# 12226 - The Hot Stellar Content and HB morphology of the massive globular cluster G1

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

**INVESTIGATORS**



| *Name* | *Institution* | *E-Mail* |
|---|---|---|
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**VISITS**

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 01 | (1) M31-G1 | ACS/WFC<br>WFC3/UVIS | 3 | 10-Jul-2010 00:57:29.0 | yes |
| 02 | (1) M31-G1 | ACS/WFC<br>WFC3/UVIS | 1 | 10-Jul-2010 00:57:36.0 | yes |
| 03 | (1) M31-G1 | ACS/WFC<br>WFC3/UVIS | 1 | 10-Jul-2010 00:57:41.0 | yes |
| 04 | (2) M31-G1-OFF | ACS/WFC<br>WFC3/UVIS | 3 | 10-Jul-2010 00:57:49.0 | yes |
| 05 | (2) M31-G1-OFF | ACS/WFC<br>WFC3/UVIS | 1 | 10-Jul-2010 00:57:55.0 | yes |

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 06 | (2) M31-G1-OFF | ACS/WFC<br>WFC3/UVIS | 1 | 10-Jul-2010 00:57:58.0 | yes |

10 Total Orbits Used

**ABSTRACT**

We propose to obtain deep WFC3 imagery of the Local Group's most luminous globular cluster, G1. Our primary aim is to define the hot stellar content and the extent of what appears to be a multimodal horizontal branch, analogous to those known in Omega Cen and NGC 2808. G1 is 40 kpc distant in the M31, and it would have been highly unlikely that collision with a giant molecular clould would be responsible for the complex populations which must therefore be the result of self-enrichment. We will obtain data very similar to those obtained for the known Galactic multimodal globular clusters NGC 6388 and 6441, and compare the stellar distribution on the horizontal branch with models. We can constrain the fraction of helium-enriched stars, if present, and search for supra-horizontal branch and other anomalous hot, evolved, stars. Parallel ACS observations will be the deepest ever obtained in the adjacnt field to G1, and will help to constrain whether G1 was the nucleus of a now disrupted galaxy.

**OBSERVING DESCRIPTION**

We will image G1 using WFC3 IR as the primary camera. 3 orbits in F275W - purpose: discover and characterize the UV bright stars. 3 orbits in F336W: If UV bright stars are discovered, two flux points will constrain T_eff. 2.5 orbits in F435W: Construct a classical color-magntiude diagram in Johnson B and V to assess metallicity range of the red giants. 2.5 orbits in F606W - same goal as above (CMD). The two bluest colors to constrain the temperature, Mbol and other physical properties of the hot star population. The F435 and F606 provide (1) additional flux points for the UV-bright stars; (2) a Johnson B, V CMD reaching below the HB to assess the metallicity spread.

## Visit

**Proposal 12226, Visit 01** Sat Jul 10 04:58:02 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: ORIENT 60D TO 240 D

*Comments: F275W*

## Fixed Targets

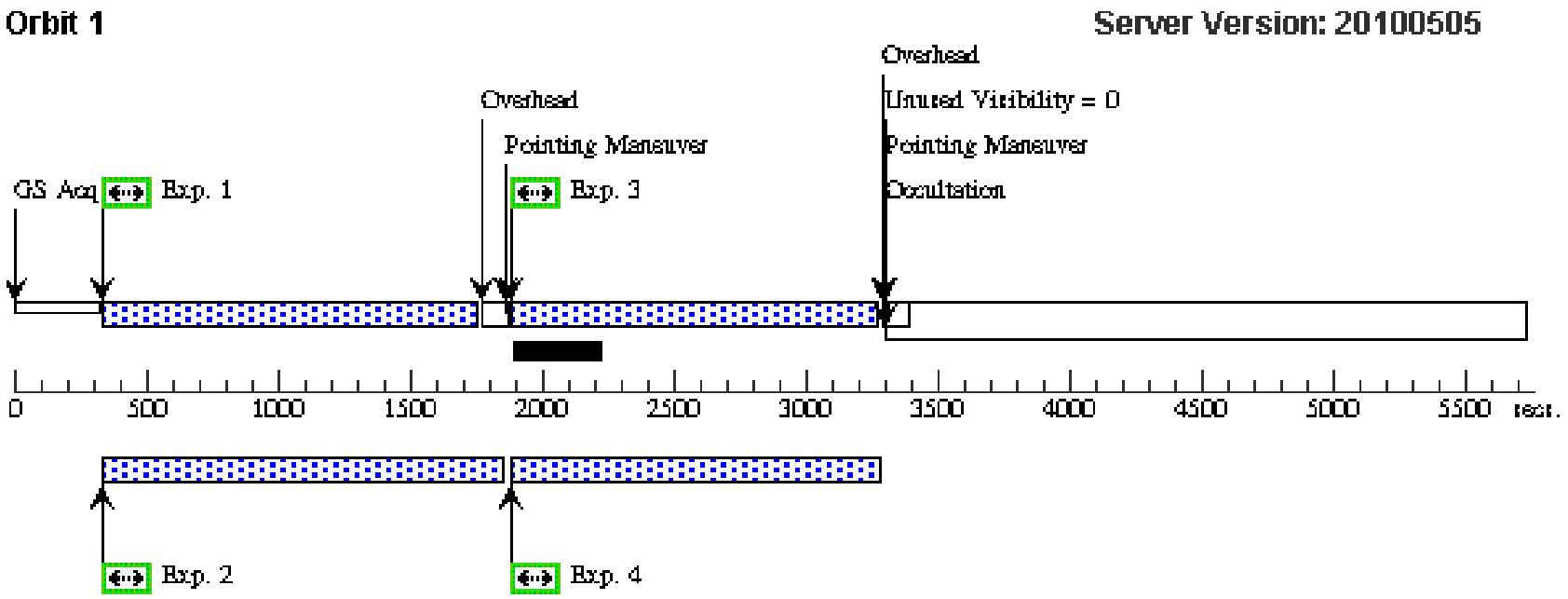
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | M31-G1 | RA: 00 32 46.5350 (8.1938958d)<br>Dec: +39 34 41.13 (39.57809d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

