



## 11108 - Near Infrared Observations of a Sample of $z \sim 6.5-6.7$ Galaxies

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

| <i>Name</i>                        | <i>Institution</i>                      | <i>E-Mail</i>            |
|------------------------------------|-----------------------------------------|--------------------------|
| <b>Dr. Esther M. Hu (PI)</b>       | <b>University of Hawaii</b>             | <b>hu@ifa.hawaii.edu</b> |
| Dr. Lennox L. Cowie (CoI)          | University of Hawaii                    | cowie@ifa.hawaii.edu     |
| Ms. Yuko Kakazu (CoI) (ESA Member) | CNRS, Institut d'Astrophysique de Paris | kakazu@iap.fr            |

### 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) HC-6B                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:01:36.0        | yes                           |
| 02           | (2) HC-6C                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:01:50.0        | yes                           |
| 03           | (3) HC-6DE                   | WFC3/IR                             | 2                  | 31-Aug-2009 21:02:09.0        | yes                           |
| 04           | (4) HC-6F                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:02:19.0        | yes                           |
| 05           | (5) HCM-6A                   | WFC3/IR                             | 2                  | 31-Aug-2009 21:02:30.0        | yes                           |
| 06           | (6) HC-6G                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:02:40.0        | yes                           |
| 07           | (7) HC-6H                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:02:57.0        | yes                           |
| 08           | (8) HC-6I                    | WFC3/IR                             | 2                  | 31-Aug-2009 21:03:08.0        | yes                           |

16 Total Orbits Used

## **ABSTRACT**

The majority of the most distant galaxies discovered to date have been found by strong Lyman alpha emission at red optical wavelengths. An accurate estimate of the star formation rates for these objects requires a measurement of the line-free UV continuum, which must be taken at infrared wavelengths. Here we propose to obtain imaging with WFC3 in the F140W filter for a sample of 9 Lyman alpha galaxies with redshifts  $z \sim 6.5$  up to  $z = 6.740$  from a complete, flux-limited widefield narrowband and multi-color survey conducted on the 8-m Subaru Telescope. This program will investigate galaxy morphologies and star formation for a uniform sample of the highest redshift galaxies now known.

## **OBSERVING DESCRIPTION**

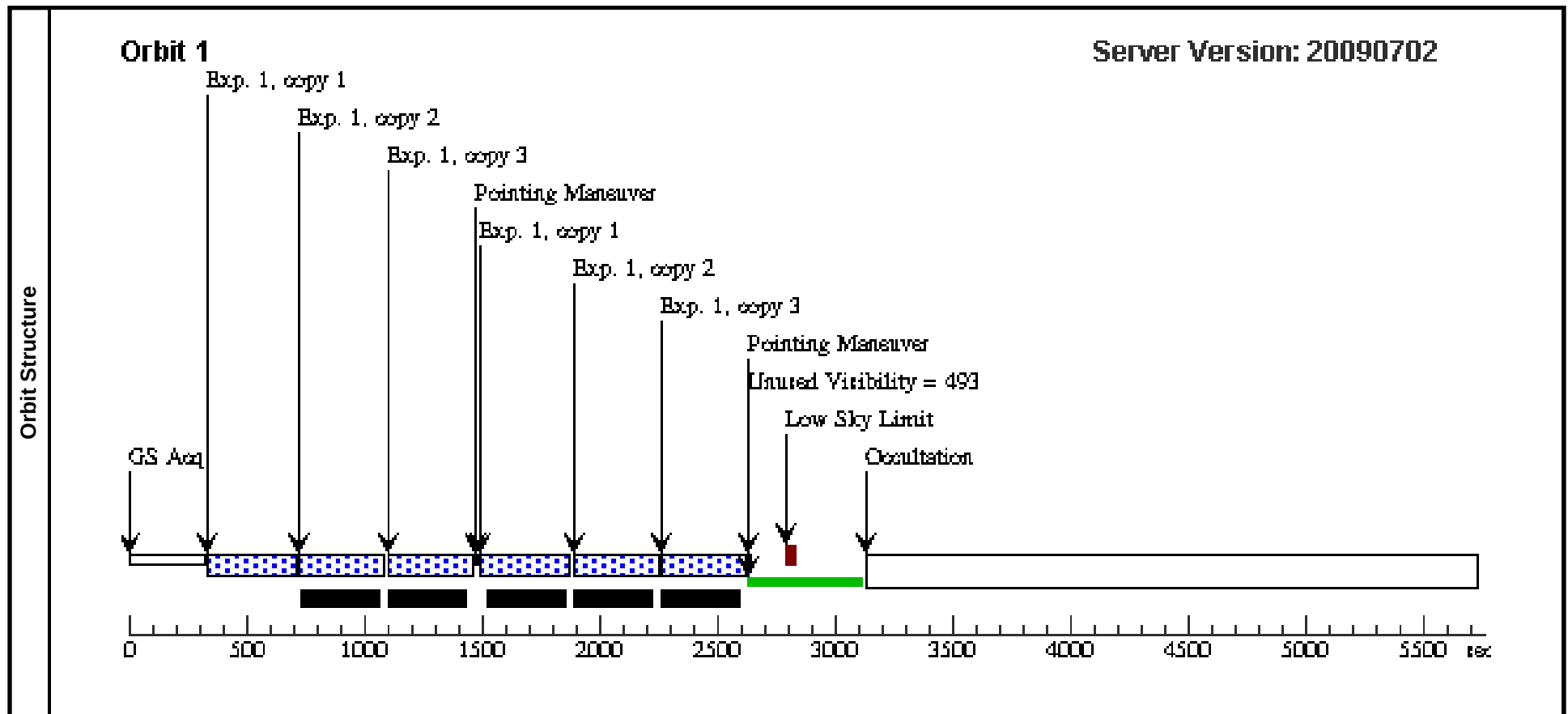
We will observe each of the galaxies in the sensitive broad band filter F160W using the NIC2 camera. (The F110W band contains emission from the Lyman alpha line.) We will not observe at longer wavelengths where we already have very deep ground based K images with 0.4" resolution obtained with the CISCO camera on the Subaru 8m telescope. The filter and camera combination provides the required angular resolution and minimizes detector issues. The 19" FOV of NIC2 will also allow us to easily match the images to the ground data and will also allow us to look for peripheral objects or structure in the vicinity of the galaxy.

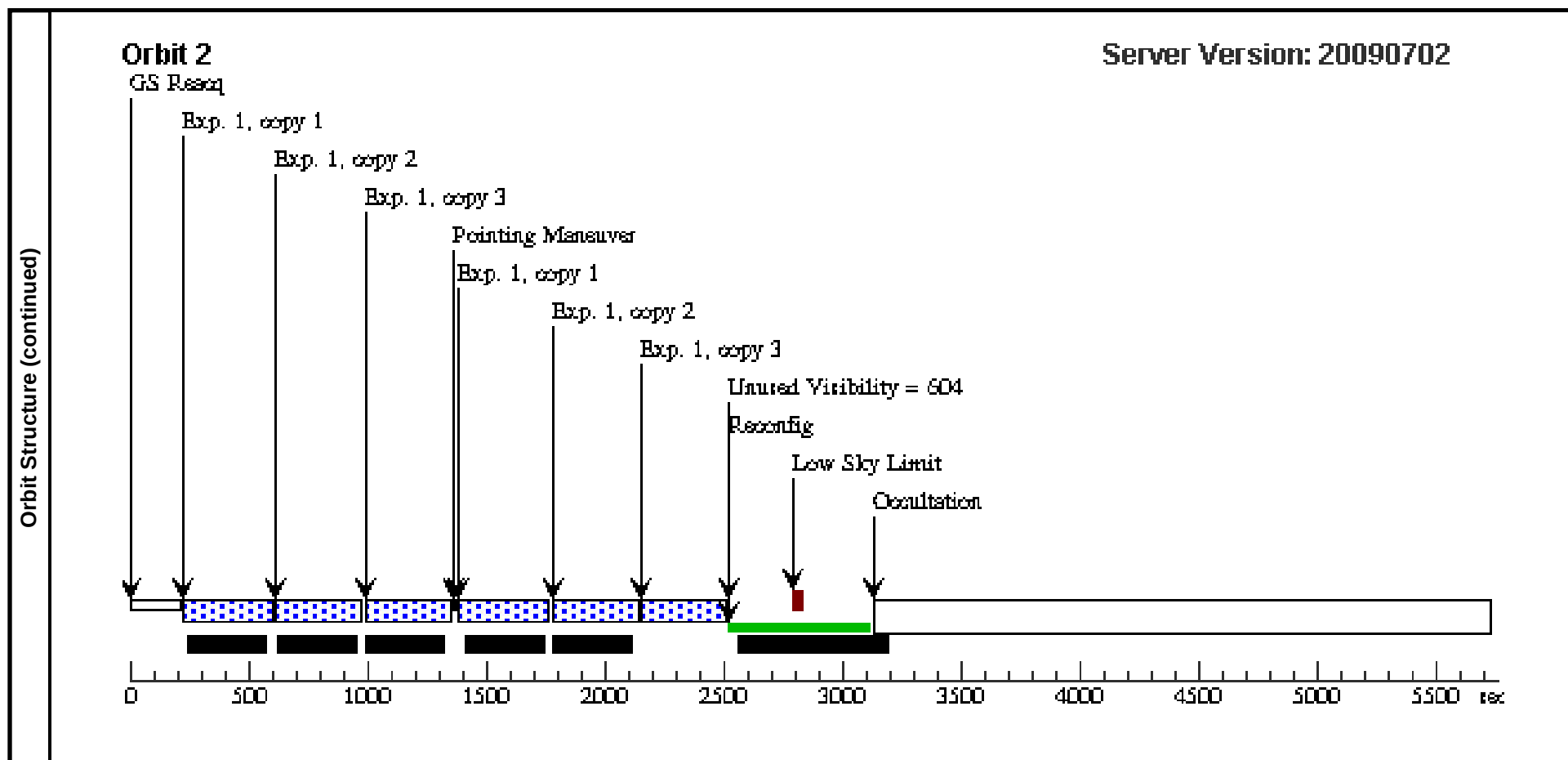
We have calculated the exposure times to give a S/N of 10 assuming that the surface brightness is uniform over a 0.5 square arcsecond region and using

