# 11710 - The Extreme Globular Cluster System of Abell 1689: The Ultimate Test of Universal Formation Efficiency

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

**INVESTIGATORS**


| *Name* | *Institution* | *E-Mail* |
|---|---|---|
| **Dr. John P. Blakeslee (PI)** | **Dominion Astrophysical Observatory** | **john.blakeslee@nrc.ca** |
| Dr. Eric W. Peng (CoI) | Space Telescope Science Institute | eric.peng@nrc-cnrc.gc.ca |
| Dr. Rychard Bouwens (CoI) | University of California - Santa Cruz | bouwens@ucolick.org |
| Dr. Larry Bradley (CoI) | The Johns Hopkins University | ldb@pha.jhu.edu |
| Dr. Patrick Cote (CoI) | Dominion Astrophysical Observatory | patrick.cote@nrc-cnrc.gc.ca |
| Ms. Regina Barber DeGraaff (CoI) | Washington State University | barberdegraaff@gmail.com |
| Dr. Laura Ferrarese (CoI) | Dominion Astrophysical Observatory | Laura.Ferrarese@nrc-cnrc.gc.ca |
| Dr. Bradford Holden (CoI) | University of California - Santa Cruz | holden@ucolick.org |
| Dr. Myungkook J. Jee (CoI) | University of California - Davis | jee.james@gmail.com |
| Dr. Andres Jordan (CoI) | Smithsonian Institution Astrophysical Observatory | ajordan@cfa.harvard.edu |
| Mr. Daniel K. Magee (CoI) | University of California - Santa Cruz | magee@ucolick.org |
| Dr. Gerhardt R. Meurer (CoI) | The Johns Hopkins University | meurer@pha.jhu.edu |
| Dr. Michael J. West (CoI) | European Southern Observatory - Chile | mwest@eso.org |
| Dr. Andrew Zirm (CoI) (AdminUSPI) | The Johns Hopkins University | azirm@pha.jhu.edu |


**VISITS**

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 01 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/UVIS | 4 | 30-Jun-2008 21:52:27.0 | yes |
| 02 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/IR | 4 | 30-Jun-2008 21:52:41.0 | yes |
| 03 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/IR | 4 | 30-Jun-2008 21:52:51.0 | yes |
| 04 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/IR | 4 | 30-Jun-2008 21:53:04.0 | yes |
| 05 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/IR | 4 | 30-Jun-2008 21:53:12.0 | yes |
| 06 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/UVIS | 4 | 30-Jun-2008 21:53:20.0 | yes |
| 07 | (1) ABELL1689<br>ANY | ACS/WFC<br>WFC3/IR | 4 | 30-Jun-2008 21:53:33.0 | yes |

28 Total Orbits Used

**ABSTRACT**

The stellar masses of the most luminous galaxies poorly represent the masses of the halos in which they reside. However, recent studies of the very rich globular cluster (GC) populations in the centers of galaxy clusters point toward an apparently linear scaling of the number of GCs with the total core mass of the galaxy cluster. Thus, unlike for the stars in cD galaxies, GC formation in these systems appears to have proceeded with a roughly universal mass conversion efficiency. GCs are also distinct in that their spatial distributions are more extended than the starlight, and recent simulations suggest that they follow the mass density profile of the merged dark matter halos that formed stars at high redshift. To provide a definitive test of the universal efficiency hypothesis requires measuring the number of GCs in the most massive galaxy clusters, where the number should be a factor of 5 or more greater than seen in M87. Likewise, the relationship between GCs and mass density can only be tested in systems

where the total mass and mass density are well-determined. Fortunately, the imaging power of HST brings the GC population of Abell 1689, the most extreme high-mass lensing cluster, into range. Estimates of the size of the A1689 GC population from available data suggest an unprecedented 100,000 GCs, but this number is based on the tip of the iceberg and is extremely uncertain. We propose to obtain the first accurate measurement of the number of GCs and their density profile in this extraordinary system - the most massive and most distant GC system ever studied - and thus make the ultimate test of the universal GC formation hypothesis. Our deep I-band image will also provide a stringent "null-detection" test of several known z>7 galaxy candidates and improve the mass model of the system by increasing the number of usable lensed background galaxies. Finally, we will take deep multi-band parallel observations with WFC3/IR to help in quantifying the abundance of rare faint red objects.

**OBSERVING DESCRIPTION**

We will observe the central galaxy in Abell 1689 for 28 orbits with the F814W filter of the ACS/WFC. The observations will be split into seven visits of four orbits each. All visits are constrained to the same orientation, which is chosen to match the orientation of the existing multi-band ACS/WFC GTO data. Each orbit is split into two dithered exposures, and we also dither between orbits, using an 8-point dither line which moves the field in the y-direction by the width of the CCD gap between exposures. Successive visits have small POSTARG offsets in the x-direction to improve hot pixel removal. We do parallel observations with the WFC3/IR and WFC3/UVIS channels to search for high-redshift "dropout" galaxies with a deep series of exposures in a single parallel field. The WFC3 filters are only changed between visits; the filters for these parallel observations for visits 1-7 are: F606W, F098M, F105W, F125W, F160W, F606W, F098M, in that order.

## Visit

**Proposal 11710, Visit 01, implementation** Tue Jul 01 01:53:38 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: ORIENT 103.1D TO 116.1 D

