# 14722 - A Local Laboratory for Studying Positive Feedback from Supermassive Black Holes

Cycle: 24, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

**INVESTIGATORS**



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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) MINKOWSKIS-OBJECT | WFC3/UVIS | 1 | 09-Nov-2016 11:52:16.0 | yes |
| 02 | (1) MINKOWSKIS-OBJECT | WFC3/UVIS | 1 | 09-Nov-2016 11:52:17.0 | yes |
| 03 | (1) MINKOWSKIS-OBJECT | WFC3/UVIS | 1 | 09-Nov-2016 11:52:18.0 | yes |
| 04 | (1) MINKOWSKIS-OBJECT | WFC3/UVIS | 1 | 09-Nov-2016 11:52:18.0 | yes |
| 05 | (1) MINKOWSKIS-OBJECT | WFC3/UVIS | 2 | 09-Nov-2016 11:52:19.0 | yes |
| 06 | (1) MINKOWSKIS-OBJECT | WFC3/IR | 1 | 09-Nov-2016 11:52:20.0 | yes |

7 Total Orbits Used

**ABSTRACT**

AGN feedback is a critical regulator of galaxy growth. As well as curtailing star formation in diffuse, hot gas, it is increasingly understood to sometimes enhance star formation in the clumpy ISM through shock-induced collapse of clouds. Simulations have shown that such positive feedback may play a significant role in determining the stellar populations of galaxies. Minkowsi's Object (MO) provides an excellent local laboratory to probe this poorly-studied process in detail. The detection of a Type II supernova in MO (unexpected given the low mass of MO) suggests that jet-induced star formation may overproduce massive stars, and that models of the initial mass function in such systems may need to be revised. Recent results also suggest that star formation efficiency is enhanced in MO. Using WFC3, we will obtain morphologies, SEDs, H-a luminosities, equivalent widths, sizes, and population synthesis models of star forming regions across MO in order to address these questions, critical for understanding not just this single object, but the general process: 1. Does jet induced star formation change the luminosities and initial mass functions of star clusters? 2. What do the age gradients of the star clusters tell us about the process of conversion of gas (HI, CO) into stars as the radio jet progressed through the parent cloud? Does this match numerical simulations? 3. By using observations to refine simulations, what can we learn about intrinsic properties of these kinds of radio jets, such as propagation speed, age, pressure and jet energy flux?

**OBSERVING DESCRIPTION**

WFC3 Broad-Band UVIS and IR imaging: one orbit per filter in UVIS F336W, F438W, F555W, F814W and IR F125W. WFC3 Narrow-Band imaging for H-alpha at z = 0.01875, i.e. 6686 Angstroms: 2 orbits in UVIS F665N. Four point dither used.

## Visit

**Proposal 14722, Visit 01, implementation**

Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.173<br>Line Spacing=0.112 | Coordinate Frame=POS-TARG<br>Pattern Orientation=23.884<br>Angle Between Sides=81.785<br>Center Pattern=false | | (1) |