a J band flux for the objects of  $2.5 \times 10^{-30}$  erg cm<sup>-2</sup> s<sup>-1</sup> Hz<sup>-1</sup> at 1.1 microns (the average flux measured on stacked ground-based images). If the galaxies are highly structured we should obtain better S/N in the bright components. We require 3 orbits per galaxy for the F160W observations.

# Proposal 11108 - Visit 01 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

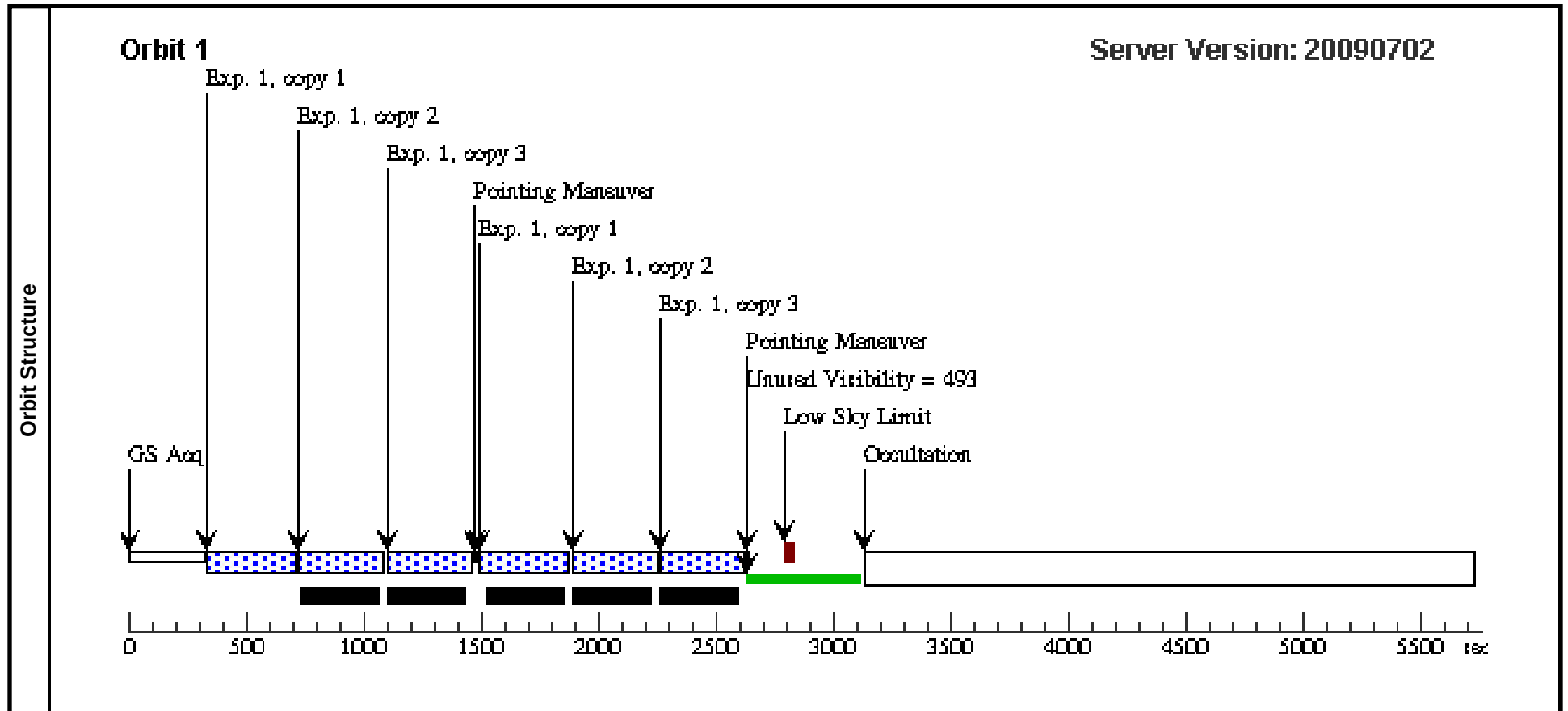
|               |                                                                                                                                                           |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|-----------------------------------|------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----|--|--|
| Visit         | Proposal 11108, Visit 01, implementation                                                                                                                  |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      | Tue Sep 01 01:03:14 GMT 2009 |     |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Diagnostics   | (Visit 01) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                                                                                                                                           |                                                                                    |                         |                          | Secondary Pattern                 |                                          |                         |                                                                                                                                                                      | Exposures                                                                                                                                                            |                              |     |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Coordinate Frame=POS-TARG<br>Purpose=DITHER<br>Pattern Orientation=18.528<br>Number Of Points=4<br>Angle Between Sides=74.653<br>Point Spacing=0.572<br>Center Pattern=false<br>Line Spacing=0.365 |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      | (1)                                                                                                                                                                  |                              |     |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                                                                                                                                      | Target Coordinates                                                                 |                         | Targ. Coord. Corrections |                                   | Fluxes                                   |                         | Miscellaneous                                                                                                                                                        |                                                                                                                                                                      |                              |     |  |  |
|               | (1)                                                                                                                                                       | HC-6B                                                                                                                                                                                                                                     | RA: 02 39 11.5900 (39.7982917d)<br>Dec: -01 41 19.00 (-1.68861d)<br>Equinox: J2000 |                         |                          |                                   | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1    |                         | Reference Frame: ICRS                                                                                                                                                |                                                                                                                                                                      |                              |     |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                                                                                                                                     | Target                                                                             | Config,Mode,Aperture    | Spectral Els.            | Opt. Params.                      | Special Reqs.                            | Groups                  | Exp. Time/[Actual Dur.]                                                                                                                                              |                                                                                                                                                                      | Orbit                        |     |  |  |
|               | 1                                                                                                                                                         | HC-6B F160 W                                                                                                                                                                                                                              | (1) HC-6B                                                                          | WFC3/IR, MULTIACCUM, IR | F140W                    | NSAMP=15;<br>SAMP-SEQ=SPAR<br>S25 | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BN3 | Pattern 1, Exps 1-1 (1) | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                                                                                                                                                                      | [1]                          |     |  |  |
|               |                                                                                                                                                           |                                                                                                                                                                                                                                           |                                                                                    |                         |                          |                                   |                                          |                         |                                                                                                                                                                      | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2] |  |  |