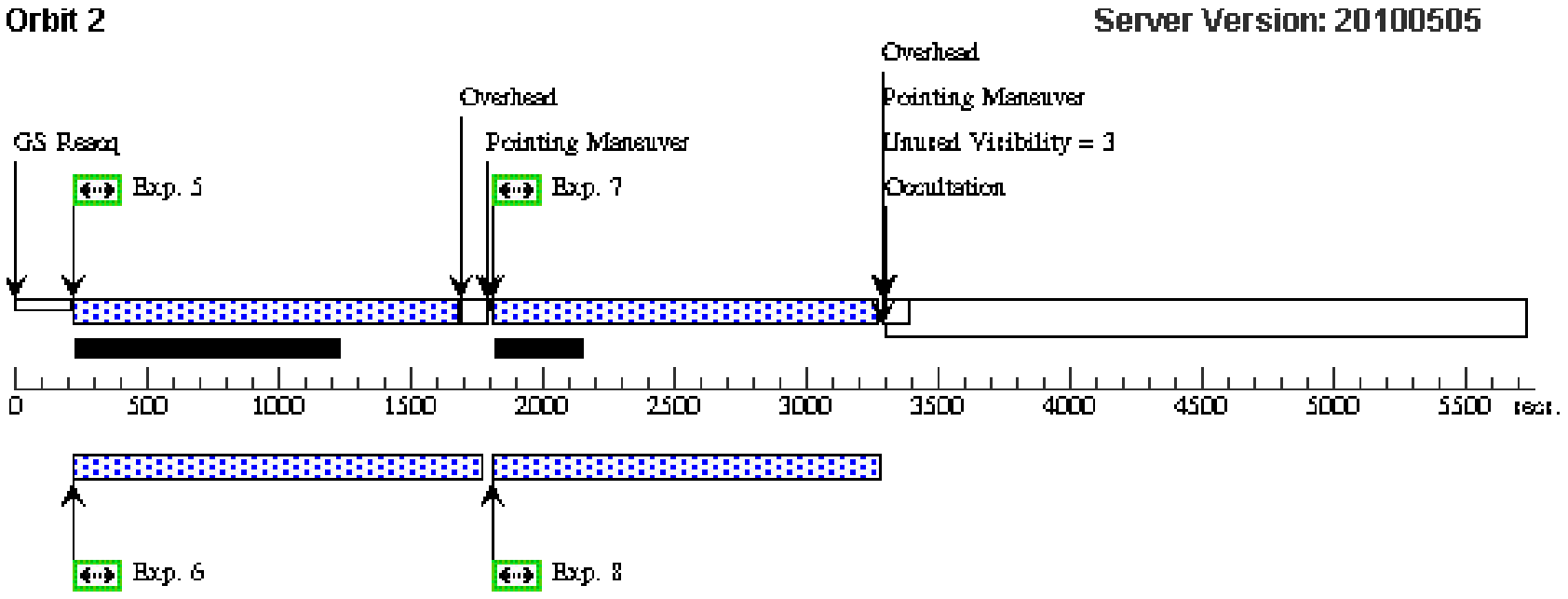
*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