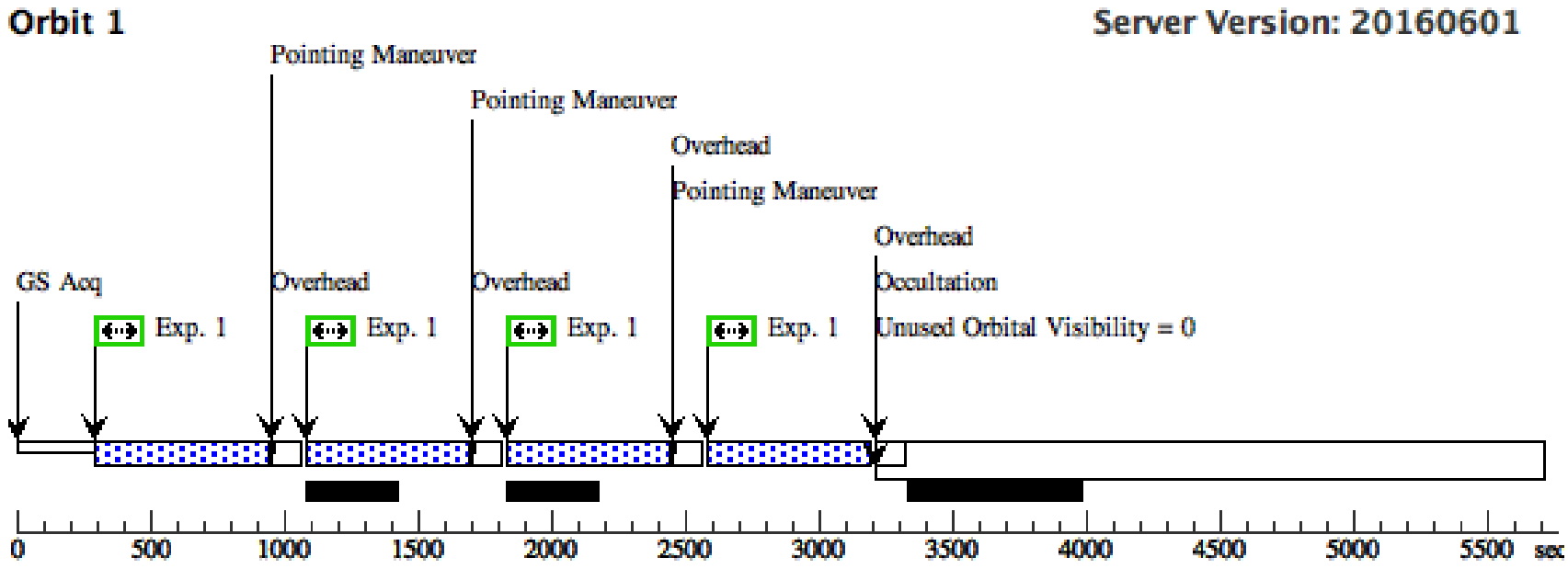
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/UVIS, ACCUM, UVIS2 | F336W | FLASH=11 | | Pattern 2, Exps 1-1 in Visit 01 (2) | 400 Secs (2464 Secs)<br>*[==>616.0 Secs (Pattern 1)]*<br>*[==>616.0 Secs (Pattern 2)]*<br>*[==>616.0 Secs (Pattern 3)]*<br>*[==>616.0 Secs (Pattern 4)]* | ***[1]*** |

## Orbit Structure



## Visit

**Proposal 14722, Visit 02, implementation**

Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.173<br>Line Spacing=0.112 | Coordinate Frame=POS-TARG<br>Pattern Orientation=23.884<br>Angle Between Sides=81.785<br>Center Pattern=false | | (1) |