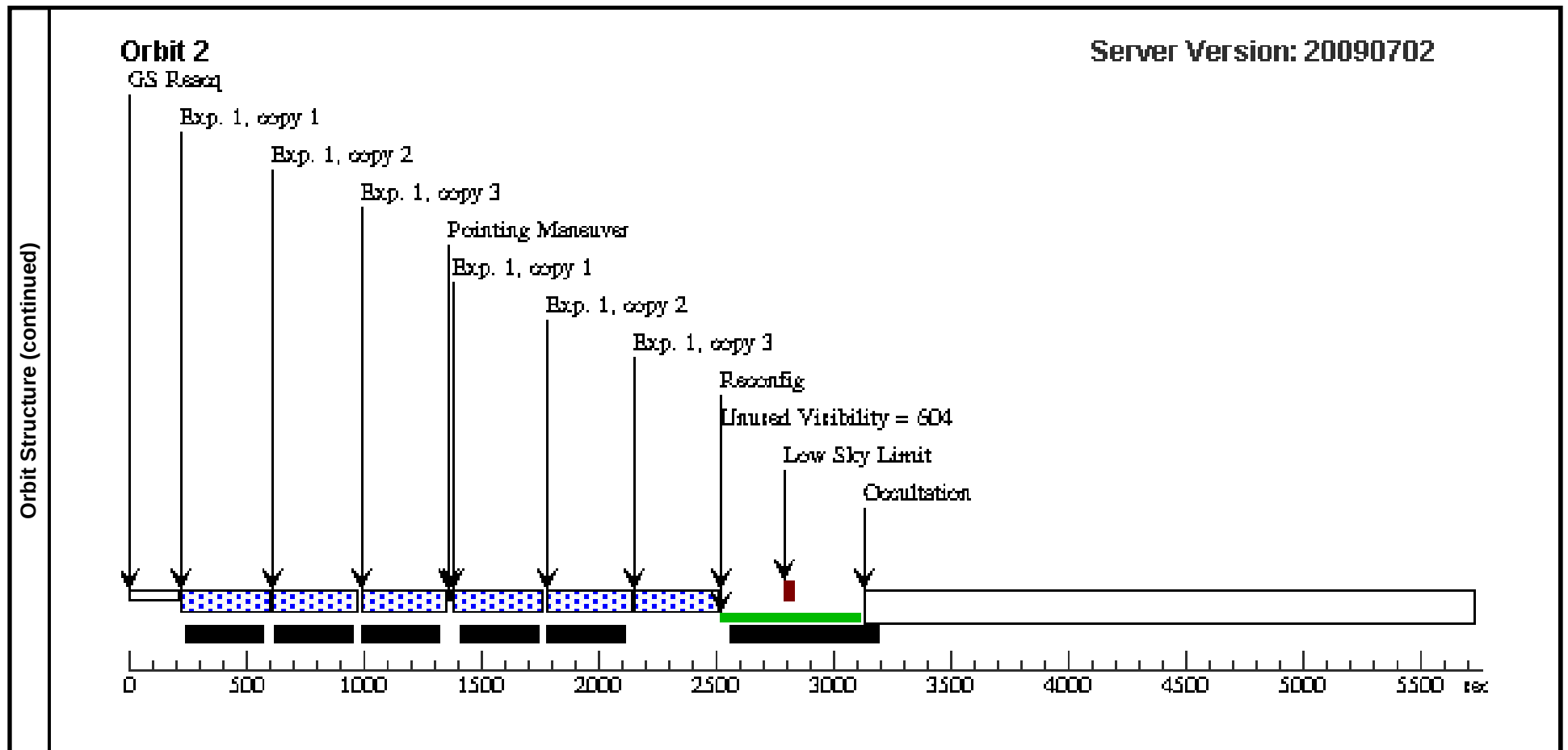




# Proposal 11108 - Visit 02 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

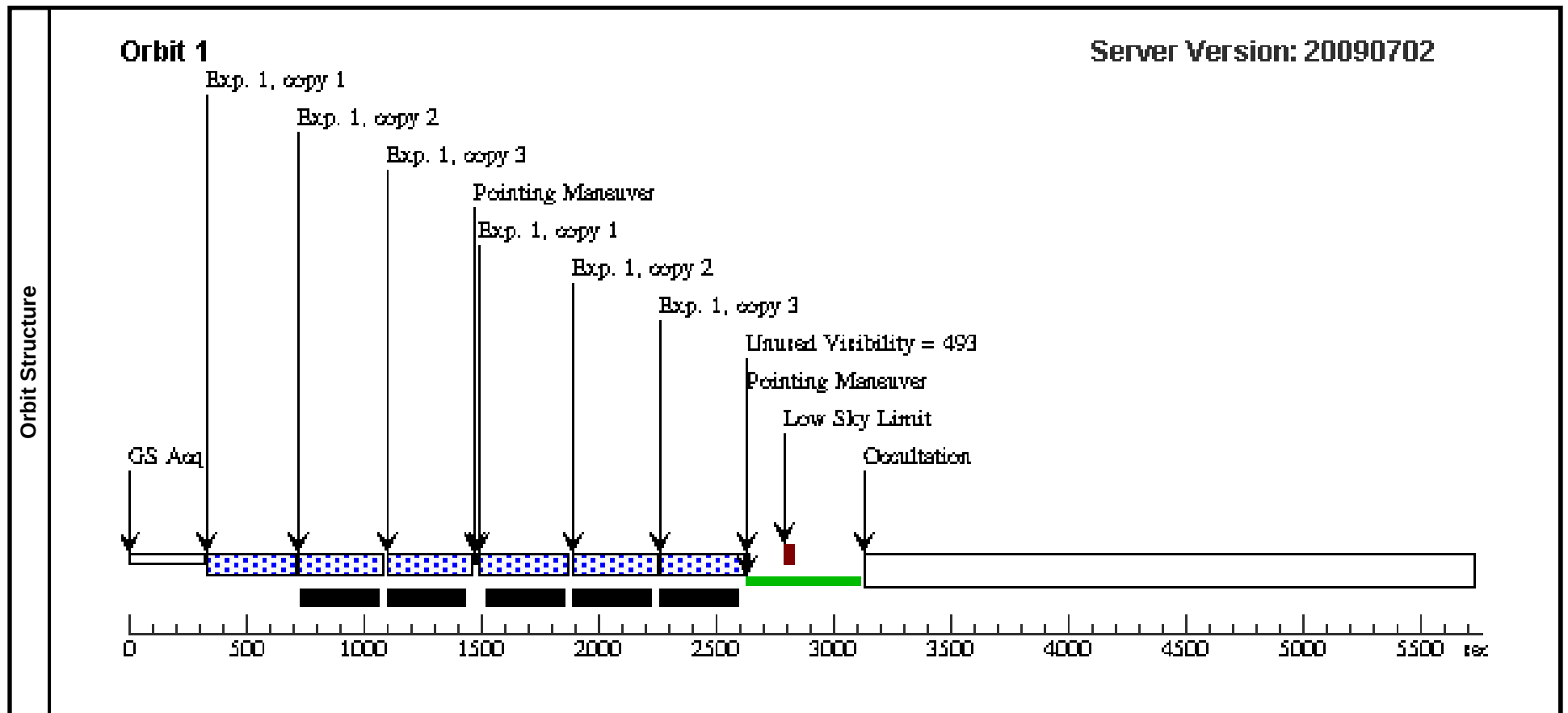
|               |                                                                                                                                                           |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----|--|--|
| Visit         | Proposal 11108, Visit 02, implementation                                                                                                                  |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      | Tue Sep 01 01:03:16 GMT 2009 |     |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Diagnostics   | (Visit 02) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |                                                                                    |                         |                          | Secondary Pattern                                                                                             |                                          |                         |                                                                                                                                                                      | Exposures                                                                                                                                                            |                              |     |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |                                                                                    |                         |                          | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                                          |                         |                                                                                                                                                                      | (1)                                                                                                                                                                  |                              |     |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     | Target Coordinates                                                                 |                         | Targ. Coord. Corrections |                                                                                                               | Fluxes                                   |                         | Miscellaneous                                                                                                                                                        |                                                                                                                                                                      |                              |     |  |  |
|               | (2)                                                                                                                                                       | HC-6C                                                                                                                    | RA: 02 39 27.2000 (39.8633333d)<br>Dec: -01 35 23.40 (-1.58983d)<br>Equinox: J2000 |                         |                          |                                                                                                               | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1    |                         | Reference Frame: ICRS                                                                                                                                                |                                                                                                                                                                      |                              |     |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |                                                                                                                                                                      |                              |     |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target                                                                             | Config,Mode,Aperture    | Spectral Els.            | Opt. Params.                                                                                                  | Special Reqs.                            | Groups                  | Exp. Time/[Actual Dur.]                                                                                                                                              |                                                                                                                                                                      | Orbit                        |     |  |  |
|               | 1                                                                                                                                                         | HC-6C F160 W                                                                                                             | (2) HC-6C                                                                          | WFC3/IR, MULTIACCUM, IR | F140W                    | SAMP-SEQ=SPARS 25;<br>NSAMP=15                                                                                | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BNS | Pattern 1, Exps 1-1 (1) | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                                                                                                                                                                      | [1]                          |     |  |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                    |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2] |  |  |

