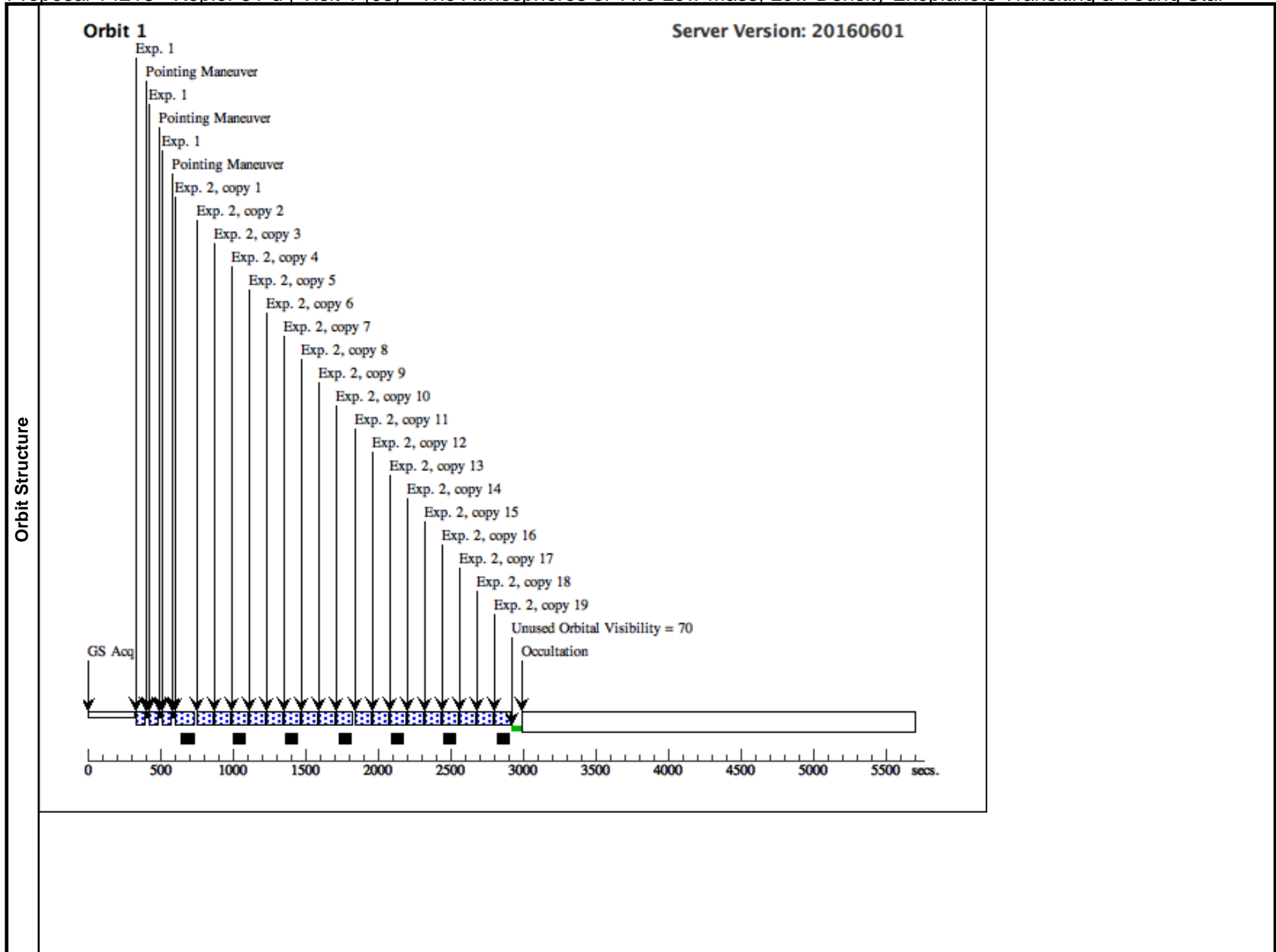
| | | | | | | | |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|
| 11 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [10] |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|

Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|
| 12 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [11] |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|

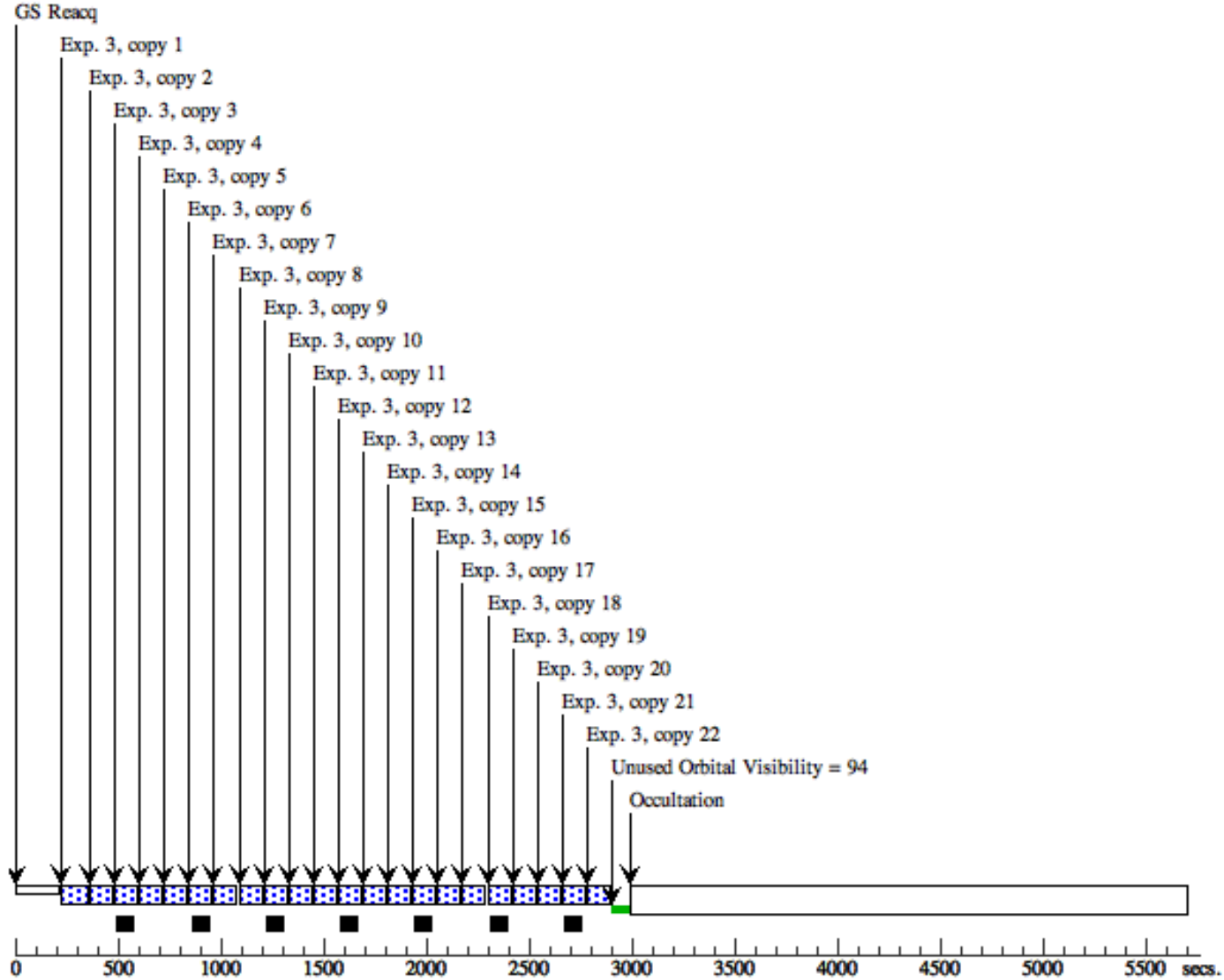
Proposal 14218 - Kepler 51-d | Visit 1 (03) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