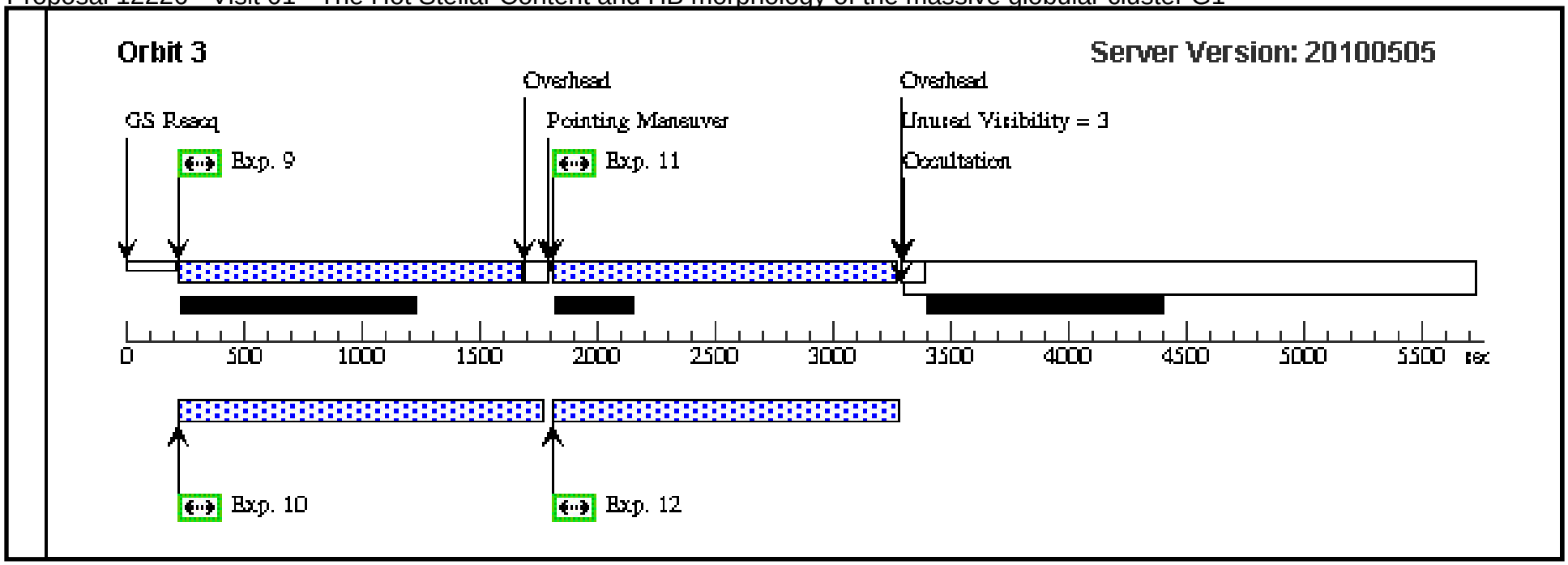
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG -2.8,-4.2 | Prime + Parallel Group 1-2 | 1395 Secs<br>*[==>]* | <br>***[1]*** |
| 2 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 1-2 | 1300 Secs<br>*[==>1310.0 Secs ]* | <br>***[1]*** |
| 3 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG -1.4,-2.8 | Prime + Parallel Group 3-4 | 1395 Secs<br>*[==>]* | <br>***[1]*** |
| 4 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 3-4 | 1215 Secs<br>*[==>1275.0 Secs ]* | <br>***[1]*** |
| 5 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG 0,-1.4 | Prime + Parallel Group 5-6 | 1465 Secs<br>*[==>]* | <br>***[2]*** |
| 6 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 5-6 | 1370 Secs<br>*[==>1430.0 Secs ]* | <br>***[2]*** |
| 7 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG 1.4,0 | Prime + Parallel Group 7-8 | 1465 Secs<br>*[==>]* | <br>***[2]*** |
| 8 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 7-8 | 1285 Secs<br>*[==>1345.0 Secs ]* | <br>***[2]*** |
| 9 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG 2.8,1.4 | Prime + Parallel Group 9-10 | 1465 Secs<br>*[==>]* | <br>***[3]*** |
| 10 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 9-10 | 1370 Secs<br>*[==>1430.0 Secs ]* | <br>***[3]*** |
| 11 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F275W | | POS TARG 4.2,2.8 | Prime + Parallel Group 11-12 | 1465 Secs<br>*[==>]* | <br>***[3]*** |
| 12 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 11-12 | 1285 Secs<br>*[==>1345.0 Secs ]* | <br>***[3]*** |

Orbit Structure




Orbit 3
Server Version: 20100505
Overhead
Overhead
GS Reacq
Pointing Maneuver
Unused Visibility = 3
Occultation
Exp. 9
Exp. 11
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 10
Exp. 12