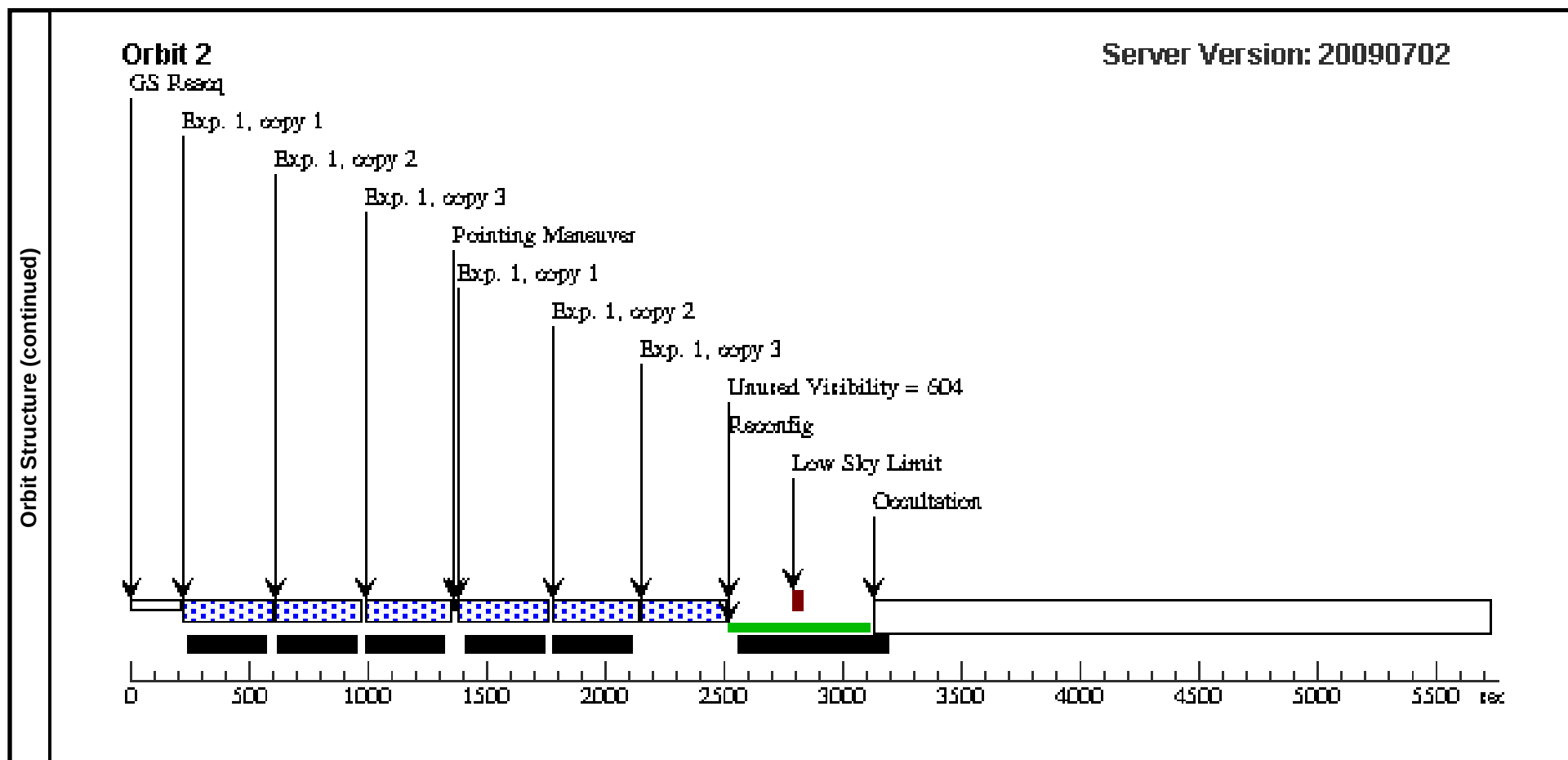




# Proposal 11108 - Visit 03 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

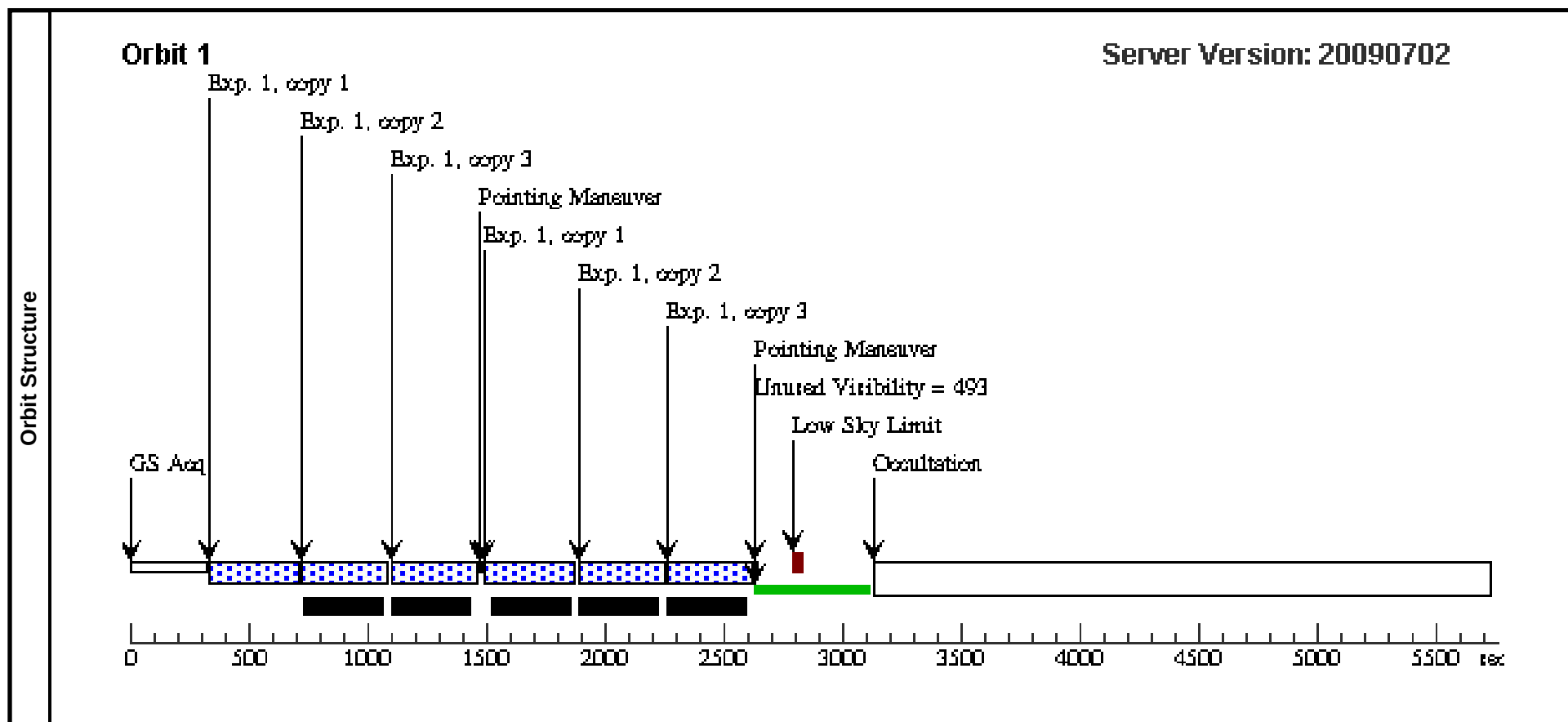
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------|--|--|
| Visit         | Proposal 11108, Visit 03, implementation                                                                                                                  |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      | Tue Sep 01 01:03:18 GMT 2009 |       |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
| Diagnostics   | (Visit 03) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |            |                                                                                    |  | Secondary Pattern                                                                                             |                                |                                          |                         | Exposures                                                                                                                                                            |                              |       |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |            |                                                                                    |  | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                                |                                          |                         | (1)                                                                                                                                                                  |                              |       |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     |            | Target Coordinates                                                                 |  | Targ. Coord. Corrections                                                                                      |                                | Fluxes                                   |                         | Miscellaneous                                                                                                                                                        |                              |       |  |  |
|               | (3)                                                                                                                                                       | HC-6DE                                                                                                                   |            | RA: 02 39 39.5000 (39.9145833d)<br>Dec: -01 34 42.10 (-1.57836d)<br>Equinox: J2000 |  |                                                                                                               |                                | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1    |                         | Reference Frame: ICRS                                                                                                                                                |                              |       |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target     | Config,Mode,Aperture                                                               |  | Spectral Els.                                                                                                 | Opt. Params.                   | Special Reqs.                            | Groups                  | Exp. Time/[Actual Dur.]                                                                                                                                              |                              | Orbit |  |  |
|               | 1                                                                                                                                                         | HC-6D F16 0W                                                                                                             | (3) HC-6DE | WFC3/IR, MULTIACCUM, IR                                                            |  | F140W                                                                                                         | NSAMP=15;<br>SAMP-SEQ=SPAR S25 | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BNS | Pattern 1, Exps 1-1 (1) | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                              | [1]   |  |  |
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2]   |  |  |
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |  |  |