*Comments: Visit 1.*

## Patterns

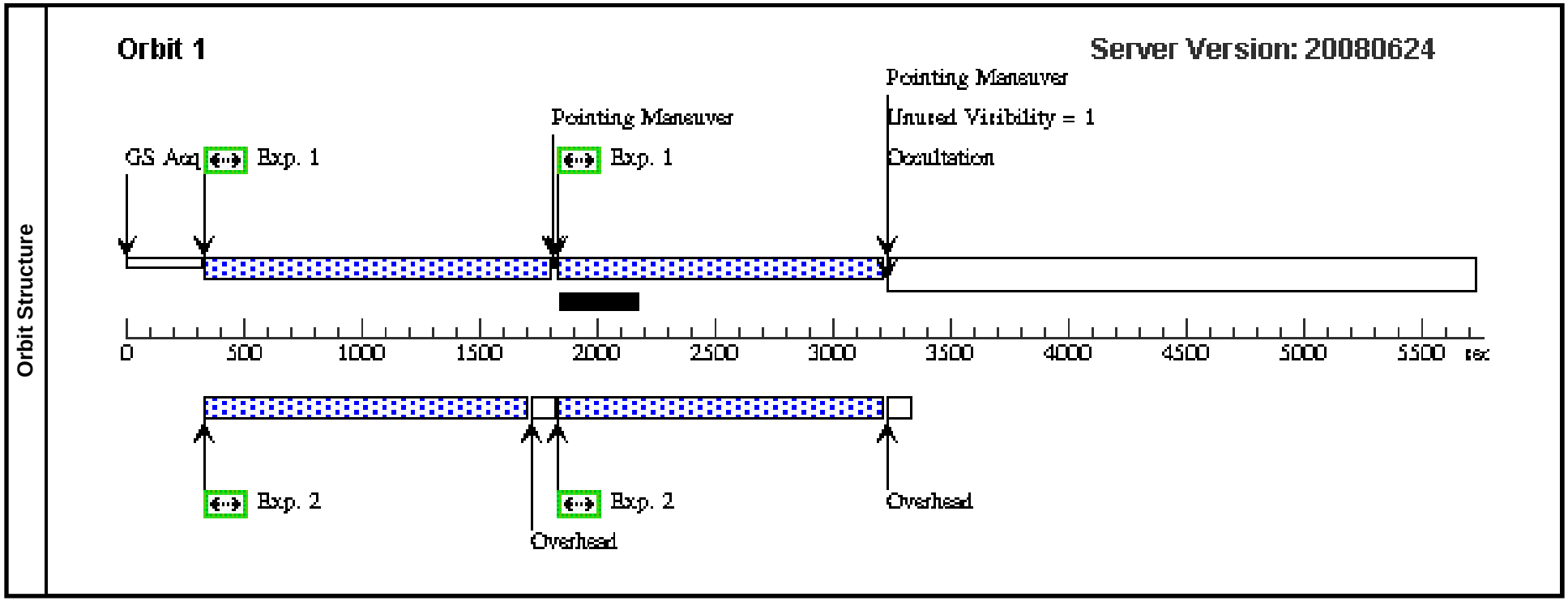
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | | Pattern 1-2 (4) | 1250 Secs | |
| | | | | | | | Prime + Parallel Group 1-2 | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/UVIS, ACCUM, UVIS | F606W | CR-SPLIT=NO | | Pattern 1-2 (4) | 1200 Secs | |
| | | | | | | | Prime + Parallel Group 1-2 | *[==>1344.0 Secs (Pattern 1)]*<br>*[==>1386.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 3)]*<br>*[==>1496.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 5)]*<br>*[==>1496.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 7)]*<br>*[==>1496.0 Secs (Pattern 8)]* | ***[4]*** |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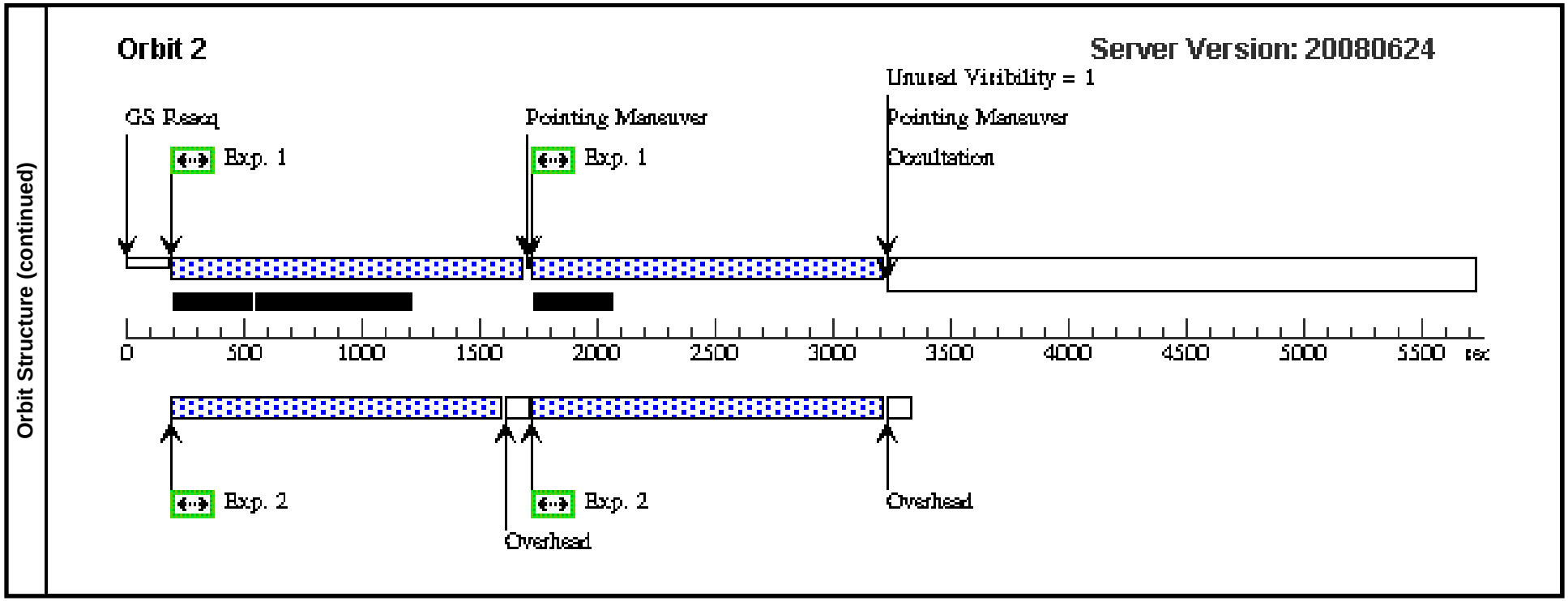
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 1
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead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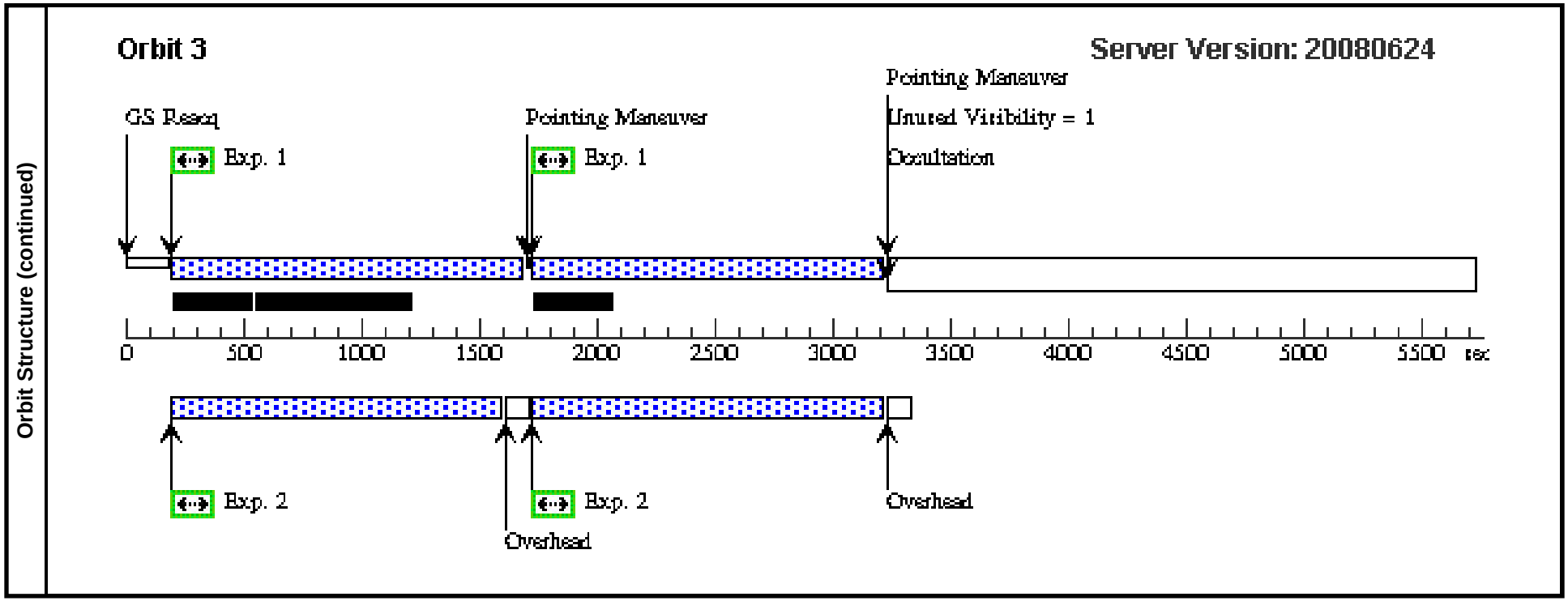
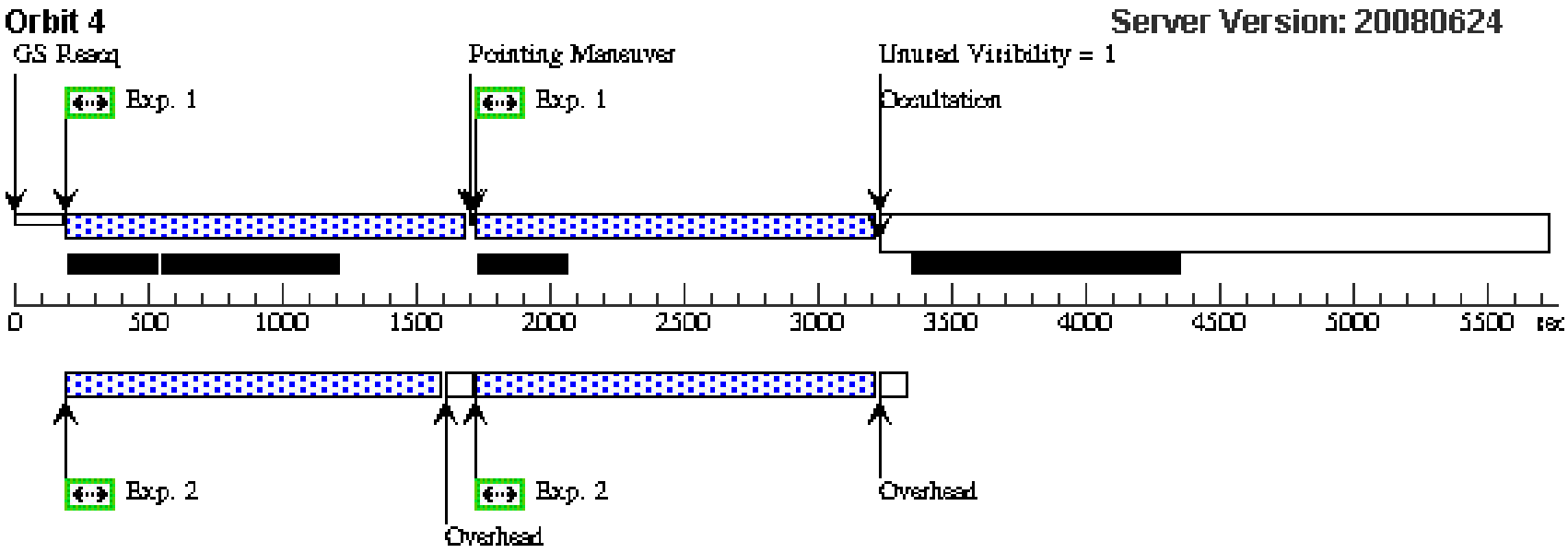
Server Version: 20080624
Unused Vitibility = 1
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
Pointing Maneuver
GS Reacq
Pointing Maneuver
Unused Visibility = 1
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead

Orbit Structure (continued)



## Visit

**Proposal 11710, Visit 02, implementation** Tue Jul 01 01:53:39 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 2*