## Visit

**Proposal 12226, Visit 02** Sat Jul 10 04:58:04 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: F336W*

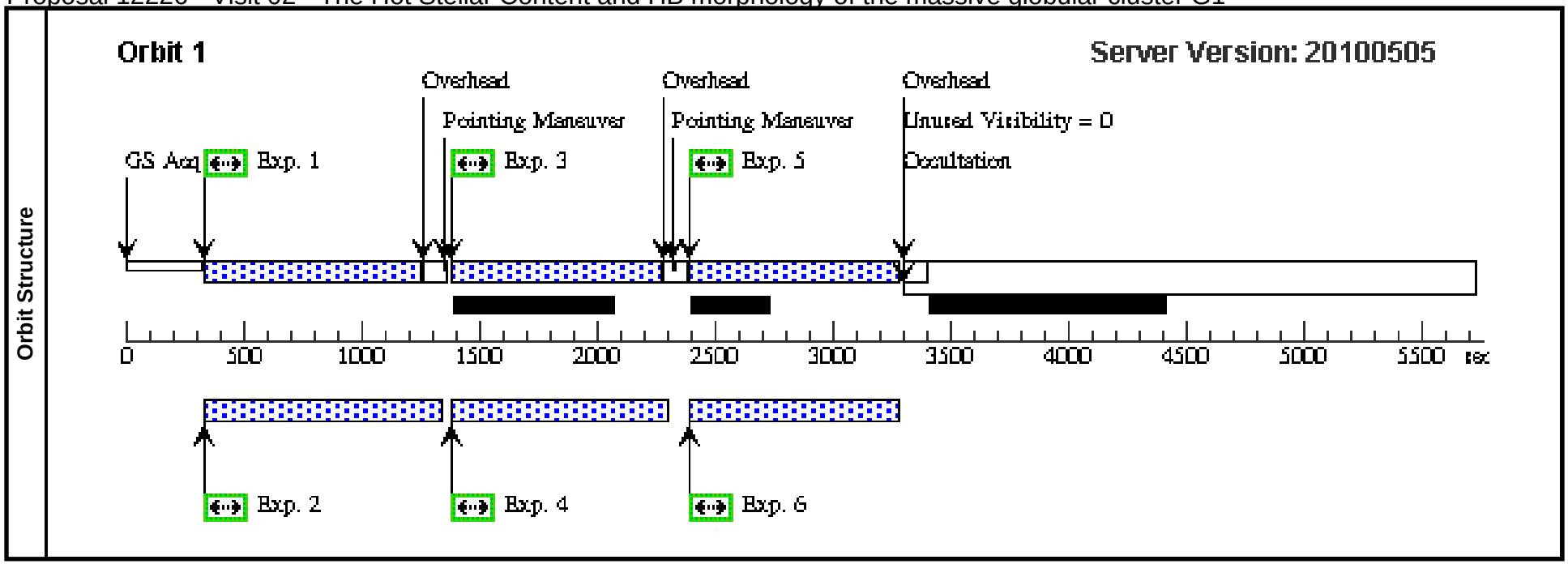
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | M31-G1 | RA: 00 32 46.5350 (8.1938958d)<br>Dec: +39 34 41.13 (39.57809d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG -2.8,-4.2 | Prime + Parallel Group 1-2 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 2 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 1-2 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 3 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG -1.4,-2.8 | Prime + Parallel Group 3-4 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 4 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 3-4 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 5 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG 0,-1.4 | Prime + Parallel Group 5-6 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 6 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 5-6 | 710 Secs<br>*[==>764.0 Secs ]* | <br>***[1]*** |


Orbit Structure
Orbit 1
Server Version: 20100505
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Visibility = 0
Occultation
GS Acq
Exp. 1
Exp. 3
Exp. 5
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 4
Exp. 6

## Visit

**Proposal 12226, Visit 03** Sat Jul 10 04:58:04 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: F336W*

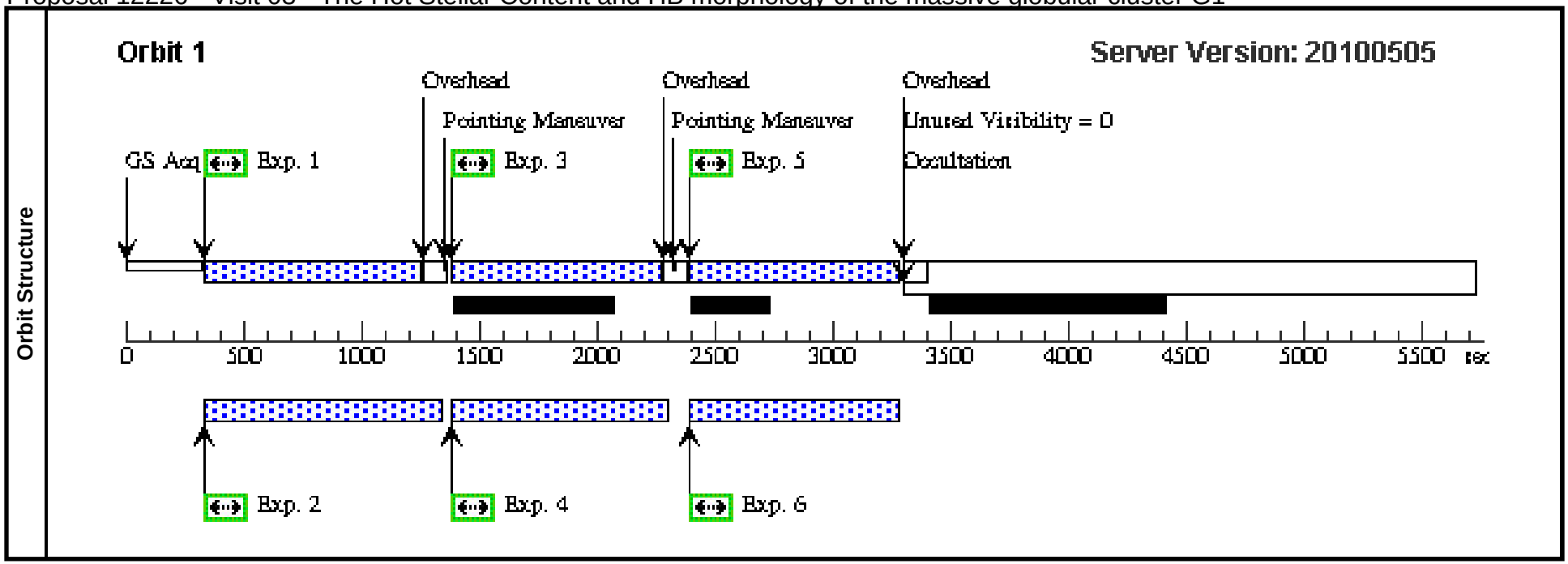
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | M31-G1 | RA: 00 32 46.5350 (8.1938958d)<br>Dec: +39 34 41.13 (39.57809d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG 1.4,0 | Prime + Parallel Group 1-2 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 2 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 1-2 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 3 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG 2.8,1.4 | Prime + Parallel Group 3-4 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 4 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 3-4 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 5 | | (1) M31-G1 | WFC3/UVIS, ACCUM, UVIS2-FIX | F336W | | POS TARG 4.2,2.8 | Prime + Parallel Group 5-6 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 6 | | (1) M31-G1 | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 5-6 | 710 Secs<br>*[==>764.0 Secs ]* | <br>***[1]*** |