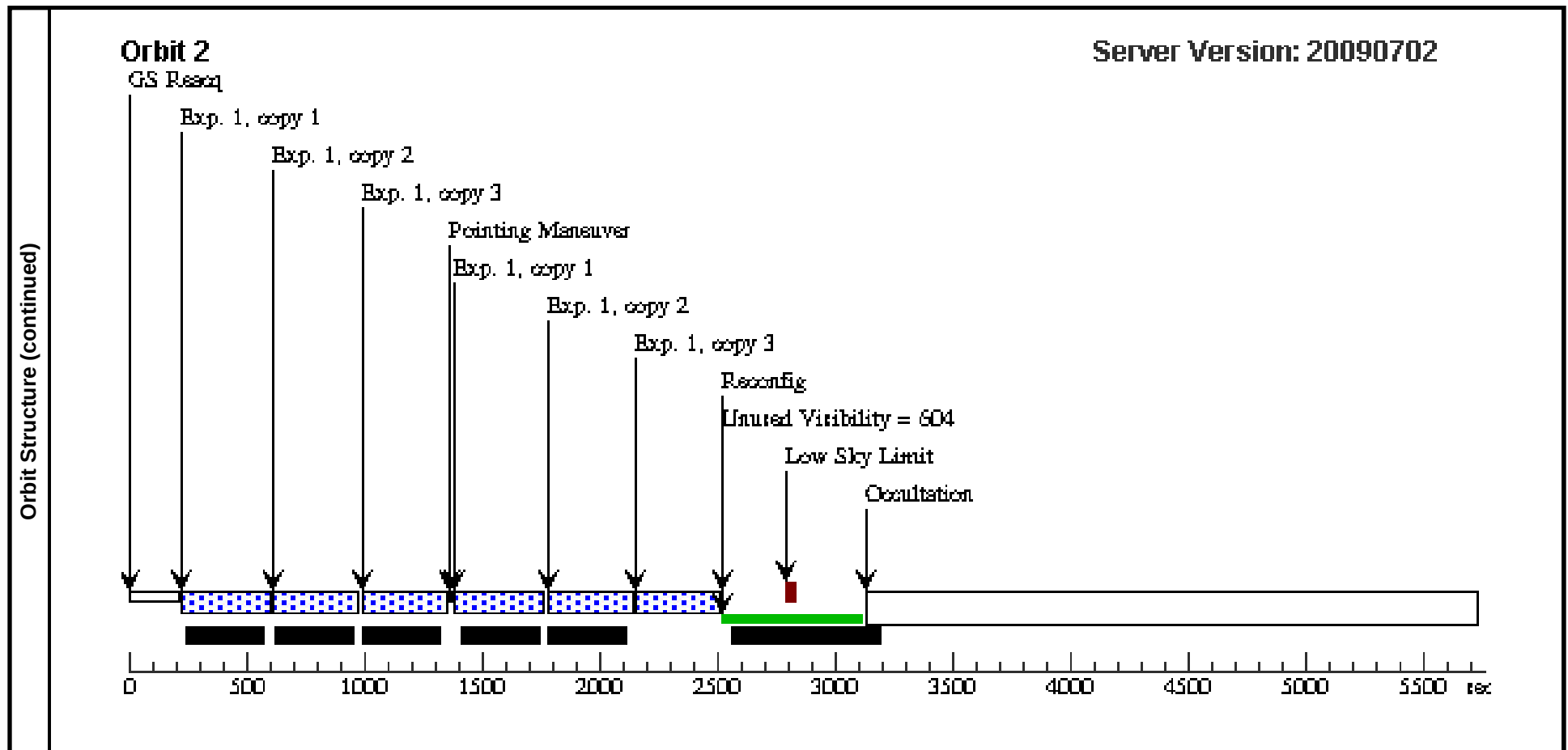




# Proposal 11108 - Visit 04 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

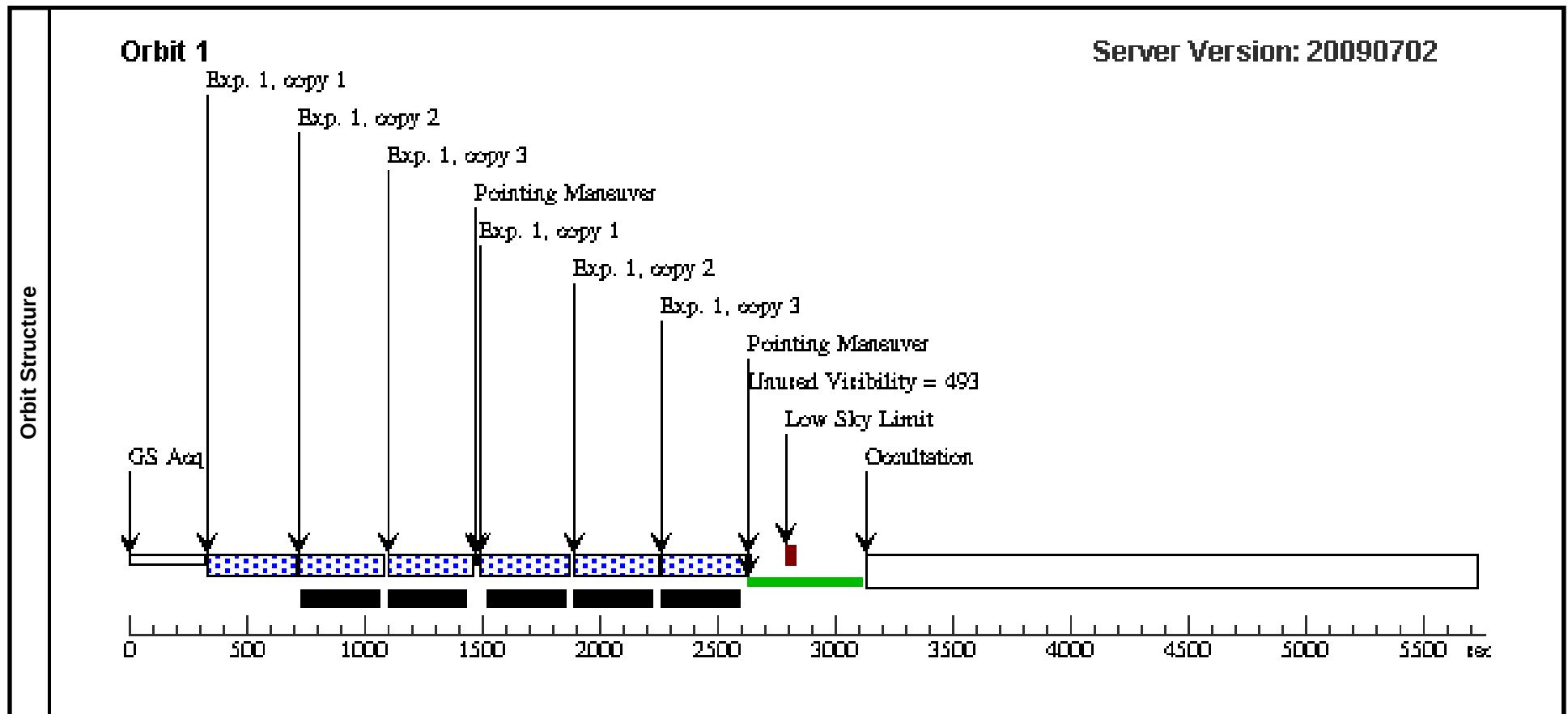
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------|------------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|--|--|
| Visit         | Proposal 11108, Visit 04, implementation                                                                                                                  |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      | Tue Sep 01 01:03:19 GMT 2009 |           |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Diagnostics   | (Visit 04) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |           |                                                                                    |                                                                                                               |                          | Secondary Pattern              |                                          |                                       |                                                                                                                                                                      |                              | Exposures |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |           |                                                                                    | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                          |                                |                                          |                                       |                                                                                                                                                                      |                              | (1)       |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     |           | Target Coordinates                                                                 |                                                                                                               | Targ. Coord. Corrections |                                |                                          | Fluxes                                |                                                                                                                                                                      | Miscellaneous                |           |  |  |
|               | (4)                                                                                                                                                       | HC-6F                                                                                                                    |           | RA: 02 39 49.6000 (39.9566667d)<br>Dec: -01 31 21.60 (-1.52267d)<br>Equinox: J2000 |                                                                                                               |                          |                                |                                          | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1 |                                                                                                                                                                      | Reference Frame: ICRS        |           |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target    | Config,Mode,Aperture                                                               |                                                                                                               | Spectral Els.            | Opt. Params.                   | Special Reqs.                            | Groups                                | Exp. Time/[Actual Dur.]                                                                                                                                              |                              | Orbit     |  |  |
|               | 1                                                                                                                                                         | HC-6F F160 W                                                                                                             | (4) HC-6F | WFC3/IR, MULTIACCUM, IR                                                            |                                                                                                               | F140W                    | NSAMP=15;<br>SAMP-SEQ=SPAR S25 | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BN3 | Pattern 1, Exps 1-1 (1)               | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                              | [1]       |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |                                                                                                               |                          |                                |                                          |                                       | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2]       |  |  |