## Patterns

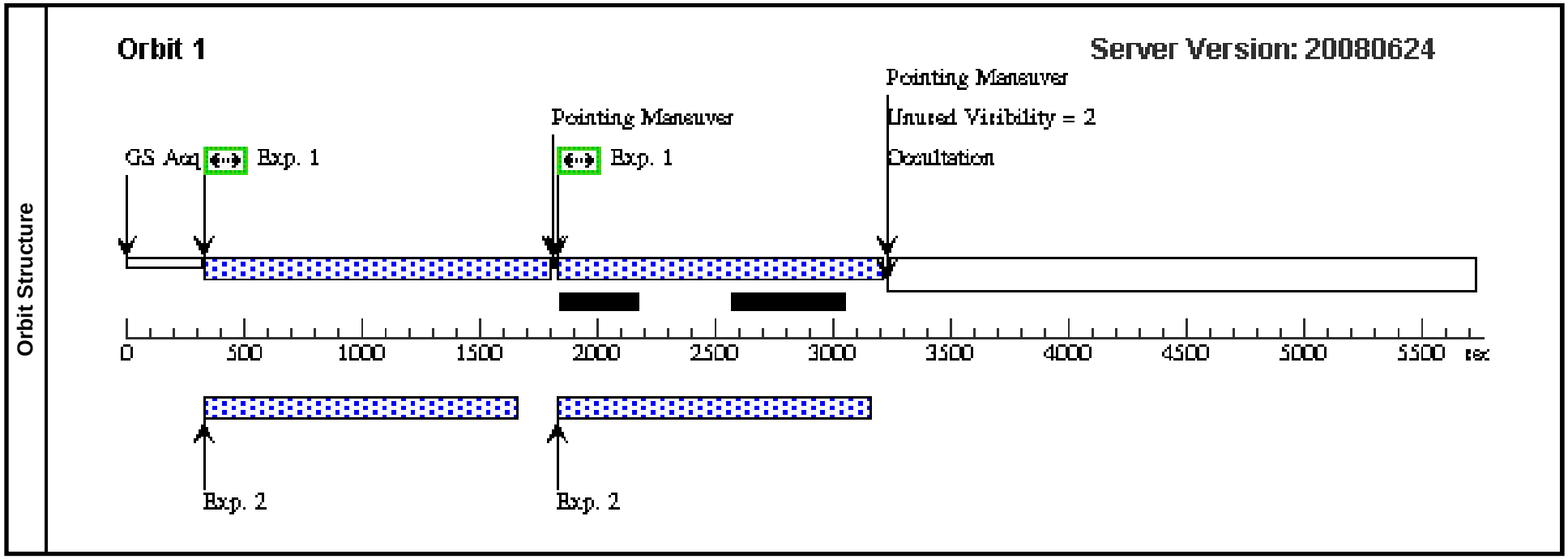
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.225,0 | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | 1250 Secs | |
| | | | | | | | | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/IR, MULTIACCUM, IR | F098M | SAMP-SEQ=SPARS100;<br>NSAMP=14 | | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | | |
| | | | | | | | | *[==>(Pattern 1)]*<br>*[==>(Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 5)]*<br>*[==>(Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>(Pattern 7)]*<br>*[==>(Pattern 8)]* | ***[4]*** |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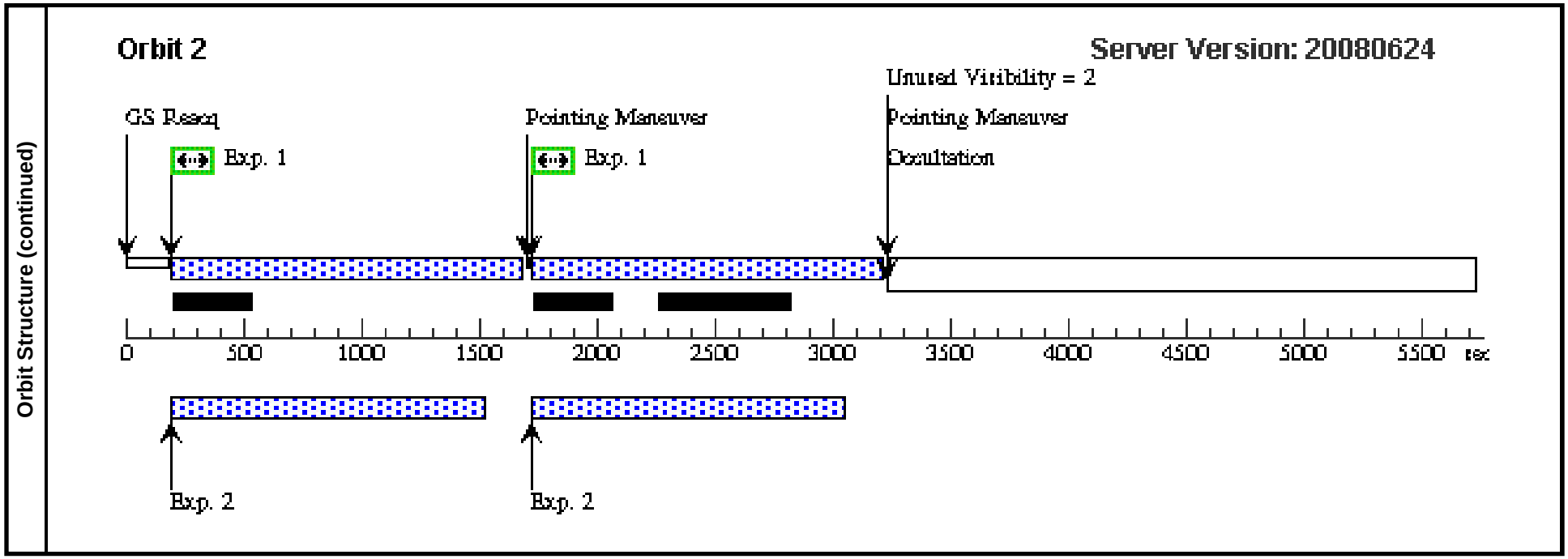
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 2
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2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Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
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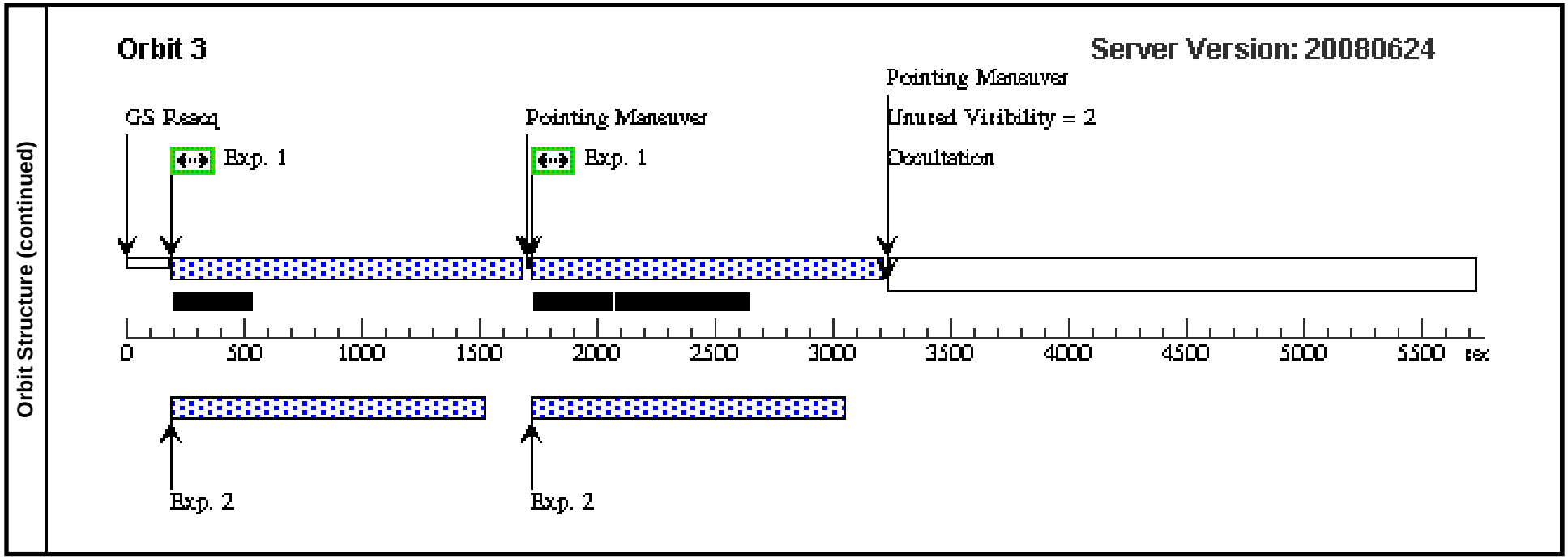
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 2
Occultation
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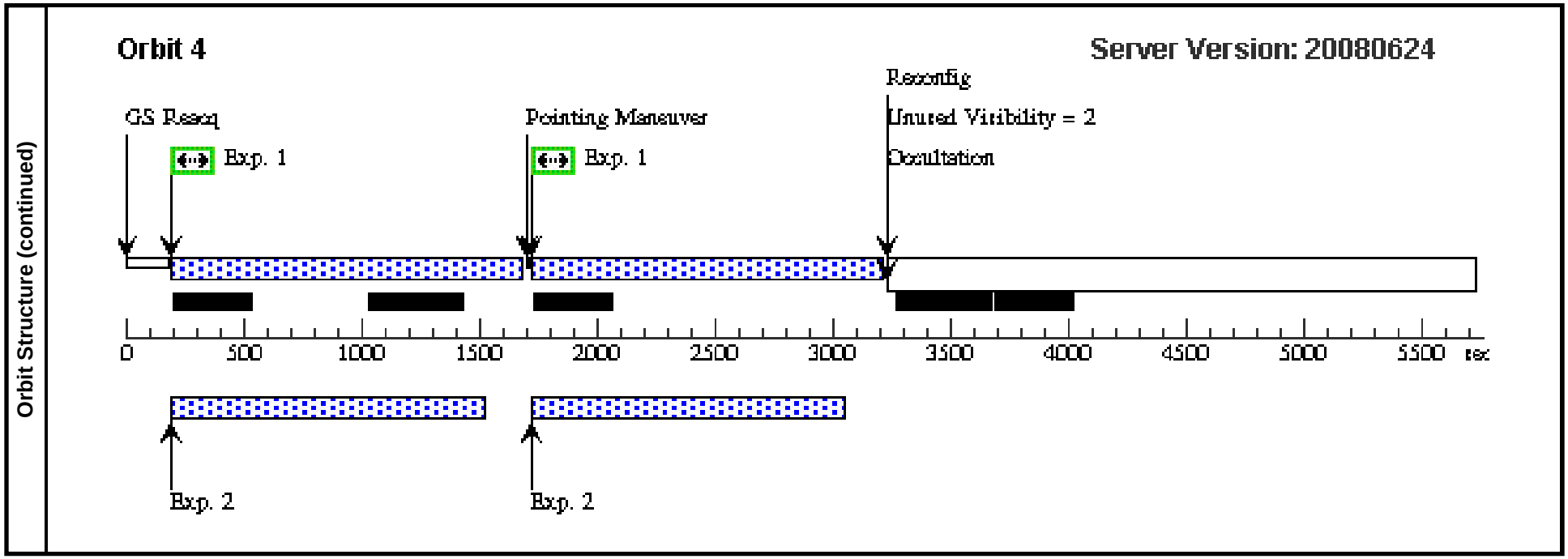
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 4
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Reconfig
Unused Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2

## Visit

**Proposal 11710, Visit 03, implementation** Tue Jul 01 01:53:40 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 3*

