# 15920 - RELICS: Unveiling the Most Distant Lensed Arc at z~10

Cycle: 27, Proposal Category: GO

(Availability Mode: SUPPORTED)

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**VISITS**

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 01 | (1) SPT0615-JD | WFC3/IR | 2 | 07-Aug-2019 19:00:38.0 | yes |
| 02 | (1) SPT0615-JD | WFC3/IR | 2 | 07-Aug-2019 19:00:41.0 | yes |
| 03 | (1) SPT0615-JD | WFC3/IR | 2 | 07-Aug-2019 19:00:43.0 | yes |

6 Total Orbits Used


**ABSTRACT**

We propose 6 orbits of follow-up infrared imaging on one of the most exciting discoveries to come from the 188-orbit HST Treasury program RELICS: a candidate z~10 galaxy strongly lensed into a bright arc. Out of all of the existing HST and Spitzer imaging programs searching for distant galaxies, this z~10 candidate is unique by its large lensed size, offering the rare chance to resolve spatial structure in a galaxy just 500 Myr after the big bang. A recent ALMA search discovered a tentative 4-sigma detection of the [OIII] 88\micron\ fine structure line at z~10.2 (private communication), although deeper data are needed. However, the distinct spatial features and the two predicted lensed counter images are not discernible in the shallow HST RELICS discovery images.

Here we propose a total of 6 orbits of deeper WFC3/IR imaging (1 each in F105W and F125W, 2 each in F140W and F160W) to:

(1) reveal the extended arc morphology in more detail

(2) detect one or both lensed counter images, improving the lens model and producing geometric verification of the arc redshift

(3) deepen the imaging on the large number of lensed z~6-8 candidates (26 candidates, 2nd highest among all 41 RELICS cluster fields), improving constraints on the faint-end of the rest-UV luminosity function

This prolific lensing cluster and the z~10 arc promises to be favorite targets for JWST observations in Cycle 1 and beyond. This discovery of a z~10 galaxy bright enough for detailed and resolved study required a large search area of many lensing clusters and may not be replicated in JWST's lifetime.

**OBSERVING DESCRIPTION**

This program will obtain 6 orbits of WFC3/IR imaging of the galaxy cluster SPT0615-57. The imaging mostly overlaps the existing RELICS imaging, but is shifted to search for the z~10 counterimage.

We divide our 6 orbits among 4 IR filters:

F105W: 1 orbit
F125W: 1 orbit
F140W: 2 orbits
F160W: 2 orbits

Within each orbit, we will obtain 4 images in a single filter, using small dithers to optimally sample the PSF.

The orients were chosen to best overlap the existing RELICS HST imaging. However, EARLY SCHEDULING prior to the JWST call for proposal deadline is our priority, if possible. Therefore, we are willing to relax our orient contraints if necessary to obtain earlier schedulability.