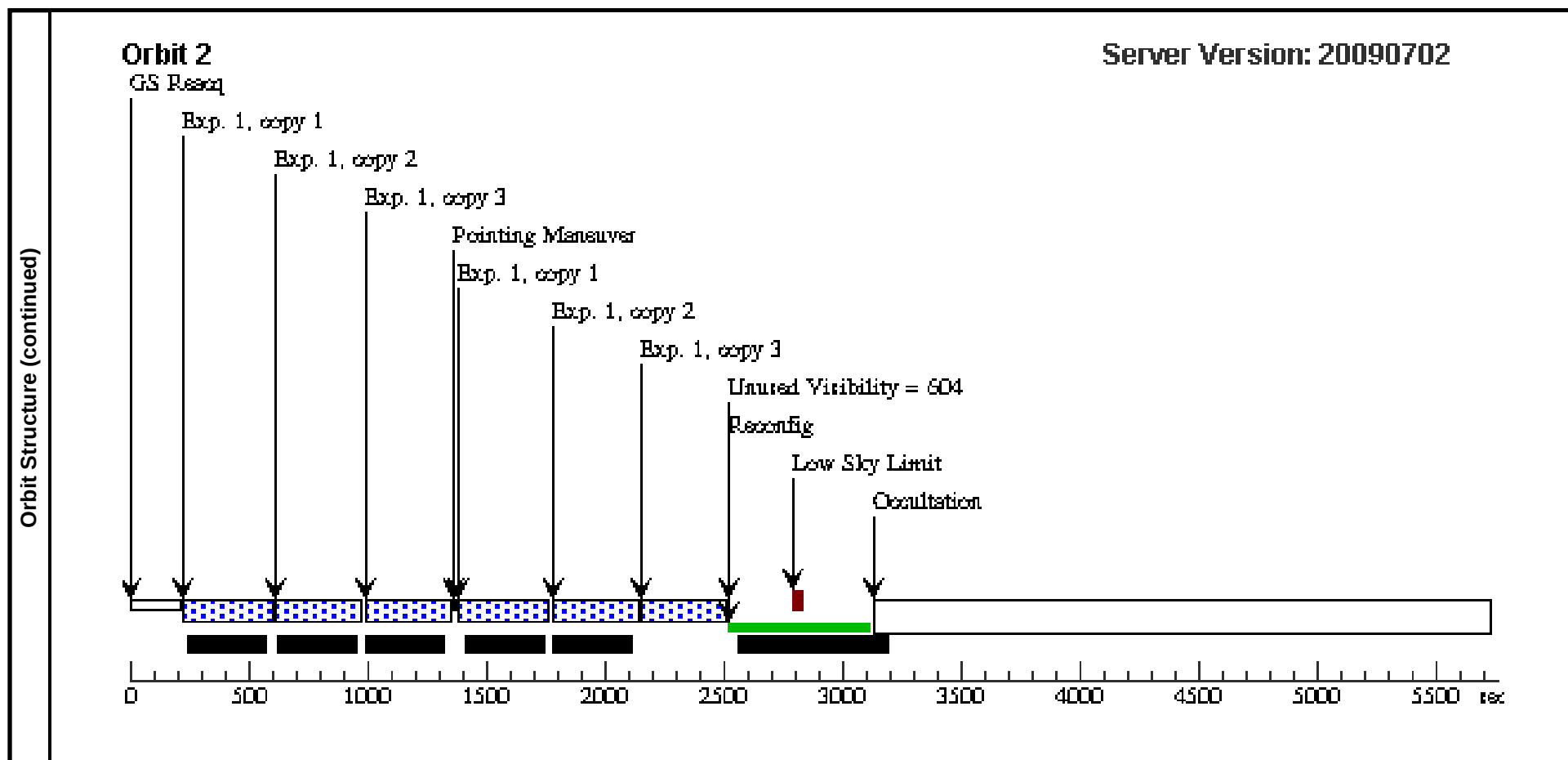




# Proposal 11108 - Visit 05 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

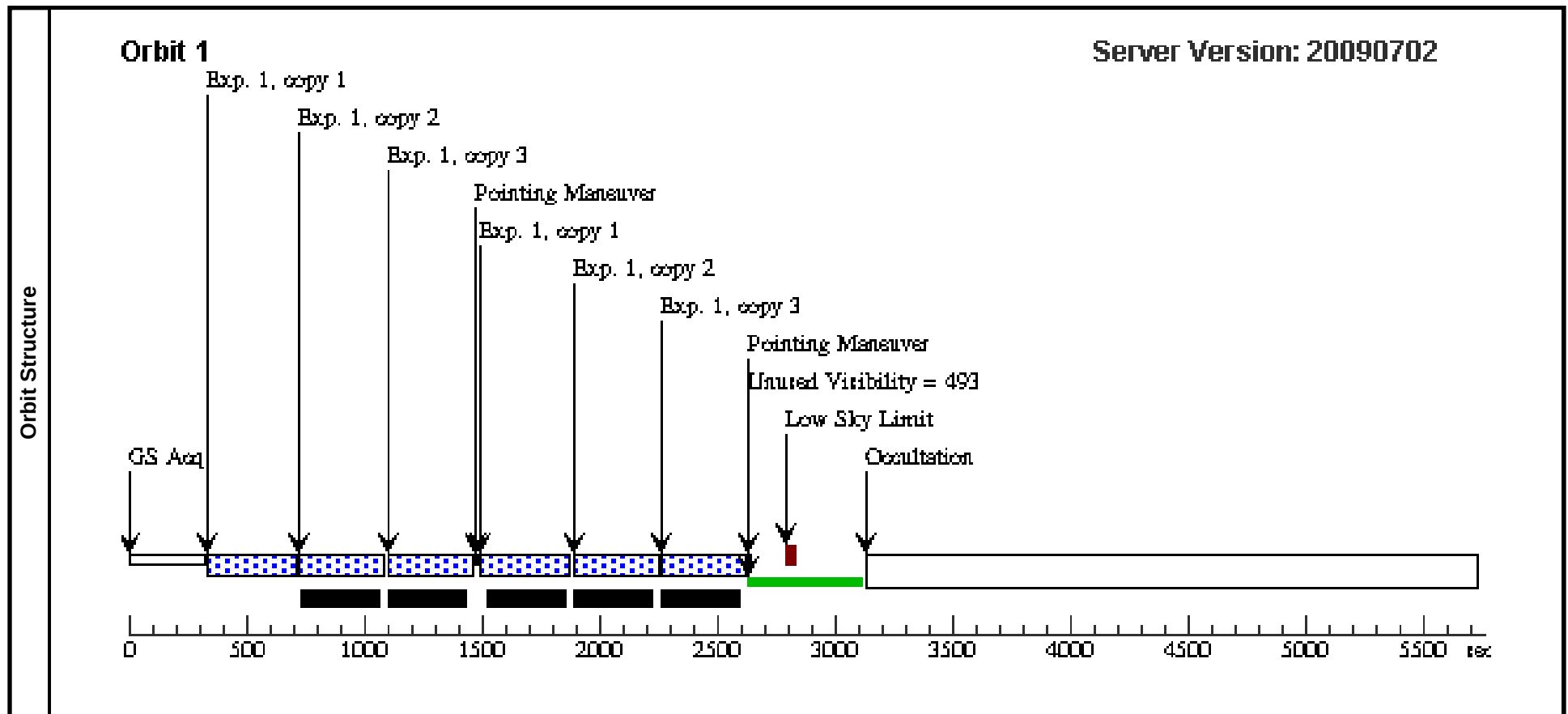
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------|
| Visit         | Proposal 11108, Visit 05, implementation                                                                                                                  |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      | Tue Sep 01 01:03:20 GMT 2009 |       |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
|               | Special Requirements: GYRO MODE 3GOBAD; ORIENT 219.2D TO 270.6 D; ORIENT 323.8D TO 341.3 D                                                                |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
| Diagnostics   | (Visit 05) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |            |                                                                                    |  | Secondary Pattern                                                                                             |                                |                                          |                         | Exposures                                                                                                                                                            |                              |       |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |            |                                                                                    |  | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                                |                                          |                         | (1)                                                                                                                                                                  |                              |       |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     |            | Target Coordinates                                                                 |  | Targ. Coord. Corrections                                                                                      |                                | Fluxes                                   |                         | Miscellaneous                                                                                                                                                        |                              |       |
|               | (5)                                                                                                                                                       | HCM-6A                                                                                                                   |            | RA: 02 39 54.7300 (39.9780417d)<br>Dec: -01 33 32.80 (-1.55911d)<br>Equinox: J2000 |  |                                                                                                               |                                | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1    |                         | Reference Frame: ICRS                                                                                                                                                |                              |       |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target     | Config,Mode,Aperture                                                               |  | Spectral Els.                                                                                                 | Opt. Params.                   | Special Reqs.                            | Groups                  | Exp. Time/[Actual Dur.]                                                                                                                                              |                              | Orbit |
|               | 1                                                                                                                                                         | HCM-6! F1 60W                                                                                                            | (5) HCM-6A | WFC3/IR, MULTIACCUM, IR                                                            |  | F140W                                                                                                         | NSAMP=15;<br>SAMP-SEQ=SPAR S25 | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BN3 | Pattern 1, Exps 1-1 (1) | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                              | [1]   |
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2]   |
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |
|               |                                                                                                                                                           |                                                                                                                          |            |                                                                                    |  |                                                                                                               |                                |                                          |                         |                                                                                                                                                                      |                              |       |

