11174 - A Spitzer/X-ray candidate cluster at z>2: NICMOS imaging

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Emanuele Daddi (PI) (ESA Member)	**Commissariat a l'Energie Atomique (CEA)**	**edaddi@cea.fr**
Prof. Alvio Renzini (CoI) (ESA Member)	Osservatorio Astronomico di Padova	arenzini@pd.astro.it
Prof. Nobuo Arimoto (CoI)	National Astronomical Observatory of Japan (NAOJ)	arimoto@optik.mtk.nao.ac.jp
Dr. Marcella Brusa (CoI) (ESA Member)	Max-Planck-Institut fur extraterrestrische Physik	marcella@mpe.mpg.de
Dr. Ranga-Ram Chary (CoI) (AdminUSPI)	California Institute of Technology	rchary@caltech.edu
Prof. Andrea Cimatti (CoI) (ESA Member)	Universita di Bologna	cimatti@arcetri.astro.it
Dr. Alexis Finoguenov (CoI)	University of Maryland	alexis@mpe.mpg.de
Dr. Xu Kong (CoI)	University of Science and Technology of China	xkong@ustc.edu.cn
Dr. Masato Onodera (CoI)	Yonsei University, Korea	monodera@galaxy.yonsei.ac.kr

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) DADDIF-GAL-CLUS	NIC3	4	18-Jan-2008 02:01:27.0	yes
02	(1) DADDIF-GAL-CLUS	NIC3	3	18-Jan-2008 02:01:33.0	yes

7 Total Orbits Used

ABSTRACT

We propose deep H-band imaging with NICMOS of a remarkable z>2 cluster of galaxy candidate. Over a 1000 arcmin^2 field imaged with Spitzer's IRAC and MIPS we have discovered a compact (<30" diameter) concentration of extremely red galaxies with a factor of >40 overdensity over the adjacent field. Among these galaxies for which we can derive meaningful photometric redshifts, 17 are consistent with zphot=2-2.5, making very likely that the concentrationis is a real cluster at such high redshift. This is further supported by a 3.5 sigma detection of extended X-Ray emission on Newton-XMM data, by a likely color-magnitude sequence of red galaxies, and by the presence of a giant galaxy consistent with a BCG at the cluster redshift. While spectroscopic confirmation of the cluster might result prohibitive with current facilities, HST high resolution imaging will allow us to gain crucial information for the study and scientific exploitation of this hot gas hosting, record high-z cluster of galaxies. The HST high resolution observations will allow us to unveil the rest frame optical morphologies of the galaxies and confirm the presence of ellipticals in the structure, detect and characterize the color-magnitude relation, measure their effective radii and construct their Kormendy relation for the passively evolving subsample, improve the photometric redshift estimates to confirm the real cluster nature of the structure, estimate stellar masses and check for possible deviations from the local mass-size relation, search for mergers and AGNs, and establish a cluster benchmark for cluster-field comparisons at this highest redshift.

OBSERVING DESCRIPTION

Our goal is to obtain high resolution and high S/N imaging of the $z>2$ cluster member candidates in the structure. Given the extremely red SEDs of the sources, the most efficient mean by far is observing in the near-IR with NICMOS in the F160W band. This also allows to obtain data at optical rest-frame wavelengths (between B and V bands rest frame for $z\sim2$--2.5).

The angular size of the galaxy overdensity is about 30$"$, which can be easily covered with a single pointing with the NICMOS3 camera. With a FWHM of about 0.2$"$, corresponding to about 1.7 kpc (proper size) at $z=2$--2.5, this will suffice to distinguish disks and irregular (i.e. dusty or merging) galaxies from spheroids and to constrain sizes to a limit of $\simlt1$ kpc. This size limit is comparable to the size of the smallest field $z>1.4$

passive ellipticals (Daddi et al. 2005).

The IRAC brightest galaxy in the structure (candidate BCG) has $H=22.2$ AB, derived
from the best fit SED (Fig.~\ref{fig:x}). The cluster member candidates are up to 3.5 magnitudes fainter in IRAC than the BCG
(see Fig~\ref{fig:1}). Conservatively assuming they are as red as the BCG in $(H-m_{3.6\mu m})$
color, we need to reach
$H=25$ AB in order to secure high quality imaging of most cluster members (14/17 to this limit).