## Patterns

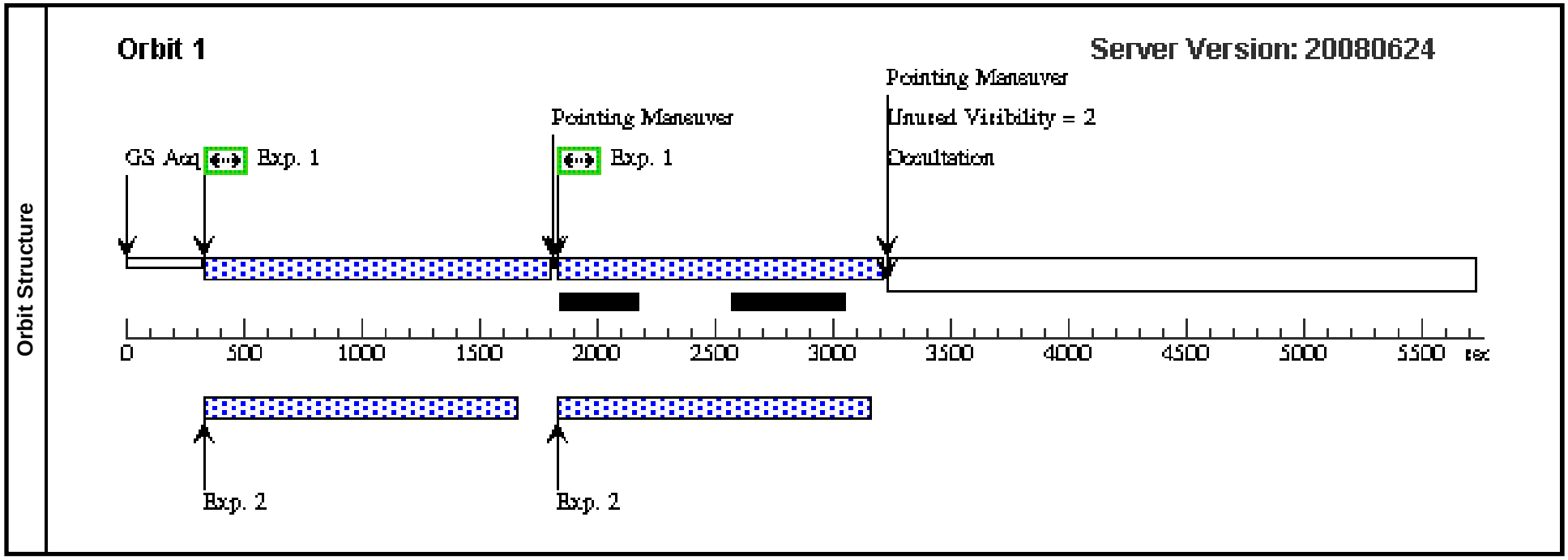
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.45,0 | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | 1250 Secs | |
| | | | | | | | | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/IR, MULTIACCUM, IR | F105W | SAMP-SEQ=SPARS 100;<br>NSAMP=14 | | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | *[==>(Pattern 1)]*<br>*[==>(Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 5)]*<br>*[==>(Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>(Pattern 7)]*<br>*[==>(Pattern 8)]* | ***[4]*** |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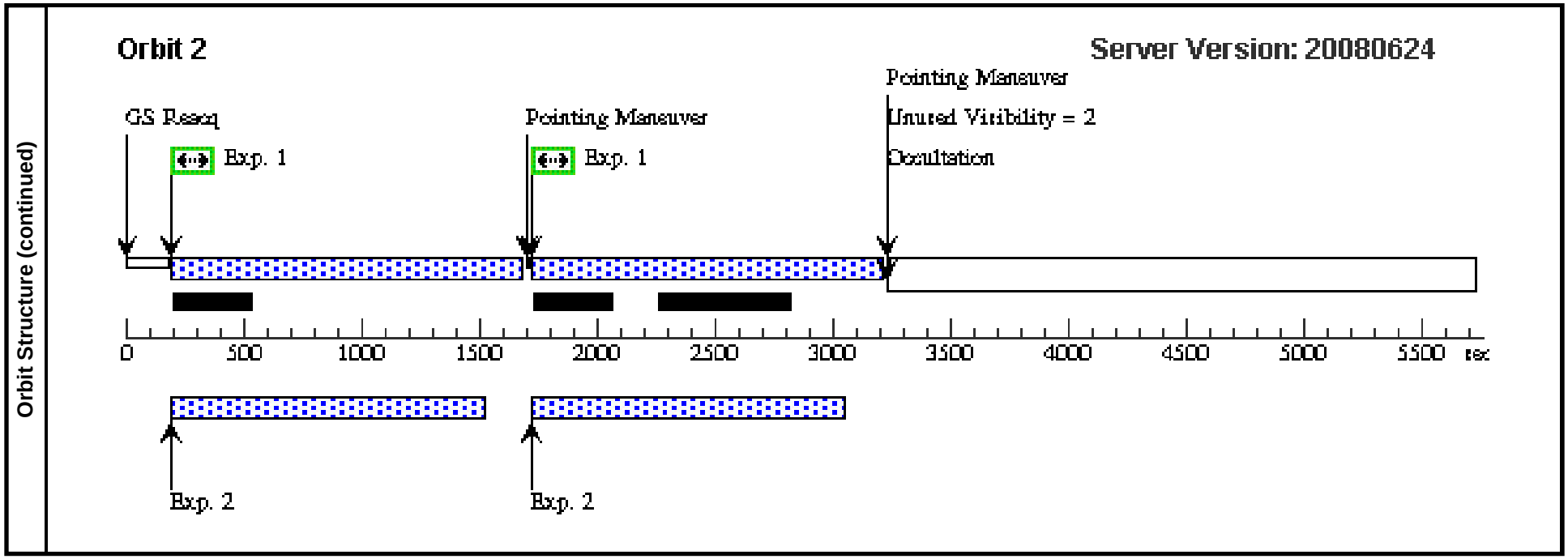
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 2
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2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GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 2
Occultation
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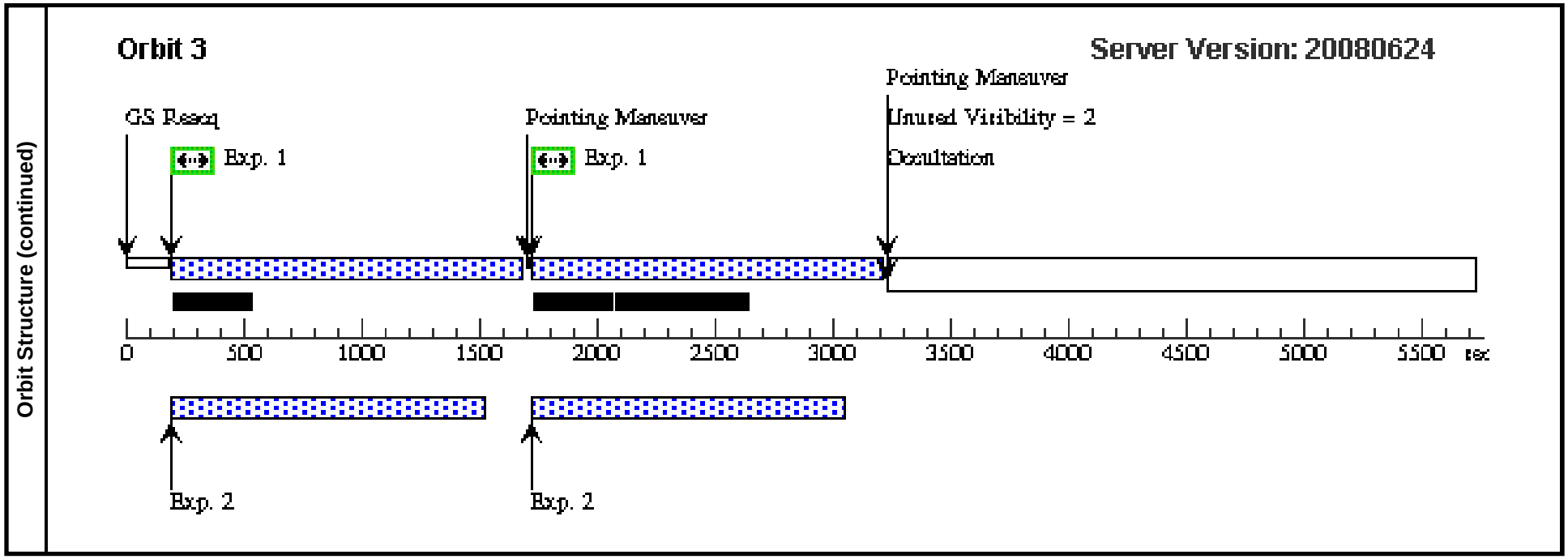
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 2
Occultation
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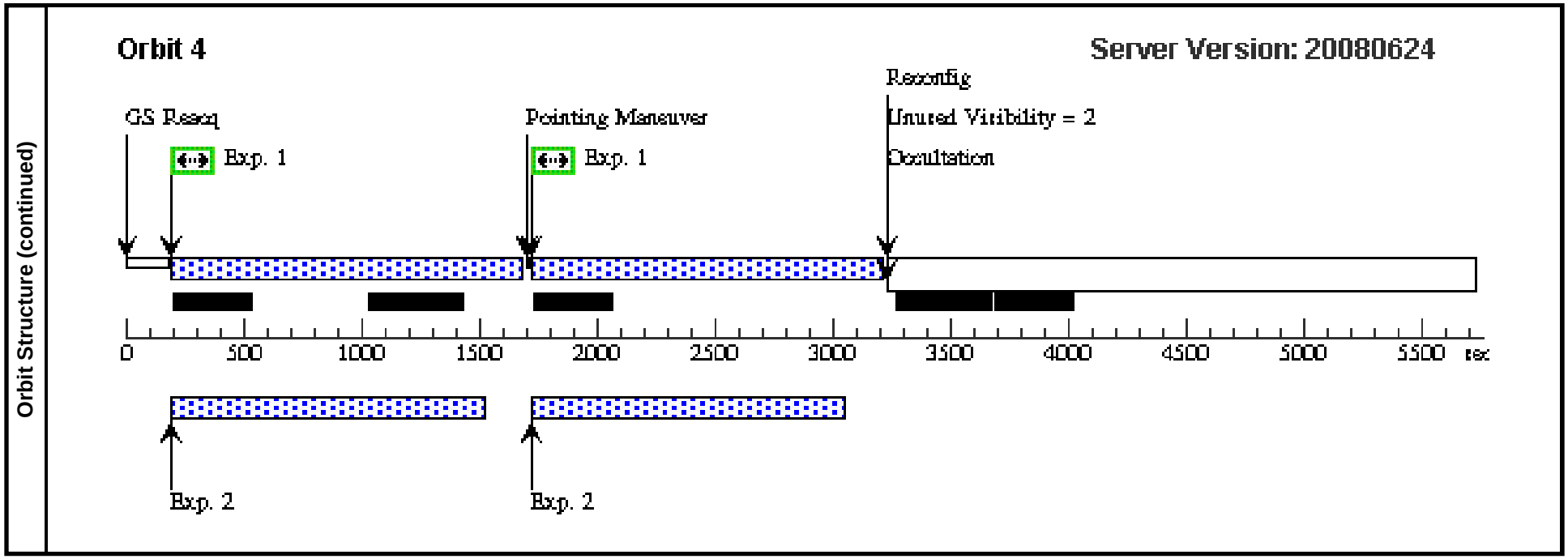
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
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GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Reconfig
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2

## Visit

**Proposal 11710, Visit 04, implementation** Tue Jul 01 01:53:41 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 4*

## Patterns

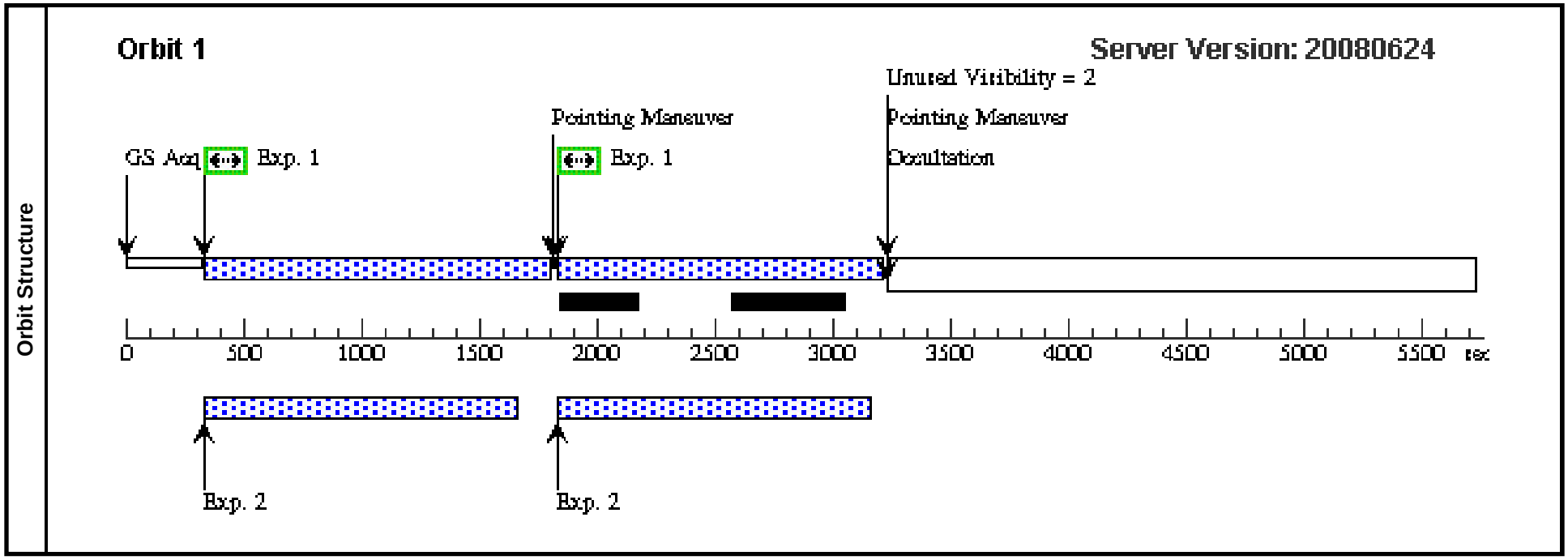
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.56,0 | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | 1250 Secs | |
| | | | | | | | | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/IR, MULTIACCUM, IR | F125W | SAMP-SEQ=SPARS 100;<br>NSAMP=14 | | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | *[==>(Pattern 1)]*<br>*[==>(Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 5)]*<br>*[==>(Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>(Pattern 7)]*<br>*[==>(Pattern 8)]* | ***[4]*** |