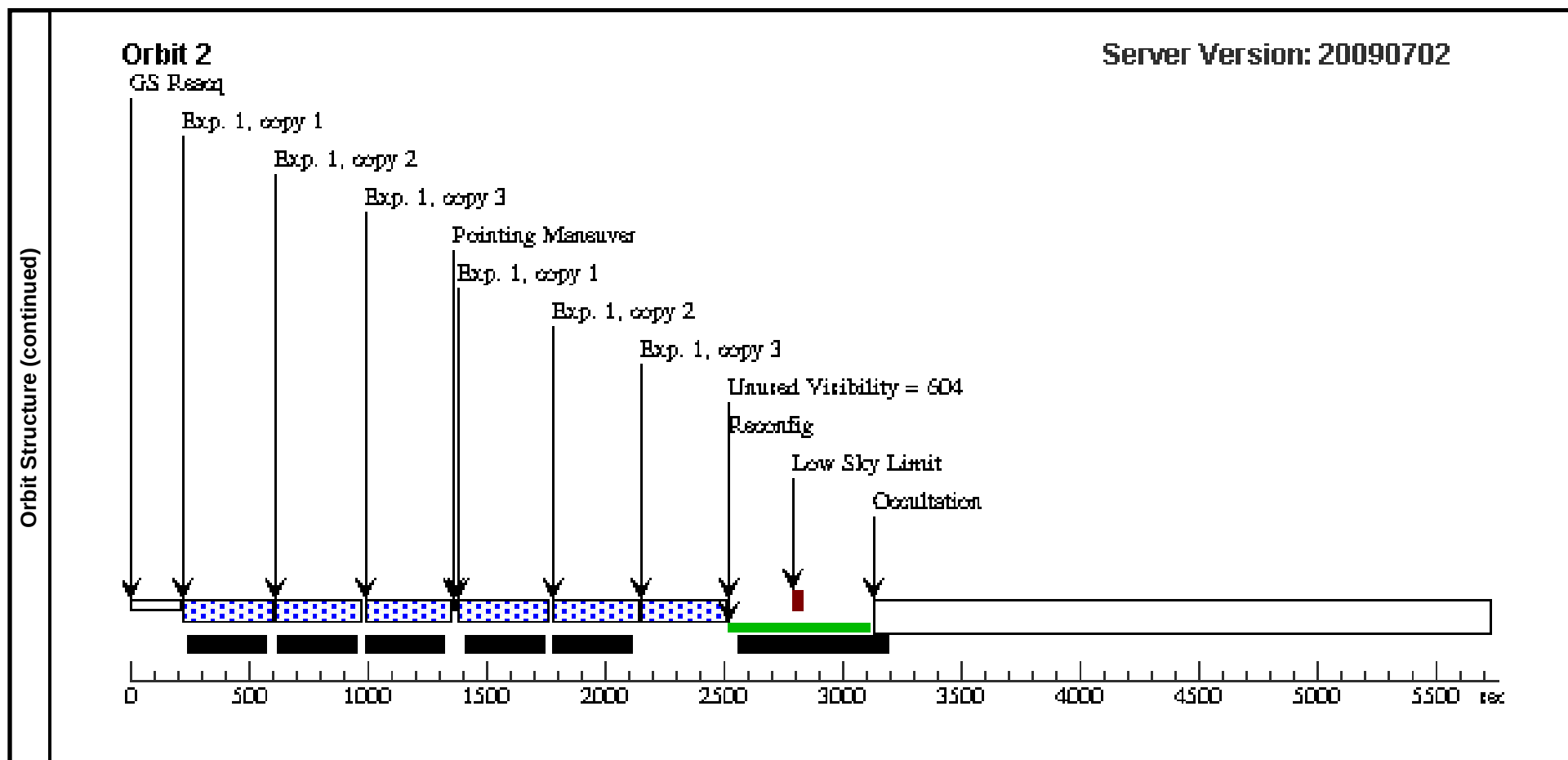




# Proposal 11108 - Visit 06 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

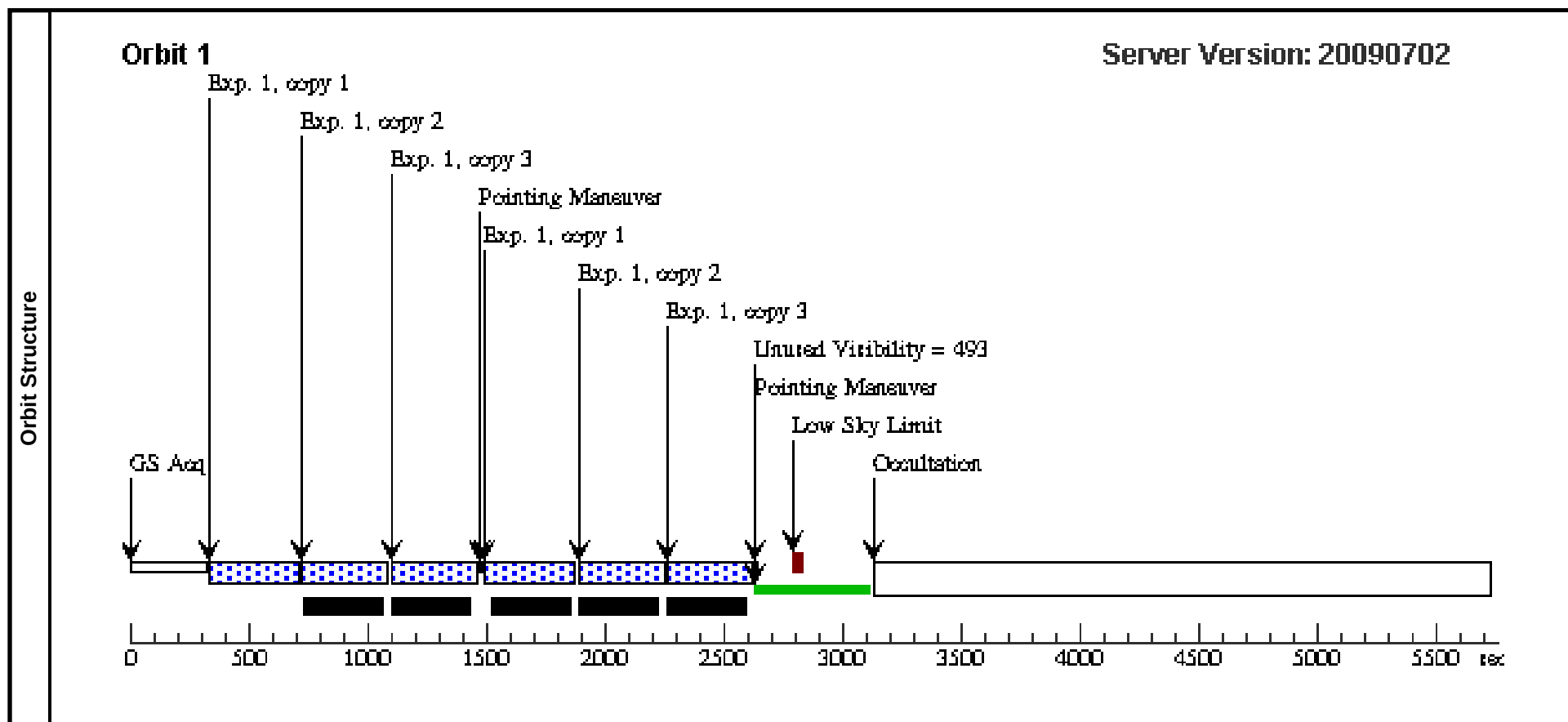
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------|--|
| Visit         | Proposal 11108, Visit 06, implementation                                                                                                                  |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           | Tue Sep 01 01:03:21 GMT 2009 |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|               | Special Requirements: GYRO MODE 3GOBAD; ORIENT 238.4D TO 305.7 D; ORIENT 325.9D TO 31.5 D; ORIENT 56.5D TO 125.7 D; ORIENT 145.9D TO 215.7 D              |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
| Diagnostics   | (Visit 06) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |                                                                                  |                         |                          | Secondary Pattern                                                                                             |                                          |                         |                                                                                                                                                                      | Exposures |                              |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |                                                                                  |                         |                          | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                                          |                         |                                                                                                                                                                      | (1)       |                              |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     | Target Coordinates                                                               |                         | Targ. Coord. Corrections |                                                                                                               | Fluxes                                   |                         | Miscellaneous                                                                                                                                                        |           |                              |  |
|               | (6)                                                                                                                                                       | HC-6G                                                                                                                    | RA: 02 40 1.8100 (40.0075417d)<br>Dec: -01 41 0.20 (-1.68339d)<br>Equinox: J2000 |                         |                          |                                                                                                               | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1    |                         | Reference Frame: ICRS                                                                                                                                                |           |                              |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target                                                                           | Config,Mode,Aperture    | Spectral Els.            | Opt. Params.                                                                                                  | Special Reqs.                            | Groups                  | Exp. Time/[Actual Dur.]                                                                                                                                              |           | Orbit                        |  |
|               | 1                                                                                                                                                         | HC-6G F16 0W                                                                                                             | (6) HC-6G                                                                        | WFC3/IR, MULTIACCUM, IR | F140W                    | NSAMP=15;<br>SAMP-SEQ=SPAR S25                                                                                | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BN3 | Pattern 1, Exps 1-1 (1) | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |           | [1]                          |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |           | [2]                          |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |
|               |                                                                                                                                                           |                                                                                                                          |                                                                                  |                         |                          |                                                                                                               |                                          |                         |                                                                                                                                                                      |           |                              |  |