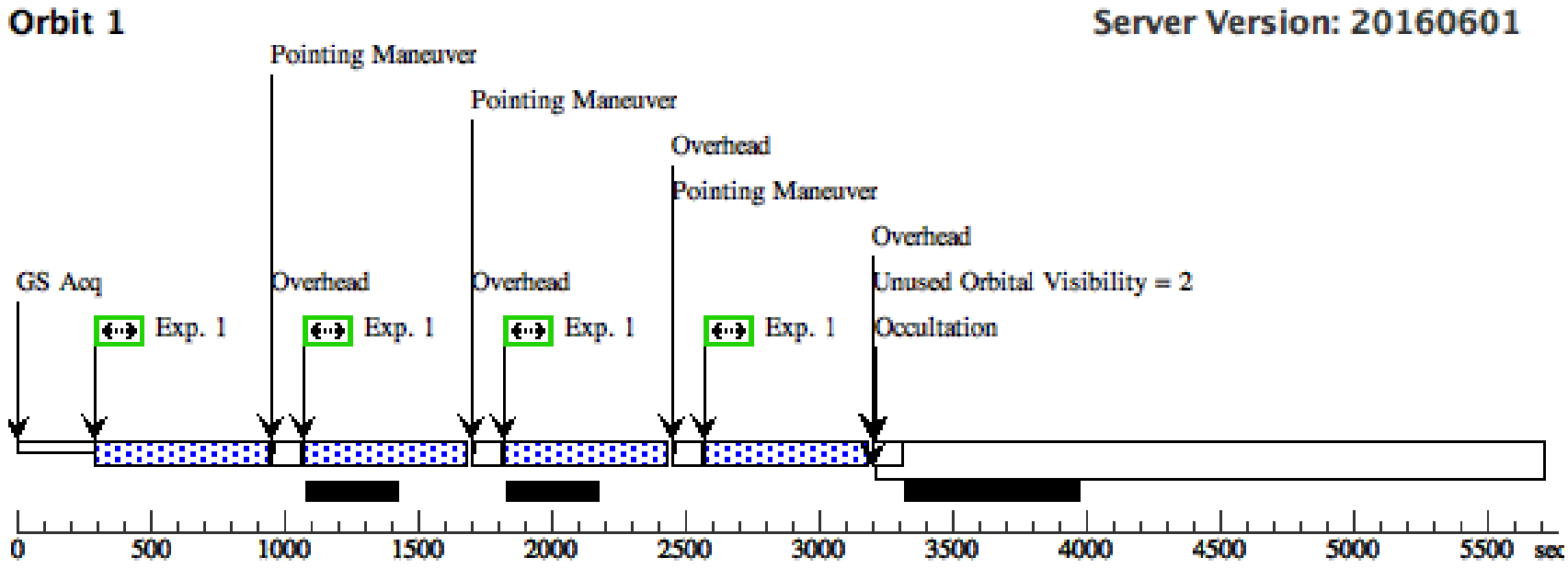
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/UVIS, ACCUM, UVIS2 | F438W | FLASH=7 | | Pattern 2, Exps 1-1 in Visit 02 (2) | 400 Secs (2468 Secs)<br>*[==>617.0 Secs (Pattern 1)]*<br>*[==>617.0 Secs (Pattern 2)]*<br>*[==>617.0 Secs (Pattern 3)]*<br>*[==>617.0 Secs (Pattern 4)]* | ***[1]*** |

## Orbit Structure



## Visit

**Proposal 14722, Visit 03, implementation** Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

## Patterns

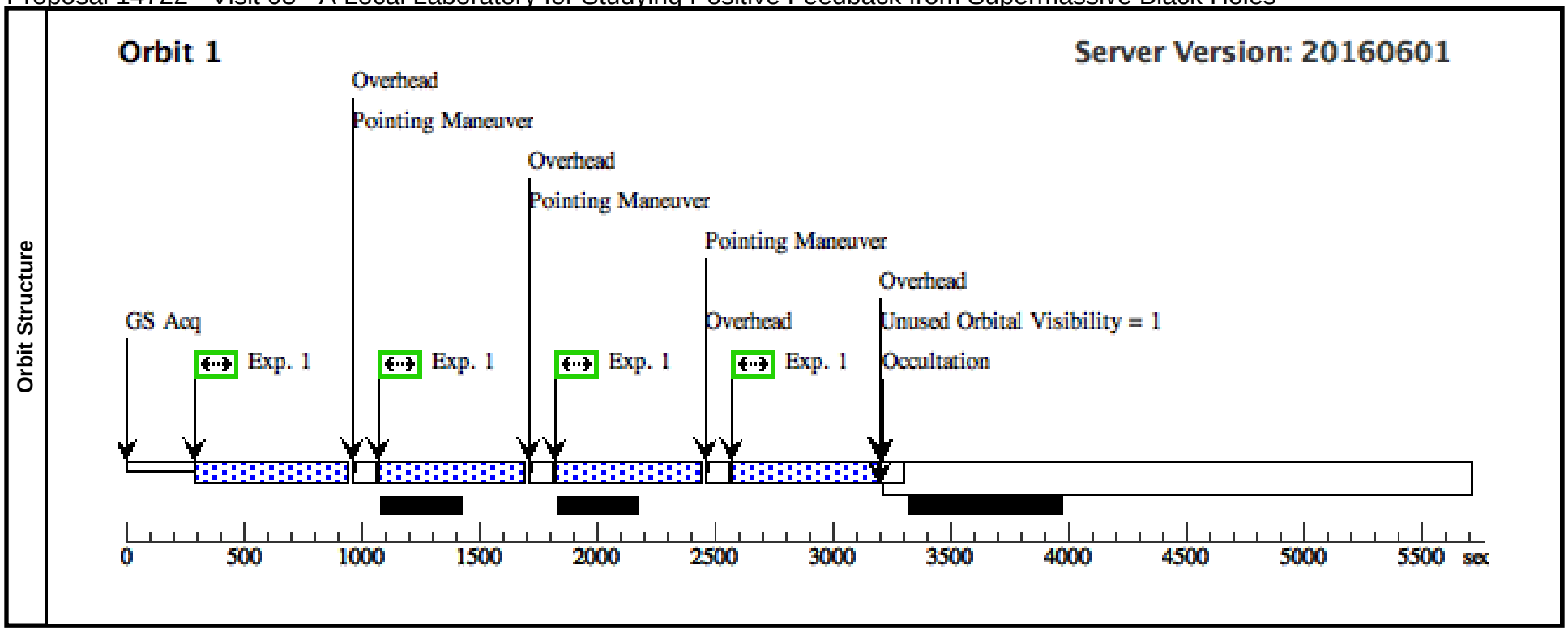
| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.173<br>Line Spacing=0.112 | Coordinate Frame=POS-TARG<br>Pattern Orientation=23.884<br>Angle Between Sides=81.785<br>Center Pattern=false | | (1) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/UVIS, ACCUM, UVIS2 | F555W | | | Pattern 2, Exps 1-1 in Visit 03 (2) | 400 Secs (2484 Secs)<br>*[==>621.0 Secs (Pattern 1)]*<br>*[==>621.0 Secs (Pattern 2)]*<br>*[==>621.0 Secs (Pattern 3)]*<br>*[==>621.0 Secs (Pattern 4)]* | ***[1]*** |