We have used the NICMOS exposure time calculator for estimating the required integration
time to reach $S/N>10$ detection of a $H=25$ source. We consider a 1$"$ diameter aperture
and assume that at least 70\% of the flux falls withis the aperture. We consider 2 sub exposures
of 1300s per orbit (52 minutes visibility).
We find that in total 7 orbits are necessary to reach the required S/N ratio.

We will split the observations in a 4-orbit visit plus a 3-orbit visit. Each visit will perform a NIC-SPIRAL-DITH pattern with 2" (10 pixel) spacing (plus 1/2 pixel or 1/3 pixel extra shift for PSF sampling).

Visit

Proposal 11174, Visit 01 Fri Jan 18 07:01:37 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: NIC3

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=NIC-SPIRAL-DITH	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=0.0		
	Number Of Points=8	Angle Between Sides=		
	Point Spacing=2.06666	Center Pattern=false		
	Line Spacing=			

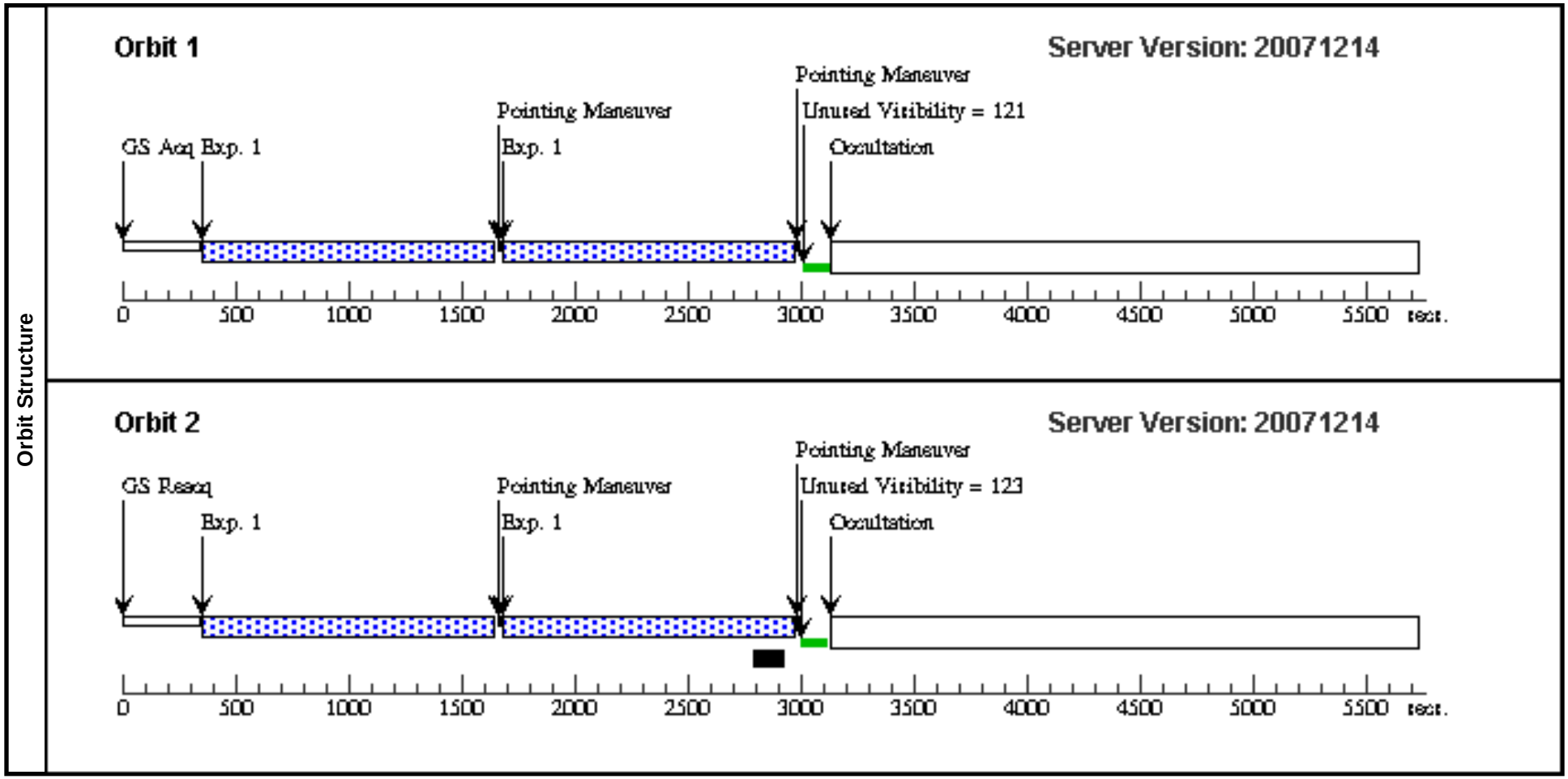
Fixed Targets

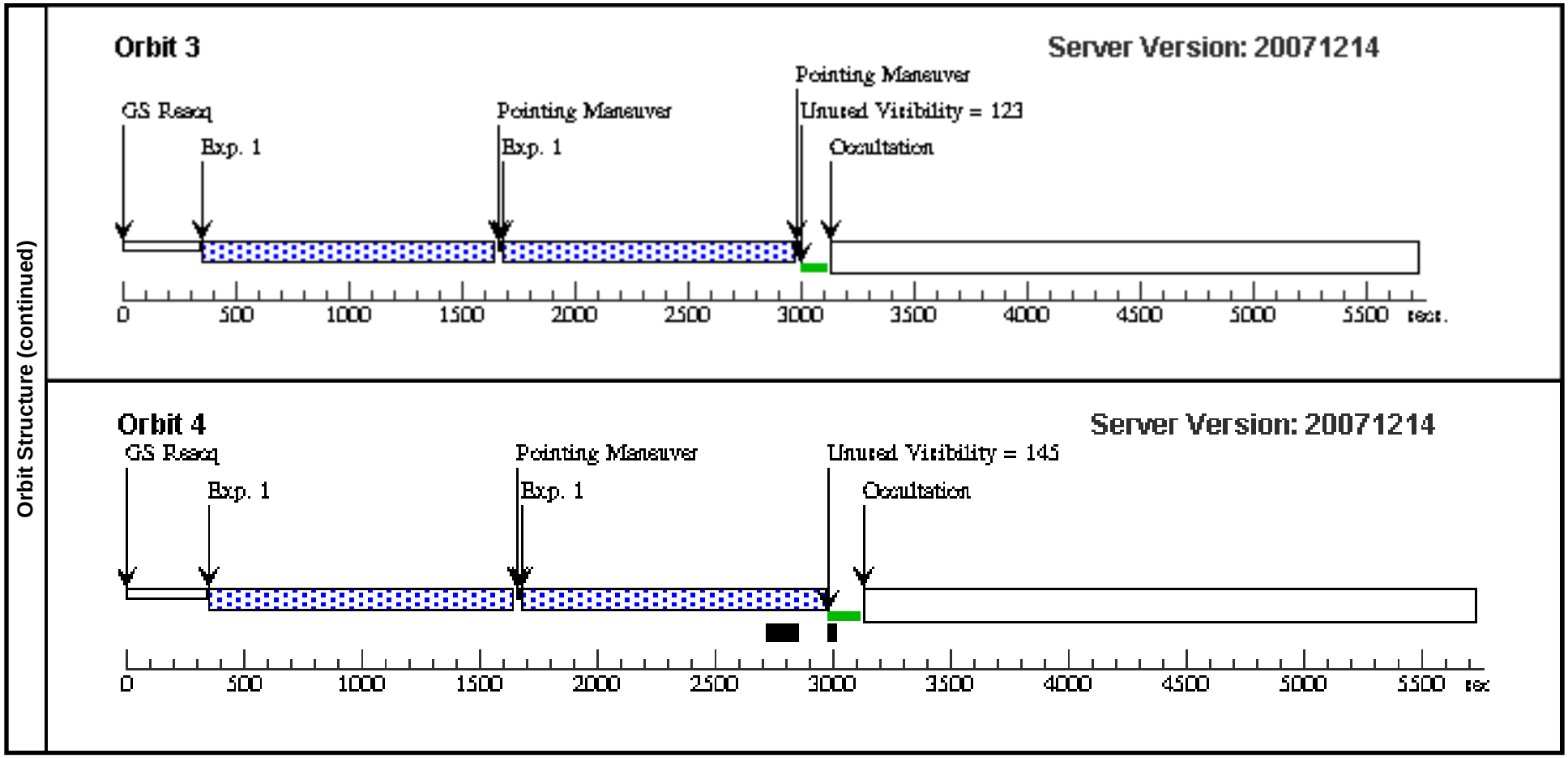
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DADDIF-GAL-CLUS	RA: 14 49 14.4000 (222.3100000d)		V=28	Reference Frame: ICRS
		Dec: +08 56 18.40 (8.93844d)		J=23 AB brightest sources	
		Equinox: J2000			