Orbit Structure
Orbit 1
Server Version: 20100505
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Visibility = 0
Occultation
GS Acq
Exp. 1
Exp. 3
Exp. 5
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 4
Exp. 6

## Visit

**Proposal 12226, Visit 04** Sat Jul 10 04:58:05 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: F438W*

## Fixed Targets

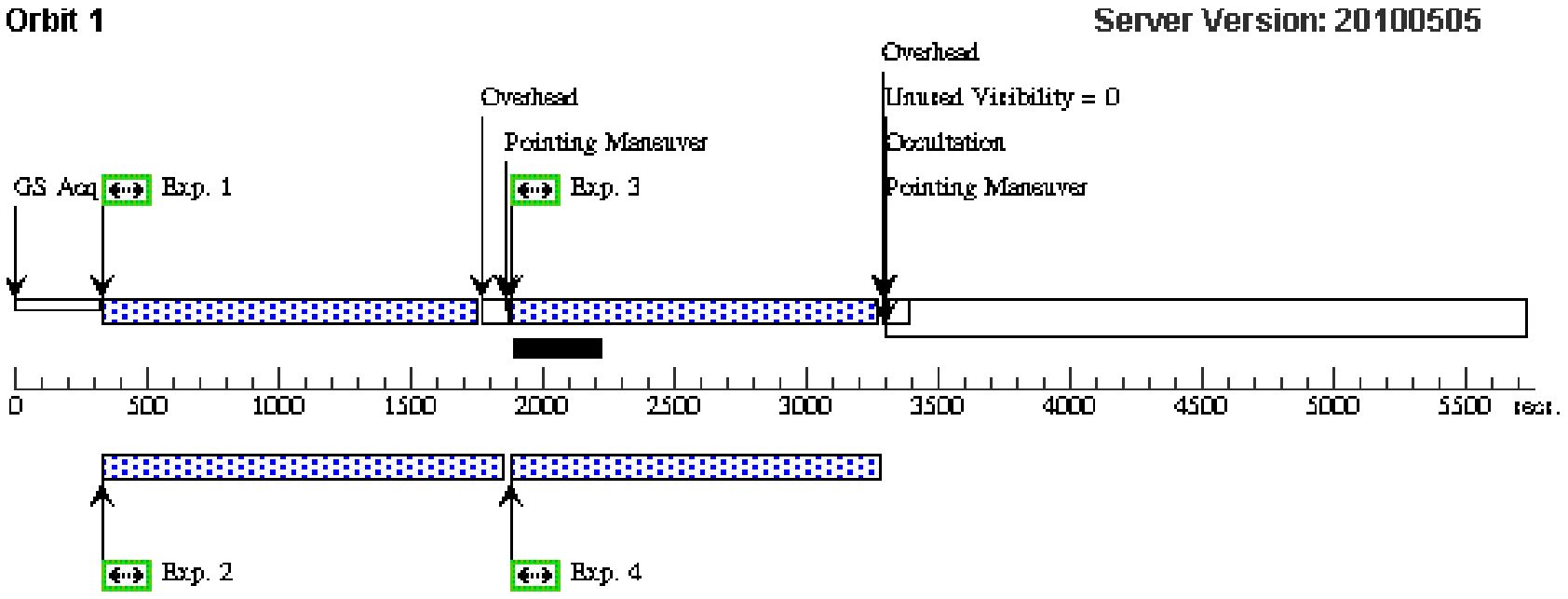
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (2) | M31-G1-OFF | RA: 00 32 46.5850 (8.1941042d)<br>Dec: +39 34 41.63 (39.57823d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