Orbit Structure
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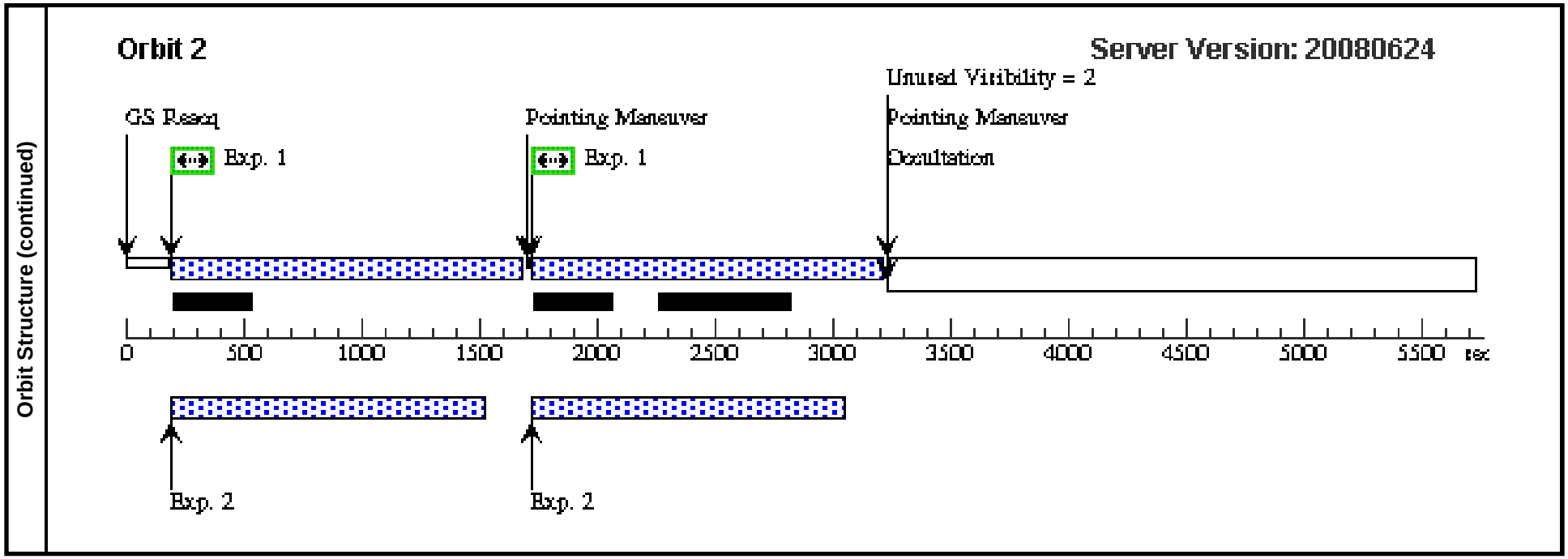
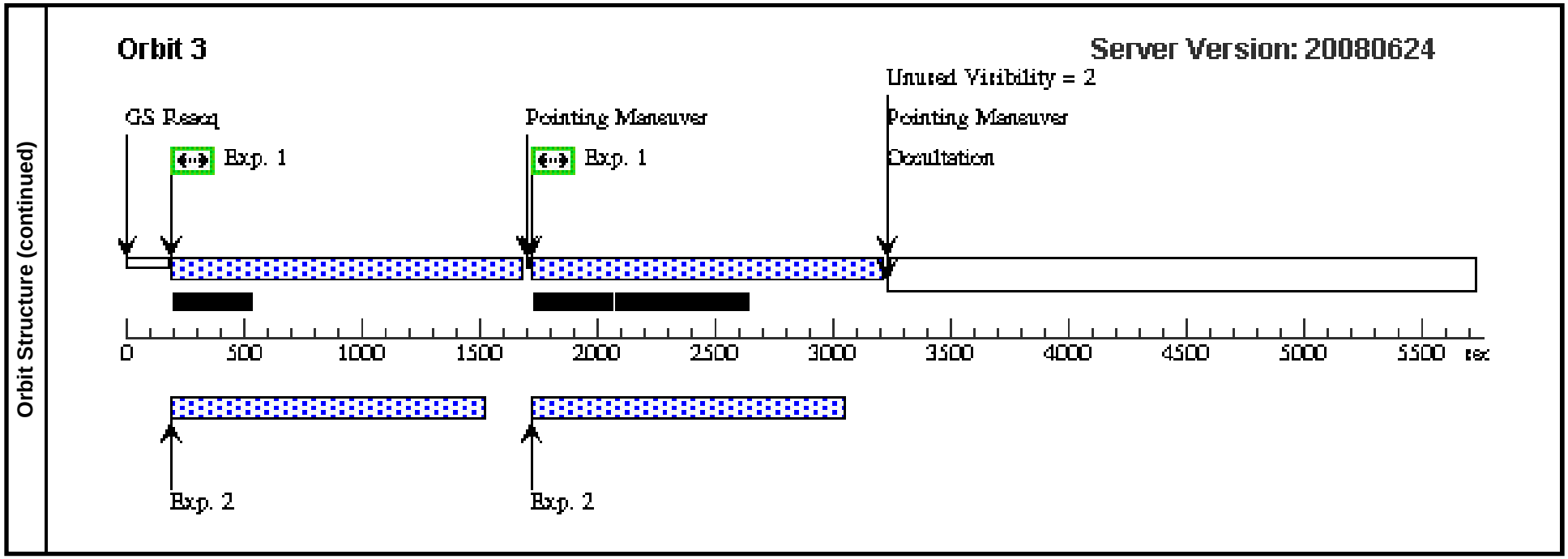
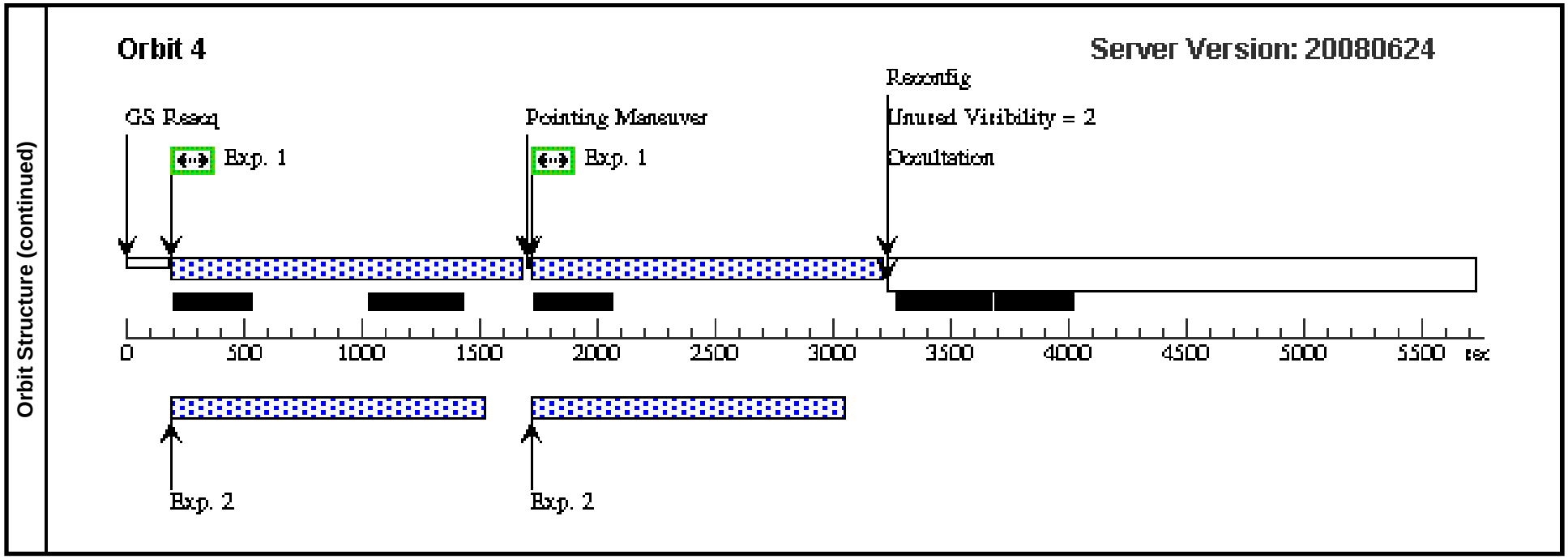
Unused Vitibility = 2
Pointing Maneuver
Pointing Maneuver
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 4
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Reconfig
Unused Viribility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2

## Visit

**Proposal 11710, Visit 05, implementation** Tue Jul 01 01:53:42 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 5*

## Patterns

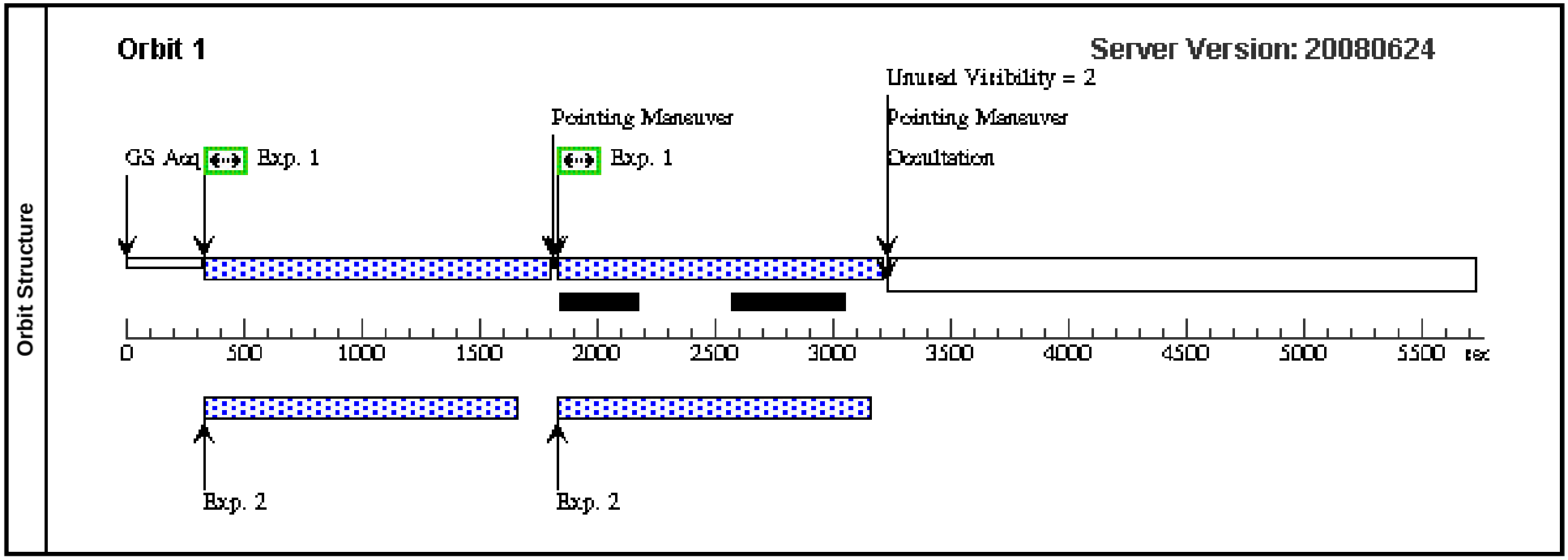
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