Comments: The 30" diameter area of interest contain 10--20 targets with faint IR magnitudes, between AB 23 and 26

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) DADDIF-GAL-CLUS	NIC3, MULTIACCUM, NIC3	F160W	NSAMP=22; SAMP-SEQ=SPARS64		Pattern 1-1 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
								[==>(Pattern 5)] *[==>(Pattern 6)]*	***[3]***
								[==>(Pattern 7)] *[==>(Pattern 8)]*	***[4]***


Orbit Structure
Orbit 1
Server Version: 20071214
Pointing Maneuver
Unused Visibility = 121
Pointing Maneuver
Exp. 1
GS Acq Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.
Orbit 2
Server Version: 20071214
Pointing Maneuver
Unused Visibility = 123
Pointing Maneuver
Exp. 1
GS Reacq
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.


Orbit Structure (continued)
Orbit 3
Server Version: 20071214
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 123
Occultation
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.
Orbit 4
Server Version: 20071214
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Unused Visibility = 145
Occultation
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11174, Visit 02 Fri Jan 18 07:01:38 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: NIC3

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=NIC-SPIRAL-DITH	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=0.0		
	Number Of Points=6	Angle Between Sides=		
	Point Spacing=2.1	Center Pattern=false		
	Line Spacing=			

Fixed Targets

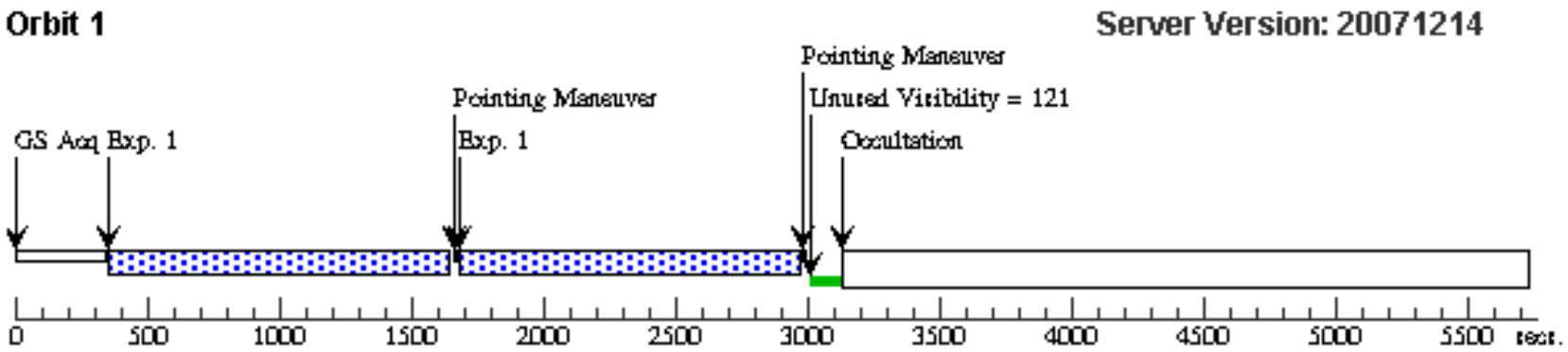
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DADDIF-GAL-CLUS	RA: 14 49 14.4000 (222.3100000d)		V=28	Reference Frame: ICRS
		Dec: +08 56 18.40 (8.93844d)		J=23 AB brightest sources	
		Equinox: J2000			