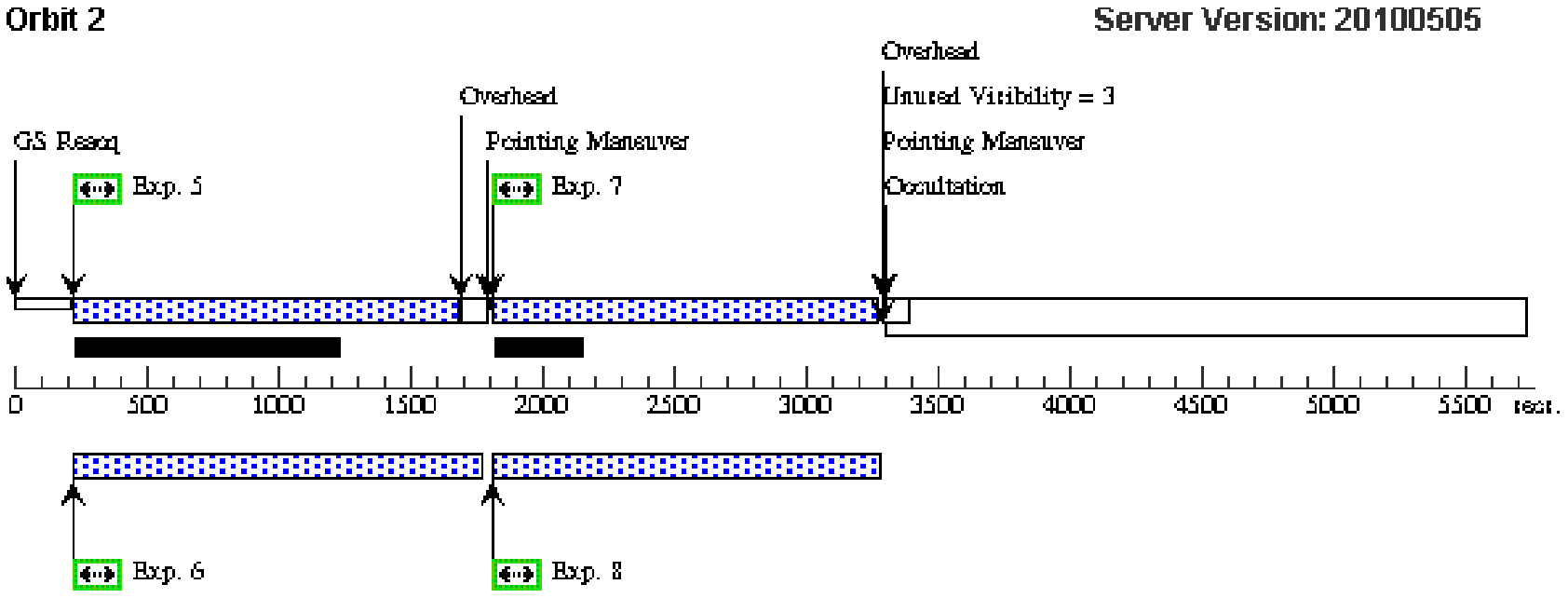
*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

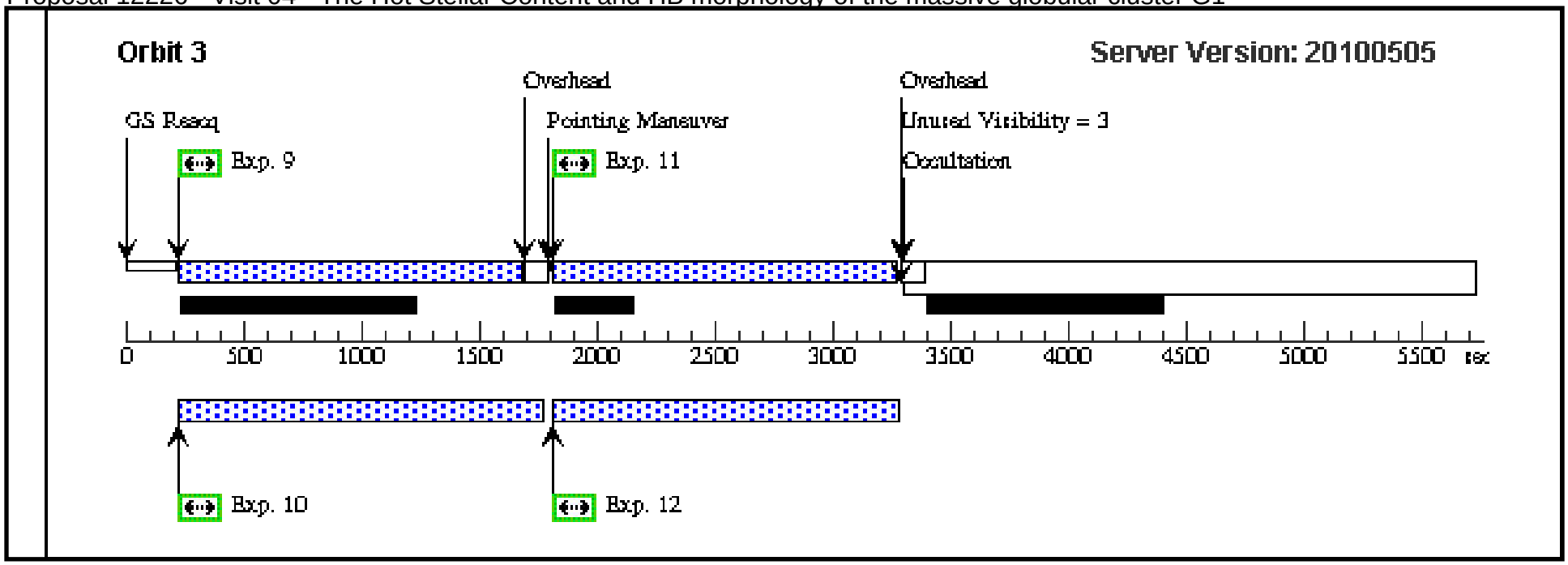
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG -2.8,-4.2 | Prime + Parallel Group 1-2 | 1395 Secs<br>*[==>]* | <br>***[1]*** |
| 2 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 1-2 | 1300 Secs<br>*[==>1310.0 Secs ]* | <br>***[1]*** |
| 3 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG -1.4,-2.8 | Prime + Parallel Group 3-4 | 1395 Secs<br>*[==>]* | <br>***[1]*** |
| 4 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 3-4 | 1215 Secs<br>*[==>1275.0 Secs ]* | <br>***[1]*** |
| 5 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG 0,-1.4 | Prime + Parallel Group 5-6 | 1465 Secs<br>*[==>]* | <br>***[2]*** |
| 6 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 5-6 | 1370 Secs<br>*[==>1430.0 Secs ]* | <br>***[2]*** |
| 7 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG 1.4,0 | Prime + Parallel Group 7-8 | 1465 Secs<br>*[==>]* | <br>***[2]*** |
| 8 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 7-8 | 1285 Secs<br>*[==>1345.0 Secs ]* | <br>***[2]*** |
| 9 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG 2.8,1.4 | Prime + Parallel Group 9-10 | 1465 Secs<br>*[==>]* | <br>***[3]*** |
| 10 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 9-10 | 1370 Secs<br>*[==>1430.0 Secs ]* | <br>***[3]*** |
| 11 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F438W | | POS TARG 4.2,2.8 | Prime + Parallel Group 11-12 | 1465 Secs<br>*[==>]* | <br>***[3]*** |
| 12 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F606W | | | Prime + Parallel Group 11-12 | 1285 Secs<br>*[==>1345.0 Secs ]* | <br>***[3]*** |