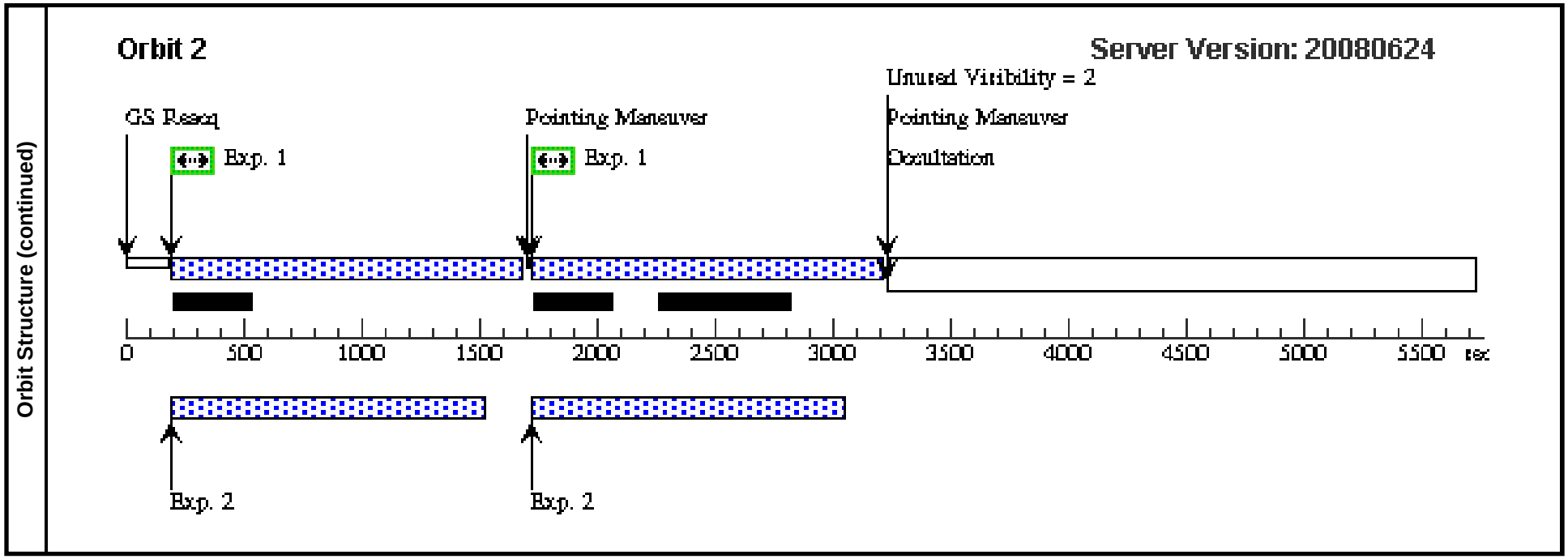
## Fixed Targets

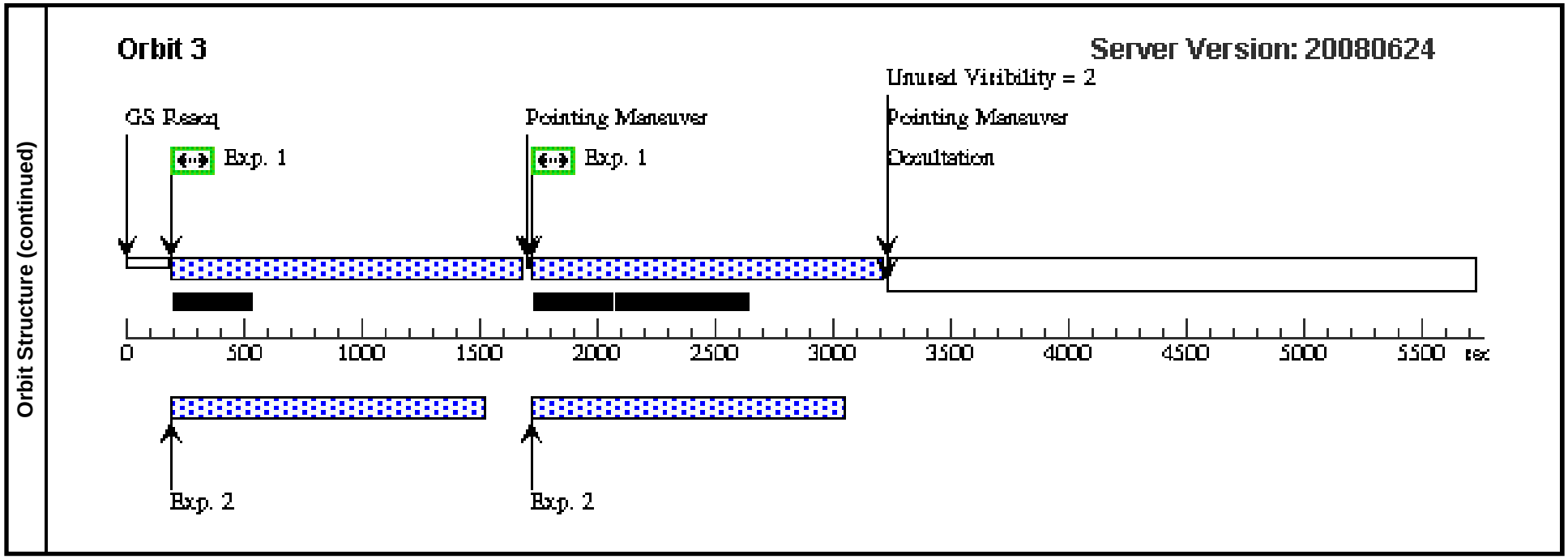
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

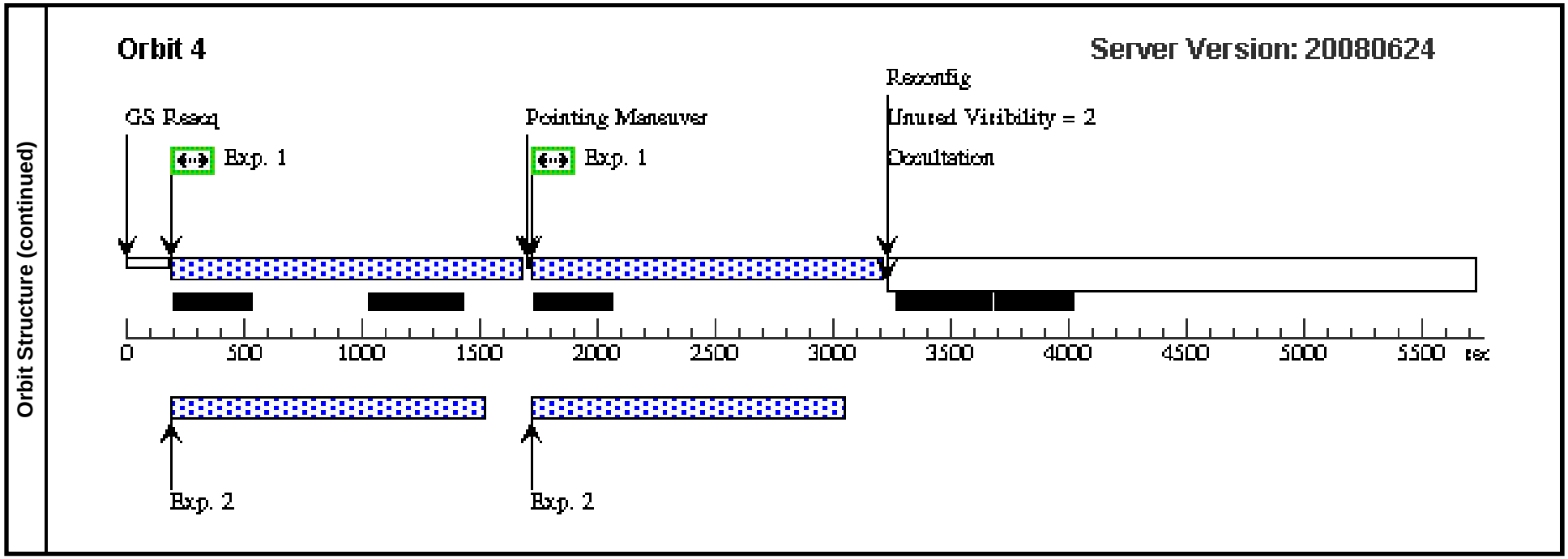
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.33,0 | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | 1250 Secs | |
| | | | | | | | | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/IR, MULTIACCUM, IR | F160W | SAMP-SEQ=SPARS100;<br>NSAMP=14 | | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | | |
| | | | | | | | | *[==>(Pattern 1)]*<br>*[==>(Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 5)]*<br>*[==>(Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>(Pattern 7)]*<br>*[==>(Pattern 8)]* | ***[4]*** |


Orbit Structure
Orbit 1
Server Version: 20080624
Unused Vitibility = 2
Pointing Maneuver
Pointing Maneuver
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 4
Server Version: 20080624
Reconfig
GS Reacq
Pointing Maneuver
Unused Viribility = 2
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2

## Visit

**Proposal 11710, Visit 06, implementation** Tue Jul 01 01:53:42 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 6*

## Patterns

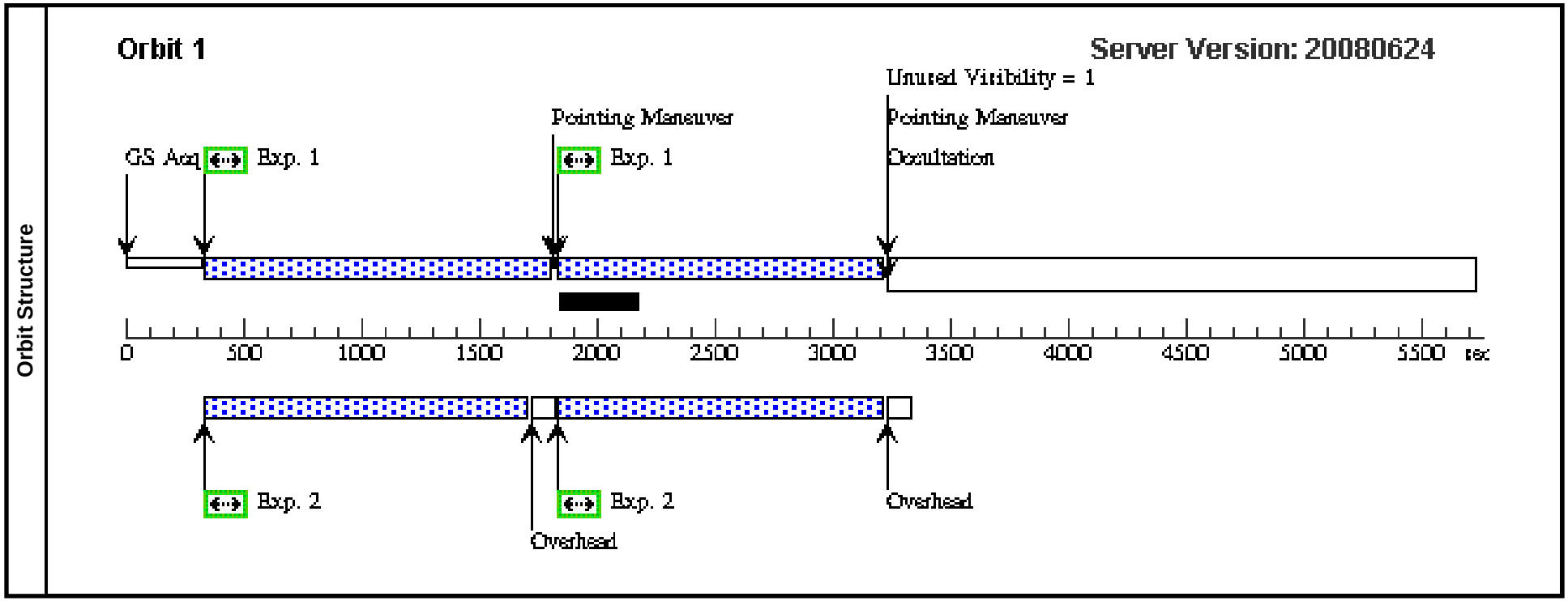
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