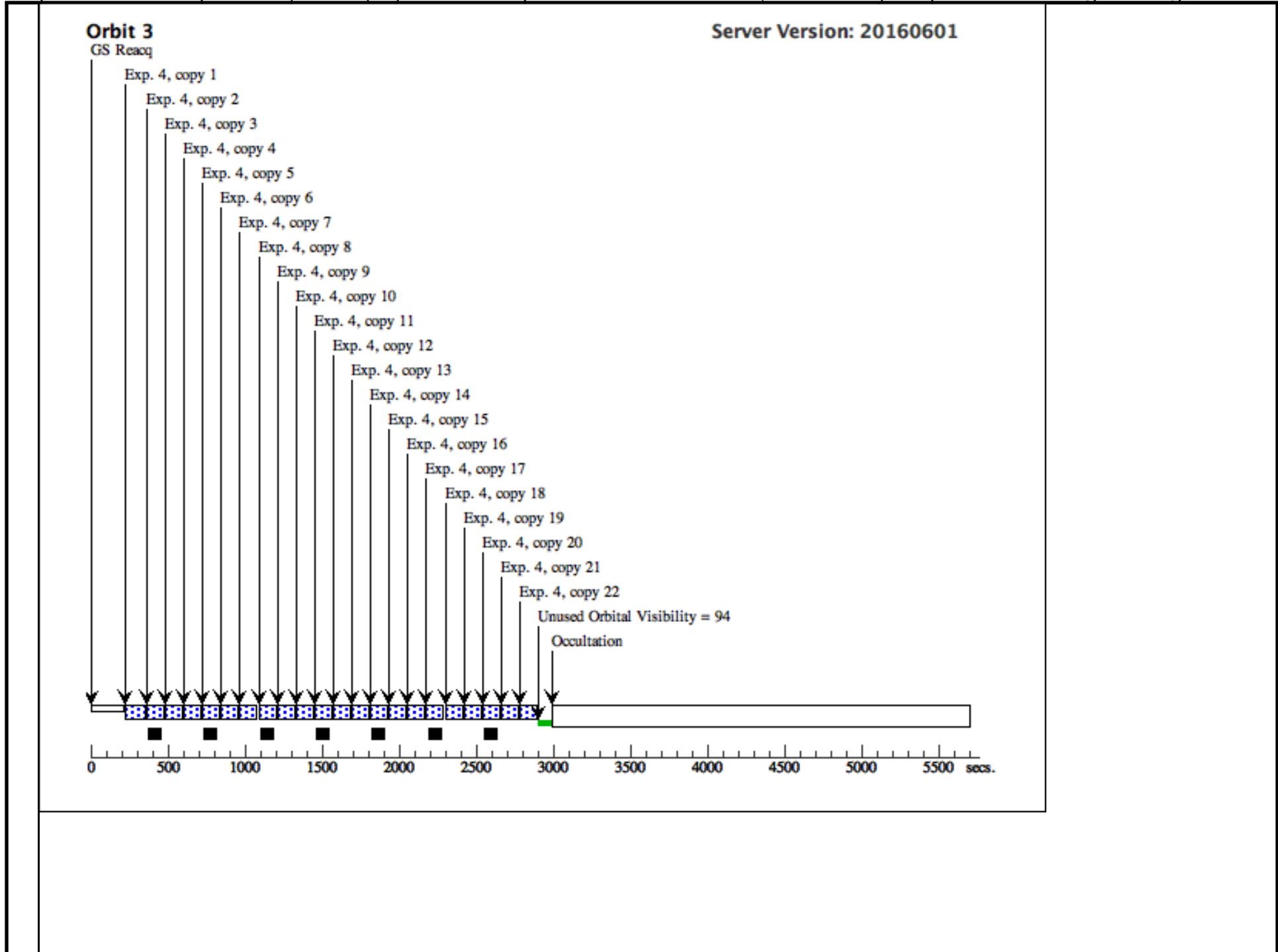
| | | | | | | | |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|
| 13 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [12] |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|