## Visit

**Proposal 15920, F105W-F125W (01), implementation** Wed Aug 07 23:00:44 GMT 2019

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 30%

## Fixed Targets

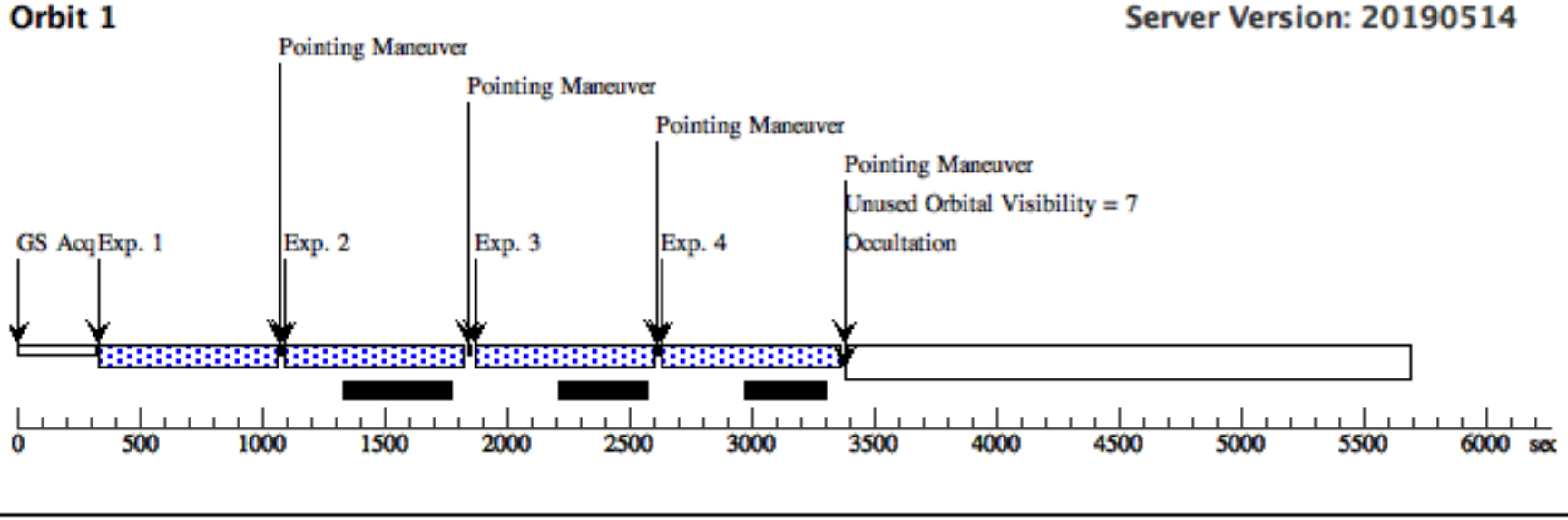
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | SPT0615-JD | RA: 06 15 52.1604 (93.9673350d)<br>Dec: -57 46 50.50 (-57.78069d)<br>Equinox: J2000 | | V=18 | Reference Frame: ICRS |

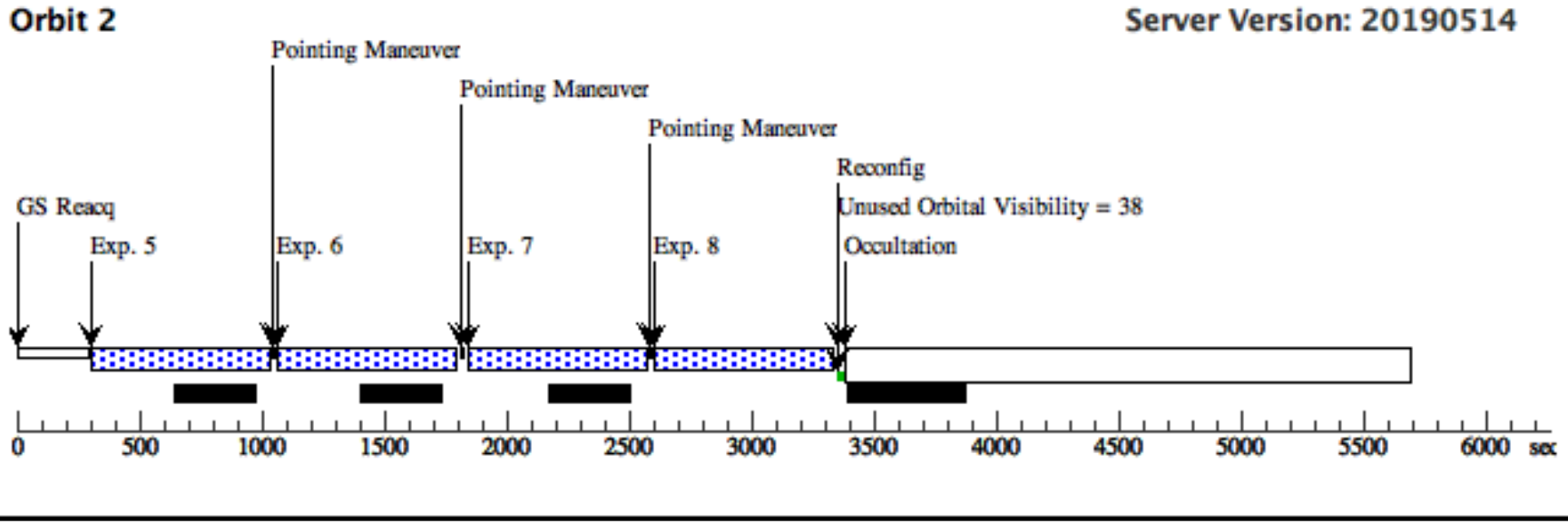
*Comments:*
*Category=CLUSTER OF GALAXIES*
*Description=[GRAVITATIONAL LENS, RICH CLUSTER]*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F105W | NSAMP=15; SAMP-SEQ=SPARS50 | | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 2 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F105W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG -0.20325,0.30275 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 3 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F105W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.317,0.90825 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 4 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F105W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.11375,1.211 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 5 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F125W | NSAMP=15; SAMP-SEQ=SPARS50 | | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 6 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F125W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG -0.20325,0.30275 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 7 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F125W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.317,0.90825 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 8 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F125W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.11375,1.211 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |

Orbit Structure



## Visit

**Proposal 15920, F140W (02), implementation** Wed Aug 07 23:00:45 GMT 2019

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 30%; SAME ORIENT AS 01

## Fixed Targets

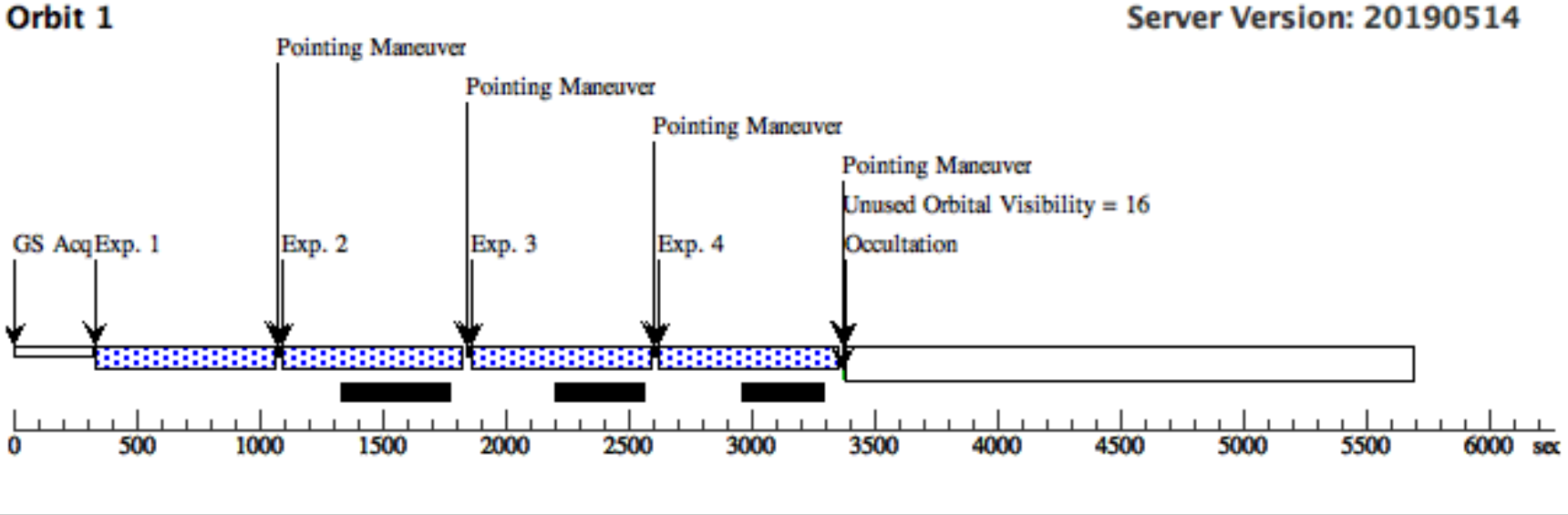
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | SPT0615-JD | RA: 06 15 52.1604 (93.9673350d)<br>Dec: -57 46 50.50 (-57.78069d)<br>Equinox: J2000 | | V=18 | Reference Frame: ICRS |