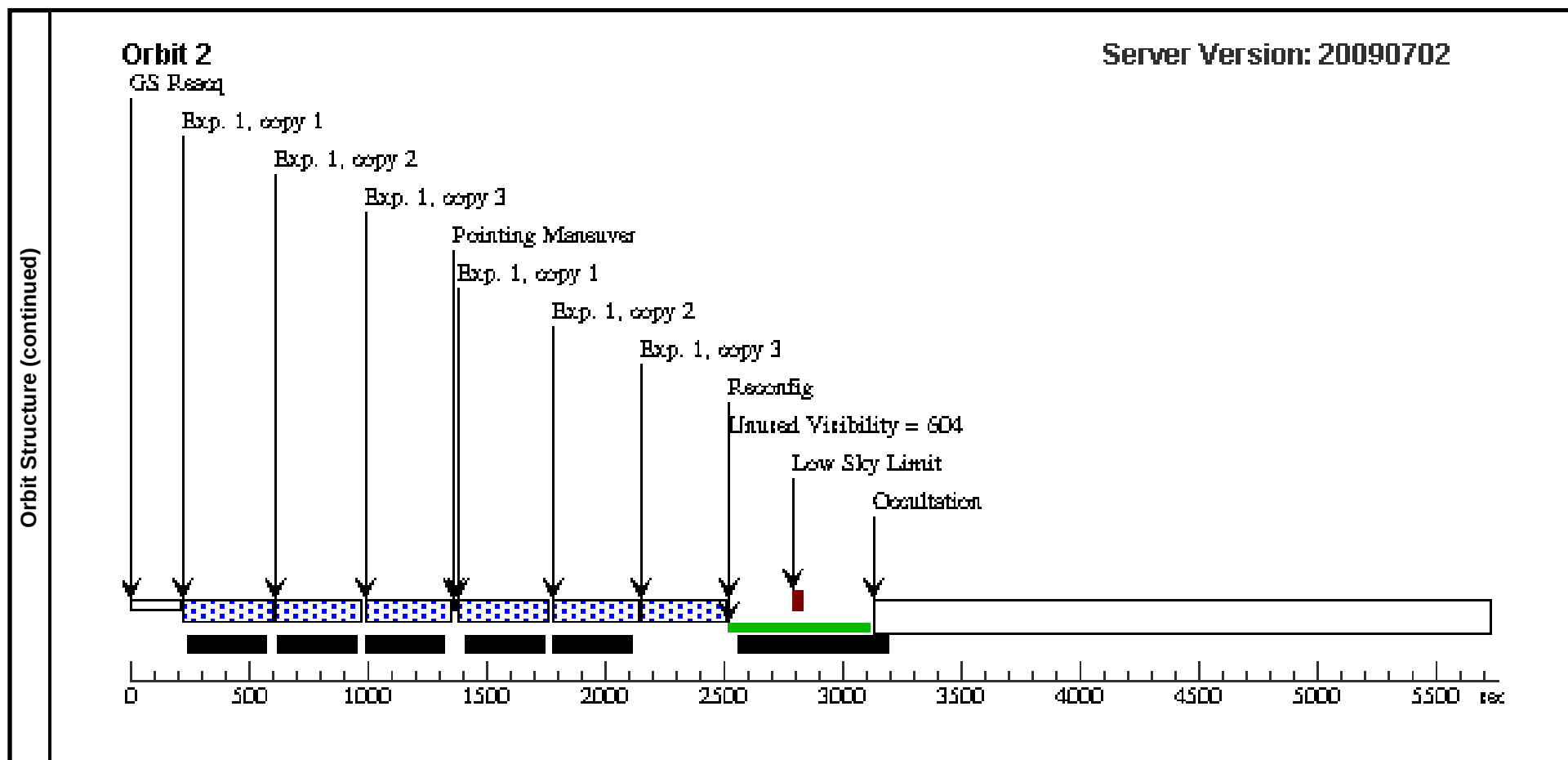




# Proposal 11108 - Visit 07 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

|               |                                                                                                                                                           |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------|--|--------------------------|--------------------------------|---------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|--|--|
| Visit         | Proposal 11108, Visit 07, implementation                                                                                                                  |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      | Tue Sep 01 01:03:23 GMT 2009 |           |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
| Diagnostics   | (Visit 07) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                                                                                                                                           |           |                                                                                   |  |                          | Secondary Pattern              |                                       |                                       |                                                                                                                                                                      |                              | Exposures |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Purpose=DITHER<br>Angle Between Sides=74.653<br>Number Of Points=4<br>Center Pattern=false<br>Point Spacing=0.572<br>Line Spacing=0.365 |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              | (1)       |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                                                                                                                                      |           | Target Coordinates                                                                |  | Targ. Coord. Corrections |                                |                                       | Fluxes                                |                                                                                                                                                                      | Miscellaneous                |           |  |  |
|               | (7)                                                                                                                                                       | HC-6H                                                                                                                                                                                                                                     |           | RA: 02 40 4.2500 (40.0177083d)<br>Dec: -01 22 52.60 (-1.38128d)<br>Equinox: J2000 |  |                          |                                |                                       | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1 |                                                                                                                                                                      | Reference Frame: ICRS        |           |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       |                                                                                                                                                                      |                              |           |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                                                                                                                                     | Target    | Config,Mode,Aperture                                                              |  | Spectral Els.            | Opt. Params.                   | Special Reqs.                         | Groups                                | Exp. Time/[Actual Dur.]                                                                                                                                              |                              | Orbit     |  |  |
|               | 1                                                                                                                                                         | HC-6H F16 0W                                                                                                                                                                                                                              | (7) HC-6H | WFC3/IR, MULTIACCUM, IR                                                           |  | F140W                    | NSAMP=15;<br>SAMP-SEQ=SPAR S25 | LOW-SKY;<br>GS ACQ SCENARI O BASE1BN3 | Pattern 1, Exps 1-1 (1)               | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                              | [1]       |  |  |
|               |                                                                                                                                                           |                                                                                                                                                                                                                                           |           |                                                                                   |  |                          |                                |                                       |                                       | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2]       |  |  |





# Proposal 11108 - Visit 08 - Near Infrared Observations of a Sample of z~6.5-6.7 Galaxies

|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------|--|--------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|--|--|
| Visit         | Proposal 11108, Visit 08, implementation                                                                                                                  |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      | Tue Sep 01 01:03:23 GMT 2009 |           |  |  |
|               | Diagnostic Status: Warning                                                                                                                                |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Scientific Instruments: WFC3/IR                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               | Special Requirements: GYRO MODE 3GOBAD                                                                                                                    |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Diagnostics   | (Visit 08) Warning (Form): Gyro Mode overrides default value of 2G.                                                                                       |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Patterns      | #                                                                                                                                                         | Primary Pattern                                                                                                          |           |                                                                                    |  |                          | Secondary Pattern                                                                                             |                                          |                                       |                                                                                                                                                                      |                              | Exposures |  |  |
|               | (1)                                                                                                                                                       | Pattern Type=WFC3-IR-DITHER-BOX-MIN<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.572<br>Line Spacing=0.365 |           |                                                                                    |  |                          | Coordinate Frame=POS-TARG<br>Pattern Orientation=18.528<br>Angle Between Sides=74.653<br>Center Pattern=false |                                          |                                       |                                                                                                                                                                      |                              | (1)       |  |  |
| Fixed Targets | #                                                                                                                                                         | Name                                                                                                                     |           | Target Coordinates                                                                 |  | Targ. Coord. Corrections |                                                                                                               |                                          | Fluxes                                |                                                                                                                                                                      | Miscellaneous                |           |  |  |
|               | (8)                                                                                                                                                       | HC-6I                                                                                                                    |           | RA: 02 40 14.6100 (40.0608750d)<br>Dec: -01 24 14.30 (-1.40397d)<br>Equinox: J2000 |  |                          |                                                                                                               |                                          | V=(?)<br>2.5e-30 erg cm^-2 s^-1 Hz^-1 |                                                                                                                                                                      | Reference Frame: ICRS        |           |  |  |
|               | Comments: Lyman alpha galaxy selected by emission-line flux for continuum imaging. Flux given is typical stacked J flux estimate from ground-based images |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
| Exposures     | #                                                                                                                                                         | Label                                                                                                                    | Target    | Config,Mode,Aperture                                                               |  | Spectral Els.            | Opt. Params.                                                                                                  | Special Reqs.                            | Groups                                | Exp. Time/[Actual Dur.]                                                                                                                                              |                              | Orbit     |  |  |
|               | 1                                                                                                                                                         | HC-6I F160 W                                                                                                             | (8) HC-6I | WFC3/IR, MULTIACCUM, IR                                                            |  | F140W                    | NSAMP=15;<br>SAMP-SEQ=SPAR S25                                                                                | LOW-SKY;<br>GS ACQ SCENARI<br>O BASE1BN3 | Pattern 1, Exps 1-1 (1)               | [==>(Pattern 1, Copy 1)]<br>[==>(Pattern 1, Copy 2)]<br>[==>(Pattern 1, Copy 3)]<br>[==>(Pattern 2, Copy 1)]<br>[==>(Pattern 2, Copy 2)]<br>[==>(Pattern 2, Copy 3)] |                              | [1]       |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       | [==>(Pattern 3, Copy 1)]<br>[==>(Pattern 3, Copy 2)]<br>[==>(Pattern 3, Copy 3)]<br>[==>(Pattern 4, Copy 1)]<br>[==>(Pattern 4, Copy 2)]<br>[==>(Pattern 4, Copy 3)] |                              | [2]       |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |
|               |                                                                                                                                                           |                                                                                                                          |           |                                                                                    |  |                          |                                                                                                               |                                          |                                       |                                                                                                                                                                      |                              |           |  |  |