Orbit 2

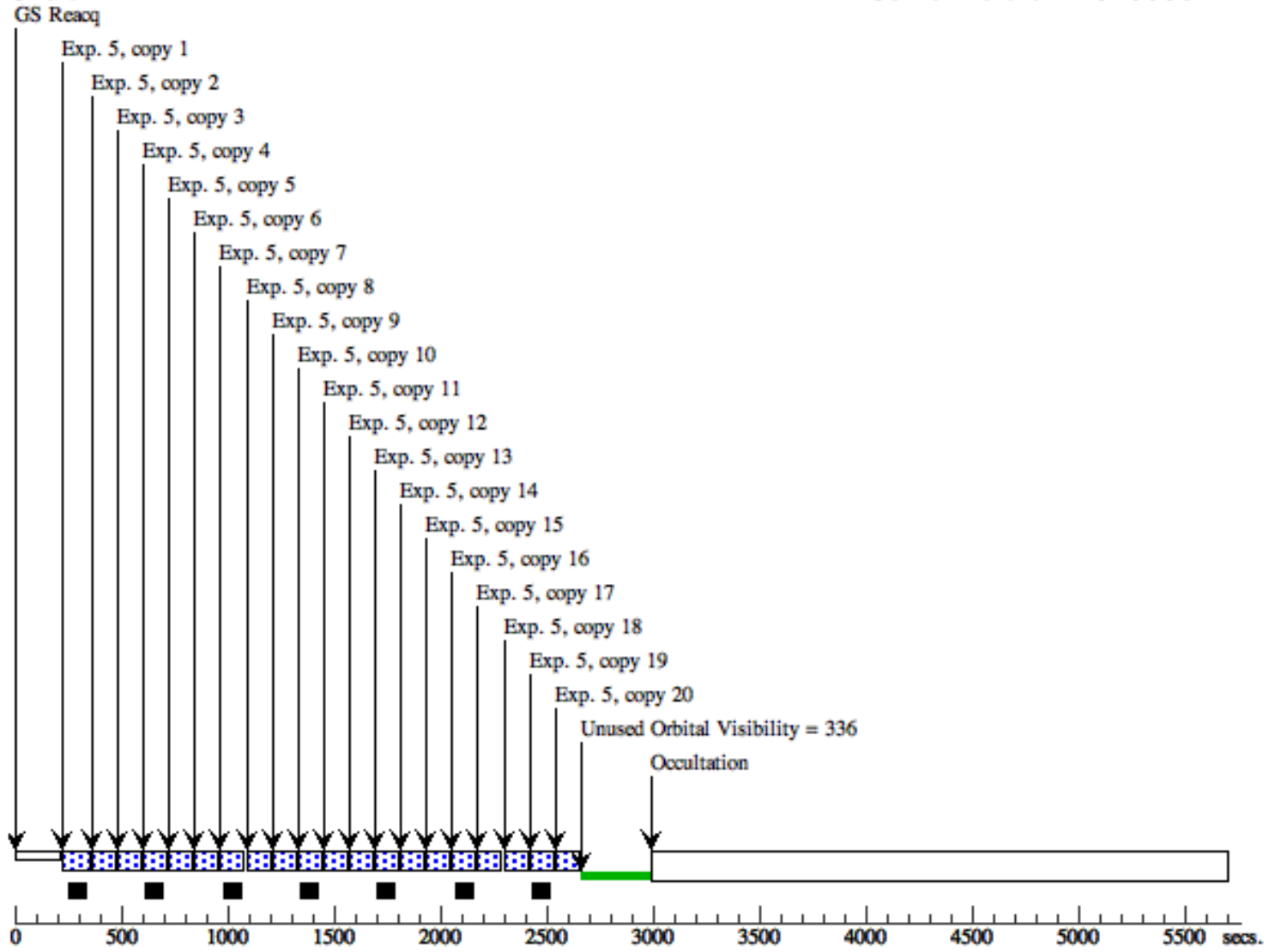
Server Version: 20160601





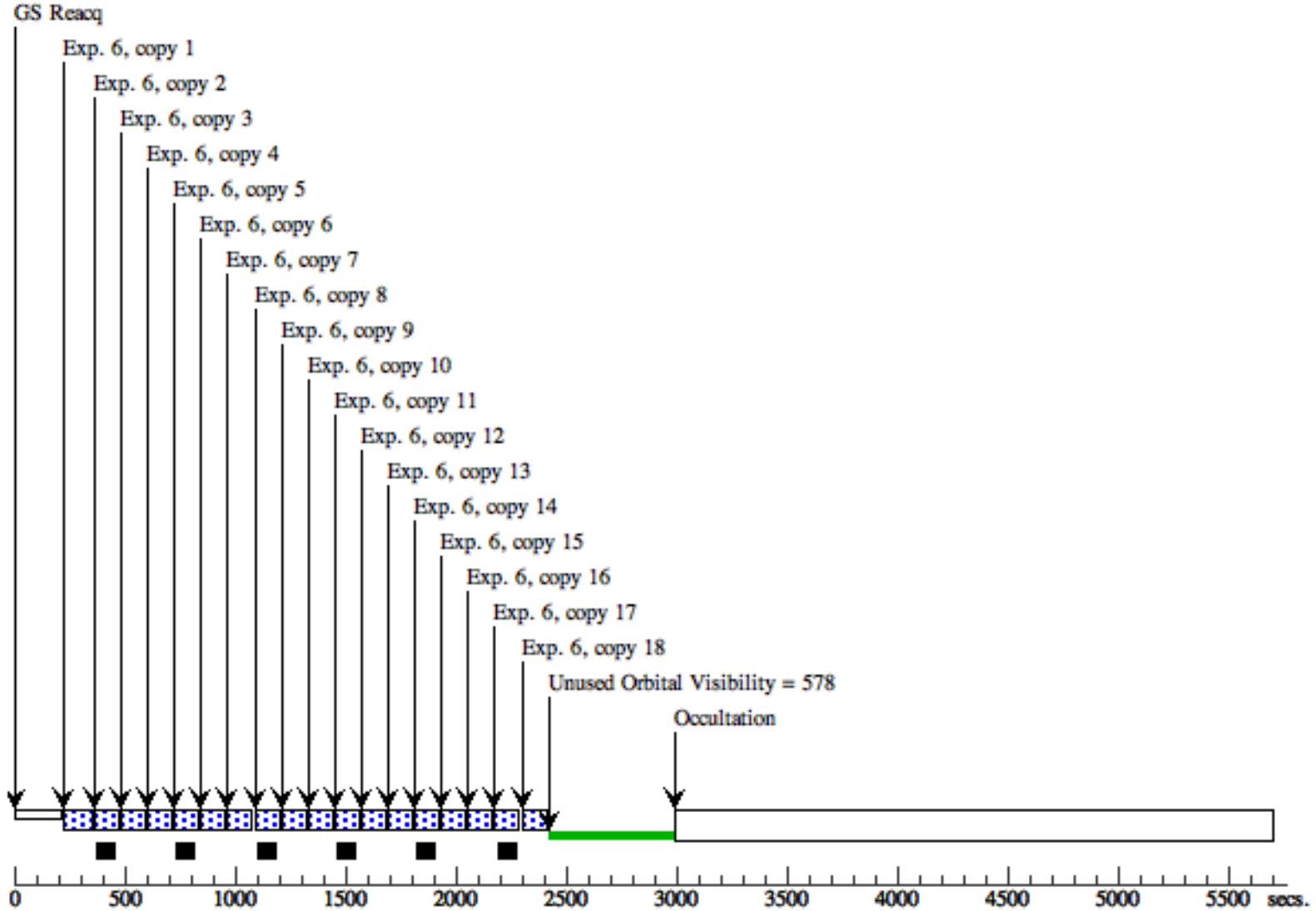
Orbit 4

Server Version: 20160601



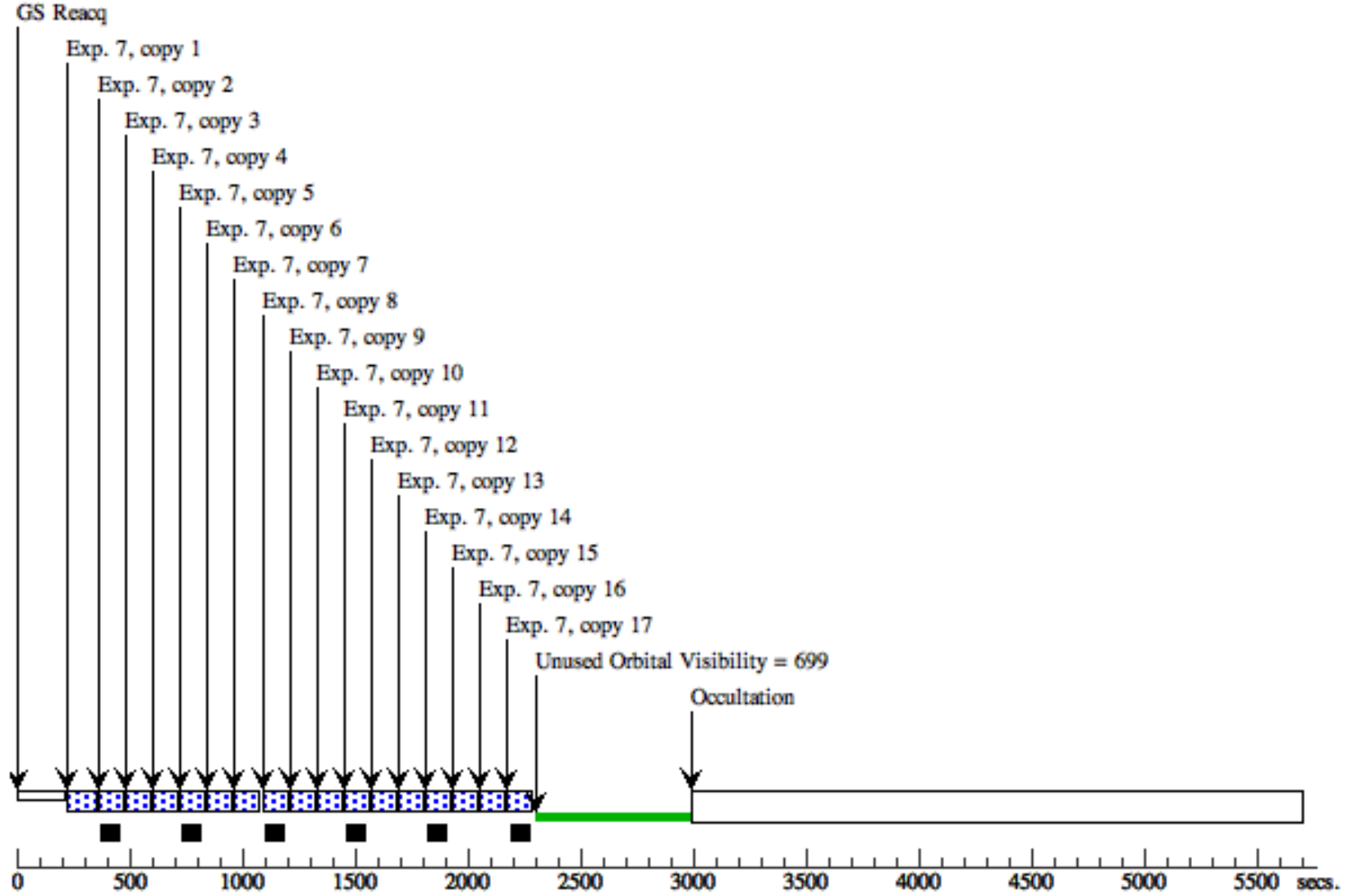
Orbit 5

Server Version: 20160601



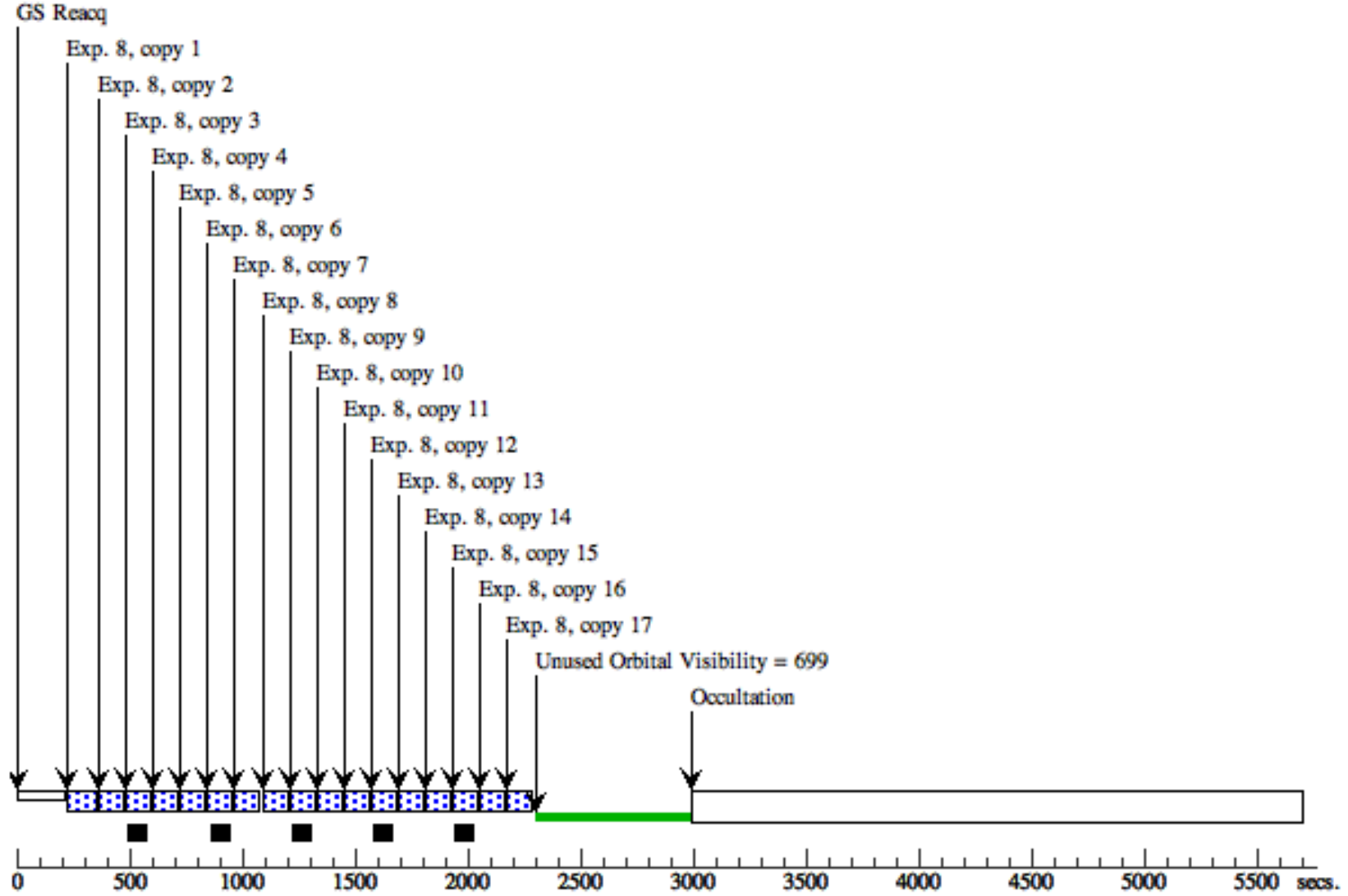
Orbit 6

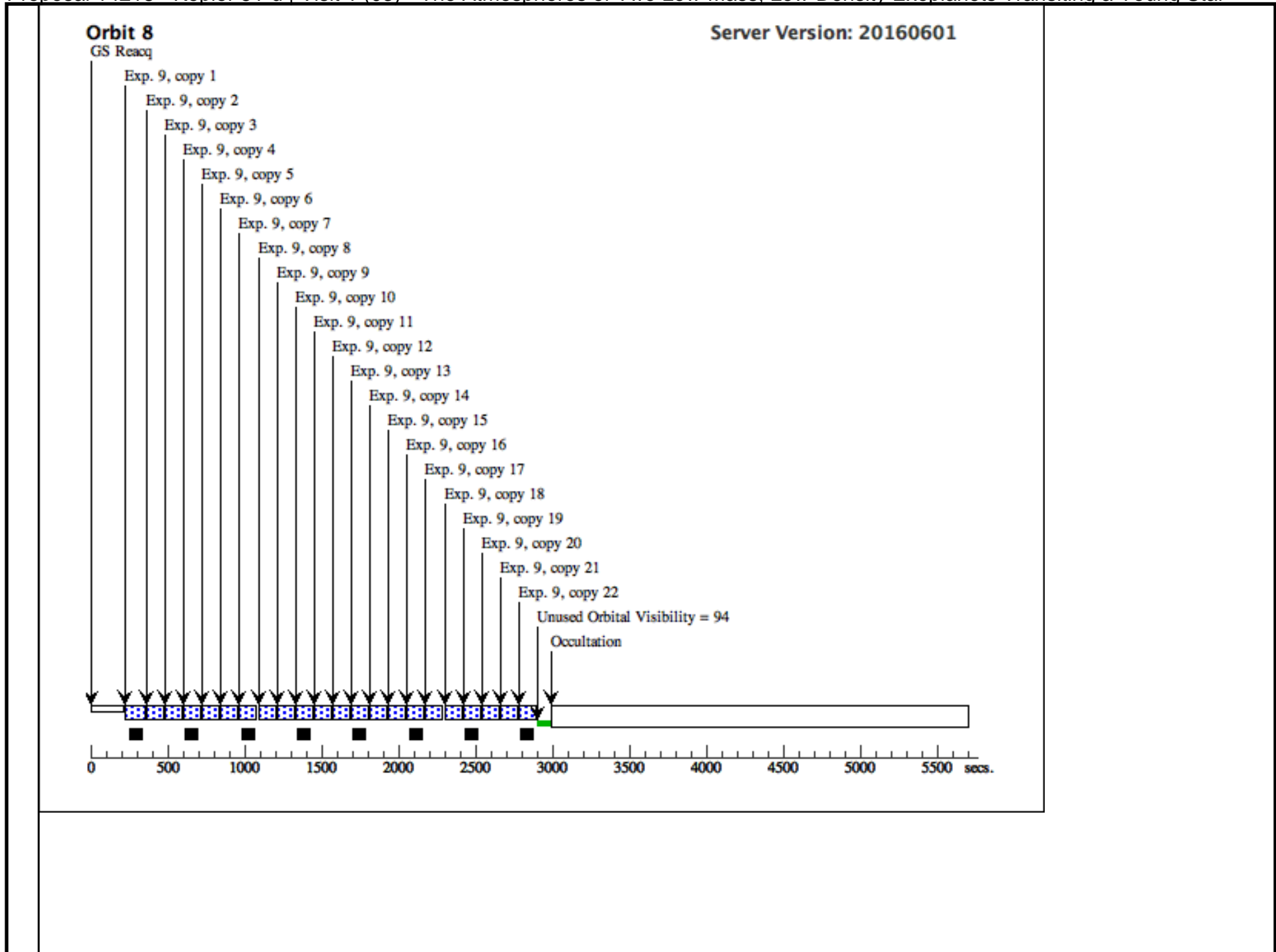
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Orbit 7

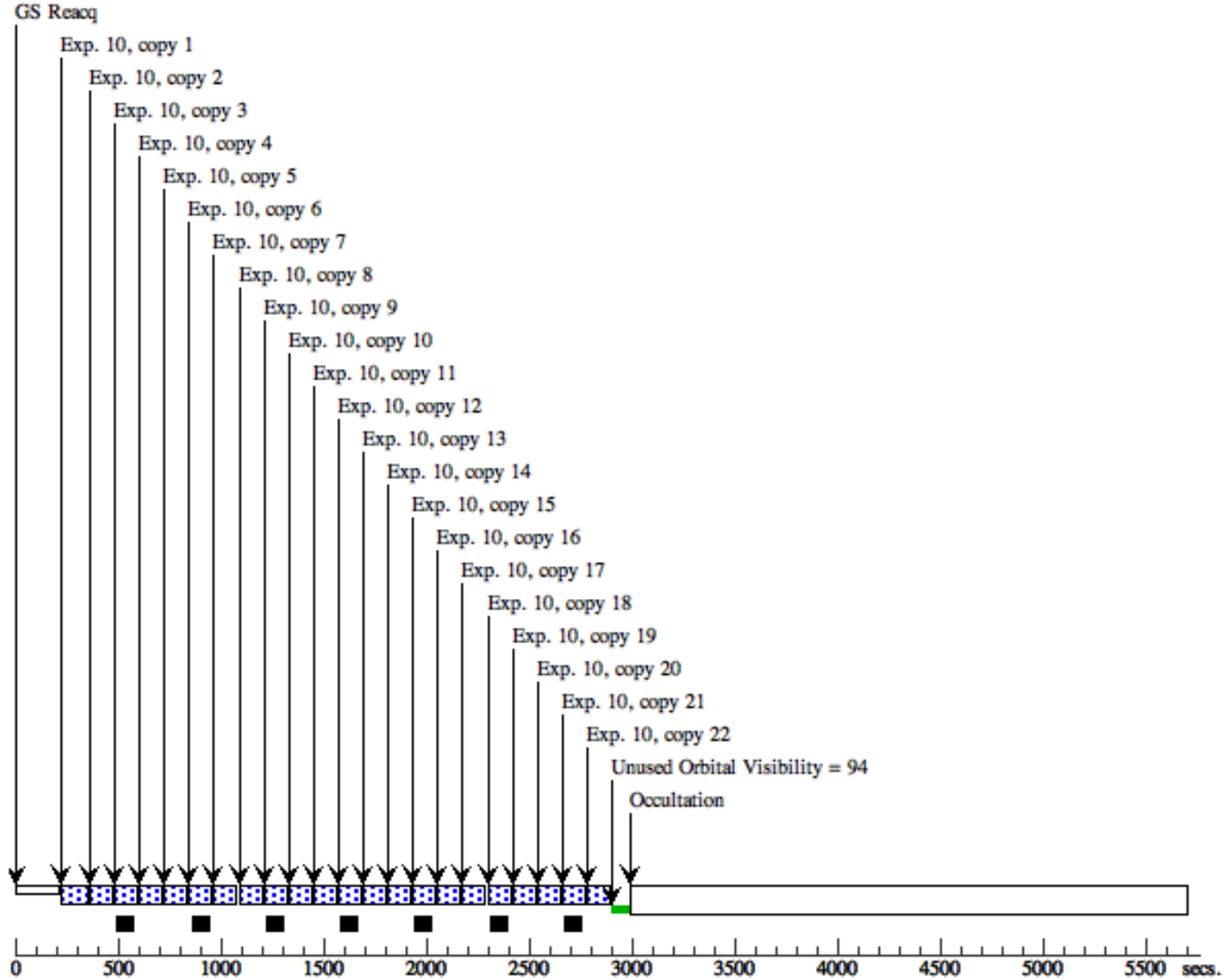
Server Version: 20160601





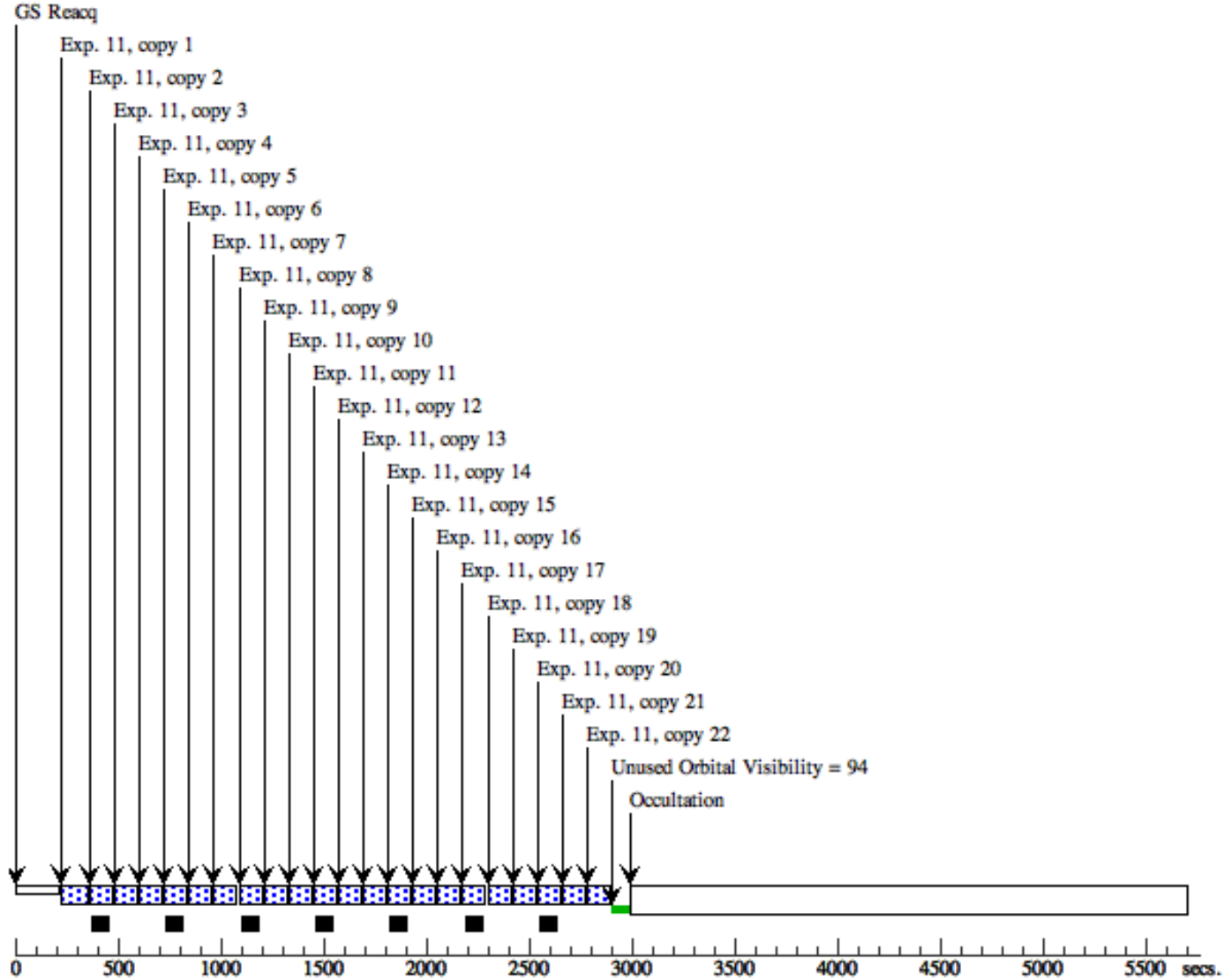
Orbit 9

Server Version: 20160601



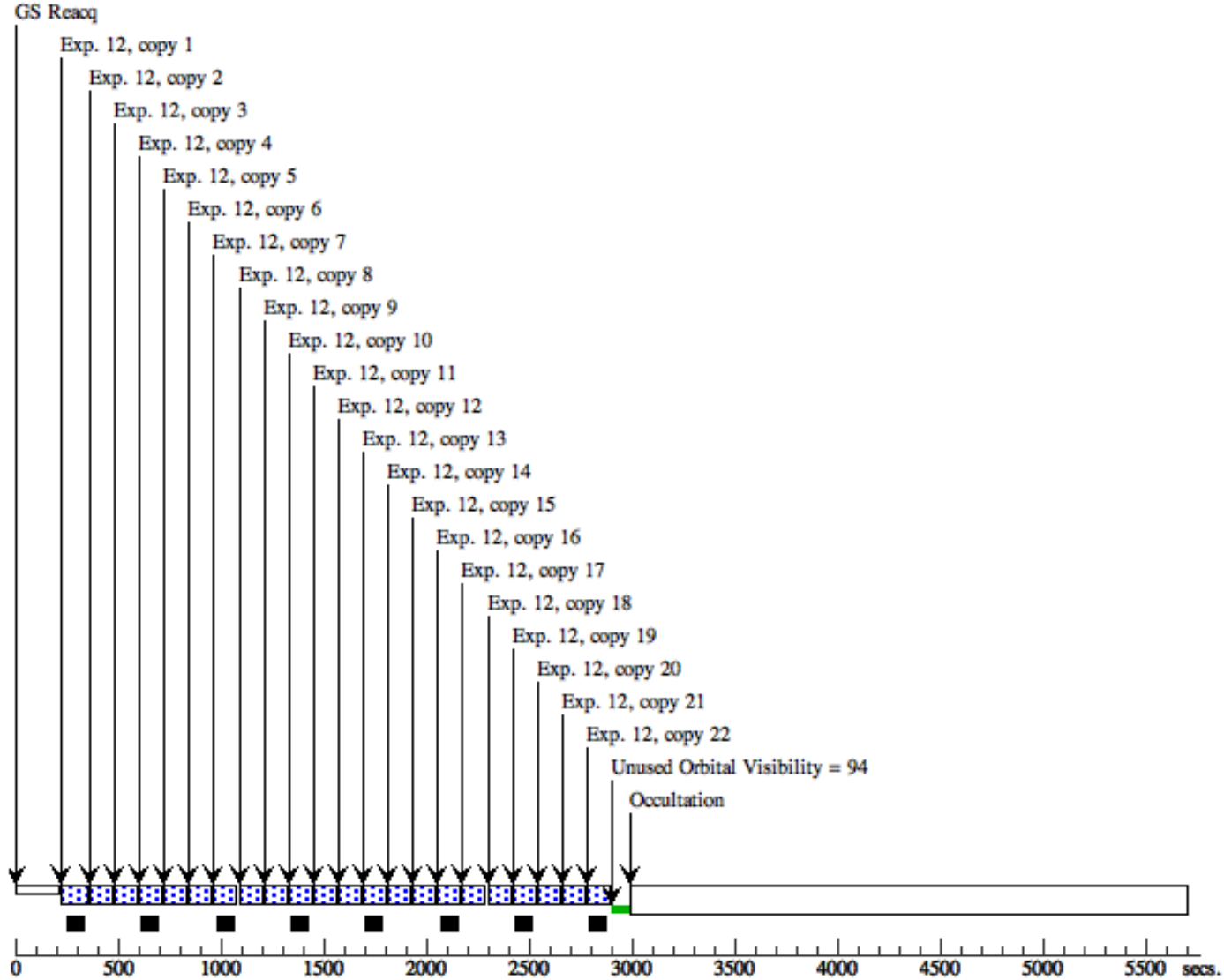
Orbit 10

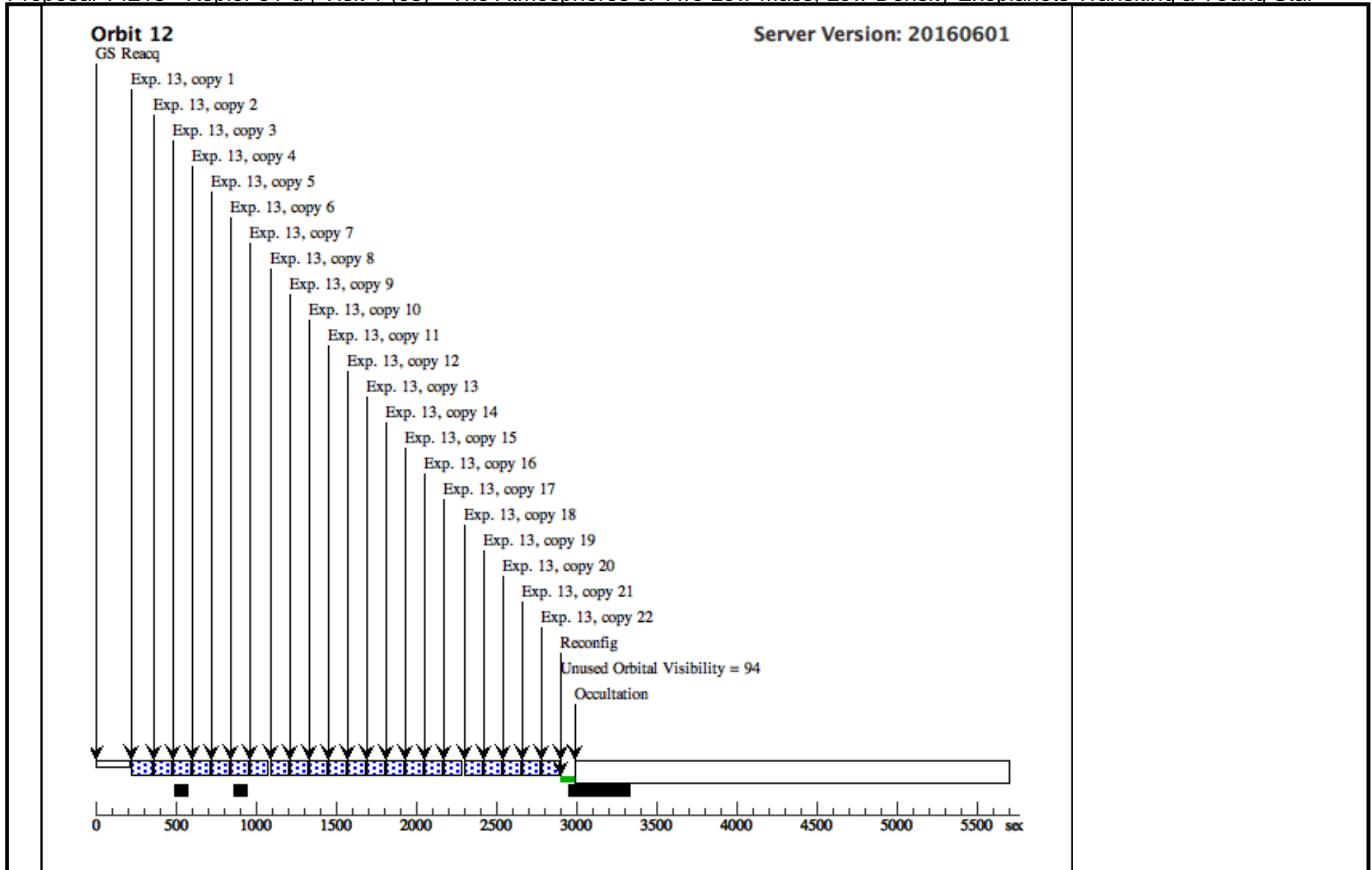
Server Version: 20160601



Orbit 11

Server Version: 20160601





Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | |
|---|--|--|---|---------------------------------|---|-------------------------|
| Visit | Proposal 14218, Kepler 51-d Visit 2 (04), implementation Tue Jan 10 02:10:25 GMT 2017 Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: SCHED 100%; ORIENT 260D TO 50 D; ORIENT 80D TO 230 D; Period 130.183016154 D AND ZERO-PHASE HJD2455044.92184 | | | | | |
| | (Kepler 51-d Visit 2 (04)) Warning (Orbit Planner): LONG SU LIKELY TO INTERSECT THE SAA | | | | | |
| Diagnosics | | | | | | |
| | | | | | | |
| Patterns | # | Primary Pattern | Secondary Pattern | Exposures | | |
| | (1) | Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing= | Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false | | (1) | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
| | (1) | KEPLER-51 | RA: 19 45 55.1460 (296.4797750d) Dec: +49 56 15.66 (49.93768d) Equinox: J2000 | | V=(?) J = 13.562, H=13.291, K = 13.197 | Reference Frame: SIMBAD |
| Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. | | | | | | |

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|--------------------|---------------|-------------------------------|---------------|-------------------------------|---|---|---|-------|
| 1 | F140W direct | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | F140W | SAMP-SEQ=SPARS 5; NSAMP=15 | PHASE 0.99628712 3411 TO 0.99679924 432 | Pattern 1, Exps 1-1 in Kepler 51-d Visit 2 (04) (1) | 33.16592 Secs (99.498 Secs) | |
| | | | | | | | | [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] | [1] |
| 2 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPARS10 | | | 103.128633 Secs X 19 (1959.444 Secs) | |
| | | | | | | | | [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] | [1] |

Exposures

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

| | | | | | | | |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 3 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] [==>(Copy 21)] [==>(Copy 22)] | [2] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 4 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [3] |
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Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 5 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [4] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 6 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [5] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|-------------------------------------|---|-----|
| 7 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) | <i>[==>(Copy 1)]</i> <i>[==>(Copy 2)]</i> <i>[==>(Copy 3)]</i> <i>[==>(Copy 4)]</i> <i>[==>(Copy 5)]</i> <i>[==>(Copy 6)]</i> <i>[==>(Copy 7)]</i> <i>[==>(Copy 8)]</i> <i>[==>(Copy 9)]</i> <i>[==>(Copy 10)]</i> <i>[==>(Copy 11)]</i> <i>[==>(Copy 12)]</i> <i>[==>(Copy 13)]</i> <i>[==>(Copy 14)]</i> <i>[==>(Copy 15)]</i> <i>[==>(Copy 16)]</i> <i>[==>(Copy 17)]</i> <i>[==>(Copy 18)]</i> <i>[==>(Copy 19)]</i> <i>[==>(Copy 20)]</i> <i>[==>(Copy 21)]</i> <i>[==>(Copy 22)]</i> | [6] |
|---|--------------------|---------------|-------------------------------|------|-----------------------------------|-------------------------------------|---|-----|

Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 8 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)] [==>(Copy 17)] [==>(Copy 18)] [==>(Copy 19)] [==>(Copy 20)] [==>(Copy 21)] [==>(Copy 22)] | [7] |
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Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|---|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 9 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [8] |
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Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|-----|
| 10 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [9] |
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Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

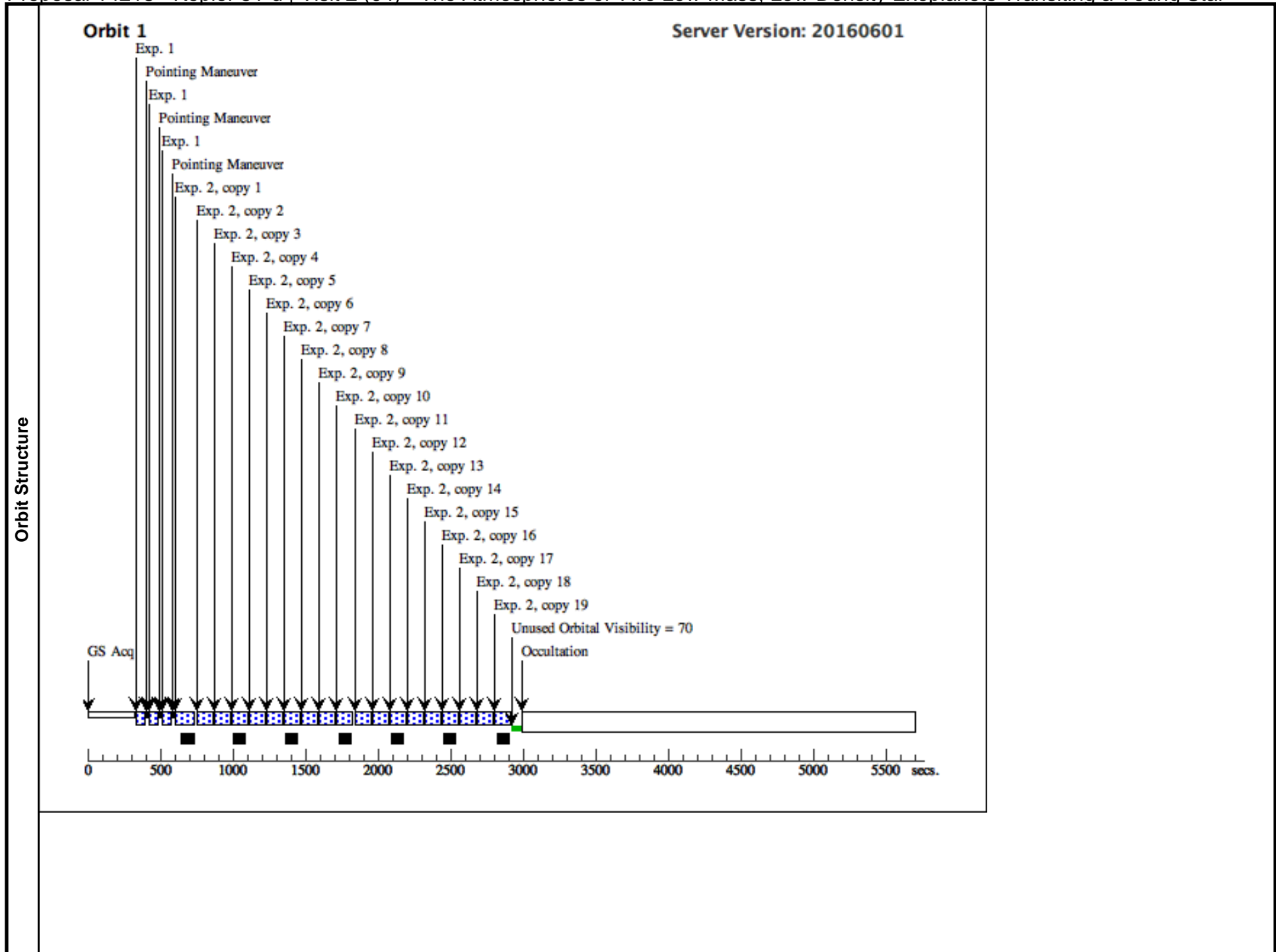
| | | | | | | | | |
|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--------------------------------------|---|------|
| 11 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 21 (2165.701 Secs) | <p>[==>(Copy 1)]</p> <p>[==>(Copy 2)]</p> <p>[==>(Copy 3)]</p> <p>[==>(Copy 4)]</p> <p>[==>(Copy 5)]</p> <p>[==>(Copy 6)]</p> <p>[==>(Copy 7)]</p> <p>[==>(Copy 8)]</p> <p>[==>(Copy 9)]</p> <p>[==>(Copy 10)]</p> <p>[==>(Copy 11)]</p> <p>[==>(Copy 12)]</p> <p>[==>(Copy 13)]</p> <p>[==>(Copy 14)]</p> <p>[==>(Copy 15)]</p> <p>[==>(Copy 16)]</p> <p>[==>(Copy 17)]</p> <p>[==>(Copy 18)]</p> <p>[==>(Copy 19)]</p> <p>[==>(Copy 20)]</p> <p>[==>(Copy 21)]</p> | [10] |
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Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

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|----|--------------------|---------------|-------------------------------|------|-----------------------------------|--|------|
| 12 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 21 (2165.701 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] | [11] |
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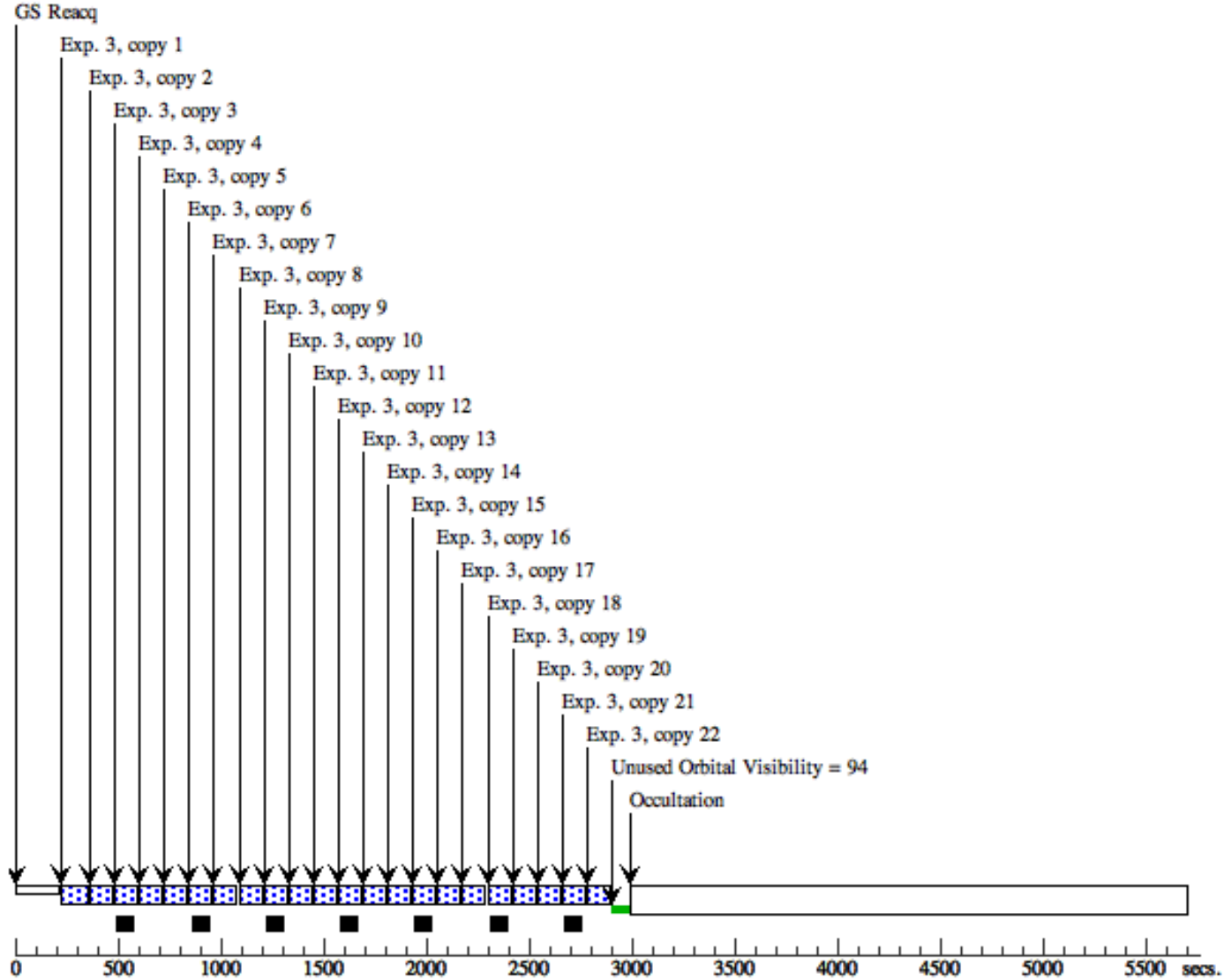
Proposal 14218 - Kepler 51-d | Visit 2 (04) - The Atmospheres of Two Low-Mass, Low-Density Exoplanets Transiting a Young Star

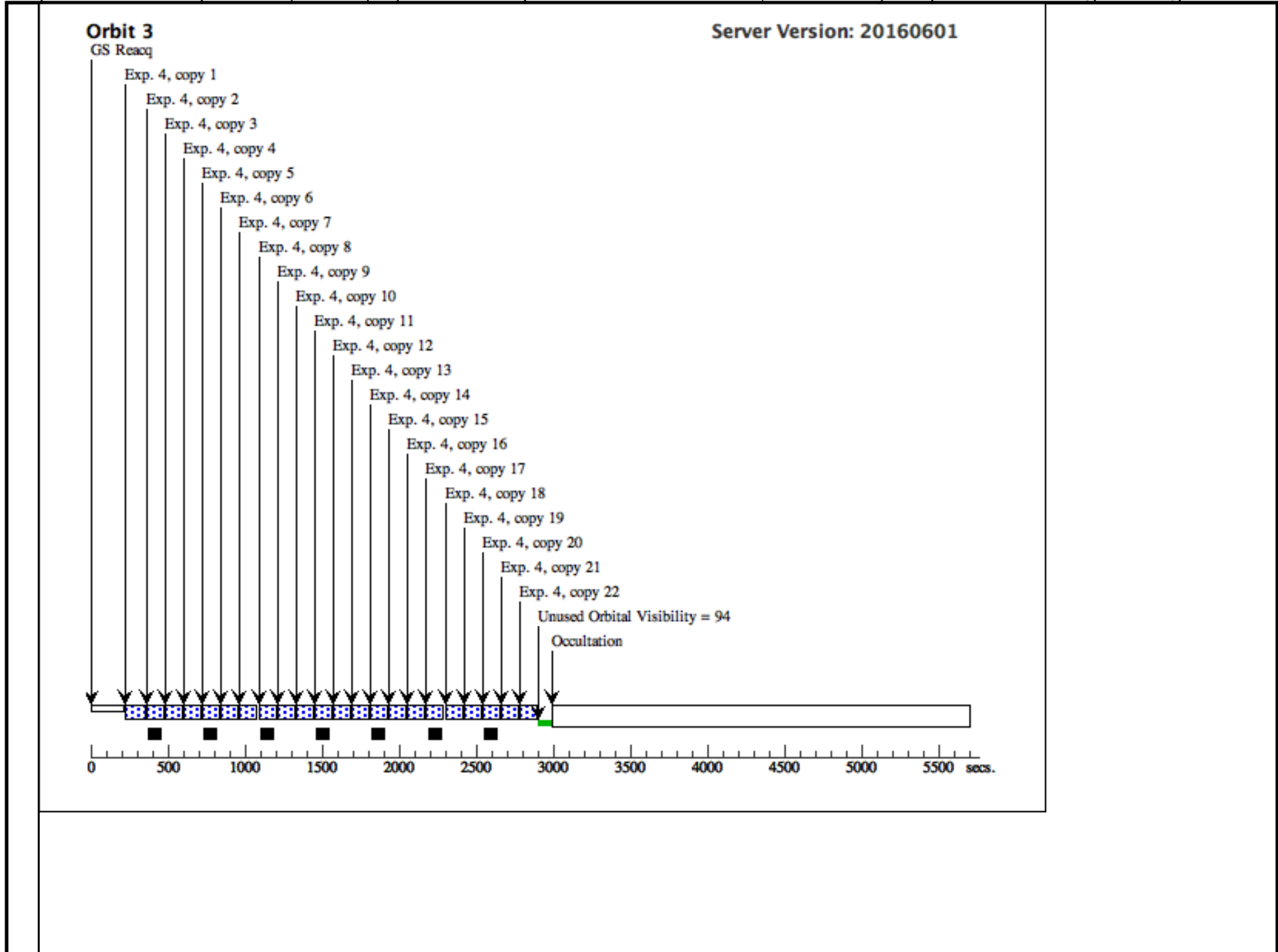
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| 13 | Continuous Spectra | (1) KEPLER-51 | WFC3/IR, MULTIACCUM, GRISM256 | G141 | NSAMP=15; SAMP-SEQ=SPAR S10 | 103.128633 Secs X 22 (2268.83 Secs) [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)] [=>(Copy 8)] [=>(Copy 9)] [=>(Copy 10)] [=>(Copy 11)] [=>(Copy 12)] [=>(Copy 13)] [=>(Copy 14)] [=>(Copy 15)] [=>(Copy 16)] [=>(Copy 17)] [=>(Copy 18)] [=>(Copy 19)] [=>(Copy 20)] [=>(Copy 21)] [=>(Copy 22)] | [12] |
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Orbit 2

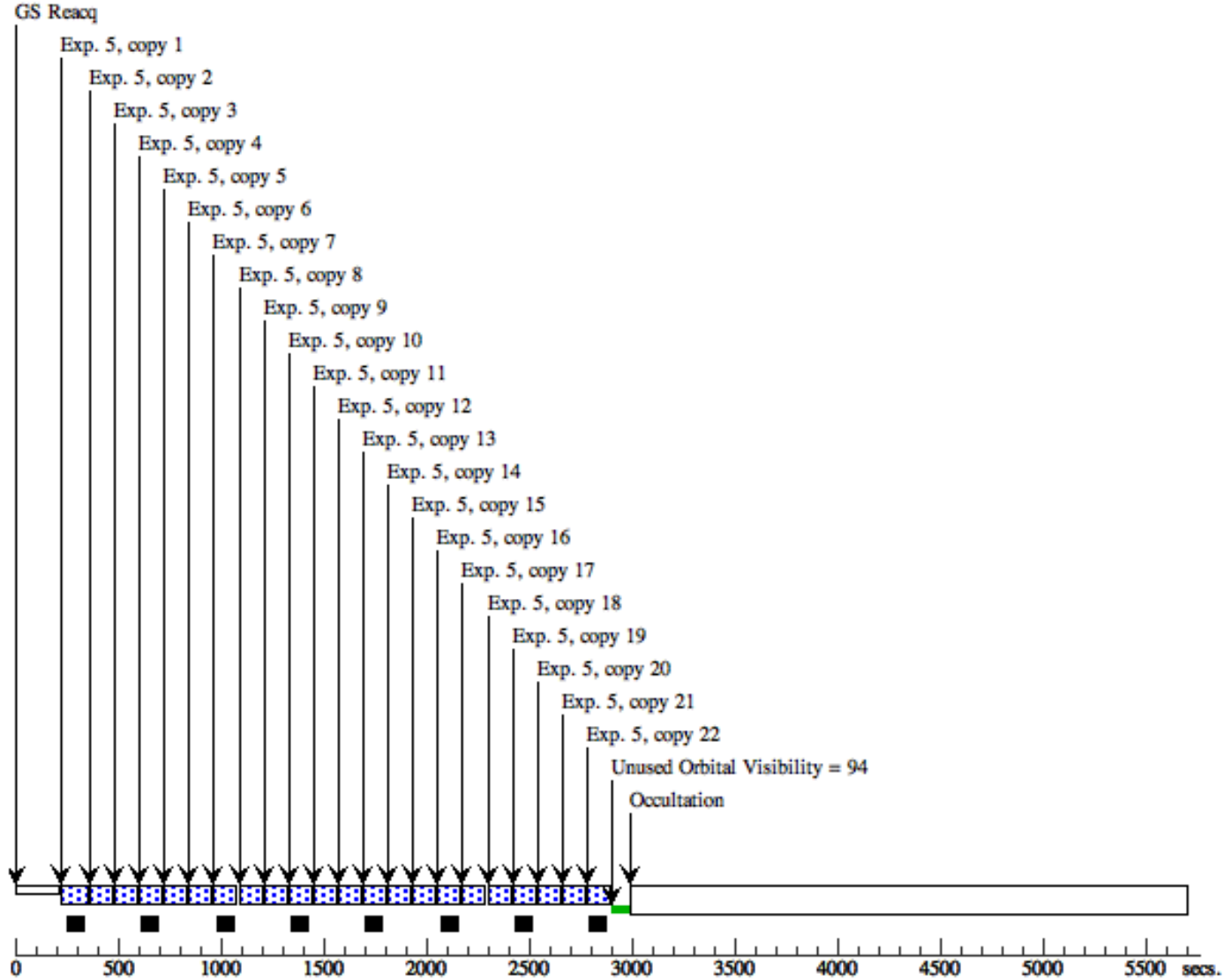
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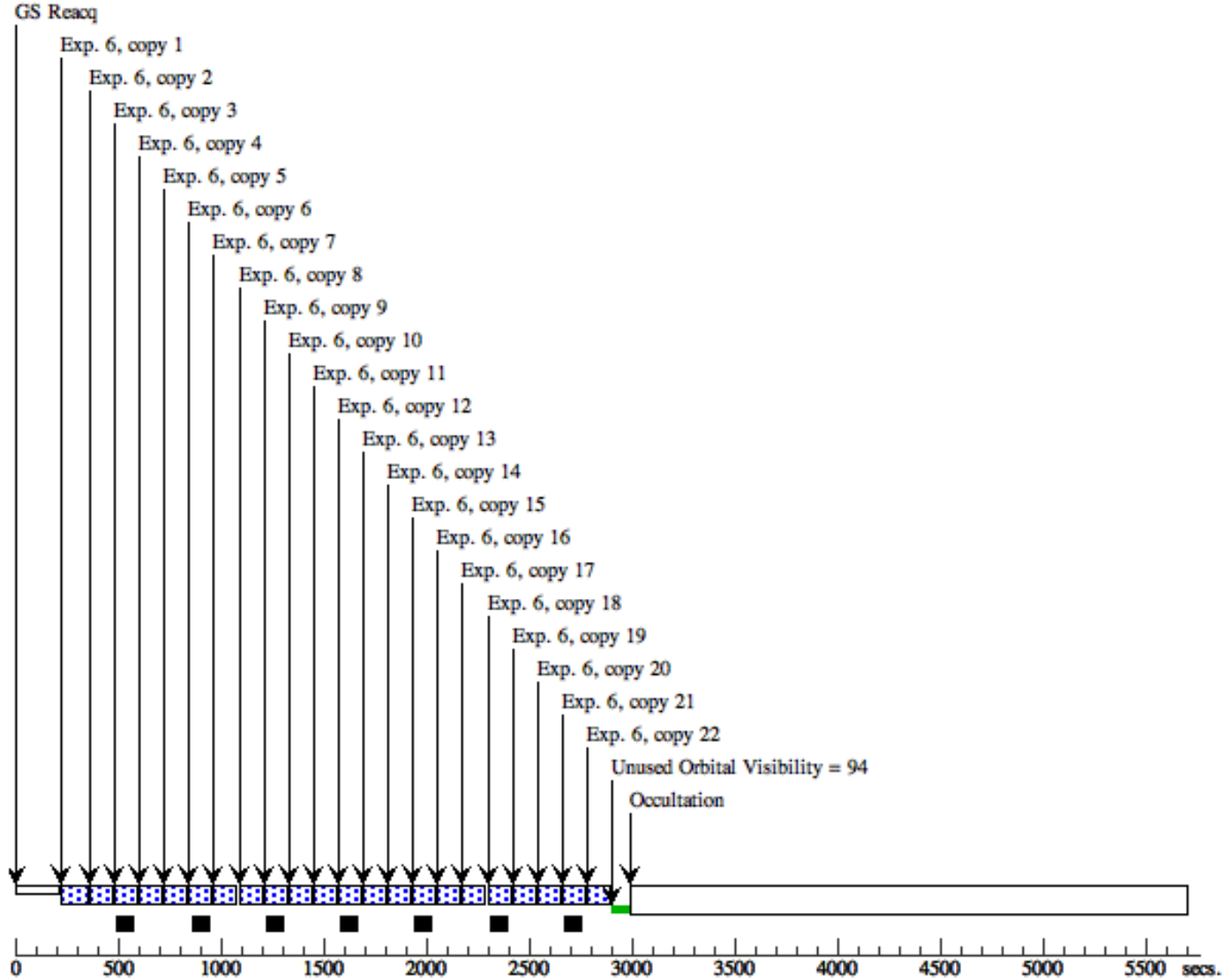
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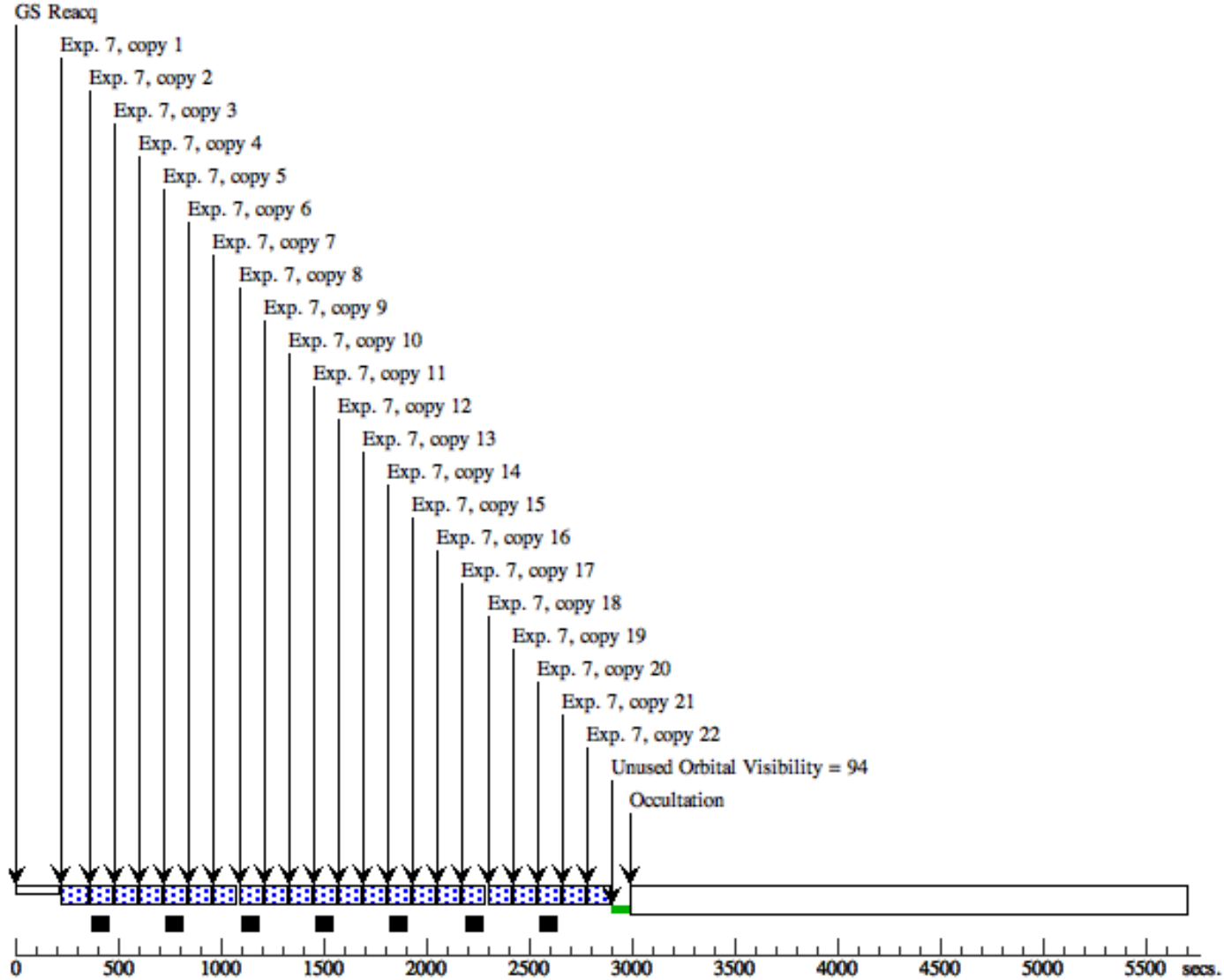
Orbit 5

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Orbit 6

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Orbit 7

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