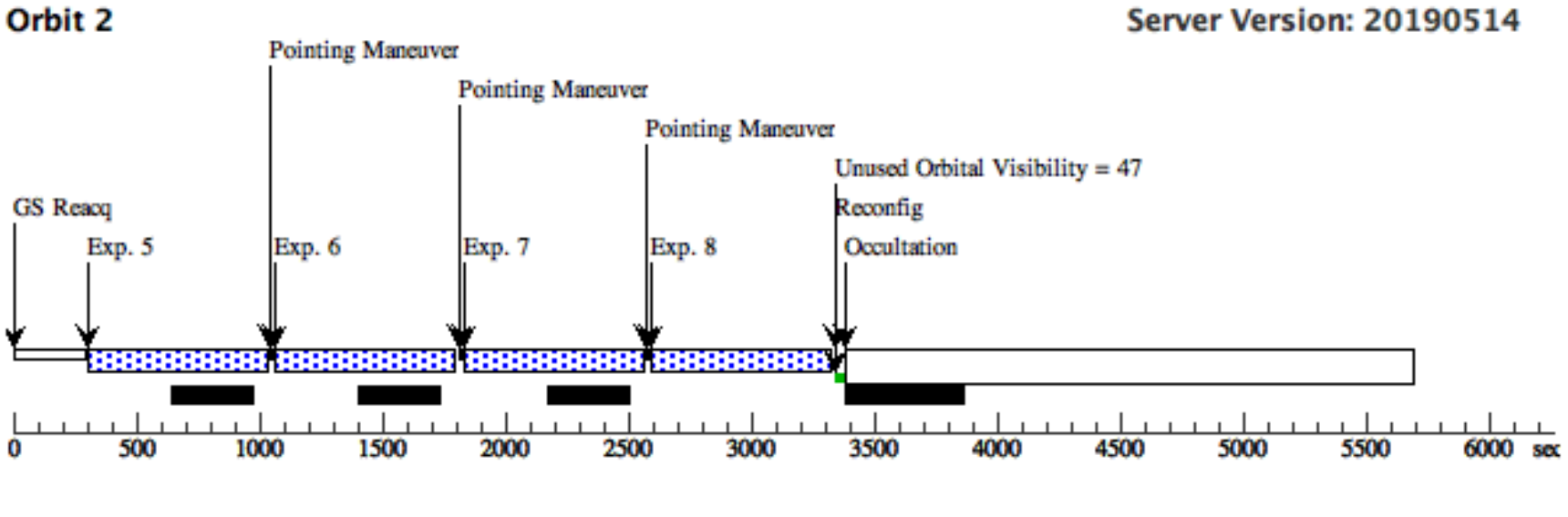
*Comments:*
*Category=CLUSTER OF GALAXIES*
*Description=[GRAVITATIONAL LENS, RICH CLUSTER]*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 2 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 0.542,0.18165 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 3 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 0.33875,0.4844 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 4 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG -0.20325,0.30275 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 5 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.317,0.90825 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 6 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.859,1.0899 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 7 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.65575,1.39265 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 8 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F140W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.11375,1.211 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |

Orbit Structure



## Visit

**Proposal 15920, F160W (03), implementation** Wed Aug 07 23:00:45 GMT 2019

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 30%; SAME ORIENT AS 01

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | SPT0615-JD | RA: 06 15 52.1604 (93.9673350d)<br>Dec: -57 46 50.50 (-57.78069d)<br>Equinox: J2000 | | V=18 | Reference Frame: ICRS |

*Comments:*
*Category=CLUSTER OF GALAXIES*
*Description=[GRAVITATIONAL LENS, RICH CLUSTER]*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 2 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 0.542,0.18165 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 3 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 0.33875,0.4844 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 4 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG -0.20325,0.30275 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[1]* |
| 5 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.317,0.90825 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 6 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.859,1.0899 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 7 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.65575,1.39265 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |
| 8 | | (1) SPT0615-JD | WFC3/IR, MULTIACCUM, IR-FIX | F160W | NSAMP=15; SAMP-SEQ=SPARS50 | POS TARG 7.11375,1.211 | | 702.938605 Secs (702.939 Secs)<br>*[==>]* | *[2]* |

Orbit Structure