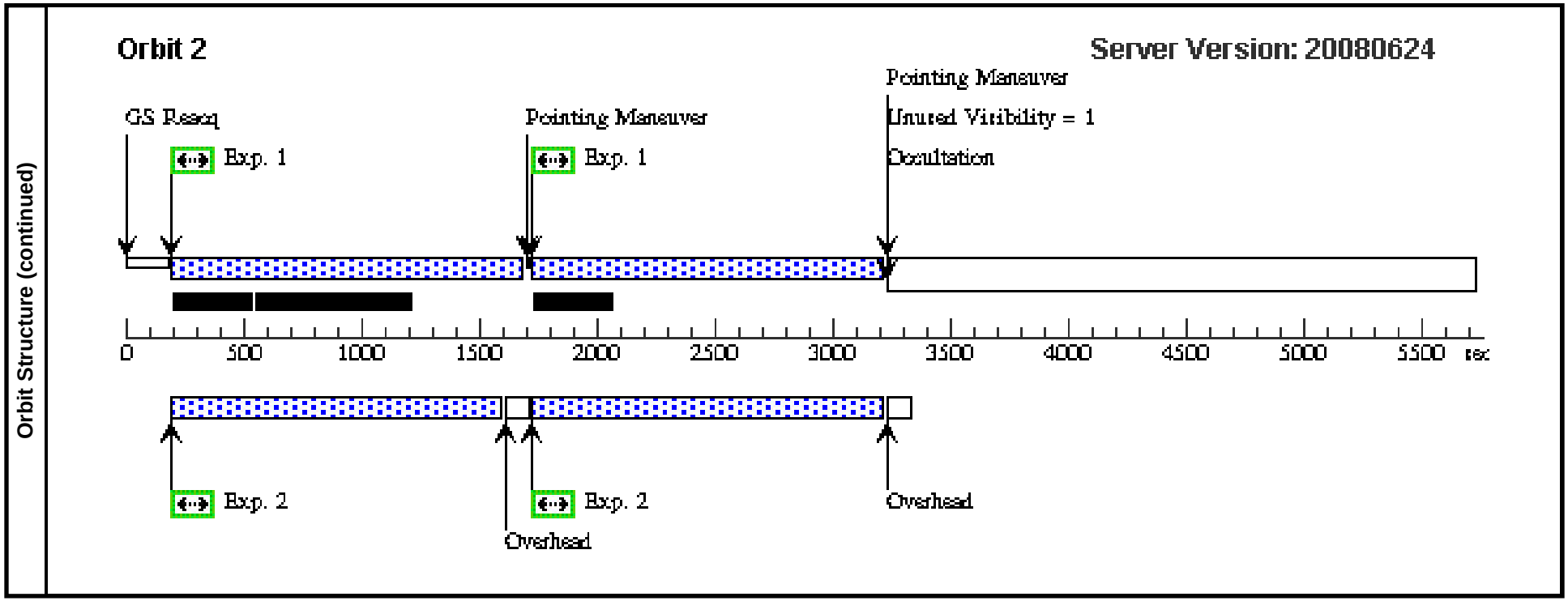
## Fixed Targets

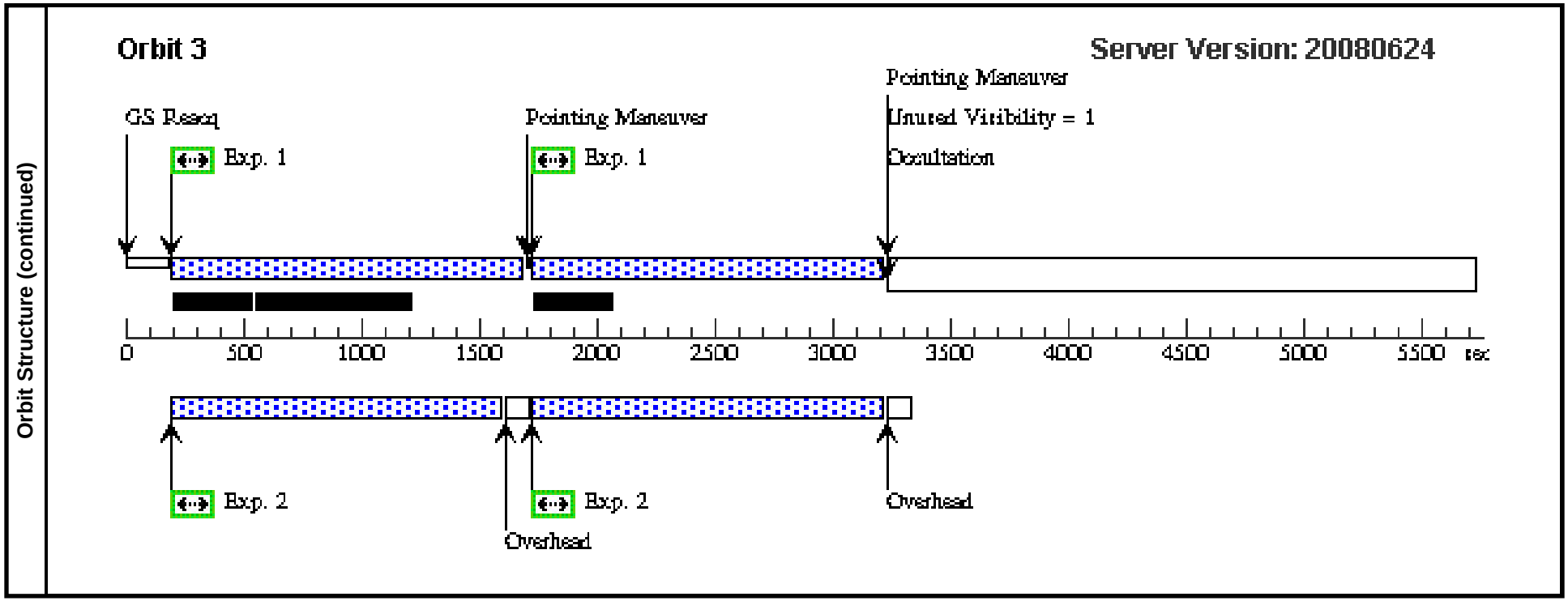
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

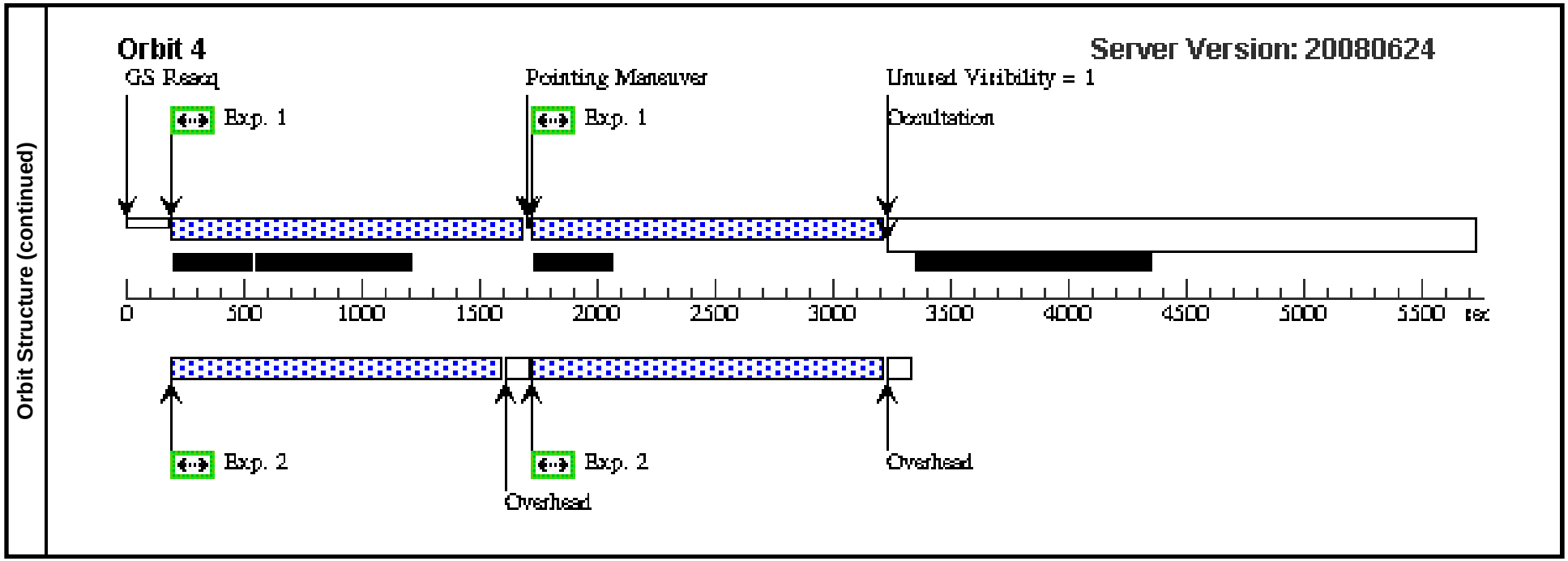
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.9,0 | Pattern 1-2 (4) | 1250 Secs | |
| | | | | | | | Prime + Parallel Group 1-2 | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/UVIS, ACCUM, UVIS | F606W | CR-SPLIT=NO | | Pattern 1-2 (4) | 1200 Secs | |
| | | | | | | | Prime + Parallel Group 1-2 | *[==>1344.0 Secs (Pattern 1)]*<br>*[==>1386.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 3)]*<br>*[==>1496.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 5)]*<br>*[==>1496.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1404.0 Secs (Pattern 7)]*<br>*[==>1496.0 Secs (Pattern 8)]* | ***[4]*** |


Orbit Structure
Orbit 1
Server Version: 20080624
Unused Vitibility = 1
Pointing Maneuver
Pointing Maneuver
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Overhead
Overhead


Orbit Structure (continued)
Orbit 4
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Unused Vitibility = 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Overhead
Exp. 2
Overhead

## Visit

**Proposal 11710, Visit 07, implementation** Tue Jul 01 01:53:43 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: SAME ORIENT AS 01