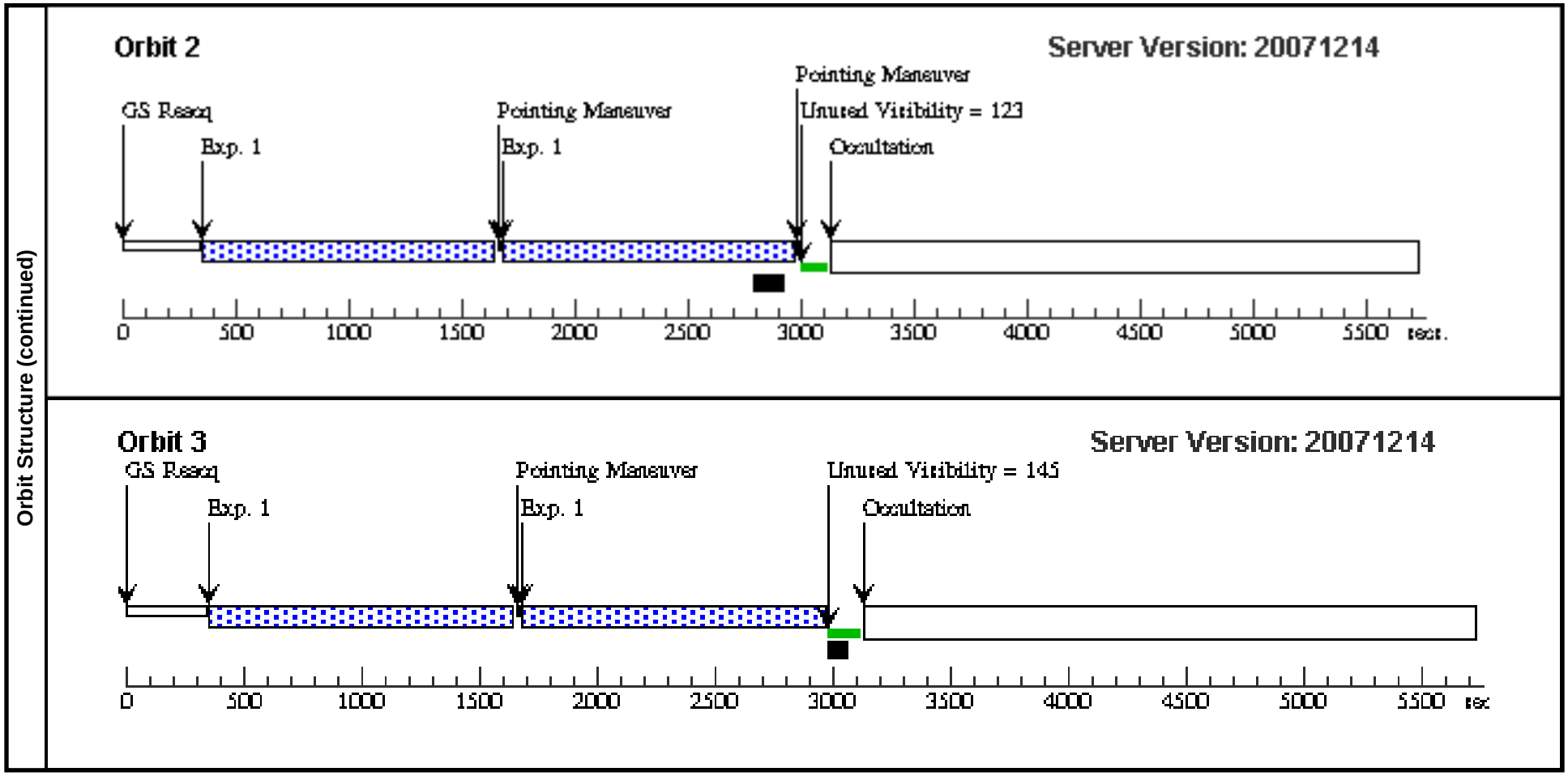
Comments: The 30" diameter area of interest contain 10--20 targets with faint IR magnitudes, between AB 23 and 26

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) DADDIF-GAL-CLUS	NIC3, MULTIACCUM, NIC3	F160W	SAMP-SEQ=SPARS64; NSAMP=22	POS TARG -6.0666 6,0.0	Pattern 1-1 (2)	*[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
								[==>(Pattern 5)] *[==>(Pattern 6)]*	***[3]***

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20071214
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Pointing Maneuver
Unused Visibility = 123
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.
Orbit 3
Server Version: 20071214
GS Reacq
Exp. 1
Pointing Maneuver
Exp. 1
Unused Visibility = 145
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec