



# 13705 - Brown dwarf Atmosphere Monitoring (BAM!): Characterizing the Coolest Atmosphere

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

## INVESTIGATORS

| <i>Name</i>                                   | <i>Institution</i>                | <i>E-Mail</i>                    |
|-----------------------------------------------|-----------------------------------|----------------------------------|
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| Dr. Robert John De Rosa (CoI)                 | Arizona State University          | rjderosa@asu.edu                 |
| Dr. Remi Soummer (CoI)                        | Space Telescope Science Institute | soummer@stsci.edu                |
| Dr. Laurent Pueyo (CoI)                       | Space Telescope Science Institute | lap@pha.jhu.edu                  |

## 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) NAME-WISE-J0458+6434     | WFC3/IR                             | 4                  | 29-Sep-2014 21:03:38.0        | yes                           |

4 Total Orbits Used

## ABSTRACT

Using the G141 WFC3/IR grism, we propose a HST spectrophotometric monitoring study of the coolest variable brown dwarf (~650K) identified as part of our Brown dwarf Atmosphere Monitoring (BAM) program. The proposed observations will enable exploration of the dynamic atmospheric evolution of a benchmark T8.5 binary brown dwarf system, which we have discovered to exhibit the second-largest amplitude variation amongst all

currently known brown dwarf variables. The close binarity of this system requires the exquisite stability of the HST point spread function to enable resolved monitoring of both components and to discriminate the source of the variability - the second component is a planetary mass object based on evolutionary models. This BAM follow-up study is designed to characterize both the longitudinal and vertical structure of the atmospheric properties of this system via multi-wavelength observations covering the entire spectral range of the WFC3/IR detector. Additionally, by monitoring the target over two separate epochs we will measure the evolution of atmospheric features giving rise to the flux variations. The proposed program will provide a comprehensive dataset serving as a benchmark comparison to directly imaged planets, intensely irradiated Hot Jupiters, and synthetic atmospheric models incorporating different physical processes.

## **OBSERVING DESCRIPTION**

We are observing W0458+6434, a T8.5 binary brown dwarf system detected by the WISE satellite, with the HST/WFC3 infra-red camera using the G141 grism. This program intends to resolve the spectra of both binary components and perform spectrophotometric monitoring of this system over four HST orbits.

To resolve the spectra of the two binaries we need to have the binaries oriented at 0 or 180 degrees with respect to the y-axis in the detector frame given by the ORIENT keyword using the equation below,

$$\text{ORIENT} = \text{PA}_y + 180 - 44.59,$$

where,  $\text{PA}_y$  is the angle by which the FoV needs to be rotated to align the binaries parallel to the y-axis. For W0458, this angle is approx. 25 degrees, suggesting the optimal ORIENT to be 160 degrees. Additionally, we intend to observe the target in the Continuous Viewing Zone, which combined with the above ORIENT restriction is available in three 2-day windows over the duration of the entire current HST cycle.

The two components of this binary system are separated by 0.25 arcsec or  $\sim 2\text{px}$ . After discussion with the WFC3 CS, we determined that doing a dither pattern and drizzle combination for these observations would not be useful. The separation is sufficient for the extraction of each individual target. Also, previous WFC3/IR proposals have gained significantly by ensuring the objects were maintained on a single pixel throughout the observations, limiting systematic effects.

We are thus observing the target in the 256px sub-array mode with one F140W image taken for calibration purposes at the start of each orbit,

Proposal 13705 (STScI Edit Number: 1, Created: Monday, September 29, 2014 8:03:41 PM EST) - Overview

followed by the G141 grism exposures. The exposure times have been selected to ensure  $\text{SNR} > 100$  in the fainter component ( $J \sim 18.5$  mag) at the J-band peak (1.28  $\mu\text{m}$ ).

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|                                                                                                   |                                                                                                                                                                                       |                      |                                                                                    |                                                                                          |                                                                   |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Visit                                                                                             | <b>Proposal 13705, Visit 01, implementation</b> <span style="float: right;">Tue Sep 30 01:03:41 GMT 2014</span>                                                                       |                      |                                                                                    |                                                                                          |                                                                   |
|                                                                                                   | <b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFC3/IR<br>Special Requirements: CVZ; ORIENT 155D TO 165 D; BETWEEN 15-DEC-2014:00:00:00 AND 15-JAN-2015:00:00:00 |                      |                                                                                    |                                                                                          |                                                                   |
| Fixed Targets                                                                                     | #                                                                                                                                                                                     | Name                 | Target Coordinates                                                                 | Targ. Coord. Corrections                                                                 | Fluxes                                                            |
|                                                                                                   | (1)                                                                                                                                                                                   | NAME-WISE-J0458+6434 | RA: 04 58 53.9000 (74.7245833d)<br>Dec: +64 34 51.90 (64.58108d)<br>Equinox: J2000 | Proper Motion RA: 199 mas/yr<br>Proper Motion Dec: 161 mas/yr<br>Epoch of Position: 2000 | V=(?)<br>A - J = 17.50,<br>H = 17.8,<br>B - J = 18.5,<br>H = 18.8 |
| Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. |                                                                                                                                                                                       |                      |                                                                                    |                                                                                          |                                                                   |

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| Exposures | #  | Label | Target                    | Config,Mode,Aperture          | Spectral Els. | Opt. Params.                   | Special Reqs.               | Groups | Exp. Time (Total)/[Actual Dur.]         | Orbit |
|-----------|----|-------|---------------------------|-------------------------------|---------------|--------------------------------|-----------------------------|--------|-----------------------------------------|-------|
|           | 1  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | F140W         | NSAMP=7;<br>SAMP-SEQ=SPAR S10  | GS ACQ SCENARI<br>O BASE1B3 |        | 44.356737 Secs (44.357 Secs)<br>[==>]   | [1]   |
|           | 2  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 3  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 4  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 5  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 6  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 7  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 8  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 9  |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 10 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 11 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 12 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 13 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 14 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 15 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |
|           | 16 |       | (1) NAME-WISE-J0 458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141          | NSAMP=15;<br>SAMP-SEQ=SPAR S25 |                             |        | 313.122361 Secs (313.122 Secs)<br>[==>] | [1]   |

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|    |                          |                               |       |                                   |                                         |     |
|----|--------------------------|-------------------------------|-------|-----------------------------------|-----------------------------------------|-----|
| 17 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [1] |
| 18 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | F140W | NSAMP=7;<br>SAMP-SEQ=SPAR<br>S10  | 44.356737 Secs (44.357 Secs)<br>[==>]   | [1] |
| 19 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 20 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 21 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 22 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 23 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 24 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 25 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 26 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 27 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 28 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 29 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 30 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 31 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 32 | (1) NAME-WISE-J0458+6434 | WFC3/IR, MULTIACCUM, GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |

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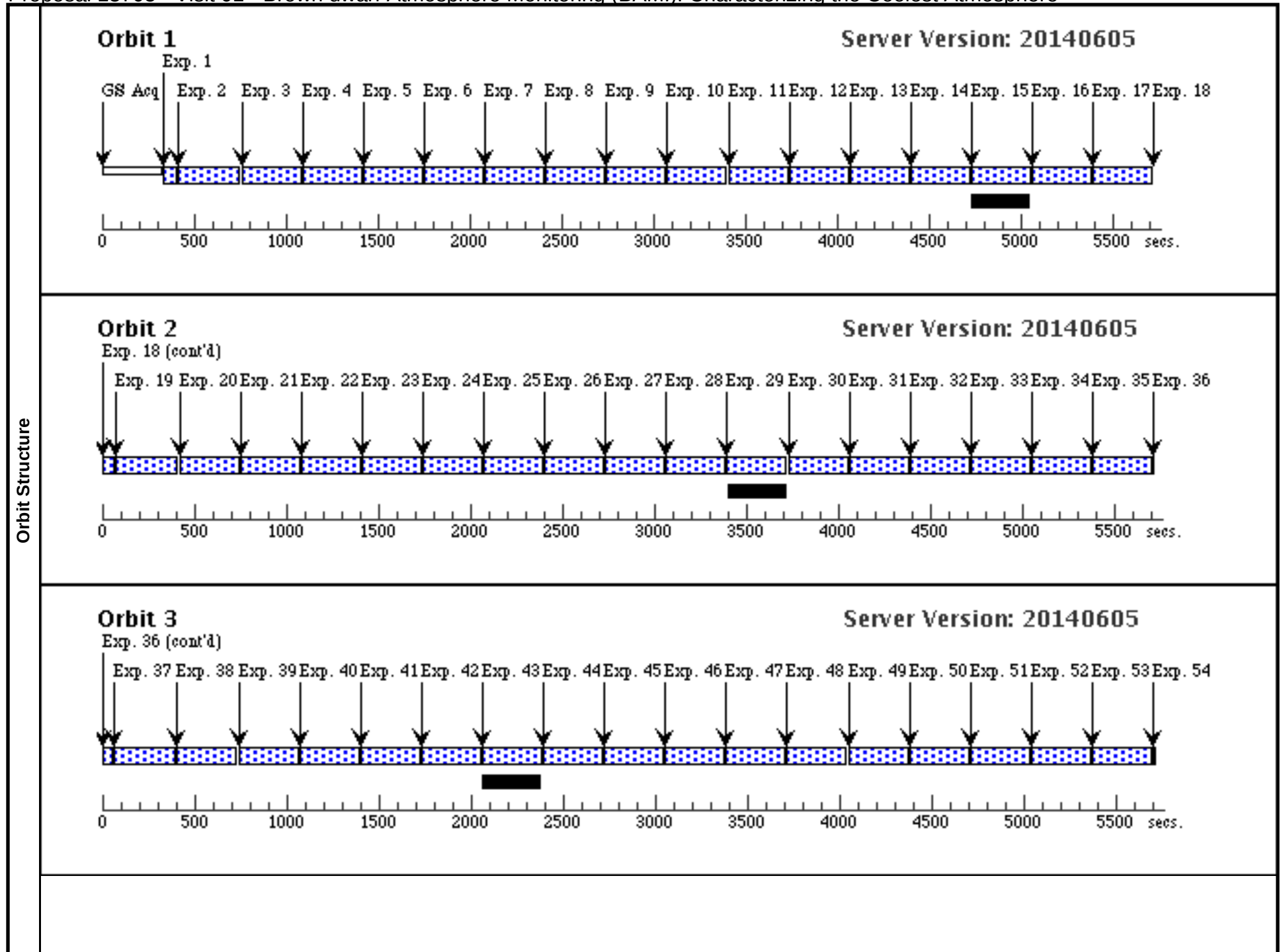
|    |                              |                                  |       |                                   |                                         |     |
|----|------------------------------|----------------------------------|-------|-----------------------------------|-----------------------------------------|-----|
| 33 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 34 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 35 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [2] |
| 36 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | F140W | NSAMP=7;<br>SAMP-SEQ=SPAR<br>S10  | 44.356737 Secs (44.357 Secs)<br>[==>]   | [2] |
| 37 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 38 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 39 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 40 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 41 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 42 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 43 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 44 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 45 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 46 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 47 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 48 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |

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|    |                              |                                  |       |                                   |                                         |     |
|----|------------------------------|----------------------------------|-------|-----------------------------------|-----------------------------------------|-----|
| 49 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 50 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 51 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 52 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 53 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [3] |
| 54 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | F140W | NSAMP=7;<br>SAMP-SEQ=SPAR<br>S10  | 44.356737 Secs (44.357 Secs)<br>[==>]   | [3] |
| 55 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 56 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 57 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 58 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 59 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 60 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 61 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 62 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 63 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
| 64 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141  | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |

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|  |    |                              |                                  |      |                                   |                                         |     |
|--|----|------------------------------|----------------------------------|------|-----------------------------------|-----------------------------------------|-----|
|  | 65 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141 | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
|  | 66 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141 | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
|  | 67 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141 | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
|  | 68 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141 | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |
|  | 69 | (1) NAME-WISE-J0<br>458+6434 | WFC3/IR, MULTIACCUM,<br>GRISM256 | G141 | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | 313.122361 Secs (313.122 Secs)<br>[==>] | [4] |



## Orbit 4

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