Orbit Structure
Orbit 1
Server Version: 20160601
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Overhead
Unused Orbital Visibility = 1
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

## Visit

**Proposal 14722, Visit 04, implementation**

Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.173<br>Line Spacing=0.112 | Coordinate Frame=POS-TARG<br>Pattern Orientation=23.884<br>Angle Between Sides=81.785<br>Center Pattern=false | | (1) |

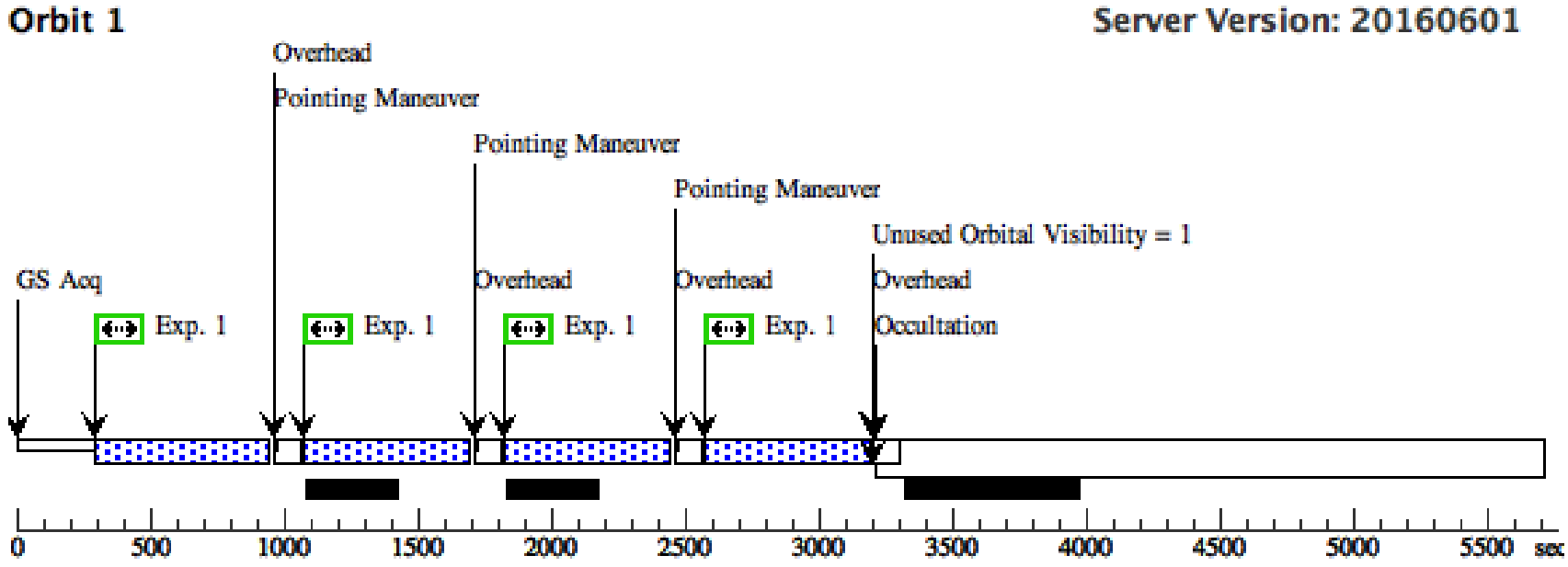
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/UVIS, ACCUM, UVIS2 | F814W | | | Pattern 2, Exps 1-1 in Visit 04 (2) | 400 Secs (2484 Secs)<br>*[==>621.0 Secs (Pattern 1)]*<br>*[==>621.0 Secs (Pattern 2)]*<br>*[==>621.0 Secs (Pattern 3)]*<br>*[==>621.0 Secs (Pattern 4)]* | ***[1]*** |