Orbit Structure




Orbit 3
Server Version: 20100505
Overhead
Overhead
GS Reacq
Pointing Maneuver
Unused Visibility = 3
Exp. 9
Exp. 11
Occultation
0
500
1000
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2000
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3500
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4500
5000
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sec
Exp. 10
Exp. 12

## Visit

**Proposal 12226, Visit 05** Sat Jul 10 04:58:06 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: F606W*

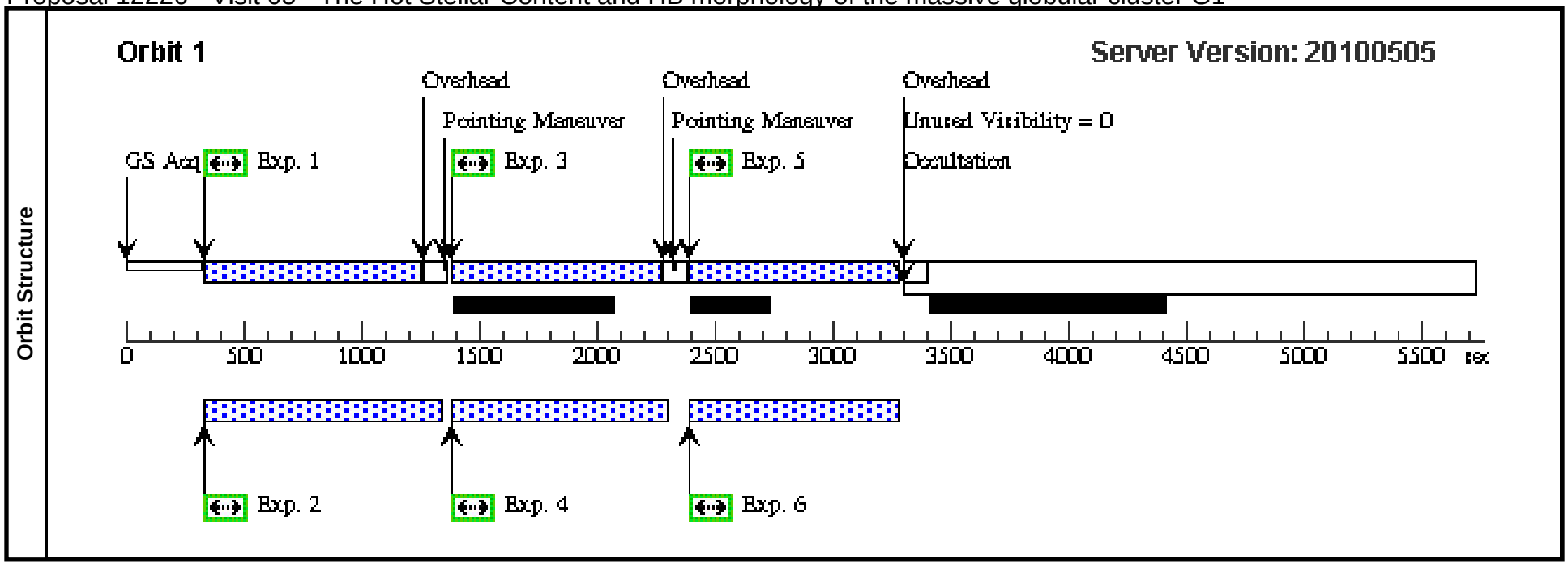
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (2) | M31-G1-OFF | RA: 00 32 46.5850 (8.1941042d)<br>Dec: +39 34 41.63 (39.57823d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG -2.8,-4.2 | Prime + Parallel Group 1-2 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 2 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 1-2 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 3 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG -1.4,-2.8 | Prime + Parallel Group 3-4 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 4 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 3-4 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 5 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG 0,-1.4 | Prime + Parallel Group 5-6 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 6 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 5-6 | 710 Secs<br>*[==>764.0 Secs ]* | <br>***[1]*** |