*Comments: Visit 7*

## Patterns

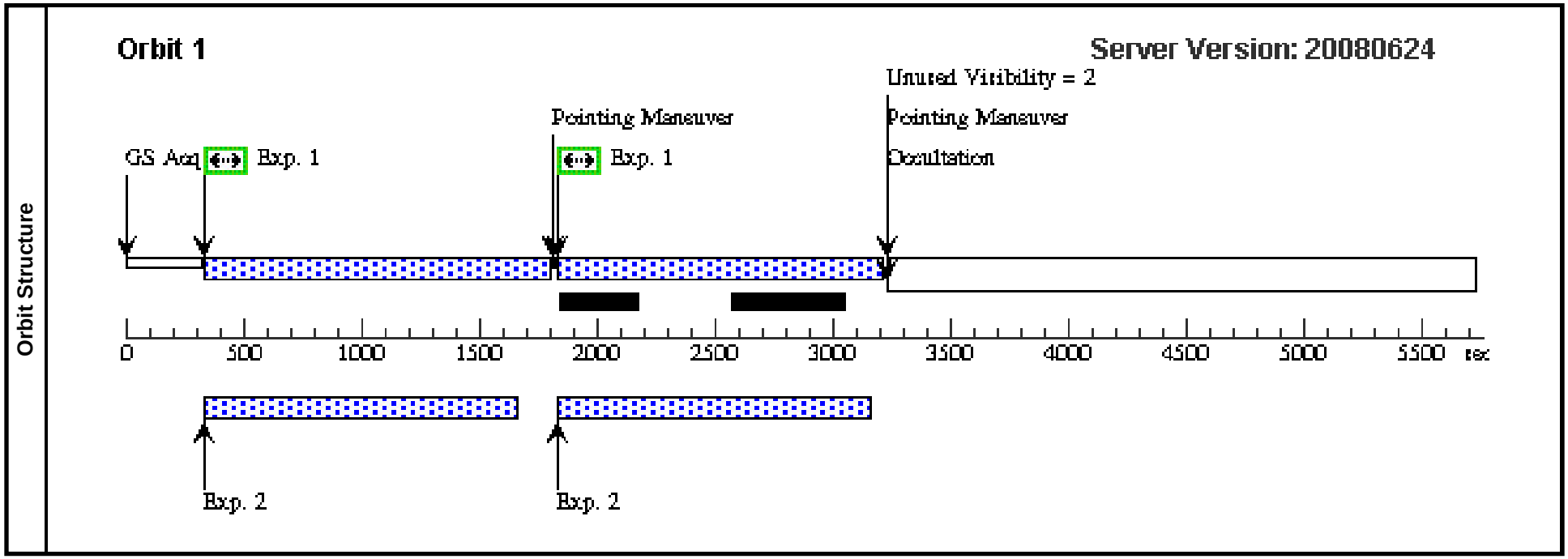
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (4) | Pattern Type=ACS-WFC-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=8<br>Point Spacing=2.72<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=265.28<br>Angle Between Sides=<br>Center Pattern=false | | (1-2) |

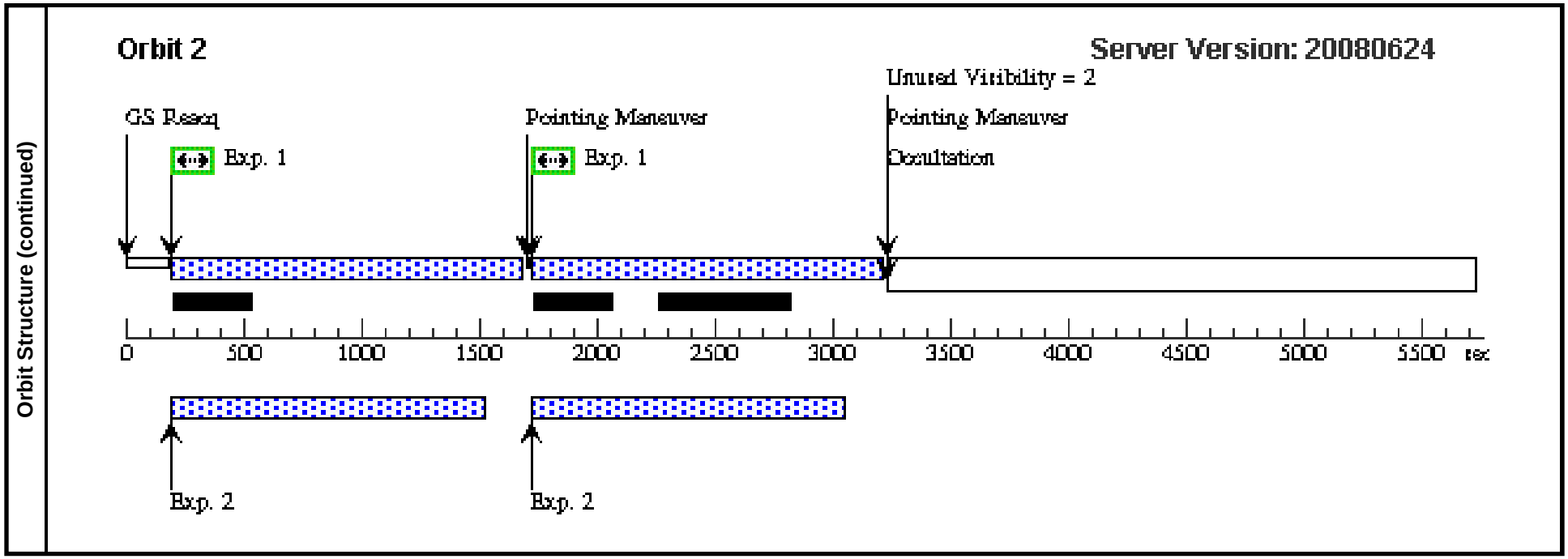
## Fixed Targets

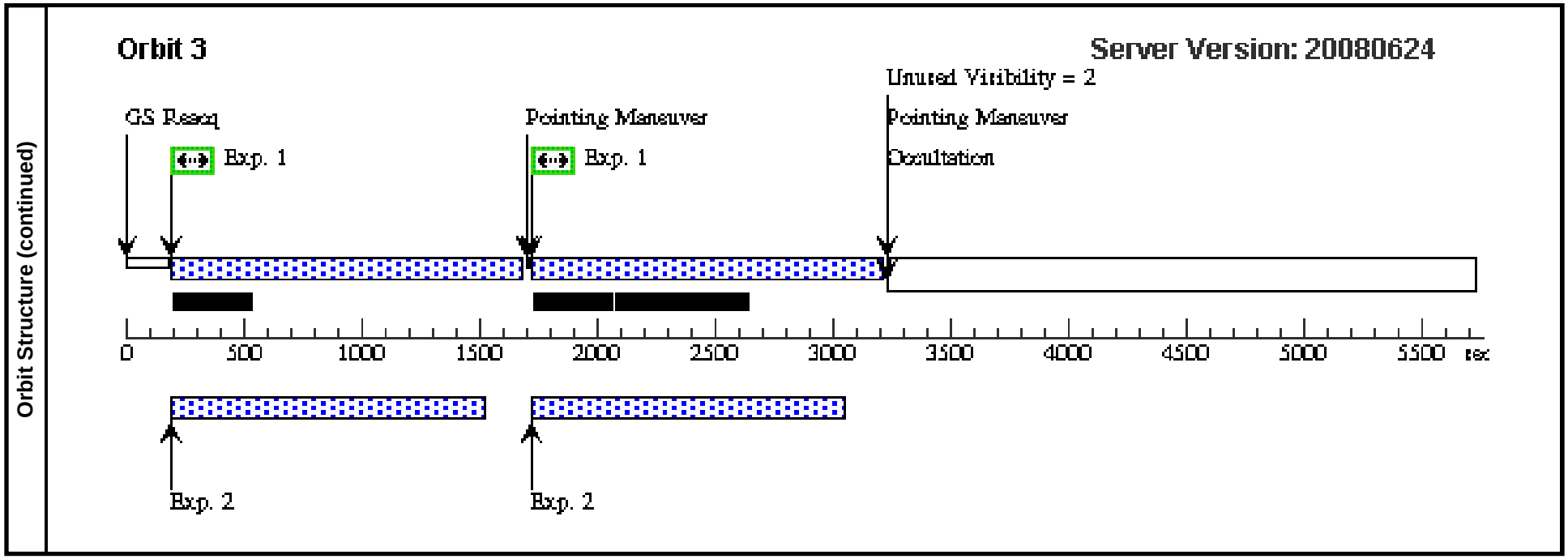
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | ABELL1689 | RA: 13 11 29.9803 (197.8749179d)<br>Dec: -01 20 27.10 (-1.34086d)<br>Equinox: J2000 | | V=28 | Reference Frame: ICRS |

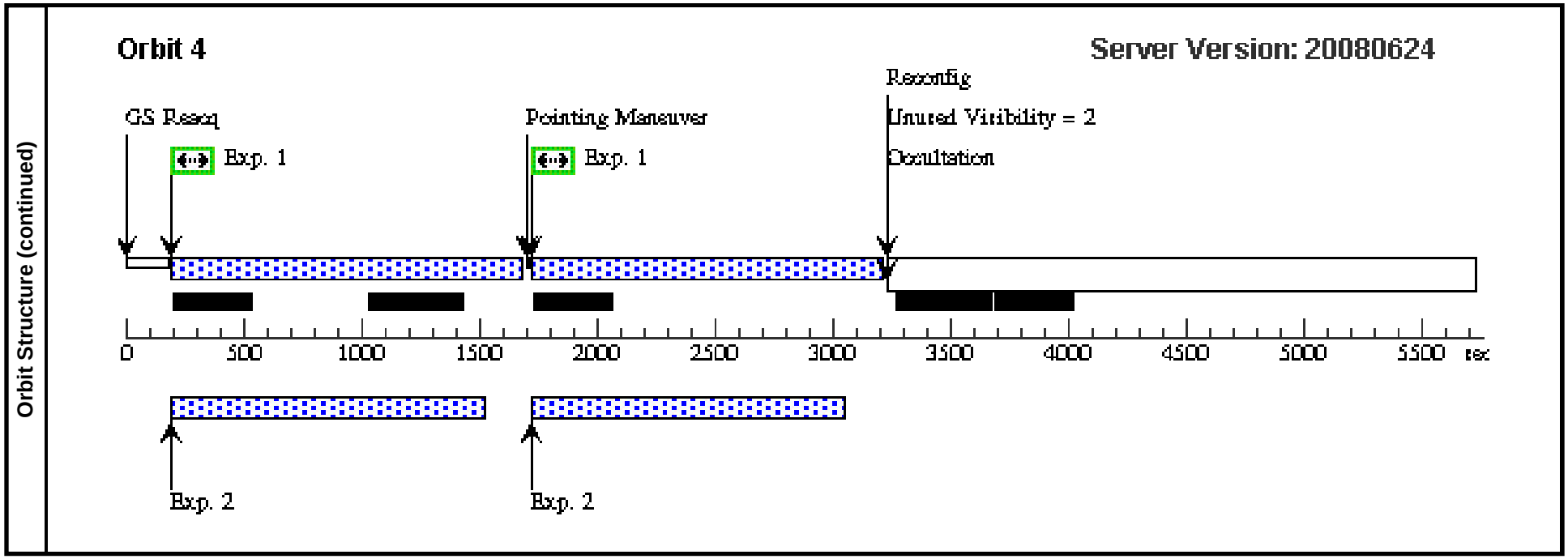
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) ABELL1689 | ACS/WFC, ACCUM, WFC | F814W | | POS TARG 0.675,0 | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | 1250 Secs | |
| | | | | | | | | *[==>1260.0 Secs (Pattern 1)]*<br>*[==>1260.0 Secs (Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 3)]*<br>*[==>1370.0 Secs (Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 5)]*<br>*[==>1370.0 Secs (Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>1370.0 Secs (Pattern 7)]*<br>*[==>1370.0 Secs (Pattern 8)]* | ***[4]*** |
| 2 | | ANY | WFC3/IR, MULTIACCUM, IR | F098M | SAMP-SEQ=SPARS100;<br>NSAMP=14 | | Pattern 1-2 (4)<br>Prime + Parallel Group 1-2 | | |
| | | | | | | | | *[==>(Pattern 1)]*<br>*[==>(Pattern 2)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 5)]*<br>*[==>(Pattern 6)]* | ***[3]*** |
| | | | | | | | | *[==>(Pattern 7)]*<br>*[==>(Pattern 8)]* | ***[4]*** |


Orbit Structure
Orbit 1
Server Version: 20080624
Unused Vitibility = 2
Pointing Maneuver
Pointing Maneuver
GS Acq
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
Unused Vitibility = 2
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2


Orbit Structure (continued)
Orbit 4
Server Version: 20080624
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Reconfig
Unused Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2