## Orbit Structure



## Visit

**Proposal 14722, Visit 05, implementation** Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.173<br>Line Spacing=0.112 | Coordinate Frame=POS-TARG<br>Pattern Orientation=23.884<br>Angle Between Sides=81.785<br>Center Pattern=false | | (1) |

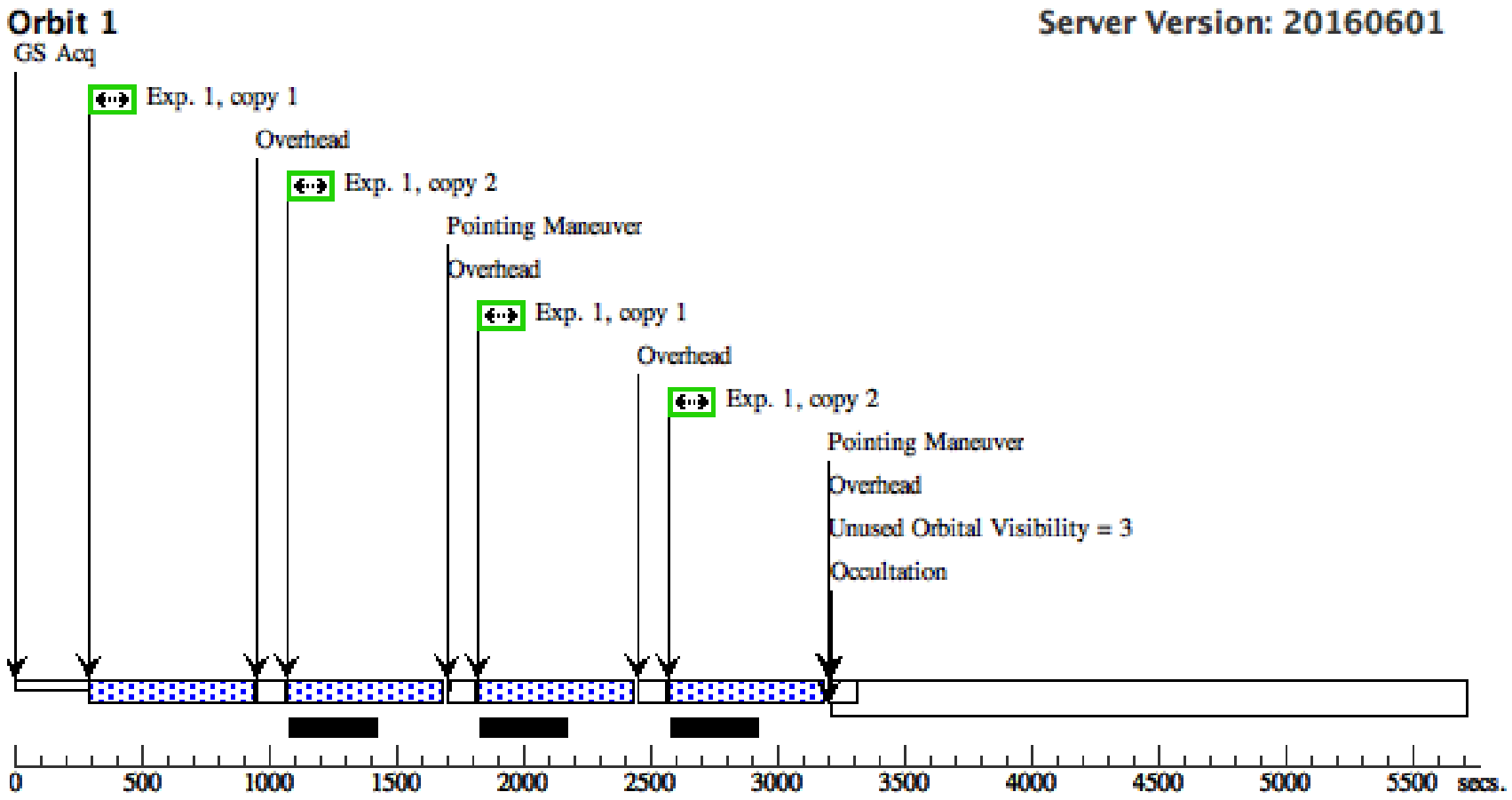
## Fixed Targets

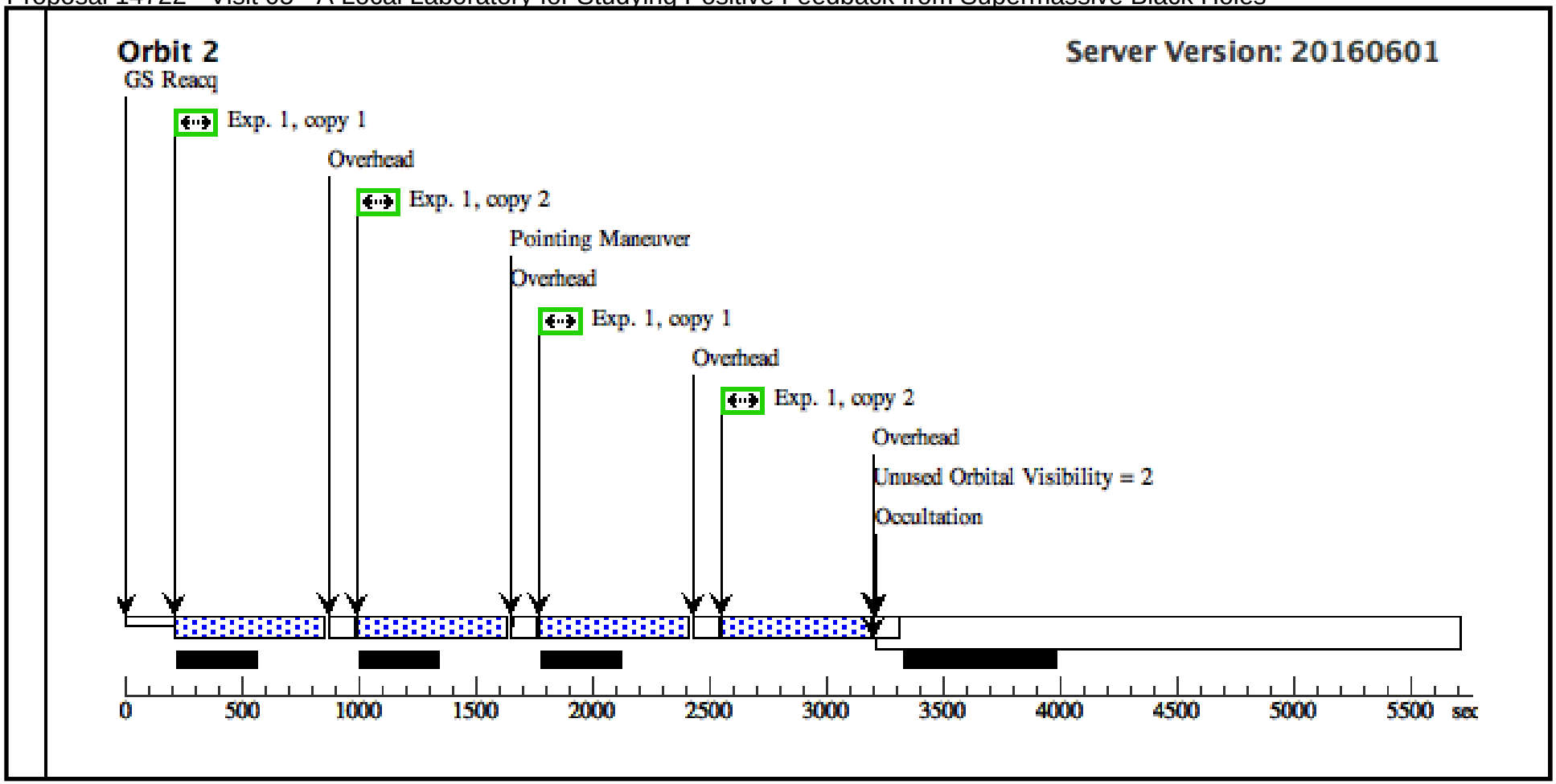
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/UVIS, ACCUM, UVIS2 | F665N | FLASH=10 | | Pattern 2, Exps 1-1 in Visit 05 (2) | 600 Secs X 2 (5040 Secs) | |
| | | | | | | | | *[==>616.0 Secs (Pattern 1, Copy 1)]*<br>*[==>616.0 Secs (Pattern 1, Copy 2)]*<br>*[==>616.0 Secs (Pattern 2, Copy 1)]*<br>*[==>616.0 Secs (Pattern 2, Copy 2)]* | ***[1]*** |
| | | | | | | | | *[==>644.0 Secs (Pattern 3, Copy 1)]*<br>*[==>644.0 Secs (Pattern 3, Copy 2)]*<br>*[==>644.0 Secs (Pattern 4, Copy 1)]*<br>*[==>644.0 Secs (Pattern 4, Copy 2)]* | ***[2]*** |

Orbit Structure




Orbit 2
Server Version: 20160601
GS Reacq
Exp. 1, copy 1
Overhead
Exp. 1, copy 2
Pointing Maneuver
Overhead
Exp. 1, copy 1
Overhead
Exp. 1, copy 2
Overhead
Unused Orbital Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

## Visit

**Proposal 14722, Visit 06, implementation** Wed Nov 09 16:52:21 GMT 2016

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/IR

Special Requirements: (none)

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=WFC3-IR-DITHER-BOX-UVIS<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=23.02<br>Line Spacing=35.212 | Coordinate Frame=POS-TARG<br>Pattern Orientation=0.713<br>Angle Between Sides=89.287<br>Center Pattern=true | | (1) |

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | MINKOWSKIS-OBJECT | RA: 01 25 47.4000 (21.4475000d)<br>Dec: -01 22 21.00 (-1.37250d)<br>Equinox: J2000 | | V=17 | Reference Frame: ICRS |

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) MINKOWSKIS-OBJECT | WFC3/IR, MULTIACCUM, IR-UVIS | F125W | NSAMP=12;<br>SAMP-SEQ=STEP100 | | Pattern 1, Exps 1-1 in Visit 06 (1) | 599.232292 Secs (2396.929 Secs)<br>*[==>(Pattern 1)]*<br>*[==>(Pattern 2)]*<br>*[==>(Pattern 3)]*<br>*[==>(Pattern 4)]* | *[1]* |

## Orbit Structure