Orbit Structure
Orbit 1
Server Version: 20100505
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Visibility = 0
GS Acq
Exp. 1
Exp. 3
Exp. 5
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 4
Exp. 6

## Visit

**Proposal 12226, Visit 06** Sat Jul 10 04:58:06 GMT 2010

**Diagnostic Status: No Diagnostics**

Scientific Instruments: ACS/WFC, WFC3/UVIS

Special Requirements: SAME ORIENT AS 01

*Comments: F606W*

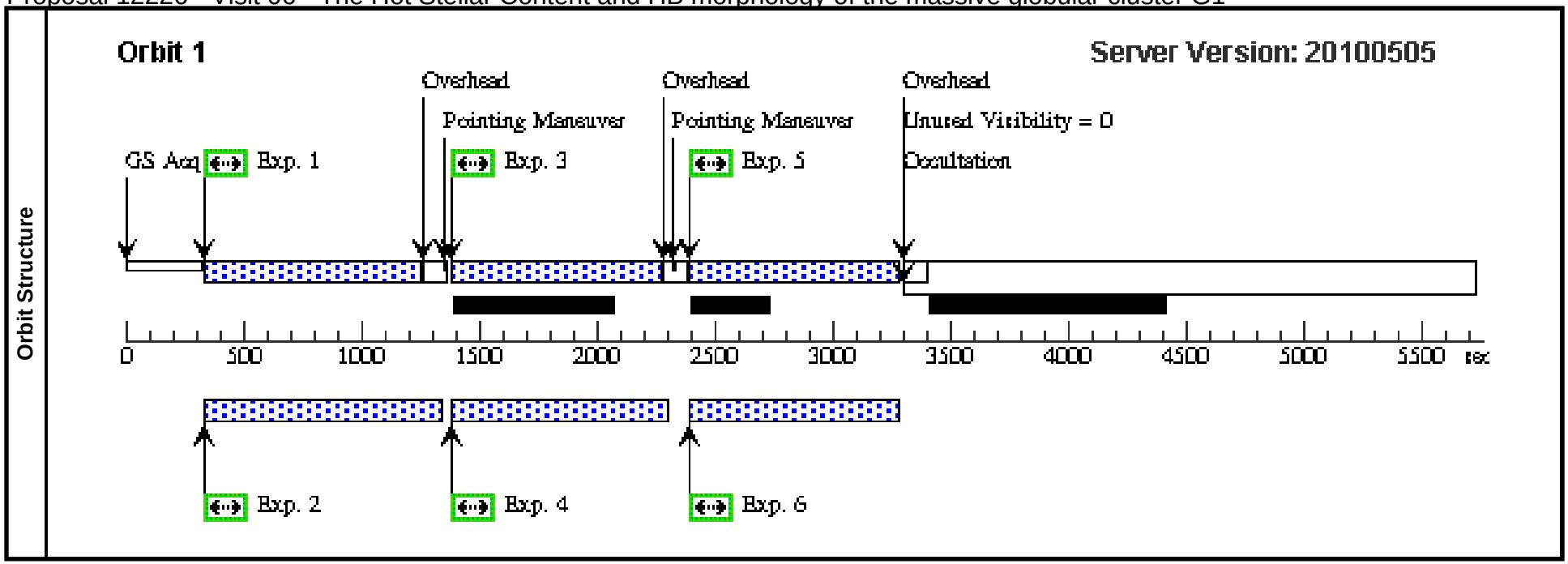
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (2) | M31-G1-OFF | RA: 00 32 46.5850 (8.1941042d)<br>Dec: +39 34 41.63 (39.57823d)<br>Equinox: J2000 | Radial Velocity: -300.0 km/sec | V=13.0+/-0.5 | Reference Frame: ICRS |

*Comments: G1 is a globular cluster in M31, 40 kpc from the M31 nucleus.*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG 1.4,0 | Prime + Parallel Group 1-2 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 2 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 1-2 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 3 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG 2.8,1.4 | Prime + Parallel Group 3-4 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 4 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 3-4 | 800 Secs<br>*[==>800.0 Secs ]* | <br>***[1]*** |
| 5 | | (2) M31-G1-OFF | WFC3/UVIS, ACCUM, UVIS2-FIX | F606W | | POS TARG 4.2,2.8 | Prime + Parallel Group 5-6 | 885 Secs<br>*[==>889.0 Secs ]* | <br>***[1]*** |
| 6 | | (2) M31-G1-OFF | ACS/WFC, ACCUM, WFCENTER | F814W | | | Prime + Parallel Group 5-6 | 710 Secs<br>*[==>764.0 Secs ]* | <br>***[1]*** |


Orbit Structure
Orbit 1
Server Version: 20100505
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Visibility = 0
Occultation
GS Acq
Exp. 1
Exp. 3
Exp. 5
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 4
Exp. 6